

## Western Hemlock Looper

*Lambdina fiscellaria lugubrosa* (Hulst)

Lepidoptera: Geometridae

Shore, T. L. 1989. Sampling western hemlock looper pupae (Lepidoptera: Geometridae) using burlap traps. *Journal of Entomological Science* 24: 348-354.

**Objective:** To develop procedures for using pupae caught in burlap traps as an index of *L. fiscellaria lugubrosa* density.

**Abstract:** The western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst), is a destructive defoliator that periodically causes damage to western hemlock, *Tsuga heterophylla* (Raf.) Sarg., stands. Damage generally occurs in mature stands where severe defoliation causes growth reduction, top kill, and tree mortality. Burlap bands wrapped around western hemlock trees at breast height were used to sample *L. fiscellaria lugubrosa* pupae. The number of pupae was highly variable, and not related to tree diameter or trap surface area. There was a significant positive linear relationship between the number of viable pupae per trap ( $X$ ) and the number of healthy eggs ( $Y$ ) subsequently deposited on lichen in the trees ( $Y = 0.368X$ ;  $R^2 = 0.88$ ,  $P = 0.017$ ,  $n = 4$ ). A figure demonstrating the relationship between the mean number of pupae per trap and the sample size required with a 20% sampling error was presented.

**Sampling Procedure:** The number of sample trees required to obtain estimates within 20% of the population mean at low densities is large (Fig. 1). Alternatively, sampling to a fixed level of precision, such as  $\pm 10$  pupae, is acceptable (Fig. 1).

Wrap a 25 cm wide piece of burlap around the bole of each tree at breast height. Secure the band loosely to allow larvae to crawl beneath the burlap. Visit trees frequently during the pupation period and remove all pupae from beneath each band. Count and record the number of pupae attached to the burlap. A positive linear relationship exists between the number of healthy eggs per 100 grams lichen, and the number of pupae per burlap trap:

$$Y = 0.368 X$$

where,  $Y$  is the number of healthy eggs per 100 grams lichen, and  $X$  is the number of viable pupae per burlap band ( $R^2 = 0.88$ ,  $P = 0.017$ ,  $n = 4$ ).

This predictive index appears to overestimate defoliation levels. The author suggests it can be used as a predictive index for population density and defoliation estimates the following year, but may require modifications as more data become available.

**Notes:** The number of pupae attached to the burlap was selected as the best estimator since it is less variable with respect to the mean, and is the most sensitive indicator at low populations levels. Since there was no significant differences among trap surface area, d.b.h., and the number of pupae caught, it is not necessary to standardize pupal counts to represent the trap surface area.

**Figure:**

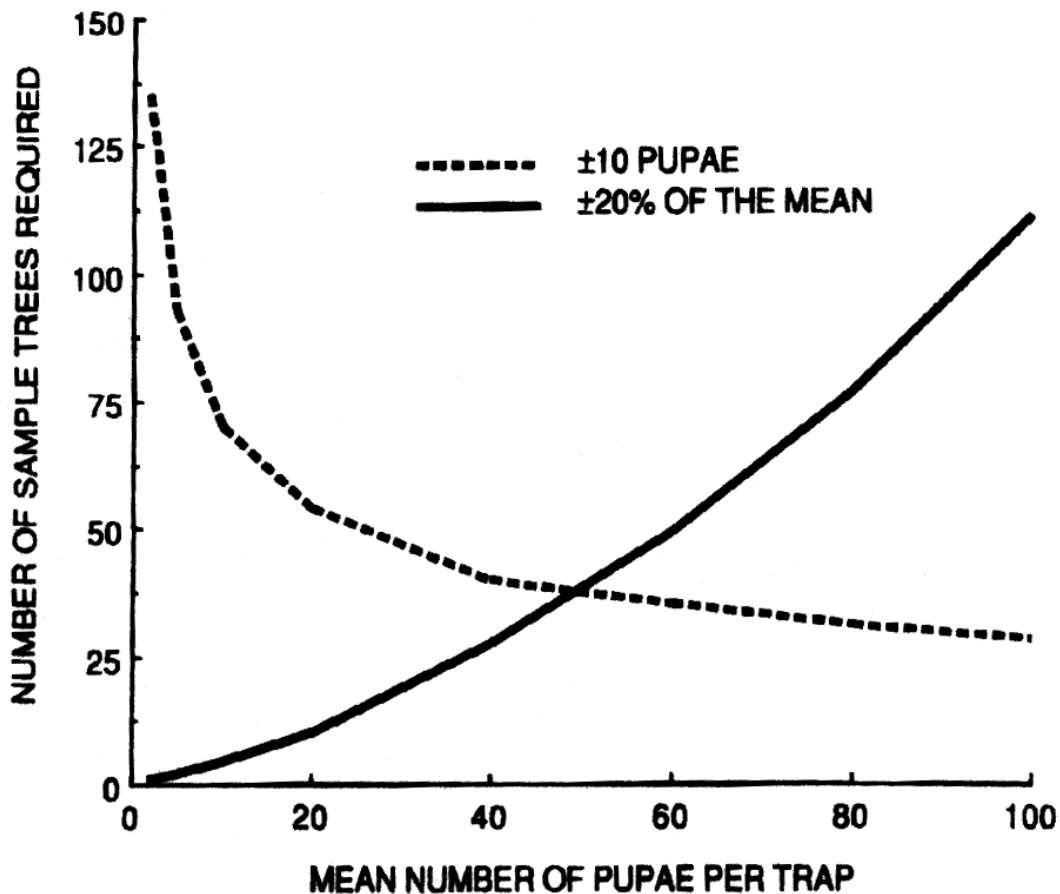


Fig. 1. The relationship between mean number of pupae per trap and the sample size required to obtain precision of  $\pm 20\%$  of the mean or  $\pm 10$  pupae. Based on the variance-mean regression  $S^2 = 4.34X^{1.59}$ , ( $R^2 = 0.94$ ), substituted into equations [1] and [2] in text.

Figure 1 reprinted with permission from the Journal of Entomological Science, January 15, 2001.