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ORTHOPTEROUS GROUP INSARAE

(Tettigoniidae, Phaneropterinae)

by

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A REVISION OF THE ORTHOPTEROUS GROUP INSARAE (TETTIGONIIDAE, PHANEROPTERINAE)

BY JAMES A. G. REHN AND MORGAN HEBARD

Recent extensive collections made in the southwestern United States by the authors have afforded so much material of this little known group, that it has been deemed advisable to study all of the forms and the results of this work are presented in the present paper.

The group Insarae (Hormiliae of Authors) belongs to the family Tettigoniidae and the subfamily Phaneropterinae, in Brunner's classification being preceded by the Tylopsiae and followed by the Scudderiae.

The Insarae are distinguished by the tympanum of the cephalic tibiae being open on both sides, while the limbs are long and slender and the femora have the genicular lobes more or less decidedly produced. The pronotum has the lateral lobes either angularly or roundly inserted, in which latter case it is more or less decidedly sellate. The subgenital plate of the males bears two disto-lateral processes, which in different species are mere tubercles or rather long processes, constituting non-articulate styliform appendages or articulate styles. The ovipositor is short, strongly compressed and more or less decidedly arcuate or bent-arcuate, with dorsal and ventral margins serrate or serrulate distad and having the distal portion of the disk also more or less armed or roughened. No apterous species are known and there is but one species having the tegmina aborted and the wings concealed in the male sex. Certain species are strongly dimorphic in wing length.

The rimate tympanum of the cephalic tibiae readily separates the Tylopsiae from the present group.

The Scudderiae differ in having the male subgenital plate very long and attenuate, curved dorsad with the caudal margin emarginate or fissate (excepting in some species of *Symmetroleura*). The American species of the genus *Symmetroleura* are in fact in some respects intermediate between the two groups, agreeing with the Scudderiae in the general facies, more ample pronotum, shorter limbs and more delicate tegminal venation; the subgenital plate and

cerci of the male showing, however, much closer similarity to the type found in the more northern species of *Insara*, and the armed ventro-cephalic margins of the cephalic and median femora are a not unusual condition in the Insarae, while this character is not found as pronounced elsewhere in the Scudderiae.

The colors given in the treatment of the genus *Arethaea* are taken from Ridgway's recent "Color Standards and Color Nomenclature," in the treatment of the other genera the same authors earlier "Nomenclature of Colors" is used.

The number of specimens examined in the preparation of the present paper was 514; 282 males, 197 females, 1 gynandromorph and 34 nymphs. Of these, 263 were collected by the authors. Through the kindness of other workers and curators we have been able to have before us the historic material in America belonging to this group with but one or two exceptions, and of the few remaining historic specimens of the group now in Europe a number have also been examined. Our thanks to those who have assisted us in this work are more adequately expressed in the discussion of the material in the revisions of the larger genera.

It would have been very pleasing to furnish much more definite keys and generic descriptions, but, through study of the material before us, we have found that one can not be as definite in giving various characters as Brunner in his "Monograph der Phaneropteriden" and "Additamenta zur Monographie der Phaneropteriden," without making misleading and false statements when all of the species are considered.

KEY TO THE GENERA OF THE GROUP INSARAE

- A. Cephalic and median femora not subcarinate disto-dorsad. (Lateral lobes of pronotum angularly inserted.¹ Abdominal segments not dilated, with dorsal margins not produced mesad.)

¹ In using this term some explanation is needed to avoid confusion. Our meaning is that the lateral lobes of the pronotum are joined to the dorsum at an angle, so that these portions are separated by a distinct line. Among the species of the group having this character there are some which have this line further defined by low but distinct carinae, while in *Insara covilleæ* the line is distinct but least pronounced.

The opposite condition is found in the genus *Arethaea*, in which there is no pronounced demarkation between the dorsum and lateral lobes of the pronotum.

- B. Genicular lobes of cephalic, median and caudal femora bearing two spines. Lateral lobes of pronotum with cephalic and caudal margins not directed obliquely ventro-cephalad. Fastigium of vertex smooth and subhorizontal proximad, declivent distad, not in contact with frontal fastigium. Tegmina elongate lanceolate with apex rounded. (Lateral lobes of pronotum with length greater than width. Cerci crassate, apex heavily toothed. Subgenital plate of male very elongate, supplied with articulate styles which are very long for the group.) **Callinsara** Rehn
- BB. Genicular lobes of cephalic, median and caudal femora bearing a single spine. Lateral lobes of pronotum with cephalic and caudal margins directed obliquely ventro-cephalad. Fastigium of vertex declivent, tri-tuberculate proximad, in partial contact with frontal fastigium. Tegmina very broad with apex obliquely truncate. (Lateral lobes of pronotum with length less than width. Cerci crassate proximad, becoming long and slender with apex sharp. Subgenital plate of male not elongate, supplied with small bulbous non-articulate points.) **Dolichocercus** new genus
- AA. Cephalic and median femora briefly subcarinate disto-dorsad.
- B. Fastigium of vertex subhorizontal, in full contact with frontal fastigium with which it presents a deplanate cephalic surface. Lateral lobes of pronotum angularly inserted. Dorsal abdominal segments with margins acute-angulate produced mesad. (Abdominal segments dilated.²)
- C. Fastigium of vertex with dorsal surface on one level. Lateral lobes of pronotum vertical or nearly so. Tegmina long or abbreviate, not aborted. Wings with distal portion exposed, never rudimentary. (Subgenital plate of male bearing articulate styles or non-articulate styli-form appendages. Genicular lobes of cephalic and median femora unispinose or bispinose. Tegmina obliquely truncate or rounded at apex.) **Insara** Walker
- CC. Fastigium of vertex with dorsal surface on three distinct levels. Lateral lobes of pronotum inserted at a more obtuse angle, regularly diverging ventrad. Tegmina aborted. Wings concealed and rudimentary. (Subgenital plate of male bearing non-articulate knobs. Genicular lobes of cephalic and median femora bispinose. Tegmina broadly rounded.) **Brachyinsara** new genus
- BB. Fastigium of vertex declivent, weakly in contact with frontal fastigium with which it does not present a deplanate cephalic surface. Lateral lobes of pronotum roundly inserted (so that the pronotum is more or less decidedly sellate). Dorsal abdominal segments with margins straight or crenulate, not acute-angulate produced mesad.

² The abdomen is more dilated in the species of *Insara* and *Brachyinsara* than in the species of *Arethaea*. Naturally, however, females of all the species have the abdomen usually much more dilated than the males.

(Abdominal segments not as much dilated.) (Lateral lobes of pronotum more or less bullate. Tegmina very long, abbreviate or aborted. Wings with distal portion exposed in all but extremely brachypterous females. Genicular lobes of cephalic and median femora bispinose. Subgenital plate of male very long, supplied with non-articulate styliform appendages or tubercles which vary from rather long to short for the group.).....**Arethaea** Stål

CALLINSARA Rehn

This genus, which includes the single species *Callinsara clupeiennis*, has recently been described and fully treated by the senior author.³ Although nearer relationship is shown to *Dolichocercus* than to the other genera of the group *Insarae*, the present genus differs greatly in general appearance, tegminal structure and important characters of the armament of the limbs, form of fastigium, pronotum, tegmina, wings and genitalia.⁴ This genus is at present known only from the unique male type from the Misiones, in extreme northeastern Argentina, South America, which specimen is in the collection of the Academy of Natural Sciences of Philadelphia.

DOLICHOCERCUS⁵ new genus

1891. *Hormilia* Brunner, Add, Monogr. Phaner., p. 116. (In part.)
 1897. *Hormilia* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, p. 317.
 (In part.)
 1906. *Insara* Kirby. Synon. Catal. Orth., II, p. 443. (In part.)

Genus monotypic. GENOTYPE—*Dolichocercus latipennis* [*Hormilia latipennis*] (Brunner).

This genus is a member of the Phaneropterinae and of the group *Insarae* and is known only from Central America. It shows no close relationship to any other genus of the group, but agrees with *Callinsara* in the non-dilated abdominal segments which have their dorsal margins not produced mesad.⁶

³ 1913. *Callinsara clupeiennis* Rehn, Proc. Acad. Nat. Sci. Phila., 1913, pp. 361 to 364, figs. 25 to 28.

⁴ The most important of these characters are given in the generic key for the group *Insarae* on page 39.

⁵ Δολιχός = long, and κερκίς. In allusion to the very long cerci of the male.

⁶ The two South American species described as *Hormilia fasciata* and *Hormilia peruviana* agree with the present genus in this character and are certainly not members of the genus *Insara*. An attempt to correctly place these species without an examination of the types would be unsatisfactory, but it appears probable that one or both will be found to belong either to the present genus or to closely allied new genera.

Generic Description.—Fastigium of vertex narrow, compressed; bearing three pyramidal projections, one meso-caudad, the others on each side placed at a short distance cephalad of the median projection; this fastigium declivent, in partial contact with the facial fastigium. Eyes sub-globose. Antennae subcrassate proximad. Lateral margins of dorsum of pronotum not constricted, rounded; lateral lobes of pronotum perpendicular to dorsum but set obliquely to it in such a way that the ventro-cephalic angle lies in a position considerably cephalad of the dorso-cephalic angle. Tegmina long and very broad, particularly toward the apex which is obliquely truncate. Wings present. Abdomen weakly dilated, dorsal segments of same not produced mesad. Disto-dorsal segment of male abdomen weakly bilobate; cerci of male exceedingly long, crassate proximad, distal third incurved. Subgenital plate of male with lateral margins produced distad in small, glabrous, bulbous, non-articulate points. Cephalic and median femora with genicular margins not produced meso-dorsad; genicular lobes of same weak, bearing a single spine; ventro-cephalic margins of these femora armed with five or six heavy teeth. Cephalic tibiae with proximal extremity extremely swollen, narrowing very abruptly below the tympanum which organ is open on both sides, dorsal margins of same unarmed except for a single apical spine.

Dolichocercus latipennis (Brunner) (Figs. 1 and 23.)

1891. *Hormilia latipennis* Brunner, Add. Monogr. Phaner, pp. 117-118.

[Chiriqui, Panama (not Costa Rica).]

1897. *H[ormilia] latipennis* Saussure and Pictet, Biol. Cent-Amer., Orth., I, pp. 318, 320. [Chiriqui, Panama (record repeated).]

Type.—♀; Chiriqui, Panama (not Costa Rica). [Dohrn Collection.]

Description of Type.—(Ex Brunner.) “Fusco-testaceous, marmorate with fuscous. Antennae slender, annulate with fuscous and white. Front rounded, punctate with fuscous. Pronotum with lateral lobes roundly inserted, higher than long. Elytra in middle one and one-half times as broad as the length of the pronotum, broader toward the apex, obliquely truncate, radial ramus forked, disappearing before the apex of the elytra, ulnar vein not ramose. Wings acuminate. Anterior femora? Intermediate and posterior femora rounded above, the former distinctly twice annulate with sulphur, below spinulose. Ovipositor a little narrowed, superior margin wholly, inferior margin apically crenulate. ♀.”

Allotype here Selected.—♂ ; Porto Bello, Panama. March 10, 1911. (A. Busck.) [U.S.N.M.]

Description of Allotype.—Size medium for the group, structure delicate. Fastigium of vertex as given in generic description, strongly sulcate cephalad of meso-caudal projection and with lateral margins somewhat thickened cephalad; facial fastigium presenting a flat cephalic surface; antennae beyond proximal joints extremely slender, peculiarly marked and with joints proportionately longer than in the species of *Insara*. Dorsum of pronotum deplanate with a medio-longitudinal and two transverse sulci very weakly indicated, lateral margins subsinuate; lateral lobes of pronotum as given in generic description, the cephalic margin weakly concave in dorsal half and weakly convex in ventral half, ventrocephalic angle broadly rounded at an angle of a little more than ninety degrees, ventral margin rounding evenly into caudal margin which is straight, humeral sinus very broad and deep, roundly angulate at an angle of a little more than ninety degrees. Tegmina and wings as given in the generic description, very delicate in structure. Disto-dorsal segment of abdomen weakly bilobate; supranal plate elongate, lanceolate; cerci exceedingly long, crassate and moderately tuberculate proximad then slender and smooth, narrowing very gradually to sharp apex, distal third curving gently inward thus forming nearly a right-angle; subgenital plate as given in the generic description. Cephalic and median femora as given in generic description, very slender with extreme disto-dorsal portion weakly constricted from base of genicular lobes. Caudal tibiae with all but the proximal portion of the ventral margins armed, genicular lobes elongate although but little produced beyond apex of tibiae and terminating in a single short spine.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of caudal femur	Length of ovipositor
♀ Chiriqui, Panama. (<i>Type</i> ⁷).....	15	2.8	23	5	18.5	6
♂ Porto Bello, Panama. (<i>Allotype</i>)	14.8	3	20.5	5	17.5	

⁷ The measurements here given for the type are quoted from Brunner's original description.

Color Notes.—General color mummy brown shading to walnut brown on limbs and tegmina. The tegmina are somewhat iridescent and the wings, suffused with dark brown, are particularly so. Eyes vandyke brown. Antennae mummy brown, at considerable intervals narrowly and regularly annulate with whitish and very dark brown. Cerci with crassate base and curved apical portion mummy brown, central portion translucent yellowish. The insect has a much more delicate appearance than any species of *Insara*.

Distribution.—The present species is known from but two localities, one in extreme western Panama, the other in the central part of the isthmus.

Remarks.—Though we have been unable to examine the type of Brunner's *Hormilia latipennis*, described from a single mutilated female, we feel assured that the male specimen before us belongs to that species and the characters found warrant the erection of the new genus under which it is here placed.

Specimens Examined: 1; 1 male.

Porto Bello, Panama, March 10, 1911, (A. Busck), 1♂. *Allotype*. [U.S. N. M.]

INSARA Walker

1859. *Phaneroptera* Saussure (not of Serville, 1831), Rev. et Mag. de Zool., 2e Ser. XI, p. 201.
1869. *Insara* Walker, Cat. Dermap. Saltat. Br. Mus., II, p. 267.
1873. *Hormilia* Stål, Öfv. Vetensk.-Akad. Förh. xxx, No. 4, p. 41.
1874. *Hormilia* Stål, Recens. Orth., II, p. 28.
1878. *Hormilia* Brunner, Monogr. Phaner., p. 230.
1891. *Hormilia* Brunner, Add. Monogr. Phaner., p. 116. (In part.)
1895. *Hormilia* Bruner, Bull. Lab. Nat. Hist. Univ. Iowa, III, Pt. 3, p. 65.
1896. *Hormilia* Griffini, Boll. Mus. Zool. Univ. Torino, XI, No. 232, p. 13.
1897. *Hormilia* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, p. 317. (In part.)
1900. *Hormilia* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 96.
1900. *Hormilia* Cockerell, Amer. Nat., XXXIV, p. 290.
1900. *Arethaea* Scudder (not of Stål, 1876), Can. Ent., XXXII, p. 332.
1900. *Hormilia* Biolley, Tomado del Informe Mus. Nat. Costa Rica, 1899-1900, p. 50.
1902. *Hormilia* Scudder and Cockerell, Proc. Davenp. Acad. Sci., IX, p. 52.
1902. *Hormilia* Rehn, Trans. Amer. Ent. Soc., XXIX, p. 20.
1904. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542.
1904. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 572.
1905. *Hormilia* Caudell, Proc. U. S. Nat. Mus., XXVIII, p. 477.

1906. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 806.
 1906. *Insara* Kirby, Synon. Catal. Orth., II, p. 442. (In part.)
 1907. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila. 1907, p. 58.
 1907. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 78.
 1907. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 78.
 1909. *Hormilia* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 167.
 1909. *Hormilia* Rehn and Hebard, Acad. Nat. Sci. Phila., 1909, p. 474.

Genus monotypic. GENOTYPE—*Insara strigulata* Walker = *Insara tolteca* [*Phaneroptera tolteca*] (Saussure).

This genus is a member of the Phaneropterinae and of the group Insarae (*Hormiliae* of Brunner, 1878), to which group the genera *Callinsara*, *Dolichocercus*, *Brachyinsara* and *Arethaea* also belong. The genus appears to be peculiar to North and Central America; the two species credited to it (as *Hormilia*) from South America belonging with little doubt to an allied genus. The remaining described genera belonging to the group Insarae are also peculiar to North and Central America, with the exception of *Callinsara* which is known only from South America.

Generic Description.—Fastigium of vertex narrow, compressed, subequal, subhorizontal, with a decided medio-longitudinal sulcation, lateral margins roundly elevated; fastigium of vertex in contact with facial fastigium, the two presenting a flat cephalic surface, their lateral aspect presenting an outline which forms a sharply rounded angle of a little more than ninety degrees. Antennae subcrassate proximad, from three to five times the length of the body. Pronotum not at all or decidedly constricted in the mesocephalic portion; dorsum flat or deeply sellate, bounded laterad by clearly defined angulations or low but distinct lateral carinae; lateral lobes angularly inserted, perpendicular or nearly so, caudal margin of same more or less arcuate; humeral sinus distinct or indicated only by a very feeble sinuation. Tegmina very long or abbreviate, rather broad or very narrow; apex of same obliquely truncate or rounded. Wings present. Abdomen more or less dilated; dorsal segments more or less acute-angulate produced mesad; disto-dorsal segment of males having a more or less pronounced and extensive depression. Cerci of males short or long, straight or incurved either evenly or with a decided angulation, crassate; apex of same toothed, this tooth directed meso-dorsad or dorsad at an angle to the cercus. Subgenital plate of male short, lateral margins narrowing distad and produced in articulate or

non-articulate styliform appendages; distal margin between these appendages broadly and roundly emarginate or sinuato-truncate or obtuse-angulate produced. Ovipositor from about one to one and two-thirds times the length of the pronotal disk, deep, more or less sharply bent upward at base, arcuate; apex more or less roundly acuminate; bent portion of dorsal margin and distal portion of ventral margin finely serrate. Subgenital plate of female short or elongate, triangular or lanceolate or scutiform, with immediate apex rounded or angulato-emarginate; a medio-longitudinal sulcus present proximad. Limbs more or less elongate. Cephalic and median femora carinate disto-dorsad for a short distance with distal margin of same more or less produced; genicular lobes of same produced, unispinose or bispinose. Cephalic tibiae with proximal extremity much swollen, narrowing decidedly or appreciably below tympanum which organ is open on both faces.

Classification.—From a systematic standpoint the present genus is divided into two natural groups, the first of these has the genicular lobes of the cephalic and median femora produced in a single dentiform process. All of the species having this character are further separable by characters of the tegmina, which are obliquely truncate at the apex, and of the male subgenital plate, which is supplied with distinct articulate styles. The species belonging to this first group are *I. tolteca*, *intermedia*, *bolivari* and *prasina*. Of these, the first three species are closely related, while the latter species is a very aberrant and distinctive insect, distinguished particularly by its size, coloration and great tegminal width. No species belonging to this group is found as far north as the Rio Grande.

The second group of the genus has the genicular lobes of the cephalic and median femora produced in a dentiform process, but having in addition a small spine on the ventral margin of this process. All of the species having this character are further separable by characters of the tegmina, which are rounded at the apex, and of the male subgenital plate, which is supplied with distinct but non-articulate styliform appendages or knobs. The first two species belonging to this group, *I. phthisica* and *gracillima*, are also southern in distribution and are very different from any of the others; they differ from the three normal species of the first group in the group characters given above, and also in being more at-

tenuate and lacking the distinctive dorsal abdominal marking which is present in all of those species, but in appearance they show a decided general similarity to those species and agree with the first group also in the character of the proximal portion of the cephalic tibiae, which is more swollen and narrows more abruptly below the tympanum than in any of the other species of the second group. All of the forms found north of the Rio Grande, *I. elegans*, *elegans consuetipes*, *apache*, *covilleae* and *gemmicula*, show a general relationship, one of the most striking features of which is the pale green coloration, more or less maculate in all but *I. apache*. To the second group also belongs *I. lamellata*, known only from Lower California. The remaining species, *I. abbreviata*, is a very aberrant member of the second group, unique in form of pronotum, tegmina and male subgenital plate; it is known only from central Mexico.

Notes on Spination.—The armament of the distal portion of the cephalic and median femora is constant in the present genus and furnishes important characters. It has, on the other hand, seemed undesirable to include in the specific descriptions data concerning the armament of the ventro-cephalic margins of the cephalic and median femora, (the ventro-caudal margins are always unarmed) owing to the fact that the small spines there found are exceedingly variable in number and are, not infrequently, wholly absent in species which usually possess them. We have, however, noted that *I. prasina* bears in most cases the greatest number of such spines (as high as 6-5 for the cephalic and 5-4 for the median femora), while individuals of the other species, belonging to the group of which *I. tolteca* is a member, are usually supplied with several spines on each of these margins.⁸ The remaining species of the genus have in most cases one or two of these spines on each of the ventro-cephalic margins of the cephalic and median femora with the exception of *apache*, *abbreviata*, *gemmicula* and *covilleae* which species have these margins unarmed.

Morphological Notes on Genitalia.—Important characters of the male subgenital plate exist, as given in the above classification. Cercal characters are present in this genus and may be used to separate a number of the species. The cerci are, however, not forked or serrate in any of the species, the differences lying in their

⁸ See footnote under description of *I. phthisica*, p. 47.

length, heaviness, degree and regularity of curvature and the size and direction of the apical tooth with which they are always armed. Characters of the ovipositor are few, differences in the degree of sharpness of the upward curvature being sometimes important, particularly in separating *I. elegans* from *I. elegans consuetipes*, which latter geographic race has the ovipositor not nearly as sharply bent upward. The margins of the ovipositor do not acquire serrations until the mature condition is reached; these serrations are in the shape of isosceles triangles, their apices frequently blunt and rounded. The subgenital plate in the females presents several distinct forms as treated in the generic description, but a certain amount of specific variation is found and it seems advisable to use this character only in conjunction with a general study of each species.

Notes on Tegmina.—The venation of the tegmina does not appear to be of importance as a source of group or specific characters. The tegminal outline is of the greatest use in separating the genus into two groups and is also important in separating *I. elegans* from its geographic race, *elegans consuetipes*. Variation in tegminal length is pronounced in *I. intermedia* alone. In the other species of the present genus the tegminal length is found to vary to a decidedly limited degree.

Notes on Color Pattern.—In the present group the color pattern is important and affords, in a number of cases, valid specific characters. In the normally brown species which are streaked and speckled with darker, *I. tolteca*, *intermedia*, *bolivari*, *phthisica* and *gracillima*, we find that the first three species bear meso-dorsad on the second and third dorsal abdominal segments a distinctive and striking trapeziform spot; in the remaining two species the sides of the median and first four dorsal abdominal segments are more irregularly and much less strikingly marked with dark brown. *I. prasina* is distinguished from all of the other species by its apple green coloration and the fact that the fourth abdominal segment bears on each side a conspicuous small rounded black spot or dot, situated near the caudal margin of the segment. The only species of the genus having the dorsal abdominal segments immaculate are *I. apache* and *abbreviata*; the former species is immaculate chromium green in general coloration, the latter is the only species which is practically immaculate in general coloration yet exhibiting both a

pale green and a brown color phase. The remaining forms, *I. elegans*, *elegans consuetipes*, *covilleae* and *gemmicula*, known almost wholly from north of the Mexican boundary, all (excepting *elegans consuetipes*) invariably have a dark brown maculation present on each side of the fourth abdominal segment near its caudal margin, which margin caudad of this maculation is paler than the general coloration of the abdomen. This marking is greatly intensified and specialized in *gemmicula*; much intensified, with the pale caudal margin very pronounced, in *covilleae*; not strikingly prominent in *elegans*, and very much reduced, often absent in *elegans consuetipes*. The general color pattern is distinctive in each of these species.

History.—In 1869, Walker erected the monotypic genus *Insara*⁹ and described the species *strigulata*; Kirby, in 1906,¹⁰ recognizing this species to be a synonym of Saussure's *Phaneroptera tolteca*,¹¹ described in 1859, correctly associated these names.

Unfortunately Walker's genus *Insara* was unrecognized by Stål in 1873, which resulted in his erecting the synonymic genus *Hormilia*¹² which latter name has been used throughout the literature to the present date excepting in Kirby's Catalogue.

In 1878, Brunner¹³ described four species as *H. gracillima*, *intermedia*, *abbreviata* and *fasciata*. The first three species belong to the present genus, but the South American species, *fasciata*, which the author suggested might be considered a member of a different genus, does not belong to *Insara* as the characters given for that species unquestionably show.

The same author also described two species in 1891¹⁴ *H. peruviana* and *latipennis*. The original descriptions prove that these species are not members of the genus *Insara* and we have been enabled through the examination of a male of *latipennis* to erect for it a new genus, *Dolichocercus*, in the present paper.

Griffini, in 1896, described a single species, *H. bolivari*¹⁵ and the

⁹ Cat. Dermap. Saltat. Br. Mus., II, p. 267.

¹⁰ Synon. Catal. Orth., II, p. 442.

¹¹ Rev. et Mag. de Zool., 2e Ser., XI, p. 201.

¹² Ofv. Vetensk.-Akad. Förh., XXX, No. 4, p. 41.

¹³ Monogr. Phaner., p. 231.

¹⁴ Add. Monogr. Phaner., p. 117.

¹⁵ Boll. Mus. Zool. Univ. Torino, XI, No. 232, p. 13.

following year two species, *H. phthisica* and *prasina*, were described by Saussure and Pictet.¹⁶

In 1900, Scudder described *H. elegans*¹⁷ and but little later in the same year *Arethaea consuetipes*,¹⁸ which latter species we have found through previous examination of the type and present study of the paratype to be a geographic race of *I. elegans*. Scudder referred this species to *Arethaea* through failure to compare his material with *I. elegans*, apparently basing his decision solely on Brunner's incorrect key character regarding the presence or absence of styles on the male subgenital plate as separating *Insara* (*Hormilia*) from *Arethaea*.

Rehn, in 1907, described a single species as *H. apache*.¹⁹

Material Examined.—239; 124 males, 99 females, 1 gynandromorph and 15 nymphs.

Nearly half of these specimens (111) were taken by the authors on recent trips and are located in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. Of the remaining specimens we find 65 in the Hebard Collection; 33 in the Academy of Natural Sciences of Philadelphia and 12, the entire series of the genus in the United States National Museum, were loaned to us through the kindness of Mr. A. N. Caudell. The remaining 18 specimens we have been able to examine through the kindness of the authorities in charge of the British Museum, Scudder Collection, American Museum of Natural History, Brooklyn Institute of Arts and Sciences, and the University of Kansas. To those who have so kindly assisted us we wish to express our hearty thanks.

In the preparation of the present paper the types of the following species have been examined by us.

(*Insara strigulata* Walker, synonym of *Insara tolteca* (Saussure).)

Insara prasina (Saussure and Pictet)

Insara phthisica (Saussure and Pictet)

Insara elegans (Scudder)

Insara elegans consuetipes (Scudder)

¹⁶ Biol. Cent.-Amer., Orth., I, p. 318.

¹⁷ Proc. Davenp. Acad. Sci., VIII, p. 96.

¹⁸ Can. Ent., XXXII, p. 332.

¹⁹ Proc. Acad. Nat. Sci. Phila., 1907, p. 58.

Insara apache (Rehn)

Insara covilleae n. sp.

Insara gemmicula n. sp.

Insara lamellata n. sp.

KEY TO THE SPECIES OF THE GENUS *INSARA*

- A. Subgenital plate of male with distinct articulate styles. Genuicular lobes of cephalic and median femora produced in a single dentiform process bearing no small supplementary spine. (Cephalic tibiae with proximal extremity much swollen, narrowing sharply distad of tympanum.) Tegmina obliquely truncate at apex. Dorsal abdominal segments strongly acute-angulate produced mesad.
- B. Tegmina narrow, distal width greater than mesal width. (General color varying from ochraceous to seal brown, more or less marmorate with darker browns; rarely suffused with green.)
- C. Lateral carinae of dorsum of pronotum from narrowest point gently concavo-divergent in the cephalic third, then as arcuately divergent caudad without a distinct angulation. (Tegmina reaching beyond distal extremities of caudal femora. Lateral lobes of pronotum with length subequal to depth.)
- tolteca** (Saussure)
- CC. Lateral carinae of dorsum of pronotum from narrowest point distinctly convexo-divergent in the cephalic third, then arcuately divergent caudad with a decided though obtuse angulation.
- D. Size smaller. Tegmina usually not reaching distal extremities of caudal femora. Lateral lobes of pronotum with length slightly less than depth.....**intermedia** (Brunner)
- DD. Size larger. Tegmina reaching beyond distal extremities of caudal femora. Lateral lobes of pronotum with length often considerably less than depth.
- bolivari**' (Griffini)
- BB. Tegmina very wide throughout, distal width subequal to mesal width. (Lateral lobes of pronotum with length subequal to depth. General color immaculate apple green.)
- prasina** (Saussure and Pictet)
- AA. Subgenital plate of male bearing non-articulate styliform appendages. Genuicular lobes of cephalic and median femora produced in a single dentiform process bearing a small supplementary spine. Tegmina rounded at apex, (proximal width the greatest). Dorsal abdominal segments weakly acute-angulate produced mesad.
- B. Cephalic tibiae with proximal extremity much swollen, narrowing sharply distad of tympanum. Structure very slender. General color varying from ochraceous to seal brown, more or less marmorate with darker browns.
- C. Structure showing extreme attenuation. Lateral lobes of pronotum with length much greater than depth.
- phthisica** (Saussure and Pictet)

- CC. Structure not as attenuate. Lateral lobes of pronotum with length greater than depth.....**gracillima** (Brunner)
- BB. Cephalic tibiae with proximal extremity somewhat swollen, narrowing gradually distad of tympanum. Structure not as slender. General color green (with exception of brown color phase of *I. abbreviata*).
- C. Dorsum of pronotum deplanate.
- D. Lateral lobes of pronotum with length subequal to depth. Lateral margins of dorsum of pronotum not carinate.
- E. Limbs normal.
- F. Structure slender. Tegmina narrow.
- G. Size medium. Distal portion of tegmina and wings narrow.
- H. Structure slender. Marginal field of tegmina narrowing abruptly distad from proximal third. Ovipositor bent sharply upward. Tegmina marked with a herring-bone pattern, often very decidedly.
elegans (Scudder)
- HH. Structure more slender. Marginal field of tegmina narrowing gradually distad. Ovipositor bent broadly upward. Tegmina immaculate or nearly so.
elegans consuetipes (Scudder)
- GG. Size very small. Distal portion of tegmina and wings exceedingly narrow. (Marginal field of tegmina narrowing abruptly distad from proximal third. Insect strikingly marked with cinnamon, cream color, black and white.).....**gemmicula** new species
- FF. Structure robust. Tegmina broad, marginal field narrowing gradually distad. (Ovipositor bent sharply upward. General color immaculate green.).....**apache** (Rehn)
- EE. Limbs unusually short and heavy with ventral margins of cephalic and median femora becoming sub-lamelate distad. (Ovipositor very long, evenly and gently arcuate.).....**lamellata** new species
- DD. Lateral lobes of pronotum with length considerably greater than depth. Lateral margins of dorsum of pronotum carinate. (Tegmina abbreviate. Limbs very long and attenuate. Humeral sinus indicated by a very slight sinuation. General color immaculate green or nearly immaculate brown.).....**abbreviata** (Brunner)
- CC. Dorsum of pronotum not deplanate, pronotum extremely sellate. (Other key characters the same as those given for

I. elegans excepting color pattern. Tegmina conspicuously marked with a series of large spots, white or pale greenish in color.).....**covilleae** new species

Insara tolteca (Saussure) (Figs. 3 and 4.)

1859. *Phaneroptera tolteca* Saussure, Rev. et Mag. de Zool., 2e Ser., XI, p. 201. [Mexico.]
1869. *Insara strigulata* Walker, Cat. Dermap. Saltat. Br. Mus., II, p. 268. [Oajaca, Mexico; Orizaba, Mexico.]
1874. *H[ormilia] tolteca* Stål, Recens. Orth., II, p. 28. [Mexico.]
1878. *H[ormilia] tolteca* Brunner, Monogr. Phaner., pp. 231, 232. [Mexico.]
1897. *Hormilia tolteca* Saussure and Pictet, Biol. Cent-Amer., Orth., I, pp. 318, 319, pl. 15, figs. 10-13. (In part.) [Mexico; Cordova, Mexico; Atoyac, Vera Cruz, Mexico; Orizaba, Mexico; Teapa, Tabasco, Mexico; Las Mercedes, Guatemala; Torola, Guatemala; San José, Costa Rica.]
1900. *H[ormilia] tolteca* Biolley, Inf. Mus. Nat. Costa Rica, 1899-1900. p. 51. [San José, Costa Rica.]

The present species is closely related to *I. intermedia* and *I. bolivari*, though the lateral carinae of the dorsum of the pronotum are distinctive. From the former species it may be further distinguished by its greater size, usually longer tegmina and wings, less constricted dorsum of the pronotum and somewhat shallower lateral lobes of the same. From *bolivari* it may be also separated by its much less constricted dorsum of the pronotum and considerably shallower lateral lobes of the same. In the slight degree of constriction of the dorsum of the pronotum the present species rather resembles *I. gracillima*. The superficial resemblance of this species to the longer winged individuals of *intermedia* and to *bolivari* is striking, and both *I. phthisica* and *I. gracillima* have also a superficially similar appearance, though these latter species are much more slender.

Type.—♀; Mexico. [Presumably in Geneva Museum.]

The following description is based upon a specimen identified and recorded as *tolteca* by Saussure and now in the Academy of Natural Sciences of Philadelphia.

Description.—♂; Teapa, Tabasco, Mexico. March. (H. H. Smith.)

Size medium for the genus, form rather slender. Head with greatest width contained about one and three-quarters times in the depth, occiput rounded, slightly declivent toward the fastigium, the latter narrow, com-

pressed, subequal, with an appreciable medio-longitudinal sulcus on the dorsal surface, lateral margins roundly elevated, fastigium in contact with frontal fastigium for the full width of both; eyes large, prominent, ovate in outline, slightly less in length than the infra-ocular portion of the genae. Pronotum with dorsal length about one and four-tenths the greatest (caudal) dorsal width; dorsum of pronotum very slightly depressed within the margins; lateral carinae of dorsum of pronotum gently concavo-divergent in the cephalic third, then as gently arcuato-divergent caudad without a distinct angulation; cephalic margin of dorsum of pronotum straight, caudal margin of same arcuate, lightly emarginate mesad; lateral lobes of pronotum with length subequal to depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle rather broadly rounded, the caudal margin arcuate, the humeral sinus deep, roundly acute-angulate. Tegmina long and narrow, the distal width greater than the mesal width, the tegmina reach beyond the distal extremities of the caudal femora and are obliquely truncate at the apex with the angles very narrowly rounded; marginal field of tegmina narrowing evenly distad from point of greatest width which is proximad. Disto-dorsal segment of abdomen with greater part of surface occupied by a subdepressed area, hexagonal in shape; supra-anal plate rather long, broadly trigonal, with lateral margins somewhat convex; cerci short, straight, crassate, tapering to a blunt apex, the apex toothed, this tooth directed at an angle meso-dorsad; subgenital plate short, lateral margins convergent distad, distal extremity sinuato-truncate, bearing laterad short slender articulate styles, cephalad from the base of the styles extend slightly divergent rounded elevations which become obsolete about the middle of the plate. Cephalic and median limbs slender, the cephalic and median femora carinate dorso-distad for a very short distance with distal margin of same bluntly rectangulate, genicular lobes spiniform; cephalic tibiae with proximal extremity much swollen, narrowing sharply below the tympanum, median tibiae slightly expanded proximad. Caudal femora shorter than the tegmina by more than the greatest pronotal length, the proximal half moderately bullate, genicular lobes decidedly acute-angulate produced with the immediate apex narrowly rounded.

A female, bearing the same data as the male here described, furnishes the additional information given below.

Description of Female.—Very much like male in size and general appearance. Ovipositor nearly equal to cephalic femur in length, broad, sharply bent at the base, the bent portion of dorsal margin and distal half of ventral margin finely serrate; subgenital plate elongate-lanceolate with immediate apex very narrowly rectangulate emarginate, in transverse section this plate is narrowly U-shaped and embraces the base of the ovipositor.

Measurements (in millimeters) of individuals treated above

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Teapa, Tabasco, Mexico.....	16	3.8	24.8	3	3.6	28.9	20	
♀ Teapa, Tabasco, Mexico.....	16	3.8	24.5	2.9 ²⁰	3.4 ²⁰	27.9	19.6	5

Color Notes.—The general color of the two specimens, here treated fully, is raw umber darkening to mummy brown on face, sides of head, lateral lobes of pronotum, proximal portion of marginal field of tegmina and on all of the femora; the cephalic and median femora, however, are distinctly once-banded with the lighter shade. The tegmina are irregularly and finely marked with darker brown, which gives the insects a more or less speckled and streaked appearance. The second and third dorsal abdominal segments are marked dorsad with a large and striking trapeziform spot of velvety-appearing bistre, this spot is sometimes margined laterad with a very fine yellowish line. One specimen before us from San Rafael (Jicaltepec), Vera Cruz, Mexico is noticeably suffused with greenish and in life was probably quite green in color.

Distribution.—The species is known to occur in Mexico, north as far as Jicaltepec, Vera Cruz, southward to Oaxaca, and Tonalá, in Chiapas, and eastward to Teapa in Tabasco and La Zacualpa in Chiapas; south of this it has been taken at Las Mercedes, Olas de Moka and Torola in Guatemala and San José in Costa Rica, this latter the southernmost record.

Biological Notes.—Professor P. Biolley gives us the following note on the habits of the insect about San José, Costa Rica. "It jumps about in the grass with much agility, the insect reaches maturity in August or September."

Synonymy.—In 1869, Walker described the genus *Insara* and the species *strigulata*; this species is a synonym of Saussure's *tolteca* as Kirby stated in his Synonymic Catalogue of Orthoptera

²⁰ These two measurements are taken from another female of the same size as that sent by Saussure, as in the latter specimen the tegmina are much damaged.

in 1906. We have examined the types of *Insara strigulata* and, from these, here select as the single type a female from Oaxaca, Mexico now in the British Museum.

Specimens Examined: 10;²¹ 5 males, 5 females.

San Rafael (Jicaltepec), Vera Cruz, Mexico, July 1, 1♂, 1♀, [Hebard Collection].

Motzorongo, Vera Cruz, Mexico, February 13, 1903, (L. Bruner), 1♂, [Hebard Collection].

La Buena Ventura, Vera Cruz, Mexico, 1909, 1♂, [Am. Mus. Nat. Hist.].

Teapa, Tabasco, Mexico, March, (H. H. Smith), 1♂, 1♀, [A. N. S. P.].

La Zacualpa, NE. of Tuxtla, Chiapas, Mexico, 1909, 1♂, [Am. Mus. Nat. Hist.].

Tonala, SW. of Tuxtla, Chiapas, Mexico, August, 1909, 2♀, [Am. Mus. Nat. Hist. and Hebard Collections].

Olas de Moka, Solola, Guatemala, September, 1898, (Englehardt), 1♀, [U. S. N. M.].

Insara intermedia (Brunner) (Figs. 5 and 6.)

1878. *H[ormilia] intermedia* Brunner, Monogr. Phaner., pp. 231, 232. [Cordova, Mexico; Guatemala.]

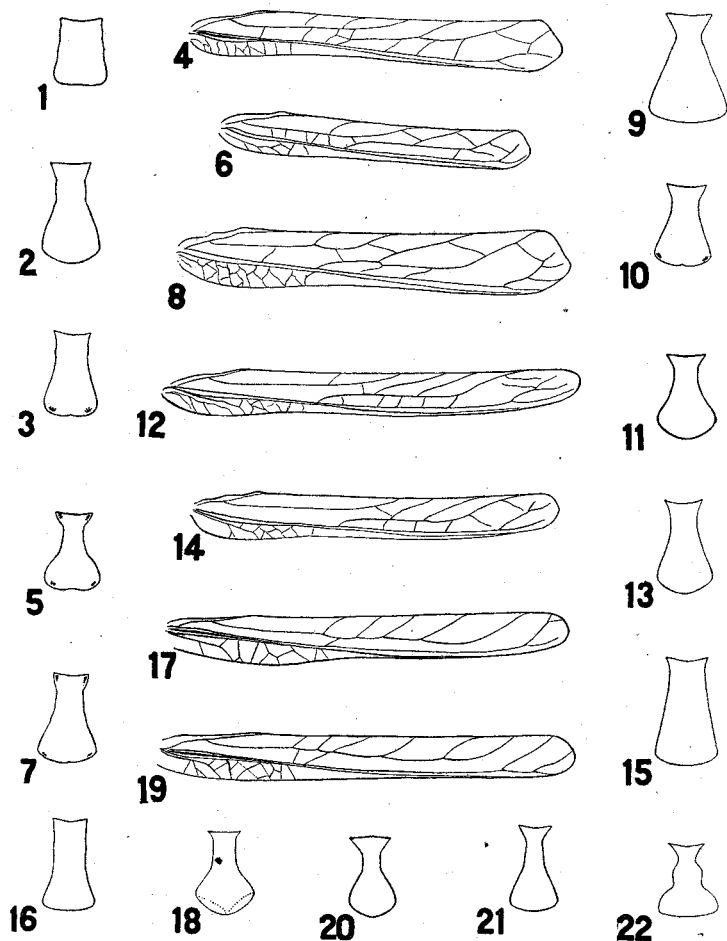
1897. *Hormilia intermedia* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318, 319. [Orizaba, Mexico; Capetillo, San Geronimo, Guatemala; Chontales, Nicaragua; Caché, Costa Rica.]

1900. *H[ormilia] intermedia* Biolley, Inf. Mus. Nat. Costa Rica, 1899-1900, p. 51. [San José, Costa Rica.]

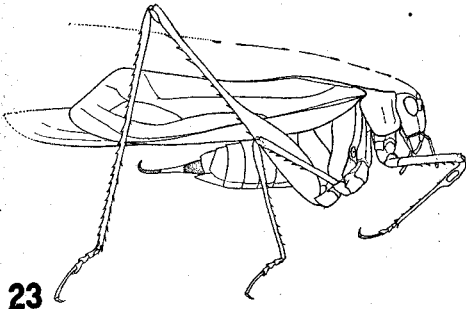
1906. *Hormilia intermedia* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 806. [Monte Redondo, Costa Rica; Guatel, Costa Rica; Piedras Negras, Costa Rica.]

The present species, though very closely allied to *I. tolteca*, may be readily distinguished by its smaller size, more compact structure, usually considerably shorter tegmina and wings, more constricted dorsum of the pronotum and somewhat deeper lateral lobes of the same. In its compact structure, constricted dorsum of the pronotum and lateral lobes with length less than depth, this insect shows a very close affinity to *I. bolivari*, which species is, however, much larger, longer in fact than *tolteca*, with long tegmina and wings, while the lateral lobes of the pronotum in *bolivari* differ in having their length usually considerably less than their depth.

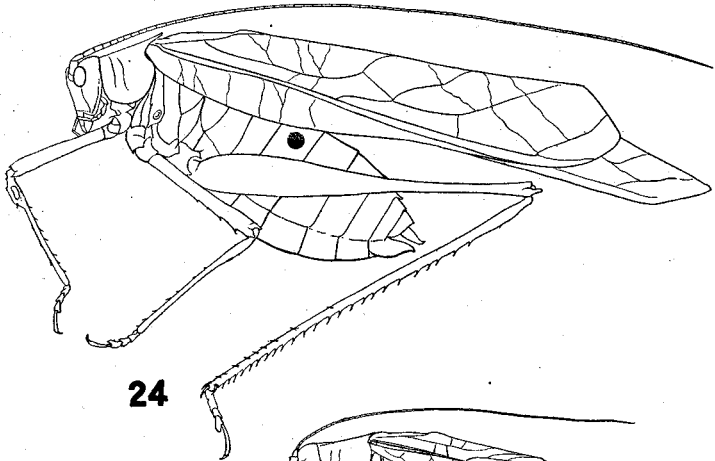
²¹ The specimens recorded as this species in the Biologia have been examined and all found to be correctly determined with the exception of the individuals from the Volcan de Chiriqui, Panama, which belong instead under *Insara bolivari* (Griffini).



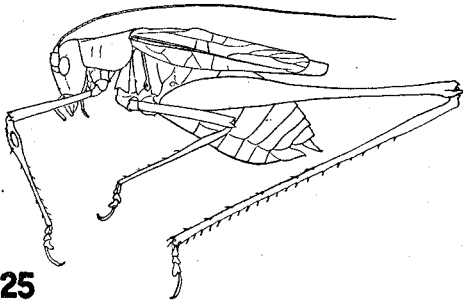
Male tegminal outline and dorsal outline of pronotum of species of *Dolichocercus*, *Insara* and *Brachyinsara*. Tegminal outlines $\times 2$ unless otherwise indicated, pronotal outlines $\times 3$. Fig. 1, *Dolichocercus latipennis*; 2 and 12, *Insara phthisica*; 3 and 4, *I. tolteca*; 5 and 6, *I. intermedia*; 7 and 8, *I. bolivari*; 9, *I. prasina*; 10 and 14, *I. gracillima*; 11 and 17 ($\times 2\frac{1}{2}$), *I. elegans*; 13 and 19 (♀ , $\times 2\frac{1}{2}$) *I. elegans consuetipes*; 15, *I. apache*; 16, *I. abbreviata*; 18, *I. covilleae*; 20, *I. gemmicula*; 21, *I. lamellata*; 22, *Brachyinsara magdalenae*.



23



24



25

Lateral outlines of males here described. ($\times 2$) Fig. 23, *Dolichocercus latipennis*; 24, *Insara prasina*; 25, *Insara abbreviata*.

The small size and usually short wings of *intermedia* give the species a different general appearance from any of the other forms.

Types.—♂ and ♀; Cordova, Mexico; Guatemala. [All in Geneva Museum.]

The following description is based upon a male taken at a locality from which the authors have a large series of specimens.

Description.—♂; Juan Viñas, Costa Rica. March 1, 1902. (L. Bruner.) [Hebard Collection.]

Size fairly small for the genus, form rather more compact than usual. Head and eyes very much as in *I. tolteca*. Pronotum with dorsal length about one and four-tenths the greatest (caudal) dorsal width; dorsum of pronotum slightly depressed within the margins; lateral carinae of dorsum of pronotum distinctly convexo-divergent in the cephalic third, then arcuato-divergent caudad with a decided though obtuse angle: cephalic margin of dorsum of pronotum straight, caudal margin of same arcuate, lightly emarginate mesad, this emargination more pronounced than in *tolteca*: lateral lobes of pronotum with length less than depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle rather broadly rounded, these angles differing less noticeably from each other than in *tolteca*, the humeral sinus deep, roundly acute-angulate. Tegmina rather short and narrow, the distal width very slightly greater than the mesal width, marginal field as in *tolteca*; in this specimen the tegmina reach the distal extremities of the caudal femora and are truncate at the apex, less obliquely than in *tolteca*. Disto-dorsal segment of the abdomen similar to that of *tolteca* but shorter; supra-anal plate as in that species; cerci short, straight, crassate, scarcely tapering to a blunt apex, the apex toothed, this tooth directed meso-dorsad at a right angle; subgenital plate similar to that of *tolteca*, very slightly broader. Limbs much as in *tolteca*, the caudal femora proportionately shorter and more bullate.

A female bearing the same data as the male described above furnishes the additional information given below.

Description of Female.—Somewhat more compact than the male with proportionately shorter tegmina and wings which do not reach the tips of the caudal femora, though the caudal femora are likewise shorter than in the male. Ovipositor similar to that of *tolteca*; subgenital plate elongate, scutiform, considerably emarginate laterad with narrow apex broadly rounded, in transverse section cephalad this plate is W-shaped, rotundato-angulate with the median sulcation shallow, and embraces the base of the ovipositor.

Color Notes.—The general color of the male specimen described above is a pale shade of raw umber which darkens to mummy brown on face, sides of head, dorsal portion of lateral lobes of pronotum and proximal portion of the marginal field of the tegmina, and to raw umber on the limbs; this color pattern is practically the same as that found in *tolteca* and the cephalic and median femora

are likewise once banded with the lighter shade. The tegmina are also finely and irregularly marked with darker brown which gives the insects a more or less speckled and streaked appearance. The second and third abdominal segments are marked as in *tolteca*, the spot in the present species being even more intense and the lateral yellowish line by which it is margined is usually very distinct. Half of the specimens before us are of this general coloration.

The female described above has the general color hair brown, with the dorsal surface of the head and disk of the pronotum buff, while all the other markings are in sharper contrast and the general aspect is darker. The other half of the series before us agrees with this specimen, with the exception of the two longer-winged males referred to in the measurements given above, and a very short-winged female from San José, Costa Rica, the color of which three specimens indicates that in life they were much suffused with pale green of an olive shade.

Professor Biolley, in speaking of living individuals of this species, states that "they differ from the former species (*tolteca*)—above all by the green color of the feet and abdomen" The writer comments on not having seen this character of coloration mentioned in descriptions of the species, probably because the authors had no fresh specimens at hand. None of the specimens before us have retained the slightest trace of such coloration.

Measurements (in millimeters) of individuals treated above

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Juan Viñas, Costa Rica	15.8	3.1	20.8	2.8	3	24	19	
♀ Juan Viñas, Costa Rica	14.5	3.1	15.5	2	2.2	17.5	16.9	4.9

The series before us indicates that the females of this species, as a rule, have the tegmina and wings shorter than the males. The average length of the tegmina in five males and five females from Juan Viñas, Costa Rica, is as follows: males 20.4, females 17.5. Two males from the same locality, but not included in the above measurements, have wings and tegmina quite as long as in the more abbreviate individuals of *tolteca*; these two specimens have a tegminal length of 22.5 and 23.5, and a wing length of 24.6 and 26.8.

Distribution.—The species occurs as far north as Orizaba, Mexico, thence southward it is found through Nicaragua to the latitude of Guatel in Costa Rica.

Biological Notes.—In his treatment of the present species, Professor Biolley states that it has done great damage to rose bushes in his garden at San José, Costa Rica.

Specimens Examined: 33; 17 males, 13 females, 3 nymphs.

Juan Viñas, Costa Rica, March 1, 1902, (L. Bruner), 11♂, 5♀, [Hebard Collection].

San José, Costa Rica, (P. Biolley), 3♀, [A. N. S. P.].

Monte Redondo, Costa Rica, January, 1903, (C. F. Underwood), 6♂, 2♀, 1♂n., [A. N. S. P. and Hebard Collection].

Guatel, Costa Rica, April 20 to 22, 1902, (C. F. Underwood), 1♀, 1♀n., [A. N. S. P.]

Pozo Azul, Costa Rica, (Carriker), 1♀, [Hebard Collection].

Piedras Negras, Costa Rica, (Schild and Bergdorf), 1♀, [A. N. S. P.].

Surubres, Costa Rica, October 19, 1909, (P. P. Calvert), 1♀n., [A. N. S. P.].

Insara bolivari (Griffini) (Figs. 7 and 8.)

1895. *Hormilia tolteca* Bruner (not *Phaneroptera tolteca* of Saussure, 1859), Bull. Lab. Nat. Hist. Univ. Iowa, III, pt. 3, p. 65. [Castillo, Nicaragua.]
1895. *Hormilia fasciata* Bruner (not of Brunner, 1878), Bull. Lab. Nat. Hist. Univ. Iowa, III, pt. 3, p. 65. [Castillo, Nicaragua.]
1896. *Hormilia bolivari* Griffini, Boll. Mus. Zool. Univ., Torino, XI, No. 232, pp. 13 to 15. [Colon, Panama.]
1897. *Hormilia tolteca* Saussure and Pictet (not *Phaneroptera tolteca* of Saussure, 1859), Biol. Cent.-Amer., Orth., I, p. 319. (In part.) [Volcan de Chiriqui, Panama.]
1897. *Hormilia bolivari* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318 to 320. [Colon, Panama.]

This insect is of larger size and somewhat heavier build than either of its close allies, *I. tolteca* and *I. intermedia*. From the former species it may be further separated by the constricted dorsum of the pronotum (which is of the same type as that of *intermedia*, though somewhat more expanded caudad), by the lateral lobes of the same with length less than depth and by the longer and wider tegmina. From *intermedia* the present species may be further separated by the lateral lobes having their length noticeably, instead of slightly, less than their depth, and the fact that, while *intermedia* has the smallest tegmina and wings of the three

closely allied species, *bolivari* has these organs developed to the greatest extent.

Type.—♀; Colon, Panama. (Dr. E. Festa.) [Zoological Museum of Turin.]

The following description is based upon a male, taken at a locality the nearest to that of the type at which the species has been captured since its description.

Description.—♂; Peralta, Costa Rica. March 26, 1910. (P.P. Calvert.) [A. N. S. P.]

Size a little larger than medium for the genus, form moderately slender though somewhat heavier than *I. tolteca*. Head and eyes much as in that species. Pronotum with dorsum similar to that of *I. intermedia* but slightly more expanded caudad and with caudal margin very lightly emarginate mesad;²² lateral lobes also similar to that species but slightly deeper,²³ humeral sinus deep, roundly, and, when compared with that of *intermedia*, more broadly acute-angulate. Tegmina long and wide when compared with those of *tolteca*, the distal width greater than the mesal width, the tegmina reaching beyond the extremities of the caudal femora and obliquely truncate at the apex with angles very narrowly rounded; marginal field of tegmina narrowing evenly distad, from point of greatest width which is proximad, as in *tolteca*. Disto-dorsal segment of abdomen very much as in *intermedia*; supra-anal plate as in *tolteca*; cerci fairly long, longer than in *tolteca* or *intermedia*, crassate, tapering to a blunt apex, the shaft deflected slightly inward at the middle, apex toothed, this tooth directed meso-dorsad at nearly a right-angle; subgenital plate similar to that of *tolteca*. Limbs and armament of the same much as in *tolteca*, caudal femora proportionately longer with the genicular lobes more produced.

A female taken at a locality adjacent to that of the described male, furnishes the data given below.

Description of Female.—♀; Forest near Santa Cruz, Costa Rica. January 25, 1910. (Tristan and Calvert.) [A. N. S. P.]

Very much like male in size and general appearance. Tegmina reaching the distal extremities of the caudal femora. Ovipositor much as in *tolteca*; subgenital plate rather elongate, scutiform, not emarginate laterad, apex narrowly rounded, in transverse section much as in *intermedia*.

²² We find the degree of this mesal emargination to be variable in *I. tolteca*, *intermedia* and especially *bolivari*; one specimen of the latter species before us has this emargination pronounced, while in two individuals it is scarcely perceptible.

²³ Two individuals from Nicaragua show somewhat deeper lateral lobes of the pronotum than the rest of the series, which would indicate that a certain amount of variability exists in this character.

Measurements (in millimeters) of individuals treated above

	Length of body ²⁴	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Peralta, Costa Rica . . .	16	3.8	27	4	4.3	31.8	21.1	
♀ Santa Cruz, Costa Rica	20	4	24.4	3	3.4	27	21	5.3

The females before us indicate that in this sex the tegmina are more or less shorter than in the males.

Color Notes.—The coloration of the two specimens here treated fully is almost exactly like that of the female of *intermedia*, the coloration of which is described in the present paper under that species. The specimens before us from Nicaragua are, however, more fuscous, and the coloration of one individual indicates that in life it was much suffused with pale green of an olive shade.

Distribution.—The species is now known to range from Castillo, Nicaragua southward to Colon, Panama.

Synonymy.—No synonyms of the present species exist, but, in 1895, Bruner recorded this species as the related *I. tolteca* and also the very different South American *fasciata* of Brunner (which latter species, though described as a member of the genus *Hormilia*, does not agree with that genus in certain characters of great importance).

Saussure and Pictet also included three specimens of the present species in the series of *I. tolteca* recorded by them in the *Biologia* in 1897.

Remarks.—The placing of this species apart from *tolteca* and *intermedia* by Saussure and Pictet in the *Biologia Centrali-Americana*, would certainly not have taken place had they recognized specimens of the insect in their collections; the forking of the median vein of the tegmina can not be used to separate these three species.

Specimens Examined: 9; 4 males, 5 females.

Castillo, Nicaragua, February and March, 1893, (B. Shimek), 1♂, 3♀, [Hebard Collection ex Bruner].

²⁴ The body length in the present paper is always given as probably correct in the fresh condition.

Peralta, Costa Rica, March 26, 1910, (P. P. Calvert), 1♂, [A. N. S. P.].

Forest near Santa Cruz, Costa Rica, January 25, 1910, (Tristan and Calvert), 1♀, [A. N. S. P.].

Volcan de Chiriqui, Panama, (Champion), 2♂, 1♀, [Brit. Mus.].

Insara prasina (Saussure and Pictet) (Figs. 9 and 24.)

1897. *Hormilia prasina* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318, 319 to 320, pl. 15, fig. 14. [Mazatlan, Sinaloa, Mexico; [Imagen], Guerrero, Mexico.]

1904. *Hormilia prasina* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [Guadalajara, Jalisco, Mexico.]

This species is the largest of the genus and is the only form with apple green coloration and very broad wings. No resemblance or generality of structural characters would appear to show close affinity of this species to any other in the genus. The subgenital plate of the male indicates that the species finds its nearest relatives in the group to which *tolteca* belongs, while the coloration is more like that of the *elegans* group.

Described from a pair from the states of Sinaloa and Guerrero, Mexico.

Single Type here selected: ♂; Hacienda de la Imagen, Guerrero, Mexico. Elevation 4000 feet. (H. H. Smith.) [Biologia Collection in British Museum.]

We here describe the only non-alcoholic specimen at present before us.

Description.—♂; Guadalajara, Jalisco, Mexico. August 12, 1893. (J. F. McClendon.) [A. N. S. P.]

Size very large and form rather heavy for the genus. Head with greatest width contained one and eight-tenths times in depth, occiput rounded, slightly declivent toward the fastigium, the latter narrow, compressed, subequal in width with an appreciable longitudinal sulcus on the dorsal surface, lateral margins roundly elevated, fastigium in full contact with frontal fastigium for full length of both, this sulcus dorso-arcuate; eyes small, but moderately prominent, narrowly ovate in outline, in length less than that of the infra-ocular portion of the genae. Pronotum with dorsal length about one and four-tenths the greatest (caudal) dorsal width; dorsum of pronotum very slightly depressed within the margins; lateral carinae of dorsum of pronotum faint and widely divergent in less than the cephalic third, then sharply defined and widely divergent caudad with a distinct angulation, the lines of divergence scarcely arcuate; cephalic margin of dorsum of pronotum straight, caudal margin very broadly arcuate; lateral lobes of pronotum with length subequal to depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle rather broadly rounded, the

caudal margin arcuate, the humeral sinus rather deep, roundly acute-angulate. Tegmina long and very broad, distal width subequal to mesal width, the tegmina reaching considerably beyond the distal extremities of the caudal femora and obliquely truncate at apex with angles somewhat narrowly rounded; marginal field of tegmina very broad for nearly half the tegminal length, narrowing gently distad from the point of greatest width which is proximad. Disto-dorsal segment of abdomen with greater part occupied by a subdepressed area, in shape hexagonal with angles somewhat rounded; supra-anal plate rather long, rather broadly trigonal, with lateral margins somewhat convex; cerci long for the group, crassate, gently and regularly incurved, tapering evenly and sharply to apex which is considerably flattened above and armed with a rather long tooth, the end of which is hooked inward, this tooth directed dorsad at an obtuse angle; subgenital plate short, lateral margins convergent distad, distal extremity broadly and roundly emarginate, bearing laterad slender and very short articulate styles, while cephalad from the base of the styles extend slightly divergent rounded elevations which become obsolete about the middle of the plate. Cephalic and median limbs slender, the cephalic femora carinate dorso-distad for a very short distance with distal margin of the same bluntly acute-angulate, genicular lobes triangular, dentiform; cephalic tibiae with proximal extremity greatly swollen, narrowing sharply below the tympanum which organ is apert, median tibiae slightly expanding proximad. Caudal femora shorter than the tegmina by about the length of one of the cephalic femora, the proximal half mildly bullate, genicular lobes triangular, dentiform, with blunt apex.

♀; Tepic, Mexico. (Dried alcoholic.) [Hebard Collection.]

Description of Female.—Very much like male in size and general appearance. Ovipositor considerably less than cephalic femur in length, broad, bent sharply upward at base, the bent portion shorter than in *tolteca*, the distal half of the dorsal margin, and distal extremity only of the ventral margin, finely serrate; subgenital plate short, triangular, with narrow apex broadly rounded, the plate is sulcate meso-proximad and can scarcely be said to embrace the base of the ovipositor.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Guadalajara, Mexico. (See above)	21.5	4.7	31.7	5.7	5.7+	37.6	23	
♂ Hacienda de la Imagen, Guerrero, Mexico. <i>Type</i>	16.4	4.2	31	4.7	6.2	35.6	24	
♀ Tepic, Mexico. (See above)	20	4.1	27.6	5.1	5.1	33	22.1	4.8

Color Notes.—The general color of the non-alcoholic male now before us is immaculate apple green, which has faded considerably on body and proximal portion of the tegmina to straw color. Antennae nearly black, annulate with very dark green. The apices of the wings are burnt sienna, and the fourth dorsal abdominal segment bears on each side a small and conspicuous rounded black spot situated near the caudal margin of the segment. The dried alcoholic specimens have lost all trace of original coloration with the exception of these two small black spots which in these individuals are as prominent as in the non-alcoholic specimen.

Distribution.—The species is known to occur on the west coast of Mexico, from Mazatlan southward to the state of Guerrero. Guadalajara is more interior than any other locality at which the species has been taken.

Specimens Examined: 6; 3 males, 3 females.

Mazatlan, Sinaloa, Mexico, (Forrer), 1 ♀. *Allotype.* [Brit. Mus.]

Tepec, Mexico, 1 ♂, 2 ♀, dried alcoholics, [Hebard Collection].

Guadalajara, Jalisco, Mexico, August 24, 1903, (J. F. McClendon), 1 ♂, [A. N. S. P.]

Hacienda de la Imagen, Guerrero, Mexico, elevation 4000 feet, (H. H. Smith), 1 ♂. *Type.* [Brit. Mus.]

Insara phthisica (Saussure and Pictet) (Figs. 2 and 12.)

1895. *Hormilia gracillima* Bruner (not of Brunner, 1878), Bull. Lab. Nat. Hist. Univ. Iowa, III, pt. 3, p. 65. [Castillo, Nicaragua.]

1897. *Hormilia phthisica* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318, 319. [Temax, Yucatan.]

This species is closely related to *I. gracillima* from which it may be readily separated by its much more attenuate structure and, in the male, by the much longer and more decidedly and regularly curved cerci. Though bearing a striking general resemblance to the species allied to *I. tolteca*, and showing relationship to them in the fact that the cephalic tibiae have the proximal extremities much swollen and narrowing sharply below the tympanum, the insect differs widely from those species in many important respects. The absence of articulate styles on the subgenital plate of the male, the small supplementary spine on the genicular lobes of the cephalic and median femora and the rounded apex of the tegmina indicate that the present species is more closely related to the very different appearing northern species related to *I. elegans*.

Type.—♂; Temax, Yucatan. (Gaumer.) [Biologia Collection in British Museum.]

We here describe the single male of the present species in our possession.

Description.—♂; Castillo, Nicaragua. February 1893. (B. Shimek.) [Hebard Collection ex Bruner.]

Size a little larger than medium for the genus, form most attenuate of all the species. Head with greatest width contained about one and four-fifths times in greatest depth, similar to that of *I. tolteca* but with eyes not quite so prominent. Pronotum with dorsal length almost twice the greatest (caudal) dorsal width; dorsum of pronotum slightly depressed within the margins; lateral carinae of dorsum of pronotum very weak, in cephalic fifth divergent in a straight line, then subparallel for an equal distance, for remaining three-fifths very slightly convexo-divergent caudad; cephalic margin of dorsum of pronotum straight, caudal margin of same arcuate with a very slight emargination indicated mesad; lateral lobes of pronotum with length decidedly greater than depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle very broadly rounded, humeral sinus deep and roundly subrectangulate. Tegmina very long and very narrow, their dorsal and ventral margins subparallel, these organs reaching to the distal extremities of the caudal femora and rounded at the apex; marginal field of tegmina very small, narrowing evenly distad from point of greatest width which is proximad. Disto-dorsal segment of abdomen very broadly arcuate caudad, median section showing a rounded depressed area; supra-anal plate small, trigonal, with lateral margins somewhat convex. Cerci very long and, beyond the base, very slender for the genus, tapering rather sharply at base, then nearly uniform in diameter to apex which bears a large blunt tooth, this tooth directed slightly dorsad of the curve of the shaft of the cerci; subgenital plate short, lateral margins convergent distad and produced in non-articulate styliform appendages, cephalad from the base of these appendages extend slightly divergent rounded elevations which become obsolete about the middle of the plate, distal extremity of plate between the produced lateral margins obtuse-angulate produced, the sides of this angle slightly concave.²⁵ Cephalic and median limbs long and slender, cephalic femora carinate dorso-distad for a considerably greater distance than in *tolteca* and having the distal margin of same produced in a bluntly acute-angulate tooth, genicular lobes similarly much produced but bearing a small supplementary spine;²⁶ cephalic tibiae with proximal extremity

²⁵ The distal extremity of the subgenital plate varies from this type to one which is truncate between the lateral non-articulate styliform appendages, as is shown in the type, this is also found to be true in *I. gracillima* as is shown by our specimens of that species.

²⁶ We do not give the armament of the ventral margins of the cephalic femora as we have much evidence to show that this is too variable to be of any service as a character. In the present specimen the number of small

greatly swollen, narrowing sharply below the tympanum which organ is apert, median tibiae expanding slightly proximad. Caudal femora long, with genicular lobes produced in long blunt teeth.

Allotype here selected: ♀; Yucatan. (Schott.) [Hebard Collection.]

Description of Allotype.—Quite similar to type in size and general appearance. Tegmina reaching the distal extremities of the caudal femora. Ovipositor similar to that of *tolteca*, except that it is somewhat less broad, as in *I. gracillima*; subgenital plate of the same type as found in *gracillima*.²⁷

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest length of lateral lobe	Greatest depth of lateral lobe	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Temax, Yucatan. <i>Type</i>	16.8	3.7	3.6	2.6	28.1	2.9	32.3	24.3	
♂ Castillo, Nicaragua.....	17.5	4.1	3.6	2.7	28.5	2.8	34.4	26	
♀ Yucatan. <i>Allotype</i>	17.5	3.9	3.5	2.6	27.8	2.4	33.4	26	4.9
♀ Aspinwall, Tehuantepec, Mex..		4.2	3.3	2.8	28.9	2.4	32	25.3	

The above measurements show that there is some variation in the present species and larger series may eventually prove it to be a geographic race of *I. gracillima*, to which species it is closely allied.

Color Notes.—General color of body and antennae pale russet, shading to wood brown on limbs and organs of flight, the latter obscurely marked with darker shades. Median segment and first four dorsal abdominal segments marked on each side with seal brown, thus forming two somewhat arcuate dark bands, somewhat

trigonal spines on the ventral margins of the cephalic femora is 5-2 on the cephalic, and 0-0 on the caudal margins, these spines irregularly distributed. Unfortunately Saussure and Pictet have used this as the character to separate the present species from *I. gracillima*, in their key in the *Biologia* giving the difference as 2 trigonal teeth for *I. phthisica* and 3-4 small spines for *gracillima*. Our series of *gracillima* show a range of 3-1 on the cephalic and 0-0 on the caudal ventral margins of the cephalic femora, while *phthisica* shows a range of 5-1 and 0-0 on these margins.

²⁷ In the allotype this plate is somewhat shrivelled, owing probably to the fact that the specimen was once preserved in alcohol.

irregular in outline but with convexity dorsad, these bands with least separating width on the third abdominal segment. The outer distal portions of the cephalic and median femora and the outer proximal portions of the cephalic and median tibiae are darkened, approaching prout's brown in color. The original description indicates that the male specimen here described is somewhat less heavily marked with the darker shades than the type, the spot referred to there as "a large black maculation near the extremity of the tegmen" is, in the specimen before us, indicated merely by a narrow dark marking one millimeter in length. From the series of *Insara* of similar coloration before us, it is evident that often the darker markings fade considerably in drying with the exception of those found on the dorsal surface of the abdomen.

Distribution.—The present species has been taken at Temax in northern Yucatan, at Aspinwall Barrio on the Isthmus of Tehuantepec and at Castillo in southern Nicaragua.

Specimens Examined: 4; 2 males, 2 females.

Yucatan, (Schott), 1 ♀. *Allotype*. [Hebard Collection]

Temax, Yucatan, (Gauger), 1 ♂. *Type*. [Brit. Mus.]

Aspinwall Barrio, Isthmus of Tehuantepec, Mexico, (Sumichrast), 1 ♀, [Scudder Collection].

Castillo, Nicaragua, February 1893, (B. Shimek), 1 ♂, [Hebard Collection ex Bruner].

Insara gracillima (Brunner) (Figs. 10 and 14.)

1878. *H[ormilia] gracillima* Brunner, Monogr. Phaner., p. 231, pl. 5, fig. 70. [Guatemala; Cordova, Mexico.]

1897. *Hormilia gracillima* Saussurè and Pictet, Biol. Cent.-Amer., Orth., I, p. 318. [Durango or Sinaloa, Mexico; Cordova, Mexico; Orizaba, Mexico; Teapa, Tabasco, Mexico; Guatemala; Volcan de Chiriqui, Panama.]

This insect differs from its close relative *I. phthisica* in having a less attenuate structure and in the male a different disto-dorsal segment of the abdomen and shorter cerci, the shaft of which latter is less decidedly curved and has a noticeable inward deflection at the middle. An even greater general resemblance to the species allied to *I. tolteca*, than is found in *phthisica*, is in consequence shown. The relationship, however, to the northern species near *I. elegans* is quite as close as is found in *phthisica*.

Types.—♂ and ♀; Guatemala. [Geneva Museum; Brunner Collection 6989] Cordova, Mexico. [Geneva Museum]

We have described below a male taken about twelve miles from one of the type localities.

Description.—♂; Orizaba, Vera Cruz, Mexico. December, 1887. (L. Bruner.) [Hebard Collection]

Size medium for the genus, form very attenuate but not as attenuate as in *I. phthisica*. Head and eyes very similar to those of that species. Pronotum with dorsal length about one and one-half the greatest (caudal) dorsal width; dorsum of pronotum, lateral carinae and cephalic and caudal margins of same similar to *phthisica*, but the general form shorter as shown in the proportions given above; lateral lobes of pronotum with length distinctly greater than depth, similar to *phthisica* but general form shorter in accord with the less attenuate structure of the insect, very little longer and considerably shallower than in *I. tolteca*, although not as shallow as in *phthisica*. Tegmina similar to those of *phthisica* but not so attenuate, with larger marginal field. The tegmina reach beyond the distal extremities of the caudal femora. Disto-dorsal segment of abdomen very broadly arcuate caudad, median section showing a considerably depressed area bounded on either side by straight carinae which are convergent cephalad; supra-anal plate small, trigonal, with lateral margins somewhat convex; cerci medium in length for the genus,²⁸ not as robust but longer than in *I. tolteca*, less slender and shorter than in *phthisica*, tapering rather sharply at base then gradually to the apex which is somewhat flattened above and armed with a tooth, this tooth directed meso-dorsad at an angle of a little more than ninety degrees to the distal portion of the cercus; subgenital plate as in *phthisica* with elevations and produced portions slightly less pronounced.²⁹ Limbs not so long and slender as in *phthisica*, but otherwise similar.³⁰

A female bearing the same data as the male here described furnishes the additional information given below.

Description of Female.—Quite similar to male in size and general appearance. Tegmina do not reach the distal extremities of the caudal femora. Ovipositor similar to that of *tolteca* except that it is somewhat less broad; subgenital plate elongate-lanceolate with immediate apex very narrowly acute-angulate emarginate, the plate showing a widening sulcation in the proximal two-thirds and embracing weakly the base of the ovipositor.

So few specimens are known of this species and of *phthisica* that little can be established concerning the relative proportions of the two species.

²⁸ Brunner in his original description states that the cerci of this species are very long. This is due to the fact that, when the present species was described, all of the known males of the other species of the genus possessed short cerci with the exception of *fasciata*, which species does not belong in the genus.

²⁹ See foot note regarding the distal extremity of this plate under the description of *I. phthisica*.

³⁰ See footnote 26 on page 66, concerning the variability of the armament of the cephalic femora.

It appears certain, however, that the tegmina and wings of *phthisica* are uniformly longer, and the lateral lobes of the pronotum shallower, than in *gracillima*. The measurements given for *gracillima* show that there is a certain amount of variation in that species, though the specimens agree in general proportions and all important characters.

Measurements (in millimeters).

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Orizaba, Mexico.....	16.5	3.5	25.1	2.9	30.1	21.3	
♂ San Rafael, Mexico.....	15	3.8	26.5	2.7	31	23	
♂ Costa Rica.....	16.5	4	26.6	2.6	31.1	24.2	
♀ Orizaba, Mexico.....	18	3.9	24.8	2.9	28.3	23.2	5

*Color Notes.*³¹—General color of insect bistre, shading to raw umber on the limbs. The cephalic femora are narrowly twice-banded with vandyke brown,³² while the tegmina are irregularly and finely marked with a darker brown than the ground color, which gives the insect a more or less speckled and streaked appearance. The dorsal abdominal segments are marked with darker brown similarly as described in this paper under *phthisica*.

Distribution.—The present species is found from Chiriqui, Panama, northward through Costa Rica and Guatemala to Mexico, where it has been taken in the southern states of Tabasco and Vera Cruz, and northward in Durango or Sinaloa.

*Specimens Examined:*³³ 4; 3 males, 1 female.

Costa Rica, 1♂, [Hebard Collection].

San Rafael, Vera Cruz, Mexico, 1♂, [Hebard Collection].

Orizaba, Vera Cruz, Mexico, December 1887, (L. Bruner), 1♂, 1♀, [Hebard Collection].

Insara elegans (Scudder) (Figs. 11, 17 and 27.)

1900. *Hormilia elegans* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 96, pl. III, fig. 1. [Las Cruces, New Mexico; Mesilla, New Mexico.]

³¹ All of the specimens before us show that they have become somewhat discolored in drying, and their markings, although now faded and irregular in most cases, indicate that, when fresh, all of the specimens were probably distinctly marked as described.

³² The specimen from Costa Rica has the median femora similarly twice-banded.

³³ These specimens are in the Hebard Collection.

1900. *Hormilia elegans* Cockerell, Amer. Nat., XXXIV, p. 290. [Mesilla Valley, New Mexico; Salt River Valley, Arizona.]
1902. *Hormilia elegans* Scudder and Cockerell, Proc. Davenp. Acad. Sci., IX, p. 52. [Las Cruces, New Mexico; Mesilla, New Mexico.]
1904. *Hormilia elegans* Rehn, Proc. Acad. Nat. Sci. Phila. 1904, p. 572. (In part.) [Florence, Arizona.]
1905. *Hormilia elegans* Caudell, Proc. U. S. N. M., XXVIII, p. 477. [Huachuca Mountains, Arizona; Catalina Mountains, Arizona.]
1907. *Hormilia elegans* Rehn, Proc. Acad. Nat. Sci. Phila. 1907, p. 58. [Benson, Arizona; San Bernardino Ranch, Cochise County, Arizona.]
1907. *Hormilia elegans* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 78. (In part.) [Phoenix, Arizona.]
1909. *Hormilia elegans* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 167. [Deming, New Mexico.]

The present species differs from its more western race, *I. elegans consuetipes*, in being less slender in structure and the marginal field of the tegmina narrows more abruptly distad from the proximal third,³¹ moreover typical *elegans* shows a herring-bone pattern of greater or less intensity on the tegmina, while in the western geographic race these organs are immaculate or nearly so. From *I. covilleae*, the species showing nearest relationship, *elegans* may be easily separated by the very different pronotum, less abruptly narrowing marginal field of the tegmina and striking differences both in coloration and color pattern.

Described from three females from two adjacent localities in central southern New Mexico.

Single Type here chosen.—♀; Mesilla, New Mexico. Elevation 3865 feet. June 30, 1897. (A. P. Morse.) [Scudder Collection.]

Description of Type.—Size medium for the genus, form rather slender. Head with greatest width contained about one and three-fifths times in greatest depth; occiput rounded, slightly declivent toward fastigium, the latter narrow, compressed, subequal, with an appreciable medio-longitudinal sulcus on the dorsal surface, lateral margins roundly elevated, fastigium in contact with frontal fastigium for full length of both, widening slightly more than in *I. tolteca* above this sulcus; eyes large, prominent, ovate in outline, equalling in length the infra-ocular portion of the genae. Pronotum with dorsal length about one and three-tenths the greatest (caudal) dorsal width, dorsum of pronotum deplanate, slightly elevated caudad;

³⁴ The figure which accompanies the original description is poorly drawn and fails completely to show this character and the tegmen as it really is.

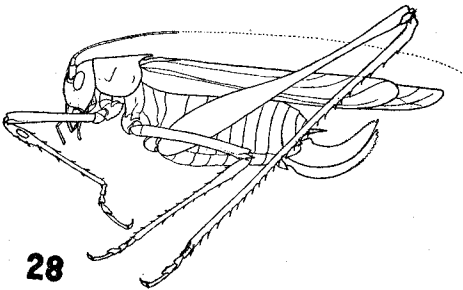
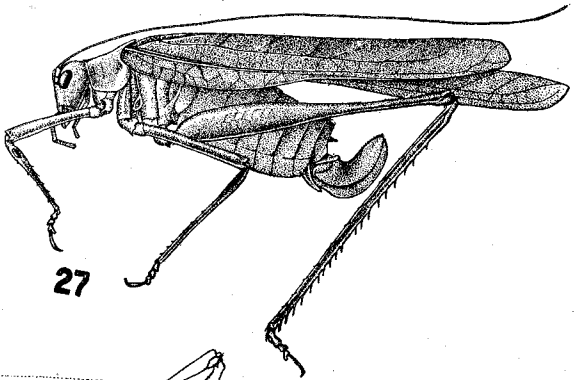
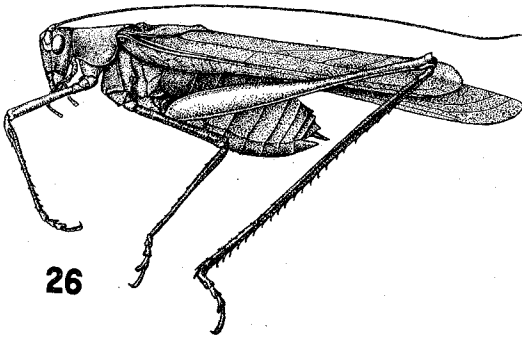


Fig. 26. *Insara elegans consuetipes*. Lateral view of male paratype. ($\times 2$) Fig. 27. *Insara elegans*. Lateral view of type. Female. ($\times 2\frac{1}{2}$) Fig. 28. *Insara lamellata*. Lateral outline of type. Male. ($\times 2$)

lateral margins of dorsum of pronotum³⁵ in cephalic fifth divergent, then subparallel for an equal distance, for half of the remaining distance divergent in a straight line, then strongly divergent with a very slight convexity; these parts of the margins joining without angulation; cephalic margin of dorsum of pronotum gently arcuate-emarginate, caudal margin of same strongly arcuate,³⁶ this margin with a decided convexity ventrad and having the inner edge of this convex area subangulate; lateral lobes of pronotum with length equal to depth, the ventro-cephalic angle obtuse and sharply rounded, the ventro-caudal angle broadly rounded from a point at the middle of the ventral margin of the lateral lobes to the humeral sinus, humeral sinus distinct, subrectangulate and rather broadly rounded; a peculiar raised callosity occupies the ventro-caudal portion of the lateral lobes, extending from the middle point on the ventral margin to the humeral sinus and bounded on the inside by a nearly straight line between these two points. Tegmina long and narrow, the distal width little less than the mesal width, the tegmina reaching considerably beyond the distal extremities of the caudal femora and rather broadly rounded at the apex;³⁷ marginal field of tegmina narrowing rather abruptly from cephalic third. Ovipositor nearly equal to the cephalic femur in length, deep,³⁸ sharply bent dorsad at base, the bent portion of the dorsal margin and distal portion of the ventral margin finely serrate; subgenital plate elongate, lateral margins compressed, the plate is sulcate meso-proximad and can scarcely be said to embrace the base of the ovipositor. Cephalic and median limbs slender; the cephalic femora carinate dorso-distad for a very short distance with the distal margin of same slightly but rather sharply produced, genicular lobes dentiform and bearing a small supplementary spine on the ventral margin; cephalic tibiae with proximal extremity somewhat swollen, narrowing gradually below the tympanum which organ is apert; median tibiae slightly expanding proximad. Caudal femora shorter than the tegmina by the

³⁵ These margins appear to the naked eye as Scudder has given in his original description; "Pronotum with strongly arcuate and pronounced lateral carinae, making the disk twice as narrow in the middle as behind."

³⁶ A very slight median emargination of the caudal margin of the dorsum of the pronotum is indicated in this specimen, but this character is exceedingly variable, often absent, as is shown by the series of the present species before us, and is therefore valueless.

³⁷ Scudder in his original description gives, "apex roundly and obliquely subtruncate," though the figured specimen shows no trace of oblique truncation at the tegminal apex. It is true that the lectotype might be said to fit the original description, but the tegminal apex is more properly described as broadly rounded, and all of the other specimens in the series before us have the apex of the tegmina rounded with no trace of oblique truncation.

³⁸ In the present species the ovipositor narrows much more gradually beyond the bent portion than in *tolteca*, and, in consequence, *elegans* has that portion of the ovipositor considerably deeper.

length of the cephalic femur, slightly bullate for somewhat more than the proximal half, not nearly as much so as in *I. tolteca*, genicular lobes acute-angulate produced and bearing a small sharp spine at apex.

A male taken but a few miles from Mesilla, New Mexico, is here chosen as the *Allotype*.

Allotype.—♂; Las Cruces, New Mexico. September 27. (T. D. A. Cockerell.) [U.S.N.M.]

Description of Allotype.—Very similar to female in general appearance but somewhat smaller. The marginal field of the tegmina narrows more abruptly distad from proximal third than in the female. Disto-dorsal segment of abdomen with median section showing a shallow depressed area, in cross section the lateral margins are formed by distinct angles, these margins are straight, convergent cephalad; supra-anal plate small, trigonal, with lateral margins convex; cerci medium in length for the genus, not quite as robust at base as in *I. gracillima*, gently tapering and slightly incurved for two-thirds of their length, then of uniform diameter and more decidedly incurved to apex which is suddenly flattened above and armed with a sharp tooth, this tooth directed meso-dorsad at an angle of a little more than ninety degrees to the distal portion of the cercus; subgenital plate short, lateral margins convergent distad and produced in non-articulate styliform appendages, cephalad from the base of these appendages extend slightly divergent rounded elevations which become obsolete about the middle of the plate, distal extremity of plate between the produced lateral margins obtuse-angulate produced, the sides of this angulation slightly concave.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♀ Las Cruces, New Mexico. <i>Type</i>	17	3.7	26.1	3.1	29.6	19.6	5.4
♀ Las Cruces, New Mexico. <i>Paratype</i>	15.5	3.8	27.5	3.1		19	5.5
♂ Mesilla, New Mexico. <i>Allotype</i>	15.2	3.5	23.8	2.7	27.4	19.2	
♀ San Antonio, Texas.....	15.5	3.9	27.9	3	31.7	21.5	5.7
♂ San Antonio, Texas.....	16	4	24	2.8	29	20.4	
♂ Pueblo, Colorado.....	15.2	3.5	21	2.2	24.3	17.6	
♀ Florence, Arizona.....	18.3	3.8	27.2	2.7	31.7	20	5.8
♂ Florence, Arizona.....	13.7	3.7	22.2	2.3	23.7	17.7	

The material before us shows that, although there is a certain amount of size variation in the present form, the proportions are quite constant.

Further measurements of specimens from Deming, New Mexico, and Florence, Arizona, have been given by Rehn and Hebard,³⁹ but no geographic increase or decrease in size over certain portions of the insects range can be admitted. The large series now before us shows numbers of large and small individuals from the same locality from various portions of the range of the species.

When compared with its western race, *I. elegans consuetipes*, this form is seen to have, as a rule, considerably less attenuate proportions.

Color Notes.—General color of insect pale bice green, in dried specimens this color has almost always faded to mummy brown on the body and proximal portions of the appendages; eyes wood brown. A dark brown maculation is almost invariably present on each side of the fourth dorsal abdominal segment near the caudal margin, which margin caudad of this maculation is buffy. Caudal extremity of anal field of tegmen usually marked with a small dark spot. The pale bice green general coloration of the tegmina becomes much paler along the veins which approach the sutural margin diagonally, and between these the coloration is frequently intensified and sometimes very minutely speckled with brown; this gives the tegmina a distinctive "herring-bone" pattern in the present form. This color pattern ranges from a very pronounced type to one quite as immaculate as in *I. elegans consuetipes*. The specimens of the very pronounced "herring-bone" pattern before us are from Brewster County, Texas, and Pima County, Arizona. The great majority of the series have this pattern moderately indicated while a very few specimens from San Antonio, Cotulla and Uvalde, Texas, are immaculate. There are four specimens before us which have the general coloration very pale buff and in these the "herring-bone" pattern is very faint; these individuals are from Del Rio and Neville Spring, Texas and Deming, New Mexico.

The opinion expressed by Rehn and Hebard that "this species is exceedingly variable in coloration" was caused by specimens of the very different and strikingly colored *I. covilleae* being confused with the present species. As is found in many species of Orthoptera, there is a great amount of variation in the intensification and recession of the color pattern of *elegans*, but when this pattern is present it is almost uniform, the only differences being found in the fact that in some specimens all of the veins which approach the

³⁹ 1909. Proc. Acad. Nat. Sci. Phila., 1909, p. 167.

sutural margin of the tegmina diagonally are paler, while in others only a few of these veins are so defined.

Distribution.—The present species has been taken from San Antonio and Benavides, Texas, westward to the region where it mingles with *I. elegans consuetipes* along the low divides east of the Colorado River in Arizona. The most northern record is Pueblo, Colorado, west of which locality it has not been taken north of southern New Mexico and central Arizona. We have but one Mexican record, Tlahualilo, in northeastern Durango, though the species is probably widely distributed over all northern Mexico adjacent to the United States from the Gulf of Mexico to the Gulf of California.

Biological Notes.—From our field notes we find that this species is very partial to mesquite, having been found in that bush at almost every locality at which it was taken. At Uvalde, Texas, the notes state that these insects were stridulating in numbers soon after dark on mesquite, but later in the night fewer were to be heard. Dog Cañon, Brewster County, Texas and Deming, New Mexico, are the only localities at which we have taken specimens attracted to light at night. The favorite habitat of the species when found in the desert is the heavier vegetation along usually dry washes. Our notes for Snyder's Hill, Pima County, Arizona, afford the following information, "Greasewood (*Covillea tridentata*) flat where mesquite (*Prosopis velutina*) and an acacia (*Acacia greggii*) predominated along the dry washes. *Elegans* kept up a whirring in the two latter bushes (after dark), this sound had no harshness and could be heard scarcely over five feet distant. About every fifth bush examined after dark contained one of these singers."

The capture of a few specimens of this species in the creosote bush (*Covillea tridentata*), at El Paso, Texas, was surprising, as at no other place was it found on this bush, which is the host-plant of the monotypic *I. covilleae*.

Specimens Examined: 89; 51 males, 32 females and 6 nymphs.

San Antonio, Texas, 1885, (M. Newell), 1 ♀, [Hebard Collection ex Bruner]: August 15, 1912, (R. & H.), 1 ♂, 1 ♂n.

Cotulla, Texas, August 13, 1912, (R. & H.), 1 ♂.

Benavides, Texas, August 9, 1912, (R. & H.), 3 ♂, 1 ♀.

Laredo, Texas, August 12, 1912, (R. & H.), 3 ♂.

Uvalde, Texas, August 21, 1912, (R. & H.), 1 ♂.

Del Rio, Texas, August 22, 1912, (R. & H.), 1 ♂.

Two miles N. of Bone Spring, Brewster County, Texas, September 9, 1912, (R. & H.), 3♂.

Dog Cañon, Brewster County, Texas, September 3, 1912, (R. & H.), 2♂, 1♀.

Neville Spring, Brewster County, Texas, September 8, 1912, (R. & H.), 8♂.

Franklin Mountains, El Paso, Texas, elevation 3800 feet, September 16, 1912, (H.), 4♂, 1♀.

El Paso, Texas, elevation, 3700 feet, September 16, 1912, (H.), 3♂, 3♀, 1♀n.

Pueblo, Colorado, elevation 4660 feet, September 15, 1898, 1♂, [Hebard Collection].

Mesilla, New Mexico, elevation 3865 feet, June 30, 1897, (Morse), 1♀. *Type.* [Scudder Collection]

Las Cruces, New Mexico, elevation 3883 feet, September 27, October, (Cockerell), 1♂, 2♀. *Allotype* and *paratypes.* [U. S. N. M. and Scudder Collection]

Deming, New Mexico, elevation 4315 feet, July 20, 1907, (R. & H.), 2♀.

Benson, Arizona, elevation 3576 feet, July, 1♀, [Bklyn. Inst. A. & S.].

San Bernardino Ranch, Cochise County, Arizona, elevation 2500 feet, August, (Snow), 1♀, [Univ. Kansas].

Huachuca Mountains, Arizona, August 15, 1903, (Osler), 1♀, [U. S. N. M.]

Snyder's Hill, Pima County, Arizona, elevation 2500 feet, October 11, 1910, (R. & H.), 7♂.

Sycamore Cañon, Baboquivari Mountains, Arizona, elevation 3700 feet, October 6 to 9, 1910, (R. & H.), 1♀.

Hot Springs, Arizona, elevation 1697 feet, (H. S. Barber), 1♂, [U. S. N. M.]

Phoenix, Arizona,⁴⁰ elevation 1082 feet, September 5, 6, October 15, (Kunzé), 9♂, 11♀, [Hebard Collection and U. S. N. M.].

Florence, Arizona, elevation 1493 feet,⁴¹ June 8, 14, July 13, 20, 23, September 20, 1903, (Biederman), 1♂, 5♀, 2♂n., 2♀n., [A. N. S. P.].

Tlahualilo, Durango, Mexico, elevation 3500 feet, July, 1905, (A. W. Morrill), 1♂, [U. S. N. M.].

***Inara elegans consuetipes* (Scudder) (Figs. 13, 19 and 26.)**

1900. *Arethaea consuetipes* Scudder, Can. Ent., XXXII, p. 332. [Indio, California.]

This geographic race of *I. elegans* might easily be considered a distinct species so striking are the characters which separate it from that species, were it not for the fact that a series of specimens from

⁴⁰ The majority of these specimens are intermediates between *I. elegans* and *I. elegans consuetipes*, while a number are typical of *elegans* and a few approach the western geographic race closely.

⁴¹ Of these specimens two of the adults and the four nymphs were taken in June.

Phoenix, Arizona, shows unquestionably that *consuetipes* is no more than a geographic race of *elegans*, in that the majority of the specimens from that locality are absolute intermediates between the two, while there are a few specimens which closely approach *consuetipes* and a number which show a still closer affinity to *elegans*. The geographic race may be distinguished from typical *elegans* in its more slender structure, gradually narrowing marginal field of the tegmina, much less sharply bent ovipositor in the female, and in the tegminal coloration which is immaculate.

Types.—2 ♂; Indio, California. July 9, 1897. (A. P. Morse.) [Morse and Scudder Collections.]

Lectotype here selected:—♂, in Morse Collection bearing the data given above. The original description shows clearly that the measurements given are taken from the specimen in the possession of Professor Morse, and we have consequently selected that specimen as the type.

Description of Paratype.—Size near that of *I. elegans*, form more slender. Head with greatest width contained about one and one-half times in greatest depth, similar to that of *elegans*; eyes also as in that species. Pronotum with dorsal length about one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deplanate, lateral margins as in *elegans* but much less strongly divergent, making the disk not twice as narrow mesad as it is caudad, so that they appear but moderately arcuate to the naked eye; cephalic and caudal margins of dorsum of pronotum as in *elegans*; lateral lobes of pronotum with length slightly greater than depth, otherwise as in *elegans* except that the raised callosity is not so distinct. Tegmina as in *elegans* except that the marginal field of the same narrows gradually distad from proximal third. Disto-dorsal segment of abdomen, supra-anal plate, cerci and subgenital plate as in *elegans*. Limbs and armament of same as in *elegans* but with form slightly more slender.

A female, taken from a place nearest the type locality at which that sex of the present species has been captured, is here chosen as the *Allotype*.

Allotype.—♀; Colorado, Imperial County, California. October 1, 1910. Elevation, 130 feet. (R. & H.) [Hebard Collection.]

Description of Allotype.—This sex differs from that of *elegans* in the differential characters which are common to both sexes given above and also in the much less sharply bent and consequently longer ovipositor.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen
♂ Indio, California. <i>Type</i> ⁴²	16	4.75	25	
♂ Indio, California. <i>Paratype</i>	17.5	3.9	23.3	2.7
♀ Colorado, California. <i>Allotype</i>	20.3	4.2	28.2	2.9
9♂♂ Colorado, California. Averages, and extremes.....	16.5 (14.9-18.7)	4 (3.9-4.2)	24.4 (22.9-26.1)	2.7 (2.5-3)
9♀♀ Colorado, California. Averages and extremes.....	18.1 (15-20.3)	4.1 (3.8-4.3)	27.4 (25.6-28.4)	2.8 (2.6-3)
♂ Las Vegas, Nevada.....	15.8	3.9	25	2.9
♂ Las Vegas, Nevada.....	16	4	24.7	2.9
♀ Las Vegas, Nevada.....	17.2	4.4	27	3

	Length of wing	Length of caudal femur	Length of ovipositor
♂ Indio, California. <i>Type</i> ⁴²	29.5	21	
♂ Indio, California. <i>Paratype</i>	27.6	18.8	
♀ Colorado, California. <i>Allotype</i>	32.6	22.8	6
9♂♂ Colorado, California. Averages and extremes.....	28.8 (26.5-30.9)	20 (19-20.5)	
9♀♀ Colorado, California. Averages and extremes.....	31.8 (31.1-33.3)	21.6 (20.2-23)	6.2 (5.8-7.1)
♂ Las Vegas, Nevada.....	28.9	19.9	
♂ Las Vegas, Nevada.....	29.1	20.9	
♀ Las Vegas, Nevada.....	32	21	6.2

Color Notes.—General color of insect pale bice green, in the dried specimens this has faded and the body and proximal portions of the appendages are in most cases mummy brown; eyes wood brown; a small dark maculation is frequently found on each side of the fourth

⁴² The measurements of this specimen are quoted from Scudder's original description which is insufficient and misleading in some respects. The pronotal length is incorrect.

dorsal abdominal segment near the caudal margin, and the caudal extremity of the anal field of the tegmina is occasionally marked with a small dark dot. In coloration the insect is one of the most immaculate of the genus.

Distribution.—The present species is known to range from Caliente and Las Vegas in southern Nevada, southward along the Colorado River to Yuma, Arizona, and westward over the Colorado Desert of southern California as far as Indio. The present geographic race is found to merge with true *elegans* in the country about Phoenix, Arizona, and the eastern limit of the distribution of typical *elegans consuetipes* is undoubtedly to be found in the first low divides east of the Colorado River in Arizona.

Biological Notes.—This geographic race was found in the low river bottom at Colorado, California, on Arrow-wood (*Pluchea sericea*); constant beating during an entire morning secured the series here recorded. One specimen was taken across the Colorado River at this point in the town of Yuma, Arizona, attracted there to light at night. At Las Vegas, Nevada, the species was first heard stridulating in a thick mesquite tree some twenty feet in height after darkness had fallen; very many individuals were heard in this tree but, owing to the height at which most of the insects were perched and the thorns, very few could be taken, and these only because they were singularly unafraid. Each specimen taken rested quietly while the branch upon which it was perched was slowly pulled downward and the insect was thereby brought within reach. When, however, an incautious attempt is made at night to capture a specimen, the same unexpected agility is shown as is true of *elegans*, the insect slipping away into the dark quickly and noiselessly, using both legs and wings in its escape. The female specimen taken at Las Vegas was captured during the day on bare soil near an arroyo. The specimens captured at Caliente, Nevada, were beaten from a dense growth of *Chrysothamnus lanceolatus* in the valley bottom; these two individuals were found only after considerable effort.

This geographic race shares with typical *elegans* a truly desérticulous distribution, and, like *elegans*, it is there found to prefer to live in bushes near water or where water is to be found after rains, the desert vegetation in such situations showing this fact by being heavier and more luxuriant.

The stridulation of the insect is a soft whirring note which seems indistinguishable from that of *elegans*; so faint is this stridulation that it can not be detected farther than 15 or 20 feet on the stillest night.

Specimens Examined: 29; 13 males, 15 females and 1 gynandromorph. Indio, California, July 9, 1897, (A. P. Morse), 1♂. *Paratype.* [Scudder Collection]

Colorado, Imperial County, California, October 1, 1910, elevation 130 feet, (R. & H.), 9♂, 12♀, including ♀ *allotype.*

Yuma, Yuma County, Arizona, October 1, 1910, (R. & H.), 1♀.

Arizona, 1♀, [U. S. N. M.].

Caliente, Lincoln County, Nevada, September 3, 1909, elevation 4400 feet, (R. & H.), 1♂, 1 gynandromorph.

Las Vegas, Lincoln County, Nevada, September 2, 1909, elevation 2028 feet, (R. & H.), 2♂, 1♀.

***Insara apache* (Rehn) (Fig. 15.)**

1907. *Hormilia apache* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 58.

[Carr Canyon and Palmerlee in Huachuca Mountains, Arizona.]

1912. *Hormilia apache* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 101. (Type fixation.)

Although no close relationship exists between the present species and any other member of the genus, some degree of affinity is indicated between it and *I. elegans consuetipes* in the pronotum and tegmina, although in *apache* the former is very much more simple and the latter much broader; in these two species also, the cephalic tibiae in both sexes, and the disto-dorsal segment of the abdomen and subgenital plate in the male, are similar: considerable difference from *elegans consuetipes* is to be found in the robust build of *apache*, very different cerci in the male and more sharply bent ovipositor in the female. Although the cerci are very different from any other species and show the highest specialization found in the genus *Insara*, they suggest an extreme development of the type found in *I. intermedia*. The insect is unique in general appearance.

Type.—♂; Carr Canyon, Huachuca Mountains, Arizona. August, 1905. (H. Skinner.) [A.N.S.P.]

Description of Type.—Size medium, form robust when compared with the species allied to *I. elegans*. Head with greatest width contained one and seven-tenths times in the depth, in form similar to that of *elegans* but with occiput more globose and eyes smaller in proportion to the head. Pronotum with dorsal length one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deplanate, lateral margins of dorsum of pronotum expanding very moderately and regularly caudad with, however, a

very slight expansion cephalad at the cephalic margin, the point of least width of dorsum consequently close to the cephalic margin; cephalic margin of dorsum of pronotum gently arcuato-emarginate, caudal margin of same very broadly arcuate with a very faint median emargination indicated; lateral lobes of pronotum with length slightly less than the depth, the ventrocephalic angle obtuse and rounded, the margin from this angle to the humeral sinus rather regularly arcuate, humeral sinus distinct and angulate but not wide or deep. Tegmina rather long and broad, exceeding the caudal femora in length, narrowing evenly from point of greatest width at the caudal margin of the tympanum to the broadly rounded apex. Disto-dorsal segment of abdomen with median section showing a rounded, slightly depressed area; supra-anal plate small, trigonal; cerci very long and rather slender, slightly incurved, tapering from the base rather sharply for one-third the length, then uniform to apex which is broadly and deeply flattened above and bowed out below, the apex armed with a flattened tooth which is directed dorsad at a right angle;⁴³ subgenital plate of moderate length, lateral margins subparallel, somewhat elevated caudad and produced in slightly divergent, slender, and non-articulate styloform processes, caudal margin broadly and roundly emarginate. Cephalic and median limbs long and rather heavy for the genus; cephalic femora much as in *elegans*, and, as in that species, the genicular lobes bear a small supplementary spine; cephalic tibiae likewise similar. Caudal femora much as in *elegans* but longer and slightly heavier, with genicular lobes produced in longer and more uniformly slender dentiform processes.

The allotypic female, bearing the same data as the type, affords us the data given below.

Description of Allotype.—Similar to male in size and general appearance. Tegmina equal to caudal femora in length. Ovipositor less than cephalic femur in length, bent sharply upward at base, the bent portion of the dorsal margin and the distal extremity of the ventral margin finely serrate; subgenital plate elongate, lateral margins compressed; the plate is sulcate meso-proximad and does not embrace the base of the ovipositor.

The single paratype, a female from Palmerlee, Arizona, is now in the Hebard Collection.

Measurements (in millimeters) of individuals here treated

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
Carr Canyon, Huachuca Mountains, Arizona							
♂ <i>Type</i>	17	4.8	25	5	28.3	22	
♀ <i>Allotype</i>	16.5	5	23.5	4.5	24.6	23.5	5.8

⁴³ In the original description both the figure and description of the cerci are faulty and misleading.

Color Notes.—The general color of the type specimens is chromium green; the antennae are marked with about seven irregularly disposed dark brown annuli on the distal third. The entire dorsal surface of the abdomen is immaculate.⁴⁴

Distribution.—The present species is known only from Cochise County, Arizona; it has been taken there only at the localities given below.

Specimens Examined: 3; 1 male, 2 females.

Palmerlee, Huachuca Mountains, Arizona, (Schaeffer), 1 ♀. *Paratype*. [Hebard Collection ex Bklyn. Inst. A. & S.]

Carr Canyon, Huachuca Mountains, Arizona, August, 1905, (H. Skinner), 1 ♂, 1 ♀. *Type, allotype*. [A. N. S. P.]

Insara abbreviata (Brunner) (Figs. 16 and 25.)

1878. *H[ormilia] abbreviata* Brunner, Monogr. Phaner., pp. 231, 233. [Cuernavaca, Mexico.]

1897. *Hormilia abbreviata* Saussure and Pictet, Biol. Cent.-Amer., Orth, I, pp. 318, 320. [Cuernavaca, Mexico.]

1902. *Hormilia gracillima* Rehn (not of Brunner, 1878), Trans. Am. Ent. Soc., XXIX, p. 20. [Cuernavaca, Mexico.]

The form of the pronotum, tegmina and subgenital plate in this species is unique, and a much greater disparity exists in the tegminal length when compared with the length of the caudal femur than is found in any of the other known species of the genus. Although differing in many important respects, *I. abbreviata* finds its closest relationship with *I. apache*, to which species it bears a somewhat similar resemblance, if the brevity of tegmina is disregarded, and affinity is shown in similar tympanal and cercal structure.

Type.—♀; Cuernavaca, Morelos, Mexico. [Brunner Collection 7152.]

The following description is based upon the allotypic male here selected.

Description of Allotype.—♂; Cuernavaca, Morelos, Mexico. September. (O. W. Barrett.) [A. N. S. P.]

Size medium, form compact. Head with greatest width contained one and four-fifths times in depth, similar in form to *I. prasina* except that in

⁴⁴ As in all the species of this group which are pale green in color, these specimens when dried have turned, wholly or in part, pale yellowish, and we would not feel able to make the statement given above, were it not true that, in all the other species of the genus which have markings on the dorsal surface of the abdomen, these markings remain distinct after the specimens have been dried.

the present species the fastigial suture is straight, transverse; eyes much as in *prasina* but less prominent. Pronotum with dorsal length about twice the greatest (caudal) dorsal width; dorsum of pronotum very slightly depressed within the margins; lateral carinae of dorsum of pronotum parallel in the cephalic half and very slightly sinuate, moderately arcuate-divergent in caudal half, the point of least width mesad; cephalic margin of dorsum of pronotum almost straight, a very shallow angulate emargination indicated; caudal margin of same very broadly arcuate; lateral lobes of pronotum with length one and one-half times the depth, the ventro-cephalic angle sharply angulate at slightly more than ninety degrees, the ventro-caudal angle broadly rounded, caudal margin arcuate, the humeral sinus indicated only by a very slight sinuation. Tegmina abbreviate, about three-fifths the length of the caudal femora, broad in proportion to length, narrowing with a very slight and even convexity from point of greatest width at caudal margin of tympanum to the rather sharply rounded apex; marginal field of tegmina broad in proportion to tegminal width. Disto-dorsal segment of abdomen truncate caudad with a very slight medio-longitudinal depression;⁴⁵ cerci rather long and more slender than in other species peculiar to Mexico, slightly incurved, this curvature more pronounced near base and apex, tapering rather sharply for one-third the length, then uniform to apex which is suddenly and considerably flattened above and armed with a tooth the end of which is slightly hooked, this tooth directed meso-dorsad at almost a right-angle; subgenital plate short and narrow, lateral margins slightly convergent distad, distal extremity produced mesad and laterad in short distinct knobs, the median protuberance slightly the greater, the caudal margin of the plate being in consequence angularly brace-shaped in general outline. Cephalic⁴⁶ limbs slender, the cephalic femora carinate dorso-distad for a very short distance with distal margin of same rather sharply acute-angulate and genicular lobes bearing a supplementary spine, ventral margins of cephalic femora unarmed; cephalic tibiae somewhat swollen, narrowing gradually below tympanum,⁴⁷ which organ is apert. Caudal femora mildly bullate proximad for a distance a little more than half their length, genicular lobes triangular, dentiform, but with blunt apices.

As the female of this species is known from the type alone, we learn from Brunner's original description only that the size of that sex is somewhat smaller than that of the male, that the length of the pronotum and tegmina is greater, and that the pronotal length is equal to that of the ovipositor. No mention is made of the sub-

⁴⁵ The supra-anal plate is invisible in this specimen.

⁴⁶ The median limbs are missing in the specimen before us.

⁴⁷ This character agrees perfectly with that found in the northern species of the genus and may be used to separate readily this species from all other known forms peculiar to Mexico.

genital plate. In other respects the two sexes appear to be very similar.

Measurements (in millimeters) of only specimens known

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Cuernavaca, Morelos, Mexico. <i>Allotype</i>	15.8	4.	12.2	3.1	13	20.5	
♂ Cuernavaca, Mexico.....	15	4.1	13.6	2.9	15	20.4	
♂ Cuernavaca, Mexico.....	13	4	14	3	15.4	21.8	
♀ Cuernavaca, Mexico.....							
<i>Type</i> . ⁴⁸	15	5	17	2.5			5

Color Notes.—The general color of the allotype and the longer male is immaculate bice green,⁴⁹ probably very intense in life. The lateral carinae of the pronotum are sharply outlined in cream buff and bordered on the inner side by very dark maroon purple; so narrow is this border that the color is scarcely discernible without the aid of a microscope. The other male before us is wood brown in general coloration, the tegmina extremely faintly mottled with darker. The general coloration shades to raw umber on the limbs. The lateral carinae of the pronotum are outlined in paler brown but not as sharply as in the green specimens.

Distribution.—The present species is known only from Cuernavaca, Morelos in central Mexico.

Specimens Examined: 3; 3 males.

Cuernavaca, Morelos, Mexico, September, (O. W. Barrett), 1♂. *Allotype*. [A. N. S. P.]: January 4, 1899, 2♂. [Hebard Collection]

*Insara covilleae*⁵⁰ new species (Figs. 18 and 30.)

1904. *Hormilia elegans* Rehn (not of Scudder, 1900), Proc. Acad. Nat. Sci. Phila., 1904, p. 572. (In part.) [Florence, Arizona.]

1907. *Hormilia elegans* Rehn (not of Scudder, 1900), Proc. Acad. Nat. Sci. Phila., 1907, p. 78. (In part.) [Phoenix, Arizona.]

⁴⁸ The measurements of the type are quoted from the original description.

⁴⁹ This is the only species of this genus peculiar to Mexico which has the entire dorsal surface of the abdomen immaculate.

⁵⁰ This name is chosen owing to the fact that the species is monotypic, inhabiting the desert shrub *Covillea tridentata*.

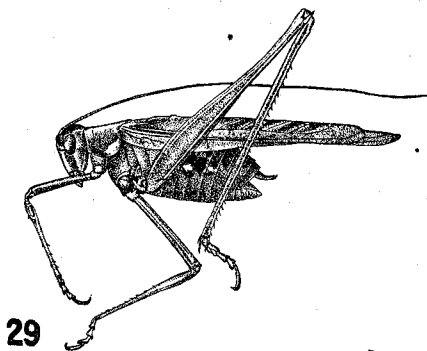
1909. *Hormilia elegans* Rehn and Hebard (not of Scudder, 1900); Proc. Acad. Nat. Sci. Phila., 1909, p. 474. [Cottonwood, San Bernardino County, California.]

The authors have in the past most unfortunately confused the present species with *I. elegans*, to which it shows a definite relationship, but from which it differs not only in a number of minor characters but also in the strikingly different pronotum, the more abruptly narrowing marginal field of the tegmina, the general coloration, and the very different color pattern. Moreover, although the two species show probably closer relationship to each other than to any of the other species of the genus and are found in distribution to overlap over a wide area, still they may be readily distinguished from each other by their stridulation, and while *I. covilleae* is only found upon the creosote bush (*Covillea tridentata*), *elegans* is almost never found on that plant but inhabits a large variety of other desert bushes which grow especially along washes in the desert. The large and conspicuous white or pale greenish spots on the tegmina of the present species and the extremely sellate pronotum, may serve to separate the insect easily from all other known species of the genus.

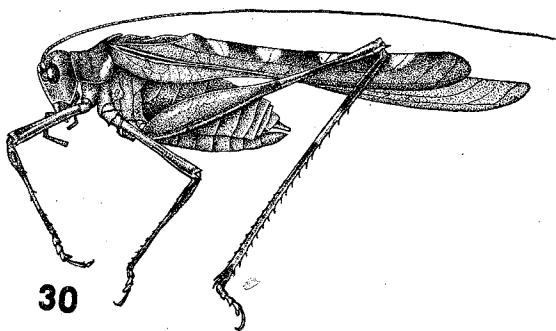
Type.—♂; Tumamoc Hill, Tucson Mountains, Pima County, Arizona. October 3 to 4, 1910. Elevation, 2500 feet. (R. & H.) [Hebard Collection.]

Description of Type.—Size and form much as in *elegans*. Head with greatest width contained about one and four-fifths times in the greatest depth, except for the somewhat narrower proportions very much like that of *elegans*; eyes large, more prominent than in *elegans*, ovate in outline, in length slightly exceeding the infra-ocular portion of the genae. Pronotum with dorsal length about one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deeply sellate; lateral margins⁵¹ of dorsum of pronotum diverging in the cephalic fifth, then sub-parallel for one-half the remaining distance, from that point strongly concave-divergent to nearly the caudal margin where a slight convexity is noticeable, these parts of the lateral carinae joining without angulation and the carinae much less sharply defined and in section more broadly rounded than in *elegans*; cephalic margin of dorsum of pronotum almost straight, caudal margin of same strongly arcuate, this margin with a decided convexity ventrad and having the inner edge of this convexity sub-angulate; lateral lobes of pronotum with

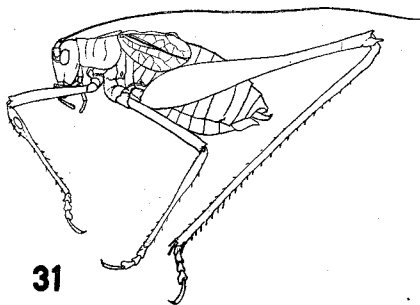
⁵¹ The lateral margins of the dorsum of the pronotum in this species appear to the naked eye even more arcuate than in *elegans* but not as pronounced.



29



30



31

Fig. 29. *Insara gemmicula*. Lateral view of type. Male. ($\times 2$)
 Fig. 30. *Insara covilleae*. Lateral view of type. Male. ($\times 2$) Fig. 31.
Brachyinsara magdalenae. Lateral view of type. Male. ($\times 2$)

length less than depth, much deeper caudad than cephalad, the ventro-cephalic angle very broadly obtuse and rounded, the ventro-caudal angle sub-rectangulate and broadly rounded, humeral sinus distinct but not as deep as in *elegans*, sub-rectangulate and rather broadly rounded; a striking and much elevated callosity occupies the caudal portion of the lateral lobes, this callosity extending from a point on the ventral margin a little cephalad of the deepest portion of the humeral sinus to the humeral sinus and bounded on the inside by a nearly straight line between these points; over the remaining portion of their surface the lateral lobes are rather deeply excavate. Tegmina very similar to those of *elegans* except that the marginal field narrows very abruptly and disappears beyond the proximal third. Disto-dorsal segment of abdomen showing a shallow depressed area, in cross section the lateral margins are formed by distinct angles, the margins of the depression are arcuate-convergent cephalad; supra-anal plate as in *elegans*; cerci of same type as in *elegans* but less decidedly and more evenly incurved throughout their length; subgenital plate short, narrowing caudad, more narrow than in *elegans*, the lateral margins convergent distad and produced in non-articulate styliform appendages, cephalad from the base of these appendages extend rounded elevations which are sub-parallel for a distance equal to the distance between the appendages, then slightly divergent without angulation and becoming obsolete about the middle of the plate, distal extremity of plate between the produced lateral margins obtuse-angulate, produced slightly more than the styliform appendages, the sides of this angulation slightly concave.⁵² Cephalic and median limbs shorter and somewhat more slender than in *elegans*; the cephalic femora carinate dorso-distad for a very short distance with the distal margin of the same noticeably and very sharply produced, genicular lobes long, dentiform, bearing a small supplementary spine on the ventral margin; cephalic and median tibiae much as in *elegans* though shorter and somewhat more slender. Caudal femora shorter than the tegmina by the length of the median femur, when compared with those of *elegans* they are found to be very much shorter, more bullate for somewhat more than proximal half but in the remaining distal portions somewhat more slender than in that species.

A female, bearing the same data as the type, is the *Allotype*.

Description of Allotype.—Size larger than male, form somewhat more attenuate than in that sex, very similar in general appearance. The marginal field of the tegmina narrows not quite so abruptly in this sex, which condition is also true in the female sex of *elegans*. Ovipositor and subgenital plate similar to *elegans*.

In addition to the *Type* and *Allotype* the following series may be considered paratypic:

Tucson, Arizona; October 2, 1910, (R. & H.), 2 ♂.

⁵² In the series of males of the present species before us, the caudal margin of the subgenital plate is variable in form, but the non-styliform appendages are almost always very short knob-like protuberances and the angulation between always extends as far or farther caudad than these.

Tumamoc Hill, Tucson Mountains, Pima County, Arizona;
 October 3 to 4, 1910. Elevation 2000 to 3092 feet. (R. & H.)
 3 ♂, 1 ♀, 2 ♀ n.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen
♂ Tumamoc Hill, Arizona. <i>Type</i> .	15.4	3.7	24	2.2
♀ Tumamoc Hill, Arizona. <i>Allotype</i>	17.4	4	25.7	2.5
♂♂ Tumamoc Hill, Arizona. Average of paratypic series....	14.3	3.6	21.8	2
♀ Tumamoc Hill, Arizona. <i>Paratype</i>	(13.5-15.5)	(3.3-4)	(21-23)	(2-2.2)
♂ Yuma, Arizona.....	18.2	3.8	26.6	2.3
♂ Yuma, Arizona.....	13.7	3.7	21.4	1.8
♂ Yuma, Arizona.....	14.5	3.3	21.7	1.9
♀ Yuma, Arizona.....	17.2	3.9	26.9	2.3
♀ Yuma, Arizona.....	17.9	3.8	24.6	2.1
♂ Inyo Mountains, California	16	3.6	22.2	2.1
♀ Lincoln County, Nevada (near Lyons, California).....	20.4	3.9	27.6	2.4
♀ Lordsburg, New Mexico.....	13.9	3.2	21.3	2.1
♀ Lordsburg, New Mexico.....	14.4	3.5	23	2.2
♀ Lordsburg, New Mexico.....	14.9	3.6	22	2.3

	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Tumamoc Hill, Arizona. <i>Type</i>	2.9	28.2	16.8	
♀ Tumamoc Hill, Arizona. <i>Allotype</i>	3	29.4	18.1	5.4
♂♂ Tumamoc Hill, Arizona. Average of paratypic series....	2.3	25.9	15.8	
	(2.1-2.6)	(24.8-28.)	(14.5-18)	
♀ Tumamoc Hill, Arizona. <i>Paratype</i>	3	29.5	18.2	5.2
♂ Yuma, Arizona.....	2.1	24.8	14.4	
♂ Yuma, Arizona.....	2	24.9	15.9	
♀ Yuma, Arizona.....	2.7	30.3	19.3	5.4
♀ Yuma, Arizona.....	2.3	28.4	19.4	5.2
♂ Inyo Mountains, California...	2.2	26.5	15.7	
♀ Lincoln County, Nevada (near Lyons, California).....	3	30.8	18.2	5.6
♀ Lordsburg, New Mexico.....	2.4	24.1	14.9	4.9
♀ Lordsburg, New Mexico.....	2.5	26.2	16.4	5.4
♀ Lordsburg, New Mexico.....	2.9	24.9	16.2	5.2

These measurements at once show that, when compared with *elegans*, the proportions of the present species differ chiefly in the mesal and distal width of the tegmina and the length of the caudal femora.

Color Notes.—The general color of the great majority of the specimens before us is a dark shade of bice green, a few individuals are tinged with prout's brown while one or two have the general color prout's brown shaded with olive green on the tegmina and exposed portions of the wings. The convexity on the caudal margin of the dorsum of the pronotum and the raised callosities on the ventro-caudal portion of the lateral lobes are white, sometimes tinged with greenish; the inner border of this marking on the caudal margin of the dorsum of the pronotum is acute-angulate emarginate mesad. The tegmina are strikingly marked with a regular succession of large spots, white in the majority of specimens, but more or less tinged with green in a few individuals. These spots are four to six in number, those situated proximad being well rounded while those situated distad are more drawn out, the last being indicated frequently by a mere transverse lineation; all are in contact with the sutural margin of the tegmen. The cephalic and median tibiae have the non-swollen portions white or pale greenish, the caudal femora have the proximal half of the non-swollen distal portion of the same color and this is likewise found to be true of those portions of the caudal tibiae which lie adjacent to the light portions of the caudal femora when the limbs are closed. The fourth dorsal abdominal segment is heavily marked with vandyke brown, becoming darker in shade caudad to the caudal margin, which margin is strikingly defined by a broad band of white. As in the other species of the genus, particularly those of green coloration, a number of specimens of the present species have faded considerably in drying, especially about the body.

Distribution.—The series before us shows that the present species is found over a wide range in the desert regions of the Southwest where the creosote bush (*Covillea tridentata*) flourishes. The distribution of that bush, however, covers a much greater area than that of this monotropic species, as has been proven by the authors' careful examination of the creosote bush over almost its entire range. The insect has been found from Lordsburg, New Mexico, westward through the desert portions of southern Arizona, north-

ward to Lincoln County, Nevada near Lyons, California, and in California as far north as Lyons and the Inyo Mountains and as far west as Cottonwood Station in the Mojave Desert and Palm Springs on the western edge of the Colorado Desert. The southward distribution of the species in Mexico is unknown.

Biological Notes.—This species inhabits the creosote bush (*Covillea tridentata*) and is found on no other vegetation. In this bush in the proper situations both nymphs and adults are to be found in the daytime hidden in the terminal clusters of leaflets, always in few numbers and not to be secured except by vigorous and constant beating, as the peculiar coloration of the insects makes them practically invisible in such surroundings.

The present species although amply equipped with organs of flight does not appear to fly about as much at night as does *elegans*; this is indicated by the fact that the authors have not as yet taken a single specimen of *covilleae* attracted to lights, which occasionally bring *elegans* not only to camp fires but into towns at night.

At Snyder's Hill, Pima County, Arizona, the species was found more abundant than at any other locality the authors have visited and ample opportunity was afforded after dark to hear its stridulation and compare it with that of *elegans*. The sound produced is a whirring note very similar to that of *elegans* but slightly harsher with a ticking sound in the whirr much more distinct. These differences were so easily recognized that immediately upon detecting a songster the species could at once be determined and thereupon the insect, if *covilleae*, was invariably found in a creosote bush and if *elegans*, in mesquite or other desert bush but not in *Covillea tridentata*.⁵³

The individuals of this species were observed to climb about the creosote bush with a slow cautious movement, the males stopping frequently to stridulate, both sexes, if molested, fluttering rapidly from one part of the bush to another.

Synonymy.—Unfortunately the authors have confused specimens of the present species with *elegans* three times in the past; this was due to the fact that *elegans* was very unsatisfactorily described, few specimens of it were known, and these showed sufficient variability

⁵³ See note of capture of a few specimens of *elegans* in creosote bush in biological notes for that species.

to make it uncertain at that time whether they should be considered mere variations, geographic races or different species. Each time, however, that the error was made, the individuals were mentioned as differing from the typical form.

Remarks.—Nymphs of the present species are similar to the adults in coloration and markings, their wing-pads are unicolorous. Female nymphs have the ovipositor sheath with dorsal and ventral margins smooth without any indication of serrations. This is also found to be true in all the known nymphal females not only of this genus but of *Dichopetala* as well.

Specimens Examined: 42; 20 males, 16 females, 3 male nymphs, 3 female nymphs.

Lordsburg, New Mexico, October 15, 1910, elevation 4250 to 4600 feet, (R. & H.), 3 ♀.

Tucson, Arizona, October 12, 1910, (R. & H.), 2 ♂, *Paratypes*.

Tumamoc Hill, Tucson Mountains, Arizona, October 3 to 4, 1910, elevation 2000 to 3092 feet, (R. & H.), 4 ♂, 2 ♀, 2 ♀ n., *Type, allotype, paratypes*.

Snyder's Hill, Pima County, Arizona, October 11, 1910, elevation c. 2500 feet, (R. & H.), 6 ♂, 2 ♀, 1 ♂ n.

Florence, Arizona, July 13, 22, (C. R. Biederman), 1 ♂, 1 ♀, [A. N. S. P.].

Phoenix, Arizona, September 6, 7, 8, 1904, (R. E. Kunz), 1 ♂, [U. S. N. M.]; 1 ♀, [A. N. S. P.]; 2 ♀, [Hebard Collection].

Yuma, Arizona, October 1, 1910, (R. & H.), 2 ♂, 2 ♀.

Lincoln County, Nevada, near Lyons, California, September 1, 1909, elevation 3000 to 3800 feet, (R. & H.), 1 ♀.

Inyo Mountains, California, July 7, 1911, (Wickham), 1 ♂, [Hebard Collection].

Lyons, San Bernardino County, California, September 1, 1909, elevation 2800 to 3000 feet, (R. & H.), 1 ♀.

Cottonwood Station, San Bernardino County, California, September 9, 1907, elevation 2274 feet, (H.), 3 ♂, 2 ♂ n., 1 ♀ n.

Palm Springs, California, February 14, (Hubbard), 1 ♀, [U. S. N. M.].

*Insara gemmicula*⁵⁴ new species (Figs. 20 and 29.)

The present insect differs so greatly from all the other known species of the genus that it is difficult to find to which of these it is most nearly related. Some relationship to *I. lamellata* is apparent. These species show some affinity to *I. elegans* in the general contour of the head and pronotum, but even in these parts marked differences are evident. From *elegans* we find the present species to differ in the much smaller size; the proportionally longer dorsum of the pronotum which is less expanded caudad; the lateral lobes

⁵⁴ In allusion to the diminutive size and pleasing appearance of the species.

of the pronotum, with length noticeably greater than depth; the tegmina and wings, which are much more attenuate distad; the different disto-dorsal abdominal segment and somewhat different cerci and the very different and striking coloration.

Type.—♂; Echo Mountain, San Gabriel (Sierra Madre) Range, Los Angeles County, California. In chaparral. August 26, 1909. Elevation 2700 to 3500 feet. (Rehn.) [Hebard Collection.]

Description of Type.—Size very small for the genus, form attenuate. Head and eyes much as in *elegans*. Pronotum with dorsal length about one and six-tenths times greatest (caudal) dorsal width; dorsum of pronotum deplanate; lateral margins of dorsum of pronotum strongly divergent in straight lines for slightly more than cephalic fifth, then with a rounded obtuse-angulation parallel for an equal distance, the remaining portion gently divergent with a slight convexity indicated caudad; cephalic margin of dorsum or pronotum almost straight, very gently arcuate, caudal margin of same strongly arcuate; lateral lobes of pronotum with length greater than depth, the ventro-cephalic angle obtuse and very sharply rounded, the ventro-caudal angle broadly rounded as in *elegans*, humeral sinus distinct, shallow and broadly rounded at an angle of somewhat more than ninety degrees; a peculiar raised callosity occupies the ventro-caudal portion of the lateral lobes extending from about the middle of the ventral margin to the base of the humeral sinus and bounded on the inside by a convex line between these two points. Tegmina much smaller than in *elegans* and narrowing greatly distad, the distal width considerably less than the mesal width, the tegmina do not reach the distal extremities of the caudal femora and are sharply rounded at the apex; marginal field of tegmina narrowing much as in *elegans*. Disto-dorsal segment of abdomen with entire dorsal surface showing a considerably depressed area, in cross section the lateral margins of this depressed area are formed by distinct, acute and sharply rounded angles, the margins are straight and convergent cephalad; supranal plate very small, trigonal, with margins convex; cerci medium in length for the genus, very little enlarged at base, very gently tapering and slightly incurved for half their length, then of uniform diameter and almost straight to apex, which is very suddenly and slightly flattened above and armed with a sharp tooth, this tooth directed meso-dorsad at an angle of a little more than ninety degrees to the distal portion of the cercus; subgenital plate much as in *elegans* though slightly narrower with the distal extremity between the produced lateral margins rectangular, produced, the sides of the angulation decidedly concave. Limbs and armament of same similar to *elegans*.

The female of the present species is unknown.

In addition to the type a single specimen bearing the same data as the type except that it was taken on September 18, 1910, may be considered paratype.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur
♂ Echo Mountain, California <i>Type</i>	13.7	3.3	17	2.4	1.3	19.5	15.9
♂ Echo Mountain, California <i>Paratype</i>	14.4	3.3	16	2.5		19	16

Color Notes.—Head and cephalic appendages parrot green; the face marked with four narrow vertical cream colored bands, two of these directed downward from the base of the eyes and two from the antennal scrobes; vertex cream colored and back of the eyes extend two narrow cream colored parallel bands between which the dorsal surface of the head is claret brown; eyes mars brown. Dorsum of pronotum claret brown, lateral carinae sharply defined in buff while the lateral lobes are parrot green with the raised callosity on the ventro-caudal margin white and a small mark of the same color at the ventro-cephalic angles of the lateral lobes. Tegmina bice green with cephalic margin marked with a herring-bone pattern of mummy brown, the tympanum and interstices between the slanting mummy brown maculations vinaceous; marginal field of tegmina translucent, the veinlets giving a greenish white suffusion. Exposed tips of the wings bice green. The cephalic and median femora are parrot green and the swollen portions of the corresponding tibiae are of the same color, the remaining portions of these tibiae are greenish white much suffused with liver brown, this latter color being that of the feet; the caudal femora are parrot green with the ventral surfaces cream buff, the caudal tibiae are parrot green with a faint whitish annulus indicated at the end of the proximal third and shading from the distal third through greenish white to white much suffused with liver brown. Ventral portion of the body parrot green, dorsal surface of abdomen claret brown heavily marked on either side of the third and fourth abdominal segments with seal brown, in the centre of this dark marking on the third abdominal segment is a large nearly circular white blotch which runs into the caudal margin of the segment, the fourth dorsal abdominal segment has also a few narrow white markings along its

caudal margin. The cerci are buff and bear vandyke brown teeth, while the supra-anal plate is parrot green.

The paratypic specimen is faded, particularly about the body, but shows a similar coloration and color pattern throughout.

Distribution.—This insect is known only from Echo Mountain, one of the western foothills of the San Gabriel Range back of Los Angeles, California.

Biological Notes.—The two specimens known were both beaten from the heavy chaparral which clothes the steep slopes of Echo Mountain. Long continued search and vigorous beating during both days spent at the locality failed to reveal other specimens.

Remarks.—This is the frailest as well as the most highly colored species of the genus and is the only one found on the Pacific slopes of the southern Californian mountains.

Specimens Examined: 2, 2 males.

Echo Mountain, San Gabriel (Sierra Madre) Range, Los Angeles County, California, in chaparral, elevation 2700 to 3500 feet, (Rehn), August 28, 1909, 1♂. *Type.* [Hebard Collection]. September 18, 1910 (Rehn), 1♂. *Paratype.* [A. N. S. P.]

*Insara lamellata*⁵⁵ new species (Figs. 21 and 28.)

The present species shows some affinity to *I. gemmicula*, but unfortunately we are unable to give the chief differential characters, owing to the fact that this species is known only from females and *gemmicula* only from males. This insect, though resembling *gemmicula* in some respects, shows much more robust proportions than that species, the lateral outline of the dorsum of the pronotum is somewhat different, and the ventral margins of the cephalic and median femora are distinctive. The ovipositor is longer, and more gently and evenly arcuate than in any other species of the genus.

Type.—♀; San José del Cabo, Lower California. (Dried alcoholic.) [Hebard Collection.]

Description of Type.—Size medium for the genus, form robust. Head and eyes much as in *I. elegans*. Pronotum with dorsal length nearly one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deplanate, lateral margins of same divergent in straight lines for slightly more than the cephalic fifth, then with a rounded obtuse-angulation weakly concavo-divergent for an equal distance, the remaining portion gently divergent caudad with a slight concavity apparent; cephalic margin of dorsum of pro-

⁵⁵ In allusion to the peculiar lamellate development of the ventral margins of the cephalic and median femora.

notum gently arcuate-emarginate, caudal margin of same weakly arcuate; lateral lobes of pronotum more ample in area than in *I. gemmicula*, with humeral sinus even more shallow, otherwise quite similar. Tegmina short, rather broad, narrowing gradually distad, not reaching the extremities of the caudal femora and rounded at the apex; the veinlets rather prominent; in general contour and prominence of the veinlets the tegmina of this species show a certain similarity to those of *I. apache*. Ovipositor longer than the cephalic femur, deep, evenly and gently arcuate, the distal half of the dorsal margin and distal portion of the ventral margin finely serrate; subgenital plate triangular, broader than long, the lateral margins weakly convex, this plate is more than usually flattened and can scarcely be said to embrace the base of the ovipositor. Limbs shorter and heavier than in *elegans*, with ventral margins of cephalic and median femora becoming sub-lamellate distad, this character more pronounced in the cephalic femora.

The male of the present species is unknown.

In addition to the type, three females bearing like data may be considered paratyptic.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♀ San José del Cabo, Lower California. <i>Type</i>	15.8	3.9	17	2.7	1.9	19	20.3	7
♀ San José del Cabo, Lower California. <i>Paratype</i>	16.9	4.2	16.5	2.9	2	18	20.7	7
♀ San José del Cabo, Lower California. <i>Paratype</i>	15.7	3.6	16.4	2.7	1.8	18	18.4	6.8
♀ San José del Cabo, Lower California. <i>Paratype</i>	15	3.8	15.3	3	1.9	16.8	19.4	6.7

Color Notes.—All of the specimens are dried alcoholics and show no trace of original coloration or color pattern, except that two specimens show that the occiput and dorsum of the pronotum were originally dark.

Distribution.—The species is known from the type locality only, that place situated at the extremity of Lower California.

Specimens Examined:—4; 4 females.

San José del Cabo, Lower California, 4 ♀. *Type, paratypes.* [Hebard Collection]

BRACHYINSARA new genus

Genus monotypic. GENOTYPE—*Brachyinsara magdalena* new species.

The present genus is a member of the Phaneropterinae and of the group Insarae, and is known only from Magdalena Island, Lower California. It shows nearest relationship to the genus *Insara*, from which it differs in the peculiarly irregular and more sulcate fastigium of the vertex, the peculiarly shaped lateral margins of the dorsum of the pronotum, the lateral lobes of the pronotum, which in transverse section are more diverging ventrad, the aborted tegmina and concealed rudimentary wings and the striking bilobate disto-dorsal segment of the male abdomen. Closer relationship to the second section of the genus *Insara*, (to which *I. elegans* belongs) is shown in *Brachyinsara* by the bispinose genicular lobes of the cephalic and median femora and the subgenital plate of the male with lateral margins produced in non-articulate knobs.

Generic Description.—Fastigium of vertex narrow, compressed (particularly so dorsad); subhorizontal, but with dorsal surface on three distinct levels this caused by there being two distinct steps on the dorsal surface; dorsal surface very decidedly sulcate medio-longitudinally; fastigium of vertex in contact with facial fastigium, the two presenting a flat cephalic surface, their lateral aspect presenting an outline which at the juncture of the dorsal and cephalic surfaces presents an angle of a little less than ninety degrees. Antennae subcrassate proximad. Lateral margins of dorsum of pronotum decidedly biconstricted. Tegmina aborted, wings rudimentary. Abdomen much dilated, dorsal segments of same weakly acute-angulate produced mesad. Disto-dorsal segment of male abdomen bilobate. Cephalic tibiae with proximal extremity swollen, narrowing rather gently below tympanum, which organ is open on both sides, median tibiae slightly expanded proximad.

Brachyinsara magdalena new species (Figs. 22 and 31.)

Type.—♂; Magdalena Island, Lower California. March 1889. (Chas. D. Haines.) [Hebard Collection.]

Description of Type.—Size medium for group, form very robust. Head with greatest width contained about one and four-fifths times in depth; eyes globose, strongly exerted, much less in length than infra-ocular portion of the genae. Pronotum with dorsal length equal to the greatest (caudal) dorsal width; dorsum of pronotum in general deplanate, slightly

elevated cephalad and caudad; lateral margins of dorsum of pronotum obscure and strongly concavo-divergent in cephalic fifth, then pronounced in remaining four-fifths, for half of which portion it is strongly convex but weakly divergent then as decidedly convex and very strongly divergent, the angles formed by these margins all broadly rounded: cephalic margin of dorsum or pronotum weakly emarginate, caudal margin of same very broadly arcuato-truncate; lateral lobes of pronotum with length slightly greater than depth (slightly deeper caudad than cephalad), the ventro-cephalic angle obtusely rounded, the ventro-caudal angle broadly rounded, ventral margin nearly straight, very weakly sinuate, humeral sinus indicated by a very shallow, broadly rounded, obtuse angulation. Tegmina aborted, extending little beyond the distal extremity of the tympanal area, distal margin broadly rounded with this arcuation continued into the costal margin without angulation; the wings are present as mere atrophied slips wholly concealed by the tegmina. Disto-dorsal segment of abdomen produced mesad with that portion of caudal margin truncate, the segment deeply cleft mesad and divided into two large evenly arcuate lobes which nearly envelop the cerci; cerci short, rather strongly incurved, crassate, tapering but little to the flattened apex which is toothed, this tooth directed meso-dorsad at an angle; sub-genital plate very short and broad with lateral margins arcuate-convergent distad, distal extremity shallowly obtuse-angulate emarginate, bearing laterad blunt knobs, cephalad these knobs are continued as slightly divergent rounded elevations which become obsolete about the middle of the plate. Cephalic and median femora slender; these joints carinate dorso-distad for a very short distance with distal margin bluntly rectangulate produced; genicular lobes of same produced in a broad (blunt or finely spined) tooth which tooth bears a supplementary spine on its ventral margin; distal portion of ventro-cephalic margin of cephalic femora bearing 1 to 2 small teeth. Caudal femora heavy with proximal half bullate; genicular lobes broad, acute-angulate produced, with immediate apex bluntly rounded.

In addition to the type a nymphal male bearing the same data may be considered paratypic.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Greatest width of lateral field of tegmen	Tympanal width	Length of caudal femur	Greatest width of caudal femur
♂ Magdalena Island, Lower California. <i>Type</i>	15	3.3	5.2	3.4	3	17.6	2.4

Color Notes.—Both specimens are dried alcoholics but still show traces of dorsal markings. The type indicates that the fourth dorsal abdominal segment was heavily marked, while in the nymph

the entire dorsal surface of the abdomen still shows traces of a decided color pattern.

Distribution.—The present species is known only from Magdalena Island, situated off the Pacific coast of Lower California in 25° N. Lat.

Morphological Notes.—The half grown nymph shows the peculiar development of the fastigium of the vertex more sharply pronounced than in the adult, the former also has the genicular lobes sharper and the dorsal abdominal segments more decidedly acute-angulate produced mesad. The pronotum in this specimen, however, only mildly indicates the peculiar dorsal outline so decidedly pronounced in the adult.

Specimens Examined: 2; 1 male, 1 nymph.

Magdalena Island, Lower California, March, 1889, (Chas. D. Haines) 1♂, 1♂n. *Type, paratype.* [Hebard Collection.]

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1907. *Arethaea* Rehn and Hebard, *Ibid.*, 1907, p. 300.
1908. *Arethaea* Rehn and Hebard, *Ibid.*, 1908, p. 398.
1909. *Arethaea* Rehn and Hebard, *Ibid.*, 1909, p. 168.
1912. *Arethaea* Rehn, *Kansas Univ. Sci. Bull.*, V, p. 306.

The genus was based on a single species. GENOTYPE.—*Arethaea gracilipes* (Thomas) [*Ephippitytha gracilipes*].

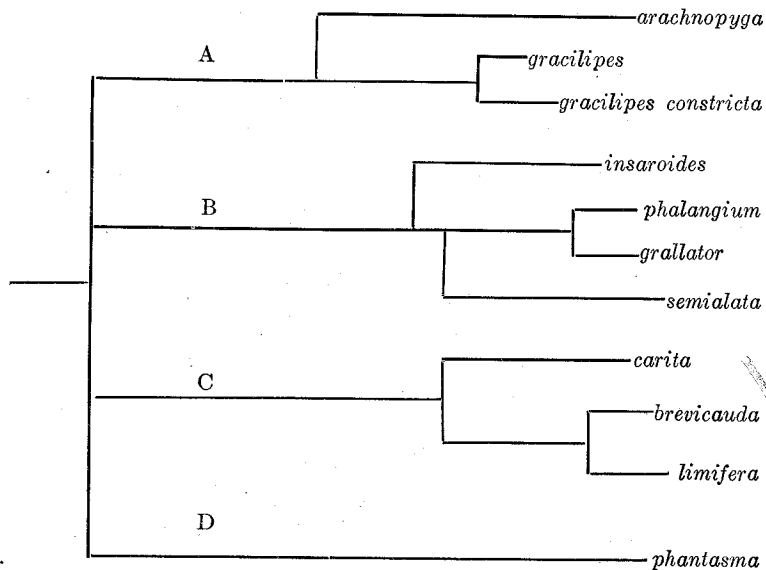
Generic Description.—Body elongate. Head having great freedom of movement permitting vertical or subhorizontal position, occiput tumescent; fastigium declivent, narrowing cephalad, in contact with the frontal fastigium, sulcate; internal margin of antennal scrobes ampliate; eyes prominent, elongate-elliptical to ovoid; antennae very elongate, brittle, proximad subcrassate. Pronotum more or less decidedly sellate, disk concave, compressed on prozona, more or less deplanate on metazona, caudal margin of disk produced, arcuate to acute-angulate, no lateral carinae or angles present but strumose lines of pattern on prozona simulating same; transverse sulcus distinct, passing regularly from disk to lateral lobes; lateral lobes longer than deep, narrowing cephalad, caudal margin oblique-truncate or rotundate, with a strumose thickening, caudal portion of lobes moderately to decidedly bullate laterad. Tegmina elongate in male sex, with generally subparallel margins, or in female of similar form but shorter or extremely abbreviate, acute-ovate and shorter than the pronotal disk; apex more or less rounded or acute (in extremely brachypterous females); marginal field roundly developed proximad, evanescent mesad and distad; discoidal vein in distal half emitting two to six rami to sutural margin and apex; anterior ulnar vein straight; stridulating field of male tegmina as long as or distinctly shorter than pronotal disk, stridulating vein oblique, nearly straight or arcuate, margin of the field not at all or decidedly produced at the apex of the stridulating vein, more or less angularly emarginate distad of the same. Wings in all but extremely brachypterous females surpassing the tips of the tegmina. Meso- and meta-sternum lobate. Abdomen of male sex with or without a dorsal elevated development on the proximo-dorsal segment. Cerci of male simple, attenuate, distal extremity sharply bent or faintly arcuate inwards, apex depressed or conically acute; subgenital plate of male with distal margin truncate or emarginate, true free styles never present, lateral processes substyliform or mere knobs. Ovipositor short, moderately or very deep, margins serrulate distad, disk of ovipositor distad with lamellate teeth ar-

ranged in regular series. Limbs elongate, slender, terete, cephalic and median femora disto-dorsad with or without an angular and subspiniform production, ventro-cephalic margins of same unarmed; genicular lobes of cephalic and median femora bispinose, of caudal femora unispinose. Tympanum of cephalic tibiae open on both faces.

Classification.—From a systematic standpoint the characters of greatest value in the differentiation of the species of the genus are: in both sexes, general form of the body, character of the margins of the dorsal abdominal segments, shape of the eye and the character of the disto-dorsal margin of the femora; in the male, form of the pronotum, form and proportions of the stridulating field of the tegmina, the character of the development of the apex of the stridulating vein, the shape of the speculum and form of the supra-anal plate, subgenital plate and cerci; in the female, form of the pronotum, form and relative length of the tegmina and the form of the ovipositor. The general form shows a moderate amount of specific variation in robustness and that chiefly in the female sex, the brachypterous forms and those with reduced tegmina and wings being the more robust, much more so than the males of the same species. The form of the eye is of considerable importance as a diagnostic character, several species (*phalangium* and *grallator*) having very elongate elliptical eyes, over twice as deep as wide, while in the other species the form though ovate, elliptical or ovoid is never so narrow proportionately. The form of the pronotum is in general subject to considerable variation, due to differences in the amount of sellation of the whole, the width of the disk, the caudal margin of the same and the degree of bullation of the lateral lobes. The general form of the pronotum is very distinctive in one species (*phantasma*), not being even approached by the other forms, the texture and coloration of the same section being equally characteristic. The degree of bullation of the lateral lobes needs careful attention when used as a character in this genus, as frequently specimens which have in nature a considerable bullation of these lobes will show little in the dried condition. This appears to be due to compression in pinning the specimen or shrinkage in the drying process. As a rule, aside from such relatively evident cases, the amount of this bullation is constant and specific, but in *A. gracilipes* it is much less stable and as uncertain there as a number of other features in that plastic species. The relative length

of the tegmina in both sexes and the stridulating field in the male are of the greatest diagnostic importance. The tendency toward brachypterism in the females of this genus is apparently specialization, correlated in its extreme condition (in group C) with the highest development of the male sound-producing apparatus. Two other of the four species-groups show pronounced brachypterous tendencies, the forms exhibiting the same (*arachnopyga* in group A and *semialata* in group B) being divergent from the main phyla of these groups and apparently the most specialized of each. In *gracilipes constricta* we find tendencies toward brachypterism developing within the race, the normal condition of which is as truly macropterous as is true *gracilipes*. In the male tegmina the relative proportions of the stridulating field, its length compared with that of the pronotal disk, the production of the apical section of the stridulating vein, the form of the margin and of the speculum are the chief characters of importance. The genitalia, which are discussed below in more detail, are of diagnostic importance in a few of the species, but in one case (the plastic *gracilipes*) the male cerci might be called polymorphic.

The following diagram illustrates our ideas regarding the group relationship of the species.



These groups might be generally characterized as follows:

- Group A. $\left\{ \begin{array}{l} \textit{arachnopyga} \\ \textit{gracilipes} \\ \textit{gracilipes constricta} \end{array} \right\}$ Angulate but not decidedly produced apex to stridulating vein of male tegmina. Cerci of male with distal extremity bent. Abdominal segments of both sexes having non-crenulate margins. Female never decidedly brachypterous.
- Group B. $\left\{ \begin{array}{l} \textit{insaroides} \\ \textit{phalangium} \\ \textit{grallator} \\ \textit{semialata} \end{array} \right\}$ Apex of stridulating vein of male tegmina not angulate, rounded. Cerci of male with distal extremity bent. Abdominal segments of both sexes having non-crenulate margins. Female never decidedly brachypterous.
- Group C. $\left\{ \begin{array}{l} \textit{carita} \\ \textit{brevicauda} \\ \textit{limifera} \end{array} \right\}$ Apex of stridulating vein of male tegmina decidedly produced, progressively developing into an elongate peg-like process. Cerci of male with distal extremity not bent. Abdominal segments of both sexes having decidedly crenulate or non-crenulate margins. Female decidedly brachypterous.
- Group D. $\left\{ \textit{phantasma} \right\}$ Apex of stridulating vein of male tegmina not decidedly produced. Cerci of male with distal extremity bent. Abdominal segments of both sexes having decidedly crenulate margins. Female macropterous. (Form of pronotum, stridulating field of male tegmina, texture of pronotum and tegmina and coloration distinctive.)

Group A has a divergent form in *arachnopyga* which is strikingly specialized in the male sex, the form of the supra-anal plate and the disto-dorsal abdominal segment being unique in the genus, the female also showing specialization in tegminal length which,

however, is approached in certain females of the plastic *A. gracilipes constricta*. The species *gracilipes* with its geographic race *constricta* is the most plastic unit in the genus, probably on account of its adaptability, ranging as it does over the greater part of the territory in which the genus occurs. A number of the characters which are important as diagnostic in other forms vary appreciably in this variable type.

Group B is composed of three elements; *insaroides* apparently primitive in a number of respects, as the form of the pronotum and the stridulating field of the male tegmina; *phalangium* and *grallator* specialized in the development of the extremity of the cephalic and median femora and the extreme angulation of the caudal margin of the disk of the pronotum, macropterous, however, in both sexes, and *semialata* which has a tendency toward angulation at the apex of the stridulating vein of the male tegmina and an approximation toward group C in the slenderer ovipositor.

Group C is quite homogenous, *carita* standing slightly apart from the others in the lesser degree of brachypterism in the female and the lesser degree of production of the apex of the stridulating vein of the male tegmina. The crenulation of the abdominal segments is not indicated (*brevicauda*) or decided (*carita* and *limifera*). The specialization of the sound-producing apparatus of the male reaches its greatest extreme in this group (i.e. *limifera*).

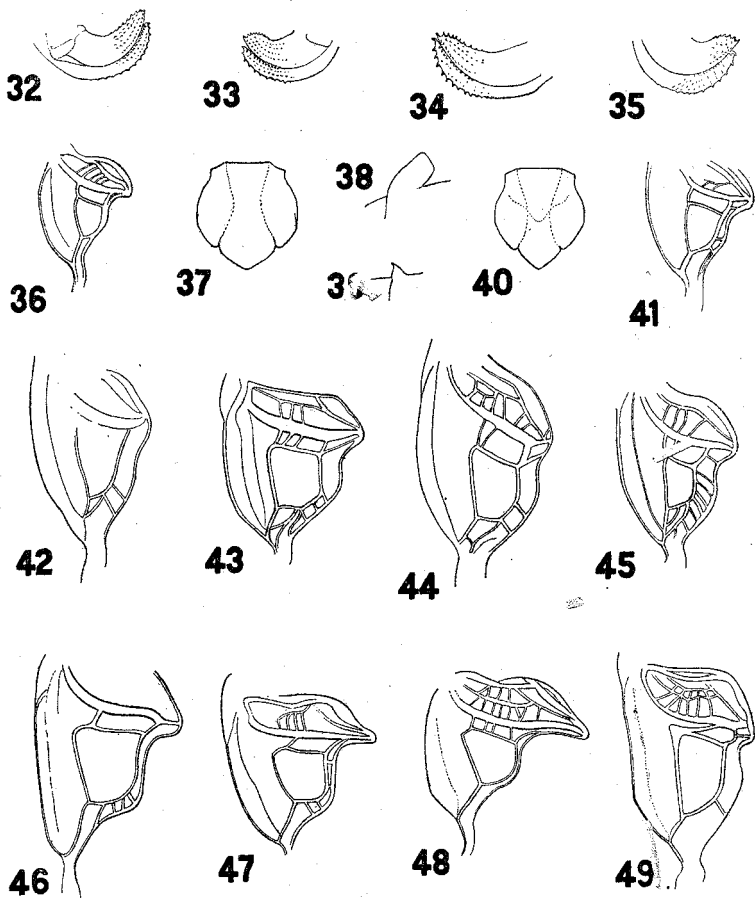
Group D is very decidedly separated from the other forms of the genus, differing in a number of features. The coloration and general appearance of the single species comprising the group is distinctive.

Morphological Notes on Male Genitalia.—The supra-anal plate presents three general types in this genus; one, the more prevalent, being more or less tongue-shaped, usually as long as broad, occasionally with parallel sides and distad more or less rounded, rather weakly or not at all sulcate proximad; another; found in the species of group C, is distinctly transverse with the lateral and distal margins more or less arcuate, and the third, found only in *arachnopyga*, is large, slightly longitudinal, rectangular, deeply sulcate for the greater part of its length and recessed into the disto-dorsal segment, which is rectangularly excised to receive it, a feature not found in any of the other forms. The cerci are in general of similar form in all the species except those of group C, the distal

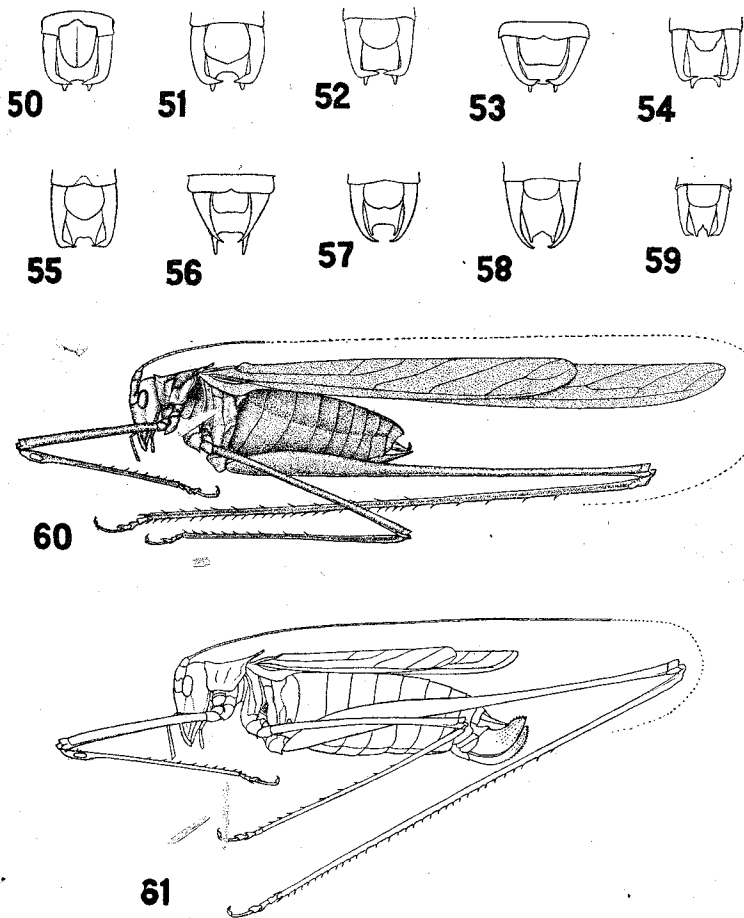
fourth or so sharply bent inwards, there acute or subdepressed. In group C the distal extremity tapers and is gently arcuate inwards. The plastic *A. gracilipes* is an exception to the rule in this respect, as in certain others, and very rarely specimens of it occur with the distal section of the cerci much as in group C. The subgenital plate always has the lateral margins more or less converging distad, the distal margin varying in width, often individually in *gracilipes*, and from truncate to deeply triangular-emarginate, the latter decided in group D, where the lateral arms of the emargination are sigmoid. The lateral processes of the distal extremity of the plate are more or less produced, never very long and occasionally only knobs, in *gracilipes* varying greatly in individuals. The ventral surface of the subgenital plate is distinctly tricarinate in *insaroides* and *phantasma*.

Morphological Notes on Female Genitalia.—The supra-anal plate of the female shows very slight variation, this also being true of the subgenital plate. The ovipositor is more sharply arcuate in *insaroides*, *phantasma*, *phalangium* and *grallator*, in fact almost bent in certain of these, while in group C and *semialata* it is much narrower. The dorsal margin is armed with regular serrations or serrulations distad, the ventral margin with recurved serrulations distad, generally passing into crenulations mesad. The surface of the valves is armed distad with low lamellate teeth, which are arranged in longitudinal rows on the dorsal valves and in transverse rows on the ventral valves, of which latter those along the lateral suture are generally the most decided and regular. The cerci are tapering and little differentiated in the species.

Abdominal Features.—In the great majority of the species the abdomen is marked laterad by longitudinal bars of color, generally contrasted whitish and purplish. The caudal margin of the dorsal abdominal segments is, in certain species, more or less angularly produced at these bars and more rarely in a similar fashion mesad, where a less distinct bar is occasionally present. The surface is generally more or less strumose at these color bars, but in one species (*phantasma*) the production of the margin is present while the color bars have become obsolete. The margins of the dorsal abdominal segments occasionally (*carita*, *limifera* and *phantasma*) are distinctly crenulate, in *phantasma* thickened points are present between the crenulations. The most decided abdominal structure



Ovipositor outline of (fig. 32) *Arethaea gracilipes constricta*, Dallas, Texas; (33) *A. insaroides*, allotype; (34) *A. semialata*, allotype; (35) *A. phantasma*, allotype. ($\times 3$) Dorsal outline of pronotum of male of *Arethaea gracilipes*, Raton, New Mexico (fig. 37) and *A. gracilipes constricta*, Kerrville, Texas (fig. 40). ($\times 4$) Lateral outline of appendage of the proximo-dorsal abdominal segment of *Arethaea gracilipes*, Raton, New Mexico (fig. 38) and *A. gracilipes constricta*, Kerrville, Texas (fig. 39). ($\times 4$) Outline of stridulating field of male tegmina; fig. 36, *Arethaea arachnopyga*, type; 41, *A. gracilipes*, type; 42, *A. insaroides*, type; 43, *A. phalangium*, Thomasville, Ga.; 44, *A. grillator*, type; 45, *A. semialata*, type; 46, *A. carita*, allotype; 47, *A. brevicauda*, allotype; 48, *A. limifera*, type; 49, *A. phantasma*, type. ($\times 8$)



Outline of apex of male abdomen seen from the dorsum. ($\times 4$) Fig. 50, *Arethaea arachnopyga*, type; 51, *A. gracilipes*, Raton, New Mexico; 52, *A. insaroides*, type; 53, *A. phalangium*, Thomasville, Ga.; 54, *A. grillator*, type; 55, *A. semialata*, type; 56, *A. carita*, allotype; 57, *A. brevicauda*, allotype; 58, *A. limifera*, type; 59, *A. phantasma*, type. Fig. 60, Lateral view of *Arethaea arachnopyga*, type. ($\times 2$) Fig. 61, Lateral outline of allotype of same. ($\times 2$)

found in this genus is noticed only in the male sex and then in but a portion of the species. The caudal section of the proximo-dorsal segment is elevated dorsad into a process which may be moderately low and sub-obliquely or arcuato-truncate cephalad or comparatively high, slightly recurved cephalad, inflated, bulbous and more or less finely haired. Apparently this structure is a specialized fold of the chitinous integument, as in a few of the species possessing it the caudal aspect evidences its origin, but in the more highly modified structure found only in certain individuals of *gracilipes* this feature is not so evident. The very peculiar feature regarding this development is that it is not even a specific character in *semialata*, specimens from the northern part of the range of which have a well developed process, while those from the more southern localities have no trace of this structure. In *gracilipes* specimens from the higher elevations have the extreme bulbous type present, while those from the lower altitudes have the simpler, more usual type of process. Taken altogether this structure is one of the most puzzling features in the external morphology of the genus, the fact that such a marked development should be variable within specific limits being most unusual. The process is present in all of the form of group A, present (*insaroides*) or absent (*phalangium* and *grallator*) in group B, present (*brevicauda* and *limifera*) or absent (*carita*) in group C and absent in group D (*phantasma*) and present or absent in the species *semialata*. Thus the appendage is seen to be present or absent in species which are evidently members of the same phyla. What the function of this structure may be we do not know and can only suggest that it may be the orifice of a scent gland.

Notes on Tegminal Structure.—In the male sex the highly specialized structure of the stridulating field of the tegmina affords excellent specific characters, which we have utilized to great advantage in the present paper. Two tendencies are noticed in the development of this field, one in the formation of an ample area, long and broad, with a but little differentiated margin and a non-produced apex to the stridulating vein (exemplified in *phantasma*, *phalangium* and *grallator*) and another in the more or less pronounced abbreviation of the field, which is broadest at the stridulating vein, the apex of which becomes progressively produced into a peg-like process, the extreme type of which is as long as the remaining width of the field (*limifera*). This latter tendency appears to us to be the great-

est specialization in the genus, correlated as it is with the reduction in tegminal length in the female. This broadening at the stridulating vein is accompanied by an abbreviation of the speculum and a pronounced angulato-emargination of the distal portion of the free margin of the field. The male sex is invariably macropterous, while the female is macropterous in six species, decidedly brachypterous in three⁵⁶ (group C) and moderately brachypterous in two (*arachnopyga* and *semialata*). As stated above the reduction in size of the flight organs is in direct ratio to the specialization in structure of the apex of the stridulating vein of the male tegmina. In one of the species generally macropterous in the female (*gracilipes*), certain individuals approach the type of brachypterism found in *semialata* and *arachnopyga*. The number of rami to the discoidal vein⁵⁷ varies from two to six and in two species (*carita* and *brevicauda*) as much as from two to five. The number of these has been considered diagnostic by previous authors, but our studies show that as specific criteria no value can be placed on them, varying as they often do on the two tegmina. The number present in the series of each species is treated under the respective Morphological Notes. Very frequently the proximal rami, and occasionally others, are forked and the distal one of the forks has been annexed by the next distad complete ramus. This is generally effected through the agency of an adventitious more or less distinct medio-longitudinal false nervure connecting the rami, breaking in one or more places. In similar fashion the anterior ulnar vein occasionally annexes the proximal discoidal rami.

Color Pattern.—The main features of the color pattern consist of more or less distinct postocular bars of whitish and purplish, continued over the cephalic portion of the prozona, broad edgings of the same tones on the caudal margins of the lateral lobes of the pronotum and narrower continuations of the same on the caudal margin of the pronotal disk, and more or less decided lateral abdominal bars of whitish or yellowish and purplish, and in certain species a median one. The face frequently has distinct pale infra-ocular bars, while the dorsum of the prozona and of the abdomen is fre-

⁵⁶ This sex is unknown in one of these three (*limifera*), so this statement is made on the basis of affinity of the male sex.

⁵⁷ The proximal one of these rami is really the median vein, but as it does not differ at all in character from the other rami we have counted it as one.

quently punctulate with purplish. The femora are almost always washed more or less with purplish, occasionally overlaid with whitish. The great majority of the species follow this general pattern more or less closely, but *phantasma* is unique in having the margins of the pronotum beaded with purplish and the lateral abdominal bars obsolete.

Distribution.—Extending from southern California (San Luis Obispo County), southern Nevada (Crestline) and central northern Nebraska (Niobrara), east to eastern Kansas (Fairmount) and eastern Texas (Rosenberg), south to southern Mexico (Tonala, Chiapas) and west to Guadalajara, Mexico and the shores of the Pacific in southern California. A single species, *A. phalangium*, exhibits a most interesting case of discontinuous distribution, its range being complete removed from the main area of distribution of the genus as it is found in the southeastern United States (Georgia and Florida). Vertically the genus ranges from near sea-level (Brownsville, Texas; Tonala, Chiapas) up to at least 7500 feet (Livermore Peak, Texas). The region in which the genus reaches its greatest diversity is south-western Texas and the adjacent portion of northern Mexico, its origin doubtless being Sonoran.

History.—In 1870, Thomas⁵⁸ described the first species of the present genus from southern Colorado, assigning it to the Old World genus *Ephippitytha*, to which, however, it is not at all related. In 1876, Stål, recognizing the peculiar character of Thomas's species, erected⁵⁹ the genus *Arethaea* for it. Scudder, in 1877, apparently unaware of Stål's name, created the genus *Aegipan*⁶⁰ for two new species of the present genus, *phalangium* from Georgia and *grallator* from Texas. In 1878, Brunner, in his classic revision of the Phaneropterinae,⁶¹ described two species of the genus, *multiramosa* from Georgia and *constricta* from Texas. Scudder, in 1900, in describing from southern California the first brachypterous female individual of the genus,⁶² referred it to the quite different genus *Dichopetala* as *D. brevicauda*, an error Morse pointed

⁵⁸ Proc. Acad. Nat. Sci. Phila., 1870, p. 76:

⁵⁹ Bihång till Kongl. Svenska Vetensk.-Akad. Handl., IV, no. 5, p. 55.

⁶⁰ Proc. Boston Soc. Nat. Hist., XIX, p. 39.

⁶¹ Monogr. der Phaneropt., p. 234.

⁶² Canad. Entom., XXXII, p. 331.

out several years later,⁶³ while in the same paper Scudder⁶⁴ described a species from the same region as *Arethaea consuetipes*, which we now know to be a member of the genus *Insara*. In 1902, Scudder described a second brachypterous female individual from New Mexico as *A. carita*.⁶⁵ Rehn, in 1907, based the species *A. sellata*⁶⁶ on a macropterous male from Arizona.

The recognition of Thomas's species has been the greatest difficulty with most of the previous authors, Brunner first erroneously determining it, in which he was followed by Scudder, who in so doing, relegated to the synonymy a perfectly valid name of his own.

Material Examined.—272; 156 males, 98 females, 18 immature specimens.

The majority (153) of these specimens were taken by the authors on recent trips and are located in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. Of the remaining specimens we find 23 in the Hebard Collection; 20 in the Academy of Natural Sciences of Philadelphia; 24 in the Scudder Collection at the Museum of Comparative Zoology, and 26 in the United States National Museum, loaned to us through the kindness of Mr. A. N. Caudell. The material of the genus in the collections of the Brooklyn Institute of Arts and Science, the American Museum of Natural History, the University of Kansas and the University of Nebraska was also placed at our disposal by the authorities in charge. To all those who so kindly assisted us in our work we wish to express our sincere thanks.

In the preparation of the paper the types of the following species have been examined by us.

Arethaea arachnopyga n. sp.

Arethaea gracilipes (Thomas)

Arethaea insaroides n. sp.

Arethaea phalangium (Scudder)

Arethaea grillator (Scudder)

Arethaea semialata n. sp.

Arethaea carita (Scudder)

⁶³ Psyche, IX, p. 381.

⁶⁴ Canad. Entom., XXXII, p. 332.

⁶⁵ Proc. Davenp. Acad. Sci., IX, p. 52.

⁶⁶ Proc. Acad. Nat. Sci. Phila., 1907, p. 61.

(*Arethaea sellata* Rehn = *A. carita*, ♂)

Arethaea brevicauda (Scudder)

Arethaea limifera n. sp.

Arethaea phantasma n. sp.

The only types belonging to the genus which we have not examined are those of *A. multiramosa* and *constricta* Brunner, both of which names have been placed without difficulty.

KEY TO THE SPECIES OF THE GENUS ARETHAEA

The present key is admittedly artificial, as it is impossible to express in such shape the shades of difference in proportions and other relative features, which make up the majority of the differential characters in this genus, and which would have to be used in a truly natural key. In consequence the emphasis here placed on many of the differential features is by no means a true index to their natural, or taxonomic, value. The sequence of the species groups and their natural affinities have already been discussed. Female specimens are considerably more difficult to assign satisfactorily than are the males, possessing as the latter do the highly characteristic stridulating field of the tegmina.

In the case of the female sex of *arachnopyga* it has been necessary to make a separate entry, distinct from the male sex, but in all of the other forms the two sexes are treated in unit alternatives. We would strongly recommend that the figures illustrating the characters of the species be consulted in connection with the key.

A. Stridulating field of the male tegmina very broad proximad, with its greatest breadth subequal to or but little less than the length of the same area, apex of the stridulating vein decidedly or excessively produced; tegmina of female shorter than or but little exceeding the length of the pronotal disk. Cerci of the male not strongly bent inwards distad.

B. Male tegmina with stridulating field proportionately narrowed proximad, distal margin of apical process of stridulating vein not as long as the width of the speculum; proximo-dorsal abdominal segment of male without a dorsal process. Female tegmina slightly longer than the pronotal disk..... **carita** Scudder

BB. Male tegmina with stridulating field proportionately broader proximad, distal margin of apical process of stridulating vein as long as (*brevicauda*) or longer than (*limifera*) the width of the speculum. Proximo-dorsal abdominal segment of male with a dorsal process. Female tegmina distinctly shorter than the pronotal disk (female of *limifera* unknown).

C. Limbs moderately elongate (caudal femora 22.8 mm. to 26.7). Apical process of stridulating vein of male tegmina not as long as the width of the remaining portion of the field; marginal field of male tegmina moderately developed. Cerci of male more robust. Abdominal segments of both sexes with margins not distinctly crenulate.....**brevicauda** (Scudder)

CC. Limbs greatly elongate (caudal femora 27.5 mm. to 30.6). Apical process of stridulating vein of tegmina subequal in length to the width of the remaining portion of the field; marginal field of male tegmina excessively developed. Cerci of male slenderer. Abdominal segments with margins distinctly crenulate. (Female unknown.).....**limifera** new species

AA. Stridulating field of the male tegmina narrower proximad, with its greatest breadth distinctly less than the length of the same area, or when very nearly subequal to the length the latter is decidedly less than that of the disk of the pronotum (*gracilipes* and *arachnopyga*), apex of the stridulating vein not decidedly (*i. e.*, peg-like) produced; tegmina of female at least twice as long as the pronotal disk. Cerci of male strongly bent inwards distad (except in occasional specimens of *gracilipes*).

B. Supra-anal plate of male greatly developed, elongate subrectangulate, deeply sulcate for the greater portion of its length and recessed into the disto-dorsal abdominal segment. (Female moderately brachypterous—see alternative with *semialata*.)

arachnopyga new species ♂

BB. Supra-anal plate of male normally developed, frequently transverse, not deeply sulcate and never recessed into the disto-dorsal abdominal segment. (Females macropterous or moderately brachypterous.)

C. Cephalic and median femora with the disto-dorsal extremity strongly compressed, angularly produced, subspiniiform. Eyes very elongate-elliptical, more than twice as deep as wide.

D. Size larger (tegmina, ♂ 28 to 32 mm., ♀ 30.5 to 34). Stridulating field of the male tegmina shorter than the pronotal disk; tegmina of both sexes somewhat broader at the distal fourth than at the proximal third.

phalangium (Scudder)

DD. Size smaller (tegmina, ♂ 20.7 to 26.5 mm., ♀ 23 to 29). Stridulating field of the male tegmina subequal to the length of the pronotal disk; tegmina of both sexes subequal in width at the distal fourth and the proximal third.

grallator (Scudder)

CC. Cephalic and median femora with the disto-dorsal extremity not at all or but little compressed, never angularly produced or subspiniiform. Eyes ovate, ovoid or elliptical, but never twice as deep as wide.

- D. Margin of the stridulating field of the male tegmina gently arcuate and not at all projecting at the apex of the stridulating vein. Pronotum very short and broad. Proximo-dorsal abdominal segment of male with process. (Subgenital plate of male weakly tricarinate ventrad. Ovipositor very broad).....**insaroides** new species
- DD. Margin of the stridulating field of the male tegmina appreciably produced though rounded at the apex of the stridulating vein. Pronotum more elongate.⁶⁷ Proximo-dorsal abdominal segment of male with or without process.
- E. Stridulating field of male tegmina elongate, subequal to the disk of the pronotum in length, broad. Pronotum deeply sellate; lateral lobes quite elongate, broadly rounded caudad; texture of pronotum and tegmina coriaceous. Abdominal segments with margins strongly crenulate. Ovipositor broad. (Subgenital plate of male deeply V-emarginate, ventral surface of plate tricarinate. Female macropterous.)
phantasma new species
- EE. Stridulating field of male tegmina more or less decidedly shorter than the length of the pronotal disk, as a whole narrower. Pronotum not deeply sellate; lateral lobes at most but moderately elongate, oblique caudad; texture of pronotum and tegmina not coriaceous but as in other species of the genus. Abdominal segments with margins not crenulate. Ovipositor never broad.
- F. Stridulating field of the male tegmina not sharply narrowing distad, but slightly produced at the apex of the stridulating vein. Female with the tegmina not surpassing the apex of the abdomen.
- | | |
|---|--|
| } | semialata new species ♂ & ♀ ⁶⁸ |
| } | arachnopyga new species ♀ ⁶⁸ |
- FF. Stridulating field of male tegmina sharply narrowing distad, considerably produced at the apex of the stridulating vein. Female with the tegmina surpassing the apex of the abdomen.

⁶⁷ The female of *semialata* approaches the opposite category in this respect, but the ovipositor in that form is far slenderer than in *insaroides*.

⁶⁸ The females of these species can be readily separated as follows:

Ovipositor over twice as long as deep; caudal margin of pronotal disk arcuate.

semialata.

Ovipositor not more than twice as long as deep; caudal margin of pronotal disk rectangulate.

arachnopyga.

G. Head broader. Pronotum with the disk broader in proportion to its length, caudal margin of disk roundly obtuse-angulate to rectangulate.....**gracilipes** (Thomas)

GG. Head narrower. Pronotum with the disk narrower in proportion to its length, caudal margin of disk acute-angulate.

gracilipes constricta Brunner

Arethaea arachnopyga⁶⁹ new species (Figs. 36, 50, 60 and 61.)

This species, in certain respects, occupies as unique a position as *A. phantasma*, having no very close relationship to the other forms of the genus. The male can immediately be distinguished from all of the other forms by the larger, longitudinally sulcate supra-anal plate, the margin of the disto-dorsal abdominal segment being deeply emarginate to receive the plate. From *A. semialata*, to which it bears a more pronounced superficial resemblance than to any other, the present form can, in addition to the character given above, be separated by the narrower disk of the pronotum, the more acute-angulate caudal margin of the disk, the more oblique caudal margin of the lateral lobes of the pronotum, the less extensive stridulating field of the male tegmina, which in general more resembles that of *gracilipes*, and by the heavier ovipositor.

The male sex in many features is very close to *A. gracilipes constricta*, but the genital characters are different and the female is moderately brachypterous instead of macropterous as in *gracilipes*.

Type.—♂; Marathon, Brewster County, Texas. Elevation 3940 to 4160 feet. August 26 to 27, 1912. (Rehn and Hebard.) [Hebard Collection.]

Description of Type.—Size medium; form moderately compressed. Head with the greatest width, which is immediately ventrad of the eyes, contained one and one-half times in the depth of the head; occiput rounded, moderately declivent to the fastigium; fastigium narrow, lanceolate, acuminate, sulcate medio-longitudinally, apex subdepressed; frontal fastigium briefly truncate dorsad and in contact with the fastigium of the vertex; eyes prominent, elliptical, the greatest width about two-thirds the greatest depth, the latter subequal to the depth of the infraocular portion of the genae; antennae more than three times the length of the body. Pronotum considerably compressed, the lateral lobes somewhat expanding caudad when seen from above,

⁶⁹ *Αράχνης spider, πυγή buttocks*; in allusion to the resemblance of the supra-anal plate of the male to the jaws of a spider.

general form of the pronotum subsellate, the dorsal line nearly straight when seen from the side, appreciably ascending in the vicinity of the cephalic margin; surface of the disk of the pronotum greatly constricted mesad, the greatest caudal width of the disk approximately two-thirds the length of the disk; cephalic margin of disk sinuato-truncate with a median rudimentary tubercle, caudal margin rectangulate with the immediate angle faintly produced and narrowly rounded, no trace of lateral angles or shoulders present; transverse sulcus forming an obomegoid figure on the disk; lateral lobes with the greatest dorsal length appreciably surpassing the greatest depth of the same, cephalic margin sinuate, ventro-cephalic angle roundly rectangulate, ventral margin sinuate, ventro-caudal angle in general obtuse with the immediate angle rounded, caudal margin oblique, subsinuately truncate, humeral sinus decided but not deep, roundly obtuse-angulate, callosed caudal section of the lateral lobes rather narrow and not sharply defined. Tegmina equal to about one and two-thirds times the length of the body, moderately narrow, the width at the distal fourth contained about seven and one-half times in the length of the same and distinctly greater than the width at the proximal third; lobate marginal field very short, but little longer than the stridulating field, the margin sharply sheared distad; distal portion of costal margin gently arcuate to the narrow but rounded apex; discoidal vein with three rami, the proximal one diverging slightly proximad of the middle of the tegmen; stridulating field distinctly shorter than the pronotal disk, its greatest width about two-thirds of its length, free margin produced at the apex of the stridulating vein into an acute process which is arcuate proximad and nearly straight transverse distad, the immediate apex narrowly rounded, free margin distad of process sinuate, the field narrowing distad, anal vein moderately arcuate, stridulating vein slightly oblique, robust, subarcuate, speculum subtrigonal, rather small. Exposed portion of wings about two-fifths the tegminal length. Abdomen with the process of the proximo-dorsal segment considerably elevated, not recurved, in fact much as in *A. gracilipes constricta*; disto-dorsal abdominal segment strongly transverse, distal margin truncate laterad, strongly brace-shaped emarginate mesad for half the depth of the segment; supra-anal plate with its base recessed within this emargination of the preceding segment and its length greater than its width, lateral margins subparallel, apex bluntly, roundly and broadly obtuse-angulate, surface with a moderately deep medio-longitudinal sulcus for the greater portion of the length of the plate, distad thickly pilose. Cerci moderately robust, tapering, at about the distal third strongly recurved at a right angle, the extremity also directed somewhat dorsad, the apex acute, slightly depressed; subgenital plate very broad, the proximal width subequal to the length, lateral margins narrowing distad, distal margin subtruncate with a very faint median angulate emargination, lateral styliform processes brief. Cephalic and median femora with bispinose genicular lobes, caudal femora with unispinose genicular lobes. Cephalic femora more than twice as long as the pronotal disk; cephalic tibiae with elliptical foramina. Median

femora about three and one-half times the length of the pronotal disk. Caudal femora almost twice the length of the body, moderately inflated proximad; caudal tibiae exceeding the femora by about the length of the pronotum.

Allotype.—♀; Data same as of the type.

Description of Allotype.—The following characters are those of difference from the description of the male sex. Pronotum with the disk less constricted mesad and less expanded caudad than in the male, the greatest caudal width of the disk but slightly more than half the length of the same; caudal margin of disk slightly acute; lateral lobes with the greatest depth but two-thirds the dorsal length of the same, humeral sinus but a weak arcuate emargination. Tegmina in length subequal to twice that of the head and pronotum together, not surpassing the tips of the median femora, lanceolate, narrow, the margins subparallel for the greater portion of their length, distad the costal margin is rather strongly arcuate to the narrowly rounded apex which is sutural in position; discoidal vein with the proximal of the three rami diverging at three-fifths the length of the tegmina. Exposed portion of the wings surpassing the tegmina by nearly the length of the pronotum. Abdomen with no trace of a proximo-dorsal abdominal process; disto-dorsal abdominal segment transverse and with its distal margin arcuato-emarginate mesad; supra-anal plate tongue-shaped, distinctly longer than broad, the lateral margins subparallel proximad and arcuato-convergent distad, the apex blunt rectangulate, surface of plate sulcate medio-longitudinally on proximal half; cerci tapering, acuminate, faintly depressed distad; ovipositor in length equal to the pronotum and half of the head, the greatest depth equal to half of the length, arcuate, the margins converging distad, dorsal margin serrato-dentate on distal two-thirds, ventral margin with recurved serrato-dentations distad, passing into crenulations mesad, surface with decided lamellate dentations on the distal section, these arranged irregularly in five longitudinal series on the dorsal valves, the ventral of the five series with a great number of subcontiguous teeth, and on the ventral valves transversely and very irregularly distributed, along the sulcus, however, rather thickly placed; subgenital plate transverse trigonal, blunt. Median femora three times as long as the pronotal disk. Caudal femora a third again as long as the body exclusive of the ovipositor.

Paratypic Series.—We have before us two adult male and one immature female paratypes from the type locality.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor in females)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Marathon, Texas. <i>Type</i>	14.8	4.2	2.4	24.5	3
♂ Marathon, Texas. <i>Paratype</i>	17	4	2.2	24	2.9
♂ Marathon, Texas. <i>Paratype</i>	17.2	3.8	2	22.8	2.7
♀ Marathon, Texas. <i>Allotype</i>	18.7	3.4	2.3	14	1.6
♀ Montelovez, Coahuila, Mexico.....	18	3.2	2	7	1.1

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Marathon, Texas. <i>Type</i>	9.6	9.7	14.2	29	
♂ Marathon, Texas. <i>Paratype</i>	9	8.7	13.1	26.7	
♂ Marathon, Texas. <i>Paratype</i>	9.4	8.9	13.3	28.6	
♀ Marathon, Texas. <i>Allotype</i>	3.9	9.5	13.3	28.2	4.8
♀ Montelovez, Coahuila, Mexico.....	.6	9.8	13.3	26.5	4.2

Color Notes.—General color of the body ranging from straw yellow and pale chalcedony yellow on the head and thorax to ochraceous-rufous and amber yellow on the abdomen, the tegmina passing from the thoracic color to light bice green and rinnemann's green on the distal half of the tegmina and the exposed portion of the wings. In the allotype (female) the head and thorax are inclined toward chrysolite green, becoming lumiere green ventrad, the abdomen chalcedony yellow. Head with traces of infra-antennal bars of greenish white; occiput more or less yellowish with traces of purplish punctulations; postocular bar narrow, arcuate dorsad, cream white irregularly edged with purplish; eyes army brown to mars brown; antennae of the general color with the three proximal joints washed ventrad more or less decidedly with cadmium orange to burnt sienna. Pronotum with the converging prozonal continuations of the postocular bars and the margining of the caudal margin of the disk composed, as in the other species, of contiguous lines of pansy purple to burnt lake and sulphur yellow.

low to pale yellow-green, the pale section of the prozonal lines occasionally weak; dorsum of the pronotum more or less thickly, completely and decidedly punctulate with pansy purple to burnt lake, lateral lobes occasionally (in allotype) with similar punctulations. Tegmina with the area of the male stridulating field between the speculum and the anal vein seal brown, the anal vein lined with madder brown. Abdomen with the lateral lines only indicated by narrow areas of the general color unmarked by punctulations of pansy purple to burnt lake, which thickly and uniformly cover the remainder of the dorsal and lateral aspects of the abdomen, coalescing into a line ventrad of the pale line on the proximo-dorsal abdominal segment. Extremity of the abdomen of the male more yellowish than the body, inclining toward aniline yellow. Limbs more or less washed with purplish as in other species of the genus, rarely with a suffusion of hoary white as well (in allotype), tibiae of the general color. Ovipositor with denticulations blackish brown.

Distribution.—The present species is only known from two localities, one (Marathon) in western Texas, the other (Montelovez) in Coahuila, Mexico. The former locality is directly east of the main chain of elevations of that region.

Biological Notes.—This very peculiar species was found by us to be very scarce, occurring in an area of high green grasses interspersed with various plants. Here it was taken adult August 26 and 27 and again September 12 and 13. A single female in the instar preceding maturity was taken on the first visit, so it is probable that the species does not reach maturity much before the latter part of August.

Morphological Notes.—The only important difference in structure noticed in the series is also one of size. The two females exhibit a disparity in the length of the tegmina and wings, as shown in the table of measurements. The allotype has the tegmina about reaching the tips of the caudal femora and subequal in width for a considerable portion of their length, the wings of the usual form and surpassing the tegmina by more than a quarter of the length of the latter. In the Montelovez female the tegmina are only half as long as in the allotype, tapering regularly for the greater part of their length, with a very narrowly rounded apex, the wings surpassing the tegmina as mere tips. This variation in alar length

appears to be individual, but there exists a possibility of the Montelovez specimen representing a form of which the male is at present unknown.

Remarks.—This species is apparently localized in distribution, occurring only in suitable habitats, but how widely it ranges we cannot even estimate, as the conditions wherein it was found at Marathon were exceptional for western Texas in many respects.

Specimens Examined: 6; 3 ♂, 2 ♀, 1 immature ♀:

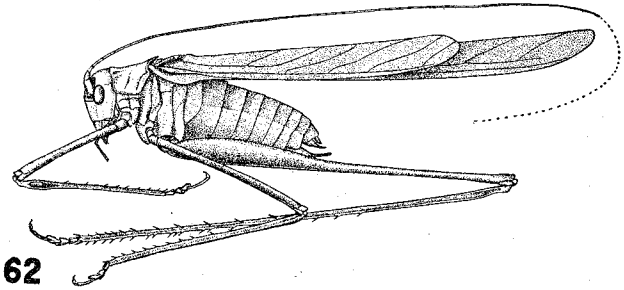
Marathon, Brewster, Company, Texas, elevation 3900 to 4160 feet, August 26 and 27 and September 12 and 13, 1912 (R. & H.), 3 ♂, 1 ♀, 1 immature ♀. *Type, allotype, paratypes.*

Montelovez, Coahuila, Mexico, 1 ♀, [Scudder Collection].

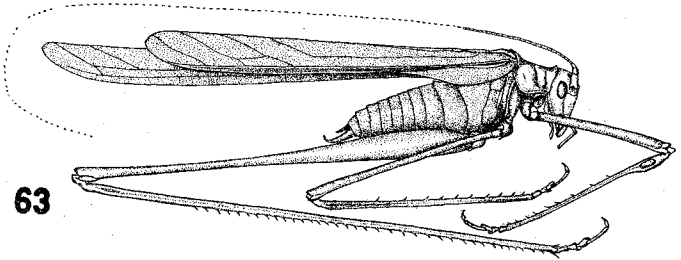
Arethaea gracilipes (Thomas) (Figs. 37, 38, 41, 51 and 62.)

1870. *E[phippitytha] gracilipes* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 76. [Southern Colorado.]
1871. *Ephippitytha gracilipes* Thomas, Prelim. Rep. U. S. Geol. Surv. Wyoming, pp. 265, 268. [Southern (page 268) or southeastern (page 265) Colorado.]
1872. *Ephippitytha gracilipes* Thomas, Prelim. Rep. U. S. Geol. Surv. Montana, p. 445, pl. II, fig. 11. [Northern Arizona.]
1872. *Ephippitytha gracilipes* Glover, Illustr. N. Amer. Entom., Orth., pl. XI, fig. 11.
1900. [*Arethaea*] *gracilipes* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 67. (Part.) [Colorado; Arizona.]
1902. *Arethaea constricta* Scudder and Cockerell (not of Brunner), Proc. Davenp. Acad. Sci., IX, p. 52. (Part.) [Ten miles west of La Luz, New Mexico.]
1902. *Arethaea gracilipes* Scudder and Cockerell, Ibid, p. 52. [La Trementina, New Mexico.]
1904. *Arethaea gracilipes* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [Casas Grandes, Chihuahua, Mexico.]
1906. *A[rethaea] gracilipes* Kirby, Synon. Catal. Orth., II, p. 443. (Part.) [Colorado; Arizona.]
1907. *Arethaea constricta* Rehn (not of Brunner), Ibid, 1907, p. 74. [Tucson, Arizona.]
1909. *Arethaea constricta* Rehn and Hebard (not of Brunner), Ibid, 1909, p. 168. [Fort Wingate, New Mexico.]

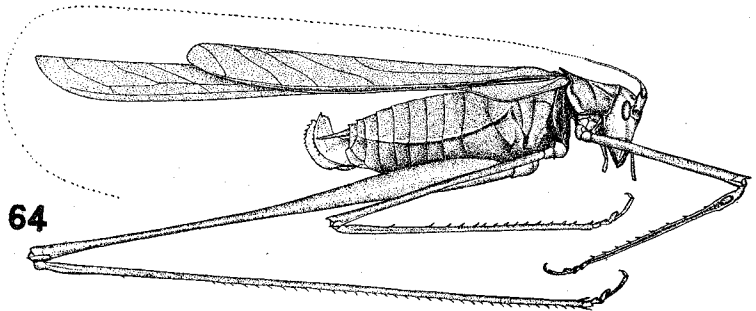
The present species and its geographic race *constricta* stand so much apart from the other forms of the genus that the characters given in the key will readily differentiate them from the other species. In many respects *gracilipes constricta* shows relationship to the species-group B, while *gracilipes sensu strictiore* has a con-



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63



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Fig. 62. Lateral view of type of *Arethaea gracilipes*. ($\times 2$) Fig. 63. Lateral view of type of *A. insaroides*. ($\times 2$) Fig. 64. Lateral view of allotype of *A. grillator*. ($\times 2$)

siderable superficial resemblance to *A. carita* in the bullation of the male pronotum. The extremes of the two races are quite different in general appearance, but an analysis of the differences and the examination of series reduces the degree of real difference. True *gracilipes* in general differs from the race *constricta* in having the head broader, the fastigium broader with the margins of the same more decidedly arcuato-divergent caudad, the pronotum more inflated and sub-bullate, the disk (particularly in the male) broader in proportion to the length, the caudal margin of the same roundly rectangulate, the process of the proximo-dorsal abdominal segment of male more elevated and subrecurved, generally very high and bulbous distad, the proportionately shorter, and in the male broader, tegmina and the limbs slightly shorter.

Type.—♂; Southern Colorado. 1869. [United States National Museum.] Dried from alcohol and colorless.

Description of Male.—As the type is in such poor condition we here describe a male from Raton, New Mexico, August 26, (Cockerell), [United States National Museum].

Size small; form very elongate, subcompressed. Head relatively broad, the greatest width immediately ventrad of the eyes contained slightly less than one and one-half times in the greatest depth of the head; occiput sub-bullate; fastigium rather broad proximad, elongate trigonal, strongly narrowing distad, lateral margins well elevated, arcuato-sublamellate, a decided medio-longitudinal sulcus present, apex of fastigium low, narrowly subtruncate and in contact with the fastigium of the face; eyes quite prominent, elliptical in outline, their length subequal to that of the infra-ocular portion of the genae. Pronotum moderately inflated, sub-bullate across the lateral lobes, sellate, the dorsal outline weakly concave when seen from the side; disk considerably expanded caudad, the greatest width there appreciably more than half the pronotal length; cephalic margin of disk very shallowly and imperfectly obtuse-angulate emarginate, caudal margin of disk roundly obtuse-angulate, the immediate angle completely rounded, lateral margins of disk completely rounding into the lateral lobes; transverse sulcus forming a broad obomegoid figure mesad on the disk; lateral lobes with the greatest depth of the same two-thirds of the greatest length of the lobes, cephalic margin of the lobes sinuato-emarginate, ventro-cephalic angle rotundato-rectangulate, ventral margin sigmoid, i.e., concavo-emarginate and arcuate caudad, ventro-caudal angle broadly rounded, caudal margin obliquely truncate, humeral sinus roundly obtuse-angulate, rather shallow, surface of the lobes with a considerable area along the caudal margin callosio-inflated. Tegmina about one and one-half times the length of the body, appreciably narrower at the proximal third than at the distal fourth, the width at the latter contained about seven and one-half times in the length; apex narrowly rounded; lobate marginal field very slightly longer than the disk of the pronotum; stridulating field distinctly shorter than

the pronotal disk, the greatest width about two-thirds of the length, free margin at the apex of the stridulating vein briefly acute-produced, the immediate angle of the production rounded, margin distad of the projection sinuate, stridulating vein almost horizontal, arcuate, not at all heavy, anal vein strongly arcuate; discoidal vein with three rami. Exposed portion of the wings in length surpassing the tegmina by about twice the pronotal length. Abdomen with the proximo-dorsal segment bearing a high, somewhat recurved process, the apex of which is rounded and sub-bulbous, the caudal face of the process deeply folded; disto-dorsal abdominal segment sub-arcuate emarginate mesad; supra-anal plate with its distal margin subtruncate; cerci moderately elongate, robust, the distal fourth subrectangularly inbent, acute, the whole slightly and the extremity decidedly depressed, the internal margin of the cercus with a slight ridge; subgenital plate broad, moderately elongate, the distal margin deeply arcuato-emarginate, brief but rather robust styliform processes present laterad. Femora with the apices non-produced dorsad; cephalic and median femora with bispinose genicular lobes and caudal pair with unispinose lobes. Cephalic femora about twice the length of the pronotal disk; cephalic tibiae with elliptical foramina. Median femora about half again as long as the cephalic femora. Caudal femora subequal to the tegmina in length, moderately inflated proximad; caudal tibiae surpassing the femora by about the length of the pronotal disk.

Description of Female.—For the female sex we describe one from Tucson, Arizona, October 12, 1910, (Rehn and Hebard), [Hebard Collection].

The characters here given are those of difference from the description of the male sex. Fastigium narrower and more compressed than in the male sex.⁷⁰ Pronotum with the caudal margin of the disk obtuse-angulate with the immediate angle narrowly acute; calloused area along the caudal margin of the lateral lobes less inflated than in the male. Proximo-dorsal abdominal segment without a trace of a dorsal process; disto-dorsal abdominal segment with a transverse median impressed area, the cephalic margin of which is arcuate, distal margin of segment subtruncate but slightly arcuato-emarginate at the bases of the cerci; supra-anal plate semi-elliptical, having a medio-longitudinal sulcus proximad; cerci moderately elongate, tapering; ovipositor moderately deep, slightly longer than the pronotal disk, moderately arcuate and appreciably narrowing distad, the immediate apices of the valves blunted, dorsal and ventral margins for half of their length serratedentate, the teeth of the ventral margin recurved, surface of distal third of dorsal valves with decided spiniform tubercles rather irregularly arranged in sub-linear series, the ventral row the most regular, ventral valves with a similar decided series bordering the sulcus, elsewhere on distal half with scattered rugose tuberculations; subgenital plate short, trigonal, apex blunted. Cephalic femora slightly more than twice the length of the pronotal disk; median femora about three times as long as the pronotal disk; caudal femora slightly longer than the tegmina.

⁷⁰ This is probably as wide in New Mexican females as in the males, but unfortunately none are available for study.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Southern Colorado. <i>Type</i>		3.5 ⁷¹	2.5	21	2.5
♂ Raton, New Mexico. (U.S.N.M.).....	13.7	3.9	2.2	23.1	2.8
♂ Fort Wingate, New Mexico. (A.N. S.P.).....	15.7	3.2	2	20.7	2.6
♂ West of Luluz, New Mexico. (Scudder Collection).....	14.2	3.8	2.4	22.3	2.8
♂ Marathon, Texas.....	15.2	3.5	2.2	22.8	2.9
♂ Snyder's Hill, Arizona.....	13.2	3.3	2.3	21.5	2.5
♂ Espinosa Ranch, Arizona.....	14.5	3.6	2.2	22.7	2.7
♂ Sycamore Canyon, Arizona.....	14.8	4	2.4	24.6	2.6
♀ Tucson, Arizona. (Descr. spec.).....	16.4	3.9	2.4	24	2.2
♀ Tucson, Arizona.....	16	3.6	2.1	22	2.3
♀ Pine, Arizona. (Hebard Collection)..	14.4	3.9	2.2	23.7	2.6
♀ Tumamoc Hill, Arizona.....	17.9	3.7	2.2	22.7	2.5
♀ Sahuaro Plain, Arizona.....	18.6	3.4	2.2	23.5	2.5
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	13.8	3.7	2.3	22.5	2.2
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	15.5	3.6	2.1	22.6	2.4
	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Southern Colorado. <i>Type</i>	8	7.8	11.6	25	
♂ Raton, New Mexico. (U.S.N.M.).....	7.7	7.2	11.2	22.6	
♂ Fort Wingate, New Mexico. (A.N. S. P.).....	9	7.2	11.2	24	
♂ West of Luluz, New Mexico. (Scudder Collection).....	11	8.2	13	27.2	
♂ Marathon, Texas.....	9.6	8.2	12.4	26	
♂ Snyder's Hill, Arizona.....	8.8	7.5	11.8	24.6	
♂ Espinosa Ranch, Arizona.....	8.7	8.5	13	27	
♂ Sycamore Canyon, Arizona.....	9.1	8.6	13.7	28.4	
♀ Tucson, Arizona. (Descr. spec.).....	7.2	8.9	12.5	26.4	4.5
♀ Tucson, Arizona.....	8	8.9	12.8	26.5	4.6
♀ Pine, Arizona. (Hebard Collection)..	8.8		13.4	28	5.1

⁷¹ Caudal margin not included as it has been broken away by the pin.

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♀ Tumamoc Hill, Arizona.....	9.6	9.2	13.5	30	4.2
♀ Sahuaro Plain, Arizona.....	8.5	9.7	14.2	28	4.6
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	7.9	9.2	13.5	27.5	4.5
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	7.8	9	13.3	26.7	4.5

In the male sex, specimens from the higher elevations in New Mexico average smaller than those from the lower elevations in southern Arizona, but in the absence of female individuals from New Mexico it does not seem advisable to emphasize this apparent geographic size variation. The individual variation seen in the two females from Tucson and those from Sycamore Canyon is not very great, although in several characters the two former ones represent the extreme measurements.

Color Notes.—General color of the whole body quite uniform in the individual, in different specimens ranging from a greenish extreme to a brownish one; to be exact from as deep as winter green through tiber green and pale veronese green to yellowish citrine and, finally, to clay color. In a number of the individuals having the latter base color, the distal half or so of the tegmina and the exposed portion of the wings are green, often as strongly colored as winter green, while in the others the color lightens to cinnamon buff or even pinkish buff on the head, pronotum and immediate base of the tegmina. Face in numerous greenish specimens with broad subvertical whitish to wax yellow infra-antennal bars, caudal margin of genae similarly colored; antennae ranging from wax yellow to light dull green-yellow, the two proximal joints occasionally more or less completely orange, again their ventral surface and the adjacent portion of the remainder of the antennae frequently washed with garnet brown; eyes varying from russet to chestnut-brown; fastigium frequently washed with garnet brown; postocular bars always more or less indicated, but usually weak, arcuate, narrow, garnet brown dorsad and creamy white to green-

ish white ventrad. Pronotum with converging continuations of the postocular bars indicated more or less distinctly on the prozona, similar in color, the garnet brown occasionally fairly broad and the enclosed portion of the prozona almost always more or less finely punctulate with the same; caudal margin of pronotal disk margined with the same two colors, rarely the garnet brown is absent but frequently it is much weakened; lateral lobes with the callosed caudal margin hoary white, creamy white or yellowish white. Tegmina of male with the broad arcuate section of the stridulating field between the speculum and anal vein infusate, generally deeply so and ranging from seal brown, with the immediate vicinity of the anal vein madder brown, to verona brown with the anal vein cinnamon-buff; vicinity of the same portion of the anal vein in the female more or less distinctly lined with vinaceous-rufous. Abdomen with the usual pale lateral line always more or less indicated, ranging from cream color to clay color, frequently more or less contrasted dorsad by a parallel edging of garnet brown, the latter often absent, the dorsum of the abdomen between the pale lines frequently closely and finely punctulate with garnet brown. Cerci of male more or less yellowish, tips blackish; ovipositor of female with the distal extremity deeper in tone than the proximal section. Limbs, as in other forms of the genus, more or less suffused with garnet brown, this often very pale and rarely absent, generally limited to the femora, but occasionally in a tintured form coloring the tibiae as well, on the cephalic and median femora generally tinting the entire part, the caudal femora usually having the proximal and distal extremities of the base color.

Taken as a whole the individuals from southern Arizona are paler and more buffy than those from the more elevated sections in New Mexico and western Texas, no buffy specimens being in our series from the latter regions, while full greenish individuals are the exception from southern Arizona. The buffy individuals as a whole show less color contrasts, but the converse deduction that the greenish ones all show more contrasts does not hold true, occasional greenish specimens having very little contrast, although the greatest contrasts are in that extreme. The paleness of the Arizona specimens appears to be suitably explained by the more decided desert habitat in which they occur.

Distribution.—The range of typical *gracilipes* extends from southern Colorado south to northern Chihuahua, Mexico (Casas Grandes), east to western Texas (Marathon) and west to central (Pine) and central southern (Baboquivari Mountains) Arizona, apparently passing into *gracilipes constricta* in west central Texas and western Kansas. Of our material that from northern and central New Mexico is most typical, while the specimens from western Texas are not typical, although nearer the present form than *gracilipes constricta*. The vertical distribution of the present race is, from the evidence of the material before us, from about 2200 feet (Tucson) to about 7000 feet (Fort Wingate).

Biological Notes.—The present form inhabits a variety of country, but usually is found in grama or other grasses varying from six inches to several feet high, which frequently grow in park-like country under mesquite and acacia, and again the insect has been taken in rabbit weed (various species of composites). On numerous occasions it has been taken attracted to light at night. On one occasion it was taken drinking water at the edge of a rock tinaja or basin. It is in general a rather scarce species, although so widely distributed.

The earliest date we have for the insect is July 22 (Pine, Arizona) and the latest October 12 (Tucson). Immature specimens were taken as late as October 11 (Tucson), which shows that the latest date given above is doubtless considerably before the actual latest date of seasonal occurrence.

Morphological Notes.—The form of the fastigium varies somewhat in the male sex, this being as described in the greater portion of the specimens from New Mexico, but narrower in the Arizona, west Texas and Fort Wingate individuals of that sex. The bullation of the pronotum and width of the same across the expanded lateral lobes is less in the individuals from western Texas than in any others, in all the females, however, less pronounced than in the males. The form of the caudal margin of the pronotal disk in the male varies from regularly arcuate to roundly obtuse-angulate regardless of locality, the same margin in the female always more decidedly angulate though equally variable, the immediate angle occasionally acute produced. The tegmina of male with three to five rami to the discoidal vein. The abdomen of the male always bears

a well developed process on the proximo-dorsal segment, this placed mesad by the caudal margin and in the New Mexican specimens as above described under the male sex, but in the west Texas and Arizona individuals this process is lower, more trigonal when seen from the side, not at all recurved or bulbous but just as decidedly erect and sulcate caudad and always more apparent than in *A. gracilipes constricta*. The cerci of the male vary greatly in form, ranging from a tapering type with the distal fourth bent incurved at a right angle and with the apex very acute, to one with the recurved distal fourth strongly depressed and lamellate, with the apex blunt acute but marginal and not at all aciculate, and to another type with the distal fourth hardly at all curved, following much the same direction as the main portion of the cercus and with the apex decidedly aciculate. The first type is by far the most numerous, occurring in the New Mexico and Arizona specimens, the second in two males (all seen) from western Texas, although suggested in another from Luluz, south central New Mexico, the third only in Chihuahua material. The study of a far larger series of specimens from that region of which El Paso is the geographic center may show that these cercal forms are characteristic of definite regions or elevations, and that the recognition of more races would be advisable, but the present day evidence is not sufficient to make any such deductions. The sub-genital plate of the male shows very considerable variation in the form and width of the distal emargination and in the length of the styliform processes. The latter feature has no geographic significance as far as we can determine, and we do not possess sufficient series from single localities to make any statement regarding the constancy of certain forms of the margin. The ovipositor of the female shows some little variation in size but the form shows no noteworthy differences.

Synonymy.—From an examination of *gracilipes* and a study of topotypes of *constricta* Brunner, it is evident that they are only geographic forms of the same species. Brunner erroneously used the name *gracilipes* for the very different species which Scudder had previously named *grallator*. Of the records given for both of the forms and based on specimens we have examined all but four, two belonging to the present form. These are Thomas's 1872 record from northern Arizona and Scudder and Cockerell's La

Trementina specimen. The former is unquestionably the present race and the latter is presumably the same.⁷²

Remarks.—The examination of the type of this form, shrivelled and discolored though it is, permitted us to correctly place the "*gracilipes*" of Brunner and other authors, as the species named *grallator* by Scudder. The form of the stridulating field of the tegmina and the structure of the extremities of the cephalic and median femora readily place the type specimen. The extremes of the two races of this species have such different appearances that with only a few typical specimens one could easily consider them distinct species, but the possession of a considerable number of individuals enables us to see their close relationship. Each form is typical in a certain definite geographic area, probably intergrading over a portion of western Nebraska, Kansas and west central Texas, for while we lack absolute intermediates we possess specimens which show the lines of variation away from one type toward the other. True *gracilipes* is developed more highly in the elevated portion of northern New Mexico and adjacent Colorado than elsewhere, varying slightly away from the typical form southward and also somewhat westward; the specimens from southern Arizona, while *gracilipes* in general sum total of characters, being less decided than those from the higher elevations in or near the main uplift of the Rocky Mountains.

Specimens Examined; 41; 21 ♂, 18 ♀, 2 immature ♀ :

Southern Colorado, 1869, 1 ♂. *Type*. [U. S. N. M.]

Raton, Colfax County, New Mexico, August 26, (Cockerell), 1 ♂, [U. S. N. M.].

Las Vegas Hot Springs, New Mexico, August 12, (H. S. Barber), 1 ♂, [U. S. N. M.].

Jemez Hot Springs, Bernalillo County, New Mexico, July 29, 1911, (John Woodgate), 1 ♂, [Hebard Collection].

Fort Wingate, McKinley County, New Mexico, August 17, 1910, August 28, 1903, (John Woodgate), 2 ♂, [Hebard collection and A. N. S. P.].

Albuquerque, New Mexico, 1 ♂, [Hebard Collection ex Bruner].

Arroyo ten miles west of La Luz, Otero County, New Mexico, August 28 (at light), (C. H. T. Townsend), 1 ♂, [Scudder Collection].

New Mexico, (H. Meeske), 1 ♂, [Hebard Collection ex Bruner].

⁷² Prof. Cockerell writes us that the specimen was sent to Scudder and kept by him. It could not be found in the Scudder series by us.

Pine, Gila County, Arizona, July 22, 1889, 1 ♀, [Hebard Collection ex Bruner].

Tucson, Arizona (F. H. Snow), 1 ♀, [Univ. of Kansas]; October 12, 1910, (R. & H.), 5 adult and 1 immature ♀.

Tumamoc Hill, Tucson Mountains, Arizona, elevation 2400 to 3090 feet, October 3 and 4, 1910, (R. & H.), 1 ♂, 5 ♀.

Sonora Road Canyon (Roebles Pass), Tucson Mountains, Arizona, elevation about 3000 feet, October 11, 1910, (R. & H.), 2 ♀.

Sahuaro Plain between Tucson and Coyote Mountains, Pima County, Arizona, October 5, 1910, (R. & H.), 1 ♀.

Snyders Hill, Pima County, Arizona, elevation about 2500 feet, October 11, 1910, (R. & H.), 1 ♂.

Roebles Ranch, Pima County, Arizona, October 5, 1910 (attracted to light), (R. & H.), 1 ♂.

Palo Alto Ranch, Altar Valley, Pima County, Arizona, elevation about 3000 feet, October 6 to 8, 1910, (R. & H.), 1 ♂.

Near Espinosa Ranch, Altar Valley, Pima County, Arizona, elevation about 3200 feet, October 9, 1910, (R. & H.), 1 ♂.

Sycamore Wash and Canyon, Baboquivari Mountains, Pima County, Arizona, elevation 3400 to 4700 feet, October 6 to 9, 1910, (R. & H.), 2♂, 3 ♀. Arizona, 1 ♂, [U.S.N.M.].

Marathon, Brewster County, Texas, elevation 3900 to 4160 feet, September 12 and 13, 1912, (R. & H.), 1 ♂.

Canyon behind Pulliam Bluff, Chisos Mountains, Texas, elevation 4600 to 5000 feet, September 7, 1912, (R. & H.), 1 ♂.

Casas Grandes, Chihuahua, Mexico, September, 1902, (W. E. Hughes), 2 ♂, 1 immature ♀, [A.N.S.P.].

***Arethaea gracilipes constricta* Bruner (Figs. 32, 39 and 40.)**

1878. *A[rethaea] constricta* Bruner, Monogr. der Phaneropt., p. 236. [Dallas, Texas.]

1885. *Arethaea gracilipes* Bruner (not of Thomas), Bull. Washb. Coll., I, p. 127. [Barber County, Kansas.]

1900. *Arethaea constricta* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 67. [Texas.]

1900. *Arethaea gracilipes* Scudder (not of Thomas), Ibid., VIII, p. 67. (Part.) [Kansas.]

1904. *Arethaea gracilipes* Caudell (not of Thomas), Sci. Bull. Brooklyn Inst. Arts & Sci., I, no. 4, p. 114. [Esperanza Ranch, Brownsville, Texas.]

1905. *Arethaea gracilipes* Isely (not of Thomas) Trans. Kansas Acad. Sci., XIX, p. 245. [East of Fairmount, Kansas.]

1906. *A[rethaea] constricta* Kirby, Synon. Catal. Orth., II, p. 443. [Texas.]

1906. *A[rethaea] gracilipes* Kirby (not of Thomas), Ibid., II, p. 443. (Part.) [Kansas.]

The characters separating the present race from *A. gracilipes* s.s. have been emphasized under the typical form.

Type.—♂; Dallas, Texas. [Berlin Museum.]

Description of Male.—The following characters, which are purely comparative with the same sex of true *gracilipes*, are drawn up from a male bearing the following data; Victoria, Victoria County, Texas, July 26 to 27, 1912, (Hebard), [Hebard Collection].

Size medium. Head with the depth greater in proportion to the width immediately ventrad of the eyes; occiput more compressed, lanceolate, margins nearly straight cephalad but moderately divergent caudad; eyes slightly narrower in proportion to the length than in true *gracilipes*. Pronotum less inflated, not bullate across the lateral lobes, dorsal outline more concave when seen from the side, than in the other race; disk distinctly longer and proportionately narrower, the greatest width of the disk caudad hardly more than half the length of the same; cephalic margin of the disk bisinuate with a median blunt angle, caudal margin of disk acute-angulate; obomegoid figure of transverse sulcus narrower; lateral lobes with the caudal margin obliquely sinuato-truncate. Tegmina with the lobate marginal field no longer than the pronotum; stridulating field much shorter than the pronotal disk, structure of the field as in true *gracilipes* except that the stridulating vein is more obliquely arcuate. Process of the proximo-dorsal abdominal segment not strongly erect nor recurved, trigonal when seen from the side, the dorsal outline oblique, the caudal vertical, the whole appendage low, in form more decidedly a fold of the plate than an elevated specialized appendage as in *gracilipes* s.s. Disto-dorsal abdominal segment with the distal margin sinuato-truncate; supra-anal plate semi-elliptical in form; cerci as in true *gracilipes* but with the distal fourth not bent rectangularly, but obliquely directed inwards and the same portion slenderer; subgenital plate with the distal margin moderately broad, subtruncate, lateral styliiform processes moderately long. Cephalic and median femora proportionately as in *gracilipes* s.s. Caudal femora a third again as long as the tegmina, very slender.

Description of Female.—As typical of the female sex we have selected a topotype; Dallas, Texas, September 25 to 26, 1912, (Rehn and Hebard), [Hebard Collection]. The features of the female have been almost entirely covered in the preceding description of *gracilipes* (female) and the male of the present form, so that it is only necessary to call attention to several points. Fastigium lower and less developed than in the male. Caudal margin of the disk of the pronotum equally as acute-angulate as in the male. Appendages as in the female of *gracilipes* s.s., but ovipositor not quite so deep and the apex of the dorsal valves slightly sharper.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Niobrara, Nebraska. (Univ. of Nebraska).....	13.3	3.8	2	20	2.1
♂ Barber County, Kansas. (Hebard Collection).....	15.5	3.8	2.1	20.5	2.2
♂ Wichita, Kansas. (U.S.N.M.).....	14.4	3.7	2	19	2.2
♂ Dallas, Texas. <i>Type.</i> (Ex Brunner)..	15	3.8		20	
♂ Shovel Mount, Texas. (A.N.S.P.)....	13.5	3.5	1.9	19.7	2.1
♂ Kerrville, Texas.....	15	3.5	1.9	20.5	2.
♂ Beeville, Texas.....	17	4.2	2.2	22.8	2.4
♂ Victoria, Texas. (Descr. spec.).....	17	4.5	2.2	22.2	2.4
♂ Benavides, Texas.....	14.5	3.7	2	19	2
♂ Uvalde, Texas.....	14.5	3.7	2	21	2.2
♂ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	14	4	2.2	20.5	2.4
♂ Tonalá, Chiapas, Mexico. (A.M.N.H.)	13	3.3	1.9	19	⁷³
♀ Barber County, Kansas. (Hebard Collection).....	15.8	3.7	2	19.7	2.
♀ Wichita, Kansas. (U.S.N.M.).....	18.5	4.2	2.2	18.2	1.9
♀ Dallas, Texas. (Descr. spec.).....	19.6 ⁷⁴	3.7	2	17.5	1.9
♀ Dallas, Texas. (U.S.N.M.).....	12.6	3.1	2	19.2	1.9
♀ Cisco, Texas.....	15.7	3.3	2	17.8	1.9
♀ Shovel Mount, Texas. (A.N.S.P.)....	14.2	3.3	2.	18.7	2
♀ Beeville, Texas.....	15.8	4.2	2.2	21.8	2.5
♀ Beeville, Texas.....	18	4.2	2.3	21.5	2.4
♀ Clip, Goliad County, Texas.....	17	4.2	2.4	21.5	2.3
♀ Benavides, Texas.....	15	4.	2	21.2	2.1
♀ Uvalde, Texas.....	16	4	2.1	22.8	2.3
♀ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	12.8	3.9	2	22.8	2

⁷³ Curled in drying from alcohol.⁷⁴ Abdomen distended abnormally in stuffing.

	Length of wing distad of tegmen	Length of cephalo-femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Niobrara, Nebraska. (Univ. of Nebraska).....	6.8	7.4	10.5	22.2	
♂ Barber County, Kansas. (Hebard Collection)	9.5	9.2	14.3	29	
♂ Wichita, Kansas. (U.S.N.M.).....	7.2	7.8	12	24.5	
♂ Dallas, Texas. <i>Type</i> . (Ex Brunner)...				27	
♂ Shovel Mount, Texas. (A.N.S.P.).....	7.9	8.2	12.7	25.5	
♂ Kerrville, Texas.....	8.7	9.5	13.6	28	
♂ Beeville, Texas.....	8.3	9.3	14.8	29.3	
♂ Victoria, Texas. (Descr. spec.).....	9.3	9.7	15.1	31	
♂ Benavides, Texas.....	9.8	8.9	14.2	28.3	
♂ Uvalde, Texas.....	8.9	9	14.2	28.3	
♂ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	8.3	9.5	13.6	28.2	
♂ Tonala, Chiapas, Mexico. (A.M.N.H.)	9.5	8.1	11.8	24.5	
♀ Barber County, Kansas. (Hebard Collection).....	7.3		11.7	25.3	4.2
♀ Wichita, Kansas. (U.S.N.M.).....	6.4	8.5	12	25.8	5
♀ Dallas, Texas. (Descr. spec.).....	8.2	8.7	12.5	25.6	4.5
♀ Dallas, Texas. (U.S.N.M.).....	8	8.9	13.3	26.4	3.9
♀ Cisco, Texas.....	6.9	8.3	12.1	25.5	4
♀ Shovel Mount, Texas. (A.N.S.P.).....	7	8.5	12.5	25.2	4
♀ Beeville, Texas.....	8.3	10.3	15	30.3	4.5
♀ Beeville, Texas.....	8	9.4	15	30	4
♀ Clip, Goliad County, Texas.....	9.2	10.4	15.5	32.1	4.5
♀ Benavides, Texas.....	8.4	8.9	13.3	27.5	4.4
♀ Uvalde, Texas.....	8.6	9.6	14.2	28	4.2
♀ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	8	10	13.5	29.6	4.5

It is evident that in the Coastal and Fayette Prairie Regions of Texas the present form reaches its maximum size, the series of specimens from Victoria, Beeville and Clip showing the greatest proportions found in the series. Individuals from Nebraska, Kansas, northern Texas and the Edwards Plateau region (Shovel Mount and Kerrville) are appreciably smaller than the coastal individuals, while the isolated specimen from Tonala, Chiapas, Mexico is also quite small. The small size of some of the proportions of the latter

may be partly due to shrivelling as the specimen has been dried from alcohol.

Color Notes.—Color pattern and tones as a whole the same as found in *A. gracilipes* s.s. The general color is as deep as winter green in only a few specimens, in the majority of the greenish specimens nearer light oriental green, the brownish extreme with no specimen as deep as clay color, the majority cinnamon-buff and a few washed with pinkish cinnamon. The intensification of the green on the distal portion of the tegmina and the exposed section of the wings is found in a large number of the greenish individuals, some specimens of a pinkish buff general color having the same area tinged with pale greenish. The number of specimens showing at least traces of greenish far outnumber those not exhibiting the same, and it seems that the brownish phase is a reaction to environmental conditions, although we have little positive evidence on this point. In a large portion of the series the abdomen is far more yellowish than the remainder of the body, but a very considerable portion of this is due to drying.

When compared with the color description of *A. gracilipes* s.s., the following noteworthy features of difference are apparent. Caudal margin of the pronotal disk frequently having the garnet brown portion of the edging reduced to a mere thread; disk of the pronotum and occiput in the majority of the specimens with a more or less distinct thread-like medio-longitudinal line of creamy. Tegmina with the immediate vicinity of the rami of the anterior ulnar and discoidal veins adjacent to the sutural margin frequently pale in the greenish specimens, usually opaline green; sutural margin of the entire tegmen frequently edged, in both sexes, with deep vinaceous to seal brown and hessian brown. Pale lines on the sides of the abdomen decided in the majority of the specimens and almost always bordered ventrad with a line of from pale garnet brown to very deep maroon, the dorsal dark line of the marking less distinct than in *A. gracilipes* s.s., often a mere morocco red wash and quite frequently absent, dorsum of the abdomen between these lines often punctulate with garnet brown.

Distribution.—The present form ranges from as far north as Niobrara, in extreme northern Nebraska, south as far as Tonala, Chiapas, Mexico, east to northeastern Kansas (Fairmount), east-central (Dallas, Calvert and Victoria) and southern (Brownsville) Texas,

westward apparently passing into *A. gracilipes* s.s., in western Kansas and west-central Texas, specimens from as far west as Clark County, Kansas and Uvalde and Carrizo Springs, Texas representing *constricta*. The specimen from Montelovez, Coahuila, Mexico is included with this form, although being from alcohol we feel some uncertainty regarding its real position.

The highest known elevations from which we have seen the present race are 1950 feet in Clark County, Kansas and 1526 to 1725 feet at Kerrville, Texas, while at Tonalá and Brownsville its distribution almost touches sea-level.

Biological Notes.—Isely took the present form in open prairies east of Fairmount, Kansas. The present authors have taken it in numerous situations in Texas; in short grass in open spots between oak thickets (Dallas and Beeville), in the very short and sparse vegetation on out-crops of shell-limestone (Weatherford), among green weeds in rather moist bottom land (Uvalde), in dry sorghum (Laredo), in long dry grass along railroad tracks (Clip), in fields more or less thickly overgrown with grasses and low plants (Victoria and Benavides) and also beaten from oak (Cisco). One immature female taken at Brownsville by Mathewson is labelled "on huisache" (*Vachellia farnesiana*). It thus can be seen to frequent a variety of habitats, although in our experience most numerous in well grassed fields dotted with low bushes and plants. In such situations at Victoria it occurred in company with *A. grallator* and at Benavides with *A. phantasma*.

The earliest date for an adult of this race is May, at Brownsville, the next June 11, at Wichita, Kansas, the latest, October 4, at Shovel Mount, Texas. A female individual in the instar preceding maturity, from Brownsville, Texas, taken May 23 has been examined by us.

Morphological Notes.—The general form of the pronotum varies slightly in character in the present race, but its features as differential from *A. gracilipes* s.s., remain constant. A certain amount of artificial dilation and compression of the pronotum, due to pressure when pinning, is occasionally noticed, but the former is easily recognized as such when compared with the bullation found in the typical form of the species. The caudal margin of the pronotum varies from rectangulate to distinctly acute-angulate, the margins laterad of the angle frequently subarcuate and again the apex acute-

tuberculate. Cephalic margin of the pronotal disk with or without a median tubercle, this generally absent in northern specimens and almost always present in southern (from Victoria and Beeville south) individuals. The proximo-dorsal abdominal process of the male is almost always lower than in the typical form and never bulbous in character. The cerci of the male exhibit a gradual narrowing of the distal portion when specimens from Nebraska south to southern Texas are examined, the Niobrara, Nebraska and Barber County, Kansas individuals having the recurved section as sharply bent as in *gracilipes*, broad and sublamellate, with the immediate apex not at all attenuate and with the main shaft thickened, from which type there is a gradual drawing out of the appendage, until in the material from southern Texas the cerci are as given in the description of this race, the exact angle of the bend of the distal fourth varying somewhat, but the shaft slenderer and the form tapering with the apex aciculate. On the other hand the single Tonalá individual has the cerci broader, the distal section much depressed and lamellate, the general form much as in the specimens from western Texas referred to true *gracilipes*. The form of the subgenital plate of the male varies as in the typical form.

Remarks.—The race to which the name *constricta* is restricted, is a unit exhibiting within itself considerable variation, this in size and to a less extent in structure, but as a whole it shows less plasticity than *A. gracilipes* s.s. The differentiation of the material of the two races is not difficult and, we feel, completely warranted by the series before us.

Specimens Examined: 70; 42 ♂, 27 ♀, 1 immature ♀:

Niobrara, Knox County, Nebraska, August 2, 1902, (W. D. Pierce), 2 ♂, [Univ. of Nebraska].

Clark County, Kansas, elevation 1950 feet, August 25, 1911, (F. X. Williams), 1 ♂, [Univ. of Kansas].

Barber County, Kansas, (F. W. Cragin), 2 ♂, 2 ♀, [Hebard Collection ex Bruner].

Wichita, Sedgwick County, Kansas, June 11, 1909, (F. B. Isely), 1 ♂, [Univ. of Kansas]; July 13 to 20, 1 ♂, 1 ♀, [U.S.N.M.].

Kansas, 1 ♂, [U.S.N.M.].

Dallas, Texas, 1 ♀, [U.S.N.M.]; September 25 and 26, 1912, (R. & H.), 1 ♀.

Weatherford, Parker County, Texas, elevation 1000 to 1100 feet, September 23, 1912, (R. & H.), 1 ♀.

Cisco, Eastland County, Texas, 1450 to 1550 feet, September 21 and 22, 1912, (R. & H.), 1 ♀.

Calvert, Robertson County, Texas, (G. H. Harris), 1 ♂, [U.S.N.M.].

Shovel Mount, Burnet County, Texas, June 18, July 7 to 28, August 8 to 18, September 5 and October 4, 1901, (F. G. Schaupp), 6 ♂, 6 ♀, [A.N.S.P.].

Kerrville, Kerr County, Texas, elevation 1525 to 1800 feet, August 17 to 18, 1912, (R. & H.), 3 ♂.

San Antonio, Texas, June 16, (M. Newell), 1 ♂, [Hebard Collection ex Bruner]; August 15 and 16, 1912, (R. & H.), 1 ♂.

Victoria, Texas, July 26 and 27, 1912, (H.), 5 ♂.

Clip, Goliad County, Texas, August 27, 1912, (H.), 1 ♀.

Beeville, Bee County, Texas, July 28, 1912, (H.), 9 ♂, 8 ♀.

Benavides, Duval County, Texas, August 9 and 10, 1912, (R. & H.), 1 ♂, 2 ♀.

Esperanza Ranch, Brownsville, Texas, May and August 28, (Schaeffer), 1 ♂, 2 ♀, [Bklyn. Inst. A. & S.]; May 23, 1913, (Mathewson; on huisache), 1 immature ♀, [Hebard Collection].

Laredo, Webb County, Texas, elevation 500 to 550 feet, August 10 to 12, 1912, (R. & H.), 1 ♂.

Carrizo Springs, Dimmit County, Texas, June, 1885, (A. Wadgymer), 1 ♂, 1 ♀, [Hebard Collection ex Bruner].

Uvalde, Texas, elevation 1000 to 1100 feet, August 21 and 22, 1912, (R. & H.), 1 ♂, 1 ♀.

Montelovez, Coahuila, Mexico, 1 ♂, [Scudder Collection].

Tonala, Chiapas, Mexico, 1909, 1 ♂, [Amer. Mus. Nat. Hist.].

***Arethaea insaroides* new species** (Figs. 33, 42, 52 and 63.)

This rather isolated species is in general related on one hand to the remaining species of group B (*phalangium*, *grallator* and *semialata*) and on the other to the very peculiar and in fact unique *A. phantasma*. From *phalangium* and *grallator* this form can be readily distinguished by the abbreviate pronotum, which has a rounded caudal margin to the disk instead of a sharply angulate one, and the non-produced femoral apices. From *semialata* the present species can be distinguished by the shorter pronotum, the form of the stridulating field of the male, the more elongate tegmina of the female and the broader ovipositor. From *A. phantasma* the species here described differs in the much shorter and more inflated pronotum, the proportionately shorter and broader stridulating field of the male tegmen, which has its sutural margin less sinuate, the margins of the same formed by the anal veins being regularly converging distad, the subtruncate distal margin of the male subgenital plate, the proximo-dorsal abdominal segment of

the male which has a distinct compressed medio-marginal elevation and in the ovipositor of the female being more scabrous on the disk.

Type.—♂; Jimulco, Coahuila, Mexico. November. (Lawrence Bruner.) [Hebard Collection ex Bruner.]

Description of Type.—Size rather small; form moderately elongate. Head with the greatest breadth ventrad of the eyes contained one and one-half times in the greatest depth of the head; occiput very short, subinflated, very weakly declivent to the fastigium, considerably declivent to the antennal scrobes; fastigium subcompressed, lateral margins arcuato-elevated, converging cephalad, immediate apex very low and narrow, medio-longitudinal sulcus well impressed; frontal fastigium acute, very narrowly in contact with the fastigium of the vertex; face evenly rounded transversely, no distinct elevated ridges present; eyes moderately prominent, in outline elliptical, the greatest width contained about one and one-half times in the depth of the same, the depth subequal to that of the infra-ocular portion of the genae; antennae imperfect. Pronotum strongly sellate, appreciably inflated ventrad, the greatest transverse width across the ventral portion of the lateral lobes subequal to the length of the pronotal disk; disk considerably constricted mesad, somewhat elevated caudad and with the greatest caudal width about two-thirds of the length, cephalic margin of disk arcuato-emarginate mesad, arcuato-subproduced laterad, caudal margin of disk obtuse-angulate with the immediate angle rounded, disk broadly rounding into the lateral lobes, the faintest possible indication of converging angles present on the prozona, rounded indications of shoulders present in the usual positions; transverse sulcus distinct, continuous, on the disk forming a median rectangulate figure; lateral lobes slightly longer than deep, cephalic margin sinuate, ventro-cephalic angle subrectangulate, ventral margin subarcuato-emarginate cephalad, subarcuate caudad, ventro-caudal angle rounded, caudal margin obliquely arcuato-truncate, humeral sinus obtuse-angulate and broad surface of the metazonal section of the lobes sub-bullate. Tegmina about twice as long as the body, elongate lanceolate, narrow, subequal; lobate marginal field in length about equal to one-fourth of the tegminal length, similar in form to that found in other species of the genus; costal margin gently curving distad to the rounded apex; stridulating field slightly longer than the disk of the pronotum, its greatest width about two-thirds of its length, anal vein regularly arcuate, sutural margin of field broadly arcuate at the apex of the stridulating vein, distad of which it is subsinuate, stridulating vein heavy, oblique, arcuate, speculum with the external outline subarcuate; discoidal vein with three rami placed in distal two-fifths of tegmina; anterior ulnar vein reaching sutural margin of tegmina slightly distad of middle, with three well defined rami. Wings surpassing the apex of the tegmina by about a third the length of the latter. Abdomen subdepressed; proximo-dorsal abdominal segment having a greatly compressed subtrigonal disto-median elevated process; disto-dorsal abdominal segment with the distal margin

sinuato-truncate; supra-anal plate slightly transverse, in general form similar to the type found in the majority of the species of the genus; cerci similar in general form to those of other species, sharply bent inwards at distal fourth, the angle hardly rectangulate, the apex acute, depressed; subgenital plate narrowing distad, in general rather broad, distal margin broad, subtruncate, lateral styliform processes short, tapering, ventral surface with prominent rounded lateral carinae and a less decided subangulate median one, the latter not quite reaching the distal margin, the lateral ones continuous with the styliform processes. Limbs not greatly elongate, dorso-genicular region of cephalic and median femora subcompressed but not acute produced, genicular lobes of same femora bispinose, of caudal femora unispinose; cephalic femora slightly less than three times as long as the pronotum, cephalic tibiae with elongate elliptical foramina; median femora subequal to the body in length; caudal femora slightly longer than the tegmina, moderately inflated proximad, caudal tibiae surpassing the femora by more than the pronotal length.

Allotype.— ♀; Same data as the type.

Description of Allotype.—The following characters are those of difference from the description of the type. Fastigium smaller, less elevated and more compressed than in the male, sulcus equally impressed; face more flattened cephalad than in the male and with indications of infra-antennal ridges; eyes very slightly more longitudinal than in the male. Pronotum with the greatest transverse width across the ventral portions of the lateral lobes slightly greater than the dorsal length of the pronotal disk, the latter less elevated caudad than in the male and with the greatest caudal width less than two-thirds of the length, caudal margin of disk subrectangulate with the immediate angle not rounded; lateral lobes appreciably longer than deep, surface of the metazonal section of the lobes less bullate than in the male. Tegmina a fourth again as long as the body (exclusive of the ovipositor); lobate marginal field slightly more than a fourth of the length of the entire tegmen; anterior ulnar vein reaching the sutural margin distinctly distad of the middle and with its rami much less apparent than in the male. Proximo-dorsal abdominal segment without erect process; disto-dorsal abdominal segment deplanate dorso-mesad, the flattened area angularly margined laterad, distal margin of segment subarcuate, flattened mesad; supra-anal plate much as in male; cerci terete, moderately elongate; ovipositor slightly surpassing the femora in length, moderately deep, regularly arcuate, distal half of dorsal margin serrato-dentate, greater part of ventral margin crenulate becoming serrato-dentate distad, the serrations all recurved and smaller than those on the dorsal margin, distal extremity of the valves rounded in outline, surface of distal half of valves scabroso-dentate, the denticles in general arranged as in the other species of the genus, but the series are less regularly defined; subgenital plate trigonal, bicarinate mesad. Median femora about three-fourths the length of the body. Caudal femora about a third again as long as the tegmina.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Jimulco, Coahuila, Mexico. <i>Type</i>	12.8	3.3	2.3	24.8	2.8
♀ Jimulco, Coahuila, Mexico. <i>Allotype</i> . .	16.8	3.9	2.5	20	2.2
	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Jimulco, Coahuila, Mexico. <i>Type</i>	8	9	12.7	27.2	
♀ Jimulco, Coahuila, Mexico. <i>Allotype</i> . .	6.9	10	13	27.2	4.2

*Color Notes.*⁷⁵—General color baryta yellow becoming opaline green to chrysoprase green on the tegmina and wings, the dorsum of the pronotum dull veronese green. Head inclining toward martius yellow; eyes cinnamon brown to prout's brown. Pronotum with the dorsum (as well as much of the occiput) weakly, sparsely and irregularly sprinkled with purplish; caudal margin of the lateral lobes broadly, and of the disk narrowly, margined with creamy white, the only trace of the usual accompanying purplish being on the caudal margin of the disk. Tegmina with the vicinity of the rami of the anterior ulnar and discoidal veins touched with whitish, forming a pattern resembling that found in certain species of the genus *Insara*; sutural margin in the male lined with garnet brown; stridulating field with the vicinity of the free margin yellowish, the vicinity of the anal vein auburn. Wings more (♀) or less (♂) honey yellow proximad. Abdomen of male very thickly sprinkled with burnt lake punctations on the dorsal segments, paired arcuate pale yellowish lines present laterad on the same; cerci of male buff yellow, black at apex. Limbs of the general color, the median and cephalic femora more or less purplish for the greater part of their length; caudal femora punctulate or washed with purplish dorsad, vicinity of the ventral sulcus of the proximal

⁷⁵ The female has discolored considerably in drying, so the following notes are based primarily on the male.

portion of the caudal femora more or less creamy white. Ovipositor becoming blackish brown distad.

Distribution.—The present species is only known from a single locality in southwestern Coahuila, Mexico. Nothing is known regarding the habits of the species.

Remarks.—The position held by *insaroides* is peculiar, sharing as it does quite a few characters with two very different groups of the genus, to one (Group B) of which, however, it is closely enough related to be included. In general it may be said to show greatest affinity to *A. semialata*, but it does not have the sexual dimorphism in wing length found in that species, the apex of the stridulating vein of the male is less produced and the ovipositor deeper.

Specimens Examined: Jimulco, Coahuila, Mexico, November, (Lawrence Bruner), 1 ♂, 1 ♀. *Type* and *allotype*. [Hebard Collection ex Bruner.]

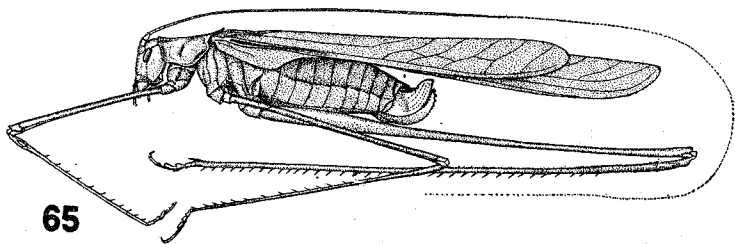
***Arethaea phalangium* (Scudder) (Figs. 43, 53 and 65.)**

1877. *Aegipan phalangium* Scudder, Proc. Bost. Soc. Nat. Hist., XIX, p. 40. [Georgia.]
1878. *A[rethaea] muliramosa* Brunner, Monogr. Phaneropt., p. 235. [Georgia.]
1900. [*Arethaea*] *phalangium* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 67. [Georgia.]
1905. *Arethaea phalangium* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1904, p. 795. [Thomasville, Georgia.]
1906. *A[rethaea] phalangium* Kirby, Synon. Catal. Orthopt., II, p. 443. [Georgia.]
1907. *Arethaea phalangium* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1907, p. 300. [Gainesville, Florida.]

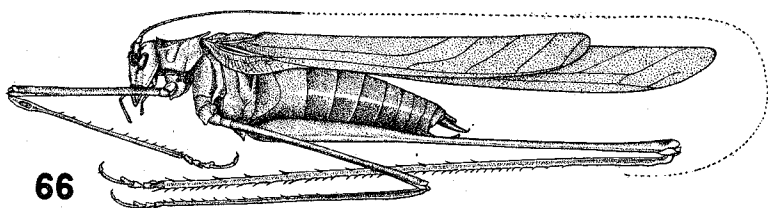
This striking species, which is one of the largest in the genus, has no close relationship to any other form of the genus but *A. grillator*, to which it is closely related, differing chiefly in the larger general size, very slightly longer tegmina and wings, the shorter stridulating field of the tegmina of the male, which is shorter than the pronotum, in the tegmina being somewhat broader at the distal fourth than at the proximal third, in the distal extremity of the male subgenital plate being broader and less arcuato-emarginate with the styliform processes more distant, and in the simpler coloration.

Type.— ♀; Georgia.⁷⁶ (H. K. Morrison.) [Scudder Collection.]

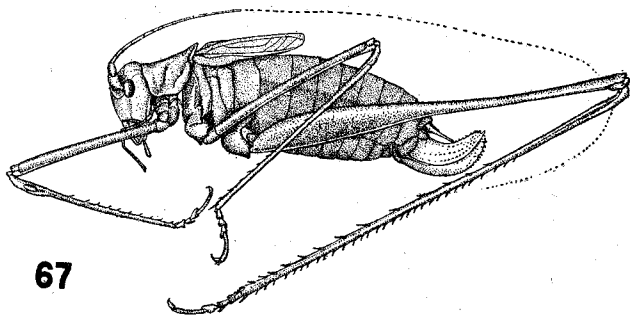
⁷⁶ Scudder originally measured both sexes and gave male characters as well as those of the female, but we are able to find only one typical female in the series.



65



66



67

Fig. 65. Lateral view of female of *Arethaea phalangium*, Thomasville, Ga. ($\times 2$) Fig. 66. Lateral view of type of *A. semialata*. ($\times 2$) Fig. 67. Lateral view of type of *A. carita*. ($\times 2$)

Description of Female.—Gainesville, Alachua County, Florida, August 16, 1905, (Rehn & Hebard), [Hebard Collection]. Size large; form elongate and compressed. Head with the greatest width immediately ventrad of the eyes contained one and one-half times in the greatest depth; occiput considerably and regularly declivent; fastigium acute trigonal, low, elongate fossulato-sulcate mesad, apex subdepressed, well separated from the low, broad, slightly acute frontal fastigium; eyes prominent, slightly compressed, very elongate elliptical, the greatest width contained twice in the depth, the latter slightly greater than that of the infra-ocular portion of the genae; antennae several times as long as the body.⁷⁷ Pronotum moderately sellate, nearly straight dorsad when seen from the side, but slightly elevated cephalad and caudad, as a whole considerably compressed, the disk narrow, moderately compressed mesad with the greatest caudal width of same contained twice in the length; cephalic margin of disk sinuato-truncate, caudal margin of disk moderately produced, very slightly acute-angulate; lateral portions of disk with traces of angles cephalad and indications of shoulders caudad; surface of disk slightly caudad of middle with a broad V shaped impressed figure; lateral lobes with the greatest depth contained one and one-half times in the greatest dorsal length, cephalic margin sinuato-truncate, ventro-cephalic angle rotundato-rectangulate, ventral margin sinuato-truncate, ventro-caudal angle roundly obtuse-angulate, caudal margin obliquely truncate, humeral sinus very broad, shallow, arcuate, the surface of the lobes appreciably impressed immediately cephalad of the same. Tegmina a third again as long as the body (exclusive of ovipositor), the width at distal fourth contained about eight times in the length of the same, the width at the proximal third being slightly but appreciably less than at distal fourth; marginal field considerably expanded on proximal fourth of tegmen, subarcuate, more sharply rounded distad than proximad; distal extremity narrowly rounded; discoidal vein with five to six rami, the proximal of which is in the usual position of the median vein and with which it appears to be analogous. Wings projecting distad of the tegmina a distance equal to about a third the length of the latter, subacute, the costal margin broadly arcuate distad. Abdomen subcompressed proximad; disto-dorsal segment truncate distad, slightly arcuato-emarginate at the base of the cerci; supra-anal plate semi-elliptical in form, with a medio-longitudinal sulcus which is also indicated on the distal portion of the adjacent segment; cerci terete, acute; ovipositor subequal in length to that of the dorsum of the abdomen, deep, the greatest depth nearly two-thirds the greatest length, decidedly bent-arcuate proximad, margin of the dorsal valves serrulate on distal half, margin of ventral valves finely crenulate for almost its whole length, becoming serrato-dentate distad, surface of the dorsal valves distad with approximately seven rows of low tooth-like ridges, the ventral row with more numerous teeth than the others, surface of the ventral valves with a number of similar tooth-like ridges placed transversely on the distal section, these regularly spaced only along the

⁷⁷ Not complete in the present specimen.

junction of the two valves; subgenital plate acute-trigonal, elevated and bicarinate mesad. Limbs very slender and elongate; cephalic and median femora with the dorsal margin of the distal extremity compressed and produced into a triangular point or spiniform process, all genicular lobes of the same limbs bispinose. Cephalic femora over two and a half times as long as the disk of the pronotum; cephalic tibiae with an elliptical tympanum. Median femora about half again as long as the cephalic femora. Caudal femora nearly twice the length of the median femora, little inflated proximad, genicular lobes unispinose; caudal tibiae surpassing the femora by about the pronotal length.

Description of Male: Thomasville, Thomas County, Georgia, June 29, 1903, (Collected for Hebard), [Hebard Collection]. The following characters are those of difference from the female sex. Head and pronotum as in the female but with a very weak and fine medio-longitudinal ridge on the dorsum of the pronotum. Tegmina with the form as a whole as in the female, but in length half again as long as the body and with the discoidal vein bearing five rami on each tegmen; stridulating field appreciably shorter than the dorsum of the pronotum, its greatest width about two-thirds its greatest length, stridulating vein heavy, oblique, subarcuate, margin of field but little produced at the apex of the stridulating vein, there rotundato-rectangulate, sinuate distad of the same, speculum crudely quadrate. Wings projecting distad of the tegmen slightly more than a third the length of the latter. Disto-dorsal abdominal segment having the distal margin subarcuate with a faint median truncate section; supra-anal plate slightly transverse, subrectangulate in general form but with the margins and angles rounded; cerci tapering, with the distal fourth rather sharply bent inwards, subdepressed in the same section, apex acute; subgenital plate elongate, narrowing distad, ventral surface with five carinae distad, one mesad (this extending greatly proximad) and two closely placed pairs laterad, distal extremity with brief substyliform processes, between which the margin is arcuato-truncate. Limbs as in the female.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal width of pro- notum	Length of teg- men	Width of tegmen at distal fourth
♂ Georgia. (Ex Scudder).....	15.5			29	
♂ Georgia. (Ex Brunner- <i>multiramosa</i>)..	20	5		32	
♂ Augusta, Georgia. (Hebard Collection)	22.6	5.1	2.8	30	3.1
♂ Thomasville, Georgia. (Hebard Collec- tion)	18.3	5	2.8	28	3.4
♂ Sanford, Florida. (Scudder Collection)	18	4.8	2.8	28.2	3.1
♂ Homestead, Florida.....	20.5	5.3	2.8	31.3	3.4
♀ Georgia. <i>Type</i>	18.5	5	2.9	30.5	3.9
♀ Florida. (Hebard Collection).....	24.3	5.8	2.9	33	3.8

Measurements (in millimeters)—Continued

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♀ Gainesville, Florida. (Hebard Collection)	24.5	5.4	2.9	32.5	3.9
♀ Sanford, Florida. (Scudder Collection)	19.2	5.7	3	34	3.8
♀ Biscayne Bay, Florida. (Scudder Collection).....	20	5.3	3	32	3
♀ Homestead, Florida.....	24.8	5.8	3.2	32	3.7
♀ Homestead, Florida.....	24	5.8	2.9	32.3	3.5
	Length of exposed portion of wing	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovi- positor
♂ Georgia. (Ex Scudder).....				36	
♂ Georgia. (Ex Brunner-multiramosa)....				33.6	
♂ Augusta, Georgia. (Hebard Collection)	8.5	12.3	17.3		
♂ Thomasville, Georgia. (Hebard Collection).....	9.3	11.8	17.7	34.5	
♂ Sanford, Florida. (Scudder Collection)	9.4	12	17.4	32	
♂ Homestead, Florida.....	9.4	13	19.6	37.6	
♀ Georgia. <i>Type</i>	9.	13	18.8	35.8	5.8
♀ Florida. (Hebard Collection).....	10.3	14.5	20.8	39.4	5.1
♀ Gainesville, Florida. (Hebard Collection)	8.6	14.5	20.8	39	5.3
♀ Sanford, Florida. (Scudder Collection).....	10	14.2	20.2	38.2	5.4
♀ Biscayne Bay, Florida. (Scudder Collection).....	9.5	14.7	21.2	40	5.1
♀ Homestead, Florida.....	8.5	15.4	20.8	38	5
♀ Homestead, Florida.....	9	15.5	21.3	37	5

From the foregoing measurements it is evident that in this species there is but a comparatively small amount of variation and that purely individual.

Color Notes.—General color varying from course green to light hellebore green, paling to amber yellow and light chalcedony yellow on the head, lateral lobes (and sometimes much of the dorsum) of pronotum, pleura and part of the base of the abdomen; the venter

of the abdomen generally approaching wax yellow, but occasionally more greenish and then near apple green. Head with a narrow postocular line of pansy purple lined ventrad with creamy, rarely the creamy alone present; fastigium washed more or less with pansy purple; eyes ranging from oil yellow to vinaceous-russet; antennae with the two proximal joints of the general color, remainder ranging from martius yellow to buff yellow, occasionally washed ventroproximad with very dilute pansy purple. Pronotum with the caudal margin of the lobes and disk edged (the former broadly and the latter narrowly) with pansy purple and creamy, the latter external; a continuation of the postocular stripe of the head more or less distinctly indicated in the usual position on the cephalic fourth of the pronotum. Tegmina with the greater portion of the stridulating field of the male mustard yellow, the extreme proximal portion of the same field of the general color and that along the anal vein infuscate, the latter vein lined with very dull pansy purple; in the female the anal field is occasionally mustard yellow as well as considerable of the proximal portion of the tegmina, other individuals of the same sex having the anal field of the base color, while all of the females have a touch of dull pansy purple at the base of the anal vein. Abdomen with a more or less distinct fine arcuate lateral line of dull pansy purple and creamy extending distad to the base of the cerci in both sexes, the dorsum of the abdomen between the same blotched with hoary in one specimen, the same region in most of the individuals largely punctulate or finely marmorate with pansy purple. Ovipositor of the general color, darkest distad. Limbs with the femora more or less decidedly washed on the distal three-fourths or so with pansy purple, this broken up and clouded more or less decidedly with hoary white, the distal extremity of the femora and all of the tibiae of the general color. Occasionally the caudal femora are of the general color proximad.

Distribution.—The present species has a range quite isolated from the remainder of the genus, being found only from southwestern and east central Georgia (Thomasville and Augusta) south to the extreme southern point of the mainland of Florida (Homestead). It is not known from west of Thomasville, although it may occur there as well as north of the same point, but not for a great distance in the latter direction the fall line probably marking the limit of its northward distribution in Georgia. It does not, as far as known, occur on the Florida Keys, but does reach the extreme point

of the pine belt along the east coast. The isolation of this Austro-riparian species from its congeners of this otherwise Sonoran genus is similar to that of the Florida Jay (*Aphelocoma cyanea*) and less typically to that of the Florida Burrowing Owl (*Speotyto cunicularia floridana*), the latter, however, having West Indian relatives which may have been the parent stock of the peninsular form.

Biological Notes.—All known concerning the habitat of this species is that it usually occurs in or near pine woods, in the undergrowth of which it was taken at Gainesville. The three specimens from Homestead were found dead in spider webs on the railroad station, to which spot they had been attracted by lights, the locality being surrounded by pine woods. The specimen from Augusta, however, was found among grasses in a sandy scrub oak area just above the fall line.

From the material before us it is seen to occur adult as early in the year as June 29 (Thomasville), August 16 being our latest date. A female in the instar preceding maturity was taken by Davis on April 23 (Fort Myers).

Morphological Notes.—The number of rami of the discoidal vein varies in the present species from four to six, two males having 4-4, one male and three females having 4-5, one male having 5-5, one female having 4-6, one female having 5-6 and one male having 6-6. The number of these rami has no geographic significance. There is some little variation in the acuteness of the angle of the caudal margin of the pronotal disk in both sexes, also in the exact form of the speculum of the male, the Thomasville one having, as well, a more marked sinuation of the sutural margin of the stridulating field than in the others of that sex. The Sanford and Homestead males have the expanded marginal field of the tegmina larger and more elongate than in the Thomasville male, in the two former this being more than and in the latter less than a fifth of the tegminal length, while in the females from Homestead the length of the expanded marginal field is contained slightly more than four times in the tegminal length and in the Sanford and Gainesville females slightly less than four times in the same.

In the Thomasville male the cerci are slightly more robust than in the others of that sex. The medio-longitudinal thread on the pronotal disk described in the male varies in definition in the series, being absent in some specimens and completely or partially indicated in others regardless of sex.

Synonymy.—It is perfectly evident that Brunner's *Arethaea multiramosa* is an absolute synonym of Scudder's *Aegipan phalangium* of a year earlier date. The two were described from the same state, where but a single species of the group occurs, and the descriptions are not separable.

Remarks.—The present form is very close to the Texan *A. grallator*, from which it can be separated by the characters given above as diagnostic; in addition *phalangium* generally has the ulnar vein reaching the sutural margin of the tegmina nearer the apex than in *grallator* and the pronotum more compressed than in the latter species. One of the characters used by Brunner, i.e., number of rami to the discoidal vein is of no value as a diagnostic feature, the series before us showing a variation from four to six, moreover the extremes have been found in a single individual.

Specimens Examined: 13; 4 ♂, 8 ♀, 1 ♂ nymph.

Georgia, (H. K. Morrison), 1 ♀. *Type*, [Scudder Collection].

Augusta, Ga., July 29, 1913, (R. & H.), 1 ♂, [Hebard Collection].

Thomasville, Ga., June 29, 1903, 1 ♂, [Hebard Collection].

Hastings, St. John County, Florida, 1 ♀, [Morse Collection].

Gainesville, Fla., August 16, 1905, (R. & H.), 1 ♀, [Hebard Collection].

Sanford, Florida, (S. B. Frazer), 1 ♂, 1 ♀, [Scudder Collection].

Fort Myers, Florida, April 23, 1912, (W. T. Davis), 1 ♀ nymph, [W. T. Davis Collection].

Biscayne Bay, Florida, 1 ♀, [Scudder Collection].

Homestead, Dade County, Florida, July 10-12, 1912, (R. & H.), 1 ♂, 2 ♀.

Florida, 1 ♀, [Hebard Collection ex Bruner].

Arethaea grallator (Scudder) (Figs. 44, 54 and 64.)

1877. *Aegipan grallator* Scudder, Proc. Bost. Soc. Nat. Hist., XIX, p. 39.
[(Dallas), Texas; Texas.]

1878. *Arethaea gracilipes* Brunner (not *Ephippitytha gracilipes* Thomas, 1870), Monogr. Phaneropt, p. 235. [Dallas, Texas.⁷⁸]

1900. *Arethaea gracilipes* Scudder (not of Thomas, 1870) Proc. Davenp. Acad. Sci., VIII, p. 67. (Part.) [Texas.]

1903. *Arethaea phalangium* Caudell (not of Scudder, 1877), Proc. U. S. Nat. Mus., XXVI, p. 804. [Vicinity of Victoria, Texas.]

1906. *A[rethaea] gracilipes* Kirby (not of Thomas, 1870), Synon. Catal. Orth., II, p. 443. (Part.) [Texas.]

1907. *Arethaea gracilipes* Rehn (not of Thomas, 1870), Proc. Acad. Nat. Sci. Phila., 1907, p. 62. (Key.)

This species is closely related to but one of the other forms of the genus, the preceding *A. phalangium*. The characters separating the two are given in the diagnosis under *phalangium*.

⁷⁸ The record from Arizona quoted by Brunner from Thomas refers to true *gracilipes*.

Types.—Texas, "May to August," (G. W. Belfrage), two females; Dallas, Texas, "June 13 to 26," (J. Boll), five males, three females. Labelled "Scudder's Type 1876." [All in Scudder Collection.]

Single Type here chosen.—♂; Dallas, Texas. (J. Boll.) [Scudder Collection.]

Description of Type.—The characters are almost entirely those of difference from the same sex of *A. phalangium*. Size moderately large. Fastigium low, compressed, acute lanceolate, narrower than in *phalangium*, longitudinally excavate; eyes slightly less prominent than in *phalangium*, proportions of eyes similar. Pronotum slightly less compressed, the dorsum proportionately broader, when seen from the side the dorsal outline is hardly elevated cephalad; cephalic margin of disk subtruncate, caudal margin of disk rotundato-rectangulate; lateral portions of disk with distinct carinate ridges on the prozona, these directed in a sinuate fashion dorso-caudad and moderately converging caudad, stopping abruptly at the transverse sulcus, the latter forming a broad V-shaped pattern on the disk, lateral portions of the disk on the metazona rounding into the lateral lobes cephalad and with very blunt rounded angles caudad, median portion of disk with a very fine medio-longitudinal slightly raised line; lateral lobes with the greatest depth contained one and one-half times in the dorsal length of the same, margins as in *phalangium* except that the caudal margin is more vertical and less oblique, when viewed from the dorsum the ventral portion of the lobes are seen to diverge more laterad than in *phalangium*. Tegmina about a half again as long as the body, the width at distal fourth contained slightly more than eight times in the length of the same, the width at the proximal third being hardly greater than at the distal fourth; marginal field and apex of tegmina as in *phalangium*; discoidal vein with three to four rami; stridulating field subequal to the pronotum in length, its greatest width about two-thirds its greatest length, stridulating vein not at all heavy, straight, strongly oblique, margin of field hardly produced at the apex of the stridulating vein, there moderately arcuate, immediately distad of the same sinuato-arcuate, thence obliquely arcuato-truncate. Wings with the exposed portion almost equal to half the tegminal length. Supra-anal plate more semi-elliptical than in *phalangium*; cerci with the distal fourth bent inwards at a right angle, the tips more acute than in *phalangium* but otherwise similar; subgenital plate carinate as in *phalangium*, the distal extremity slightly narrower, distal margin arcuato-emarginate, the styliform processes shorter and blunter. Limbs essentially as in *phalangium*, the character and proportions similar.

Allotype here selected.—♀; Same data as the selected type.

Description of Allotype.—The following characters are those of difference from the male sex of the present species and the corresponding sex of *phalangium*. Tegmina in proportions and form as in the male; discoidal vein with four rami on each side. Wings with the exposed portion equal to

about two-fifths the tegminal length. Ovipositor slightly shorter and deeper than in *phalangium*, the apical extremity rather more blunted, marginal and discal teeth as in *phalangium*.

Paratypic Series.—The remainder of the original series in addition to the selected type and allotype, four males and four females listed above, is paratypic.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Dallas, Texas. <i>Type</i>	15.9	4	2.4	22.7	2.8
♂ Dallas, Texas. <i>Paratype</i>	19	5	3	26.5	3
♂ Dallas, Texas. <i>Paratype</i>	16.3	4.8	2.5	23.3	3
♂ Dallas, Texas. <i>Paratype</i>	17	4.8	2.8	23.5	2.8
♂ "Texas." <i>Paratype</i>		4.3	2.5	23	2.6
♂ Shovel Mount, Texas. (A.N.S.P.)....	14	4	2.6	21.8	2.3
♂ Victoria, Texas.....	15	4.1	2.4	20.7	2.7
♂ Victoria, Texas.....	16	4.2	2.5	22.5	3.3
♂ Victoria, Texas.....	17.2	4.3	2.4	24	2.9
♂ Victoria, Texas.....	19.5	4.6	2.6	24	3
♂ Victoria, Texas.....	19.5	5	2.8	26.2	3
♀ Dallas, Texas. <i>Allotype</i>	16.2	4.5	2.7	25.2	2.9
♀ Dallas, Texas. <i>Paratype</i>		5	2.7	27.6	3.2
♀ Dallas, Texas. <i>Paratype</i>		4.3	2.5	23	2.6
♀ Victoria, Texas.....	18	4.8	2.8	24.5	3
♀ Victoria, Texas.....	18.3	4.7	2.7	24.3	2.7
♀ Victoria, Texas.....	19.4	4.6	2.5	26.8	2.9
♀ Victoria, Texas.....	19	5	2.6	28	3
♀ Victoria, Texas.....	22	5.3	2.7	29	3.2
	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Dallas, Texas. <i>Type</i>	10.7	10	15	31.3	
♂ Dallas, Texas. <i>Paratype</i>		11		34.5	
♂ Dallas, Texas. <i>Paratype</i>		10.5	17	32.5	
♂ Dallas, Texas. <i>Paratype</i>		10.3	15.3	32.3	
♂ "Texas." <i>Paratype</i>		10	15.7		
♂ Shovel Mount, Texas. (A.N.S.P.)....	8.8	9.5	13.9	27.3	

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of medio femur	Length of caudal femur	Length of ovipositor
♂ Victoria, Texas.....	9.5	9.3	13.7	28.5	
♂ Victoria, Texas.....	10.2	10.3	15.7	31.4	
♂ Victoria, Texas.....	9.6	11.4	16.8	31.7	
♂ Victoria, Texas.....	11.6	11.5	17.5	35.7	
♂ Victoria, Texas.....	12	11.9	18.5	37	
♀ Dallas, Texas. <i>Allotype</i>	10.5	10.5	15.5	32.4	4.3
♀ Dallas, Texas. <i>Paratype</i>		12.2	19		5
♀ Dallas, Texas. <i>Paratype</i>		10	15.7		
♀ Victoria, Texas.....	10	10.3	16.5	34.3	4
♀ Victoria, Texas.....	8.7	11	17.3	34.5	4
♀ Victoria, Texas.....	9.8	11.1	17.2	35	4
♀ Victoria, Texas.....	11.8	12	18.5	37	4.2
♀ Victoria, Texas.....	10.7	13	20.2	39.5	4

From the above table of measurements it is evident that the species varies greatly in size, this being purely individual in character. The Victoria series alone includes four minimum and seven maximum measurements in the male sex and two minimum and nine maximum measurements in the female sex. The single Shovel Mount male is quite small, having four of the minimum measurements, but this individual is almost exactly matched by a Victoria male and the two Rosenberg males are hardly larger.

Color Notes.—General color varying from chamois and deep colonial buff to apple green, the average condition rather strongly wax yellow on the pleural region, the dorsum of the pronotum generally washed with amber to wax yellow and the tegmina in greater part biscay green to bice green. Pattern of creamy, hoary or even silvery white and pansy purple to burnt lake essentially as in *phalangium*, the latter element of the pattern frequently suffusing some of the surface adjacent to it, particularly on the dorsum of the prozona. Head with the eyes sorghum brown to chocolate; antennae more greenish than in *phalangium*. Pronotum with the continuation of the postocular bar always decided, occasionally almost no trace of the darker element being evident; fine pale medio-longitudinal pronotal line almost always subobsolete. Teg-

mina with only the immediate proximal section of the general color, the remainder of the tone described above; distal portion of the stridulating field of the male more primuline yellow to old gold, the proximal section of the field almost always contrastingly colored with green, ranging from light yellow green to cedar green, rarely uniform with the adjacent pronotal disk; the vicinity of the anal vein in the male decidedly infuscate with madder brown to hessian brown, vicinity of the anal vein in the female similarly but less decidedly infuscate. Abdomen with the dark element of the pattern occasionally blackish brown; dorsum of the abdomen between the lines of the pattern occasionally punctulate as in *phalangium*. Limbs as in *phalangium*.

Distribution.—The present species has a rather limited range, all within the state of Texas and almost entirely in the east central part of the state. It ranges from as far north as Dallas, south at least to Victoria, east to Rosenberg, and west as far as Shovel Mount, Burnet County. Vertically it ranges from near sea-level at Victoria and Rosenberg to the vicinity of a thousand feet elevation on the edge of the Edwards plateau at Shovel Mount.

Biological Notes.—According to Scudder the present species is frequently attracted to lights, while Caudell took it flying in open prairie, where it usually made short flights, as a rule never more than fifty to one hundred yards. Our experience with the species has been much the same as that of the latter author, as we found it at Victoria and Rosenberg more or less common in fields which were thickly overgrown with grasses, low plants and even knee-high weeds, occasionally with patches of taller plants such as coffee bean (*Sesban macrocarpa*) and huisache (*Vachellia farnesiana*) bushes as high as twelve to fifteen feet. Here the insects were very easy to secure, as they would climb up for about two feet in the higher weeds and, when approached, would flutter up and with tegmina and wings set and legs extended permit the wind to carry them. They rarely drifted more than a few feet, were easily picked up and appeared incapable of quick motion.

Adults, according to Scudder, were taken by Belfrage as early as May (exact date unknown), while the earliest date on the material before us is June 21. The latest date known is August (ex Scudder), the latest on our material is July 26 (Victoria). On the latter date the species was unquestionably at its prime, as it was ex-

tremely numerous and the material was in excellent condition, so it is quite probable that it lasts considerably past the end of July.

We have seen no nymphs of the species and, in consequence, cannot give any data regarding that condition.

Morphological Notes.—There is some little variation in the character of the angle of the caudal margin of the pronotal disk, this in numerous specimens being more distinctly rectangulate and not quite so rounded as in the type specimen; in many the immediate angle is produced as a more or less evident point. The number of rami to the discoidal vein varies from three to five, four being the average number. The series shows the following combinations in the number of discoidal rami: 3-3, 2 ♂♂, 1 ♀; 3-4, 8 ♂♂, 2 ♀♀; 4-4, 16 ♂♂, 9 ♀♀; 4-5, 2 ♂♂, 6 ♀♀; 5-5, 2 ♂♂, 3 ♀♀. It will be seen from this that the lower combinations predominate in the male and the higher ones in the female sex, but how much importance should be attached to this apparent correlation is doubtful, as the material is not equally divided between the sexes. It is evident, however, that in eighteen of the specimens examined the number of rami on the two tegmina do not agree. The form of the margin of the stridulating field in the male shows no appreciable variation. The apex of the subgenital plate of the male shows some variation in width and also in the depth and rotundity of the emargination, but the general form departs very little from that described and figured.

Synonymy.—It is very evident from an examination of Brunner's description of *gracilipes* as understood by him, that it refers to the present species and not to the form to which Thomas originally gave that name. The key characters alone—the form of the apex of the stridulating vein of the male tegmina and the produced dorso-genicular extremities of the cephalic and median femora—show immediately that he had a member of the *phalangium-grallator* group, while his measurements, color details and locality remove the former, which he there described as *multiramosa*, from consideration. Caudell's reference of Victoria, Texas specimens to *phalangium* is erroneous, an examination of the material showing that it belongs under the present species.

Remarks.—The present form is a western complement of *phalangium*, differing chiefly in characters which are not striking but constant. In size there is a considerable amount of individual varia-

tion, but the average is smaller than in *phalangium*. In distribution the present form occurs in a region occupied by none of the other forms of the genus except the widely distributed *gracilipes*, being found entirely northeast of the range of *phantasma* and east of that of the other forms of the genus found in the United States except *phalangium*.

Specimens Examined: 53; 29 ♂, 24 ♀.

Dallas, Texas, (J. Boll), 5 ♂, 3 ♀. *Type, allotype, paratypes*. [Scudder Collection]; 1 ♀, [U.S.N.M.].

Shovel Mount, Burnet County, Texas, June 30, 1901, (F. G. Schaupp), 1 ♂, [A.N.S.P.].

Columbus, Colorado County, Texas, 1 ♀, [U.S.N.M.].

Rosenberg, Fort Bend County, Texas, July 25 and 26, 1912, (H.), 2 ♂.

Lavaca County, Texas, June 21, 1 ♂, 2 ♀, [U.S.N.M.].

Victoria, Victoria County, Texas, July 26 and 27, 1912, (H.), 17 ♂, 15 ♀; June, (Caudell), 1 ♂, 1 ♀, [U.S.N.M.].

Texas, (Linneceum), 1 ♂, 1 ♀, [Scudder Collection]; 1 ♂, [U.S.N.M.].

Arethaea semialata new species (Figs. 34, 45, 55 and 66.)

1902. *Arethaea constricta* Scudder and Cockerell (not of Brunner), Proc. Davenport Acad. Sci., IX, p. 52. (Part.) [Near Organ Mountains, Mesilla Valley, New Mexico.]

This form needs comparison only with the members of species-group C, i.e. *carita*, *brevicauda* and *limifera*, toward which it diverges from the other members of its own species-group B. From all three species of Group C the male sex can immediately be separated by the less decidedly sellate pronotum and the narrower stridulating field of the tegmina, which has the portion at the apex of the stridulating vein far less produced and the general form of the speculum more longitudinal. In the female sex the tegmina, instead of being lanceolate and abbreviate or ovate and sublobate, are at least half as long as the body, the integument of the body is smooth instead of strumose at the longitudinal bars and the margins of the dorsal abdominal segments are entire instead of distinctly crenulate. From the other members of Group B (i.e. *insaroides*, *phalangium* and *grallator*) the present form can be distinguished by the greater production of the apex of the stridulating vein of the male tegmina, the narrower ovipositor and moderately brachypterous female. The male bears considerable superficial resemblance to the same sex of *gracilipes*, but the two can be read-

ily distinguished by the more elongate stridulating field of the tegmina of *semialata*.

Type.—♂; Moss Well, Chisos Mountains, Brewster County, Texas. Elevation 4500 to 5000 feet. September 5 to 8, 1912. (Rehn and Hebard.) [Hebard Collection.]

Description of Type.—Size moderately large; form compressed. Occiput very considerably declivent; fastigium acute trigonal, the margins moderately elevated, sulcate, apex acute and subdepressed, very narrowly in contact with the frontal fastigium; eyes quite prominent, elliptical, the greatest width contained about one and one-half times in the depth, the latter subequal to that of the infra-ocular portion of the genae; antennae incomplete (surpassing the tips of the wings in several specimens). Pronotum moderately sellate, faintly bullate across the lateral lobes when seen from the dorsum, the dorsal line when seen from the side weakly elevated cephalad and caudad; disk of the pronotum weakly constricted mesad, the greatest caudal width of the same two-thirds the length; cephalic margin of the disk very weakly arcuato-emarginate, caudal margin of disk roundly obtuse-angulate. transverse sulcus forming a broad V-shaped figure on the disk; lateral lobes of the pronotum with their greatest depth about two-thirds their greatest dorsal length, cephalic margin slightly oblique, sinuate, ventro-cephalic angle blunt obtuse, ventral margin sinuato-truncate, ventro-caudal angle roundly obtuse, caudal margin oblique truncate, humeral sinus moderately deep, roundly obtuse-emarginate. Tegmina elongate, failing to reach the genicular extremity of the caudal femora by about the pronotal length, the width at the distal fourth contained about eight times in the length of the tegmina and slightly greater than the width at the proximal third; lobate-marginal field equalling one-fourth the entire tegminal length, broad, costal margin there strongly arcuate; apex of tegmina rather narrowly rounded; stridulating field slightly longer than the disk of the pronotum, the greatest width of the field (to tip of stridulating vein) about two-thirds the length of the field, free margin arcuate proximad of the apex of the stridulating vein, the latter well produced but rounded, distad of this vein the margin is rather deeply sinuato-emarginate and again much less distinctly so at the apex of the field, stridulating vein greatly oblique proximad and very slightly oblique distad, anal vein nearly straight in the proximal three-fifths and arcuate distad, speculum elongate subrectangulate; discoidal vein with four rami; anterior ulnar vein reaching the sutural margin very slightly distad of the middle. Exposed portion of the wings over twice the length of the pronotal disk. Abdomen with the surface of the segments non-strumose at the lateral pale lines, nor with the margins there produced, the margins of the dorsal segments not distinctly crenulate, no process present on the proximo-dorsal segment; disto-dorsal segment with the margin truncate; supra-anal plate ovoid, the width distad of the base greater than at the base, the greatest width subequal to the greatest length, apical margin roundly obtuse-

angulate, the surface of the plate impressed, non-sulcate; cerci of the type usual in the genus, the main portion tapering with a low sublamellate ridge on the internal face, distal fourth bent nearly at a right angle, subdepressed, acuminate; subgenital plate moderately elongate, narrowing distad, distal margin deeply truncate-excised between rather long styliform lateral appendages. Femora non-produced distad; genicular lobes of cephalic and median femora bispinose, of caudal femora unispinose. Cephalic femora about two and a half times as long as the pronotal disk; cephalic tibiae with the tympanum elliptical. Median femora slightly longer than half the tegminal length. Caudal femora twice as long as the median femora, very slender, though appreciably inflated proximad; caudal tibiae surpassing the femora by nearly twice the pronotal length.

Allotype.—♀; Data same as for the type.

Description of Allotype.—The characters here given are those of difference from the description of the male. Form (for the genus) subrobust. Fastigium with the margins less elevated than in the male sex, weakly sulcate; eyes slightly shorter than the infra-ocular portion of the genae. Lateral lobes of the pronotum with the greatest depth equal to three-fourths the greatest dorsal length of the same, caudal margin of the lobes slightly more vertical than in the male, humeral sinus shallow, arcuato-emarginate. Tegmina short, slightly shorter than the median femora, narrow, the distal two-thirds subequal in width, the width at the distal fourth contained nearly seven times in the tegminal length; lobate marginal field decidedly arcuate, in length about one-third that of the entire tegmina; apex well rounded. Wings very slightly surpassing the tips of the tegmina. Disto-dorsal abdominal segment sinuato-emarginate at the base of the cerci; supra-anal plate half-elliptical, with a shallow medio-longitudinal sulcus proximad, which is also indicated on the adjacent portion of the disto-dorsal segment; ovipositor half the length of the cephalic femora, not as deep as in most of the species of the genus, the greatest depth half the length, arcuate, dorsal margin serrato-dentate on distal half, ventral margin with recurved serrato-dentations on distal half, these becoming crenulations mesad, surface with the lamellations arranged in sublinear series, longitudinal on the dorsal valves, transverse on the ventral valves, as usual in other species of the genus; subgenital plate short, transverse, subtrigonal, the apex blunt, subsinuate. Median femora slightly longer than the tegmina. Caudal tibiae exceeding the femora by slightly more than the length of the pronotal disk.

Paratypic Series.—We have selected as paratypes four adult males from the type locality and one adult male and two adult females from the Canyon behind Pulliam Bluff, Chisos Mountains, Texas, a point very close to the type locality.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Near Organ Mountains, New Mexico. (Scudder Collection).....	15.7	3.7	2.3	24	2.9
♂ Franklin Mountains, Texas.....	14.1	3.5	2.3	22.5	2.4
♂ Maguire's Ranch, Davis Mountains, Texas.....	17.7	3.5	2.4	23.2	2.3
♂ Livermore Peak, Davis Mountains, Texas.....	14.3	3.9	2.1	25.6	2.7
♂ Garden Spring, Texas.....	20	3.6	2.2	26.5	3
♂ Moss Well, Chisos Mountains, Texas. <i>Type</i>	18.9	3.9	2.5	25.4	3.1
♂ Moss Well, Chisos Mountains, Texas. <i>Paratype</i>	17.5	4	2.5	27.5	3.2
♂ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	17.2	3.6	2.5	26.6	3.1
♀ Franklin Mountains, Texas.....	18.7	4.2	2.5	13.8	1.7
♀ Maguire's Ranch, Davis Mountains, Texas.....	17	4.2	2.4	12.2	1.6
♀ Moss Well, Chisos Mountains, Texas. <i>Allotype</i>	18.2	4.3	2.6	13	1.9
♀ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	21.5	4.4	2.7	13.8	1.7
	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Near Organ Mountains, New Mexico. (Scudder Collection).....	8	9.6	13.3	27.3	
♂ Franklin Mountains, Texas.....	6.7	8.3	11.8	24	
♂ Maguire's Ranch, Davis Mountains, Texas.....	7.5	10.7	14	27.1	
♂ Livermore Peak, Davis Mountains, Texas.....	6.9	10.4	14.3	26.6	
♂ Garden Spring, Texas.....	8.2	10.4	15.6	31	
♂ Moss Well, Chisos Mountains, Texas. <i>Type</i>	8.9	9.9	14.3	28.8	

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Moss Well, Chisos Mountains, Texas. <i>Paratype</i>	7.2	10.5	15.5	31.2	
♂ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	8.3	10.5	14.5	30	
♀ Franklin Mountains, Texas.	3.3	9.3	12.5	24.4	5
♀ Maguire's Ranch, Davis Mountains, Texas.	3.2	10.3	13.9	27	5.2
♀ Moss Well, Chisos Mountains, Texas. <i>Allotype</i>9	10.4	14.2	28.8	5.2
♀ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	2.5	10.9	15	29.2	5.7

From the above measurements it will be seen that the specimens from the Franklin and Davis Mountains average slightly smaller than those from Garden Spring and the Chisos range.

Color Notes.—General color of the head and thorax varying from pale glass green to pale cartridge buff, more or less suffused with hoary white and in certain males with buff-pink; abdomen with the base color ranging from deep sea-foam green to mustard yellow and cream color; tegmina and exposed portion of wings varying from light bice green to winter green, in numerous males becoming pale ochraceous-tawny proximad on the tegmina. Head with the fastigium more or less washed with dragon's-blood red; eyes varying from walnut brown to bay; antennae largely chamois to colonial buff, becoming of the general color distad, proximal section more or less washed ventrad with raw sienna to cadmium orange; post-ocular line arcuate, weak, dead white occasionally with a dorsal edging of pansy purple to burnt lake. Pronotum with the continuations of the postocular lines more or less indicated on the prozona, occasionally almost absent, converging, the purplish variable in intensity, rarely as brilliant as pomegranate purple, the area between the same, and frequently to a lesser extent the whole dorsum of the pronotum, more or less punctulate with the same tone; caudal margin of the disk edged with whitish as usual

in the genus, the accompanying purplish occasionally absent, the whitish occasionally subobsolete mesad; caudal margin of the lateral lobes with the usual whitish edging broad, rarely very slightly indicated and occasionally suffused with light buff. Tegmina of male with the area of the stridulating field between the speculum and stridulating and anal veins varying from cinnamon-brown to mummy brown, the vicinity of the anal vein hay's russet to hazel; tegmina of female with the proximal section of the vicinity of the anal vein more or less suffused with purplish, the interstitial areas of the tegmina in the vicinity of the sutural margin washed with brownish. Abdomen with the lateral lines of the base color, usually emphasized by an increase in number of the adjacent purplish punctulations (in but a single specimen, and that nymphal, is the purplish dense enough to form a solid line), the whole dorsum of the abdomen thickly and the lateral aspects of the same more sparsely punctulate with purplish, rarely with the distal section of the dorsal segments thickly overlaid with hoary white; ventral surface of the abdomen with a broad medio-longitudinal bar of lemon yellow to light cadmium; ovipositor of the general color, the teeth and lamellations raw umber tipped with black. Limbs more or less washed with purplish as in other species of the genus, this suffusion usually limited to the femora and often accompanied more or less with hoary white, rarely the latter completely masks the underlying purplish.

Distribution.—The present species ranges from as far north as the vicinity of the Organ Mountains, Donna Ana County, New Mexico (Mesilla Valley), south to the Chisos Mountains in the southern portion of the bend of the Rio Grande, western Texas. The most eastern locality from which it is known is Garden Spring, fourteen miles south of Marathon, Texas, while the northern locality is the most westerly known for the species. The vertical range is from about 4000 feet (Franklin Mountains) to 7500 feet (Livermore Peak).

Biological Notes.—This form was generally found in more or less abundant grasses as well as among scattered plants and oak shoots under oaks in a canyon bottom (Maguire's Ranch), while nowhere was the species abundant. At Garden Spring it occurred in scattered grasses and low plants on a hill slope of broken pebbly rock. In this latter situation the insect was climbing and jumping clumsily

about. The nymphs taken September 15 and 16 on the Franklin Mountains are in the second instar preceding maturity, while the other nymphs, taken August 29 to September 11, are in the first instar preceding maturity. As the specimen from one of the highest elevations (6750 feet) is that taken on August 29, and the September 15 to 16 individuals are from the lowest locality for the species, it would seem that altitude has little or no effect on the date of development.

Morphological Notes.—The fastigium in both sexes exhibits considerable variation in the amount of compression, the margins regularly diverging caudad or being subparallel. The pronotum shows some variation in the amount of bullation laterad, but this is not very decided. The caudal margin of the pronotal disk is regularly rounded in certain males and roundly obtuse-angulate in others. In the male sex the number of rami of the discoidal vein varies from three to four, three specimens having 3-3, five having 3-4 and five having 4-4. In the female sex one individual has these rami 3-4, three have them 4-4 and one bears 5-5. The proximo-dorsal abdominal segment of the male sex has a distinct disto-dorsal process in the specimens from the Mesilla Valley and the Franklin Mountains, but the males from the other more southern localities have no trace of this process. There is an appreciable amount of variation in the width of the distal margin of the male subgenital plate, this margin being more frequently subtruncate than subarcuate-emarginate.

Synonymy.—The specimen recorded as *A. constricta* by Scudder and Cockerell from Mesilla Valley near the Organ Mountains, is now before us, so we are able to properly associate it with the material collected by us in western Texas.

Remarks.—The present species has certain peculiarities and combinations of peculiarities not found in any of the other forms of the genus. The combination of short tegmina and wings in the female and ample stridulating field of the male tegmina are the striking features of the species, as all of the other forms having short tegmina and wings in the female have the stridulating field of the male shorter, with the apex of the stridulating vein considerably or greatly produced. The regular and non-crenulate abdominal segments, taken in company with the above characters, enable one readily to recognize the species.

Specimens Examined: 28; 13 ♂, 5 ♀, 3 immature ♂, 7 immature ♀.

Near Organ Mountains, Mesilla Valley, New Mexico, August, (Cockerell), 1 ♂, [Scudder Collection].

Franklin Mountains, El Paso County, Texas, 4000 to 5500 feet, September 15 and 16, 1912, (R. & H.), 2 ♂, 1 ♀, 1 immature ♂, 1 immature ♀.

Maguire's Ranch, Upper Limpia Canyon, Davis Mountains, Texas, 5600 to 5800 feet, August 29 and 30, 1912, (R. & H.), 1 ♂, 1 ♀.

Slopes of Pine Mountain, Davis Mountains, Texas, 6750 feet, August 29, 1912, (R. & H.), 1 immature ♀.

Livermore Peak, Davis Mountains, Texas, 7500 feet, August 30, 1912, (R. & H.), 1 ♂.

Garden Spring, Brewster County, Texas, September 11, 1912, (R. & H.), 2 ♂, 1 immature ♀.

Moss Well, Chisos Mountains, Texas, 4500 to 5000 feet, September 5 to 8, 1912, (R. & H.), 5 ♂, 1 ♀. *Type, allotype, paratypes*; 1 immature ♂, 3 immature ♀.

Canyon behind Pulliam Bluff, Chisos Mountains, Texas, 4600 to 5000 feet, September 7, 1912 (R. & H.), 1 ♂, 2 ♀, *paratypes*; 1 immature ♂, 1 immature ♀.

***Arethaea carita* Scudder (Figs. 46, 56, 67 and 68.)**

1902. *Arethaea carita* Scudder, in Scudder and Cockerell, Proc. Davenport Acad. Sci., IX, p. 52, pl. IV, fig. 5. [Mesilla Park, New Mexico.]

1904. *Arethaea carita* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [Casas Grandes, Chihuahua, Mexico.]

1906. *A[rethaea] carita* Kirby, Synon. Catal. Orth., II, p. 444. [New Mexico.]

1907. *Arethaea sellata* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 61, figs. 13 and 14. [Palmerlee, Cochise County, Arizona.]

1908. *Arethaea sellata* Rehn and Hebard, *Ibid.*, 1908, p. 398. [Palmerlee, Arizona.]

1912. *Arethaea sellata* Rehn, Kansas Univ. Sci. Bull., V, p. 306. [Santa Rita Mountains, 5000 to 8000 feet, Arizona.]

The present form and *A. brevicauda* and *limifera* constitute a well marked group of species, characterized by having very short or abbreviate tegmina in the female⁷⁹ and crenulate margins to the dorsal abdominal segments of the same sex (this character excepted in *brevicauda*), both sexes having more (♂) or less (♀) distinct strumose lateral longitudinal lines on the abdomen, while the male sex has the stridulating field of the tegmina broad and with its free margin strongly or abnormally produced at the apex of the stridulating vein, while the male cerci are not abruptly recurved at the tips.

⁷⁹ Presumably so in *limifera*, but the female of that species is not known.

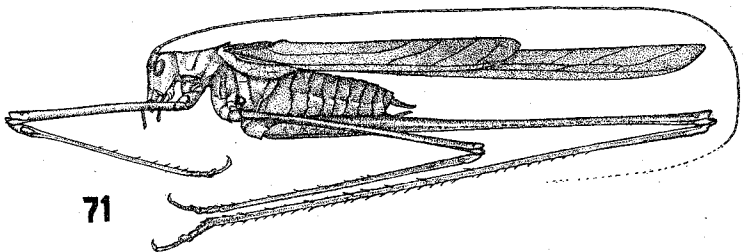
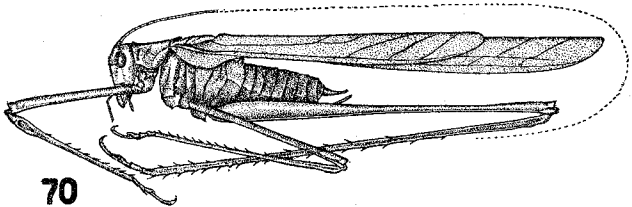
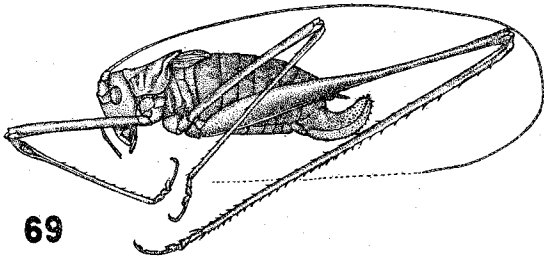
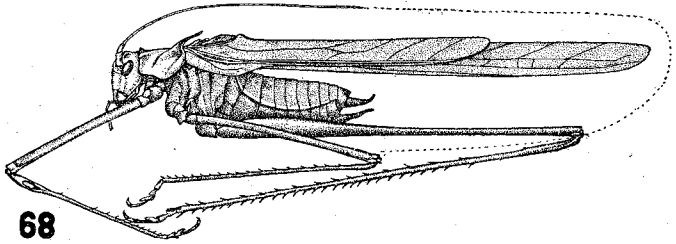


Fig. 68. Lateral view of allotype of *A. carita*. ($\times 2$) Fig. 69. Lateral view of type of *A. brevicauda*. ($\times 2$) Fig. 70. Lateral view of allotype of *A. brevicauda*. ($\times 2$) Fig. 71. Lateral view of type of *A. phantasma*. ($\times 2$)

The characters separating *A. brevicauda* and *limifera* from *A. carita* are given under their respective headings.

Type.—♀; Mesilla Park, Donna Ana County, New Mexico. September 12. (Cockerell.) [Scudder Collection.]

Description of Type.—Size moderately large; form subcompressed. Occiput moderately inflated, strongly declivent cephalad to the fastigium; fastigium elongate, narrow, subequal, narrowly and not deeply sulcate mesad, apex low and with its margin truncate, squarely in contact with that of the fastigium of the face; eyes ovate, the greatest width contained one and a half times in the depth, the latter appreciably surpassed by that of the infra-ocular portion of the genae; antennae imperfect.⁸⁰ Pronotum compressed, sellate, the dorsal line when seen from the side slightly ascending near the caudal margin and considerably ascending near the cephalic one; disk slightly constricted mesad, the greatest caudal width of the disk slightly more than half the length of the same, cephalic margin subtruncate, caudal margin obtuse-angulate, transverse sulcus forming a V-shaped figure slightly caudad of the middle of the disk, lateral portions of the disk broadly rounding into the lateral lobes, a trace of a shoulder caudad; lateral lobes with the greatest depth three-fourths the greatest dorsal length, cephalic margin slightly oblique, sinuato-truncate, ventro-cephalic angle rotundato-rectangulate, ventral margin sinuato-truncate, ventro-caudal angle roundly obtuse-angulate, caudal margin oblique, gently arcuate, humeral sinus very shallow, arcuato-emarginate. Tegmina abbreviate, slightly more than one and one-half times as long as the pronotum, narrow, the distal half subequal in width; lobate marginal field limited to proximal half of the tegmina; apex of tegmina narrowly rounded. Wings reaching to the tips of the tegmina but not surpassing the same.⁸¹ Abdomen with the dorsal margins multicrenulate, position of the usual pale lines indicated by weakly strumose ridges; disto-dorsal abdominal segment with the margin subtruncate; supra-anal plate tongue-shaped, slightly longer than the proximal width, with a moderately distinct medio-longitudinal sulcus on proximal section and adjacent portion of the distal abdominal segment; cerci tapering, about twice the length of the supra-anal plate, apex blunt; ovipositor about one and one-quarter times the length of the pronotum, arcuate, slightly tapering, dorsal margins with distinct serrato-dentations for half the length, ventral margins with similar recurved ones for about one-third the length, crenulate mesad, surface of dorsal valves with three distinct series of lamellate dentations, of ventral valves with a single series, all disposed as usual in the genus; sub-genital plate transverse, trigonal, apex subtruncate. Femora with no dorso-distal genicular spiniform projections; genicular lobes of cephalic and median femora bispinose, lobes of caudal

⁸⁰ In other females having these appendages more or less complete they are seen to at least surpass the body in length.

⁸¹ The other females of the species seen have the wings very slightly surpassing the tegmina.

femora acute but without traces of distinct spinulations.⁸² Cephalic femora over twice the length of the pronotum; cephalic tibiae with the tympanum elliptical in form. Median femora three times the pronotal length. Caudal femora about twice the length of the median femora, considerably inflated proximad; caudal tibiae surpassing the femora by about the pronotal length.

Allotype.—♂; Palmerlee, Cochise County, Arizona.⁸³ July 30, 1905. (C. Schaeffer.) [Brooklyn Institute of Arts and Science.]

Description of Allotype.—Size medium; form moderately elongate: Head with the occiput gently declivent to the moderately elevated fastigium, lateral margins of the latter regularly converging cephalad, distinctly sulcate, apex depressed; facial fastigium trigonal, slightly deeper than broad, the borders marginate; eyes very prominent, elliptical, greatest width about two-thirds the greatest depth; antennae over three times the length of the body. Pronotum strongly sellate, the dorsum constricted mesad, dorsal line when seen from the side very briefly ascending cephalad and with the caudal half regularly and decidedly oblique-arcuate ascending dorso-caudad, greatest caudal width of the disk about two-thirds the greatest dorsal length of the same; cephalic margin of disk very broadly triangular emarginate, caudal margin semi-ovate in outline, lateral lobes on metazona, when seen from the dorsum, strongly bullate; transverse sulcus placed mesad on disk, there finely and narrowly obomegoid in outline, on lateral lobes decided dorsad; lateral margins of the pronotal disk slightly strumose cephalad on the prozona and in direction diverging cephalad, absent mesad, the disk there rounding into the lateral lobes, on caudal two-thirds of metazona forming distinct but non-carinate shoulders, immediately ventrad of which the lateral lobes are impressed; lateral lobes of the pronotum with their greatest depth two-thirds the greatest dorsal length, cephalic margin oblique, subsinuate, ventro-cephalic angle narrowly rotundato-rectangulate, ventral margin arcuato-emarginate, ventro-caudal angle rounded, caudal margin obliquely arcuate, humeral sinus rotundato-rectangulate. Tegmina about four-fifths the length of the caudal femora, moderately narrow; marginal field moderately expanded and arcuate, the length of the same about one-fourth that of the entire tegmen; costal margin evenly arcuate distad; apex narrowly rounded; discoidal vein with three rami; stridulating field with its greatest width (to apex of stridulating vein) three-fifths the length of the same field, free margin strongly produced at the apex of the stridulating vein, distad of this near the base of the speculum strongly arcuato-emarginate and less deeply arcuato-emarginate at the apex of the same, speculum with its greatest width subequal to its length, stridulating vein strongly arcuate proximad, slightly sinuate distad, anal vein gently arcuate. Portion of the wings projecting distad of the tegmina nearly as long as the median femur. Abdomen with

⁸² True, though very minute, spinulations are present in the other females of the species examined.

⁸³ This is the holotype of *A. sellata* Rehn.

the dorsum subtectate, the segments substrumose at the pale lateral lines where the margins of almost all the segments are slightly produced caudad; proximo-dorsal segment with no trace of a process; disto-dorsal segment with the margin truncate; supra-anal plate transverse, the greatest width one and one-half times the length, rectangulate, the angles rounded; cerci tapering, rather stout proximad, the apex sharp and slightly incurved but not at all bent; subgenital plate elongate, narrowing caudad, distal margin arcuato-emarginate, lateral styliform processes elongate. Limbs slender; cephalic and median femora with bispinose, caudal femora with unispinose genicular lobes. Cephalic femora slightly more than twice the length of the pronotum. Median femora about two-thirds the length of the tegmina. Caudal femora subequal to the combined length of the pronotum and tegmina, rather weakly inflated proximad; caudal tibiae surpassing the femora by about three-fourths the pronotal length.

Color Notes.—General color varying from pale cendre green to paris green, always slightly paler on the genae, face and lateral lobes of the pronotum, and more whitish on the pleura, but otherwise the general tone is quite uniform. Head with more or less distinct infra-antennal bars of creamy white to pale shrimp pink, these narrowing ventrad in the female and reaching to the angle of the clypeus, in the male as a whole narrower and converging ventrad, in both sexes margining the clypeus laterad; postocular bars well indicated in the male and frequently very weak in the female, arcuate, greenish white to pale shrimp pink, generally margined dorsad by a line of pansy purple to burnt lake; eyes varying from light ochraceous-salmon to bister; antennae varying from pale green yellow to apricot yellow, the three proximal segments more or less washed ventrad with deep chrome to orange. Pronotum with the continuations of the postocular bars more or less pronounced, rarely subobsolete and then only in the female, converging caudad and not crossing the principal sulcus, in tone similar to the same on the head, the purplish variable in intensity and the area between the bars more or less punctulate with purplish, pale section of the bars margined ventrad by a thread of purplish in the majority of the males, caudal margin of the disk and the lateral lobes whitish, frequently tinged with greenish and rarely with shrimp pink, the edging relieved by the usual purplish lining similar to the postocular bars, the purplish variable in intensity in both sexes and rarely absent on the lateral lobes, the pale edging variable in width on the lobes and occasionally no wider than the narrow edging on the disk. Tegmina with the hyaline stridulating field

of the male sex washed with pale sayal brown to pale bister, the free margin more greenish, the vicinity of the anal vein of the field touched proximad and distad more or less distinctly with claret brown. Abdomen with the lateral bars variable in intensity, when decided consisting of a pale line, very pale viridine yellow to pale shrimp pink, and a distinct ventral and usually less distinct dorsal line of pansy purple to burnt lake. In addition to the lateral bars there is present on the abdomen of all the males a more or less decided medio-longitudinal bar of the same three components; surface of the dorsal segments of the abdomen more or less thickly punctulate with purplish. In the female the lateral bars are less decided, with little or no purplish and no evident median bar. Limbs of male largely pale yellow-green to baryta yellow, the femora more or less completely washed with vinaceous-purple, this rarely decided and then less extensive than in the more weakly colored individuals. In the female there is little or no trace of purplish on the limbs, while the type has much hoary white on the femora.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Palmerlee, Arizona. <i>Allotype</i> ; type of <i>sellata</i> . (Bklyn. Inst. A. & S.).....	16.	4	2.5	20.5	2.2
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.).....	15.3	4.2	2.7	20.9	2.4
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.).....	15.3	4.2	2.7	20.8	2.2
♂ Phoenix, Arizona. (Hebard Collection).	13.6	4.2	2.5	19.2	2.2
♂ Fort Grant, Arizona. (U.S.N.M.).....	14.3	4	2.8	20	2.2
♂ Santa Rita Mountains, Arizona. (Bklyn. Inst. A. & S.).....	14.5	4.2	3	22	2.5
♀ Mesilla Park, New Mexico. <i>Type</i> . (Scudder Collection).....	17.8	4.2	2.4	6.7	1.2
♀ Casas Grandes, Chihuahua, Mexico. (A.N.S.P.).....	— ⁸⁴	4.3	2.2	6.7	1
♀ Camacho, Zacatecas, Mexico. (Hebard Collection).....	17.5	4	2.6	7.6	1.2

⁸⁴ As the apex of the abdomen of this specimen has been destroyed we cannot give the body length or the ovipositor length.

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Palmerlee, Arizona. <i>Allotype</i> ; type of <i>sellata</i> . (Bklyn. Inst. A. & S.).....	11.8	9.5	12.5	25	
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.).....	12.4	8.6	11.7	23.8	
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.).....	13.3	10.2	13.6	26.3	
♂ Phoenix, Arizona. (Hebard Collection)	11.8	9	12.4	23.3	
♂ Fort Grant, Arizona. (U.S.N.M.).....	12.6	9.2	13		
♂ Santa Rita Mountains, Arizona. (Bklyn. Inst. A. & S.).....	14	9.1	12.7	25.2	
♀ Mesilla Park, New Mexico. <i>Type</i> . (Scudder Collection).....		9.3	13.3	26	5.2
♀ Casas Grandes, Chihuahua, Mexico. (A.N.S.P.).....	.6	9.8	14	27	— ⁸⁴
♀ Camacho, Zacatecas, Mexico. (Hebard Collection).....	.5	10	13	26	5.4

Distribution.—The range of *carita* extends from southern New Mexico (Mesilla Park) and south-central Arizona (Phoenix and Fort Grant) south to northern Zacatecas (Camacho), Mexico, the latter locality also being the most eastern, while the most northern (Phoenix) is the western extreme. The vertical distribution can only be given approximately, as almost all of the material is without exact elevation data. Judging from the localities from which the species is known it would seem to range from under two thousand feet (Phoenix) to at least six thousand feet (Camacho). The Santa Rita records, 5000 to 8000 feet, are too indefinite for their maximum elevation to be given.

Biological Notes.—Nothing is known of the immature condition or habits of the species. The period of occurrence in the adult condition covers at least portions of three months, as specimens have been examined which were taken as early as July (specifically 15th and 30th) and as late as September (specifically the 12th).

Morphological Notes.—The fastigium varies in width in the male sex as in *semialata*, while in the three females it varies in form from

that found in the type to one with the margins converging much as, but to a less extent than, in the male. Pronotum of the male with the cephalic margin of the disk varying from the type described to arcuato-emarginate, while the caudal margin of the same is rotundato-rectangulate in a few specimens of both sexes. The number of rami of the discoidal vein varies from two to five in the male sex, one specimen having 2-2, seven 3-3, five 3-4, two 4-4 and one 4-5. In the female sex one individual has 2-3 rami, one 3-3 and one 3-4. The usual spine on the genicular lobe of the caudal femora is practically absent in the type, but indicated in the other specimens. The male genitalia show little variation aside from that frequently found in the distal margin of the subgenital plate, which is occasionally arcuato-emarginate instead of truncate, and in the length of the styliform processes of the same.

Synonymy.—That *A. sellata* represents the macropterous male of the same species to which Scudder, on the basis of a brachypterous female, gave the name *carita*, is evident to us after studying the types and all the known material bearing on the question. At the time *A. sellata* was described (and in fact to the present time), sexual dimorphism in wing length in this genus was unknown, and in the two very different looking sexes of the present species there is little in the way of general or superficial characters which would associate them. However, certain of the more obscure characters, as the structure of the abdominal segments, certain pronotal features and details of the form of the head, enable us to place the two in their proper relation.

Remarks.—The present form is the least specialized of the group of three species to which it belongs, the others (*brevicauda* and *limifera*) representing more divergent developments along the same lines. The sexual dimorphism is greater than in *arachnopyga* and *semialata*, but less than in *brevicauda*, while the stridulating field of the male tegmina in structure occupies a position between *gracilipes* and *arachnopyga* on one hand and *brevicauda* and *limifera* on the other. The form of the abdomen and appendages shows the greatest relationship to be with *brevicauda* and *limifera*.

Specimens Examined: 20; 17 ♂, 3 ♀.

Mesilla Park, New Mexico, September 12, (Cockerell), 1 ♀. *Type*. [Scudder Collection]

Palmerlee, Cochise County, Arizona, July 30, 1905 (1), (C. Schaeffer), 2 ♂ (one = *Allotype* = type of *sellata*), [Bklyn. Inst. A. and S.]; July 15, (H. Kaerber), 1 ♂ [A.N.S.P.].

Huachuca Mountains, Arizona, (C. Schaeffer), 7 ♂, [Bklyn. Inst. A. and S.].

Phoenix, Arizona, (R. E. Kunzé), 1 ♂, [Hebard Collection].

Fort Grant, Arizona, 1 ♂, [U.S.N.M.].

Fort Buchanan, south of Tucson, Arizona, 1 ♂, [Scudder Collection].

Santa Rita Mountains, Arizona, 5000 to 8000 feet, July, (F. H. Snow), 2 ♂, [Univ. of Kansas]; same data without elevation, 2 ♂, [Bklyn. Inst. A. and S.].

Casas Grandes, Chihuahua, Mexico, September, (W. E. Hughes), 1 ♀, [A.N.S.P.].

Camacho, Zacatecas, Mexico, September, (L. Bruner), 1 ♀, [Hebard Collection].

Arethaea brevicauda (Scudder) (Figs. 47, 57, 69 and 70.)

1900. *Dichopetala brevicauda* Scudder, *Canad. Entom.*, XXXII, p. 331. [Cahon Pass, California.]

1902. *Arethaea brevicauda* Morse, *Psyche*, IX, p. 381. (Generic Assignment.)

1906. *A[rethaea] brevicauda* Kirby, *Synon. Catal. Orth.*, II, p. 444. [California.]

This species needs comparison with only two forms, *A. carita* and *limifera*. From *carita* it can readily be separated in the male sex by the stridulating field of the tegmina being shorter and broader, with its free margin much produced at the apex of the stridulating vein and the same vein straight, in the narrower distal section of the subgenital plate and more crassate cerci, as well as the proximo-dorsal abdominal segment of the same sex having a decided process; the female sex differs from that of *carita* in the very abbreviate, sublobate and overlapping tegmina, which are shorter than the pronotal disk. From the male of *limifera* (the only sex known of that species) the same sex of *brevicauda* differs chiefly in the projection at the apex of the stridulating vein being less decided and not as peg-like. Additional features separating *brevicauda* and *limifera* exist, these being treated under the latter species.

Type.— ♀; Cahon Pass, California. July 18, 1897. (A. P. Morse.) [Scudder Collection.]

Description of Type.—Size rather small; form subcompressed. Head with the greatest breadth immediately ventrad of the eyes contained about one and one-half times in the depth of the head; occiput moderately in-

flated, but little declivent to the fastigium, which latter is strongly bent ventrad and almost subvertical, narrow, strongly compressed but not much elevated, slightly narrowing distad, the apex bluntly and narrowly truncate, in contact with the facial fastigium, entire length of the fastigium considerably sulcate; eyes moderately prominent, elliptico-ovate, the greatest width very slightly more than two-thirds the depth, the latter appreciably greater than the same dimension of the infra-ocular portion of the genae; antennae at least twice as long as the body. Pronotum sellate, the lateral lobes appreciably bullate ventrad, median section subconstricted, dorsal line when seen from the side concave, regularly ascending caudad; disk with the greatest caudal width contained almost twice in the length; cephalic margin of disk gently arcuato-emarginate, caudal margin obtuse-angulate with the immediate angle subtruncate, lateral portions of disk rounding into the lobes, a weakly strumose condition present at the prozonal section of the postocular bars; transverse sulcus forming a V-shaped figure mesad on the disk, strongly impressed on the greater portion of the lateral lobes; lateral lobes with the greatest depth about two-thirds the greatest dorsal length, cephalic margin sinuato-emarginate, ventro-cephalic angle rotundato-rectangulate, ventral margin arcuato-emarginate cephalad, rounding into the ventro-caudal angle caudad, caudal margin moderately oblique subarcuate, humeral sinus indicated only by a very broad and shallow arcuate emargination. Tegmina about three-fourths the length of the pronotal disk, lobiform, overlapping mesad, ovoid, greatest width about two-thirds of the greatest length, narrowing distad, apex rectangulate with the immediate angle slightly produced; costal margin arcuate proximad, thence oblique, but nearly straight, sinuate, sutural margin arcuate, venation formed by the principal veins and transverse reticulations. Wings aborted, not reaching the tips of the tegmina. Abdomen with the segments distinctly strumose at the lateral bars and less decidedly so medio-longitudinally, the margins of the segments weakly and roundly produced at the lateral bars and at the median dorsal bar; proximo-dorsal abdominal segment with no process; disto-dorsal segment subtruncate mesad; supra-anal plate briefly tongue-shaped; cerci about twice the length of the supra-anal plate, tapering, the tips blunted; ovipositor somewhat longer than the pronotal disk, the greatest depth contained slightly more than twice in the length, arcuate, apical section bluntly acuminate, margins and disk armed as in other species of the genus; subgenital plate trigonal, with a distinct medio-longitudinal sulcus bordered laterad by parallel rounded ridges. Limbs but moderately elongate; femora with the dorsal genicular sections not spiniform produced; genicular lobes of the cephalic and median femora bispinose, of caudal femora more or less distinctly unispinose. Cephalic femora slightly more than twice the length of the pronotal disk. Median femora with their length surpassing that of the cephalic femora by about the tegminal length. Caudal femora robust for the genus, considerably inflated in the proximal half, their length nearly twice that of the median femora: caudal tibiae surpassing the femora by slightly more than the tegminal length.

Allotype.—♂; San Jacinto River, elevation 2500 feet, San Jacinto Mountains, Riverside County, California. July 25. (For-dyce Grinnell, Jr.) [Acad. Nat. Sci. Phila.]

Description of Allotype.—The following characters are those of difference from the description of the male of *carita*. Fastigium compressed, moderately elevated, narrowing distad, the margins arcuate when seen from the side, apex narrow, subtruncate and subdepressed, sulcate; facial fastigium shorter and broader than in *A. carita*; eyes as in the female of the species; antennae at least more than twice the length of the body. Pronotum somewhat less sellate than in *A. carita*, the dorsal line when seen from the side straighter and less ascending cephalad and caudad, the dorsum considerably constricted mesad; cephalic margin of disk emarginato-truncate, caudal margin semicircular in outline. Tegmina very slightly shorter than the caudal femora, rather narrow, the width at distal third one-ninth the total length; marginal field shorter than in *carita*, nearly a fifth of the total tegminal length; discoidal vein with four rami; stridulating field with its greatest width (to apex of stridulating vein) very slightly less than the length of the same field, free margin greatly produced at the apex of the stridulating vein, distad of this near the base of the speculum rectangularly emarginate and distinctly arcuato-emarginate at the apex of the same, the speculum with its greatest (proximal) width slightly greater than its length, stridulating vein slightly oblique, very faintly sigmoid, anal vein in the field considerably arcuate. Portion of wings projecting distad of the tegmina three-fourths to five-sixths the length of the median femora. Abdomen with the segments as in *carita*, but the margins non-crenulate and the projections of the same at the lateral pale bars more rounded; proximo-dorsal segment with a decided erect trigonal process, which is clearly a chitinous fold, excavate caudad and obliquely subtruncate cephalad; disto-dorsal segment with the margin undulato-truncate; supra-anal plate as in *carita* but the lateral margins and angles are more broadly rounded; cerci more crassate than in *carita*, less distinctly tapering, the apex more distinctly incurved but not at all bent or even rotundato-angulate; subgenital plate regularly and decidedly narrowing distad, the distal width not a third the proximal width (a half in *carita*), distal margin deeply arcuato-emarginate, lateral styliform processes brief. Limbs moderately short (for the genus), the caudal femora proportionately more inflated; cephalic and median femora with bispinose, caudal femora with unispinose genicular lobes. Median femora little more than half the tegminal length. Caudal femora very slightly longer than the tegmina; caudal tibiae surpassing the femora by about two-thirds the pronotal length.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pro- notum	Greatest dorsal (caudal) width of pronotum	Length of teg- men	Width of tegmen (in ♂ at distal fourth, in ♀ at middle)
♂ San Jacinto River, California. <i>Allotype</i> . (A.N.S.P.).....	15.2	3.7	2.4	21.3	2.3
♂ Los Angeles County, California. (U.S.N.M.).....	15	3.7	2.7	23.5	2.6
♂ Los Angeles County, California. (U.S.N.M.).....	14.3	3.4	2.5	21	2.5
♂ Los Angeles County, California. (U.S.N.M.).....	15.2	3.4	2.7	23.5	2.5
♂ San Bernardino County, California. (U.S.N.M.).....	15	3.8	2.7	18	2
♀ Cahon Pass, California. <i>Type</i> . (Scudder Collection).....	12.4	4.2	2.2	3	2
♀ Crestline, Nevada.....	18	3.9	2.4	3.6	2
	Length of wing distad of teg- men	Length of cephal- ic femur	Length of me- dian femur	Length of caudal femur	Length of ovi- positor
♂ San Jacinto River, California. <i>Allotype</i> . (A.N.S.P.).....	9	8.7	11.5	22.8	
♂ Los Angeles County, California. (U.S.N.M.).....	11.4	9.2	12.8	25.2	
♂ Los Angeles County, California. (U.S.N.M.).....	9.3	8.6	11.3	23	
♂ Los Angeles County, California. (U.S.N.M.).....	10.4	10	13.3	26.7	
♂ San Bernardino County, California. (U.S.N.M.).....	10	9.1	12	25.4	
♀ Cahon Pass, California. <i>Type</i> . (Scudder Collection).....		9	11.7	21.7	4.5
♀ Crestline, Nevada.....		8.9	10.9	22.5	5.2

The discrepancy in body length in the females is due to the fact that the type has shrunk and the Crestline individual was stuffed.

Color Notes.—The pattern of the male is exactly the same as in *carita*, showing almost all the same variations,⁸⁵ but the tones are paler and weaker, ranging from pale yellow-green and light turtle green (on tegmina) to straw yellow and glass green (on tegmina). The purplish edging of the postocular bars and the caudal margins of the pronotum is almost always weaker than in *carita*, the orange suffusion proximad on the antennae is weaker, sometimes subobsolete, and again more brownish. On the male tegmina there is a tendency toward a more or less extensive brownish delineation of the rami of the discoidal and the ulnar veins and their rami, occasionally this is not noticed and again both margins of the tegmina are more or less brownish, the costal in one case pencilled with pale pansy purple. Abdomen with the proximo-dorsal appendage more or less brownish; lateral and dorsal lines of the abdomen varying in about the same proportion as in *carita*. Of the female sex we have but one individual (that from Crestline) which has retained the original coloration. It is pale lumiere green on the head and pronotum, becoming hoary white on the pleura and baryta yellow to ochraceous-buff on the abdomen, the limbs greenish white passing more or less distinctly into pale cendre green on the tibiae. The pale areas on the head, pronotum, lateral bars on the abdomen and pleural edgings hoary white with little or no accompanying purplish. Tegmina pale cendre green with the costal margin touched with hoary white. The abdomen has no median bar, but the dorsal section, *i.e.* that between the lateral bars, shows traces of a hoary white suffusion; ovipositor ochraceous-buff passing into prout's brown distad, the teeth on the distal sections of the margins blackish.

Distribution.—The present species is apparently limited in distribution to southern California and southern Nevada. In California it occurs from as far north and west as the country between San Luis Obispo and San Simeon Bay, in San Luis Obispo County, south at least to the western slopes of the San Jacinto Mountains in Riverside County. The record from Tighes is probably even more southern than that from the San Jacinto range, as we

⁸⁵ The whitish areas in the males are more yellowish than in *carita*, but we believe this is due to the fact that none of the material of that sex of *brevicauda* has been stuffed and the yellowish tone is in consequence due to discoloration.

have reason to believe that the locality is in San Diego County, but numerous efforts to place Tighes have been unsuccessful. In Nevada we have only a single record from Crestline, Lincoln County. Two of the records given for the species from California are indefinite county records, Los Angeles and San Bernardino Counties, and we are unable to say where in these geographically varied areas, comprising parts of the Mohavan desert, the elevated Sierra Madre ranges and the coastal valley section, the species occurs. The occurrence of the species at Crestline, Nevada, at a considerable elevation and north of the Mohave Desert leads us to believe that it will be found to have a rather extensive distribution over the mountain ranges of the great Basin. Two of the exact Californian records are in the coastal region, the other (Cahon Pass) being at the summit of the divide between the coastal and Mohavan regions.

We have or can ascertain elevations for but three of the records; 2500 feet (San Jacinto River), approximately 3800 feet (Cahon Pass) and 6000 feet (Crestline).

Biological Notes.—All we know regarding the habits of this species is that it was taken at Crestline in bunch grass near junipers (*Juniperus utahensis*), where there was hardly any other vegetation. The locality is on an elevated gently rolling plateau, covered with scattered groves of juniper and occasional piñon. Here the ground is pebbly and practically bare in the groves, while in the open are tracts of sage brush and areas of scant grasses and occasional low yellow-flowered bushes.

The dates of occurrence are few, these extending from July 18 (Cahon Pass) to September 4 (Crestline).

Morphological Notes.—In the male sex there is some variation in the extent of the bullation of the pronotum and quite a little in the degree of concavity of the dorsum of the same, the type representing one extreme while the other approximates *carita* in this respect. The degree of bullation appears in large measure to be due to the handling in pinning and to the drying process. The cephalic margin of the pronotal disk varies in shape from that found in the allotype to one which is very broadly obtuse emarginate, while the caudal margin varies from semicircular to roundly obtuse-angulate in outline. The number of rami to the discoidal vein in the male varies from two to five, one individual having

2-2, one 2-3, two 3-4, three 4-4 and one 4-5. The one having 2-2 is depauperate in size. The dorsal abdominal process is similar in form in all of the males, while the distal margin of the disto-dorsal segment varies from truncate to undulato-truncate. The cerci show no noteworthy variation, while the subgenital plate varies only in the shape of the distal margin, which is occasionally angularly emarginate, and in the length of the styliform processes. The females show no noteworthy variations.

Synonymy.—This species was erroneously described by Scudder as a *Dichopetala*, the correct generic assignment having been given several years later by Morse. The brachypterous condition of the type unquestionably influenced Scudder to refer the species to *Dichopetala*, to which, however, it is in no way related.

Remarks.—The association of the sexes in the present species, as in *carita*, is indicated by both sexes sharing certain characters which are more decided than in other species, the chief of these being the broader head, the more inflated caudal femora and the decidedly tri-strumose abdomen.

Specimens Examined: 11; 8 ♂, 3 ♀.

Between San Luis Obispo and San Simeon Bay, California, (Palmer), 1 ♂, [Scudder Collection].

Los Angeles County, California, (Coquillett), 4 ♂, [U.S.N.M.].

San Bernardino County, California, (Coquillett), 2 ♂, [U.S.N.M.].

Cahon Pass, California, July 18, 1897, (A. P. Morse), 1 ♀. *Type.* [Scudder Collection]

San Jacinto River, elevation 2500 feet, San Jacinto Mountains, California, July 25, (Fordyce Grinnell, Jr.), 1 ♂. *Allotype*, [A.N.S.P.].

Tighes, California, 1 ♀, [Scudder Collection].

Crestline, Lincoln County, Nevada, elevation 6000 feet, September 4, 1909, (R. & H.), 1 ♀.

Arethaea limifera new species (Figs. 48 and 58.)

This species is an extreme development of the phylum to which *brevicauda* belongs and from which form it differs most strikingly in the stridulating field of the tegmina of the male (the only sex known) being more specialized, the stridulating vein more elongate and excessively developed at the free margin into a peg-like process, while the speculum is decidedly broader than long. As all the material of the new form consists of two males dried after immersion in alcohol, and consequently considerably shrivelled and without any trace of the original color, only the most obvious dif-

ferences are given as diagnostic. These are, in addition to the form of the stridulating field, the broader marginal field and more abruptly arcuate costal margin of the tegmina, the decidedly crenulate margins of the abdominal segments, the slenderer cerci and more elongate limbs.

Type.—♂; Environs of Guadalajara, Jalisco, Mexico. 1901. (M. Diguët.) [Amer. Mus. Nat. Hist.]

Description of Type.—The following description is largely comparative with *A. brevicauda* and also, on account of the character of the material, restricted to features which appear to be unaffected by the condition of the specimens. Size slightly larger than *A. brevicauda*. Fastigium more inflated, higher, the margins regularly converging cephalad and arcuate when seen from the side, apex depressed, sulcate; eyes prominent, ovoid, the apex dorsad, the greatest width contained one and one-half times in the depth, the latter very slightly greater than the depth of the infra-ocular portion of the genae. Pronotum sellate, the dorsum considerably ascending caudad, cephalic margin of disk very broadly angulato-emarginate, caudal margin very roundly obtuse-angulate, the immediate angle emarginato-truncate; transverse sulcus broadly V-shaped on the disk, deeply impressed on the dorsal section of the lateral lobes; lateral lobes with the greatest depth about two-thirds the greatest dorsal length, cephalic margin oblique subsinuate, ventro-cephalic angle sub-rectangulate, ventral margin subtruncate, ventro-caudal angle roundly obtuse, caudal margin moderately oblique, more vertical than in the other species, arcuato-truncate, humeral sinus rotundato-rectangulate. Tegmina quite elongate, about seven times as long as the pronotal disk, the width at the distal fourth about one-ninth the length of the same; marginal field very broad, its greatest breadth very decidedly proximad of the middle of the field, thence tapering distad, costal margin rather abruptly arcuate to the blunted apex; discoidal vein with three rami; stridulating field with its greatest width (to apex of stridulating vein) subequal to the length of the field, free margin excessively produced at the apex of the stridulating vein into a peg-like process, which is longer from the adjacent angle of the speculum than the remainder of the stridulating vein, remainder of the free margin much as in *brevicauda* but less arcuate between the two emarginations, stridulating vein nearly transverse, faintly sinuate, speculum subtrigonal with its apex proximad, the greatest width more than the direct greatest length. Abdomen with a decided proximo-distal process similar in character to that of *brevicauda*, margins of dorsal segments strongly and regularly crenulate; subgenital plate strongly transverse, narrow, margin arcuate; cerci as in *brevicauda* but slightly slenderer and less arcuate distad; subgenital plate as in *brevicauda* but slightly broader distad, margin arcuato-angulate emarginate, lateral angles mere knobs and not styliform processes. Limbs very elongate; femora with the dorsal genicular section not spiniform produced, genicular lobes of the cephalic and median femora

bispinose, of the caudal femora with or without spiniform points. Cephalic femora two and one-half times as long as the pronotal disk. Median femora slightly longer than half the tegminal length. Caudal femora slightly surpassing the tegmina in length, moderately inflated proximad; caudal tibiae exceeding the femora by the length of the head and pronotum together.

Paratypic Series.—A single paratypic male, bearing the same data as the type, has been examined.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Guadalajara, Mexico. <i>Type.</i> (A.M.N.H.).....	13.2 ⁸⁶	4	2.8	28	3
♂ Guadalajara, Mexico. <i>Paratype.</i> (A.M.N.H.).....	12 ⁸⁶	3.8	2.7	26.2	2.7
	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	
♂ Guadalajara, Mexico. <i>Type.</i> (A.M.N.H.)..	7.6	..	16	30.6	
♂ Guadalajara, Mexico. <i>Paratype.</i> (A.M.N.H.)	7.2	9.5	13.6	27.5	

Color Notes.—As both of the available specimens are entirely without any trace of the original color tones, we are unable to give any indication of the same. The pattern, however, appears to have been much the same as that of *brevicauda*.

Distribution.—This species is only known from the type locality in Jalisco, Mexico.

Remarks.—The paratype shows no noteworthy differences from the type except that the rami of the discoidal vein number four and five.

Specimens Examined: 2 ♂.

Environs of Guadalajara, Jalisco, Mexico, 1901, (M. Digue), 2 ♂. *Type, paratype.* [A.M.N.H.]

⁸⁶ Abnormal on account of shrivelling.

Arethaea phantasma new species (Figs. 35, 49, 59 and 71.)

This very strongly marked species differs from all of the other forms of the genus in the structure of the pronotum, of the margins of the abdominal segments and the form of the anal vein of the tegmina. In the texture of the tegmina it is different from the majority of the species, the non-produced dorsal margins of the genicular extremity of the cephalic and median femora separate it immediately from *phalangium* and *grallator*, the long-winged female from *semialata*, *arachnopyga* and probably all the species of group C, while the non-produced extremity of the stridulating vein distinguishes it from *gracilipes*.

Type.—♂; Benavides, Duval County, Texas. August 9 and 10, 1912. (Rehn & Hebard.) [Hebard Collection.]

Description of Type.—Size medium; form very slender. Head with the greatest width across genae contained one and one-half times in the greatest depth of the head; occiput moderately declivent to the fastigium and strongly so to the antennal scrobes; fastigium very broad, strongly rounded when seen from the lateral aspect, narrowing cephalad, lateral margins sharp, with a moderate medio-longitudinal sulcus, apex low and subobsolete, interfastigial suture distinct; facial fastigium low, median ocellus ovate, deeply impressed, large; eyes short elliptical, less than twice as deep as the greatest width of the same, the depth slightly greater than that of the infra-ocular portion of the genae, very prominent; antennae about two and a half times as long as the tegmina. Pronotum strongly sellate, when seen from the side the dorsal outline is rather sharply elevated cephalad and more gradually elevated caudad, the disk and dorsal portion of the lateral lobes considerably impressed mesad; cephalic margin of disk arcuato-emarginate, caudal margin of same strongly arcuate, slightly flattened, all of the margins of the pronotal disk and lateral lobes with more or less regularly placed calloused points or beads; disk with a median impressed V-shaped figure, the lateral portions of which design are continued obliquely ventro-cephalad over a considerable portion of the lateral lobes; disk completely rounded into the lateral lobes and only the faintest possible indication of angles present cephalad and caudad; lateral lobes with the greatest depth (caudal) contained about one and one-half times in the greatest dorsal length of the same, cephalic margin of lobes sinuato-emarginate, ventro-caudal angle bluntly rectangulate, ventral margin arcuato-emarginate on cephalic three-fifths, caudal two-fifths of ventral margin and caudal margin broadly arcuate, humeral sinus broad, deep, rotundato-rectangulate, surface of ventro-caudal portion of the lobes rugulose. Tegmina (as well as the greater portion of the exposed area of the wings) coriaceous in texture, venation decidedly elevated, the length exceeding that of the body by about a fourth, narrow, at proximal third distinctly but not greatly narrower than at distal fourth; marginal field considerably expanded but limited to proximal

fourth, distal fourth of costal margin curving to the rather narrow and blunt apex, which latter is sutural in position; discoidal rami three in number, the proximal one diverging but a short distance distad of the middle of the vein; stridulating field with the stridulating vein strongly oblique, arcuate proximad to base of tegmen, speculum longitudinal, the greatest width contained one and one-half times in the greatest length of the same, apex of speculum acute, sutural margin of stridulating field broadly arcuate proximad of the apex of the stridulating vein, then briefly sinuato-emarginate distad and finally oblique subtruncate to the major portion of the sutural margin. Wings surpassing the tegmina by slightly more than half the length of the latter; greatest depth of wings in repose subequal to the greatest depth of tegmina, apex of wings moderately acute. Dorsum of the abdomen with no proximal erect process; margins of the dorsal segments multicrenulate, the points of the crenulations being formed by minute thickened callous nodes; disto-dorsal abdominal segment with margin entire, truncate; supra-anal plate transverse arcuate; cerci moderately robust, tapering, slightly depressed, nearly straight, distal fourth bent inwards at a right angle, the tips aciculate; subgenital plate elongate, subcompressed, tricarinate ventrad, the median carina more decided and elevated than the lateral ones, distal margin deeply subtriangularly emarginate, the emargination sinuate laterad, brief substyliform processes present laterad of the emargination. Limbs very elongate. Cephalic and median femora with the supragenicular portion of the extremity subcompressed, blunt angulate, not at all produced or spiniform; genicular lobes of the same limbs bispinose, of the caudal femora unispinose. Cephalic femora slightly less than twice the length of the head and pronotum; cephalic tibiae with tympanum elliptical. Median femora nearly one and one-half times the length of the cephalic femora. Caudal femora slightly less than twice the length of the body, little inflated proximad; caudal tibiae exceeding the femora by about the length of the head and pronotum.

Allotype.—♀; Data same as type.

Description of Allotype.—The following characters are chiefly those of difference from the male sex. Head and pronotum as in the male. Tegmina subequal to the body (exclusive of ovipositor) in length, at proximal third not narrower than at distal fourth; discoidal rami four in number, the proximal one diverging mesad. Wings as in male. Disto-dorsal abdominal segment with margin entire, arcuato-truncate; supra-anal plate semielliptico-trigonal, the proximal half and the adjacent distal half of the disto-dorsal abdominal segment with a deeply impressed medio-longitudinal sulcus; cerci moderately elongate, terete; ovipositor robust, very short, sharply curved, greatest depth distinctly greater than half the length of the same, dorsal margin with the distal half moderately serrato-dentate, the size of the serrations increasing distad, distal third of the ventral margin with recurved serrato-dentations, the median third finely crenulate, the proximal third straight and smooth, surface of the distal third of the ovipositor with series of sharp ridge-like teeth arranged in linear fashions, there being about six series on the dorsal valves, the ventral series of which has

many more very closely placed teeth than the others, the ventral valves having three series arranged longitudinally but with the individual teeth placed transversely; subgenital plate small, trigonal, impressed, with two converging carinae mesad. Caudal femora about half again as long as the body (exclusive of the ovipositor).

Paratypic Series.—We have selected as paratypic a series of nine males and three females from Benavides.

From the appended measurements it will be seen that the size variation is chiefly individual, although the Carrizo Springs specimens are somewhat above the average of the others in proportions. Apparently this is in line with a corresponding increase in size in the Carrizo Springs region of other forms, as *Dichopetala gladiator*, having much the same distribution as the present species. In the case of *phantasma* our material is too scanty to more than state the probability of such geographic variation.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of distal fourth of tegmen
♂ Benavides, Texas. <i>Type</i>	16.6	3.9	2.2	21	2.5
♂ Benavides, Texas. Average and extremes of <i>type</i> and five <i>para-</i> <i>types</i>	17 (16.6-18.1)	3.9 (3.8-4.1)	2.2 (2.2-2.3)	20.9 (19.8-22)	2.4 (2.2-2.7)
♂ Katherine, Texas...	14.5	3.9	2.2	18.1	2.4
♂ Katherine, Texas...	17	4.1	2.6	21.6	2.7
♂ Carrizo Springs, Texas.....	20.2	4.1	2.8	22.4	3
♂ Carrizo Springs, Texas.....	16.4	4	2.5	22.6	2.5
♀ Benavides, Texas. <i>Allotype</i>	20.7	3.9	2.2	21.5	2.4
♀ Benavides, Texas. Average and ex- tremes of <i>allotype</i> and three <i>paratypes</i>	19.7 (17.7-22)	4 (3.9-4.4)	2.4 (2.2-2.5)	22.3 (21.5-23)	2.7 (2.4-3)
♀ Katherine, Texas...	14.5	4.2	2.3	22	2.4
♀ Katherine, Texas...	19.8	4.2	2.2	22.4	2.7
♀ Carrizo Springs, Texas.....	19			24.8	2.8

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Benavides, Texas. <i>Type</i>	11.7	11.1	16.2	30.2	
♂ Benavides, Texas. Average and extremes of <i>type</i> and five <i>paratypes</i>	11.9 (11.5-12.7)	10.8 (10-11.2)	15.5 (14.7-16.3)	30 (28.3-31.4)	
♂ Katherine, Texas...	11.3	10.2	15	29.2	
♂ Katherine, Texas...	12.2	11.3	15.5	30	
♂ Carrizo Springs, Texas.....	11.4	11.4	16.7	32.2	
♂ Carrizo Springs, Texas.....	12.2	10.9	15.2	29	
♀ Benavides, Texas. <i>Allotype</i>	12.5	10.2	14.1	30.2	4.1
♀ Benavides Texas. Average and extremes of <i>allotype</i> and three <i>paratypes</i>	12.3 (11.8-13)	11.3 (10.2-12)	15.6 (14.1-17)	32.5 (30.2-35.3)	4.1
♀ Katherine, Texas...	10.7	10.3	15	31	4
♀ Katherine, Texas...	11.4	11.6	16.4	31.5	4.2
♀ Carrizo Springs, Texas.....	12.9	12.5	18.3	35	4.8

Color Notes.—General color varying from pale honey yellow through pale greens to civette green, the deepest color almost invariably found only on the distal portion of the tegmina and wings, the tibiae and the genicular portion of the femora; the average tone of coloration being chrysolite green. The head, pronotum, and abdomen always and the proximal portion of the tegmina almost always paler, sometimes hoary and frequently quite yellowish in contrast to the remainder of the coloration, ranging from chartreuse yellow to chamois. Head frequently with an irregular postocular patch of creamy white finely and very unevenly sprinkled with pompeian red; eyes ranging from walnut brown to blackish brown. Dorsum of the head and pronotum with the coloration more yellowish than on the lateral aspect of the same;

margins of the pronotum more or less edged with pompeian red to vandyke red, varying in depth and width on different parts of the margins and also individually, occasionally almost no trace of this red being present and again in the other extreme very strongly indicated, these margins always beaded with hoary white, alternating with the reddish; lateral lobes of the pronotum, in the highly colored specimens, more or less stippled with the reddish color cephalad and caudad, occasionally this being over hoary white; a very faint irregular and broken indication of the postocular marking of the head present on the pronotum at the lateral margins of the disk. Tegmina with the stridulating field broadly marked with bay along the anal vein, rarely the greater portion of the whole field weakly washed with the same; tips of the veins adjacent to the sutural margin occasionally touched with paler green than the general color or even with whitish. Wings with exposed portion washed proximad along the veins with pomegranate purple. Pleura very rarely with a pair of ovato-quadrangle spots of vandyke red. Limbs with the femora frequently more or less washed with pompeian red to vandyke red, particularly the median pair, all of the femora generally sprinkled with small hoary white areas. Ovipositor with the distal margins and teeth blackish brown.

Distribution.—The present species is only known from southern Texas, its range extending at least as far north as San Diego, Duval County, northwest to Carrizo Springs, Dimmit County and south as far as Ringgold Barracks, Starr County. Its vertical range is limited, extending from near sea-level at Katherine to about 800 feet elevation at Carrizo Springs.

Biological Notes.—At Katherine, in the sandhill region, the present species was found uncommon in tall grasses and weeds and also in the scrub oak (*Quercus virginianus*) areas. At Benavides it was occasional in cleared old pasture, which was much overgrown with various very dry and not very dense weeds. Here the insects would, when frightened, flutter in a ghost-like fashion from one clump of brush to another, which action suggested the specific name. In the same situation at Benavides, *A. gracilipes* was also found.

From the dates with the material, the present species would seem to mature as early as May and also be found in that condition

as late as August 28, probably much later as nymphs were taken at Benavides on August 10.

Morphological Notes.—The structural variation found in the species is not very great aside from that of the number of discoidal rami. The caudal margin of the disk of the pronotum is rarely considerably emarginate mesad, while the humeral sinus of the same is always rectangulate in general form, but with its immediate angle occasionally rounded. The number of discoidal rami varies from three to five, the latter number present equally on both tegmina in two males and on a single tegmen in one male and one female. The more frequent number is three or four, generally equal in number on the two tegmina, the number unequal in eight specimens of both sexes. In the male cercus there is some slight variation in the robustness of the distal extremity and very faintly of the whole cercus. Some male individuals show slight variation from the more normal type in the amount of depression of the whole cercus. These features of the pronotum, tegmina and genitalia are purely individual and have no geographic significance.

Remarks.—The present form is probably as a whole the most sharply defined of the genus. The combination of a very decidedly sellate pronotum with full rounded lateral lobes, which latter also have a peculiarly modified surface, a different texture to the tegmina as well as a very large tambourine of the same in the male, unarmed dorso-genicular regions of the cephalic and median femora and short elliptical eyes will readily serve to differentiate this species. It is limited in distribution to a region shared with a number of equally peculiar forms of Orthoptera.

Specimens Examined: 27; 17 ♂, 7 ♀, 3 ♂ nymphs.

San Diego, Duval County, Texas, July 12, (E. A. Schwarz), 1 ♂, [U.S.N.M.].

Benavides, Duval County, Texas, August 9 and 10, 1912, (R. & H.), 10 ♂, 4 ♀. *Type, allotype paratypes;* 2 ♂ nymphs.

Katherine, Willacy County, Texas, August 8, 1912, (R. & H.), 2 ♂, 2 ♀, 1 ♂ nymph.

Ringgold Barracks, Starr County, Texas, (Schott), 1 ♂, [Scudder Collection].

Carrizo Springs, Dimmit County, Texas, May, 1886, June, 1885 and August 28, 1885, (A. Wadgymer), 3 ♂, 1 ♀, [Hebard Collection and U.S. N.M.].

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