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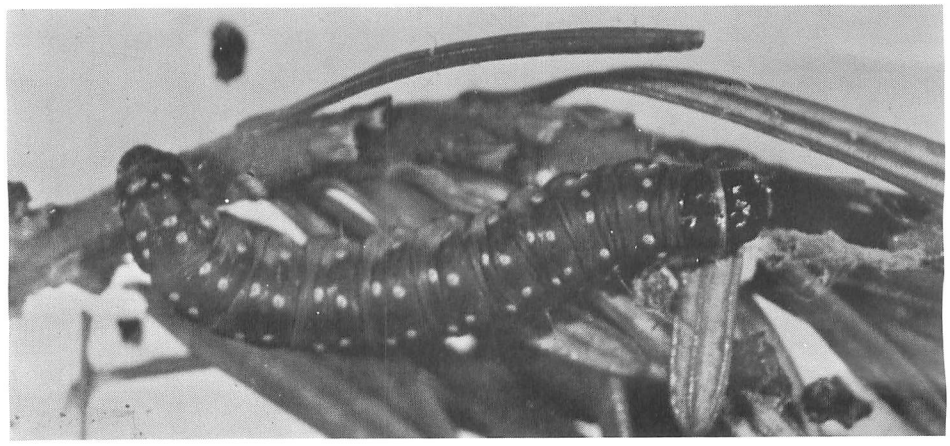
Spruce Budworm

The spruce budworm, *Choristoneura fumiferana* (Clemens), is the most destructive forest insect in North America. In eastern Canada, massive epidemics of this pest occur periodically in spruce-fir forests, resulting in losses of millions of cubic metres of spruce and fir. Mature stands of balsam fir are particularly susceptible and tree mortality occurs after several years of continued heavy feeding. In eastern Canada the spruce budworm feeds primarily on balsam fir and red and white spruces, but damage to other conifers occurs when these are growing in mixture with the favored tree species.

The budworm overwinters on the tree as a very tiny larva in various hibernation sites: in male flower cups, under bud and bark scales, among lichens or in bark crevices. Shortly before the buds begin to expand in the spring, the larvae emerge from their winter quarters and mine needles produced the previous year, unopened buds or, when available, male flowers. Later they all feed in the expanding buds and, as the new shoots grow, they spin fine silk among the needles and between shoots. When the new needles have been eaten they move back to feed on the older needles. Heavy feeding will cause trees to take on in midsummer a scorched appearance that can be readily seen from aircraft. When the larvae are fully grown and about 22 mm long, they change to pupae in the feeding sites or on lower branches. The pupae become moths from late June to early August and after mating the females deposit eggs in masses of 15 to 50 on the underside of the needles. The eggs hatch in about 10 days and the tiny larvae soon seek hibernation sites in which to spin their silken shelters and pass the winter.

During epidemics of the spruce budworm, distant forests may be invaded as a result of long-range moth flights. In addition, when young larvae hatch in summer or when they come out of hibernation in the spring, they tend to spin down on long silken threads and, on being picked up by convective air currents, may be widely dispersed.

Numerous parasites and predators feed on the spruce budworm during all its life stages, and disease organisms take an additional toll. However, despite these natural control factors, large-scale chemical control operations in various parts of eastern Canada have been necessary to protect valuable spruce and fir stands. A great deal of research is also being conducted to provide forest managers with alternatives to chemical insecticides. These include enhancement of the killing capability of naturally occurring disease organisms such as fungi, bacteria and viruses, the use of chemical agents to produce sterility, the use of sex attractants for early detection of population increases, and the prevention of reproduction by the use of juvenile hormones to mention a few.



Spruce budworm

Severe defoliation

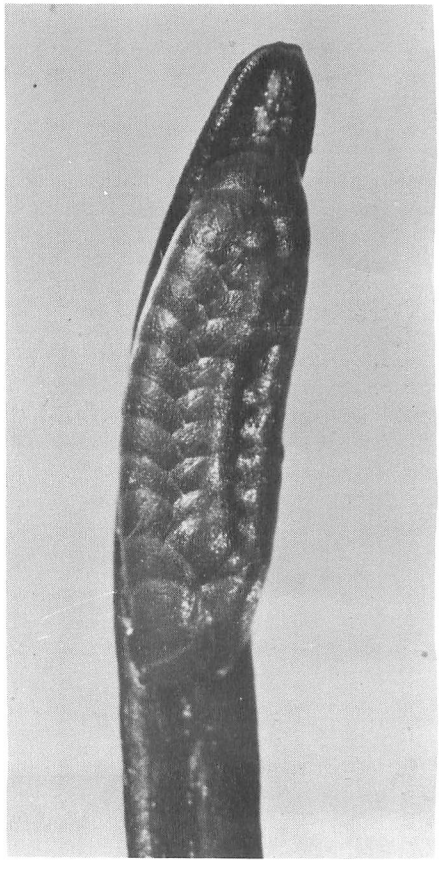
Although the enormity of the problem has necessitated the use of chemical insecticides in the meantime, recent advances have permitted the use of a biological insecticide utilizing the microorganism *Bacillus thuringiensis* Berliner. These biological insecticides now offer viable alternatives to chemicals in the management of spruce budworm populations.

Large-scale control operations carried out by forest managers and involving millions of hectares and fleets of aircraft in a single year are beyond the scope of this leaflet. On the other hand, where a limited number of valuable shade or ornamental trees are involved, damage can be kept to a minimum and the insect more readily killed if the insecticide is applied when the larvae are small. Therefore, a contact or stomach insecticide should be applied soon after the buds have burst or a bacillus type of insecticide applied when the needles on the new shoots begin to separate. For a currently acceptable insecticide consult an appropriate government official.

A.H. Rose and O.H. Lindquist

Copies of this leaflet can be obtained from the Centre's Information Office.

Information on many other spruce, fir and hemlock insects is given in "Insects of Eastern Spruces, Fir and Hemlock", Forestry Technical Report 23, available from any bookstore distributing Government of Canada publications. (price: $5.00)



Egg cluster

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