BRANCHING OUT
IPM NEWSLETTER FOR TREES & SHRUBS

Asian Longhorned Beetles Continue to Bug Us!

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More than 80,000 trees and millions of dollars have been lost since the first accidental introduction of the Asian longhorned beetle (ALB), *Anoplophora glabripennis*. The beetles stowed away in wood packing material that made its way into New York State in 1996. Nearly two decades later, this 1.4-inch, somewhat shy insect continues to terrorize our trees.

Having successfully eradicated the beetles from Manhattan, Staten Island and most of Long Island, locals reported new sightings of the beetles in the corporate office park area of Farmingdale on Long Island in July 2013. Only a few miles from the original beetle infestation in Amityville, the infestation left the U.S. Department of Agriculture's Animal and Plant Health Inspection Service wondering if this was the insect version of "The Amityville Horror, Part II."

Since then, 381 infested trees were reported in the Farmingdale area, highlighting the severity of an invasion that can occur if left unchecked even for short periods of time. Afflicted trees have been found on nearly a weekly basis in what is being termed the "Central Long Island Expansion," and more infested trees are anticipated as canopy inspection surveys by federal climbers begin.

DNA analysis has shown that this new infestation shares many similarities with the previous infestation in Amityville. In fact, some analyses suggest the recent blight may be a satellite of the original infestation in 1996, but the jury is still out. Analogous DNA has also been found in infested areas elsewhere in North America and parts of China.

To mitigate the spread of the ALB invasion on Long Island, USDA-APHIS has quarantined 23 square miles of commercial residential areas in Farmingdale, but it is estimated that the total isolated area will grow to at least 49 square miles and will encompass Oyster Bay, Babylon and parts of Huntington. As of April 2014, 156 trees have been cut down in the "Central Long Island Expansion," with 225 removals pending. Uncut trees within the quarantine zones have traditionally been treated with the systemic insecticide, imidacloprid, a class of chemicals that act as an insect neurotoxin, killing them as they feed on the leaves and twigs of treated trees. There are however no plans to introduce chemicals to treat the most recent outbreak.

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At least 90 percent of Asian longhorned beetle infestation reports in the U.S. and Canada have come from concerned local citizens. To encourage citizen science and early detection, the USDA-APHIS has launched a $3 million campaign on the East Coast to inform arborists, farmers and concerned citizens to "start hunting for Asian longhorned beetles." Swift, on-the-ground identification means rapid response and faster results from eradication efforts by the USDA-APHIS. Websites, newsletters and billboards are available to guide "first detectors" in recognizing this invasive beetle, but the following information will significantly broaden your knowledge of the pest.

Identification

Typically, those beetles found in the U.S. are 0.7–1.5 inches in body length, with the exception of one unusual case of a dwarfed individual found in Brooklyn, N.Y. that was only about 0.5 inches. Beetle sexes are easily distinguished morphologically, with females generally having larger bodies and shorter antennae compared to the males, which have antennae almost twice the length of their bodies (Figure 1, left).

The many faces of ALB

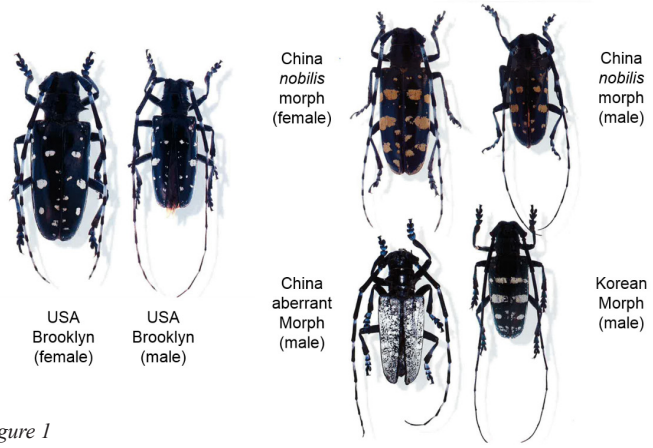

Figure 1

Lingafelter, S.W and Hoebeke, E.R. 2002. Revision of *Anoplophora* (Coleoptera: Cerambycidae). Entomological Society of Washington, Washington, D.C., USA.

The wing covers of the Asian longhorned beetle are normally black with a weak iridescent copper, blue or violet sheen and up to 20 irregularly-sized and distributed patches of white (Figure 1, left). Though they are the same species, there are individual beetles (morphs) with tan spots instead of white (Figure 1, top right), which do occur in some U.S. populations of ALB but are more common in China, with darker tan-colored individuals found in Korea. In fact, some specimens from South Korea are completely banded (Figure 1, bottom right). The most uncommon form is the aberrant morph found in China, which has minute freckled spots of white scattered throughout the wing covers (Figure 1, bottom left).

With no discrimination in the life cycle or the tree hosts used to lay eggs (because they are all the same species), it is conceivable that the larvae of these morphs may accidentally be found in wood packing material and may be introduced into the U.S. So while you are all aware that a black and white Asian longhorned beetle spells trouble, beware that variations in the color and markings of these beetles, which may otherwise hinder our ability to recognize them, can occur.

Biological Control

While this may have blown your mind (as it did mine), there is something else that might bowl you over further.

The Hajek Laboratory at Cornell University's Department of Entomology has been working on the biological control potential of a commercially available insect pathogenic fungus called *Metarhizium brunneum* (strain F52) for use against invasive Asian longhorned beetles. The fungus has proven to be an effective pathogen in the U.S. When the beetles contact the spores of fungal strain F52, the spores begin to germinate on the insect's body, and through a combination of mechanical and enzymatic pressure, the fungus

enters the insect. While the fungus grows inside, it absorbs all the nutrients from its host, making it sick. Finally, after days of growth and nutrient absorption, the fungus bursts out of the insect, through all the soft tissues of the body, and coats the insect in a green spore mass that is ready to infect the next beetle. Certainly sounds like a gory horror movie, no?

Asian long-horned beetle infected with the green fungus, Metarhizium brunneum *F52 which is being developed as a biological control agent in research at Cornell University © Dr Todd Ugine*

Very recently, it was discovered that fungal strain F52 was capable of forming environmentally persistent structures called microsclerotia, which are aggregates of fungal hyphae. These microsclerotia are desiccation tolerant, have excellent storage stability and can be easily applied using standard spray equipment. All of these factors make microsclerotia excellent candidates for mycoinsecticide development.

When these granules are incorporated into hydromulch (a mixture of water, wheat straw mulch and natural glue or psyllium), the formulation represents a novel, easy-to-use and environmentally friendly mycoinsecticide that can be sprayed onto the trunks of forest or orchard trees to control insect pests. Hydromulch is commonly used in the grass-growing process known as hydroseeding (or hydraulic mulch seeding) that uses a slurry of seed and mulch to grow grass economically; it is also used in erosion control or for seeding riparian areas. The Hajek lab's premise for using hydromulch is that it holds environmental moisture that allows microsclerotia to germinate and produce the infective spores that cause lethal infections in the Asian longhorned beetle.

Hydromulch applied to a tree © Tarryn Goble

Because beetle adults are fairly long-lived (up to three months) during the summer time and spend significant amounts of time walking up and down the trunks of trees looking for mates and then chewing oviposition pits. Their behavior brings them into considerable contact with the bark of trees where the hydromulch can be sprayed. Highlighted research in our Hajek lab has shown that females exposed to the fungus in hydromulch have a significant reduction in the amount of viable offspring they can produce. What's more, when unmated adults are exposed to the fungus in hydromulch applied to bark pieces, they died within 12 days. While this might seem like a long time compared to contact insecticides, the fungus can self-perpetuate in the environment given enough applications and before death, females are so sick that they lay fewer eggs.

Bark pieces attached to trees outside during persistence studies © Tarryn Goble

Preliminary outdoor persistence studies showed that sprayed hydromulch could stick to bark pieces for over a month, and there were still enough infective spores after this time to effectively kill beetles. It is anticipated that this residual time can be greatly improved. Ongoing research will address better spore production of the fungus by tweaking water holding components in the hydromulch and improving the persistence of the product for use outdoors.

So while the Asian longhorned beetles may seem to be terrorizing our trees right now, watch out. This fungus is no fun-guy to be dealing with.

Striped maple logs sprayed with F52 microsclerotia in hydromulch and left outside for persistence studies © Tarryn Goble