Predatory wasp gives early warning of beetle infestation

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by Sharon Oosthoek, CBC News


Cerceris fumipennis wasp with its beetle prey. This native wasp can determine in as little as 30 minutes if emerald ash borers are in the area. (Mike Bohne/U.S. Department of Agriculture Forest Service)

A centimetre-long wasp is poised to become a lead investigator of potential infestations by emerald ash borers, a beetle that is destroying swaths of trees across eastern North America.

Researchers at Ontario's University of Guelph say *Cerceris fumipennis* — a wasp native to the region — can determine in as little as half an hour after leaving its nest in search of prey whether the invasive beetles are in the area.

Traditional sleuthing involves peering into treetops where beetles congregate, or hanging sticky traps. But both are costly and finding the beetles can take days, weeks, or even years if the infestation is in the very early stages.

Yet the earlier an infestation is discovered, the fewer trees have to be cut down or injected with expensive pesticides to stop the beetles' spread.

Now some U.S. forest managers in New England and New York state are pressing this black-winged wasp into service, and the Canadian Food Inspection Agency (CFIA) is seriously considering following suit.

"This is a brand new program," says Colleen Teerling, an entomologist with the Maine Forest Service, which started using *Cerceris fumipennis* this summer. "A year and a half ago, nobody had even heard about this wasp in the U.S."

While the emerald ash borer has yet to spread to Maine, officials there are monitoring its progress carefully.

Much is at stake.

The shiny green beetle has claimed more than 25 million trees in Ontario, Quebec and 12 American states since being discovered in the Windsor area in 2002. The beetles, which arrived from Asia in packing materials, kill ash trees by destroying the water- and nutrient-conducting tissues under the bark.

"This borer seems to stop at nothing," says Mark Widrlechner, a horticulturist for the U.S. Department of Agriculture. "And it seems the ash tree has no genetic resistance to this pest."

Widrlechner heads a national program to collect ash seeds so they can be reintroduced once the devastation is over. He has seen first-hand the beetles' toll and worries about areas where ash trees represent up to 40 per cent of the forest canopy.

"If the ash disappears, what will fill the niche? Will it be one of the native trees or a non-native tree that could use the open niche to become invasive?" he asks.

If that happens, he says it could change the whole ecosystem and threaten plants and animals that depend on ash-dominated forests.

 *The emerald ash borer has killed more than 25 million trees across eastern North America since its discovery near Windsor, Ont., in 2002. (Philip Careless/CFIA)*Ash trees are also valued for their resilient wood — used in tool handles, flooring and baseball bats — and were planted along city streets in massive numbers to replace elm trees wiped out by Dutch elm disease about 40 years ago.

The U.S. Department of Agriculture's Forest Service estimates that if the current rate of infestation continues, it could cost the forestry industry between $20 and $60 billion US. In addition, the cost of removing and replacing ash trees along urban streets could amount to $7 billion US over 25 years.

When University of Guelph entomologist Steve Marshall started looking into the issue several years ago, the extent of the threat was just becoming clear.

In 2006, he recruited master's student Philip Careless to see if the wasps could be used as an early warning system. While they don't kill beetles in sufficient numbers to control an infestation, Marshall suspected the wasps might just "provide a natural and very low-cost approach to monitoring for emerald ash borers."

Marshall's earlier research showed the wasp feeds on jewel beetles, including emerald ash borers. But no one had ever tried to move wasp nests to areas at risk of beetle infestations to see whether they could be used as mobile surveillance units.

So Careless spent the past three summers working with the CFIA to perfect a technique for digging up earthen wasp nests at night, when the females remain inside, and driving them to areas with a high risk of beetle infestation.

'Stealing their groceries'

Careless, who has since graduated but continues to work with the CFIA on the project, found the wasps reoriented themselves the next morning and ventured out to find jewel beetles to bring back to feed their larvae.

By placing clear plastic cups over the nests' entrance, Careless intercepted wasps returning with prey and found that emerald ash borers made up a significant proportion in infested areas.

"We were essentially stealing their groceries every time they came home. I don't know how they tolerated it," says Careless. "But we did drop the groceries back down the hole afterwards because we wanted the wasps to stick around their nests."

Based on experiments over the summer of 2009, Careless showed wasps detected more emerald ash borers and did it faster than the traditional system of sticky traps or human surveillance.

Using some fancy wasp math, Careless found he could also determine the extent of a given infestation.

On the basis of the speed of the fastest wasp observed — which he clocked at 33.4 metres per minute — Careless was able to estimate how far a beetle infestation might have spread by calculating how long the wasp was gone from its nest.

For example, a wasp that took 57 minutes to forage travelled just over 1,900 metres to catch the beetle and return to its nest. That meant that the beetle was caught within 950 metres of the nest.

By spreading nests at regular intervals, it then becomes possible to estimate the extent of infestation, even in its very early stages.

And that has forest managers hopeful that they may yet preserve North America's ash trees. "Early detection is probably one of the most critical things," says Teerling.