

Obscure Grasshopper

Opeia obscura (Thomas)

Distribution and Habitat

The obscure grasshopper is widely distributed in the grasslands of North America. It thrives in habitats of short grasses and mid grasses, preferring blue grama, a short grass, for food and patches of mid grasses for roosting and basking. On stems of the latter, grasshoppers rest vertically head up for the greater part of the day. In the tallgrass prairie, scattered populations may occupy upper ridges vegetated by short grasses.

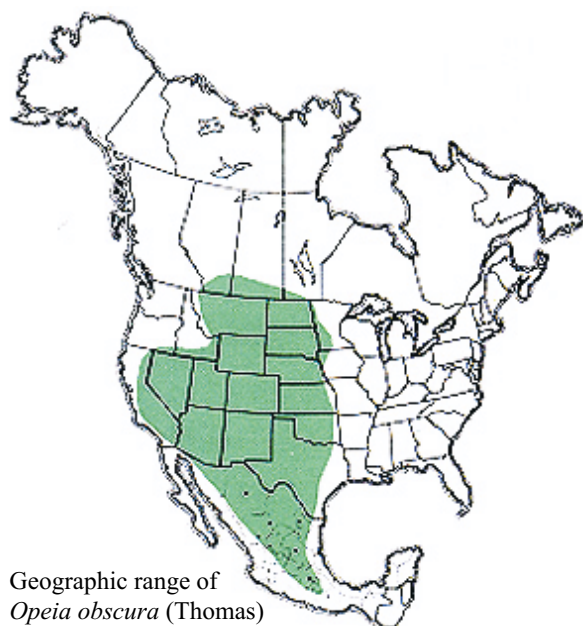
Economic Importance

The obscure grasshopper concentrates its feeding on blue grama, an important forage grass for livestock on western grasslands. It ingests the green leaves and occasionally cuts and drops them. As a result it has two habits that make it a potentially damaging pest on rangeland. However, past records show that populations of the species do not reach outbreak numbers, but may add from 0.3 up to 3 grasshoppers per square yard to the density of an outbreak to slightly increase the overall damage. In low density assemblages (less than eight per square yard), the obscure grasshopper may become the dominant species, reaching peak densities of four per square yard.

Of the three weight divisions of range grasshoppers, the obscure grasshopper is in the lightest group. Live weights of males from the mixedgrass prairie of eastern Wyoming average 66 mg and females 143 mg (dry weight males 21 mg and females 48 mg).

Food Habits

The obscure grasshopper is a grass feeder and prefers blue grama. Examination of crop contents of grasshoppers collected from grasslands of Colorado, Kansas, Nebraska, and North Dakota revealed that diets consisted of 85 to 100 percent blue grama. Nineteen other species of grasses were found in crop



Geographic range of *Opeia obscura* (Thomas)

contents. Usually in small amounts, these grasses included needleandthread, buffalograss, sand dropseed, little bluestem, and western wheatgrass. In addition, small or trace amounts of threadleaf sedge, needleleaf sedge, eight forbs, fungi, and arthropod parts were found. In a desert prairie of Texas, crop contents consisted of 78 percent blue grama, 13 percent buffalograss, 4 percent fall witchgrass, 2 percent *Aristida* sp., and 2 percent *Muhlenbergia* sp. Although a few observations have been made of nymphs feeding on dry cattle droppings, this grasshopper has not been observed to feed on plant litter or bran bait.

The obscure grasshopper feeds chiefly on the green leaves of grasses. The usual method of attack is to sit vertically, head up, on a leaf of blue grama, cut it near the middle, hang on to the cut portion with the front tarsi, and devour it to the tip. From a horizontal position on bare ground, this grasshopper may also feed on a recumbent leaf of blue grama. Feeding toward the base, it leaves a narrow section of leaf. Occasionally a grasshopper may feed head down on a green leaf of needleandthread, but this orientation is not maintained long before it turns around to its usual head up direction.

Dispersal and Migration

Little information is available on the capacity of the obscure grasshopper to disperse and migrate. Adults have long wings that range in length from nearly reaching the end of the abdomen to surpassing it by 3 mm. They are able to make short evasive flights. Available information indicates that their vagility is less than that of most long-winged rangeland species such as *Aulocara elliotti* and *Ageneotettix deorum*. Obscure grasshopper adults have not been found in the mountains west of Boulder, Colorado, which indicates little or no movement from their natural grassland habitats. In Wyoming's mixedgrass prairie where outbreaks of grasshoppers have been sprayed with insecticide, this species has virtually been eliminated for periods of four years. In one case, a male was found late in the season of the second year after treatment of an area, but the population did not subsequently make a comeback. The male evidently arrived from surrounding untreated rangeland, indicating that despite low vagility there is some dispersal.

Evasive flight is straight and silent for distances of 2 to 5 feet at heights of 3 to 6 inches. Flying grasshoppers may alight on vegetation or on the ground surface.

Identification

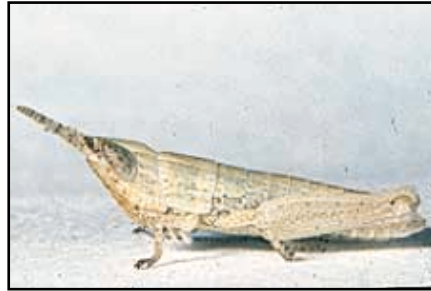
The adult obscure grasshopper is colored pale tan, sometimes pale green (Fig. 6 and 7). The males are small; the females are medium sized. Head has face strongly slanted; lateral foveolae of vertex invisible from above, top of head with single median carina. Antennae are ensiform. Except for carinae, the disk of pronotum is solidly colored (without dark stripes or triangles); lateral carinae nearly parallel; median carina cut once behind the middle (Fig. 8). Genae of head

Instar 1



1. BL 5.3-5.8 mm FL 2.2-2.5 mm AS 13.

Instar 2



2. BL 7.0-7.9 mm FL 3.3-3.6 mm AS 15-16.

Instar 3



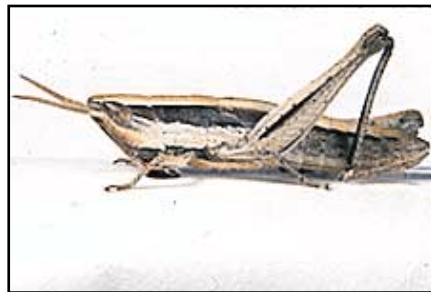
3. BL 7.6-9.7 mm FL 4-4.8 mm AS 18-19.

Instar 4



4. Males: BL 8.2-11 mm FL 4.4-6.1 mm AS 21-22.
Females: BL 11.2-12.9 mm FL 6.5-7 mm AS 21.

Instar 5



5. Males: BL 11.5-12.2 mm FL 6.5-7 mm AS 22.
Females: BL 16-16.3 mm FL 9 mm AS 23.

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

and lateral lobes of pronotum variably colored and marked with stripes and bands. Tegmina with longitudinal, dark brown, broken band in center (Fig. 9). Hind femur with a dark stripe in upper part of medial area, the stripe varies in width and darkness. Hind tibia colored pale tan or gray.

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

1. Head with face strongly slanted, antennae ensiform; lateral foveolae triangular, invisible from dorsal view.
2. Pronotum with distinct, parallel lateral carinae and distinct median carina. The median carina is entire (uncut) in instars I to III; slightly cut in instar IV and more so in instar V.
3. General color pale tan, markings present but pale with little contrast to the general color. Dark markings becoming more evident in instars IV and V. Hind femur with dark stripe on upper part of medial area, stripe faint in earlier instars. Hind tibia pale yellow; gray in front in instars IV and V.

Early instars of three species, *Opeia obscura*, *Eritettix simplex*, and *Psoloessa delicatula*, often occur together and may cause a problem in identification. They hatch late in the season and appear superficially similar. *O. obscura*, however, begins to hatch a month earlier than the other two species. A few distinct characters separate them readily. Nymphs of *P. delicatula* have the face nearly vertical, while the faces of *O. obscura* and of *E. simplex* are strongly slanting. The latter two can be separated by the differences in color patterns of the pronotal disk; *E. simplex* has a dark velvet band along each side, while *O. obscura* is entirely pale tan.

Hatching

The obscure grasshopper is a late-hatching species. In both the shortgrass prairie of Colorado and the mixedgrass prairie of Montana and Wyoming, eggs may begin to hatch as early as the first week of June or as late as the last week of June. The period of hatching is usually short, two weeks, but may occasionally be as long as four weeks. No study has been made of its embryology and egg development. The eggs, which lie relatively deep in the soil between depths of five-eighths and seven-eighths of an inch, are not exposed to extremes of soil temperature as the eggs of some other species of rangeland grasshoppers, such as *A. ellioti* and *A. deorum*.

Nymphal Development

Living under warm conditions of late spring and early summer, nymphs of the obscure grasshopper require 36 to 50 days to pass through five instars and become adults.

Figures 6-10. Appearance of the adult male and female of *Opeia obscura*, dorsal view of head and pronotum of adult female, fore and hind wings, egg pod and eggs.

When weather conditions delay hatching until the first of summer, nymphs then develop more rapidly in the warmer weather that follows. Adult males usually appear first, followed within a week by the females.

Adults and Reproduction

The adults generally remain at the same site in which the eggs hatched and the nymphs developed. There they have plenty of blue grama for food and patches of midgrasses for refuge and roosting. First appearance of adults in the mixedgrass prairie of Montana and Wyoming and the shortgrass prairie of Colorado occurs during late July or early August. In Arizona adults appear as early as April. The attrition of adults by parasites and predators goes on daily, and by October few individuals are left alive.

No special study of the obscure grasshopper's mating behavior has been made. In a laboratory terrarium, one observation was made of a male mounting a female and attempting, unsuccessfully, to engage his genitalia with the female's.

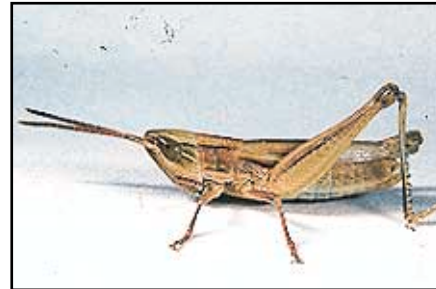
Females deposit their eggs deep in the soil and form a pod with weak earthen walls (Fig. 10). The eggs themselves are held together tightly and covered by cementing secretions of the female. An observation of oviposition was made of a caged female in a laboratory terrarium that contained mixedgrass sod and bare ground. The female chose bare ground beneath a 15-watt incandescent bulb. She worked her ovipositor into the soil to the full length of the abdomen and took 100 minutes to complete oviposition, after which she took 20 minutes to withdraw her abdomen and 90 seconds to brush loose soil over the hole with her hind tarsi. Following this parental care she walked away.

Pods of the obscure grasshopper are seven-eighths inch long and contain eight to ten small (4 to 4.3 mm long), pale tan eggs. The eggs overwinter, but no study of their embryology has been made. The species has one generation annually.

Population Ecology

The obscure grasshopper is a frequent inhabitant of sites in the mixedgrass and shortgrass prairies. It is usually a subdominant member of an assemblage in mixedgrass prairie and often a dominant member in shortgrass prairie. In both cases densities are low, ranging from less than 0.1 to 2.2 per square yard. Occasionally in the mixedgrass prairie the species becomes the dominant one of an economic infestation (greater than eight young adults per square yard) and it may reach a density of three per square yard.

The fluctuations of population densities of the obscure grasshopper were recorded in an assemblage of 19 species in the mixedgrass prairie of eastern Wyoming (Table 1). An increase took place over a two-year period just before a sudden five-fold increase occurred from 1973 to 1974. The assemblage tripled at the same time, indicating favorable conditions for



Male

6. BL 13.5-15 mm FL 7.9-8.9 mm AS 21-23.



Female

7. BL 18-19.7 mm FL 10.5-11.5 mm AS 23-24.



Dorsum

8. Showing ensiform antennae, the condition of lateral foveolae of vertex invisible from above, and parallel lateral carinae of pronotum.



Wings

9. Spread left tegmen and hind wing of female.



Eggs

10. Egg pod and clutch of eggs removed from pod

nearly all of the species. The response of the obscure grasshopper and the dominant species of the assemblage, *Ageneotettix deorum*, followed Parker's model of gradual increase for a period of a few years, then a large increase of numbers in the following year. The assemblage, however, was decreasing until the final year, but the rate of increase of some species was great enough to cause the whole population to go from noneconomic to economic without reaching outbreak proportions (25 or more young adults per square yard).

On the shortgrass prairie of northeastern Colorado, increases in a population of the obscure grasshopper, as the dominant species in an assemblage of five species, did not appear to follow Parker's model. Rather, this species increased by 1.7 to 2.7 fold over a period of four years to reach a peak density of 2.2 adult grasshoppers per square yard. On the other hand, this peak density may be less than the density possible under more favorable conditions.

Prevalence of the obscure grasshopper in the mixedgrass prairie of eastern Wyoming is moderate as indicated by the results of the 1991 grasshopper survey. The species was found in 77 of the 419 sites examined (18 percent). It occurred chiefly as a subdominant in assemblages of grasshoppers. In the mixedgrass prairie of Montana, a study of the grasshopper fauna in 1953 and 1954 showed that the obscure grasshopper was present in ten sites out of 38 (26 percent) and dominant in one of these. In the latter site, the assemblage consisted of nine species with a total density of three per square yard.

Daily Activity

The obscure grasshopper is a phytophilous species, spending most of each day sitting vertically head up on the stems and leaves of grasses. Observations made shortly after sunrise and before the grasshoppers became active indicate that

the night is spent 1 to 2 inches above ground on both grasses and sedges. When the rays of the sun have struck their perches, about one hour after sunrise, both nymphs and adults begin to bask by adjusting their positions so that they directly expose a side or sometimes their back. They may also expose their back by taking diagonal positions on blue grama plants or small soil mounds. Occasionally they are found basking on bare ground, in which case they expose a side and often lower the associated hindleg. During the basking period, ground temperatures range from 70° to 100°F and air temperatures 1 inch above ground level range from 64° to 83°F. Activities such as feeding begin when ground temperature has risen to 85°F and air temperature to 70°F. No observations of their mating have been made in their natural habitat. In the mixedgrass prairie of western South Dakota females have been observed ovipositing into soil adjacent to buffalograss.

Because of their habit of sitting vertically on grasses, they are prone to remain inactive. When nymphs are flushed from their perches, they usually jump onto another plant. Occasionally they land on bare ground but quickly climb a grass leaf or stem. Adults may jump and behave like the nymphs or fly evasively. High soil temperatures of 110° to 130° and air temperatures at or above 90°F induce the grasshoppers to seek protection. They react in three main ways: they climb up to 4 inches on midgrasses, or they take diagonal positions on blue grama facing the sun to expose less of the body surface, or they rest in the shade under a canopy of vegetation above ground level on blue grama.

Their day ends with basking in the evening rays of the sun while resting vertically on grasses. As sunlight dims and temperatures cool, they eventually assume their nighttime positions.

	Number per sq yd and (increase rate)						
	1968	1969	1970	1971	1972	1973	1974
<i>Ageneotettix deorum</i>	3.4	2.2 (0.6)	0.8 (0.4)	1.2 (1.4)	0.8 (0.7)	1.3 (1.6)	1.3 (2.6)
<i>Opeia obscura</i>	1.9	0.6 (0.3)	0.1 (0.2)	0.1 (1)	0.1 (1)	0.2 (2)	0.2 (4.5)
Assemblage of 19 species	12.8	6.1 (0.5)	2.9 (0.5)	5.6 (1.9)	4.0 (0.7)	3.3 (0.8)	10.5 (3.1)

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