

Rapid assessment of the need for a detailed Pest Risk Analysis for *Phylloxera quercus* group

Disclaimer: This document provides a rapid assessment of the risks posed by the pest to the UK in order to assist Risk Managers decide on a response to a new or revised pest threat. It does not constitute a detailed Pest Risk Analysis (PRA) but includes advice on whether it would be helpful to develop such a PRA and, if so, whether the PRA area should be the UK or the EU and whether to use the UK or the EPPO PRA scheme.

STAGE 1: INITIATION

1. What is the name of the pest?

Phylloxera quercus Boyer de Fonscolombe group (Hemiptera: Phylloxeridae).

There is considerable taxonomic uncertainty regarding the oak feeding phylloxerids. Several described species may not represent unique taxa but rather, are different morphological forms of the same species found on different host plants. The *Phylloxera quercus* group consists of the following species: *P. coccinea* (von Heyden), *P. foae* Börner, *P. ilicis* Grassi, *P. italicum* Grassi and *P. quercus* Boyer de Fonscolombe (Blackman and Eastop, 1994).

2. What is the pest's status in the EC Plant Health Directive (Council Directive 2000/29/EC¹) and in the lists of EPPO²?

The *Phylloxera quercus* group are not listed in the EC Plant Health Directive, or any EPPO lists, i.e. the A1 and A2 Lists of pests recommended for regulation as quarantine pests; the EPPO Alert List or the EPPO Action List.

3. What is the reason for the rapid assessment?

There have been a number of UK interceptions of *Phylloxera quercus* group on *Quercus ilex* from Italy (Fera, unpublished data). There is also some uncertainty regarding the distribution of *P. quercus* and whether or not it is established in the UK as many published reports have been based on misidentifications of the native oak phylloxerid, *Phylloxera glabra*.

STAGE 2: RISK ASSESSMENT

4. What is the pest's present geographical distribution?

Due to the many taxonomic and distributional uncertainties surrounding the *Phylloxera quercus* group, and the fact that oak phylloxerids in general are very often misidentified, the distribution given below is unconfirmed.

- *Phylloxera quercus* is found in southern Europe, North Africa and the Middle East (Blackman and Eastop, 1994; Mohammad & Abdullah, 1985). In Europe, it is confirmed from Italy, France and Spain. There are also unconfirmed records from Belgium, Croatia, Czech Republic, the Netherlands, Slovenia (Binazzi, 2010). The Natural History Museum (NHM), London has slides labelled *P. quercus* from Greece, and Canada – but experts there cannot vouch for their correct identity (Blackman, pers comm.).
- *Phylloxera coccinea* is found in Europe and east to Kazakhstan (Blackman and Eastop, 1994). In Europe, it is recorded from Belarus, Belgium, Bosnia and

¹ http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000L0029_do_001.pdf

² <http://www.eppo.org/QUARANTINE/quarantine.htm>

Herzegovina, Croatia, Czech Republic, Denmark, France Germany, Italy, Latvia, Lithuania, Macedonia, Republic of Moldova, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, The Netherlands, Ukraine, Yugoslavia (Serbia, Kosovo, Voivodina, Montenegro), (Binazzi, 2010). Dumbleton (1964) reported *P. coccinea* collected from *Q. robur* in New Zealand, this was since found to be a misidentification of *Moritziella corticalis* (Kaltenbach).

- *Phylloxera foveae* is found in Europe; Germany, Italy, Slovenia and the Ukraine (Binazzi, 2010; Blackman & Eastop, 1994)
- *Phylloxera ilicis* (Grassi) and *Phylloxera italica* (Grassi) are both only recorded from Italy (Grassi, 1912; Binazzi, 2010).

UK records of *Phylloxera quercus*: Reports from the UK are all likely to be misidentifications but this will take more investigation. All UK specimens of *Phylloxera quercus* at the Natural History Museum, London have been deemed misidentifications of *P. glabra* (Blackman, pers. comm.). Specimens labelled *P. quercus* from Oxford University Museum of Natural History (OUMNH) Hope Collection are deemed misidentifications of *P. glabra* (S. Reid observation). Kloet and Hincks (1964) report *P. quercus* as present in the UK, however we can assume this is erroneously based on the Walker & Theobald determinations which are now known to be misidentifications of *P. glabra* (Blackman, pers. comm.) Crawley and Akhteruzzaman (1988) report *P. quercus* on *Quercus robur* from Silwood Park, Berkshire. R. Hammon suspected the identification was erroneous (pers. Comm.); Prof Crawley did not retain specimens and could not recall who made the identifications. The FC entomologists, Barson & Carter included it in their 1972 key to British Oak-Feeding Phylloxeridae, but state "although on the British list, may have been recorded in error....we have found no evidence of the occurrence of alate *P. quercus* in Britain". There is also a Scottish find of *P. quercus* reported by the Highland Biological Recording Group (survey by Philip Entwistle) but this is also a doubtful record.

UK records of *Phylloxera coccinea*: There is a specimen labelled *P. coccinea* at the NHM, but this was a misidentification of *Moritziella corticalis* (Kalt.) (Barson & Carter, 1972).

5. Is the pest established or transient, or suspected to be established/transient in the UK?

Due to the many uncertainties regarding to the taxonomy of the *Phylloxera quercus* group and the fact that they cannot be easily distinguished in the field from native oak phylloxerids, it is not known if any of the *P. quercus* group species are established in the UK.

There have been six interceptions *P. quercus* group species in the UK, all on Holm oak (*Quercus ilex*) imported from Italy. Live specimens were observed on two of the six interceptions (20307838; Domero 40143/2015/3 and 20910960; Domero 101409/116/1). The latter sample harboured several hundred active winged adults, as well as live nymphs and eggs. It is highly suspected that the species intercepted was *P. quercus* (Boyer de Fonscolombe).

6. What are the pest's natural and experimental host plants; of these, which are of economic and/or environmental importance in the UK?

In Europe, the *Phylloxera quercus* group are reported to feed on the undersides of leaves of deciduous and evergreen *Quercus* spp. (Fagaceae). *Quercus ilex*, *Q. robur*, *Q. petraea*, *Q. coccifera*, *Q. pubescens* (Blackman & Eastop, 1994) and *Q. pyrenaica* are reported as hosts of *Phylloxera quercus*. The UK has two native species of oak trees, *Quercus robur*, the English oak, and *Quercus petraea*, the Sessile oak. Both are deciduous; *Q. petraea* is dominant in northern and western areas and *Q. robur* more dominant in the south. Both have been very important for timber for centuries and this has led to a large reduction in the native

oak forests, but they are still common in woodlands and parks and are widely planted in hedges. In addition, there are over 30 other oak species listed as occurring in the UK, including the evergreen *Q. ilex*, Holm oak. The UK, therefore, has several important woodland and amenity species which are known host plants of the *P. quercus* group.

The published accounts of the complex lifecycle of the *P. quercus* group are largely based on Grassi (1912). In the case of *P. quercus*, overwintering usually occurs as eggs, and occasionally young nymphs on evergreen oaks. In late spring some winged morphs form which colonize deciduous oaks for the summer months, and simultaneously a wingless morph develops and remains on the primary host. In Italy, it is reported that under unusually good climatic conditions the pest may not leave the primary or alternative host where it can develop simultaneous parthenogenetic populations (Niccoli *et. al.* 2008; Franceso *et al*, in press). Other members of the species group are reported to feed exclusively on deciduous oaks, *P. foaee* for example is monoecious holocyclic on *Q. petraea*, and *P. coccinea* is monoecious holocyclic on a number of *Quercus* spp., but especially *Q. robur* (Blackman & Eastop, 1994).

7. If the pest needs a vector, is it present in the UK?

No vector is required.

8. What are the pathways on which the pest is likely to move and how likely is the pest to enter the UK?

Pathway 1: Natural spread: migration from continental Europe. It is not known whether *Phylloxera quercus* group species naturally migrate to the UK as the distribution status for the UK is unclear. There is no published account of their flying ability.

Very unlikely ☐ Unlikely ☒ Moderately likely ☐ Likely ☐ Very likely ☐

Pathway 2: Transported with infested host plants from areas where the pest is present.

Very unlikely ☐ Unlikely ☐ Moderately likely ☐ Likely ☒ Very likely ☐

9. How likely is the pest to establish outdoors or under protection in the UK?

We do not know with certainty whether any of the *Phylloxera quercus* group species are present in the UK. There are many uncertainties with regard to its distribution on the continent, therefore it is impossible to make a true assessment of its climatic range, and hence the likelihood of it establishing in the UK. *Phylloxera coccinea* has the most northerly range of any of the *P. quercus* group species and is therefore the most likely species to establish in the UK. However, it is probably not the species that we have been intercepting on imported *Q. ilex* trees from Italy; this is more likely to be *P. quercus*, a species with a Mediterranean distribution. If an infested primary host (*Q. ilex*) is planted in sufficient physical proximity to an established *Q. ilex* or a secondary host (*Q. petraea* or *Q. robur*) the pest could however, potentially establish.

Outdoors: Very unlikely ☐ Unlikely ☐ Moderately likely ☒ Likely ☐ Very likely ☐
Under protection¹: Very unlikely ☐ Unlikely ☐ Moderately likely ☒ Likely ☐ Very likely ☐

¹ Hosts are generally grown outdoors but seedlings of some of the less hardy continental oaks may be grown in cold frames.

10. How quickly could the pest spread in the UK?

The lifecycle of this pest group does include an alate (winged) morph. An assessment of how quickly this pest could spread is limited by the relatively poor understanding of its biology outside of Italy. Although there are published observations of the pest's ecology and lifecycle in Italy, there are no published observations of its flying ability or rate of spread (Angela Niccoli, Research Centre for Agrobiology and Pedology (Florence) pers. comm.)

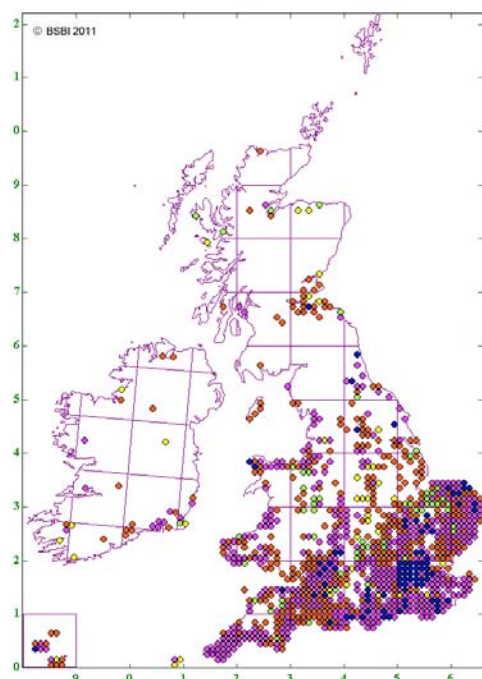
Natural spread:	Very slowly	<input type="checkbox"/>	Slowly	<input checked="" type="checkbox"/>	Moderate pace	<input type="checkbox"/>	Quickly	<input type="checkbox"/>	Very quickly	<input type="checkbox"/>
In trade:	Very slowly	<input type="checkbox"/>	Slowly	<input type="checkbox"/>	Moderate pace	<input checked="" type="checkbox"/>	Quickly	<input type="checkbox"/>	Very quickly	<input type="checkbox"/>

11. What is the area endangered by the pest?

In the UK, the south of England is more likely to be endangered due to the milder climatic conditions. However, we cannot dismiss the unconfirmed report of *P. quercus* being present in Scotland, and therefore – although there is some uncertainty associated with this record – the whole of the UK could be considered at risk. Areas of the UK that harbour the main primary host plant, *Quercus ilex*, are of most concern; it is widespread over lowland Britain, especially in south-east England and coastal sites (see map).

Some of the *P. quercus* group species colonize deciduous oaks for the summer months; this would of course pose a risk to native oaks in the vicinity of an infested evergreen oak. In Italy, it is reported that under unusual climatic conditions, *P. quercus* may not leave the primary or alternative host where it can develop simultaneous parthenogenetic populations (Francesco *et al.*, in press).

Hectad map of *Quercus ilex* (Evergreen Oak / Holm Oak) in GB and Ireland (www.bsbi.org.uk)



12. What is the pest's economic, environmental or social impact within its existing distribution?

All of the *Phylloxera quercus* group species are reported to cause noticeable feeding damage to their hosts. *Phylloxera ilicis* feed mainly on current and one-year old twigs and

cause small swellings (tuberosities); *Phylloxera italica* is reported to cause small, sparse, whitish spots on the undersides of leaves of *Q. robur* and *Q. petraea*; *P. coccinea* spring morphs (fundatrices) cause crinkling and discolouration of margins of young oak leaves. All species in the *P. quercus* group have a spring-summer morph that feeds on the undersides of leaves of *Quercus* spp. and cause some degree of yellowish necrotic spotting. Descriptions of the damage caused by *P. quercus* appears more often in the literature than any of the other species in the group. Once this pest has punctured the undersides of the leaves some degree of decolouration usually develops. The tissue deformation leads to bronze coloured spots becoming visible on the upper leaf surface, which sometimes merge together. *Phyllosticta* fungi exploit the feeding punctures and therefore also contribute to the necrosis.

Phylloxera quercus is the species most frequently reported causing damage to oak trees in Italy. Studies have concentrated on the aesthetic damage to *Q. ilex* in urban areas by disfiguring the leaves. Stunting of grow and defoliation has only been observed during severe infestations. In Florence, severe foliar deformation has been observed on Holm oak hedges, but infestations are not reported to affect the production of acorns, nor cause death of young trees (A. Niccoli, pers. comm.). In Iraq however, *P. quercus* is reported to kill young oaks during years of severe infestation (Mohammad & Abdulla, 1985).

In Italy, leaf necrosis caused by *P. quercus* is reported to have a greater impact on evergreen oaks which exhibit accumulative damage over consecutive years of infestation, whereas necrosis only becomes apparent in the early summer on deciduous oaks. Infestations are most significant in urban areas, where even low population levels cause aesthetic damage to the oak leaves (A. Niccoli *et. al.*, 2008).

Lubiarz (2007) reports damage by *P. glabra* and *P. coccinea* to *Q. robur* in Poland but doesn't quantify it.

Very small ☐ Small ☐ Medium ☒ Large ☐ Very large ☐

13. What is the pest's potential to cause economic, environmental or social impacts in the UK?

The UK has several important woodland and amenity species which are known host plants of the *P. quercus* group.

The species we have been intercepting on *Q. ilex* from Italy is most likely to be *P. quercus*, which is most likely to be able to establish in sheltered urban areas in southern England that have a moderate–high density of both evergreen and deciduous oaks.

Economic	Very small <input type="checkbox"/>	Small <input checked="" type="checkbox"/>	Medium <input type="checkbox"/>	Large <input type="checkbox"/>	Very large <input type="checkbox"/>
Environmental	Very small <input type="checkbox"/>	Small <input checked="" type="checkbox"/>	Medium <input type="checkbox"/>	Large <input type="checkbox"/>	Very large <input type="checkbox"/>

14. What is the pest's potential as a vector of plant pathogens?

The *Phylloxera quercus* group are not known to vector plant pathogens.

STAGE 3: PEST RISK MANAGEMENT

15. What are the risk management options for the UK?

As detailed above, these oak feeding phylloxerids have the potential to be damaging to a variety of *Quercus* trees. However, growers should determine whether control of the insect is warranted. There is no requirement for statutory action against this species, given the uncertainties concerning the distribution and identity of this species. Small spots on the leaves by the autumn could be tolerated and natural enemies may limit the pest's population. If however, a large percentage of the leaves are brown by the autumn, growers may wish to try and control the insect in the following season. When infestations are severe, growers may wish to spray the new leaves in spring with a systemic insecticide. However, because the insects feed on buds and the under-surface of young developing leaves, they can be difficult to target, so good coverage is essential. Insecticidal soaps have also proven effective.

Several groups of generalist predators have been found in association with *P. quercus* in Italy [Anthocoridae (Hem), Crysopidae (Neur), Cecidomyidae (Dip), Syrphidae (Dip), Coccinellidae (Col)] (Francesco *et al*, in press), therefore it is possible that our native generalist predators could have an impact and influence whether or not populations survive and spread.

16. Summary and conclusion of rapid assessment.

This rapid assessment shows:

Likelihood of entry is: likely with moderate uncertainty. There have only been six putative interceptions of *P. quercus* group species in the UK, all on Holm oak imported from Italy. It is possible however, that during some stages of its life cycle the pest could have avoided detection. It is also possible that it could have been mistaken for a native phylloxerid.

Likelihood of establishment is: moderately likely with high uncertainty. We do not know with certainty whether any of the *Phylloxera quercus* group species are present in the UK. There are also uncertainties regarding their distribution on the continent, therefore it is impossible to make a true assessment of their climatic range.

Economic impact is expected to be: small with moderate uncertainty.

Endangered area: the south of England is considered the most endangered area of the UK although *P. quercus* group species do present a risk to all parts of the UK.

Risk management: Severe infestations may require insecticide treatment, but the pest is often difficult to target.

In conclusion, there is considerable uncertainty associated with the identity and impact of this pest. Given that it is not known with any degree of certainty whether or not *P. quercus* group species are established in the UK, and that control measures are in any case often unnecessary, as the damage is largely aesthetic, no statutory action is recommended.

17. Is there a need for a detailed PRA? If yes, select the PRA area (UK or EU) and the PRA scheme (UK or EPPO) to be used. (for PH Risk Management Work stream to decide)

No	<input checked="checked" type="checkbox"/>
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Yes		PRA area: UK or EU		PRA scheme: UK or EPPO	
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18. IMAGES OF PEST



Fig 1. *Phylloxera ?quercus* apterous and alate nymphs on *Quercus ilex* from Italy. © Fera



Fig 2. *Quercus ilex* from Italy with *Phylloxera ?quercus* damage © Fera

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Map:

www.bsbimaps.org.uk/atlas/map_page.php?spid=1637.0&sppname=Quercus%20ilex&comname=Evergreen%20Oak%20/%20Holm%20Oak

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