

inward and downward. Ovipositor more slender, and with an evident but faint downward curve beyond the middle. Other characters as in *apterum*, the measurements approximately the same.

Ft. Myers and LaBelle, Fla., March 2—5; three males, two females (*W. S. B.*). Swept from low huckleberry bushes and other foliage along the margins of swales. The differential characters as above given are deemed sufficient to place this as a form of *apterum* worthy of a varietal name. It will probably be found only in the southern third of Florida.

#### Subfamily V. DECTICINÆ.

##### THE SHIELD-BEARERS.

Tettigoniids of large size and peculiar appearance in that they are nearly wingless and have the pronotum more or less prolonged backward over one or more of the basal segments of abdomen, thus forming a buckler or shield, whence the common name. Our eastern forms agree in having the face broad, perpendicular or nearly so; eyes small, subglobose, separated by at least three times their own diameters; antennæ very slender, arising from between the inner lower margins of eyes, but little longer than the body; vertex short, one-third or more the width of interocular space, strongly declivent between the antennæ; pronotum with front margin truncate, hind one rounded or subtruncate; lateral lobes longer than deep; prosternum usually armed beneath with two erect spines; tegmina very short, rarely as long as pronotum, developed only as shrilling organs in male, often scarcely visible, female; wings absent or rudimentary; tarsi more or less depressed, their first two segments sulcate lengthwise on the sides; front tibiæ with a slit-like foramen (hearing organ) each side near base and an apical spine on their upper outer side; front coxæ spined; hind tibiæ armed below with four apical spines; hind tarsi with a free lobe (plantula) at base of first joint; cerci of male variable as to genera and species; ovipositor stout, nearly straight.

According to Caudell only about 225 species of Decticinae distributed among 47 genera, were known in 1908. They are confined mostly to the temperate zones, 20 or more of the genera occurring in the United States. The main distribution of these is west of the Mississippi, where some of the species are very abundant and do much damage to vegetation. East of that stream but two genera are represented, one of them by a single species. But little is known of the life history of our eastern forms. They ap-

pear to be omnivorous in their choice of food, and, when kept in captivity, even cannibalistic. They are found for the most part in dry, upland open wooded districts or mountainous regions, where they are active during the day. On account of their comparatively wingless condition they probably do not wander far from their hatching place. In color they are usually a dull grayish- or yellowish-brown, their hues thus corresponding closely with the dead leaves and other herbage of their abiding places. As the males stridulate only at night, and the adults of both sexes move slowly and only when closely approached, they are seldom seen and are probably more plentiful than they appear to be. The principal literature pertaining to the subfamily which will be of interest to the American student is as follows: Herman, 1874; Scudder, 1894a; Caudell, 1907, 1908; Rehn & Hebard, 1916a.

KEY TO EASTERN GENERA OF DECTICINÆ.<sup>71</sup>

- a. Ovipositor straight or nearly so (Fig. 195); tegmina of male shorter than pronotum; prosternum usually armed with a pair of spines; lateral lobes longer than deep. I. ATLANTICUS.
- aa. Ovipositor distinctly curved upward (Fig. 199); tegmina of male longer than pronotum, sometimes fully developed; prosternum unarmed; lateral lobes as deep as long. II. IDIONOTUS.
- I. ATLANTICUS Scudder, 1894a, 179. (Gr., "a mythical island.")

The members of this genus possess the characters of the subfamily above given. In addition they have the head of medium size, not prominent, disk of pronotum much produced behind over the base of abdomen, front margin truncate; lateral carinæ always evident, sometimes gently rounded, again sharp and prominent; lateral lobes longer than deep, their front margins nearly straight and vertical, lower one short, oblique, the angle between the two obtuse, lower hind angle broadly rounded, hind margin long, oblique and sinuate; tegmina of male vaulted, overlapping, their stridulating field large but mostly concealed beneath the pronotum; tegmina of female wholly concealed; fore femora unarmed or with one to five spines on outer lower margin; hind femora variable in length and stoutness, their lower margins unarmed, or the inner one with several spines; last dorsal segment deeply emarginate at middle, the notch enclosing the small triangular or rounded deflexed supra-anal plate. Cerci of male subcylindrical, variable in length and thickness, armed within,

<sup>71</sup>A single specimen of *Pcdiodectes (Stipator) nigromarginata* Caudell, is recorded by that author (1907, 346) as being in the Scudder collection from Georgia, but it cannot be found and the record is probably erroneous, the species being otherwise known only from Kansas, Oklahoma and Texas.

at or behind the middle with a single tooth; subgenital plate of male either notched or subtruncate, its styles variable in length and thickness; of female always notched, usually deeply so. Ovipositor variable in length, usually straight, sometimes feebly curved downward, its tip acute.

The synonymy of the species of the genus *Atlanticus* is very much confused. Until 1894 only three species, now included under that name, were known from the United States, two described from South Carolina by Burmeister (1838) under the names *Decticus pachymerus* and *dorsalis*, and one from Tennessee by Saussure (1859) as *Orchesticus americanus*. Burmeister's names were placed by Scudder (1862) under the Old World genus *Thyreonotus* (Serv.) and by him applied to two well known northern forms (one of them the *americanus* of Saussure) which R. & H. (1916a) aver are not the same as those described by Burmeister, though they have not seen the latter's types and base their conclusions mainly on the fact that the species to which Scudder applied the names do not, as far as known, occur in South Carolina. Scudder (1894a) founded *Atlanticus* and referred to it the northern forms which he had previously placed under *Thyreonotus*, and a third species, *gibbosus*, from Florida. Later (1900) he described a fourth species, *testaceus*, from Missouri?, R. & H. (1912) described *A. glaber* from Florida and Davis (1915a) *A. monticola* from North Carolina. Finally R. & H. in their Revision (1916a) applied Burmeister's names to two southern forms, placed Saussure's *americanus* (*dorsalis* of most authors) under *Atlanticus*, referred the northern form previously known as "*pachymerus* Burm." to *testaceus* Scudd., and described two forms as new, thus recognizing nine species of *Atlanticus*, all occurring east of the Mississippi, and all but two confined to that area.<sup>72</sup> Since no one knows, or probably ever will know, to what forms Burmeister's names should in reality be rightfully applied, I judge that the conclusions of R. & H. are as good as any that can be made, and to avoid stirring the hodge-podge still farther I have, in the main, adopted them.

But two species of *Atlanticus* occur in Indiana and in their various stages are quite frequent from April 1st to September 15th in dry upland woods and on sloping hillsides with a southern exposure, but are seldom, if ever, found in damp localities. On the first warm days of early spring the young begin to emerge and in suitable places for a month or more are among the most common

<sup>72</sup>Scudder (1894a) and R. & H. (1916a) stated that *Atlanticus* was confined to the Atlantic slope of North America, but Rehn has recently described a species from China.

Orthopterans seen. They are much more active during early life than in the mature state when they crawl rather than leap. In captivity they feed as readily upon animal as upon vegetable food, and in the natural state probably feed upon the dead bodies of such small animals as they can find. The earliest hatched reach maturity in central Indiana about the first of June, and may then often be found resting on the leaves and stems of low shrubs and weeds, but seldom climb over two or three feet from the ground. The adults are far less numerous than the young, the vast majority of the latter probably falling a prey to the many ground-frequenting sparrows and other birds, as they do not hide by day as do the members of the genus *Ceuthophilus*.

The following key is based largely on that of R. & H. in their Revision, the order being changed to agree with the sequence of the species treated, the language simplified and some additional characters given.

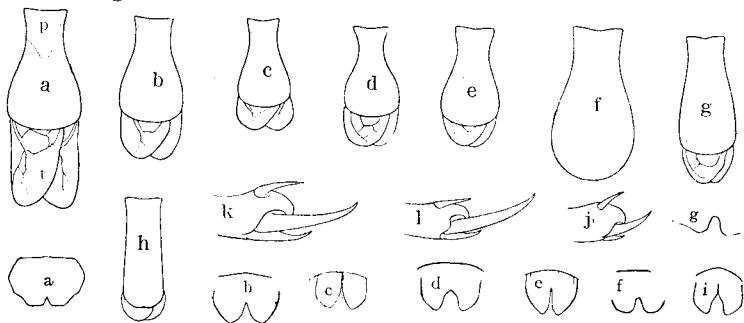


Fig. 194. Structures of *Atlanticus*. a—i, Dorsal outlines of disk of male pronotum (p) and tegmina (t) when projecting,  $\times 1.5$ ; also outlines of subgenital plate of female showing shape of notch,  $\times 2$ . a, of *testaceus*; b, *pachymerus*; c, *davisi*; d, *monticola*; e, *americanus*; f, *gibbosus*; g, *dorsalis*; h, *calcaratus*; i, *glaber*. j—l, Outlines of tips of hind tibiae showing the inner apical spurs,  $\times 5$ , j, *testaceus*; k, *glaber*; l, *calcaratus*. (After R. & H.)

#### KEY TO AMERICAN SPECIES OF ATLANTICUS.

- a. Disk of pronotum distinctly narrower near apical third or fourth, its margins or lateral carinae thence distinctly diverging backward, its length never twice the greatest width (Fig. 194, a—g.)
- b. Lateral carinae of disk of pronotum sharp, the angles very distinct; tegmina of male never completely covered by the pronotum.
- c. Subgenital plate of male angularly emarginate but never deeply and narrowly cleft; notch of subgenital plate of female V- or U-shaped, the projections each side never long and sublanceolate (Fig. 194, a—d); cercus of male in front of tooth stout.
- d. Length of exposed portion of male tegmina more than half that of pronotum; hind femora less than twice as long as pronotum; notch of subgenital plate of female narrowly V-shaped, its side projections short, broadly rounded (Fig.

- 194, *a*); ovipositor with apex tapering only on upper side, its tip therefore ventral (Fig. 195, *a*.) 275. TESTACEUS.
- dd.* Length of projecting male tegmina not more than one-third that of pronotum; hind femora at least twice as long as disk of pronotum; lateral projection each side of notch of subgenital plate of female not broadly rounded.
- e.* Ovipositor with apex tapering only on upper side, its tip therefore ventral (Fig. 195, *b*); hind femora of male 19 or more mm. in length; tegmina of male with tips slightly produced. 276. PACHYMERUS.
- ee.* Ovipositor with apex tapering both above and below, the tip therefore median (Fig. 195, *c*, *d*); hind femora of male less than 19 mm.; tegmina of male with tips broadly rounded.
- f.* Ovipositor straight; notch of subgenital plate of female very narrowly V-shaped (Figs. 194, 195, *c*.)
277. DAVISI.
- ff.* Ovipositor feebly but distinctly curved; notch of subgenital plate of female U-shaped (Figs. 194, 195, *d*.)

278. MONTICOLA.

- cc.* Subgenital plate of male narrowly and deeply cleft; notch of subgenital plate of female very deep, the projections each side elongate and narrowly rounded; cercus of male rather long, slender, subcylindrical (Fig. 195, *j*); ovipositor with apex tapering only on upper side, the tip ventral (Figs. 194, 195, *e*.)
279. AMERICANUS.

- bb.* Lateral carinæ of disk of pronotum obtusely rounded, distinct only on the posterior lobe; tegmina of male almost or wholly covered by the pronotum (Fig. 194, *f*.)

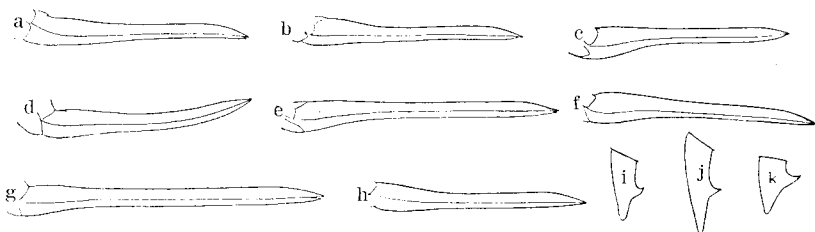


Fig. 195. *a*—*h*, Outlines of ovipositor of *Atlanticus*,  $\times 1.5$ : *a*, of *testaceus*; *b*, *pachymerus*; *c*, *davisi*; *d*, *monticcola*; *e*, *americanus*; *i*, *dorsalis*; *g*, *gibbosus*; *h*, *glaber*. *i*—*k*, Outlines of left cercus of male,  $\times 4$ ; *i*, *davisi*; *j*, *americanus*; *k*, *dorsalis*. (After R. & H.)

- g.* Size large, length of body, male, 26—33 mm.; cercus of male elongate, tapering and with a long slender curved sub-basal tooth (Fig. 197, *b*); basal half of hind femora strongly swollen; disk of pronotum more narrow at apical fourth than at front margin (Fig. 194, *f*.) 280. GIBBOSUS.

- gg.* Smaller, length of body, male, less than 26 mm.; cercus of male short, robust, its tooth short (Fig. 195, *k*); basal half of hind femora much more slender; disk of pronotum not more narrow at apical fourth than at front margin. 281. DORSALIS.

- aa.* Disk of pronotum not or very feebly narrowed at any point, its lat-

eral carinæ subparallel or nearly so, its length always more than twice its greatest width (Fig. 194, *h*.)

*h*. Middle apical spur on inner margin of hind tibiæ but little if any more than twice as long as the lower inner one (Fig. 194, *k*); prosternal spines present, elongate, slender. 282. GLABER.

*hh*. Middle inner apical spur of hind tibiæ two and a half times or more as long as lower inner one (Fig. 194, *l*); prosternal spines absent or very short. 283. CALCARATUS.

275. ATLANTICUS TESTACEUS (Scudder), 1900, 97. Short-legged Shield-bearer.

Size medium for the genus, form robust. Male.—Grayish or fuscous-brown; sides of pronotum and tegmina blackish, the former often shining, especially in the young; lateral lobes with a narrow curved yellowish line along the hind margin; exposed dorsal field of tegmina light brown; femora with numerous minute pale spots. Female.—Usually grayish or reddish-brown throughout, except the yellow line on side of pronotum, which is bordered above with a dash of black. Head large, set into pronotum almost to eyes. Antennæ slender, less than twice as long as body, the basal segment strongly flattened, about as wide as fastigium. Pronotum with disk large, its greatest width about two-thirds its length; lateral carinæ sharp, distinctly converging from base to apical fifth, then feebly diverging to apex; hind margin broadly rounded or subtruncate; lateral lobes with hind margin long, sinuous, very oblique. Tegmina of male exposed a distance at least equal to greatest width of pronotum, often more, their tips broadly rounded. Cerci of male subcylindrical, stout, tapering, feebly curved, rather bluntly pointed, the tooth at inner apical third short, blunt; apex of subgenital plate broadly shallowly emarginate; styles short, obtuse. Ovipositor straight, about as long as hind femora, its apical sixth tapering above to the acute tip. Length of body, ♂, 18—24, ♀, 19—25; of pronotum, ♂, 9—10.8, ♀, 8.8—10.4; of tegmina, ♂, 7—9; of hind femora, ♂, 14.5—17, ♀, 16.5—21; of ovipositor, 18.5—23 mm. Greatest width of pronotum, ♂, 6.3—7.8, ♀, 6.1—7.3 mm. (Fig. 196.)

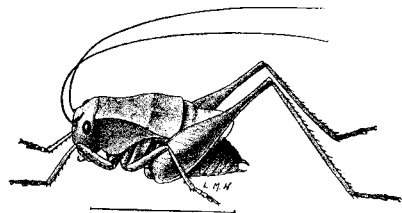


Fig. 196. Male. (After Lugger.)

This bulky brown Orthopteron occurs throughout Indiana but is more common in the northern counties. It frequents for the most part dry open woodlands, thinly wooded rocky slopes and borders of thickets, where it crawls slowly over the fallen leaves

being very clumsy in its movements. The earliest date on which a mature specimen has been noted was June 6th, in Vigo County, numerous specimens being taken between that date and June 20, while they may be found until after heavy frosts.

The general range of *A. testaceus* is northern, it being the most common *Atlanticus* north of the Ohio and east of the Mis-

Mississippi, its known distribution extending from Vermont, Massachusetts and southern Ontario, west to Minnesota and central Illinois and south to Virginia and central Kentucky. It is the species heretofore recorded by most writers, myself included (1903, 393), as *A. pachymerus* (Burm.) and there is no direct evidence to prove that it is not that species.

Davis (1893) has given a pleasing account of the song and habits of *testaceus* as noted on Staten Island, in part as follows:

“On June 26 I heard in a moist pasture a stridulation that was unknown to me. It much resembled that of *Orchelimum vulgare*, with the preliminary *zip, zip* omitted. It was a continuous *z-e-e-e*, with an occasional short *ik*, caused by the insect getting its wing covers ready for action after a period of silence. In due time I discovered, in a tussock of rank swamp-grass, the brown songster, *Thyreonotus pachymerus*, perched on a dead leaf. He was transferred from the tussock to a tin can and at home I made a home for him in a larger can in which was a branch of post oak whose leaves soon dried, furnished innumerable nooks and crannies in which to hide. Usually, however, the insect did not hide at all but perched himself on one of the topmost leaves and there waved his antennæ after the manner of all long-horned Orthoptera. Starting with raspberries, he had the rest of the fruits in their season, including watermelon, of which he showed a marked appreciation. If I offered him a raspberry and then gradually drew it away, he would follow in the direction of the departing fruit, and would finally eat it from my hand. At night he stridulated with unabated zeal to the first of August when he began to be less sprightly. Finally his song, instead of filling the room, was but a faint sound and the end came on the tenth or eleventh of September.”

Allard (1911b, 118) says of the song of *A. testaceus* on Plummer's Island, Md.: “One was singing after dark very close to the ground on a dry rocky thinly-wooded hillside. Its notes have the same lisping character as an *Orchelimum*. The phrases are brief, but rapidly repeated, with irregular intervals of silence intervening; *sh-sh-sh-sh-sh—sh-sh-sh-sh-sh—sh-sh-sh-sh-sh*. Several times while watching the insect stridulate by candle-light the writer lisped an approach to its notes and got an immediate response.”

At Moline, Ill., McNeill (1891) found the first adults on Aug. 9 and states that those kept in captivity showed a decided taste for animal food so that in the wild state it may be at least partly carnivorous.

Osborn records a specimen from Camp Douglas, Wis., and Lugger figures and describes the species from Minnesota, stating that only a few were found but giving no definite locality. In Michigan it is known only from the Porcupine Mts. and Gun Lake. Walker (1905, 113) states that the only Ontario specimens he

had seen were taken at Arner, Aug. 9. "They were found in the more open parts of a dry upland wood consisting chiefly of oak. Most of them were found on the short grass which was growing on the slopes of a ravine in the wood."

276. ATLANTICUS PACHYMERUS (Burmeister), 1838, 712.

The important features of difference between this species, as identified by R. & H., and *A. testaceus* are given by those authors (1916a, 54) as follows: "Caudal femora in both sexes of *pachymerus* at least twice, male, or more than twice, female, as long as pronotal disk; cephalic and median limbs relatively longer; greatest caudal width of pronotal disk equal to 54 to 66 per cent of greatest length of same; prosternal spines more aciculate and elongate and mesosternal lobes more acute. Male with pronotum less expanded caudad, the divergence of lateral carinæ less pronounced; tegmina well produced, the portion distad of the stridulating field distinctly shorter than in *testaceus* (Fig. 194, *b*); cerci more slender and more acuminate, the apex more produced, the tooth more nearly median than in *testaceus*; subgenital plate with distal margin rectangular-emarginate to acutely subfissate; styles slender and relatively elongate. Female with lateral carinæ of abdomen distinctly and median carina slightly more pronounced; ovipositor of approximately the same length as in *testaceus* but relatively much shorter, being considerably less than length of caudal femora. Subgenital plate more deeply divided, the lateral portions rotundato-rectangulate" (Fig. 194, *b*.) Length of body, ♂, 23.2—26.7, ♀, 20—28.2; of pronotum, ♂, 9.5—11.4, ♀, 9.1—10.6; of tegmina, ♂, 5.4—7.6; of hind femora, ♂, 19.8—24.2, ♀, 21—24.2; of ovipositor, 18—24 mm. Greatest width of pronotum, ♂ 5.8—7, ♀, 5.7—6.5 mm.

Southern Pines, N. Car., July 2 (*Davis*). Burmeister's types of *pachymerus* were from Germar's collection and labelled "South Carolina," without name of collector or region of the State. His brief description was as follows:

"Fusco-griseus, pronoti lateribus infuscatis, macula ad sinum marginis postica flava; vertice abdomineque toto unicoloribus. Male, elytris liberis fornicatis. Female, elytris nullis; vagina recta, abdomine longior. Long. corp. 9" (18.7 mm); femor. post. 8" (16.6 mm)."

Of this description and their placement of the species R. & H. (*loc. cit.*) say: "We are able to place Burmeister's name on this species by a process of elimination, \* \* \* the three words describing the male, 'elytris liberis fornicatis,' clearly referring to this species, *testaceus* or *davisi*; of these only the present form occurs near the coastal region of South Carolina from which the original material of *pachymerus* probably came. The characters given for the female are only sufficient to separate that sex from *monticola*. The length of the body and of caudal femora as given by Burmeister, while less than any found in the material before us, do not at all invalidate the claim of this species to his name.



The body length given could easily be accounted for by the abdomen being shrunken, while geographic or individual size variation could easily cause the discrepancy seen in the femoral length." Later on they admit that they have no exact record of the occurrence of *pachymerus* in South Carolina and give its known distribution as extending from Greensboro and Raleigh, N. Car., to the Ozark Mountain region of Arkansas. At Goldsboro, N. Car., the species was found "among fallen leaves of deciduous trees in a rather open forest composed chiefly of short-leaf pine."

As already noted none of the evidence thus submitted by K. & H. is, in my opinion, conclusive that the species thus fixed by them is the one described by Burmeister, and the latter must continue to remain a matter of question unless his types can be found and compared with our different forms.

277. ATLANTICUS DAVISI Rehn & Hebard, 1916a, 58. Davis's Shield-bearer.

Slightly smaller and more slender than *testaceus*. Male usually dark sooty brown flecked everywhere with grayish; apical third of hind femora paler, yellow line on lower border of pronotum indistinct or wanting. Female dull reddish- or yellowish-brown; posterior lobe of pronotum, dorsum of abdomen and ovipositor dark brown; face often with a blackish spot below each eye; sides of pronotum with obsolete fuscous markings. Fastigium slightly narrower than eye, feebly declivent. Disk of pronotum shorter than in *testaceus*, its lateral carinæ not as sharp as there, converging from base to apical third, then feebly diverging to apex, its greatest width two-thirds its length, hind margin subtruncate, its angles broadly rounded (Fig. 194, c); lateral lobes two-thirds longer than deep, lower margin straight, obtusely rounded into front one, hind margin oblique, fee-

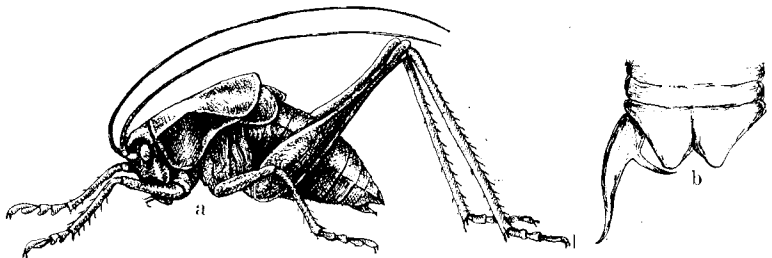


Fig. 197. a, Male of *Atlanticus davisi*,  $\times 1.7$ ; b, tip of male abdomen of *A. gibbosus*, showing form of cercal tooth. (After Caudell.)

bly sinuate. Tegmina of male exposed a distance equal to about one-half that of width of hind margin of pronotum, their tips well rounded. Hind femora with lower inner margin often armed with one to four very short spines. Male with cerci rather short, feebly curved, the basal portion stout, apical third much less so; the tooth at apical two-fifths short, slightly indent (Fig. 195, i); subgenital plate with a triangular notch; styles short, stout. Female with notch of subgenital plate very narrowly V-shaped; ovi-

positor slightly longer than hind femora, straight or nearly so, the apical fifth tapering on both margins to the median acute tip (Fig. 195, c.) Length of body, ♂, 16.8—23, ♀, 17—26.5; of pronotum, ♂, 7.7—9.5, ♀, 8—10.6; of tegmina, ♂, 3.5—5.5; of hind femora, ♂, 15—18, ♀, 17.5—22; of ovipositor, 18.4—23 mm. Greatest width of pronotum, ♂, 5.2—6.2, ♀, 5—6.6 mm. (Fig. 197, a.)

Southern half of Indiana, frequent, June 4—Sept. 28 (W. S. B.); East Jewett, N. Y., and Great Falls, Va. (Davis). This is the species treated in my former work (1903, 394) as *Atlanticus dorsalis* (Burm.), a name which R. & H. have applied to a form occurring in Georgia and Florida. In Indiana *A. davisi* has been taken from Marion and Putnam counties southward, and occurs most frequently on the high rocky, thinly wooded slopes of the southern counties where it is more abundant than *testaceus*. From the latter species it may be readily known by the shorter, less rounded hind lobe of pronotum, less exposed male tegmina, longer and more slender apical portion of male cerci, and by the tip of ovipositor being formed by the tapering of both margins, not the upper one alone as in *testaceus*.

The known range of *davisi* extends from Lake George, N. Y., west to southern Iowa and south to southern Virginia. In the eastern States it occurs in company with *A. americanus* among the dead leaves and scattered undergrowth of deciduous woods.

278. ATLANTICUS MONTICOLA Davis, 1915a, 104. Mountain Shield-bearer.

Size and form of *A. davisi*. Female "brown, the sides of pronotum streaked with black, particularly at the posterior portion, also an interrupted band of black on the outer sides of femora. Pronotum narrower in front than behind, somewhat pinched before the middle, the lateral carinæ well defined. Ovipositor stout, swollen at base with a gradual upward curve from about the middle and symmetrically narrowed to a point from both above and below (Figs. 194, 195, d.) Notch of subgenital plate U-shaped." (Davis). Tegmina of male covering about one-fourth of abdomen, their marginal field broader at base and narrowing toward apex instead of quite narrow and subequal throughout as in *davisi*. Length of body, ♂, 17.6—19.8, ♀, 20—23.2; of pronotum, ♂, 8—9, ♀, 8.3—9.9; of tegmina, ♂, 4.4—6; of hind femora, ♂, 14.8—18.8, ♀, 18.5—20.2; of ovipositor, 17.6—19.4 mm. Greatest width of pronotum, ♂ and ♀, 5.7—6.4 mm.

Lake Toxaway, N. Car., and Clayton, Ga. (Davis). The single paratype female at hand resembles that sex of *davisi* closely, but differs in the narrower disk of pronotum, with lateral carinæ less convergent, its posterior lobe more rugose above with angles much less rounded; the distinctly shorter lower half of lateral lobes with hind margins therefore much more oblique, the lower hind angle more narrowly rounded and humeral sinus more

distinct, the very evidently upcurved ovipositor and the broader, more U-shaped notch of subgenital plate.

The known range of this mountain-loving species extends from near Durbin, W. Va., to Clayton, Ga., at elevations of 2,000 to 6,000 feet. At Jones' Knob, N. Car., it was taken by R. & H. on July 19 and Oct. 7 in the undergrowth of the deciduous forest immediately below the spruce belt.

279. ATLANTICUS AMERICANUS (Saussure), 1859, 201. American Shield-bearer.

Size medium or above for the genus; form robust. Brownish-yellow to dark reddish-brown, lateral lobes of pronotum often in part darker; hind femora and sides of abdomen occasionally with small fuscous blotches. Fastigium and pronotum much as in *testaceus*, the latter with disk often subcarinate behind the middle, narrowest at apical third. Tegmina of male projecting beyond pronotum a distance about half that of width of front margin of pronotum. Hind femora as long as or slightly longer than body. Male cercus with apical portion feebly tapering; tooth small, sharp, situated at apical two-fifths (Fig. 195, *j*.) Ovipositor as in key and Fig. 195, *e*, as long as or slightly longer than hind femora. Length of body, ♂, 20—30, ♀, 22—28; of pronotum, ♂, 9.4—11, ♀, 10—11.3; of tegmina, ♂, 4.8—6.2; of hind femora, ♂, 22—28, ♀, 24.5—29.4; of ovipositor, 24—28.3 mm. Greatest width of pronotum, ♂, 5.4—6.9, ♀, 6.2—6.7 mm.

North Madison, Conn., Aug. 25, one pair from the crests of high rocky ledges along the Hammonasset River (*W. S. B.*). Yaphank, Long Island and Lakehurst, N. Jer., Aug. 27, Sept. 6 (*Davis*). A common form of the northeastern states and, according to R. & H., the one to which Scudder (1862) and most subsequent authors applied the name *dorsalis* Burm. Its known range extends from central New England west to the Appalachian Mountains and southwest to northern Florida, central Alabama and Natchez, Miss. Saussure's types were from Tennessee. The Connecticut record above given is the first definite one for that State. The only known Florida station is River Junction where on August 31 R. & H. took five males and four females from "among tree shoots in heavy forest of beech, hickory, oak and magnolia on limestone hills." They state (1916a, 79) that *americanus* is a "frequenter of the areas of dead leaves and low undergrowth in pine and deciduous forests, occasionally being more numerous along the edges of the timber than in the depths of the woods. Its presence will often be signaled by the patter on the leaves as it jumps away from the disturbing footsteps. The insects are so thoroughly protected by their coloration that it is often difficult to see them, even when moving, much less when

stationary. Their activities are chiefly nocturnal and work with a flash lamp will sometimes reveal them in many situations."

Davis (1911a) mentions the finding of eight specimens of this large Orthopteron in a single burrow of the wasp, *Chlorion ichneumonea* L., the "cricket" being so clumsy in motion that it easily falls a prey to the wasp. He also states (1915a) that this and other species of *Atlanticus* "are often attracted to the trees sugared for moths and they may be likewise collected in traps consisting of jars or old tin cans sunk in the ground and baited with molasses. More females than males seem to be attracted by the above methods."

280. ATLANTICUS GIBBOSUS Scudder, 1894a, 180. Robust Shield-bearer.

Large for the genus; form robust. Pale brownish-yellow to cinnamon-brown, more or less sprinkled with fine fuscous markings; upper half of lateral lobes usually blackish-fuscous. Fastigium wider than basal joint of antennæ, its tip broad, rounded. Pronotum with disk large, strongly produced backward, its hind margin broadly and evenly rounded; lateral lobes twice as long as deep, lower margin short, oblique, its front angle obtuse, hind angle very broadly rounded, hind margin very long, humeral sinus scarcely evident. Tegmina usually concealed in both sexes, rarely feebly protruding in male. Hind femora very stout, about two and a half times the length of pronotum, their inner lower margin armed with two to nine short spines. Male with notch of subgenital plate deep, narrow; styles short, obtuse; cerci as in key and Fig. 197, *b*. Female with subgenital notch narrowly U-shaped, the lobes each side broadly rounded (Fig. 194, *f*.) Ovipositor straight, twice or slightly less than twice as long as pronotum, its apical fifth tapering above, and tip therefore ventral (Fig. 195, *g*.) Length of body, ♂, 26—33, ♀, 27—34.5; of pronotum, ♂, 11.6—14, ♀, 12.5—14.7; of hind femora, ♂, 28.5—34.8, ♀, 31.7—37; of ovipositor, 25—29 mm. Greatest width of pronotum, ♂, 6.7—7.9, ♀, 7.1—8.2 mm.

Dunedin, Fla., July 15—Oct. 29 (*W. S. B.*); Lake City, Fla., May 28 (*Gainesville Coll.*). Recorded also from numerous places in the northern part of Florida, Ft. Reed being the most southern station on the east coast and Dunedin on the west one, at which it has been taken. About Dunedin the young are quite common in dry open pine and scrub-oak woods during March and April and probably reach maturity in June. At Pablo Beach R. & H. found it in palmetto scrub and salt marsh. They state (1907) that the adults "possess greater strength in the jaws than any other North American orthopterous insect known to us. A single bite can easily pierce the cuticle and cause the blood to flow. In consequence the field collector quickly acquires a wholesome respect for their defensive abilities. Individuals showed surprising

activity in escaping when alarmed by seeking hiding places under the scrub palmettoes, to which they hurried with seeming un-gainliness but nevertheless considerable speed."

Part of Scudder's types were from North Carolina and the known range of *gibbosus* extends from that State to Dunedin, Fla., and inland to Warm Springs, Ga. It occurs from sea level to about 2,000 feet in elevation and is chiefly found among the wire-grass and dead leaves of oak and pine woods.

This is the largest of our species of *Atlanticus* and the males may be readily known by the large size taken in connection with their concealed tegmina and long tooth of cerci, while the females are distinguished mainly by the size, obtuse lateral carinæ and long, strongly rounded posterior lobe of pronotum.

281. ATLANTICUS DORSALIS (Burmeister), 1838, 713.

"Coriicolor, lateribus omnino fuscis, pronoto macula in sinu flava; vertice pedibusque griseo-fuscis, tibiis extus dilutioribus. Male elytris sub pronoto absconditis. Long. corp. 11'' (22.9 mm.); femor post 1'' (25.4 mm.)" (*Burmeister.*) "Male with tegmina projecting very slightly caudad of the caudal margin of pronotal disk; cerci short, robust, the distal portion moderately acute (Fig. 195, *k*); subgenital plate slightly acute-angulate emarginate. Female with subgenital plate deeply and broadly emarginate, tips of lateral sections well rounded (Fig. 194, *g*); ovipositor straight, but little more than two-thirds the length of caudal femur. Length of body, ♂, 25.4, ♀, 25.7; of pronotum, ♂, 10.7, ♀, 12.2; of hind femora, ♂, 24.3, ♀, 29.8; of ovipositor, 20.6 mm." (*R. & H.*)

The original description of Burmeister was of a single male from South Carolina in the Germar collection. *R. & H.* (1916a, 87) assigned the name to one adult pair and some nymphs taken at Billy's Island and Thomasville, Ga., stating that they have arrived at their conclusion "by a process of elimination," since they feel certain that it must occur in eastern South Carolina and that it is the only species found anywhere near that agrees with the particular character given by Burmeister of having the tegmina of male hidden under the pronotum, etc.

Known definitely only by an adult male from Billy's Island and a female from Thomasville, Ga., and some nymphs from the latter place and Jacksonville, Fla. At Thomasville they were found among the wire-grass in damp areas in the pine woods.

The present status of the *dorsalis* of Burmeister is, in my opinion, the same as that of his *pachymerus*, i. e., an open question. From a truly scientific basis the evidence cited by *R. & H.* in both cases has little value, as they have seen specimens of neither from South Carolina. However, for the time being, the

names of Burmeister may as well be assigned to the species to which they are attached by R. & H. as to any other and I have so retained them.

282. ATLANTICUS GLABER Rehn & Hebard, 1912, 269. Smooth Shield-bearer.

Size medium, form rather slender. Pale brown; lateral lobes of pronotum black, their lower margin ivory-white and apical half suffused with olive-gray; sides of abdomen with vague blackish triangular blotches. Fastigium slightly wider than basal joint of antennæ. Disk of pronotum elongate, narrow, convex, subequal in width throughout, its hind margin broadly rounded (Figs. 194, *h*, 198.) Tegmina of male scarcely, or not at all, exceeding the hind margin of pronotum. Hind femora slender, nearly as long as body, armed with four to nine spines on inner lower margin. Male with apex of subgenital plate acutely emarginate; cerci short, stout, depressed toward apex, the latter rather blunt; the tooth at apical two-fifths short, sharp, slightly recurved. Female with notch of subgenital plate rather broadly U-shaped, the lateral angles subacute (Fig. 194, *i*); ovipositor straight, nearly one-third shorter than hind femora, the apex ventral (Fig. 195, *h*). Length of body, ♂, 24—31, ♀, 24.5—32; of pronotum, ♂, 10.6—12, ♀, 11.2—11.8; of hind femora, ♂, 25.8—27, ♀, 28—30.2; of ovipositor, 17.5—20.4 mm. Greatest width of pronotum, ♂, 4.1—4.7, ♀, 4.1—4.9 mm. (Fig. 198.)

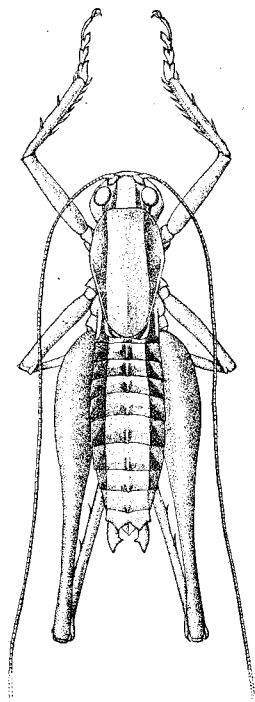


Fig. 198. Male type.  
× 1.5. (After R. & H.)

Dunedin and Sarasota, Fla., Nov. 2—March 1, (W. S. B.). The types of R. & H. were from Miami and the species seems to replace *A. gibbosus* in central and southern Florida. It has so far been recorded only from Ft. Reed, Tampa, Pineland, Marco, Miami and Homestead, Fla., the adults having been taken from March 6 to May 20, mostly among the undergrowth of pine woods, sometimes among the grasses of adjoining marshes. At Marco Davis took them "by treading closely and more or less shoving the feet through the tangled grasses of a small moist meadow on the interior of Key Marco." North of Florida it is known only from Billy's Island, Ga., where Hebard found it in July, 1917.

283. ATLANTICUS CALCARATUS Rehn & Hebard, 1916a, 93. Long-spurred Shield-bearer.

Closely related to *A. glaber*. Differs according to R. & H. by "the shorter pronotum, truncate caudal margin of disk of same, deeper and

shorter lateral lobes which have an appreciable indentation at the sinus, more acute angles of the disto-dorsal abdominal segment; less exerted and shorter cerci and subfissate subgenital plate of male, the more robust limbs and the greatly elongate medio-internal distal spur of the caudal tibiæ." In addition *A. calcaratus* has the black stripe on sides of pronotum wider, more shining and extending back along sides of abdomen, the yellow one below it wider, more prominent; outer face of hind femora darker. Tegmina extending 2—3 mm. beyond pronotum, their dorsal field black. Prosternal spines often represented by small conical teeth. Ovipositor feebly upcurved beyond the middle, its apex median. Length of body, ♂, 22.5—24.4, ♀, 28; of pronotum, ♂ and ♀, 10—11; of tegmina, ♂, 3.6—5.2; of hind femora, ♂, 23.9—24.8, ♀, 26.5; of ovipositor, 17 mm. Greatest width of pronotum, 3.8—4 mm.

Known only from a series in the Philadelphia collections taken at Billy's Island, Ga., and a single male in the Morse collection from Hastings, Fla.

## II. IDIONOTUS Scudder, 1894a, 179. (Gr., "peculiar" + "back.")

Medium sized species having the vertex more than one-half as broad as interocular space; pronotum not greatly produced backward, its disk flat and with a submedian U-shaped transverse sulcus; lateral carinæ sharp, strongly converging near apical third of pronotum to narrow its disk to nearly one-half the caudal width; median carina present behind the transverse sulcus; front tibiæ armed above on outer margin with three spines; hind femora more than twice the length of pronotum, unarmed beneath; tegmina overlapping, as long as or longer than pronotum, male, one-half its length, female, their tips broadly rounded. Other characters as given in key.

### 284. IDIONOTUS SPHAGNORUM (F. Walker), 1869, 258.

Pale reddish-brown; lateral lobes of pronotum blackish-fuscous, the front and lower margins and basal third pale yellow; sides of abdomen with a row of black spots; outer face of hind femora with fuscous striæ; hind tarsi and sides of vertex black in female. Pronotum narrow, its hind margin broadly rounded, male, subtruncate, female. Tegmina dimorphic in male, in the macropterous form surpassing tips of hind femora. Male with cerci cone-shaped, armed within near base with a sharp black curved spine, this invisible from without; supra-anal plate broad, deeply and narrowly notched, the lobes each side squarely truncate; subgenital plate scoop-shaped, with a deep, broad, triangular apical notch; styles subcylindrical, movable, twice as long as broad. Ovipositor as long as hind femora, strongly upcurved. Other characters as given above. Length of body, ♂, 17—20, ♀, 24.5; of pronotum, ♂ and ♀, 5.2—5.5; of tegmina, ♂, 6, ♀, 2.5; of hind femora, ♂, 12, ♀, 14.5; of ovipositor, 11—14 mm. Width of pronotum, ♀, front margin, 2.7; hind margin, 3.7 mm. (Fig. 199.)

This interesting Dectidid has been taken on several occasions by E. M. Walker at Ft. William, Ont., where it was first found in rather long grass. He records it also (1909, 210) from Aweme, Man., and Millarville and Calgary, Alta. Caudell informs me that his *Idionotus brevipes* (1907, 396) from "Arctic America" is

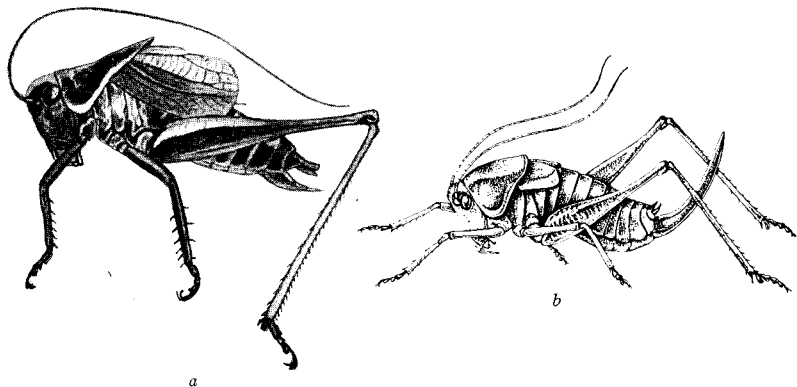


Fig. 199. *Idionotus sphagnorum* (F. Walker.) a, Male,  $\times 2$ . (After E. M. Walker.) b, Female,  $\times 1.3$ . (After Caudell.)

the male, and his *Platypleis fletcheri* (1907, 403) the female, of *I. sphagnorum*. The known range of the species extends from northwestern Ontario to western Alberta and northward to Arctic America, F. Walker's types being from St. Martin's Falls, Hudson's Bay.

Of the habits of *I. sphagnorum*, as noted at Ft. William, E. M. Walker (1911) says:

"In addition to open grassy places it occurs also in paths and old lumber roads in the depths of spruce swamps. The tree growth in these swamps consists mainly of black spruce, interspersed with tamarack, white cedar and balsam fir. With the exception of a single female, which I found squatting close to the ground on a path in the swamp, all the specimens taken were males, and were all traced by their stridulation. When discovered, they were sometimes found perching in a conspicuous position upon the upper side of a leaf or twig of some shrub, a few feet from the ground, but several times the sound was traced to the trunk of a tree, and the musician was in some cases too high up to be detected.

"The stridulation of this grasshopper is a soft trill of little volume, audible at a distance of but a few yards. It is sometimes continuous for some seconds, but is generally interrupted rhythmically, the divisions being produced at a rate varying according to the amount of sunshine. In bright sunshine I counted forty in fifteen seconds, the rate being thus two and two-thirds divisions per second, but on an afternoon when the sun was almost wholly overcast the rate was reduced to forty-one or forty-two in thirty seconds, or about half the rate in sunshine. When close to the strid-



ulating insect I could detect that there were no absolute pauses between the trills, a very low trilling sound filling in all the intervals. The rhythm is not always quite regular. Sometimes after a succession of trills of apparently equal length one may be shortened or lengthened, and then the regular trilling resumed."

#### Subfamily VI. GRYLLACRINÆ.

Small or medium sized wingless Tettigoniids, in our species having the head short, globose, face vertical; vertex broad, two-thirds as wide as interocular space, bluntly rounded, strongly declivent; pronotum covering only prosternum, its lateral carinæ absent; lateral lobes as deep as long, their front and hind margins broadly rounded into the lower one; meso- and metanotum similar to dorsal abdominal segments, their hind margins truncate; fore and middle femora feebly curved, unarmed beneath; fore and middle tibiæ armed with four long distant spines on each of their lower carinæ; hind tibiæ armed with four or five spines on each carina. Male with supra-anal plate thickened, decurved, emarginate; cerci long, slender, awl-shaped; subgenital plate with a wide deep transverse notch, the lateral projections each bearing at tip a short obtuse style. Ovipositor but slightly longer than hind femora, strongly curved upward, its valves compressed, acute.

According to Kirby the subfamily is represented throughout the world by 15 genera and about 240 nominal species, 172 of which belong to the single genus *Gryllacris*. But one genus occurs in the United States.

##### I. CAMPTONOTUS Uhler, 1864, 548. (Gr., "curved" + "back.")

Form similar to *Ceuthophilus* Scudd. Head large, oval, much broader than pronotum, not deeply sunken into it; eyes elongate-ovate, vertical, situated a little behind the basal joint of antennæ, and exceeding it slightly in length; maxillary palpi long, the last joint as long as preceding one, feebly inflated at tip; antennæ at least five times the length of body; dorsal abdominal segments subequal in length, the last two slightly shorter; legs very short, moderately stout; hind femora armed beneath with two to six very short spines on each carina; tarsi stout, four-jointed, with split cushions beneath, the first joint equal in length to the two following ones conjoined. Other characters as given under subfamily heading. A single species is known from the eastern United States.