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ASIAN LONGHORNED BEETLE

Anoplophora glabripennis

ENT-75

Agriculture and Natural Resources

Date: 01/22/2016

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Asian longhorned beetle (ALB; *Anoplophora glabripennis*) is an exotic wood-borer that poses a severe threat to natural and urban forests in North America if it is not eradicated and becomes widespread. ALB has a wide host range that includes tree species in 12 genera with maples (*Acer* spp.) being among the most ecologically and economically significant. ALB is native to China and Korea, and was likely transported to the United States in wooden packing material such as pallets, crates or dunnage. First detected in North America in 1996 in New York City, additional infestations have since been detected in New York, New Jersey, Illinois, Massachusetts, Ohio, and Ontario, Canada. The beetle has been successfully eradicated in Illinois, New Jersey, and parts of New York and Ontario. Eradication efforts continue in other states and Ontario where ALB has been found.



Asian longhorned beetle. *Photo credit: Joe Boggs, The Ohio State University.*



Damage caused by newly emerged ALB adult females chewing through the bark of small twigs. *Photo credit: Joe Boggs, The Ohio State University.*

In Ohio, ALB was discovered in Clermont County in June 2011, and the Ohio ALB Cooperative Eradication Program was established with the goal of eradicating the infestation. Participating agencies include United States Department of Agriculture (USDA) Animal Plant Health Inspection Service (APHIS), Ohio Department of Agriculture (ODA), Ohio Department of Natural Resources (ODNR), Ohio State University Extension, USDA's Agricultural Research Service and USDA Forest Service. Quarantines were established in Clermont County to prevent the spread of ALB. The removal of regulated items that could spread the beetle, such as logs, trees, tree trimmings, chipped wood with pieces larger than 1 inch in two dimensions, and firewood, from the quarantined area is restricted by law.

Host Range

ALB has a broad host range that includes trees representing multiple species from 12 genera: maples (*Acer* spp.); horsechestnuts and buckeyes (*Aesculus* spp.); elms (*Ulmus* spp.); willows (*Salix* spp.); birches (*Betula* spp.); sycamore and planetrees (*Plantanus* spp.); poplars (*Populus* spp.); mimosa (*Albizia julibrissin*); katsura (*Cercidiphyllum japonicum*); ash (*Fraxinus* spp.); golden raintree (*Koelreuteria paniculata*); and mountainash (*Sorbus* spp.).



Oviposition pits in the bark where female beetles deposit an egg. *Photo credit: Joe Boggs, The Ohio State University.*

Life History

ALB belongs to the insect family Cerambycidae. Adults in this family are called "longhorned beetles" because of their long antennae. ALB adults are large beetles, ranging from 1 to 1½ inches (2.5 to 3.8 cm), with very long antennae, which may span more than 3½ inches (8.9 cm). The beetles have a shiny black body with irregular white spots and blue tinted feet. Their antennae have alternating black and bluish-white bands. ALB develops via complete metamorphosis meaning that they pass through egg, larval, pupal and adult stages.

Newly emerged ALB adult females feed for a short time by chewing through the bark of small twigs to consume the sugar-rich phloem tissue. This is called "maturation feeding" because the food consumed helps the beetles mature their eggs. However, the damage done by the adults is negligible compared to the damage caused by the larvae.

Once maturation feeding is complete, they lay eggs on the trunk and branches of host trees in "oviposition pits" created by chewing through the bark and phloem down to the sapwood (outer xylem). Each oviposition pit has a single egg that is deposited on the sapwood. Each female usually lays between 30 and 90 eggs in her lifetime; some are capable of laying more. The eggs hatch within 10 to 15 days. Upon hatching, the immature ALB (larvae) may feed for a short time beneath the bark on the phloem, or they may not feed on the phloem and bore directly into the xylem; ultimately, all ALB larvae feed exclusively in the xylem. Cerambycid beetles are also called "roundheaded



borers" because of the large, roundish segment just behind the head of the larvae. ALB larvae look like a typical roundheaded borer.

ALB larva. *Photo credit: Joe Boggs, The Ohio State University.*

Feeding by ALB larvae damages the xylem, which moves water from the roots to the canopy of the tree. As larval feeding continues over time, damage to the xylem slowly accumulates causing structural weakening in tree branches. Branches often break, especially during storms. Eventually, larval feeding kills the tree. The larvae feed through the summer and fall until pupation; occasionally, pupation occurs in the spring.

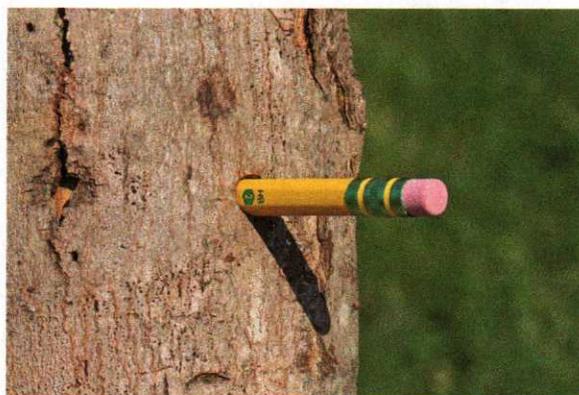
Adults emerge in late spring through late summer with peak emergence typically occurring in late June to early August; however, adults can be present in the fall. As adults chew their way out of the tree, they create large circular exit holes. Mating begins 2 to 3 days after emergence. ALB can overwinter in the egg, larval or pupal stage, but adults do not survive the winter, dying after the first fall freeze. There is one generation per year.

Diagnostic Signs and Symptoms

Diagnostic signs and symptoms useful for detecting ALB include nearly dime-sized exit holes in the bark that can be $\frac{1}{4}$ to $\frac{1}{2}$ inch diameter. The holes are about the same diameter as a pencil and extend deep into the tree because ALB larvae feed deep in the xylem. The ability to insert a pencil deep into the exit hole is a good indicator it was made by a cerambycid; this is considered the "pencil test." Other ALB indicators include scars from oviposition pits and coarse sawdust that may be present on the trunk, branches or base of the tree that was created by female beetles chewing oviposition pits, or expelled by feeding larvae. Increased woodpecker activity may occur on heavily infested branches with woodpeckers creating deep holes as they excavate for ALB larvae located deep in the xylem.



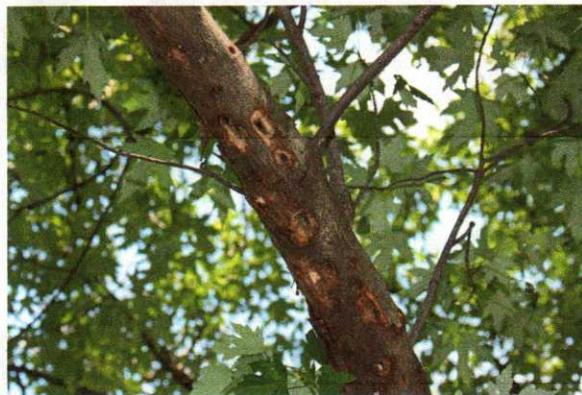
Emergence hole created by adult beetles. *Photo credit: Joe Boggs, The Ohio State University.*



The pencil test. If a pencil can be inserted into an exit hole, it is a good indication that the hole was made by a cerambycid beetle because the larvae feed deep in the xylem. *Photo credit: Joe Boggs, The Ohio State University.*



Sawdust present on the trunk, branches or base of the tree is a sign of adult or larval activity. *Photo credit: Joe Boggs, The Ohio State University.*



Woodpeckers create deep holes in the trunk and branches of infested trees as they excavate ALB larvae. *Photo credit: Joe Boggs, The Ohio State University.*

Because the larvae feed primarily in the xylem, feeding damage decreases the structural integrity of branches, which become weak and break. Larval galleries are often apparent in broken branches. One outlying ALB population in Ohio was discovered because an alert homeowner became concerned when branches broke on a maple tree. As tree health declines, thinning of the canopy and dead branches become noticeable, but this only occurs after the tree has been infested for a number of years.



Larval tunnels or galleries can be found in broken branches of infested trees.

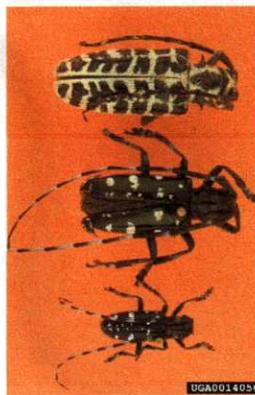
Photo credit: Joe Boggs, The Ohio State University.

ALB Look-alikes

There are several insects native to the eastern U.S. that could be mistaken for ALB. Potential look-alikes include the cottonwood borer, the white-spotted sawyer and the eyed click beetle. The cottonwood borer and white-spotted sawyer are similar in size to ALB, but can be distinguished by solid black antennae (not banded) and different markings on the wings. The cottonwood borer has blocky white markings on the wings, while the white-spotted sawyer has mottled bronzy-black wings with white patches. The cottonwood

Cottonwood borer (top) with Asian longhorned beetle female (middle) and male (bottom). Female ALB are larger than males. *Photo credit: Gerald J. Lenhard, Louisiana*

borer and white-spotted sawyer larvae infest weakened and dying trees, and rarely affect healthy trees. The cottonwood borer infests the lower trunk and roots of poplar trees (*Populus* spp.), with eastern cottonwood being the most preferred. The white-spotted sawyer infests pine tree species, including pines (*Pinus* spp.), spruce (*Picea* spp.) and balsam fir (*Abies balsamea*). The eyed click beetle has false eyespots, small indistinct white spots on the wings, and short solid black antennae. These beetles are often found around dying or dead wood, but neither the larvae nor adults feed on trees.



State University,
Bugwood.org.



White-spotted sawyer. Photo credit: Natasha Wright, Florida Department of Agriculture and Consumer Services, Bugwood.org.



Eyed click beetle. Photo credit: Joe Boggs, The Ohio State University.

Native cerambycid larvae are commonly found in dying or dead tree branches and trunks and are impossible to distinguish from ALB larvae. Roundheaded borers that are found in preferred ALB hosts such as maples should not be ignored, particularly if they are found in live trunks and branches; however, they should be identified by ALB experts.

Prevent the Spread

ALB has the potential to become a catastrophic pest of hardwood trees in North America due to a wide range of suitable hosts and difficulties in detection and monitoring. If the spread of this beetle is not stopped, ALB will cause significant ecological and economic impacts. The forest products and nursery industry in Ohio and elsewhere would be threatened by the loss of trees. Tree mortality caused by ALB will also impact biodiversity and ecosystem services in urban and natural forests. The eastern and southern half of Ohio is dominated by hardwood forests, and damage to trees will impact homeowners, parks and recreation, and maple syrup processors. Additionally, the state tree of Ohio, the buckeye, is a host for ALB.

Eradication efforts in some areas of North America have been successful and those efforts continue in Ohio. However, if ALB is allowed to spread, those efforts will be undermined. To prevent the spread of ALB, quarantines are established in areas where the beetle has been detected. Removing infested trees or high risk host trees in the surrounding area are essential to stop the spread of ALB and save millions of trees. Do not transport living or dead trees, including firewood, branches, roots, stumps, or other debris from quarantined areas. Larvae often go unnoticed because feeding occurs under the bark, and this is why transporting wood is a

major problem. It is particularly important to purchase firewood where you plan to burn it to avoid spreading ALB or other pests, such as emerald ash borer, gypsy moth, and walnut twig beetle.

Early detection of ALB infestations is critical to the success of eradication efforts in terms of time and money. Most infestations have been identified by alert citizens that find the beetle, but careful monitoring for tree damage will also help catch an infestation early. If signs or symptoms of ALB are found, report the infestation to the ODA by phone at (614) 728-6201 or online at agri.ohio.gov. Citizens in Ohio or other states may also report a suspected ALB infestation to USDA APHIS by accessing their ALB website and clicking on "Have You Seen The Beetle" at: asianlonghornedbeetle.com.

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