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AS FOUND IN THE UNITED STATES
(ORTHOPTERA: TETTIGONIIDAE)

BY

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THE GROUP PTEROPHYLLAE AS FOUND IN THE UNITED STATES

(TETTIGONIIDAE: PSEUDOPHYLLINAE)

BY MORGAN HEBARD

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(Plates XVIII and XIX)

The Pterophyllae form a particularly interesting group of Katydidids in the United States, where in the East they are found north to central New England, southern Ontario, southern Michigan, and northern Illinois, westward into eastern Iowa, central eastern Kansas, eastern Oklahoma and central northern and southwestern Texas. Three distinctive (and two as yet undescribed) species have recently been discovered in northeastern, central eastern and southwestern Mexico.¹

All are large and handsome insects which, at first consideration, would appear to include strikingly distinct genera, species and races. Such is however not the case. They actually form a plastic entity, with different recognizable branches and subdivisions so complicated that the exact number which should be recognized by name is arbitrary and certainly will remain so until all the variation which occurs can be elaborately analyzed from much more material from certain regions, and certain breeding experiments can be accomplished.

Thus, of the three genera here discussed, both *Paracyrtophyllus* and *Lea*, might almost as justly be reduced to subgenera; while of the five species, the two races here recognized as constituting *Pterophylla furcata* may eventually prove to represent the two ex-

¹I have seen no material of *Cyrtophyllus crepitans* Redtenbacher, described from St. Vincent in 1892, or of *Thliboscelus camellifolia* Serville (not *Locusta camellifolia* Fabricius 1775), described from Brazil in 1839, which Caudell renamed *Pterophylla brasiliensis* in 1911. These species were referred to *Thliboscelus* by Kirby in 1906 and to *Pterophylla* by Caudell in 1911 (Ent. News, xxii, p. 167). Their correct generic position cannot at present be determined.

treme developments reached in *Pterophylla camellifolia* along one of its lines of racial differentiation. Finally, though incipient racial differentiation is definitely indicated in the northern, southern and southwestern portions of the range of *camellifolia*, additional to the Gulf Coast and southwestern Arkansas races here discussed, I feel that further nominal recognition is unwarranted even though the average specimen from those regions shows certain surprising differences.

All of the species are strictly arboreal except the races of *Lea floridensis*, which prefer palmettos and underbrush and much less often climb up into lofty trees. As the eastern *Pterophylla* is dependent on deciduous trees, its distribution is often discontinuous but that of *Paracyrtophyllus* in central and western Texas is naturally much more so, where oak areas are often very widely separated or confined to a zone in the mountains dotted with such trees only.

The nocturnal and comparatively sedentary habits of all result in these insects being usually rare in collections, as individuals are very seldom happened upon and can only on special occasions be taken one by one by special effort. I have often heard the night air simply ringing with their song in the lofty river forests of the southeast, all of the singers being virtually inaccessible in the tree-tops well over 100 feet above. The song of all five species is probably distinctive.

The group Pterophyllae, recognized by Brunner in 1895 as the Cyrtophylli, is distinguished by the following features.

Size large, body bulky. General color green (with the exception of *Lea floridensis* which in both races occasionally develops a light pinkish brown color phase and two undescribed Mexican species which are very distinctively colored). Antennae slender, with bases not contiguous. Tegmina coriaceous, not extremely broad, with surface definitely convex, and lateral margins broadly convex. Tegmina of male with stridulating field very strongly impressed and tympanum transparent. Wings cycloidal, hyaline. Prosternum with two elongate spines. Mesosternum and metasternum acutely produced. Mesosternum with cephalic margin obtuse, not cingulate; sulci, which rise from the foveolae, cruciate. Metasternal foveolae confluent.

1. Pronotum only slightly constricted, subsellate. General color light green² with face and underparts paler.....2

² Except in *Lea*, where a light pinkish brown color phase is occasionally developed. Green specimens, however, become light yellow-brown when discolored by alcohol.

Pronotum conspicuously constricted, strongly sellate, substrangulate. General color blackish, purplish, and chestnut brown. (To this section belong two recently discovered and highly distinctive Mexican species, the description of which should appear in the near future.)

2. Caudal margin of pronotum very broadly convex (truncate to subtruncate). (Male cercus lacking a lobe between its dorsal and ventral arms; subgenital plate showing no meso-distal broadening in dorsal aspect. Female cercus with a minute inner tooth at apex.)...3

Caudal margin of pronotum less broadly convex, sometimes showing slight angulation.....4

3. Head and pronotum larger in proportion to body bulk.³ Tegmina and limbs very short. Male abdomen with third tergite (counting median segment as first tergite) bearing a large, stout, erect knob (like in *Lea* but heavier); ninth tergite not at all conspicuously inflated, its caudal margin broadly concave; tenth tergite not conspicuously inset, its caudal margin broadly convex above and not strongly defined from supra-anal plate; supra-anal plate with distal margin not emarginate mesad and with lateral portions toothed ventro-laterad; cercus very small for group with base transverse and dorsal longer than ventral arm; elongate subgenital plate showing greatest abbreviation in group. Southcentral Texas.....*Paracyrtophyllus robustus* Caudell

Head and pronotum of more nearly normal size for group. Tegmina and limbs of medium length. Male abdomen with third tergite unspecialized; ninth tergite not at all conspicuously inflated, its caudal margin weakly concave in median portion; tenth tergite not conspicuously inset, its caudal margin even less strongly concave; supra-anal plate with distal margin angulate emarginate mesad and serrate in lateral portions; cercus larger but very small and delicate for group, with dorsal only about half length of ventral arm; elongate subgenital plate exceeded in degree of production only by that of the Mexican *Pterophylla robertsi* Hebard. Chisos Mountains in Big Bend Region of Texas.....*Paracyrtophyllus excelsus* (Rehn and Hebard)

4. Pronotum with lateral lobes longer than deep. Tegmina and limbs elongate for group. Male abdomen with third tergite bearing a large erect process with apex rounded; ninth tergite not at all conspicuously inflated, its caudal margin weakly concave in median portion; tenth tergite not conspicuously inset, its caudal margin even less strongly concave; cercus lacking a lobe between its dorsal and ventral arms, which arms are almost parallel; subgenital plate showing no meso-distal broadening. Female supra-anal plate triangularly produced distad. Female cercus definitely forked at apex.....10

³ As females are proportionately heavier than males in the two following species, this feature and that of the degree of truncation of the caudal margin of the pronotum are more pronounced in that sex.

- Pronotum with lateral lobes not longer than deep. Tegmina and limbs medium for group. Male abdomen with third tergite bearing a large median triangular elevation, its apex cephalad forming a round prominence; ninth tergite very strikingly inflated, its caudal margin in median portion strongly and extensively concave; tenth tergite very deeply inset beneath ninth, its caudal margin broadly concave above supra-anal plate; cercus with a lobe between its dorsal and ventral arms; subgenital plate elongate with meso-distal broadening conspicuous in dorsal aspect. Female supra-anal plate rounded truncate distad. Female cercus not forked at apex.....5
5. Male supra-anal plate larger, smooth and rounded truncate distad; cercus with lobe moderately wide, arms strongly divergent and ventral arm the longer and lacking a proximo-internal tooth. Female cercus with a minute inner tooth at apex.....6
- Male supra-anal plate small, smoothly convex distad; cercus with lobe very wide, arms extremely divergent and ventral arm strikingly elongate with a heavy proximo-internal tooth. Female cercus with a minute dorsal tooth at base of slender tapering recurved apex. Sierra Madre Oriental, Mexico.....*Pterophylla robertsi* Hebard
6. Male cercus with ventral arm not forked distad.....7
- Male cercus with ventral arm strikingly forked distad.....9
7. Male cercus with ventral arm curved or bent inward meso-distad, there simple or slightly thickened (plate XVIII, figures 2 to 5).....8
- Male cercus with ventral arm bent inward meso-distad, there produced in a small conical projection. Southwestern Arkansas
Pterophylla camellifolia dentifera subsp. n.
8. Male cercus with median lobe projecting very much less than either arm. Eastern United States, west to eastern Kansas
Pterophylla camellifolia camellifolia (Fabricius)
- Male cercus with median lobe strongly projecting, extending caudad slightly more than ventral arm. Gulf Coast of Mississippi, probably west to extreme eastern Texas
Pterophylla camellifolia intermedia (Caudell)
9. Male cercus with distal (outer) fork of ventral arm the shorter. Eastern Texas, excepting narrow humid eastern margin
Pterophylla furcata laetica subsp. n.
- Male cercus with distal (outer) fork of ventral arm the longer. South-eastern Oklahoma.....*Pterophylla furcata furcata* (Caudell)
10. Size average smaller. Pronotum with constriction moderately indicated; lateral carinae definitely more divergent caudad and less broadly defined in color. Male cercus with apex of ventral arm simple, slender, acute. Eastern peninsular Florida, south to La Grange.....*Lea floridensis divergens* Hebard
- Size average larger. Pronotum with constriction scarcely indicated; lateral carinae very weakly divergent caudad and usually conspicuously defined in color. Male cercus with immediate chitinized apex

of ventral arm blunt and oblique truncate to its internal base, bearing there a minute chitinous node or tooth. Southern peninsular Florida, north to the Indian River. *Lea floridensis floridensis* (Beutenmuller)

In preparing the present study I have been greatly aided by Drs. R. H. Beamer of the University of Kansas, T. H. Hubbell and I. J. Cantrall of the University of Michigan, A. B. Gurney of the National Museum and H. F. Strohecker of Kenyon College.

After two years of complete disability, due to acute arthritis, this is the first revision I have published. Without the constant and exceptionally efficient assistance of Miss Mary E. Chubb, it could not have been accomplished.

A total of 288 specimens has been examined, including all of the three (not strongly defined) genera, five species, and four geographic races here recognized as belonging to the Fauna of the United States. The material is in the author's collection unless otherwise stated.

Much remains to be determined as to the status and the limits of distribution of the species and races which occur on the Gulf Coast from Mississippi to eastern Texas and of those found in southwestern Arkansas, southeastern Oklahoma, northwestern Louisiana and northeastern Texas. Adequate series from numerous localities in the regions of uncertainty, supplemented by breeding experiments if possible, should solve these problems entirely or in large part.

PARACYRTOPHYLLUS Caudell

Based in 1906 on the single species *robustus* Caudell, a second species is here included. Both of these show very striking specific differentiation, though plainly belonging to the same phylum.

The limb spination can not be given the generic importance which Caudell supposed that it had, as it is now known to be individually highly variable in the genotype and of no value in separating the other species from *Pterophylla*.

Though sharing with *Lea* Beutenmüller a similar general type of male cercal development, other characters prove these genera to be members of widely distinct phyla.

The genus, is as yet known only from central Texas and a very restricted zone in the mountains of the southwestern part of that

state, though it probably occurs in similar environment in adjacent northeastern Mexico.

Three recently discovered (two as yet undescribed) Mexican species, however, all belong to a very different phylum or phyla, although two of them are from a not very distant locality in Nuevo Leon.

Paracyrtophyllus robustus Caudell (Pl. XIX, figs. 1 and 2.)

1906. *Paracyrtophyllus robustus* Caudell, Jour. N. Y. Ent. Soc.; xiv, p. 36, pl. I, figs. 1 to 6. [♂, ♀; Texas (type selected by Caudell and Hebard, 1912), ♀ Tiger Mills, Texas.]

Material from "Texas" recorded as *Cyrtophyllus concavus* (a synonym of *Pterophylla camellifolia*) by Scudder in 1862 is referable to the present species.

Specimens Examined: 28; 27 males and 1 female.

TEXAS: Romney, VI, 30, 1936, (Beamer, Jackson, Lindsay and Field), 14♂, [U. of Kans. and Hebard Cln.]. Leakey, VII, 8, 1936, (Beamer, Jackson and Field), 4♂, [U. of Kans. and Hebard Cln.]. Brownwood, VII, 28, 1931 (R. H. Painter), 1♂. Blanco Co., VII, 1931, (J. K. G. Silvey) 1♀, [Univ. of Mich.]. Fredericksburg, VII, 6, 1923, (C. H. Gable; on Live Oak), 3♂. Helotes, VII, 1, 1917, 2♂. "Texas," 1♂, [A.N.S.P.]. Luling, VIII, 15, 1935, (T. H. and G. G. Hubbell; two only heard and taken from tops of Post Oaks in open grove of three species of oaks), 2♂, [Univ. of Mich.].

This is the only species of the present group in which the dorsal margins of the cephalic tibiae are ever armed with spines. The present series, however, shows that great individual variation exists in this feature, as in three specimens these margins are unarmed and in five others the external alone bears a single spine. The range of these spines in the present series is from nothing to six for the external margin and the internal margin is normally unarmed, only six specimens showing there from one to three spines.

The variability in this feature (which Caudell had considered of major generic importance), combined with the fact that *excelsus* (Rehn and Hebard) is definitely more closely related to the present insect than to those we here assign to *Pterophylla* indicates that *Paracyrtophyllus* is by no means a strongly defined genus.

Like others of this group, the present species shows considerable variation in size and also in tegminal width. The largest individuals before me, which also have both pronotum and tegmina broad-

est, are from Brownwood, Blanco County and Luling, while the smallest males are from Helotes. None in the large series from Romney, though variable, approaches these extremes closely.

This handsome species is confined to central Texas where it is known only from the localities given above. Its distribution is probably considerably greater from North (Romney) to South (Helotes) than from East to West. It is arboreal and prefers oaks which are scattered through the region and are often the only trees present.

At Romney, members of a University of Kansas expedition found the species relatively abundant in a brushy area, where a fine series was taken from the scattered scrub oaks. These trees, though representing the highest present, were low enough to make location and capture of individuals after dark easier than is usually the case with arboreal species.

Hubbell writes that, at Luling, the song was a fast rasping series of short notes, separated by intervals somewhat longer than the syllables.

Paracyrtophyllus excelsus (Rehn and Hebard) (Pl. XIX, fig. 3.)
1914. *Pterophylla excelsa* Rehn and Hebard, Ent. News, xxv, p. 293, figs. 1 to 3. [♂, ♀; Moss Well at foot of Pulliam Bluff in Chisos Mountains, Texas, at 4700 to 5000 feet.]

Additional Specimens Examined: 2; 1 male, 1 female.

TEXAS: Chisos Mountains, VII, 18, 1921, (C. D. Duncan), 1 ♂, [Cal. Acad. Sci.]; Big Bend Park, VII, 25, 1927, (R. H. Baker), 1 ♀.

The unarmed dorsal margins of the cephalic tibiae and average more elongate, less robust form led originally to the placing of this species in *Pterophylla*. The instability of the first of the above features and the evident closer affinity to *robustus* shown by several important characters convinces me of the necessity of the present generic reassignment, though *excelsus* plainly represents a development annectant between the genotypes of *Paracyrtophyllus* and *Pterophylla*.

Common in low scattered oaks, *Quercus emoryi*, at the type locality, twenty three males were easily taken there by the author. A pair was also recorded from the Chisos Mountains. The large series secured shows quite considerable size variation although there is little diversity in proportionate tegminal length.

The song is an incessant rasp; "quuck — quuck — quuck — quuck," repeated very deliberately for long periods of time. Individuals are rather sluggish and much more fearless than the usual dectid, so that only patience is required to secure a series once a colony has been located.

PTEROPHYLLA Kirby

Described in 1828⁴ by the elder Kirby, the genotype *Locusta camellifolia* Fabricius was selected by Kirby the younger in 1906.⁵

Burmeister's *Cyrtophyllus*, described in 1838⁶ was correctly synonymized by the younger Kirby in 1906.

Serville's monotypic genus *Thliboscelus* 1839, was correctly synonymized by Caudell in 1911.⁷

Two species are here recognized; one, divided into three, the other into two, geographic races.

Though including the most abundant and widespread species of the group, its races as well as those of the second species are yet known from very little material. Additional series are much needed to determine the degree of variation which occurs in each of the more western races, as well as more exact data on their probably much restricted limits of distribution.

The genus is found throughout the eastern United States except in the more tropical portions of southern peninsular Florida (De Leon Springs is a southeastern limit) and the Florida Keys and in the northern portions of this country, and it occurs also in extreme southern Ontario. It is known westward as far as eastern Iowa, the southern portion of extreme eastern Kansas, eastern Oklahoma and eastern Texas.

The three recently discovered (two as yet undescribed) Mexican species, represent a distinctive phylum or phyla characterized by higher specialization, obviously derived from the present stock.

⁴ Introd. Ent., (5), II, p. 218. The name was proposed first in 1825, but at that time no species were included. (Zool. Jour. London, I, p. 432.)

⁵ Syn. Cat. Orth., II, p. 343.

⁶ Burmeister described *Cyrtophyllus perspicillatus* from a male from South Carolina, this constituting the genotype in that case since, although he included another species, he noted that *perspicillatus* was the only one he had seen. That name is now known to be a synonym of *camellifolia*.

⁷ Ent. News, XXII, p. 167.

Pterophylla camellifolia camellifolia (Fabricius)

(Pl. XIX, figs. 4 and 5; pl. XVIII, figs. 2 to 5.)

1775. *L[ocusta] camellifolia* Fabricius, Syst. Ent., p. 283. [♀, America.]1775. *L[ocusta] perspicillata* Fabricius, Syst. Ent., p. 283. [♂, America.]1831. *Platyphyllum concavum* Harris, Encycl. Amer., VIII, p. 42. [♂, ♀; Mass.]1859. *Platyphyllus zimmermanni* Saussure, Rev. et Mag. de Zool., 1859, p. 206. [♀, S. Car.]1906. *Cyrtophyllus elongatus* Caudell, Jour. N. Y. Ent. Soc., XIV, p. 40. [♂, ♀: Pa.; Plummers Island, Md.; Piney Branch, D. C.; Falls Church, Va.; Crawford and Fountain (type locality⁸) Counties, Ind.]

The above indicates the established synonymy for the present race. Prior Texan records of this species or one of its synonyms are discussed here as follows; Scudder's under *Paracyrtophyllus robustus*, Caudell's under *Pterophylla furcata laetica* and Hebard's under *Pterophylla camellifolia intermedia*.

Limital records for *camellifolia camellifolia* are southeast to De Leon Springs, Florida. North to Wellesley, Massachusetts; London, Ontario; Ann Arbor, Michigan; and Winnetka and Putnam, Illinois. West to Delaware County and Ottumwa, Iowa; Lawrence, Kansas, and Tulsa and Ada, Oklahoma. Material is particularly needed from the Gulf Coast over probably a narrow southern margin in Alabama and Mississippi, but farther north in Louisiana and eastern Texas, before the exact southwestern limits of this race can be determined.

Although Blatchley believed that the insect prefers trees in the open rather than forests, I have found it much more numerous and generally distributed in extensive areas of deciduous forest, particularly where lofty oaks are numerous. Even though the oak scrub is not high in New Jersey, the extensive areas of such often afford excellent opportunity to secure specimens of this frequently inaccessible insect, while the heavily and extensively wooded slopes of the Appalachian Mountains in Pennsylvania and Virginia resound with their song on warm nights.

For Flag Rock Pass, Virginia, I made the following notes, "Many present. At night with hand flashlight individuals may often be located on branches, sometimes in foliage. They usually face toward one when the light shines in the tree, their faces then alone clearly visible, looking very pale among the leaves. Rarely

⁸ A male selected as type by Caudell and Hebard in 1912.

do they show any alarm but often face the light and then, if not molested, climb slowly around to the other side of their perch. When touched with a long stick they usually tumble from their perch to the ground, occasionally giving a short preliminary spring. On the way down they partially spread their organs of flight, thereby using the principle of a parachute."

In the southeast I have often heard their loud chorus when passing through the lofty deciduous forests of the river swamps or "hammocks" of high oaks, but in those regions individuals were almost always highly inaccessible and difficult to secure. At De Leon Springs, Florida, this insect was heard to be abundantly present in the tops of the very high Water Oaks of a "hammock," where in the undergrowth at usually from fifteen to twenty feet from the ground, *Lea floridensis divergens* was also present but only in moderate numbers. The difference in character as well as quality of the song of these two species was very striking. A similar situation has been observed near Ormond, Florida, by Hubbell.

The song of this insect consists of two to five (usually three) exceedingly loud but pleasantly resonant notes, incessantly repeated, from which song the name "Katy-did" was undoubtedly derived. The sound has been described as "xr—, excessively rasping and grating" by Scudder, and it is surprising to find that both Morse and Blatchley also found it unpleasant. To me it is quite the reverse, exceptionally pleasing, as excellently and fully described by Caudell,⁹ embodying a resonant fullness and enthusiasm which brings to mind leafy treetops on clear Summer nights.

Usually dwelling only in high deciduous treetops, individuals are often very difficult to secure. When, however, a colony can be located in either scrub or second growth forest areas where only low trees grow, series of males can at night be easily taken with the aid of a flashlight and a long pole. In the beam of the light their faces or undersides show up conspicuously whitish in the green foliage and when touched with the tip of the pole they leap clumsily and parachute down. On the ground they are both awkward and slow. Since females cannot sing, individuals of that sex are rarely located and collected by the above method.

During the first severe frosts or sudden cold storms in late Autumn, these insects often fall to the ground and when warmed

⁹ Jour. N. Y. Ent. Soc., xiv, p. 32 and 40, (1906).

the next day feebly attempt to climb back into the trees. At such a time it is probably easiest to secure females by examining the trunks of trees where a colony had been located earlier in the season, that sex also being predominant in late Autumn. Females have also been found ovipositing low on the trunks of trees.

Specimens Examined: 167; 84 males, 66 females and 17 immature individuals.

CONNECTICUT: Lyme, VIII, 27, 1910, (B. H. Walden), 1 ♂, 1 ♀. New Canaan, IX, 19, 1907, (B. H. Walden), 1 ♂. (Other records by Walden, 1911.)

NEW YORK: Vicinity of New York City, 1 ♂. (Numerous other records by Davis 1926.)

NEW JERSEY: Delaware Water Gap, IX, 1 and 2, 1923, (H. Fox), 1 ♂. Lakehurst, VII, 28, 1922 to IX, 17, (majority by H. B. Weiss) 4 ♂, 7 ♀, [A. N. S. P. and Hebard Cln.]; IX, 17, and X, 1, 1939, (J. W. Cadbury; one attracted to molasses bait, others in low oaks in pine barrens), 5 ♂, 1 ♀, [A. N. S. P.]. Chatsworth, VIII, 20, 1912, (W. T. Davis), 1 ♂. Medford, IX, 27, 1914, (W. Stone), 1 ♀, [A. N. S. P.]. Spray Beach, Long Beach Island, IX, 16, 1915, (B. Long), 1 ♂, [A. N. S. P.]. Staffords Forge, VIII, 26, 1927, (J. A. G. Rehn), 1 ♀, [A. N. S. P.]. Malaga, VIII, 13, 1913, (H. A. Wenzel), 1 ♀, [A. N. S. P.]. Manumuskin, X, 20, 1902, (E. Daecke), 1 ♀. Ocean View, VIII, 11, 1936, (H. Fox), 1 ♂. (Other records by Fox, 1928.)

PENNSYLVANIA: Greentown, Pike Co., I, 23, 1927, (E. R. Tinkham; long dead on top of beech leaves in heavy woods), 1 ♀. Blue Mountains, Bucks Co., IX, 16, (S. F. Aaron; on summit, numerous, active and stridulating in daytime), 1 ♂, [A. N. S. P.]. Philadelphia, (J. Steiffer), 1 ♀, [A. N. S. P.]. Chestnut Hill, IX, 2, 1904, (M. Hebard; in small birch 30 feet above ground), 1 ♂. Elwyn, (C. S. Wells), 1 ♂, [A. N. S. P.]. Secane, (F. Aaron), 2 ♂, [A. N. S. P.]. Catawissa, IX, 4, 1 ♀, [A. N. S. P.]. Schuyler, IX, 19, 1 ♂, [A. N. S. P.]. Orrtanna, IX, 4, 3 ♀, [A. N. S. P. and Hebard Cln.]. Harrisburg, IX, 5, 1 ♀. Rockville, Dauphin Co., IX, 1, 1 ♀, [A. N. S. P.]. Camp Hill, Cumberland Co., VII, 16, 1 ♂, [A. N. S. P.]. Marysville, X, 7, 1 ♂. Duncannon, X, 2, 1 ♂. Waverly, IX, 20, 1928, 1 ♀. Millers Gap, Perry Co., IX, 23, 1914, (H. W. Fowler) 1 ♂, [A. N. S. P.]. Buffalo Gap, Union Co., 2600 ft., VII, 31, 1935, (Rehn and Rehn, "numerous on oak foliage in second growth deciduous forest not over 25 feet high; individuals rested with front legs and antennae forward, middle legs at right angles to body and hind legs at 45° to axis of body." Five pair raised to maturity August 5 to 11), 12 large juv. ♂, 10 large juv. ♀, [A. N. S. P.].

MARYLAND: Chestertown, VIII, 24, (E. G. Vanatta), 1 ♀, [A. N. S. P.]. Plummers Island, X, 28, 1918, (Rehn and Hebard), 1 ♀; XI, 11, 1915, (Hebard; found dead in deciduous woods), 2 ♀. Mount Quirauk to High Rock, Blue Ridge Mountains, IX, 11, 1937 (H. R. Roberts) 1 ♂, 1 ♀.

VIRGINIA: Flag Rock Pass, Warm Springs Mountain, 3000 to 3100 ft., VIII, 2, 1916, (M. Hebard; 1 immature bred adult VIII, 20), 2 ♀; VIII, 23, 1916, (M. Hebard; "in area of low oaks and some chestnut, singing vigorously at night; generally numerous in forest but obtained easily only in areas of low trees, for individuals are almost invariably in the tops of the tallest trees present"), 8 ♂. Hot Springs, 2400 ft., VIII, 23, 1916, (M. Hebard; on trellis under oaks) 1 ♀.

NORTH CAROLINA: Blowing Rock, 1902, (J. Willcox), 1 ♀, [A. N. S. P.]. (Other records by Rehn and Hebard, 1916, and Brimley, 1938.)

SOUTH CAROLINA: Myrtle Beach, Horry Co., VII, 22, 1940, (J. W. Cadbury; attracted to molasses bait on trunk of low oak in sandy pine woods near beach), 1 ♂, [A. N. S. P.]. Bateburg, VIII, 29, 1930, (R. H. Beamer), 1 ♀, [Univ. of Kans.]. No further data, (from Saussure Cln.), 1 ♀.

GEORGIA: Mountain City, VIII, 19, 1913, (J. C. Bradley), 1 ♂. Dillard, 2200 ft., IX, 3, 1917, (Rehn and Hebard; numerous in oak forest), 1 ♂. No further data, (from Saussure Cln.), 1 ♀.

FLORIDA: Gainesville, VI, 26 and 27, 1924, 1 large juv. ♂, 1 large juv. ♀; VI, 25 to VII, 16, 1924, 13 ♂, 8 ♀, (all F. W. Walker). (Heard but not taken at De Leon Springs by Hebard, IX, 8, 1917.) Wakulla Springs, VII, 14, 1934, (P. A. McKinstry), 2 ♂, [Univ. of Kans. and Hebard Clns.]. Township 2 N R 7 W, Liberty Co., VII, 24 to 30, 1925 (T. H. Hubbell), 8 ♂, 3 ♀, 2 juv. ♂, 1 juv. ♀, [Univ. of Mich. and Hebard Clns.]. De Funiak Springs, VII, 2, 1925, (T. H. Hubbell), 1 ♂, [Univ. of Mich.].

ONTARIO: (Reported from Niagara, London and Morpeth by E. M. Walker, 1904.)

OHIO: (Recorded as *C. concavus* by Meade, 1904.)

WEST VIRGINIA: North Fork Mountain Pass, Pendleton Co., 3600 ft., IX, 4, 1938, (J. W. H. Rehn), 1 ♂, [A. N. S. P.].

KENTUCKY: (Reported as moderately common locally by Garman, 1894.)

ALABAMA: Evergreen, VIII, 4, 1915, (M. Hebard; at night, parachuted out of Water Oak, falling with a thud; one male heard singing in a Water Oak the previous night), 1 ♀.

INDIANA: Muncy, Fall of 1907, 2 ♀. (Fully discussed and other localities given by Blatchley, 1920.)

MICHIGAN: (Recorded as *C. concavus* by Pettit and McDaniel, 1918.) (A northern limit is Ann Arbor, [Univ. of Mich.].)

ILLINOIS: Evanston, VIII, 15, 1899, 1 ♀. Lake Senachwine, Putnam Co., VII, 13 to 15, 1933, (Mohr), 1 ♂. Urbana, IX, 14, 1892, (Snow), 1 ♂. Charlestown, VIII, 23, 1910, (in woods), 1 ♂. (Other records by Hebard, 1934).

IOWA: Delaware Co., VIII, 5, 1932, 1 ♀. Louisa Co., VIII, 5, 1935, (G. Warren), 1 ♀. Ottumwa, IX, 8, 1937, (H. Knutson; on highway), 1 ♀.

MISSOURI: St. Louis, X, 9, 1904, 1 ♂. Mountain Grove, VII, 31, and VIII, 2, 1903, 1 ♂, 1 ♀. Willard, VIII, 17, 1919, (A. E. Brower) 1 ♂, 1 ♀.

ARKANSAS: Mountain View, Stone Co., 1100 ft., VIII, 11, 1939, (Rehn and Rehn; beaten from very low surface cover in scrubby deciduous and Red Cedar woods), 1 ♀, [A. N. S. P.]. Benton, VI, 29, 1938, (H. R.

Roberts; high in deciduous trees in pine woods), 3 ♂. Magazine Mountains, summit at 28 ft., VIII, 12, 1939, (Rehn and Rehn; numerous in oak and hickory forest about 30 ft. high), 1 ♂, 2 ♀, [A. N. S. P.]

NEBRASKA: Though recorded as "not rare in the wooded or eastern part of the state" as *Platyphyllum concavum* by Bruner in 1893, no specimen from there exists in any collection and the statement is in part if not wholly incorrect. It is possible that a northwestern limit point for the species will be found in the wooded bottomlands of extreme southeastern Nebraska, but its present known and authentic limit localities lie some distance to the southeast and south.

KANSAS: Lawrence, VIII, (E. S. Tucker) 1 ♂, [Univ. of Kans.]; IX, 1910, 1 ♂, (discussed by Hebard, in 1931, who also gave Independence as a western limit in 1934). Douglas Co., VII, 29, 1919, (W. E. Hoffman), 1 ♀, [Univ. of Kans.]. Coffeyville, VII, 11, 1933, (L. W. Hepnet), 1 ♂, [Univ. of Kans.].

OKLAHOMA: Adair, VII, 15, 1931, 1 ♀. Fort Gibson, VII, 20, 1937, (Standish and Kaiser), 1 ♂, 1 ♀. Tulsa, VII, 22, 1937, (Standish and Kaiser), 1 ♂, 1 ♀. Gore, VII, 20, 1937, (Standish and Kaiser), 1 ♂.

In the above material decided variation in size and shape of organs of flight, length of limbs and size of ovipositor, general contour and curvature of the arms of the male cercus and length and contour of the male subgenital plate is shown.

Considerable variation in size occurs, the minimum average being found in the northern portions of the insect's distribution and in the higher and more boreal portions of the Appalachian Mountains. In such material the male subgenital plate also shows conspicuously a maximum general reduction. A large series from Gainesville, Florida, includes much the largest specimens I have seen, but even in this series the size variation is considerable. Westward as far as eastern Iowa and eastern Missouri, the size average remains small, the male subgenital plate, however, showing frequently a slightly greater meso-distal expansion. The material from southwestern Missouri, Arkansas and northeastern Oklahoma averages larger with male subgenital plate averaging more elongate than elsewhere, the meso-distal expansion of that plate averaging greatest in the Oklahoma specimens. A male before me from South Carolina has the subgenital plate of intermediate length for the species but its meso-distal expansion very decided. In another from Myrtle Beach in that State, however, this plate is much as in the Florida series, it being elongate and only moderately expanded meso-distad.

Individual extremes in the development of the male subgenital plate appear very distinct, but intergradation to different degrees in different series is much too general, in my opinion, to warrant the use of this feature toward recognition of any geographic race.

The ventral arm of the male cercus frequently shows some convexity just after it begins to curve inward toward the apical tooth in much of my southeastern material. The fact that this feature varies individually in degree of development in all southeastern series and on the other hand is prominent in a few specimens from Pennsylvania, again precludes its being given racial significance. (See pl. XVIII, figs. 2 to 5.)

The length and width of the tegmina is much more apt to vary individually with little or no geographic significance. I believe that, as in *Paracyrtophyllus robustus*, this feature will prove to be merely adaptation to the character of the foliage constituting an individual's immediate environment during its period of growth. Individuals of this species, as a rule, move only comparatively very short distances during their entire life cycle.

Pterophylla camellifolia intermedia (Caudell) (Pl. XVIII, fig. 1.)
1906. *Cyrtophyllus intermedius* Caudell, Jour. N. Y. Ent. Soc., xiv, p. 41, pl. 1, figs. 2 and 8. [♂; Biloxi, Miss.¹⁰ (selected as type by Caudell and Hebard, 1912).]

Through the kindness of A. B. Gurney of the U. S. N. M. I have been able to study the type of this insect and am compelled to reverse my decision of 1931, which placed *intermedia* as a synonym of *camellifolia*. This type is in an excellent state of preservation and agrees fully with *camellifolia camellifolia* except that the rounded median lobe of the cercus is much more produced, being nearly as high as its proximal width and in direct vertical aspect projects slightly more than the inward ventral arm. The arms are also heavier and shorter than is usual in the nominate race. Thus quite as definite divergence from *camellifolia camellifolia* is present as is found in a different part of the male cercus in the case of *camellifolia dentifera* here described.

I now know that the present race occurs little east of Biloxi, Miss., contrary to Rehn and Hebard's belief in 1914 when they first placed it as a race of *camellifolia*, since typical *camellifolia* has been taken as far west as De Funiac Springs in western Florida.

¹⁰ The originally described female from Wellborn (not Wellsboro), Texas, is referable to *camellifolia laetifica* here described.

The male here recorded from Jefferson, in the northern portion of the very narrow humid strip along the eastern boundary of Texas, indicates that *camellifolia intermedia* probably occurs on the Gulf Coast from Mississippi to extreme southeastern Texas and for some distance inland, at least in the western portions of that region. The females from west of Biloxi recorded below, are tentatively assigned to the present race, males from the region being necessary to solve the problem.

The Jefferson, Texas male shows definite divergence toward *camellifolia camellifolia* in having the cercus with lobe lower, though high, well over half as high as broad and projecting almost as far as the lower arm.

My record of *camellifolia* from Rosenberg, Texas in 1931 is erroneous; at that time the specimen recorded below from Doucette was so labelled accidentally and the mistake remained unnoticed until recently.

Specimens Examined: 4; 1 male, 2 females, and 1 immature individual.

MISSISSIPPI: Orange Grove, VII, 10, 1934, (R. H. Beamer), 1 ♀, [Univ. of Kans.]. Lucedale, VI, 17, 1931, (H. Dietrich), 1 ♀.

TEXAS: Jefferson, VI, 21, 1938, (R. L. Sailer), 1 ♂, atypic, divergent towards *camellifolia camellifolia*. Doucette, VI, 21, 1912, (M. Hebard; only individual seen, on small bush near the bare ground in lofty deciduous forest), 1 large juv. ♀.

***Pterophylla camellifolia dentifera* new subspecies** (Pl. XVIII, fig. 6.)

A single male before me, from a locality between the known southwestern limit of *c. camellifolia* (Benton, Arkansas) and the known southeastern limit of *f. furcata* (Broken Bow, Oklahoma) shows a definite step from the simple cercus of the other races of the former species toward the furcate cercus characteristic of the races of the latter. The species involved are so similar except in male cercal features that racial assignment of the present insect is difficult. From the evidence at hand, however, I believe that the present condition should be associated with *camellifolia*, though it is evident that the races here recognized of *furcata* represent decidedly higher specialization of a similar general type of male cercus. I have here considered *furcata* a distinct species, due to its much higher cercal specialization coupled with definite differences in habitat and song. Additional material, particularly from

extreme southwestern Arkansas, extreme northwestern Louisiana and extreme northeastern Texas, must be secured to establish finally the exact degree of relationships here extant.

At the present type locality even the regional conditions are probably intermediate between the comparatively humid eastern forests which are the habitat of *camellifolia* and the drier and lower deciduous (largely oak) forests to the west and southwest in which *furcata* is found.

Type.—♂; Fulton, Hempstead County, Arkansas. July 3, 1937. (H. R. Roberts.) [Hebard Cln. Type No. 1332.]

Generally similar to the nominate race. Cercus with ventral arm short and stout, bent inward distad at a right angle, at which point projects caudad a small straight sharp tooth approximately as long as its proximal width. Otherwise probably indistinguishable from *c. camellifolia*, but showing in this specimen the following features. Size medium. Tegmen very broad, short and very broadly rounded distad. Male subgenital plate strongly produced with meso-distal expansion prominent; not as strongly produced as the average in our Arkansas series of typical *camellifolia* but much as the average in those of that race from northeast Oklahoma. Limbs short. Ventro-cephalic margins of cephalic femur with two and two, of median femur with three and five, very small teeth, ventro-caudal of all femora unarmed; ventro-external margins of caudal femur with three and six slightly larger teeth.

General coloration light green, with stridulating area light brown. Antenna not pinkish proximad.

Length of body (not including subgenital plate) 27.5, length of pronotum 5.1, greatest (caudal) width of pronotal disk 5.9, length of tegmen 33.8, greatest width of tegmen 17.8, length of caudal femur 18.9, greatest width of caudal femur 3 mm.

This insect was abundant in the mixed forest, where the present specimen was taken from a deciduous tree about twenty feet high.

Pterophylla furcata laetica new subspecies (Pl. XVIII, figs. 7 and 9.)

This southern race is separated from typical *furcata* only by the less decided, though very prominent, furcation of the ventral arm of the male cercus, the production distad (outer branch) being considerably shorter and less robust than the inbent distal portion (inner branch). This is obviously one step in the cercal development from that of *furcata furcata* toward that which distinguishes *camellifolia dentifera* less strongly from *camellifolia camellifolia*.

Females of these races are apparently indistinguishable. Referable here, from distributional evidence, is the female from Wellborn (not Wellsboro), Texas, described as this sex of *Cyrtophyllus intermedius* by Caudell in 1906 (which I have recently examined).

The race occupies most of the extensive more arid western portion of eastern Texas. In the narrow humid eastern margin of Texas, it is supplanted by *camellifolia camellifolia* or *camellifolia intermedia* in the south and probably by the former race or *camellifolia dentifera* in the extreme north. It is supplanted by *furcata furcata* in southeastern Oklahoma. Sufficient material is not yet available to determine the exact limits of distribution and amount of intergradation existing between these races.

Type.—♂; Palestine, Texas. August 16, 1915. (M. Hebard). [Hebard Cln. Type No. 1333.]

Cercus with ventral arm short and stout, bent inward distad at a right angle, at which point projects caudad a large tooth, approximately twice as long as its proximal width, its bulk about one-half that of the distal inbent portion of the arm and approximately two-thirds as long as that section. Otherwise probably indistinguishable from *f. furcata*, but showing in the type and paratype the following features. Size large. Tegmen very broad as well as elongate, distal margins very broadly convex convergent to the relatively narrowly rounded apex, which lies nearest the sutural margin. Male subgenital plate strongly produced with meso-distal expansion prominent, though not as prominent as in the series of *f. furcata* before me. Limbs short. Ventro-cephalic margins of cephalic femur with four and four (five and five in paratype) of median femur with four and four (five and five in paratype), very small teeth, ventro-caudal of all femora unarmed (except that one such tooth is present distad on these margins of the median femora in paratype); ventro-external margins of caudal femur with five and seven (five and six in paratype) slightly larger teeth.

General coloration light green with stridulating area light brown. Antenna not pinkish proximad.

The measurements of the type are followed by those of the paratype. Length of body (not including subgenital plate) 31 and 27, length of pronotum 5.8 and 5.6, caudal width of pronotal disk 6.8 and 6.7, length of tegmen 36.8 and 34.7, greatest width of tegmen 17.9 and 16.8, length of caudal femur 20.9 and 20.2, greatest width of caudal femur 3.7 and 3.6 mm.

Specimens Examined: 13; 12 males and 1 female.

TEXAS: Palestine, VIII, 16, 1915, (M. Hebard), 2♂, *type* and *paratype*. Waxahatchie, VI, 30, 1938, (H. R. Roberts; in fairly tall oaks in park), 1♂. College Station, VII, 23, 1938, (Sailer and Craik), 9♂, 1♀, [Univ. of Kans. and Hebard Clns.].

The series from College Station shows the following variation. Antennae with joint intersections beyond bases darkened, this very weak in one and obsolete in three, the female among the latter having these organs dull pink beyond their bases. Occiput dark with dark suffusions continued along lateral margins of pronotum in one, but these markings lighter and more suffused in four others, the same but very weak in two, occiput alone dark in one and head and pronotum immaculate in one pair. Male cercus with distal (outer) fork of ventral arm from slightly under two-thirds to slightly over three-fourths length of inner arm.

In covering about three miles in a Post Oak area near Palestine at night I heard five males at one place, one at another. The two specimens taken were in Post Oaks about twelve feet from the ground. Their song was very loud and harsh—"Grruck—grruck—gruuck—grruck," often continued for a considerable period of time. A series could probably have been secured if more time had been available.

Pterophylla furcata furcata (Caudell) (Pl. XVIII, fig. 8.)

1906. *Cyrtophyllus furcatus* Caudell, Jour. N. Y. Ent. Soc., xiv, p. 41, pl. I, fig. 9. [♂, origin doubtful.]

1926. *Pterophylla furcata* Hubbell, Proc. Okla. Acad. Sci., vi, p. 177. [♂; Broken Bow, Oklahoma.]

I have examined the type in the National Museum which, though discolored, shows the same cercal structure as the males discussed below. This specimen came from the oldest portion of the Bruner Collection and, I believe, was incorrectly labelled "West Point, Nebraska." It appears highly probably that *furcata furcata* enjoys only a very limited distribution, possibly confined to southeastern Oklahoma and southward limited by *furcata laticata*, while northward it is supplanted in northeastern Oklahoma by *camellifolia camellifolia*. Furthermore the valid known northwestern limits for *camellifolia camellifolia* extend only to central eastern Kansas, eastern Iowa and northern Illinois, so that the present species should no longer be included in either Nebraska or Kansas lists.

Specimens Examined: 13; 8 males and 5 females.

OKLAHOMA: Page, IX, 14 and 15, 1935, (T. H. and G. G. Hubbell; abundant in oaks from eight to twenty feet above ground in scrubby Post Oak, Black Jack and pine forest on dry hillsides), 7♂, 5♀, [Univ. of Mich. and Hebard Clns.]. Broken Bow, VII, 8, 1925, (A. S. Ortenberger), 1♂, [Univ. of Mich.].

The known series shows that only in the character of the male cercus can this insect be separated from *camellifolia*. Though this difference appears very great, it must be noted that two stages between it and typical *camellifolia* are here described as geographic races of these two species.

In the males the ventral arm of the cercus is short and stout, bent inward distad at a right angle, at which point projects caudad a large horn-like process as thick or thicker at its base than the distal inbent portion of the arm and slightly to fully one-third longer than that section, tapering and slightly curved to its sharp apex. Male subgenital plate strongly produced with meso-distal expansion very prominent, this expansion averaging slightly greater than in the males of *furcata laetica* and the plate even longer and more expanded than in the maximum condition developed by *camellifolia camellifolia* (in Kansas, Arkansas and northeastern Oklahoma).

Hubbell writes that at Poteau, Oklahoma, on June 18, 1938, W. F. Blair secured a large series, where the species was abundant in hickories and Post Oaks from three to ten feet above the ground.

LEA Caudell

This genus was described in 1906 to include a single species, *Cyrtophyllus floridensis* Beutenmüller. This species was divided into a northern and southern geographic race by Hebard in 1939. It is locally distributed throughout eastern peninsular Florida but has yet been reported only from Fort Myers in the western portion and is probably absent from the Keys.

It much prefers Cabbage and Saw Palmettos, but is also found in scrub oaks, vine tangles and the thick bushes and tall weeds of sandy coastal areas or those bordering areas of heavy tropical vegetation and rarely in such areas in the south. Rarely has it been heard high in oaks and at De Leon Springs, in a "hammock" of tall oaks it was present in moderate numbers in the undergrowth, where *Pterophylla camellifolia camellifolia* could be heard but not taken, though in large numbers, in the lofty treetops. In fact, its preferred habitat is palmettos and bushes instead of the tops of the highest trees, though the latter is the favorite environment of the members of *Pterophylla*.

Lea floridensis divergens Hebard (Pl. XIX, fig. 6.)

1939. *Lea floridensis divergens* Hebard, Trans. Amer. Ent. Soc., LXV, p. 166, pl. X, fig. 29. [♂, ♀; Pablo Beach, St. Augustine, Pomona, Ocala, De Leon Springs, La Grange, and Orlando, Florida.]

As may be noted from the characters given in the present key, this northern geographic race shows a less conspicuous divergence from the general type characteristic of *Pterophylla*, than does the southern race *floridensis floridensis*.

It is locally distributed in Cabbage Palmettos and bushes in pine flatwoods, in bushes near Cabbage Palmettos back of coastal sand dunes and also in the undergrowth of oak "hammocks." Once located at night by their song, males are usually found to be sluggish in their movements and easy to capture, as rarely is one located high in a tree.

The song is a peculiar wooden "grruck."¹¹ This single note is regularly repeated, usually about thirty eight per minute but I have heard the frequency raised to nearly sixty a minute when an individual became excited. At De Leon Springs we had the opportunity to compare it with that of *Pterophylla camellifolia camellifolia* and noticed that it is decidedly weaker and of lower pitch.

I have seen only two males, listed below, additional to the nineteen males and two females originally described, but the two males which, I find from my field notes I heard at Kissimmee, high up in Water Oaks in a dry "hammock" on September 9, 1917, were probably representative of the present race.

FLORIDA: Benson Junction, Volusia Co., VIII, 30, 1938, (Hubbell and Friauf), 1 ♂, [Univ. of Mich.]. Eau Gallie, VIII, 7 and 8, 1938, (Hubbell and Friauf), 1 ♂, somewhat divergent toward *floridensis floridensis*, [Univ. of Mich.].

From notes very kindly furnished by Hubbell I find that he has also taken twenty-four males and six females of this race, among which three males and two females are of a light pinkish brown color phase. The series was secured at Satsuma, Juniper Springs, Doe Pond, Niggertown Lake, (the last three localities in the Ocala National Forest), Glenwood and Leesburg; the adults from July 24 to September 6, but large immatures as early as June 8. It was found common once in pine and oak scrub, the majority in oaks ten to thirty feet above the ground; once in oaks, Cabbage Palmettos and vine tangles. Three females were found ovipositing near the

¹¹ Described by Davis as, "chluck."

ends of dry broken stalks of Cabbage Palmetto fronds still attached to the trunks. A slit is cut on the lower face of the stalk, entering slightly obliquely and along the grain.

This insect has twice been found in small numbers in the undergrowth of a "hammock" where in the tops of the lofty oaks *Pterophylla camellifolia camellifolia* was abundantly present; near Ormond by Hubbell, and at De Leon Springs by Rehn and Hebard.

Lea floridensis floridensis (Beutenmüller) (Pl. XIX, figs. 7 and 8.)

1903. *Cyrtophyllus floridensis* Beutenmüller, Bull. Amer. Mus. Nat. Hist., XIX, p. 637, 2 text figs. [♂; Indian River opposite Grant, Florida.]

1939. *Lea floridensis floridensis* Hebard, Trans. Amer. Ent. Soc., LXV, p. 168. [♂, ♀; near Grant (slightly atypical), St. Lucie, Juno, Miami, Coral Gables and Homestead.]

This southern geographic race may be distinguished by the features noted in the present key. Its definitely optimum development gives it a distinctive appearance. It is known only from the southern portion of peninsular Florida, where, on the East Coast it has been found from Homestead and Paradise Key (in the Everglades) north to near Grant on the Indian River, at which latter locality intergradation with the northern race is shown.

The race is very locally distributed. Colonies, sometimes of moderate size but often widely separated, are known to prefer a Cabbage or Saw Palmetto habitat in sand dune coastal scrub, among second growth pines and on the borders of or in "hammocks."

I have seen only six pairs. Hubbell writes that at Paradise Key, from August 30 to October 21, he secured ten males and one female in shrubbery and vines usually at five to fifteen feet from the ground, where it was present in small numbers and even scarcer in the tall trees of the dense tropical "hammock." A small tree having aromatic leaves seemed to be a favorite habitat; several specimens were taken from it and one had been eating the leaves; this easily recognized by the pleasant spicy odor of the crop contents.

During extensive field work in the Florida Keys, I have never heard or seen it. It is probably this race which H. F. Strohecker writes me that he heard at Fort Lauderdale and Fort Myers, the latter constituting the only known record for the genus in southwestern Florida.

Among the thirty-six specimens from Coral Gables, which Strohecker recorded in 1939, one male and five females are light pinkish brown, all of these having been taken from dead brown fans of the Cabbage Palmetto.

That author states that the insect was first heard on June 1, adult seasonal abundance being greatest about the middle of July and that by August 25 only occasional individuals were heard. Specimens were found hiding in the folds of palmetto fans during the day, but more locally than is the case with many of the species of *Belocephalus*. Males, when located at night by their song, can be easily captured with a light as they are then moving about very deliberately and are not at all alert.

EXPLANATION OF FIGURES

PLATE XIX

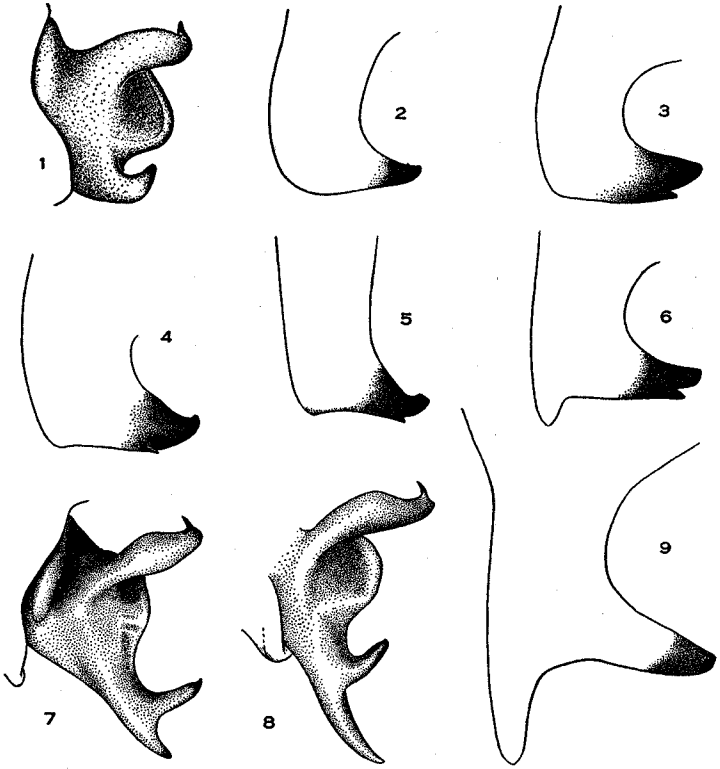
(Figures natural size)

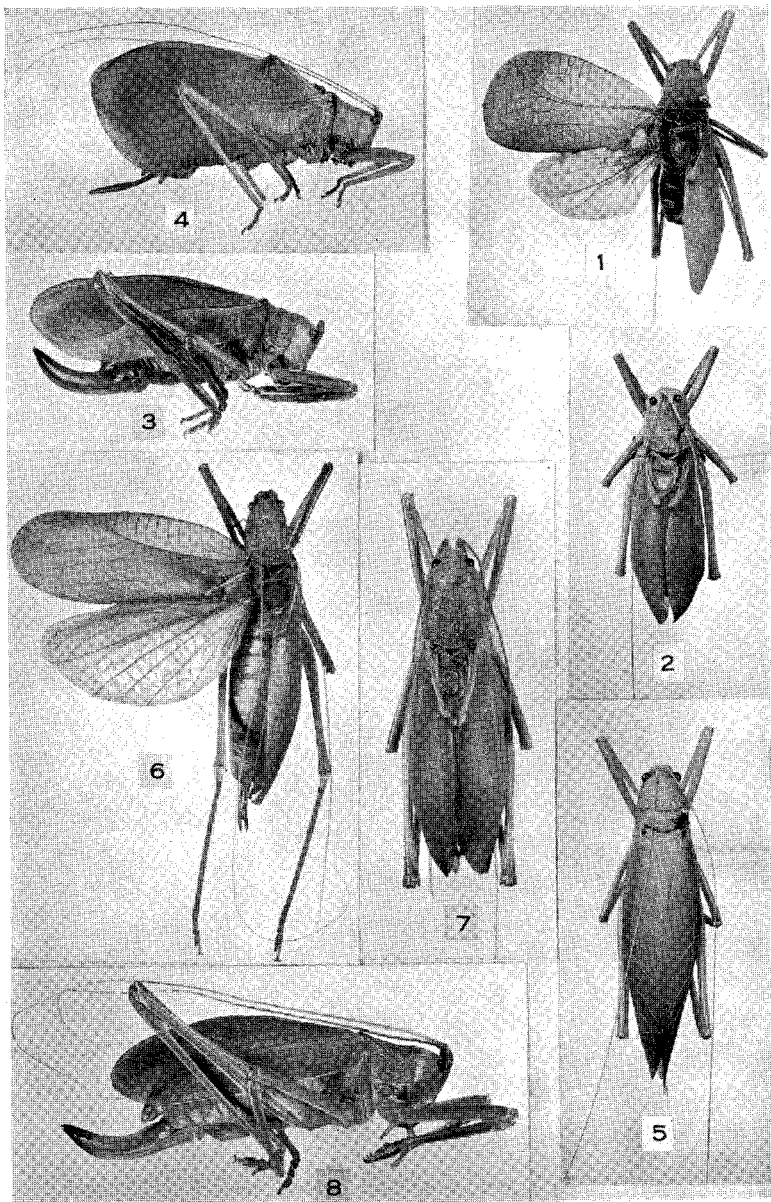
- Fig. 1.—*Paracyrtophyllus robustus* Caudell. Dorsal view of male. "Texas."
(Pronotum appears to have caudal margin extremely truncate, this partly due to the caudal portion being more reflexed than is usual.)
- Fig. 2.—*Paracyrtophyllus robustus* Caudell. Dorsal view of male. Romney, Texas.
- Fig. 3.—*Paracyrtophyllus excelsus* (Rehn and Hebard). Lateral view of female. Big Bend Park, Chisos Mountains, Texas.
- Fig. 4.—*Pterophylla camellifolia camellifolia* (Fabricius). Lateral view of male. Mountain Grove, Missouri. (Showing very considerable production of subgenital plate, particularly striking in series from the southwestern portions of the distribution of this race.)
- Fig. 5.—*Pterophylla camellifolia camellifolia* (Fabricius). Dorsal view of female. Gainesville, Florida.
- Fig. 6.—*Lea floridensis divergens* Hebard. Dorsal view of male. *Type*. Pablo Beach, Florida.
- Fig. 7.—*Lea floridensis floridensis* (Beutenmüller). Dorsal view of male. Coral Gables, Florida.
- Fig. 8.—*Lea floridensis floridensis* (Beutenmüller). Lateral view of female. Coral Gables, Florida.

PLATE XVIII

(Figs. 1, 7, and 8, dorsal view of male cercus, much enlarged. Figs. 2, 3, 4, 5, 6, and 9, dorsal view of ventral arm of male cercus, very much enlarged.)

- Fig. 1.—*Pterophylla camellifolia intermedia* (Caudell). *Type*. Biloxi, Mississippi. (Drawing made through the kind cooperation of I. J. Cantrall.)
- Fig. 2.—*Pterophylla camellifolia camellifolia* (Fabricius). Chestnut Hill, Pennsylvania.
- Fig. 3.—*Pterophylla camellifolia camellifolia* (Fabricius). Tulsa, Oklahoma.
- Fig. 4.—*Pterophylla camellifolia camellifolia* (Fabricius). Gainesville, Florida.
- Fig. 5.—*Pterophylla camellifolia camellifolia* (Fabricius). Orrtanna, Pennsylvania.
- Fig. 6.—*Pterophylla camellifolia dentifera* new subspecies. *Type*. Fulton, Arkansas.
- Fig. 7.—*Pterophylla furcata laetica* new subspecies. *Type*. Palestine, Texas.
- Fig. 8.—*Pterophylla furcata furcata* (Caudell). Page, Oklahoma.
- Fig. 9.—*Pterophylla furcata laetica* new subspecies. *Type*. Palestine, Texas.





HEBARD—AMERICAN PTEROPHILAE