

## Douglas-fir Tussock Moth

*Orgyia pseudotsugata* (McDonnough)

Lepidoptera: Lymantriidae

Dahlsten, D. L.; Rowney, D. L.; Copper, W. A.; Wenz, J. M. 1992. Comparison of artificial pupation shelters and other monitoring methods for endemic populations of Douglas-fir tussock moth, *Orgyia pseudotsugata* (McDunnough) (Lepidoptera: Lymantriidae). *Canadian Entomologist* 124: 359-369.

**Objective:** To predict larval populations of *O. pseudotsugata* on white fir in northern California from counts of cocoons or egg masses found in artificial pupation shelters.

**Abstract:** Douglas-fir tussock moth, *Orgyia pseudotsugata* (McDonnough), is a periodic defoliator of Douglas-fir, *Pseudotsuga menziesii* (Mirb.), and true firs, *Abies* spp., in western North America. Outbreaks occur quite unexpectedly every 7-10 years and usually persist for 3-4 years. Defoliation by *O. pseudotsugata* can be severe and cause widespread tree mortality during the first year of an outbreak. Surviving trees may exhibit growth loss, top-kill, and tree deformity.

Artificial pupation shelters as a means of monitoring populations of *O. pseudotsugata* in northern California were compared to sampling larval populations from three crown levels (as described in Dahlsten et al. 1985) and the use of pheromone traps. Cocoon numbers from the shelters were positively correlated with larval density in the same year in 1978 ( $r = 0.76$ ) and 1979 ( $r = 0.71$ ). Egg mass counts were not strongly correlated with larval density the following year ( $r = 0.55$ ), but the positive correlation indicates that egg mass counts can be used to predict larval density. Furthermore, egg mass counts from artificial pupation shelters require less effort than sampling larval densities from three crown levels from multiple trees, and the shelters provide an earlier prediction of larval populations than foliage sampling allows. Artificial pupation shelters also offer an advantage over pheromone traps in that they do not require regular service and can be left in place without service until counts are made. Population increases detected from cocoon or egg mass counts the previous fall could be confirmed by sampling larval densities on foliage.

**Sampling Procedure:** Make pupation shelters from wood blocks 9 cm tall, 10 cm wide, and 4 cm deep (Fig. 1). Cut an opening 2.5 cm in diameter and approximately 4 cm deep on one side of the block, near the bottom. Larvae will pupate inside this opening. Cut a 2.5 cm hole through the block near the top of the wide face. Hang the shelter on the tree using this hole.

Establish 0.4 ha plots containing white fir, *Abies concolor* (Gord. and Glend.) Lindl., within the area to be monitored. In each plot, install a pupation shelter on 10 white firs before larvae begin pupating in late July. Leave shelters in place until adults emerge if counting cocoons, or until egg-laying has ceased if counting egg masses. Using the artificial pupation shelters for multiple, consecutive years will allow land managers to monitor trends in *O. pseudotsugata* populations over time.

**Notes:** Paper cartons, as shown in Fig. 1, compared favorably to the wooden pupation shelters as a means of monitoring populations of *O. pseudotsugata*. However, the wooden shelters are more durable and can be left in place for several years. Cleaning the pupation shelters after taking counts will avoid the need to distinguish between old cocoons or egg masses from previous years and those from the current season.

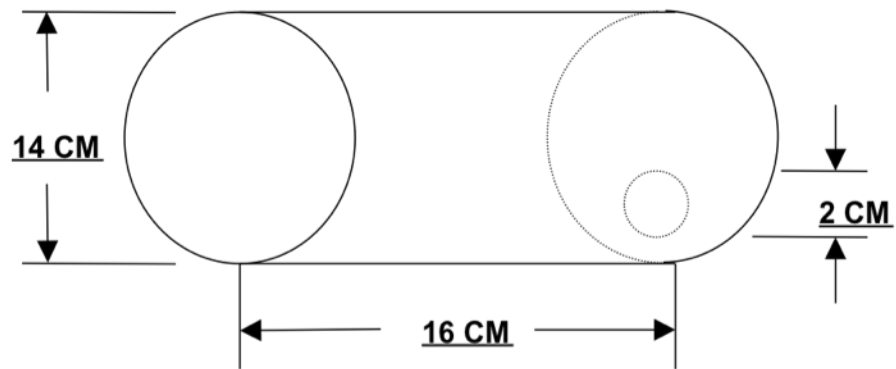
The authors noted that using a larger number of plots within an area may reduce variation seen among plots, and installing more shelters per plot may improve the prediction of population trends when populations are very low. Further work is needed to correlate defoliation within plots to cocoon or egg mass counts.

**Reference:**

Dahlsten, D. L.; Norick, N. X.; Wenz, J. M.; Williams, C. B.; Rowney, D. L. 1985. The dynamics of Douglas-fir tussock moth populations at low levels at chronically infested sites in California. In: Bevan, D.; Stokley, J. T., editors. Site characteristics and population dynamics of lepidopteran and hymenopteran forest pests: Proceedings of IUFRO Conference Subject Group S2.07.06; 1980 September 1-7; Dornoch, Scotland; p. 132-139.

Figure

Paper carton shelter (1978)



Wood block shelter (1978-1979)

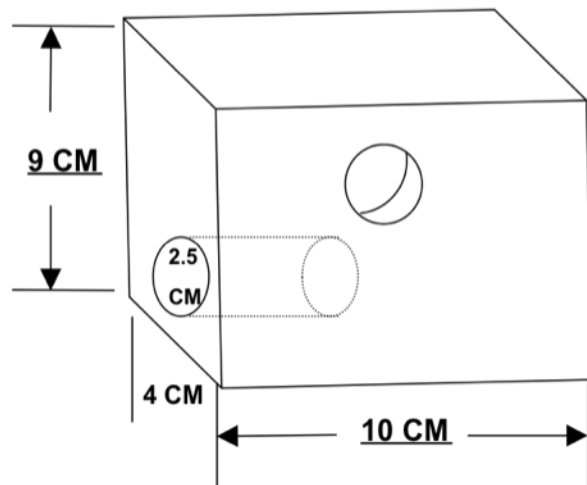


Fig. 1. Artificial pupation shelters used for monitoring Douglas-fir tussock moth cocoons and egg masses in California, 1978 and 1979. Refer to text for more information regarding shelter design.

Modified Figure 1 reprinted with permission from the authors, granted April 21, 2009.