Spruce Budworm

Choristoneura fumiferana (Clemens)
Lepidoptera: Tortricidae

Simmons, G. A.; Fowler, G. W. 1984. Considerations when sampling spruce budworm egg masses on balsam fir in the Lake states: low to extreme population levels. *Great Lakes Entomology* 17: 87-95.

Objectives: To examine the effects of sampling balsam fir branches from different areas of same tree; to compare effects of a range of budworm egg mass densities in terms of bias and variance; and to examine the influence of branch size on accuracy and precision of egg mass density estimation.

Abstract: The spruce budworm is the most destructive defoliator of balsam fir, *Abies balsamea* (L.) Mill., and white spruce, *Picea glauca* (Moench) Voss, in eastern North America. The last three larval instars cause most of the defoliation. Periodic outbreaks occur every 30 years and epidemics can last from 5-10 years. A study was carried out in five spruce-fir stands in Michigan's Upper Peninsula to study egg mass densities and distributions.

There was considerable tree to tree and plot to plot variation in egg mass densities, which resulted in high sampling error. However, the most optimal sample unit in terms of accuracy and precision was to select two to four whole branches from the mid-crown position of each tree.

Sampling Procedure: Select and remove with pole pruners two to four whole branches randomly from the mid-crown position of balsam fir. Count and record the number of egg masses and measure the foliated area of each branch sampled. Egg mass density is expressed as either the number of egg masses per square meter or the number of egg masses per branch.

Notes: This paper is third in a series of papers that attempt to improve egg mass sampling techniques (Fowler and Simmons 1982, Simmons and Fowler 1982). Even though sampling from the mid-crown yields the most precise and accurate estimates, the distortion of probability statements is maximized.

References:

*Fowler, G. W.; Simmons, G. A. 1982. Spruce budworm egg mass density on balsam fir: low to extreme high levels. *Great Lakes Entomology* 15: 277-286.

Simmons, G. A.; Fowler, G. W. 1982. Spruce budworm egg mass density on balsam fir and white spruce: low population levels. *Great Lakes Entomology* 15: 287-296.