

Searching for Exotic Beetles

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When non-native species of plants, animals, and disease organisms are introduced to other regions they have the potential to become serious pest problems in their new location. Concern over the introduction of potentially damaging species has led the Plant Protection and Quarantine (PPQ) program—part of the USDA Animal and Plant Health Inspection Service—to increase its domestic surveillance for non-native species in the United States over the past several years.

Most exotic (non-native) species enter the United States through international movement of people, commodities, and conveyances. Most are accidental introductions, though some

intentional introductions (primarily plants) have turned out to be invasive pests. Not all introduced species become agricultural or forest pests; typically, one in seven exotic species is considered invasive. There is often a lapse between the time the pest is introduced and the time that the pest is discovered or reported in the United States; unfortunately this often allows new pest populations to build.

Beetle Patrol

In 2009, PPQ is conducting exotic beetle trapping around the Boston port area as part of the USDA's national wood borer and bark beetle survey. The Boston port area may be a high-risk



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A cargo ship heads toward the port of Boston, passing between Spectacle Island and Deer Island in Boston Harbor.

area for the introduction of new exotic forest pests because of the high volume of cargo imports that enter the United States through it.

Commodities entering the port are often shipped in solid wood packing material, a potential harbor for insect pests of trees. Prior to 2005, there were no regulations requiring the treatment of solid wood packing material for the prevention of pest introductions. Today, all foreign solid wood packing material must be fumigated or heat treated to prevent new forest pests from entering the United States through that very high-risk pathway.

The goals of the USDA's national wood borer and bark beetle survey are to obtain information about:

- The presence, distribution, or absence of target species.
- The advent of new species.
- Patterns of distribution throughout the United States and possible pathways for introduction.
- The phenology of target exotic species in the United States and their selection of hosts.
- The characteristics of high-risk habitats or sites.
- The survey methods themselves.

When selecting survey sites, we primarily target cargo transport companies, businesses that receive imports, and areas around the port of entry where there are host trees that could support the establishment of exotic beetles.

PPQ has chosen twenty locations within 15 miles of the port of Boston for the wood borer and bark beetle survey. One of the sites chosen this year is the Arnold Arboretum because of its close proximity to the Boston port and the presence of a wide variety of tree species in its collections.

Setting the Trap

The survey involves trapping and identifying beetles in order to determine if exotic species are present in the area. We placed three Lindgren 12-funnel traps at each of the twenty selected locations for a total of sixty traps in the Boston area. Each trap is baited with one, or a combina-



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One of the Lindgren funnel traps at the Arnold Arboretum.

tion, of the following lures: ultra high release ethanol, ultra high release alpha-pinene, or the 3-ips lure. The volatiles in the lures simulate stressed or dying hardwood and softwood trees, the types of host trees that many of the exotic beetles are attracted to.

The traps are hung in trees, on poles, or on fences near target hosts. Traps are placed a minimum of 25 meters (82 feet) apart to prevent volatiles from mixing in the air and deterring beetles. Each trap has a collection cup at the bottom that is filled with non-toxic antifreeze to preserve the collected beetles. The trapping period will last from mid March through the end of August to cover a range of emergence periods of the target beetles. Bark and ambrosia beetles typically emerge in early to late spring, while larger wood-boring beetles typically emerge later in summer through fall. The traps are serviced on a bi-weekly schedule to collect any trap contents and replace lures as needed.

All of the trapped beetles will be sent to the Carnegie Museum of Natural History, Section of Invertebrate Zoology, in Pittsburgh, Pennsylvania. They will be screened by qualified experts to determine if they are the target exotic beetles or other non-native beetles.

Determining the potential invasiveness of these exotic beetles is difficult since there is very little research information available for most of them. Often, they are not studied in their native countries if they do not cause eco-

conomic damage there. We can't predict exactly how an introduced beetle species will affect forests in the United States, but experts do try to make educated guesses.

If any exotic beetles are found they will be confirmed by PPQ experts, and state and local

authorities will be notified. The USDA's New Pest Advisory Group (part of PPQ), in conjunction with state and local officials, would then evaluate the new pest risk and determine the appropriate action to take to protect our national forests and agricultural industries.

A Gallery of Beetles

Here are some of the exotic beetles targeted in the survey:

Hylurgus ligniperda (Red-haired Pine Bark Beetle)

NATIVE: Europe, Mediterranean areas, Africa, and parts of Asia

ENTERED U.S.: Introduced near Rochester, New York, in 1994. Found in a Lindgren funnel trap. Has been found in four counties.

HOST: *Pinus* spp. (pines) preferred. Also, *Abies* spp. (firs); *Larix* spp. (larches); *Picea* spp. (spruces); *Pseudotsuga* spp. (Douglas-firs)

DAMAGE: Affects bark, stem, root, trunk, and seedlings. Feed and develop in tunnels beneath the bark. They are know vectors of the disease fungi *Leptographium* spp. and *Ceratocystis* spp.



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Red-haired (or golden-haired) pine bark beetles under the bark of a Monterey pine (*Pinus radiata*).

Ips sexdentatus (Six-toothed Bark Beetle)

NATIVE: Mainland Asia and Europe

ENTERED U.S.: Has been intercepted at ports of entry. Has not been found domestically beyond ports.

HOST: *Pinus* spp. (pines) preferred. Also, *Abies* spp. (firs); *Larix* spp. (larches); *Picea* spp. (spruces); *Pseudotsuga* spp. (Douglas-firs)

DAMAGE: Affects inner bark, leaf, stem, and whole plant. Mates, develops, and feeds in tunnels beneath the bark. Mainly attacks stressed or dying trees. It can kill trees of commercial importance. It also introduces blue stain fungi (*Ophiostoma* spp.) into host trees which hasten the death of tree, discolor wood, and can result in loss of lumber grade and value.



Six-toothed bark beetles in galleries.

Two Highly Destructive Exotic Beetles

Unfortunately, many exotic wood-boring beetles are not attracted to traps baited with volatiles and can only be surveyed for visually. This requires trained spotters using binoculars from ground level, or professional tree climbers knowledgeable in insect signs and symptoms. The **Asian longhorned beetle (ALB)** (*Anoplophora glabripennis*) is a highly destructive invasive beetle that can only be surveyed for in this manner. There is ongoing research to identify more effective survey methods for this devastating pest.

Larvae of the Asian longhorned beetle tunnel into the heartwood of live healthy trees, eventually killing their hosts. Favored species are maples, birches, Ohio buckeye, elms, horse chestnut, and willows. ALB, and efforts to eradicate it, have resulted in the loss of thousands of street trees in several states. ALB was detected in Worcester, Massachusetts, in August, 2008, and its potential spread is of great concern in New England. Volunteers will be educated to survey for ALB throughout Massachusetts this year. Visual surveys and education outreach for ALB will be conducted in all New England states during 2009. For more information about ALB, please visit: <http://www.aphis.usda.gov/oa/alb/alb.html> or <http://massnrc.org/pests/alb/>

Emerald ash borer (EAB) (*Agrilus planipennis*) is another highly destructive beetle that has spread in regions of the United States and Canada. EAB attacks ash trees (*Fraxinus* spp.) and has been moved from its introduction point in Michigan to other states primarily through movement of nursery stock and firewood. We have not detected EAB in Massachusetts yet, but a survey for it

is planned for this year. The Massachusetts Department of Conservation and Recreation, Division of Forestry, will place purple panel sticky traps baited with lures at twenty high-risk locations such as campgrounds, nurseries, and wood processors. Currently, there are no plans to trap inside the Arnold Arboretum for EAB because it is not a high-risk location for the introduction of this pest. For more information about EAB, please visit: www.emeraldashborer.info



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***Ips typographus*
(European Spruce Bark Beetle)**

NATIVE: Europe and Asia

ENTERED U.S.: Has been intercepted in traps in Indiana (1995) and Maryland (2002). It is not known to be established in the U.S.

HOST: *Picea* spp. (spruces) preferred. Also, *Abies* spp. (firs); *Larix* spp. (larches); *Pinus* spp. (pines); *Pseudotsuga* spp. (Douglas-firs)

DAMAGE: Affects bark, crown, foliage, leaf, stem, and whole plant. Considered one of the most serious pests of spruce in Europe.

It vectors a blue stain fungus (*Ceratocystis polonica*) which can also kill the host. It causes major economic losses when it is in outbreak numbers and can cause severe decline in spruce populations within its native range.

Males aggregate and colonize a stressed tree by boring into the bark and preparing nuptial chambers. The females are then attracted to the chambers to mate. The females lay eggs in maternal galleries where the larva will develop. They can have multiple generations in a year depending on temperature.

Dead spruce trees in Slovakia, killed by European spruce bark beetles.



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***Xyleborus seriatus* (No common name; very little is known about this beetle.)**

NATIVE: China, Russia, Japan, Korea, Taiwan

ENTERED U.S.: Intercepted in Lindgren trap in Massachusetts in 2005, the first North American record. This beetle was also trapped in Maine in 2008.

HOST: *Acer* spp. (maples), *Aesculus* spp. (buckeyes), *Alnus* spp. (alders), *Betula* spp. (birches), *Cryptomeria* spp., *Fagus* spp. (beeches), *Larix* spp. (larches), *Pinus* spp. (pines), *Prunus* spp. (cherries), *Quercus* spp. (oaks), *Thuja* spp. (arborvitae), *Tsuga* spp. (hemlocks), etc. Large possible host range.

DAMAGE: Very little data. Is known to be associated with *Ambrosiella* fungi. Spores of a symbiotic fungi are carried on their bodies to new galleries. Larvae and adults feed on this fungi growing between the bark and sapwood. Thought to be a secondary pest and will not kill healthy trees. Several *Xyleborus* species are potential survey targets.

***Xylotrechus hircus* (No common name; very little is known about this beetle.)**

NATIVE: Native to Eastern Russia, China, Korea

ENTERED U.S.: Intercepted in Lindgren trap in Oregon in 1999; not known to be established.

HOST: *Betula* spp. (birches)

DAMAGE: No information available. Species damage unknown. Several *Xylotrechus* species are potential survey targets.