

dd. Front and middle femora unarmed beneath; vertex terminating in a rounded tubercle with concave sides; smaller, more slender species, length of body less than 24 mm.

Subfamily IV. CONOCEPHALINÆ, p. 533.

aa. Tegmina and wings absent, or the former rudimentary; general color gray or brown.

e. Pronotum extending back to the abdomen; prosternal spines usually present; tegmina present, usually rudimentary; fore tibiæ with a hearing organ near the base.

Subfamily V. DECTICINÆ, p. 586.

ee. Pronotum short, not covering the whole top of thorax; prosternal spines absent; tegmina and wings absent; fore tibiæ without a hearing organ near the base.

f. Eyes elongate-ovate, vertical, situated at the side of the basal joint of antennæ; ovipositor ensiform, curved strongly upward; tarsi depressed, their joints lobed beneath.

Subfamily VI. GRYLLACRINÆ, p. 602.

ff. Eyes subrotund, situated partly above the basal joint of antennæ; ovipositor nearly straight; tarsi compressed, the joints not lobed.

Subfamily VII. RHAPHIDOPHORINÆ, p. 606.

Subfamily I. PHANEROPTERINÆ.

THE BUSH AND ROUND-HEADED KATYDIDS.

The species of this subfamily are among the largest of our winged Tettigoniidæ, and, with those of the Pseudophyllinæ, are commonly known as "Katydids." The name Phaneropterinæ is based upon the typical old world genus, *Phaneroptera* Serv., meaning, "visible wing," and refers to the exposed tips of the inner wings which extend beyond the tegmina in repose. They all agree in having the head short, face vertical, or nearly so; vertex varying greatly in width, the fastigium either ending in a blunt deflexed spine or broadly rounded, never projected in front of eyes as a cone or sharp spine; eyes small, variable in form, situated close to and at the side of basal joint of antennæ; pronotum short, its disk flat or concave, more or less narrowed in front, usually meeting at right angles the perpendicular lateral lobes, its posterior lobe prolonged distinctly behind them with usually a wide, deep humeral sinus or emargination at the junction; median carina wanting or very faint, lateral ones more or less distinct, hind margin broadly rounded, rarely (*Arethava*) obtuse-angled; lateral lobes flat, their hind margin and lower posterior angle broadly rounded; lower margin rounded or sinuous, front margin variable; tegmina as described in key, usually a bright uniform green in color; wings long and strong, folded like a fan; meso- and metasterna broadly lobed along their median line; legs variable

in length as to genus, the front and middle ones always much shorter than the hind pair; ovipositor and male genitalia variable as to genus.

These "round-headed" and "bush katydids" are mostly arboreal in habitat, the great majority of them passing their entire lives on shrubs and trees, where they feed upon the leaves and tender twigs, and, when present in numbers, often do much injury. The color and form of their wings serve admirably to protect them against their worst foes, the birds; and as they live a solitary life, i. e., do not flock together in numbers as do the green or meadow-grasshoppers, they are but seldom noticed by man. Their love calls, or songs, however, make the welkin ring at night from mid-July until after heavy frost, and though but one or two of the species make a note in any way resembling the syllables "katy did, she did," yet all are accredited with this sound by the casual observer, and hence the common name usually given to the members of this subfamily. Their call is seldom made by day for the obvious reason that it might attract the attention of the birds and so lead to the destruction of the songster. As twilight approaches, however, the male of each species begins his peculiar note, which is often kept up with little or no intermission until the approach of day warns him that his feathered enemies will soon be on the alert, and that silence will be, for a time, the best policy to pursue.

From the other Locustidæ, these katydids differ widely in their habits of oviposition. The eggs are rarely deposited in the earth or in twigs, but are either glued fast in double rows to the outer surface of slender twigs, or are inserted in the edges of leaves. On account of this method of oviposition, the ovipositors of the katydids are broader, more curved, and more obtuse at the end than in the other subfamilies, whose members oviposit in the earth, in rotten wood or in stems of grass.

The subfamily is represented in the eastern states by eight genera, the principal literature treating especially of their species being as follows: Riley, 1874; Brunner, 1878; Scudder, 1893, 1898; Blatchley, 1893, 1903; Saussure & Pictet, 1897—1899; Rehn & Hebard, 1914, 1914a, 1914b, 1916; Rehn, 1917.

KEY TO EASTERN GENERA OF PHANEROPTERINÆ.

- a* Hind legs nearly or fully four times as long as body (Fig. 151); pronotum saddle-shaped, its hind margin obtuse-angled; eyes oblong-oval, nearly twice as long as wide. I. ABETHLÆA, p. 460.
- aa*. Hind legs at most less than three times as long as body; pronotum not saddle-shaped, its hind margin broadly rounded; eyes usually globose, at most but one-half longer than wide.

- b. Tegmina distinctly shorter than wings, their apex not broadly obliquely truncate (Fig. 157, *a*); apex of ovipositor not acuminate.
- c. Tegmina long, narrow, but little or slightly broader at middle than at apex; fastigium of vertex horizontal or but feebly deflexed, but little if any wider than basal joint of antennæ.
- d. Middle femora unarmed beneath; eyes subglobose; subgenital plate of male long, slender, upcurved, its apical notch usually V-shaped. II. SCUDDERIA, p. 462.
- dd. All the femora spinulose beneath; eyes oblong-oval, one-half longer than wide; subgenital plate of male short, broad, nearly straight, its apical notch broad and rounded.

III. SYMMETROPLEURA, p. 475.

- cc. Tegmina broad, distinctly wider at middle than at extreme apex.
- e. Fastigium of vertex deflexed to nearly the same plane as the frontal fastigium, obtuse, usually twice or more than twice as wide as first antennal joint.
- f. Hind femora long, reaching to or beyond apical fourth of tegmina; fore and middle tibiæ flat or sulcate above, their margins raised, acute; tegmina oblong-elliptical or ovate; ovipositor long, curved gradually upward, usually strongly serrate on both edges. IV. AMBLYCORYPHA, p. 476.
- ff. Hind femora shorter, stouter, not reaching beyond apical third of tegmina; fore and middle tibiæ smooth and rounded above without angular margins; tegmina ovate-lanceolate, sometimes very broadly so; ovipositor short, bent abruptly upward, finely or not at all serrate.
- g. Disk of pronotum flat, its margins rounded or subacute, entire; smaller, length of body not over 33, of tegmina, not over 50 mm. V. MICROCENTRUM, p. 484.
- gg. Disk of pronotum concave, its margins elevated and crenulate; larger, length of body 37 or more, of tegmina 60 or more mm. (Fig. 163, *a*.)

VI. STILPNOCHLORA, p. 489.

- ee. Fastigium of vertex not as wide as basal joint of antennæ, but slightly deflexed and meeting the narrower frontal fastigium at almost a right angle; disk of pronotum coarsely and thickly punctate; length of tegmina not over 33 mm.

VII. TURPILIA, p. 492.

- bb. Tegmina as long as or slightly longer than wings, very broad, the apex obliquely truncate; apex of ovipositor acuminate; fore and middle tibiæ flat or sulcate above, their margins raised, acute.

VIII. PHRIXA, p. 493.

I. ARETHLÆA Stål, 1876, 55.

Elongate, very slender species, having the face flat, perpendicular, fastigium triangular, depressed, declivent, sulcate, continuous with the front; antennæ very long, slender, the basal joint twice as long as broad, set in shallow, widely margined sockets; pronotum saddle-shaped with faint median carina; prozona with

sides rounded into the lateral lobes, metazona triangular, prolonged backward and upward; humeral sinus feeble; lateral lobes sloping, longer than wide, their hind margins very oblique, so broadly rounded into the sinuous lower margin that the angle is scarcely evident; tegmina very long, narrow, basal fifth of costal border widened, tips rounded; wings 8—9 mm. longer than tegmina; legs very long, extremely slender, hind tibiæ longer than the femora, lower lobe of knees ending in a pointed spine.

The genus is confined to the United States and Mexico, one of the 11 known nominal species occurring in Georgia and Florida, the others from Texas and Nebraska to California.

210. *ARETHÆA PHALANGIUM* (Scudder), 1877, 40.

Size large for the genus; form elongate, compressed. General color green. Head with a narrow pinkish-purple stripe behind each eye these extending back, narrowing and converging on prozona; hind margins of metazona and lateral lobes white bordered within by pinkish. Hind femora tinged with pinkish-purple. Tegmina one-third to one-half longer than body, broader at apical fourth than at basal third, the stridulating field of male shorter than the disk of pronotum. Male with supra-anal plate very short, its apex broadly rounded; cerci short, stout, apically incurved, their tips acute; subgenital plate long, rigid, truncate at tip; styles very short, placed on the outer angles of the plate. Female with ovipositor very short, broad, upturned, strongly compressed, bluntly pointed, its sides rugose and margins finely crenate. Other structural characters as above given. Length of body, ♂, 16—22, ♀, 19—24; of antennæ, ♂, 65—68, ♀, 61; of pronotum, ♂, 4.8—5.3, ♀, 5—5.8; of tegmina, ♂, 28—32, ♀, 31—36; of wings, ♂, 36.5—43, ♀, 36.5—40; of hind femora, ♂, 33—37, ♀, 36—40; of hind tibiæ, ♂, 41, ♀, 42; of ovipositor, 5—5.8 mm. (Fig. 151.)

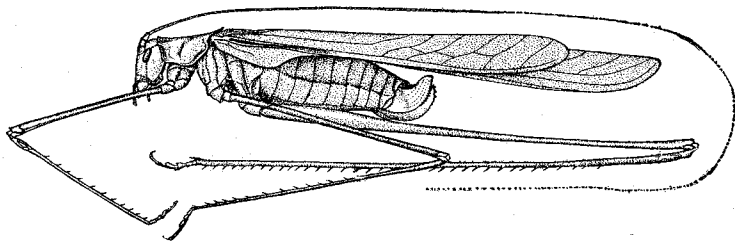


Fig. 151. Lateral view of female of *Arethæa phalangium*. $\times 2$. (After R. & H.)

This peculiar long-legged, slender-bodied species was described from Georgia, is known only from that State and Florida, and seems to be very scarce wherever found. In Florida it has been recorded only from Hastings, Gainesville, Sanford, Miami, Homestead, Pine Island and Ft. Myers. Nymphs were taken at Miami and Ft. Myers in March and April, and adults at the other stations between May 18 and Aug. 16. Hebard (1916) says that it is

probable that the species occurs as adult in greater numbers earlier than do most other Tettigoniidæ, and that by August only occasional survivors are to be found. It occurs for the most part on the undergrowth of open pine woods. In Georgia it is known only from Thomasville, Hebardville and Augusta.

Scudder (1877, 38) founded for this species and one other the genus *Aegipan* which has since been placed as a synonym of *Arethæa*. The *Arethæa multiramosa* Brunner (1878, 235) is a synonym of *A. phalangium*.

II. SCUDDERIA Stål, 1873a, 41. (In honor of S. H. Scudder.)

BUSH KATYDIDS. NARROW-WINGED KATYDIDS.

This genus includes katydids of medium size, having the vertex compressed, hollowed out on either side for the better accommodation of the eyes; disk of pronotum flat; tegmina as described in key, their tips rounded; fore coxæ armed with a spine; fore tibiæ sulcate above with margins acute; hind femora long, slender, almost equalling the length of tegmina in some species; all the knees with lobes armed with two feeble spines. Males with subgenital plate as described in key; last dorsal segment, in all but one of our eastern species, greatly prolonged, decurved, forked or

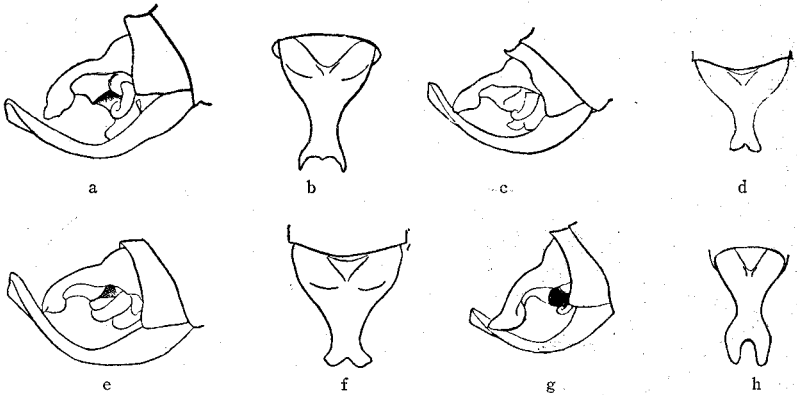


Fig. 152. Lateral view of extremities of male abdomen and dorsal view of male abdominal process of *Scudderia*. a, b, of *texensis*; c, d, *pistillata*; e, f, *curvicauda*; g, h, *furcata*. (After Scudder.)

notched at tip to receive or partially embrace the apical portion of the upcurved subgenital plate (Fig. 152). Females with ovipositor short, broad, usually curved sharply upward, the apical third finely crenate on both margins (Fig. 153).

The genus *Scudderia* is mainly confined to America north of Panama and up to 1898, when it was monographed by Scudder, the synonymy was so badly mixed that it is difficult to say just

what species was previously referred to by any writer. Mr. Scudder in his Monograph (1898) finally brought order out of chaos and fixed the present standing of most of the species. The genus was later again monographed by R. & H. (1914a), and of the 11 species and three varieties recognized by them, six species and two varieties are herein treated as occurring in the eastern states and Canada. The females are very similar and difficult to separate unless taken with the males in the field. The following key is therefore based mainly upon the latter sex.

KEY TO EASTERN SPECIES OF SCUDDERIA.

- a. Last dorsal abdominal segment of male subtriangular, without an elongate, decurved median process; subgenital plate not compressed toward apex; cerci long, slender, tapering (Fig. 153, *h*); tegmina rather broad, dull, with swollen veinlets; ovipositor with both margins curved, not bent, more than half as long again as pronotum (Fig. 153, *a*.) 211. SEPTENTRIONALIS.
- aa. Last dorsal segment of male with an elongate, median, decurved process either notched or forked at tip (Fig. 152, *a*, *g*); subgenital plate narrowed and compressed towards apex; cerci shorter, very strongly incurved (Fig. 153, *i*.) their apical third thickened; ovipositor bent as well as curved, distinctly less than half as long again as pronotum.
- b. Apex of decurved process of male not distinctly and deeply forked as shown in Fig. 152, *h*, but either with a very wide and shallow or a narrow median notch.
- c. Notch of dorsal abdominal process of male subquadrate, with a minute median tooth, the notch as wide as the middle of the upturned subanal plate and embracing the sides of the latter when in natural position, its lateral processes slender and compressed (Fig. 152, *a*, *b*); ovipositor suddenly and strongly bent upward, its base distinctly broader than the middle (Fig. 153, *b*.) 212. TEXENSIS.
- cc. Notch of dorsal abdominal process without a median tooth, much narrower than the subgenital plate and touching only, not embracing, the upcurved subanal plate (Fig. 152, *c*, *f*.)
- d. Tegmina usually distinctly wider than length of pronotum, not striped with dark brown; ovipositor less suddenly bent upward and (except in *strigata*) not wider at base than at middle.
- e. Lobes or lateral processes (each side of notch) when viewed from above, narrow and distinctly tapering apically; tegmina wide, not over four times longer than the middle breadth; ovipositor sharply bent upward, its base and middle subequal in width (Fig. 153, *c*.) 213. PISTILLATA.
- ee. Lobes or lateral processes of notch well rounded, subequal in width, their margins thinner; tegmina usually no broader than depth of body, nearly or more than five times longer than the middle breadth.

- f. Tegmina at middle distinctly broader than length of pronotum; disk of pronotum with side margins diverging backward, subacute, not broadly rounded into the perpendicular lateral lobes. 214. CURVICAUDA.
- fi. Tegmina narrower, at middle no wider than length of pronotum; side margins of pronotum more parallel, broadly rounded into the more sloping lateral lobes; ovipositor distinctly broader, less suddenly bent upward. (Fig. 153, c.) 214a. LATICAUDA.
- dd. Tegmina much narrower than the length of pronotum, strongly reticulate, each with a blackish-brown stripe along its dorsal field; notch of abdominal process very shallow, the lobes each side short, broad, strongly flattened; lateral angles of pronotum broadly rounded; ovipositor wider at base than at middle (Fig. 153, f.) 215. STRIGATA.
- bb. Apex of decurved abdominal process of male distinctly and deeply forked (Fig. 152, g, h), usually embracing the sides of the upcurved subgenital plate; size smaller and form more slender than our other common species.
- g. Lobes of forks of abdominal process shorter, subcylindrical, rounded above, widely separated at tips. 216. FURCATA.
- gg. Lobes of forks of abdominal process obliquely compressed, their upper edges subacute, more narrowly separated, especially at tip. 216a. CUNEATA.

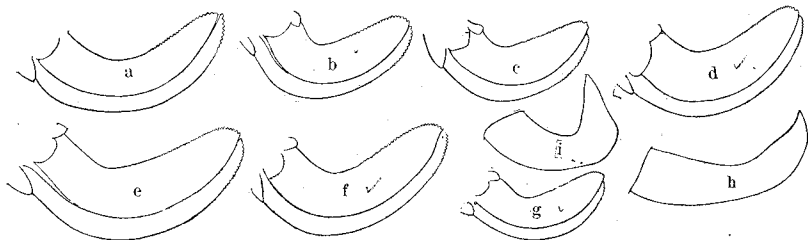


Fig. 153. a—g, Outlines of ovipositor of *Scudderia*; a, of *septentrionalis*; b, *texasensis*; c, *pistillata*; d, *curvicauda*; e, *laticauda*; f, *strigata*; g, *furcata*; h, Outline of male cercus of *S. septentrionalis*; i, same of *S. pistillata*. All much enlarged. (After R. & H.)

211. *SCUDDERIA SEPTENTRIONALIS* (Serville), 1839, 416. Northern Bush-katydid.

Size very small for the genus; form slender. General color pale green more or less tinged with yellow; tegmina, basal half of pronotum, hind femora and all the tibiæ a uniform rather dark green; apical half of antennæ brownish. Disk of pronotum with sides feebly divergent behind, lateral carinæ evident only behind middle, basal lobe broader than in *S. furcata*. Tegmina shorter and broader than in *furcata*, more strongly reticulate and of a coarser texture. Male abdominal appendages as described in key, the subgenital plate narrowing gradually, strongly upcurved, its apex deeply and broadly notched. Ovipositor one-third as broad as long, gently curved, finely crenate above (Fig. 153, a.) Length of body, ♂, 16—18.5, ♀, 20; of pronotum, ♂, 4.7, ♀, 5; of tegmina, ♂, 25—28, ♀, 26—27; of hind femora, ♂ and ♀, 18—19.5; of ovipositor, 8.7 mm. Greatest width of tegmina, ♂, 7—7.3, ♀, 7.5 mm. (Fig. 154.)

Greenport, Long Island, N. Y., Aug. 3; taken at light (*Davis*). A very scarce species wherever found, its known range extending from Norway, Maine, to West Point, Nebraska, and south to Vineland, N. Jer. The male was figured by Luggler (1898, 221) as that of *Scudderia pistillata* Brunner, and therefore doubtless occurs in Minnesota, though not definitely recorded by him. The figure from Luggler's work was also care-

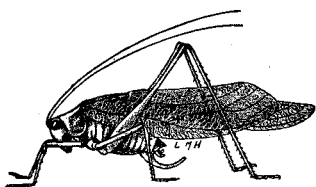


Fig. 154. Male. Natural size.
(After Luggler.)

lessly used by me (1903, 347) as that of the male of *pistillata*. The species is not known from Indiana, though it probably occurs about peat bogs in the Transition Zone of the northern third of the State. It is not recorded from Canada or Michigan, though a specimen from Lone Rock, Wis., is in the U. S. Nat. Museum. The few specimens in collections throughout the eastern states have mostly been taken from undergrowth in woods. The *S. truncata* Beutenmüller (1894a, 252) is a synonym.

212. *SCUDDERIA TEXENSIS* Saussure-Pictet, 1897, 328. Texan Bush-Katydid.

Size large for the genus. Tegmina, wings and legs bright grass green, body and face tinged with yellow, pale clay-yellow in dried specimens. Pronotum much longer than broad, narrower in front than behind, usually with a yellowish line along the lateral carinæ. Hind femora very slender, armed beneath on inner carina with three or four minute spines. Male genitalia as described in key. Length of body, ♂, 21—25, ♀, 24—28; of pronotum, ♂ and ♀, 5.5—6.5; of tegmina, ♂, 31—39, ♀, 28—38; of wings beyond tegmina, 6; of hind femora, ♂, 26—30, ♀, 27—32; of ovipositor, 7—8 mm. Width of tegmina, 6.3—8.5 mm. (Plate I.)

This large, narrow-winged species is, in Indiana, one of the most abundant of the bush-katydid, occurring everywhere throughout the State, but is much less common in the southern counties, where it probably reaches maturity about July 15. The earliest date on which adults have been taken was July 22, in Putnam County. This insect is probably less arboreal than any other species of katydid, as it is often found clinging to the tall, coarse grasses and sedges which grow near the borders of lakes and ponds and in damp ravines, and to the coarse weeds along the margins of prairies and meadows. When approached it flies rapidly in a zigzag, noiseless manner for a long distance to another clump of grass or weeds, or to the lower branches of an oak, a tree in which it delights to dwell.

Aside from Indiana specimens others are at hand from North Madison, Conn., and Lake City, Gainesville, Dunedin and Ft. Myers, Fla. The two males from Lake City are very much smaller

with distinctly narrower tegmina than those from the north, the length of body being but 18 and of tegmina but 28 mm., while the greatest width of tegmina is less than 1 mm. more than the length of pronotum. About Dunedin the nymphs are frequent from Jan. 15 to April 10, but the only adults seen were taken on October 31 and December 18. There it occurs on grasses and sedges about the borders of low places in pine woods, along railway embankments and in old abandoned fields. It has been recorded from numerous localities throughout Florida, adults having been taken at Miami in January and at LaBelle and Marco in April.

Until 1898 *S. texensis* was confused by most American collectors with *S. curvicauda*, and many of the older records of the latter species refer to the former. The specific name given the species by Saussure and Pictet was an ill-fitting one, as it ranges from New England and Ontario west to Montana and Wyoming and south to southern Florida and western Texas, being everywhere found in suitable habitats within the bounds of the area mentioned. Walker (1904a, 325) states that it is "quite common in southwestern Ontario, but seems to be confined to that part of the province." R. & H. (1914a, 295) mention it as "one of the very few destructive Phaneropterids found in the United States, doing particular damage to cranberry crops. In New Jersey it has been frequently observed along the salt marshes where, after dark, it would be found locally abundant in areas of *Scirpus*, resting head down and motionless near the tips of these rushes and frequently beaded with dew. On bright warm afternoons it was observed in the taller vegetation near the border of the salt marshes, where the males were moving actively about emitting their rather prolonged and harsh stridulation."

Of the notes of *S. texensis* Allard (1911, 30) says:

"I have heard two distinct methods of stridulation produced at will by this *Scudderia*. The usual note heard from Massachusetts to Georgia is a soft *sh-sh-sh-sh-sh-sh*, occasionally repeated. This note is produced by a rapid shuffling of the wings very briefly. At other times and much more rarely the call consists of a succession of sharp, keen, distinct rasping notes slowly delivered, *zeet-zeet-zeet-zeet*. These notes, which are so unlike the usual call, are usually at once answered in a similar manner by another individual elsewhere. One is at first tempted to assign them to some other insect. By creeping carefully toward the musician, the writer has watched this mode of stridulation close at hand. The tegmina are very slowly and deliberately opened and rasped upon each other slowly several times. These notes are really more in keeping with the incisive notes of other *Scudderias* and it is evident that they are not accidental. They probably convey some definite meaning to other individuals within earshot. *S. texensis*

becomes noisy as soon as the afternoon sun gets low, and continues to stridulate into the evening. These katydids sometimes congregate in small colonies of half a dozen or more in favorite spots. It is a persistent singer, though its notes are delivered at rather rare, irregular and infrequent intervals, a characteristic of most species of *Scudderia*."

The eggs of *texensis* are laid in the edges of leaves between the upper and lower epidermis, and at first are so thin that they are not noticeable except when the leaf is held between one's self and the light. They are loosely inserted in these pockets made by the ovipositor of the mother, and as they swell in coming in contact with the ruptured tissues of the plant, they are held tightly in place. In the northern states the winter of this, as well as of the other species of the genus, is passed in the egg stage, the young appearing about the last of April.

213. *SCUDDERIA PISTILLATA* BRUNNER, 1878, 240. Broad-winged Bush-katydid.

Size medium for the genus. Color as in *curvicauda* to which it is closely allied. It is, however, shorter-bodied, broader-winged and shorter-legged. Tegmina broader than in any other species, with heavy veinlets which give them a very leaf-like appearance. Notch of dorsal abdominal process of male very similar to that of male *curvicauda*, but its lateral processes subtriangular, distinctly tapering instead of well rounded and of subequal breadth as in the latter species. Subgenital plate shorter than in *curvicauda*. The short, broad tegmina and short hind femora of *pistillata* are the characters which most readily distinguish the two. Length of body, ♂ and ♀, 19—20; of pronotum, ♂ and ♀, 4.7—5.7; of tegmina, ♂, 29—33, ♀, 25.5—28; of hind femora, ♂, 21—29, ♀, 19.5—21; of ovipositor, 6.5 mm. Greatest width of tegmina, ♂, 9—11, ♀, 8—9 mm.

This is apparently a scarce insect in Indiana, having been taken in small numbers only about the peat bogs and borders of lakes in Steuben, Fulton and Kosciusko counties; Aug. 13—Oct. 7. Specimens are at hand from the White Mountains, N. H., Sherborn, Mass., DeGrassi Point, Ont., and Tecumseh, Mich., July 25—Sept. 3. It is a species of northern range, its known distribution extending from Nova Scotia and New England north and west to Fort Williams, Ont., Regina, Sask., and Bozeman, Mont., and south and west to Monterey and Bolar, Va., southern Illinois and northeastern Nebraska.

Piers (1896) has given an interesting account of *pistillata* as it occurs in Nova Scotia as follows:

"This handsome katydid is very common about Halifax. It is found upon the foliage of bushes, chiefly alders, in or near swampy places. Although plentiful, its protective similitude to a leaf, both in color and form, and its usual slow movements, make it very difficult to detect. Usually it can be readily captured with the fingers while it clings to a leaf. Oc-

asionally, on a near approach to the bush upon which it rests, it will drop suddenly a foot or two to a branch beneath.

“Attention is chiefly directed to it by the loud stridulation of the males at nightfall. During the day they are usually silent, or at rare intervals produce a short sharp *zip*. After dark, however, they make the swamp resound with their loud calls, and we then become aware of their abundance. On close examination at such a time the males—usually only one on each bush—may be seen walking very slowly over the leaves and twigs. Occasionally they suddenly slightly lift and part the wing covers and close them again, thereby producing a sharp *zip* or *crick*, this being their usual day note. After making this sound at irregular intervals for some time, the tegmina are opened to a greater extent, and are then again closed, producing a long-drawn, exceedingly loud *cr-r-r-r-r-ick*, which is repeated in couplets several times in succession. This challenging cry is immediately answered by one after another of its neighboring fellows, until numbers are rasping out their ear-piercing notes, as notable a rural chorus as that of the tree toads.”

Walker (1904a, 327) states that *pistillata* is much more abundant in northern than in southern Ontario, being “common on bushes, tall herbs and grass on the borders of low woods and along fence rows.” Hebard says that at Pequaming, Mich.: “I heard the first katydid about August 12, and as *pistillata* is the only large Locustid found in this region, I knew what species was producing the sound. Before this date there was no insect which made a loud noise at night. Now in the evenings ‘*zikk-zikk-zikk-zikk*’——‘*zikk-zikk, zikk, zikk*’ could often be heard. A week later they were plentiful and in the meadows and pastures their daytime note of ‘*zikk*’ was to be heard on all sides. Having found that they preferred the tops of bushes where they could sun themselves, eat and stridulate, I found them easy to capture, for, approaching cautiously, one could usually get within a few feet of the musician before it took alarm and ceased its music.”

Fox (1917) states that “at Monterey, Va., *pistillata* was found in briers and low shrubbery on dry stony mountain slopes close to the woods covering the summit where it was associated with *S. furcata*. At Bolar it occurred in the tall herbage of an old meadow in the intermontane valley. This is, I believe, the most southern authentic record of this species.” Saussure & Pictet (1897, 332) record *pistillata* from Georgia. Scudder says this record is “surprising,” and R. & H. (1914a, 280) say “this locality is certainly an error, as the insect is not known to occur in the Appalachians south of northern Pennsylvania.” Since they wrote Fox has found it in Virginia and S. & P. were probably correct in their record.

214. *SCUDDERIA CURVICAUDA* (DeGeer), 1773, 446. Curve-tailed Bush Katydid.

Size large for the genus. Closely resembling *texensis* in size and appearance. General color pale green; head, pronotum, fore and middle femora and under surface tinged with yellow, usually fading to dull clay-yellow in drying. Lateral margins of pronotum with yellow lines faint or wanting. Pronotum broader in front and less distinctly divergent behind than in *texensis*; humeral sinus less rounded, lateral lobes distinctly longer, their hind margin less oblique. Tegmina shorter and somewhat broader. Hind femora proportionally shorter. Notch of abdominal process very different, as described in key. Female more robust with ovipositor broader, much less suddenly and strongly bent upward and with serrations less prominent than in *texensis*. Length of body, ♂, 18—23, ♀, 19—25; of pronotum, ♂ and ♀, 5—6; of tegmina, ♂, 26—37, ♀, 28—38; of hind femora, ♂, 21—30, ♀, 21—32; of ovipositor, 7—8 mm. Width of tegmina, ♂ and ♀, 6—8 mm.

This, the most robust of our northern species of *Scudderia*, probably occurs in all portions of Indiana, but is apparently less common than *texensis*, especially in the southern counties. It is abundant about the marshy meadows bordering some of the lakes and tamarack swamps of northern Indiana. The earliest date on which a mature specimen was taken was July 10 in Knox Co. In autumn I have, for several years, found both it and *texensis* present in numbers in company with *Mecostethus lineatus* and *Chorthippus curtippennis* in a muck meadow forming part of a long narrow swamp five miles northeast of Indianapolis. The two katydids are so similar in appearance and habits of flight that they cannot be told apart in the field, but when closely examined are easily separated by the characters given in the key. As already noted, the earlier records of this species were largely based on specimens of *texensis*, both Bruner and Scudder for many years confusing the two. The *S. curvicauda* of my first work on the family (1893, 99) should be referred to *texensis* and the *S. furculata* (p. 100) to *curvicauda*. The *Phaneroptera angustipennis* Harris (1841, 129) is also a synonym of *curvicauda*.

The known range of *S. curvicauda*, as here recognized, extends from Maine and Nova Scotia north and northwest to the Severn River, Ont., and Aweme, Man., and south and west to New Jersey, Virginia, Tennessee and Nebraska. The species varies much in size and appearance, R. & H. (1914a, 281) separating the smaller northern individuals under the name *S. c. borealis*. The characters which they give in their key are comparative only, being "size small, form compact; tegmina rather broad and short," and in their original description they give not a single fixed char-

acter of differential value. No one can satisfactorily separate a species, or even a race based on such a diagnosis, and as specimens at hand taken by Gooderham in Nova Scotia and Quebec show that the structural characters of the genital organs are precisely the same, I regard their name no more necessary than would be one for the small narrow-winged individuals of *texensis* recorded above from Florida. In the southern and southwestern states *S. curvicauda* merges with a form, the *S. laticauda* Brunner, which has some definite structural characters which are evident and which probably represent a valid race.

The more recent records of *curvicauda*, which can be relied upon as belonging to that species, show that in the east and north it is more arboreal than in Indiana. Walker (1904a, 326) states that his Toronto specimens all came from trees and bushes in more or less open, partly wooded country. In Pennsylvania Fox (1914, 518) found *S. curvicauda* to be "essentially a sylvan species frequenting the trees and underbrush of both dry and moist woodlands, less frequent in the border thickets of open meadowlands," while about Tappahannock, Va., the few examples taken were found in bushes and briery thickets in the vicinity of woodland. R. & H. (1914a, 284) state that the species is "common and widely distributed through the undergrowth of the woods in

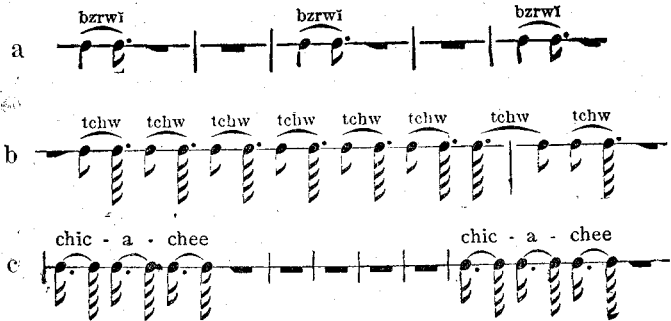


Fig. 155. a, Note of *Scudderia curvicauda* by day; b, note of same species by night; c, note of *Amblycorypha rotundifolia*. (After Scudder.)

the Pine Barrens of New Jersey; in this region *S. texensis* is also common, but is found only in marshes, swamps or bogs."

Scudder (1893) has set the day and night songs of *S. curvicauda* to scale, and has given a pleasing account of their notes as follows:

"It is more noisy by night than by day; and the songs differ considerably at these two times. The day song is given only during sunshine, the other by night and in cloudy weather. I first noticed this while watching one of the little creatures close beside me; as a cloud passed over the sun he suddenly changed his note to one with which I was already famil-

lar, but without knowing to what insect it belonged. At the same time all the individuals around me, whose similar day song I had heard, began to respond with the night cry; the cloud passed away, and the original note was resumed on all sides. Judging that they preferred the night song to that of the day, from their increased stridulation during the former period, I imitated the night song during the sunshine, and obtained an immediate response in the same language. The experiment proved that the insects could hear as well as sing. * * * The note by day is *berwi* and lasts for one-third of a second. The night song consists of a repetition, ordinarily eight times, of a note which sounds like *tchw*. It is repeated at the rate of five times in three-quarters of a second, making each note half the length of the day note."

214a. *SCUDDERIA CURVICAUDA LATICAUDA* Brunner, 1878, 238. Broad-tailed Bush-katydid.

Larger and more robust than typical *curvicauda*. Color as there. Pronotum larger, being both wider and nearly one-fifth longer, its side margins more parallel and more broadly rounded into the lateral lobes. Tegmina more narrow, nearly five times as long as greatest width. Dorsal abdominal process of male broader, the notch as in *curvicauda*. Ovipositor distinctly broader and less strongly bent upward, its median and basal width equal or nearly so. Length of body, ♂, 21—23, ♀, 23—27; of pronotum, ♂, 6—7, ♀, 6—8; of tegmina, ♂, 33—39, ♀, 36—40; of hind femora, ♂, 29—32.5, ♀, 30—35; of ovipositor, 9.5—11 mm. Greatest width of tegmina, 7—8 mm.

Mobile, Alabama, July 3 (*Loding*); Billy's Island, Ga., June; LaGrange, Fla., Sept. 13 (*Davis*). Brunner's types were from Georgia. From Florida it has been definitely recorded only from Jacksonville, Atlantic Beach, Gainesville and Live Oak, though R. & H. (1914a, 288) give its range as extending from "Wilmington, N. Car., to Sanford, Fla., and westward as far as Monticello, Miss." It occurs mainly in the undergrowth of open pine woods. They state also that intermediate forms connecting *laticauda* with *curvicauda* have been found in numerous localities from Virginia to Oklahoma, Arkansas and Texas, the area of intergradation between the two forms being very wide.

215. *SCUDDERIA STRIGATA* Scudder, 1898, 280. Striped Bush-katydid.

Size medium; form very slender. Dull pale green the tegmina with a blackish-brown stripe extending along the side of dorsal area from base nearly to apex of each tegmen; anal area pale brown with a large blackish sub-basal spot. Margins of pronotal disk yellow; upper portion of lateral lobes with an obscure brown stripe. Sides of abdomen with a broad interrupted brown stripe, this bordered above and below with a yellowish one. All the femora usually flecked with dark brown. Disk of pronotum more narrow than in *curvicauda*, its side margins broadly rounded into the lateral lobes. Tegmina and male abdominal process as described in key. Ovipositor as long as in *curvicauda*, bent sharply upward near basal third, the ventral margin evenly and strongly curved. Length of body, ♂ and

♀, 19—22; of pronotum, ♂, 5.3, ♀, 5.7; of tegmina, ♂, 32—33.4, ♀, 30—33; of wings, ♂ and ♀, 37—39.5; of hind femora, ♂ and ♀, 27.5; of ovipositor, 8.2 mm.

A very handsome and striking Floridian species. Taken in August and September in some numbers by R. & H. between DeFuniak Springs and River Junction; also at Grand Ridge and near Kissimmee. It occurs only in low swales between the sand ridges. Scudder's types were taken near Jacksonville, and he considered it as only a color variety of *laticauda*, it having been raised to specific rank by R. & H. (1914a, 289).

216. *SCUDDERIA FURCATA* Brunner, 1878, 239. Fork-tailed Bush-katydid.

Size small for the genus; form slender, the sexes subequal. General color a dark leaf-green, rarely suffused with brown, the head, pronotum and under surface greenish-yellow, fading to dull clay-yellow, lateral carinæ of pronotum rarely yellowish; antennæ green at base, the apical three-fourths dusky. Hind tibiæ greenish or purplish-brown, fading to dull yellow or often to dull brown. Disk of pronotum short with sides parallel, the margins or lateral carinæ rather sharp; humeral sinus relatively narrow, deep; all the margins of the lateral lobes broadly rounded. Tegmina subequal in width throughout, coarsely reticulate. Notch of male abdominal process as described in key, forming a curious, fork-like appendage (Fig. 152, *h*,) the lateral processes of which are subcylindrical, much swollen, and normally embrace the sides of the upcurved subgenital plate near the end of the latter. Ovipositor rather short, the dorsal margin suddenly bent upward, the basal and median width subequal. Length of body, ♂, 15—20, ♀, 19—21; of pronotum, ♂ and ♀, 4.6—5; of tegmina, ♂ and ♀, 26—32; of hind femora, ♂ and ♀, 19—20; of ovipositor, 6—7 mm. Width of tegmina, 6—6.2; of ovipositor, 1.8—2.2 mm.



Fig. 156. a, Male; b, female. Natural size. (After Luggler.)

This fork-tailed katydid occurs in all portions of Indiana, having been taken in every county where collections have been made. In the hilly regions of the southern counties it is very common and practically the only species of *Scudderia* noted, *texensis* and *curvicauda* occurring about the marshes of the more level country. In central and southern Indiana the first mature specimens of *furcata* appear about July 15, but they do not become plentiful before the first of August, and I have seen the nymphs in Vigo Co. as late as September 18. It is most frequently seen on the low

bushes and trees about the margins of thickets and along fence rows, but in the prairie country north it frequents coarse grasses and weeds in company with the other species. Its flight is noiseless, seemingly without definite direction, and is not so prolonged as that of *S. texensis*.

This is the most widely distributed and abundant species of the genus, ranging from Maine, Nova Scotia and Quebec north and west to North Bay, Ont., British Columbia and the Pacific coast, and south and west to central Florida, the Gulf coast of Texas, and central California. In a part of its southwestern range it intergrades with the race or variety *S. f. furcifera* Scudder, full details of the distribution of both forms being given by R. & H. (1914a). In Florida it has been recorded definitely only from Jacksonville, Monticello, Pensacola, Gainesville, LaGrange and Lakeland, the last being its most southerly known station in the State.

Walker (1904a, 328) says: "It seems to be quite generally distributed throughout Ontario as far north as Lake Nipissing, but is commoner in the southern part. It frequents trees and bushes about the edges of woods and thickets on both dry and marshy ground, but most often on the latter. I have also taken it at Agassiz, B. C., where it was common on September 9." In Michigan it appears to be scarce, having been definitely recorded only from Huron Co. by Shull. Bruner (1893a) mentions it as found in the middle and southern districts of Nebraska, but less common than *curvicauda*. The *S. fasciata* Beut. (1894a, 251) is a synonym.

C. V. Riley (1874, 169), under the name of *S. curvicauda*, gives the following account of the egg-laying habits and call note of *furcata*; his figure 51 showing beyond doubt that the latter species was the one to which he referred:

"The female stations herself firmly by the middle and hind legs on twigs or leaves contiguous to the one selected to receive the eggs. This leaf is then grasped by the front feet and held in a vertical position, while the edge is slightly gnawed or pared off by the jaws to facilitate the entrance of the point of the ovipositor. When this is done the abdomen is curved under and brought forward, and the ovipositor is seized on its convex edge by the mandibles and maxillæ, which, with the aid of the palpi, guide the point to that portion of the leaf prepared to receive it. After gentle, but repeated efforts, the point of the instrument is finally inserted between the tissues of the leaf, and gradually pushed in to more than half its length. As soon as the cavity is formed, the egg is extruded, and passed slowly between the semi-transparent blades of the ovipositor. As the egg leaves the ovipositor the latter is gradually withdrawn, while the egg re-

mains in the leaf, retained in place, probably, by a viscid fluid that is exuded with it. As many as five of the eggs are sometimes deposited in one row in the same leaf, but more often they are single.

"The shrill of the male is by no means so loud as that of the oblong-winged katydid, *Amblycorypha oblongifolia* (DeGeer), in which its sound is always drowned in the woods. It consists of a softer *zeep, zeep*, sometimes uttered singly, but generally thrice in succession. The call is occasionally responded to by a faint chirp from the females, produced by stretching out their wings as if for flight, and is as often heard in the day as at night."

216a. *SCUDDERIA FURCATA CUNEATA* Morse, 1901b, 130.

Averaging slightly larger than typical *furcata*, but otherwise differing only in the form of the fork of the decurved abdominal process of male, the base of which is narrower and more compressed, the cavity of the fork narrower, slightly deeper, with the processes each side compressed so that their upper edge is very narrow and subacute, not swollen and subcylindrical as in *furcata*. Females of the two forms absolutely inseparable. Length of body, ♂ and ♀, 18—22; of pronotum, ♂, 5—6.7, ♀, 4.8—6.4; of tegmina, ♂ and ♀, 27—34; of hind femora, ♂, 25—29, ♀, 23—30; of ovipositor, 6.3—7.4 mm.

Jacksonville and Miami, Fla., Sept. 7—24 (*Davis*); Tappahannock, Va., Sept. 9 (*Fox*). The Florida specimens at hand are typical *cuneata* as described by Morse, while the Virginia male is intermediate between *cuneata* and *furcata*, the processes of abdominal fork being more narrow and less swollen than in the latter, but much less compressed than in typical *cuneata*. In my opinion *cuneata* is but a variety of *furcata* connecting the latter with *S. mexicana* (Sauss.), a smaller and more strongly compressed species with the lobes of the fork more deeply emarginate beneath, which occurs in Texas, Arizona and along the Pacific coast; the three being probably only well marked forms of one widely distributed and variable species which will bear DeGeer's name.

In Florida *S. f. cuneata* has been recorded from Jacksonville, Gainesville, Monticello, Pensacola and Miami, Aug. 11—Oct. 14. *Davis* (1914, 197) says: "The apical expanded portion of the anal segment shows considerable variation in specimens from Florida, all referred to this species."

R. & H. (1914a, 312) give the known range of *cuneata* as extending from Raleigh, N. Car., south to Miami, Fla., and west to Alabama, Morse's type having been from the latter State. "It has been found to be a scarce but rather generally distributed species, in the low country below the fall line in the region defined." The records show that it is found principally among the undergrowth of pine and other woods. *Fox* (1917) records it from near Nor-

folk and Tappahannock, Va., the single male from the latter place having been taken in company "with numerous examples of *furcata* in an *Andropogon* thicket close to the margins of woods." He has also taken both it and *furcata* at Macon, Ga., and states that some of the specimens "were intermediates, possibly hybrids."

III. SYMMETROPLEURA Brunner, 1878, 245. (Gr., "equal" + "side.")

Slender-bodied species of medium size resembling *Scudderia* but having the fastigium between the eyes, sulcate and very narrow; eyes oblong-oval; disk of pronotum flat, two-thirds longer than wide, its sides just visibly divergent toward base, lateral carinæ obtuse, front margin truncate, hind one broadly rounded; lateral lobes perpendicular, longer than deep, their hind margin obliquely broadly rounded into the lower one; tegmina proportionally shorter than in *Scudderia*, their texture coarser, the reticulation much finer and more close, without the prominent cross veins of *Scudderia*, the costal field visibly narrowing from middle to apex. Male with last dorsal segment not prolonged into a decurved spine; supra-anal plate triangular, deflexed between the cerci, the latter slender, tapering, surpassing the short, broad subgenital plate, their tips incurved. To this genus Kirby (1906, 446) accredits five species, two from Africa, two from South America, the other from Carolina.

217. SYMMETROPLEURA MODESTA Brunner, 1878, 246. Modest Bush Cricket.

Pale green, fading in great part to pale clay-yellow; pronotum often tinged with reddish-brown, especially along the lateral carinæ, spines of tibiæ and femora white. Tegmina four times longer than their greatest width, the anal or sutural margin behind the flattened dorsal field straight. Ovipositor one-third longer than pronotum, abruptly upcurved near base, the upturned portion feebly tapering, apex rounded, the margins of apical half crenulate-dentate. Other structural characters as given above. Length of body, ♂, 15—16, ♀, 18—20; of pronotum, ♂, 4—4.5, ♀, 3.8—4.5; of tegmina, ♂, 25—26, ♀, 25; of hind femora, ♂, 17—18.5, ♀, 16.5—17.5; of ovipositor, 5 mm. Width of tegmina, ♂ and ♀, 6; of ovipositor, 2 mm.

Dunedin, Fla., June 10; one male taken at porch light (W. S. B.). Bosky Dell, Ill.; one female (*Field Museum*). This seems to be a very scarce species whose range is confined to the Austral Life Zone. Brunner's type, a single male, was from "Carolina." Scudder (1898, 287) records a female from North Carolina. Davis has received it from Mississippi and R. & H. (1907) mention the capture of a male from floating water hyacinth near Palatka, Fla., Aug. 18. It is also recorded by them (1916, 255) as having been

taken in Florida at Fernandina, Atlantic Beach, Crescent City and Enterprise, May 25—August 25; and at Raleigh, N. Car., and Billy's Island and Spring Creek, Ga., June 7—Aug. 8. Sherman and Brimley (1911) list it from Raleigh and Southern Pines, N. Car., and Brimley (1908) states that at Raleigh it has been taken only from mid-July to early August, both at light and on sugar, but not in ordinary collecting. No one of the records given mention more than two specimens from any one locality and most of them only one. The female in the Field Museum was taken by W. J. Gerhard at Bosky Dell, near Carbondale, southern Illinois, on Sept. 27, 1909. This extends greatly its known range to the north and west, all other records having been from North Carolina to central Florida.

IV. AMBLYCORYPHA Stål, 1873a, 40. (Gr., "blunt" + "head.")

THE ROUND-HEADED KATYDIDS.

Species of medium or small size, having the fastigium rounded, strongly deflexed, more than twice as broad as first antennal joint; eyes elliptical or oblong-oval; antennæ setaceous, reaching to middle of tegmina or beyond; pronotum with disk flat, narrowed in front, hind margin broadly rounded, front one subtruncate, lateral lobes usually shorter than deep, their hind margin obliquely broadly rounded into the lower one; tegmina but slight-

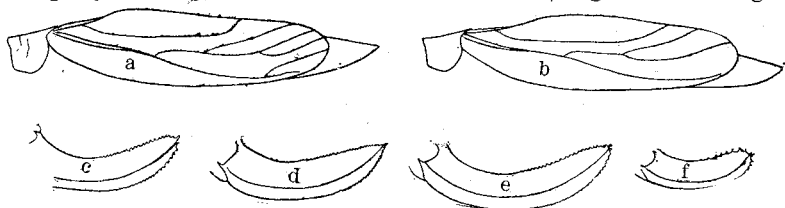


Fig. 157. Lateral outlines of pronotum, tegmen and exposed wing of *Amblycorypha*. $\times 2$. a, of *floridana*; b, of *carinata*. Outlines of ovipositors of *Amblycorypha*. $\times 4$. c, of *oblongifolia*; d, *floridana*; e, *carinata*; f, *uhleri*. (After R. & H.)

ly wider at middle than apex, the latter broadly rounded; femora slender, all armed beneath with several short spines. Male with stridulating organ brownish, opaque, traversed by a strong green cross-vein; supra-anal plate short, broad, truncate; cerci long, tapering, inbent and crossed, their tips acute; subgenital plate broad at base, feebly tapering, carinate beneath, apex usually deeply notched, the blunt process each side bearing a short, cylindrical style. Ovipositor broad, of medium length, curved gradually upward from near middle, apical half sharply and usually strongly serrate on both edges, the apex rounded.

R. & H., in the latest treatise on the genus (1914b) recognize

seven species and three races or varieties from North America. Three species and two varieties fall within the scope of this work.

KEY TO EASTERN SPECIES OF AMBLYCORYPHA.

- a. Tegmina oblong-elliptical, of subequal width throughout, the wings distinctly protruding beyond their tips (Fig. 157, a); metasternal lobe each side longer than broad, its hind margin narrowly rounded or acute; humeral sinus deep, distinct.
- b. Larger, tegmina always more than 30 mm. in length; hind femora not surpassing tips of tegmina, distinctly shorter in male; apex of subgenital plate of male with a deep V-shaped notch.
- c. Stridulating area of male tegmina larger, much exceeding that of pronotal disk; ovipositor more evenly and regularly curved, more strongly serrate (Fig. 157, c); lateral carinæ evident but rounded, often obsolete on apical fourth or more of pronotum. 218. OBLONGIFOLIA.
- cc. Stridulating field of male tegmina smaller, but little greater than that of pronotal disk; ovipositor less evenly and regularly curved, more finely serrate.
- d. Lateral carinæ in front of middle of pronotum rounded into the lateral lobes; stridulating vein of male proportionally narrower; ovipositor shorter, when compared with caudal femora weaker (Fig. 157, d.) 218a. FLORIDANA.
- dd. Lateral carinæ of pronotum distinct and continuous throughout; stridulating vein of male broader; ovipositor longer, heavier (Fig. 157, e.) 218b. CARINATA.
- bb. Smaller, tegmina not over 28 mm. in length; hind femora surpassing tips of tegmina in both sexes; apex of subgenital plate of male subtruncate, not or feebly notched. 219. UHLERI.
- aa. Tegmina ovate, distinctly broader at middle, the wings but slightly surpassing their tips (Fig. 160); metasternal lobe each side broader than long, its hind margin subtruncate; humeral sinus shallow or subobsolete. 220. ROTUNDIFOLIA.

218. AMBLYCORYPHA OBLONGIFOLIA (DeGeer), 1773, 445. Oblong-winged Katydid.

Size large for the genus; form robust. General color a bright pea-green, the shrilling organ of male brownish, with a heavy green cross-vein; abdomen and usually the fore and middle femora, yellowish or brownish-green; hind femora often brownish-yellow. Disk of pronotum with sides distinctly divergent on basal two-thirds, subparallel with lateral carinæ less distinct on apical third; humeral sinus well impressed; hind margin of lateral lobes broadly rounded. Tegmina elongate-elliptical, about 3.3 times as long as wide. Wings in repose surpassing tegmina 6 or more mm. Hind femora very slender, usually scarcely reaching tip of tegmina, female, distinctly shorter, male, their inner lower carina armed with six to 12 rather strong teeth. Length of body, ♂, 21—23, of ♀, 22—25; of pronotum, ♂, 6—6.5, ♀, 7; of tegmina, ♂, 36—38, ♀, 35—37; of posterior femora, ♂ and ♀, 30—31; of ovipositor, 11.5—13 mm. Width of tegmina, 11—12 mm. (Fig. 158.)

The oblong-winged katydid is a frequent insect throughout Indiana, becoming mature in the southern part about July 20, and in the northern counties probably a fortnight later. It occurs for the most part on shrubbery and flowers of golden-rod and other Compositæ along fence rows and edges of thickets and woods, especially in damp localities; and when flushed flies with a kind of whirring

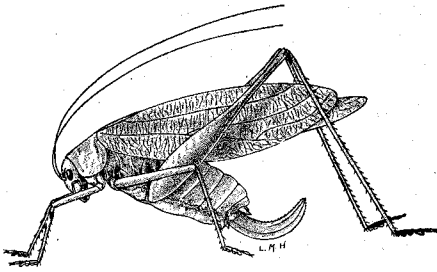


Fig. 158. Female. Natural size. (After Lugger.)

noise, alighting on fence or the lower branch of tree. I have often located the male by its note, which to me is a creaking squawk—like the noise made by drawing a fine-toothed comb over a taut string. It is usually but once repeated, though sometimes three times. On several occasions it has been made after the insect was in my fingers.

A number of pink specimens have been taken from low meadows near Bass Lake, Starke County. The causes which produce this curious "sport," by which a grass-green is changed to a delicate pink, are, as yet, unknown. Scudder has said that "one thinks at once of autumn leaves and their change from green to red and notices that these pink katydids all occur in the autumn." In Indiana the pink specimens have been taken in early August, long before frost and before any noticeable change in the surrounding vegetation.

Several of the species of *Amblycorypha* are known to occur occasionally in the pink form, which appear much more frequent in this genus than in any other of the Tettigoniidæ. Wheeler (1907), Knab (1907), Hancock (1916) and other authors have published interesting papers on the subject of pink katydids. Hancock succeeded in rearing a family of a cross between a pink female and a green male of *oblongifolia*. He found that the eggs of this species are laid in the ground and require two to three years to hatch. Of the 13 young, nine were pink and four green, the color remaining practically the same throughout their lives. He concludes, as did Wheeler, that the pink color, as well as the green, is hereditary, the pinkness therefore being congenital or germinal in character and not the result of conditions of environment.

The known range of typical *oblongifolia* is from New England and Montreal west to southwestern Ontario, Michigan, Minnesota

and Colorado, and south and southwest to Maryland, North Carolina, Alabama, Louisiana and Texas. In the southern coastwise states it is replaced by the nominal race or variety, *A. o. floridana* R. & H. In Ontario Walker (1904a, 329) states that it is rare about Toronto, but common from Hamilton westward to the St. Clair River, occurring for the most part on shrubs and tall weeds. The note of the male, he says, "is very harsh and scraping in character and is usually of about three-fifths of a second's duration. At a little distance it sounds something like 'kizizik.' I have heard it at night and in the afternoon while the sun was still shining."

Lugger (1898, 223) states that both *A. oblongifolia* and *rotundifolia* occur abundantly in Minnesota, frequenting bushes and tall weeds in low places. Both appear to be scarce in Michigan, Hubbell (Ms.) listing *oblongifolia* only from Wayne, Ingham and Jackson counties, and *rotundifolia* from Washtenaw Co. About Moline, Ill., McNeill (1891) found *oblongifolia* more common in the vicinity of houses than the species of *Scudderia*, and states that its note is "a quick shuffling sound which resembles 'katy' or 'katydid,' very slightly. It sometimes flies in the evening, but much more rarely than does *S. curvicauda*."

Hancock (1916) has given an account of the egg-laying habits of *oblongifolia* as follows:

"When ready to oviposit the female comes down to the ground from the vegetation which she frequents. She then searches about on the ground, often among the dead leaves, to find a suitable place to deposit her eggs. She does this very deliberately and slowly, feeling her way with her palpi, often nibbling the surface as if testing a suitable place. At times she appears to be quite exacting in her choice of location, one of these requisites being a certain amount of dampness of soil, as well as certain surface conditions. When she finds a suitable spot, she curves her abdomen, which is now distended with eggs, forward underneath her body and at the same time seizes the end of the large ovipositor in her mandibles. In this way she directs its point to the desired place in the ground. Then she forces or drills a hole in the earth for the reception of each egg or cluster of eggs. Sometimes they are laid at such a shallow depth in the ground that the rains splash away the dirt covering, fully exposing them to the air."

Bruner (1891, 73) described *Amblycorypha scudderæ* from Nebraska, stating that it differs from *oblongifolia* by its smaller size, more evenly rounded or arcuate edges of tegmina, comparatively shorter hind legs and more strongly serrated point of ovipositor. R. & H. (1914b, 320) have made *scudderæ* a synonym of *oblongifolia*, stating that "the characters mentioned by Bruner are worthless," though they use two of them, viz., the arcuate edge

of tegmina and degree of serration of ovipositor, in their key in separating *oblongifolia* from their *floridana* and *carinata*.

218a. AMBLYCORYPHA OBLONGIFOLIA FLORIDANA Rehn & Hebard, 1905, 42.

A form or race of *oblongifolia* differing only by the characters given in the key, which are taken from the key of R. & H. (1914b, 319), and by having the disk of pronotum slightly longer, its sides less divergent backward in the female. Length of body, ♂, 25—25.8, ♀, 21—28.3; of pronotum, ♂, 6.6, ♀, 7—7.4; of tegmina, ♂, 34.6—35.8, ♀, 32—36.8; of hind femora, ♂, 28.7—30.4, ♀, 28.5—32.6; of ovipositor, 11—12.2 mm. (Fig. 159.)

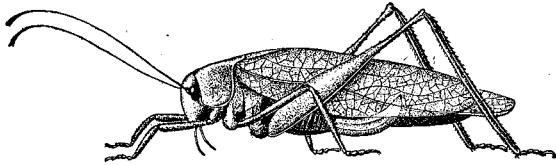


Fig. 159. Female type. Natural size. (After R. & H.)

The original description of this form was prefaced thus: "Alied to *A. oblongifolia* but differing in the straighter ovipositor and less angulate angles of disk of pronotum." Later (1907, 301) R. & H. say: "The less curved form and rather smaller size of the ovipositor will serve to separate the female of *floridana* from that of *oblongifolia*, while in the male the tympanum is distinctly narrower, both actually and proportionally, than in *oblongifolia*. The lateral angles of the disk of the pronotum are as a rule by no means as sharply rectangulate as in *oblongifolia* and the disk is broader caudad in the latter species. From the evidence in hand it appears that *floridana* represents the southern extreme of *oblongifolia*, specimens from Thomasville, Ga., being as near *floridana* as *oblongifolia*." Still later (1914b, 322) they state that the Thomasville specimens connect "true *floridana* with a northern sub-species (*S. f. carinata*) of the same stock, which in its turn is perfectly distinct from *oblongifolia*."

All of the differences which they give, both in descriptions and keys, separating the three forms, are comparative only, and readily come within the limits of variation of a single species over a wide extent of territory. The lateral carinae of northern and eastern *oblongifolia* are always rounded on the prozona, and vary greatly in continuity, in the majority of Indiana specimens being wanting on the apical third or fourth of pronotum, where the disk is rounded directly into the sides. The disk of pronotum is also variable in length and divergence and the ovipositor in length and degree of curvature. While extremes of the three forms are obviously different, I regard both *floridana* and *carinata* as varieties

of *oblongifolia*, as no permanent fixed characters separating them have as yet been pointed out.

About Dunedin, Fla., nymphs of *S. o. floridana* are frequent from February 1 to April 15, but the adults have been taken only in October. It occurs in the tall grasses about the margins of brackish marshes and on weeds in low wet places in pine woods. During the summer and autumn months this appears to be a common katydid throughout Florida, having been recorded from numerous localities by other collectors. At Homestead it was found by R. & H. (1914c, 399) "on the prairie-like everglades, where they were scarce in the day time, but plentiful at night, perched on the grasses, stridulating fearlessly. Their note is an indescribable buzz and click."

The range of this southern form is given by R. & H. (1914b, 322) as "extending from Big Pine Key and Detroit, south Florida, as far north typically as Jacksonville, Fernandina and Atlantic Beach, westward as far as eastern Texas, intergrading in the Atlantic Coast region, at least, into the northern subspecies (*carinata*) over an extensive area covering from southern Georgia to eastern South Carolina."

218b. *AMBLYCORYPHA OBLONGIFOLIA CARINATA*⁶⁵ Rehn & Hebard, 1914b, 323.

"Differing from *floridana floridana* in the lateral margins of the pronotal disk being more angulate and carinate almost or quite continuously; in the stridulating field of the male tegmina being proportionally broader, in the sutural margin of the tegmina distad of the anal field being more arcuate and in having a longer and heavier ovipositor. Length of body, ♂, 20.8—24, ♀, 21—27.2; of pronotum, ♂, 6.3—7, ♀, 6.9—7.4; of tegmina, ♂, 33—35.5, ♀, 30—35.5; of hind femora, ♂, 29—32, ♀, 26.6—32.6; of ovipositor, 12.3—14.5 mm." (R. & H.)

Charlottesville, Va., July 17 (*Fox*); Sherborn, Mass. (*Morse*). It will be noted that the width of the stridulating field of tegmina is said by R. & H. to be broader than in *floridana*, whereas the leading character given in their key to separate *floridana* from typical *oblongifolia* is the narrower stridulating field of the former. The measurements are also in great part intermediate between typical *oblongifolia* and *floridana*. They record numerous intergrading forms between *floridana* and *carinata*, but I regard the latter as only an intermediate form, connecting *oblongifolia* and its southern race, *floridana* and therefore scarcely worthy of a special name. As noted above the extremes are sufficiently dis-

⁶⁵This form should probably bear the varietal name *saussurei* Bruner, as he first mentioned it (1886, 196) as follows: "A sixth species (of *Amblycorypha*) occurs along the Atlantic coast from Maryland southward. It is nearly of the same size as *oblongifolia* but differs from it in having the dorsum of pronotum very smooth and also in several other important features. It might therefore be called *A. saussurei* after M. Henri de Saussure." As R. & H. claim that this description, as such, is unrecognizable, I have retained their name.

tinct, but the means merge, so as to be practically indistinguishable unless one wishes to juggle with words and names.

The range of typical *carinata* is given by R. & H. as extending from southern Massachusetts west to New Jersey and Pennsylvania, and south over southeastern Virginia to eastern North Carolina and north-central Georgia, while Davis has it from Agricultural College and Lucedale, Miss. Fox (1917) states that in Virginia *carinata* inhabits similar situations as does *oblongifolia*, but is more frequent in tidewater areas.

219. AMBLYCORYPHA UHLERI Stål, 1876, 57. Uhler's Katydid.

Size small for the genus. Above gress-green fading to pale greenish-yellow, shrilling organ of male brown or blackish, the cross-vein green; beneath greenish-yellow fading to dull clay-yellow. Antennæ pale reddish-brown, surpassing the tips of tegmina. Pronotum strongly narrowed in front, lateral carinæ distinct on basal two-thirds, rounded into lateral lobes in front of middle; hind margin broadly rounded, lateral lobes deeper than long, their hind margin broadly rounded. Tegmina oblong-elliptical, not reaching tips of hind femora. Wings protruding beyond tegmina 3—5 mm. Metasternal lobe each side longer than broad, its hind margin rounded. Male with cerci strongly tapering, thickly clothed with bristling hairs; tegmina longer and narrower than in female. Ovipositor broad, of equal width throughout, slightly longer than pronotum, not strongly curved, the apical half rather strongly serrate on both margins (Fig. 157, *f.*) Length of body, ♂, 14—15, ♀, 16—17.5; of pronotum, ♂, 4.8—6, ♀, 5.5—7; of tegmina, ♂, 23—27, ♀, 20—28; of hind femora, ♂, 21—27, ♀, 22.5—28; of ovipositor, 7.5—10. Width of tegmina, ♂, 7—9, ♀, 6—8.5 mm.

This, our smallest species of the genus, is much less common in Indiana than either *oblongifolia* or *rotundifolia*, not having been taken north of Vigo Co., where it frequents the tall sedges and willows bordering the large ponds in the Wabash River bottoms. In southern Indiana it was once found plentiful, September 3—4, near Wyandotte Cave, Crawford Co., where a number were secured on grass and herbs. In Posey, Warrick and Harrison counties, single specimens have been taken by sweeping willows in late September. The young sometimes feed upon the leaves of the black and scarlet oaks, *Quercus velutina* Lam., and *Q. coccinea* Wang, and the perfect insect is often found on or beneath these trees.

In Florida *A. uhleri* is also scarce, occurring for the most part on bushes and other undergrowth in open pine woods. A single male, taken at light at Dunedin, Oct. 14, is at hand, and is larger, with longer tegmina than any of those from Indiana. It probably occurs throughout the State, having been recorded in small num-

bers from Jacksonville to Ft. Barrancas south to Homestead; adults, July 7—August 23, nymphs March 6.

The known range of *A. uhleri* is mainly southern, extending from New Jersey west and north to central Indiana and Minnesota, and south and west to southern Florida, eastern Oklahoma and central Texas. It is not recorded from Canada or Michigan, and only from a single specimen without definite locality, from Minnesota. In habitat it appears to be largely hygrophilous, most of the records mentioning it as occurring on weeds or bushes in or near low, damp woods from tidewater to 2,600 feet above. In Virginia Fox (1917) says it is "apparently the most abundant representative of the genus in the Piedmont and tidewater sections, occurring chiefly in open country on the trees, bushes, weeds and tall grasses of fields, pastures and roadsides."

Of the call note of *uhleri* Allard (1912) says: "It consists of a rapid silken shuffling sound, *sh-sh-sh-sh*, occasionally repeated. At other times the notes become brief, staccato lisps, *i-tsip-i-tsip-i-tsip-i-tsip*, followed by the usual *sh-sh-sh-sh*. Abrupt modifications of this sort nearly always get a similar response from the other individuals."

220. *AMBLYCORYPHA ROTUNDIFOLIA* (Scudder), 1862, 445. Round-winged Katydid.

Size medium for the genus. Color essentially the same as that of *oblongifolia*. Disk of pronotum with sides subparallel, female, feebly diverging behind, male; lateral carinæ evident but rounded on basal two-thirds; humeral sinus very shallow; hind margin of lateral lobes more oblique and less broadly rounded than in *oblongifolia*. Tegmina ovate, proportionally much broader, the wings but slightly protruding from beneath their tips. Hind femora reaching tips of tegmina in male, slightly longer, female, armed on the lower, inner carina with four or five minute teeth. Ovipositor more distinctly curved and more strongly serrate than in either *oblongifolia* or *uhleri*. Length of body, ♂ and ♀, 19—20; of

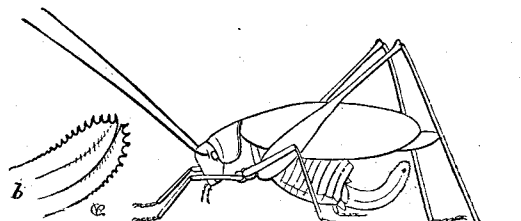


Fig. 160. a, Female. Natural size. b, Enlarged end of ovipositor. (After Riley.)

pronotum, ♂, 5—6, ♀, 5.8—6.4; of tegmina, ♂ and ♀, 24—27; of hind femora, ♂, 22—25, ♀, 24—27; of ovipositor, 9—11 mm. Width of tegmina, 8.5—9.5 mm. (Fig. 160.)

The round-winged katydid occurs frequently throughout Indiana, though more abundant in the southern half of the State. It is more of a terrestrial species than *oblongifolia*, being often

seen on the ground, or on the clumps of tall grass and weeds, which grow in damp ravines, while its flight is comparatively noiseless and less prolonged. In southern Indiana the males become mature about the fifth of July, the females a week later.

Pink individuals of *rotundifolia* have been recorded from Pennsylvania and New Jersey, but they appear to be much more scarce than those of *oblongifolia*.

The known range of typical *A. rotundifolia* extends from the White Mountain region of New England west to Michigan and Minnesota, and south and west to South Carolina, northern Georgia and western Arkansas. In western North Carolina, southern Georgia and Alabama it is said by R. & H. (1914b, 336) to have shorter wings, less evident humeral sinus and a broader disk of pronotum, thus showing an intermediate form between typical *rotundifolia* and the western race *A. r. parvipennis* Scudder. R. & H. have also reduced *A. iselyi* Caud., described from Kansas and known from Iowa and Missouri, to a race or variety of *rotundifolia*. It is not recorded from Canada, though it should occur along the southern border. Lugger mentions it as common in Minnesota, and Bruner (1893a, 29) as a "not uncommon species" in the eastern part of Nebraska. In Virginia Fox says it is "taken in shrubbery and undergrowth in or close to open deciduous woods and apparently confined to the mountain sections of the State."

Of the note of *rotundifolia*, Scudder (1893, 68) says: "This insect stridulates both by day and by night, and without variation (Fig. 155, c). The song consists of from two to four notes—sounding like *chic-a-chee*—repeated rapidly so as to be almost confounded, and when three requiring just one-third of a second; the song is repeated at will, generally once in about five seconds, for an indefinite length of time."

Allard (1911) says that near Oxford, Mass., in September, *A. rotundifolia* "occurs everywhere in the grass, weeds and shrubbery of fields and pastures. Its notes may be heard at all times during the day as well as during warm nights. They are soft, lisping, continuing indefinitely, and may be expressed thus: '*Tsip-i-tsip-i-tsip-i-tsip-i-tsip.*'"

V. MICROCENTRUM Scudder, 1862, 446. (Gr., "small" + "point.")

Species of medium or large size, having the occiput convex, fastigium obtuse, deflexed, more or less sulcate; eyes subglobose, prominent; disk of pronotum flat, sides subparallel, lateral carinae distinct, hind margin broadly rounded; humeral sinus deeply impressed; lateral lobes perpendicular, much deeper than long, the

hind margin broadly rounded into the lower one; tegmina coriaceous, ovate lanceolate, broadest at middle, both costal and sutural margins tapering to the much narrower but rounded apex, the overlapping dorsal field forming a right angle with the median area; wings distinctly projecting beyond the tegmina their tips acuminate; all the femora armed beneath with several small spines; hind ones short and very slender; meso- and metasternal lobes elongate, their tips acute or narrowly rounded. Males with supra-anal plate oblong-triangular, deflexed between the cerci, the latter long, slender, subcylindrical, their tips usually incurved and mucronate; subgenital plate composed of two separate lobes, uniting beyond the middle, then tricarinate beneath, the terminal processes bearing rather long, cylindrical styles. Female with ovipositor very short, bent strongly upward, usually finely crenulate, with apex obtuse; subgenital plate triangular, compressed, obtuse.

This is an American genus whose species are mostly tropical, Kirby (1906, 480) including 26 under the name *Orophus* Serv. which he wrongly used for *Microcentrum*. Of these but two are known from the United States, both occurring east of the Mississippi.

KEY TO EASTERN SPECIES OF MICROCENTRUM.

- a. Front margin of pronotum sinuate, and with a more or less distinct median tooth; cerci of male with the tips incurved and mucronate; ovipositor with apex subtruncate or very broadly rounded; general color dark grass-green. 221. RHOMBIFOLIUM.
- aa. Front margin of pronotum squarely truncate; cerci of male with apical third thickened, the tip blunt, feebly or not at all incurved; ovipositor with apex attenuate, narrowly rounded; general color pale green, the head and under surface tinged with yellow.

222. RETINERVE.

221. MICROCENTRUM RHOMBIFOLIUM (Saussure), 1859, 204. Larger Angular-winged Katydid.

Size large both for the family and the genus, the sexes subequal. Dark grass-green, the face, under surface, fore and middle legs and often the front half of pronotum greenish-yellow often fading to dull clay-yellow. Fastigium faintly sulcate or, in the male, with a shallow median pit. Disk of pronotum short, subquadrate, the median tooth of front margin variable in size and form, always small, often vague; hind margin broadly rounded. Tegmina ovate-lanceolate, surpassing the tips of hind femora by two-fifths their length. Male with stridulating area elongate-triangular, opaque, coarsely punctate; subgenital plate with outer carinae subparallel, apex with a deep rounded notch. Other structural characters as given in key and under generic heading. Length of body, ♂, 25—28, ♀, 28—30; of pronotum, ♂ and ♀, 6—7; of tegmina, ♂, 42—45, ♀, 43—

47; of hind femora, ♂, 22.5—24; ♀, 23—25; of ovipositor, 4.5—5 mm. Greatest width of tegmina, 13—14 mm. (Fig. 161.)

This is the *M. laurifolium* of my previous work (1903, 354) and of most American authors up to 1906, Kirby having then shown that the name *laurifolium* rightfully belongs to a tropical species of *Stilpnochlora*. *M. rhombifolium* is the largest of our northern katydids and is frequent throughout the southern half of Indiana, but has not been noted north of Lafayette, where Fox (1915) says it "appears to be common since its notes were heard continuously throughout late July and August." In the

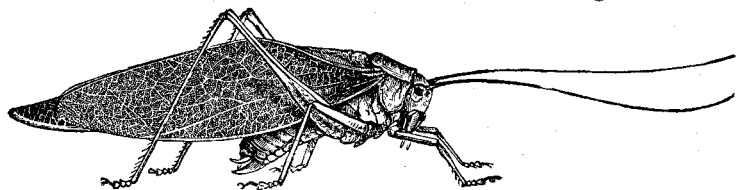


Fig. 161. Male. Natural size. (After Riley.)

country it is most commonly called "the katydid," and the note of the broad-winged katydid, *Pterophylla camellifolia* (Fab.) is usually attributed to it, but its true note may be represented "by the syllable 'tic,' repeated from eight to 20 times at the rate of about four to the second." However, *M. rhombifolium* is probably less common in Indiana than the broad-winged katydid, with which it is confused. As it frequents low bushes and other shrubbery it is more often seen, the true katydid being commonly found in the taller trees. It is often attracted to light and in Indianapolis numerous examples have been found on porches and in the gutters beneath electric lights. In movement *M. rhombifolium* is very sluggish, seldom taking to flight when approached and readily picked up by the fingers. It probably occurs in small numbers in all parts of the State.

About Dunedin, Fla., adults of *rhombifolium* have been taken from November to April, but are very scarce. The nymphs in all stages are, however, frequent during the winter and often taken by sweeping. It occurs throughout Florida and on the southern keys, adults being recorded from numerous localities and in nearly every month of the year. At Miami it was noted by Hebard (1915b) to be "not uncommon in early March about the town on trees and shrubbery, as could be determined on warm evenings by the frequently heard stridulations. On nights when the temperature fell at dusk below 65° all Orthopteron stridulations ceased."

The known range of *rhombifolium* extends from Staten and Long Islands, N. Y., north and west to Michigan, Minnesota and

eastern Nebraska, and south and west to southern Florida, Oklahoma, southwestern Texas, Arizona and Claremont, California. From the west and northwest the published records are few for so widely a distributed species and are mostly under the name *M. laurifolium* (Linn.). Scudder (1862, 447) gave Massachusetts as one of the localities of his *M. affiliatum*, a synonym of *rhombifolium*, and S. I. Smith (1873, 357) mentions it from Connecticut, but no definite localities were given and no other New England records can be found. It is not mentioned in either of the Iowa lists, nor is a definite locality recorded from Michigan. Garman says it is "common everywhere in Kentucky on black locust and other trees." Luger records it only from Winona, Minn., and Bruner, as occurring only in eastern Nebraska south of the Platte River. From New Jersey south and southwest the records are more numerous, especially those from Georgia and Florida. J. Smith (1910, 187) states that it occurs throughout New Jersey, and R. & H. (1916, 256) give numerous records between there and central Georgia, as do they and other authors from Georgia, southwest to California. At Claremont in the latter State Baker (1905, 78) found it common among the orange trees, and one of his specimens is at hand.

The eggs of *M. laurifolium* are usually glued in double rows on the sides of slender twigs, which have been previously roughened with the jaws and otherwise prepared for a place of deposit. The two rows are contiguous and the eggs of one alternate with those of the other. Those of the same row overlap about one-fourth their length. They are of a grayish brown color, long oval in shape, very flat, and measure 5.5x3 mm. They are usually deposited in September, hatch the following May, and the young, in central Indiana, reach maturity during the first half of August. These eggs have, on a number of occasions, been brought to me by persons who found them on their fruit trees, and thought they were the San Jose scale or some other injurious scale insect.

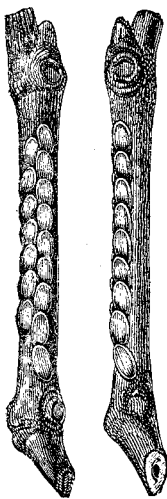


Fig. 162. Eggs of the Angular-winged Katydid. (After Riley.)

Of the habits of this species Davis (1887, 56), under the name *M. retinerve*, says: "It often lays its eggs on the honey suckle and I once observed a female on the 16th of September, ovipositing on a low tree by the roadside, gradually biting the bark into a ridge along which the eggs were laid tile fashion. The male produces

two somewhat different songs, or varies the same song in time or extent of utterance, so that unless the same individual is listened to for some time, the notes might be attributed to different species."

Riley (1874, 155), as his figures show, confused *M. rhombifolium* also with *M. retinerve* (Burm.) and under the latter name gave a full account of the habits of *rhombifolium* from which I quote as follows:

"The females commence to oviposit early in September, and continue to lay at intervals until the first severe frost. The eggs are occasionally deposited during the day, but the operation usually takes place at night. The number of eggs laid at one time varies from two to 30, the first batches containing more than those deposited later in the season. Each female produces from 150 to 200, or perhaps more, and I have known them to lay on the edge of a leaf, or of a piano-cover, or along a piece of cord.

"These eggs are rather flat when laid, but become more swollen, so that they have a narrower look as they approach the hatching period in spring. During the early part of May, the embryo larva—which lies straight in its egg, completely filling it, with the legs bent up as in a pupa, and the long antennæ curling around them—attains its full development, and after hours of tedious contracting and expanding movements, manages to burst the egg open at its top or exposed end, along the narrow edge, and generally about half way down. Through this opening young Katy slowly emerges, undergoing a moult during the process, and leaving its first skin, in a crumpled white mass, attached to the empty bivalvular egg shell. Including hind legs and antennæ it measures at this time, rather more than an inch in length, the body alone being one-eighth of an inch long; and in contemplating it, one can not but wonder how the long, stiff legs and great length of antennæ, together with the plump body, could so recently have been compressed into the comparatively small shell to which we see it clinging.

"In from ten to twenty minutes after hatching, these little beings essay their first leaps, and soon begin to eat with avidity. They feed with almost equal relish upon a great variety of foliage, but I have found that when reared upon very succulent leaves, such as lettuce, cabbage, purslain and the like, they are less hardy, and do not attain so great an age as when nourished upon more ligneous food, as the leaves of oak, apple or cherry.

"The first notes of this katydid are heard about the middle of July, and the species is in full song by the first of August. The wing covers are partially opened by a sudden jerk, and the notes produced by the gradual closing of the same. The song consists of a series of from 25 to 30 raspings, as of a stiff quill drawn across a coarse file. There are about five of these raspings or trills per second, all alike, and with equal intervals, except the last two or three, which, with the closing of the wing covers, run into each other. The whole strongly recalls the slow turning of a child's wooden rattle, ending with a sudden jerk of the same; and this prolonged rattling, which is peculiar to the male, is invariably and instantly answered by a single sharp 'chirp' or 'tschick' from one or more

females, who produce the sound by a sudden upward jerk of the wings.

"Both sexes are for the most part silent during the day, but during the period of their greatest activity their stridulations are never for an hour remitted, from the time the great setting sun hides behind the purple curtains of the west till he begins to shed his scarlet rays in the east—the species being so numerous that the sound as it comes from the woods is one continuous rattling, not unlike the croaking of frogs, but set to a higher key."

222. *MICROCENTRUM RETINERVE* (Burmeister), 1838, 692. Smaller Angular-winged Katydid.

Size medium for the genus, the sexes subequal. Smaller than *rhom-bifolium* which it very closely resembles. Fastigium as there but slightly narrower, more distinctly sulcate. Pronotum with front margin truncate, not toothed; humeral sinus more narrow. Tegmina proportionally shorter, less strongly tapering, their tips more broadly rounded, surpassing hind femora one-third their length. Front and middle femora with only one or two very minute spines beneath. Male with stridulating field narrow, the cross-vein usually pale brown; cerci longer than in *rhom-bifolium*, less incurved, their apical third distinctly swollen; subgenital plate with outer carinæ converging, both apex and apical notch distinctly narrower than in *rhom-bifolium*. Other differences as given in key. Length of body, ♂, 20—22, ♀, 24—26; of pronotum, ♂, 5—5.5, ♀, 5.5—6.5; of tegmina, ♂, 36—38, ♀, 38—41; of hind femora, ♂ and ♀, 18—20; of ovipositor, 5.5—6.5 mm. Width of tegmina, 12—13 mm.

Martin Co., Ind., Aug. 20, one male; Vigo Co., Ind., Sept. 26, one female; Plummer's Island, Md., Sept. 10 (W. S. B.). Probably occurs throughout the Austral life zone of the southern third of Indiana. Recorded from Florida only by Scudder (1877a, 83), who states that "a male, a female and two pupæ were taken at Ft. Reed between April 24 and May 2."

The known range of *retinerve* is more southern than that of *rhom-bifolium*, extending from New Jersey west through southern Indiana, Kentucky and Clarksville, Tenn., to Kansas and Nebraska, and south and southwest to central Georgia, Oklahoma, Texas, New Mexico, Arizona and, if Brunner's record (1878, 340) can be relied upon, to Orizaba, Mexico, and Guatemala. It appears to be a common form on Plummer's Island, Md., as I took three males there in a few hours' collecting on Sept. 10. They were found on the ground or the branches of low shrubs. Bruner has recorded it as not common but more widely distributed in eastern Nebraska than *rhom-bifolium*. From the records the males seem to far outnumber the opposite sex.

VI. *STILPNOCHLORA* Stål, 1873a, 40. (Gr., "glisten" + "green.")

Species of very large size, having the fastigium horizontal, sulcate, slightly wider than first antennal joint, its apex obtuse; eyes

small, subglobose; antennæ very slender, reaching beyond middle of tegmina; disk of pronotum slightly concave, narrowed in front; lateral carinæ distinct, obtuse in front, higher, sharper and crenate on basal third; front margin feebly sinuate, hind one very broadly rounded or subtruncate; humeral sinus narrow, deep; lateral lobes much deeper than long, their lower margin broadly rounded into both the hind and front ones; tegmina subcorneous, broadly lanceolate, their anal fields flat, forming a right angle with the median one, dorsal margin behind the anal field slightly sinuous and at apical fourth abruptly decurved to the narrowly rounded apex; lower margin broadly curved from base to middle, thence nearly straight to apex (Fig. 163, *a*); wings with folded tips acuminate, distinctly longer than tegmina; front and middle femora terete, unarmed, hind ones armed beneath with a number of small distant spines; lobes of knees bispinose; hind tibiæ four-sided, the upper, inner and outer sides rather wide, flat, feebly concave, the lower one narrow, the four margins raised and armed with numerous teeth; meso- and metasterna with large triangular lobes. Male with supra-anal plate triangular, sulcate; cerci excavated above, abruptly incurved; subgenital plate as in *Microcentrum*. Ovipositor very small, narrow, gradually curved upward, its apex obtusely pointed.

This American genus of giant katydids has been recently (1917) reviewed by Rehn, who recognized eight species as belonging to the faunas of South and central America and the West Indies, one of which is known to extend into Florida as far north as Gainesville.

223. *STILPNOCHLORA COULONIANA* (Saussure), 1861, 128. Giant Katydid.

Size very large. Above green; pronotum with rounded front portion of lateral carinæ yellow, the sharp crenulate portion and hind margin narrowly edged with black; face, fore and middle femora and under surface greenish-yellow, the face often with a short, median reddish-brown stripe. Basal half of sharp margins of flat anal field of tegmina crenulate and often edged with black. Structural characters as given under the genus heading. Length of body, ♂, 30—32, ♀, 35—40; of pronotum, ♂, 8—9, ♀, 11—12; of tegmina, ♂, 55—60, ♀, 63—68; of hind femora, ♂, 29—34, ♀, 34—39; of ovipositor, 6—7 mm. Greatest width of pronotum, 9—11, of tegmina, 20—25 mm.

Eustis, Fla., April 6, one female; Cape Sable, Fla., Feb. 26, one female (*W. S. B.*). The Eustis specimen was taken with the fingers as it was resting on a leaf along the border of a cultivated field, while the Cape Sable one was beaten from the foliage of a saffron-plum, *Bumelia angustifolia* Nutt., growing along the edge of a salt marsh hammock. The other Florida localities recorded

are Tortugas Islands, Key West, Chokoloskee, Miami, Lake Worth, Ft. Myers, Sanford and Gainesville. At Key West Hebard took a female containing 124 fully developed and 14 partially developed eggs from a bush of dahoon holly, *Ilex cassine* L., on March 16. Davis captured a male at electric light in Ft. Myers on March 31, and saw several others. At Miami Hebard found a young female on March 5, and Davis a male and two nymphs on Sept. 22, all in Brickell's Hammock. At Gainesville a male and female were taken Sept. 26—Oct. 2, and at Sanford a female on Nov. 28. These are the only published Florida records, and for so large an insect they are very few. They indicate that the species must as yet be very scarce in the State, and passes the winter in the adult stage. Rehn (1917, 111) states that *S. coulöniana* is known only from Cuba, the Isle of Pines and Florida. Saussure's type was from Cuba, and it is said to occur over the whole Island.

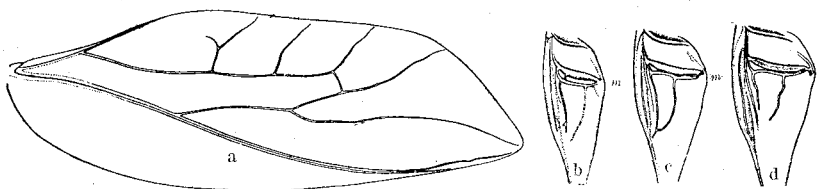


Fig. 163. a, Lateral outline of tegmen of *Stilpnochlora coulöniana*, natural size. Stridulating field of left tegmen of male; b, of *S. marginella*; c, of *S. coulöniana*; d, of *S. quadrata*. (After Rehn.)

This, the largest Tettigoniid known from the eastern United States, was first recorded and described from this country by Scudder (1862, 447) under the name of *Microcentrum thoracicum*, his specimen being a female from the Tortugas Islands. Scudder's name was placed by Brunner (1878, 359) as a synonym of *Stilpnochlora marginella* (Serv.), and the species has been recorded as such a number of times from Florida and is listed under that name by Scudder and Kirby in their catalogues. Rehn (1917, 111) has separated our insect from *S. marginella* and placed it under Saussure's *S. coulöniana*, a name considered by Brunner, Scudder and Kirby as a synonym of *S. marginella*. Rehn gives his reasons for his action thus: "The chief feature which distinguishes the species is the form of the stridulating field of the male tegmina. This is least extensive, with its free margin almost regularly arcuate and hardly angulate, and having a short stridulating vein in *marginella*; in *coulöniana* the field is broader, with a rounded obtuse angulation at the extremity of the vein, which is somewhat heavier and longer."

Two females in my collection from Mexico, one from Jalapa, the other from Orizaba, differ from the Florida specimens only

in their slightly larger size and more divergent lateral carinæ of pronotum. These are probably what Rehn considers *S. quadrata* Scudder (1869c, 331), as that is the only species he mentions as inhabiting Mexico. This species he also separates from *marginella* and *couloniana* only "by the greater breadth of the male tegminal field, with margin more obtuse-angled and the more elongate stridulating vein," and states that Florida females of *couloniana* "are almost indistinguishable from Mexican individuals," i. e., females of what he considers *quadrata*.

An examination of a series of males of the three forms, *marginella*, *couloniana* and *quadrata*, in the Philadelphia collections, shows that the free margin of the left tegmen (*m*, Fig. 163, b, c) is slightly more obtusely rounded in *quadrata* than in *couloniana*, and slightly less so in *marginella* than in *couloniana*. A large series would probably show that *quadrata* is a synonym of *couloniana* and that the latter is at the most only a race or form of *marginella*.

VII. TURPILIA Stål, 1874, 16.

This genus is closely allied to *Microcentrum*, its species differing mainly by their smaller size and the characters given in the generic key. They have the fastigium much narrower, but slightly decurved; disk of pronotum proportionally longer and narrower, much more strongly punctate; tegmina relatively more lanceolate and more densely reticulate; lobes of meso- and metasterna longer, triangular, their tips acute.

224. TURPILIA ROSTRATUM (Rehn & Hebard), 1905, 43. Narrow-beaked Katydid.

Size medium, the sexes subequal. Bright green, more or less suffused with yellow; in dried specimens the apical half or more of tegmina and protruding tips of wings usually alone green, the remainder dull brownish-yellow. Fastigium as described in key, distinctly sulcate, its apex rounded. Disk of pronotum with lateral carinæ evident but rounded, more distinct on basal half, front margin broadly and shallowly concave, hind one strongly rounded; humeral sinus rather broad and shallow. Tegmina ovate-lanceolate, apex narrowly rounded, surpassing tips of hind femora about one-third their length. Wings protruding 4—5 mm. beyond the tegmina. All the femora feebly spinulose beneath. Male cerci very long, tapering, nearly straight, surpassing the subgenital plate, their tips armed with a pair of minute apical teeth, and a third ventral subapical one; subgenital plate broad, tapering, its lateral carinæ faint, apex subtruncate, with a minute median rounded notch; styles short, feebly tapering. Ovipositor with both ventral and dorsal margins of apical half finely crenulate, the apex broad, bluntly rounded. Length of body, ♂, 20—21, ♀, 25—26; of pronotum, ♂, 5.3, ♀, 5—5.7; of tegmina, ♂, 29—32, ♀,

31—33; of hind femora, ♂ and ♀, 15.5—16.5; of ovipositor, 5.5 mm. Greatest width of tegmina, 7.5—8 mm. (Fig. 164.)

Punta Gorda, Fla., Nov. 15—17 (*Davis*). Known only from the southern third of Florida and the adjacent keys, March—November. R. & H. (1914c, 400) state that at Key West in July it was taken only at night on buttonwood, *Conocarpus erecta*

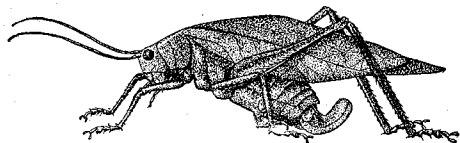


Fig. 164. Female type. Natural size. (After R. & H.)

L. All the specimens were stalked with flash lamp, by the aid of their song which was low and rasping, much like *zrrp-zrrp-zrrp*. At Punta Gorda *Davis* found it not uncommon in November in a clump of mangroves.

VIII. PHRIXA Stål, 1874, 16. (Gr., "bristling.")

Species of large size and broad form, having the occiput convex; fastigium of vertex horizontal, subterete, often sulcate, not continuous with frontal fastigium; eyes small, globose; antennæ longer than body, setaceous; disk of pronotum compressed, convex, rounded into the lateral lobes, the latter perpendicular, deeper than long, their front and hind margins nearly straight and rounded into the subangulate lower margin; tegmina very broad, coriaceous, opaque, longer than wings, their apical third obliquely truncate, the overlapping anal field triangular, very short in male, densely punctate-reticulate, with stridulating vein subobsolete above on the left tegmen; all the femora sulcate and armed with several small spines beneath; lobes of mesosternum rounded, of metasternum, transverse, truncate behind. Males with supra-anal plate elongate-triangular; cerci and subgenital plate variable as to species. Females with ovipositor rather long, moderately curved; narrower at base than middle, the apex oblique, subacuminate, remotely serrate on both edges; subgenital plate triangular, obtuse.

This genus forms a sort of connecting link between the subfamilies Phaneropterinae and Pseudophyllinae, and was, until 1914, supposed to be confined to Mexico, six species having been described from that country, one of which is now known to occur in Florida.

225. PHRIXA MAYA Saussure & Pictet, 1897, 334. Yucatan Katydid.

Size large, form robust. Uniform leaf-green, the abdomen fading to greenish-yellow. Occiput sparsely subgranulate; fastigium of vertex distinctly impressed, but slightly surpassing the scrobes of antennæ; lower margin of lateral lobes oblique, subsinuate. Tegmina as described above,

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