and south and west to Mississippi, Texas, Southern California, Cuba and Mexico. It is not known from New England nor from Canada. For an insect of so wide a range definite records of *E. minuta* are very few. Kostir mentions it as occurring at Columbus, Cedar Point and Sugar Grove, Ohio. No locality has been recorded for Michigan, though it doubtless occurs in the State. Lugger does not record it from Minnesota though Scudder says he does. Bruner states that it or *T. mixtus* Hald. occurs in the south half of Nebraska. McNeill records it from Champaign, Ill. without other mention. R. & H. (1916, 284) give a number of records from Virginia south to Georgia, and state that it is found on wet sand near water, often in great numbers over the entire region of the southeastern United States.

The *T. histrio* and *T. histrionicus*, described by Saussure from Central America, Texas and Cuba, are placed by Scudder (1902) as synonyms of *E. minuta*.

Subfamily III. MYRMECOPHILINÆ.

The Ant-Loving Crickets.

As here restricted this subfamily comprises very small, subspherical wingless crickets having the ocelli absent; face much narrowed by the very large antennal pits; pronotum in both sexes of much the same form but longer than meso- and metanotum, its lateral lobes very short; fore tibiæ without a hearing organ; hind femora ovate, compressed, very greatly enlarged; hind tibiæ armed above on inner margin with three or four long movable spines; basal joint of hind tarsi distinctly longer and stouter than the other two.

The subfamily is represented by the single genus:

I. Myrmecophila Latreille, 1829, 183. (Gr., "ant" + "to love.")

Form ovate, very convex; head almost hidden beneath the pronotum; vertex rounded, strongly declivent; eyes small, situated above the very large antennal fossæ and usually in great part concealed by the pronotum; antennæ stout, about as long as body, setaceous, their basal joint very large, compressed, the others very short, exceedingly numerous; pronotum slightly wider behind than in front, its fore and hind margins subtruncate; meso- and metanotum similar in form to segments of abdomen, sometimes slightly wider; fore and middle legs slender; hind tibiæ shorter than the femora, compressed, lower margin curved, upper one ciliate, its inner carina with three long movable spines, outer carina with one, apex with two pairs of slender spurs, the upper

pair the longer; anal cerci long, cylindrical, tapering, very bristly. Male with subgenital plate boat-shaped, its apex rounded, feebly upcurved, deepiy cleft. Ovipositor short, rather stout, straight.

The species of *Myrmecophila* are among the smallest of Orthoptera, and occur in all parts of the earth. They are always found either in company with ants or on the ground beneath cover where ants are very likely to occur. The principal literature treating of our American forms is as follows: Bruner, 1884; Scudder, 1899d; Wheeler, 1900; Blatchley, 1903; Schimmer, 1909.

Wheeler (1900) has given an interesting account of the habits of one of these little crickets from which I quote at length as follows:

"In the present paper I wish to call attention to the peculiar habits of *Myrmecophila nebrascensis* Bruner which is very common in the vicinity of Austin, Texas, where it may be found in the nests of no less than five very different species of ants. My observations on the habits of this *Myrmecophila* began early in March. The little crickets were taken from the Formica or red ants' nests and placed in artificial nests of the agricultural ant, an insect of much larger size, slower movements and in many other respects more satisfactory for purposes of observation than the Formica.

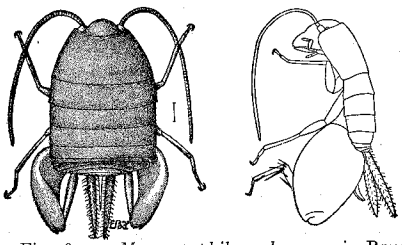

Fig. 217. *Myrmecophila nebrascensis* Brun. (After Lugger.)

"On April 3d I placed in the artificial nest twenty Myrmecophilas, eight or ten of which had been squeezed or had lost one or both saltatory legs during capture. All the disabled individuals were at once seized and dispatched in so vindictive a manner, that I could not doubt that the ants were irritated by the pungent red ant nest-odor still clinging to the crickets. In an instant all the ants in the compartment of the nest had gathered in little groups, each devouring a Myrmecophila. The uninjured crickets made not the slightest attempt to escape, but felt themselves perfectly at home as soon as they set foot on the floor of the nest. Their adaptation to a new nest and to an ant of a larger size and belonging to an entirely different sub-family from their former host, was immediate and complete. With constantly vibrating antennæ they began dodging in and out among the little groups of assembled ants. From time to time one of them would be seen cautiously approaching an ant, that was busy with its dinner of Myrmecophila, and fall to nibbling at its legs or the tip of its abdomen. There could be no doubt that the cricket derived some benefit from the oily secretion covering the surface of the ant's body. At first the ant disregarded this nibbling, which probably resembles the attentions of the toilet habitually received from sister ants, but the cricket's scraping mandibles and maxillæ soon grew annoying and the ant would either move away or turn its head, open its mandibles and make a lunge at the Myrmecophila like a large dog annoyed by a puppy But before the huge mandi-

bles had closed, the cricket was far away, already nibbling at the abdomen of some other ant. The cricket can get at only the legs and abdomen of its host, since the spreading legs prevent it from reaching the thorax. It often stands on its hind legs, and places its forelegs on the ant's leg, in order to reach the femur or tibia. For very obvious reasons, it avoids nibbling at or even approaching the ant's head. It is always alert, as if perpetually aware of danger and ready to dodge at the slightest movement made by the ant.

"Occasionally in the narrow confines of an artificial nest the ants do succeed in capturing and devouring one of their vigilant little guests, but the fact that of the eleven sound crickets left after the above observation was made, eight were still alive June 22d, when I had to discontinue my observations for the summer, shows that the crickets are extremely expert in keeping out of danger. The attitude of the ants during all this time underwent no change as far as I could observe, for they would still occasionally make lunges at the crickets.

"The crickets do not derive all their substance from cleansing their hosts. In earthen nests they are often seen haunting even the galleries that have been abandoned by the ants, scrutinizing the walls and nibbling at them from time to time. There can be no doubt that they find here the same substance which covers the ants, for the walls of the galleries of a populous nest soon become greasy from the attrition of the constantly passing ants. Sometimes the crickets may be seen nibbling at dead ants that have been temporarily abandoned in the galleries or placed on the kitchen-midden of the nest. The intestine of a Myrmecophila which I dissected was found to contain oil-globules and a granular whitish substance."

Kirby (1906, 53) recognized 15 species of these little crickets. Of these but one occurs in all Europe, where it is very widely distributed, while five nominal species have been described from the United States. But one of these is known east of the Mississippi.

315. MYRMECOPHILA PERGANDEI Bruner, 1884, 42.

Broad oval, depressed, nearly twice as long as broad; very thinly clothed with exceedingly short, subprostrate yellowish bristles. Dark reddish-brown; front and hind margins of pronotum, hind margins of the other dorsal segments and apex of ovipositor piceous-brown; legs, cerci and base of antennæ and ovipositor paler brown, extreme front margin of pronotum yellowish. Pronotum about twice as long as either the meso- or metanotum, the front margin about one-fourth narrower than hind one; meso- and metanotum subequal, longer than the succeeding dorsal segments, which are equal in length. Hind femora pyriform, more curved below than above, less than twice as long as broad. Outer hind tibal spurs more than half as long as tarsi. Cerci about as long as hind femora. Length of body, ♂, 3—4.3, ♀, 4—5; of hind femora, ♂, 2.5, ♀, 3; of ovipositor, 2.5 mm.

Southern half of Indiana, April 26—Sept. 6; Dunedin, Fla., Dec. 3—March 24 (*W. S. B.*).

This small ant-loving cricket was first taken in Indiana near New Harmony, Posey County, on April 26, 1901. It was after-

ward found to be rather common in the region thereabouts as well as in Knox, Perry, Dubois, Crawford, Orange and Lawrence counties; the northernmost point at which it has been observed being near Mitchell, Lawrence County. Since its known general range is southern it probably does not occur in the northern half of the State. With us it is found in company with a half dozen species of ants, the most common of which is a rather large yellowish-red form, *Camponotus melleus* Say. The cricket seems to be always on the move, and when disturbed leaps with great agility. Those taken in Crawford County in September were almost double the size of those noted in the spring and probably more accurately represent the mature insect.

At Dunedin four specimens have been taken, each singly beneath half buried logs, two of them without an ant beneath the logs where they were found. One of them had only one hind leg, yet leaped a foot in height and a distance of 18 inches several times when first uncovered. Dunedin is the most southern station known for *M. pergandei* and it is elsewhere known in Florida only from Crescent City, a single nymph from there being in the Philadelphia collection.

This was the first of these little crickets described from North America, Bruner's types being from the "Atlantic States from Maryland southward." Its known range now extends from Washington, D. C. west to southern Indiana and south and west to Clayton, Ga. and Dunedin, Fla. In Ohio it has been taken by Dury near Cincinnati. The other four species of United States Myrmecophila are separated by Scudder (1899d, 425) only by minor characters of size and color, and it is very probable that two or three of them will prove to be but synonyms or varieties. Bruner in his original description of *pergandei* stated that the characteristic feature of that species is "the two light colored elliptical markings upon the disk of the pronotum," but these are not found in any of the Indiana or Florida specimens at hand.

Subfamily IV. MOGOPLISTINÆ.

The Wingless Bush Crickets.

Small slender-bodied depressed wingless or subapterous Gryllids, thinly clothed with translucent, easily abraded scales and having the head short, depressed; vertex truncate in front; upper portion of face strongly swollen, protuberant between the antennæ, separated from vertex by a transverse sulcus; ocelli very small or absent; eyes well developed not covered by pronotum; palpi variable in length and form of segments; pronotum of males