Orangelegged Grasshopper

Spharagemon equale (Say)

Distribution and Habitat

The orangelegged grasshopper is widely distributed in the grasslands of the western United States and Canada. It inhabits the tallgrass, mixedgrass, shortgrass, bunchgrass, and desert prairies and also shrub-grass communities of the Great Basin.

Economic Importance

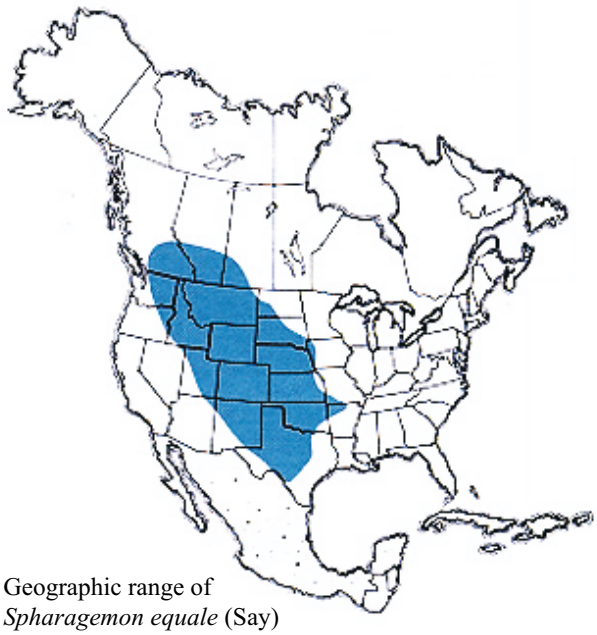
The orangelegged grasshopper occurs as a subdominant species in rangeland assemblages of grasshoppers. Because of the usually low densities (0.1 to 0.3 young adults per square yard), its feeding on both grasses and forbs is usually of minor economic importance. On bunchgrass prairie of British Columbia, however, it and *Metator nevadensis* caused considerable damage to cattle ranges in 1921. The adults are conspicuous and relatively large compared with the majority of rangeland grasshoppers. Live weight of males and females captured in the mixedgrass prairie of eastern Wyoming averaged 403 mg and 980 mg, respectively (dry weight: males 123 mg and females 299 mg).

Food Habits

A polyphagous species, the orangelegged grasshopper feeds on diverse grasses and forbs. Examination of 91 crops of grasshoppers collected in the sand prairie of southeastern North Dakota revealed that the species had fed upon 12 species of grasses, four sedges, and 11 forbs with no plant being clearly preferred. Crops of 18 grasshoppers collected in western Nebraska indicated a clear preference for blue grama. Two other grasses, needleandthread and prairie sandreed, were contained in the crops as well as one forb, lotus milkvetch, all in much smaller amounts than blue grama. Crops of 18 grasshoppers collected in the shortgrass prairie of north central Colorado (Pawnee Study Site) contained a preponderance of milkvetch (*Astragalus* sp.) and small amounts of four other forbs and three grasses.

Food preference tests of caged adults indicated that dandelion, blue grama, needleandthread, and downy brome were preferred food plants. Western wheatgrass, alfalfa, tumble mustard, kochia, and common lambsquarters were fed upon but not preferred. Flixweed was only nibbled upon. Early reports that this grasshopper prefers mustards have not been confirmed.

Five observations of the orangelegged grasshopper's method of attacking grass and sedge have been made in the mixedgrass prairie. At least two methods appear to be used. One is to raise up on the hindlegs and cut through a leaf 1/2 to 1 inch above its base, hang onto the cut section of 1 to 3 inches with the front tarsi, and consume all of it. The other method is to remain in a horizontal position on the ground, raise up on all legs over a leaf stub, and consume it to the base.



Geographic range of *Spharagemon equale* (Say)

Dispersal and Migration

The orangelegged grasshopper is a strong flier possessing long wings that extend 5 to 10 mm beyond the end of the abdomen. Distances of flushed flight range from 3 to 60 feet at heights of 4 inches to 6 feet. Patterns of flight may be straight or sinuous with either a gradual linear descent before landing or a right angle turn near the end of flight, followed by a gradual or steep descent. Both males and females usually crepitate in flight. Appetitive flight (unflushed flight) is common in the habitat; however, observations have been too few to determine what needs of the grasshopper are being met by these flights. Several investigators have noted aggregations of adults on bare soil in an otherwise vegetated habitat; perhaps both flight and walking are involved in movement to these spots, which may be important in pair formation and courtship.

A few observations provide evidence for dispersal by this species. West of Boulder, Colorado, where resident populations occur up to 7,200 feet, two "accidentals" were found at 8,500 feet. On sidewalks and pavement in downtown Billings, Montana on 1 August 1986, one male was collected along with seven specimens of the migratory grasshopper, *Melanoplus*

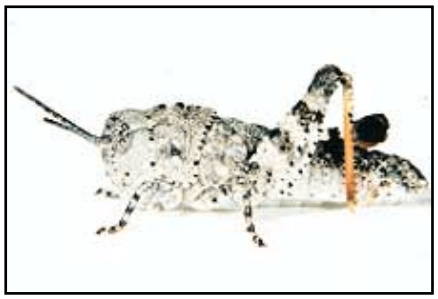
Instar 1

1. BL 4.5-5.9 mm FL 3-3.2 mm AS 13.

Instar 2

2. BL 6.6-8.5 mm FL 3.8-4.9 mm AS 15-17.

Instar 3



3. BL 9-10 mm FL 5.1-6.1 mm AS 18-20.

Instar 4

4. BL 10.5-15 mm FL 6-7.8 mm AS 20-21.

Instar 5

5. Males: BL 15.8-19.7 mm FL 9.2-10 mm AS 23.
Females: BL 19-24 mm FL 10-11.6 mm AS 23-24.

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

sanguinipes. In the city of Boise, Idaho, on 22 July 1923, five males and five females were collected at lights during the night along with specimens of *Dissosteira spurcata* and *Conozoa sulcifrons*. Migrating swarms of the orangelegged grasshopper have not been observed.

Identification

The orangelegged grasshopper is a relatively large bandwinged species. The adult is tan with brown bands and maculations (Fig. 6 and 7). The median carina of the pronotum is low and cut once in front of the middle; occasionally it is cut twice. The tegmina are crossed by three bands, the distal band sometimes being faint. The hindwings have a pale yellow disk and are crossed in the center by a broad, dark band (Fig. 9). The hind tibia is orange. The inner face of the hind femur is likewise orange and crossed with two or three fuscous bands (Fig. 8).

The nymphs are identifiable by their color patterns and external structures (Fig. 1-5).

1. Head with face nearly vertical, lateral foveolae triangular.
2. General color pale tan to brown.
3. Instar I

   (a) Pronotum with median carina distinct and slightly elevated; carina entire or faintly incised about one-fourth distance from posterior end.

   (b) Hind femur with outer face fuscous for distal three-fourths, proximal one-fourth tan and unspotted. Hind tibia fuscous. Hind tarsus with first and second segments white, third segment white except distal third fuscous.
4. Instar II

   (a) Pronotum with median carina distinct and slightly elevated; median carina faintly incised, slightly more than one-third distance from posterior end.

   (b) Hind femur with outer face pale tan to tan crossed by two fuscous bands. Hind tibia fuscous or fuscous and orange.
5. Instars III, IV, V

   (a) Pronotum with median carina distinct and slightly elevated, weakly incised near middle in instar III and anterior to middle in instars IV and V.

Figures 6-10. Appearance of the adult male and female of *Spharagemon equale*, hindleg of female, wings of female, egg pod, and exposed clutch of recently laid eggs.

(b) Hind femur with outer face pale tan or pale gray, sparsely spotted brown and fuscous, two dark transverse bands usually present, knee usually dark as well. Hind tibia orange.

Hatching

The orangelegged grasshopper is an intermediate-hatching species. In the mixedgrass prairie of eastern Wyoming, first hatch of eggs depends on seasonal weather and may occur as early as the last week of May or as late as mid June. Hatching ensues two to three weeks after eggs of *Aulocara elliotti* have begun to hatch. Field data indicate that the period over which hatching takes place in a particular year is brief, ranging from 7 to 11 days.

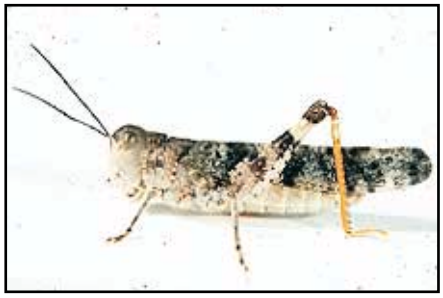
Nymphal Period

When nymphs emerge in spring, grasses, sedges, and forbs are young and nutritious. These supply an abundance and variety of host plants. The nymphal period ranges from 49 to 64 days and averages 55 days. Both male and female nymphs pass through five instars to reach the adult stage.

Adults and Reproduction

Depending on seasonal weather, adults may begin to appear in the mixedgrass prairie of eastern Wyoming as early as mid July or as late as early August. Remaining in the same habitat in which the nymphs developed, the adults are present during August and September, and may survive into early October when weather stays mild. Inspection of ovaries and field observation of oviposition indicate that egg laying begins three to four weeks after the adult stage is reached. No observation of courtship has been made, and there has been only one observation of a pair *in copulo* (13 August 1969 at 9:15 a.m. DST). Gravid females deposit their eggs into bare soil. These bare areas interspersed among the grasses range from 4 square inches to much larger areas, such as cattle trails. Caged females readily oviposit into containers of bare soil. They take 38 to 43 minutes from the start of boring into the soil to extraction of the ovipositor. Females then spend 90 seconds brushing soil over the hole with the hind tarsi, using one leg at a time. After this final act of protecting the eggs, the females walk away. No males have been observed attending ovipositing females.

Male



6. BL 22-28.8 mm FL 13-15.2 mm AS 25-26.

Female

7. BL 28.5-33.5 mm FL 14-17.5 mm AS 24-27.

Hindleg

8. Inner face of female hindleg showing general orange color and fuscous pattern.

Wings

9. Spread wings of female.

Eggs

10. Egg pod and part of a recently laid clutch of eggs. Note definitive egg color of two eggs showing through top left of pod.

The pods range from 1 1/8 to 1 1/4 inches long (Fig. 10). The section of pod containing eggs is 3/4 inch long and 3/16 inch in diameter. One-half inch above the eggs, the pod consists of light brown froth. The pod contains 24 to 26 light brown eggs, 5 to 5.5 mm long. Recently laid eggs are pale yellow. They eventually turn a light brown during their early development.

Population Ecology

The orangelegged grasshopper is a subdominant member of rangeland grasshopper assemblages. Where they occur in the mixedgrass prairie of Wyoming, densities of young adults usually range from 0.1 to 0.3 per square yard. In spite of low numbers, populations survive from year to year and appear to be influenced by the same factors that affect other rangeland grasshoppers (Table 1). When economically damaging grasshoppers increase to outbreak numbers, the orangelegged grasshopper may reach densities as high as two young adults per square yard.

Daily Activities

A geophilous species, the orangelegged grasshopper lives most of its life on the ground. At night, both nymphs and adults sit horizontally on the ground under a canopy of grasses. Before the sun's rays strike the ground early in the morning, a few individuals can be found sitting on small bare areas of 2 to 6 square inches interspersed among mats of blue grama. They face various directions with no particular orientation relative to the sun.

One to two hours after sunrise, the majority of individuals have emerged from their nighttime shelters and bask on bare ground. By turning a side perpendicular to the sun's rays and lowering the associated flexed hindleg, they expose the abdomen to the warming rays of the sun. The majority bask from 7 to 9 a.m. DST at ground temperatures of 60° to 90°F and air temperatures of 60° to 70°F (1 inch level). A few adults may bask longer, and they appear to reach body temperatures above their preference. These individuals then turn from the basking posture to face into or away from the sun and assume a stilt posture.

Daily activities of feeding, mating, and ovipositing follow the basking period and usually begin about 9:30 a.m. DST. When temperatures of bare ground exceed 100°F and air temperatures exceed 90°F (1 inch level), the adults leave bare ground and climb on top of blue grama or threadleaf sedge, and face the sun directly to expose the least body surface. At these times the grasshoppers are quiescent. When temperatures moderate later in the day, they again become active. In the evening, activity ceases and they again bask until nearly sunset at which time they seek shelter for the night under canopies of grasses.

Table 1. Growth of a rangeland grasshopper population and of *Spharagemon equale*, a subdominant member, in a mixedgrass habitat of eastern Wyoming (Platte County T27N R67W Sec 36 SE).

	Number per square yard				
	1970	1971	1972	1973	1974
Spharagemon equale	0.1	0.1	0.2	0.5	1.0
Assemblange of 16 species	3.7	5.1	8.7	15.3	48.6

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