

ENTOMOLOGY.

The Rocky Mountain Locust.

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During last June notices appeared in the newspapers that injury was being done by grasshoppers or locusts in southern Manitoba. These reports



naturally caused much anxiety among the old settlers who had been in the Prairie Province at the time of the serious locust depredations during 1868, 1870, 1872, 1874. By instruction of the Hon. Sydney Fisher, and at the request of the Hon. Thomas Greenway, I visited the localities reported to be infested in the beginning of July and again in the middle of August. The reports of injuries to growing crops were found to be correct, and the locust which was doing the injury was, as in the former invasions referred to, the Hateful, or Rocky Mountain, Locust (*Caloptenus spretus*).

The exact identification of the species was in this case a matter of no little importance, for it is well known that, although there are many kinds of locusts in the west, none of them are to be feared as crop destroyers to anything like the same extent as the above named, which has exceptional powers of flight and is gregarious in its habits. As is usually the case in such matters, when conviction on this point involved a good deal of extra labor, some farmers were slow to believe that such an ordinary-looking insect could be so serious an enemy as was claimed by those who recognized in the grasshopper of this year their old enemy of the early seventies, and doubts were being cast on the correctness of the identification. This question was at once decided upon catching a few specimens near Deloraine. To one who has studied these insects it is, of course, just as easy to distinguish the Rocky Mountain Locust from its near allies as it is for a farmer to tell wheat from rye, barley or oats.

A good use of this special knowledge was made by Mr. John Scott, who has lived a few miles south of Deloraine for many years. He noticed a swarm of the locusts alight on his farm last autumn, and this spring warned his neighbors to be on their guard and take some steps to protect their crops, similar to those which he himself adopted. As soon as the grasshoppers hatched he spread rows of dry straw across the field where they were most numerous; the young hoppers gathered into these at night in large numbers and were destroyed by the straw being set on fire after nightfall. This was repeated four nights running, and myriads were thus killed before they had spread far from their hatching grounds or had done any appreciable harm. Had Mr. Scott's neighbors followed his advice and example there is no doubt that the loss would have been much less than was the case in that district last summer.

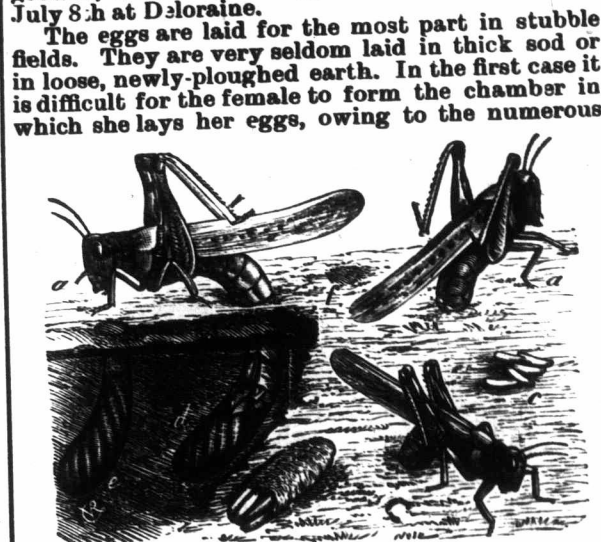
The area over which the Rocky Mountain Locust occurred in Manitoba this year was a narrow strip only a few miles in width, lying to the south of Deloraine and Boissevain, and running along the northern slope of the Turtle Mountains. It is probable that this locust breeds regularly every year in parts of the Turtle Mountains, but it is many years since it spread from these breeding grounds north into Manitoba. It has, however, shown only too well in previous years that it is able to breed and multiply on our prairie lands when once established there. As, therefore, judging from the experience of the last twenty years, it is unlikely that fresh swarms will for some time again spread from their permanent breeding grounds, it is of the utmost importance that everybody in the infested region should do everything possible to help in exterminating this formidable foe. This is particularly the case in the present instance, because if all will work together complete extermination should be a matter of comparative ease. The life habits of the insect are well understood, and the experience of farmers living in regions where it occurs much oftener than with us shows that by making a very small change in the ordinary methods of working their farms, and at no very large extra expense, this dire enemy can be practically wiped out, even where eggs have been laid in enormous numbers.

WHAT TO DO.

It is conceded by all that the best remedy is the ploughing down of the eggs so deep—five or six inches is sufficient—that when the young locusts hatch in spring they may not be able to work their way up to the surface. The important things, then, for Manitoban farmers to do now are to discover where on their farms eggs have been laid, and to see to it that every rod of this land is ploughed either this autumn or next spring before the young locusts emerge and move off into the crops.

WHERE THE EGGS ARE LAID.

The places where the mother insects lay their eggs can be discovered only by seeing them at work, or by examining the soil carefully for the egg-pods. The time required for boring the hole and laying the complement of eggs is three or four hours. The appearance of the insect itself, the pods and the separate eggs are well shown of natural size in Dr. Riley's excellent figure herewith. The female locust lays her eggs in the ground, about an inch beneath the surface, in small podlike masses, as shown in the figure. The egg-pod consists of a coating of a waterproof mucous material, which is deposited at the same time as the eggs. There are in each pod about 30 eggs, and each female lays about three pods during the autumn. There is only one brood in a season, the winter being passed in the egg. When the young locusts hatch, they emerge through the upper end of the egg-pod. In Manitoba last season the young hoppers were noticed about the 1st of June, but they probably hatched early in May, because it takes seven or eight weeks for the insects to attain full growth, and winged hoppers were abundant by July 8th at Deloraine.



LOCUSTS LAYING EGGS.

The eggs are laid for the most part in stubble fields. They are very seldom laid in thick sod or in loose, newly-ploughed earth. In the first case it is difficult for the female to form the chamber in which she lays her eggs, owing to the numerous roots of the grasses, and in the second case the burrows could only be made with great difficulty in the dry, powdery earth. All observers report that eggs are rarely laid in newly-ploughed and well harrowed land.

The late Dr. C. V. Riley wrote: "The eggs may be laid in almost any kind of soil, but by preference they are laid in bare sandy places, especially on high dry ground, which is tolerably compact and not loose." "Newly-ploughed land is not liked, it presents too loose a surface; but new breaking is often filled with eggs." (This is doubtless owing to the firm surface of the sod before backsetting.) "Sandy soil that is compact, especially when having a south or east exposure, is much chosen; but in loose and shifting sand the eggs would perish."

Prof. O. O. Lugg, State Entomologist of Minnesota, writing in July, 1889, after examining a district which had been devastated, says as to the places chosen for egg-laying: "A close inspection soon revealed the fact that fields with last year's stubble contained large numbers of eggs, whilst stubble land of the previous year and older contained none, or but very few. There were some eggs in denuded spots of timothy fields; where the timothy plants covered the ground entirely no eggs could be detected; a similar observation was made in pastures; if well-sodded, no eggs; if bare of vegetation, a few could be detected. No eggs could be found in the native prairie land, and but a few along roads and the elevated beds of railroads."

In the special bulletin issued on this subject by the North Dakota Agricultural Experiment Station in 1891, it is stated: "As the eggs are never laid in thick sod, nor in loosely ploughed earth, it will be seen that the ploughing need not extend to any land except the stubble fields."

From the foregoing extracts by three of the leading authorities on the subject it is evident that if farmers will attend carefully to their stubble lands, where by far the greatest proportion of the eggs are laid, there is every hope that next year there may be no trouble from locusts; but, at the same time, it must be borne in mind that unless all help, there were certainly sufficient locusts this year in the district I visited for the young to commit serious depredations next year, and to spread over a much wider area in the Province.

REMEDIES.

Ploughing—The remedy above all others, as stated above, which has given satisfactory results is the ploughing down of the eggs, and although harrowing has been recommended by some, it cannot be relied on. Knowing the importance of giving definite advice to the farmers of southern Manitoba, I corresponded with the State Entomologists of Minnesota and North Dakota, both of whom have had extensive experience in fighting the Rocky Mountain Locust. I submit herewith quotations from recent letters giving most valuable information:

"Ploughing from 4 to 4½ inches deep is the only true remedy. It is not necessary to plough during fall, though best; if ploughed early in spring the surface of the field will become quite compact by rain, even by the wind. None or but very few young locusts will reach the surface, and these will starve before reaching plants upon which to feed. Permit no stubble fields. They should all be ploughed, as in them most of the eggs will be deposited. A few acres of stubble land can and will breed enough locusts to endanger the crops of all the surrounding fields. In the past I have repeatedly tried the plan of harrowing in the autumn instead of ploughing, and have invariably failed, since sufficient numbers of locusts hatched to destroy the crop. In fact, the trouble near Penham was almost entirely caused by a party who insisted on harrowing the fields containing eggs instead of ploughing them. He harrowed thoroughly during the autumn, but in spring I found numerous eggs and egg-pods. At my request he harrowed again in spring (would not plough) and seeded with a drill. This field was the principal one in which numerous locusts hatched and from which they migrated to others."—Prof. Otto Lugg, State Entomologist of Minnesota.

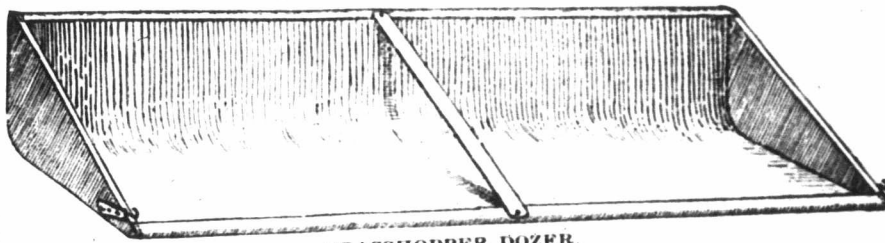
There is no question as to the efficacy of ploughing. Fields lying side by side on the same ridge of land that were visited by Rocky Mountain Locusts last fall showed this point very clearly. One of the fields was left unploughed, and from this small area probably 25 bushels of grasshoppers hatched out, while in the fields that were ploughed no trace of grasshoppers could be found except as they came from unploughed fields. The farmers in parts of this State find that early fall ploughing gives a much better yield of wheat than either late fall ploughing or spring ploughing, and for this reason, as well as for the destruction of the locusts, we recommend that all fields in the infested localities be ploughed as early as possible.

"So far as ploughing simply to destroy the eggs of the locusts, there is no reason why this need be done in the fall any more than in the following spring. In fact, in the localities where grasshoppers appeared this year, fields that were ploughed immediately before seeding were as free as those ploughed shortly after harvest, though the ground in both cases was undoubtedly filled with eggs."

"Now, in regard to harrowing, there is no doubt that if the egg masses are brought to the surface and broken at this time of the year the vitality of the eggs will be destroyed. The only question connected with harrowing is how thoroughly the egg-masses will be broken up. Where soil is firm I have recommended harrowing, and then cross-harrowing, so as to disturb every portion of the surface. The disk harrow used for pulverizing sod about five or six weeks after breaking would probably do good work if the ground is too firm for the ordinary harrow. The heavy rains which usually come in August and September would probably soil so much that ordinary harrowing would probably fail to serve the purpose. Disking the fields immediately after harvest would leave the soil in such loose condition that the insects would probably avoid that locality for egg-laying."—Prof. C. B. Waldron, Horticulturist North Dakota Agricultural Experiment Station.

To secure the best results as far as the destruction of the locusts is concerned, fall ploughing is undoubtedly the most effective method; but, if from press of other work it is impossible to plough all land which was under crop this year, much good may be done by early spring ploughing before the insects hatch or before they are large enough to move from their hatching grounds to adjacent crops. Stubble land which it is intended to summer-fallow next year must be turned down, if possible, before the 1st of June, and at the latest by the middle of that month.

Other Remedies.—Should grasshoppers, notwithstanding all precautions, be found abundant, farmers may have recourse to burning, by means of strips of straw, as was done by Mr. Scott this year, or to the use of hopper-dozers or tar pans, which are implements made of sheet-iron, containing some tar or coal oil in the bottom. A cheap and simple plan of one of these, costing from \$1.50 to \$2, was described many years ago by Prof. Riley. It consists of a strip of sheet-iron, 8 or 10 feet long, turned up 1 inch in front and 1 foot behind, with pieces soldered in at the ends (or made of wood) and hooks placed in front at both ends for the attachment of ropes. If to run on rough ground, it will be better to put runners, 1½ or 2 inches high, underneath. Into this put a layer of coal tar ½ inch deep, or water and coal oil. The implement can be drawn by a boy at each end, or a horse if preferred.



GRASSHOPPER DOZER.

A few weeks after this date many herds of cattle will present an unsightly appearance from having bare patches of skin, especially in the region of the neck. This is largely the result of the presence of small, inconspicuous lice. This cause can be removed by thoroughly washing the animals once or twice with one of the many reliable dips. This should be attended to with all cattle at the time of going into winter quarters, whether there are evidences of lice or not. It will save feed, make money when the animals are offered for sale, and prevent the necessity of apologizing to visitors for the patchy appearance of the animals.