

THE GYPSY MOTH IN MASSACHUSETTS.

[A discussion on the work of its extermination, at the eighth annual meeting of the Association of Economic Entomologists, Buffalo, August 22nd, 1896.]

REPORTED BY A. H. KIRKLAND.

At the eighth annual meeting of the Association of Economic Entomologists, held at Buffalo, August 21st and 22nd, 1896, a part of one session was devoted to the consideration of the work of exterminating the gypsy moth in the Commonwealth of Massachusetts. The subject was presented for discussion by the President, Prof. C. H. Fernald, at the morning session of the second day. Prof. Fernald referred to the action of the Association at its Springfield (1895) meeting, and stated that at the legislative hearings of the past spring, held with reference to determining the size of the appropriation to be granted for continuing the work of exterminating the gypsy moth, no representations made by the Gypsy Moth Committee, the Director, or himself, carried a fraction of the weight that the endorsement of the Association afforded. The legislators recognized the Association as a body of eminent scientists, and accordingly valued the opinion of its members.

In speaking of the present condition of affairs brought about by the failure of the Legislature to provide sufficient funds for the continuance of the work in the most approved manner, the Professor stated that future action must be along one of three lines :

(1) To continue the work with a view to *extermination*. This can be done, but will involve a vast outlay.

(2) To attempt the *control* of the insect, but with no idea of its ultimate extermination. This means a great annual expenditure that must be continued indefinitely.

(3) To abandon the whole work, "let the insect spread at its own sweet will," and trust to the property owners to care for their own estates. Should this latter course be adopted, it would be impossible to say how long a period of time would elapse before the pest would spread over the whole of New England and into adjacent territory. The insect is now in a condition to spread rapidly through avenues of traffic, and its diffusion over the whole country would probably be a matter of comparatively short time.

The committee in charge, and those directly connected with the work, have been criticised because the importation of parasites has not been attempted. This, the Professor explained, had not seemed wise while the work has been carried on with a view to extermination, since

the latter condition involved the destruction of all large colonies wherever they occurred, and would thus prevent the successful breeding of parasites. Such insects would require the most favourable conditions in order to become acclimatized, and this would necessitate the preservation of large colonies of the gypsy moth as food for the parasites. Should the work of extermination be abandoned, a careful study of the natural enemies of the gypsy moth in its native home would be advised.

At the request of Professor Fernald, Director Forbush gave an account of the progress made in the gypsy moth work and its present condition. He said that when this insect, which was introduced into Massachusetts more than twenty-five years ago, first became seriously destructive, a commission was appointed by the Governor to "prevent its spreading and secure its extermination." This commission found that the territory infested by the moth was much larger than had been supposed. The commission was superseded the next season by another, which in a short time was abolished, and the work was then turned over to the State Board of Agriculture.

The work was begun under a grave misconception of the amount of territory infested. As soon as the State Board assumed the direction of the undertaking, it was found that the infested territory extended, not, as believed by the first commission, over a small and well-defined area, but, instead, over some thirty cities and towns. The size of the infested territory as considered by the first commission, compared with the actual area later found to be infested, was very aptly illustrated by the comparison of the size of a silver dollar with that of a broad-brimmed hat.

With a region of two hundred and twenty square miles to be examined and cleared of the moth, the appropriations made the first two years proved entirely insufficient to do more than to destroy the larger swarms of the insect and clear them from a few of the towns on the periphery of the region. The two years' work demonstrated, however, to those in charge that the moths could be cleared from any given territory provided ample appropriations could be secured to organize, equip and train a sufficient force of men. The season of 1892 was rather unfavourable for the multiplication of the moths, and so much progress was made during that year that ten towns appeared to have been entirely cleared of the moth. The committee in charge of the work believed the time had come to strike a decisive blow. The Director and the Entomologist went carefully over the ground and estimated the cost, recommending in their

report to the committee that a large appropriation be granted by the Legislature for immediate use. The Legislature cut down the estimates for the appropriation, and granted only one hundred thousand dollars. Thus the best opportunity in the history of the work was lost. During the past three seasons the meteorological and other conditions seem to have been particularly favourable for the increase of the gypsy moth, and no such favourable opportunity for its complete extermination has offered as was presented in 1892. From that time until the present, although large sums have been annually appropriated, aggregating altogether more than half a million dollars, each appropriation has been far less in amount than the immediate necessities of the work required, and each has been granted so late in the season that it has been impossible to accomplish the desired results. This ineffective legislation has been, no doubt, the result of an organized opposition on the part of those who do not believe in the possibility of extermination. Considerable opposition has come from farmers, people who are benefited, perhaps, more than any other class by the policy of the State in making appropriations for this purpose.

Many of the worst swarms of insects have been entirely exterminated, and the work has been so effectively done in most of the outer towns of the infested region that the moth has been cleared from these towns so far as careful inspection could determine. But during the present year, the appropriation having been delayed nearly six months, the caterpillars in the central towns hatched and became again somewhat generally distributed over the region, thus reinfesting some of the places originally infested and also originating new colonies.

Few moths have ever been observed outside the region found infested in 1891, except in one or two isolated localities, and all the moth colonies found since 1891, outside these thirty towns, had evidently been in existence for several years when discovered. None have been found at a distance from the infested towns. Since work was begun the present year the progress made has been very encouraging. The numbers of the different forms of the moth found this year have so far been much less than those found in 1895. No moths have been found in the extreme north-easterly towns, such as Danvers and Marblehead, and very few have been found in Lynn, a city which formerly had more than twelve hundred infested localities.

Mr. Forbush expressed a desire for information concerning the death of trees from defoliation by insects.

Prof. J. B. Smith inquired whether or not the infested territory had been reduced.

Mr. Forbush replied that the chief reduction had been made on the outside, but that many colonies had also been exterminated in the centre of the region. The greatest progress was made during the first and second years of the State Board work. There had been cases of re-infestation of "exterminated" territory from larvæ brought from the infested centre.

At the request of Prof. Fernald, Mr. Kirkland spoke briefly of the experimental work of the past year. He stated that two main lines of investigation had been followed: experiments with insecticides and the study of natural enemies. In conjunction with the chemist who prepared the compounds, a large series of arsenical preparations had been tested. Experiments with Paris green and correctives to prevent burning gave negative results. Sulph-arsenates did not give results superior to arsenites. Experiments with arsenite of lead versus arsenate of lead had shown the two poisons to be about equal in insecticidal properties. The former is somewhat heavier than the latter, and does not stay in suspension as well. The experiments with barium arsenate had already been described.

Of the few hymenopterous parasites taken, *Pimpla pedalis* and *P. tenuicornis* had been reared in small numbers from *Porthetria dispar*. The first brood of these insects attacks the *Clisiocampa americana*, and the second brood emerges in time to prey somewhat on *P. dispar*. The work on life-histories of the predaceous beetles had been carried out by a man especially detailed for the purpose, Mr. A. F. Burgess, and much valuable information obtained.

Many predaceous Heteroptera of the genera *Euschistus* and *Podisus* had been reared and studied by Mr. Kirkland, and many doubtful points in their life-history cleared up. These insects when emerging from their hibernating quarters attack the larvæ of the tent caterpillar, *Clisiocampa americana*, in great numbers.

The Japanese parasite of the gypsy moth had been received from Rev. H. A. Loomis, Yokohama, but the cocoons of the parasite were infested by a secondary parasite. Only a few of the primary parasites were alive when received, and these died without attacking gypsy moth larvæ ("enfeebled"). This Japanese parasite would be worthy of careful study should the work of exterminating the gypsy moth cease. The

experimental work of the Gypsy Moth Committee has suffered from the effects of the same shortsighted legislative policy that has hindered the progress of field operations. Mr. Kirkland pointed out that often the expenditure of a small sum in experimental research gave valuable results, and regretted that the experiments on the gypsy moth had been made to suffer from lack of funds.

In discussing the above remarks, Prof. A. D. Hopkins highly commended the good work that had been done in destroying the gypsy moth, but expressed the opinion that extermination would not be accomplished, owing to the lack of financial support on the part of the Legislature.

Prof. J. A. Lintner advocated the advisability of extermination, and stated that it was his opinion that if the State would grant sufficient funds, extermination would be accomplished. He thought the time had come when Massachusetts should be aided by the financial support of the National Government. He contrasted the action of the Government concerning the Rocky Mountain locust invasions with its present inaction as regards the gypsy moth. National support would also inspire the Massachusetts people with more confidence.

Dr. James Fletcher spoke in very flattering terms of the success in extermination thus far obtained, and of the value of the special report on the gypsy moth to entomologists in general. This book he considered would be an invaluable work of reference for economic entomologists.

He had been in the infested region twice and knew that the work had been well done, and this in spite of difficulties arising from insufficient means. In answer to a question by Dr. Fletcher, Mr. Forbush made a more explicit statement concerning the progress of the work and the conditions governing the same. He cited the case of the city of Lynn, where over one thousand colonies of the gypsy moth had been exterminated.

Dr. Fletcher suggested that the Association should give formal expression of its opinion regarding the attempt being made by the State of Massachusetts to stamp out this pest.

Prof. J. B. Smith stated that New Jersey devoutly hoped that the insect would be kept within its present domain, and offered resolutions commending the work already accomplished by the State of Massachusetts, and urging the continuance of the same, with liberal financial support.

Prof. F. M. Webster seconded Mr. Smith's resolutions, and the same were carried by a unanimous vote.