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The Mormon Cricket

Claude Wakeland, J. R. Parker

Since the days of the early settlers the Mormon cricket, a large wingless grasshopper, has remained a periodic scourge and persistent threat to agriculture in Intermountain and Far Western States. A native, dry-land insect of the West, naturally inhabiting high, rugged terrain in mountainous country, Mormon crickets are feared in cultivated areas because of their sudden, devastating migrations and the severity and extent of their attacks.

Mormon crickets increase to large numbers at irregular intervals in more well-defined areas than do most range grasshoppers. The outbreak centers or hold-over places are mostly in areas remote from crops. When conditions are favorable, the crickets become very abundant, form in bands, and migrate long distances from the hold-over areas by walking and jumping.

They are voracious feeders on nearly all plants. Probably their greatest damage is to range forage. They feed on more than 250 species of range plants and on all cultivated crops they come in contact with. The insect shows preference for some kinds of plants and for certain plant parts. In general, flower and seed parts are severely attacked. The preferred range plants are those with large or fleshy succulent leaves, such as balsamroot, mustard, dandelion, bitterroot, and young Russian-thistle. All crops in outlying dry farm areas, which are in the path of migrating Mormon cricket bands, may be attacked, but the greatest financial loss occurs in small-grain crops, principally wheat. Alfalfa, sweetclover, and truck crops, especially young sugar-beet plants, are among its preferred foods.

Tender garden crops often are com-

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pletely destroyed. Headed grain crops may be stripped of the kernels. Very important, but inadequately measured, is the destruction of seed on forage and browse plants—such destruction adversely affects the establishment or maintenance of range cover.

Laboratory experiments were conducted by Frank T. Cowan and H. J. Shipman to determine the quantity of food consumed by Mormon crickets, which in reality are nonflying range grasshoppers. They found that an adult ate an average of 100 milligrams of food (dry weight) a day. At that rate, 96,800 crickets, or 20 per square yard over an acre, would eat 20 pounds of forage a day, which is the same as the average daily consumption of a cow.

Losses to agriculture chargeable to Mormon crickets during the past 100 years undoubtedly amount to millions of dollars. In 1938 alone the insect was estimated to have caused an average measurable loss of 15 percent on almost 13 million acres of range land and to have damaged crops from slightly to severely on 235,000 acres of croplands.

The extensive infestations of the late 1930's were reduced to a point where in 1949 the insects invaded and damaged only 230 acres of crops and caused slight injury to range plants on 200,000 acres of range.

During the 1930's Mormon crickets reached the largest outbreak proportions on record. A survey in the fall of 1938 revealed damaging populations in Colorado, Idaho, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. No survey was made then in California, but large numbers of crickets were known to be there.

MEASURES TO CONTROL Mormon crickets have evolved through progressive stages as rapidly as research has led the way. Early operations to halt migrating bands involved the use of trench barriers, wood-metal barriers, metal barriers, oil-on-water barriers, and dusting the insects with sodium arsenite dust. Dust was applied by means of hand dust guns and later by power dusters.

Sodium fluosilicate in poisoned bran baits was tested in grasshopper control in 1933 but was not used extensively against Mormon crickets until 1939. Early trials with baits containing arsenic were failures; before 1939 dusting with mixtures of sodium arsenite and hydrated lime was the most effective known method of control. Dusting was expensive and arsenic was dangerous to the operator, to livestock, and to green plants. In 1935 attempts to find a cheaper and less dangerous method were started by Cowan. He learned that tiny amounts of arsenic were highly repellent to Mormon crickets and that mixtures of bran and sodium fluosilicate were readily eaten and highly toxic.

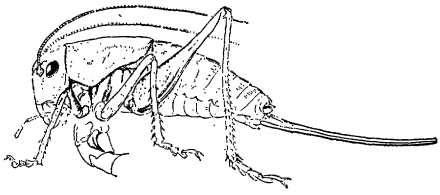
Bait composed of mill-run bran, sawdust, and sodium fluosilicate has superseded sodium arsenite dust. It is applied by ground spreaders and by airplanes. Mormon crickets are controlled also with a bait composed of pure bran impregnated lightly with an oil solution of chlordane or toxaphene. Each improvement in control methods has meant increased effectiveness, less work, or lower operational costs.

According to records of several years, the cost of control with sodium arsenite was $2 an acre with hand machines and $1.50 with power dusters. The average per-acre cost of baiting in 1941 through 1949 was 85 cents or 65 cents less than the cost of power dusting. In the 9 years, 2,649,160 acres were baited. This represents a saving of $1,721,954 from the use of bait rather than power dusting with sodium arsenite.

Several different baits are used with good results. Steamed, rolled wheat impregnated with a solution of 1 pound of toxaphene in one-half gallon of oil to each 100 pounds of wheat is one of the easiest baits to handle. The material, spread at the rate of 3 to 5 pounds to the acre, gives almost complete control. Large, flaky bran, 100 pounds, impregnated with a solution of 1 pound

of toxaphene or one-half pound of chlordane in 1 gallon of oil and spread at the rate of 10 pounds an acre, also results in satisfactory control.

Baits are applied by aircraft or



The female of the Mormon cricket is a wingless katydid whose long ovipositor is a ready tool for inserting the eggs deep in the ground.

ground equipment. Airplanes equipped for spreading bait for grasshoppers are usually used. On small infestations bait broadcasters or blower spreaders are commonly used. The bait also may be spread by hand.

Because the crickets ordinarily feed heavily while migrating, bait is spread in strips across the front of an advancing band, or uniformly in hold-over areas where crickets are not migrating. More than 95 percent of the crickets in a band are commonly killed in this way.

Entomologists have started experiments with new chemicals in the hope of finding better methods of control.

THE MORE IMPORTANT hold-over areas in the Rocky Mountain States have been mapped and are surveyed each year. Poisoned bait is applied whenever dangerous numbers are found. Baiting relatively small acreages within the hold-over areas, in recent years, has held range damage to a minimum, prevented crop damage, and eliminated the extensive control operations formerly conducted after Mormon crickets had spread from the hold-over areas to much larger acreages.

Organized control over nearly two decades has reduced the infestations chiefly to hold-over areas and has eliminated the possibility of current heavy crop damage.

Present control operations are aimed principally at preventing populations from again building up in local areas to the point where major outbreaks could occur. Since 1945 control has been accomplished mainly against range infestations distant from cultivated lands. Control work was done in Colorado, Utah, Montana, Nevada, Oregon, and Washington in 1950 and 1951.

Other areas of infestation in Utah and other States were reported and examined late in the season. Those infestations are developing in areas that for several years have been suspected of being particularly favorable to the crickets. Many are on public lands used for grazing and some are in remote mountain or desert locations where the land has little value to humans but provides conditions favorable to survival of the insects. Infestations may build up there and the crickets emigrate, over a period of years, to nearby crop or grazing lands to become the "seed" from which a destructive outbreak can grow when climatic and biological factors are favorable.

The increased populations of crickets that were noted in several States in 1950 have developed in areas in which severe outbreaks were experienced in 1937 and 1938. Where feasible, measures were taken to control the infestations.

The later developments indicate, to those familiar with the earlier, widespread outbreaks of Mormon crickets, that similar infestation conditions may be near at hand if control at the source is neglected. Control of small outbreaks when they start depends on annual surveys to determine the extent and intensity of infestations. Trained men make such surveys by searching out cricket concentrations and recording pertinent data, such as size of bands, location, and intensity, factors that govern the need for control.

Prevention of another large-scale outbreak of Mormon crickets is feasible. Between 1938 and 1949, the infested area was reduced from nearly

19,000,000 acres to 116,000 acres. By directing control against small concentrations of the insects in known infested areas, we can continue to decimate them so that they have no opportunity to band, migrate, and coalesce into large bands that grow to outbreak proportions. Mormon crickets increased in numbers in several States in 1950 and showed a banding and migrating tendency they had not exhibited in recent years. Unless many small bands are consistently controlled when they are found, another widespread outbreak may be in the making.

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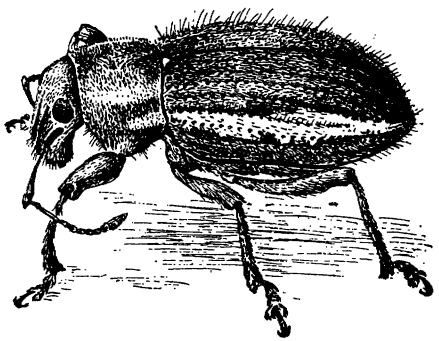

White-fringed beetle.

White-Fringed Beetle

R. A. Roberts

The name "white-fringed beetle" is applied commonly in the United States to a group of species and races of beetles belonging to the genus *Graphognathus.* They are believed to have been brought accidentally from South America to the United States. They were first found in Okaloosa County, Fla., in 1936 and before long were discovered in adjoining counties in Alabama.

In 1937 their larvae did serious damage to cotton, corn, peanuts, and velvetbeans in the infested area. Entomologists and officials from several States who visited the area concluded that white-fringed beetles were a serious threat to a wide range of cultivated crops elsewhere in the United States. Representatives of the State Plant Board of Florida, the Alabama Department of Agriculture and Industries, and the Bureau of Entomology and Plant Quarantine agreed that a cooperative Federal-State program to attempt the control of the white-fringed beetle should be started immediately.

The beetles were found in Louisiana and Mississippi in 1937. In 1942 some were collected in North Carolina at Wilmington. In 1946 infestations were discovered in Georgia near Eastman, Fort Valley, and Macon. Inspections during 1946 of properties landscaped with ornamental plants obtained from nurseries in the infested area in Georgia disclosed many additional infestations in that State, as well as two in Alabama and one in South Carolina. In 1948 the beetle was found in Tennessee. On January 1, 1952, nearly 340,000 acres (including 100,000 acres of farm land) were known to be infested.

The adult beetle is a little less than