

H. J. Stonecker
with kind regards
of Morgan Hebard

STUDIES IN
ORTHOPTERA
WHICH OCCUR IN NORTH AMERICA
NORTH OF THE MEXICAN BOUNDARY
VI
A REVISION OF THE GENUS ARETHAEA
(TETTIGONIIDAE: PHANEROPTERINAE)

BY
Morgan Hebard

From the Transactions of The American Entomological Society, LXII, 231-256

Issued

No. 1019

SEP 29 1936

\$.40

This is a separatum from the TRANSACTIONS and is not a reprint. It bears the original pagination and plate numbers, and was placed on sale at the price quoted and library copies mailed at Philadelphia on the above date of issue.

**STUDIES IN ORTHOPTERA WHICH OCCUR IN
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**VI. A REVISION OF THE GENUS ARETHAEA
(TETTIGONIIDAE, PHANEROPTERINAE)***

BY MORGAN HEBARD

(Plates XVIII and XIX)

There has always been to the author a particular interest in this Sonoran genus, found exclusively in the southern half of the western United States and northern Mexico, as a rule in semi-arid environment, with the exception of the largest of all the species, which occurs in the wire-grass of the pine woods of the southeastern United States.

All of the species are small and slender, light green in coloration, with organs of flight very narrow when fully developed and limbs amazingly thin and elongate. Usually macropterous, the males of only a single species have the organs of flight decidedly reduced in a portion of its area of distribution. Females of some species are similar in this respect, while in a few species they are always highly brachypterous.

Living in tufts of grasses, usually of the very narrow-leaved varieties, the resemblance of individuals to their favorite environment is amazing. They often rest motionless, in or on such tufts of grass, with legs spraddled out and the very slender and elongate antennae, which frequently are pale yellowish, drifting in the breezes. When flying, individuals appear almost helpless, drifting with the wind with legs still spraddled out and wings feebly fluttering. When on the ground away from grass they seem almost as feeble, standing high but unsteadily, while their leaps are short and weak.

* Parts IV-V. Trans. Am. Ent. Soc., LX, pp. 281-293, (1934).

In 1914 eleven species and races of the genus *Arethaea* were recognized by Rehn and Hebard. It is a distinct surprise to find that nineteen are present in the collections now available. In the United States the species and races are now quite well understood, but much field work remains to be done in northern Mexico where the genus is very widely distributed and where adequate field work may reveal the presence of several more yet unknown species and races. Until much more material from that region is assembled the southern boundaries of a number of species and races can not be determined.

In the present paper it is our desire to describe the yet unrecognized forms before us, to correct confusion which occurred in our studies of 1914 (due to lack of sufficient material to recognize certain geographic races and in one case incorrect association of the sexes), to record all subsequent material that has not already been reported (except that from Texas, which will shortly appear in a study of the Orthoptera of that State) and to provide a discussion and key which will enable the student to see not only the inter-relationship of the species and races more clearly but also to recognize more easily the characters which may safely be used to distinguish them.

The natural sequence of the species in this genus is as follows:

semialata Rehn and Hebard. Extreme western Texas and southcentral New Mexico.

coyotero Hebard. Southern Nevada and northwestern Arizona.

gracilipes gracilipes (Thomas). Southern Colorado, western Oklahoma, Pan-Handle of Texas, New Mexico and northeastern Arizona.

gracilipes papago Hebard. Southern and western (at low elevations) Arizona, northern Sonora and the southeastern border of California.

gracilipes cerciata new subspecies. Big Bend region of southwestern Texas.

constricta comanche new subspecies. Central and southern Texas, Nuevo Leon and Coahuila.

constricta constricta Brunner. Nebraska south across northern Texas to the Pan-Handle.

insaroides Rehn and Hebard. Southern Coahuila.

mescalero new species. Southeastern New Mexico.

arachnopyga Rehn and Hebard. Big Bend region of southwestern Texas.

phantasma Rehn and Hebard. South-central (not including Brownsville region) Texas.

sellata Rehn. Southern Arizona.

carita Scudder. Central-northern New Mexico to northern Chihuahua and southeastern Arizona.

polingi Hebard. Northwestern Arizona.

brevicauda (Scudder). Southern Nevada, northwestern Arizona, southern California.

limifera Rehn and Hebard. Northern Jalisco.

grallator (Scudder). Almost entire central and western portion of east Texas.

phalangium (Scudder). Georgia and Florida.

ambulator new species. North-central Texas.

Characters which are particularly distinctive:

For Both Sexes

Margins of pronotum strikingly nodose; *phantasma*.

Pronotum with a fine medio-longitudinal buffy line; *grallator*.

Cephalic and median femora angularly produced dorso-distad; *grallator*, *phalangium*, *ambulator*.

For Males

First abdominal tergite not specialized; *semialata*, *coyotero*, *sellata*, *grallator*, *phalangium*, *ambulator*.

Supra-anal plate highly specialized; *arachnopyga*.

Cerci bent inward and dorsad; *mescalero*.

Cerci with a prominent convexity at base of apical tooth; *mescalero*.

Cerci curving evenly inward in distal portion; *sellata*, *polingi*, *brevicauda*, *limifera*.

Organs of flight sometimes showing considerable reduction in this sex; *ambulator*.

Tegmina with stridulating field at apex of stridulating vein strongly produced, *carita*, *polingi*; very strongly produced, *brevicauda*, *limifera*.

For Females

Organs of flight very greatly reduced, shorter than pronotum; *sellata*, *polingi*, *brevicauda*.

Organs of flight considerably reduced but much longer than pronotum; *semialata*, *gracilipes gracilipes* (only in some series), *arachnopyga*, *carita*.

In a number of species females are very difficult to distinguish, but in the others are quite as readily recognized as the males. The following key gives the important features of difference for each sex.

1. Femora not specialized distad. Eyes less than twice as deep as wide. .2
Cephalic and median femora compressed dorso-distad, there angularly produced, subspiniform dorsad. Eyes more than twice as deep as wide. (Male cerci strongly bent horizontally inward distad. Male with first abdominal tergite not specialized. Pronotum with caudal margin of disk angulate produced. Stridulating field of male tegmen roundly and weakly produced at apex of stridulating vein.).....17
2. Stridulating field of male tegmen weakly to moderately produced at apex of stridulating vein. Male cerci strongly bent distad. (Abdominal tergites smooth to feebly crenulate.).....3
Stridulating field of male tegmen strongly to very strongly produced at apex of stridulating vein. Male cerci weakly or not at all bent, but curved, inward distad, (the distal tooth slender and tapering. Male supra-anal plate simple. Abdominal tergites with caudal margins simple to moderately strongly nodulose).....13
3. Male with first abdominal tergite not specialized.....4
Male with first abdominal tergite specialized.....6
4. Abdominal tergites with caudal margins smooth to subcrenulate. (Pronotum with caudal margin of disk convex, showing very weak angulation. Male cerci with inbent apical portion produced as a small conical tooth. Organs of flight caudate in male, reduced and not reaching beyond apex of ovipositor in female.) Western Texas.
semialata Rehn and Hebard
Abdominal tergites with caudal margins very strikingly nodose. Pronotum with caudal margin of disk convex. Organs of flight caudate in both sexes.).....5
5. Pronotum very weakly sellate, its margins simple. Size large and form less graceful. Male cerci with distal bent portion directed inward and dorsad. Southeastern New Mexico.....*mescalero* new species
Pronotum decidedly sellate, its margins strikingly nodose. Size smaller, form very graceful. Male cerci with distal bent portion directed inward. South-central (not including Brownsville region) Texas.
phantasma Rehn and Hebard
6. Stridulating field of male tegmen broadly convex at apex of stridulating vein. (Male with production of caudal margin of pronotum and specialization of first abdominal tergite much as in *gracilipes papago*, cerci heavier distad.) Southern Coahuila.
insaroides Rehn and Hebard
Stridulating field of male tegmen moderately produced and angulate at apex of stridulating vein.....7
7. Pronotum with caudal margin of disk convex or rounded obtuse-angulate, but never acute-angulate produced. Sutural margins of tegmina not conspicuously darkened, the principal veins near that margin no paler than the intervening areas.....8

- Pronotum with caudal margin of disk sharply angulate produced at slightly to distinctly less than a rightangle. Sutural margins of tegmina usually conspicuously darkened, the principal veins near that margin usually paler than the intervening areas.....12
8. Pronotum with caudal margin of disk broadly convex, showing no angulation. Male cerci with inbent apical portion a comparatively slender tooth which is no wider proximad than mesad. (Male with specialization of first abdominal tergite moderately high, about as wide as its basal width. Organs of flight caudate in male, very greatly reduced and much shorter than pronotum in female.¹) Southern Nevada and Arizona Plateau.....*coyotero* Hebard
- Pronotum with caudal margin of disk bluntly angulate produced, forming a rounded weakly obtuse angulation or rectangulate, (except sometimes in *gracilipes cerciata*). Male cerci with margins of inbent apical portion converging to form a stouter tooth.....9
9. Male with specialization of first abdominal tergite not as high, height no greater or slightly less than its basal width, its apex not bulbous. (Male cerci with inbent apical portion moderately stout, weakly horizontally flattened, its margins converging to form a stout acute tooth.).....10
- Male with specialization of first abdominal tergite very high, higher than its basal width, with apex bulbous. (Female with organs of flight varying from as caudate as in male to reduced, not surpassing apex of ovipositor.) Southern Colorado, western Oklahoma, Pan Handle of Texas, New Mexico and northeastern Arizona.
- gracilipes gracilipes* (Thomas)
10. Male supra-anal plate normal for genus. (Organs of flight caudate in both sexes.).....11
- Male supra-anal plate highly specialized, elongate, recessed into the preceding tergite and medio-longitudinally deeply sulcate, the lateral halves with surfaces convex. (Organs of flight caudate in male, only slightly surpassing apex of ovipositor in female.) Big Bend of the Rio Grande, southwestern Texas.....*arachmopyga* Rehn and Hebard
11. Male cerci with inbent apical portion moderately stout, horizontally flattened, its margins converging to form a stout acute tooth. Southern and western (at low elevations) Arizona, northern Sonora, extreme southeastern California.....*gracilipes papago* Hebard
- Male cerci with inbent apical portion much broader, very decidedly horizontally flattened, its margins broadly convex and convergent only at extremity to form a much shorter tooth. Big Bend of the Rio Grande, southwestern Texas....*gracilipes cerciata* new subspecies

¹ This sex is readily separated from females of other species which are as strongly brachypterous by the much longer ovipositor which curves gradually instead of being bent dorsad.

12. Male cerci with inbent apical portion comparatively slender, horizontally flattened, its margins converging to form a stout acute tooth. Organs of flight caudate, never showing more than very slight reduction. Central and southern Texas, Nuevo Leon and Coahuila.

constricta comanche new subspecies

Male cerci with inbent apical portion stouter, decidedly horizontally flattened, its margins converging to form a decidedly heavier acute tooth. Organs of flight caudate, but often showing slight to fairly marked reduction, particularly in more northern material. Eastern Nebraska south across northern Texas to the Pan Handle.

constricta constricta Brunner

13. Male with first abdominal tergite not specialized. (Male tegmina with stridulating field strongly but quite broadly produced at apex of stridulating vein. Pronotum with caudal margin of disk rounded subrectangulate produced. Abdominal tergites with margins simple. Male cerci showing an even distal curvature. Organs of flight fully caudate in male, very greatly reduced and much shorter than pronotum in female.²) Southern half of Arizona at lower elevations, but particularly extreme southeastern section.....*sellata* Rehn
Male with first abdominal tergite specialized.....14
14. Male tegmina with stridulating field strongly but quite broadly produced at apex of stridulating vein.....15
Male tegmina with stridulating field very strongly and narrowly produced at apex of stridulating vein. Caudal margin of pronotal disk never sharply acute; lateral lobes with area of convex callosity sometimes inflated.....16
15. Pronotum with caudal margin of disk well rounded angulate produced at slightly more than a rightangle. Abdominal tergites with margins feebly to rather strongly nodose. Male cerci showing some slight angulation of their distal curvature. Male with caudal margins of first abdominal tergite strongly elevated with outline of these portions convex to the meso-caudal specialization. Organs of flight fully caudate in male, less than half as long as abdomen in female. Central-northern New Mexico to northwestern Chihuahua and southeastern Arizona.....*carita* Scudder
Pronotum with caudal margin of disk rounded angulate produced at slightly less than a rightangle. Abdominal tergites with caudal margins not nodose but showing angulate production meso-laterad. Male cerci showing an even distal curvature. Male with caudal margins of first abdominal tergite much less elevated on each side of

² The females are exceedingly similar to those of *polingi*, but apparently have the ovipositor slightly more strongly bent dorsad.

- the meso-caudal specialization. Organs of flight fully caudate in male, very greatly reduced and much shorter than pronotum in female.³ Arizona Plateau.....*polingi* Hebard
16. Limbs elongate. Male tegmina with production at apex of stridulating vein not equal to width of remaining portion of field. Marginal field of tegmina normal. Male cerci more robust. Abdominal tergites with caudal margins smooth. Organs of flight fully caudate in male, very greatly reduced and much shorter than pronotum in female. Southern Nevada, northwestern Arizona and southern California.⁴
brevicauda (Scudder)
- Limbs very elongate. Male tegmina with production at apex of stridulating vein subequal in length to width of remaining portion of field. Marginal field of tegmina more strongly developed. Male cerci more slender. Abdominal tergites with caudal margins strongly crenulate. Organs of flight fully caudate in male; female unknown. Northern Jalisco.....*limifera* Rehn and Hebard
17. Pronotum shorter, stridulating area of male tegmina nearly as long. Pronotum with a fine medio-longitudinal buffy line. (Organs of flight caudate, tegmina not widening beyond proximal third. Abdominal tergites with caudal margins smooth. Male cercus much like that of *phalangium*.) Almost entire central and western portion of east Texas.....*grallator* (Scudder)
- Pronotum longer, stridulating area of male tegmina conspicuously shorter. Pronotum lacking a medio-longitudinal line.....18
18. Male cercus not showing a rounded projection before base of the small apical tooth. Pronotum with humeral sinus broad and shallow. Organs of flight caudate, tegmina widening beyond proximal third. Abdominal tergites with caudal margins smooth. Size largest of the genus. Georgia and Florida.....*phalangium* (Scudder)
- Male cercus showing a rounded projection before base of the small apical tooth. Pronotum with humeral sinus very broad and very shallow. Organs of flight often considerably reduced in both sexes, when caudate the tegmina do not widen beyond proximal third. Abdominal tergites with caudal margins strongly crenulate. Size smaller and form slender, though large and robust for the genus. North-central Texas.....*ambulator* new species

³ The females are very similar to those of *brevicauda*, but the ovipositor is distinctly shorter and is definitely bent dorsad. Even more similar are those of *sellata*, in which the ovipositor is apparently slightly more strongly bent dorsad.

⁴ Excepting the Mojave Desert and adjacent regions including Death Valley and the Imperial Valley, over all or the greater portion of which country the genus *Arethaea* is absent or extremely scarce.

The form of the apices of the cephalic and median femora is the most important character for dividing the species of the genus. Such specializations we now know instantly distinguishes individuals of the *Grallator* Group from all others even in the very early stages of immaturity.

Presence or absence of a gland-like specialization on the first abdominal tergite in males has no value in associating species with their nearest relatives. Whether the male cerci are bent or curved distad has more significance (except for the species *sellata* and *carita* which in certain other features show affinity) as is true for the degree of production of the stridulating field of the male tegmina at the apex of the stridulating vein (except for *insaroides*, which in a number of characters shows otherwise close affinity to *gracilipes*). Whether the caudal margins of the abdominal tergites are simple, crenulate or nodose is often of diagnostic value, but some individual variation occurs.

The distribution of *Arethaea* covers the semi-arid southern half of the western United States and northern Mexico, a single species being peculiar to Georgia and Florida in the southeastern United States. Limited in continuous distribution eastward to the western border of the narrow humid strip of eastern Texas, the northern boundary is almost a straight line across southwestern Kansas, southern Colorado, southern Nevada and California to the Pacific, but in the eastern portion there is an intrusion into the north which, including eastern Kansas, reaches northeastern Nebraska. In Mexico we are now certain that the genus is present only as far south as northern Jalisco, where a single, possibly isolated, species occurs. Insufficient field work has been done to outline a southern boundary accurately, but *Arethaea* should be found generally distributed (except at high elevations) as far south as the Tropic of Capricorn.

All of the species live in grasses and weeds near the ground, many in the small clumps of fine short grass of the semi-arid sections of the southwestern United States and northern Mexico. Usually found singly and often not more than one or two in a

day's collecting, individuals may occasionally be present in fair numbers in local areas of favorable environment. Females of a number of species can not fly, and when sustained flight is possible individuals take wing almost exclusively at night, for all of the species are nocturnal. Occasional specimens fly to light at night, but series can be obtained in this way only through the efforts of a resident collector which can be continued throughout the season in a favorable environment.

Hiding in grasses and weeds during the day, the color and form of specimens of *Arethaea* is such that, had beating not been resorted to, we would again and again have missed finding them at localities where our stay was limited.

Much material has been furnished us for study through the cooperation of other Institutions, to whose Curators we wish to express deep gratitude. Unless otherwise stated, the material here recorded belongs to the author's collection, at the Academy of Natural Sciences of Philadelphia.

In several cases we feel that the association of species made by Rehn and Hebard must be altered. Though the stridulating field of the male tegmina in *semialata* and *insaroides* is less produced and more broadly rounded than in *gracilipes* and its close allies, we believe that these species as well as *arachnopyga* must be considered offshoots in different directions from the Gracilipes Group, *semialata* representing the least specialized and *arachnopyga* the most specialized. Originally *semialata* and *insaroides* were placed in the Grallator Group. Moreover, the species of that group, *grallator*, *phalangium* and *ambulator* should be placed last in the genus, being similarly and distinctively distinguished from all other species of this assemblage. It is true that *phantasma* is the most distinctive species of all and in some respects the most highly specialized, but in other features affinity to the Gracilipes Group is clearly indicated. The species *polingi*, *brevicauda* and *limifera* are clearly members of the Brevicauda Group, but *mescalero*, *sellata* and *carita* represent species too heterogeneous to constitute a group or to be placed in any of other groups here mentioned.

***Arethaea semialata* Rehn and Hebard**

1914. *Arethaea semialata* Rehn and Hebard, Trans. Amer. Ent. Soc., **XL**, p. 154, figs. 34, 45, 55 and 66. [♂, ♀: Garden Spring in Brewster County, Moss Well in Chisos Mountains (type locality), Canyon behind Pulliam Bluff in Chisos Mountains, Livermore Peak in Davis Mountains at 7500 feet, slopes of Pine Mountain in Davis Mountains, Maguire's Ranch in Davis Mountains and Franklin Mountains near El Paso, Texas; Mesilla Valley near Organ Mountains, New Mexico.]

This species has subsequently been found only in the Big Bend region of the Rio Grande in Texas, but it undoubtedly occurs in adjacent Coahuila and Chihuahua.

***Arethaea coyotero* Hebard**

1935. *Arethaea coyotero* Hebard, Trans. Amer. Ent. Soc., **LXI**, p. 132, pl. 5, fig. 6 and pl. 6, figs. 1 and 2. [♂, ♀: Crestline at 6000 feet, Ash Meadows in Amargosa Desert at 2300 feet and Beatty, Nevada; Prescott (type locality), Granite Peak and Mount Trydal near Prescott to 7300 feet, Senator and Kingman, Arizona.]

The distribution of this species is probably not nearly as extensive as that of many species of the genus, but it may eventually be found east as far as extreme southwestern Utah.

***Arethaea gracilipes gracilipes* (Thomas)**

1870. *E[phippitytha] gracilipes* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 76. [♂, southern Colorado.]
1914. *Arethaea gracilipes gracilipes* Rehn and Hebard (in part), Trans. Amer. Ent. Soc., **XL**, p. 120, figs. 37, 38, 41, 51 and 62. [♂, ♀: Raton, Las Vegas Hot Springs, Albuquerque, Jemez Hot Springs, Fort Wingate and La Luz, New Mexico; (probably) Pine, Arizona.]
- COLORADO: Trinidad (recorded by Hebard in 1929).
- OKLAHOMA: Guymon, 3133 feet, VIII, 15, 1921, (J. A. G. Rehn; jumping through ghost-grass), 1 ♂.

TEXAS: Occurs only in Pan-Handle.

- NEW MEXICO: Clifton House, 6400 feet, VIII, 4, 1921, (J. A. G. Rehn; from grasses and indigo-like plant), 2 ♂, 2 ♀ (organs of flight decidedly reduced in females). Tucumcari, 4194 feet, VIII, 14, 1921, (J. A. G. Rehn; in grassland with low rabbit-weed), 1 ♀. Clovis, 4218 feet, VIII, 22, 1921, (Rehn and Hebard), 1 ♂. Cameo in Roosevelt County, 4124 feet, VIII, 22, 1921, (M. Hebard; in feathery plants among grasses in sand dunes), 2 ♂, 3 ♀. Roswell, 4000 feet, VIII, 23, 1921, (Rehn and Hebard), 1 ♂. Well Country Camp, north slope of Sandia Mountains, 7000 feet, VIII, 16, 1921, (M. Hebard; occasional in rabbit-weed), 1 ♂, 4 ♀ (organs of flight very decidedly reduced in females). Zuni, summer of 1917, (A. Skinner), 1 ♂.

Also recorded from Tesuque Creek at 7200 feet, mesa north of Rio en Medio at 7000 feet and Rancho del Monte at 7000 feet (north of Santa Fé), by Hebard in 1935.

A series of fourteen males from Bent, New Mexico, taken July 1 to 15, 1927 by O. C. Poling, are atypical, showing divergence toward *gracilipes papago*.

***Arethaea gracilipes papago* Hebard**

1935. *Arethaea gracilipes papago* Hebard, Trans. Amer. Ent. Soc., LXI, p. 135, pl. 5, fig. 7 and pl. 6, figs. 3 to 6. [♂, ♀: twenty-four localities in Arizona including Growler Valley south of Growler Pass at 1200 feet (type locality); Blythe, California.]

Found in southern Arizona east to Oracle, the Santa Rita and the Patagonia Mountains and west to the Growler Valley, this race is known northwestward as far as Wickenburg and Kingman. We have it also from Nogales, Sonora, recorded in 1932 as *gracilipes gracilipes* but corrected in 1935.

***Arethaea gracilipes cerciata* new subspecies (Pl. XVIII, figs. 1 and 2.)**

1914. *Arethaea gracilipes gracilipes* Rehn and Hebard (in part), Trans. Amer. Ent. Soc., XI, pp. 124, 127, 128 (described) and 130. (The males here discussed.)

In 1914 the then available material of the *Gracilipes* Group led Rehn and Hebard to believe that a single extremely variable species existed, which was divided into two races, *gracilipes gracilipes* and *gracilipes constricta*.

The much larger series now before us prove that two distinct though closely related species are represented and that *gracilipes* divides into three, *constricta* into two geographic races. This we recently explained when describing the western geographic race *gracilipes papago*.⁵

The less produced caudal margin of the pronotal disk distinguishes this insect from *constricta constricta* (Brunner), to which race closest approach in form of the male cerci is shown, but in *gracilipes cerciata* the cercal apices are even more strongly horizontally flattened and are broader, almost ovate as they taper briefly only in their distal portion.

⁵ Trans. Amer. Ent. Soc., LXI, p. 135, pl. 5, fig. 7 and pl. 6, figs. 3 to 6, (1935).

The meso-caudal specialization of the first abdominal tergite (following the median segment) though individually somewhat variable in contour, in caudal aspect has its margins erect and almost parallel in *gracilipes gracilipes* and *gracilipes cerciata*, diverging ventrad and showing broad convexity in *gracilipes papago*; in lateral aspect it is no wider at its base than distad in *gracilipes gracilipes*, but is broader at its base than distad in *gracilipes cerciata* and *gracilipes papago*; its apex in *gracilipes cerciata* is intermediate between the bulbous of *gracilipes gracilipes* and the rounded of *gracilipes papago*. This specialization in the races of *constricta* is smaller and nearest that of *gracilipes papago* though simpler.

In all of the races of *gracilipes* the tegmina are uniformly colored (except in the anal area) and never show the herring-bone pattern usually (but not always) pronounced in the races of *constricta*.

Females of *gracilipes* and *constricta* may be easily separated as to their respective species, but the characters noted for them have little or no value toward proper racial assignment.

Type.—♂; canyon behind Pulliam Bluff, Chisos Mountains, Texas. Elevation 4600 to 5000 feet. September 7, 1912. (Rehn and Hebard). [Hebard Collection, Type no. 1287].

Size as large as the largest specimens of typical *gracilipes* known. Pronotum with margins simple, caudal margin of disk bluntly obtuse angulate produced at slightly more than ninety degrees (in paratype and allotype broadly convex without indication of angulation), its lateral margins weakly convex. First abdominal tergite with meso-caudal specialization in lateral aspect as high as wide, but in caudal aspect decidedly higher than its basal width, its apex full and rounded but not bulbous. Tegmina and wings fully developed, the latter considerably surpassing the apices of the caudal femora. Tegmina with stridulating field small, moderately (for genus, actually quite strongly) produced at apex of stridulating vein. Abdominal tergites with caudal margins simple, showing no trace of crenulation. Supra-anal plate simple, not recessed into the preceding tergite, very slightly longer than broad, its dorsal surface moderately concave, its lateral margins parallel but rounding broadly into the transverse distal margin. Cerci strongly bent inward distad, the apical portion very strongly horizontally flattened, spatulate, its margins convex and convergent only distad to form a much shorter tooth than in the other races of the species.

Subgenital plate moderately produced, lateral margins moderately convergent to the short styliform processes, between which the distal margin is very broadly concave. Cephalic and median femora not compressed distad nor angulate produced disto-dorsad.

Allotype.—♀; Shafter, Texas. September 30, 1928. (E. R. Tinkham). [Hebard Cln.].

Size larger than any female of *gracilipes gracilipes* before us, closely resembling that sex of that race. Very similar to male, but larger with heavier body. Organs of flight likewise fully developed. Supra-anal plate very small, semicircular. Ovipositor as characteristic of the species, but tapering less distad to the consequently more rounded apex than in *gracilipes gracilipes*. Subgenital plate very small, blunt triangular, bicarinate.

The measurements of a paratypic male from Marathon, at 3900 to 4160 feet, taken September 12 and 13, 1912 by Rehn and Hebard, follow those of the type. Length of body ♂ 16. and 14.5 (abdomen shrivelled), ♀ 21.3 (inflated); length of pronotum ♂ 3.8 and 3.8, ♀ 3.9; length of tegmen ♂ 25.8 and 22.8, ♀ 27.7; distance tegmina are surpassed by wings ♂ 9.8 and 10, ♀ 8.5; length of cephalic femur ♂ 9.7 and 8.9, ♀ 8.7; length of caudal femur ♂ 28.4 and 25.3, ♀ 28.; length of ovipositor 4.8 mm.

General coloration light green. Antennae yellowish buff. Males with markings of head and pronotum as here described for *ambulator*, but lines and particularly their purplish portions broader. Female lacking these markings of head and pronotum as here described for *ambulator*, but lines greenish white. Abdominal dorsum in males with mere traces of similar lateral lines, but in female such markings are (and evidently were in life) obsolete; ventral surface of abdomen of type given in notes as "having a medio-longitudinal stripe of sulphur yellow which in drying may disappear". (This has occurred.) Organs of flight (badly discolored in males) immaculate green except that the margins of the anal fields and sutural margins are almost colorless, faintly tinged with brown, the lateral portions of the stridulating fields of the males solidly brown. Limbs green. Occiput, pronotum, dorsum of abdomen (very strongly) and limbs with microscopic purplish dots in female, this indicated but not as strongly in the paratypic male and obsolete except on the pronotal disk cephalad in the male type (in less discolored males more of the very delicate markings would probably be visible).

This is evidently much the scarcest form of *Arethaea* in the Big Bend region, where *semialata* Rehn and Hebard and *arachnopyga* Rehn and Hebard are sometimes abundantly present.

***Arethaea constricta comanche* new subspecies**

(Pl. XVIII, figs. 3 and 4.)

1904. *Arethaea gracilipes* Caudell (not *Ephippitytha gracilipes* Thomas, 1870), Sci. Bull. Brooklyn Inst. Arts and Sci., I, p. 114. [♂, ♀; Esperanza Ranch near Brownsville, Texas.]
1914. *Arethaea gracilipes constricta* Rehn and Hebard (in part not typical *constricta* Brunner, 1878) Trans. Amer. Ent. Soc., XL, p. 130, figs. 39 and 40. [♂, ♀; Calvert (atypic), Kerrville, San Antonio, Victoria, Clip, Beeville, Benavides, Brownsville, Laredo, Carrizo Springs and Uvalde, Texas; Monclova (not Montelovez), Coahuila.]

This is the southern race of a species which we here, under *gracilipes cerciata*, have explained was considered a geographic race of *gracilipes* by Rehn and Hebard in 1914.

The present species is distinguished from *gracilipes* by the more sharply produced, acute, caudal margin of the pronotal disk and in a large percentage of the specimens before us (and particularly among the females) a herring-bone pattern of coloration is developed on the tegmina. In addition the tegmina usually have their anal fields and sutural margins dark brown. In all of the races of *gracilipes* the tegmina never show a trace of herring-bone color pattern and their anal fields and sutural margins are paler, the latter usually colorless, rarely tinged with brown (except faintly so in *gracilipes cerciata*).

The present race may be distinguished from *constricta constricta* by its average larger size; the inbent portion of the male cerci is more slender and tapering and less conspicuously horizontally flattened, and the white line along the sides of the abdomen is bordered ventrad by a dark line which proximad (usually) broadens into a wide suffusion (this rarely occurring in *constricta constricta*). Very definite reduction in length of tegmina and wings is not shown by any of our series of *constricta comanche*, but is a not infrequent occurrence in *constricta constricta* in the northern portions of its range.

Type.—♂; Beeville, Texas. July 28, 1912. (M. Hebard). [Hebard Collection, Type no. 1288].

Size medium small for the genus, averaging slightly larger than in *constricta constricta*. Pronotum with margins simple, caudal margin of disk acute-angulate produced at distinctly less than a rightangle, with apex

sharply rounded. First abdominal tergite with specialization not as high as in any of the races of *gracilipes*, but higher than in *constricta constricta*;⁶ in lateral aspect with basal width definitely greater than its height, but in caudal aspect higher than broad, with apex rounded. Organs of flight fully developed, but the wings do not reach the apices of the caudal femora (they surpass the apices of the caudal femora in only a few specimens of our series, the majority in which this occurs being females). Abdominal tergites with caudal margins showing very feeble crenulation. Supra-anal plate simple, not recessed into the preceding tergite, slightly shorter than broad, its feebly convex lateral margins not convergent and curving broadly into the transverse distal margin. Cerci more like those of *grallator* (Scudder) than those of the more closely related forms; very strongly bent inward distad, the inbent portion slender, horizontally flattened and tapering so decidedly that its distal half is entirely formed by the straight apical tooth. Subgenital plate much as here described for *gracilipes cerciata*, but more elongate. Limbs and stridulating field of male tegmina much as in that and the related races.

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

Very similar to females of *constricta constricta* (the series of that race before us averages smaller with organs of flight proportionately shorter in the majority). Very similar to the males of the present race, but usually with body heavier. Organs of flight as given under that sex. Supra-anal plate slightly longer than wide, lateral margins feebly convex convergent and rounding evenly into the broadly convex apex. Ovipositor as in *constricta constricta*. Subgenital plate very small, very blunt triangular, bicarinate.

| ♂ | Length of body | Length of pronotum | Length of tegmen | Distance tegmina are surpassed by wings | Length of cephalic femur | Length of caudal femur | Length of ovipositor |
|-------------------------|----------------|--------------------|------------------|---|--------------------------|------------------------|----------------------|
| Beeville. Paratype. . | 15.8 | 4.2 | 23.7 | 10.7 | 10. | 32.7 | — |
| Beeville. Type. | 15.5 | 4.3 | 21.2 | 9.4 | 10. | 31.2 | — |
| Kerrville. | 14. | 3.8 | 20.3 | 8.8 | 9. | 27.7 | — |
| Sabinal. | 14.2 | 3.8 | 20.1 | 9.1 | 8.8 | 27.4 | — |
| ♀ | | | | | | | |
| Beeville. Paratype. . | 17.7 | 4.3 | 22.9 | 8.8 | 10. | 31.3 | 4.9 |
| Beeville. Allotype. ... | 16.4 | 4. | 21.7 | 9.1 | 10.4 | 31.8 | 4.9 |
| Benavides. | 14.7 | 3.9 | 20.2 | 8.7 | 7.9 | 27. | 4.8 |
| Benavides. | 13.8 | 3.9 | 21.4 | 8.4 | 8.7 | 27.3 | 4.7 |

Measurements of twelve specimens of this race were given under "*gracilipes constricta*" by Rehn and Hebard in 1914.

⁶ Some individual variation naturally occurs in this small organ.

General coloration light green; though evidently much discoloration has occurred in drying such fragile material, some specimens were clearly cinnamon buff in general coloration in life. Antennae yellowish buff. Head, pronotal and abdominal markings as here described for *ambulator*, but the purplish is supplanted by brown and the brown portion of the abdominal lateral line proximad apparently usually widens into a broad suffusion. In quite a number of discolored specimens the delicate markings are greatly obscured or lost. Tegmina and wings green (or cinnamon buff), the former with anal fields (and particularly the stridulating area in males on each side, sometimes throughout) and sutural margins usually conspicuously darkened, brown; in addition the majority show weakly to very strongly (apparently due to conditions of local environment as slight individual variation is shown within each series from the same locality, though females average more intensive than males) a herring-bone pattern, the veins toward the sutural margins paling and the intervals between them in some individuals moderately darkened.⁷ Limbs green, the femora light purplish brown to near their bases and apices. Prozonal portion of pronotal disk and (sometimes) dorsum of abdomen particularly proximad, with microscopic purplish brown dots.

Though preferring grasses, material has been found in dry sorghum and on Huisache, *Vachellia farnesiana*.

In addition to the series of twenty-six males, fifteen females and one immature individual noted above and previously recorded, of which eight males and seven females bearing the same data as the type are designated paratypes, the following material is before us.

TEXAS: College Station, VI, 17, 1933, (H. J. Reinhard), 1 ♂ (atypic, cercal tooth slightly stouter than normal). Aransas County, VIII, 6, 1928, (R. H. Beamer), 1 ♂, [Univ. of Kans.]. Jim Wells County, VII, 24, 1928, (R. H. Beamer), 1 ♂, [Univ. of Kans.]. Falfurrias, VII, 13, 1935, (H. R. Roberts), 1 ♂, [A.N.S.P.]. Brooks County, VII, 25, 1928, (L. D. Beamer), 1 ♂, 2 ♀, [Univ. of Kans.]. Kendall County, VII, 22, 1928, (L. D. Beamer), 1 ♂. Kerrville, VI, 17, 1908, (F. C. Pratt; on *Monarda citriodora*), 1 ♂, [U.S.N.M.]. Kenedy, V, 22, 1908, (E. S. Tucker; at light), 1 ♂, [U.S.N.M.]. Bexar County, VI, 18 to VII, 28, 1929, (H. B. Parks), 2 ♂, 2 ♀, [U.S.N.M.]. Six miles west of Sabinal, X, 31, 1931, (L. Seaton; only one seen in brushy pasture), 1 ♂, [U.S.N.M.]. Dimmit County, VI, 5, 1934, (in light trap), 1 ♂, [U.S.N.M.]. Sutton County, VIII, 20, 1928, (J. G. Shaw), 2 ♀, [U.S.N.M.].

The range of this race reaches north and east to College Station and Calvert, north to Kerrville and Sutton County, and

⁷ Though a herring-bone pattern is usually shown on the tegmina in *constricta constricta*, it is, as a rule, less strongly indicated in that race.

west to the latter, Uvalde and Carrizo Springs. In Mexico it is known from Rodriguez and Monterey, Nuevo Leon,⁸ and Monclova, Coahuila.

In our series of the northern race, *constricta constricta*, distinct divergence toward *constricta comanche* is shown by the cerci of males from Alvarado and Shovel Mount, Texas. In the eastern portion of the range of *constricta comanche*, moreover, divergence toward *constricta constricta* is indicated, the male from College Station as well as that from Calvert having the cercal tooth stouter than normal for this race and the tegmina without trace of herring-bone pattern but fully caudate.

***Arethaea constricta constricta* Brunner**

(Pl. XVIII, fig. 5; pl. XIX, fig. 1.)

1878. *[Arethaea] constricta* Brunner, Monogr. der Phaneropteriden, p. 236. [♂; Dallas, Texas.]

1914. *Arethaea gracilipes constricta* Rehn and Hebard (in part), Trans. Amer. Ent. Soc., XL, p. 130, fig. 32. [♂, ♀: Niobrara, Nebraska; Clark and Barber Counties and Wichita, Kansas; Dallas, Weatherford and Shovel Mount in Burnet County (atypical), Texas.]⁹

We recorded this race from Morris, Butler, Dickinson and Saline Counties, Kansas in 1931, from Riley County and Onaga, Kansas in 1934 and from Howe, Oklahoma in 1931.

In northern Texas *constricta constricta* is now known west to the Pan-Handle. It undoubtedly intergrades with *constricta comanche* here described in central Texas.

***Arethaea insaroides* Rehn and Hebard**

1914. *Arethaea insaroides* Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 137, figs. 33, 42, 52 and 63. [♂, ♀; Jimulco, Coahuila.]

The species is known only from the described pair.

***Arethaea mescalero* new species**

(Pl. XVIII, figs. 6 to 8; pl. XIX, fig. 2.)

This is a comparatively large species, uniform light green except for the uniform light brown stridulating field of the male

⁸ Recorded as *Arethaea gracilipes constricta* by Hebard in 1932.

⁹ The record from Tonala, Chiapas, Mexico, was based on a dried alcoholic male which is typical of *constricta constricta*. Loaned for re-examination through the kindness of the American Museum of Natural History, it is now possible to state definitely that the specimen was incorrectly labelled as to locality.

tegmina which is decidedly large and broad for the genus and is scarcely produced at the apex of the stridulating vein. Its general appearance is consequently nearest that of the very widely distinct Mexican *Arethaea limifera* Rehn and Hebard.

The margins of the pronotum are simple, but the caudal margins of the abdominal tergites are strikingly nodose. In form the male cerci somewhat resemble those of *A. constricta comanche* here described, but their apices are directed nearly vertically dorsad instead of horizontally inward, the male abdomen is unspecialized and the male subgenital plate is longer and narrower distad.

The species is as yet known only from southeastern New Mexico.

Type.—♂; (probably near Melena), Chaves County, New Mexico. July 8, 1927. (P. A. Readio). [Hebard Collection, Type no. 1289].

Size large for the genus, form elongate and compressed. Fastigium broad proximad, narrowing sharply to the apex, medio-longitudinally impressed; its apex falling short of and briefly separated from apex of facial fastigium. Eyes prominent, oblique, elliptical, less than twice as long as broad. Antennae extremely elongate. Pronotum weakly sellate, its margins simple, caudal margin of disk very broadly and evenly convex, lateral lobes with humeral sinus moderately deep. Tegmina and wings caudate, the latter strongly surpassing the apices of the caudal femora; stridulating field of former decidedly ample and broad for the genus, with margin scarcely produced at apex of stridulating vein. Dorsal surface of abdomen without proximal specialization, distal margins of tergites strikingly though minutely nodose. Supra-anal plate approximately semicircular. Cerci elongate, showing very faint curvature of shaft inward and tapering moderately to apex, which is formed by a stout tooth directed dorsad and inward. Subgenital plate elongate, its lateral margins very broadly concave and weakly convergent to the rather narrow and shallowly rounded-angulate emarginate distal margin, the disto-lateral styliform processes very small. Limbs very elongate and slender; the genicular lobes of the cephalic and median femora bispinose, of the caudal femora unispinose, their dorso-distal extremities truncate and not pinched.

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

Similar to male but with body larger and heavier. Organs of flight similarly caudate. Supra-anal plate damaged. Ovipositor moderately elongate for the genus, its margins convex-convergent distad, curvature dorsad showing little angulation, margins and lateral surfaces armed distad

with stout short teeth. Subgenital plate very small, bluntly rounded triangular, concave medio-longitudinally between coarse convex lateral carinae, very minutely emarginate at apex.

The measurements of the type are followed by those of a male paratype from Cameo, New Mexico. Length of body ♂ 17. (abdomen retracted) and 21.8, ♀ 22. (estimated); length of pronotum ♂ 4.7 and 4.7, ♀ 4.7; length of tegmen ♂ 26.7 and 27.3, ♀ 27.9; distance tegmina are surpassed by wings ♂ 10.7 and 11.1, ♀ 9.; length of cephalic femur ♂ 10.7 and 10.7, ♀ 10.3; length of caudal femur ♂ 29.4 and 28.3, ♀ 29.; length of ovipositor 5.8 mm.

Generally immaculate light green. Head with a mere trace of a post-ocular purplish line. Pronotal disk showing microscopic faintly purplish dots, the lateral portions of its caudal margin very narrowly greenish white, in some specimens with a trace of purplish on the inner margins. Pronotal lateral lobes with convex callosities greenish white. Male tegmina with stridulating field very evenly light buffy brown, with veins toward sutural margin green proximad, or both proximad and distad. Abdomen with merest trace of a paler lateral line and with faintly purplish microscopic dots dorsad. Limbs immaculate, but caudal femora whitish ventro-proximad.

Specimens Examined: 7; 6 males and 1 female.

NEW MEXICO: Cameo, Roosevelt County, 4124 feet, VIII, 22, 1921, (J. A. G. Rehn; in feathery plants among grasses in depression between sand dunes, where five males of *A. gracilipes gracilipes* (Thomas) were taken), 1 ♂, *paratype*. (Probably near Melena), Chaves County, VII, 8, 1927, (P. A. Readio), 1 ♂, 1 ♀, *type* and *allotype*, [Hebard Cln.]. Eddy County, VII, 12, 1927, (L. A. Anderson), 4 ♂, *paratypes*, [Univ. of Kansas].

***Arethaea arachnopyga* Rehn and Hebard**

1914. *Arethaea arachnopyga* Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 115, figs. 36, 50, 60 and 61. [♂, ♀: Marathon (type locality), Texas; Monclova (nec Montelovez), Coahuila.]

A large series from the western foothills of the Ord Mountains in Brewster County, Texas has been subsequently received.

***Arethaea phantasma* Rehn and Hebard**

1914. *Arethaea phantasma* Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 178, figs. 35, 49, 59 and 71. [♂, ♀; Katharine, San Diego, Benavides (type locality), Ringgold Barracks and Carrizo Springs, Texas.]

We now know that this very remarkable species occurs in south-central Texas north to Wilson County and south to Falfurrias. It has not been found in the Brownville Region or in Mexico.

***Arethaea sellata* Rehn**

1907. *Arethaea sellata* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 61, figs. 13 and 14. [♂; Palmerlee, Arizona.]
1912. *Arethaea sellata* Rehn, Kansas Univ. Sci. Bull., v, p. 306. [♂; Santa Rita Mountains, Arizona.]
1914. *Arethaea carita* Rehn and Hebard (in part, not of Scudder 1902), Trans. Amer. Ent. Soc., xl, p. 161, figs. 46, 56 and 68. [♂; Fort Grant, Palmerlee, Huachuca Mountains, Santa Rita Mountains, Fort Buchanan and Phoenix, Arizona.]

Through a peculiar and unfortunate coincidence in 1914, Rehn and Hebard had before them only males of *sellata* and females of *carita* from southern New Mexico and southeastern Arizona. This resulted in their placing *sellata*, a valid and very distinct species, as a synonym of *carita*, a species previously known only from the unique female type. Both sexes of these species may be readily separated by the key and figures here given.

ARIZONA: Chiricahua Mountains, VI, 17, 1932, (E. D. Ball), 1♂; VI, 20, 1928, (A. A. Nichol), 1♂; VIII, 23, 1932, (E. D. Ball), 1 juv. ♂. Millers Canyon, Huachuca Mountains, VII, 10, 1905, 1♂, [Davis Cln.] Huachuca Mountains, 2♂, [Davis and Hebard Cln.]; VI, 11, 1933, (R. H. Beamer), 1♂, [Univ. of Kansas], VII, 8, 1932, (R. H. Beamer and R. H. Beamer, Jr.), 3♂, 6♀, [Univ. of Kansas and Hebard Cln.]. Patagonia Mountains, VII, 20, 1930, (E. D. Ball), 1♀. Washington Mountains near Nogales, VII, 15, 1920, (J. A. Kusche), 2♂, [Univ. of California and Hebard Cln.]. Santa Rita Mountains, VI, 13, 1932, (E. D. Ball), 1 juv. ♀; VII, 16, 1932, (E. D. Ball), 1♂; VII, 17, 1932, (R. H. Beamer), 1♂, 1♀, [Univ. of Kansas and Hebard Cln.].

The species surely occurs also in the adjacent mountains of Sonora.

***Arethaea carita* Scudder**

1902. *Arethaea carita* Scudder, in Scudder and Cockerell, Proc. Davenport Acad. Sci., ix, p. 52, pl. 4, fig. 5. [♀; Mesilla Park, New Mexico.]
1904. *Arethaea gracilipes* Rehn (not *Ephippitytha gracilipes* Thomas 1870), Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [(alcoholic) ♂ and juv. ♀; Casas Grandes, Chihuahua.]
1904. *Arethaea carita* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [(alcoholic) ♀; Casas Grandes, Chihuahua.]
1914. *Arethaea carita* Rehn and Hebard (in part), Trans. Amer. Ent. Soc., xl, p. 161, fig. 67. [♀; Mesilla Park, New Mexico; Casas Grandes, Chihuahua; Camacho, Zacatecas.]

The incorrect association of the male sex of *sellata* with the female sex of *carita* in 1914 is here explained under that species.

NEW MEXICO: Mesa east of Albuquerque, 5250 to 5500 feet, VIII, 8, 1921, (J. A. G. Rehn; beaten from rabbit-weed), 1 ♂, 1 small juv. ♀. Canyon WNW of Hachita Grande Peak, 5500 to 5800 feet, IX, 27, 1922, (Rehn and Hebard; few in fine grasses), 1 ♂, 3 ♀.

ARIZONA: San Bernardino Ranch in Cochise County, 3900 to 3950 feet, IX, 24, 1922, (Rehn and Hebard), 1 ♂. Perillas Mountains in Cochise County near border, 4500 feet, (M. Hebard; from fine dry grass on hillside), 1 ♀. Douglas, VIII, 31 to X, 15, 1925 to 1931, (Jones and Ball), 4 ♂, 4 ♀. Osborn, 4750 feet, IX, 23, 1922, (M. Hebard; in short grass at base of hill), 1 ♀. Don Luis, 5100 to 5150 feet, IX, 24, 1922, (Rehn and Hebard; in fine grass on limestone hillside among agaves, ocotillo and mimosa), 1 ♂, 1 ♀. Naco, X, 7, 1932, (E. D. Ball), 1 ♀. Santa Catalina Mountains, south base at 2000 to 3000 feet, VIII, 25, 1924, (A. A. Nichol), 1 ♂.

Where the distribution of this species and *sellata* coincides in southeastern Arizona, it is apparently present in the valleys and lower slopes of the mountains, below the locations where *sellata* is usually found.

Arethaea polingi Hebard

1935. *Arethaea polingi* Hebard, Trans. Amer. Ent. Soc., LXI, p. 138, pl. 5, figs. 8 and 9, pl. 6, figs. 8 and 9. [♂, ♀; Prescott (type locality), Truxton and Kingman, Arizona.]

The species is as yet known only from northwestern Arizona.

Arethaea brevicauda (Scudder)

1900. *Dichopetala brevicauda* Scudder, Canadian Ent., xxxii, p. 331. [♀; Cahon Pass, California.]

1914. *Arethaea brevicauda* Rehn and Hebard (in part; all but Crestline, Nevada specimen which represents *coyotero*), Trans. Amer. Ent. Soc., XL, p. 169, figs. 47, 57, 69 and 70. [♂, ♀; Cahon Pass, San Jacinto River in San Jacinto Mountains at 2500 feet, Tighes, San Bernardino County, between San Luis Obispo and San Simeon Bay and Los Angeles County.]

The corrected distribution given in 1914 is extended far eastward and also southward by the following records.

NEVADA: Tule Spring in Clark County, VI, 30, 1921, (O. C. Poling), 1 ♂.

ARIZONA: Boulder Spring near Kingman, (O. C. Poling), 3 ♂.

CALIFORNIA: Five miles south of Palm Springs, VI, 8, 1930, (P. H. Timberlake), 1 ♀, [Univ. of Cal. Coll. of Agr.]. San Jacinto Mountains, VII, 21, 1929, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Warner's in Laguna

Mountains, VII, 1919, (G. H. Field), 1 ♀. Campo, VIII, 23, 1931, (E. R. Tinkham), 2 ♀. Potrero, 2323 feet, IX, 12, 1922, (M. Hebard; beaten from tall but not thick yellow grasses), 1 ♀. Lockwood, VII, 2, 1935, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Mount Tom in Inyo County, VII, 11, 1922, (O. C. Poling), 1 ♂. Tacoima Wash in Los Angeles County, 1060 feet, VI, 23, 1913, (F. Grinnell, Jr.), 1 ♂, [A.N.S.P.]. Coalinga, below 500 feet, I, 3, 1907, (J. C. Bradley), 1 ♂

***Arethaea limifera* Rehn and Hebard**

1914. *Arethaea limifera* Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 175, figs. 48 and 58. [♀ ; near Guadalajara, Jalisco.]

We recorded six additional males in 1932 labelled simply "Mexico".

***Arethaea grillator* (Scudder)**

1877. *Aegipan grillator* Scudder, Proc. Boston Soc. Nat. Hist., XIX, p. 39. [♂, ♀ ; Dallas, Texas.]

1914. *Arethaea grillator* Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 148, figs. 44, 54 and 64. [♂, ♀ ; Rosenberg, Columbus, Lavaca County and Shovel Mount, Texas (and correcting Dallas record as *gracilipes* by Brunner and Victoria record as *phalangium* by Caudell).]

The distribution of this species is now known to include almost the entire central and western portion of eastern Texas, eastern limits being Dallas, Elkhart and Rosenberg and western limits Denton, Comanche County, San Antonio and Victoria.

***Arethaea phalangium* Scudder**

1877. *Aegipan phalangium* Scudder, Proc. Boston Soc. Nat. Hist., XIX, p. 40. [♀, Georgia.]

1914. *Arethaea phalangium* Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 141, figs. 43,¹⁰ 53 and 65. [♂, ♀ ; Augusta and Thomasville, Georgia; Hastings, Gainesville, Sanford, Fort Myers, Biscayne Bay and Homestead, Florida.]

GEORGIA: Hebardville, V, 15, 1915, (M. Hebard), 1 small juv. Folkston, VIII, 2, 1934, (R. H. Beamer), 2 ♀, [Univ. of Kansas and Hebard Cln.].

FLORIDA: Hilliard, VIII, 19, 1930, (L. D. Tuthill), 1 ♀, [Univ. of Kansas]. Newberry, VII, 22, 1924, (F. W. Walker), 1 ♀, [Hebard Cln.]; VIII, 12, 1925, (T. H. Hubbell; at night on palmetto in Long-Leaf Pine saplings

¹⁰ This is a misleading figure as the specimen from which it was drawn is abnormal. That portion of the stridulating area before the stridulating vein can not be seen while the convexity of the margin at the apex of that vein is stronger and shows more of a tendency toward angulation than is usual. The appearance of this area in a normal specimen is much more like figure 44.

with wire grass and palmetto undergrowth), 1 ♀, [Univ. of Mich.]. Orlando, V, 10, 1924, (T. H. Hubbell; at night by beating scrub on sand dunes), 1 juv. ♂, [Univ. of Mich.]. Miami, III, 16, 1915, (M. Hebard; in wire grass, Saw Palmettoes, Sofkee undergrowth of pine woods, *Pinus caraiæba*), 1 extremely small juv. Southside, Miami, III, 3, 1916, (M. Hebard; same as last), 1 extremely small juv. Wakulla Springs, VII, 14, 1934, (P. A. McKinstry), 1 ♀. Marianna, VI, 4, 1924, (T. H. Hubbell; at night in open turkey-oak woods on sandy soil, beaten from oak shoots), 1 juv. ♂, [Univ. of Mich.].

This handsome species is now known north to Augusta, Georgia and west to Thomasville, Georgia and Marianna, Florida.

***Arethæa ambulator* new species**

(Pl. XVIII, figs. 9 to 11; pl. XIX, fig. 3.)

This species, with *grallator* (Scudder) and *phalangium* (Scudder) is distinguished by having the dorso-distal extremity of the cephalic and median femora pinched and acutely produced, the production projecting slightly further than the adjacent spines of the genicular lobes.

It is nearest *phalangium*, differing in the even broader and shallower humeral sinus of the pronotal lateral lobes, the crenulate distal margins of the abdominal tergites, very distinctive male cerci and subgenital plate and the considerably longer and narrower ovipositor, which is very definitely less rounded and more pointed at its apex. Moreover decided reduction of the organs of flight is normal in the species in the northeastern portion of its distribution, a condition not yet known to ever occur in any of the other species of the *Phalangium* Group.

Type. — ♂; McWhorter's Ranch near May Pearl, Ellis County, Texas. May 16, 1934. (F. B. Isely). [Hebard Collection, Type no. 1286].

Size large for the genus; form elongate and compressed, but heavier than in the other species. Head much as in *phalangium*. Fastigium very narrow and acute, deeply and broadly medio-longitudinally sulcate, its apex separated from the very small rounded dorsal apex of the facial fastigium. Eyes prominent, oblique, elongate elliptical, slightly over twice as long as broad. Antennæ extremely elongate. Pronotum moderately sellate, its margins simple; caudal margin of disk produced at very slightly less than a right-angle (with apex individually varying from acute to sharply rounded); lateral lobes with humeral sinus very broad and very shallow. Tegmina and wings showing very decided reduction, incapable of sustained

flight (this is apparently always the case in this region, but in the only two males from more southwestern localities the tegmina and wings are fully developed, the latter slightly surpassing the apices of the caudal femora). Stridulating field of tegmina longitudinal but appreciably shorter than the comparatively elongate pronotum, with margin at apex of stridulating vein little produced, broadly convex. Distal margins of abdominal tergites strikingly crenulate. Supra-anal plate with lateral margins weakly convergent, first broadly convex, then broadly concave, to the broadly convex apex. Cerci elongate, nearly straight, tapering distad weakly then strongly for a brief distance, with apical portion bent inward at very slightly less than ninety degrees and terminating in a large apical tooth, the inbent portion with area before the tooth having its outer surface prominently swollen (thus quite unlike the structure in the related species). Subgenital plate elongate, acute-angulate emarginate distad at slightly less than ninety degrees, the margins of this emargination convex, then concave to the very small and very short styliform processes. Limbs very elongate and very slender, but appreciably less slender than in the related species; genicular lobes of cephalic and median femora bispinose, of caudal femora unispinose. Caudal femora weakly inflated proximad, but more strongly so than in the related species, this clearly indicating somewhat better saltatorial power.

Allotype.—♀; same data as type but taken May 14, 1932. [Hebard Cln.].

Similar to male but with body larger and heavier and organs of flight somewhat more strongly reduced, the wings not reaching the abdominal apex. Pronotum with caudal margin of disk more strongly produced, acute angulate. Supra-anal plate longer than wide, gradually narrowing to the rounded apex and medio-longitudinally sulcate. Ovipositor longer, narrower and less sharply bent dorsad than in the related species; margins and lateral surfaces armed in distal portion with short stout teeth. Subgenital plate very small, bicarinate, triangular with a very small apical emargination.

Moderate variation is shown in the size of the series before us, the tegminal length ranging from 17. to 20.2 mm. in the males (but 25.7 and 26. in the two western males) and from 11.7 to 14. mm. in the females. The described pair measure as follows: length of body ♂ 20.4, ♀ 21.5; length of pronotum ♂ 5.5, ♀ 6.1; length of tegmen ♂ 18.8, ♀ 11.1; distance tegmina are surpassed by wings ♂ 5., ♀ 3.; length of cephalic femur ♂ 14.3, ♀ 13.7; length of caudal femur ♂ 33.3, ♀ 32.9; length of ovipositor 6.8 mm.

General coloration uniform light green. Antennae greenish buff or clear yellow buff. Head with a fine postocular purplish line margined ventrad with whitish, which is continued on pronotum to first sulcus. Caudal margins of metanotum and pronotal lateral lobes similarly margined, this broader laterad on the former. Abdomen with a narrow buffy line dorso-

laterad which is very finely margined with purplish in its cephalic portion; ventral surface with longitudinal lines of light yellow to base of subgenital plate. Tegmina immaculate green except stridulating field in males which is light brown, darkened near the stridulating vein and with lateral marginal veins dark, often purplish; female with base of humeral trunk often purplish. Cephalic and median femora very dull purplish to near apices, caudal femora the same from end of proximal enlarged portion to near apices, ventral surface of enlarged portion whitish, externally margined dorsad with purplish, other portions of limbs light green.

Twenty-two specimens were secured at May Pearl on May 16, 1934, by Isely, who writes as follows: "They apparently live in colonies, hidden in the thick grass and weeds in the day time, coming out after one works back and forth through the area. A number of those taken were kept alive in an outdoor cage where they would appear only after the grass was pushed about."

Like its relatives, *ambulator* is probably nocturnal and in the northeastern section of its range its alar development indicates that it cannot fly, but climbs and can leap about in the grasses in which it lives. The males found there may be able to accelerate their movements a little by fluttering, but such would be very ineffectual in the females.

One of the most interesting features concerning *ambulator* is the fact that adults are present in goodly numbers as early as the middle of May. The species evidently appears earlier in the season than any of the other known forms of the genus, all of which appear adult later and reach their maximum adult abundance in the Summer or Fall. This may explain why, in a region where much field work has been done (mainly from July to September) not a specimen of *ambulator* had been secured until 1932.

Specimens Examined: 25; 16 males, 8 females and 1 immature individual.

TEXAS: Fifteen miles west of Denton, VI, 3, 1932, (F. B. Isely; on limestone prairie), 2♂, 2♀. May Pearl, V, 14 to VI, 12, 1932 and 1934, (F. B. Isely), 10♂, 6♀, *type*, *allotype*, *paratypes*, 1 large juv. ♂. Ellis County, V, 2 and 31, 1932, (F. B. Isely), 2♂, *paratypes*. Nine miles north of Llano, V, 6, 1932, (E. V. Walter; "only one seen, jumps very weakly in spite of its very long legs."), 1♂, [U.S.N.M.]. Mason, V, 6, 1932, (E. V. Walter; in grass along fence, one male and several large immature females seen), 1♂, [U.S.N.M.].

PLATE XVIII

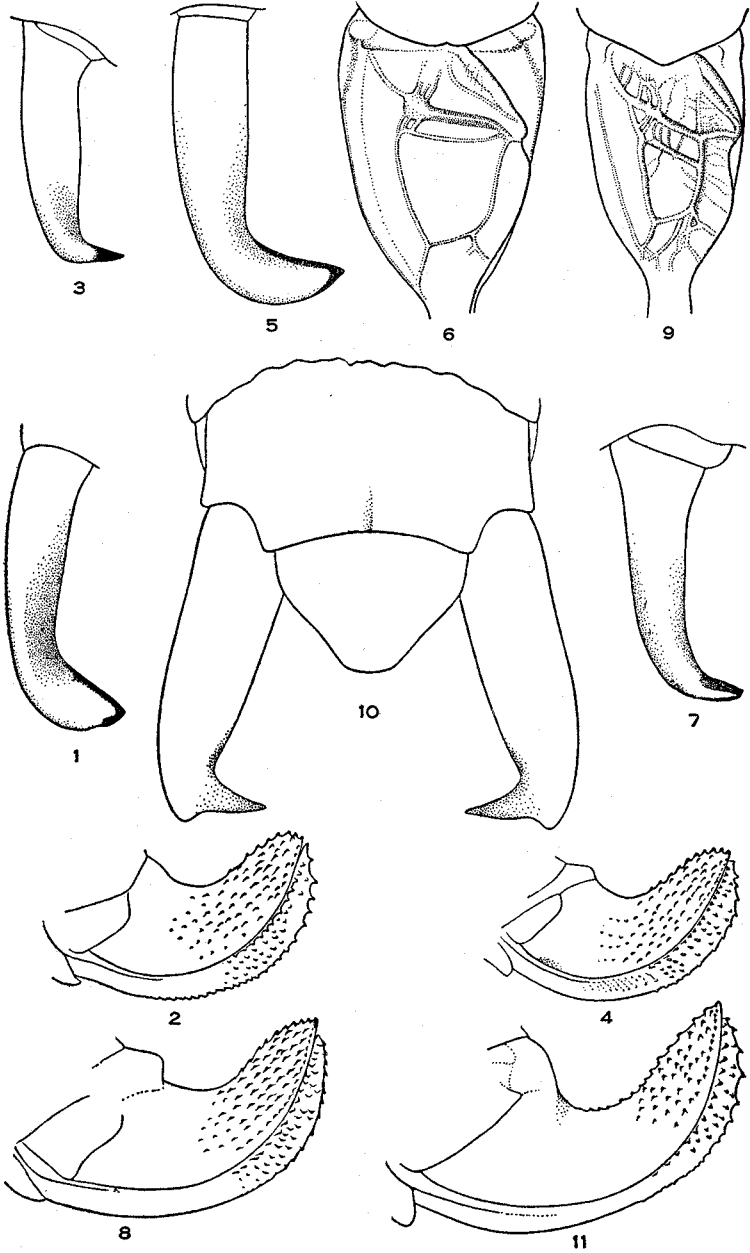
- Fig. 1.—*Arethaea gracilipes cerciata* new subspecies. Dorsal view of male cercus. *Paratype*. Marathon, Texas. (X 16.)
- Fig. 2.—*Arethaea gracilipes cerciata* new subspecies. Lateral view of ovipositor. *Allotype*. Shafter, Texas. (X 7 1/2.)
- Fig. 3.—*Arethaea constricta comanche* new subspecies. Dorsal view of male cercus. *Type*. Beeville, Texas. (Same scale as figure 1.)
- Fig. 4.—*Arethaea constricta comanche* new subspecies. Lateral view of ovipositor. *Paratype*. Beeville, Texas. (Same scale as figure 2.)
- Fig. 5.—*Arethaea constricta constricta* Brunner. Dorsal view of male cercus. *Topotype*. Dallas, Texas. (Same scale as figure 1.)
- Fig. 6.—*Arethaea mescalero* new species. Dorsal view of stridulating field of male tegmina. *Paratype*. Cameo, New Mexico. (X 8 1/4.)
- Fig. 7.—*Arethaea mescalero* new species. Dorsal view of male cercus. *Paratype*. Cameo, New Mexico. (Same scale as figure 1.)
- Fig. 8.—*Arethaea mescalero* new species. Lateral view of ovipositor. *Allotype*. Chaves County, New Mexico. (Same scale as figure 2.)
- Fig. 9.—*Arethaea ambulator* new species. Dorsal view of stridulating field of male tegmina. *Type*. May Pearl, Texas. (Same scale as figure 6.)
- Fig. 10.—*Arethaea ambulator* new species. Dorsal view of distal portion of male abdomen and cerci. *Type*. May Pearl, Texas. (Much enlarged.)
- Fig. 11.—*Arethaea ambulator* new species. Lateral view of ovipositor. *Allotype*. May Pearl, Texas. (Same scale as figure 2.)

PLATE XIX

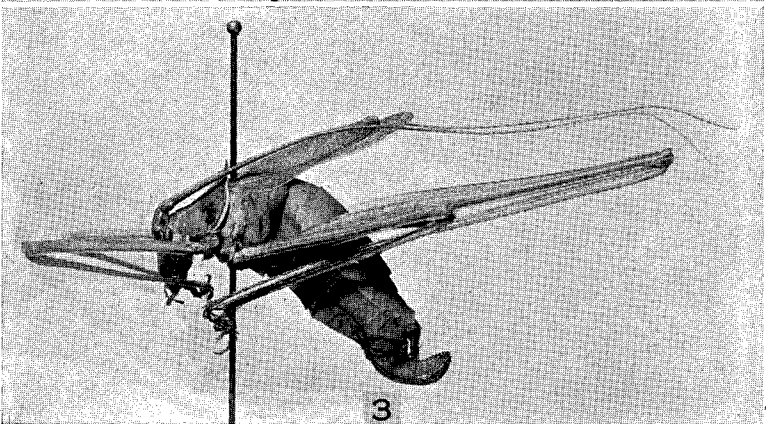
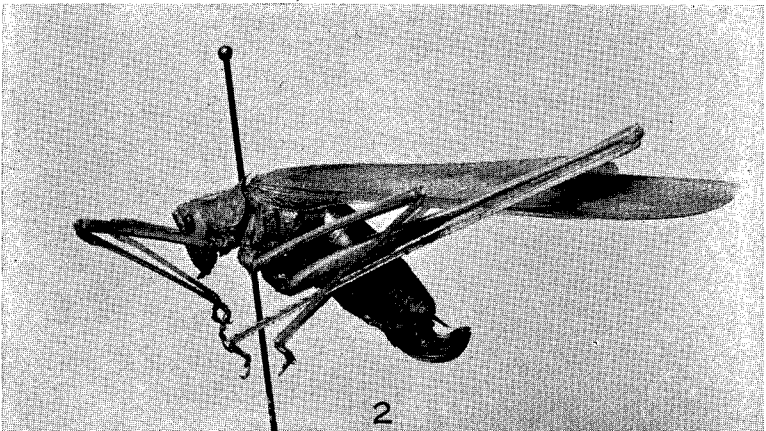
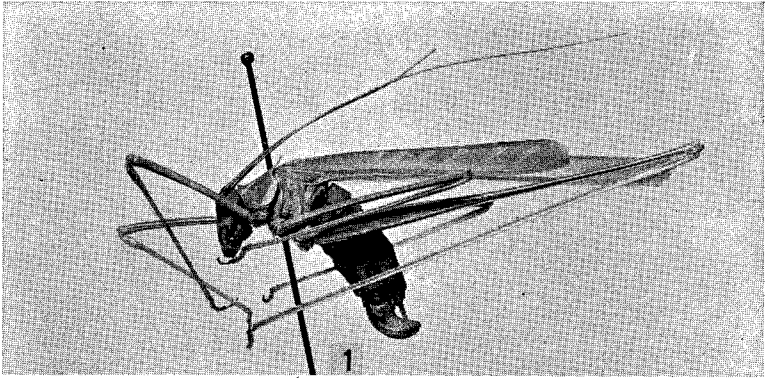
(Figures twice natural size.¹¹)

- Fig. 1.—*Arethaea constricta comanche* new subspecies. Lateral view of female. *Paratype*. Beeville, Texas.
- Fig. 2.—*Arethaea mescalero* new species. Lateral view of female. *Allotype*. Chaves County, New Mexico.
- Fig. 3.—*Arethaea ambulator* new species. Lateral view of female. *Paratype*. May Pearl, Texas.

¹¹ In all of these specimens the antennae are damaged. When entire they extend far beyond the apices of the caudal femora and wings.



HEBARD—NORTH AMERICAN ORTHOPTERA



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