Pine Beauty Moth (*Panolis flammea* Schiff.) Outbreak Management: Suppression Versus Natural Enemies

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Pine beauty moth (*Panolis flammea* Schiff.) is one of the most serious defoliators that periodically threatens Scotch pine forests on poor sandy soils in Lithuania. Population increase of this pest began in 1999. Because a maximum of only 15% defoliation was predicted in particular areas, no additional funding was required for suppressing the population and no apparent damage was realized.

Significant damage was predicted for 2000 and it was estimated that suppression measures would be needed on an area of only 13,000 ha, however funding was available to treat only 6,450 ha. Therefore, by the end of that summer, the outbreak expanded to an area of 44,800 ha, 4,000 ha of which was completely defoliated.

Extensive surveys revealed that in 2001, slight defoliation (30-50%) should be expected on an area of 8,500 ha, medium defoliation (50-75%) on 103,000 ha and heavy defoliation (>75%) on 19,100 ha. It was estimated that it would cost 3.1 million Lt (Lita; $0.32 U.S. = 1 Lita) to treat 37,900 ha (forest with >30% defoliation), 2.3 million Lt to treat 29,400 ha (>50% defoliation), and 1.2 million Lt to treat 19100 ha (forests with >75% defoliation). This resulted in a heated discussion about the justification for area-wide suppression measures:

- Arguments against suppression: (1) natural enemies will bring to an end the outbreak (59±8% of overwintering pupae were parasitised, mainly by the tachinid fly *Ernestia rudis* Fall. and ichneumonid *Rictichneumon pachymerus* Ratz.); (2) there is no money available in the current budget for these expenses.

- Arguments for treatment: (1) forests are at risk because repeated 80-100% defoliation can be fatal for pines; (2) parasites will not prevent tree damage because they kill *P. flammea* only during their final stages of development.

As a result of these deliberations, it was determined that suppression was justified to treat 18,620 ha of forests (~ 60%); conventional pyrethroids were used. Damage to varying degrees was recorded on an area of 1,243 ha (8,530 ha new), however the forests most at risk were protected against further defoliation and dieback.

Based on the forecast for 2002, slight defoliation on 4,485 ha, medium on 4,670 ha, heavy on 5,320 ha, and projected pupal parasitism of 54-61%, suggests that the current outbreak will persist and will spread to new territories. Aerial sprays, using mainly biological insecticides, were scheduled on an area of 12,880 ha and 1.2 million Lt funding was allocated. Pine beauty moth pupae overwintered and emerged successfully but, surprisingly, females laid very few eggs (67% of the eggs have not maturated). The suggested reason for that could be the lack of adequate food because of the high pest densities that occurred in the previous year. Consequently, only the most damaged forests were treated in 2002 (1,900 ha) to prevent any further defoliation, and 0.3 million Lt (25%) was expended. As a result the outbreak terminated.

Conclusions

- Parasites were not important in terminating pine beauty moth outbreaks.
- Pest management activities (suppression) effectively preserved forests at risk.
- Delaying funding for pest management is more expensive – 1.47 million Lt was spent over three years instead of about 0.5 million Lt that was needed in the first year of the outbreak. Furthermore the initial expenditure would have prevented 50,000 ha of damaged forests.