

VI.7 Hopper Helper

By Wendal Cushing

Preface

This reference was developed as a resource for personnel after years of observing them struggle to identify the life stages and species of grasshoppers while in the field. Although many resource tools are available, they often are too technical or too bulky to be used in survey operations.

Data for this reference were based on studies done in the Grasshopper Integrated Pest Management (GHIPM) Project demonstration area in McKenzie County, ND. Pocket Hopper Helper, which fits in a shirt pocket, provides necessary information about grasshoppers that will aid the user in identifying different species found in southwestern North Dakota and on western rangelands.

Acknowledgments

The production of Pocket Hopper Helper and Hopper Helper has entailed the efforts and expertise of many coworkers. I wish to acknowledge their valued contributions which made this publication possible.

In particular, I wish to thank three employees of the Animal and Plant Health Inspection Service's (APHIS) Plant Protection and Quarantine (PPQ) Phoenix Methods Development Center: Nelson Foster, for facilitating the production of this aid to be used in conjunction with factsheets for field identification of common grasshoppers; K. Chris Reuter, who provided assistance with identification characters of immature and adult grasshoppers and review of the manuscript; and Lonnie Black, who prepared final drawings from my originals and representative specimens of individual species.

Introduction

Hopper Helper provides field personnel with an easy-to-use guide for survey operations. Data gained through direct observation in field operations in southwestern North Dakota provided the basis for this guide. Please observe the following seven additional facts in applying this field guide:

1. The data in the Seasonal Life History Chart (see next chapter) are based on each instar stage, which lasts about 7 days. In other words, it takes about 35 days, from the day it hatches, for the average grasshopper to become an adult. Changing weather conditions can lengthen or shorten this process.
2. When applying the Seasonal Life History Chart to your operation, for every 100 miles south of latitude 47°46'N (Watford City, ND), instar stages will be ahead of schedule by about 7 days (one instar stage).
3. To improve readability, words and symbols used to represent approximate size are defined as:
 - Small = approximately 11 mm.
 - Average = approximately 22 mm.
 - Large = approximately 33 mm.
 - Robust = approximately 44 mm.

G, M, and F indicate preferred food sources for grasshoppers. A "G" appearing next to a grasshopper's name indicates the species' preferred food is grass. "M" stands for mixed food sources (grass and forbs). "F" stands for forbs.

* = the particular characteristic mentioned is the primary identification characteristic of the grasshopper species.

4. For quick reference, all grasshopper species are numbered 1–44.
5. To make the most effective use of this guide, become familiar with the external morphological structures (physical characteristics) most often used in identification.
6. To make full use of the color description in this outline, use fresh specimens when possible.
7. Have available a copy of Robert Pfadt's "Field Guide to Common Western Grasshoppers."

Physical Characteristics Used To Identify Grasshoppers

The following drawings are useful in pinpointing physical characteristics (morphology) of nymphal and adult grasshoppers. Learning the morphology of grasshoppers will speed identification in the field.

Figure A—Lateral view of an adult female.

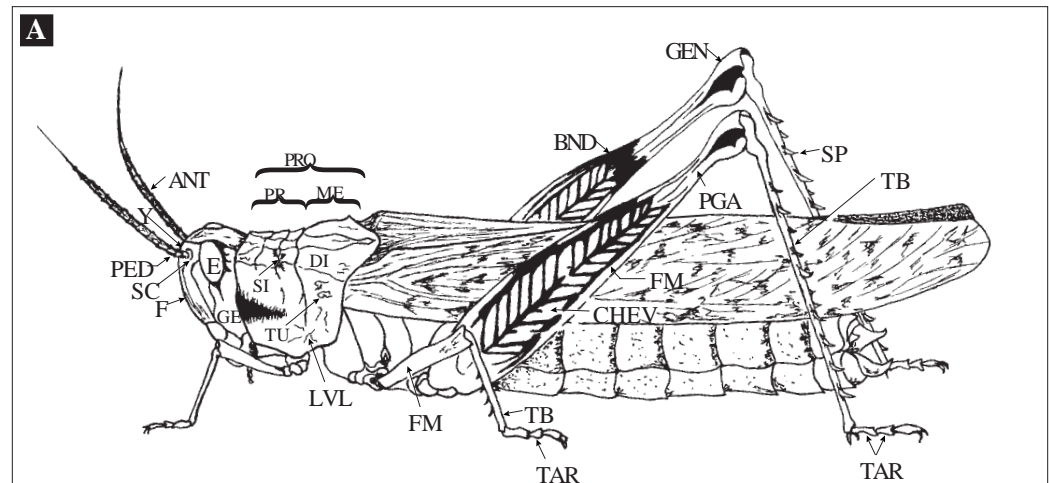


Figure B—Anterior view of head of adult female.

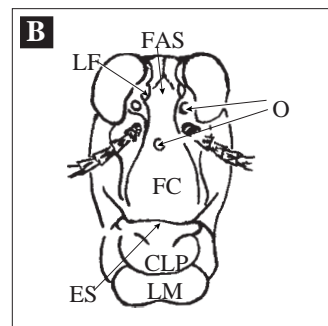
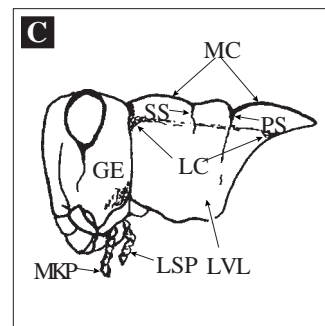


Figure C—Lateral view of head and pronotum of adult female.

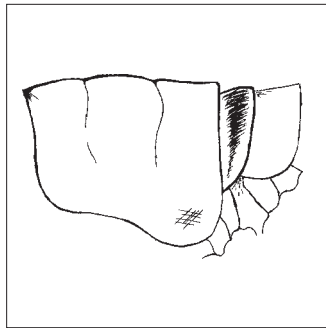


*ANT	Antenna	GEN	Genicular area	*PR	Prozona
*BND	Band	LSP	Labial palpus	*PRO	Pronotum
CHEV	Chevrons	LM	Labrum	*PS	Primary sulcus
CLP	Clypeus	*LC	Lateral carina	SC	Scape
DI	Disk of pronotum	*LF	Lateral foveolae	SCU	Scutellum
*E	Compound eye	*LVL	Lateral ventral lobe of pronotum	Si	Sinus
ES	Epistomal suture	*MC	Median carina	SP	Spines
*F	Frons	*ME	Metazona	SS	Secondary sulcus
FAS	Fastigium	MKP	Maxillary palpus	TAR	Tarsus
*FC	Frontal costa	O	Ocelli	*TB	Tibia
*FM	Femur	PED	Pedicel	*TU	Tubercle
*GE	Gena	PGA	Pregenicular area	V	Vertex

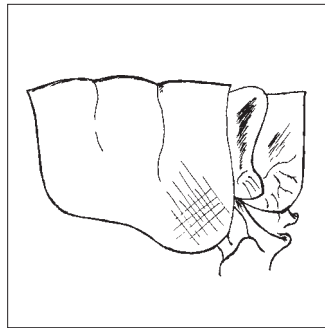
* = characteristics most used in identification.

Key to Normal Nymphal Instars

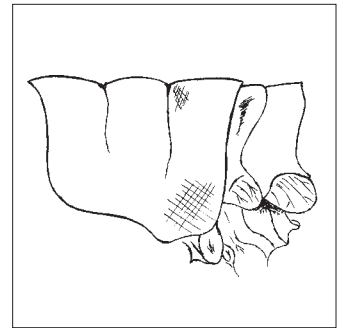
(From Handford 1946)



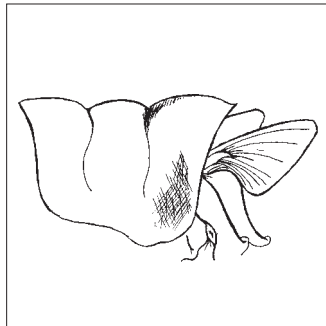
Wing pads rounded with no visible bulge at apex first instar



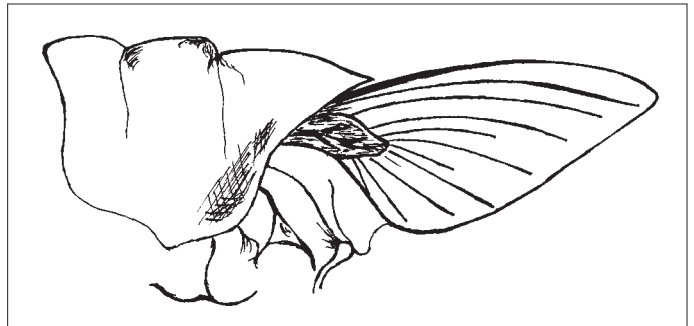
Wing pads rounded with visible bulge at apex second instar



Wing pads more sharply triangular and showing slight venation third instar



Wing pads short, not extending beyond first abdominal segment, more truncated fourth instar



Wing pads elongated, extending beyond the second but hardly beyond the third abdominal segment, more pointed at the apex fifth instar

Several of the adult grasshoppers possess wings that are not of the typical form and are sometimes confused with the wing pads of immatures. Examples of some short-winged species are shown below.

Figure 1—Immature wing pads.

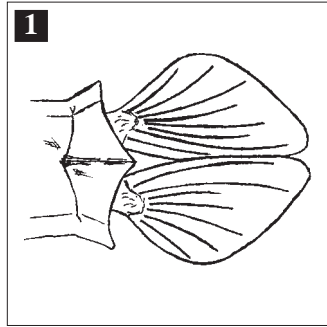


Figure 2—
Hypochlora alba
Melanoplus dawsoni
Phoetaliotes nebrascensis
Both sexes

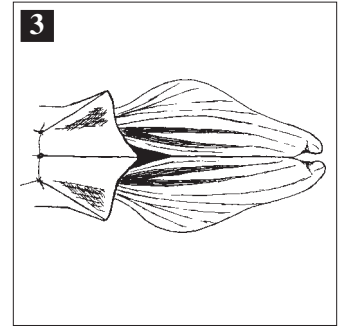
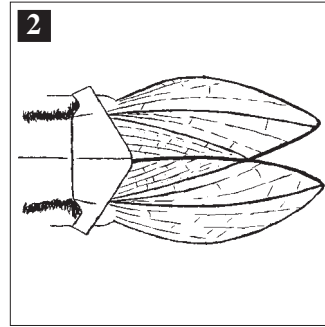


Figure 3—*Aeropedellus clavatus*
Females only

Figure 4—*Boopedon nubilum*
Females only

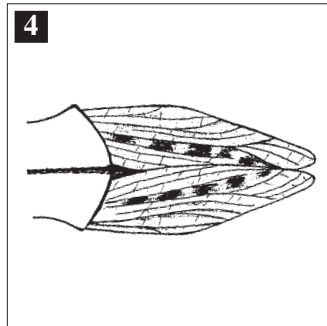


Figure 5—*Pseudopomala brachyptera*
Both sexes

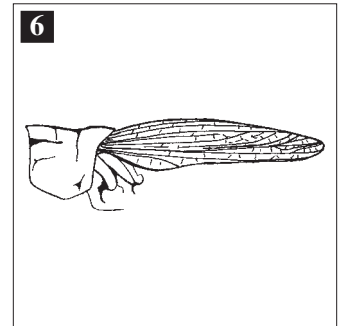
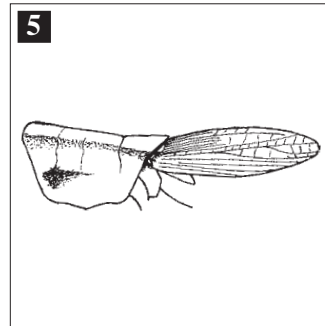


Figure 6—*Chorthippus curtipennis*
Females only

Figure 7—*Chloealtis conspersa*
Females only

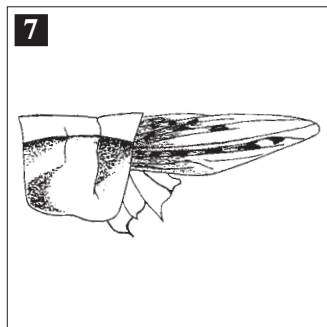
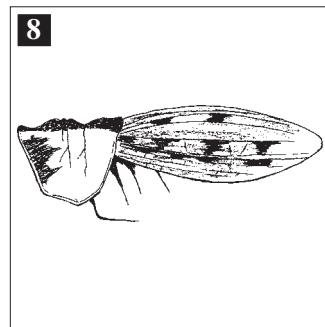


Figure 8—*Oedaleonotus enigma*
Both short- and long-winged forms are common in both sexes.



Overwintering Species

(To be adults at spring greenup.)

Arphia conspersa 1-G

Adult: A large brown grasshopper with red or yellow wings. Lower abdomen and hind tibia yellowish. This species often will flush before you get close enough to catch them in a net.

Immature: Usually dark brown and having many of the adult morphological characteristics, *two light bands on inner face of femur.

Chortophaga viridifasciata 2-G

Adult: A large grasshopper with smoke-colored wings, greenish-yellow at base. Color usually green, antennae red with the pronotum slightly arched. *A visible band through the compound eye.

Immature: Body color may range from green to brown speckled with white, but the median carina is always high and sharp. First instars usually appear near mid-July.

Pardalophora haldemanii 3-G

Adult: A large, robust grasshopper with one sulcus cutting the pronotum. *Inner surface of the hind femora usually a greenish yellow. Dark spots on forewing, rough pronotum.

Immature: Later instars are large with one sulcus cutting the pronotum. Very similar to *Xanthippus*, can have two sulci on pronotum.

Xanthippus corallipes 4-G

Adult: A large, robust grasshopper with *two sulci cutting the pronotum. Inner surface of the hind femora and tibiae a bright reddish pink. Dark spots on forewing, rough pronotum.

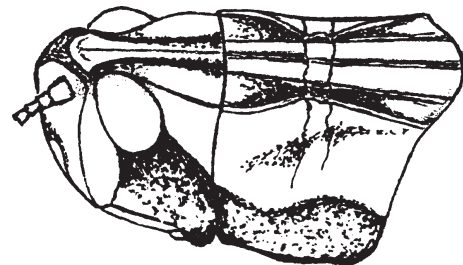
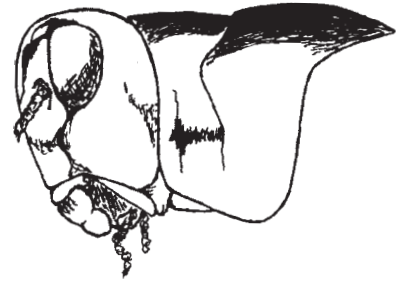
Immature: Overwinter in the later instar stages.

*Usually dark blue on inner femur in first four instars, becoming more reddish pink instars five and six. A slight "X" is sometimes visible on the dorsal area of the pronotum. First instars appear in early July.

Eritettix simplex 5-G

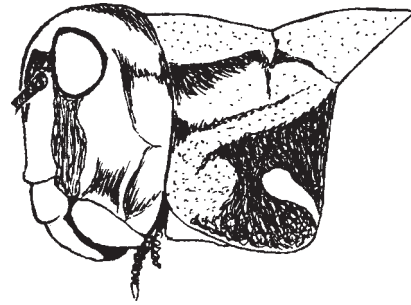
Adult: An average-sized grasshopper. Colors range from a bright green to a light tan. Adults normally begin to appear in early May. *Adults and immatures share tricarinate feature on head and pronotum.

Immature: Apparently overwinter in the fourth and fifth instar stage and can be found from fall to early spring. First instars usually appear around the first week of July.

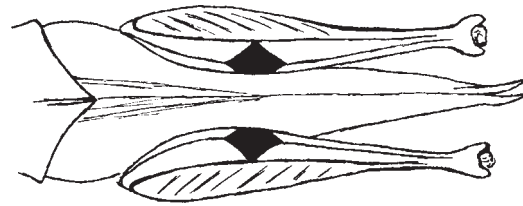


***Psoloessa delicatula* 6-G**

Adult: A small, drab grasshopper with a *diamond visible on the hind femora. Posterior dorsal area of pronotum very flat. Lateral carinae strongly constricted in the middle for immatures and adults.



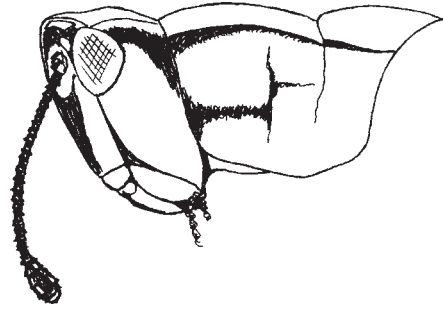
Immature: Color somewhat darker than *Eritettix* sp. with an evident white mark on the pronotum. Face not as slanted as *Eritettix* sp. First instars usually appear around the first week of July. Diamond on hind femora often visible in immatures.



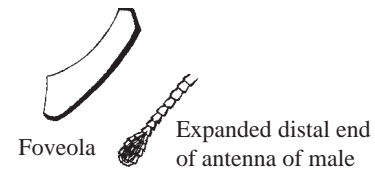
Early-Hatching Species

Aeropedellus clavatus 7-G

Adult: Females have short wings, white cheeks, and a line ahead of the eye. The drawing shows an early summer adult. The lateral carinae constrict near the middle.



Immature: Lateral foveolae evident in all instars. First instars usually appear by the first week of June.

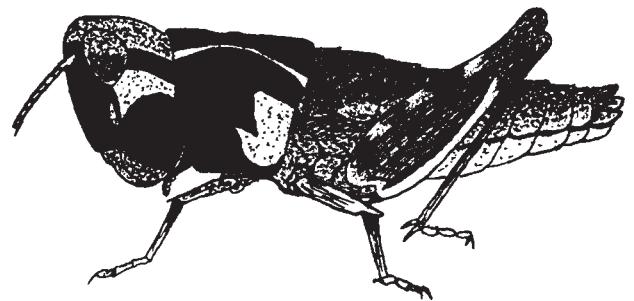


Ageneotettix deorum 8-G

Adult: *Face usually dark, body color speckled, knee black with an orange tibia. Dorsal pronotum with an hourglass shape. *Whitish antennae while grasshopper is alive. Foveolae appear almost square. Inner hind tarsal claw unusually long.

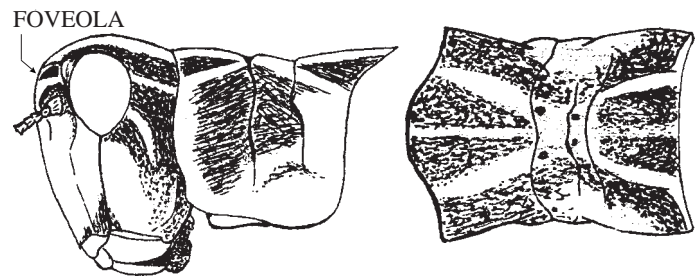


Immature: Face usually dark with lateral foveolae evident. First instars usually appear by mid-May.

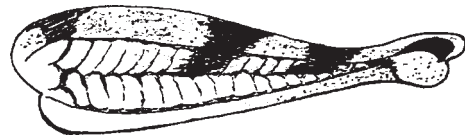


Aulocara ellioti 9-G

Adult: *Banding of the inner surface of hind femora and “X” mark on the top of the pronotum. Lateral foveolae usually teardrop shaped or triangular.

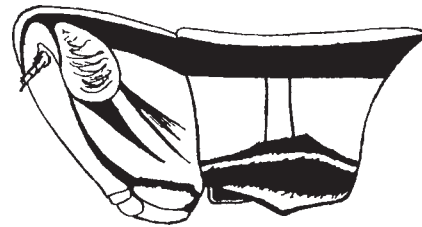


Immature: Banding of the inner surface femora. Lateral foveolae evident. First instars usually appear by the second week in May.

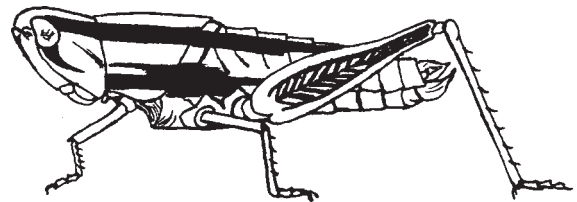


Amphitornus coloradus 10-G

Adult: *Pair of brown stripes running from the head to the end of the pronotum. Hind femora with very visible bands on the outer surface and having a blue tibia.

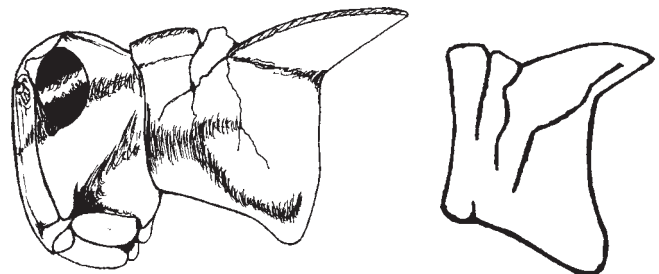


Immature: A small version of the adult. First instars normally appear by mid-May.



Trachyrhachys kiowa 11-G

Adult: *A small- to medium-sized grasshopper with bands on the forewing. Banding on the inner surface of femora and having a blue tibia. *Rough pronotum with a lateral ventral flange.



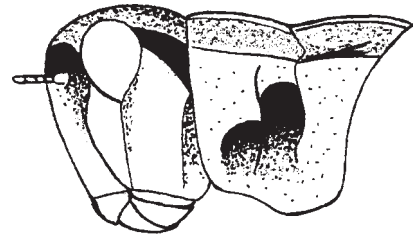
Immature: Body size small and stout. Pronotum rough and the lower hind femora is hirsute (hairy). First instars normally appear by late May.

Camnula pellucida 12-G

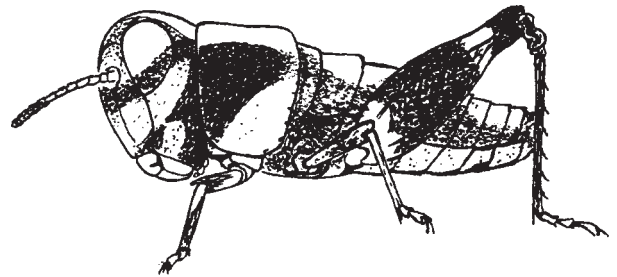
Adult: Both sexes a straw yellow. Lateral carina con-



tinuous to posterior end of the pronotum. Spotted fore-
wing and clear hindwings. *Population usually found in
hatching beds, hay yards, etc. *Continuous lateral carina.



Immature: First instars distinctive with a tan saddle. All
later instars have a tan color. First instars normally
appear by mid-May.

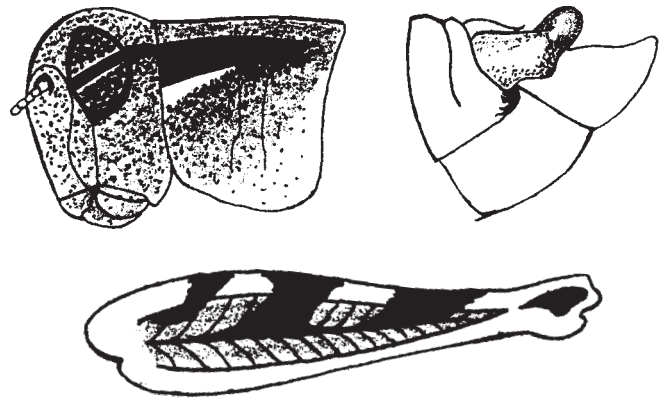


Problem *Melanoplus* Species

***Melanoplus confusus* 13-G**

Adult: *Side of pronotum with a patent leather shine and a definite line through the eye.

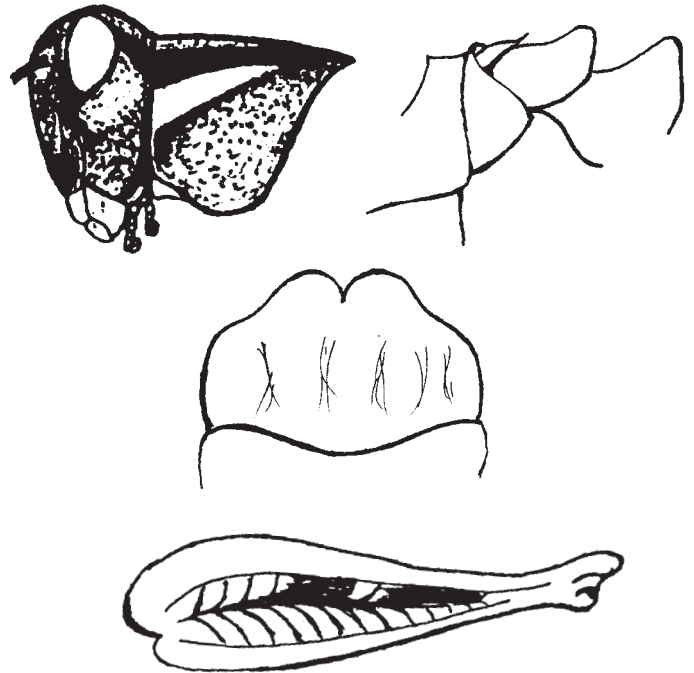
Immature: *Diagonal dark stripe bordered by narrow light lines through the eye. Cercus evident in later instars. First instars usually appear by early May.



***Melanoplus sanguinipes* 14-F**

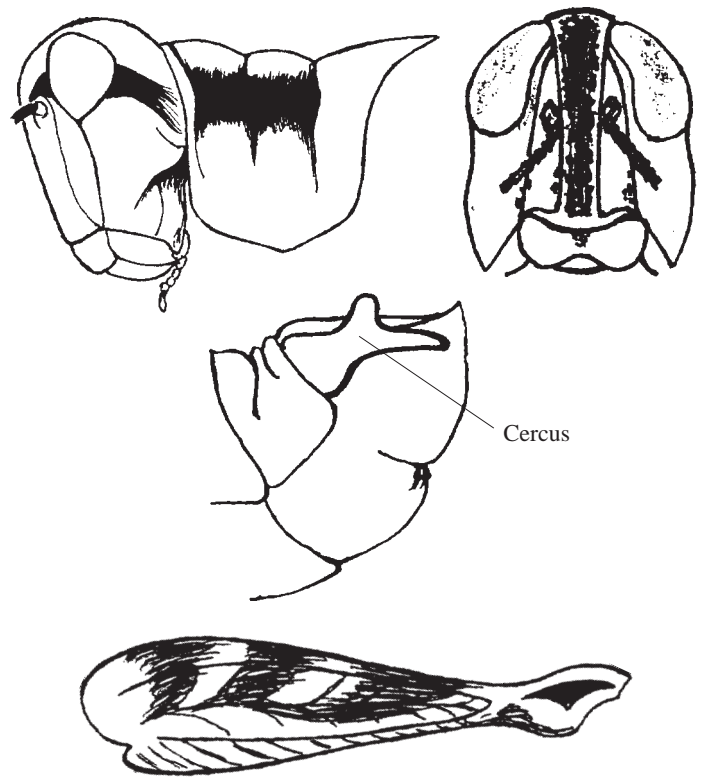
Adult: *Distinctive hump between the second pair of legs in males. The male subgenital plate distinctive.

Immature: First instars usually appear in late May, about 2 weeks later than *M. confusus*. *Early instars have speckled appearance.



Melanoplus infantilis 15-G

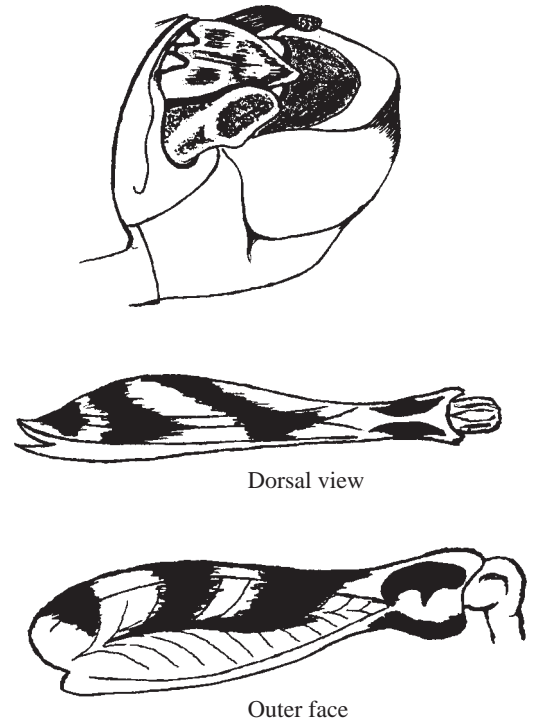
Adult: *Size small with a beelike striping on the abdomen. *Frontal costa dark, sometimes with spots along the margins. The cheek area is usually cream-colored. Most are adults by the end of June. Cercus boot shaped.
Immature: First instars usually appear by mid-May.



Melanoplus gladstoni 16-M

Adult: *Hind femora banding. *Hind femora flattened below base.

Immature: Look much like *M. infantilis* except *gladstoni* are usually adults by the end of June. This species lacks the frontal costal spots but has a very “dark” clypeus.

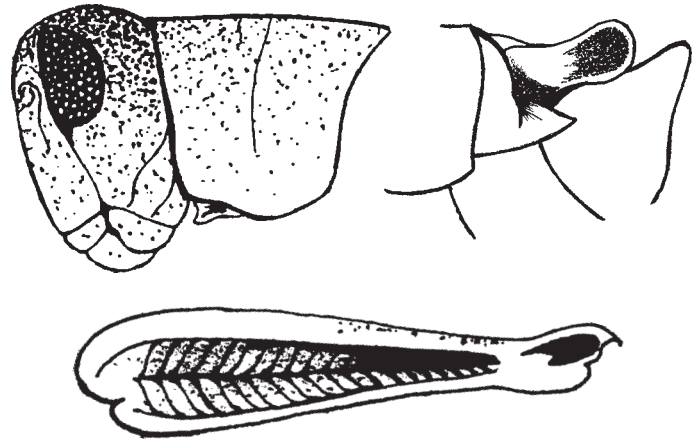


Melanoplus packardii 17-M

Adult: Most resemble *M. bivittatus* but are smaller.

*Two light stripes down the pronotum.

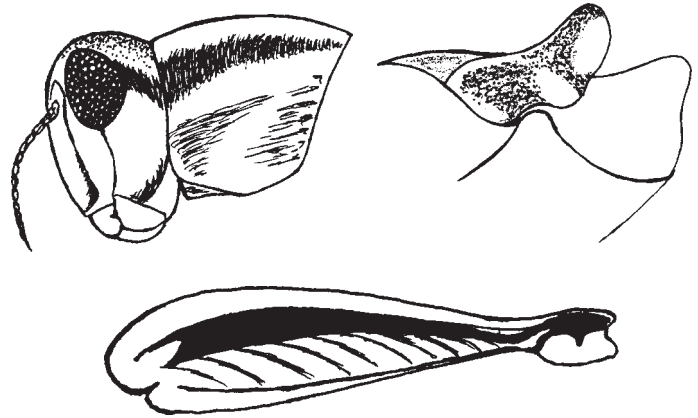
Immature: *Generally tan or green and covered with brown spots over the whole body.



Melanoplus bivittatus 18-M

Adult: *Compound eye uniformly spotted. *Two clear yellow stripes from the head to the wing tips. Size large. Color usually an olive green with yellow.

Immature: *Bright green or tan is the general body color. The definite black band on the femur and large size usually aid in this species' identification. First instars usually appear by mid-May.



Melanoplus femurrubrum 19-M

Adult: *Black band on outer face of femur. A pronounced crest and usually a large cream-colored cheek. Strongly contrasting black and white color is similar to *M. dawsoni*. *Underside of abdomen and inner surface of femur bright yellow with red tibia. Tip of male abdomen swollen.

Immature: First instars usually appear by early June.

Melanoplus dawsoni 20-M

Adult: *General body color a shiny patent leather look.



Compound eye with up to 10 white spots. *Both sexes usually have reduced wings. See fig. 2 on p. 4, description of wings. Underside bright yellow.

Immature: First instars usually appear by early July.



Melanoplus keeleri 21-G

Adult: Hind femora yellow below. Hind tibia red with a black spot or band at its base.

Immature: *Two distinct white lines running parallel through the compound eye. *Large cream-colored area covers the cheek and extends to cover the whole side of the pronotum (pattern may vary). First instars usually appear by mid-June.

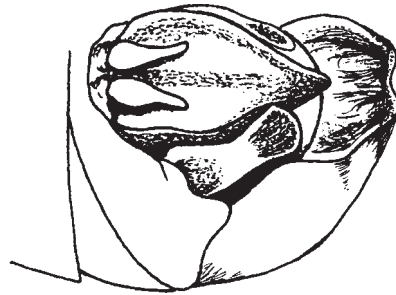


Intermediate-Hatching Species

Melanoplus angustipennis 22-G

Adult: Markings inconspicuous. It may look much like the *M. sanguinipes* male except for the cercus and furcula. *This species is associated with sandy or “blow out” (windswept) land. No noticeable femoral markings. Cercus spoon shaped.

Immature: Tan or green with fine brown spots over most of the body. No banding evident on the outer femur.



Melanoplus bowditchi 23-F

Adult: Markings inconspicuous. Body color usually a brownish olive with a spattering of brown. *Associated with sagebrush or near the base of steep eroded banks.

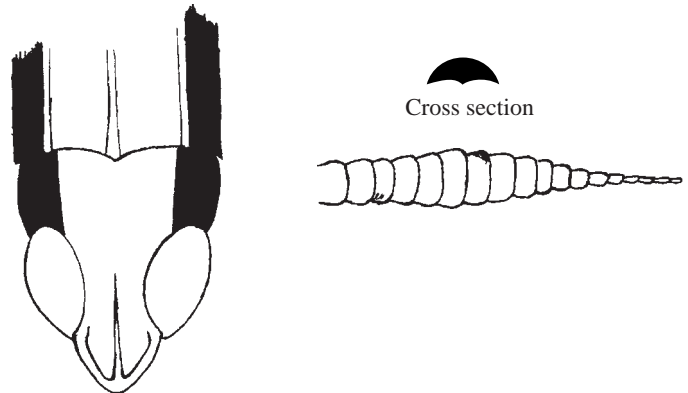
*No noticeable femoral markings.

Immature: Pale gray with dark markings and generally a speckled appearance.



Opeia obscura 24-G

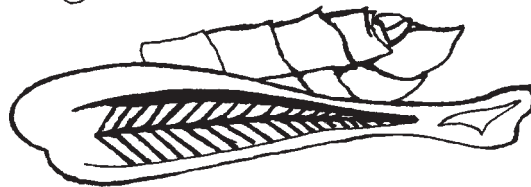
Adult: Females larger than males. Size small to average. Parallel lateral carina evident. Forewing usually with some green. Forewing with a dark longitudinal stripe. Below the stripe there is a white line in the marginal field. Antennae triangular in cross section, swordshaped (ensiform).



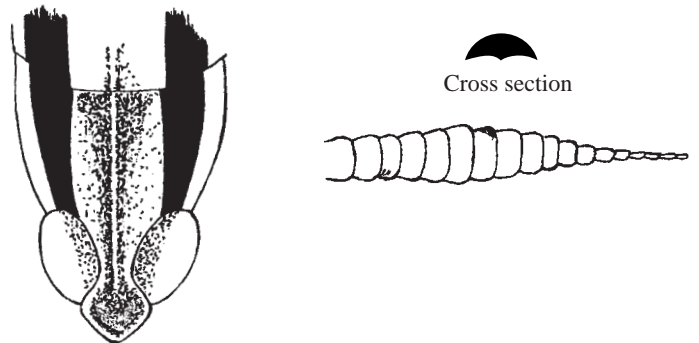
Immature: Resembles *Amphitornus* sp. except without external bands on the hind femora, and does not have brown stripes above eyes. *Hind femora long.

Mermiria bivittata 25-G

Adult: *Body yellow to greenish. Yellow underneath.



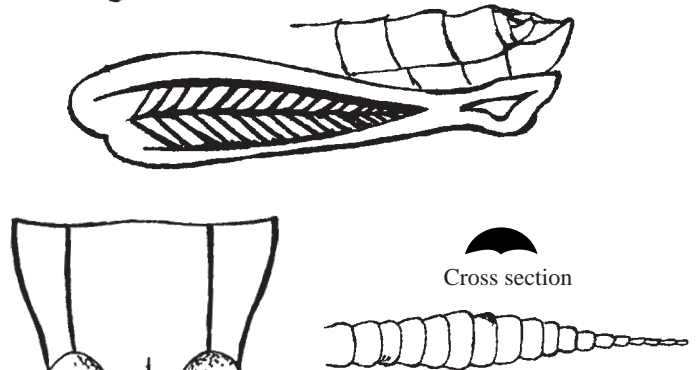
Size large. *No lateral carina evident. Brown stripes behind eye and onto the pronotum. Strongly slanted face. *Depression of vertex without a median carina. Associated with tall, coarse grass.



Immature: Quite large and generally green or tan. Fine brown spots cover the body. Antennae triangular in cross section, swordshaped.

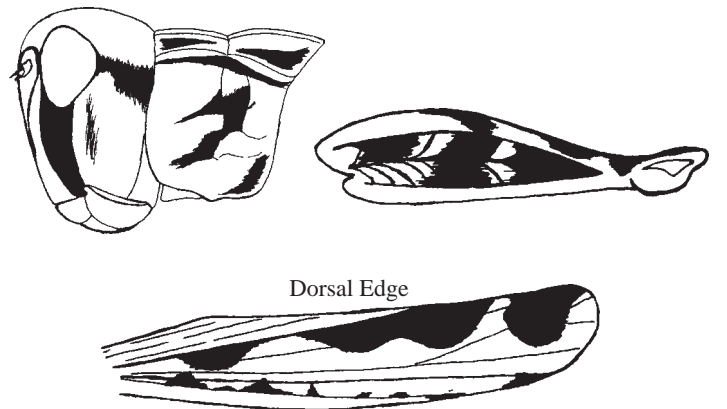
Pseudopomala brachyptera 26-G

Adult: *Abdomen extending beyond the hind femora in adults. Size large. Lateral carina well developed. Body color light brown. Fastigium divided by a median carina. Both sexes short winged. Antennae triangular in cross section, swordshaped.

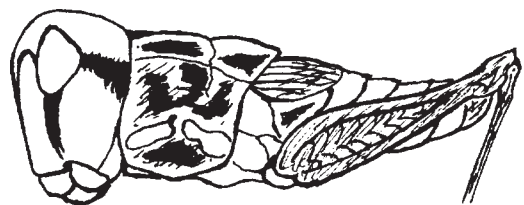


Phlibostroma quadrimaculatum 27-G

Adult: *Forewing with four spots. Tibia reddish orange. Color brownish olive with some green. Size: Females large, males small. Distinct constricted lateral carinae, vertical white stripe below eye.



Immature: *Usually a lateral carina and some green color. Hind femora a light brown. No noticeable banding. *Two white areas are usually visible on the lower pronotum.



Phoetaliotes nebrascensis 28-M

Adult: *Both sexes usually with reduced forewing.
(See fig. 2, description of wings.) *Head larger than pronotum. Black teardrop below compound eye.

Immature: *No visible lateral carina. *The hind femora with noticeable band on the upper half. Immatures appear to be soft and delicate.

Boopedon nubilum 29-G

Adult: Males are jet black and with fully developed wings. Females are large and have an olive green and brown color and short wings.

Immature: Pronotum is very distinctive with a dark saddle area.

Hypochlora alba 30-F

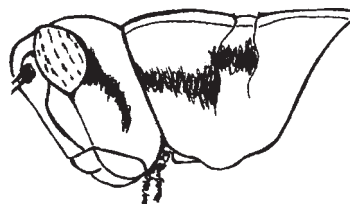
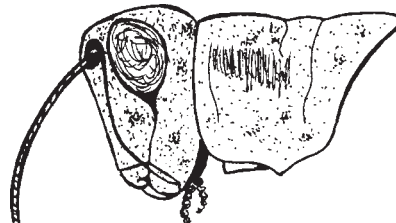
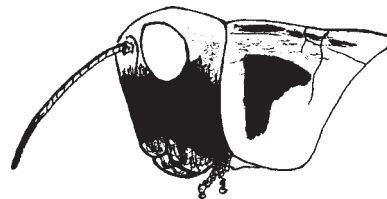
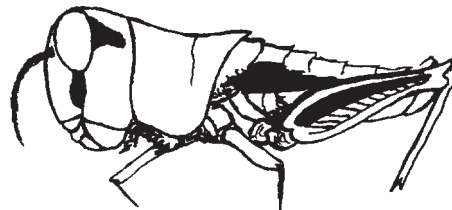
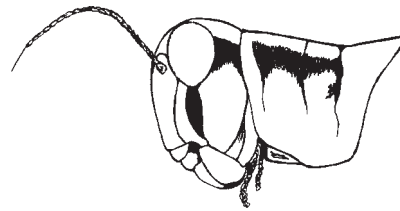
Adult: *Both sexes with pointed, reduced forewing.
(See fig. 2, description of wings.) *Color a sage-gray green that resembles the host plant (Mulkern et al. 1969). *The entire body is covered with small rust-colored dots.

Immature: A small version of the adult.

Hesperotettix viridis 31-F

Adult: Pronotum green with a pale white middorsal stripe. *A reddish orange band around the femur near the knee. Compound eye with vertical rows of spots.

Immature: Compound eyes with light spots. Antennae dark with light colored rings. A light-colored line running from the head to the posterior tip of the pronotum. In later instars, hind femoral chevrons are dark.

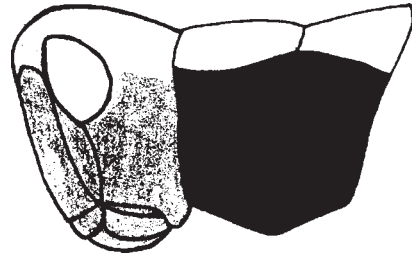


Late-Hatching Species

(To be adults by late summer.)

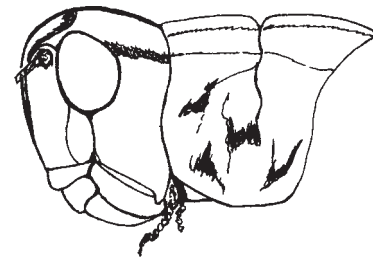
Chloealtis conspersa 32-G

Adult: Lateral pronotal area of male entirely black. Female with reduced wings. (See fig. 7, p. 4, description of wings.) Sides of female pronotum lighter colored. Black knee in both sexes.



Encoptolophus costalis 33-M

Adult: Corresponding bands on forewing and femur. A small late bandwing. Inner surface of hind femora dark bluish-black on the basal half and with a dark band toward the apex.

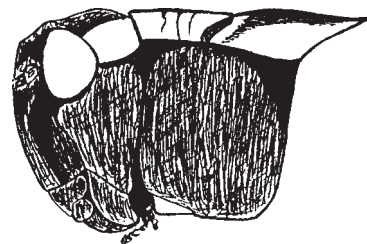


Immature: Similar to *Chortophaga* sp. in color and morphology, but this species is in an advanced instar stage when *Chortophaga* hatches.



Arphia pseudonietana 34-M

Adult: A late-season adult bandwing. Color bronze, almost black. Color varies from grayish-brown to black, mottled appearance. Usually a red wing disk with a black band.



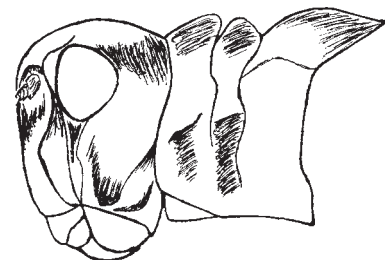
Immature: This species is usually at least two instars ahead of *Arphia conspersa* near the middle of July.



Metator pardalinus 35-M

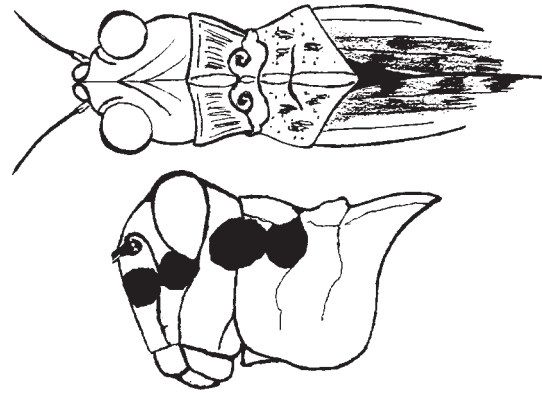
Adult: A large bandwing grasshopper. Females are almost robust. Males are smaller and have dark blue abdomen, tibia, and inner femur. Dark spots on forewing.

Immature: Early instars resemble *Trachyrhachys*, but this species does not have any dense hair on the femora.



Derotmema haydeni 36-M

Adult: A small- to medium-sized bandwing grasshopper with large, bulbous eyes and a very wrinkled pronotum and speckled spots quite evident in the forewing.

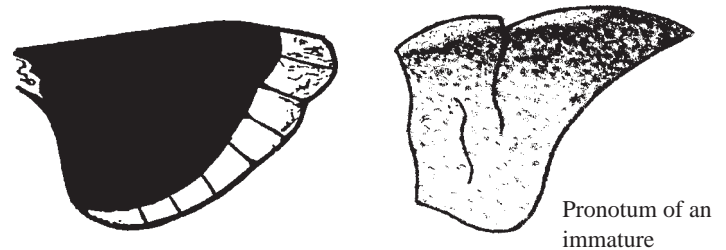


Immature: Early instars have four shiny black spots on the front of the head and two on the pronotum. All instars have two rust spots on each ventral abdominal segment.

Dissosteira carolina 37-M

Adult: Adults are known as “road dusters.” The hind wing is black with a pale yellow border. This species has the largest wingspan of our grasshoppers. Mimics local soil coloration.

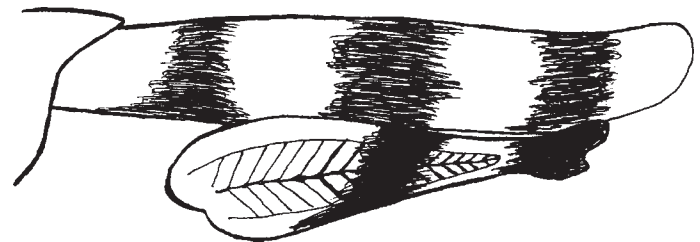
Immature: Early instars possess a morphology much like *Arphia* sp. except the body color is like wet beach sand. Later *Dissosteira* instars are much larger, and the pronotum is shaped like a buffalo’s hump.



Hadrotettix trifasciatus 38-M

Adult: *Forewing reddish-brown with conspicuous dark crossbands; apex clear. *Inner surface of hind femora a deep blue color on the basal two-thirds followed by a white band and a dark apex. Hind tibia orange.

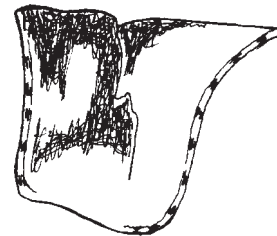
Immature: All later instars exhibit the above femoral coloration. Stout appearance.



Spharagemon equale 39-M

Adult: *General body color is a speckled, sandy look with a bright orange inner femora and tibia. *Pronotum with the median carina slightly elevated, usually cut once. Forewing banded.

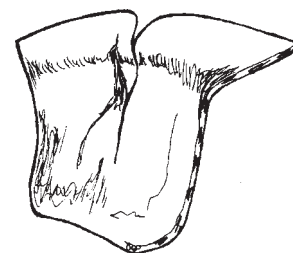
Immature: *All later instars exhibit the basic adult coloration. On first instars, hind tibia dark.



Spharagemon collare 40-G

Adult: *General body color is a speckled, sandy look with a yellowish femora and orange tibia. *Pronotum with the median carina raised into a high crest and cut deeply by one sulcus. Forewing not noticeably banded.

Immature: *All later instars exhibit the basic adult coloration. On first instars, hind tibia dark.



Chorthippus curtipennis 41-G

Adult: Body color usually varies from green to a yellowish brown with the ventral portion yellowish. The hind femora of the males have a black knee and are longer

than the abdomen. The lateral foveolae are visible from above. Female wings short. Male wings reach end of abdomen.

Immature: Quite variable in body striping and color. First and second instars have distinct brown stripe from eye well onto the abdomen.

Orphulella speciosa 42-G

Adult: *Body color variable, greens and browns with a dark band extending from behind the compound eye to the pronotum. *A dark triangular area inside the rear portion of the lateral carina. Hind femora a brownish tan in color and longer than the abdomen in the males.

*A visible depression on the point of the head. Lateral carinae of pronotum cut by one sulcus.

Immature: Possess many of the adult morphological characters.

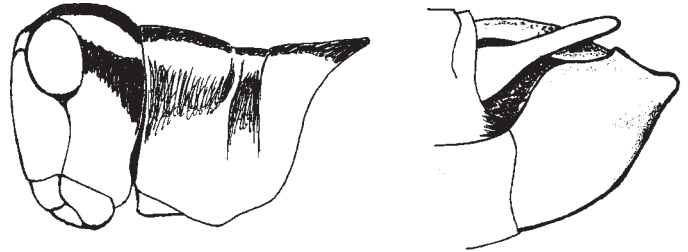
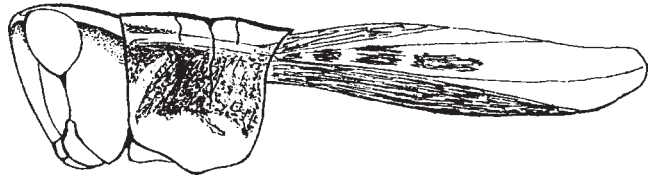
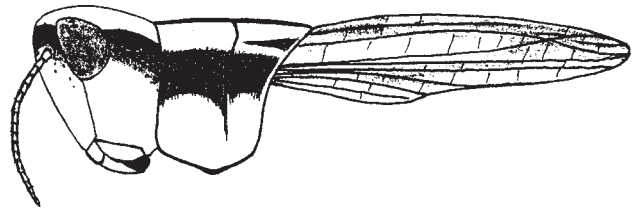
Aeoloplides turnbulli 43-F

Adult: *Stout body with a greenish yellow color. Body widest at the posterior end of the pronotum. Hind tibia blue. Male subgenital plate with a subapical tubercle. Distinctive stripe on head and pronotum. Outer femur distinctively marked with dark chevrons.

Oedaleonotus enigma 44-M

Adult: Not found in North Dakota. *Found in California, Nevada, Utah, Idaho, Washington, and Oregon. The anterior edge of the pronotum has a conspicuous cream-colored band giving the appearance of wearing a clergyman's collar. The lower portion of the femora has a thin orange line. The cercus is drumstick shaped. An early hatching species in Idaho.

Immatures: Robust appearance. Distinctive white stripe on middle of pronotum, extends onto abdomen.



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