

# Field Identification Guide

*Agrilus fleischeri*



## *Agrilus fleischeri*

*Agrilus fleischeri* Obenberger is a buprestid beetle related to the oak jewel beetle (*A. biguttatus*), emerald ash borer (*A. planipennis*) and bronze birch borer (*A. anxius*). It is native to Asia and has been found in China, Japan, Kazakhstan, Mongolia, North Korea, South Korea and Russia. Like its relatives, *A. fleischeri* is a wood borer, the larvae feeding on the phloem, cambium and outer xylem of host trees producing galleries under the bark and causing significant damage.

While generally not fatal to the host, it is thought that the beetles can reduce a tree's productivity and vitality and make it more vulnerable to other pests and diseases. Fatal infestations have, however, been reported in Lombardy poplar (*Populus nigra* var. *italica*) in China, but the species also affects several other poplar species and narrow-leaf willow (*Salix schwerinii*).

The non-native but closely related *Agrilus ater* has recently been found breeding in the UK and is morphologically very similar to *A. fleischeri*. The larvae of both are found in poplar trees, but *A. ater* seems to prefer stressed or dying trees, whereas *A. fleischeri* appears to be more aggressive and can also attack healthy trees.

Species affected	In its native range <i>A. fleischeri</i> has attacked Lombardy poplar ( <i>Populus nigra</i> var. <i>italica</i> ), Korean aspen ( <i>P. tremula</i> var. <i> davidiana</i> ), Eurasian aspen ( <i>P. tremula</i> ) and narrow-leaf willow ( <i>Salix schwerinii</i> ). It is not known whether the beetle can attack other poplar or willow species, but native and non-native species from both genera are present in the UK.
Signs and symptoms	<p><i>A. fleischeri</i> infestation is likely to be difficult to detect until the symptoms become severe because much of the insect's life cycle is hidden within the tree: eggs are laid in crevices, the larvae feed in the inner bark and pupation occurs in the sapwood. In most cases, the beetles will have already become established and have spread to new hosts by the time they are discovered.</p> <p>The adults are small (7.8–12.3 mm long), elongate, dark brown to black beetles with three pairs of white markings on the wing cases. The pair nearest the rear of the beetle are arranged in a 'V' shape. The head is black with a metallic green/greenish-blue tint in males and a brown/bronze metallic tint in females. They live for approximately 34 days and are strong flyers. They feed up in the canopy of a tree where, due to their small size and colour, they are difficult to spot. Foliage-feeding damage is thought to be minimal and therefore not a reliable indicator of the pest.</p>

Larval feeding activity within the phloem, cambium and xylem of infested trees disrupts the transportation of water and nutrients, girdling the tree when infestations are heavy. Crown dieback, thinning and dying branches typically occur from the top of the tree down as the infestation progresses. When larval density is high trees can be killed within two to three years.

Mature larvae are 18–40 mm long and range in colour from milky white to pale yellow with brown mouthparts and urogomphi, the paired projections at their tail end.

In common with other *Agrilus*, the adult beetles leave a D-shaped hole in the bark (3 mm along the flat side x 2 mm wide) when they emerge from the tree. The exit Holes for all *Agrilus* species are very similar and there are a number present in the UK, both native and non-native.

Other native insects can cause similar symptoms on poplars and willows to those caused by *A. fleischeri*. For example, goat moths (*Cossus cossus*), leopard moths (*Zeuzera pyrina*), longhorn beetles, musk beetles (*Aromia moschata*), wood wasps and bark beetles may leave exit holes in the bark, but these tend to be larger, are round or oval, rather than D-shaped, and occur much more commonly in dead trees/wood.

Canopy thinning, crown and branch dieback and discoloration of foliage in poplars and willows could have causes other than *A. fleischeri*, such as drought, waterlogging, poor silvicultural management and adverse environmental conditions.

Infection by fungal root pathogens, such as *Phytophthora cambivora*, *P. cinnamomi* and honey fungus (*Armillaria* spp.), can also lead to similar symptoms in the crown.

The presence of D-shaped exit holes and larval galleries under the bark are two key indicators of *A. fleischeri* which can differentiate it from other factors.

These are also key indicators of *Agrilus* presence. And there are two other species of *Agrilus* that can develop in poplar: *A. viridis* (native) and *A. ater* (non-native), recently established in South London. *A. ater* is very similar to *A. fleischeri*, and laboratory identification is required to distinguish between the two species.

<p>Timing</p>	<p>The information here is based on observations made in China and it is uncertain if similar patterns would be followed in the UK.</p> <p>In China <i>A. fleischeri</i> has different life-cycle durations on the two main hosts: one brood per year (univoltine) on Lombardy poplar and less than one brood per year (semivoltine) on Korean aspen.</p> <p>Adults emerge in late May with a peak in June; emergence finishes by early to mid-June. Adults feed on the foliage of the host, mating between 2 and 11 days after emergence. After a further 2–12 days females lay up to 600 eggs in bark crevices and beneath flakes of bark.</p> <p>Eggs hatch after around 13 days and the young larvae immediately tunnel into the tree where they have been found feeding in both the cambium and xylem, creating serpentine galleries. The larvae continue to feed until late September when they enter a state of dormancy. Pupation time seems to be dependent upon host species: in Lombardy poplar pupation occurs in early May, while in Korean aspen the larvae overwinter as young instars, spend the second summer feeding and then pupate after the second winter to emerge the following spring. In both cases the fully grown larvae pupate between 4 and 14 mm beneath the surface of the sapwood.</p>
<p>Biosecurity</p>	<p>Natural spread of <i>A. fleischeri</i> occurs by flight as these insects are strong flyers, and it is also thought that they can be carried passively over considerable distances by the wind and along roads with the traffic.</p> <p>Poplar is an important timber for various types of wood-based packaging and this represents another potential mechanism for spread. Canadian authorities have intercepted <i>A. fleischeri</i> twice, in 1992 in wood packaging material and in 2016 in dunnage originating from China, demonstrating that international transport is possible.</p> <p>Poplar or willow shoots with a diameter of just 1 cm and over can contain all <i>A. fleischeri</i> life stages, and so it is extremely</p>

	<p>important that no wood or foliage from potential host trees is removed from a potentially infected site. Vehicles and equipment should also be checked for live beetles. If any tree material is intentionally removed from a site (e.g., for sampling), then it should first be triple-wrapped in strong and robust plastic bags, or double-wrapped in bags which then must be secured within a plastic container. Beetles for identification should be securely contained within a robust plastic container because the adults may be able to chew through thin plastic.</p>
<p>Reporting requirements</p>	<p>This is a regulated quarantine pest. so if you find it you must report it. Please report through TreeAlert (<a href="http://www.forestry.gov.uk/treealert">www.forestry.gov.uk/treealert</a>).</p> <p>In Northern Ireland, please report via the TreeCheck website (<a href="http://www.treecheck.net">www.treecheck.net</a>) or phone app, or by emailing <a href="mailto:planthealth@daera-ni.gov.uk">planthealth@daera-ni.gov.uk</a></p> <p>For traded plants and non-tree hosts. please email <a href="mailto:planthealth.info@apha.gov.uk">planthealth.info@apha.gov.uk</a> (England and Wales) <a href="mailto:hort.marketing@gov.scot">hort.marketing@gov.scot</a> (Scotland)</p>

Based on information available in December 2023.

Cover photo: Adult *A. fleischeri*. Courtesy of E. Jendek.

## Signs and symptoms



Photograph courtesy of Mr. Zang Kai

Creamy white late instar larva of *A. fleischeri* feeding in the cambium.



## Signs and symptoms



Photograph courtesy of Mr Zang Kai

*A. fleischeri* pupa in the outer sapwood.

## Signs and symptoms



Photograph courtesy of Dr Cao Liang-Ming

Adult *A. fleischeri*. Length is 7.8–12.3 mm.



## Signs and symptoms



Photograph courtesy of Mr Zang Kai

Frass-filled larval tunnels of *A. fleischeri* beneath the bark of an infested tree.

## Signs and symptoms



Photograph courtesy of Mr Zang Kai

Adult *A. fleischeri* with D-shaped exit hole.



Photograph courtesy of Mr Zang Kai

D-shaped exit hole in the trunk of a host tree.



## Signs and symptoms



Photograph courtesy of Mr Zang Kai

A heavily infested stand of Lombardy poplar in Liaoning, northeast China.

## Signs and symptoms



Photograph courtesy of Mr Zang Kai

Vertical cracks in the bark of Lombardy poplars are normal for this species, which makes outward signs of *A. fleischeri* difficult to detect until numbers are very high.



## Look-alike signs and symptoms



Photograph courtesy of György Csoka, Hungary Forest Research Institute, Bugwood.org

Poplar and willow species are among the preferred hosts of goat moth (*Cossus cossus*). The wood-boring larvae are much darker in colour than those of *A. fleischeri*.



Photograph courtesy of György Csoka, Hungary Forest Research Institute, Bugwood.org

The base of a willow with high levels of goat moth damage; note that the holes are larger and not the clean D-shape of those made by *A. fleischeri*. They're also frequently accompanied by sap runs.



## Look-alike signs and symptoms



Photograph courtesy of Petr Kapitola, Central Institute for Supervising and Testing in Agriculture, Bugwood.org

Wood-boring leopard moth (*Zeuzera pyrina*) larvae are more frequently found in fruit trees but can be found in willows. Larvae are cream-coloured with dark spots.

## Look-alike signs and symptoms



Photograph courtesy of Valentyna Meshkova, Ukrainian Research Institute of Forestry and Forestry Melioration, Bugwood.org:

Wood-boring larvae of the musk beetle (*Aromia moschata*) are much fatter than those of *A. fleischeri* and are only found in willows.



© Crown copyright 2024.

Published by Forest Research as part of the Observatree project.

Observatree aims to create a tree-health early-warning system using citizen science.

Observatree is a partnership project led by Forest Research, the research agency of the Forestry Commission. Project partners are the Animal & Plant Health Agency (APHA), Department for Environment, Food & Rural Affairs (Defra), Fera Science Ltd, the Forestry Commission, the National Trust, Scottish Forestry, the Welsh Government and the Woodland Trust. Supporting the project is Natural Resources Wales. The first four years of this project was 50% funded by the EU's LIFE programme.

Acknowledgements:

Matt Parratt, Katy Reed and Molly Davidson at Forest Research, and Charles Lane and Rowan Howe at Fera Science Ltd for their technical and scientific expertise, and contributions from experts across the Observatree partnership.

All those who have given permission for images to be used within the guide.

The Communications Team, Forest Research, for the original design and creation of the guide.

This booklet forms part of a set that supports Observatree volunteers when out looking for priority pests and diseases. It supplements face-to-face training and is not intended as a full or detailed description. It will also be useful for others who have some knowledge of the particular pest or disease and understand how to look for these. Further information is available online from the websites listed below:

**[www.observatree.org.uk](http://www.observatree.org.uk)**

**[www.forestresearch.gov.uk/tools\\_and\\_resources/fthr/pest-and-disease-resources/](http://www.forestresearch.gov.uk/tools_and_resources/fthr/pest-and-disease-resources/)**

**[www.gov.uk/guidance/prevent-the-introduction-and-spread-of-tree-pests-and-diseases](http://www.gov.uk/guidance/prevent-the-introduction-and-spread-of-tree-pests-and-diseases)**

**<https://planthealthportal.defra.gov.uk>**