

Bad Bugs

by Harry Chandler

Gypsy moth

In 1869, the gypsy moth was imported into the United State as an experiment to produce the caterpillar that would be an improved silk producer. It escaped, and has since become a pest that defoliated forests, killed trees and caused great annoyance in urban areas.

Gypsy moth eggs are laid in masses of approximately 1,000 that hatch in April or May into .25-inch-long black, hairy caterpillars. Then, they eat, grow and molt into the summer, and feeding increases during molt up to the two-week crescendo before they enter the pupal stage. The adult brownish males fly; the whitish females do not fly, but they attract males by means of a chemical pheromone. Egg masses are deposited during mid-summer and hatch the following spring.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION ARCHIVE, CONNECTICUT AGRICULTURAL EXPERIMENT STATION, BUGWOOD.ORG



Above, Gypsy Moth Larva(e).

Right, male(left) and female (right) Asian gypsy moths - shown for comparison.



USDA APHIS PPQ ARCHIVE, USDA APHIS PPQ, BUGWOOD.ORG

The problem with gypsy moth is they defoliate large groups of trees and then drop their feces on anything or anybody under the trees. Then, to add misery to distress, they appear to be crawling on every tree in sight.

Continued on page 95

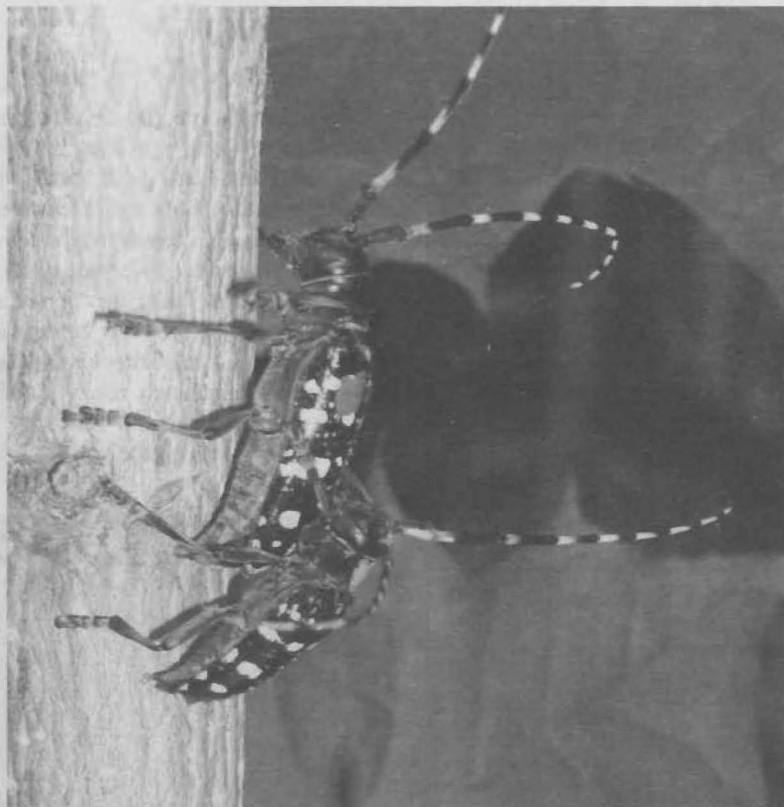
Bad Bugs

Continued from page 72

To date, the gypsy moth problem has been reduced by the application of *Bacillus thuringiensis*, generally referred to as Bt. Bt was discovered in 1915 from diseased flour moth caterpillars, but little research was done to use this bacterium until the '50s. The first Bt product was registered by 1961, primarily for control of caterpillar pests in agricultural crops. Further products of Bt are now used on caterpillar, mosquito and leaf beetles. The gypsy moth is pretty well under control due to observation, diligence, research and control.

Asian long-horned beetle

The Asian long-horned beetle was discovered in 1996 in several hardwood trees in Brooklyn, N.Y., and the secretary of agriculture declared an emergency to combat the infestation with regulator and control actions. The beetles are believed to have been introduced into the United States from wood-packing material accompanying cargo shipments from Asia. The beetle was



Asian Long-horned beetles, male/female pair.

DEAN MOREWOOD, HEALTH CANADA, BUGWOOD.ORG

next found in three other boroughs in New York City, and then in 1998, an infestation was found in the suburbs of Chicago, Ill. The beetle was then found in New Jersey and, in August 2008 it was found in Worcester, Mass.

The Worcester infestation is a real bell ringer of the danger of an Asian long-horned beetle infestation. According to a report by Robert D. Childs, UMass Extension, Amherst, Mass.: "As of February 25, 2009, over 15,000 trees have been removed from the northern section of Worcester since January 5, 2009, when the removal began. In the residential areas of northern Worcester where cutting was continuing, but the survey work has not yet been done, the cutting crews found approximately 70 to 80 percent of the unsurveyed properties have Asian long-horned beetle infested trees. It is expected that 20,000 to 22,000 trees will be removed in 2009, which meets the original estimates."

When an infested tree is removed, it is not just cut down. To remove the infestation, a stump grinder is required.

Continued on page 96

Bad Bugs

Continued from page 95

Asian long-horned beetle adults are 1 to 1.5 inches long with long antennae, and are shiny black with small white markings on the body and the antennae. After mating adult females chew depressions into the bark of Norway, silver, red and sugar maple, box elder, horsechestnut, buckeye, elm London plane, birch and willow trees where they lay their eggs.

Once the eggs hatch, the small white larvae bore through the bark into the tree, feeding deeper into the tree's heart-

wood forming tunnels in the trunk and branches. This weakens the integrity of the tree and will eventually kill it if the infestation is severe.

Emerald ash borer

Another beetle from Asia was identified in July 2002 as the cause of widespread ash tree decline and mortality in southeastern Michigan and Windsor, Ont. They have since been found throughout Michigan, in part of Ohio, Indiana, Illinois, Maryland, Missouri, Pennsylvania, Virginia, West Virginia and Wisconsin. Infestations have also



Adult Emerald Ash Borer



DAVID CAPPART, MICHIGAN STATE UNIVERSITY, BUGWOOD.ORG

Emerald Ash Borer Larva(e).

been found in more areas of Ontario and Quebec. Evidence suggests that the emerald ash borer is generally established in an area for several years before it is detected.

The adult beetles are generally larger and brighter green than the native North American species. Adults are usually about .5 inch long, bronze, golden or reddish-green overall with darker

metallic emerald green wing covers. The dorsal side of the abdomen is metallic purplish red and can be seen when the wings are spread. The larvae reach a length of about 1 inch long.

An emerald ash borer has an approximate life cycle of one year. Beetle activity peaks between mid-June and early

Continued on page 98

Bad Bugs

Continued from page 97



MICHAEL MONTGOMERY, USDA FOREST SERVICE, BUGWOOD.ORG

Adult Hemlock Woolly Adelgid and eggs inside an ovisac.

July and continues into August. Beetles are usually more active during daytime, especially when it is warm and sunny. Most appear to remain in protected locations in bark crevices or on foliage during rain or high winds. The emerald ash borer feeds on ash foliage, leaving small irregularly shaped patches along the leaf margins.

Each female lays approximately 30 to 60 eggs during an average lifespan, but a long-lived female may lay more than 200 eggs. The eggs are deposited individually in bark crevices or under bark flaps on the trunk or branches, and darken to a

reddish-brown. Eggs hatch in seven to 10 days. After hatching, the first instar (period between molts) larvae chew through the bark and into the phloem (nutrient carrying tissue of plant) for several weeks, creating S-shaped galleries (enclosed passageway) packed with fine sawdust-like frass (insect refuse). As a larva grows, its gallery becomes progressively wider. Beetle galleries often etch the outer sapwood. The length of the gallery generally ranges from 10 to 50 centimeters, and the feeding is usually completed in autumn.

It is difficult to detect the emerald ash borer in newly infested trees because they exhibit few, if any, external symptoms. Jagged holes excavated by woodpeckers feeding on the prepupal larvae may be the first sign that a tree is infested, and D-shaped exit holes left by emerging adult beetles may be seen on branches or the trunk, especially on trees with smooth bark.

As densities of emerald ash borer build foliage wilts, branches die and the tree canopy becomes increasingly thin. Many trees appear to lose about 30 to 50 percent of the canopy a few years after

infestation. Trees may die after three to four years of heavy infestation and epicormic shoots may arise on the trunk or branches of the tree.

Hemlock woolly adelgid

Another Asian pest is the hemlock woolly adelgid. It is a small aphid-like insect that threatens the health of the eastern hemlock. It was first reported in Virginia. It was established in 16 states from Maine to Georgia, and areas of extensive tree mortality are found throughout the infested region. The most severe impact is in some sections of Connecticut, New Jersey, Pennsylvania and Virginia. Hemlock decline and mortality typically occurs within four to 10 years of infestation in the insect's northern range.

The hemlock woolly adelgid is less than 1/16-inch long, and varies from dark reddish-brown to purplish-black in color. As it matures, it produces a covering of wool-like wax to protect itself and eggs from natural enemies and prevent them from drying out. This "white fuzzy wool" is most conspicuous when

Continued on page 100

Bad Bugs

Continued from page 99

the adelgid is mature and laying eggs. It can readily be seen from late fall to early summer on the underside of the outermost branch tips of hemlock trees.

The hemlock woolly adelgid is unusual in that it enters a period of dormancy during the hot summer months. The nymphs during this time period have a tiny halo of woolly wax surrounding their bodies. They begin to feed once cooler temperatures prevail and continue through the winter month. The ovisacs (sack of eggs) of the winter generation contain up to 300 eggs and the spring ovisacs contain between 20 and 75 eggs. When hatched, the crawlers search for suitable feeding sites on the twigs at the base of hemlock needles. Once settled, the nymphs begin feeding on the young twig tissue and remain at the location throughout the remainder of their development. Unlike other related insects that feed on nutrients in sap, the hemlock woolly adelgid feeds on stored starches. These starch reserves are critical to the tree's growth and long term survival.

Dispersal and movement of hemlock woolly adelgid occurs primarily during the first crawler stage as a result of wind and by birds, deer and other forest-dwelling mammals that come in contact with the sticky "wool" and crawlers. Isolated infestations and long distance movement of hemlock woolly adelgid, most often occur as the result of people transporting infested nursery stock.

The best option for managing hemlock woolly adelgid in forests is biological control. There are natural enemies native to eastern North America that feed on them, but they are not effective at reducing populations enough to prevent tree mortality. Biological control opportunities using natural enemies (predators and pathogens) from the adelgid's native environment are currently being investigated. Several predators known to feed exclusively on adelgids have been imported from China, Japan and western North America and are slowly becoming established throughout the infested region. It will likely take a complex of natural enemies to maintain hemlock woolly adelgid populations below damaging levels. Efforts to locate evaluate and establish other natural enemies continue.



Pale crown appearance with no new growth indicate this tree is under severe attack from Hemlock Woolly Adelgids. Photo taken in Rabun County, Ga.

Many of these pests have been found by ordinary people paying attention to the trees that surround them. The forests around us are constantly changing and it is up to all of us to notify our state forester or state entomologist about any observations of sudden dieback, strange bugs or a sudden burst of epicormic branches. It's your neighborhood, take care of it. ♦

The author has been a professional grower of vegetable and flowering plants for more than 20 years; was executive director of Vermont Woodlands Association (VWA) for 5 years and was awarded life membership; wrote a column for American Tree Farmer for 5 years; and did radio commentary for 6 years on several stations, titled "Woodlands, Wetlands and Wildlife." He has also grown Christmas trees, is a tree warden and has produced articles for various Tree Warden Newsletters. He and his wife Judy live in Vermont on their forested property, property which has been in the family for over 100 years.