

Whitwhiskered Grasshopper

Ageneotettix deorum (Scudder)

Distribution and Habitat

The whitwhiskered grasshopper, *Ageneotettix deorum* (Scudder), is widely distributed in grasslands of North America. Highest densities develop in the mixedgrass and the bunchgrass prairies. In the tallgrass prairie large numbers may occur on high ridges covered by blue grama or in grazed pastures of smooth brome or Kentucky bluegrass. A study of altitudinal distribution of grasshoppers in Colorado shows that this species is common in plains grassland at altitudes up to 5,750 feet but that numbers decline at 6,700 feet. Above 7,500 feet it is a non-resident.

Economic Importance

The whitwhiskered grasshopper is a pest of rangeland grasses. It is often the dominant species in outbreaks on the mixedgrass prairie reaching densities of 25 adults per square yard and comprising 50 percent or more of the grasshopper assemblage. Its exact role as a pest has not been experimentally determined. Observations of its behavior in natural habitats show that it not only feeds on green leaves of grasses but also on ground litter (felled leaves, seeds, dung of livestock, and dead insects). In feeding on attached green leaves, this grasshopper often severs them from the plant.

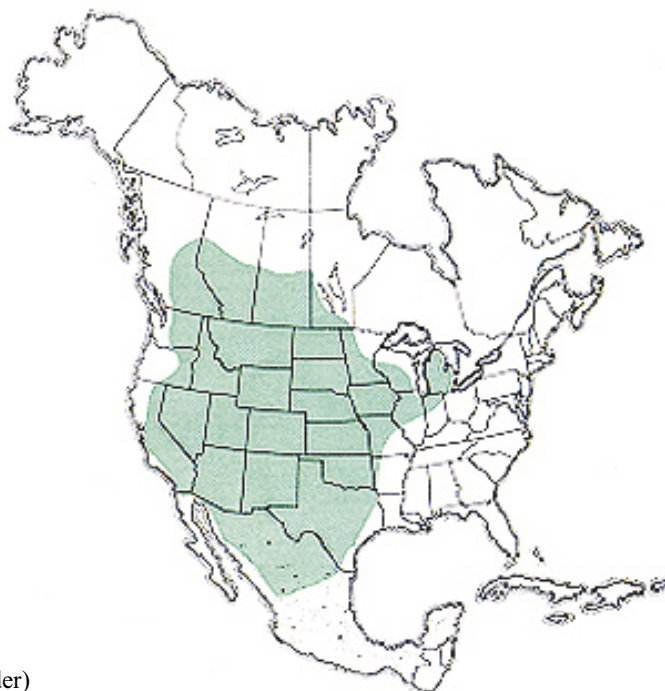
The whitwhiskered grasshopper is one of the smaller rangeland grasshoppers. Males average 110 mg live weight and females 310 mg (dry weight: males 31 mg, females 89

mg). These weights are little more than half that of the bigheaded grasshopper. Because of difference in size and food habits, the smaller grasshopper presumably has less than half the impact of the larger.

Food Habits

The whitwhiskered grasshopper feeds on many kinds of grasses and on several sedges. In its natural habitat it exhibits no clear preference for any particular species of host plant. Laboratory tests, however, show it prefers wheat and Kentucky bluegrass over native grasses. Examinations of crop contents indicate that the amount of each species of grass consumed is directly proportional to its abundance in the habitat. Important host plants include blue grama, western wheatgrass, needleandthread, Kentucky bluegrass, threadleaf sedge, and needleleaf sedge. In a desert prairie of southwest Texas, crop contents of this grasshopper consisted of 76 percent blue grama, 11 percent fall witchgrass, 5 percent buffalograss, and 8 percent of an undetermined forb.

Young nymphs have been observed feeding on green leaves of Sandberg bluegrass. This grass matures and dries up early, becoming less attractive to the older instars and adults. Both direct observations and crop content examinations show that nymphs and adults feed heavily on ground litter as well as on green leaves.



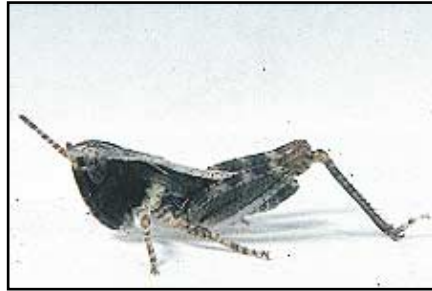
Geographic range of
Ageneotettix deorum (Scudder)

Instar 1



1. BL 4.7-5.1 mm FL 2.1-3.3 mm AS 13.

Instar 2



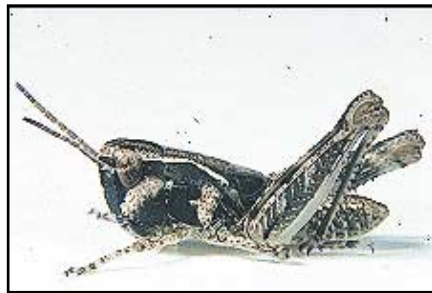
2. BL 6.4-6.7 mm FL 4-4.2 mm AS 15-17.

Instar 3



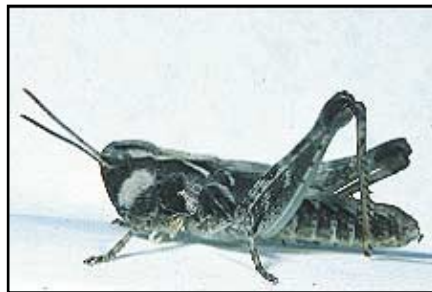
3. BL 8.3-9.2 mm FL 5.1-5.6 mm AS 20.

Instar 4



4. BL 9.9-11 mm FL 7.3-7.7 mm AS 22.

Instar 5



5. BL 14-15 mm FL 9.1-9.8 mm AS 24.

Figures 1-5. Appearance of the five nymphal instars of *Ageneotettix deorum* - 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 adults have been observed clinging to needleandthread and western wheatgrass and feeding on the leaves in a head-down position. When late summer rains stimulate new growth of western wheatgrass, the adults take advantage of this nutritious food supply. They may eat the young leaves down to the ground. Several species of forbs are consumed in small amounts.

Migratory Habits

The whitewiskered grasshopper is a vigorous flier near the ground. Evasive flights are straight, silent, low (3 to 6 inches), and short (3 to 6 feet). A competent flier, it is known to make dispersal flights. It has been found at high mountain altitudes as a relatively frequent "accidental" (adults in locations where the species does not complete its life cycle). Adults have also been found in the center of large cities on cement sidewalks and on paved streets and parking lots. No records have yet been made of migrating swarms.

Identification

Adults of the whitewiskered grasshopper (Fig. 6 and 7) are medium-sized and colored reddish-brown with many fuscous markings. The head has only a slightly slanted face. The antennae have the dorsal side light gray or whitish, a character that has provided the common name for this species. Wings are long, but range from short of the end of abdomen to beyond the abdomen. The tegmina are speckled brown. The hind tibiae are red to orange with the proximal end usually black; the terminal inner spur is elongated, 1.5 times as long as the other inner spur (Fig. 9). The hind femora have the knees black and have three fuscous marks on the upper marginal area; the middle mark is triangular.

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

1. Head with lateral foveolae oblong and visible in dorsal view; antennae filiform but flattened, suffused or ringed light gray or whitish; face moderately slanted.
2. Pronotum with cream-colored bands along each lateral edge of disk; bands continue on head to compound eye (Fig. 8); median carina of disk low but distinct.
3. Tibia with paired terminal spurs unequal in length.

Figures 6-10. Appearance of the adult male and female of *Ageneotettix deorum*, two diagnostic characters, and the egg pod and loose egg.

- Color distinctively black along front and side of head, side of thorax, side of abdomen, and on medial area of hind femur; dorsum of body light tan with a few brown spots. Instars 2 to 5 with light tan patch below compound eye and on lateral lobe.

Hatching

The whitwhiskered grasshopper is an early-hatching species. Eggs begin embryonic growth in the summer of deposition and continue until they attain 50 percent development at which time (stage 19 embryo) they diapause. During winter, diapause is broken but embryonic development does not resume until temperatures rise in the spring. The nymphs emerge about the same time as the nymphs of the bigheaded grasshopper. The hatching period lasts from four to six weeks. Like the egg pods of the bigheaded grasshopper, those of the whitwhiskered grasshopper lie horizontally just below the ground surface exposed to hot temperatures and extremely dry conditions in summer. The eggs are able to withstand these adverse physical conditions, but many predators - birds, rodents, beetles, bee flies - find them a nutritious food source.

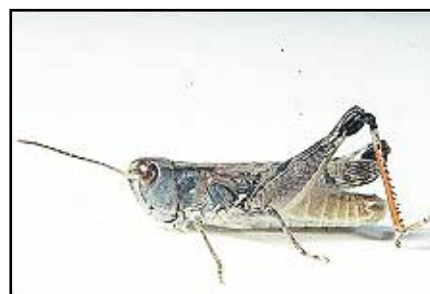
Nymphal Development

The nymphs of the whitwhiskered grasshopper develop more slowly than those of the bigheaded grasshopper. They complete nymphal development in 40 to 48 days, the females taking longer than the males. Although development of most individuals requires five instars, males may require only four and females may occasionally have six.

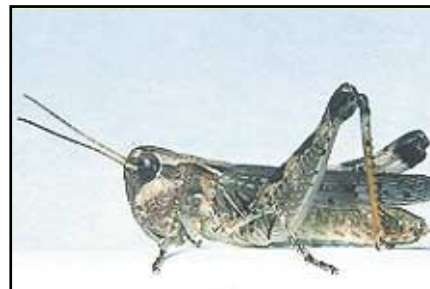
Adults and Reproduction

The adults generally remain in the same area in which the eggs hatch and the nymphs develop. There they find the resources necessary for their survival and reproduction and tolerance for large number of enemies - birds, rodents, spiders, and predaceous insects - that use them for food. Populations of adults dwindle over the summer, but daily mortality early in adult life ranges from less than 1 percent to nearly 10 percent.

Males spend much time wandering about on the ground seeking mates. Pair formation is initiated by the males approaching moving females. Courtship consists of visual signals, principally the male raising and lowering his hind femora and antennae. Copulation has been observed to last only five minutes.



6. BL 15.5-16.2 mm FL 9-9.7 mm AS 25.



7. BL 21-24 mm FL 12-12.5 mm AS 25.



8. Color pattern of head and pronotum, dorsal view.



9. Inner side hindleg of male showing color pattern and tibial spurs.



10. Egg pod and loose egg.

Male

Female

Pattern

Hindleg

Egg Pod

The female deposits her first clutch of eggs when she is 14 days old. She then deposits succeeding clutches at a rate of approximately one every three days. The pods contain from three to five eggs and average four.

A female usually selects blue grama or buffalograss sod for her oviposition site but may occasionally choose bare ground. Laying the eggs in soil at a shallow depth, she forms the pod horizontally just below the surface. An ovipositing female attracts several attending males. After completion of oviposition she covers the hole left by the extraction of her ovipositor with litter and soil particles. To do this, she sweeps the ground with her hindlegs using the tarsi as brushes.

The fecundity of the whitethiskered grasshopper appears to be less than that of the bigheaded grasshopper. Confined as mating pairs in field cages and fed cheatgrass brome and plains bluegrass, 22 females produced an average of 81 eggs each. The greatest reproduction by a female was 107 eggs. Caged females had an average longevity of 88 days and males 85 days. In their natural habitat females live an average of 23 days. The latter figure, along with the preoviposition period of 14 days and rate of oviposition of four eggs every three days, provides an estimate of fecundity in nature that averages 12 eggs per female. There is one generation annually.

The egg pod of the whitethiskered grasshopper is 10 to 12 mm long and 4 mm in diameter (Fig. 10). It is tough and curved. The cap is slanted and faces upward in the soil. Eggs are 5.0 to 5.3 mm long and pale yellow to whitish.

Population Ecology

The whitethiskered grasshopper is frequently the dominant species in grasshopper assemblages infesting the mixedgrass prairie. Populations of this species exhibit a

variety of responses to their environment. A common response is a gradual increase in numbers of 1.5 to 3-fold annually for a period of about four years and then a sudden increase of 6-fold to precipitate an outbreak. The entire grasshopper population may have risen to 50 adults per square yard and of this density the whitethiskered grasshopper contributes 50 percent. Crashes of the population may happen suddenly. After three to five years or more of high densities, the population may crash to low levels. The species appears to be highly sensitive to weather and enemies. Daily mortalities of nymphs have been shown to range from 3 - 9 percent and of adults from less than 1 to over 9 percent. The causes of these variations have yet to be investigated.

Daily Activity

The whitethiskered grasshopper is a diurnal, ground-loving insect. At night, individuals rest on bare ground or on litter often under the protection of a canopy of grass. One to two hours after sunrise individuals move to the east side of grass crowns and begin basking by resting perpendicular to the rays of the sun (side exposed to sun) and by hugging the ground surface. They bask for an hour or more, then the adults begin their normal activities of pottering (intermittent wandering with frequent changes in direction), feeding, mating, and egg laying. Activity slows when temperatures rise in the early afternoon to 90°F (air) or 120°F (soil surface). Individuals then seek the shade of small shrubs sitting on the ground or litter. As temperatures decline later in the afternoon, they again take up normal activities. Two to three hours before sunset they begin basking once more, this time on the west side of grass crowns. As the sun sets individuals remain on the ground to pass the night at rest.

Selected References

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