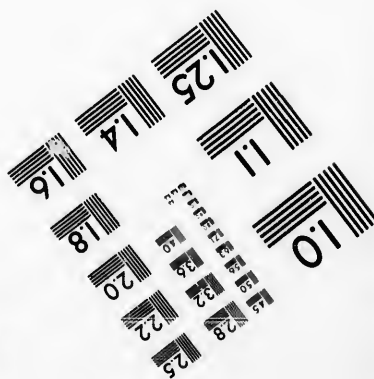
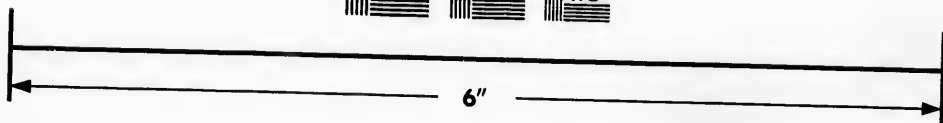
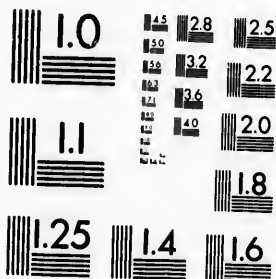


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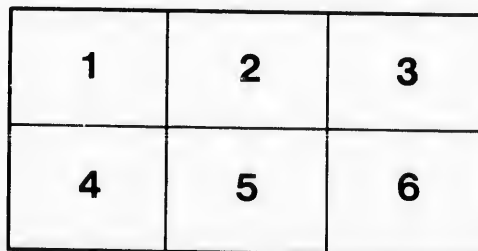
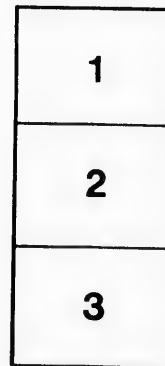
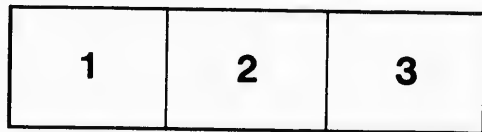
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DEPARTMENT OF AGRICULTURE,
OTTAWA, - - - CANADA.

—:—

BULLETIN No. 14.

—:—

THE HORN-FLY.

—:—

SEPTEMBER, 1892.

To the Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit to you herewith Bulletin 14 of the Central Experimental Farm which has been prepared at my request by Mr. James Fletcher, the Entomologist and Botanist of the Dominion Experimental Farms. It treats of the "Cattle Horn-fly," a new insect pest which has lately found its way into Canada from the United States. Many letters of enquiry have of late been received at the Central Experimental Farm in reference to this insect, and the injury resulting from its attacks has awakened a general interest in the subject among the farmers of Ontario and Quebec. The concise and complete account given in this Bulletin of the life history and habits of this insect and of the remedies which have been found most efficacious, will, it is hoped, give to the farmers of Canada the information needed in reference to this important subject.

I have the honour to be,
Your obedient servant,
WM. SAUNDERS,
Director Experimental Farms.

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CENTRAL EXPERIMENTAL FARM.

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DEPARTMENT OF AGRICULTURE,
OTTAWA, - - - - - CANADA.

THE CATTLE HORN-FLY.
(*Haematobia serrata*, Robineau-Desvoidy.)

BY JAMES FLETCHER, F.L.S., F.R.S.C.

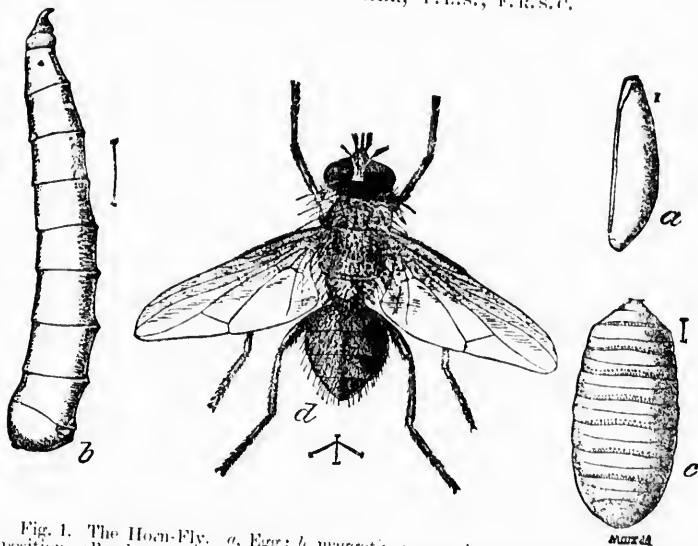


Fig. 1. The Horn-Fly. *a*, Egg; *b*, maggot; *c*, puparium; *d*, adult fly in biting position—all enlarged. (Figures kindly lent by the United States Entomologist.)

Considerable anxiety has been evinced by stock-owners in the Provinces of Ontario and Quebec, concerning the sudden appearance upon their cattle of enormous numbers of a small blackish fly which irritates the animals so much with its bite and disturbs them so constantly that they fall off rapidly both in flesh and yield of milk.

This is the so-called "Horn-Fly" which has attracted much attention in the United States for the last three years. It is a European pest which was first brought to the notice of the U. S. Division of Entomology in September, 1887, and was probably imported with cattle from Europe, where it has been known since 1830.

In 1889, its complete life-history was worked out by Prof. Riley and his assistants Messrs. L. O. Howard and C. L. Marlatt. This was published in "Insect Life" vol. II., p. 93-103 and in the Annual Reports of the U. S. Entomologist for 1889 and 1890.

These investigations were so thorough that there was little left for later observers to discover.

Prof. J. B. Smith, of New Jersey, also worked up the life-history independently, at the same time, and published an account of his work in Bulletin 62 of the New Jersey Agricultural Experiment Station.

Fig. 1, above, shows this new pest much enlarged in all its different stages of egg, maggot, pupa-case and perfect insect. (The hair-lines by the side of the figures show the real size.) Fig. 2 illustrates the peculiar habit this insect has, of resting in large numbers, on the base of the horns, which has given rise to its popular name. Both of these figures have been kindly lent by the U. S. Entomologist and are the same as were used in the article in Insect Life above referred to.

The advent of this insect into Canada was first brought to my notice by Mr. Elmer Lick, of Oshawa, Ont., on July 30th last, when he stated that it had appeared in large numbers in that section of country and was causing considerable alarm. Since that date I have received specimens and enquiries from localities ranging from the extreme west of Ontario to Boucherville, P. Q., some few miles east of Montreal. In all cases farmers seem to be thoroughly aroused and to appreciate the losses they may suffer by neglecting this pest. Exaggerated statements of losses, and injuries to the animals which are quite impossible, have received free and extensive circulation by word of mouth, and through the newspapers. Cows are inaccurately said to have been killed by the flies, which, it is alleged, lay their eggs either on the horns into which the maggots bore and then penetrate the brain, or "in holes which they eat through the hide, lay eggs therein, which hatch out in

large numbers and proceed with their boring operations until the vital portions of the cow are touched and death ensues."

None of these statements are founded on fact. As stated above, the complete life-history has been worked out. I had the good fortune to be in Washington, staying with Mr. Howard, in August, 1889, and was courteously permitted to join in his investigation of this matter. Together we visited some of the infested stock-farms in Virginia and secured living flies and eggs from which, later on, the perfect insects were reared.

The life-history is briefly as follows:—

The eggs (Fig. 1. *a.*) are laid singly on the freshly-dropped dung of cattle, chiefly during the warmer hours of the day. They are $\frac{1}{2}$ of an inch in length, brown in colour from the very first and from this fact are not easily seen where laid. The young maggots hatch from the eggs in less than twenty-four hours, and at once burrow a short distance beneath the surface of the dung. Here they remain until full-grown, feeding on the liquid portions of the manure. This is their only food and all stories about their boring into the horns, brains or flesh of living animals are untrue. When the maggots are full-grown, which takes about a week, they are $\frac{2}{3}$ of an inch in length, shaped as shown at Fig. 1. *b.*, and are of a dirty white colour. They descend a short distance into the ground to pupate, and the dark-brown pupa-cases (Fig. 1. *c.*) are $\frac{1}{2}$ of an inch in length. During the hot weather of summer the pupal state lasts only four or five days, but the last brood passes the winter in this condition a short distance beneath the surface of the ground, and the flies emerge the following spring. The perfect insect (Fig. 1. *d.* male) is shaped much like the common cattle-fly* or the house-fly; but it is smaller, being only $\frac{1}{3}$ of an inch in length, that is, about one-third the size of those insects.

The colour of the Horn-fly is dark gray with a yellowish sheen, and the body is covered with black bristles. The head consists almost entirely of the dark-red silvery-edged eyes, but bears on its lower surface the black dagger-shaped tongue which is the cause of so much torture to cattle. When not in use this is carried projecting forward in front of the head.

*NOTE.—*Stomoxys calcitrans*, sometimes called the "Biting House-fly," from its annoying bite and frequent occurrence in houses. The true House-fly (*Musca domestica*) never bites having only a sucking tongue.

This pest will be at once distinguished from the ordinary cattle-fly by its smaller size, greater activity and the characteristic habit of gathering in clusters upon the horns of cattle, particularly upon the upper side. When very abundant the flies form a more or less complete ring around the horn extending sometimes from two to four inches from the base towards the tip, as shown in figure 2.

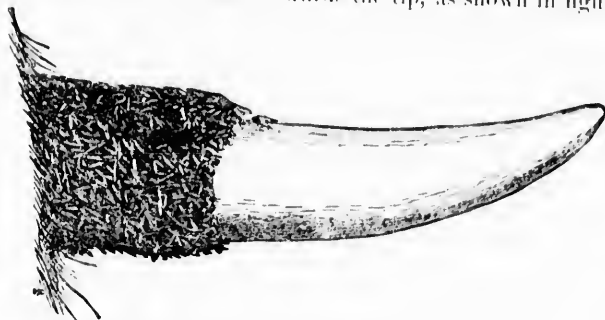


Fig. 2. Cow-horn showing band of resting flies—reduced.

The clustering upon the horns seems to be peculiar to this species, for where the common Cattle-fly occurs with it in large numbers upon the same animals, I have never found specimens in the thick clusters upon the horns. Neither does the Horn-fly, like the Cattle-fly, bite horses and other animals; but seems to confine its attacks to cattle. It may not be amiss to mention here that no injury whatever results from this habit of gathering on the horns, the flies merely resorting to the horns as a resting place from which they cannot be easily dislodged by the animal. They also congregate on the neck and at the base of the tail. The flies assume two characteristic positions, one while feeding when the wings are slightly elevated and held out from the body, as shown in fig. 1. *d.* the other while resting, when the wings lie nearly flat down the back, with the tips only slightly separated. It is in this resting position that they are always found on the horns.

Cattle of all breeds are subject to the attacks of this pest, but there is very great difference in the susceptibility to injury of various breeds and individual animals according to their temperament and the texture of their skins. While feeding, the flies work their way down through the hairs so as to reach the skin of their victim, but they are extremely agile and quickly take flight at the

slightest disturbance. The bites seem to produce great irritation and sores are frequently formed on the bodies of animals by their rubbing themselves against trees and other objects or by licking bitten places where the irritation cannot be allayed by rubbing, as inside the thighs and around the udder.

It is in the perfect state only that this insect is troublesome to stock; but it appears early in spring and lasts the whole season, successive broods following each other rapidly throughout the summer. Mr. Howard found that from ten to seventeen days, say two weeks, was about the time required from the laying of the egg to the appearance of the fly, and as there are about four active breeding months—from May 15th to September 15th—there is time for eight generations or broods. This rapidity of development will account for the flies appearing in such large numbers as to have attracted general attention simultaneously in many widely separated localities. There is no doubt that the pest has been present on our Canadian stock farms throughout the past summer, but has only now increased in sufficient numbers to alarm the owners. Prof. Robertson, the Dairy Commissioner for the Dominion, tells me that he has received an unusual number of complaints this year of flies worrying stock, and these are in all probability attributable to this new importation, which brought into the United States only six years ago, has spread in all directions over many States of the Union and is now infesting our herds in Canada.

The appearance of this insect in Canada is a serious matter, for it has been found that stock in infested regions have been so much tormented that animals fall off in condition very much, and the yield of milk is reduced in some instances from one-third to one-half. There are, however, several simple remedies which will, if attended to, greatly reduce this loss, and if all farmers would combine and use them, not only would their animals benefit in comfort but the owners would reap rich returns for their outlay.

REMEDIES.

Notwithstanding the great loss which may result to stock-owners from neglecting to attend to this new enemy, there is no reason why it should not be kept within control by simple and well tested remedies. This, of course, will be much more easily done if by some united effort steps are taken promptly at its first appearance in a

new locality. From the fact that it has appeared comparatively late in the season, and probably will not this year give trouble much longer, as it always disappears with the first frosts of autumn, farmers will have an opportunity of becoming acquainted with the habits of the pest and of learning the best remedies to be used against it, before a new season opens, and all should be prepared with the return of spring to wage a systematic, vigorous, and persistent warfare, and strive to induce their neighbours to do the same, so as to prevent its increasing in numbers and spreading all over the Dominion.

All accounts agree that the fly increases much more rapidly early in the season than later on in the year. This shows the advantage of being prepared before the pest appears with the necessary materials and beginning work promptly so as to destroy as many as possible before breeding commences.

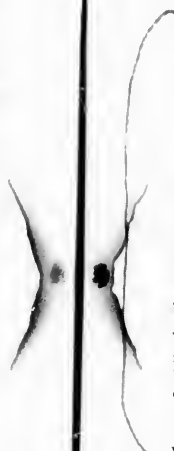
The remedies are cheap, simple, and easily applied; but constant attention is required to make them effective. They may be grouped under two heads:

1. Preventive, or such as prevent injury to the animals by keeping the insects from biting them;
2. Active, the object of which is the destruction of the insects either in the perfect or larval condition.

1. *Preventive*.—Under this heading I cannot do better than quote from the article by Messrs. Riley and Howard in "Insect Life," Vol. II., No. 4, which reads as follows:—

"Almost any greasy substance will keep the flies away for several days. A number of experiments were tried in the field, with the result that train-oil alone and train-oil with a little sulphur or carbolic acid added, will keep the flies away for from five to six days, while with a small proportion of carbolic acid it will have a healing effect upon sores which may have formed. Common axle-grease will answer nearly as well, and this substance has been successfully and extensively used by a large stock-dealer in Virginia. Tallow has also been used to good advantage. The practice of smearing the horns with pine or coal-tar simply repels them from these parts. Train-oil or fish-oil seems to be more lasting in its effects than any other of the substances used."

Crude Carbolic Acid or Oil of Tar, mix sufficiently with fish oils if the two substances be placed together in a bottle and well shaken.



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They may be mixed in the proportion of 1 oz. of either in half a gallon of oil. The Oil of Tar has a stronger odour than Carbolic Acid and is cheaper.

The remedy which I think in the long run will be found to be the best is the Kerosene Emulsion, and when farmers have learnt how easily this very valuable remedy against the insect enemies of crops and domestic animals can be prepared, many of the pests which now give trouble will be brought into subjection.

This emulsion consists simply of a mixture of soaps-suds with twice the quantity of ordinary coal oil, made as follows:

Kerosene (coal oil).....	2 quarts,
Rain water.....	1 quart,
Soap.....	2 oz.

Boil the soap in the water till all is dissolved; then, while boiling hot, turn it into the kerosene, and churn it constantly and forcibly with a syringe or force pump for five minutes, when it will be of a smooth, creamy nature. If the emulsion be perfect it will adhere to the surface of glass without oiliness. As it cools it thickens into a jelly-like mass. This gives the stock emulsion, which must be diluted before using with nine times its measure, that is 27 quarts, of water. It will be found to mix much more easily if done at once, before it cools.

The above proportions give three quarts of the stock emulsion which with 27 quarts of water added, make up 30 quarts of the mixture ready for use.

This may be applied to the animals either by means of a sponge or what will certainly be found most convenient, where there are many animals to treat, by means of a force pump and spray nozzle.

Prof. W. B. Alwood has found that the stock emulsion diluted ten times and mixed with one part of a water extract of tobacco waste (made by steeping 1 pound of tobacco stems in 1 gallon of hot water for an hour or more), gave almost perfect immunity for a period of three days and that two treatments per week almost entirely relieved his cattle from annoyance. He makes the application with a knapsack pump fitted with a cyclone nozzle, and the work is done just after milking time. His method is as follows.—The animals are driven into an enclosure through a gate which will only admit one at a time. A man with a knapsack pump on his back stands at the gate and sprays one side of each animal as it passes.

they are then driven out again, and the other side is treated in the same manner. The quantity of liquid thus applied is very small, but has been found sufficient. Previously, Prof. Alwood employed two men at milking time, and used one or two pints for each animal.

The knapsack sprayer mentioned above consists of a tank of 4 or 5 gallons capacity, fitted with straps for carrying it on the back, and supplied with a small force pump, a few feet of rubber hose and a spraying nozzle. These can be procured from several of the pump makers for about \$12, or \$14, complete.

Smaller and less expensive pumps would answer equally well, and may be obtained at prices ranging from \$2 to \$5 from most of our Canadian seedsmen. The following are the addresses of some of the best pump makers in the United States:—

Thos. Woodason, 451 East Cambria St., Philadelphia.

Albinson & Co., 2026 Fourteenth St., Washington, D. C.

Gould's Manufacturing Co., Seneca Falls, N. Y.

The Nixon Nozzle and Machine Co., Dayton, Ohio.

Adam Weaver, Vinland, N. J.

I am not aware that any pumps of the above classes are made in Canada; but doubtless they can be obtained from Canadian agents.

Should there be any Canadian manufacturers who make spraying pumps, I shall be glad to hear from them.

II. *Active*.—Of applications to destroy the fly, a proprietary substance consisting mainly of tobacco dust and creosote, and known as "X. O. Dust," manufactured by a Baltimore firm, is very highly spoken of, particularly by Prof. J. B. Smith, of the New Jersey Experiment Station. This costs about 25 cents a pound. When placed upon the cattle by dusting it through the hair, the flies will not remain long enough on the animals to bite them. Its effects last only about two days.

Kerosene emulsion made as directed above, sprayed over the cattle, killed all the flies reached and prevented others coming, as long as the odour lasted, which was from three to seven days.

Remedies for the destruction of the perfect insects, are mainly useful upon the first appearance of the pest in a new locality, or early in the season for the destruction of the first brood. The best way to fight this enemy is by the treatment of the cattle droppings so as to destroy the eggs and larvæ. The maggots can only live in the dung while it is in a moist condition. Any means, therefore,

which will ensure its drying up before the maggots are full grown, will destroy them. For this purpose lime, land plaster, and wood ashes have been recommended, and the last-named of these will probably be found the best, not only from its strong alkaline properties, which are destructive to insect life, but also from its great value as a fertilizer, and from the further fact that it is easily obtainable on every farm. If farmers could be only induced to keep this valuable material for application to their own land, instead of, as is too often the case, selling it to speculators at much less than its value to themselves, the benefit derived therefrom would much more than repay them for the trouble and expense, even without considering the use for which it is now recommended. Messrs. Riley and Howard state that—"Throwing a spadeful of lime upon a cow dung will destroy the larvæ that are living in it. If the evil should increase, it will well pay a stock-raiser to start a load of lime through his fields occasionally, particularly in May or June, as every larva killed then represents the death of very many flies during July and August. We feel certain that this course will be found in many cases practical and of great avail, and will often be an advantage to the pasture besides."

I am of the opinion that Canadian wood ashes would be far superior to lime for the above purpose, and if neither of these materials were easily obtained, a good shovelful of dry earth or road-dust, would soon absorb the moisture necessary for the development of the larvæ.

What appears to me to be the most practical recommendation, is, that of Prof. J. B. Smith. He says:—"By sending a boy over the pasture every other day with a shovel to thoroughly spread out the cow droppings, all eggs and larvæ would be destroyed." I believe if this were done twice a week it would be sufficient, and would be equally effective in wet weather, when the substance would be washed away, as in hot weather, when it is dried up.

