

Forest Tent Caterpillar

Malacosoma disstria (Hübner)

Lepidoptera: Lasiocampidae

Shepherd, R. F.; Brown, C. E. 1971. Sequential egg-band sampling and probability methods of predicting defoliation by *Malacosoma disstria* (Lepidoptera: Lasiocampidae). *Canadian Entomologist* 103: 1371-1379.

Objective: To describe methods for sequential sampling of *Malacosoma disstria* (Hübner) egg masses and predicting defoliation levels the following spring.

Abstract: The forest tent caterpillar is a major defoliator of hardwood forests. Young larvae feed on developing buds, while later instars feed gregariously often defoliating the tree completely. Defoliation causes reduced leaf area, growth loss, twig dieback and tree mortality in cases of prolonged infestation. A sequential egg mass sampling system for predicting defoliation of trembling aspen, *Populus tremuloides* Michx., by *M. disstria* is described and its accuracy assessed.

The cumulative egg mass totals from 46-cm branch samples were compared to decision thresholds that classify the amount of defoliation expected the following year as light, moderate, or heavy (Table IV). The plan achieved an accuracy rate of 65% when comparing predicted with actual defoliation levels the following spring. A second method, sequential sampling with sliding boundaries, is a combination of the sequential sampling plan but adjusts for the age of the stage of the outbreak (Table VIII). This plan improved the accuracy rate to 73%.

Sampling Procedure:

Sequential sampling plan: Select only dominant and co-dominant trees, and sample two branches per tree from among the top four branches exclusive of the terminal. Record the number of egg masses on the first 46 cm of the main branch from the tip. Any lateral shoots initiating within this distance should also be examined. Compare the cumulative egg mass totals to the decision thresholds presented in Table IV and continue sampling until a decision is met. The amount of defoliation will be classified in one of three categories:

Light: No trees exhibit complete defoliation. Feeding damage nonexistent or confined to the top of aspen crowns. Little or no feeding evident on other tree species or underbrush.

Moderate: The occasional aspen may be completely defoliated, however most have tops partially defoliated (thinned). Little feeding on underbrush.

Heavy: Aspen trees completely defoliated with conspicuous feeding damage present to other species including underbrush.

This plan achieved a predictive level of 65%, indicating that the number of egg masses found per branch in the fall is probably not a consistent predictor of defoliation levels the following spring. This discrepancy between expected and actual defoliation increases with age of the outbreak. Forest tent caterpillar populations typically suffer lower egg viability and higher larval mortality in late outbreak stages than in early ones, which results in less tree defoliation.

Sequential sampling with sliding class boundaries: Sequential sampling with sliding class boundaries involves estimating the number of egg masses on a two branch sample rather than simply estimating defoliation class. A table of defoliation levels, which is adjusted depending upon the stage of the outbreak (i.e., age), is used to classify defoliation as either light-moderate or moderate-heavy (Table VIII). Using the new defoliation estimates the predictive level was increased to 73%, and was particularly useful during the later stages of the outbreak. It may be advantageous to consult the original publication prior to conducting this sampling technique.

Notes: Defoliation levels during the first year of a *M. disstria* outbreak can be assessed most accurately with the sequential sampling plan, which is critical in preparation of control programs. As the outbreak ages, the sequential sampling plan with sliding class boundaries should be used to predict subsequent defoliation levels. For the sequential sampling plan with sliding class boundaries, it is assumed that the same sequence of yearly defoliation within any local situation will be repeated throughout each outbreak.

Tables:

Table IV. Sequential table of decision lines for three defoliation levels of aspen associated with forest tent caterpillar egg-mass densities.

No. of trees	Accumulated no. of egg masses per 2-branch sample								
	Light	≤	Continue	≥	Moderate	≤	Continue	≥	Heavy
1		-		-		-		11	
2		-		-		-		13	
3		-		-		-		15	
4		2		-		-		17	
5		3		-		-		19	
6		4		-		-		22	
7		5		-		-		25	
8		6		-		-		27	
9		7		13		13		30	
10		8		14		16		32	
11		9		15		18		34	
12		10		16		20		37	
13		11		17		23		39	
14		13		18		25		42	
15		14		19		28		44	
16		15		21		30		46	
17		16		22		32		49	
18		17		23		35		51	
19		18		24		37		53	
20		19		25		39		56	
21		20		26		42		58	
22		21		27		44		61	
23		22		28		47		63	
24		24		29		49		65	
25		25		30		51		68	

Table VIII. Relation between defoliation class boundaries for aspen stands as denoted by number of egg bands of the forest tent caterpillar per two upper branches per tree, and age of outbreak.

Age of outbreak (yr)	Defoliation - class boundary	
	Light - moderate	Moderate - heavy
	Egg bands per two-branch sample	
1	1.20	2.40
2	1.55	2.75
3	1.90	3.10
4	2.25	3.45
5	2.60	3.80

6	2.95	4.15
7	3.30	4.50
8	3.65	4.85

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