

Subfamily VII. TRIGONIDIINÆ.

THE WINGED BUSH CRICKETS.

Very small crickets of a pale brown, rarely blackish hue, having the body short, stout; head large, subquadrate, as wide or wider than pronotum; antennæ very slender, three or more times as long as body; eyes rather large, subglobose or oblong-oval, separated by twice or more their own width; pronotum subquadrate, flat or feebly convex above, without carinæ, its front and hind margins subtruncate; tegmina of male as long as or longer than abdomen, usually furnished with a prominent rhomboidal tympanum which is not divided and has only one long curved oblique vein; tegmina of female more narrow, usually slightly shorter than abdomen, the longitudinal veins straight, prominent, usually connected by numerous alternating cross veinlets; wings when present often much longer than tegmina; fore and middle legs slender, subequal; hind femora stout, unarmed beneath; hind tibiæ no longer than femora armed above with three pairs of long movable spines and also near apex with two long inner spurs and three very short outer ones; tarsi slender, the basal joint longer than the other two united; second short, cordiform, depressed, third very slender; subgenital plate of male conical or scoop-shaped; cerci short, very slender; ovipositor sabre-like, much shorter than hind femora, compressed, strongly curved, acutely pointed.

But little has been written of the habits of these little crickets. The species are all hygrophilous in habitat, living for the most part on the foliage and stems of tall grasses and weeds and low shrubs along the margins of ponds, lakes ditches and streams. None of them are ever numerous enough to do much damage, the plants on which they dwell being of little, if any economic value.

Four genera represent the subfamily in our territory. The literature pertaining to them is scant in quantity and widely scattered, the following being the most important: Uhler, 1864; Saussure, 1874, 361, 1878, 598; Blatchley, 1903; Rehn, 1903f; R. & H., 1912c, 1916, 300; Hebard, 1915b.

KEY TO EASTERN GENERA OF TRIGONIDIINÆ.

- a. Last joint of maxillary palpi club-shaped; basal joint of antennæ wider than long; pronotum subquadrate, as wide as or wider than long; color never red and dark brown.
- b. Interocular area convex, vertex strongly declivent; eyes subrotund, deeper than long; color in life dull yellow or pale to dusky brown.

- c. Front tibiæ with an auditory opening on one or both faces; males with a large stridulating area; larger, length of body, male, 4.5 or more mm. I. ANAXIPHA.
- cc. Front tibiæ without an auditory opening; males with a minute stridulating area; smaller, length of body, male, 4 mm.

II. FALCICULA.

- bb. Interocular area strongly flattened, vertex but little declivent; eyes compressed, longer than deep; color in life pale greenish-yellow.

III. CYRTOXIPHA.

- aa. Last joint of maxillary palpi lobate, deeply concave; basal joint of antennæ longer than wide; pronotum subcylindrical, longer than wide; head and thorax red, tegmina dark brown. IV. PHYLLOSCYRTUS.

I. ANAXIPHA Saussure, 1874, 370. (Gr., "upraised" + "sword.")

Very small brown or dusky crickets having the head vertical; front oblique, declivent and forming a protuberance between the antennæ; ocelli very small, arranged in a triangle; antennæ excessively long, setaceous; last joint of maxillary palpi longer than the one preceding, its apex dilated and truncate; pronotum short, broad, bearing numerous erect stiff hairs; tegmina of male with dorsal field very wide, their tips rounded; the speculum on apical half prominent, undivided by a cross nerve; tegmina of female more narrow and closely embracing the sides of abdomen; wings either absent or present and nearly twice as long as tegmina; legs long, pubescent; front tibiæ with hearing organ present on both faces in winged forms, on outer face only in wingless forms; spines of hind tibiæ usually much longer than the spaces between their bases. Other characters those of the subfamily. The genus is mostly tropical in distribution, five nominal species being recorded from the eastern and southern states.

KEY TO EASTERN SPECIES OF ANAXIPHA.

- a. Ovipositor one-half as long as hind femora; hind femora of male longer than tegmina, in fresh specimens with a dark stripe along the lower half of outer face in both sexes. 342. EXIGUA.
- aa. Ovipositor distinctly less than one-half the length of femora; hind femora of male shorter than tegmina, without a dark stripe.
- b. Color a uniform pale brown, usually without distinct dark markings on head or tegmina; form compact. 343. PULICARIA.
- bb. Color blackish or dusky brown or head with dark stripes; form more elongate, less compact.
- c. Sides of body without a prominent dark brown stripe; spurs of hind tibiæ longer than the spaces between their bases; form very slender.
- d. General color pale brownish-yellow; occiput usually with two dark stripes which extend downward onto face.
- 343a. VITTATA.
- dd. General color dusky or smoky brown. 344. SCIA.

- cc. Sides of body with a wide dark brown stripe, extending from eye back along sides of thorax and including the lateral field of tegmina and exposed portion of wings when at rest; spines of hind tibiæ shorter than the spaces between their bases.

345. IMITATOR.

342. *ANAXIPHA EXIGUA* (Say), 1825, 309. Say's Bush Cricket.

Dull yellowish-brown or clay yellow; head and pronotum in fresh specimens dark reddish-brown; face usually with three stripes and dashes of reddish-brown; tegmina and legs pale brown; spines of hind tibiæ with bases and tips dusky; abdomen of male blackish; of female, dark brown, paler on sides; ovipositor dark brown, paler at tip. Pronotum about one-fourth wider than long. Tegmina of male but slightly surpassing tip of abdomen. Other characters as in key. Length of body, ♂, 5—6, ♀, 6—7; of antennæ, ♂, 32; of tegmina, ♂, 4—4.5, ♀, 3—3.5; of hind femora, ♂ and ♀, 6; of ovipositor, 3.5—4 mm. (Fig. 244.)

This handsome little cricket occurs in numbers in suitable localities throughout Indiana. In the northern counties it is found among the sphagnum mosses growing in dense tamarack swamps, and also on the shrubs about the margins of lakes and marshes. Farther south it is often very abundant on the leaves and stems of the arrow alum, cat-tail flags, button-bush and other semi-aquatic plants. It is very active and difficult to capture, and, on account of its small size, is doubtless overlooked in many localities where it occurs in numbers. In central Indiana it reaches maturity about August 1st, and exists until after heavy frosts. Unlike the *Nemobids*, which it most closely resembles, it is never found on the ground, but clings to the stems of bushes and grasses, a few feet above the surface. No long-winged individuals have been taken in Indiana but R. & H. (1916) have recorded several from other states and note that they have open "auditory foramina" on both faces of fore tibiæ, while the brachypterous specimens have them only on the outer face of the tibiæ.

This is our largest and most widely distributed *Anaxipha*, its known range extending from southern New England west to Minnesota and Nebraska and south and southwest to Jacksonville, Fla. and Brownsville, Texas. Say's types were from Missouri and the species has been many times recorded as *A. pulicaria* Burm.

In New England *exigua* is recorded only from Westbrook, Conn., where it occurs in tangled vegetation on or near salt marshes. Davis (1889) says that on Staten Island "it is not uncommon along the ditches in the salt meadows where the high tide bushes, *Iva frutescens* L., grow. It clings from six inches to a foot up the stems and its song has a particular silvery tone." In

Virginia Fox found it on *Scirpus americana* Pers. in a tidal marsh. Allard (1910b) describes the habits and notes of *exigua* in north Georgia as follows: "This pretty cricket is very active, and not readily captured in its natural hiding places in the dense vegetation of wet situations. Its notes are a faint, shrill, prolonged tinkling *ti-ti-ti-ti-ti-ti-ti-ti*. Dwelling in almost impenetrable tangles, it is exceedingly difficult to separate the notes of the single singer from among the tiny tinkling medley which seems to pervade the atmosphere of the locality. This cricket is musical by day and at night."

343. *ANAXIPHA PULICARIA* (Burmeister), 1838, 732.

Pale brownish-yellow, often with a slight infuscation on head, pronotum and hind femora; basal dorsal segments of abdomen brown. Pronotum more than one-half wider than long, distinctly widening from apex to base. Tegmina much longer and narrower than in *exigua*, reaching 2 to 4 mm. beyond tip of abdomen, male, to its tip, female. Tympanum of male one-half or more longer than its width. Other characters as in key. Length of body, ♂, 4.5–5; of tegmina, ♂, 5, ♀, 3; of hind femora, ♂ and ♀, 4–5; of ovipositor 2.2 mm.

This small compact Gryllid has been taken by me at Dunedin, Fla., where it was found in small numbers in March on the low herb-

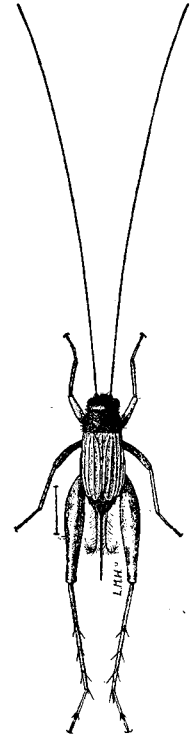


Fig. 244. Female, much enlarged. (After Lugger.)

age of a recently cleared garden tract in the midst of a dense hammock. There it occurred in company with *Acrydium arenosum blatchleyi* and other ground frequenting Orthoptera. A single male was taken Feb. 7 on Hog Island while sweeping low shrubs, and another at Lakeland Feb. 16, from between the stems and leaf sheaths of a saw-grass. It was described from Jamaica, is known also from Mexico and in this country from Raleigh, N. Car. southwest to Brownsville, Tex. In Florida it has been taken by others at Gainesville, Miami, Sand Point and Ft. Reed, Scudder's types of *Cyrtoxipha delicatula* (1877a, 82) from Ft. Reed having been based on the long-winged form of *A. pulicaria* as shown by R. & H. (1912c.) It appears to be much less thamnophilous in habits than *exigua* being more often found in tangles of low grasses, weeds and vines in moist woods and on the edges of the salt marshes.

343a. *ANAXIPHA PULICARIA VITTATA* (Bolivar), 1888, 159.

Differs from *pulicaria* by its smaller, more slender form, usually distinctly striped occiput and face and by having the spines of hind tibiæ more closely spaced. The under side of abdomen is often wholly black. Wings in macropterous examples exceeding the tegmina by 4 mm. Length of body, ♂, 4—4.5; of tegmina, 4; of wings, 8; of hind femora, 4 mm.

A West Indian form known in this country from Albany, Ga. and Atlantic Beach, Punta Gorda and Key West, Fla. From the specimens examined at Philadelphia it appears to be only a slender variety of *A. pulicaria*, the dark stripes of occiput and face being often absent, while in *pulicaria* they are sometimes evident on the occiput. It occurs in similar habitats as *pulicaria* and, like that species, in both the macropterous and brachypterous forms. R. & H. (1916, 305) state that the individuals devoid of black marks "can only with difficulty be separated from small individuals of *pulicaria*, which species is, however, appreciably more robust."

344. *ANAXIPHA SCIA* Hebard, 1915b, 465.

Dull clay-yellow, clouded with smoky brown; occiput dusky brown, the lower face of vertex with a very narrow pale median stripe; tegmina nearly uniform smoky brown; femora dull yellow with dark blotches; apical fourth of hind femora and entire tibiæ pale dull yellow. Basal joint of hind tarsi equal in length to the longest tibial spine; legs longer and more slender than in *vittata*. Cross veinlets of female tegmina more distinct than in *pulicaria*. Length of body, ♂ and ♀, 5.2; of tegmina, ♂, 4.5, ♀, 3.3; of hind femora, 4.7; of ovipositor, 2.7 mm. (Fig. 245, a.)

Described and known from three specimens taken "from among the roots above black muck, sodden leaves and tidal litter in a red mangrove swamp on the edge of Brickell's Hammock, Miami, Fla.,

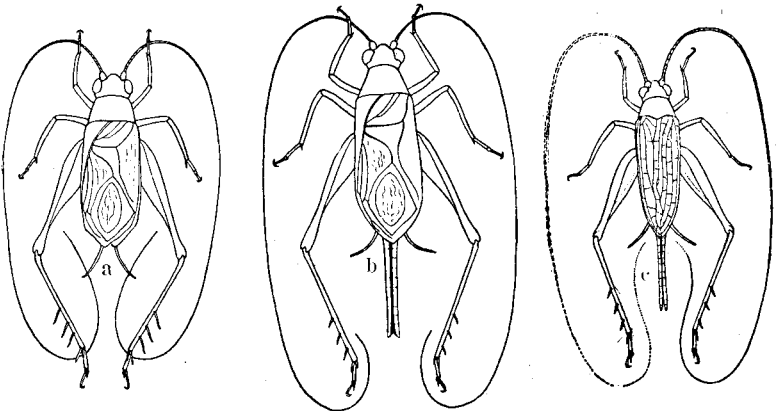


Fig. 245. a, *Anaxipha scia*, male; b and c, *A. imitator*, male and female, $\times 4$. (After Hebard.)

March 15—16." (*Hebard.*) A large series may perhaps show that this is but a color form of *pulicaria* due to its peculiar habitat.

345. ANAXIPHA IMITATOR (Saussure), 1878, 487.

Elongate-oblong. Dull smoky brown; sides of body with a solid dark brown stripe as described in key; lower face with a wide, V-shaped chocolate-brown mark, often also a narrow reddish-brown oblong one between the antennæ; occiput and pronotum with dusky blotches. Pronotum distinctly widening from apex to base, the latter in male nearly twice the width of former; tegmina surpassing abdomen 2—3 mm., exceeded by wings 4—5 mm. in both sexes. Hind femora and tegmina reaching tip of ovipositor in female. Basal joint of hind tarsi more than twice the length of the other two united. Ovipositor stout, feebly curved, very acute. Length of body, ♂, 5.3—6.2, ♀, 4.7—5.4; of tegmina, ♂, 5—5.4, ♀, 4.4—4.7; of wings, ♂, 7.7—8.6, ♀, 7.4—7.8; of hind femora, ♂ and ♀, 4.3—5; of ovipositor, 2—2.5 mm. (Fig. 245, *b, c.*)

Miami, Fla., March 15—16 (*Hebard.*) A Cuban species taken in numbers by Hebard (1915b), "on the narrow border of sloping ground between the jungle of Brickell's Hammock and the red mangrove swamp. There, on the ground among a litter of the dried leaves of the species of wild coffee, *Psychotria undata* Jacq., individuals were found jumping and flying nimbly about. They never flew more than a foot or two from the ground, in flight suggesting numerous species of small tropical roaches. At 11 A. M. on a cloudy day with temperature 70°, the few specimens heard stridulating emitted a trilling note, not loud but penetrating, the trills lasting one to two seconds, with the normal interval between a little less than one second. This song was not nearly as tinkling as that of *Cyrtoxipha gundlachi*, but still pleasant to the ear."

II. FALCICULA Rehn, 1903f, 258. (Gr., "sickle" + "little.")

Very small bush crickets closely allied to *Anaxipha*, but having the terminal joint of palpi triangular with apex squarely truncate; stridulating organ of male much smaller, confined to the basal fourth of the tegmen, the stridulating vein short, transverse; cross veinlets of female tegmen wanting; hind femora very short and stout; subgenital plate of male conical, scoop-shaped; cerci elongate, tapering, reaching the tips of hind femora. One species is known.

346. FALCICULA HEBARDI Rehn, 1903f, 258. Hebard's Bush Cricket.

Oblong, compact, robust. Uniform pale yellowish-brown; pronotum often with a very narrow pale median line. Antennæ about twice the length of body; pronotum nearly one-half wider than long, both it and head with numerous stout-erect bristles; tegmina slightly surpassing abdomen, male,

reaching base of ovipositor, female, their tips subtruncate. Wings wanting. Ovipositor stout, strongly curved, very minutely serrate. Length of body, ♂, 4, ♀, 4.5—5; of tegmina, 2.5; of hind femora, 3.2; of ovipositor, 1.5 mm.

This, one of the smallest of our eastern Orthoptera, was described from Thomasville, Ga. and ranges from Atlantic Co., N. Jersey south and southwest to Beaumont and Dickinson, Texas. In Florida it has so far been recorded only from two stations. At Gainesville it was found in numbers by R. & H. (1907) in the wire grass in long-leaf pine woods, while at Pine Island, Hebard found a single pair in similar habitat. It probably occurs in suitable environment throughout the northern portion of the State. Wherever found it has been taken mainly among the wire grass and fallen pine needles of dry open pine woods, where its colors harmonize perfectly with its surroundings. The Cuban record of Rehn (1909) was an error, based on a specimen of *Anaxipha vittata*.

III. CYRTOXIPHA Saussure, 1874, 373. (Gr., "curved" + "sword.")

Very small slender-bodied bush crickets possessing the characters given in the generic key, and having the head longitudinal, broadly flattened between the eyes; last joint of maxillary palpi shorter than fourth, expanding very strongly from base to apex, the latter squarely truncate; pronotum much narrowed in front; wings always present and prolonged in the form of a tail or queue; front tibiæ slightly enlarged at base, with auditory foramen present on both faces; hind femora very slender; spines of hind tibiæ very delicate and but slightly longer than the spaces between their bases.

KEY TO EASTERN CYRTOXIPHA.

- a. Ovipositor shorter, more slender, not surpassing tips of hind femora, its teeth acute; size somewhat smaller, form more slender. 347. GUNDLACHI.
- aa. Ovipositor longer and stouter, distinctly surpassing tips of hind femora, its teeth bluntly rounded; size larger, form stouter. 347a. COLUMBIANA.

347. CYRTOXIPHA GUNDLACHI Saussure, 1874, 373. Gundlach's Bush Cricket.

Uniform pale green fading to brownish-yellow; tips of tibial spines and apical half of ovipositor blackish. Pronotum one-third broader at base than apex, its greatest width one-half more than its length. Tegmina in both sexes surpassing abdomen 2—3 mm., exceeded by wings the same distance, those of males hyaline with tympanum and subapical spectrum much as in *Anaxipha exigua*; those of female with cross veinlets distinct, not prominent, the tips narrowly rounded. Hind femora slightly surpassing

tips of tegmina. Length of body, ♂, 5.5—6, ♀, 6—6.5; of tegmina, ♂, 4.5—5.5, ♀, 5.5—6.3; of hind femora, ♂, 3.8—4, ♀, 4.2—4.7; of ovipositor, 2.6—3 mm.

Ormond, Lakeland, Lake Okeechobee, Ft. Myers, Cape Sable, Key West and Dunedin, Fla., Oct. 26—Apr. 13 (W. S. B.) Recorded from many localities in the southern two-thirds of Florida by other collectors. About Dunedin both nymphs and adults occur throughout the winter being often beaten from the low branches of oak and bayberry into an umbrella, where their movements are so agile that they are captured with difficulty. They occur for the most part on shrubs in the vicinity of ponds and lakes and about the borders of wet hammocks, though a number have been taken from mangrove and other shrubs on Hog Island.

In the United States, typical *gundlachi* is known only from Florida, Ormond and Silver Springs being its most northern stations. It is said by R. & H. (1916) to be widely distributed in the West Indies and known from Central and northern South America. Hebard (1915b) states that in March "the very pleasant tinkling song of *gundlachi* is to be heard everywhere on warm evenings about Miami."

347a. *CYRTOXIPHA GUNDLACHI COLUMBIANI* Caudell, 1907b, 237.

Differs from typical *gundlachi* only by the characters given in key. The average size is perhaps a little larger, but not greater than the largest individuals of *gundlachi*. Length of body to apex of tegmina, ♂ and ♀, 8.5; of pronotum, 1.5; of tegmina, 5.6—6.8; of wings, 7.3—9.4; of hind femora, 5—5.8; of ovipositor, 3.2—3.6 mm.

Orlando, Fla., August 2 (*Cotton*); Ft. Monroe, Va. (*Davis*.) I regard this as a northern race of *C. gundlachi*, the only difference of any note being in the size and armature of the ovipositor. The cross-veinlets of the female tegmina, one of the characters used in its separation, are as numerous and almost as prominent in some females of *gundlachi* as in the northern form. Caudell's types of *columbiana* were from Washington, D. C. and Falls Church, Va. and its known range extends from those points south and southwest to Dallas and Doucette, Texas. From Florida it has been previously recorded only from Atlantic Beach. Of its habits R. & H. (1916) say: "The species is thamnophilous and dendrophilous and has never been found in the least abundant. Its small size and retiring habits make it a very difficult insect to collect." It occurs on shrubs and small trees, usually near water.

Allard (1910b) says of its song as noted at Thompson's Mills, Ga.: "I have never heard it singing less than six or seven feet

from the ground. I found it abundant on the foliage of peach trees and the tallest oaks, also in the low trees and grape vines and very active so that it is not easily taken. Its notes are very brief, exceedingly high pitched trills which are uttered rapidly and persistently by day and by night. It is, however, more strictly a night singer and its great chorus begins late in the afternoon and continues far into the night. Once begun it is impossible to single out a note; the evening atmosphere everywhere being seemingly filled with an indistinguishable silvery trilling."

IV. *PHYLLOSCYRTUS* Guerin, 1844, 333. (Gr., "leaf" + "curved.")

Head wider than pronotum, strongly flattened and declivent between the eyes; vertex broad, rounded into the face; eyes prominent, wider than deep; ocelli wanting; maxillary palpi stout, terminal joint very large, spoon-shaped, deeply and widely concave above, fourth joint small, triangular; pronotum as in key, its lateral lobes longer than deep, their lower margin nearly straight, recurved; tegmina leathery in texture, slightly exceeding the abdomen in both sexes; stridulating organ of male much as in *Anaxipha*; alternate longitudinal veins of female tegmina more prominent, cross veinlets absent; wings slightly shorter than tegmina; fore tibiæ with a tympanum on both faces; hind tibiæ shorter than the femora, their spines shorter than the interspaces; subgenital plate of male short, conical; ovipositor as in *Anaxipha*. An American genus, 14 species being listed by Kirby, only one of which occurs with us, the others inhabiting Mexico and South America.

348. *PHYLLOSCYRTUS PULCHELLUS* Uhler, 1864, 544. Handsome Bush Cricket.

Head and pronotum bright crimson red; recurved lower margin of lateral lobes yellow; antennæ twice the length of body, blackish at base and tip, the middle portion yellowish; palpi bluish-black; dorsal field of tegmina reddish- or chocolate-brown, the sides black with paler nervules; cerci and legs pale yellow; abdomen shining black. Ovipositor brown, paler at base. Head and pronotum finely and closely punctate. Structural characters under the genus heading. Length of body, ♂ and ♀, 6—7; of tegmina, 5.5; of hind femora, 5.2—6; of ovipositor, 3.2—3.5 mm.

This handsome vari-colored little cricket occurs in small numbers in the southern half of Indiana, but has not been taken north of Marion County. It reaches maturity about mid-August and occurs on low shrubs and vines about the margins of ponds and marshes, being especially partial to the foliage of the button-bush, *Cephalanthus occidentalis* L. When approached cautiously

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

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

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

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

Subfamily VIII. ENEOPTERINÆ.

THE LARGER BROWN BUSH CRICKETS.

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