

AN INSECT PEST OF THE FOREST TREE.

(*Hyphantria cunea* Drury)

GRADUATING THESIS

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A group of Arctiidae---Hyphantria cunea in the middle of group.



Hyphantria cunea  
Dorsal view--two diameters



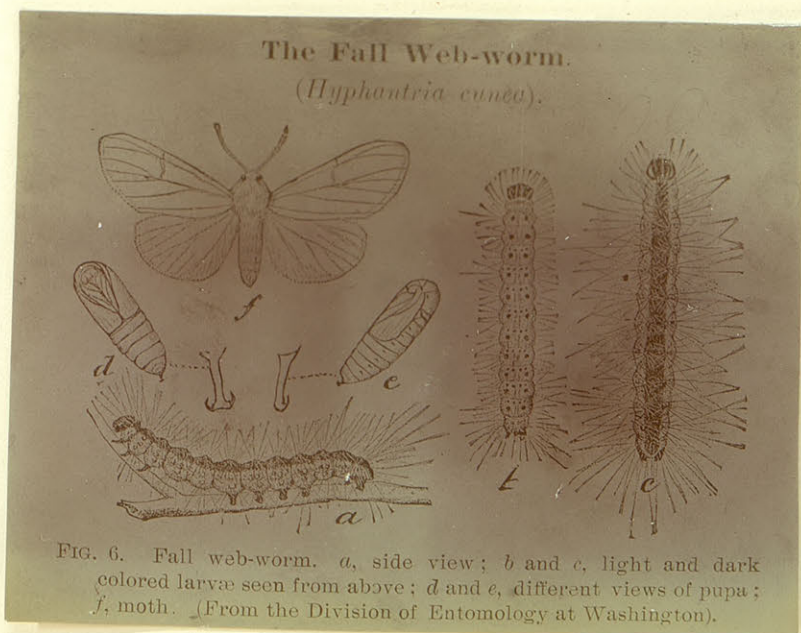
Hyphantria cunea  
Ventral view--two diameters





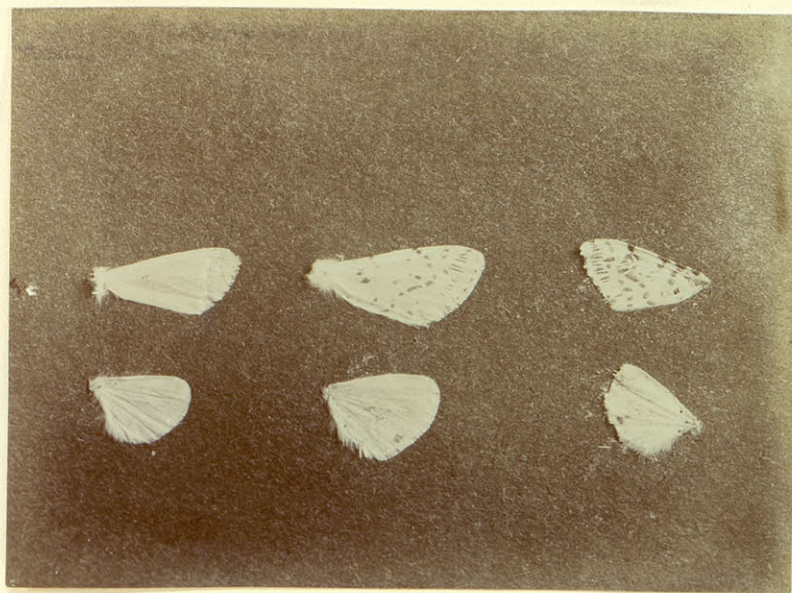
*Estigmene acrea*

One of the larger Arctiidae--two diameters



From Riley's Reports





Wings of *Hyphantria cunea*

Showing variation in marking



Wing of *Hyphantria cunea*

Showing the vennation-fore wing



Hyphantria cunea Drury.

Description:--*Hyphantria cunea* is one of the smaller of the Arctiidae. The average spread of the male adult is 24.86 millimeters; and of the female adult, 30.98 millimeters. There is considerable variation in the measurements for size in the species, as is evident from the table of measurements herewith given.

MALE			FEMALE		
No.	Spread	Length of Abdomen	No.	Spread	Length of Abdomen
1	26.25 *	9.75	1	31.00	10.00
2	24.50	8.50	2	31.30	11.10
3	26.00	9.50	3	31.00	11.00
4	24.90	9.60	4	33.00	13.55
5	21.00	7.00	5	34.40	11.60
6	22.40	9.30	6	34.25	11.90
7	29.00	10.00	7	31.90	10.25
Avg.	24.86	9.09	....	30.98	11.34

\*Measurements are in millimeters. .

The females are uniformly larger than the males, as will be observed from the measurements given above.

The color is in most cases a snow-white in our locality, especially the first brood of the season. From nearly two thousand moths matured in our insectary during the summer of 1904 I failed to obtain but six specimens with more than a very small dot, this located on the front margin of the fore wing at about one fourth of the distance to



the tip. The six more spotted specimens have the second dot located at the point where vein VII<sub>1</sub> and V<sub>2</sub> unite. When a third dot appears, it is located on the junction of vein V<sub>1</sub> with vein III. The antennae vary from white to brownish, and the abdomen is usually snow-white---always so in my summer bred specimens.

In the first spring brood, bred from specimens of my summer colonies, and kept over winter in the cages, I find specimens ranging from snow-white to very darkly spotted, the extremes of one brood being shown in the accompanying photograph.



After the first three dots appear, I can trace no regularity in the location of the spots; but the first three appear regularly as before described. I have observed this on about one hundred specimens.

The division of *Hyphantria* into cunea and textor (Harris) seems to be without any foundation, for I have found the characters of both species often in members of the same colony and from the same moth. Riley observes the same to be true. I am inclined to believe, in the absence of any available literature or experience from others regarding it, that the spotted brood is the brood that has lived over winter, while the snow-white moths are generally produced by the summer broods. Fernald suggests that the spotted ones are a southern variety, while the immaculate ones are indigenous to the north, but this, I think, is unwarranted by fact, for I have bred many of the



spotted forms, and found many of them at large in this section. On the contrary it would seem that the occurrence of more spotted ones in the south is due to the fact that they are two brooded there, and the spring brood bears the dark ones, as is the case in our locality. I do not know if any one has observed this to be a fact

In all cases the femurs are yellow above, white beneath. The tarsi are black spotted above, and white beneath. The antennae of the males are ~~prolonged~~ of the females filiform. The male antenna has forty five



the appended photograph from a  
ely of the antenna of a male and  
shows them enlarged thirteen

#### Life History.

The eggs of the *Hyphantria cunea* are small, oval, pale green, about .5mm. in diameter, and .7mm in length. Fernald describes them as being yellow, but I have never seen them other than a pale green. They are laid in regular rows, in irregular areas, usually on the under side of the leaf and at the tip of the branch upon which the larvae are to feed. There is, however, not a little variation from the rule in this last, for I have found them on grape---a plant which I have never been able to get them to eat. The eggs hatch in from ten to twelve days, usually nearly every egg laid producing a larva.

The larvae appear at first to be a mass of hairs. In about three days the larva becomes large enough to be seen through this mass of hairs. It is then of a pale lemon yellow color with black specks along the lateral edges, or on the middle of the dorsal aspect. In eight or nine days the first molt occurs. The larva is now about three eighths of an inch long. The markings are now more distinct, and are



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In all cases the femurs are yellow above, white beneath. The tarsi are black spotted above, and white beneath. The antennae of the males are pectinate; of the females, filiform. The male antenna has forty five joints, and the female forty four. The appended photograph from a balsam mount shows the form very nicely of the antenna of a male and of a female specimen. The photograph shows them enlarged thirteen diameters.

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permanent. The larva becomes a greenish yellow, sometimes a whitish green, with various black or brown markings on the dorsal aspect. Sometimes there is a broad stripe of brownish black from tip to tip, covering the entire dorsum, and sometimes there is only a light row of dots on each side of the dorsum. There are also all grades of variation between the two. This marking of the larva is in no way related to the marking of the adult, the darkest larva being just as likely to produce a snow white moth as is the lightest one.

In my colonies, from thirty to six hundred seventy eight larvae composed a family. They spin web immediately, making a close web about the leaf. After a day or two they begin to include other leaves, and continue this as their demand for food increases.

The first molt occurs in about ten days; the second at about seventeen days old; and the third at about three weeks of age. When about twenty five days old they cease spinning web, and eat in the open foliage. They eat great quantities during the last few days of their communal life, one of my strong colonies having devoured eight hundred square inches of leaf surface in a day. After two or three days of this solitary life, they descend to the ground, and pupate in many cases in the soil at a depth of one-half to one inch in a frail puparium made from the hairs of their own body. In many cases, however, they seek sheltered places above the ground. I have found masses of fifty or one hundred packed in the hollow of a tree or in cavities under the bark. Many climb the sides of houses or other buildings and pack full any cracks or crevices they can find. Last fall in our town thousands of them could be seen upon the sides of houses, hunting for a sheltered nook in which to spend the winter.

The first moths appear in our climate as early as the first of April but there seem to be no colonies started from these. Perhaps the nights



are too cool, and in fact our late frosts are very sure to destroy the eggs of these early comers. The first colonies begin to be seen along in the first part of June, appearing in the tip of the branches, and soon making an unsightly web that is easily observed. These moths mature in the latter part of June and the first part of July, and in about two weeks the work of the second brood begins. Last year was the first season they have been observed to be two brooded in our section. This year they are coming out so early that they are sure to be so again.

#### Their Damages.

The damage done by these is three-fold. They destroy the leaves of the trees thus hindering growth: they form very ugly webs all over the infested trees: and they become a veritable nuisance on porches and even within houses when present in any large number.

Their damage to trees is enormous. There is practically no tree immune from attack, and shrubs in many cases form a favorite food for them. Deutzias and honeysuckles were especially relished last fall. I have even forced them to eat cabbage and lettuce, and do not doubt that in the scarcity of other food these would suffer badly. They have been found on more than one hundred and twenty five plants, and doubtless infest many upon which they have not been observed. Of the forest trees those most relished are box elder, elm, mulberry, ash, and willow. Where any of these are present, only a few webs will be found on any other species. Any of the fruit trees may be attacked, but persimmons are apparently more susceptible than the ordinary standard lines of fruit trees. Plums suffer severely, and apples only moderately. I have observed occasional colonies on nearly every variety of fruit trees.

The damage to the tree seems to be indirect. The limbs infested are



not killed, but the elimination of so much leaf surface materially decreases the growth and strength of the tree. I have observed a box elder ten feet in height, which had every leaf stripped from it. The next season showed no evil results, so far as the branches were concerned. The tree started as early as its neighbors of the same age, and made a good growth. The only apparent difference was a checking of the growth of the tree the year before, it having lost about ten per cent of its normal longitudinal growth by the attack. Of course this was observed on a single specimen, and cannot be taken as a rule without further observation.

#### Remedies---Natural Enemies.

On account of the wooly bodies of the larvae, birds are not willing to devour many of them, to say the most, and I have never observed a bird eating any of them. There are, however, a large number of parasites that do much to keep them in check. I have bred three species of Tachinids, one ichneumon, and one braconid<sup>x</sup> these, and others have been found in other places to work very vigorously upon them. I found but one colony infested with tachinids, and reared but three specimens of the ichneumon. The braconid parasite is the most important here. Of the fall brood, nearly every colony contained infested individuals. From a colony of five hundred forty seven larvae, I obtained but three adult specimens. The interior of the cage was covered with larva skins bound down to the pupa case of the parasite. From observations of seventeen colonies, I estimate the number of larva reaching the pupa state in the fall brood to be about ten in a hundred. Comparatively few of these emerge in the spring so that there is probably an increase of little more than one per cent in a year.

There is a fungus which attacks them sometimes, and is fatal to a



colony when it does. But I believe our climate is too dry to hope for much from this source. I found but one colony affected with this last year.

#### Artificial Remedies.

Artificial remedies seem to be rather unsatisfactory in a good many cases. I have made no attempts at destroying them, save by burning them in the web, and by clipping them off. Both of these methods are slow, and the first at least is not in any degree humane. The burning cannot be done in a way that will not leave many larvae half burned, to live for some time. Clipping them off and crushing them avoids this and is perhaps the most satisfactory method for small lots. Where a larger area is to be treated, I believe the application of poison spray will effectively destroy them, for though they are protected by their web most of the time they are constantly taking in new leaves and with them will get the poison. The spraying should be done while the colonies are quite small, if to be done economically, and should be repeated if necessary to destroy all the larvae. Frequently some of the larvae are more backward in development than others, and remain behind in the web a week after their more forward brothers have moved on to new leaves. These will mature just as well as the more forward ones, and it will generally be found necessary to spray a second time for their benefit.



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