The Large Aspen Tortrix

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The large aspen tortrix (*Choristoneura conflictana* (Walker)) periodically causes extensive defoliation throughout parts of the range of its principal host, quaking aspen (*Populus tremuloides* Michx.). Outbreaks are characterized by the buildup of large populations that persist for 2 or 3 years and then suddenly collapse. Extensive outbreaks covering 10,000 square miles have occurred in northern Manitoba and Alaska. The insect is a boreal species widespread over the northern regions of North America and extending southward on "boreal islands" in the westward States to New Mexico and Arizona (fig. 1).

The tortrix larvae feed on foliage early in the spring, often causing complete defoliation before the buds have expanded. Healthy trees usually grow new leaves by midsummer, often smaller and fewer than normal, causing thinned crowns. A reduction in the annual growth is the major symptom during the early stages of an outbreak. Repeated defoliation over a period of years can cause branch or tree death, which is most noticeable on trees growing on submarginal sites. Weakened trees are susceptible to other adverse factors such as plant diseases.

The impact of an outbreak depends upon many factors, including the duration and severity of defoliation and the use and wildlife, recreational, and esthetic values of the stand. Defoliation alone can reduce values, especially

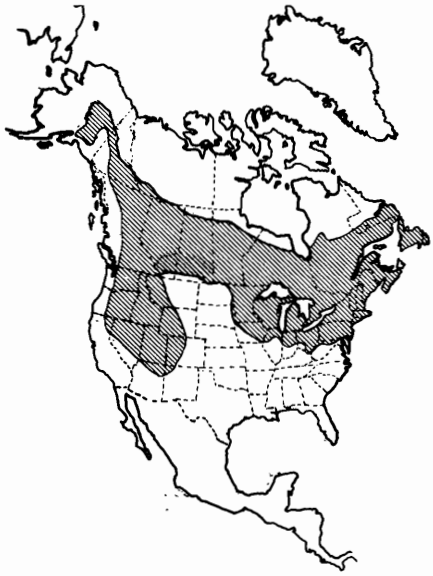

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Figure 1.—Probable distribution of the large aspen tortrix in North America.

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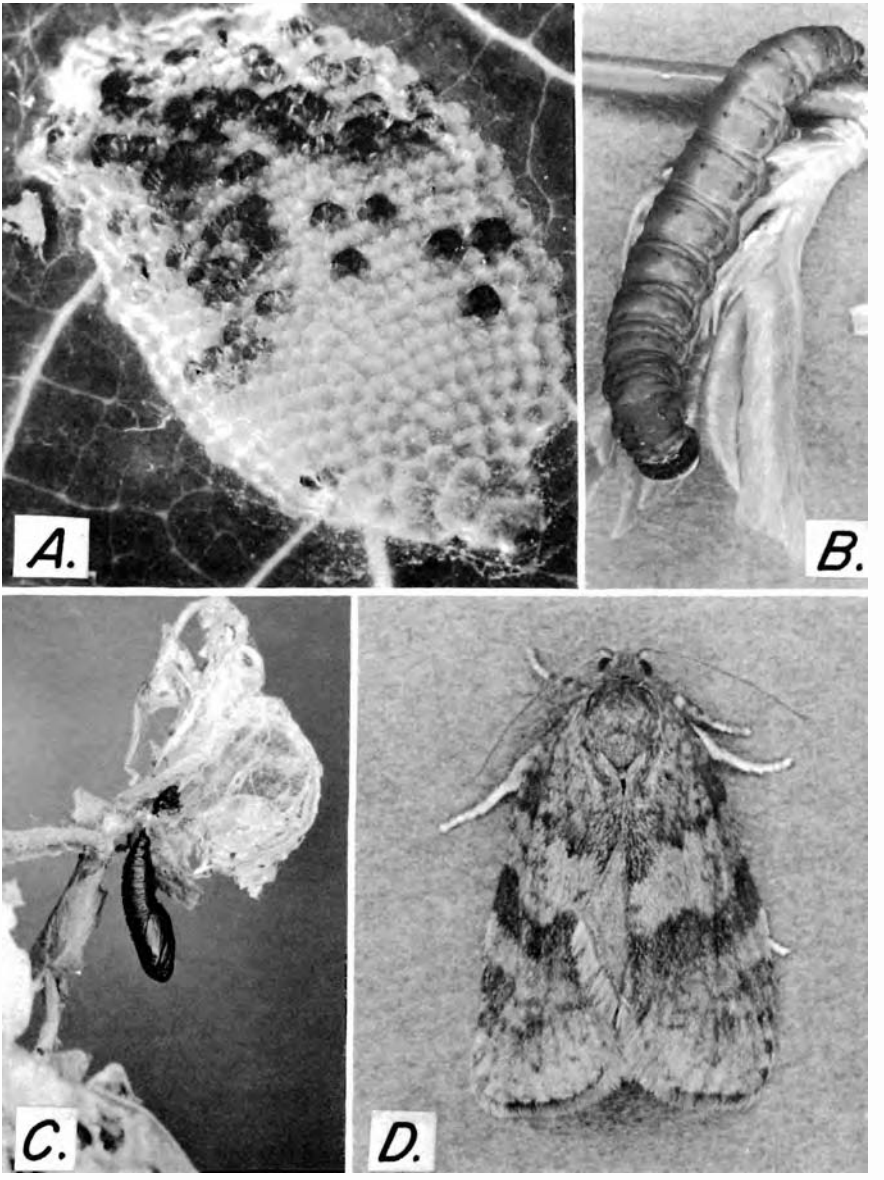

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Figure 2.—Life stages of the large aspen tortrix: *A*, Egg mass—the black eggs are parasitized by *Trichogramma minutum* and the white "eggs" are empty chorions following eclosion; *B*, mature larva; *C*, pupa; *D*, adult.

in high-use areas; this happened in California in the early 1960's.

Host Trees

The tortrix becomes a problem only where quaking aspen is a major component of the forest stand. During periods of epidemic conditions, it will also feed on balsam poplar, black cottonwood, white birch, willows, alders, and common chokecherry. It also constructs heavy webbing and slightly damages understory plants when populations are high. Major feeding on plants other than quaking aspen can occur when quaking aspen is completely defoliated prior to the last feeding instar.

Description

The adult is a brownish-gray moth with indistinct dark markings on its forewings (fig. 2). The female is the largest of the described North American Tortricinae moths. The individual egg is scalelike, oval, and pale green. The eggs are laid in masses covering areas from 0.02–0.14 square inch; the rows overlap like fish scales. The number of eggs per mass ranges from 60 to 450. The young larva is pale yellow with light brown legs and head capsule. The mature larva is dark green to almost black; the head and anal plate are a uniform reddish-brown to black. The last instar ranges from 0.60–1.0 inch in length.

The pupal stage is light green when first formed but soon changes to a reddish-brown to black color. The last larval skin is usually attached to the base of the pupa. The pupa is from one-half to two-thirds of an inch long.

Life History

The large aspen tortrix has one generation a year throughout its range. The insects overwinter as second-instar larvae within hibernacula spun in protected places. These overwintering sites may be found in moss and bark crevices at the base of trees and beneath dead bark on twigs both on the ground and attached to the trees (fig. 3).

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Figure 3.—Overwintering hibernacula of the large aspen tortrix beneath dead bark on aspen branch. The hibernacula are about 1/16 inch long.

The small larvae begin to migrate up the stems of aspen on warm days in the early spring. The larvae mine into the buds and destroy the young tissue. Complete destruction of the tissue may occur before the bud has had a chance to expand. At this stage, secondary hibernacula are often constructed at the base of

buds, possibly for protection during initial feeding and as a reaction to adverse early spring temperatures. The later stage larvae feed more openly, usually in leaves that have been tied together by webbing. There are normally five instars. The larvae drop on silken threads when disturbed or after completely defoliating the plant. During epidemics, the larvae frequently wander in search of food, causing extensive webbing on grass and understory plants (fig. 4).

The pupae are found on trees within rolled leaves from mid-June to mid-July, depending on the geographic location. Leaves of the understory plants are often used as pupation sites in areas of severe defoliation.

The adults are active for about a 2-week period from late June to mid-July. The female moths are sluggish and stay in the area of emergence. The males are more energetic and erratic in flight. Oviposition occurs from mid-June to late July. The greenish egg masses are usually deposited on the upper surfaces of the leaves but can be found on the undersurface and on the bole of the tree. The eggs hatch, and the young larvae feed on the leaf tissue, skeletonizing the leaf. Frequently at this time, they are gregarious and can be found feeding within previously rolled leaves at old pupation sites.

Movement to hibernation sites begins in early August and is completed by September. The larvae spin their hibernacula and molt within them before becoming dormant for the winter. The first instar skin is usually attached to the outside of the hibernaculum.

Natural Control Factors

Several insect predators and parasites have been found associated with the large aspen tortrix. Two species of ants have been observed attacking the small larvae in Canada. A small predaceous bug in the family Anthocoridae commonly preys on the young larvae in Alaska. *Glypta fumiferanae* and *Omotoma fumiferanae* are common parasites of the tortrix in Canada;

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Figure 4.—Extensive webbing of understory plants due to larvae wandering in search of food.

Glypta inversa, *Dirophanes hariolus*, and *Omotoma fumiferanae* are frequently reared from Alaskan material. *Trichogramma minutum* is a common egg parasite. Other parasite species have been active in various parts of the host range, but their significance is unknown.

Birds consume large numbers of the larvae when populations are high. Woodpeckers, vireos, and chickadees have been observed feeding on the tortrix. Also a species of fungus commonly kills the insect in the hibernaculum. Cold temperature at a critical period can kill second-instar larvae directly or indirectly by destroying young leaf tissue.

It is doubtful that any of the above factors are responsible for major declines in large aspen tortrix populations. Starvation, however, could be a major factor responsible for population collapse of this species. Larvae may completely defoliate aspen before the last feeding instar. As a result, these fifth instar larvae come under starvation stress and are forced to feed upon less nutritious host plants, resulting in abnormal larval development and poor survival. Starved females that survive usually produce about half their normal component of eggs.

Artificial control of this species is not generaly recommended because populations characteristically collapse in 2 or 3 years, except occasionally for high-use areas such as campgrounds. Despite growth loss, aspen trees usually withstand the outbreak with little tree mortality.

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