

# EPPO Datasheet: *Agrilus fleischeri*

Last updated: 2020-04-22

## IDENTITY

**Preferred name:** *Agrilus fleischeri*

**Authority:** Obenberger

**Taxonomic position:** Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Buprestidae

**Other scientific names:** *Agrilus fleischeri kurosawai* Obenberger, *Agrilus fleischeri nipponicola* Kurosawa, *Agrilus fleischeri* var. *coreicus* Kurosawa, *Agrilus kochi* Théry, *Agrilus tscherepanovi* Stepanov

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**EPPO Categorization:** A2 list, Alert list (formerly)

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**EPPO Code:** AGRLFL



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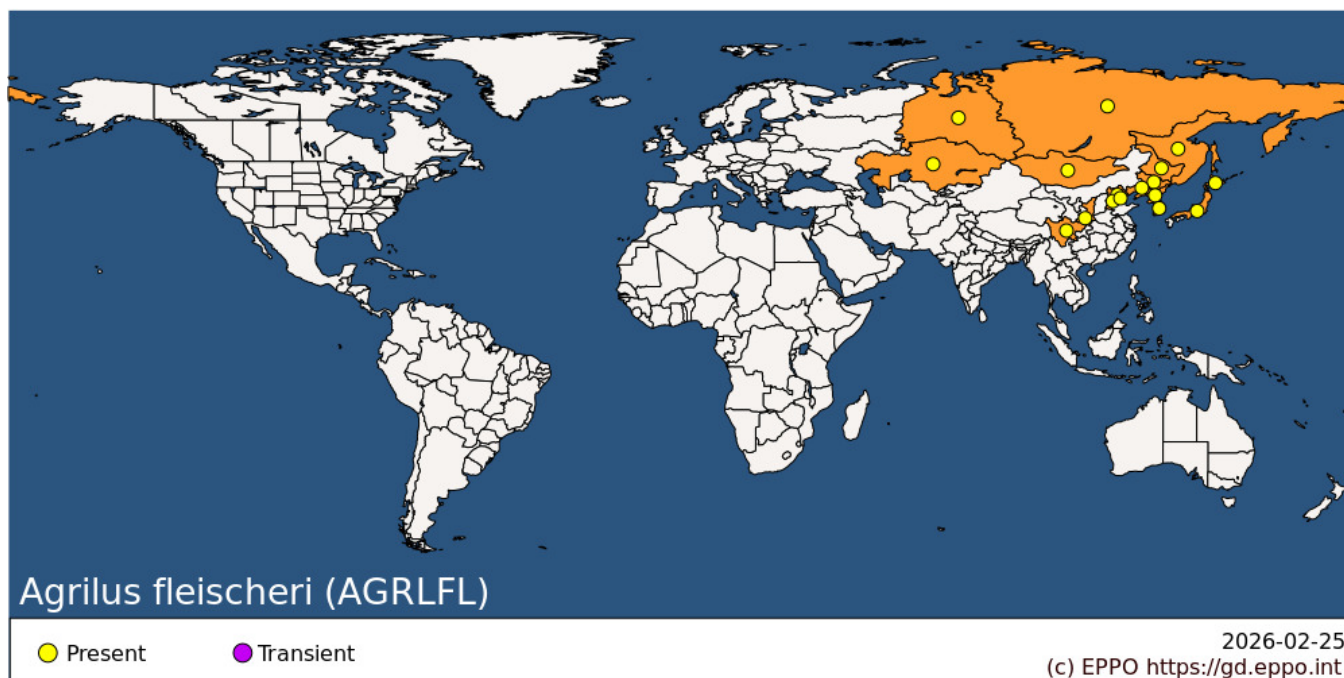
## HOSTS

*Agrilus fleischeri* infests poplars and willows as a cambial-feeding insect pest. In East Asia, primary hosts include *Populus tremula* (Eurasian aspen), *P. tremula* var. *daurica* (Korean aspen), *P. laurifolia* (laurel-leaf poplar) and *P. nigra* var. *italica* (Lombardy poplar). In the literature, *Salix* spp. (willows) are recorded as hosts but no data on damage has been reported. Records of *A. fleischeri* on *Quercus* spp. are considered erroneous (Jendek & Grebennikov, 2011). In China, *P. tremula* var. *daurica* (native to China) and *P. nigra* var. *italica* (non-native to China) are two common poplar species used in plantations. A field study conducted in Liaoning province has shown that the non-native *P. nigra* var. *italica* was more vulnerable to *A. fleischeri* than the native *P. tremula* var. *daurica* (Zang *et al.*, 2017a).

**Host list:** *Populus daurica*, *Populus laurifolia*, *Populus nigra* var. *italica*, *Populus sieboldii*, *Populus*, *Salix schwerinii*

## GEOGRAPHICAL DISTRIBUTION

*A. fleischeri* was found infesting *P. nigra* var. *italica* in Saima Township, Fengcheng City, Liaoning Province, China in 2013 (Wang, pers. obs.), as well as artificially girdled *P. tremula* var. *daurica* in 2015 at the same site (Zang *et al.*, 2017b; Yao *et al.*, 2018).



**EPPO Region:** Kazakhstan, Russian Federation (Eastern Siberia, Far East, Western Siberia)

**Asia:** China (Beijing, Hebei, Heilongjiang, Jilin, Liaoning, Shaanxi, Sichuan, Tianjin), Japan (Hokkaido, Honshu), Kazakhstan, Korea, Democratic People's Republic of, Korea, Republic of, Mongolia

## BIOLOGY

In China, *A. fleischeri* typically has one generation per year on *P. nigra* var. *italica*, although most individuals require 2 years on *P. tremula* var. *davidiana* to complete their life cycle.

In Liaoning province, adult emergence begins in late May, peaks in early June, and ends in early June to mid-August. The average longevity of adults is 34 days. The emerged adult leaves a distinct D-shaped exit hole on the trunk, which is on average 3 mm in length and 2 mm in width. During the early stages of adult emergence, the number of emerged males is higher than the number of emerged females, while the reverse is true afterwards.

Adults consume poplar leaves for about 7 days before mating and females feed on the margins of poplar leaves for another week prior to oviposition. In experimental conditions females produced an average of 218 eggs throughout their lifespan.

Eggs are laid either together or individually within bark cracks and crevices or beneath bark flakes. Eggs are first observed in early June, peaking in July and then declining in mid-August. Eggs usually hatch after approximately 12 days.

Newly hatched larvae bore directly into the bark until reaching the cambium where they feed, producing serpentine galleries under the bark. The early-instar larvae feed on the cambium and xylem from mid-June through to late September. The late-instar larvae excavate pupal chambers in the outer sapwood beginning in mid-August, then overwinter as J-shaped mature larvae and pupate in early May the next year. Transformation from pupa to adult takes about 26 days in experimental conditions at 23°C and 69% relative humidity (Zang *et al.*, 2017b).

## DETECTION AND IDENTIFICATION

No identification key or molecular methods (no sequences are recorded in GenBank) for identifying this pest are currently available. Distinguishing *A. fleischeri* from the European species *A. ater* is difficult.

## Symptoms

Signs and symptoms on trees infested with *A. fleischeri* include D-shaped exit holes created by emerged adults, serpentine larval galleries filled with fine frass under the bark, yellow foliage, dying branches, dieback and mortality of trees. The bark of *P. tremula* var. *daurica* is smooth but becomes dark brown and cracks vertically after infestation, while the bark of *P. nigra* var. *italica* is relatively rough and there is no obvious cracking of the bark in response to larval feeding. It is difficult to detect the pest when it is present at low populations or during the early stages of infestation. Signs of adult feeding on the margins of the leaves may be noticeable in mass infestation.

## Morphology

### Eggs

Newly deposited eggs are milky white, then turn to faint yellow, and change to brown before hatching. Eggs are irregular oval in shape and approximately 1.1 mm long by 0.7 mm wide (Zang *et al.*, 2017b).

### Larvae

Mature *A. fleischeri* larvae are 18–40 mm long and milky white to light yellow in colour, but the mouthparts and urogomphi are dark brown. The tenth abdominal segments are pale cream and trapezoid in shape. The pronotal groove bifurcates posteriorly and the prosternal groove is entire (Zang *et al.*, 2017b).

### Pupae

Pupae are exarate and milky white at the early stage. Eyes first turn to black, and then the elytra also become black before developing to adults. Pupae are on average 11 mm long and 3 mm wide (Zang *et al.*, 2017b).

### Adults

Adults of *A. fleischeri* are 7.3–12.3 mm long and 1.8–3.4 mm wide, dark brown to black, glabrous, with six elytral spots. The face is green for the male and brown for the female. The antennae are serrate with 11 segments, and the kidney-shaped compound eyes are black. Females tend to be larger than males (Jendek & Grebennikov, 2011; Zang *et al.*, 2017b).

## PATHWAYS FOR MOVEMENT

Potential pathways for movement of *A. fleischeri* into Europe are the importation of ‘host plants for planting’, ‘round wood (with or without bark) and sawn wood of hosts’, ‘deciduous wood chips, hogwood, processing wood residues (except sawdust and shavings)’ as well as ‘wood packaging material (including dunnage)’, ‘bark’ and ‘cut branches’. In particular, untreated wood-packing material constructed from recently cut trees can frequently harbour wood-boring insects (Haack, 2006). Some *Agrilus* larvae may require 2 years to complete development, such as in cut firewood (Petrice & Haack, 2007).

There is no information about dispersal of *A. fleischeri* adults through actual flight or in wind-tunnel experiments. However, when tethered to a flight mill, *A. planipennis*, a congener to *A. fleischeri* and similar in size, flies on average 1.3 km/day and can exceed 7 km per day (Taylor *et al.*, 2010).

## PEST SIGNIFICANCE

### Economic impact

*Populus* and *Salix* are widely grown for forestry, environmental or amenity purposes. Wood products from poplar trees are commonly used for paper-making, construction and medical supplies (Wang *et al.*, 1984) as well as for furniture, flooring, plywood, packaging, matches and firewood (FAO, 2008).

*A. fleischeri* has been responsible for significant damage (tree mortality and decreased of wood quality) to

economically important poplar trees in Liaoning, northeast China, and especially to *P. nigra* var. *italica*, which is widely found in the EPPO region (Zang *et al.*, 2017b). However, the damage reported in Liaoning concerns only a small part of where *P. nigra* var. *italica* is grown in Northern China. Limited or no data was found on the susceptibility and/or impact for other hosts, or in other areas where it occurs (i.e. other Chinese provinces, as well as Japan, Kazakhstan, Mongolia, Russia, South Korea and North Korea).

## Control

Detection of this cambial-feeding insect is difficult and few effective control methods are currently available. There are several insecticides (e.g. azadirachtin, bifenthrin, dicrotophos, dimethoate, dinotefuran, emamectin benzoate, imidacloprid and permethrin) that have been shown to control other *Agrilus* species to varying degrees (Appleby *et al.*, 1973; Petrice & Haack, 2006; Smitley *et al.*, 2010).

Biological control can be an effective approach to managing pest populations, especially for the concealed woodboring pests (Yang, 2004). Four parasitoids (*Euderus fleischeri*, *Oobius saimaensis*, *Polystenus rugosus* and *Spathius* sp.) associated with *A. fleischeri* have been discovered on infested *P. tremula* var. *daurica* trees, and three species (*O. fleischeri*, *Polystenus rugosus*, and *Paramblynotus* sp.) on infested *P. nigra* var. *italica* trees (Yao *et al.*, 2018). The dominant parasitoids are *O. saimaensis* and *E. fleischeri* on *P. tremula* var. *daurica*, while *O. fleischeri* and *Paramblynotus* sp. were dominant parasitoids on *P. nigra* var. *italica*. These natural enemies play an important role in suppressing populations of *A. fleischeri* in natural forests of China. In addition, the high parasitism rates of these parasitoids in China suggest that they could potentially help manage this buprestid beetle if it does invade new areas (Zang *et al.*, 2017b).

## Phytosanitary risk

Poplar and willow are widely introduced and cultivated in many EPPO countries and regions because they grow quickly on a range of sites. Poplars are often planted with a low diversity of selected genotypes and poplar production can be concentrated along main rivers such as the Po in Italy or the Garonne in France. High densities of *Populus* spp. in broadleaved forests are found in the eastern part of the EPPO region (Russia in particular). Locally, high densities are also observed (e.g. in Norway, Finland, Belgium and the South of France).

The preference of *A. fleischeri* for exotic poplar trees that have been planted in the Liaoning province could indicate that European poplar species may be more susceptible, in particular *P. nigra*, just as *A. planipennis* in China threatens the exotic *Fraxinus americana*, *F. pennsylvanica*, *F. excelsior* and *F. velutina*, whereas the native *F. mandshurica* and *F. chinensis* are less affected (Liu *et al.*, 2003, Zhao *et al.*, 2007). The pest could establish in the EPPO region where poplar and willow are grown (with an uncertainty on the species attacked). The climatic conditions allowing the establishment of *A. fleischeri* are considered suitable at least where similar conditions from areas where the pest currently occurs (i.e. in the eastern part and central Europe), with more uncertainties for other EPPO regions. Existing predators of the native pests may contribute to the control of *A. fleischeri*.

## PHYTOSANITARY MEASURES

*A. fleischeri* was added to the EPPO Alert List in 2018 (EPPO, 2018) and to the EPPO A2 list in 2019.

Suggested phytosanitary measures are specified in the pest risk analysis performed by EPPO in 2018 (EPPO, 2019) and are as follows. Plants for planting of *Populus* spp. and *Salix* spp. should originate from pest-free areas or pest-free sites of production under complete physical isolation, plants being packed in conditions preventing infestation during transport (or commercialized outside the period where adults are present). Round wood and sawn wood of more than 6 mm thickness of *Populus* spp. and *Salix* spp. should either originate in pest-free areas or undergo debarking followed by heat treatment, irradiation or fumigation. Alternatively, the bark may be removed with 2.5 cm of outer xylem. Bark and cut branches of *Castanea* spp. and *Quercus* spp. should originate in pest-free areas. Wood chips, hogwood and processing wood residues should originate in pest-free areas and be stored and transported under control of the NPPO to prevent contamination by adults. Wood packaging material should undergo treatment according to ISPM 15.

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## How to cite this datasheet?

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## Datasheet history

This datasheet was first published in the EPPO Bulletin in 2020 and is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', 'Hosts', and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

EPPO (2020) *Agrilus fleischeri*. Datasheets on pests recommended for regulation. *EPPO Bulletin* **50**(1), 166-169. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/epp.12642>