Gypsy Moth

Lymantria dispar (Linnaeus)
Lepidoptera: Lymantriidae

Liebhold, A. M.; Elkinton, J. S. 1988. Techniques for estimating the density of late-instar gypsy moth, *Lymantria dispar* (Lepidoptera: Lymantriidae), populations using frass drop and frass production measurements. *Environmental Entomology* 17: 381-384.

Objective: To develop procedures for estimating *L. dispar* larval densities based on frass drop.

Abstract: The gypsy moth was introduced into Medford, Massachusetts in 1869, and is now a major defoliator of hardwoods throughout the northeastern USA and Canada. Defoliation results in reduced growth, decreased vigor and extensive tree mortality. A technique was developed for estimating larval densities using measurements of the amount of frass produced per larva (frass yield), and the amount of frass falling in the forest per unit area (frass drop). The technique was tested in a post-season experiment in which 6,000 larvae were released in a stand. Frass yield was measured by caging larvae individually in the field on cut host foliage. The most reliable and efficient method of measuring frass drop was the deployment of several large funnel-shaped frass traps (16 cm diameter) on wooden stakes. Number of pellets was found to be superior to frass weight as a unit for quantifying frass yield and drop, because it was not influenced strongly by instar distribution. The distribution of frass widths suggest frass size can be used as a tool to differentiate among instars.

Sampling Procedure: Several traps were evaluated for their effectiveness at collecting *L. dispar* frass: (1) an 82 by 82-cm canvas tarp stretched across a wooden frame and placed on the forest floor; (2) a 63 by 63-cm cheesecloth stretched across a wooden frame and placed on the forest floor; (3) a 16-cm diameter plastic disk with an acrylic sticker attached to a wooden stake; (4) the disk in (3) with cylindrical sheet metal sides to prevent frass bouncing; and (5) a funnel. The funnel trap consists of a polyethylene funnel (16 cm diameter) inserted into a section of tygon tubing (1.0 cm diameter by 5 cm long) with mosquito netting glued over the bottom. Place the trap on top of a 1 m wooden stake positioned vertically in the ground. Count and remove the number of frass pellets every 5 d. The pellets are characteristically star shaped in cross section, and distinguished easily from other forest insects. The equation for calculating larval density for each day is:

$$\text{Larvae/ha} = C \cdot \text{frass/trap} \cdot \text{larvae/frass}$$

where, C = 1/area (ha) of one trap, and C is determined from measuring the horizontal area of the trap. The mean amount of frass per trap is determined

by the frass/trap (frass drop) term. Density estimates based on the number of frass pellets provide more reliable estimates than frass weight. Frass size is a useful tool to determine the abundance of each instar at any given stage after the third instar. The diameter ranges of frass pellets for the different instars are as follows:

Instar	Frass Diameter (mm)
Fourth	1.0-1.5
Fifth	1.5-2.1
Sixth	2.1-3.0

Note: Because frass diameters may vary with host quality or population density (Lance and others 1986), determination of instars by this method should be done with caution.

Reference:

Lance, D. R.; Elkinton, J. S.; Schwalbe, C. P. 1986. Components of density-related stress as potential determinants of population quality in the gypsy moth (Lepidoptera: Lymantriidae). *Environmental Entomology* 15: 914-918.