Spottedwinged Grasshopper

Cordillacris occipitalis (Thomas)

Distribution and Habitat

The spottedwinged grasshopper, *Cordillacris occipitalis* (Thomas), has a wide distribution in western North America. It inhabits grasslands including the mixedgrass, shortgrass, desert, and bunchgrass prairies.

Economic Importance

The spottedwinged grasshopper is a pest of rangeland grasses, especially in areas of the mixedgrass prairie where the texture of soils is sandy loam. There it is often the dominant species. Young adults reach densities as high as 40 per square yard. In areas with heavier soils, densities are less or the species is virtually absent, as it is in much of the bunchgrass prairie. Light densities of one to five per square yard are common in the mixedgrass and shortgrass prairies, and these numbers of the spottedwinged grasshopper then add to the damage of the dominant species.

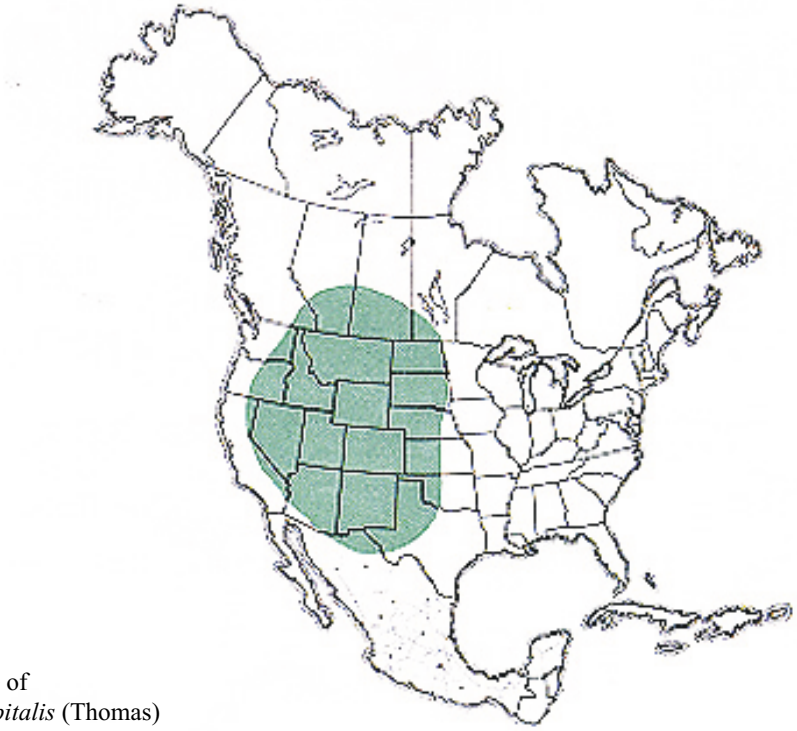
The spottedwinged grasshopper weighs approximately half that of the bigheaded grasshopper. Live weights of spottedwinged males average 101 mg and females average 224 mg (dry weight: males 30 mg, females 67 mg). As both species have similar feeding habits, the assumption is that a spottedwinged grasshopper has half the impact of a bigheaded grasshopper on rangeland forage.

Food Habits

The spottedwinged grasshopper feeds on the green leaves of grasses. It climbs a plant and in a head-down position chews on a leaf. It holds onto the leaf with its front tarsi and usually consumes all of the cut portion. Sometimes it loses a leaf, especially a short tip, which then falls to the ground. This usually is eaten by other grasshoppers or becomes litter.

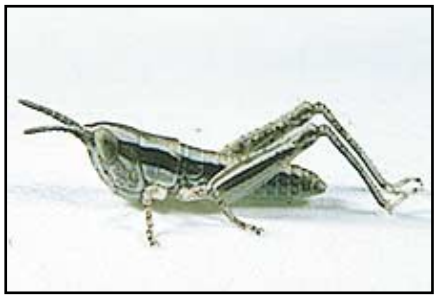
A study in eastern Colorado has shown a high and significant correlation between the frequency of plant species in the diet of this grasshopper and the frequency of grass species in its habitat. The study indicates that this grasshopper is not highly selective, as it feeds on a variety of grasses. Common host plants of the spottedwinged grasshopper include blue grama, needleandthread, western wheatgrass, sand dropseed, downy brome, threadleaf sedge, and needleleaf sedge. Observations of its feeding and analyses of crop contents reveal that it grazes on a minimum of 15 species of grasses and four species of sedges.

Only rarely does this grasshopper consume forbs or ground litter. Arthropod parts have occasionally been found in crop contents. No information is available on whether this grasshopper feeds on bran bait. It is



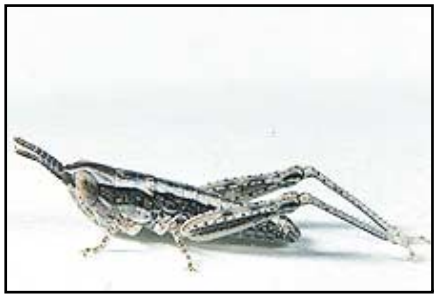
Geographic range of
Cordillacris occipitalis (Thomas)

Instar 1



1. BL 5.2-6.0 mm FL 3.2-3.4 mm AS 13.

Instar 2



2. BL 8.2-8.8 mm FL 4.5-4.8 mm AS 17.

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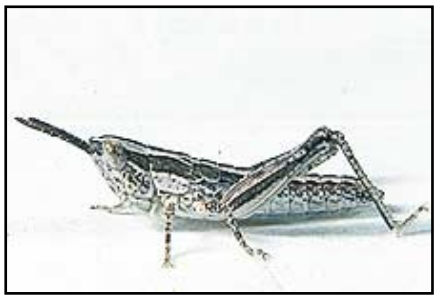
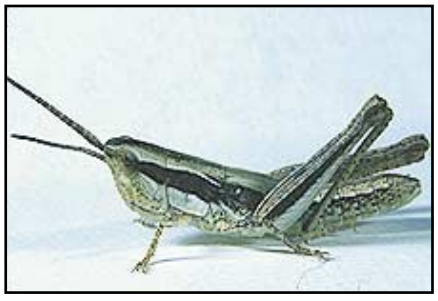


3. BL 9.3-10 mm FL 4.9-5.9 mm AS 19-20.

Instar 4

4. BL 9.7-13.1 mm FL 5.7-8.0 mm AS 21-22.

Instar 5



5. BL 12.7-16 mm FL 7.9-9.8 mm AS 22-24.

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

attracted, however, to discarded fresh apple cores, which it eats from a horizontal position on the ground.

Migratory Habits

There are no records of the spottedwinged grass-hopper making dispersal or migratory flights. The possession of long wings, however, that extend to the end of the abdomen or beyond, provide it with the necessary appendages for lengthy flight. One indication that it may make dispersal flights is found in the observation of a large population of young adults on a site in the mixed-grass prairie of eastern Wyoming. These grasshoppers disappeared between weekly samplings. Neither live grasshoppers nor their carcasses were observed in this area where an economic infestation existed a week earlier.

Evasive flights of the spottedwinged grasshopper are straight, silent, low (2 to 4 inches), and short (2 to 4 feet). These flights are usually with the wind but may be across the wind.

Identification

The adult of this species is a tan and gray, slim, medium-sized grasshopper (Fig. 6 and 7). Antennae are tan or pale and slightly ensiform. A conspicuous brown stripe is present on the side of the head extending from behind the middle of the compound eye and continuing onto the lateral lobe of the pronotum. The pronotum has a low but distinct median carina, which is cut once behind the middle, and low lateral carinae highlighted in ivory. Wings are long, extending to the end of the abdomen or slightly beyond; tegmina are spotted brown (the character that gives this grasshopper its common name) with an ivory streak above base of hindleg (Fig. 6 and 8). Hind tibiae are pale orange.

The nymphs of the spottedwinged grasshopper are identifiable by their shape, color patterns, and external structures (Fig. 1-5).

1. Head with strongly slanted face; antennae ensiform and colored brown with anterior edge of segments light tan.
2. Conspicuous brown stripe on side of body starts from behind middle of compound eye, runs on side of head, and continues onto side of thorax and abdomen. Wide tan stripe with brown spots on dorsum of body.

Figures 6-10. Appearance of the adult male and female of *Cordillacris occipitalis*, wings, and the egg pod and an opened pod exposing three eggs in situs.

3. Pronotum with low, distinct median carina; lateral carinae colored light yellow or ivory.
4. Hind femur with upper medial area brown, lower medial area light gray.

Hatching

The spottedwinged grasshopper is an early-hatching species. Eggs begin incubation upon being laid in the ground and develop to embryonic stage 19 by fall. At this time they are in diapause. Development resumes when temperatures rise in spring. The nymphs emerge five to seven days ahead of the nymphs of the bigheaded grasshopper. The hatching period lasts four weeks. The eggs lie at a shallow depth (top one-half inch of soil) and are exposed to hot temperatures and dry conditions in summer. Eggs are able to withstand the heat and desiccation; they remain viable and absorb lost water whenever moisture conditions become favorable. Predators - birds, rodents, beetles, bee flies - hunt for them in the ground and feed on them.

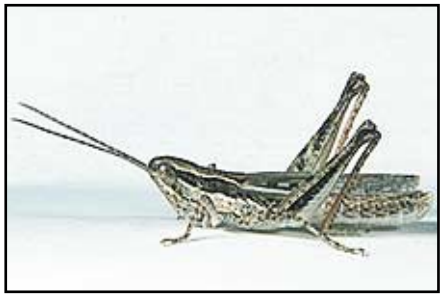
Nymphal Development

Although nymphs are present in the habitat for eight weeks, individual nymphs do not take this much time to reach the adult stage. From twice weekly sampling and mathematical calculation, the length of the nymphal period has been estimated to be 22.5 days. Further divisions of this period are estimated as 5.5 days for the first instar, 6 days for the second, and 11 days for the last two or three nymphal instars. From our knowledge of grasshopper development in several other species, the figure of 11 days for the last instars appears to be underestimated. For an individual female nymph to develop to adulthood, a more reasonable distribution of instar development times would be 5.5, 6, 7, 8, and 9 days, or 36 days for the entire period. This figure is closer to the estimate of 41 days for nymphal development based on the usual method of estimating the length of the nymphal period in nature (i.e. the number of days between the first appearance of nymphs and the first appearance of adults.)

Adults and Reproduction

Adults remain in the same habitat in which the nymphs hatch and develop. This habitat continues to furnish nutritious food and a favorable place in which to

Male



6. BL 16.5-18.5 mm FL 10-10.4 mm AS 24-25.

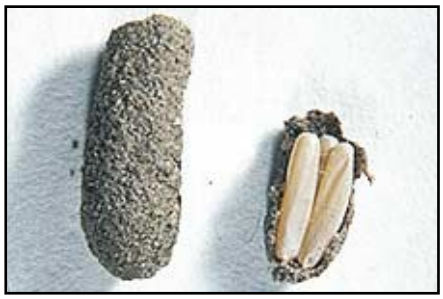
Female

7. BL 21-23.5 mm FL 12-12.8 mm AS 24-25.

Wings

8. Forewing (tegmen) showing spots and clear hindwing.

Egg pod



9. A whole egg pod and one opened to show eggs.

live, in spite of an abundance of deadly enemies, such as birds, rodents, spiders, and insect predators and parasites.

Mating pairs are seen in the habitat after a week or two of adult maturation. The male attracts females with his calling song, made by stridulating (rubbing a line of pegs on the hind femur against a raised intercalary vein of the tegmen). He approaches an attracted female and sends visual signals by raising and lowering his antennae and tipping his hindlegs. Before he mounts her, the male assumes a position at right angles to the female. Both mating and oviposition usually occur in the morning.

When ready to lay eggs, the female may brace herself on a clump of grass and then work her abdomen down into bare ground, or she may simply oviposit in a bare area. The pod is formed in a vertical position and usually contains two or three eggs oriented vertically in the bottom half.

No cage studies have been made to determine the fecundity of the spottedwinged grasshopper. Field sampling of eggs indicate that fecundity is about half that of the bigheaded grasshopper. Peak adult densities of both species were nearly the same in a mixedgrass prairie site in eastern Wyoming, 5.7 per square yard of the spottedwinged grasshopper and 5.8 per square yard of the bigheaded grasshopper. Sampling of eggs in fall showed the presence of 22 eggs per square yard of the spottedwinged grasshopper and 45 eggs per square yard of the bigheaded grasshopper.

The pod of the spottedwinged grasshopper has the shape of a tiny test tube. It is three-eighths inch long and one-eighth inch in diameter (Fig. 9). A froth plug is recessed about one-eighth inch from the top. Eggs are pale yellow and 4.4 to 5.6 mm long.

Population Ecology

For periods of five years and longer, low densities of 0.2 to 0.5 individuals per square yard of the spottedwinged grasshopper occur in assemblages of grasshoppers inhabiting the mixedgrass prairie. In sites of sandy loam soils, however, the spottedwinged grasshopper may follow Parker's model of population growth in which the population increases by two fold each year for three successive years then by three to four fold in the fourth year, reaching outbreak numbers. Such an irruption occurred in an eastern Wyoming site in 1974. In the assemblage of grasshopper species of the outbreak, the spottedwinged grasshopper was dominant at a density of 20 per square yard. This density was followed by the whitewhiskered grasshopper at nine per square yard, the bigheaded at seven per square yard, and the striped grasshopper at seven per square yard. Nine other species of grasshoppers made up the remainder of the assemblage and totaled six per square yard. The causes of the phenomenal increases of the spottedwinged grasshopper are unknown but may be related to variations in predation of the adults. Detailed sampling of natural populations indicates that when adults survive into late summer the females are released from reproductive control and lay more eggs.

Daily Activity

The spottedwinged grasshopper spends part of its day on the ground and part in vegetation. During the night the nymphs usually rest head-up on grass leaves two to seven inches above the ground. Adults rest either on vegetation or on the ground. About one-half to one hour after sunrise the majority of individuals have moved to the ground and are basking - sides perpendicular to rays of the sun and hugging the ground. They bask for an hour or longer. When air temperature rises to 70°F, they begin normal activities of pottering, feeding, and mating. The females oviposit later in the morning, when air temperature registers 82°F.

When air temperatures for brief periods rise above 90°F and soil temperatures above 120°F in midsummer, the grasshoppers, adults by this time, climb small shrubs (e.g., fringed sagebrush and spreading wildbuckwheat) for protection from the heat. They rest head-up in the shade two to eight inches above the ground.

Later in the afternoon when air temperatures have declined to 90°F or lower, the grasshoppers once again become active and begin a second period of feeding. Later they may bask, and eventually they take up their night resting positions in the vegetation or on the ground.

Selected References

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