

## Western Hemlock Looper

*Lambdina fiscellaria lugubrosa* (Hulst)

Lepidoptera: Geometridae

Liang, Q.; Otvos, I. S.; Bradfield, G. E. 1996. Distribution pattern and sampling of eggs of the western hemlock looper (Lepidoptera: Geometridae) in mature western hemlock stands. *Journal of Economic Entomology* 89: 1531-1536.

**Objectives:** To determine the vertical distribution of eggs within tree crowns; to determine the optimum sample sizes for different error levels; to investigate tree variation related to oviposition; and to develop a sampling plan based on egg frequency.

**Abstract:** The western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst), is a destructive defoliator that causes damage periodically to western hemlock, *Tsuga heterophylla* (Raf.) Sarg., stands and other coniferous hosts. Damage occurs in mature and senescing stands where severe defoliation causes growth reduction, top kill, and tree mortality. An egg sampling study was conducted in mature western hemlock stands from 1992-1994 in British Columbia, Canada.

Egg distribution within crowns was homogenous, suggesting that the lower crown was acceptable for egg density estimation. The optimal sample size for estimating eggs was presented for error margins of 10, 20, 40, 60 and 80% (Table 3). Tree height, tree diameter at 1.3 m height, crown width, crown length, and presence of heartrot did not affect egg lay. Lichen samples (40 g, air dried) were taken from the lower crown. Eggs are separated using the method of Otvos and Bryant (1972) for eastern hemlock looper, *Lambdina fiscellaria fiscellaria* (Guenée).

**Sampling Procedure:** Because random sampling is difficult to conduct in mature hemlock stands, choose dominant or codominant trees subjectively. Sample the lower crown for lichen using a pole pruner, and collect enough from each tree to fill a polyethylene bag (20 by 10 by 46 cm) loosely. Remove debris from the lichen and determine a sample size to use, which is measured in grams of air dried lichen. In this study, 40 g was chosen as a sample size because it was the smallest common to all samples collected. Separate eggs from the lichen using the method outlined in Otvos and Bryant (1972). Count only eggs of the current year as either healthy (brown), infertile (green), or parasitized (black). Refer to Table 3 to determine optimal sample sizes based on five levels of error. An error of 20% is generally considered appropriate, and would require the sampling of 16 trees if an average of 25 eggs per sample were collected (Table 3).

**Note:** Restrict sampling to mature western hemlock stands that have an abundance of lichen.

**Reference:**

\*Otvos, I. S.; Bryant, D. G. 1972. An extraction method for rapid sampling of eastern hemlock looper eggs, *Lambdina fiscellaria fiscellaria* (Lepidoptera: Geometridae). *Canadian Entomologist* 104: 1511-1514.

**Table:**

Table 3. Optimum sample size (number of 40 g air-dried lichen samples per plot) for sampling *L. fiscellaria lugubrosa* eggs in mature western hemlock stands in interior of British Columbia, based on data of 1992-1994.

Mean	D (95% error margin/mean)				
	0.1	0.2	0.4	0.6	0.8
1	1316	329	82	36	21
25	63	16	4	2	1
50	37	9	2	1	1
75	28	7	2	1	1
100	24	6	1	1	1
125	21	5	1	1	1
150	19	5	1	1	1

Table 3 redrawn with permission from the *Journal of Economic Entomology*, January 15, 2001.