WHAT CAUSES THE PATTERNS OF GYPSY MOTH DEFOLIATION?

Clive G. Jones
The New York Botanical Garden, Institute of Ecosystem Studies,
Mary Flagler Cary Arboretum, Box AB, Millbrook, New York 12545

ABSTRACT

Gypsy moth defoliation is typically observed to occur on xeric ridge tops before more mesic, lowland forest, in oak-dominated habitats in the Northeast. In subsequent years defoliation may also occur in mesic forests. What causes this pattern of defoliation? Differences in the degree of defoliation may be due to differences in the density of gypsy moth populations in these "defoliation-susceptible" and "defoliation-resistant" habitats, with higher densities on ridge tops -- the "focal area hypothesis." It is also possible that ridge tops have a lower foliage biomass than mesic forests, such that the same density of gypsy moth results in a proportionately greater removal of foliage -- the "foliage biomass hypothesis."

The results of a long-term study in Vermont, where these classic defoliation patterns were observed in the first year of defoliation (1989) are discussed with regard to these alternative, but non-exclusive "focal area" and "foliage biomass" hypotheses. Percent defoliation was 17 x greater on the ridge top than in the surrounding mesic forest. Egg mass densities in 1988 and 1989 were not significantly different between habitats and the number of eclosed female pupae did not differ in 1989. However, total pupal density and larval densities were significantly greater on ridge tops in 1989 (approx. 1.3 to 3-fold higher). Leaf area removed was greater on the ridge top supporting the "focal area hypothesis." However foliage biomass, as indicated by tree and canopy height, and leaf area index was also lower on the ridge top, supporting the "foliage biomass hypothesis." It would appear that the patterns of the first year of defoliation are explained by both higher larval densities and lower foliage biomass on ridge tops compared to mesic forests.

The implications of these findings to the potential for ridge tops to act as focal areas in subsequent years is discussed. The data suggest that this will be unlikely, even though densities and defoliation may be higher on ridge tops. From a management standpoint the data indicate that suppression of ridge top populations will have little impact on defoliation in the surrounding areas, but future monitoring is necessary to ascertain whether or not this is the case. The data suggest that inclusion of estimates of foliage biomass in different forest habitats will markedly improve the prediction of local defoliation based on egg mass densities, and may enhance regional-scale rating of stand susceptibility to defoliation.