the tympanum of male more or less infuscate, the stridulating vein not visible above. Cerci of male terete, very long, strongly semicircularly curved, their apical portion attenuate, upcurved, the tips black, acute. Subgenital plate deeply grooved below, the lobes narrow, oblique, triangular, the apical notch shallow. Other characters as given above. Length of body, ♂, 21; of pronotum, 7; of tegmina, 33; of hind femora, 23 mm.

This Mexican species, described from Yucatan, has been taken at Miami, Fla., by both Davis and Hebard. The former (1914, 197) records the taking of a single male after night, Sept. 22, while "shining the road" that leads through Brickell's Hammock with a lantern. Hebard (1915b, 457) mentions the taking, on March 5, of a nymph by beating heavy shrubbery in a dense jungle at the same place; these two records being the only ones of both genus and species from the United States.

Like the small mantis, *Mantoida maya* S. & Z., also originally described from Yucatan, *P. maya* is a tropical introduced form which will probably be found only sparingly in the southern third of Florida.

Subfamily II. PSEUDOPHYLLINÆ.

The True Katydids.

Our eastern species of this subfamily are insects of large size, having the head very broad, fastigium of vertex short, triangular, acute, grooved above, crowded by the prominent, widely margined antennal scrobes; eyes small, subglobose, very widely separated; antennæ reaching far beyond the closed tegmina; pronotum saddle-shaped, its disk with faint lateral carinæ, rounded into the perpendicular lateral lobes, front margin truncate, hind one broadly rounded; prosternum armed with two slender tapering spines; tegmina very broad, ovate, leaf-like, usually strongly concave within, wholly enclosing the abdomen, their anal field short, triangular, overlapping, the sutural margin beyond straight or feebly curved into the broadly rounded tips, the costal field crossed by numerous straight parallel veinlets; wings shorter than tegmina; membranous, very thin, rarely used in flight; meso- and metasterna not lobed; all the femora sulcate and armed beneath; fore tibiæ without apical spines, hind ones 4-sided with all the margins spined; first two joints of hind tarsi with sides sulcate. Males with stridulating organ very highly developed, the transparent speculum of each tegmen depressed or sunken and set in a strong half-oval frame, the left or upper one with a strong stridulating cross-vein near the base; cerci broad at base, widely forked, the

tips of the forks usually incurved and mucronate; subgenital plate long, narrow, more or less spear-shaped. Females with ovipositor more than twice as long as pronotum, sickle-shaped, apex acute, apical third of lower margin very finely serrate; supra-anal plate narrow, twice or more as long as wide, apex rounded or subtruncate.

This subfamily is richly represented in the tropical countries of the world, but very poorly so in the United States, where only three genera and half a dozen or so species occur. They are for the most part strictly arboreal, dwelling amidst the foliage of the tallest of trees, but where these are absent they live in the orchards and shrubbery about small towns and country houses. Caudell (1906, 32) well describes their habits when he says: "The nights may resound with the song of the males and yet the listener never sees one of the songsters. This is accounted for by the habitat of the insect which is in the tallest trees available. The young feed on the leaves and very probably rarely or never leave the shelter of the tree upon which they were born. * * * Considerable doubt exists as to whether or not these tree katydids ever fly. I have repeatedly endeavored to persuade specimens to fly and have succeeded in getting them to spread their wings and sail to the ground, alighting with a thud, but no attempt was made by the insects toward actual flight. They probably soar from one tree to another after the manner of the flying squirrel."

The principal literature treating of our species of Pseudophyllinæ is by Riley, 1874; Brunner, 1895; Blatchley, 1903; Caudell, 1906, and R. & H., 1916.

KEY TO EASTERN GENERA OF PSEUDOPHYLLINÆ.

a. Disk of pronotum scarcely longer than wide, the lateral lobes subquadrate or deeper than long; tegmina broadly ovate; subgenital plate of male with apex entire. I. PTEROPHYLLA.

aa. Disk of pronotum distinctly longer than wide, the lateral lobes longer than deep; tegmina somewhat narrower, elliptical; subgenital plate of male with apex deeply forked. II. LEA.

I. PTEROPHYLLA Kirby, 1828, 218. (Gr., "wing" + "leaf.")

Very large green katydids, possessing the characters as above set forth and having the lateral carinæ of pronotum evident only near the base; front tibiæ unarmed above, middle coxæ with a basal tubercle; hind femora with not more than seven spines on the lower outer carina; supra-anal plate in both sexes entire or sulcate above only on basal fourth; male with supra-anal plate about as broad as long, forks of cerci strongly divergent, their

tips separated by a distance greater than the length of lower fork; subgenital plate produced into a long spear-shaped appendage, grooved above.

As pointed out by Kirby (1906, 343) this generic name replaces *Cyrtophyllus* Burm. (1838, 697) for our common eastern true katydids. Caudell (1906, 37) recognized four species as belonging to *Cyrtophyllus*, three of which he described as new. One of these (*elongatus*) is now known to be a synonym of *P. camellifolia* (*C. perspicillatus*) while another is placed by R. & H. (1916) as a southern race of that species. Our two eastern forms were separated by Caudell as follows:

KEY TO EASTERN FORMS OF PTEROPHYLLA.

a. Lower branch of male cerci with incurving apical portion scarcely as long as the less tapering basal portion, the apex of the broad base of the cercus between the two branches less enlarged; tegmina of female broadly rounded apically, the posterior (sutural) margin usually as convex as the costal margin. 226. CAMELLIFOLIA.

aa. Lower branch of male cerci with incurving apical portion as long as the thick, uniformly tapering basal portion, the cercus between the two branches much enlarged, forming a triangular projection; tegmina of female narrowly rounded apically, the posterior margin almost straight. 226a. INTERMEDIUS.

226. PTEROPHYLLA CAMELLIFOLIA (Fabricius), 1775, 283. Northern True Katydid.

Size large, form robust, the sexes subequal. Tegmina dark green; body, head, pronotum and legs paler green tinged with yellow, often becoming dull greenish-yellow in drying; tympanum of male brown. Disk of pronotum saddle-shaped, coarsely and densely punctate; metazona broader than prozona, usually distinctly sloping from the broadly rounded or subangulate hind margin to the principal transverse sulcus, the latter descending on lateral lobes much farther than the anterior sulcus; prozona about as long as metazona, crossed at middle by the deep anterior sulcus, its front margin truncate; lateral lobes subquadrate, all their margins nearly straight, the lower angles rounded. Tegmina as described under subfamily heading, those of female about two and one-half times as long as broad. Male with lower branches of cerci about one-fourth shorter than upper ones, their tips strongly incurved and partly clasping the sides of the elongate subgenital plate, the upper forks crossing each other, each ending in a minute sharp black spine. Ovipositor as described under subfamily heading. Length of body, ♂, 25—30, ♀, 26—34; of pronotum, ♂ and ♀, 5.5—6; of tegmina, ♂, 32—38, ♀, 34—37; of hind femora, ♂, 18—21, ♀, 19—23; of subgenital spine, ♂, 12—14.5; of ovipositor, 16.5—20 mm. Width of pronotum, ♂ and ♀, 6—6.5; of tegmina, ♂, 17—20, ♀, 14—16; of ovipositor, 3.2 mm. (Fig. 165.)

This broad-winged katydid occurs in considerable numbers throughout Indiana, but is much more commonly heard than seen,

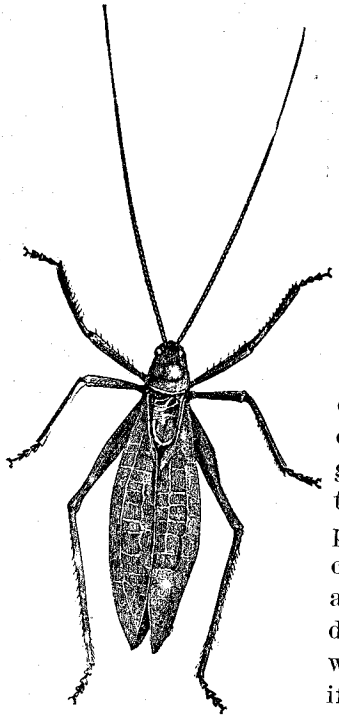

Fig. 165. Male. Natural size. (After Harris.)

as it dwells in small colonies in the densest foliage which it can find, such as the tops of shade and forest trees, the entwining vines of the grape arbor, the shrubbery of yards and orchards and the trees along fence rows. Its note is the loudest made by any member of the family, the male having the musical organ larger and better developed than in any other. The call is almost always begun soon after dusk with a single note uttered at intervals of about five seconds for a half dozen or more times. This preliminary note gives the listener the impression that the musician is tuning his instrument, preparatory to the well-known double call which is soon begun and kept up almost continuously from dark till dawn. Occasionally, in warm cloudy weather, this call is made by day, and if the musician is located he will sometimes be found resting on the topmost leaf of a shrub, swinging to and fro as the breezes blow, and sounding his cymbals in seeming unison with the movement. This katydid reaches maturity in southern Indiana by mid-July. The song has been heard in Crawford County as early as July 10, and as late as Oct. 27, and a single female was captured in LaPorte County, near Lake Michigan, on October 15.

In a Putnam County farmyard I listened for hours, one August night, to the serenade of a band of katydids. They seemingly tried to outdo themselves for my benefit. But to them I was a nonentity—an unknown being. No thought of me or of my attentive ear lurked in or passed through their brains, as they clashed their cymbals in every shrub and tree around the old farm house. One idea alone possessed the minds of the male musicians. That idea was love—passion—"that greatest thing in the universe." Long and loud the cymbals sounded, each shuffle, each note, doubtless accompanied by the wish that the next would call from the skies, from the branches above or about them—from anywhere, it mattered not—one of their form and kind. One to whom they could "whisper sweet nothings"—one whom they could caress tenderly

with long antennæ—one whom, in time, they could clasp lovingly with their slender limbs and forget cymbals, calls, skies, food, earth, everything in that long embrace which is to them the acme, the one, the highest object of their mature existence.

The serenade continued thus, almost unbroken, from dusk till dawn. A serenade it was in truth—a song of love—of passion, poured out to the listening ears of the other sex. At times a single player dropped out of the chorus. His work, his love-calls had not been in vain. From some leafy retreat, where she had been hidden by day, a lady katydid slowly emerged, and, entranced by the song—by, to her ears, the tender wooing notes—drew nearer and nearer unto the charmed circle whence the cymbals clanged and shuffled. Their notes became less vigorous. More softly they fell upon her ear, until finally, as she coyly advanced they ceased and the caress of the antennæ took their place. The other musicians noted the absence of one of their chorus, and sounded their drums the louder, but for most of them their labor was in vain. Many of them doubtless go through life unblessed by the presence of the gentler sex, clanging their nightly calls from mid-July to the coming of the hoar-frost, and to its biting nips finally succumbing, possessed by the thought—if a katydid can think—that this earth is a desolate and cruel abiding place for such as they. So have the most of bachelors—human and otherwise—doubtless thought, as in the past they yielded up the ghost.

The known range of this true katydid extends from New England and London, Ont., west to Michigan and northern Illinois, and south and west to North Carolina, northern Georgia and central Kansas. In New England it has been definitely recorded only from Massachusetts and Connecticut, Scudder (1900a, 103) stating that it is found in isolated colonies in the former State and more generally but still locally in Connecticut. Davis (1889) mentions it as occurring on Staten Island, N. Y., in late July and August. Walker (1904a, 330) states that it is common at Niagara, and that he had often heard it at Yonkers, N. Y. Caulfield (1888) records the only Ontario specimen as taken at electric light in London. It is not mentioned in any of the local Michigan lists at hand, though stated by Pettit and McDaniel to have been recorded from the State. Lugger, though giving a description and an account of its habits (1898, 226), does not record it from Minnesota but says: "If found in this State it will very likely occur in small colonies." Ball (1897) mentions it as rare at Ames, Iowa, while Bruner (1893a, 29) records it as not rare in the eastern or wooded part of Nebraska. The records south and

southwest of New England are more numerous, a number of them, as far as northern Georgia, being given by R. & H. (1916, 257). Caudell (1906, 38) states that it is found in Kansas.

Most of the above records have been made under the names *Platyphyllum concavum* Harr. (1841, 128), *Cyrtophyllus concavus* Scudder (1862, 444) and *Cyrtophyllus perspicillatus* Burm. (1838, 697), all of which are synonyms of *Pterophylla camellifolia* (Fab.). The female was described by Fabricius as *Locusta camellifolia*, and in the next line he described the male as *L. perspicillata*, the former name therefore having priority. The *Cyrtophyllus elongatus* Caudell (1906, 40) is also a synonym of *P. camellifolia*.

Of the call of this species Scudder (1875e) has written:

"The note, which sounds like *xr*, has a shocking lack of melody; the poets who have sung its praise must have heard it at the distance that lends enchantment. In close proximity the sound is excessively rasping and grating, louder and hoarser than I have heard from any other of the Locustarians in America or in Europe, and the Locustarians are the noisest of all Orthoptera. Since these creatures are abundant wherever they occur, the noise produced by them, on an evening specially favorable to their song, is most discordant. Usually the notes are two in number, rapidly repeated at short intervals. Perhaps nine out of ten will ordinarily give this number, but occasionally a stubborn insect persists in sounding the triple note—('Katy-she-did'); and as katydids appear desirous of defiantly answering their neighbors in the same measure, the proximity of a treble-voiced songster demoralizes a whole neighborhood, and a curious medley results; notes from some individuals may then be heard all the while, scarcely a moment's time intervening between their stridulations, some nearer, others at a greater distance; so that the air is filled by these noisy troubadours with an indescribably confused and grating clatter."

Caudell (1906, 32) says: "The female of this katydid is unique among Orthopterous insects, so far as known, in that they stridulate in a manner similar to that of the males. The tegmina are partially opened and closed just as are those of the males during stridulation. The roughened surface of the triangular anal areas rub over each other, like the tympani of the males, the right tegmen sliding beneath the left one. The resulting sound is a sharp, scraping note, heard easily for several yards. This sound is made by the female when disturbed by handling, but whether or not it is ever made voluntarily in nature is not known, but it presumably is when the insect is disturbed by any cause."

According to Riley (1874, 167) the eggs of the true katydid are thrust, by means of the sharp ovipositor, into crevices and soft substances, and probably, in a state of nature, into the crevices of loose bark, or into the soft stems of woody plants. They are of a

dark slate color, about 6.5x2 mm. in size, very flat, pointed at each end, and with the edges beveled off or emarginate. Caudell (1906, 33) mentions a female that was found on Plummer's Island, Md., with the ovipositor inserted into the bark of a small elm tree a few feet above the ground. Later (1918, 112) he records one as ovipositing in the bark of the black walnut.

226a. PTEROPHYLLA CAMELLIFOLIA INTERMEDIA (Caudell), 1906, 41. Southern True Katydid.

Smaller than the average *camellifolia*. Color the same. Pronotum with anterior transverse sulcus less deeply impressed. Tegmina of female narrower, the hind margin, when spread, nearly straight, the tip narrowly rounded. Cerci of male as described in key. Length of pronotum, ♂, 5, ♀, 5.5; of tegmina, ♂, 34, ♀, 35.5; of hind femora, ♂, 21, ♀, 20—21.5; of subgenital plate ♂, 13; of ovipositor, 18 mm. Width of tegmina, ♂, 18, ♀, 14 mm.

Hollister, Mo., July 22 (*Davis*). Caudell's types were from Biloxi, Miss., and Wellsboro, Texas. R. & H. (1916, 257) have recorded a male from North Carolina and placed *intermedia* as the southern race of *camellifolia*, stating that their male is intermediate between Caudell's types and typical *camellifolia*. The Missouri specimen at hand is a female having the tegmina as described by Caudell. A large series from the territory south of the known range of *camellifolia* will be necessary to fix the true status of *intermedia*.

II. LEA Caudell, 1906, 42. (Without meaning.)

Larger, more elongate species than those of *Pterophylla*, having the head narrower, vertex much the same; disk of pronotum about one-half longer than the middle width, rugose, the prozona one-fourth longer than metazona; lateral lobes perpendicular, one-third longer than high, hind margin straight, oblique, rounded into the straight lower one; tegmina elongate-elliptical, two and a half times as long as the middle breadth, both margins feebly curved into the broadly rounded tips, the venation of the costal field as in *Pterophylla*. All the femora armed below and the middle and hind tibiæ above. Male with shrilling organ as in *Pterophylla*; supra-anal plate triangular, nearly twice as long as wide; cerci widely forked, the base between the forks concave, branches slender, tapering, the upper ones incurved and crossed, the lower ones upcurved and subparallel; subgenital plate long, slender, upcurved, grooved above and beneath, deeply and narrowly forked at apex, the tips acute. Female with ovipositor much as in *Pterophylla*, slightly narrower and more upcurved; supra-anal plate

twice as long as wide, its apex narrowly rounded; cerci subcylindrical, tapering, the tips slightly forked. A very distinct genus, as shown by the characters given in key and above. Only one species is so far known.

227. LEA FLORIDENSIS (Beutenmüller), 1903, 637. Florida Katydid.

Green or greenish-yellow fading to dull yellow, the tympanum of male brown. Antennæ twice as long as body. Pronotum with two transverse sulci feebly impressed, front margin broadly convex, hind one subtruncate or very broadly rounded, lateral carinæ rounded and vague on prozona, more distinct on metazona; lower front angle of lateral lobes narrowly rounded. Other structural characters as given above. Length of body, ♂, 32—43, ♀, 35—39; of pronotum, ♂, 6.5—8, ♀, 7.2—8.5; of tegmina, ♂, 32—37, ♀, 34—35; of hind femora, ♂, 23—28, ♀, 26—27; of subgenital plate, ♂, 12; of ovipositor, 14 mm. Width of tegmina, ♂, 13—15, ♀, 15—18 mm.

LaGrange, Fla., June; Pablo Beach, Fla., Aug. 13 (*Davis*). Known only from Florida, and so far found only in a narrow strip along the east coast from Pablo Beach to Miami. The type of Beutenmüller was from near Grant, and he says that it lives in the tops of live-oak trees, the note of the male, being a continuous *"kerr-kerr-kerr-kerr,"* with about one second interval of rest. R. & H. (1907, 302) record the taking in August of numerous specimens at Pablo Beach, where it was apparently abundant "in bushes about eight to ten feet high growing on the land face of the dunes. The note is much lower than in *P. camellifolia,* decidedly weaker, and consisting of single notes separated by regular intervals."

Davis (1914, 198) records *L. floridensis* from LaGrange, Sept. 10—12, and says: "We sometimes heard among the oaks and cabbage palms, but not in the pine woods, a low *chluck, chluck,* evidently the call of some large insect, though its carrying power was poor and one had to be quite near in order to hear it. There were several of the insects about, and one evening when the moon was shining brightly and with the aid of a lantern, one was discovered among the leaves of a cabbage palm. Enough was seen to identify it with *Cyrtophyllus floridensis* and the next day I knocked a female of the same species from a cabbage palm into my umbrella. A nymph was found at night hanging from moss on a low palmetto, drying itself, having just shed its skin. This nymph was brownish in color, but the adult male and female were all green. Near Miami, 180 miles to the south of LaGrange, one of these insects was heard stridulating every evening in the latter part of September. It lived among the Spanish moss in a large oak in a clearing, and as it always took alarm at the light of my lantern it could not be observed, much less collected."