

PREPARING FOR AN INVASION

Professor Hugh Evans and Dr David Williams, from Forest Research, visited eastern Canada and the USA to investigate two beetles threatening European forests

As the common names for the beetles suggest, the native bronze birch borer (BBB) and the invasive emerald ash borer (EAB) are brightly coloured and distinctive beetles in the family Buprestidae.

Our fact-finding mission to eastern Canada and the USA was set up as part of PREPSYS¹, a new EU project coordinated by Forest Research (FR). It involves partners in Austria, Ireland, the Netherlands and the USA, and aims to assess the risks posed by the two beetle species. Central to the project is the emphasis on learning from experiences of dealing with them in North America. In particular, we wanted to see the threat they potentially pose to European forests.

Bronze birch borer

Threat: Potentially damaging to birches in Europe

Native to North America, BBB (*Agrilus anxius*) is only occasionally damaging to birch there, being particularly associated with stressed or pre-damaged trees. However, on our visit to the Midwestern state of Michigan, Professor Leah Bauer from the USDA Forest Service/Michigan State University showed us European birch (*Betula pendula*) killed by BBB. Apparently healthy trees had succumbed to relatively low levels of beetle attack (see Figure 1), suggesting birch in Europe could be under considerably higher risk than native birches in North America.

Whilst consistent with the limited evidence indicating high susceptibility of European birch to BBB attack, the



Figure 1: damage caused by the bronze birch borer

question remains as to how the beetle could be transported from North America to Europe? Movement of birch as firewood, with some outer wood or bark, clearly presents the highest risk pathway, although small living trees could also provide a transport route.

The PREPSYS project will investigate this further and collaborate with Dr Claire Rutledge, the entomologist in charge of Emerald Ash Borer Research at the Connecticut Agricultural Experiment Station, on the development

of monitoring systems for the beetle.

Prognosis for Europe

Rapid mortality of European birch due to low-density attacks by BBB confirmed the potential for damage should this beetle establish in Europe. Initial efforts are, therefore, concentrating on developing an effective survey technology and improving our analysis of pathways for potential transport to Europe.

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“The damage caused by EAB in North America... makes the development of a reliable and easily deployed early detection an urgent priority”

Emerald ash borer

Threat: Invasive and highly damaging in North America

Damage from EAB (*Agrilus planipennis*), which is native to SE Asia, particularly China, is extensive and increasing in North America. The expansion in distribution from its first discovery in Michigan in 2002 to 2017² illustrates just how quickly this devastating pest can spread. Our hosts explained how dendrochronology had shown the pest was in North America for at least 12 years before discovery. Early detection is essential if remedial action is to be successful. There is ongoing work into detection survey methodology in Canada and the USA, which we will need to assess and refine for use in Europe.

In Toronto and Ontario, we were shown survey regimes based on green triangular (prism) sticky traps located in the mid to upper canopies of street and woodland trees. In Michigan, purple sticky traps were favoured, which constitute the main method for both State and Federal programmes in the USA. A further variant, based on green



Green multifunnel trap for EAB

multifunnel traps together with chemical lures, was demonstrated in Michigan and at Cape Cod, Massachusetts. However, at all locations our hosts emphasised that trap effectiveness depends on a number of variables, including placement, lure



Adult emerald ash borer found flying near to an ash tree

composition, EAB population density and climatic conditions. Consequently, we are actively collaborating with Dr Claire Rutledge to compare traps and lures for both EAB and BBB to establish potential for use in early detection in Europe.

EAB management strategies

Heavy tree mortality in all visit locations confirmed the capacity of EAB to devastate trees in urban and rural woodlands. The rapid spread in North America shows that if the initial invasion is missed, even by a few years, there is no scope for eradication. We were, therefore, particularly interested in potential management strategies should EAB establish in Europe.

A sobering conclusion in all locations, but especially in the continuing northward advance of EAB in Canada, is that efforts have moved from concentrating on beetle population management to managing the rate of death of trees in order to spread the effort of tree felling and replacement. Thus, in various parts of Toronto, we saw work to inject trees with a systemic insecticide to give one to two year protection for vulnerable trees, buying time for removal of heavily infested or recently killed trees. In the USA, where a

wider range of insecticides is registered, we were told that a highly effective chemical provided up to three years protection. Irrespective of the insecticide used, the emphasis was on application to higher value trees in an urban setting.

Biological control

In the longer term, management is looking towards biological control to contain, but not eradicate, EAB population growth. We were fortunate to be able to see the mass-rearing facility for exotic parasitic wasps (parasitoids) at the US Department of Agriculture in



Purple prism trap for EAB in USA



David Williams attaches an ash billet



Close up of the emerald ash borer



Ash billets and plastic containers for release of larval



A green prism trap used to monitor EAB in Canada

Michigan, where its State Plant Health Director Dr Craig Kellog and his staff described impressive progress in rearing three species of wasp imported from the natural range of EAB in China. Mass rearing of egg and larval parasitoids has been successfully achieved and led to releases in multiple States. Two species are now persisting and spreading, but one is more climatically limited and further work is being carried out on climate matching from different regions in China. A bonus of our combination of laboratory and field visits was that we were able to see field releases of parasitoids take place in both Canada and in the USA.

Prognosis for Europe

The damage caused by EAB in North America, and the knowledge that it is already in the European part of Russia, makes the development of a reliable and easily deployed early detection an urgent priority for PREPSYS in the near future, which will complement other research on such threats funded by Defra. Ash (*Fraxinus excelsior*) is known to be susceptible to EAB and, therefore, a high level of preparedness is essential.

Professor Hugh Evans, Senior Project Leader in Wales, and Dr David Williams, Entomologist, Forest Research

References

1. *Pest Risk Evaluation and Pest Management Systems project*, www.forestry.gov.uk/fr/prepsy
2. Visit <http://bit.do/EAPmapNA> to see the current distribution of EAB in North America.

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