

United States Department of Agriculture
Bureau of Entomology and Plant Quarantine

AIDS TO THE IDENTIFICATION OF THE MORMON AND COULEE CRICKETS
AND THEIR ALLIES (ORTHOPTERA; TETTIGONIIDAE, GRYLLACRIDIDAE)

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Introduction

In field work with the Mormon cricket (Anabrus simplex Hald.) and the coulee cricket (Peranabrus scabricollis (Thos.)), it is important to distinguish the two species from each other and from several allied genera and species of Orthoptera. In this paper identification keys, descriptions, notes on known distribution, and illustrations are presented for the purpose of aiding in the identification of these species. In some cases it is impossible at present to be sure whether certain specimens which have been studied represent two distinct species or whether they are subspecies of the same one. An attempt has been made to explain such difficulties, and to suggest what specimens will be most helpful in adding to our knowledge of the taxonomic position and geographical distribution of those forms. The principal genera discussed, in addition to the most important ones, Anabrus and Peranabrus, are Apote, Steiroxys, Pediodes, and Eremopedes.

The present paper will be more useful to field workers if a short time is given to studying identified material of several species, so that the important distinctions may be learned by comparison with specimens. The paper is the outgrowth of a study of collections made in 1938 by field workers in 10 Western States, who brought together large and important series of several species and genera.

Caudell (1907) monographed the Decticinae of North America, and, as regards the species of immediate concern to the Mormon cricket problem, there have been few taxonomic changes. Three varieties of Anabrus simplex have been placed in synonymy by recent workers, and one new species, A. spokane, has been described by Rehn and Hebard (1920).

Morphological terms.--Definitions of some structural details may be helpful in interpreting the keys and descriptive matter. The pronotum, just behind the head, is the large shieldlike structure which covers most of the thorax in a hoodlike manner. This is composed of an upper or dorsal surface and two lateral portions, one extending down each side. The latter are

called the lateral lobes. In some species the lateral lobes merge very gradually into the dorsal surface and the junction is evenly rounded. In others the lateral lobes are separated from the dorsal surface by distinct ridges (lateral carinae), one on each side. If there is a lengthwise ridge present in the middle of the dorsal surface, it is called the median carina.

On the ventral surface of the thorax between the front legs (fig. 15, SP) there are, in some genera, paired prosternal spines. The armament of the front tibia (fig. 2, TI) varies in different genera. The external surface is drawn in figure 16, showing the paired slits (H) which are connected with hearing organs. In this case there are three spines along the hind external margin and none on the front margin, while several spines occur on each margin of the inner surface. Figure 8 shows a dorsal view of the apex of the abdomen of simplex, with the last dorsal segment (T) and the left cercus (C) indicated. The female subgenital plate occurs on the venter of the abdomen at the base of the ovipositor. In figure 18 of Anabrus simplex the apex of the subgenital plate is shown uppermost and with the apical hooks (HQ) indicated. The individual cerci (figs. 20-23) were drawn from a little to the left of a direct dorsal view in order to show more of the apex, which in some species is directed downward.

Allied Orthoptera

Anabrus and allied genera belong to the subfamily Decticinae of the family Tettigoniidae. Members of this subfamily of katydids or long-horned grasshoppers are commonly called the shield-backed grasshoppers, because of the usually well developed pronotum. In a few genera of Decticinae wings capable of sustaining flight occur, but in those here discussed only short wings are present, the wing length in Apote (fig. 2) being of about the maximum development.

There are a few Orthoptera of striking appearance in the West which may be encountered by field workers, and, though not Decticinae, these are mentioned here to prevent any possible confusion. Tropidischia (fig. 1) is a member of the camel-cricket group (Rhaphidophorinae). In this group, of which Ceuthophilus is the dominant American genus, wings are entirely lacking and the general appearance will separate these forms from the Decticinae. Distributed in all the Northwestern States, and of such a striking appearance as to be of considerable popular interest, is the genus Stenopelmatus. These insects (fig. 3) have no wings and have heavily spined legs. They are usually about $1\frac{1}{4}$ inches long, but some may attain a length of 2 inches. Figure 4 illustrates a male of Cyphoderris, a genus occurring from Colorado and Oregon into southwestern Canada, usually in forested country. Females have only vestigial wings. Specimens of Cyphoderris are about an inch long or somewhat less. Like the Rhaphidophorinae, Stenopelmatus and Cyphoderris are members of the family Gryllacrididae.

There are about 25 genera of Decticinae in the United States. The following key will aid in separating Anabrus and Peranabrus from four other genera which, because of appearance and distribution, may be confused with them.

Key to Anabrus, Peranabrus, and Genera Likely to be Confused with Them

1. Median carina of pronotum developed as a sharp ridge entire length of pronotum; dorsal surface of pronotum smooth; (external surface of front tibia unarmed along front margin); (Northwestern States, seldom south or east of Colorado)..... Steiroxys

Median carina of pronotum seldom extending through entire length and then the pronotum is rough and the carina is low and rounded.. 2

2. Male cercus (figs. 7-9, 20-23) with apex strongly curved and with conspicuous, curved, inner tooth; female subgenital plate (fig. 18) with postero-lateral angles developed into sharp, incurved spines; (front tibia usually with 1-3 spines along front margin of external surface; prosternal spines absent); (British Columbia to Manitoba, south to northern New Mexico)..... Anabrus

Male cercus without strongly curved apex (figs. 10-14), inner tooth absent or differently formed; female subgenital plate without postero-lateral angles developed into sharp, incurved spines..... 3

3. Paired prosternal spines (fig. 15, SP) present; those species from the extreme Northwest (Apote) with a conspicuous dorsal color pattern of abdomen as illustrated (fig. 6)..... 4

Paired prosternal spines absent; dorsal surface plain or color pattern not as illustrated in opposite category; (some species of Eremopedes possess weak prosternal spines, but that genus may be distinguished by characters given in the description of Eremopedes)..... 5

4. Abdomen with conspicuous dorsal color pattern (fig. 6); hind femur not or but slightly exceeding abdomen; ovipositor (fig. 2) distinctly down-curved; (Oregon, Washington, and British Columbia)..... Apote

Abdomen plain or not marked as in opposite category; hind femur greatly exceeding abdomen; ovipositor (fig. 17) not down-curved; (Great Plains, not extending west of Colorado and Wyoming)..... Pediodectes

5. Pronotum rough (fig. 5); posterior margin of last dorsal segment of male abdomen at most weakly emarginate, the lobes broadly rounded; (Oregon to British Columbia and Alberta)..... Peranabrus

Pronotum smooth; posterior margin of last dorsal segment of male abdomen deeply cleft, the lobes long and often acute (fig. 14); (Southwestern States, not occurring north of Colorado)..... Eremopedes

The Genus Anabrus Haldeman

This genus includes the true Mormon cricket (Anabrus simplex Haldeman), one other distinct species (A. cerciata Caudell), and a variable form (A. longipes Caudell) which is tentatively considered a valid species. A. spokan Rehn and Hebard is tentatively placed under the name longipes, where it is discussed.

There is considerable size variation in Anabrus, ranging from about 1 inch in body length and three-eighths inch in length of pronotum in small specimens of longipes to 2¼ inches in body length and slightly more than five-eighths inch in length of pronotum in large specimens of cerciata. The most common color is brown, but green, black, and mottled gray specimens also occur frequently.

When one is familiar with the general appearance of Anabrus from examination of specimens, it is not difficult to be certain of the genus by checking a few details of structure. The males have distinctive furcate cerci (figs. 7-9, 20-23) which, except for Steiroxys, differ from those of other genera likely to be confused with Anabrus, and the subgenital plate of the female (fig. 18) has distinctive incurved hooklike projections at the apex. The ovipositor varies from nearly straight to moderately upturned, but never points downward decidedly at the apex as in Apote (fig. 2).

The upper surface of the pronotum is smooth, not rough and pebbled as in Peranabrus, and the carinae are seldom developed except in longipes. Prosternal spines are lacking. The typical armament of the external surface of the front tibia is 5 spines along the hind margin and from 1 to 3 spines along the front, but occasional specimens lack spines along the front margin. The hind femur is less than twice the length of the pronotum in nearly all specimens of simplex, but is about twice the pronotal length in cerciata and almost always more than twice as long as the pronotum in longipes. The three species may be separated as follows:

Key to Species of Anabrus

- 1. Male cercus (figs. 7, 9) with inner tooth greatly developed and at right angle to main body of cercus; (specimens large for genus, frequently 2 inches in body length); (Washington and Oregon)cerciata Caudell
- Male cercus (figs. 8, 20-23) with inner tooth only moderately developed and not at a right angle to main body of cercus..... 2
- 2. Hind femur less than twice as long as pronotum, occasionally about twice as long; male cercus (figs. 8, 23) with inner tooth stout and with tip of inner tooth half, or more than half, the length of cercus from base of main body of cercus; lateral carinae of pronotum feebly indicated and lateral lobes smoothly merging with upper surface; (Washington to Manitoba, south to northern New Mexico).....simplex Haldeman

Hind femur a little more than twice as long as pronotum, occasionally only twice as long; male cercus with inner tooth less stout and with tip of inner tooth varying in position from very near base of main body (fig. 20) to about midway the length of cercus (fig. 22); lateral carinae of pronotum either feebly indicated or well developed; (western Montana, northern Idaho, Oregon to British Columbia).....longipes Caudell

Anabrus cerciata Caudell

The most striking feature of cerciata is the structure of the male cerci. When the apex of the abdomen is seen in dorsal view (fig. 7), the tip of the inner hook is directed inward at right angles to the main body of the cercus. The apex of the main body of each cercus curves far ventrally and a little inwardly. Figure 9 shows the right cercus in left oblique dorsal view. Females are not readily separated by key characters from females of longipes and simplex, but the very large size of most specimens, and association with males, will usually permit their recognition. Anabrus cerciata averages from $1\frac{3}{4}$ to $2\frac{1}{4}$ inches in body length and about five-eighths inch in pronotal length, but a few specimens from Mt. Ranier, Wash., have been studied which are slightly less than an inch in body length and three-eighths inch in length of pronotum. This suggests that at high altitudes specimens of cerciata are smaller than is usually the case at lower altitudes. This is known to be true in simplex.

The 1938 collection submitted for study included 77 females and 53 males from 4 lots collected in Yakima and Klickitat Counties, Wash. This was many times the amount of material previously known. No variation toward either simplex or longipes has been found thus far, indicating that cerciata is a very distinct species, occupying a rather limited area. Anabrus cerciata is rare in collections, and additional specimens for study are needed.

Anabrus longipes Caudell

There is no confusion between longipes and cerciata, because of the distinctively shaped and apparently constant male cerci of cerciata, but the true relationship of longipes to simplex is uncertain. While longipes is here treated as a species, it is really a complex of variable forms. It is easy to separate specimens from British Columbia and northern Washington from simplex, as the cerci (fig. 20) usually have a long sweeping curve at the apex and the inner tooth is small and very near the base, but material from farther south in Washington and from central Idaho averages as illustrated in figure 22 and is not so easily separated from simplex. Included in the complex is the form described as spokan by Rehn and Hebard (1920). The type locality of spokan is Sandpoint, Idaho, and that of longipes is Pullman, Wash. Typically, spokan is smaller and less robust than longipes and the lateral and median carinae of the pronotum are well indicated, whereas they are feebly developed in longipes. The cerci of the most northern specimens (fig. 20) are even more extreme in the direction away from simplex than is the case in paratypes of spokan that have been

examined. A few southern specimens are suggestive of simplex, though separable from it, and it is possible that all the material here recorded under longipes (fig. 26) represents nothing more than a subspecies of simplex. Further collections may show that sufficient intergradation exists to warrant accepting the above suggestion as fact, but at present the evidence does not seem conclusive. It hardly seems that spokan and longipes are distinct from each other, but they may be subspecies of a species which is distinct from simplex. The maps (figs. 24, 26) show that the known distributions of simplex and longipes do not overlap. If both should be found in the same locality and with no specimens included that clearly intergrade between the two (intergradation between forms which are usually distinct being the most practical basis for believing that subspecies exist within a species), longipes and simplex might be considered distinct. For the present it seems best to treat the complex of varying forms under one name, longipes, with the hope that more material and additional study will make definite conclusions possible. New collections from the area known to be inhabited by longipes and the adjoining territory may shed light on the true relationship of these uncertain forms of Anabrus.

The life history and habits of longipes have been described by Criddle (1926).

Anabrus simplex Haldeman

Although simplex, the true Mormon cricket, is variable as regards size and color there is relatively little variation in the male cerci (figs. 8, 23) over the greater part of its range; some variation toward longipes occurs in Oregon and Idaho. In only very few specimens is the hind femur as much as twice the length of the pronotum. In the large series of specimens now available the armament of the external surface of the front tibia has been found to be variable, though almost always with five spines along the hind margin and two or three in front.

Based upon specimens which in most cases varied in size and color, the following names have been given in the past which current taxonomists now consider synonyms of simplex: coloradus Thomas 1872, maculatus Caudell 1907, nigra Caudell 1907, purpurascens Uhler 1864, similis Scudder 1872. None of the latter names appears worthy of a valid status, either as species or subspecies.

At high altitudes there is a tendency for smaller specimens to occur. Material from the eastern part of the range of simplex is also smaller on the average than that from the Northwest, some specimens from North and South Dakota being only $1\frac{1}{4}$ inches in body length and three-eighths inch in pronotal length, while in others, from southwestern Idaho, the corresponding measurements are 2 inches and slightly over one-half inch, respectively. The most common color is brown; pale specimens with green markings are more abundant on the Plains than farther west, while several lots from Nevada and elsewhere are nearly black.

In addition to the distribution indicated in figure 24, the writer has examined material from Beulah, N. Mex., in the mountains of western San Miguel County. There are further records in literature from Manitoba and northwestern Minnesota. Abundant collections of simplex are now available, but material from any unusual situations, and particularly from areas near where longipes occurs, will be useful in determining the relationship between simplex and longipes.

Cowan (1929) has discussed the life history and habits of the Mormon cricket.

The Genus Peranabrus Scudder

Only one species of this genus, Peranabrus scabricollis (Thomas), the coulee cricket, is known, and there is comparatively little structural variation. The most striking feature of Peranabrus is the rough, pebbly appearance of the pronotum (fig. 5). The lateral carinae of the pronotum are fairly well developed to the front margin and, though diverging outwardly, from front to back, are usually straight rather than curved as in Anabrus longipes. The median carina is indicated the entire length of the pronotum, but is low and rounded. Most specimens are largely reddish brown in color, although some are green. The front tibia has from 4 to 5 spines along the hind margin of the external surface and is unarmed on the front margin. There are no prosternal spines. Average specimens measure from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in body length and three-eighths inch in length of pronotum. The front wings of the female do not overlap and are little more than lateral pads, but those of the males overlap and are black with yellow margins.

The distribution of the material examined is shown by figure 27; there are also records in literature from southern British Columbia, southern Alberta, and Idaho. As regards the type locality, Thomas (1872, p. 441) says, "Found in southern Montana on the dividing range of the Rocky Mountains at an elevation of 6,000 to 8,000 feet above the level of the sea." This locality has not been indicated in figure 27; the two Montana records shown are at Ronan and Lakeview. Apparently scabricollis was overlooked by Hebard (1928, 1932) in his studies on the Orthoptera of Montana, since the species is not mentioned.

The 4 lots of Peranabrus scabricollis collected in 1938 included 139 females and 121 males. Specimens from new localities or those unusual in any way will add to our knowledge of distribution and variation.

Snodgrass (1905) and Melander and Yothers (1917) have discussed the biology and habits of the coulee cricket.

The Genus Apote Scudder

Members of this genus are of rather limited distribution. The accompanying map (fig. 28) shows the distribution of material examined. Specimens are rare in collections, and all records in the literature are for southern British Columbia, Washington, or Oregon except one from "Dakota," which is believed to have been incorrectly reported. The genus may eventually be found in Idaho.

The abdomen of these striking insects is mottled gray above, with two narrow pale stripes running lengthwise, one each side of the middle. Between the pale stripes are paired dark spots arranged diagonally. The front wings extend well beyond the pronotum (fig. 2) in both sexes and the dark veins are conspicuous. The external surface of the front tibia is unarmed on the front margin. The prosternal spines (fig. 15, SP) are well developed.

In his revision of 1907, Caudell described a variety, robusta, of the single previously known species, Apote notabilis Scudder. Whether robusta is a distinct species or a subspecies of notabilis or whether it represents an extreme condition in the normal variation of notabilis that is not worthy of a different name is uncertain. Nineteen males and 16 females, taken in 1938, were included among the material submitted for study. Of these, 12 males and 11 females were from a single lot; none of the other 6 lots in which the species was represented contained more than 3 specimens. There is at least some variation in the characters separating the two forms. Any specimens of Apote are greatly desired, and where groups of individuals are encountered a series should be collected. The two forms, which are tentatively treated as subspecies of notabilis, are now separated as follows:

1. Male cercus (fig. 13) with point of inner tooth about half the distance from base to apex; lateral lobe of pronotum without pale ventral margin or with pale area poorly developed; ovipositor of female only slightly longer than hind femur

notabilis robusta Caudell

Male cercus (fig. 12) with point of inner tooth more than half the distance from base to apex; lateral lobe of pronotum with pale ventral margin well developed; ovipositor of female noticeably longer than hind femur.....notabilis notabilis Scudder

The ovipositor (fig. 2) curves upward, then distinctly downward near the tip. The male cerci (fig. 12) are very similar to those of the coulee cricket (fig. 10), but details of the last abdominal segment are different; males of Apote and Peranabrus may be separated by the characters given in the generic key and by the front wings. In Peranabrus the front wings of the males are black, conspicuously marked with yellow along the lateral and posterior margins, while in Apote they are gray with dark veins. The slightly upturned ovipositor of Peranabrus females, readily distinguishes them from females of Apote. Also, the females of Peranabrus do not have well developed wings.

The Genus Steiroxys Herman

This genus ranges west of the Great Plains from southern Canada to New Mexico, and includes four described species. Only a few specimens were contained in the 1938 collections, and the genus is not likely to be mistaken for Anabrus or Peranabrus. About five-sixteenths inch in pronotal length is the maximum size for the genus. The lateral and median carinae of the pronotum are much more conspicuous than those of any of the other genera

discussed; the lateral carinae are nearly straight in most species, but in strepens Fulton they are broadly outcurved posteriorly. Prosternal spines are absent. The front tibia is unarmed on the front margin of the external surface. The hind femur is more than twice as long as the pronotum. The ovipositor is long and slightly upturned, and the female subgenital plate is variable but never as in Anabrus (fig. 18).

The Genus Pediodes Rehn and Hebard

The genus Pediodes includes three species which occur in the northern Great Plains, though several others occur in Texas, Mexico, and elsewhere. The three species concerned, haldemani (Girard), stevensonii (Thomas), and nigromarginatus (Caudell), are not known from farther west than Wyoming and Colorado. They were formerly placed in the genus Stipator Rehn, which is now considered a synonym of Atlanticus Scudder.

Pediodes haldemani is about equal in size to Anabrus simplex and often is predominantly light green in color. The male may be distinguished from the male of the Mormon cricket by the structure of the cerci (fig. 11). In both sexes the hind femur is easily twice the length of the pronotum and the ovipositor is much more elongate than in most Plains specimens of the Mormon cricket.

Pediodes stevensonii is smaller than any species of Anabrus, the pronotum averaging about one-fourth inch in length. The male cerci are much as in haldemani, but the last dorsal segment of the male abdomen has two conspicuous projections, somewhat similar to those of Eremopedes balli (fig. 14). The body of stevensonii is rather uniformly brown; the lateral lobes of the pronotum usually have pale margins.

Pediodes nigromarginatus has a broad, pale, longitudinal stripe extending the entire length of the pronotum and abdomen. There is a narrow dark stripe running lengthwise in the middle of the pale one. The sides of the body are darker brown. This species is somewhat larger than stevensonii, but is not likely to be confused with the Mormon cricket because of the color pattern and also because of the elongate hind femur which is two to three or more times the length of the pronotum. The male cercus is elongate, nearly straight, and tapers to a point. There is an inner tooth at about right angles to the main structure about the middle, but there is no close resemblance to species of Anabrus in this organ.

The three foregoing species of Pediodes are not rare insects, but their distribution and variation are not fully known, and specimens from any locality will be useful. A lot of 44 females and 29 males of haldemani collected at Ft. Pierre, S. Dak., in 1938 shows that occasionally that species occurs in considerable numbers.

The Genus Eremopedes Cockerell

This is typically a genus of the Southwest and not likely to be encountered within the range of Anabrus, but two species, Eremopedes balli Caudell and Eremopedes scudderi Cockerell, extend their range northward into Colorado and so are discussed here for the sake of completeness. In the male, both species may be distinguished from Anabrus by the conspicuous paired projections of the last abdominal segment (fig. 14). The cercus of scudderi is of the same general type as that of balli but the tip is more acute, and, also unlike balli, there is not a series of sclerotized teeth along the inner surface; a simpler, hooklike, inner projection occurs but is unlike anything known in Anabrus. Both species are much smaller than Anabrus, the pronotum seldom much exceeding one-fourth inch in length. The hind femora are twice as long as the pronotum -- sometimes much more than twice -- and the front tibia is not armed on the front external margin. Usually there are no prosternal spines or they are little developed, but in some specimens the spines are fairly large, so that variation in this character appears to be normal.

Summary

Identification keys and notes are given to aid in distinguishing the Mormon and coulee crickets from several allied genera and species. A few less closely related Orthoptera are also figured and briefly discussed. The coulee cricket (Peranabrus scabricollis (Thos.)) is the only species of the genus Peranabrus. In addition to Anabrus simplex Hald., the Mormon cricket, the genus Anabrus contains one distinct species, cerciata Caud., and a variable form here treated as a species under the name longipes Caud. The genus Apote contains one species, notabilis Scudd., and a poorly understood form, robusta Caud., here treated as a subspecies. The genus Pediodectes contains, in the northern Great Plains, three species. The genus Steiroxys and two species of the genus Eremopedes are briefly mentioned. Particular attention is given to the known distribution of the important species.

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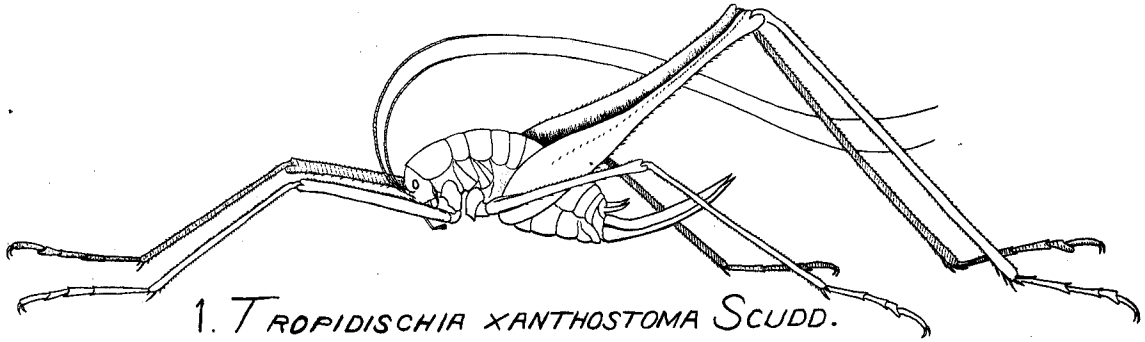
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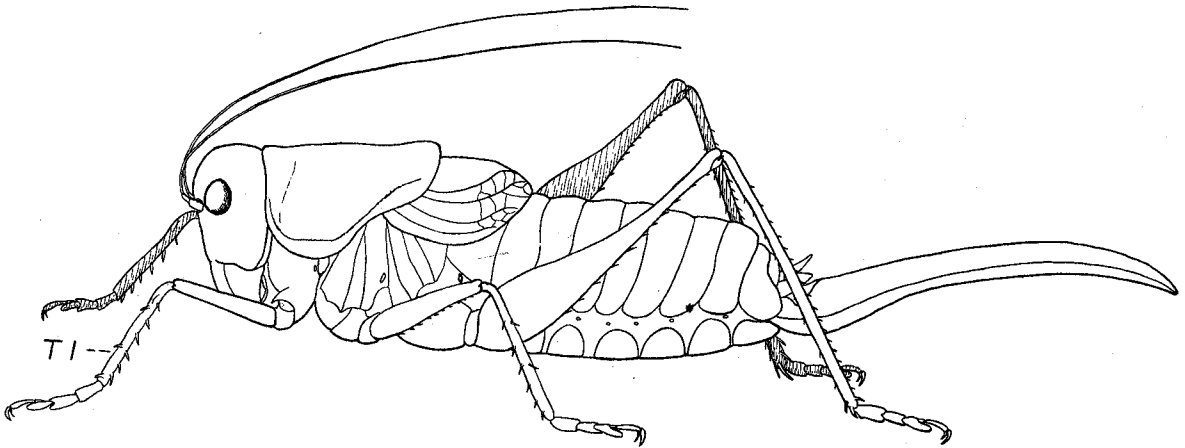
Explanation of figures

1. Tropidischia xanthostoma Scudd. Female.
2. Apote notabilis Scudd. Female. (Adapted from Caudell, 1907.)
3. Stenopelmatus fuscus Hald. Female.
4. Cyphoderris monstrosa Uhler. Male.
5. Peranabrus scabricollis (Thos.). Female.
6. Apote notabilis Scudd. Female.
7. Anabrus cerciata Caud. Dorsal view of apex of male abdomen.
8. Anabrus simplex Hald. Same.
9. Anabrus cerciata Caud. Left oblique dorsal view of right male cercus.
10. Peranabrus scabricollis (Thos.). Dorsal view of apex of male abdomen.
11. Pediodectes haldemani (Gir.). Same.
12. Apote notabilis notabilis Scudd. Same.
13. Apote notabilis robusta Caud. Dorsal view of right male cercus.
14. Eremopedes balli Caud. Dorsal view of apex of male abdomen.
15. Apote notabilis Scudd. Ventral view of thorax, showing prosternal spines (SP).
16. Eremopedes balli Caud. External surface of left front tibia, base uppermost, showing arrangement of spines and slit associated with organ of hearing (H).
17. Pediodectes haldemani (Gir.). Ovipositor of female.
18. Anabrus simplex Hald. Subgenital plate of female, apex uppermost, showing apical hooks (HO).
19. Peranabrus scabricollis (Thos.). Same.
20. Anabrus longipes Caud. Right male cercus, left oblique dorsal view.
21. Anabrus spokan R. and H. Same. (Drawn from a paratype.)
22. Anabrus longipes Caud. Same.
23. Anabrus simplex Hald. Same.
24. Anabrus simplex Hald. Map showing distribution of specimens examined.
25. Anabrus cerciata Caud. Same.
26. Anabrus longipes Caud. Same.
27. Peranabrus scabricollis (Thos.). Same.
28. Apote notabilis Scudd. Same.

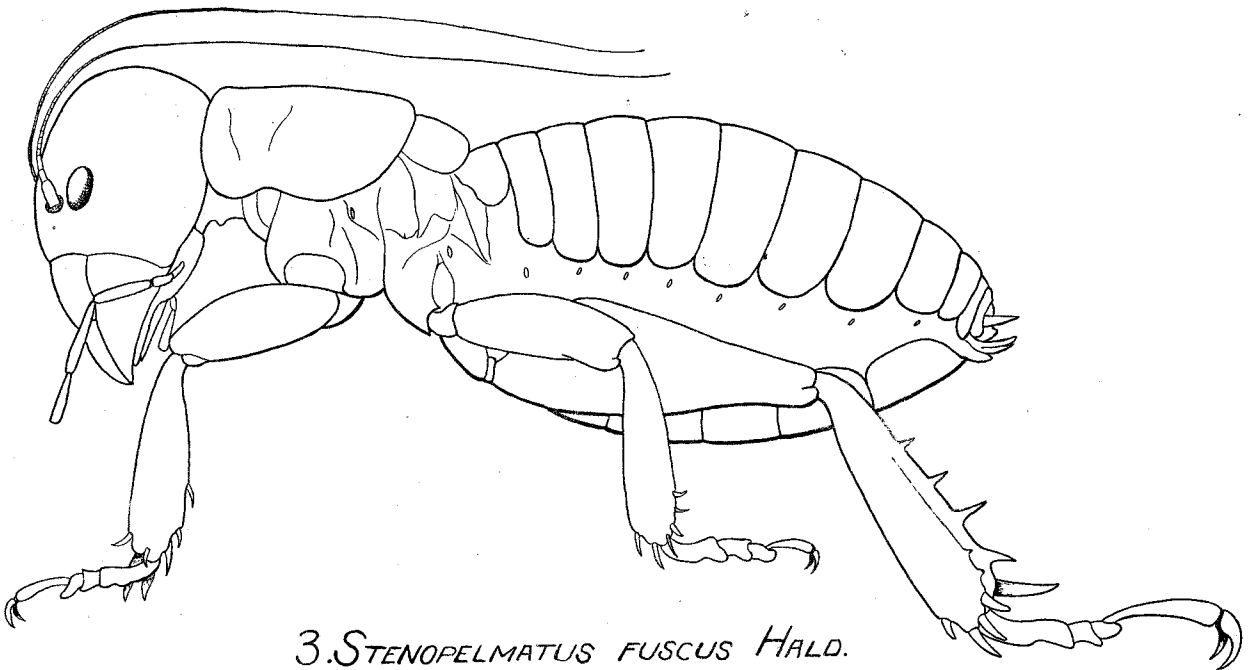
(Figs. 4-6 drawn by Mary Foley Benson, others by the author.)



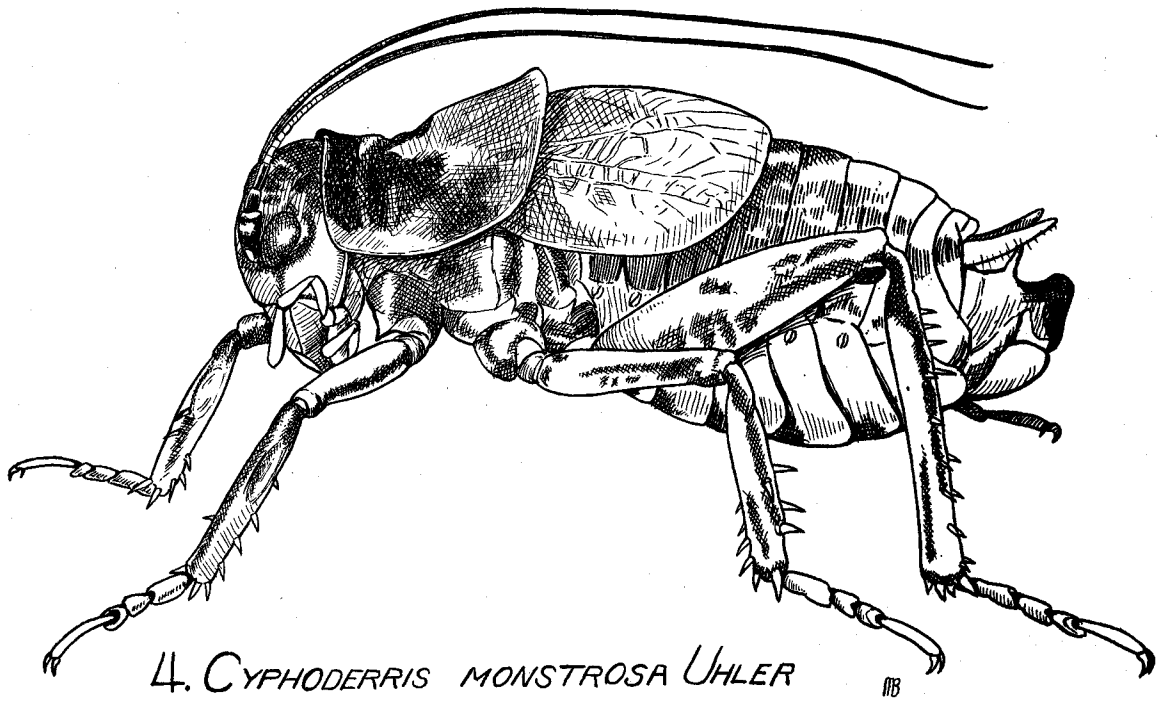
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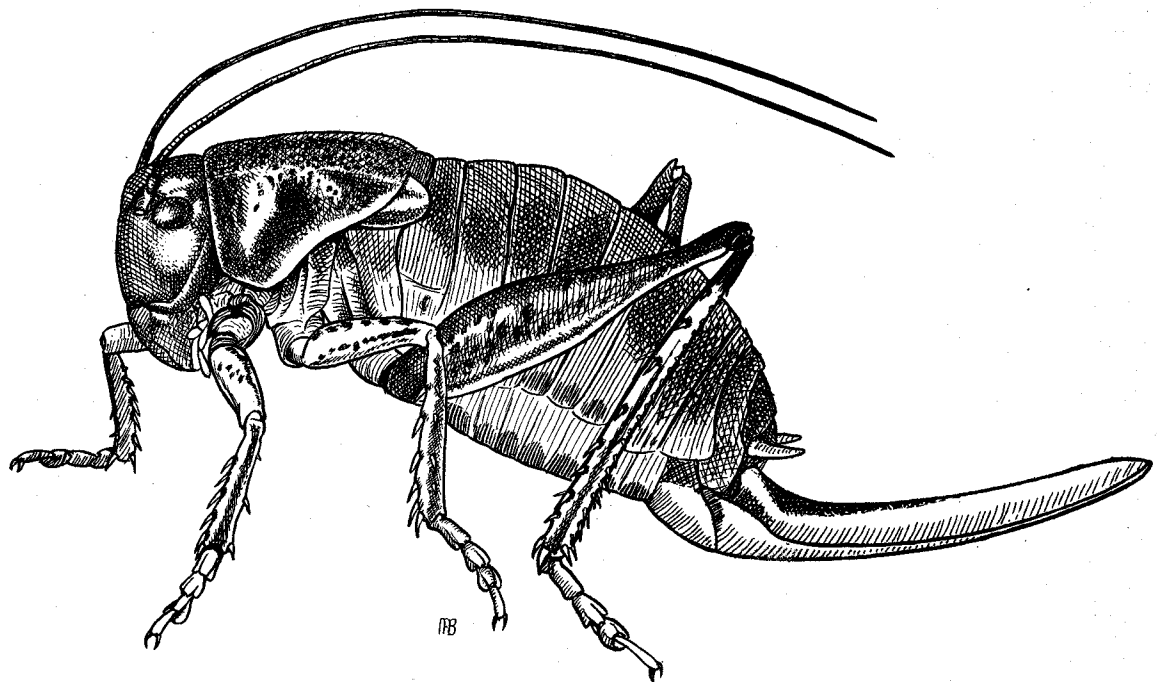
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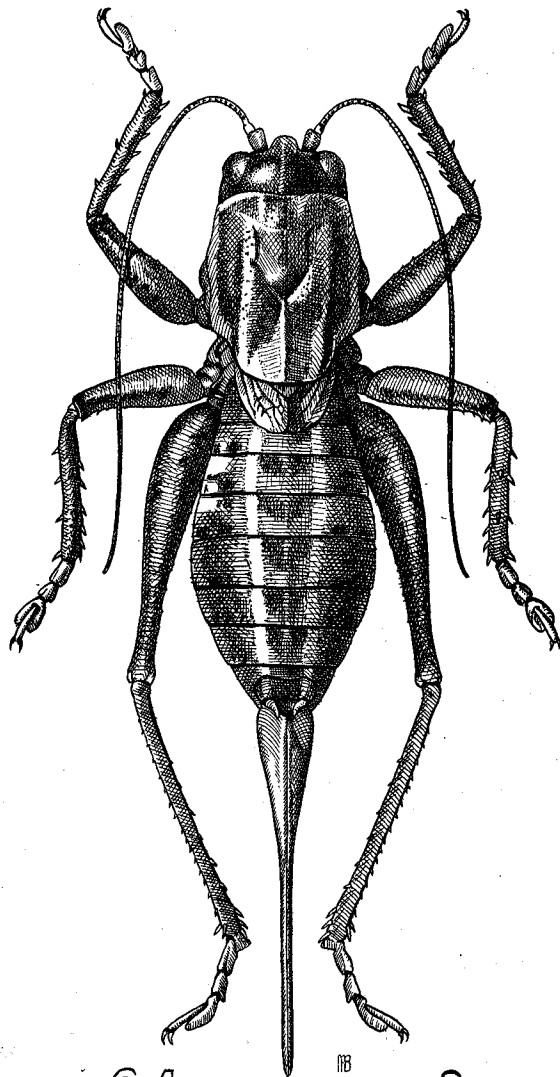
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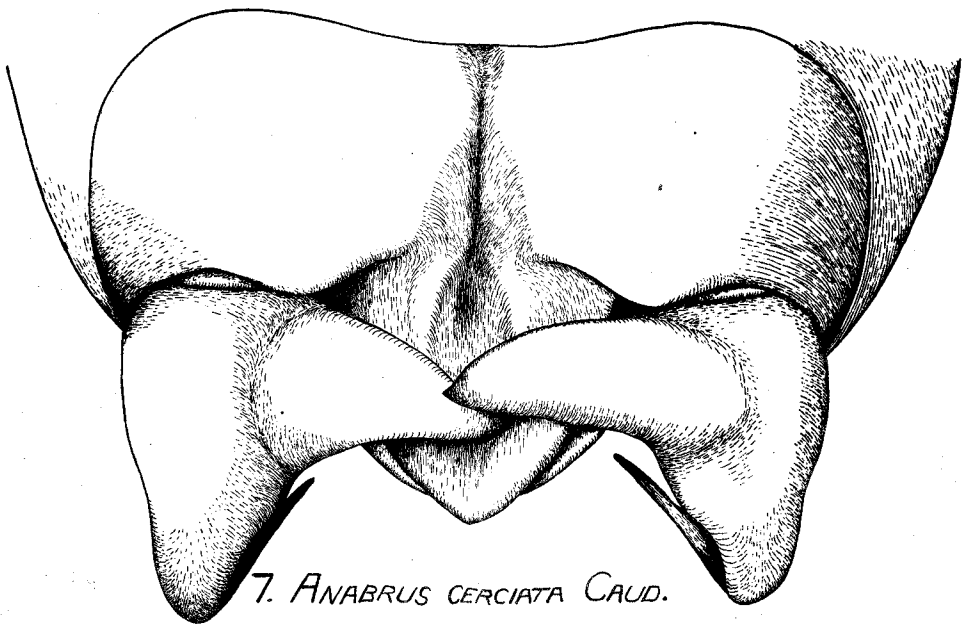
4. *CYPHODERRIS MONSTROSA* UHLER



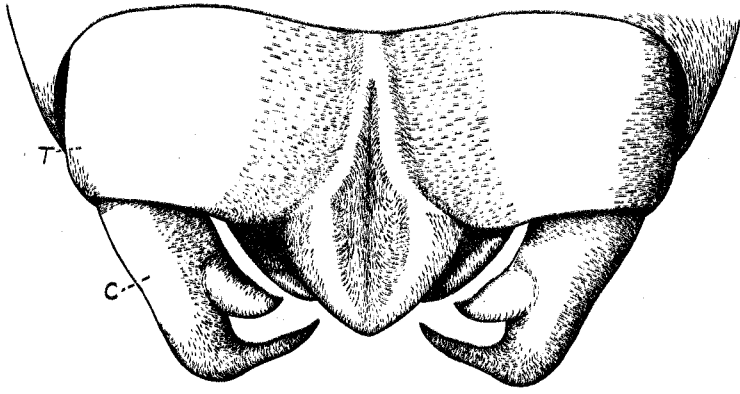
5. *PERANABRUS SCABRICOLLIS* (THOS)



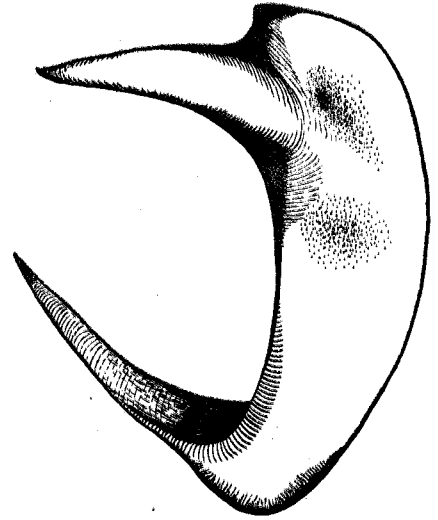
6. *APOTE NOTABILIS* SCUDD.



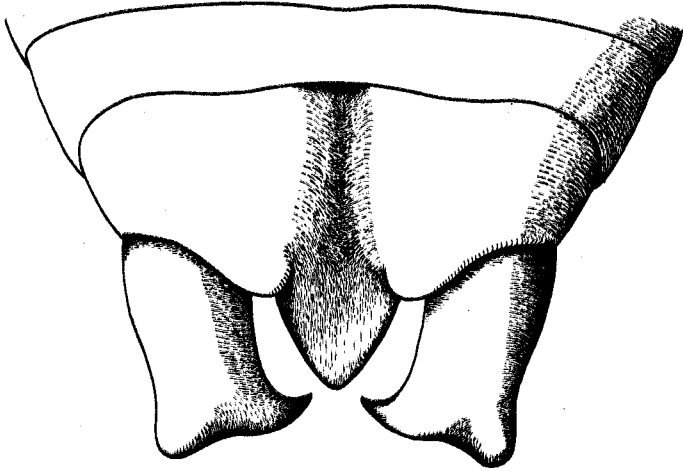
7. *ANABRUS CERCIATA* CAUD.



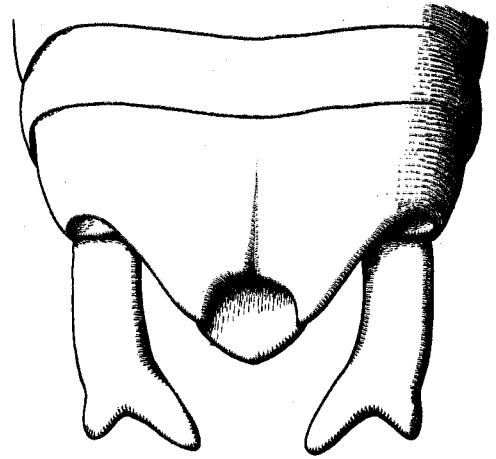
8. *ANABRUS SIMPLEX* HALD.



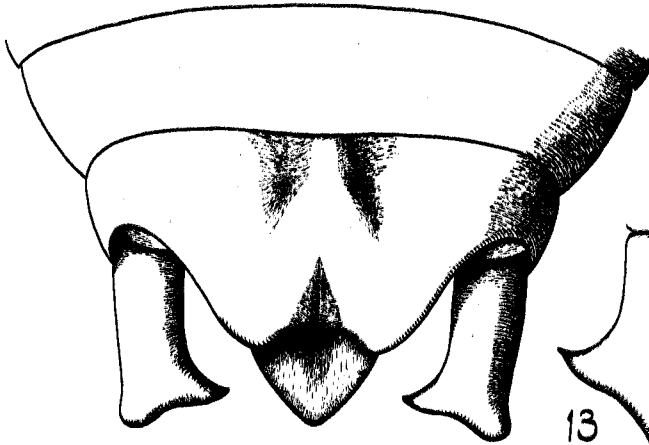
9. *ANABRUS CERCIATA* CAUD.



10. *PERANABRUS SCABRICOLLIS* (THOS.)



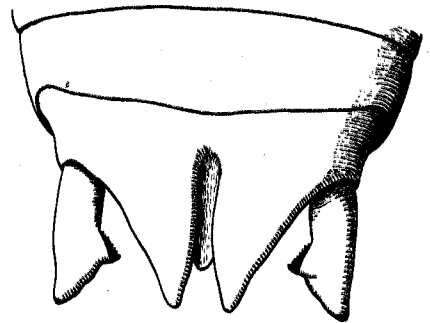
11. *PEDIODECTES HALDEMANII* (GIR.)



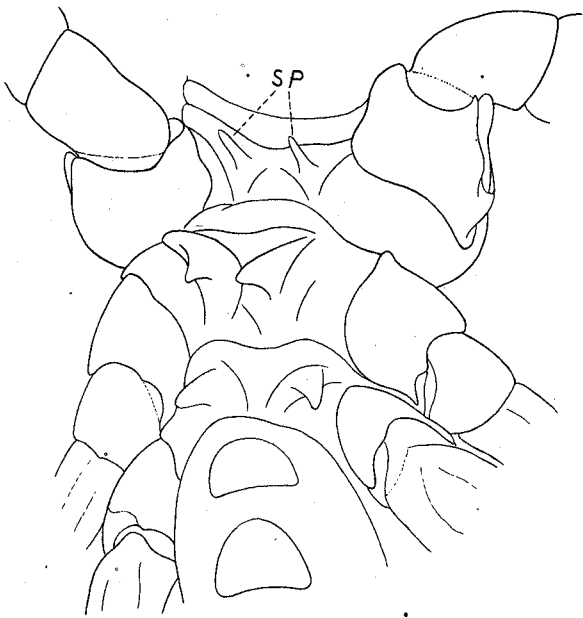
12. *APOTE NOTABILIS NOTABILIS* SCUDD. CAUD.



13



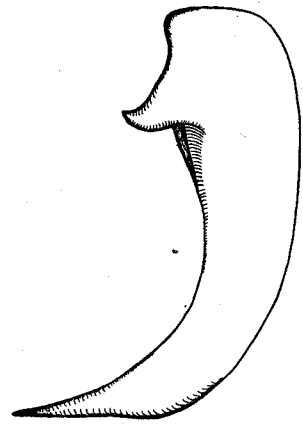
14. *EREMOPEDES BALLI* CAUD.



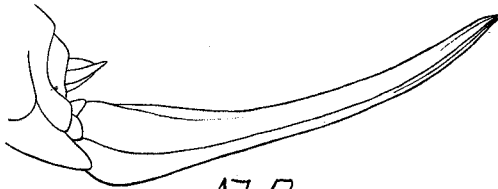
15. *A. NOTABILIS*



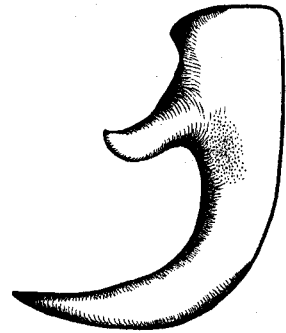
16. *E. BALLI*



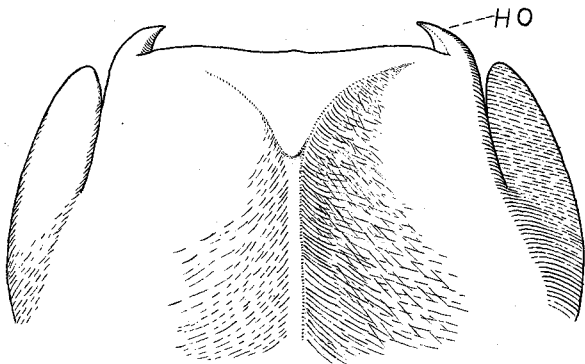
20. *A. LONGIPES*



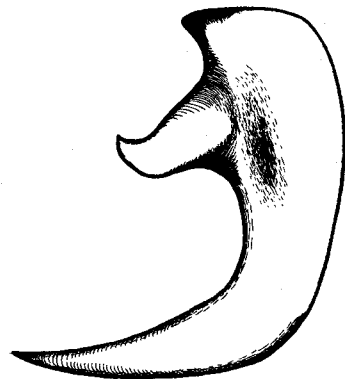
17. *P. HALDEMANII*



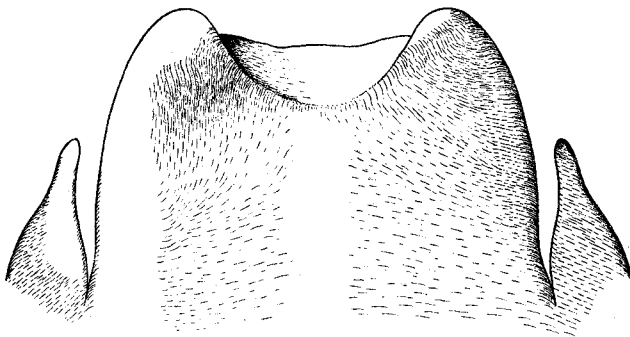
21. *A. SPOKAN*



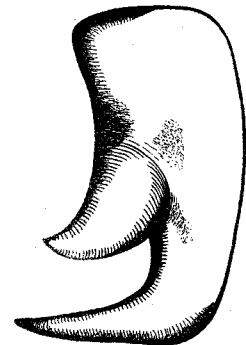
18. *A. SIMPLEX*



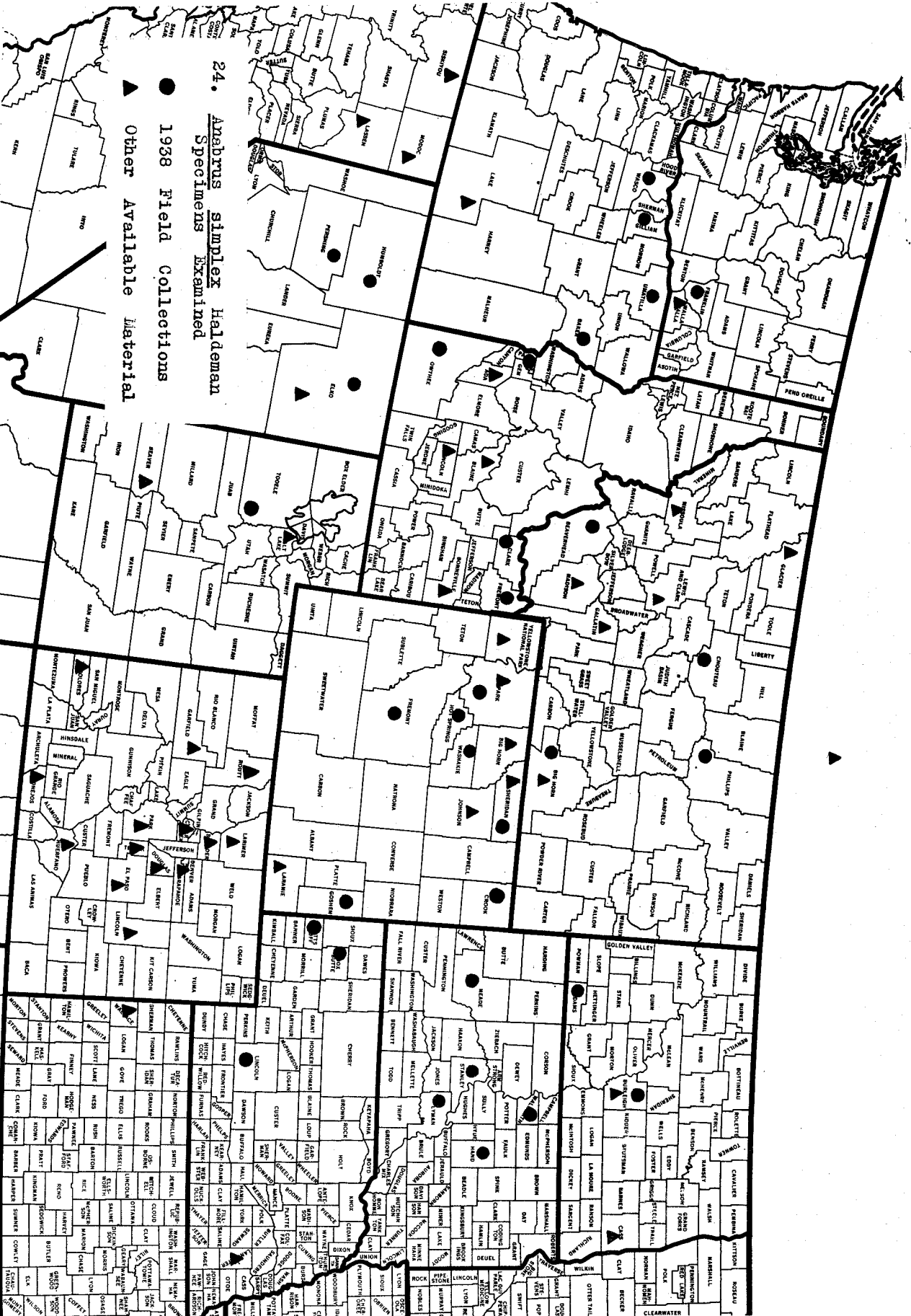
22. *A. LONGIPES*



19. *P. SCABRICOLLIS*



23. *A. SIMPLEX*



24. Anabrus simplex Haldeman
 Specimens Examined

1938 Field Collections
 Other Available Material



