A PRELIMINARY STUDY OF BORER DAMAGE IN STACKED WHITE PINE LUMBER

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IN THE late summer of 1925, a local wood-using concern suffered considerable loss from borers in white pine plank stored in two of its yards. In one lot fifty thousand board feet showed a loss of one-third at the end of the second summer. In another, also held over into the second year, a loss of fifteen per cent of the volume amounted to $818. This disregarded the depreciation in price due to lowered grade. The one company lost several thousand dollars during the season from this cause. In another yard where the plank had been stacked three seasons, local buyers refused to take twenty thousand feet at any price.

In view of these facts a short study was made, attempting to find the cause and extent of this extraordinary outbreak, and, if possible, some means of controlling the insect responsible for the losses. Nine yards with stacked lumber of known history were studied. These were scattered over the towns of Athol, Winchendon, and Ashburnham, Massachusetts, and Fitzwilliam, New Hampshire. A general description of each yard and a detailed description of each pile in which damage could be found were obtained.

Appreciable damage was found in six of the nine yards visited. In some cases only part of a small yard would be infested, while in others the uniformity and thoroughness of infestation were remarkable. It soon became apparent that two species of insect were present. The larvæ of both species were identified by Dr. F. C. Craighead, of the U. S. Bureau of Entomology. The smaller form, which was of little importance, was determined as *Callidium antenatum* Newm; the larger as *Monochamus scutellatus* Say. Due to the little damage done by the smaller, no further study was made of its habits. The following discussion, except where noted, deals with the larger, more injurious species, the pine sawyer.

The life of this insect has in it some vulnerable points on which control can be based. The adult beetles begin flying in this region about May 15. The female lays eggs in the bark of logs or round-edged plank by gnawing a pit through the heavy, outer fibers of the bark and inserting the eggs between the softer, inner bark and this heavy layer. The requirements of the species as to the moisture content necessary for incubation are very exact.[2] The grub, or larva, hatches in a few days (twelve in a laboratory test under conditions as nearly normal as possible). It immediately begins eating away the inner bark forming the characteristic chamber beneath

[1] Acknowledgment is due Dr. M. W. Blackman, Department of Forest Entomology, New York State College of Forestry, Syracuse, N. Y., for suggestions on control, and Mr. H. J. MacAloney, Assistant Entomologist, Northeastern Forest Experiment Station, for aid given throughout the course of the study.

[2] F. C. Craighead.

it. The "sawdust" is pushed out through a small hole in the outer bark. After it has grown considerably the larva begins to tunnel into the wood. Here in the north the grub usually lives through the first year in this tunnel, lengthening it down as far as the heartwood and then paralleling the bark for a few inches. Some time, usually in the second season, the larva bores a round exit hole one-fifth to one-fourth of an inch in diameter nearly out to the inner bark. It then retires to the deeper tunnel and sheds its skin, changing into the resting or pupal stage. It now goes through another change of a more gradual nature and completes the cycle by becoming an adult beetle. It finishes the round hole for emergence through the bark and comes out ready to feed and start another generation during the twelve to twenty days of its remaining life. The length of the complete cycle varies from one to three years (1).

It soon became apparent that the factor which governed the location and amount of damage in a given stack of plank was its dryness at the time of flight and egg-laying of the insect.

The distribution of damage in the stack was usually limited to layers two to five from the top. A very heavy infestation in lumber sawn during the season of greatest damage is necessary to spread the zone to anything like half of the pile. In a few piles where grass and weeds grew up around the bases, another region of light damage was found near the ground. This zoning might be explained as probably due to the fact that material with a very definite percentage of moisture is selected for oviposition by the adult beetles. With this moisture during the drying season always greater at the bottom and gradually lessening toward the top of the pile, only a narrow band of plank is in just the right condition at any one time. The lower infested area may be due to a later flight and egg-laying period of the same species, or to the attack of an allied form.

Variations in several other factors taken into consideration seemed to have no appreciable effect on the infestation. In this locality the egg-laying period is over by September 1, and possibly much earlier. In plank sawn after this and prior to March 1, the damage was negligible. The three yards in which no damage was found had their lumber sawn during this period. In other yards the piles sawn before March 1 were free from infestation, while those sawn later were well riddled. In one case where four rows of piles had been sawn and stacked during a three weeks' period in April and May and not arranged in order, the writer, without being given any previous hints, was able to decide the order of sawing from the amount of damage found. The piles in the rows first sawn had an average of 1.8 layers infested; the second, 3.6; the third, 4.2; and the fourth, 16.0.

Studying the piles in all yards by groups according to the month of sawing and averaging the corresponding numbers of layers damaged gives a very good illustration of this relation of drying to infestation. The following table is a summary of these figures separated into groups for the two thicknesses of plank.

The thicker plank is, because of its greater moisture stability, a better breeding ground than the thinner one.

Time of sawing	2-Inch Plank			3-Inch Plank		
	No. of piles	Av. no. of layers damaged	Combined thickness of layers damaged	No. of piles	Av. no. of layers damaged	Combined thickness of layers damaged
Nov.-Feb.	22	0.9	1.8"	87	0.3	0.9"
March	102	...	...	11	2.1	6.3
April	48	1.0	2.0	30	3.2	9.6
May	...	...	...	100	5.2	15.6
June	5	5.4	10.8	14	4.1	12.3
July	14	4.0	8.0	...	...	...
Sept., Oct.	30	...	...	...	...	...

This is shown by the figures in the table showing the combined thickness of layers damaged.

Shown graphically, the figures of the above table are still more striking. The "peak" of greatest damage formed in the two curves centers on the period of May and June. (See Figure 1.)

From this evidence it is quite safe to say that sawing between September 1 and March 1 will eliminate the damage without further control measures. The company first mentioned in this article, therefore, has limited the time of sawing of its plank by contract with the mill men to the winter and spring months before April 1.

If sawing cannot be finished in time to dry the lumber before the flight season of the insect, there are still controls,

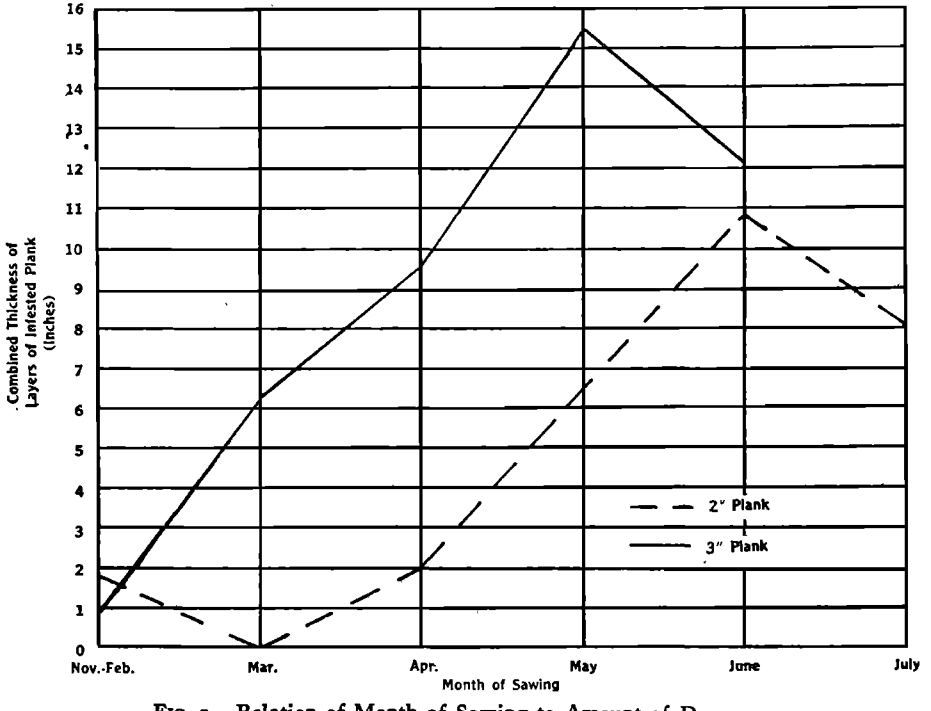

FIG. 1.—Relation of Month of Sawing to Amount of Damage.

but they entail extra work. One solution is, of course, sawing only square-edged lumber. Another is kiln drying at a temperature high enough to destroy any insect life and to dry the lumber so it is safe from further infestation. If the "sawdust" begins to appear in the piles the summer following sawing, the plank can often be made up into the finished product at once and before the larvæ have bored deeply enough below the bark to cause serious loss.

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