EPPO Datasheet: *Pseudopityophthorus minutissimus*

Last updated: 2021-10-06

IDENTITY

Preferred name: *Pseudopityophthorus minutissimus*
Authority: (Zimmermann)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Scolytinae
Other scientific names: *Crypturgus minutissimus* Zimmermann
Common names: oak bark beetle
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EPPO Categorization: A1 list
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EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: PSDPMI

Notes on taxonomy and nomenclature

Since 2015 the family Scolytidae was moved to become a subfamily (Scolytinae) within the family Curculionidae.

HOSTS

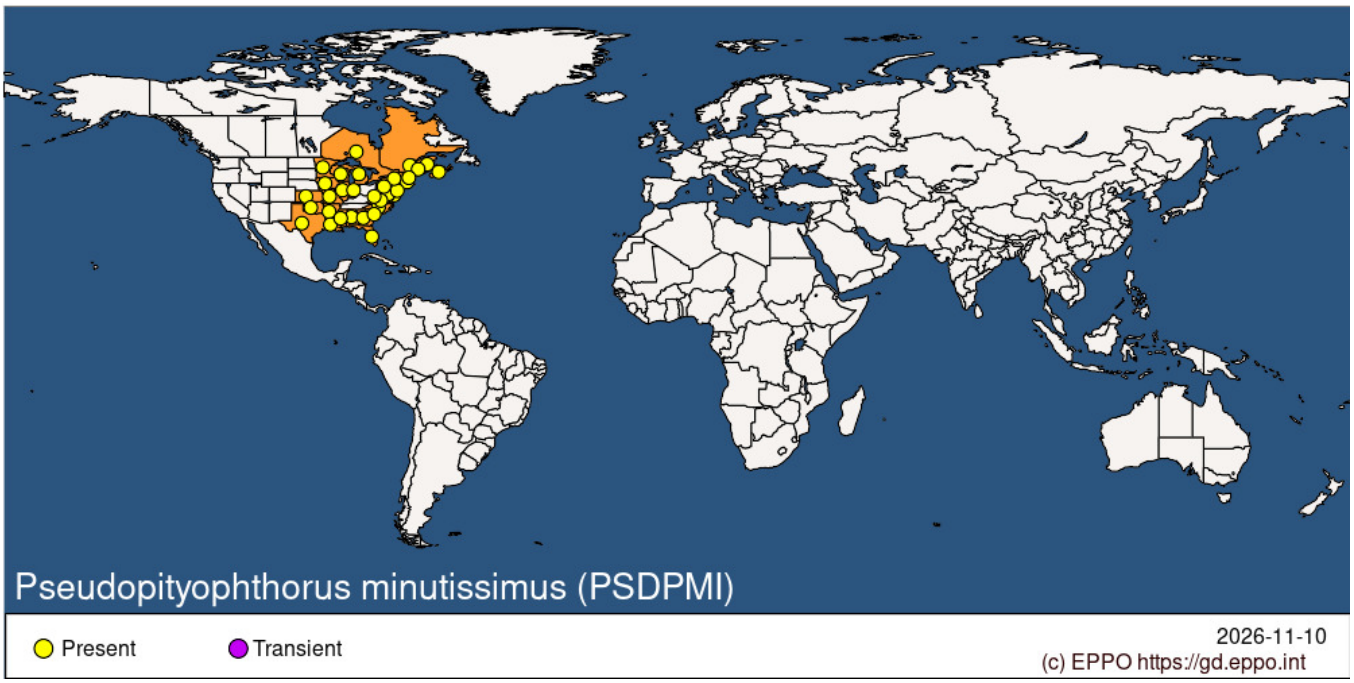
All *Pseudopityophthorus* species (except *P. fagi*) can be found in *Quercus* hosts, although several are capable of breeding in other hosts (Wood, 1982). *Pseudopityophthorus minutissimus* is mainly found on North American oak species (*Quercus* spp.) such as *Q. alba, Q. bicolor, Q. borealis, Q. ellipsoidalis, Q. falcata, Q. laurifolia, Q. muehlenbergii, Q. nigra, Q. palustris, Q. prinus, Q. rubra, Q. texana*, and *Q. velutina* (Cognato *et al.*, 2009; EFSA, 2019). In Wisconsin (USA), *P. minutissimus* was found by McMullen *et al*. (1955) to be common in red oaks (*Q. rubra*) but absent from white oak (*Q. alba*), although white oak is included in other host lists (Cognato *et al.*, 2009; EFSA, 2019).

Other hardwood hosts have been recorded. Rare and apparently non persistent infestations of *P. minutissimus* were found on *Amelanchier arborea*, *Betula* sp., *Carpinus caroliniana*, *Carya* sp., *Castanea floridana*, *Fagus grandifolia*, *Hamamelis* sp., *Prunus serotina* (Wood and Bright, 1992; Atkinson, 2018).

Host list: *Amelanchier arborea, Betula sp., Carpinus caroliniana, Carya sp., Castanea pumila, Fagus grandifolia, Hamamelis sp., Prunus americana, Prunus serotina, Quercus alba, Quercus bicolor, Quercus ellipsoidalis, Quercus falcata, Quercus laurifolia, Quercus muehlenbergii, Quercus nigra, Quercus palustris, Quercus prinus, Quercus rubra, Quercus texana, Quercus velutina*

GEOGRAPHICAL DISTRIBUTION

Pseudopityophthorus minutissimus is a species native to and widely spread in Eastern North America, including Canada and the USA (Wood and Bright, 1992; Bright, 2021).



North America: Canada (New Brunswick, Nova Scotia, Ontario, Québec), United States of America (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Oklahoma, Pennsylvania, South Carolina, Texas, Virginia, West Virginia, Wisconsin)

BIOLOGY

New adults emerge in May. Before mating, young adult beetles need to carry out maturation feeding, which usually occurs on different parts of healthy and vigorous oaks, such as twig crotches, leaf petioles, bud axils, and immature acorns. After maturation feeding, adults attack the branches or trunks of dead or weakened oaks; cut or broken branches, limbs and boles are may also be selected for attack. The species is polygamous. The male penetrates into the bark and then bores a longitudinal nuptial chamber, approximately 1 cm long in the phloem and cambium. There it is usually joined by two females (occasionally just one) that bore straight, transverse egg galleries approximately 2-5 cm long perpendicular to the wood fibres, starting in the middle of the nuptial chamber and thus producing a reproduction system which is cross-shaped. The females lay eggs in niches along the egg galleries, and once emerged, each larva bores a longitudinal gallery perpendicular to the egg gallery from which they originated. The larvae bore galleries entirely in the phloem, although they usually show on the inner surface of peeled bark. Female *P. minutissimus* lay an average of 44 eggs and, it is thought probable that five larval instars occur (McMullen *et al.*, 1955). Pupation occurs in the phloem and cambium. In most of the species' range, there are two generations per year. Usually, all life stages of the second generation successfully overwinter, except the pupal stage which is highly vulnerable to low winter temperatures. In colder areas of North America, however, only mature larvae are able to survive through the winter (Wood, 1982; EFSA, 2019).

DETECTION AND IDENTIFICATION

Symptoms

In the crown. Symptoms of primary infestation of the affected trees are crown yellowing and leaf wilting, followed by progressive twig and branch dieback and crown thinning which quickly spreads over the whole crown. As the upper branches die, the crown of the tree can be seen to die back and the trees will often sprout new branches from the trunk.

Under the bark. The mating system is usually composed of 2 short and thin (1 mm wide) transverse egg galleries. Egg galleries extend on both sides of the nuptial chamber for about 2-5 cm forming an apparent transverse biramous

system. The numerous egg niches are very close together. Larval galleries are also numerous and closely spaced; they are very thin, long, and regular. The whole mating system develops under the bark without marking the wood surface, although larvae can be seen on the inner surface of peeled bark. Cambial brown discoloration occurs after intensive bark colonization. Galleries are normally found in branches between 1.3 and 10 cm in diameter, although infestation of trunks of up to 40 cm in diameter are also reported (Solomon, 1995).

External symptoms on the branches. At the beginning of the bark colonisation, branches often show no outward appearance of damage. The only visible symptom on the bark of the branches is the occurrence of a large number of small circular entrance holes, which are often hidden in the cracks of the bark, making detection of the colonisation difficult.

Morphology

The oak bark beetle is minute, only 1.5-1.8 mm long, with adult males slightly larger than females. This species is distinguished from other *Pseudopityophthorus* species by the reticulate frons and pronotal disc in both sexes, by the very fine, confused elytral punctures and by the uniformly short, confused, slender elytral setae (Wood, 1982).

Eggs: small, pale, white, oblong eggs, less than 1 mm long.

Larva: white, C-shaped, legless and typical of bark beetles, with a reddish-brown head capsule.

Pupa: white, exarate with free and distinguishable body parts neither glued to the body nor encapsulated within a cocoon.

Adults: Teneral adults are yellowish-brown and soft before they darken to a dark-brown colour and their elytra harden. Mature males are very small, about 2.7 times as long as wide, with lateral and upper margins of frons ornamented by a dense brush of long, yellow hair. Antennal club is small, with sutures 1 and 2 moderately arcuate. Pronotum is 1.1 times as long as wide, with anterior margin armed by about 16 coarse serrations; usually glabrous. Elytral surface shiny, with minute and irregular punctures, confused, shallow and rather close. Vestiture of short, fine, confused, reclining, moderately stout hair of uniform length, often slightly stouter on the steep and convex declivity. Females are similar to males except for frons with vestiture rather sparse, much shorter, confined to a smaller area; serration on anterior margin of pronotum usually finer (Wood, 1982).

Detection and inspection methods

Early detection of *P. minutissimus* may be carried out in EPPO countries through a specific and intensive survey programme, which should be set up especially in those countries which import large quantities of oak wood from North America. In particular, surveys should be carried out at points of entry (e.g. ports) and facilities (e.g. sawmills and nurseries) which receive *Quercus* wood and plants, and in areas where *Quercus* trees are growing close to such facilities. The survey should be based on the following points:

Interception of adults using traps. An aggregation pheromone specific to *P. minutissimus* is not yet available. However, traps for *P. minutissimus* interception and early detection can be baited with alpha-copaene (Kendra *et al*., 2011) or ethyl alcohol (Roling and Kearby 1975; Montgomery and Wargo, 1983). Traps should be in place from the beginning of May until the end of August, which represents the period of the flight activity of adults. The emergence peak occurs in the middle of May (Ambourn *et al.*, 2006). *Pseudopityophthorus minutissimus* has also been trapped using window traps placed in the canopies of pin oaks which were recently killed by the pest (Ambourn *et al.*, 2006).

Detection of infested plants. A specific survey aiming to detect infested plants should be carried out by looking for symptoms of infestation in oak trees. Detection of infestation symptoms is very difficult in the early stages of the infestation, and surveys need to be performed during the vegetative season, by looking at the upper part of the canopy which may show crown symptoms. Although these symptoms are not specific to this pest, they are important features for possible early detection.

Material inspection. Careful inspections of potentially-infested material and the most relevant oak commodities (i.e. round wood, firewood, bark, plants for planting) should be carried out in the EPPO region to prevent introduction and dispersal. As beetle colonisation often shows no outward damage, inspectors should remove bark to check for

the presence of phloem degradation and occurrence of insect galleries and feeding larvae.

PATHWAYS FOR MOVEMENT

International trade of infested oak wood is the main pathway for international spread. If the wood carries bark, oak bark beetles are more likely to be present. Non-squared fresh wood, non-debarked timber (including logs, firewood, sawn wood), and fresh wood packaging material (with bark) of *Quercus* spp. from the USA and Canada are the main pathways for movement of oak bark beetle across countries and continents (EFSA, 2019). Plants for planting of host plants, cut branches of host plants, as well as chips and wood waste are listed as possible pathways (EFSA, 2019).

As *P. minutissimus* is often reported on branches with diameters of 1.3 to 10 cm, the movement of young nursery plants has been considered as a possible pathway, although the pest is in practice reported from forest trees rather than from nursery plants. In addition, colonization of small plants for planting has never been clearly demonstrated. There have been no reports of oak bark beetles infesting nursery stock, and no recent publication on this is available. Moreover, infested small branches tend to be those occurring on the upper part of the crown of large trees.

Natural spread of adults also occurs. Adults of *P. minutissimus* are able to fly, although their flight capacity is unknown (EFSA, 2019). But, as with other small bark beetle species, passive flight through wind-aided dispersal may allow the adults to cover longer distances.

PEST SIGNIFICANCE

Economic impact

Pseudopityophthorus minutissimus mainly attacks dying or dead trees. Therefore, any direct damage only has a minimal impact on host plants. However, the oak bark beetle is considered an important vector of the oak wilt disease caused by the fungus *Bretziella fagacearum (=Ceratocystis fagacearum)* (Haack *et al*., 1983; Juzwik *et al*., 2011; 2019; EFSA, 2018) and this can be transmitted to healthy trees during maturation feeding. Oak wilt disease is also killing many *Q. fusiformis* in Michigan, Minnesota, Texas, and Wisconsin each year (EPPO, 2021). Nevertheless, through most of their range, neither *P. minutissimus* or oak wilt disease are a serious problem for the local forest economy. In West Virginia less than one tree per square km of oak forest dies each year as a result of the oak bark beetle or the fungus. However, in parts of Minnesota and Wisconsin, rapid mortality is occurring in woods containing *Quercus ellipsoidalis*. These woods or forests are of little importance as sources of logs and sawn wood but have high amenity value, especially near bigger towns and cities.

Control

No specific control methods (chemical, cultural, biological, resistant varieties) are currently available against *P. minutissimus*. As the main damage is caused by the pathogen (*B. fagacearum*) associated with the beetles, and because both beetles and the pathogen are favoured by tree pruning, control measures rely principally on the avoidance of pruning during spring, the period of peak susceptibility to the insect and the pathogen. Moreover, chemical and mechanical means focused on stopping the spread of disease through grafted root systems (EPPO, 2021).

Phytosanitary risk

The major impact of *P. minutissimus* is related to its possible role as a vector of the oak wilt disease caused by the pathogen *Bretziella fagacearum*. Fresh wounds produced by maturation feeding of callow adults can be found from early spring onwards. The percentage of young adult beetles carrying the fungus is very variable. Although as many as 30% of beetles emerging from trees infected with oak wilt may carry the fungus, especially in spring, the percentage is more commonly between 0.4 and 2.5%. These data support the hypothesis that the relative importance of *P. minutissimus* in the overland transmission of the pathogen in oak species is minor (Ambourn *et al.*, 2006).

PHYTOSANITARY MEASURES

EPPO Standards (EPPO 2017; 2019) include detailed lists of recommended phytosanitary measures and the requirements for oak needed to contain oak pests and diseases. The measures are based mainly on the movement restriction of potentially infested products, or the treatment and destruction of those already infested (EPPO, 2017; 2019).

Movement restriction. Import of untreated oak wood and plants for planting of *Quercus* from North America should be prohibited to prevent insect and disease spread (EPPO, 2017; 2019).

Wood treatment. For oak wood from North America, the import into European Union Member States is allowed only following the application of ISPM 15 protocols which include the removal of all bark and the natural rounded surface, kiln drying (Englerth *et al*., 1956) or fumigation (Jones, 1973; Liese and Rütze, 1985). Fumigation is principally relevant for red oak logs with bark intended for the veneer industry (EPPO, 2021).

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Datasheet history

This datasheet was first published as '*Ceratocystis fagacearum* and its vectors' in 'Quarantine Pests for Europe' in 1992 and revised in 1997 in the second edition of the book. It was extensively revised in 2021 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.

CABI/EPPO (1992/1997) *Quarantine Pests for Europe (1st and 2nd edition)*. CABI, Wallingford (GB).

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