



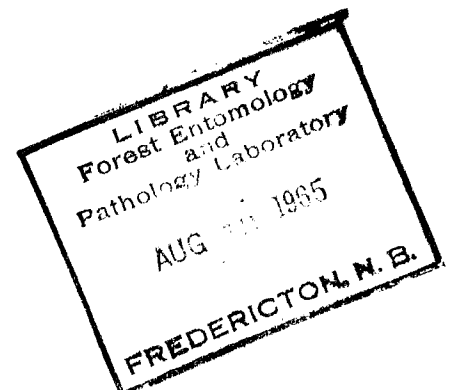
STATUS OF ROOT WEEVILS, Hylobius spp., IN CONIFEROUS PLANTATIONS IN NEWFOUNDLAND

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G. L. Warren and W. C. Parrott

DEPARTMENT OF FORESTRY LABORATORY
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INTRODUCTION

In 1937 the Newfoundland Government initiated an experimental reforestation program in the eastern part of the Island. The program was discontinued in 1951 after 3,000,000 seedlings had been planted in areas ranging in size from one to 500 acres. The sites selected varied from sandy loam to stony heathland and planting stock included a variety of native and exotic softwood species, with emphasis on jack and Scots pine. Lewis (1954) described the history of these plantings, including an assessment of early success. He indicated that failures were caused primarily by livestock browsing and exposure. He noted that Scots pine at Park Road and Collier's Ridge had been killed by the weevil, Hylobius radicis Buch., but concluded that damage had been controlled by the removal of infested trees. The Forest Insect and Disease Survey has since collected unidentified root weevils, Hylobius spp., from pines at various locations in Newfoundland and reported severe damage to Scots pine in the Makinson's plantation (Carroll, et al., 1964). These weevils have now been identified as Hylobius warreni Wood, formerly called Hypomolyx piceus DeGeer (Wood, 1957).

There are six species of weevils in North America belonging to the genus Hylobius. These are H. radicis Buch., H. pales (Herbst), H. rhizophagus Millars, Benjamin and Warner, H. congener Dalla Torre, H. pinicola (Couper), and H. warreni Wood (Millers, Benjamin and Warner, 1963). All six species attack coniferous trees but only the latter three are known to occur in Newfoundland and only H. radicis, H. pinicola and H. warreni have caused appreciable damage in Canada. The larvae of these three species damage host trees by boring in the bark and along the cambium of the root collar and the roots, decorticating and girdling infested parts.

H. radicis attacks only pines and is specific to arid, sandy sites. It has caused severe damage to plantations in southern Manitoba and Ontario (Prentice, 1955; Finnegan, 1962a) and was reported attacking plantations in Newfoundland (Lewis, 1954). However, a recent examination of plantations, natural stands of red pine and the reference collection maintained by the Forest Insect Survey, produced no evidence of this species on the Island and it is assumed that the original report was in error, probably confused with H. warreni.

H. pinicola has been reported attacking several species of coniferous trees occurring in moist to wet sites (Warren, 1960). It has not been a pest in plantations but remains a potential threat as it is abundant in natural stands of black spruce and tamarack. It was an important agent in the introduction of wood-decaying fungi in natural growing balsam fir in Quebec (Smerlis, 1961) and, like H. warreni, is probably associated with decay in spruce (Warren and Whitney, 1951; Whitney, 1962).

H. warreni attacks a wide range of coniferous tree species, especially when they occur in moist to wet sites (Warren 1956a, 1960). It is potentially an important pest of plantations although records of serious damage are few, probably because most plantations have been located in dry sites. However, Finnegan (1962b) reported destruction of over 60 per cent of a 40-year-old Scots pine plantation at Valcartier, Quebec and Warren (1956b) reported considerable damage to Scots, red and white pine and white and Norway spruce, in plantations at Valcartier and Grand'mere, Quebec. These plantations were located on sandy soils but a dense layer of Polytrichum moss and a deep, friable humus layer had created moist conditions favorable to the insect. In Newfoundland pines have been attacked wherever they have been planted, the moist to wet soils and cool climate, characteristic of this Province, being especially favorable to outbreaks of H. warreni. A recent increase in the number of reports of serious damage and an anticipated increase in plantation acreage, prompted the examination of existing plantations on the Island to assess the weevil damage. This report provides an estimate of damage in seven plantations on the Avalon Peninsula and includes a discussion of the problem and its control.

EXTENT OF H. warreni DAMAGE

Seven plantations were examined and the status of H. warreni damage described, as indicated in Table I. Percentage trees attacked and percentage mortality were estimated by strip cruising in the larger plantations and by the examination of individual trees in the Park Road and Salmonier Nursery plantations. Site conditions and degree of damage were not classified but the latter condition was reflected in tree mortality, with the heaviest populations and most severe damage occurring in stands having the greatest number of dead trees. Using this axiom as a criterion of weevil damage, plantations are listed in descending order of intensity of attack and severity of deterioration.

The results of the survey show that all plantations were attacked by the weevil but damage was catastrophic in only Western Bay "A" and Collier's Ridge plantations. The tallied mortality of 29.2 and

17.1 per cent respectively does not represent the full impact of the weevil as damage is cumulative and attack persistent. Furthermore, "lodging" of larger trees was common in the more dense areas of the Collier's Ridge plantation. Although this condition was not tallied as mortality, it is effectively the same and is a common characteristic of larger trees that have been severely damaged by Hylobius weevils. The date of complete destruction of these two plantations cannot be predicted but the rate of mortality is expected to increase as the plantations mature. The remaining plantations were not as severely damaged but some of the larger red and Scots pine trees in the Park Road plantation were badly girdled and the severity of this condition will increase rapidly, predisposing them to windthrow.

There was no apparent difference in host preference as all tree species appeared to be attacked indiscriminately. However, past observations indicate that pines are the preferred hosts and are more frequently killed by girdling but spruces eventually become infected with root decaying organisms that gain entry through weevil wounds predisposing severely infected trees to windthrow and windbreakage as they approach merchantable size.

CONTROL METHODS

Both cultural and chemical control measures have been recommended for protection against these weevils (Warren, 1956c) but research is limited and the period of protection following treatment unknown. However, pending suitable experimental studies some immediate protection can be obtained by following the existing recommended controls.

Plantations should be examined every three years from the time trees reach a stump diameter of one inch. Evidence of weevil damage indicates the need for immediate action. Regardless of the method of control adopted, it will first be necessary to prune lower branches and thin the stands to facilitate the application of treatments and to assess their effectiveness. Although removal of dead and dying trees does not effectively control the insect, these trees should be eliminated during the pre-control thinning operation to reduce the hazard of spreading infectious diseases and inducing outbreaks of secondary insects.

Cultural Control

Experience indicates that H. warreni may be controlled by removing the litter and vegetation from the vicinity of the root collar and the basal portion of the major roots. Pruning and thinning will increase the rate of evaporation and extend the control period by "drying out" the site.

Chemical Control

Chemical treatment, recommended by Warren (1956b), requires heavy applications of ethylene dichloride (up to 50%) and 5% benzene hexachloride. Ethylene dichloride is a fumigant that penetrates soil atmosphere rapidly, killing existing larval populations. However, it has poor residual properties and benzene hexachloride, a slow-acting, long residual insecticide was recommended as an adjunct to prolong the control period. The latter chemical should be applied the second year following the initial treatment with ethylene dichloride to coincide with the long life cycle of the weevil. Both chemicals should be applied at the rate of one-half pint per tree, for trees under four inches at the butt, and one pint, for those over four inches. Each treatment with the liquid insecticides should be applied to the soil near the root collar on two opposite sides of the tree. Effectiveness of the treatments may be increased by pouring the liquid into prepared shallow holes that are tamped closed following application of the insecticides.

Some of the more recent insecticides with long residual properties, such as aldrin or other chlorinated hydrocarbons, should also be tested to determine the most effective and cheapest treatment.

PROSPECTS FOR MANAGEMENT OF CONIFEROUS PLANTATIONS IN NEWFOUNDLAND

The occurrence of Hylobius weevils is regulated by site conditions and host species and, although sites are perhaps too moist for any but the native H. congener, H. pinicola, and H. warreni, imported Pinus species should be inspected to avoid the accidental introduction of the exotic Hylobius weevils that might become adapted to local conditions.

H. warreni is the only species presently causing serious damage to plantations on the Island. All plantations examined have been attacked by the weevil and the large plantations at Western Bay "A" and Collier's Ridge are in serious condition. Early survival was poor in the plantation at Western Bay "A" and mortality from weevil damage has reduced stocking beyond the point where control appears practical. The plantation at Collier's Ridge is also too badly damaged to employ successful control measures.

Although the infestation is advanced and some mortality is anticipated in the plantations at Park Road, controls should be applied to prevent excessive stand destruction. The outbreaks at Salmonier Nursery and Windsor Lake are not yet severe and the latter plantation presents an excellent opportunity to test various control methods.

The plantations at Tilton Barrens and Western Bay "B" present a more difficult problem. They have sustained moderate attack by H. warreni, indicating the necessity of treatment, but both are established on extremely stony sites supporting a dense growth of heath. The physical difficulties and excessive cost inherent in the treatment of these two large plantations emphasize the necessity of selecting only favourable planting site for future plantations.

The results of this survey show that H. warreni damage presents an important problem in the successful production of coniferous plantations in Newfoundland. The fact that the weevil attacks many native and exotic conifer species, from an early age, indicates the necessity of recognition of this problem at the reforestation planning stage. The logical solution to the problem appears to be the adoption of applied control as a standard practice of plantation management. Existing conditions present an opportunity to test ~~known~~ mechanical and chemical techniques and to develop more sophisticated methods as dictated by results and economic requirements.

TABLE I

Hylobius Damage to Plantations in Eastern Newfoundland

Location	Acres	Number planted	Year planted	Transect	examined	% trees attacked	dead	Remarks
Western Bay "A"		300,000	1950-51	10 ch.x 8 ft.	ScP 48	100	29.2	Clay/shale minor vegetation sparse
Collier's Ridge	60		1940-42	40 " x 4 "	jP 96 ScP 215	100	jP 15.6 ScP 18.6	Clay/shale, minor vegetation sparse
Western Bay "B"		300,000	1950-51	10 " x 8 "	ScP 88	90	6.8	Stony, dense heath ^a
Park Road	6		1937	-----	jP, ScP, rP, nS, ?S, wS	Approx. 90	-	Sandy loam, minor vegetation negligible
Windsor Lake	10		1948-49	5 ch.x 8 ft.	jP 25 ScP 25	75	Nil	Old field, clay loam, minor vege- tation negligible
Tilton Barrens		418,000	1949-50	10 " x 8 "	jP 81 ScP 18	jP 6.2 ScP 11.1	nil	Stony, dense heath ^a
Salmonier Nursery	2	2,500			ScP 25	aa		Gravel, some clay on slope, minor vegetation neglig- ible

^aTrees could not be properly examined because of extreme rocky condition.

aa Part of this plantation is located in a wet site and part in a dry site.
All trees in the wet area were attacked but no weevil damage was observed on those examined in the dry area.

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