

## VI.8 Seasonal Occurrence of Common Western North Dakota Grasshoppers

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Several authors have compiled excellent taxonomic keys for identifying various grasshopper groups in North America: slantfaced and bandwinged adults by Otte (1981), spurthroated adults by Brooks (1958), and the identification of nymphs of the genus *Melanoplus* by Hanford (1946). Others have used hatching dates and developmental charts to aid in grasshopper identification. For Wyoming and Montana, excellent examples are the charts developed by Newton (1954) and the charts modified for use in Colorado by Capinera (1981).

Many of the identification aids are not commonly available and are technical and difficult to use in a field situation because of bulk and terminology. Also, the field person attempting to use such identification aids usually is a temporary summer employee with little or no background in entomology.

Although scientists have computer mapping technology and sophisticated methods of conducting grasshopper surveys, grasshoppers still need to be identified at each survey stop. A small, easy-to-use reference such as this one will help in the identification process.

Used in combination, the seasonal occurrence chart (table 1) and the Pocket Hopper Helper can help a field person identify grasshopper species in the field. In a year with average grasshopper populations, a field person using the two aids in combination can identify an unknown grasshopper of known life stage (instar) in western North Dakota.

In 1987, the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) funded a multiyear Grasshopper Integrated Pest Management (GHIPM) Project to investigate ways to control rangeland grasshoppers in the West. The GHIPM Project set up a study area in McKenzie County, ND, with a demonstration area and several study sites. At each treatment location, there were 10 or more treatment-evaluation sites. Approximately one-half mile outside the treatment areas, 10 untreated sites were also monitored.

Field personnel collected data on pretreatment and post-treatment grasshopper densities, species composition, and age structure at permanent sampling sites on treated and untreated plots. To determine density, each site had a circular transect of 40 0.1-m<sup>2</sup> rings placed 5 m apart (Onsager and Henry 1977). Rings were in place for the duration of the season.

To sample, field personnel took 400 sweeps, 200 high and fast and 200 low and slow, with standard sweep nets during the grasshopper season. Samples were sacked, frozen, and later identified in the laboratory by species and age class for each site and sampling date.

During a 7-year period from 1987 to 1993, the GHIPM Project studied 25 separate demonstration areas. Laboratory personnel examined and recorded data on approximately 250,000 individual grasshoppers comprising 57 species (table 2).

Of the 57 species, no more than 38 are typical in western North Dakota rangeland samples. Of the 50 species listed in the seasonal history chart, surveyors in western North Dakota commonly find the 15 noted in table 3.

The seasonal history chart is divided into four developmental time periods of 4 months each. These four time periods are subdivided into approximately three 10-day periods. The numbers 1 through 5 represent a grasshopper's instar stage, and the letter "A" stands for adulthood. The placement of the numbers and letter A's in the chart represents the time a certain species has reached a stage of development. These data come from 7 years of observing and recording thousands of individual grasshoppers.

Several species listed on the seasonal chart have almost no early dates of occurrence indicated. This void results from a lack of basic identification tools available on important bandwinged and *Melanoplus* species and from the small number of these species examined.

The arrangement of grasshopper-hatch time periods in order by type of species are (1) overwintering, (2) early-hatching, (3) intermediate-hatching, and (4) late-hatching.

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## Overwintering Species

North Dakota has six species that commonly pass the winter in various instar stages, and others occasionally overwinter as adults. Ranchers and survey personnel usually find these species early in the season. Although damage caused by most of the six species is below the threshold of economic significance, their appearance can cause concern because many lay persons are unaware of this group and may think the season's hatch of genuinely threatening species has begun.

## Early-Hatching Species

This group of grasshoppers, whose eggs hatch from about late May to mid-June, probably is the most important. Many of the species that cause economically unacceptable levels of damage begin to develop at this time. Most agencies and Cooperative Extension Service personnel advise ranchers and farmers to check their fields and rangeland for possible infestations at this time. Late spring is the critical time to be able to differentiate among overwintering, noneconomic, and problem species. Most grasshopper control decisions take increased numbers of problem species into account.

## Intermediate-Hatching Species

This group includes a number of species that hatch over an extended period of time, mainly because of a number of environmental conditions. Most species in this group begin appearing in late May or early June.

## Late-Hatching Species

This group includes several late-hatching species and many that could fall into the intermediate-hatching group. Grasshopper species in this group appear slightly later than intermediate-hatching species and reach adulthood late. Both the intermediate- and late-hatching species need further study.

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## Selected References

- Brooks, A. R. 1958. Acridoidea of southern Alberta, Saskatchewan and Manitoba (Orthoptera). Suppl. 9. Canadian Entomologist 90: 1-92.
- Capinera, J. L.; Sechrist, T. S. 1981. Grasshoppers (Acrididae) of Colorado, identification, biology and management. Exp. Stn. Bull. 584s. Fort Collins, CO: Colorado State University.
- Handford, R. H. 1946. The identification of nymphs of the genus *Melanoplus* of Manitoba and adjacent areas. Scientific Agriculture 26: 147-178.
- Newton, R. C.; Esselbaugh, C. O.; York, G. T.; Prescott, H. W. 1954. Seasonal development of range grasshoppers as related to control. Bull. E-873. Washington, DC: U.S. Department of Agriculture, Agricultural Research Service, Bureau of Entomology and Plant Quarantine.
- Onsager, J. A.; Henry, J. E. 1977. A method for estimating the density of rangeland grasshoppers (Orthoptera: Acrididae) in experimental plots. *Acrida* 6: 231-237.

## Unpublished Reference

- Mazuranich, Philip. 1987. Seasonal history of common Montana grasshoppers. (Mimeo, 4 p.)



**Table 1—Seasonal history of common western North Dakota grasshoppers (continued)**

Early-hatching species (cont'd.)	April			May			June			July			August			
	E <sup>1</sup>	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
<i>Melanoplus packardii</i>						1	2	—	3	4	5	A				
<i>Melanoplus sanguinipes</i>						1	—	2	3	4	5	A				
<i>Trachyrhachys kiowa</i>						1	—	—	2	3	4	5	A			
<b>Intermediate-hatching species</b>																
<i>Aeoloplides turnbulli</i>						1	2	3	4	5	A					
<i>Aulocara femoratum</i>								1	2	3	4	5	A			
<i>Boopedon nubilum</i>						1	—	2	3	4	—	5	A			
<i>Chorthippus curtipennis</i>							1	2	3	4	—	—	A			
<i>Derotmema haydeni</i>								1	2	3	4	A				
<i>Hesperotettix viridis</i>						1	—	2	3	4	5	A				
<i>Melanoplus femurrubrum</i>						1	—	1	2	—	3	4	5	A		
<i>Melanoplus bowditchi</i>							1	2	3	4	5	A				
<i>Metator pardalinus</i>							1	2	3	4	5	A				
<i>Spharagemon equale</i>						—	2	3	—	4	—	5	A			
<i>Stenobothrus brunneus</i>					—	1	2	3	4	5	A					
<b>Late-hatching species</b>																
<i>Dissosteira carolina</i>							—	2	3	4	5	A				
<i>Hadrotettix trifasciatus</i>						—	2	—	—	3	4	5	A			

Late-hatching species (cont'd.)	April			May			June			July			August			
	E <sup>1</sup>	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
<i>Hypochlora alba</i>								1	2	—	3	4	5	A		
<i>Melanoplus dawsoni</i>									1	2	3	4	5	A		
<i>Phlibostroma quadrimaculatum</i>									1	2	3	4	5	A		
<i>Spharagemon collare</i>								1	2	3	4	5	A			
<i>Arphia pseudonietana</i>									1	2	3	4	5	A		
<i>Encoptolophus costalis</i>									1	2	3	4	5	A		
<i>Melanoplus keeleri</i>								1	2	—	2	—	3	4	5	A
<i>Mermiria bivittata</i>							1	—	2	3	—	4	5	A		
<i>Opeia obscura</i> <sup>6</sup>							1	2	3	4	5			A		
<i>Orphulella speciosa</i>								1	—	2	3	4	5	A		
<i>Phoetaliotes nebrascensis</i>									1	2	3	4	5	A		
<i>Melanoplus gladstoni</i>								1	2	—	3	4	5	A		
<i>Dactylotum pictum</i>									1	2	3	4	A			
<i>Schistocerca lineata</i>								—	—	—	—	—	5	A		
<i>Melanoplus angustipennis</i>							1	2	3	4	5	A				

<sup>1</sup> E = early part of month, M = midmonth, L = latter part of month.

<sup>2</sup> Overwintering immatures of *Arphia conspersa* and *Chortophaga viridifasciata* usually hatch near the second week of July.

<sup>3</sup> A = adult grasshopper.

<sup>4</sup> Numerals 1 through 5 refer to grasshopper instar.

<sup>5</sup> — = little or no data about instar stage.

<sup>6</sup> *Amphitornus coloradus* and *Opeia obscura* exhibit like early instar characteristics and colors, but *Amphitornus coloradus* usually hatches at least 10 days before *Opeia obscura*.

**Table 2—Species collected in northwestern North Dakota, 1987–93**

<i>Acrolophitus hirtipes</i> (Say)	<i>Hadrotettix trifasciatus</i> (Say)	<i>Pardalophora haldemani</i> (Scudder)
<i>Aeoloplides turnbulli</i> (Candell)	<i>Hesperotettix viridis</i> (Thomas)	<i>Phlibostroma quadrimaculatum</i> (Thomas)
<i>Aeropedellus clavatus</i> (Thomas)	<i>Hypochlora alba</i> Dodge	<i>Phoetaliotes nebrascensis</i> (Thomas)
<i>Ageneotettix deorum</i> (Scudder)	<i>Melanoplus angustipennis</i> (Dodge)	<i>Pseudopomala brachyptera</i> (Scudder)
<i>Amphitornus coloradus</i> (Thomas)	<i>Melanoplus bivittatus</i> (Say)	<i>Psoloessa delicatula</i> (Scudder)
<i>Arphia conspersa</i> (Scudder)	<i>Melanoplus bowditchi</i> (Scudder)	<i>Schistocerca lineata</i> Scudder
<i>Arphia pseudonietana</i> (Thomas)	<i>Melanoplus confusus</i> Scudder	<i>Spharagemon collare</i> (Serville)
<i>Aulocara elliotti</i> (Thomas)	<i>Melanoplus dawsoni</i> (Scudder)	<i>Spharagemon equale</i> (Say)
<i>Aulocara femoratum</i> (Scudder)	<i>Melanoplus femurrubrum</i> (DeGeer)	<i>Stenobothrus brunneus</i> Thomas
<i>Boopedon nubilum</i> (Say)	<i>Melanoplus foedus</i> Scudder	<i>Trachyrhachys kiowa</i> (Thomas)
<i>Camnula pellucida</i> (Scudder)	<i>Melanoplus gladstoni</i> Scudder	<i>Trimerotropis agrestis</i> McNeill
<i>Chloealtis conspersa</i> (Harris)	<i>Melanoplus infantilis</i> Scudder	<i>Trimerotropis campestris</i> McNeill
<i>Chorthippus curtipennis</i> (Harris)	<i>Melanoplus keeleri</i> (Thomas)	<i>Trimerotropis gracilis</i> (Thomas)
<i>Chortophaga viridifasciata</i> (DeGeer)	<i>Melanoplus occidentalis</i> (Thomas)	<i>Trimerotropis latifasciata</i> Scudder
<i>Circotettix carlinianus</i> (Thomas)	<i>Melanoplus packardii</i> Scudder	<i>Trimerotropis pallidipennis</i> (Burmeister)
<i>Dactylotum pictum</i> (Thomas)	<i>Melanoplus sanguinipes</i> (Fabricius)	<i>Trimerotropis sparsa</i> (Thomas)
<i>Derotmema haydeni</i> (Thomas)	<i>Mermiria bivittata</i> (Serville)	<i>Xanthippus corallipes</i> (Haldeman)
<i>Dissosteira carolina</i> (L.)	<i>Metator pardalinus</i> (Saussure)	
<i>Encoptolophus costalis</i> (Scudder)	<i>Opeia obscura</i> (Thomas)	
<i>Eritettix simplex</i> (Scudder)	<i>Orphulella speciosa</i> (Scudder)	

**Table 3—The 15 most abundant grasshopper species encountered on rangeland during the study in North Dakota, in alphabetical order**

<i>Aeropedellus clavatus</i> (Thomas)	Clubhorned grasshopper
<i>Ageneotettis deorum</i> (Scudder)	Whitewiskered grasshopper
<i>Amphitornus coloradus</i> (Thomas)	Striped grasshopper
<i>Aulocara elliotti</i> (Thomas)	Bigheaded grasshopper
<i>Camnula pellucida</i> (Scudder)	Clearwinged grasshopper
<i>Melanoplus bivittatus</i> (Say)	Twostriped grasshopper
<i>Melanoplus confusus</i> Scudder	Pasture grasshopper
<i>Melanoplus femurrubrum</i> (De Geer)	Redlegged grasshopper
<i>Melanoplus gladstoni</i> Scudder	Gladston grasshopper
<i>Melanoplus infantilis</i> Scudder	Little spurthroated grasshopper
<i>Melanoplus packardii</i> Scudder	Packard grasshopper
<i>Melanoplus sanguinipes</i> (Fabricius)	Migratory grasshopper
<i>Metator pardalinus</i> (Saussure)	Bluelegged grasshopper
<i>Phlibostroma quadrimaculatum</i> (Thomas)	Fourspotted grasshopper
<i>Trachyrhachys kiowa</i> (Thomas)	Kiowa grasshopper