EPPO Datasheet: *Arrhenodes minutus*

Last updated: 2022-06-02

IDENTITY

Preferred name: *Arrhenodes minutus*
Authority: (Drury)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Brentidae
Other scientific names: *Arrenodes minutus* Drury, *Brentus brunneus* Pantzer, *Brentus minutus* (Drury), *Brentus mucillosus* Olivier, *Brentus septentrionis* Herbst, *Curculio minutus* Drury, *Eupsalis lecontei* Power, *Eupsalis minuta* (Drury), *Eupsalis sallei* Power, *Platysystrophus minutus* (Drury)
Common names: oak timberworm
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EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: ARRHMI

Notes on taxonomy and nomenclature

Arrhenodes minutus is a primitive weevil in the family Brentidae. This family comprises more than 1000 species worldwide, but only six species (five genera) in North America. The genus *Arrhenodes* Schoenherr has only one species (Bright 1993).

HOSTS

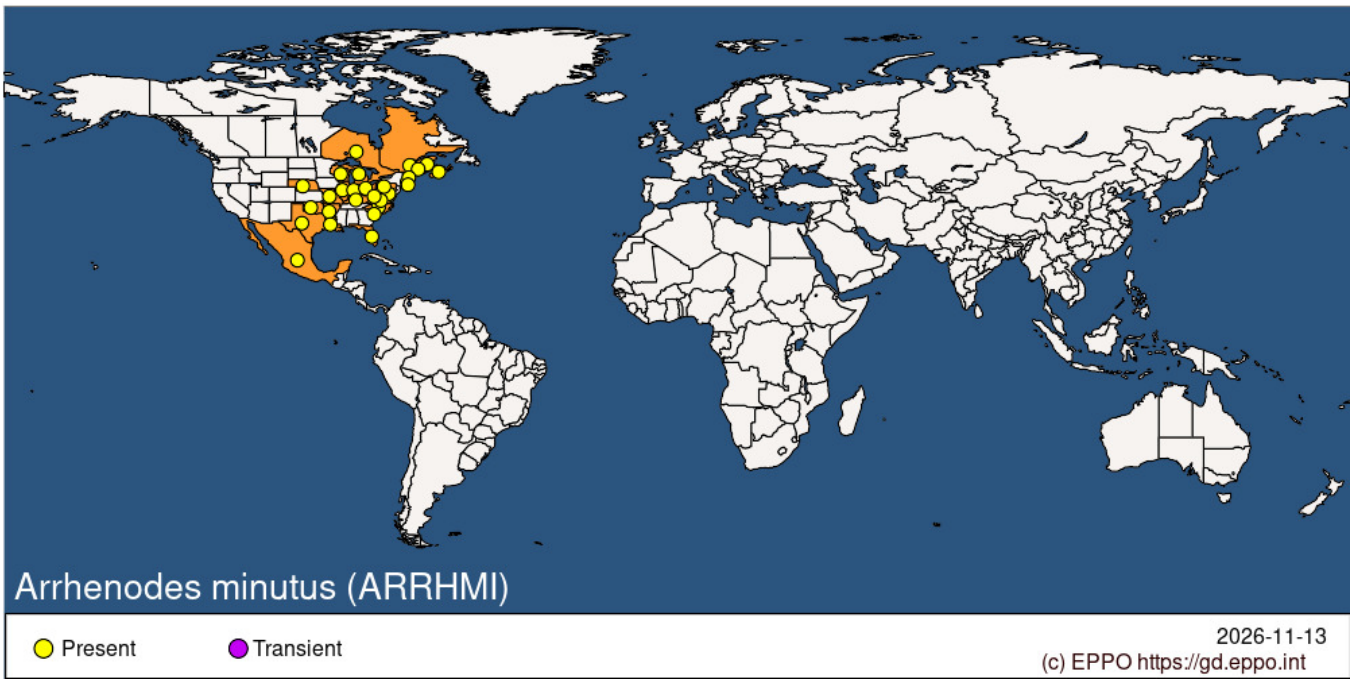
Arrhenodes minutus is recorded to primarily attack oak (*Quercus*), elm (*Ulmus*), beech (*Fagus*), as well as aspen and poplar (*Populus*) (Solomon, 1995, citing others; USDA, 1985). Apart from *Quercus*, there is little information about the species attacked in each genus.

The strict definition of host implies that an insect will complete its development on it. However, some authors mentioned that *A. minutus* adults were found under the bark of *Betula papyrifera*, *Tilia americana* (Bright, 1983; Majka *et al.*, 2008), *Gleditsia triacanthos* (Solomon, 1995) and *Acer rubrum* (Dajoz, 2005). It is not clear from the literature if these species support the life cycle of the pest. Solomon (1995) notes that such findings suggest that other deciduous species are probably susceptible to the pest. *A. minutus* has also been found under the bark of *Pinus* (Dajoz, 2005; *Pinus taeda* - Gil, 2008). However, most sources only consider deciduous trees as hosts, and it is uncertain whether *A. minutus* can accomplish its life cycle on *Pinus*.

Host list: *Acer negundo*, *Fagus*, *Populus*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus michauxii*, *Quercus muehlenbergii*, *Quercus rubra*, *Quercus shumardii*, *Quercus velutina*, *Quercus*, *Ulmus*

GEOGRAPHICAL DISTRIBUTION

Arrhenodes minutus occurs from Eastern North America to Mexico (Bright, 1983; see Map below). There have been reports outside of the native range of the species, such as in New Brunswick and Nova Scotia (Majka *et al.*, 2008). In Canada, *A. minutus* is currently found in Southern Ontario, Southern Quebec, New Brunswick and Nova Scotia (Bright, 1993; Majka *et al.*, 2008).



North America: Canada (New Brunswick, Nova Scotia, Ontario, Québec), Mexico, United States of America (Arkansas, Florida, Illinois, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Missouri, Nebraska, New Hampshire, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Texas, Virginia, West Virginia, Wisconsin)

BIOLOGY

As of March 2022, the literature on the oak timberworm comprised less than 50 scientific and technical papers that mostly report observational information. Buchanan (1960) reported on the biology of *Arrhenodes minutus* in Missouri, and Bright (1993) stated that his observations are probably valid for Canada. In Missouri, adults emerge in May and are active until August (Buchanan, 1960). They are attracted to fresh wounds on host trees and feed on sap (Solomon, 1995). Adults may congregate under loose bark near wounded tissues (Sanborne, 1983; Dajoz, 2005). Upon mating, females bore a minute (approximately 75 µm) hole in the sapwood where they deposit an egg (Buchanan, 1960). The female covers the egg with frass and a sticky secretion (Sanborne, 1983). Males guard females from other males and predators during oviposition (Sanborne, 1983; Thomas 1996; Majka *et al.*, 2008). In laboratory conditions at 22°C, Sanborne (1983) found that eggs took 3 weeks to fully develop.

Neonate larvae tunnel almost horizontally into the xylem until they almost reach the other side of the trunk; they then make a sharp U-turn and tunnel towards their original entry point (Buchanan, 1960). Pupation takes place close to the gallery exit, and its duration has not been determined (Bright, 1993; Buchanan, 1960). Adults emerge through their respective entrance holes (Buchanan, 1960).

The life cycle takes generally three years, sometimes two or four years (Buchanan 1960; Solomon 1995; USDA, 1985). In a study on *Quercus velutina* and *Q. coccinea*, Buchanan (1960) found that most larvae developed in wounded living trees. A few were able to develop in trees that had been dead for two years, but eggs had been deposited in wounds made while the tree was alive.

There is no information in the literature on the dispersal capacity of *A. minutus*.

DETECTION AND IDENTIFICATION

Symptoms

MacAloney & Ewan (1964) described damage and provided a key to identify the damage caused by insect larvae to

hardwood species. Larval boring into the xylem leaves galleries throughout the wooden tissues (Solomon, 1995; Majka *et al.*, 2008). Galleries are almost horizontal across the trunk, with a U-turn if the larva has reached the other side of the trunk (see *Biology*). The galleries become larger in diameter as the larvae develop, and measure 0.2 to 4 mm (Solomon, 1995). Frass and sawdust may be visible around entrance holes (Buchanan, 1960).

Morphology

Eggs. The eggs are < 1 mm in diameter and laid singly in wooden tissues. They are spherical and translucent, and become gradually opaque. Neonate larvae are visible shortly before egg hatching (Buchanan, 1960).

Larva. The larva was described by Böving and Craighead (1930). Larvae are white, elongate, cylindrical and curved, with three pairs of jointed legs on the thorax and one pair of prolegs at the end of the abdomen (Solomon, 1995).

Pupa. A description of pupae is provided in Riley (1874). The few individuals examined measured ca. 1 cm long.

Adult. Adults are easily recognizable for example by comparison with the figure in Bright (1993). Bright (1993) noted that they cannot be confused with any other Canadian beetles. Adults are shiny, elongate and vary widely in size, from 4 to 35 mm in length (Buchanan, 1960; Dajoz, 2005; Sanborne, 1983; Solomon, 1995). They are reddish-brown to brownish-black. Elytra carry narrow, elongate yellowish spots, which often join to form two or three transverse bars. Adults display a strong sexual dimorphism. Female mouthparts are long and slender, while male mouthparts are flattened and broad, with large mandibles (Bright, 1993; Sanborne, 1983; Solomon, 1995). Males are aggressive and use their mandibles when fighting (Sanborne, 1983).

Bright (1993) gives a detailed description of adults. The pronotum is about 1.4 times longer than wide, widest behind middle; base constricted; sides broadly arcuate, strongly converging to truncate apex; disc smooth, brightly shining, with minute, sparse punctures. Elytra more than 2.5 times longer than wide; sides parallel on basal two-thirds; apex broadly rounded; striae deeply impressed, with coarse punctures; interstriae convex, about 2.0-3.0 times as wide as striae, the interstriae smooth, with scattered finely impressed points.

Detection and inspection methods

Anderson & Kissinger (2002) provides a key to the Nearctic subfamilies and genera of the family Brentidae**.**

The presence of boring marks can be used as an index of infestation by *Arrhenodes minutus* larvae (Buchanan, 1960). Larvae were present in approximately 50, 78, 60 and 14% of trees showing boring marks respectively in March, May, June, and late July, while no larvae were found in undamaged trees (i.e. controls).

From a research perspective, the most complete monitoring procedures have been published in Buchanan (1960). From surveillance or regulatory perspectives, no standard method has been published.

PATHWAYS FOR MOVEMENT

The most likely pathway for movement of *Arrhenodes minutus* is via commercial consignments of wood and wood products of hosts, originating from North America. For example, some specimens were found in Nova Scotia in a consignment of wooden furniture from the USA (Majka *et al.*, 2008). *A. minutus* was also intercepted in France in 2005 in a consignment of wood and bark of *Q. alba* from the USA (EFSA, 2019). Adults have been found congregating under the bark of various trees that may not be hosts (see *Hosts*). Wood with bark of such species may be a pathway and constitute some risk for further spread *A. minutus* to uninfested areas.

Based on its biology, *A. minutus* could also be associated with plants with planting of its hosts. However, its capacity to colonise such plants has not been documented, and there is an uncertainty regarding this pathway (EFSA, 2019).

PEST SIGNIFICANCE

Economic impact

Arrhenodes minutus can be a direct economic pest of some oak species and other hardwoods in eastern North America, with economic losses due to larval boring damage to live standing trees (Buchanan, 1960; Solomon, 1995). Damage caused by larval tunneling of xylem tissues (see Symptoms above) affects the economic value of hardwood in Eastern North America (Thomas, 1996). Wood from heavily infested trees is often unfit for special uses, such as flooring and barrel making, and the value of factory grade timber can also be seriously reduced (Solomon, 1995).

Nevertheless, *A. minutus* is often recorded to mainly be a secondary pest attacking primarily wounded trees, recently felled trees and wounded, dying trees (Buchanan, 1960, Solomon, 1995; Wisconsin Forest Health Protection Program 2008). Attacks by *A. minutus* have also been observed on unseasoned timber, stave bolts and squared wood (Solomon, 1995).

In addition, *A. minutus* is a putative vector of *Bretziella fagacearum* (Buchanan, 1957), and could have an impact by vectoring this fungus, which causes a severe disease on oaks in North America (EFSA, 2019). It is noted that *A. minutus* is not listed amongst the main vectors of *B. fagacearum* in the EPPO datasheet on the fungus (EPPO, 2022). Very few sources address the vector status of *A. minutus* in the literature.

Control

No scientific articles on planned experiments to control any stage of *Arrhenodes minutus* have been published. However, some generic physical control measures were mentioned in EFSA (2019), such as removal of infested plant parts.

Phytosanitary risk

EFSA (2019) mention that, due to similar climatic conditions and an abundance of potential hosts, *Arrhenodes minutus* could establish and cause damage in Europe. It may have economic impact by damaging trees grown for wood production and as a vector of *B. fagacearum* (EFSA, 2019). Similar impacts may occur in other countries of the EPPO region. In particular, *Quercus* species are widespread in the EPPO region.

PHYTOSANITARY MEASURES

EFSA (2019) mentioned phytosanitary measures that are already in place in the EU, for example in relation to *Quercus* wood, and would ensure acceptable risk for wood imported from North America. For example, a combination of bark-freedom and heat treatment would be suitable. Commodities such as wood chips or wood waste obtained from hosts can be subject to heat treatment or fumigated. More details can be found in EFSA (2019) and EPPO (2017).

Finally, measures such as growing plants under physical isolation could be used to address the pathway plants for planting (see uncertainty under Pathways for movement).

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Datasheet history

This datasheet was first published online in 2022. It is 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.


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