

Mormon Cricket Control



FRANK T. COWAN

EXTENSION ENTOMOLOGIST

Montana Extension Service in Agriculture and Home Economics
J. C. Taylor, Director

Montana State College and the United States Department of
Agriculture, Cooperating, Acts of Congress,
May 8 and June 30, 1914.



INTRODUCTION

The purpose of this bulletin is to bring together the known facts concerning the mormon cricket, including life history, habits and control, in order that farmers who are suffering or likely to suffer from their depredations may be best prepared to meet the situation.

The mormon cricket is essentially a western insect. Its geographical range extends north along the Rocky Mountains from New Mexico well into Canada. Outbreaks have been known to occur as far east as the Black Hills and as far west as the Sierras. The first recorded outbreak was in the Salt Lake Valley in Utah in 1848.

During the last 87 years periodic outbreaks have occurred in at least seven western states. At the present time every one of these states has a mormon cricket problem.

There are only two cases on record where definite estimates have been made on the amounts of crop damage. The first of these was made in Colorado in 1922, when the damage in Moffatt County was placed at \$15,000 to \$20,000. The other was in Lake and Sanders Counties, Montana, in 1926, where estimates of crop loss were placed as high as \$125,000. These two instances give some idea of what might be expected during severe outbreaks. No attempt was made in either of these to estimate damage to range grasses.

MORMON CRICKET CONTROL

By

FRANK T. COWAN, EXTENSION ENTOMOLOGIST

NATURE OF AN INFESTATION

Crickets occur in bands varying in size from a few square feet to a square mile or more. These bands are formed soon after hatching on or near the egg beds and are held more or less intact throughout the life of the insect.

During the early stages of their development there may be as many as 100 or more crickets to the square foot. This naturally concentrates the bands on relatively small areas. As the young nymphs develop in size they require more room and the band accordingly spreads over a larger territory. It is usually possible to find the outer limits of a band but often in a severe infestation they may be so close together as to seemingly form one continuous mass.

CROPS DAMAGED AND NATURE OF INJURY

Although practically all farm crops including vegetables and fruits are damaged during severe outbreaks, small grains probably suffer the greatest amount. The damage to grains is unique in that seldom is any part eaten except the kernel. This type of damage is hard to see and often times the farmer doesn't realize just how much his crop is reduced until after harvest. Close examination, however, during the "dough" and ripening periods will reveal the apparently normal heads as being devoid of seeds.

Alfalfa is damaged in the early spring but not so much later in the season. Close observation in a heavily infested field will usually show the crickets on the ground feeding on dandelions, of which they are especially fond.

LIFE HISTORY

Egg.—The eggs of the mormon cricket are about one-fourth inch long, rounded at the ends and slightly curved. They are dull gray in color and resemble a kernel of rye. They are laid singly, about three-fourths inch under the surface of the soil. Several eggs often are found closely grouped but it is thought these are laid by different females who, in passing over the ground searching for a place to deposit an egg, finds the spot to her liking.

The eggs are deposited in light sandy loam soil, in elevated, well-drained locations. Heavy clay, and bottom lands are seldom chosen for egg laying. South, east and west exposures are chosen in preference to the north. Timbered slopes are avoided although many eggs are deposited on land having a heavy sage brush covering.

Hatching takes place at a comparatively low temperature (40°F. to 50°F.) which brings the hatching date much earlier than for grasshoppers. Normally this date is between April 1 and May 1, depending on weather conditions. Hatching dates have been recorded as early as the last of February in western Montana, and March 15 in Colorado. This was due entirely to an abnormally early spring.

Nymphs.—When first hatched, the young crickets are about one-fourth inch long, black, with two yellowish longitudinal stripes down the back, and a white band on the extreme outer edge of the prothoracic shield just back of the head. After about 10 days the insects molt their skins or skeletons and emerge into the second instar. The only change that can be noted between crickets of the first and second instars is a slight increase in size. In all there are seven molts before they reach the adult stage.

When the third instar is reached, the ovipositor of the female located on the under side of the body near the top of the abdomen, is visible to the naked eye. This doubles in length with each successive molt and serves as an accurate method of determining the instar. From the fourth instar on, their color may vary from a light green, or tan to black with combination of all of these colors found in individual crickets.

From 60 to 75 days are probably consumed in nymphal development. Thus if crickets hatch by April 1 they should reach the adult stage about June 1 to 15.

Adult.—On reaching maturity the adult female cricket attains a length of one and one-half inches including the sword-like ovipositor. The males are slightly smaller and of course do not have ovipositors attached. Their color variations are similar to those found in the nymphal stages. As they grow older this gradually changes to a uniform dark brown to black.

Mating takes place 10 days to two weeks after the last molt, and egg laying begins soon after. The eggs are deposited by groups separated by intervals of from five to 10 days. Matings are effected between each

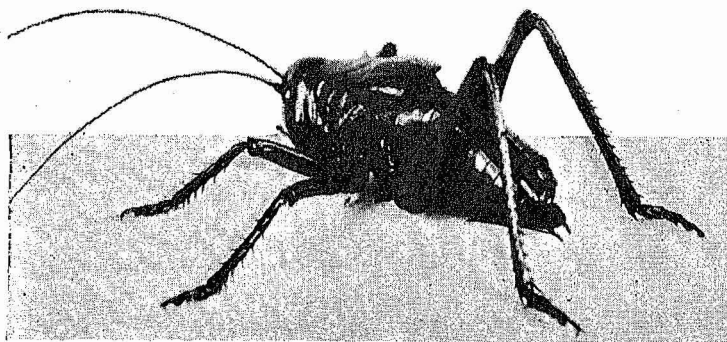


Fig. 1. Adult male. (State Ent. Cir. 53 Colo. Agri. Col.)

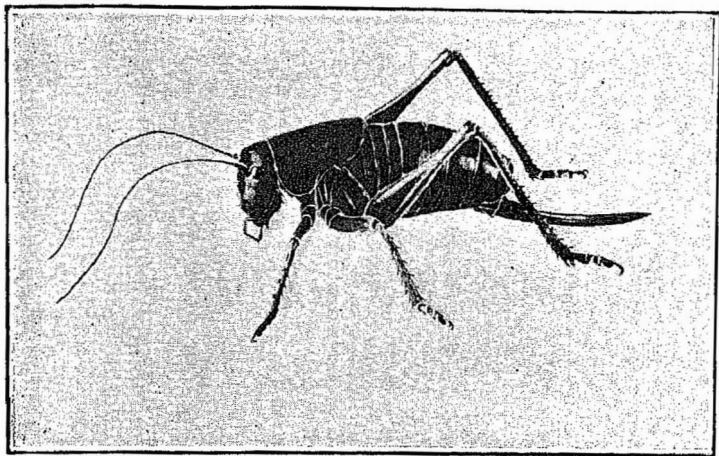


Fig. 2. Adult female

group of eggs. From 25 to 50 eggs are laid in one group. Each female probably lays from 150 to 200 eggs during her life time.

Egg laying continues throughout July and August and possibly into September.

HABITS

Food Plants.—Aside from the cultivated crops there is a long list of native plants in Montana that are used as food by mormon crickets. Foremost are the common bitterroot, all of the mustards but especially the "Tumbling" or "Jim Hill," and dandelions. Russian thistle is eaten readily early in the spring when it is young and tender but to no great extent later in the season.

Protection.—Mormon crickets are very sensitive to temperature changes in the field and strive to attain an air medium within a certain range of temperatures (60°F to 95°F). This accounts for their habit of seeking shelter in protected places during cool, cloudy weather and at night. It also accounts for their habit of "bunching up" early on sunny mornings on exposed spots and on bushes and sage brush during the heat of the day. This bunching up makes control easier.

Migration.—From the time the young crickets hatch they are almost constantly on the move. During the first three instars their movements are more or less haphazard and are concerned mainly with bunching up in bands and seeking food. The real migrations take place after they reach the fourth instar until egg-laying begins. During this time a band may

cover a distance of from five to 20 miles. Records have shown these migrations are always in a definite direction although individual bands may be seen traveling in all directions during a day's drive through an infested territory. The general direction of migration seems to be peculiar to a definite locality. To illustrate: In Colorado the general direction of migration is east; in western Montana it is south, while in northern Wyoming it is north. Just what factor or factors influence this direction of migration is not known.

Cannibalism.—This is very marked among crickets but is relatively unimportant in control.

NATURAL CONTROL

Birds.—Practically all birds of a given territory, also poultry, might be included in a list of those feeding on crickets. Crows, hawks, and blackbirds are especially fond of these insects and often may be used as markers in following the movements of a band. It is thus advisable in an infested area to protect all forms of bird life.

Insect Parasites.—Unfortunately there is only one economically important parasite of mormon crickets. This, an egg parasite, may become numerous enough to be a control factor. It is a tiny wasp that lays its egg inside the cricket egg, probably some time after deposition. Eggs thus parasited may be distinguished from normal ones (those containing crickets), by their bluish color and the total lack of any external signs of development. Normal eggs are dull gray in color and become swollen at one end as the young cricket develops. These parasites pass the winter in the cricket egg and emerge fully developed during the summer at about the time egg laying begins.

Weather.—The effect of weather on cricket outbreaks is not well known. It would seem, however, from the increasing number of outbreaks during the last few years that a long period of drought may be a contributing factor, although there is no data to support this theory. Because of their habit of clustering in sheltered places the newly hatched nymphs are known to be able to withstand an ordinary late spring snow storm with no apparent losses.

ARTIFICIAL CONTROL

Cultural.—While it is possible to plow eggs under so deep that the hatched nymphs cannot emerge, this method is rarely applicable to the uncultivated lands that crickets infest. Disking or harrowing may be of some value in the fall and after the crickets hatch in the spring, but, on the whole, cultural methods are of little practical value.

Fire.—Fire has served to combat crickets for many years and its possibilities should not be overlooked. It can prove of real value where the

insects are concentrated by "herding" or against a barrier. Certain types of gasoline torches have been used very successfully in this work.

The limiting factor in the use of fire as a primary weapon is the danger that damage to crops and range may amount to more because of the burning than would be the case if the crickets were left alone. As a secondary weapon against adult crickets it has proved valuable and should by no means be disregarded.

Barriers.—Certain types of fences or barriers can be made 100 per cent efficient in stopping migrations and trapping the insects. To be effective the fence must be of a material and so constructed that the crickets cannot climb over it. (Fig. 3). Pits or traps should be dug at intervals along the

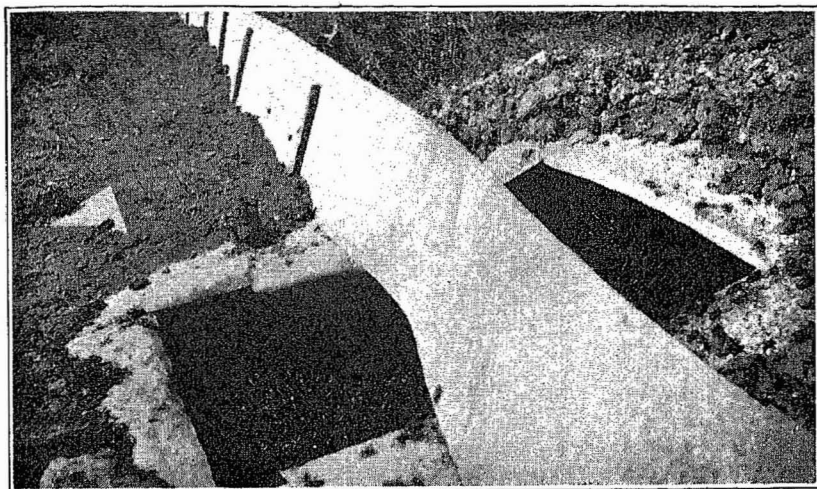


Fig. 3. Cricket barrier and trap. (State Ent. Cir. 53, Colo. Agri. Col.)

barrier and constructed so that the crickets may easily fall in but cannot climb out again. The main objections to barriers are (1) the cost, (2) difficulty in handling, and (3) attention required to operate.

Several types of barriers have proved successful. The galvanized iron used so extensively in Colorado is probably the best and likewise the most expensive. This consists of strips of galvanized iron 28 gauge, 10 inches wide set on edge and held in place with wooden stakes on the back side. The strip should be inclined at an angle of about 80 degrees toward the cricket bands. This type of barrier will probably cost about ten cents per linear foot for the metal, plus the cost for stakes and nails.

The board and tin barrier used in Washington some 20 years ago is a very good fence. It consists of an eight-inch board set on edge with a

four-inch strip of tin nailed at right angles to top projecting out toward the crickets. This barrier should cost in the neighborhood of five to six cents a linear foot. It is hard to transport and requires a great deal of maintenance.

The cheapest type of barrier is one devised by a farmer in western Montana. It consists of an eight-inch board set on edge at an angle of about 50 degrees with a three-inch strip of oil cloth pasted to the inner side near the top. This barrier is the least effective of the three, requires almost constant attention but can be built for a cost of 2½ to 3 cents a linear foot.

Poisoned Baits.—Mormon crickets are very erratic in their feeding and for that reason poisoned baits have never been entirely satisfactory. In many instances excellent results have been obtained but in the majority of cases complete failure has resulted. If bran baits are to be used, the regular grasshopper formula with double or treble the amount of poison will probably give as good results as any. It should be applied in the morning as for grasshoppers but at double the dosage.

Arsenite Dusts.—Sodium and calcium arsenites have been in use since 1927 as the primary weapon in mormon cricket control. Since the early demonstration in western Montana, their value has been proved in Colorado, Idaho, and Wyoming, as well as in other parts of this State.

Formulae

Arsenite dusts should be mixed in the following proportion with hydrated lime

Sodium arsenite	1 lb.
Hydrated lime	4 lb.
or	
Calcium arsenite	1 lb.
Hydrated lime	3 lb.

Mixing.—These materials should be mixed dry in a barrel mixer. This type of mixer can be constructed easily with little cost. It consists of a steel oil drum 30 or 55 gal. with an axle run through diagonally so that when the mixer is turned the materials within describe a figure eight motion. The axle is extended past the rims of the drum far enough to allow one end to be bent to form a crank and the other to allow the mixer to rest on some sort of a support. A door is cut in one end of the drum on the rim opposite the point where the axle projects. This door should be fitted with a rubber gasket to make it dust proof, and should be large enough to facilitate dumping a fifty pound sack of lime without the aid of a funnel. In most wheat growing areas these mixers are used extensively for treating wheat and are probably available.

The hydrated lime and arsenite are placed in the mixer, the door securely fastened. Mixing about 10 minutes should insure a thorough mixture of the lime and arsenite. The mixed dust can then be dumped into

containers suitable for transporting to the scene of operations. Oil barrels with one head removed are ideal for this purpose.

Dusting.—This mixture is a contact poison and kills by coming into contact with the insect. It is necessary then to dust it directly on the



Fig. 4. Closeup of hand dusting. (State Ent. Cir. 57, Colo. Agri. Col.)

crickets and not on the ground or vegetation with the hope that the crickets will walk through it and thus become poisoned (see Fig. 4).

Where possible the bulk of the dusting should be done while the crickets are well bunched either early morning, noon or evening. This is not always possible where crews are employed to do the work because of the limited time men have in the field. Where the farmer is using the dust to protect crops these times will probably be most convenient for him. Absolutely no dusting should be done during high winds or rainy weather. The wind makes it impossible to get the dust on the insects and the rain ruins its effectiveness.

Any good type of rotary hand duster will serve very well in distributing the dust. Large power-driven or horse-drawn units are of little use except in cultivated crops, or where the ground is smooth.

Precautions.—Arsenite dust is unpleasant to handle and may be dangerous to anyone coming in contact with it. The following precautions for operators of dust guns and the mixers should be followed to the letter:

1. Change clothes and bathe immediately on coming in from the field.
2. Wear at least a six inch top shoe and tie the pant legs down over the tops.

3. Underwear should be worn at all times while handling arsenite dust.
4. Leave as little skin exposed as possible.
5. A mask made of cellulocotton and gauze should be worn over the mouth and especially the nostrils to exclude the dust from the breathing passages. These masks should be changed every day or when they become saturated with the dust. The common types of rubber respirators are not advised. They cause the skin to perspire too freely around their edges and induce burning.
6. Dust goggles may be worn if desired.
7. Keep the hands, arms and face covered with talcum powder while dusting. This helps to keep the skin dry and prevents irritation. Do not use face creams or other greasy preparations.
8. Learn to take advantage of the wind while dusting in order to keep out of the dust as much as possible.

Treatment of Arsenic Burns.—In case burning or irritation results in spite of the precautions given above, the following simple treatment will prevent serious results:

1. After bathing treat all tender or irritated spots with a saturated solution of sodium hyposulphide (photographers' hypo) or a strong solution of baking soda. Apply either of these liberally with a piece of cotton and let dry.

2. Keep the irritated member well dusted with zinc oxide powder. This material has proved more satisfactory than the ointment.

3. Avoid violent exercise that may irritate the tender parts.

The above treatment is recommended by physicians for arsenic burns and can be followed without fear.

Precautions Against Poisoning Livestock.—Sodium arsenite dust is a poison and therefore dangerous to livestock if not handled according to directions. The following precautions should be well noted by the men doing the dusting and the ones owning the stock:

1. Cricket dust when applied properly should leave only a faint impression of white on the vegetation. Applied thus it is not dangerous to stock. Do not leave it lying around in lumps and masses on the ground or on the vegetation.

2. Do not leave containers lying around where livestock can get to them.

3. Owners of stock should keep their animals well salted at all times. It has been noted that salt hungry cattle are always the ones that get poisoned.

With the proper kind of cooperation between the one doing the dusting and the stock owners there is absolutely no danger of stock poisoning.

ORGANIZATION FOR CONTROL

Mormon cricket campaigns may be organized on the basis of one of two methods depending on the money available and the results desired.

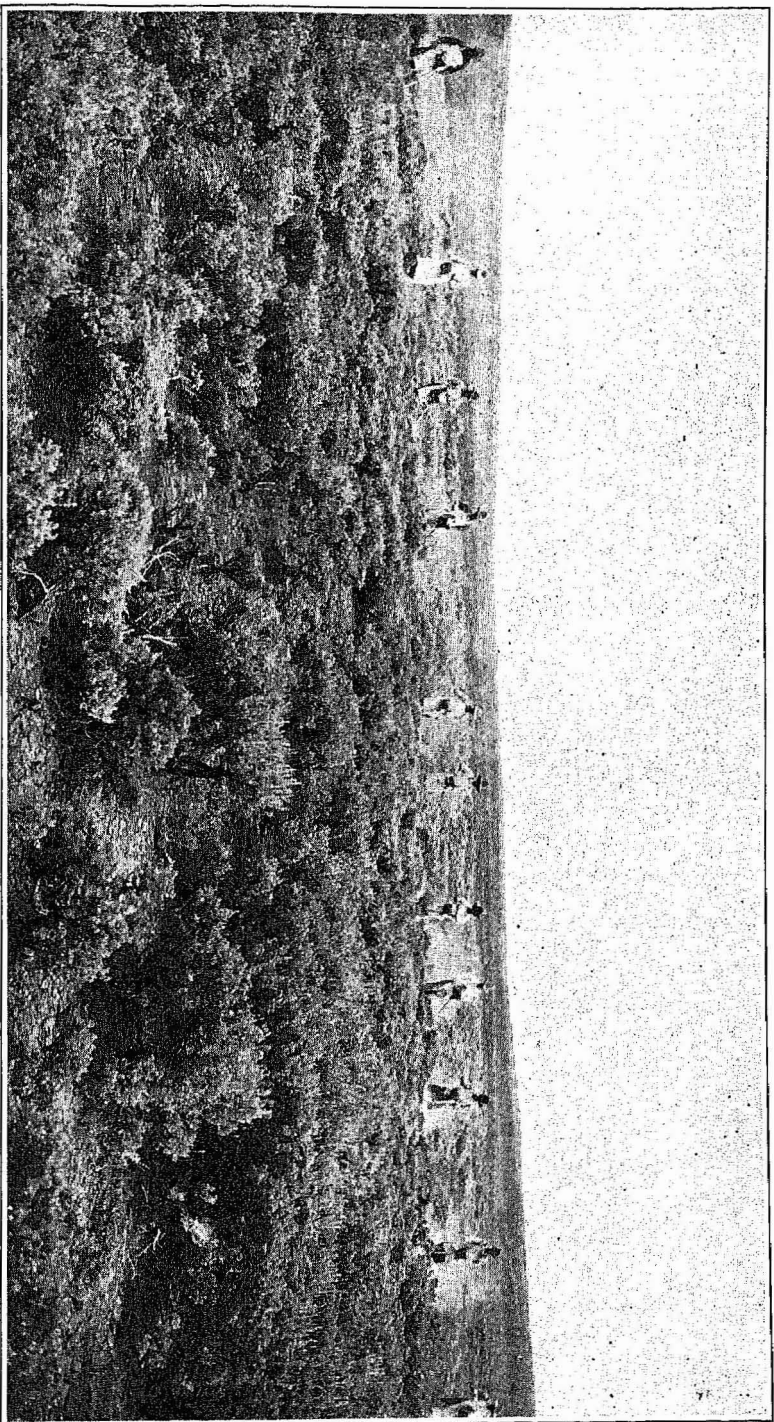


Fig. 5. Group dusting as employed in cleanup campaigns. (State Ent. Cir. 57, Colo. Agri. Col.)

Cleanup Campaign.—Where an outbreak is in its infancy and money is available for materials and labor, a cleanup campaign is advised. In this type of campaign crews working under competent foremen are sent out soon after the crickets hatch. They locate the bands on or near the hatching grounds, and treat them with arsenite dust. Usually one treatment early in the spring is all that is necessary to completely wipe out a band. As soon as one band is thoroughly dusted the crew is moved to the next and so on until all bands have been destroyed. The advantage of such a campaign is the bands are treated wherever they are found and before they get a chance to scatter. Such work should be done as soon as all of the crickets are hatched in the spring. The cost for such a campaign is approximately \$1.50 per "cricket acre." The term "cricket acre" refers to the area actually occupied by the band and has no connection with crop acreages that might be affected.

Crop Protection.—In this type of campaign the farmers living in the infested districts are required to supply the necessary labor. Often it is possible to get a crew of this type together early enough in the spring to go out and dust a few bands before they start migrating. Ordinarily this work comes at a time when the farmer is extremely busy with his spring work and doesn't like to take the time to go away from his farm for a day or two to fight crickets. He is more likely to wait until the crickets are in his fields before he begins to worry.

It was clearly demonstrated in Colorado and Idaho that one or two men equipped with dust guns and powder can protect crops from incoming bands. This is much cheaper than the "cleanup" campaign but may have to be repeated for several successive years, whereas with the former, one year's work is usually sufficient to eliminate the trouble.

Following are a few suggestions for farmers in carrying on a crop protection campaign:

1. Keep a close watch on the cricket bands so as to start dusting before they invade the crops.

2. Always dust on the side of the band adjacent to crops in order to turn them and force them back.

3. Do not try to dust all of the band or the same crickets twice.

4. Concentrate your efforts on the front of the band and do not be alarmed if a few get past because if they are well dusted they will die anyway.

5. Dust and labor may be expended most economically in the morning, evening or noonday when the crickets are clustered.

It is advisable to have a man in charge of this work whose duties it should be to see that dust and guns are available to those that need them, and to generally supervise distribution of the dust.