

THE EFFECT OF STRIP ROADS IN PINE STANDS ON THE POPULATION SIZE OF LARGE PINE WEEVIL – *HYLOBIUS ABIETIS* (L.)

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Abstract. Investigations were conducted in central western Poland, in Scots pine stands aged 25-36 years. The population size of *Hylobius abietis* larvae was determined on stumps left after felled pine trees in eight stands. It was found that on stumps located in strip roads the number of weevil larvae was significantly higher than on stumps found outside those roads.

Key words: *Pinus sylvestris*, *Hylobius abietis*, thinnings, stumps

INTRODUCTION

The large pine weevil *Hylobius abietis* (L.) is an insect causing damage in the youngest plantations of coniferous trees as a result of bark biting and gnawing through thin trees [Korczyński 1984, Zumr and Stary 1994, Sydow 1997]. Its larvae develop on stumps and roots left after felled or dead standing coniferous trees, especially Scots pine *Pinus sylvestris* L. [Kharitonova 1965, Lekander 1977]. It was found that in preimago stages weevils developed fastest and in biggest numbers on well-insolated stumps located on large clear cutting areas. In contrast, inside stands the development of weevils was much slower [Dominik 1958].

At present in relation with the mechanization of silviculture procedures strip roads are prepared with increasing frequency, by cutting all trees in narrow strips. The width of strip roads varies and depends on the type of equipment used for tree extraction. In case of tractor skidding the required width of the strip road may be up to 4 m.

It may be assumed that in strip roads weevils find better conditions for their development than in the stand outside the strip road. Conditions for the development of weevils are probably the better, the wider the strip road and the more insolated the stumps. The aim of this study was to verify the hypothesis that stumps found on strip roads left

after felled pine trees constitute better material for the development of large pine weevils than stumps in the stand outside the strip road.

MATERIAL AND METHODS

Investigations were conducted in the Oborniki Forest District (the Regional Directorate of State Forest in Poznań) and the Zielonka Experimental Forest District, in eight pure Scots pine stands aged 25-36 years, growing on podsolic soils in the fresh coniferous forest sites. Trees in strip roads were felled at the same time as in the rest of the stand. Thinning performed in stands may be defined as heavy. Strip roads were 3.5-4.0 m wide.

The experimental element was the mean number of weevil larvae found on 12 stumps in the strip road or on 12 stumps in the stand outside the strip road. The stump selection process was stratified random sampling, since the point around which the nearest stumps were controlled was selected at random. A total of 96 stumps located in strip roads and 96 stumps located elsewhere were controlled in the experiment. Results were analysed using Student's *t* test for pairs of observations [Ruszczyc 1978]. The pair of measurements consisted of the mean number of larvae on the strip road and the mean number of larvae outside the strip road within one stand.

Moreover, the frequency, i.e. the percentage, of stumps infested with weevils on strip roads and outside them, was determined and compared. Prior to statistical analysis of the significance of differences the percentages were transformed into degree of angle [Elandt 1964].

Moreover, the size of all stumps used in the determination of the number of weevil larvae was determined. For this purpose the top diameter of each stump was measured after the removal of bark.

RESULTS

It was found that weevils infested 91% pine stumps found in strip roads and 46% stumps outside strip roads. The difference was statistically highly significant (Table 1).

On average 5.2 weevil larvae were found on a stump in the strip road, while on a stump outside the strip road there were on average 1.4 larvae (Table 1). The difference was very high and statistically highly significant. Thus it may be assumed that it was shown that weevils find better conditions for development in strip roads than inside the stand loosened out after thinning.

However, it was also shown that stumps in strip roads were on average significantly bigger than those outside strip roads. The diameter of stumps in strip roads was on average 12.7 cm, while outside them 10.5 cm. This is understandable as in the strip road all trees are always felled, while in the stand during thinning most frequently thin trees are cut. Thus the shown difference may be considered typical for the situation found in thinned stands, in which strip roads are prepared.

However, it may be analysed whether the shown difference in the rate of stump infestation in strip roads and outside them was caused by the difference in stump size.

Table 1. Mean stump diameter, frequency of stumps infested with weevils and the mean number of weevil larvae on a stump in strip road and outside it

Tabela 1. Przeciętna średnica pniaków, frekwencja pniaków zasiedlonych przez szeliniaka oraz średnia liczebność larw szeliniaka na pniaku na szlaku zrywkowym i poza szlakiem

Location Lokalizacja	Stumps – Pniaki				Number of larvae per stump Liczebność larw na pniaku	
	diameter – średnica cm		infested – zasiedlone %		x	±SE
	x	±SE	x	±SE		
Strip road Szlak zrywkowy	12.75	±0.522 a	91.25	±3.468 a	5.24	±0.880 a
Elsewhere Poza szlakiem	10.49	±0.408 b	46.75	±6.402 b	1.45	±0.398 b

x – mean.

SE – standard error of arithmetic mean.

If numerical values in a given column are denoted with different letters, their means differ statistically significantly.

x – średnia.

SE – błąd standardowy średniej arytmetycznej.

Jeżeli wartości liczbowe w danej kolumnie są oznaczone różnymi literami, to średnie różnią się statystycznie istotnie.

Obviously it could only have been partly so. It needs to be stated that the diameter of stumps in strip roads was on average by only 21% bigger than that of stumps outside strip roads. In contrast, the number of larvae infesting stumps in strip roads constituted 362% in relation to their number on infested stumps located outside those roads. Thus it may be assumed that a very important cause of the differences in the numbers of weevil larvae on stumps were microclimatic factors, such as the degree of stump insolation, temperature and humidity.

CONCLUSIONS

1. In thinning stands pine stumps found in strip roads constitute a much better material for the multiplication of weevils than stumps found outside strip roads.

2. Since the differences in the rate of stump infestation are determined by microclimatic factors, in order to reduce the possibility of development of weevils it is advisable to prepare strip roads as narrow as possible.

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WPŁYW SZLAKÓW ZRYWKOWYCH W DRZEWOSTANACH SOSNOWYCH NA LICZEBNOŚĆ SZELINIAKA SOSNOWCA – *HYLOBIUS ABIETIS* (L.)

Streszczenie. Badania wykonano w środkowozachodniej Polsce, w drzewostanach sosny zwyczajnej w wieku 25-36 lat. Liczebność larw *Hylobius abietis* określono na pniakach pozostałych po ściętych drzewach sosny w ośmiu drzewostanach. Stwierdzono, że na pniakach znajdujących się na szlakach zrywkowych liczebność larw szeliniaka była istotnie większa niż na pniakach znajdujących się poza szlakami.

Słowa kluczowe: *Pinus sylvestris*, *Hylobius abietis*, trzebieże, pniaki

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