

Bronze Birch Borer, *Agrilus anxius* (L.)

Introduction

The bronze birch borer (BBB) *Agrilus anxius* L. (Coleoptera: Buprestidae) is native to the northern temperate and boreal regions of North America where its larval host birch (*Betula*) naturally occurs but it has spread into more southerly and western regions of the USA following the planting of birch as ornamental trees (EPPO, 2022). It is not recorded as present elsewhere in the world.

The larval stage of BBB burrows and tunnels through the cambial layer of the tree causing decline. North American species of birch are typically only attacked if they are suffering from some form of stress; European and Asian species of birch, however, are highly susceptible to attack, even when healthy, and are killed as a result. All sizes of trees can be infested, including branches that are just 1 cm in diameter (EPPO, 2022).

Populations of birch bronze borer are generally endemic in North America. Outbreaks are recorded on occasions when widespread drought or defoliation occurs resulting in widespread mortality of birch. Bronze birch borer has also been responsible for the widespread death of street and ornamental trees in urban areas (EPPO, 2022).

Birch is present throughout much of Europe and Asia. This widespread distribution of the host tree, coupled with the ability of BBB to tolerate a wide range of climatic conditions, suggests that the pest would be capable of establishing and destroying birch forests in areas of the EPPO region if it were to invade. Northern European countries are particularly concerned regarding the arrival of this pest due to the large amounts of birch grown in these areas (EPPO, 2022).

History of classical biological control against *Agrilus anxius*

There is no history of classical biological control against *A. anxius*.

Most promising natural enemies for classical biological control

Several egg and larval parasitoids are associated with BBB in North America and these may have potential as classical biological control agents if BBB established in areas outside of North America. However, the role of natural enemies in the population dynamics of BBB has not been demonstrated (EPPO, 2022) and Barter (1957) suggests that populations levels are mainly controlled by host availability and condition rather than natural enemies.

There is little information on egg parasitoids of BBB, but these include *Thysanus* sp. (Hymenoptera: Signiphoridae), *Coccidencyrtus* sp. (Hymenoptera: Aphelinidae), *Avetianella* (*Oobius*) sp. and *Ooencyrtus* (Hymenoptera: Encyrtidae). Overall rates of egg parasitism are highly variable ranging from 7 - 55% The *Thysanus* sp. is a gregarious egg parasitoid whilst *Coccidencyrtus* sp. only produces one adult per BBB egg. (Barter, 1957; Loerch and Cameron, 1983; Muilenburg and Herms, 2012).

Three larval parasitoids have been reported from North America *Atanycolus charus* (Hymenoptera: Braconidae), *Phasgonophora sulcata* (Hymenoptera: Chalididae) and a *Tetrastichus* sp. (Hymenoptera: Eulophidae) (Barter, 1957; Loerch and Cameron, 1983).

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Atanycolus charus is thought to attack the overwintering larvae as it has not been recorded from trees where BBB develops following a one-year life cycle (Barter, 1957). Thus, this parasitoid might be more suited in regions where BBB life cycle extends over more than one year due to cooler climate or less suitable host species. Rates of parasitism ranging from 1 to 52% but with an average of 14% are reported in Barter (1957).

Phasgonophora sulcata is a solitary endoparasitoid (Roscoe *et al.*, 2016) found in North America but not reported from elsewhere (CABI, 2019). Rates of parasitism in BBB range from 1 to 8%, (Barter, 1957). This parasitoid species is not specific to BBB and attacks other North American species of *Agrilus* (*A. liragus*, *A. bilineatus*), and the invasive emerald ash borer (EAB; *Agrilus planipennis*), as well as other buprestid species (*Chrysobothris femorata*, *Chrysobothris sexsignata*) and lepidopteran species (*Papilio* sp., *Antheraea polyphemus*) (Noyes, 2019).

Other natural enemies for classical biological control

Other hymenopteran larval parasitoids of BBB include braconids (*Spathius* sp., *Doryctes* sp., and *Wroughtonia* sp.), Ichneumonidae species (*Ichneumon* sp., *Dolichomitus* sp., *Glypta* sp., *Pimplopterus* sp. and *Olesicampe* sp.) and a Eurytomidae (*Eurytoma* sp.) but these are of low prevalence (Barter, 1957; Loerch and Cameron, 1983) and so unlikely to be suitable candidates for consideration in classical biological control programmes.

A microsporidan *Cystosporogenes* species was isolated from field populations of BBB Kyei-Poku *et al.* (2011). There was a high level of prevalence (> 80%) in adult beetles at two Canadian outbreak localities but it was not found at a third location. More research would be required to ascertain whether this microsporidium would make a suitable classical biological control agent.

Oobius agrili (Hymenoptera: Encyrtidae), an Asian parasitoid of EAB eggs can also oviposit in BBB eggs (USDA APHIS, 2007). Approximately 30% parasitism is reported in the absence of EAB eggs, but no parasitism was observed when given a choice of EAB or BBB eggs in the laboratory (USDA APHIS, 2007). However, the impact of *O. agrili* on BBB in the field in the USA, where it has been deliberately released for the control of EAB, is unknown (Muilenburg and Herms, 2012).

References

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