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The Hemlock Borer

By Harvey J. MacAloney [1]

The hemlock borer, *Melanophila fulvoguttata* (Harris), is an enemy of eastern hemlock, *Tsuga canadensis* (L.) Carr., throughout the natural range of this tree in the eastern United States and the eastern Canadian Provinces (fig. 1). Though considered a secondary insect and seldom abundant, the borer can develop to outbreak status after windthrow or drought and hasten death of weakened or already dying trees. Infestations also sometimes develop after 1 or 2 years of leaf stripping by hemlock loopers (*Lambdina* spp.) or other defoliators.

[1] Principal Entomologist (deceased), North Central Forest Experiment Station, St. Paul, Minn. 55101. The station is maintained by the Forest Service, U.S. Department of Agriculture, in cooperation with the University of Minnesota.

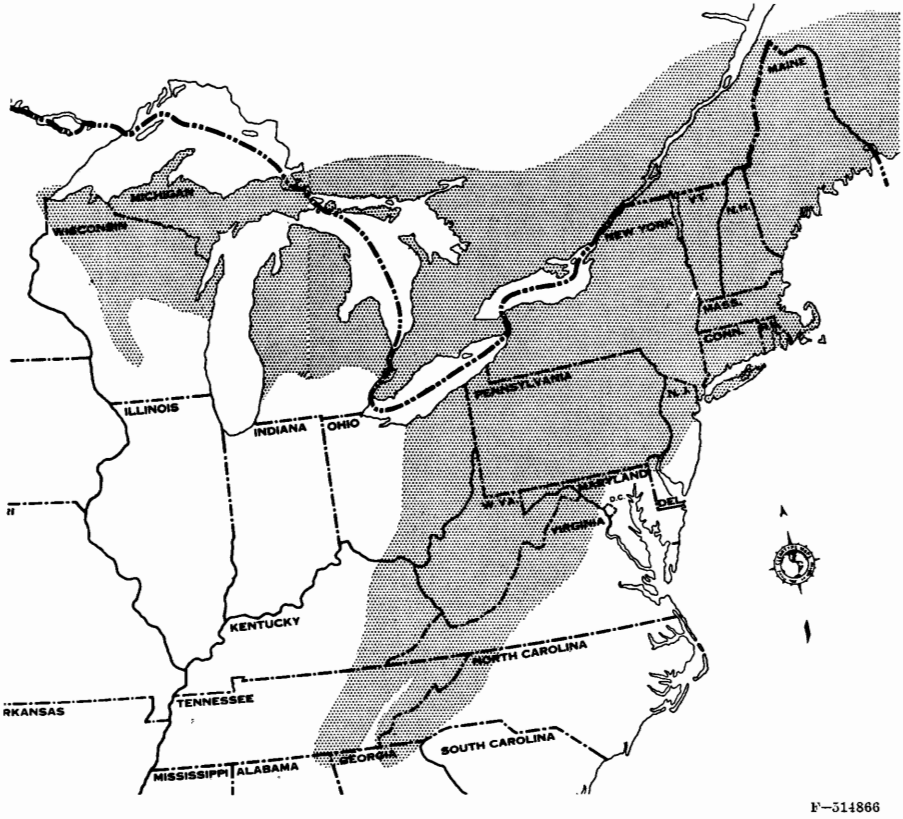

Figure 1.—Hemlock borer distribution coincides generally with the natural range of eastern hemlock shown on map. (Map adapted from one by Elbert L. Little, Jr., U.S. Forest Service.)

Severe windstorms in 1933, 1934, and 1936 caused heavy windthrow in hemlock-hardwood stands on the Menominee Indian Reservation in east-central Wisconsin, permitting tremendous borer populations to build up in the down hemlocks. Excessive stand openings and drought weakened many standing trees and an outbreak developed. By 1938, approximately 138 million board feet of merchantable hemlock had been killed, creating a serious salvage problem in a slack market.

Hosts

Though its principal host is eastern hemlock, the hemlock borer has also been reared from dying eastern white pine (*Pinus strobus* L.), tamarack (*Larix laricina* (Du Roi) K. Koch), balsam fir (*Abies balsamea* (L.) Mill.), red spruce (*Picea rubens* Sarg.), white spruce (*P. glauca* (Moench) Voss), and black spruce (*P. mariana* (Mill.) B.S.P.).

Description

The adult is a black, somewhat flat beetle with a metallic sheen and is ¼ to ½ inch long (fig. 2). Its width at the base of wing covers is about ⅛ inch. Each wing cover usually has three yellow or orange spots, though sometimes none or four.

In the larva, as with most flatheaded borers, the second thoracic segment is noticeably wider than the body segments. The mature larva is translucent white and about 1 inch long. At first, the pupa is also white, but it gradually changes to the color of the adult beetle. The slightly oval eggs are white and about 1/32 inch long.

Life History

The beetles are active from mid-May through August, as affected by weather and microclimatic conditions. In warmer, more open stands, peak emergence is in June; in cool, dense stands, July or early

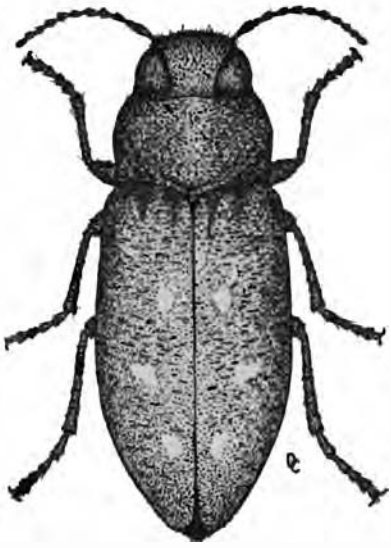

Figure 2.—Adult beetle (×5). The drawing shows three light spots ranged longitudinally on each wing cover; these are yellow or orange. (From Herrick, Insect Enemies of Shade Trees.)

August. Field studies have shown that individual beetles may live as long as 2 weeks. Eggs are laid in crevices in the bark and usually hatch in about a week. But subnormal temperatures may prolong the incubation period several days.

Development from egg to adult may take 1 year or 2. Apparently the mature larva must be exposed to a winter resting period to pupate. A larva from eggs laid in spring matures in late summer, overwinters in the outer bark doubled upon itself in a prepupal chamber, and pupates in spring. A larva from an egg laid in summer overwinters as an immature larva in the inner bark, matures the following season, spends the second winter in the prepupal chamber, and pupates the following spring.

Evidence of Attack

Thinning and fading of terminal foliage on branches is the first sign of borer attack and is evident 2 years before all needles fall and the upper

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Figure 3.—Mature larvae and galleries on the surface of the sapwood (about two-thirds actual size).

crown dies. Galleries of maturing borer larvae can be found on the surface of the sapwood by removing the bark (fig. 3). The reddish appearance of the bark, especially noticeable when borer populations are heavy, results from removal of outer bark layers by woodpeckers searching for larvae. Small oval holes in the bark, about ⅛ inch in diameter, indicate that development is complete and beetles have emerged.

In the final stages of tree deterioration and death, fruiting bodies of armillaria root rot (*Armillaria mellea* (Vahl. ex Fr.) Kummer) may appear at the base of the tree (fig. 4). Removing the bark reveals the white mycelial fans and the black shoestringlike rhizomorphs of the fungus.

Control

Preventing attack.—Hemlock, because of its shallow root system, may deteriorate from severe drought or stand opening. Decadent trees should be salvaged immediately to prevent buildup of borer populations. Attacks can be prevented by keeping the forest in a healthy condition. Practices to follow in managing hemlock stands include: (1) Removal of weakened, overmature trees and those with thin and fading foliage in the upper crown, (2) selective logging by tree groups in overmature even-aged stands, and (3) avoiding mechanical injury to trees in thinning and cutting. Damage to shade and ornamental trees can usually be prevented by keeping them vigorous.

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Figure 4. — Fruiting bodies of armillaria root rot associated with hemlock decadence (about one-seventh actual size).

Insecticidal control of the hemlock borer is not practical.

Natural control.—At least six species of parasites attack borer larvae. Two of these, *Atanycolus melanophili* Shenefelt and *Aulacostethus bilobatus* (Provancher), had an appreciable effect in controlling an epidemic infestation in east-central Wisconsin—killing about 50 percent of the larvae. The only other fairly common species was an external parasite, *Spathius* sp., gregarious in habit with four to eight larvae maturing on one borer larva. Egg parasites and ants attack the eggs. The red-headed, downy, hairy, and pileated woodpeckers and the yellow-shafted flicker also destroy large numbers of maturing larvae and pupae in severely infested trees.

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