State of Rhode Island and Providence Plantations.

OFFICE OF THE COMMISSIONER FOR THE SUPPRESSION OF THE GYPSY AND BROWN-TAIL MOTHS.

CIRCULAR No. 1.

# IMPORTANT NOTES ON THE GYPSY AND BROWN-TAIL MOTHS.


JUNE 15, 1906

PROVIDENCE, R. I.
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## INTRODUCTORY.

The gypsy and brown-tail moths, against which the work of suppression is directed, are European insects accidentally introduced into this country. The gypsy moth was brought here in 1868 or 1869, and the brown-tail moth was introduced sometime in the early nineties. The regions in Massachusetts where these insects first gained a foothold are now thoroughly infested, and that State has spent millions of dollars in trying to control or suppress them.

It is well-known history how that State fought the gypsy moth, and how at the point of almost complete extermination the work was discontinued and the pest was again allowed to spread until it now covers a large part of the eastern half of the State. It is also common knowledge what a terrible scourge both of these insects have become in Massachusetts; how they have destroyed thousands of acres of woodlands, of park trees and of trees in private grounds, and how they have become so numerous in places as to drive the people from their homes. Citizens of Rhode Island should, therefore, congratu-

late themselves that the Assembly at its last session appropriated a sum of money with which to begin the fight against these insects before the State has become so thoroughly infested that similar experiences and struggles will ensue.

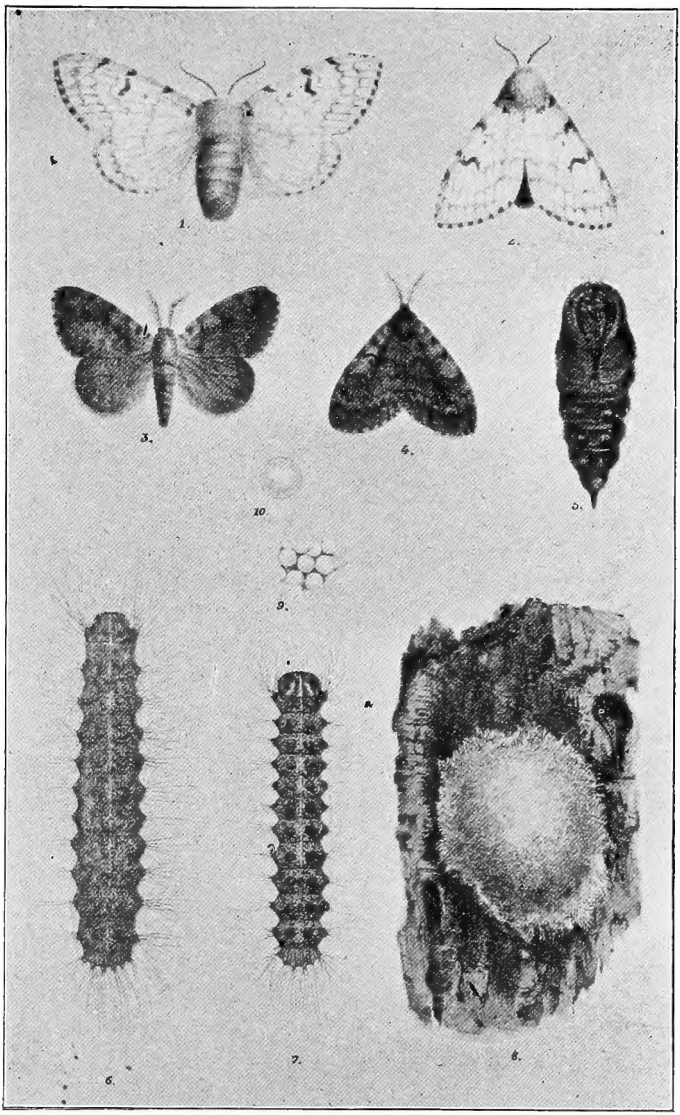
As will be noted later, this appropriation will not be sufficient to exterminate the insect; but there is every hope that the State, having taken hold of the matter, will, with the assistance perhaps of the city and national government, carry the fight to a finish. There is also hope that the insect can be exterminated in this State if a reasonable time is allowed and necessary means are provided.

This circular will contain an outline of the work as now organized, and also short descriptions of both insects to help the people of the State to identify them when they appear. Fuller accounts of the insects and the work against them will be given in a report to be issued later. We hope that all concerned will give a hearty co-operation in the work and help speed it to the desired termination.

A. E. STENE,

*State Commissioner for the Suppression of the Gypsy and Brown-Tail Moths.*

## PLATE I.



THE GYPSY MOTH

1-2, Female Moth. 2-4, Male Moth. 5, Pupa.
6-7, Caterpillars—One More Fully Developed than the Other.
8-Egg Mass. 2-10, Eggs Enlarged.

From special report on the Gypsy Moth by the Massachusetts State Board of Agriculture, 1897.

STATE OF RHODE ISLAND.

IN GENERAL ASSEMBLY,

January Session, A. D. 1906.

## RESOLUTION

MAKING AN APPROPRIATION FOR THE SUPPRESSION AND EXTERMINATION OF THE GYPSY AND BROWN-TAIL MOTHS.

*Resolved*, That the sum of fifty-one hundred dollars or so much thereof as may be necessary be and the same is hereby appropriated, out of any money in the treasury not otherwise appropriated, to be used for the purpose of suppressing and exterminating the gypsy and brown-tail moths in this State; and

*Resolved*, That the governor be and he is hereby authorized to appoint some experienced citizen of this state a commissioner who shall serve without pay excepting for actual and necessary expenses while carrying out the provisions of this resolution, whose duty it shall be to see that the said fifty-one hundred dollars is properly and judiciously used in the suppression and extermination of the gypsy and brown-tail moths; and the state auditor is hereby authorized to draw his orders on the general treasurer for the above sum of fifty-one hundred dollars, or so much thereof as may be needed, upon the presentation of properly authenticated vouchers. Said commissioner and persons in his employ may at all proper times enter upon any land of the state or of a municipality, corporation, or other owner or owners and may use all reasonable means in carrying out the provisions of this resolution:

*Provided, however*, that no part of this money shall be paid without the approval of the governor who on examination shall be satisfied that the appropriation has been properly used before signing the vouchers; and said commissioner is hereby directed to make a full report of his doings to the next January session of the general assembly.

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STATE OF RHODE ISLAND.

OFFICE OF THE SECRETARY OF STATE,

PROVIDENCE, April 30, 1906.

I certify the foregoing to be a true copy of the resolution passed by the General Assembly of said State on the 20th day of April, A. D. 1906.

In testimony whereof I have hereunto set my hand and affixed the seal of the State aforesaid the date and year first written above.

CHARLES P. BENNETT,

*Secretary of State.*

## Life History of the Gypsy Moth.

See Plate I.

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The gypsy moth has a complete metamorphosis. This means that it has four stages in its life history—the egg stage; the caterpillar, or active feeding, stage; the pupa, or resting, stage; and the adult, or moth, stage. At the present writing the insect is found in the caterpillar stage. **The eggs** are laid in clusters, containing from three hundred to seven hundred eggs, on trees, shrubs, rocks, and leaves; in fact on almost any object on which the female moth may happen to be when ready to lay. The eggs are mixed with hairs from the body of the mother insect and with a frothy glue which make the clusters resemble a small piece of sponge. The clusters are light yellow in color, oblong in shape, and from one-half to one and one-half inches in length by from one-third to one inch in width. The eggs begin to hatch in April and continue hatching through May. At first **the caterpillar** is, of course, very small, and would be difficult to distinguish from a great many others of different species. It grows quite rapidly, and in nine or ten weeks reaches its maturity, when it will be from one to one and two-thirds inches in length. The caterpillar is covered with tufts of long hairs growing from projections called tubercles along is sides and back. Its principal distinguishing mark is the two rows of tubercles extending along its back. The first five pairs of these tubercles are blue, and the six following ones are red or crimson. At first the caterpillar feeds at all times of the day. When approaching maturity, however, it feeds during the night and crawls into holes or crevices to rest for the day. When mature, the caterpillar changes into a dark brown pupa. **Pupæ** may be found, in clusters or singly, attached to the bark of trees, to rocks, fence posts, and other objects. Frequently clusters of these pupæ may be found accompanied by cast-off skins of the caterpillar, empty pupa cases, and egg masses. **The adult insect** emerges in about two weeks. The male is light brown in color, with dark

irregular bands across the fore wings. It is somewhat smaller than the female moth, and flies actively with a zigzag motion. Unlike most moths it flies in the daytime and rests at night. The females are white in color, and have irregular dark brown bands or markings across the wings. In size, it is from one and one-half to two and one-half inches between the wing-tips. It is much heavier than the male, and seldom if ever flies. It moves, if at all, only a short distance from the place where it emerged from the pupa case. This characteristic of the female moth prevents the rapid spread of the insect through its own efforts.

## OF SPECIAL IMPORTANCE.

1. Care should be used not to transport the insect on wagons, autos, and other vehicles, and on lumber, wood, rubbish, etc., from infested districts to places not now infested.

2. It is forbidden by United States law to send live insects or insect eggs through the mail, or from one State to another by any public carrier. Parties finding suspicious insects, therefore, should notify this office at once, and an inspector will be delegated to investigate, or else directions will be sent for killing the insects in such a way that they can be safely sent to this office and still be in shape for identification.

3. Egg clusters should in no case be scraped off from the trees, or taken by anyone from the places where they are found, without permission from this office.

4. Intentional carrying of live insects or egg masses of the gypsy or brown-tail moths from one place in the State to another is strictly forbidden.

5. Property owners will greatly facilitate the work against the insect by cleaning up and burning old rubbish, filling holes in trees, removing dead wood, and, in general, removing any hiding place where the insect is likely to find a refuge from the search of the inspectors and their men.

6. Citizens will confer a favor by reporting at once to this office any carelessness, discourtesy, or deviation from their line of duty on the part of the men engaged in the work.

## THE GYPSY MOTH DISTRIBUTION.

The gypsy moth is found in every ward in the city of Providence, and in two or three places outside the city limits. Wards 2, 4, 5, 6, 8, and 9 are more or less seriously infested. The infestation is very much greater, not only in area, but also in the number of insects in the infested area, than was realized at the beginning of the work. In order that people interested may learn the general details of the work as carried out, a few words descriptive of present plans and methods will be given.

## METHODS OF FIGHTING THE PEST.

*Creosoting.*—The most economical and effectual work against the gypsy moth is destroying the egg masses. It is most easily done by painting them with creosote, to which a small amount of lamp black or tar has been added to color the egg masses so that the treated ones may be distinguished from those that are not treated. When the appropriation became available, there was but very little time left in which to apply this method; in fact, many of the eggs were already hatching, and it soon became useless to paint the egg clusters. Only a part of even the then known areas could be thoroughly gone over. Another method which gives fairly good results is

*Burlapping.*—It is the habit of the caterpillars, after they become half-grown, to feed at night and to seek some convenient shelter during the day. If no such shelter is found in the trees, they descend to the ground to hide under rubbish and other objects in the neighborhood. The burlap is put on to provide a hiding place for them. During the period in which this is effective, all the burlap should be gone over once or twice a week, and in badly infested regions every

## PLATE II.

WINTER NESTS OF THE BROWN-TAIL MOTH.

After Britton, Rep. of Entomol., 1892, Conn. Exp. Sta.

day. The flaps are raised and the caterpillars are destroyed by crushing, or preferably by cutting in two with a knife carried for the purpose. To make the burlaps most effectual, all crevices, and holes, must be filled up and other hiding places removed. Signs nailed on trees, also wooden tree guards defeat the purpose of the burlap and should be taken away. Citizens can help this work along greatly by watching the burlap bands on the trees to see that they are not torn or blown off, and also by lifting the bands and destroying the caterpillars if found. Everyone who is interested in trees should learn to recognize the caterpillar, as well as other forms of the insect, in order to know when the right one is found under the burlap, as there are other species of much less importance that may take advantage of this hiding place. So far as possible, tree owners should keep track of the trees and places where gypsy moth caterpillars may be found, and notice should be given to the inspectors when making their rounds. IN NO CASE SHOULD BURLAP BANDS BE TACKED DOWN OR COVERED WITH TAR, PAINT, WHITEWASH, OR OTHER SUBSTANCE, AS THIS DEFEATS THE OBJECT FOR WHICH THEY ARE PUT ON.

*Spraying.*—In places where the caterpillars are very numerous, and where danger of spreading must be guarded against, infested trees should be sprayed. Such spraying to be efficient must be made while the caterpillars are small. When approaching maturity they are very resistant to poison, and only a small proportion can be killed by ordinary spray solutions. The best poison is lead arsenate, as this can be applied in a strong solution without injury to the trees. The quantity generally used against the moth is one pound of lead arsenate to ten gallons of water. Where lead arsenate can not be obtained, Paris green at the rate of one pound to 150 gallons of water can be substituted. As there is some danger of burning the leaves with this poison, it is necessary to slake two pounds of quick lime and add the resulting milk of lime to each 150 gallons of spray mixture.

As has been already indicated, the work so far done has shown us that the gypsy moth infests a much greater area than was at first

supposed. It is evident even now that the State appropriation will be entirely inadequate to deal with the insect, in spite of the fact that nearly every dollar will be used in actual field operations against it. It will, therefore, assist the work greatly if individual property owners will do all that they can to help it along. We therefore ask that, so far as possible, owners of trees that are so badly infested that they ought to be sprayed should have this work done, especially if the trees stand in yards or lawns. Street trees will be looked after by the State commission.

Other methods are also employed, but they are of less importance and will be taken up in a later bulletin.

## ORGANIZATION OF THE WORK.

When the State appropriation became available, the park board of the city of Providence had already placed a small fund in the hands of Curator Davis of the Park Museum with which to fight the insects found on trees in the neighborhood of the park, and a very large number of egg clusters were creosoted. Fortunately, also, the services of Edward H. Armstrong and George Johnson & Son were secured at the beginning of the State work. These parties have made a business of spraying and horticultural work, and have treated the gypsy moth for private parties during a number of seasons in the past. They were therefore well acquainted with the insect, which was quite essential, considering the necessity for immediate work, and were able to furnish a number of men with more or less experience. It was thought advisable to have some one thoroughly experienced in the methods of work and in the handling of men to devote his entire time to superintending the work in the field. On recommendation of Mr. Rogers, assistant superintendent of the work for suppressing the Gypsy and Brown-tail moths in Massachusetts, Mr. John Sweeney was engaged for this purpose. Mr. Sweeney also comes highly recommended by Mr. Kirkland and others. He has had ten years' experience in the work in Massachusetts, and was sent to New Hampshire a year

## PLATE III

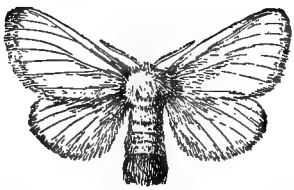

FIG. 1

FIG. 2.

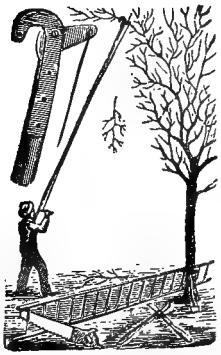

FIG. 3.

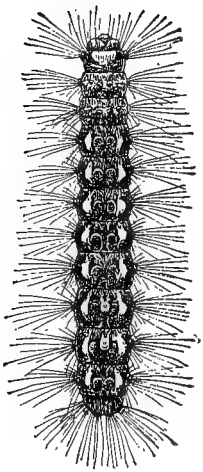

FIG. 4.

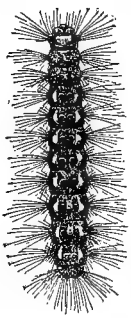

FIG. 5.

### Explanation of Plate

FIGURES NOS. 1, 2, 4 AND 5 DRAWN FROM NATURE BY J. H. EMERTON.

No. 1. — Female brown-tail moth.

No. 2. — Winter web of brown-tail moth caterpillars.

No. 3. — Pruning shears suitable for removal of winter webs.

No. 4 — Brown-tail moth caterpillars, enlarged.

No. 5. — Brown-tail moth caterpillars, natural size.

From special report on the Brown-Tail Moth, Mass., State Board of Agr., 1903.

ago as special inspector to assist Professor Sanderson in starting the work there.

The men in the field are divided into groups, each group under the charge of an inspector whose duty it is to keep track of the work and make note of the places where the insects are found. As the men employed in this work have to enter private grounds, it is recognized as essential that they should be of good character. It is expected of them that they shall be civil and courteous, and attend strictly to the business for which they are engaged. Should anyone have cause for complaint against any of the men, he will confer a favor by reporting as soon as possible to the commissioner. The men in this work are provided with badges, and property owners are cautioned not to give credit to anyone representing himself to be connected with the work unless he carries such a badge, or else a certificate from this office.

## The Brown-Tail Moth.

SEE PLATES II, III AND IV.

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Like the gypsy moth, the brown-tail moth has four stages in its life history: the egg; caterpillar; pupa, or resting, stage; and the adult or moth, stage. **The eggs** are laid during July, on the under side of the leaves, usually on the outside and towards the top of the trees. The egg cluster is similar to that laid by the gypsy moth, but it is smaller, more elongated, and thickly covered with golden brown hairs. Each egg mass contains from two to four hundred small, round, light yellow eggs. Occasionally these egg clusters may be laid on the trunks and branches of the trees, and on fences, buildings, and other objects. The eggs hatch in two or three weeks. At first the caterpillars feed on the outer surface and do not eat holes through the leaves. This causes the leaves to dry and look as if scorched by fire or blight.

Unlike any other insect that we have, the brown-tail moth passes the winter in the caterpillar stage in silken nests spun usually at the tips of the upper branches. The building of the nest is begun soon after the caterpillars have hatched, and it is from one to four inches in length and from one to one and one-half inches through when completed (see Fig. 2). It always encloses a number of the leaves on which the caterpillars have fed, and is usually formed near where the egg cluster was laid. When cold weather sets in, the young caterpillars go into the nests, and remain inside for the winter. They come out again in the early spring and feed on the young leaves until the middle of June, when they change into the pupa stage. In about three weeks the moths come out and begin to lay eggs, and the life history is completed.

We have another insect, the fall web-worm, which weaves nests that are often mistaken for those of the brown-tail moth. The nests of the fall web-worm, however, are more loose and open, and never contain living caterpillars during the winter time.

WINTER NESTS ON PEAR TREE DEFOLIATED BY THE CATERPILLARS OF THE BROWN-TAIL MOTH.

The webs on the trees in the back ground, were cut off and destroyed during the previous winter.—From special report on Brown-Tail Moth, Massachusetts. State Board of Agriculture.

**The caterpillar** of the brown-tail moth is of a dark brownish color and covered with yellowish-brown hairs. Beside these long hairs the tubercles along the back and sides of the abdomen are covered with shorter barbed hairs which cause a nettling and sometimes a serious inflammation where they come in contact with the human skin. Along both sides of the back is a succession of white spots or blotches giving the appearance, on first observation, of two white lines. Towards the rear end of the body of the caterpillar are two tubercles which are of a dark orange or red color. When full grown it is from one to one and one-third inches in length, (Figs. 4, 5). **The pupa** is from one-half to five-eighths inches in length and of a dark brown color. **The moths,** both male and female, are of a pure white color with the exception of the tip of the abdomen, which has a tuft of dark brown hair. The wing expanse measures about one and one-third inches in the male and one and one-half inches in the female. Unlike the gypsy moth, both male and female moths of this insect are strong flyers, and in this way are much more rapidly distributed than the former insect, (Fig. 1).

The moths begin to fly at dusk, but the greater number may be found from 10 o'clock until midnight. During the day they remain at rest, hidden on the under side of leaves, branches, or other objects. They are attracted to light, and in some cities of Massachusetts, where they are plentiful, accounts relate that they are so numerous around the electric street lights as to resemble a miniature snowstorm and almost obscure the lights. They are often attracted to moving trains, electric cars, and steamboats, and may in this way be carried long distances to infest new regions. Strong winds at the time of flying are responsible for scattering them over wide areas. They are also distributed in the caterpillar stage by being carried on automobiles, carriages, electric and steam cars in the same way as the gypsy moth.

### KEEP WATCH FOR THE INSECT.

It is essential that everyone should become thoroughly acquainted with this insect in all its forms, as well as with the gypsy moth so as to

prevent, as far as possible, the transportation of the pests and their propagation in new localities. If insects suspected of being the brown-tail or gypsy moths are found within the borders of Rhode Island, notice should at once be sent to the Commissioner for Suppressing the Gypsy and Brown-tail Moths, at Kingston.

## REMEDIES.

If the brown-tail moth is found when it first gets into any region, it may be readily destroyed. The winter nests are easily seen when the leaves are off the trees, and if these are cut off and burned there will be no further trouble from the insect. For this work it is necessary to get what gardeners call the "pole pruner" which is a pair of pruning shears at the end of a long pole. (Fig. 3, Plate III). The caterpillars are also readily destroyed by spraying the trees, in early summer or after the caterpillars have hatched in the fall, with Paris green or lead arsenate. The foliage must be thoroughly covered, and in order to do this the spray should be applied, in the form of a fine mist, by means of a good spray pump and especially designed spray nozzle.