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A REVISION OF THE  
NORTH AMERICAN GENUS  
**BELOCEPHALUS**

(Orthoptera; Tettigoniidae)

by  
Morgan Hebard

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A REVISION OF THE NORTH AMERICAN GENUS  
BELOCEPHALUS (ORTHOPTERA; TETTIGONIIDAE,  
COPIPHORINAE).

BY MORGAN HEBARD

This genus includes a number of species peculiar to the southeastern United States and there found only in the area recognized as the Sabalian Zone.<sup>1</sup> The more widespread forms are subject to much individual variation, and it was only through careful analyses of the series now available that we have been able to estimate the value of the features which have been used to separate them. All of the species are nocturnal and occur in the undergrowth on the borders of fields, in forests or swamps, often on the Saw Palmetto (*Serenoa serrulata*), the Cabbage Palmetto (*Sabal palmetto*) or the Silver Palm (*Coccothrinax argentea*). While occupied in field work we have found that one of the favorite retreats of these insects during the day is between the palmetto fans, wherever these overlapped, or in plants where a central fan was beginning to open, giving exceptionally good concealment. In such cases individuals could be readily seized, but invariably clung tenaciously to their support and bit with great strength if the opportunity offered. At night, males can be located by their vigorous stridulation. They are then more alert, but retreat slowly in a crab-like manner when approached with a light, and jump only as a last resort. Sometimes they were found to be quite fearless<sup>2</sup>, but at other times exceedingly shy, ceasing their song long before close enough approach had been made to enable the collector to locate their position.

The genus is monotypic. Genotype.—*Belocephalus subapterus* Scudder.

<sup>1</sup> See Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 102.

<sup>2</sup> It was noted that this was usually the case when individuals were found well above the ground in cabbage palmettoes. This was true for *sabalis* at Indian Beach and *uncinatus* at Miami Beach. A sense of greater security seemed to be the cause.

The genus is characterized as follows. Form robust. Fastigium produced well beyond first antennal joint, rounded or acute conical, above smooth and neither carinate or conspicuously flattened, toothed proximo-ventrad, apex spined or rounded. Fastigium well separated from facial fastigium. Pronotal disk with lateral margins almost straight. Prosternum very strongly bispinose. Mesosternal and metasternal lobes rounded triangular. Tegmina greatly reduced in males, vestigial lateral pads in females. Ovipositor stout for the elongate slender type, weakly curved dorsad. Female subgenital plate large, embracing base of ovipositor. Genicular lobes of caudal femora unispinose.

It is of interest to note that nearest relationship is shown to the genus *Banza* Walker, which occurs in the Hawaiian Islands, there similarly developing a number of local species. The species of *Banza* are readily separated by the truncate vertex, which scarcely surpasses or is no longer than the first antennal joint and is armed with a much heavier proximo-ventral tooth; the pronotal disk, which is faintly but evidently subsellate; the less produced metasternal lobes; the decidedly less strongly reduced tegmina, which are no more reduced in females than in males; the more knife-like ovipositor, and small female subgenital plate, which does not embrace the base of the ovipositor.

To *Banza* nearest, though purely superficial, general resemblance is found in the Malagasian and African genus *Aethiomerus* Redtenbacher, belonging to the *Agraeiinae*.

#### **BELOCEPHALUS** Scudder

1874. *Acanthacara* Thomas (not of Scudder, 1869), Bull. U. S. Geol. Geogr. Surv. Terr., 1, p. 71.  
 1874. *Acanthacara* Glover (not Scudder, 1869), Illustr. N. Amer. Orth., pl. 16, fig. 17.  
 1875. *Belocephalus* Scudder, Proc. Boston Soc. Nat. Hist., xvii, p. 458.  
 1912. *Belocephalus*, Karny, Genera Ins., Orth., Locustidae, Copiphorinae, Fasc. 139, p. 17, pl. 3, fig. 10.

The degree of production of the lateral portions of the male ultimate tergite, depth and width of its median emargination and, in some cases, character and degree of curvature of the internal margins of the productions, constitute features which must be considered in separating the species and races of the genus. In spite of this, marked individual variation in its con-

tour occurs in some of the species. This is partially accounted for by sketches made of this tergite by Hubbell of fresh material, which show that changes sometimes take place in drying. This change is confined to the inner and less chitinous portion of the lateral projections and is due to shrinkage, resulting in a reduction of the convexity of the internal margins in some cases.

A green and a brown color phase occurs, probably in all the species. We have been able to determine, through breeding, that a green immature individual changed to brown in next to its last moult, becoming a brown adult.

To preserve the color we have found that, after evisceration, the material should be dipped for a few minutes in about a five per cent solution of formaldehyde, then dried thoroughly on blotters and packed. Blotters should also be inserted in the body cavity, to insure extraction of the liquid after dipping. This method is distinctly superior to using a stronger solution or carrying the specimens in the liquid for some time, when fading in green specimens is almost certain to result.

The following key must not be used without careful consideration of the individual variation which occurs in the species of the genus, reaching its maximum, as would be expected, in the two most widespread species, *subapterus* and *sabalis*.

A1. Female subgenital plate with lateral apices not as elongate, not reaching nearly as far as dorsal margin of ovipositor when directed dorsad. Ovipositor proportionately more elongate.<sup>3</sup> Male tegmina proportionately less reduced. Antennae with joints heavily spotted externally, or annulate, with blackish brown.)

B1. Male subgenital plate simple, without a spike above each style. Male cerci with ventral arm moderately decurved.

C1. Male ultimate tergite less deeply emarginate distad, the emargination rectangulate or obtuse-angulate. Male cerci with arms very short.

D1. Male ultimate tergite so broadly obtuse-angulate emarginate that the lateral apices show little production. Size small ( $\sigma$  22.3 to 31.8,<sup>4</sup>  $\text{♀}$  24.8 to 35 mm.).

<sup>3</sup> Considerable individual size variation and the different average sizes of the species cause the actual ovipositor length to be of no value here, though this organ is proportionately decidedly more elongate in these species than in those of the alternate category AA1.

<sup>4</sup> Except in the Jacksonville region, where typical *subapterus* attains exceptional size, our largest male from there being 31.8 mm. in length.

E1. Apex of vertex armed with a decurved spine. Ovipositor averaging slightly less elongate (16.6 to 20 mm.). Pomona and Gainesville, Florida, north to southern South Carolina, southern Georgia, southeastern Alabama and west to central-western Florida.

1. *subapterus subapterus* Scudder

EE1. Apex of vertex lacking a spine or with a mere rudiment of such. Ovipositor averaging slightly more elongate (18 to 22 mm.). North-central western peninsular Florida.

1a. *subapterus rehni* Davis

DD1. Male ultimate tergite produced laterad as rounded acute-angulate triangles, so that its emargination is rectangulate or only feebly obtuse-angulate between. Size averaging larger ( $\sigma^7$  26.5 to 35.8,  $\text{♀}$  31.2 to 35.5 mm.). (Ovipositor length averaging close to *s. rehni*; 19.7 to 21.7 mm. Male vertex averaging more elongate than in typical *subapterus*.) North-central eastern and central peninsular Florida.

1b. *subapterus peninsularis* new subspecies

CC1. Male ultimate tergite deeply emarginate distad at much less than a rightangle, the internal margins of the lateral productions so formed strongly convex distad. Male cerci with arms longer (but not as elongate as in *hesperus* or *davisi*, the ventral arm very narrow at its base. Apical spine of vertex strongly decurved, as strongly as the maximum found in *subapterus*. Size small ( $\sigma^7$  27 to 31.5,  $\text{♀}$  31.8 mm.) Southeastern tropical Florida.

2. *uncinatus* new species

BB1. Male subgenital plate with lateral margins narrowly chitinous, cultrate, terminating on each side in a spike above the styles. Male cerci with ventral arm strongly decurved. (Male ultimate tergite with emargination rectangular or slightly less, the lateral productions thus formed with internal margins often moderately convex. Size small ( $\sigma^7$  26.2 to 33.1,  $\text{♀}$  30 to 32.5 mm.). Ovipositor elongate, slightly less curved than in the preceding species (19 to 22.3 mm.).

C2. Apex of vertex armed with a decurved spine.

D2. Male styles reduced or wholly atrophied. Mesodistal emargination of male subgenital plate smaller and proportionately narrower. Vertex averaging shorter ( $\sigma^7$  1.9 to 2.3,  $\text{♀}$  1.9 mm.) with the apical spine usually more decurved. Manatee, Florida.

7a. *hebaridi proximus* new subspecies

DD2. Male styles extending beyond apices of adjacent spikes, rarely at all reduced. Meso-distal emargination of male subgenital plate larger and proportionately broader. Vertex averaging slightly longer ( $\sigma^7$  1.9<sup>5</sup> to 2.8,  $\text{♀}$  2.2 to 3.1 mm.) with the apical spine usually less decurved. Fort Myers and Iona, Florida.

7a. *hebardii hebardii* Davis

CC2. Apex of vertex bluntly rounded, showing no trace of an apical spine. (Length of vertex  $\sigma^7$  1.5 mm.). Big Pine Key, Florida.

8. *micanopy* Davis

AA1. Female subgenital plate with lateral apices more elongate reaching or nearly reaching as far as dorsal margin of ovipositor, when directed dorsad. Ovipositor proportionately less elongate. Male tegmina proportionately more reduced.

B2. Antennae with joints heavily spotted externally, or annulate, with blackish brown.

C3. Vertex short ( $\sigma^7$  1.7 to 2.1,  $\text{♀}$  1.9 to 2.1 mm.). Form usually slightly more robust and compact. Size small ( $\sigma^7$  23 to 30.8,  $\text{♀}$  27.8 to 31.2 mm.). Southwestern Georgia, western Florida and southern Alabama.

3. *hesperus* new species

CC3. Vertex decidedly more elongate (with Newberry series excepted,<sup>6</sup>  $\sigma^7$  2.8 to 3.9,  $\text{♀}$  3 to 3.9 mm.). Form normal, not quite as robust and compact as is usual in the alternate category. Size averaging decidedly larger ( $\sigma^7$  29.5 to 41,  $\text{♀}$  33.7 to 41 mm.). Okefenokee Swamp, Georgia and northeastern Florida to St. Augustine, Dunnellon and Live Oak.

4. *davisi* Rehn and Hebard

BB2. Antennae immaculate, rarely with joints showing faint suffusions of light brown.<sup>7</sup>

<sup>5</sup> This minimum found in but one specimen, all the others of the large series approaching the maximum more closely.

<sup>6</sup> In that series the vertex is unusually short,  $\sigma^7$  2.2 to 2.3,  $\text{♀}$  2.7 to 2.8 mm.

<sup>7</sup> In the northeastern portion of the distribution of *sabalis*, however, this feature does not hold, material from there having quite as dark and extensive antennal markings as in the alternate category. The average larger size, longer vertex and more deeply cleft male ultimate tergite separates such individuals from those of *davisi*, with which species confusion alone is possible.

C4. Face below eyes evenly tapering to vertex, giving the head an evenly conical appearance. Fastigium of vertex more elongate ( $\sigma^7$  2.9 to 4.3,  $\text{♀}$  3.3 to 4.8 mm.), maximum length for the genus. Male abdomen often wider at apex than proximad. Male ultimate tergite deeply cleft, usually at a rightangle or slightly less, the lateral projections so formed usually sharp, but sometimes with internal margins strongly convex.<sup>8</sup> (Size large,  $\sigma^7$  36.2 to 44.2,  $\text{♀}$  39.4 to 47 mm. Ovipositor 16.7 to 20.1 mm.). Mainland of southern Florida, north to New Smyrna and Indian Beach.

5. *sabalis* Davis

CC4. Face below eyes weakly but appreciably inflated. Fastigium of vertex less elongate. Male abdomen at apex no wider than proximad. Male ultimate tergite deeply cleft, typically at a more acute angle, with lateral projections so formed sharp, typically with internal margins very strongly convex.

D3. Fastigium averaging more elongate ( $\sigma^7$  2.4 to 2.8,  $\text{♀}$  3 mm.). Male ultimate tergite very deeply cleft. Size averaging larger ( $\sigma^7$  38.7 to 45,  $\text{♀}$  42 mm.), form more robust. Key Vaca and Big Pine Key, Florida.

6. *sleighti sleighti* Davis

DD3. Fastigium averaging shorter ( $\sigma^7$  1.9 to 2.2 mm.). Male ultimate tergite deeply, but not as deeply, cleft. Size averaging smaller ( $\sigma^7$  34.2 to 40.8 mm.), form more graceful. Homestead and Florida City, Florida.

6a. *sleighti simplex* new subspecies

We here recognize eight species and four geographic races, of which two species and three races are here described as new. Among the six previously recognized species, we have reduced *rehni* to racial status under *subapterus* and have placed *excavatus* as a synonym of *subapterus subapterus*. We have been able to arrive at these conclusions through the study of eight hundred and twenty-eight specimens.

We particularly regret that no material has as yet been secured in several large sections of Florida, where the genus undoubtedly

<sup>8</sup> The form of these projections varies so greatly in *sabalis* and *sleighti* that it can not be used, as Davis supposed, to separate these species, in conjunction with slight differences in length of the caudal femur.

occurs. Material from Lake, Sumter and Citrus Counties must be studied, before the limits of the races of *subapterus* can be properly defined in that region.

The great area from Ormond to Palm Beach and far inland, particularly in its southern portion, has yielded so little that series from a number of points would give a much better conception of the distribution of *sabalis* and the significance of the variations we have noted. The presence there of one or more species of the Subapterus Group would also probably be shown.

Finally, the Florida Keys and the southern margin of the peninsula should be carefully examined. It is probable that the genus occurs in numerous places there, but it may be much more local and reduced in numbers. Our field work on Key Largo, Long Key and Key West failed in this respect, but that was due at least partially to our ignorance, at that time, of the habits of these nocturnal insects. Though probably scarcer in that region, unknown species or races are more likely to be found there than in the other territories yet uninvestigated.

In the present paper eight hundred and twenty-eight specimens have been examined. The eight species and four geographic races here recognized are all represented in the author's collection. Unless otherwise stated, the material recorded belongs to the author or the Academy of Natural Sciences of Philadelphia.

We wish to express our deep appreciation of the kind coöperation of Messrs. T. H. Hubbell, F. W. Walker, Wm. T. Davis, Professor W. S. Blatchley, Mr. A. N. Caudell of the National Museum, Dr. F. E. Lutz of the American Museum, Mr. J. A. G. Rehn of the Academy and Dr. Samuel Henshaw of the Museum of Comparative Zoology, for much assistance rendered. Mr. Hubbell not only placed in our hands all the material collected by him, but all his valuable field notes as well. Mr. Caudell sent for examination the entire series belonging to the National Museum. The value of such aid can well be realized by the specialist in such zoological groups where material is generally scarce and series rarely secured.



1. ***Belocephalus subapterus subapterus*** Scudder<sup>9</sup> (Pl. VII, figs. 1 and 2; pl. VIII figs. 1 and 2.)
1875. *Belocephalus subapterus* Scudder, Proc. Boston Soc. Nat. Hist., xvii, p. 459. [♀; northeastern Florida; Florida.]
1905. *Belocephalus subapterus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1904, p. 795. [♀; Thomasville, Georgia.]
1907. *Belocephalus subapterus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1907, p. 303. [♂, ♀, juv.; Pablo Beach, San Pablo and Gainesville, Florida.<sup>10</sup>]
1912. *B[elocephalus] subapterus* Karny, Genera Ins., Fasc. 139, Orth., Locustidae, Copiphorinae, p. 18, pl. 3 (color), fig. 10. [♀; Florida; south Georgia.]
1915. *Belocephalus subapterus* Davis, Jour. New York Ent. Soc., xxiii, p. 98, fig. 4. [♂; Gainesville, Florida.]
1915. *Belocephalus excavatus* Davis, Jour. New York Ent. Soc., xxiii, p. 98, fig. 3. [♂; Gainesville, Florida.]
1916. *Belocephalus subapterus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 258. (In part.) [South Carolina, Georgia and northern Florida records, see discussion here under distribution.]
1920. *Belocephalus subapterus* Blatchley, Orth. of North-Eastern America, p. 503, fig. 166c, p. 507. (In part.) [Gainesville, Florida.<sup>11</sup>]

We here select as single type the female from northeastern Florida, belonging to the Museum of Comparative Zoology.<sup>12</sup>

<sup>9</sup> The references to this species by Redtenbacher and Karny in their monographs are of little value.

<sup>10</sup> The Miami and Chokoloskee records referred to, published by Rehn and Hebard in 1905, are now known to be incorrect, this species not reaching nearly so far south in its distribution.

<sup>11</sup> Figure 168 and the material from Sanford and Dunedin, Florida, represents *subapterus peninsularis* here described.

<sup>12</sup> This specimen is brown, with lateral apices of the subgenital plate short, the clypeal suture included in a black transverse bar. Its measurements are given on page 158.

The other specimen originally recorded, from "Florida," was collected by Wurdemann. It may not represent *subapterus*, but can not be placed safely without definite locality. It is brown, the latero-caudal apices of the subgenital plate are short and blunt, the fastigium is much as in *subapterus*, the antennae are spotted and there is a black transverse bar which includes the clypeus. Length of body 39, length of fastigium 2.8, length of pronotum 9.5, exposed length of tegmen 1.7, length of caudal femur 15.7, length of ovipositor 18.1 mm.

In that region, as is the case with many other species of Orthoptera, an optimum condition is developed, making it often more difficult than is usual to separate females from those of *davisi* Rehn and Hebard, the only other species occurring there. The slightly heavier build, more noticeable in the expansion of the face toward the jaws, and produced latero-caudal apices of the subgenital plate best serve to separate this sex of that species, which elsewhere averages decidedly larger than *subapterus*.

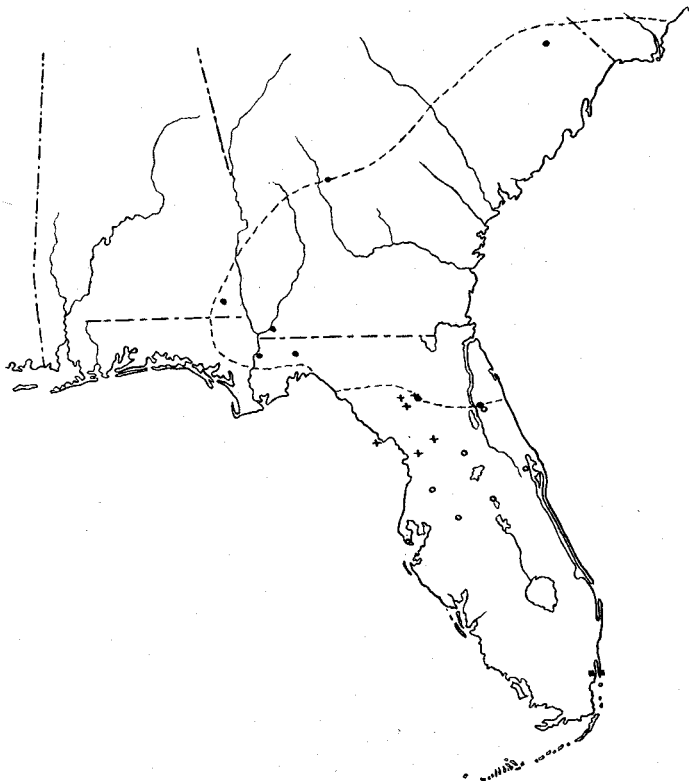


Fig. 1. Distribution of *Belocephalus subapterus subapterus* Scudder outlined approximately by series of dashes, with solid dots showing the known peripheral records. Localities at which *Belocephalus subapterus rehni* Davis has been taken indicated by +. Northernmost and southernmost localities for *Belocephalus subapterus peninsularis* subsp. n. indicated by circles. Localities at which *Belocephalus uncinatus* n. sp. has been taken indicated by squares.

Through the kindness of the authorities of the American Museum of Natural History, we have received for study the type of *excavatus* Davis. Shrinkage in drying of a teneral male has resulted in the softer (meso-distad) portion of the ultimate tergite caving in, with the natural accompaniment of a drawing in of the lateral apices. We have several such specimens in the series before us, but unfortunately, in Davis' individual, these differences are so symmetrical that it is easy to see his reasons for believing that an undescribed species was represented. The specimen is otherwise typical of *subapterus subapterus* and *excavatus* is consequently a synonym.

In *subapterus* the fastigium is normally short for the genus, terminating in a slender decurved spine. Considerable individual variation occurs, however, rare individuals having it more elongate and very infrequently with spine straight, such individuals being indistinguishable in this feature from *davisi*.

Further individual variation is shown by material from Gainesville and Newberry, Florida, where intergradation with *subapterus rehni* plainly occurs. That race is distinguished by the fastigium which is rounded distad, lacking an apical spine. The intermediate material varies in having the fastigium shorter than usual with the normal spine, or with that spine greatly reduced or represented by a weak node. The majority from Gainesville are typical of *subapterous subapterus*, a few intermediate and very few typical of *subapterus rehni*. The majority from Newberry (type locality of *rehni*) are typical of *s. rehni*, many being intermediate to different degrees, but none wholly typical of *s. subapterus*.

The male ultimate tergite in *s. subapterus* is very broadly obtuse-angulate emarginate distad, the angulation sometimes slightly rounded. In Orange and Pascoe Counties southward the typical race is supplanted by the race *s. peninsularis* here described, in which this tergite is decidedly more produced disto-laterad, causing the emargination to be deeper, while its sides often show some convexity. This constitutes divergence toward the more deeply emarginate type of ultimate tergite found in *davisi* Rehn and Hebard and its allies. A few individ-

uals in a series from Pomona, Florida, are typical of *s. subapterus*, the majority showing divergence toward *s. peninsularis*. This is probably near the northern limit of the southern race, while *s. rehni* occurs due west of that locality.

In all the races of this species the antennae are heavily though finely spotted externally or annulate with blackish brown. The powerful jaws are also of this color, as is a broad transverse band which includes the clypeal suture. The tips of the spines of the fastigium, its dorsal margins narrowly and the lateral margins of the pronotal disk (often interrupted and sometimes only indicated cephalad) are blackish brown. The external surfaces of the limbs, particularly of the tibiae, are flecked with brown or blackish brown to varying degrees. A line of yellowish buff often margins the pronotal disk, just outside of the finer line of blackish brown, and is continued on the head and on the abdomen proximad in females, in the specimens where it is most strongly indicated. As in probably all the species of the genus, a green and a brown color phase is developed, the latter usually a rather light yellowish brown, sometimes decidedly more grayish and occasionally much darker.

*Measurements (in millimeters)*

♂	Length of body	Length of fastigium <sup>13</sup>	Length of pronotum	Exposed length of tegmen	Length of caudal femur
Florence, S. C. . . . .	25.3	1.9	6.9	7.8	14.7
Seven Mile, S. C. . . . .	22.8	1.9	6	7	12.1
Seven Mile, S. C. . . . .	27.2	2.2	7	7.8	14.3
Sandfly, Ga. . . . .	29.7	2.2	7.2	8.3	14.7
Claxton, Ga. . . . .	27	2.1	7.8	8.4	16
Smithville, Ga. . . . .	22.6	1.7	6.1	7.2	13
Smithville, Ga. . . . .	28	2.1	7.8	9.8	15.9
Billy's Island, Ga. . . . .	27.3	2.1	7.7	7.1	15.8
Thomasville, Ga. . . . .	24.5	1.6	6.3	7.7	12.7
Dothan, Ala. . . . .	22.3	1.3	6.7	7.1	13.1
Tallahassee, Fla. . . . .	28	2	7	7.7	14.6
Tallahassee, Fla. . . . .	28.8	2.2	7.8	7.9	16.5
Altantic Beach, Fla. . . . .	32.3	2.3	7.8	6	16.1
Atlantic Beach, Fla. . . . .	36.1	3.2	8.3	6.7	18.8
Hastings, Fla. . . . .	30.7	2	7.3	6.8	14.9
Gainesville, Fla. . . . .	25.8	2.2	6.8	6.4	13
Gainesville, Fla. . . . .	28	2.1	7.8	8.2	16.3

<sup>13</sup> In this paper taken as from apex to tip of basal tooth.

♀	Length of body	Length of fastigium	Length of pronotum	Exposed length of tegmen	Length of caudal femur	Length of ovipositor
Seven Mile, S. C. . . . .	24.8	2	6.9	1.9	14.8	16.6
Seven Mile, S. C. . . . .	30	2.8	7.7	2.9	16.8	18.7
Sandfly, Ga. . . . .	30.3	2.1	7	2	15.8	17.3
Isle of Hope, Ga. . . . .	33.2	2.5	7.9	2.7	17	18
Macon, Ga. . . . .	26.8	2.1	7.5	2.2	17	18
Florida, <i>type</i> . . . . .	28	2.2	6.9	1.7	15.7	18.1
Atlantic Beach, Fla. . . . .	35	3.4	8	2.4	18.1	19.5
Gainesville, Fla. . . . .	26	2.1	7	1.9	14.5	18
Gainesville, Fla. . . . .	35	2.3	7.9	2.5	17.3	20

In the western portion of this race's distribution (from as far east as Thomasville, Georgia, to Camp Torreya, Florida), a shortening of the fastigium, accompanied by a somewhat greater uncination of its apical tooth, is found. This may indicate further racial division, but it is incipient and not sufficient at the present time to warrant nominal recognition. It suggests *s. rehni* in a way, but the modification is different.

In northeastern Florida the greatest reduction in the male tegmina occurs.

The known limits of this race are Florence, South Carolina; Macon, Georgia and Dothan, Alabama, south to Pomona, Gainesville, and Tallahassee, Florida and Bainbridge, Georgia. Intermediates between it and *s. rehni* are known from Gainesville and Newberry, Florida, and it is found to vary toward *s. peninsularis* at Pomona, Florida.

The immature male recorded from Port Reed, Florida, by Scudder, in 1877, is before us and is found to represent *s. peninsularis*. The series from La Grange, Florida, recorded by Davis in 1914 is also at hand and likewise represents that race. Of the material studied by Rehn and Hebard in 1916, sixty-three were correctly recorded, the specimens from Sanford, Orlando (and possibly Fort Drum), Florida, represent *s. peninsularis* and the female from Live Oak, Florida, *davisi*.

*Specimens Examined*, in addition to 55 previously correctly recorded: 240; 134 males, 60 females and 46 immature individuals.

SOUTH CAROLINA: Seven Mile, Charleston County, IX, 23, 1917, (Rehn and Hebard; occasional in rich tangled undergrowth of low lying pine woods), 14 ♂, 5 ♀, 3 juv. ♀, (2 ♂, 4 ♀ brown).

GEORGIA: Groveland, IX, 21, 1917, (Rehn and Hebard; rather numerous in one very small area of gallberry bushes in damp depression, one immature in saw palmetto in sandy low oak forest), 5 ♂, 1 ♀, 1 juv. ♀, (2 ♂, 1 ♀ brown). Claxton, IX, 22, 1923, (H. Fox), 1 ♂, (green), [Hebard Cln.]. Smithville, X, 20, 1923, (H. Fox), 2 ♂, (1 brown), [Hebard Cln.]. Macon, IX, 16 to 18, 1923, (H. Fox), 1 ♀, (brown), [Hebard Cln.]. Bainbridge, IX, 5 and 6, 1915, (Rehn and Hebard; on border of "branch" and in oak shoots in undergrowth of pine forest), 2 juv. ♂, 9 juv. ♀.

ALABAMA: Dothan, IX, 6 and 7, 1915, (Rehn and Hebard; in lush undergrowth of long-leaf pine forest, particularly in gallberry bushes), 6 ♂, 2 ♀, 2 juv. ♂, 10 juv. ♀, (1 ♀ brown).

FLORIDA: Camp Torreya, Liberty County, X, 16, 1925, (T. H. Hubbell; in briars at night), 1 ♂, [Hubbell Cln.]. Tallahassee, IX, 2, 1915, (Rehn and Hebard; few in heavy swamp grasses and bushes), 2 ♂, 1 juv. ♂, 2 juv. ♀, (adults green). Woodville, Leon County, IX, 1, 1915, (Rehn and Hebard; occasional immatures in undergrowth of long-leaf pine forest), 3 juv. ♂, 2 juv. ♀. Pomona, Putnam County, IX, 7, 1917, (Rehn and Hebard; gallberry and bayberry bushes on sandy soil with oaks and pines, immatures occasional in high swamp grasses near lake), 9 ♂,<sup>14</sup> 3 ♀, 3 juv. ♂, 12 juv. ♀, (1 ♀ brown). Santa Fe, Alachua County, X, 18, 1911, (W. D. Appel), 1 ♀, [U. S. N. M.]. Gainesville, III, 13 to IX, 9, 1923 to 1925,<sup>15</sup> (Walker and Hubbell; many taken stridulating at night in grass and tangles of brush, usually two to six inches from ground), 88 ♂, 47 ♀,<sup>16</sup> (46 ♂, 40 ♀ brown), [Walker, Hubbell and Hebard Clns.]. Waldo, Alachua County, IX, 27 to X, 7, 1923 and 1924, (F. W. Walker), 1 ♂, 1 ♀, (green), [Hebard Cln.]. Payne's Prairie, Alachua County, XII, 7 and 14, 1924, (T. H. Hubbell; stridulating in tangle of grape vines, in brush and among tall weeds on edge of hammock and field), 4 ♂, (3 brown), [Hubbell Cln.].

<sup>14</sup> Pomona is in the area of intergradation with *s. peninsularis*. One male of this series is intermediate, five other males being referable to *s. peninsularis* and recorded under that geographic race. The females and immatures of these races are not distinguishable, but separation is possible from the locality alone over the territories in which each is known to occur typical.

<sup>15</sup> The great majority of this series were taken in October, November and December.

<sup>16</sup> Of this series 23 ♂ and 10 ♀ show varying degrees of divergence toward *s. rehni*, an additional 6 ♂ and 2 ♀ being nearly or quite typical of that race and recorded in the present paper under our discussion of it. No trace of a tendency toward *s. peninsularis* is shown.

We also have a male from Eustis, Florida, taken in November, 1923. This specimen has a somewhat deformed ultimate tergite, but is apparently referable to *s. subapterus*, though that locality may prove to be largely populated by *s. peninsularis*.

1a. ***Belocephalus subapterus rehni*** Davis (Pl. VIII, fig. 3.)

1912. *Belocephalus rehni* Davis, Jour. New York Ent. Soc., xx, p. 124. [♂, ♀; Newberry, Florida.]

1914. *B[elocephalus] rehni* Davis, Jour. New York Ent. Soc., xxii, p. 202, figure.

1920. *Belocephalus rehni* Blatchley, Orth. of North-Eastern America, p. 503, fig. 166e, p. 509. (In part.) [♂, ♀; Newberry, Ocala and Dunnellon, Florida.<sup>17</sup>]

This interesting race is distinguishable from typical *subapterus* only by the vertex, which averages decidedly shorter and either lacks an apical spine or shows a mere rudiment of such.

The material before us from Cedar Keys, Dunnellon and Ocala may all be said to be typical. Considerably over half that from Newberry shows a slight tendency toward typical *subapterus* in having a very small apical spine on the short fastigium, though in none is this spine sufficiently developed to consider the specimen intermediate. From Archer one immature male is *s. rehni*, the other nearly intermediate. In the very large Gainesville series the majority are typical *subapterus*, many atypical to varying degrees and only a small proportion referable to typical *rehni*. From this it is evident that Newberry, Archer and Gainesville are in the area of intergradation between these races; Newberry nearer the area occupied only by *s. rehni* and Gainesville nearer the area occupied only by *s. subapterus*.

All we know of the southern boundary of *rehni* is that it is located somewhere northwest of Orlando and north of Trilby. There is no evidence as yet as to whether it intergrades with *s. peninsularis*. Collecting material of the species in Hernando, Sumter, Lake and the southern portion of Marion Counties should, therefore, prove of considerable interest.

The coloration is as described for *s. subapterus*.

<sup>17</sup> The Orlando determination is almost certainly incorrect, that locality being well within the range of *s. peninsularis* here described.

*Measurements (in millimeters)*

♂	Length of body	Length of fastigium	Length of pronotum	Exposed length of tegmen	Length of caudal femur	
Gainesville, Fla.....	25	1.2	6.1	7.1	13	
Gainesville, Fla.....	29.8	1.8	7.7	7.1	16	
Newberry, Fla.....	24	1.1	6.7	7	13.2	
Newberry, Fla.....	28.5	1.9	7.1	7.2	16.4	
Ocala, Fla.....	23.8	1.3	6.7	5.9	13.5	
Ocala, Fla.....	31.8	1.9	8.5	7.9	18.4	
Dunnellon, Fla.....	26.3	1.6	7.4	7	16.2	
Dunnellon, Fla.....	27.8	1.7	7.8	7.7	15.9	

♀	Length of body	Length of fastigium	Length of pronotum	Exposed length of tegmen	Length of caudal femur	Length of ovipositor
Gainesville, Fla.....	21.9	1.9	6.9	1.3	14.6	18
Gainesville, Fla.....	28.9	1.7	6.7	1.7	15	18.8
Newberry, Fla.....	27	1.8	6.8	1.3	15.9	19.8
Newberry, Fla.....	31.5	1.9	7.1	2.7	15.9	20
Cedar Keys, Fla....	27.2	1.4	7.7	2.8	16.9	18.5
Ocala, Fla.....	30.8	1.9	8	1.7	18	21.1
Ocala, Fla.....	31.1	1.7	7.8	2.1	17.9	22
Dunnellon, Fla.....	26	1.6	7.8	1.9	17.1	19.8
Dunnellon, Fla.....	31.8	1.7	8.8	2.3	19.3	21.8

The ovipositor in this race averages slightly more elongate than in *s. subapterus*.

*Specimens Examined*: 119; 69 males, 17 females and 33 immature individuals.

FLORIDA: Gainesville, IX, 9 to XI, 7, 1923 and 1924, (Walker and Hubbell), 6 ♂, 2 ♀, (3 ♂, 2 ♀ brown), [Walker, Hubbell and Hebard Clns.]. Newberry, VIII, 24 to X, 16, 1924, (F. W. Walker), 22 ♂, 10 ♀, 1 juv. ♂, 1 juv. ♀, (13 ♂, 8 ♀ brown), [Walker and Hebard Clns.]. Archer, Alachua County, VIII, 11, 1925, (T. H. Hubbell; sandy hillside), 2 juv. ♀, [Hubbell Cln.]. Cedar Keys, Levy County, X, 19, 1924, (T. H. Hubbell; in folds of tarpaulin), 1 ♀, [Hebard Cln.]. Ocala, IX, 19 and 20, 1917, (Rehn and Hebard; moderate numbers in areas of oak shoots in sandy pine woods, immature individuals quite numerous), 19 ♂, 4 ♀, 3 juv. ♂, 12 juv. ♀, (3 ♂, 3 ♀ brown). Dunnellon, IX, 19, 1917, (Rehn and Hebard; deforested rolling sandy country, taken from saw palmettoes, both in expanding fans and where the fully developed fans were touching; *D. davisii* also there in fewer numbers), 15 ♂, 7 ♀, 4 juv. ♂, 10 juv. ♀, (5 ♂, 7 ♀ brown).



- 1b. ***Belocephalus subapterus peninsularis*** new subspecies (Pl. VII, figs. 3 and 4; pl. VIII, fig. 4.)
1877. *Belocephalus subapterus* Scudder, Proc. Boston Soc. Nat. Hist., xix, p. 83. [Juv. ♂; Fort Reed, Florida.<sup>18</sup>]
1914. *Belocephalus subapterus* Davis, Jour. New York Ent. Soc., xxii, p. 198. [♂, ♀; La Grange, Florida.<sup>19</sup>]
1916. *Belocephalus subapterus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 258. (In part.) [♀; Sanford and Orlando, Florida.<sup>20</sup>]
1916. *Belocephalus davisii* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 261. [♂,<sup>21</sup> ♀; Chuluota, Florida.]
1920. *Belocephalus subapterus* Blatchley, Orth. of North-Eastern America, p. 506, fig. 168. (In part.) [Sanford and Dunedin, Florida.<sup>22</sup>]

The average larger size (though probably exceeded by typical *subapterus* in the Jacksonville region, greater production of the male ultimate tergite and average slightly longer ovipositor, are the only features by which this race is separable from the more northern *subapterus subapterus* Scudder. The male ultimate tergite consequently shows divergence toward the type developed in *davisii* Rehn and Hebard and its allies.

*Type*.—♂; Lakeland, Florida. September 11, 1917. (Rehn and Hebard.) [Hebard Collection, Type no. 1041.]

Size medium for the genus, larger than the average in typical *subapterus*. Form normal: moderately robust, with short limbs. Fastigium produced, conical, with dorsal surface moderately flattened, in dorsal aspect with lateral margins subparallel

<sup>18</sup> This locality is now known to be well within the area covered by the present race and we therefore feel justified in placing here this immature male, now before us, plainly referable to the present species.

<sup>19</sup> We have been able to examine this series through the kindness of Mr. Davis.

<sup>20</sup> The female we recorded as *subapterus* from Fort Drum is apparently referable to this species, but without males from that region we are uncertain as to its racial status. It is a small specimen, with fastigium 2 mm. and ovipositor 18.8 mm. in length.

<sup>21</sup> The ultimate tergite is distorted in this male, due to preservation in liquid preservative. This in part accounts for our original erroneous assignment.

<sup>22</sup> Material typical of this race has recently been secured at Dunedin by Professor Blatchley and kindly forwarded for examination. Sanford is known to be within the area covered by the present race. As figure 168 is from a specimen of typical *peninsularis*, we are convinced that all of the material from those localities recorded in 1920 is so referable.

proximad for a distance approximating in length the distal portion, where they converge to the sharp, moderately decurved, apical spine; basal tooth of fastigium large and terminating evenly in a short, straight, heavy spine. Pronotum, short overlapping tegmina, cerci, subgenital plate and limbs as in *subapterus subapterus*. Abdomen with seven tergites weakly produced and subdenticulate meso-dorsad. Ultimate tergite with lateral portions so produced that two acute-angulate triangles are formed, their lateral margins parallel, their internal margins forming an angle slightly greater than a rightangle and with sides (usually) showing feeble convexity.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Agrees closely with male in ambisexual characters. Size larger. Very similar to female of *subapterus subapterus* except in the average larger size and proportionately longer ovipositor. Tegmina represented by very small, rounded, lateral pads. Ovipositor elongate for the genus, moderately swollen proximad, very weakly curved dorsad throughout, unarmed, with apex acute. Subgenital plate large, embracing base of ovipositor laterad, distal margin broadly but deeply rounded-angulate emarginate, lateral margins straight and horizontal, thus the form of the lateral angles is sharply angulate at distinctly less than a rightangle, the apices themselves not reaching to near the dorsal margin of the ovipositor.<sup>23</sup>

General coloration light green or brown, the pronotum often showing a weak buffy line on each side, delimiting the disk from the lateral lobes. The following black markings occur. Antennae proximad with flecks on the external side of each segment except sometimes the first. Head with spines of vertex, very fine margins of antennal scrobes ventrad, mandibles and a broad transverse bar including the clypeal suture; vertex and very rarely occiput with a feeble lateral line on each side, continued on the pronotal disk more distinctly as a narrower internal margin of the lateral buffy lines. Cephalic limbs, median tibiae and caudal femora more weakly, finely and inconspicuously flecked. Abdomen in the green phase very rarely microscopically dotted, in the brown phase often beautifully longitudinally marked with different shades of brown, the darkest being a broad dorsal band and a line mesad on each side.

These features of coloration are the same in all the races of the species and are subject to individual variation through intensification or recession of the pattern.

<sup>23</sup> This affording one of the best features to separate the present species from *davisi*.

## Measurements (in millimeters)

	Length of body	Length of fastigium	Length of pronotum	Exposed length of tegmen	Length of caudal femur	
♂						
Pomona, Fla. . . . .	26.5	2.1	6.8	6.4	14	
Pomona, Fla. . . . .	35.2	2.9	8.8	7.1	18.3	
Apopka, Fla. . . . .	34.5	2.3	8.5	8.3	17.8	
Claircona, Fla. . . . .	31.9	2.3	8.2	7.9	17	
Orlando, Fla. . . . .	28.7	1.8	7.7	7.2	14.8	
Orlando, Fla. . . . .	34.8	2.8	8.6	8.2	17.5	
La Grange, Fla. . . . .	29.2	2.6	7	7.7	14.2	
La Grange, Fla. . . . .	35.8	2.8	8.2	7.4	16.2	
Kissimmee, Fla. . . . .	32.3	2.1	8	7.7	15.7	
Lakeland, Fla., <i>type</i> . . . . .	35.7	2.7	8.2	7	16.2	
Trilby, Fla. . . . .	28.7	2.1	7.8	7.9	16	
Hillsboro Co., Fla. . . . .	27.7	1.7	6.9	7.2	14.2	
Indian Beach, Fla. . . . .	29.8	2	8.1	8.2	15.9	
						Length of ovipositor
♀						
Sanford, Fla. . . . .	32.8	3	8	2.2	18.6	19.7
Apopka, Fla. . . . .	31.2	2.8	8	2.1	18.8	21.3
Orlando, Fla. . . . .	36	2.9	8	2.2	18.9	21.7
Orlando, Fla. . . . .	33	3	8	2.8	18.8	21.7
La Gange, Fla. . . . .	32.7	2.9	7.8	2.3	18	19.8
La Gange, Fla. . . . .	35.5	3	8	2.6	17.8	20.5
Lakeland, Fla., <i>allo-</i> <i>type</i> . . . . .	32	2.8	8.5	1.7	18.8	21.5
St. Petersburg, Fla. . . . .	32	2.3	7.8	2.3	17.3	19.8

The known northern limits of this peninsular Floridian race are Pomona, Lake Eustis and Trilby, while the southernmost records are La Grange, Kissimmee, Lakeland and St. Petersburg. We have little data on the genus in the regions adjacent to the southeastern and northwestern limits here given and this race may therefore reach some distance further in those areas.

At Indian Beach the following notes were made. "The song is very low and not rapid; rather similar to that of *Atlanticus gibbosus*, though lacking the series of whirring ticks, audible when very close to an individual of that species between its louder notes. These males continued to sing until approached closely and could be seized easily if reasonable caution were

exercised. Like *sabalis*, the few individuals which did not remain motionless upon ceasing their song, climbed about slowly, usually moving to the opposite side of their support when approached, and were captured with little difficulty. Their clinging strength is tremendous and unless seized with caution they can administer a painful bite."

*Specimens Examined*, in addition to 3 ♂, 7 ♀ and 1 juv., previously recorded as *subapterus*: 74; 22 males, 4 females and 48 immature individuals.

FLORIDA: Pomona, Putnam County, IX, 7, 1917, (Rehn and Hebard; in gallberry and bayberry bushes on sandy soil, with oaks and pines), 5 ♂,<sup>24</sup> (all green). Lake Eustis, Lake County, 1 ♂, (green), [Hubbell Cln.]. Apopka, Orange County, IX, 17, 1924, (T. H. Hubbell; on palmetto in sand scrub), 1 ♂, 1 ♀, (♀ brown), [Hubbell and Hebard Clns.]. Clairona, Orange County, IX, 5, 1924, (F. W. Walker), 1 ♂, 1 large juv. ♀, [Walker and Hebard Clns.]. Orlando, Orange County, VII, 23 to X, 4, 1924, (F. W. Walker), 5 ♂, 1 ♀, 2 juv. ♀, (2 ♂ brown), [Walker and Hebard Clns.]. Kissimmee, Osceola County, IX, 9 and 10, 1917, (Rehn and Hebard; beaten from undergrowth in Cypress bay and juv. in grasses on sandy soil), 1 ♂, 3 juv. ♂, 3 juv. ♀, (all green). Lakeland, Polk County, IX, 11, 1917, (Rehn and Hebard), 1 ♂, 1 ♀, *type* and *allotype*, 4 juv. ♂, 4 juv. ♀, (all green). Trilby, Pasco County, IX, 16, 1917, (Rehn and Hebard; undergrowth of pine woods, in oak shoots but particularly in gallberry bushes), 2 ♂, *paratypes*, 12 juv. ♂, 16 juv. ♀, (8 juv. brown). Indian Beach, Sand Key, Pinellas County, IX, 17, 1917, (Hebard; adults stridulating in low vines and plants at night), 3 ♂, 3 juv. (all green). Dunedin, I, 1, 1926, (W. S. Blatchley), 1 ♂, [Blatchley Cln.]. St. Petersburg, Pinellas County, IX, 1917, 1 ♀ [Davis Cln.]. Hillsboro County, XII, 24, 1923, (A. R. Johnson), 1 ♂, [Hubbell Cln.].

2. ***Belocephalus uncinatus*** new species (Pl. VII, fig. 5; pl. VIII, figs. 5 and 6.)

This insect is known only from the cabbage palmettoes at Miami Beach and from Miami, Florida. It is the only small species with simple male subgenital plate and annulate antennae known from the subtropical zone of Florida. It resembles typical *subapterus* but has the apical spine of the vertex more strongly decurved than is usual in any other species,<sup>25</sup> the male ultimate tergite of the type developed in *sleighti* Davis but with

<sup>24</sup> See material also recorded under typical *subapterus*.

<sup>25</sup> Though no more so than in individuals of typical *subapterus* and *subapterus peninsularis* showing maximum decurvature of this spine.

lateral productions shorter and their internal margins even more strongly convex distad, the male cerci with ventral arm unusually narrow at its base and the male subgenital plate of the same type found in *sabalis* Davis but much wider distad between the styles.

The single female before us closely resembles individuals of that sex intermediate between *subapterus subapterus* and *subapterus rehni*, the vertex being shorter and blunter, with apical tooth more decurved than in the former race.

*Type*.—♂; Miami Beach, Florida. February 17, 1922. (M. Hebard.) [Hebard Collection, Type no. 1043.]

Size small for the genus; form moderately robust, much as in *hesperus* here described. Fastigium of the usual produced conical type, but short for the genus, with lateral margins subparallel a distance exceeding in length the distal portion, where they converge to the sharp, short and decidedly decurved spine. Pronotum, short overlapping tegmina and limbs much as in *subapterus*. Abdomen with seven tergites weakly produced and subdenticulate meso-dorsad. Ultimate tergite with lateral portions so produced that only a deep U-emargination remains, their external margins straight and very feebly convergent, their internal margins very strongly convex particularly distad, so that each produced portion is only slightly narrower distad than proximad, its length approximating its basal width. Cerci quite similar to those of *subapterus* but with claws slightly more elongate and ventral arm narrower at its base. Subgenital plate more ample, the lateral margins oblique convergent to the apical, socketed styles, the interval between which is decidedly broader, evenly and broadly concave. Styles small, cylindrical, tapering, about three times as long as proximal width.

*Allotype*.—♀; Miami, Dade County, Florida. (Mrs. Annie Trumbull Slosson.) [Hebard Collection.]

Agrees closely with male in ambisexual features, except that the fastigium is shorter and blunter. Very similar to this sex of *subapterus peninsularis* in other features as described on page 163, except that the lateral apices of the subgenital plate are somewhat less produced.

Coloration as in *subapterus*, described on page 157, except that the basal tooth of the vertex is more heavily suffused with black, this sometimes extending as a ventral, medio-longitudinal suffused line to the black apical tooth.

## Measurements (in millimeters)

	Length of body	Length of fastigium	Length of pronotum	Exposed length of tegmen	Length of caudal femur
♂					
Miami Beach, Fla., <i>type</i> ..	29.2	1.7	8	7	15.2
Miami Beach, Fla., <i>para-</i> <i>type</i> .....	27	1.8	7.5	7.3	14.8
Miami Beach, Fla., <i>para-</i> <i>type</i> .....	31.5	1.8	8.7	7.3	16.3
Miami Beach, Fla., <i>para-</i> <i>type</i> .....	30.3	1.7	9.1	7.9	17
♀					
Miami, Fla., <i>allotype</i> .....	31.8	1.8	7.8	1.8	21.3

The males were all secured on a warm windy evening with the aid of an electric hand torch. They were stridulating vigorously, in the cabbage palmettoes at two different localities and were easily located and secured. The majority were six to eight feet from the ground, but others were heard in the upper fans as much as eight feet higher.

*Specimens Examined*: 9; 8 males and 1 female.

FLORIDA: Miami Beach, II, 17, 1922, (Hebard), 8 ♂, *type* and *paratypes*. Miami, (Mrs. A. T. Slosson), 1 ♀, *allotype*.

3. ***Belocephalus hesperus*** new species (Pl. VII, figs. 6 and 7; pl. VIII, fig. 7.)

This interesting little insect occupies the extreme western limit of the distribution of the genus.

It is closely allied to *davisi* Rehn and Hebard. The male ultimate tergite and cerci and female ovipositor and subgenital plate indicate this relationship. The small size and short vertex with decurved apical spine agree, however, more nearly with *subapterus* Scudder. The present insect is very slightly more robust and compactly built than either of those species.

*Type*.—♂; St. Elmo, Mobile County, Alabama. August 26, 1915. (Rehn and Hebard.) [Hebard Collection, Type No. 1042.]

Size small for the genus. Form slightly more robust than usual. Fastigium of the usual produced conical type, but short for the genus, with apical spine rather strongly decurved. Face slightly more inflated than in the allied species. Pronotum, very short overlapping tegmina, subgenital plate and limbs as in *subapterus*. Abdomen with seven tergites showing a very faint trace of the meso-dorsal production found in that species. Ultimate tergite much as in *davisi*, with lateral portions so produced that two acute-angulate angles with rounded apices are formed, their lateral margins moderately convergent, their internal margins forming a rounded rectangulate emargination (or less). Cerci much as in *davisi*, the two incurved claws of each with decurved apices proportionately longer, the interval between the bases of these evenly concave,<sup>26</sup> the external surface at the base of the ventral claw showing distinct impression. Subgenital plate with lateral margins evenly convergent to the broadly rounded lateral apices, between which the distal margin is broadly rounded obtuse-angulate concave. Beneath each of the lateral apices is a small, straight, cylindrical style, about three times as long as broad, with apex rounded.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Agrees closely with male in ambisexual features. Size much the same. The short fastigium with decurved apex and small size along serve to separate it from this sex of *davisi*. Tegmina as in that species. Ovipositor short for the genus, decidedly swollen proximad for a greater distance than in *subapterus*, very weakly curved dorsad, this as marked as in *subapterus* only distad. Subgenital plate as in *davisi*; large, embracing base of ovipositor laterad, distal margin broadly and deeply rounded angulate emarginate, lateral margins very weakly concave, lateral apices produced, filiform, reaching nearly the dorsal margin of the ovipositor if this plate is not bent down.

Color as described for *subapterus peninsularis* on page 163, except that the buffy lateral longitudinal bands on head and pronotum are usually broader and more conspicuous and the dark markings are more produced, the suffused transverse bar which includes the clypeal suture being blackish brown, much less heavy and very weak on each side above the mandibles. In these color differences closer agreement with *davisi* is again shown. All of the present series are of the green color phase.

<sup>26</sup> In *subapterus* this interval is flattened, with a trace of angulation on each side, instead of curving evenly into the internal margins of the claws.

## Measurements (in millimeters)

	Length of body	Length of fastigium	Length of pronotum	Exposed length of tegmen	Length of caudal femur	
♂						
Tifton, Ga. ....	23	1.7	6.9	7.7	13.9	
Tifton, Ga. ....	29.7	2	7.8	6.7	15.8	
Carrabelle, Fla., <i>para-</i> <i>type</i> .....	30.3	2.1	7.1	4.9	14.2	
St. Elmo, Ala., <i>type</i> .	30.8	1.9	7.7	5.2	14.7	
♀						Length of ovipositor
Irvington, Ala., <i>para-</i> <i>type</i> .....	27.8	1.9	6.7	2	15.9	16.4
Irvington, Ala., <i>para-</i> <i>type</i> .....	29	1.9	6.9	2	16	16.3
St. Elmo, Ala., <i>allo-</i> <i>type</i> .....	29	2	6.9	2	15.8	17.7
St. Elmo, Ala., <i>para-</i> <i>type</i> .....	28.8	1.9	7.2	1.8	16.1	16.9
St. Elmo, Ala., <i>para-</i> <i>type</i> .....	31.2	2.1	7.1	2.1	17	15.9

The Carrabelle male agrees closely with the type. Those from Tifton are aberrant in having a distinctly though very slightly less robust build and longer tegmina, consequently showing a very close general resemblance to *subapterus*. The male ultimate tergite and cerci, are, however, typical of *hesperus*.

*Specimens Examined*: 23; 4 males, 5 females and 14 immature individuals.

GEORGIA: Tifton, Tift County, IX, 3, 1915, (T. H. Hubbell), 2 ♂, 1 juv. ♂, [Hubbell and Hebard Clns.].

FLORIDA: Carrabelle, Franklin County, IX, 3, 1915, (Rehn; in marshy grasses and plants on edge of swamp area), 1 ♂, *paratype*. Big Bayou, Pensacola, VIII, 25, 1915, (Rehn and Hebard; in rich vegetation bordering hammock in long-leaf pine woods), 3 juv. ♂, 2 juv. ♀.

ALABAMA: Mobile, VIII, 26, 1915, (Hebard; in grasses of a deforested area), 1 juv. ♂. Springhill, Mobile County, VIII, 25, 1915, (Rehn and Hebard), 3 juv. ♀. Irvington, Mobile County, VIII, 26, 1915, (Rehn; in grasses of somewhat swampy deforested flatwoods), 2 ♀, *paratypes*. St. Elmo, Mobile County, VIII, 26, 1915, (Rehn and Hebard; in short grasses of long-leaf pine flatwoods), 1 ♂, 3 ♀, *type*, *allotype*, *paratype*, 2 juv. ♂, 1 juv. ♀.



4. **Belocephalus davisii** Rehn and Hebard (Pl. VII, fig. 9; pl. VIII, figs. 8 and 9.)
1916. *Belocephalus subapterus* Rehn and Hebard, (in part, not of Scudder, 1875), Proc. Acad. Nat. Sci. Phila., 1916, p. 258. [♀; Live Oak, Florida.]
1916. *Belocephalus davisii* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 259. [♂, ♀; Billy's Island in Okefenokee Swamp, Georgia.<sup>27</sup>]
1920. *Belocephalus subapterus davisii* Blatchley, Orth. of North-Eastern America, p. 507. (No additional material.)

This species represents a type in some ways annectant between *subapterus* Scudder and *sabalis* Davis. It is not, however, a geographic race of the former, as Blatchley indicated, since its distribution is coextensive with that of that species, but much more limited and local.

Compared with *subapterus*, we find it to differ in having the size averaging considerably larger, the male ultimate tergite even more deeply emarginate than in the race *subapterus peninsularis* (with which it is more likely to be confused), the ovipositor heavier proximad and shorter and female subgenital plate with lateral apices much more elongate, filiform.

The more western *hesperus*, here described, shows very close relationship but represents, we believe, a valid species, distinguished by the smaller size, slightly more robust form and short fastigium with more uncinat apical spine.

Compared with the southern *sabalis* the present species is seen to average smaller in size, with shorter fastigium and less deeply cleft male subgenital plate. The antennae are also usually immaculate in that species, but in the northeastern portion of its range they are quite as heavily marked as is usual in *davisii*.

We find *davisii* sufficiently plastic to make determination of material sometimes difficult. The known distribution reaches north to Billy's Island, Georgia and Live Oak, Florida, and south to St. Augustine and Dunnellon in the latter state. It should be noted that the species, with which confusion might occur, are found either west or south of the territory in which it is found.

The coloration is subject to considerable variation; often as here described for *subapterus peninsularis* on page 163, but sometimes as described for *hesperus* on page 168.

<sup>27</sup> The pair from Chuluota, Florida, recorded at that time, we find referable to *subapterus peninsularis*.

## Measurements (in millimeters)

	Length of body	Length of fastigium	Length of pronotum	Length of tegmen	Length of caudal femur	
♂						
Billy's Island, Ga., <i>type</i> . . . . .	34	2.8	8.2	6	16	
Billy's Island, Ga., <i>paratype</i> . . . . .	41	3.2	9	6	18.1	
Columbia Co., Fla. . . . .	40.5	3.9	9.3	6.8	18.8	
Waldo, Fla. . . . .	32.5	3.1	8.5	6.2	17	
Waldo, Fla. . . . .	37.6	3.7	9.3	6.8	18.8	
Newberry, Fla. . . . .	29.5	2.2	8.2	6.9	17.5	
Newberry, Fla. . . . .	37.7	2.3	8.2	7.9	17.2	
Levy County, Fla. . . . .	38	3.6	8.9	6.3	17.3	
Dunnellon, Fla. . . . .	37	3.4	9.8	6.8	18.5	
Dunnellon, Fla. . . . .	38.2	3.4	9.8	6.8	19.3	
						Length of ovipositor
♀						
Billy's Island, Ga., <i>allotype</i> . . . . .	36	3.4	8.2	2.4	18.2	18.2
Live Oak, Fla. . . . .	37.8	3.8	8.4	2	18.9	20.8
St. Augustine, Fla. . . . .	34.2	3	7.8	2.7	16.9	17.8
Waldo, Fla. . . . .	36.8	3.9	8.2	1.9	18.8	19.7
Newberry, Fla. . . . .	33.7	2.7	7.8	2.8	17.9	20
Newberry, Fla. . . . .	37.8	2.8	8.2	2.7	18.7	21
Dunnellon, Fla. . . . .	38.5	3.7	9.1	3.1	19.2	21
Dunnellon, Fla. . . . .	41	3.8	8.8	2.8	19.3	18.5

This insect is evidently much more local in distribution than *subapterus*, with which species alone its distribution is coextensive. Its considerably larger average size will readily distinguish it except in the Jacksonville region, where *subapterus* is found equally large. The longer fastigium normally separates *davisi* quite as well from that species, but in the entire Newberry series it is no longer than its optimum development in *subapterus*. This is of interest, as at that locality *subapterus rehni* Davis occurs, a race characterized by the shorter, blunt fastigium. Here the analogy ceases, however, as our Gainesville and Dunnellon material shows no such fastigial reduction, though *subapterus rehni* is found at the former locality and wholly supplants typical *subapterus* at the latter.

The degree of uncination of the apical spine of the vertex is subject to some variation. Normally elongate and very faintly

decurved, in the Billy's Island and Newberry series it shows an average slightly greater decurvature, closely resembling the normal for *subapterus peninsularis*. Such variation prevents use of what would at first appear to be an excellent feature to separate this species from *subapterus*, without qualification. The form of the male ultimate tergite, short ovipositor and different female subgenital plate, remain as the best features for separation from that species; *hesperus* being more compact, smaller and with apical spine of vertex decidedly decurved.

At Dunnellon we found this species in the same area of saw palmetto as *subapterus rehni*, but much scarcer. During the day individuals of these species were hidden in these plants both in the expanding central fans and where the fully developed fans, either alive or dead, overlapped in such a way that a place of concealment was formed. Hubbell states that the song is a rapid series of not very loud "zips," in his Newberry notes.

*Specimens Examined*, in addition to 5 males and 1 female of the originally described series, including the type and allotype: 68; 43 males, 15 females and 10 immature individuals.

FLORIDA: Suwannee River, Columbia County, XII, 3, 1923, (T. H. Hubbell), 1 ♂, (green), [Hebard Cln.]. Live Oak, Suwannee County, VIII, 26, 1911, (Rehn and Hebard; in small clump of ground oak, beside sink-hole), 1 ♀, (green). Anastasia Island, St. Augustine, XII, 9, 1923, (T. H. Hubbell), 1 ♀, (brown), [Hubbell Cln.]. Gainesville, VII, 18 and 19 and VIII, 8, 1925, (T. H. Hubbell; flatwoods adjacent to cypress swamp and pond on Waldo road), 5 juv. ♂, 5 juv. ♀. Waldo, Alachua County, IX, 27, 1924, (T. H. Hubbell; margins of cypress ponds at night), 4 ♂, 1 ♀, (pair brown), [Hubbell and Hebard Clns.]. Fairbanks, Alachua County, VIII, 5, 1924, (F. W. Walker; cypress swamp), 3 ♂, (green), [Walker Cln.]. Newberry, Alachua County, VIII, 3 to 12, 1924 and 1925, (Hubbell and Walker; in clumps of rather high palmetto on high pine land, at night), 19 ♂, 8 ♀, (9 ♂, 7 ♀ brown), [Hubbell, Walker and Hebard Clns.]. Wacassassee River, Levy County, IX, 29 and 30, 1923, (Walker and Hubbell; marginal zone of cypress swamp and in palmetto and gallberry of flatwoods), 3 ♂, [Acad. Nat. Sci. Phila. and Hubbell Clns.]. Dunnellon, Marion County, IX, 18 and 19, 1917, (Rehn and Hebard; ten in saw palmetto on rolling sandy deforested country, others in saw palmetto on edge of swamp; long search revealed few in higher region), 13 ♂, 4 ♀, (6 ♂, 1 ♀ brown).

5. *Belocephalus sabalis* Davis (Pl. VII, fig. 10; pl. VIII, figs. 10 and 11.)

1905. *Belocephalus subapterus* Rehn and Hebard, (not of Scudder 1875), Proc. Acad. Nat. Sci. Phila., 1905, p. 44. [♀; Miami and Chokoloskee, Florida.]

1912. *Belocephalus sabalis* Davis, Jour. New York Ent. Soc., xx, p. 123. [♂; Punta Gorda, Florida.]

1914. *Belocephalus sabalis* Davis, Jour. New York Ent. Soc., xxii, p. 199. [♂; Miami and Cocoanut Grove, Florida.]
1915. *Belocephalus sabalis* Hebard, Ent. News, xxvi, p. 458. [♀, juv. ♂; Cocoanut Grove and Miami, Florida.]
1916. *Belocephalus sabalis* Hebard, Ent. News, xxvii, p. 20. [juvs.; Pine-land, Pine Island, Lee County, Florida.]
1920. *Belocephalus sabalis* Blatchley, Orth. of North-Eastern America, p. 504, figs. 166a and 167. [♂, ♀; Parish and Fort Myers, Florida.]

For this insect and its near allies we recognize the *Sabalis* Group, including large species, with immaculate antennae (except for *sabalis* in the northeastern portion of its distribution) and elongate fastigium, with terminal spine straight or nearly so. The males have the ultimate tergite variously produced but always deeply cleft, the cerci with proximal portion of the lower claw broad and its caudal surface there well impressed and the subgenital plate simple, with style sockets slightly more inset than in the other species of the genus.

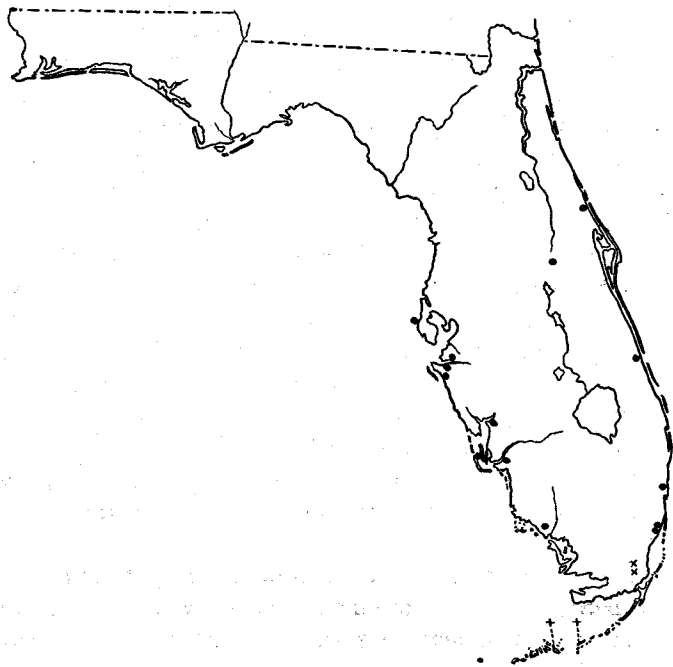


Fig. 2. Localities at which *Belocephalus sabalis* Davis has been taken, indicated by solid dots, those for *Belocephalus sleighti sleighti* Davis by + and those for *Belocephalus sleighti simplex* subsp. n. by x.

Restricted to southern and central peninsular Florida, *sabalis* has been found almost always on the coast, the most inland record being that of a single male from Orlando. Though West Coast material shows some individual variations, this is by no means as pronounced as in series from the East Coast before us. Further material from numerous other localities may show the presence of one or more recognizable geographic races, but from the available material it appears advisable to attribute the differences noted to individual variation or at most incipient racial differentiation, insufficient to warrant nominal recognition.

The western typical condition may be characterized as follows. Size large. Form robust. Fastigium elongate with tapering distal portion much longer than the proximal portion and apical spine feebly decurved, this curvature extremely weak in some females. Distal portion of abdomen slightly but distinctly widened in the males, the ultimate tergite with lateral acute-angulate portions produced, their internal margins convex to different degrees and occasionally straight,<sup>28</sup> the emargination so formed deep, usually rounded at its base and forming an angulation distinctly less than a rightangle, very rarely rectangulate. Styles flattened, slightly over twice as long as broad. Females differ from that sex of *davisi* in the larger size, average more elongate fastigium and proportionately shorter ovipositor, which shows weak though appreciably greater curvature dorsad.

The eastern material from Miami and Ft. Lauderdale shows nearest agreement. The fastigium, however, averages heavier and shorter, while a trace of fine external spots is shown on the antennae in one brown female.

The Ft. Pierce males have an average more elongate and evenly tapering fastigium than typical *sabalis*, but the ultimate tergite is broader in the males, with lateral projections sharply acute angulate. In one, a trace of fine external spots is shown on the antennae, this being stronger, weak but distinct, in the other two.

The La Grange and New Smyrna specimens have the fastigium evenly tapering but the antennae very heavily spotted with black, and the single male has the ultimate tergite no wider than in typical *sabalis*, the internal margins of the lateral pro-

<sup>28</sup> The material before us shows plainly this variation, a feature used by Davis to separate the species from his *sleighti*.

ductions convex. A male from Orlando agrees with this male except in having the ultimate tergite narrower.

All of the East Coast females have the ovipositor distinctly shorter than those from the West Coast.

Such differences as those noted above give certain individuals a very distinct appearance, but comparison of the series apparently indicates that not even racial differentiation can be recognized.

The color is subject to considerable variation, much as described for *subapterus peninsularis*, except that the antennae are usually immaculate.

*Measurements (in millimeters)*

	Length of body	Length of fastigium	Length of pronotum	Length of tegmen	Length of caudal femur	
♂						
New Smyrna, Fla. . . . .	38.5	4.2	9.4	7.2	18.8	
Orlando, Fla. . . . .	37.2	3.7	8.8	7.8	17.4	
Ft. Pierce, Fla. . . . .	36.2	3.7	8.3	6.7	16.3	
Ft. Pierce, Fla. . . . .	43	3.8	10	7.2	19.2	
Ft. Lauderdale, Fla. . . . .	39.5	2.9	9	7.5	18.3	
Ft. Lauderdale, Fla. . . . .	44	3.8	10.1	6.8	22	
Miami, Fla. . . . .	43.4	3.1	9.8	5.8	20.1	
Indian Beach, Fla. . . . .	38.5	3.8	9.2	6.8	18	
Indian Beach, Fla. . . . .	43	4.2	10.7	7.9	21	
Manatee, Fla. . . . .	39.7	3.2	9.2	6.8	18.7	
Manatee, Fla. . . . .	48.5	4.3	10.8	7.2	20.2	
Parish, Fla. . . . .	42.7	3.8	10	7.7	20	
Parish, Fla. . . . .	44.2	4.2	10.7	7.1	20.8	
Useppa Island, Fla. . . . .	39.4	3.1	9.3	7.8	17.7	
Useppa Island, Fla. . . . .	42.5	3.6	10.2	7.1	20.7	
Punta Gorda, Fla., <i>paratype</i> . . . . .	38.8	3.4	9.3	7.2	18	
Punta Gorda, Fla., <i>paratype</i> . . . . .	43.3	3.2	9.8	7.2	19.8	
						Length of ovipositor
♀						
New Smyrna, Fla. . . . .	40.6	4.4	9.1	3	20.3	17.8
New Smyrna, Fla. . . . .	41.5	4.5	9	3.4	20.1	17.8
La Grange, Fla. . . . .	40	4.2	9.7	2.7	20.7	17.7
Dade County, Fla. . . . .	39.4	3.3	10	2.3	20.8	16.7
Manatee, Fla. . . . .	42.3	4.2	9.4	2	20.6	19
Manatee, Fla. . . . .	47	4	9.8	2.7	20	19
Manatee, Fla. . . . .	45.6	4.8	10	2.1	22	20.1
Parish, Fla. . . . .	42.5	4.2	9.2	2.7	19.8	19.7

At Indian Beach the author found this insect moderately numerous in clumps of cabbage palmetto, in isolated tops of

the same, in vines and in bushes and particularly in young saw palmettoes. Compared with *hebardei* (which had been heard shortly before) we noted that "the song is very much louder and exceedingly rapid, in fact almost too rapid to count. Counting up to eight, seven or eight times in ten seconds, gave five and a half to six and a half notes per second. The sound is an incessant dzee-dzee-dzee-dzee-dzee, suggestive of the song of *Pyrgocorypha uncinata*, though decidedly less loud and lacking the distinctive ringing machine-like quality. Our observations were made on a warm night, and as Hubbell has noted about the first of the year that the song was slow, it is probable that the speed varies with the temperature, as is known to be true for the tree-cricket, *Oecanthus niveus*.

We have noted, from an immature individual in captivity, how strictly nocturnal is the species. That specimen "rested rigid in some concealed position during the day, with cephalic limbs and antennae directed straight forward and median and caudal limbs straight backward, but at night moved actively about and was extremely alert and rapid."

*Specimens Examined*, in addition to 3 ♂ *paratypes* and 12 previously recorded individuals: 71; 55 males, 14 females and 2 immature individuals.

FLORIDA: New Smyrna, Volusia County, X, 18, 1920, (B. L. Boyden; on sugar cane), 1 ♂, 2 ♀, (all brown), [U. S. N. M. and Hebard Cln.]. Orlando, Orange County, IX, 7, 1924, (F. W. Walker), 1 ♂, (green), [Hebard Cln.]. Ft. Pierce, St. Lucie County, II, 14, 1919, (Hebard; moderately large colony, in cabbage palmetto, undergrowth and vines, on shore of Indian River, from close to ground to high in palmettoes; song not loud, individuals extremely alert, ceasing song abruptly when approached), 3 ♂, (1 green). Ft. Lauderdale, Broward County, IX, 2 to 4, 1925, (T. H. Hubbell; song not loud but penetrating), 6 ♂, (3 brown), [Hubbell and Hebard Clns.]. Dade County, 1 ♀, (brown), [U. S. N. M.]. Indian Beach, Sand Key, Pinellas County, IX, 17, 1917, (Hebard; singing at night, taken with aid of flash lamp), 15 ♂, (2 brown). Parish, Manatee County, X, 17 and 22, 1916, 3 ♂, 1 ♀, (1 ♂ green), [Davis and Hebard Clns.]. Manatee, Manatee County, VIII, 18 to 24, 1925, (T. H. Hubbell; many high in foliage of cabbage palmettoes, one in weeds; song rapid, staccato, not loud, zik-zik-zik-zik-zik), 19 ♂, 9 ♀, 2 large juv. ♀, (1 ♂, 3 ♀ brown); XII, 31, 1924 and I, 1, 1925, (T. H. Hubbell; in low shrub in open, on branch of mango tree, in dry rolled up banana leaf and singing in tall grass; song loud and slow, like that of *Neoconocephalus ensiger* but slower and lower pitched zip-zip-zip-zip-zip) 4 ♂, 1 ♀, (2 ♂ green), [Hubbell and Hebard Clns.]. Oneco, Manatee County, I, 2, 1925, (T. H. Hubbell; in tall grass of low, wet, brushy area), 1 ♂, (green), [Hubbell Cln.]. Useppa Island, Lee County, V, 17, 1919, (Hebard; stridulating vigorously at night in tops of cabbage palmettoes), 2 ♂, (1 brown).

6. *Belocephalus sleighti sleighti* Davis (Pl. VIII, figs. 12 and 13).

1914. (June.) *Belocephalus sabalis* Rehn and Hebard, (not of Davis, 1914), Proc. Acad. Nat. Sci. Phila., 1914, p. 401. [♂; Marathon, Key Vaca, Florida.]

1914. (September.) *Belocephalus sleighti* Davis, Jour. New York Ent. Soc., xxii, p. 199. [♂, ♀; Big Pine Key, Florida.]

1920. *Belocephalus sabalis sleighti* Blatchley, Orth. of North-Eastern America, p. 506, fig. 166b. (No additional material.)

This insect, very close to *sabalis* Davis, is best separated by the shorter fastigium, slightly more swollen face below the eyes which consequently gives the head a less evenly tapering outline, and in the typical race the male with ultimate tergite slightly more deeply emarginate, the inner margins of the lateral productions showing average convexity. In this insect the apex of the abdomen is never wider than the proximal portions.

Were it not for the fact that we find no convergence between *sabalis* at Miami and *sleighti simplex*, here described, at Homestead, it would have appeared very probable that this insect represented a geographic race of *sabalis*.

In coloration the similarity to *sabalis* is very close, this insect differing only in having the brown suffused band which includes the clypeal suture very weakly indicated in one and subobsolete or entirely absent in four other males before us. All of these specimens are green, but a brown phase undoubtedly occurs, probably very similar to that described under *sleighti simplex*.

## Measurements (in millimeters)

	Length of body	Length of fastigium	Length of pronotum	Length of tegmen	Length of caudal femur
♂					
Marathon, Key Vaca, Fla. . . . .	45	2.8	10.1	8	19.5
Big Pine Key, Fla., para- type . . . . .	38.7	2.7	9.8	7	17.9
Big Pine Key, Fla., para- type . . . . .	40.1	2.4	9.8	5.8	17.8
Big Pine Key, Fla., para- type . . . . .	40	2.6	10.4	7.8	19.3
Big Pine Key, Fla., para- type . . . . .	41.1	2.5	10.3	7	18.2
♀					
Big Pine Key, Fla., para- type <sup>29</sup> . . . . .	42	3 <sup>30</sup>	10.5	3	20

<sup>29</sup> From Davis.

<sup>30</sup> Length of fastigium beyond base of antenna. This slightly exceeds its length from basal tooth to apex, as given by us.



*Specimens Examined*, in addition to 4 paratype males: 1, 1 male.

FLORIDA: Marathon, Key Vaca, VII, 9. 1912, (Hebard; stridulating on vine tangle at night), 1 ♂, (green).

6a. ***Belocephalus sleighti simplex*** new subspecies (Pl. VII, figs. 11, 12 and 13; pl. VIII, figs. 14 and 15.)

1914. *Belocephalus sabalis* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1914, p. 401. [♂; Homestead, Florida.]

We propose this name for a geographic race of the species, found on the mainland of peninsular Florida, at its extreme southeastern point. It is very close to typical *sleighti* of the Florida Keys, differing in the average smaller size, more graceful form, average shorter fastigium and male ultimate tergite not as deeply cleft.

Compared with *sabalis* Davis it is found to differ in the average considerably shorter fastigium, slightly more swollen face below the eyes which consequently gives the head a less evenly tapering outline, average smaller size and more graceful form. Like in the typical race, the male abdomen is never broader distad than proximad.

*Type*.—♂; Homestead, Dade County, Florida. July 10 to 12, 1912. (Rehn and Hebard.) [Hebard Collection, Type No. 1044.]

Size smallest of the large species of the genus, form more evenly cylindrical. Fastigium small, with very small apical tooth (usually) decidedly decurved. Pronotum, comparatively short tegmina, limbs, cerci and subgenital plate as in *sabalis* and typical *sleighti*. Dorsal surface of abdomen with only a trace of a medio-longitudinal, interrupted, carina. Ultimate tergite much as in *sabalis*, median cleft not as deep as in typical *sleighti*, internal margins of lateral productions convex (but often appearing straight, due partially to individual variation and partially to having been drawn in and downward in drying).

*Measurements (in millimeters)*

♂	Length of body	Length of fastigium	Length of pronotum	Length of tegmen	Length of caudal femur
Homestead, Fla., <i>type</i> . . . . .	34.2	1.9	8.6	5.2	15.9
Homestead, Fla., <i>paratype</i> . . . . .	35	1.9	8.8	5.7	16.3
Homestead, Fla., <i>paratype</i> . . . . .	39	2.2	9.1	7	18.1
Homestead, Fla., <i>paratype</i> . . . . .	39.4	2.1	9.7	6.3	17.5
Homestead, Fla., <i>paratype</i> . . . . .	40.8	2.1	8.8	6.8	17.1
Florida City, Fla. . . . .	37	2.1	9.5	6.1	16.8

The majority of the present series are green and immaculate, a few showing weakly the buffy pronotal bands dorso-laterad and very few with traces of dark markings. The mere tips of the spines of the vertex and the mandibles are blackish brown, the clypeal suture usually immaculate, rarely with a very faint suffusion of brown. Eight are of a brown color phase, of a rather light shade, but in these the darker brown dots on the external surface of the antennae are present, though by no means as prominent as in *subapterus* or the northeastern specimens of *sabalis*.

At the type locality we noted that the majority were on low saw palmetto in the pine woods, others being found on sugar cane, in a low bush and on the trunk of a pine tree. They were secured by stalking with a flash-lamp at night and proved to be alert, ceasing their low "zip-zip-zip-zip-zip" often at a distance of twenty feet. Capture was, however, easy, as rarely an attempt was made by these insects to escape; an individual, upon close approach, merely slipping down the palmetto fan a few inches or around to the other side, there flattening out with caudal limbs extending backward and cephalic limbs forward. These curious Copiphorids are able to inflict a painful bite with their powerful jaws.

*Specimens Examined*: 30; 30 males.

FLORIDA: Homestead, Dade County, VII, 10 to 12, 1912, (Rehn and Hebard), 28 ♂, *type* and *paratypes*, (7 brown). Florida City, Dade County, III, 13, 1920, (Hebard; secured when half grown on silver palm (*Coccothrinax argentea* Lodd), bred adult on cabbage, end of May and June 3), 2 ♂, (1 brown; both were green, one changing to the brown color phase in the next to last moult).

7. ***Belocephalus hebardii hebardii*** Davis (Pl. VII, fig. 14; pl. VIII, fig. 16.)  
 1912. *Belocephalus hebardii* Davis, Jour. New York Ent. Soc., xx, p. 123.  
 (♂, ♀; Punta Gorda, Florida.)  
 1920. *Belocephalus subapterus hebardii* Blatchley, Orth. of North-Eastern America, p. 508. [Fort Myers, Florida.]

This species shows nearest resemblance to *subapterus peninsularis* here described, of the preceding forms. It differs in the slightly more slender apex of the fastigium at the base of the decurved apical spine, the much more decurved ventral arm of the male cerci, the bidentate and differently emarginate male subgenital plate and the longer, straighter ovipositor.

It forms a clearly defined group, including *hebaridi proximus* here described and *micanopy* Davis, all of which agree in the features of the male ultimate tergite, cerci, specialized subgenital plate and of the female ovipositor. Under *micanopy*, comparison with *hebaridi* is made.

It is unfortunate that similarity in many other less significant features led Blatchley to place this insect as a race of *subapterus*, a species belonging to a very distinct group.

The species of the present group are found only in southwestern Florida and on the Florida Keys, the extent of distribution of each being as yet poorly understood.

The distinctive specialization of the male subgenital plate, as found in typical *hebaridi* and also in *micanopy*, may be described as follows. Its lateral margins are dorsal in position, narrowly chitinous and like a knife-edge except near their bases. These margins terminate distad in a straight chitinous spike, directed dorso-mesad, between which a rather deep meso-distal emargination is formed, the margins of which are weakly concave. At the angle thus formed on each side, below the spikes, are located the deeply inset, moderately elongate and evenly tapering styles, which in all but one male before us extend beyond the apices of the spikes above them, reaching but half that distance in a single exception. The depth of the meso-distal emargination is slightly over half its width.

The female subgenital plate is much as that described for *subapterus peninsularis* on page 163, except that it sometimes has the lateral apices bluntly rounded. The ovipositor is also similar, but averages slightly longer.

In these species the coloration is very similar, much as described for *subapterus* on page 157, except that the dark transverse band including the clypeal suture and the fine marginal lines from fastigium to and including the pronotal disk average heavier in the material before us of typical *hebaridi* and *micanopy*, though much the same in *hebaridi proximus*.

*Measurements (in millimeters)*

	Length of body	Length of fastigium	Length of pronotum	Length of tegmen	Length of caudal femur	
♂						
Punta Gorda, Fla., paratype.....	30	2.1	8.3	8.3	17.8	
Ft. Myers, Fla.....	26.2	1.9	7.2	6.7	15.7	
Ft. Myers, Fla.....	28.3	2.3	7.8	7.1	15.2	
Ft. Myers, Fla.....	31	2.4	8	7.7	16.3	
Ft. Myers, Fla.....	31.3	2.8	8.3	7.8	17.3	
♀						Length of ovipositor
Ft. Myers, Fla.....	30	2.2	7.2	2.2	16.9	22
Ft. Myers, Fla.....	31.8	2.7	8	2.3	18.8	21.8
Ft. Myers, Fla.....	31	3.1	8.2	2.5	18.8	22.1
Ft. Myers, Fla.....	31.3	2.5	8	2.5	19.2	22.3

At Ft. Myers this insect was located in daylight, concealed in the creases of the partially expanded fans of low saw palmetto plants. Long search alone made possible the acquisition of a series, as a large proportion of the plants were unoccupied. At that time the insects were asleep, with fore legs and antennae stretched out straight before them and caudal limbs stretched out straight behind. The hardest beating met with little success, close examination of the plants yielding the bulk of the series. At night males would doubtless have been much more easily secured, as they would have been out stridulating, but search in daylight is probably the best method of securing females.

*Specimens Examined*, in addition to a male paratype: 72; 31 males, 7 females and 34 immature individuals.

FLORIDA: Ft. Myers, Lee County, IX, 13 to 15, 1917, (Rehn and Hebard; in saw palmettoes of pine (*Pinus caribaea*) flat-woods and in grasses on edge of cypress swamp), 30 ♂, 7 ♀, 11 juv. ♂, 21 juv. ♀, (5 ♂, 4 ♀, 12 juv. ♀ brown); X, 1923, (J. Bell), 1 ♂, (brown), [U. S. N. M.]. Iona, Lee County, IX, 13, 1917, (Rehn and Hebard; in pine (*Pinus caribaea*) woods), 2 juv. ♂ (green).

7a. ***Belocephalus hebardii proximus*** new subspecies (Pl. VII, fig. 15; pl. VIII, fig. 17.)

This geographic race agrees closely with typical *hebardii* except that the fastigium averages shorter, with its apical spine usually more decurved, the meso-distal emargination of the male subgenital plate is smaller and proportionately narrower and the styles are reduced or have entirely disappeared through atrophy.

Though the majority of our series show only a normal amount of individual variation, the spine of the fastigium sometimes shows less curvature, in one male is exactly as is usual in typical *hebardei* and in the single female is short and almost straight. The meso-distal emargination of the male subgenital plate is also variable to some extent, in but one male approaching the smallest and deepest found in the series assigned to typical *hebardei*. The styles have disappeared in a large number of males, and when present show atrophy in being slender and irregular, rarely reaching as far as the apices of the spikes above them.

*Type*.—♂; Manatee, Manatee County, Florida. January 1, 1925. (T. H. Hubbell.) [Hebard Collection, Type no. 1074.]

The differences between this and the typical race, and the individual variation found, has been noted above. Fastigium rather short, with apex rather strongly decurved. Emargination of subgenital plate small, slightly broader than deep. Styles absent.

*Allotype*.—♀; same data as type but taken January 3, 1925. [Hebard Collection.]

Very similar to male in ambisexual characters. Agrees closely with females of the typical race. Vertex shorter but apparently abnormal for this race in having the apical spine almost straight, scarcely at all decurved.

The coloration of the individuals of this series is much the same as in *subapterus peninsularis*, the dark markings not as decided as in our series of typical *hebardei*.

*Measurements (in millimeters)*

	Length of body	Length of fastigium	Length of pronotum	Length of tegmen	Length of caudal femur	
♂						
Manatee, Fla., <i>para-</i> <i>type</i> .....	28.8	1.9	8	8	14.8	
Manatee, Fla., <i>para-</i> <i>type</i> .....	29.8	2.1	8.2	8.7	15.6	
Manatee, Fla., <i>type</i>	33.1	2	9	8.3	16.7	
Manatee, Fla., <i>para-</i> <i>type</i> .....	31.7	2.3	8.8	8.4	16.5	
						Length of ovipositor
♀						
Manatee, Fla., <i>allo-</i> <i>type</i> .....	32.5	1.9	8.4	2.8	17.2	22

*Specimens Examined*: 28; 20 males, 1 female and 7 immature individuals, FLORIDA: Manatee, Manatee County, VIII, 24, 1925, (T. H. Hubbell); in weeds, not in cabbage palmettoes, wary and harder to collect than *sabalis*), 11 ♂ (many teneral), *type* and *paratypes*, 2 juv. ♂, 5 juv. ♀, (1 juv. ♂ and 1 juv. ♀ brown); I, 1 and 3, 1925, (T. H. Hubbell; in tall weeds and grasses with *sabalis*, on moonlight night could only approach within fifteen feet with light off, when song would cease, more numerous than *sabalis*), 9 ♂, 1 ♀, *allotype* and *paratypes*, (1 ♂, 1 ♀ brown), [Hubbell and Hebard Clns.].

Two immature females, taken at Arcadia, Florida, September 12, 1917, by Rehn and Hebard in the undergrowth of the long-leaf pine woods, are apparently referable to this race; the apex of the fastigium being slightly more uncinatate than in females of the same instar of typical *hebardii* from Ft. Myers.

Hubbell states in his notes that the song undulates, composed of separate syllables or low buzzing notes which run together "Zeezzeezzeezzeezzee."

#### 8. *Belocephalus micanopy* Davis (Pl. VIII, fig. 18.)

1914. *Belocephalus micanopy* Davis, Jour. New York Ent. Soc., xxii, p. 200, p. 202, fourth fig. (♂, ♀; Big Pine Key, Florida.)

1920. *Belocephalus micanopy* Blatchley, Orth. of North-Eastern America, p. 509. (No additional material.)

This interesting insect is known only from the originally described series of four males and one female, taken from the silver palm (*Coccothrinax argentea* Lodd), which is found through the pine woods of Big Pine Key.

A single male paratype in the author's collection shows no difference whatever from typical *hebardii*, except that the fastigium is bluntly rounded distad, showing no trace of even the vestiges of an apical tooth. The insect therefore differs from typical *hebardii* as *subapterus rehni* differs from typical *subapterus*, but to a greater degree.

In view of this greater difference and the isolation of the type locality, we think it best to give *micanopy* specific recognition, though additional material may show it to be a race of *hebardii*.

The coloration agrees fully with that of *hebardii*, one of the original series being green, the others brown.

## Measurements (in millimeters)

	Length of body	Length of fastigium <sup>31</sup>	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
♂						
Big Pine Key, Fla., <i>type</i> <sup>32</sup> .....	30	2	9	7.5	16	
Big Pine Key, Fla., <i>paratype</i> .....	29	1.5	8.8	7.8	15.5	
♀						
Big Pine Key, Fla., <i>allotype</i> <sup>32</sup> .....	30	2	9	3	16	19

Davis states that "The song of this species is slow and readily distinguishable from that of *Belocephalus sleighti*." We have elsewhere noted that the song of the species of the genus probably changes in speed with changes of temperature. We believe, however, that the song of *sleighti* and *sabalis* is more rapid than that of *micanopy* and *hebardi*.

<sup>31</sup> This dimension as taken by Davis is from the antennal base to apex, as taken in the present paper from apex of basal ventral tooth to apex. The former measurement slightly exceeds the latter.

<sup>32</sup> From Davis.

## EXPLANATION OF FIGURES

## PLATE VII

- Fig. 1.—*Belocephalus subapterus subapterus* Scudder. Male. Seven Mile, South Carolina. Dorsal view of ultimate tergite. (Much enlarged.)
- Fig. 2.—*Belocephalus subapterus subapterus* Scudder. Female. Gainesville, Florida. Lateral view of apex of abdomen, base of ovipositor and subgenital plate. (Much enlarged.)
- Fig. 3.—*Belocephalus subapterus peninsularis* n. subsp. Male. *Type*. Lakeland, Florida. Dorsal outline of ultimate tergite. (Same scale as Fig. 1.)
- Fig. 4.—*Belocephalus subapterus peninsularis* n. subsp. Male. *Type*. Lakeland, Florida. Caudal view of cercus. (Greatly enlarged.)
- Fig. 5.—*Belocephalus uncinatus* n. sp. Male. *Type*. Miami Beach, Florida. Caudal view of cercus. (Same scale as Fig. 4.)
- Fig. 6.—*Belocephalus hesperus*, n. sp. Male. *Type*. St. Elmo, Alabama. Dorsal outline of ultimate tergite. (Same scale as Fig. 1.)
- Fig. 7.—*Belocephalus hesperus* n. sp. Male. *Type*. St. Elmo, Alabama. Caudal view of cercus. (Same scale as Fig. 4.)
- Fig. 8.—*Belocephalus hesperus* n. sp. Female. *Allotype*. St. Elmo, Alabama. Lateral view. ( $\times 1\frac{1}{2}$ )
- Fig. 9.—*Belocephalus davis*i Rehn and Hebard. Female. Newberry, Florida. Lateral view of apex of abdomen, base of ovipositor and subgenital plate. (Same scale as Fig. 2.)
- Fig. 10.—*Belocephalus sabalis* Davis. Male. *Paratype*. Punta Gorda, Florida. Lateral outline of head. ( $\times 2$ )
- Fig. 11.—*Belocephalus sleighti simplex* n. subsp. Male. *Paratype*. Homestead, Florida. Lateral outline of head. ( $\times 2$ )
- Fig. 12.—*Belocephalus sleighti simplex* n. subsp. Male. *Type*. Homestead, Florida. Lateral outline of head. ( $\times 2$ )
- Fig. 13.—*Belocephalus sleighti simplex* n. subsp. Male. *Type*. Homestead, Florida. Ventral view of meso-distal portion of subgenital plate and styles. (Greatly enlarged.)
- Fig. 14.—*Belocephalus hebar*di *hebar*di Davis. Male. Ft. Myers, Florida. Ventral view of meso-distal portion of subgenital plate and styles. (Same scale as Fig. 13.)
- Fig. 15.—*Belocephalus hebar*di *proximus* n. subsp. Male. *Type*. Manatee, Florida. Ventral view of meso-distal portion of subgenital plate. (Same scale as Fig. 13.)



## PLATE VIII

- Fig. 1.—*Belocephalus subapterus subapterus* Scudder. Male. Seven Mile, South Carolina. Lateral view of fastigium. (Greatly enlarged.)
- Fig. 2.—*Belocephalus subapterus subapterus* Scudder. Male. Dothan, Alabama. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 3.—*Belocephalus subapterus rehni* Davis. Male. Dunnellon, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 4.—*Belocephalus subapterus peninsularis* n. subsp. Male. *Type*. Lakeland, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 5.—*Belocephalus uncinatus* n. sp. Male. *Type*. Miami Beach, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 6.—*Belocephalus uncinatus* n. sp. Male. *Type*. Miami Beach, Florida. Dorsal outline of ultimate tergite. (Much enlarged, same scale as Pl. VII, fig. 1.)
- Fig. 7.—*Belocephalus hesperus* n. sp. Male. *Type*. St. Elmo, Alabama. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 8.—*Belocephalus davisii* Rehn and Hebard. Male. *Type*. Billy's Island, Georgia. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 9.—*Belocephalus davisii* Rehn and Hebard. Male. *Type*. Billy's Island, Georgia. Dorsal outline of ultimate tergite. (Same scale as Fig. 6.)
- Fig. 10.—*Belocephalus sabalis* Davis. Male. *Paratype*. Punta Gorda, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 11.—*Belocephalus sabalis* Davis. Male. *Paratype*. Punta Gorda, Florida. Dorsal outline of ultimate tergite. (Same scale as Fig. 6.)
- Fig. 12.—*Belocephalus sleighti sleighti* Davis. Male. *Paratype*. Big Pine Key, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 13.—*Belocephalus sleighti sleighti* Davis. Male. *Paratype*. Big Pine Key, Florida. Dorsal outline of ultimate tergite. (Same scale as Fig. 6.)
- Fig. 14.—*Belocephalus sleighi simplex* n. subsp. Male. *Type*. Homestead, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 15.—*Belocephalus sleighti simplex* n. subsp. Male. *Type*. Homestead, Florida. Dorsal outline of ultimate tergite. (Same scale as Fig. 6.)
- Fig. 16.—*Belocephalus hebardii hebardii* Davis. Male. Ft. Myers, Florida. Dorsal outline of ultimate tergite. (Same scale as Fig. 6.)
- Fig. 17.—*Belocephalus hebardii proximus* n. subsp. Male. *Type*. Manatee, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)
- Fig. 18.—*Belocephalus micranopy* Davis. Male. *Paratype*. Big Pine Key, Florida. Lateral view of fastigium. (Same scale as Fig. 1.)

