

Sagebrush Grasshopper

Melanoplus bowditchi Scudder

Distribution and Habitat

The sagebrush grasshopper is distributed widely in western grasslands. It inhabits the mixedgrass, shortgrass, desert, and bunchgrass prairies, and certain desert shrub communities. In all of these vegetational units its distribution depends upon the presence of sagebrush.

Economic Importance

The preference of the sagebrush grasshopper for silver sagebrush, a plant that furnishes good to excellent browse in fall and winter for all classes of livestock and game animals, makes this insect a potentially damaging species. The low densities of this grasshopper, however, suggest economic damage does not occur. The sagebrush grasshopper is a medium-sized species of the diverse genus, *Melanoplus*. Live weights of males average 394 mg and of females 434 mg (dry weights males 80 mg, females 144 mg).

Food Habits

The sagebrush grasshopper feeds almost exclusively on several species of sagebrush. Two of the six species known to be ingested are evidently primary host plants, silver sagebrush, *Artemisia cana*, and sand sagebrush, *A. filifolia*. Crop contents of grasshoppers collected in western North Dakota contained 97 percent silver sagebrush and 5 percent fringed sagebrush, while crop contents of grasshoppers collected in western Nebraska consisted of 88 percent sand sagebrush and the remainder undetermined forbs and pollen. The geographic range of the two host plants taken together matches closely the range of the grasshopper. Four other species - big sagebrush, fringed sagebrush, tarragon, and cudweed sagewort - are ingested in small amounts. These occur in the mixedgrass prairie along with silver sagebrush, so the nearly exclusive consumption of the latter indicates that it is the preferred species. Sand sagebrush grows on sand dunes and sand hills where silver sagebrush frequently does not occur and serves as the host plant in these more limited habitats.

The sagebrush grasshopper often attacks silver sagebrush at the edge of leaves. It may also cut a leaf at its base and hold onto it with the front tarsi to consume



Geographic range of
Melanoplus bowditchi Scudder

Instar 1



1. BL 3.9-6.1 mm FL 2.4-2.5 mm AS 13.

Instar 2



2. BL 6.5-7.5 mm FL 3.6-4.2 mm AS 16-18.

Instar 3



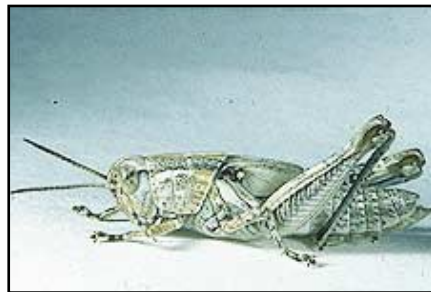
3. BL 8.1-9.4 mm FL 5.1-5.2 mm AS 19.

Instar 4



4. BL 12-14 mm FL 7.4-8 mm AS 20-21.

Instar 5



5. BL 14.5-20.5 mm FL 10-12 mm AS 22-24.

Figures 1-5. Appearance of the five nymphal instars of *Melanoplus bowditchi* - their sizes, structures, and color patterns. Notice progressive development of the wing pads. BL = body length, FL = hind femur length, AS = antennal segments number.

the entire leaf. In addition, this grasshopper feeds on the flowers of silver sagebrush when they become available. Adults have been observed feeding horizontally on a small mat-forming lichen on the ground.

Dispersal and Migration

Little is known about the dispersal and migration of the sagebrush grasshopper. Possessing long wings that extend beyond the end of the abdomen, the species evidently has the capacity to disperse and migrate. Observations have been made of its evasive flights. These are silent and usually straight at heights of 12 to 15 inches for distances of 1.5 to 12 feet. The flushed grasshopper takes off from its perch on silver sagebrush or from the ground and usually lands on vegetation, either its host plant or a grass culm.

Identification

The sagebrush grasshopper is a pale to dark gray, medium-sized, spurthroated grasshopper (Fig. 6 and 7). The wings are long, extending 3 to 5 mm beyond the end of the abdomen. The shape of the male cercus, an essential character for identifying and separating the numerous species of *Melanoplus*, is elongated and slender (Fig. 8). The medial area of the hind femur is marked by chevrons that are separated by white lines; chevrons are darker dorsally and lighter ventrally. The hind tibiae are light to medium blue.

Nymphs of the sagebrush grasshopper are identifiable by their shape, structures, and color patterns (Fig. 1-5).

1. Head. Face nearly vertical (slightly receding); compound eye with pale yellow spots; pale yellow crescent beginning on gena below compound eye and running onto lateral lobe.
2. Pronotum. Lateral lobes below crescent are light gray and weakly spotted; disk medium gray or brown, darker than lateral lobes and with many fuscous spots.
3. Hindleg. Femur with medial area having dark stripe centrally located in instars I and II and dorsally in instars III to V; tibia pale gray in instars I to IV, pale blue in instar V; front of tibia fuscous in all five instars.

Figures 6-9. Appearance of the adult male and female of *Melanoplus bowditchi*, the cercus of the male, and the egg pod and exposed eggs.

- General body color pale gray with darker markings.

Specimens of this species may be picked up in a sweep net when a surveyor passes close to host plants.

Hatching

In the mixedgrass prairie of eastern Wyoming, eggs of the sagebrush grasshopper begin to hatch during the first week of June. Hatching occurs about three weeks after the bigheaded grasshopper begins to hatch, and places the sagebrush grasshopper in the intermediate-hatching group of species.

Nymphal Development

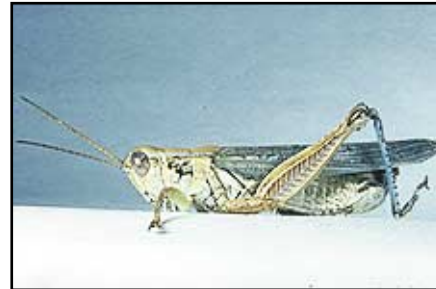
Nymphs develop rapidly, taking about 30 to 40 days to become adults. They are located close to their host plants: silver sagebrush or sand sagebrush.

Adults and Reproduction

Adults begin to appear in the habitat during the first week of July. Part of the nymphal population continues to molt to this final stage for as long as a month. Adults are present in the habitat for three months, July through September. No observations of courtship, mating, or oviposition in nature have been made. In the laboratory, females readily oviposit in bare soil. One caged female was observed ovipositing for at least 30 minutes. During this time she was attended by a male. Upon completion of oviposition and extraction of her abdomen, she covered the hole with soil by working her ovipositor back-and-forth and sideways. The pod is three-quarters inch long; froth surrounds a cluster of 12 to 13 eggs held together by scanty secretion of the accessory gland. The eggs are tan and 4.5 to 4.9 mm long (Fig. 9).

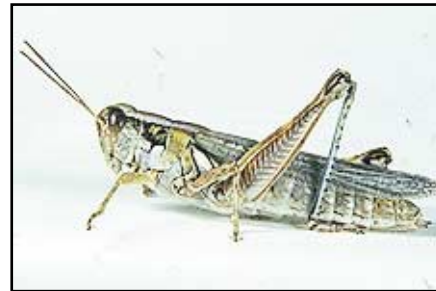
Population Ecology

The population ecology of the sagebrush grasshopper remains unstudied. We do know that it has an extensive range within which its dispersion is patchy and limited by the distribution of its host plants. Other important population characteristics such as density, fecundity, mortality, and capacity for increase are unknown. However, we know that it is an insignificant component of grasshopper outbreaks.



Male

6. BL 19-24.5 mm FL 11.5-12.5 mm AS 24-25.



Female

7. BL 22.5-26.5 mm FL 12-14.5 mm AS 24.



Cercus

8. End of adult male abdomen showing the cercus.



Eggs

9. Egg pod showing exposed eggs in bottom half of pod.

Daily Activity

The sagebrush grasshopper is a phytophilous species because it spends much of its daily life on the host plant. The precise proportion of time spent between the host plant and the ground, however, remains undetermined. During the night both nymphs and adults roost 6 to 16 inches high, head up, on stems of silver sagebrush. For about two hours after sunrise they remain on the host in these resting positions. Subsequently, they adjust their positions so that their sides or backs are exposed to the

warming rays of the sun. By 9 a.m. many individuals have jumped to the ground and bask horizontally. On the ground, they turn a side perpendicular to rays of the sun and lower the exposed hindleg. About 10 a.m., when the soil surface temperature has risen to 70°F, they begin to stir and potter. Shortly afterwards they jump back into their host plant to feed. Method of mate location, courtship, and where the adults mate, either on the host plant or on the ground, are unknown. The grasshoppers again bask in late afternoon and by 6 or 7 p.m. most are roosting on the host plant where they remain overnight.

Selected References

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