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Canadian Forest Service – Great Lakes Forestry Centre

Asian Longhorned Beetle

INTRODUCTION

Adult Asian longhorned beetles (ALB) (*Anoplophora glabripennis,* Motschulsky), were discovered at the city limits of Vaughan and Toronto, Ontario in September 2003. This insect is native to China and the Korean Peninsula and is believed to have arrived in North America in solid wood packaging materials such as crates and pallets. ALB has been intercepted on numerous occasions by the Canadian Food Inspection Agency (CFIA) at Canadian ports of entry and in warehouses. The Canadian Forest Service has helped develop new international standards for the treatment of wood packaging material so that any unwanted pests are destroyed in the country of origin, before they can be inadvertently transported to North America; as a result of these efforts, International Standards for Phytosanitary Measures (ISPM) no. 15, which sets the standards for treatment of wood packaging material used in international trade, was implemented in 2006.

Image 1. Asian Longhorned beetle adult on a maple tree in Toronto.

Attacks by ALB have been reported on numerous species of hardwoods. In North America, attacks have been found mainly on healthy hardwood trees such as maple, poplar, birch, willow, elm and sycamore. Because there are no approved chemical treatments to control the insect in Canada and there are no known natural enemies in North America, this pest is a serious threat.

The discovery of ALB in Ontario triggered the implementation of an eradication program by the CFIA with the assistance of many collaborators. To prevent the further spread of this insect, all infested or suspected infested trees (531 in total) found between September 2003 and March 2004 were destroyed and the wood was chipped; so was the wood from an additional 15,000 trees considered at high risk of being infested. In addition, a quarantine zone of about 150 km^2 was established around the infested trees to restrict the movement of wood and wood products out of the regulated area.

The decision to eradicate ALB was based on its potential for serious devastation. In addition to impacts on the urban landscape, losses to the hardwood forest industry could be worth billions of dollars in wood products if the beetle were to become established in natural forests. The effects on ecosystems could be significant in addition to expected trade embargoes and losses experienced by the maple syrup industry, tourism and recreation.

GREAT LAKES FORESTRY CENTRE (GLFC) RESEARCH

Under the leadership of a scientist from GLFC, researchers from Canada and the United States have been providing advice and recommendations to the CFIA since the beginning of the eradication program. Before destroying trees, valuable scientific knowledge was gathered about the beetle, including the tree species attacked, their size and precise location. This information has helped scientists learn more about its behaviour in the Canadian environment, improve their likelihood of detecting the beetle, and prevent its spread.

INSECT BIOLOGY AND LIFE CYCLE

Based on a careful examination of all infested trees, scientists have determined that in the Toronto infestation, over 90% of them were maple; that the beetle had been present in the Toronto area for about six years prior to its 2003 discovery; that its life cycle (egg to larva to adult emerging from a tree) lasts either one or two years and that the population was about to explode had it not been detected and largely eradicated that year.

Adult beetles (Image 1) emerge from trees by chewing their way out, leaving characteristic large round exit holes 10-15 mm in diameter. Emergence typically begins in early summer and continues until the fall. After feeding on foliage for a few weeks females find a mate, and soon chew grooves into the bark of the tree to lay single eggs, usually on the east side of the main trunk or on branches bigger than 5 cm in diameter. The adults often remain on the same tree to feed and sometimes fly a short distance to another suitable host. Each female lays between 25 and 40 eggs during its life. Eggs generally hatch within two weeks. ALB larvae feed on the inner bark and heartwood of host trees for several weeks or months, reducing nutrient transport within the tree. The resulting numerous galleries under the bark and tunnels (Image 2) into the heartwood weaken the tree and cause

dieback and death. Several trees were killed in Toronto from repeated attacks of ALB. This knowledge of ALB behaviour is essential in the development of effective survey and detection methods as well in the development of potential control methodologies.

Image 2. Cross section of a maple tree stem attacked repeatedly by the Asian longhorned beetle exposing many larval feeding tunnels. These tunnels weaken the tree, render it susceptible to wind breakage and eventually lead to tree death.

SURVEYS AND DETECTION

GLFC scientists have trained a number of survey crews and published a comprehensive manual, which is used as a training guide. Systematic ALB detection surveys are now regularly conducted in the provinces of Ontario, Quebec, and British Columbia. Researchers have determined that ALB surveys carried out during the winter months, in the absence of leaves, are more effective and produce better results because signs of ALB are more easily seen by surveyors. Guidelines for the number of trees to examine and the length of time required to survey each tree to get the most efficient results have also been produced.

The quarantine zone has been monitored annually since 2003, with the number of infested trees continuing to drop sharply. Between 2004 and 2006, less than 40 infested or suspect trees were found each year, less than 15 in 2007, and none in 2008 and 2009. To date, there have been no other outbreaks of this insect detected in Canada. However, scientists recommend five years of negative survey results within the quarantine zone before declaring the insect eradicated.

MODELLING

Researchers at GLFC are working to build more effective decision support tools for assessing and communicating risks, impacts and uncertainties about alien invasive species. The control of ALB, as with any invasive species, requires some form of expenditure to reduce losses. This may include measures such as more intense surveys, eradication and control programs, and/or money spent on research. A cost-benefit analysis can assist decision makers, regulators and researchers in determining the best way to spend limited budgets and justify research activities.

CONCLUSION

GLFC scientists continue to work closely with the CFIA on improved survey and detection methodology, and training the ALB survey crews across Canada. They remain active in new and evolving ALB research by sitting on scientific panels and collaborating with government agencies and scientists throughout North America and Europe. Future studies will examine potential control options, which would provide another tool for managers if an ALB infestation was detected elsewhere in Canada. GLFC scientists continue to provide sound scientific expertise and recommendations in the management of ALB and other invasive alien species in North America.

COLLABORATORS

- Canadian Food Inspection Agency
- Ontario Ministry of Natural Resources
- United States Department of Agriculture (USDA), including Animal and Plant Health Inspection Service, Forest Service, and Agricultural Research Service
- Cities of Toronto and Vaughan
- Region of York
- Toronto and Region Conservation Authority

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PUBLICATIONS

Ric, J.; de Groot, P.; Gasman, B.; Orr, M.; Doyle, J.; Smith, M.T.; Dumouchel, L.; Scarr, T.A.; Turgeon, J.J. 2007. Detecting signs and symptoms of Asian longhorned beetle injury: Training guide. Natural Resources Canada, Great Lakes Forestry Centre, Canadian Food Inspection Agency Sault Ste. Marie, Ontario. 118 p.

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