# CHEMICAL CONTROL OF LOOPERS IN STANLEY PARK, VANCOUVER[1]

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## Introduction

Stanley Park has long been recognized by the Forest Insect Survey as a good collecting area for loopers, primarily the western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hlst.). A heavy outbreak of this species occurred between 1911 and 1913, but by 1914 the population was greatly reduced by the action of a tachinid fly (Whitford and Craig, 1918). Many western hemlock, *Tsuga heterophylla* (Raf.) Sarg., were killed outright. Another outbreak caused moderate defoliation in 1929, and the Park was dusted in 1930 to prevent further damage (Hopping, 1934).

No further outbreaks of the hemlock looper were recorded until 1958. In July, 1958, large numbers of hemlock loopers were present, but in association with a much larger number of green-striped forest looper, *Melanolophia imitata* Wlk. By July 15 the combined population has caused light to heavy defoliation on coniferous understory trees and light defoliation to many mature overstory hemlock. Six hundred acres were sprayed by aircraft on July 26 with 10 per cent DDT to protect the trees from further damage. No appraisal was made of insect mortality but about 30 minutes after spraying the roads and paths were littered with dead and dying larvae. Samples taken on the understory trees two days after spraying indicated a relatively large number of larvae had survived the treatment, apparently protected by the thick mid-story of vine maple which exists in some sections of the heavily wooded areas.

By mid-July, 1959, the numbers of western hemlock looper and the green-striped forest looper were large enough on some trees that if allowed to complete their feeding it was feared that top-kill could occur on some of the mature and over-mature western hemlock. In contrast to 1958 the hemlock looper was the more numerous species. About 550 acres were sprayed between 7:17 a.m. and 7:43 a.m., July 25, by a Grumman Avenger aircraft from Skyway Air Services Ltd. at Langley. The insecticide was DDT in fuel oil, without emulsifier, and applied at the rate of one gallon per acre.

## Methods

Because of Park restrictions it was impossible to cut branch samples so larval mortality was calculated by a series of prepared tests. Larvae of both species were obtained by beating trees. Small hemlock branches were tied to a lath cross-piece suspended about a foot above a 40-inch square of factory cotton stretched on a frame. Tanglefoot was placed around the edge of the frame and the ends of the cross-piece to prevent larvae from escaping. The trays for the two species were set up in pairs in a large clearing with three replications about 200 feet apart at right angles to the line of flight. Larvae were placed on the foliage on the evening of July 24, and checked again early the next morning. The trays were checked four times after spraying on July 25, and once again early on July 26. All living larvae were then taken to the laboratory and reared for 11 days on foliage collected adjacent to each tray.

Spray deposit cards were set out on each tray prior to spraying, and samples of the insecticide were obtained.

## Results

The insecticide samples were analysed by the Chemical Control Sec-

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tion, Forest Biology Division, and contained 7.54 per cent DDT by weight. The amount of DDT recovered from the spray deposit cards was small, ranging from 0.06 to 0.10 pounds per acre.

Considering the low DDT deposits hemlock looper larval mortality was remarkably heavy. In the three replications 0.06, 0.09, and 0.10 pounds of DDT per acre were recovered, and the corresponding larval mortality three days after spraying was 97.4, 90.4, and 96.8 per cent respectively. The combined mortality from the three replications is shown in Table 1. Mortality

TABLE 1—Hemlock looper larval mortality resulting from an average deposit of 0.083 lb./acre DDT. Stanley Park, 1959. Figures are uncorrected for natural mortality.

| Date | Days after spray | No. larvae Dead | Living | Per cent mortality |
|---|---|---|---|---|
| July 26 | 1 | 197 | 19 | 91.2 |
| July 27 | 2 | 199 | 17 | 92.1 |
| July 28 | 3 | 204 | 12 | 94.4 |
| July 30 | 5 | 206 | 10 | 95.4 |
| July 31 | 6 | 207 | 9 | 95.8 |
| August 3 | 9 | 209 | 7 | 96.8 |
| August 6 | 12 | 209 | 7 | 96.8 |

was 91.2 per cent after 24 hours, and increased slowly to 96.8 per cent on the ninth day. Of the seven survivors after 12 days four were pupae.

Larval mortality of the green-striped forest looper was less than the hemlock looper. DDT recoverey in the three tests was 0.06, 0.09, and 0.10 pounds per acre, and larval mortality after three days was 75.8, 90.4, and 86.5 per cent respectively. Mortality in the first replication increased slowly, but reached 86.7 per cent on the twelfth day compared with 86.5 per cent for the test which received 0.09 pounds of DDT per acre. The data for the three replications were grouped (Table 2). Total mortality barely reached 90 per cent, considerably less than for hemlock looper. Twelve of

TABLE 2—Green-striped forest looper larval mortality resulting from an average deposit of 0.083 lb./acre DDT. Stanley Park, 1959. Figures are uncorrected for natural mortality.

| Date | Days after spray | No. larvae Dead | Living | Per cent mortality |
|---|---|---|---|---|
| July 26 | 1 | 225 | 46 | 83.0 |
| July 27 | 2 | 232 | 39 | 85.6 |
| July 28 | 3 | 233 | 38 | 86.0 |
| July 30 | 5 | 235 | 34[1] | 87.4 |
| August 3 | 9 | 237 | 32 | 88.1 |
| August 4 | 10 | 238 | 31 | 88.5 |
| August 6 | 12 | 240 | 27[2] | 89.9 |

[1] 2 larvae missing.
[2] 2 larvae died of parasites.

the 27 survivors were pupae.

As material was not available to allow for check experiments the mortality percentages are not corrected for natural mortality.

On July 25, about 20 per cent of the hemlock loopers were in the fourth instar and about 80 per cent in the fifth or ultimate instar. Most of the fourth-instar larvae died within 24 hours. The first green-striped forest looper larvae to drop and die were the smallest. Dead larvae the first day were 23.5 per cent fourth, 52.5 per cent fifth, and 24.0 per cent sixth or ultimate instar. By the second day all fourth-instar larvae were dead, and after the fifth day only last-instar larvae were alive. Based on these records it appears that the best time to spray for both species is no later than when the majority of the larvae reach the fourth instar. In this particular instance treatment one week or 10 days earlier would have resulted in heavier mortality in a shorter time.