

SB
945
S7B5

UC-NRLF



QB 68 825

REPORT ON THE SPRUCE BUDWORM

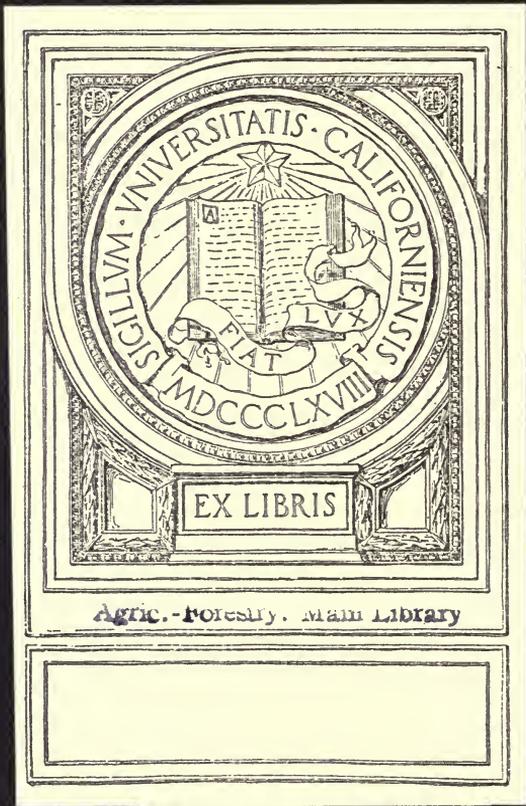
by

M.W. Blackman

Maine For. Dept. & Maine Agri. Exper. Sta.

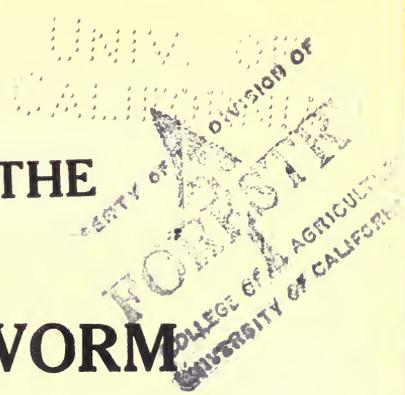
1919

UC 58861



Agric. - forestry. main library

REPORT ON THE
SPRUCE BUDWORM



BY

M. W. BLACKMAN, Ph. D.,
Professor of Entomology,

New York State College of Forestry, Syracuse University

Investigations Carried On and Report Published

BY THE

MAINE FORESTRY DEPARTMENT

IN COOPERATION WITH THE

Forestry Department, University of Maine

AND THE

Maine Agricultural Experiment Station

1 9 1 9

70 VIII
ANNO 1910

Agric. - Forestry. Main Library

THE SPRUCE BUDWORM.

The spruce budworm (*Tortrix fumiferana* Clemens) is with small doubt the most destructive enemy of the spruce, fir and hemlock in Maine. It is probably native to this country although it is well known in England. An account of the earliest known injuries by the budworm is given by Dr. Packard in which he establishes the probability that the wide spread destruction of spruce in the Casco Bay region in 1807 was due to this insect pest. However this may be, it is certain that it was responsible for the death of a large percentage of the red spruce in this same region and also in many other localities along the coastal area of Maine from Portland to Rockland, in an infestation which reached its apex in 1878 and 1879. This outbreak so far as we know, was confined to the islands and coastal area and did not extend inland any great distance. Following this great destruction, the insect seems to have disappeared so far as attracting any general attention is concerned for a period of more than thirty years. However, since 1911 numerous enquiries and complaints of its depredations have been received both by the Entomologist of the Maine Agricultural Experiment Station and by the Department of Forestry.

The present outbreak seems to be a much more serious and destructive one than that of thirty years ago, for its extent comprises not only the coast regions but practically every wooded area of the state. Indeed, by far the greatest amount of damage has occurred in the inland portions of the state, especially in Somerset, Piscataquis, Aroostook and Washington Counties in regions remote from the coast and covered with dense forests of spruce, balsam, fir and mixed hardwoods. From enquiries sent in to the Experiment Station and the Department of Forestry, from reliable information from various sources, and from personal observation, it is certain that the insect was present to an alarming extent in Franklin, Cumberland, Lincoln, Piscataquis, Penobscot, Waldo, Knox, Aroostook, Washington and Hancock Counties. It is also certain that it was to be found in Oxford, Somerset and Sagadahoc Counties, and almost as certainly in the remaining three counties of the state. However, the

greatest damage was done in the great inland spruce and balsam forests of the northern half of the state which are the main source of supply for the pulp mills.

Usually one's attention is first attracted to this insect in the spring or early summer by the wilted or blighted appearance of the new growth at the ends of the branches and twigs of spruce and balsam. This has often been described as resembling the effect produced by the passage of a light fire through the woods. If these blighted tips are examined they will be seen to be made up of the ends of the needles or leaves of the new spring growth which has been gnawed through at the base, but are still held loosely together by a silken, web-like substance. If one of these loose masses is opened, one or several caterpillars are likely to be found within. These are the culprits responsible for the damage. Each when about full grown is from one-half to three-quarters of an inch long, with dark, nearly black head and with body of a general brown color, more or less diffused with green at the sides. Each segment has several light colored warts, dark at the center from which arises a hair. The insect begins feeding in the spring soon after the development of the new needles and as they eat only the bases of these, the entire new growth is usually destroyed before the caterpillar reaches its full size about the middle of June. The uneaten portions of the leaves are held together by means of a silken thread spun by the larvae, which thus forms a loose but more or less complete covering or shelter in which it remains at all times. If all of the new growth is destroyed before the larvae becomes full fed, it extends its operations toward the base of the twig and feeds upon the older needles.

The larvae are usually full grown during the first half of June, and, still in their loose shelter of gnawed-off needles, transfers forms to pupae. These, in the course of the next week or two, give rise to medium sized, brownish-gray moths, which in infested regions are flying in numbers during the last week in June and the first half of July. The moths deposit their eggs in small light green masses on the sides of the needles. These eggs are flat and rather scale like and are so placed that they form small oval masses which are so inconspicuous as to escape casual notice. The eggs are all laid before the last of July and the larvae from them hatch in a week or ten days. These minute larvae feed for

a time, but perhaps only sparingly, and pass the winter as small only partly grown caterpillars. It is in the spring and early summer that their appetite seems most voracious and when they do the greatest damage.

The feeding of the larvae upon the developing tips of spruce or balsam usually completely kills them and as no more can be reproduced until the following season the tree is greatly weakened. However, to completely kill the tree, it is necessary either that all or nearly all of the old leaves be also eaten, or that the destruction of the buds shall continue several seasons, or that the greatly weakened tree shall be attacked by other insects, such as borers which complete the destruction. Thus, but few trees are killed the first year of attack unless complete defoliation both of the new and old needles has resulted, but for the succeeding few years the results are cumulative, as each succeeding crop of new leaves is nearly entirely destroyed, while in the meantime the old ones are being lost in the natural way. When, however, bark beetles and bark weevils attack trees already weakened by nearly complete defoliation, as has been recently reported by Swaine in Canada, they find but little resistance to overcome and the trees readily succumb.

In order to determine by personal observation the amount of damage done by the caterpillars, the writer spent a week in the forests of Piscataquis County, several days in the Rangeley Lake region, and another week in observation in the coast region from Bangor to Kittery Point. In the coast region the infestation is decidedly on the wane. Considerable damage has been done to the rather small more or less scrubby spruce upon the islands and points in the vicinity of Caseo Bay, but indications are that the injuries by the budworm are nearly over for the present. On Harpswell Neck, which was visited in company with Professor J. M. Briscoe of the Forestry Department, many of the small scrubby spruce near the roadside had been partly or entirely defoliated when the observations were made, (June 28-30), and some were in a dying condition. At this time many moths were on the wing and many pupae were still to be found attached to the defoliated twigs. However, a large percentage of the trees were only partially defoliated and will undoubtedly recover. At several places the injured or killed spruce had been cut and converted into cord-wood which was piled along the roadside.

The Rangeley region was visited early in September and here also the injury by the budworm seems to be on the decrease. Conclusive evidence of its presence was found in the partly defoliated spruce and fir, showing the characteristic work of this insect. In some cases the empty pupal skins still adhered to injured twigs. Along the woodland trail from York's Camp, Loon Lake, to Richardson's Camp, Kennebago Lake, quite a number of the balsams have been killed during the last several years, but a large percentage even of the larger growth had escaped. But relatively few spruce trees were dead, although many showed the effects of partial defoliation in the presence of dead branches and leaders. The work of the caterpillar during the past summer (1919) has resulted in only partial defoliation and in practically all cases observed; the trees will doubtless recover. Apparently the present infestation has at no time been disastrously heavy in this locality.

The observations in Piscataquis County were made during the latter part of July in company with Dr. C. T. Brues, of the Department of Entomology of Bussey Institution, Harvard University and Mr. H. B. Shepard, Forester for the Eastern Manufacturing Company. The trip was made by automobile from Lily Bay on Moosehead Lake, to the foot of Chesuncook Lake, thence by boat, canoe and on foot through Chesuncook Lake, Round Pond and Telos Lake. By this route observations were made in some thirteen townships and included a variety of conditions. Without doubt the greatest amount of damage encountered on this trip was to be observed in the forests at each side of the road between Lily Bay and Ripogenus Dam in the holdings of the Great Northern Paper Company. In certain localities, often of considerable extent, practically every fir, red spruce, and hemlock of any considerable size had been killed and most of the younger trees down to a height of only a few feet, were either killed or badly injured and distorted. The occasional white spruces seemed to have escaped with no injury or with only minor damages. Indeed, throughout the entire area examined, the white spruce seemed to possess some degree of immunity from attack and injury although in the regions of Houlton according to the observations of Mr. Wm. C. Woods reported by Dr. O. A. Johannsen in Bulletin No. 210 of the Maine Experiment Station, the white spruce was second only to the balsam

fir in susceptibility. However, there can be no doubt of the accuracy of our observations, and they are confirmed by those of Mr. Shepard, extended over a much larger area of this region. Indeed, the comparative immunity of white spruce was first pointed out by him. It is possible that some unknown local condition may be responsible for this difference in the two localities.

Several days were spent in making observations in Townships 7 R. 12, 6 R. 11, 5 R. 11 and 6 R. 12, all but the last of which are included in the holdings of the Lincoln Pulp Wood Company. While the conditions here are not so bad as in the Lily Bay region, there is evidence everywhere of a very severe and injurious infestation. In many localities, especially in the denser portions of the forests where conditions have remained undisturbed by the lumbermen for years, practically all of the larger firs and often-times as much as from 40 to 50 percent of the larger red spruce have been killed by the bud-moth within the last few years. The hemlock has also suffered a high mortality and much of the younger growth of spruce and balsam has been severely injured,—some of it past recovery.

A number of trees, some recently dead, others apparently dying, and others seriously and nearly completely defoliated, were felled in order to examine them for boring insects, either bark beetles, weevil or others, which might follow the attack of the budworm and contribute to the death of the trees weakened by defoliation. In the balsam fir, the larvae of the "sawyer" *Monohammus scutellatus* were nearly invariably found in recently killed trees. Some of these had doubtless entered the tree while it was still alive and sappy, but in a weakened condition, but the majority had certainly entered trees injured past hopes of recovery. Many of the balsams, though by no means all of them, had been attacked by the balsam bark beetle *Pityokteines sparsus* Lec. (*Ips balsameus* Lec.) and the weevil *Pissodes dubius* in the trunk regions, while the smaller limbs and twigs harbored numerous broods of another small bark beetle *Cryphalus balsamius* Hopk. There is no doubt that in some cases all three of these forms had entered and insured the death of trees which had been much weakened by the budworm and which otherwise might have recovered. It is equally certain that in the majority of cases the trees had been either killed or

weakened beyond recovery by the work of the caterpillars and the beetles, when present, were secondary enemies, entering trees already dead or sure to die.

Nearly all of the dead and dying spruce had their bark riddled by the burrows of the spruce bark beetle (*Polygraphus rufipennis* Kirby). Several also contained the brood of *Dryocoetes affaber* Mannh. (*D. piceae* Hopk.) another bark beetle attacking the trunk region, while the tops and limbs of several had been attacked by *Eccoptogaster piceae* S.w. The sawyer *Monohammus scutellatus* also breeds in the recently killed spruce although not in such numbers as in balsam. In several dying spruce examined were found the larvae and young adults of a weevil *Pissodes nigrae* living in bark not yet dead. There is little doubt that several of these beetles, including *Polygraphus rufipennis*, *Eccoptogaster piceae* and *Pissodes nigrae*, often hasten the death of much weakened trees, and in some cases at least, insure the death of trees which would otherwise survive.

One of the most encouraging observations made in connection with this infestation is that the destructive work of the budmoth larvae is decidedly on the decrease. In the Chamberlain Lake and Telos Lake region comparatively few spruce trees and much lessened number of balsam trees have been killed during the past year, when compared with the numbers killed in 1917 and 1918. Another very cheering observation is the recuperative ability shown by the spruce especially. Trees which were known to have been nearly completely stripped last year and which then seemed almost certainly doomed, showed a much improved condition during July of this past season and will certainly survive unless there is a recurrence of the attack. Such a recurrence is not probable for some years as the parasites of the caterpillars together with other natural checks seems to have the budworm under control. If past history repeats itself, as we have every reason for believing it will, there will be no widespread, serious injury for another period of from 20 to 40 years. It is likely, however, that during the next few years a few trees will continue to be killed in some localities, but there is no reason to expect such widespread devastation as has occurred since 1912.

While it is undoubtedly possible to control the bud moth by spraying the affected trees in the spring with arsenate of lead (5 lbs. to 100 gals. water) this is practical only for ornamental

and park trees. The best results will probably be obtained by two sprayings at an interval of about ten days—the first to be done when the buds are just opened in the late spring and before injury by the larvae is evident. In woodlands such a procedure is of course impractical both from the standpoint of cost and from the impossibility of penetrating the wilds with a high power spraying outfit. Indeed, in the forests man's only hope is the natural checks such as parasitic and predaceous enemies which nearly invariably in the course of a few years control any extraordinary outbreak of injurious insects.

The woodland owner can, however, lessen the danger of the much increased loss which will occur if the trees which are weakened by the budworm are attacked by hordes of beetles capable of breeding in them and completing their destruction. This he can do by using proper methods in his logging operations. If stumps are cut high and tops are not properly utilized they serve as excellent breeding places for bark-beetles, weevil, and other boring beetles, many of which when sufficiently numerous will attack and kill weakened or even apparently healthy trees. However, if the stump is reduced to the minimum, the top utilized as far as possible, and the slash properly disposed of, there is less opportunity for these injurious insects to breed and less likelihood of their breeding up to numbers sufficient to become notably injurious. In forests under natural conditions for many years, these insects are always present, but in the north-eastern United States, except following windstorms, fires and lumbering operations, they do not usually occur in numbers sufficient to do widespread damages. Perhaps the chief reason why only a small percent of the fir and spruce in the Chamberlain Lake region which was weakened but not killed by the budworm, was attacked by weevils and bark beetles, is that a considerable time has elapsed since this locality has been cut over, and the injurious forms were not present in numbers sufficient to take advantage of but a few of the weakened trees.

Trees killed by the budworm are by no means valueless, as they will remain sound for several years and can be utilized for pulpwood, provided they are not riddled by wood boring insects. This is especially true of the spruce which seems to be more resistant to decay than is the fir, and at the same time seems to be less attractive to those borers which riddle the wood such as the

“sawyers”. A very large percent of the balsam has suffered from “sawyer” injury and much of it will soon be valueless. Owners of woodlands in the regions infested should, in so far as it is practicable, concentrate their logging operations in the worst affected localities in an attempt to utilize as much as possible of the dead spruce, fir and hemlock before it becomes useless.

THIS BOOK IS DUE ON THE LAST DATE
STAMPED BELOW

AN INITIAL FINE OF 25 CENTS
WILL BE ASSESSED FOR FAILURE TO RETURN
THIS BOOK ON THE DATE DUE. THE PENALTY
WILL INCREASE TO 50 CENTS ON THE FOURTH
DAY AND TO \$1.00 ON THE SEVENTH DAY
OVERDUE.

DEC 3 1939
DEC 4 1939

DEC 14 1941

3)

LD 21-100m-7,'39 (402s

Pamphlet
Binder
Gaylord Bros.
Makers
Syracuse, N. Y.
PAT. JAN 21, 1908

495952

SB995

S7B5

UNIVERSITY OF CALIFORNIA LIBRARY

