



CANADIAN FOREST SERVICE

Science HIGHLIGHTS

INVASIVE SPECIES SURVEILLANCE

How are we improving the detection of invasive forest insects?

Optimizing the number of traps per site and using the right combination of lures could improve early detection of alien invasive species

Invasive wood-boring beetles, like the emerald ash borer, have killed millions of trees in North America. Efforts to eradicate them or control their spread are costing millions of dollars—making improved tools to detect invasive forest insects earlier a top priority. “The sooner we can detect an established invasive species, the better our chances of eradicating it or at least slowing its spread” says Jon Sweeney, a research scientist with the Canadian Forest Service–Natural Resources Canada at the Atlantic Forestry Centre in Fredericton, New Brunswick.

Sweeney and colleagues in the Canadian Forest Service (CFS) of Natural Resources Canada and the Canadian Food Inspection Agency (CFIA) are working on the right mix of traps and lures to detect invasive insects as early as possible.

Sweeney does most of his work with standard funnel traps. Each funnel is about 20 centimetres in diameter. Typically, 12 funnels are joined to form a 1.5 metre chain with a bucket at the end. The bucket is suspended about half a metre above the ground. The trap hangs from a rope strung between two trees. Using standard traps is important because it will allow Sweeney’s work to be easily replicated across Canada.

Advances in pheromone lures could make it easier to detect more invasive species

Insect traps are typically baited with one of two kinds of lures. One kind is made from substances like ethanol, another from monoterpenes, which smells like turpentine. These lures smell like the insect’s host plant. These host volatile lures attract a large number of species but are not very sensitive at low pest densities. The second kind of lure is a pheromone—a chemical scent that triggers a behavioural response in members of the same species. For example, sex pheromones attract members of the opposite sex. Pheromone-based lures are very powerful and sensitive but they tend to be species-specific.

Peter Silk, a chemist who specializes in insect chemical ecology for the CFS and Sweeney discovered a pheromone in 2006 that attracts the brown spruce longhorn beetle as well as two other species in the same genus. This pheromone has since been used in lures in the United States and Canada. A patent is pending. Sweeney and Silk want to build on this success and develop lures that are able to attract a variety of insects.

Overview

Improved tools to detect invasive forest insects earlier are a top priority.

Pheromone-based lures that attracted a variety of invasive species would increase the likelihood of early detection.

Optimizing the number of traps in a site and making lures more multi-purpose would make early detection easier.



Funnel trap

“Pheromones have recently been discovered in several species of longhorn beetles and what is really interesting is that many different species appear to respond to the same or similar pheromones” Sweeney says. “This makes these pheromones ideal candidates for invasive surveys because they potentially offer the best of both worlds, a powerful attractant that can detect the presence of several different species at low densities.” Sweeney and Silk are working with researchers in Poland, Russia and China to test the effectiveness of different lures at detecting alien species that could one day pose a threat to Canada. They are also working with colleagues across Canada to test the attraction of the same lures to native beetles, as alien cousins of the natives may respond in a similar manner.

Optimizing the number of traps per site

Tackling the problem of how many traps to set at a given site is another important aspect of Sweeney’s work. The current invasive wood borer surveillance program uses three different lures and three traps of each lure per site.

By looking at the number of different species detected the researchers can determine the percentage of species detected (or missed) at a site and the optimum number of traps to use. They also plan to test the effect of several different lures on a single trap. This can increase the total number of species detected per trap but can also be counterproductive because different types of lures may attract some species while repelling others. This is why a multi-purpose pheromone is so sought after by researchers.

“If we can optimize the number of traps in a site and make lures more multi-purpose, early detection would be easier. That would be a big advance in fighting alien invasive species,” Sweeney says.



Male brown spruce longhorn beetle on spruce log

