

it may often be seen vibrating its large maxillary palpi in a rapid and curious manner. Uhler's types were from Maryland where he said it "was found quite abundantly amongst the grass and low bushes near ditches and jumps about with great rapidity."

The known range of *P. pulchellus* extends from Staten Island, N. Y., west to central Indiana, Kentucky and Illinois and south and southwest to central Florida and northern Georgia. In Florida it appears to be very scarce, having been taken, as far as known, only at Jacksonville, Monticello, Gainesville and Sanford. Of its habits on Staten Island Davis (1896) says: "It commonly occurs on bushes and young trees and is often discovered on the sweet gum. If there is a dead curled leaf on the branch a male cricket will crawl within the chamber thus formed and sing. This is particularly the case on chilly days in the fall."

Allard (1910b) writing of *pulchellus*, as noted at Thompson's Mills, Ga., says:

"This pretty cricket dwells on shrubbery usually within two or three feet of the ground, and is musical both by day and at night. It is most abundant in low grounds bordering streams, although I have occasionally found it in thickets in upland situations, and even in the foliage of asters and cotton plants. Its song is a weak, high-pitched trill recalling that of *Oecanthus quadripunctatus*, although not as smooth and as uniform in tone. Heard close at hand, the trill is wavering, irregular, with an attendant unmusical shuffling or scraping of the wings, as if these were rather slowly and loosely vibrated upon each other. During the act of singing the tegmina are elevated almost perpendicular to the back, as is the habit in *Oecanthus*, a rather unusual procedure for almost all our other species of crickets."

### Subfamily VIII. ENEOPTERINÆ.

#### THE LARGER BROWN BUSH CRICKETS.

Crickets of medium size and usually slender form, having the body and legs finely pubescent; head as wide or wider than pronotum; occiput convex; vertex forming a blunt oblong protuberance between the basal joints of antennæ; this bearing near its middle the anterior ocellus and near its base each side one of the other two; eyes widely separated, rather small, not prominent; antennæ setaceous, not more than three times the length of body; pronotum subquadrate; tegmina not usually reaching the tip of abdomen; wings present, usually concealed by the tegmina; fore and middle legs slender, their tibiæ and femora unarmed, the basal joint of their tarsi but little if any longer than the third; hind femora only moderately enlarged; hind tibiæ armed above on each margin with six to eight rather slender spines with small

teeth between them, also with three long inner and three short outer subapical spurs; basal joint of hind tarsi stout, usually longer than the second and third united; second joint small, flattened, dilated and bilobed; subgenital plate of male triangular, conical and scoop-shaped; cerci long, slender, tapering, very bristly; ovipositor as in key, its apex slightly enlarged. Kirby (1906) recognized 49 genera as belonging to this subfamily. These are mostly found in the Old World, only three being represented in the eastern States.

KEY TO EASTERN GENERA OF ENEOPTERINÆ.

- a. Tegmina of male with a stridulating organ; fore tibiæ with a hearing organ; length of body less than 20 mm.
- b. Fore tibiæ with an auditory organ on inner face only; tegmina rarely surpassing tip of abdomen; wings rudimentary or shorter than tegmina; terminal joint of maxillary palpi at least one-third longer than the one preceding. I. HAPITHUS.
- bb. Fore tibiæ with auditory organ on both faces; tegmina in both sexes surpassing the abdomen; wings slightly surpassing the tegmina; terminal joint of maxillary palpi but little longer than the fourth. II. OROCHARIS.
- aa. Tegmina of male without a stridulating organ; fore tibiæ without a hearing organ; length of body 23 or more mm. III. TAFALISCA.

I. HAPITHUS Uhler, 1864, 546.

In addition to characters given in key the species of *Hapithus* have the head almost globular, narrower than base of pronotum; antennæ about three times the length of body, their basal joints much thickened and cylindrical; maxillary palpi with last segment enlarged at tip, obliquely truncate; pronotum short, narrower in front than behind, the lateral angles rounded, front and hind margins truncate; tegmina of male with humeral vein prominent, forming a carina along the humeral angle; those of female with anastomosing oblique veins and veinlets; wings rudimentary; hind femora quite broad, though but little thickened. Three species of the genus are known from our territory, one being an adventive only.

KEY TO EASTERN SPECIES OF HAPITHUS.

- a. Form short, robust; tegmina covering three-fourths or more of abdomen.
- b. Antennæ not or very faintly annulate with fuscous; pronotum and tegmina a nearly uniform pale brown. (Native species.)
349. AGITATOR.
- bb. Basal half of antennæ distinctly annulate with fuscous; head, thorax and tegmina thickly and irregularly sprinkled with fuscous markings; much larger and more robust. (Adventive.)

aa. Form elongate, rather slender; tegmina covering less than two-thirds of abdomen. 350. BREVIPENNIS.

349. HAPITHUS AGITATOR Uhler, 1864, 546. Restless Bush Cricket.

Short, compact, robust. Pale brownish-yellow or dull reddish-brown, a narrow line along the humeral vein of tegmina, especially in male, often yellow; face, tegmina and femora of female sometimes flecked with small fuscous dots; hind femora often tinged with fuscous; occiput, pronotum and all the femora rather thickly clothed with prostrate brownish-yellow hairs. Pronotum feebly widening from apex to base. Tegmina covering three-fourths or more of abdomen, female, usually reaching its tip, male. Ovipositor nearly as long as hind femora, very slender, feebly curved, its tip black, but slightly enlarged, crenulate beneath. Length of body, ♂, 9—10, ♀, 10—14; of pronotum, ♂, 1.5—2, ♀, 2—2.5; of tegmina, ♂, 5.5—6.5, ♀, 6—9; of hind femora, ♂, 7.5—9, ♀, 7.5—11; of ovipositor, 7—10 mm.

In Indiana this modest brown bush cricket has been taken only in the southwestern counties from Terre Haute to the Ohio River, the adults occurring from August to November. In Vigo Co. the first ones discovered were on the slender twigs of some prickly-ash shrubs which grew in a damp upland woods. The place was visited a number of times and the crickets were always found, perfectly motionless, and immediately above or below one of the thorns or prickles jutting forth from the twigs. The tips of the hind femora were raised so as to project above the body, thus causing them to resemble the thorns; and the color of the insect, corresponding closely to that of the bark, made them very difficult to discover even when in especial search of them. On every clump of prickly-ash in the woods mentioned a number of specimens were secured, but they could be found nowhere else thereabouts. A second locality was about the roots of a scarlet oak, *Quercus coccinea* Wang, which grew on a sandy hillside. Here they were plentiful, and resting motionless in the depressions of the bark or beneath the leaves in the cavities formed by the roots of the tree. A pair were also noted in another place on the flowers of golden-rod.

Of all the males taken in Indiana but one or two had the tegmina entire, and usually both tegmina as well as the rudimentary wings were wholly absent, while every female had both pairs unharmed. I at first ascribed this wing mutilation to the males fighting among themselves, but finally discovered a female in the act of devouring the wings of a male. Why this curious habit on the part of one sex? Possibly the females require a wing diet to requite them for their bestowed affections, or, perchance, they are a jealous set, and, having once gained the affections of a male,

devour his tegmina to keep him from calling other females about him. It is more than probable, however, that the mating of the sexes takes place in a similar manner to that of the white tree crickets (*Oecanthus*), the females gnawing away the tegmina of the males in order to more readily reach the alluring glands which lie beneath. The openings of these glands, located on the dorsum of the metathorax, are visible in dried specimens at hand.

In Florida I have found *H. agitator* more common than in Indiana, a few specimens having been secured at most of the collecting stations. About Dunedin it is taken in winter more commonly in dense hammocks where it hibernates in bunches of dead leaves which have lodged in the thick tangles of vines and shrubs. The males at that season probably represent a late fall brood which have not yet mated as the tegmina are mostly intact, while those taken in spring have them partially eaten away. It has been recorded by other collectors from numerous localities throughout the State, mostly under the name *H. quadratus* Scudder (1868b, 140), a form relegated to synonymy by both Scudder and Sausure, but restored as a valid species by R. & H. (1905, 52), and again reduced by them to a southern race (1916, 309.) No differential characters which can be used in a key can be found in comparing southern Indiana and Florida specimens, some of the former being fully as large with tegmina and hind femora as long as those from Dunedin. As R. & H. (loc. cit.) admit that the two so-called races merge in North Carolina and at the most "show little definite differentiation," I do not consider the name *quadratus* worthy of retention. The known range of *agitator*, as here recognized, extends from Long and Staten Islands, N. Y., west to southern Indiana and eastern Nebraska and south and southwest to southern Florida, Cuba and Brownsville, Texas. Uhler (1864) says that about Baltimore it inhabits grape vines and dense shrubbery and is found fully developed about the middle of September. The *Orocharis uhleri* McNeill (1891, 9) is a synonym of *H. agitator*.

(—). *HAPITHUS VAGUS* Morse, 1916, 178.

Very large and robust. Dull yellowish-brown, thickly and irregularly mottled with darker brown and fuscous; dorsal field of tegmina of female often with three or four dusky lines along the veins. Tegmina nearly or quite covering the abdomen; wings as long as tegmina. Hind femora relatively short and stout. Ovipositor shorter than hind femora, its apex armed beneath with one large and several small blunt teeth. Length of body, ♂ and ♀, 13—15; of tegmina, 9.5—10; of hind femora, 10—12; of ovipositor, 8.5—9 mm.

An adventive species found between 1900 and 1905 in the greenhouses of the Botanic Garden at Cambridge, Mass., where they did some damage by eating the tender green leaves of many kinds of plants, especially ferns. They were thought to have come originally from Jamaica. From the descriptions I judge this to be very close to, if not identical with, the *Apithis annulicornis* Sauss. (1874, 491) described from Surinam.

350. HAPITHUS BREVIPENNIS Saussure, 1897, 268. Short-winged Bush Cricket.

Elongate-oblong, rather slender. Pale reddish-brown; males with margin of dorsal field of tegmina yellow, bordered below with a fuscous line. Apical half of terminal joint of palpi much enlarged its apex obliquely truncate. Tegmina reaching middle of abdomen, their tips broadly rounded; those of female much less reticulate than in *agitator*. Hind femora relatively slender, three-fourths the length of body. Ovipositor straight, very slender, its tip not upturned. Length of body, ♂, 11—16, ♀, 15—19; of tegmina, ♂ and ♀, 6—9; of hind femora, ♂, 11—13.5, ♀, 12.5—15; of ovipositor, 9—11 mm.

This handsome bush cricket is known only from Georgia, Florida and Louisiana, and appears to be scarce wherever found. In Florida it has been definitely recorded from Atlantic Beach, Gainesville, Live Oak, LaGrange and Coconut Grove. It occurs for the most part among the tangled undergrowth of rather dry open oak and pine woods, the adults being found from July to October.

## II. OROCHARIS Uhler, 1864, 544.

Elongate, rather slender crickets having the body subdepressed; head short, narrower than base of pronotum; vertex flattened, strongly declivent, prolonged to form a short beak between the antennæ; maxillary palpi slender, third joint longest, cylindrical, fifth slightly longer than fourth, enlarged gradually from base, its apex obliquely truncate; antennæ setaceous, three times the length of body, the basal joint very stout; pronotum subquadrate, wider than long, front margin truncate, ciliate, hind one usually feebly bisinuate; tegmina surpassing abdomen 4—6 mm., exceeded by wings 2—4 mm., gradually tapering beyond the middle, the marginal area closely enveloping the abdomen; subapical spectrum large, enclosing in front a curved vein which parallels the boundary vein of the area; fore and middle legs stout, basal joint of their tarsi short, dilated, apical joint very slender, nearly as long as the other two united; hind femora slender, not reaching tips of tegmina; ovipositor straight, very slender, the tip crenate beneath.

## KEY TO EASTERN SPECIES OF OROCHARIS.

- a.* Beak of vertex not compressed, wider than basal joint of antennæ, its apex rounded; ocelli very small, widely separated; pronotum thickly pubescent, one-half wider than long. 351. SALTATOR.
- aa.* Beak of vertex compressed, narrower than basal joint of antennæ, its apex subacute; ocelli large, transverse, subcontiguous; pronotum scarcely wider than long, almost smooth. 352. GRYLLODES.
351. *OROCHARIS SALTATOR* Uhler, 1864, 545. Jumping Bush Cricket.

Color more or less dimorphic, usually a nearly uniform pale reddish-brown, the face flecked with darker brown, sometimes with a faint brownish or fuscous stripe along the side of head and pronotum; often grayish more or less maculate with fuscous, when of the latter hue the tegmina of female each usually with a small black basal spot and with cross-veinlets darker than those running lengthwise, thus giving the dorsal field a checkered appearance; humeral vein of tegmina in male often yellow; spines of hind tibiæ tipped with fuscous. Pronotum about one-half wider than long, its base but slightly wider than apex. Ovipositor dark brown, about a third longer than hind femora, nearly straight. Other structural characters under the genus heading. Length of body, ♂ and ♀, 14–16; of pronotum, ♂, 2.3–2.7, ♀, 2.4–2.9; of tegmina, ♂, 11–14, ♀, 13–14.5; of hind femora, ♂, 7–8, ♀, 8–10; of ovipositor, 11–13 mm. (Fig. 246.)

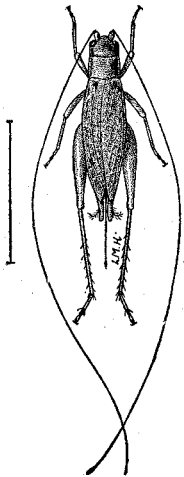


Fig. 246. Female.  
(After Lugger.)

This slender bodied bush cricket occurs in small numbers throughout the southern half of Indiana, frequenting the undergrowth of dense woods, the thickets along the borders of streams and the shrubbery of orchards and yards. A half dozen specimens were once found on Aug. 22 concealed in the folds of an old coat hanging in a grape arbor near the center of the city of Indianapolis. When disturbed it often seeks safety in flight and when it alights flattens out its body close against its resting place.

In Florida it is much more common than in Indiana, scores of specimens in both nymph and adult stages having been taken about Dunedin during the winter and spring months. There it is often beaten from the lower limbs of oak and other trees and also from bunches of leaves, and especially the large epiphyte, *Tillandsia utriculata* L., in which it is hibernating. Elsewhere in the State I have taken it at Ormond, Sanford, Utopia, Lakeland, Cape Sable and Ft. Myers. By other collectors it is mentioned only from Jacksonville, Silver Springs, Pablo Beach and Miami.

The known range of *O. saltator* extends from New Jersey west

to Nebraska and south and southwest to southern Florida, Mississippi and Texas. About Baltimore, the type locality, Uhler found it very common on *Cratægus* during September and October. Bruner mentions it (1893a) as occurring only occasionally in southeastern Nebraska. Southern specimens have been often erroneously recorded as *O. grylloides*. Of the egg-laying and song habits of this cricket Riley (1881, 62) wrote as follows:

"In December, 1877, I watched a female of *O. saltator* ovipositing in the end of a dead and rather soft twig of the soft maple at Kirkwood, Missouri. The twig had been pruned and the bark was somewhat gnawed by the cricket and the eggs thrust in irregularly from the end and from the sides. Both wood and pith were crammed with eggs, but all longitudinally inserted. The favorite nidus of the species is, however, the soft and somewhat corky, rough bark of the trunk and older branches of the American elm, the eggs being thrust in singly or in small batches, either longitudinally with, or very slightly obliquely from, the axis of trunk or branch. The female is very intent in the act, working her abdomen deliberately from side to side during the perforation.

"The stridulation of this cricket is a rather soft and musical piping of not quite half a second's duration, with from four to six trills, but so rapid that they are lost in the distance. The key is very high, but varies in different individuals and according to moisture and temperature. It most resembles the vibrating touch of the finger on the rim of an ordinary tumbler when three-fourths filled with water—repeated at intervals of from two to four per second, and it may be very well likened to the piping of a young chick and of some tree frogs. As the species is very common in the southwest its chirp is everywhere heard and is so distinctive that when once studied it is never lost amid the louder racket of the katydids and other night choristers. It is frequently heard during the day time in cloudy or damp weather, and I have heard it at St. Louis the first days of November after a slight frost.

"The courting of the sexes is amusing. They face each other and play with their antennæ for the best part of an hour or more than an hour. The female is, otherwise, pretty quiet, but the male continually mouths the twig or the bark upon which the courting is being done, and plays his palpi at a great rate, very stealthily approaching nearer to his mate meanwhile. At last the antennal fencing ceases and those of the female bend back and then the male approaches until their heads touch. He then deliberately turns round, elevates the elytra and slips his abdomen under the female, who virtually mounts and assists him, his elytra overshadowing her head."

352. *OROCHARIS GRYLLODES* (Pallas), 1772, 16.

Elongate, slender. Pale reddish-brown; lateral lobes of pronotum with a shining black stripe occupying their upper third and often passing back as a narrow line along the humeral vein of tegmina; abdomen black above. Pronotum as long as wide, feebly but obviously widening from apex to base, its disk concave along the median line. Tegmina surpassing abdomen 4—6 mm., exceeded by wings 3—4 mm. Hind femora very slender, two-thirds the length of body. Ovipositor longer than hind femora, very

slender, tips of the valves strongly tapering, acute, armed with one large and several small rounded crenations. Length of body, ♂ and ♀, 17—19; of pronotum, 3—3.2; of tegmina, 15—18; of hind femora, 12—13; of ovipositor, 13—15 mm.

Dunedin and Cape Sable, Fla., Dec. 21—Feb. 23 (*W. S. B.*) Everglade and Useppa Island, Fla. April (*Davis.*) My single Dunedin female was beaten from mangrove overhanging the water on the eastern or bay side of Hog Island, and was at once recognized as different from *saltator* by the less pubescent surface and the broad shining black stripe of lateral lobes. It is a West Indian species taken in this country only in southern Florida, having been recorded, principally under the name of *O. saulcyi* (*Guerin*), a synonym, from several places south of Punta Gorda and Miami, but not heretofore north of the former place. On Key Largo it was found by R. & H. (1912) "in the twilight of the heavy jungle growth by vigorously beating the foliage of the lower limbs of the trees and the tangled grape and other vines." About Miami in March Hebard (1915b) found small colonies in shrubbery and trees about hotels and also several beneath bark in Brickell's Hammock. Of its note he says:

"The song of this insect was, next to that of *Cyrtoxipha gundlachi*, the most frequent sound heard on warm evenings. The note is resonant, *baaaaa*, repeated incessantly at irregular intervals of a few seconds. When singing, the males were found perched upon the leaves of heavy bushes with tegmina raised high above their backs; considerable difficulty was experienced in locating individual singers."

### III. TAFALISCA F. Walker, 1869, 52.

Large robust, subcylindrical crickets having the head vertical as broad as thorax; occiput strongly convex; vertex prolonged to form a broad beak between the antennæ; ocelli very small; eyes of medium size, longer than wide; maxillary palpi with joints 3—5 subequal in length, the fifth club-shaped, concave within; antennæ setaceous, more than twice the length of body; tegmina variable in length, usually shorter than abdomen, alike in the sexes, their tips narrowly acutely rounded, slightly surpassed by the wings; legs short, stout; femora grooved but unarmed beneath; spines of hind tibiæ very stout, unequal, those on inner margin the longer; basal joint of hind tarsi as wide as the tibiæ, armed above with three stout spines and at apex with a pair of spurs longer than the joint itself; third joint very slender, as long as the other two united.



353. TAFALISCA LURIDA F. Walker, 1869, 53.

Dull brownish-yellow, often tinged with fuscous; finely pubescent; antennæ and hind tibiæ dark reddish-brown; abdomen fuscous; ovipositor dark brown. Hind femora rather slender, feebly surpassing abdomen. Ovipositor slender, the tips of its valves black, flattened, their outer margins very finely crenate and apical fourth nodulose above. Other structural characters as given above. Length of body, ♂, 23—25, ♀, 25—30; of tegmina, ♂, 16—18, ♀, 18—21; of hind femora, ♂, 14—16; ♀, 17—22; of ovipositor, 15—16 mm.

Dunedin, Lake Okeechobee, Cape Sable and Key West, Fla., Feb. 23—March 26, nymphs only (*W. S. B.*); LaGrange and Big Pine Key, Fla., September, adults (*Davis.*) At Dunedin I took a single nymph, March 26, by beating the Florida buttonwood, *Conocarpus erecta* L. on Hog Island. This is also a West Indian species but is recorded from a number of stations in the southern third of Florida, where it occurs in the nymph stages during the winter and spring months and evidently reaches maturity about June 1st. Dunedin is its most northern known locality.

#### AREA AND LIFE ZONES COVERED.

As has been noted on page three this work deals primarily only with those species of Orthoptera known to occur in the United States east of the Mississippi River and in Canada east of the 90th Meridian. However, many of the species of which it treats range over a much wider area to the north and west and a number of them have their principal distribution west of the Mississippi, the prairies and sand areas of Illinois and Indiana comprising the eastern limits of their range.

All of the recognized Life Zones of the United States and their characteristic faunas are represented in the area covered. The student must bear in mind that the fauna of no one of these life zones has a definite sharp and fixed boundary line, but that each overlaps and merges with the one above and the one below. Moreover, aside from those of the Hudsonian and Tropical zones, but few of the species of Orthoptera are limited to any one zone and some of them, as *Conocephalus fasciatus* (DeGeer), occur in all the zones. Mentioned in order from the most northern, these life zones and faunas are as follows:

**HUDSONIAN LIFE ZONE.**—Of the area treated this zone includes all of Labrador, Newfoundland, New Brunswick and Quebec, eastern Nova Scotia, the northern portions of Ontario and New England, the northern Peninsula of Michigan and isolated areas on the summits of the higher mountains of New York, Pennsyl-