

Holm oak (*Quercus ilex*) Monitoring Protocol



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Monitoring survey

Fera and the International Plant Sentinel Network (a technical initiative of Botanic Gardens Conservation International) are collaborating on one-year Defra-funded project to investigate the spread and distribution of key holm oak pest species in the UK.

As part of this research, we are looking to carry out monitoring of specimens of this species in live plant collections on Botanic Gardens and Arboreta in the UK to determine a baseline of the presence and spread of particular pest species of holm oak in the UK. Specifically, we are looking for:

- **Holm oak bark scale** (*Nidularia pulvinata*): A scale insect that feeds on sap of holm oak trees. Though not widespread, in the UK, outbreaks can be lethal to stressed trees, particularly in urban areas.
- **Holm oak gall midge** (*Dryomyia lichtenstenii*): A small gall midge whose larvae induce distinctive galls on the leaves of evergreen oak trees. they can weaken the host tree health by altering nutrient distribution through sap sucking, potentially leading to stress that makes host plants more susceptible to other diseases.
- **Holm oak Phylloxera** (*Phylloxera quercus* group): Aphid-like, sap-sucking insects that feed mainly on holm oaks and in severe cases, heavy infestations can lead to general decline in the tree's vigour, especially in the case of young or stressed trees.

 **Monitoring timeframe: July 2025 - February 2026**

If you are interested in contributing to this important tree health research, please use the instructions provided to run the surveys and submit your data.

For more information about the project or if you have any questions, please contact:

 lara.salido@bgci.org / itxaso.quintana@bgci.org

 chris.malumphy@fera.co.uk



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Holm oak: An Overview

Identification & Characteristics

The holm oak (*Quercus ilex*), also known as holly oak, is an evergreen broadleaf tree native to the Mediterranean but widely planted in the UK since its introduction in the late 1500s.

Mature trees can reach heights of 20-28m and develop a large, rounded crown with dense foliage (Figure 1a). The bark is black and finely cracked (Figure 1b), while young twigs are slender and covered with light brown, felt like hairs (Figure 1c).



Figure 1. Holm oak (*Quercus ilex*) a) tree, b) bark, c) twig.

Leaves are distinctive: dark green, glossy and leathery on the upper surface, with a paler, downy underside (Figure 2a). Unlike UK native oaks, holm oak leaves lack lobes; instead, they are oval, often with holly-like toothed edges (Figure 2b), especially on young leaves. Leaf size varies, but they are generally small and tough. Holm oaks produce acorns (Figure 2c), which are elongated and mature in autumn. The tree is easily identified in winter by its evergreen canopy, which persists year-round.



Figure 2. Holm oak (*Quercus ilex*) a) mature leaves, b) young leaves, c) acorns.

The tree's adaptability allows it to thrive in various forms - standard trees, multi-stemmed, clipped shapes or as hedges (Figure 3).



Figure 3. Holm oak (*Quercus ilex*) a) standard tree, b) multi-stemmed tree, c) clipped cylinder shaped, d) hedge.

Importance

The holm oak is highly valued as an ornamental tree, particularly in urban and coastal settings. Its evergreen foliage brings year-round structure and colour to parks, streetscapes, and gardens, making it a long-standing favourite for stately homes and public spaces. The dense canopy provides excellent shade, while a deep root system contributes to strong drought resistance.

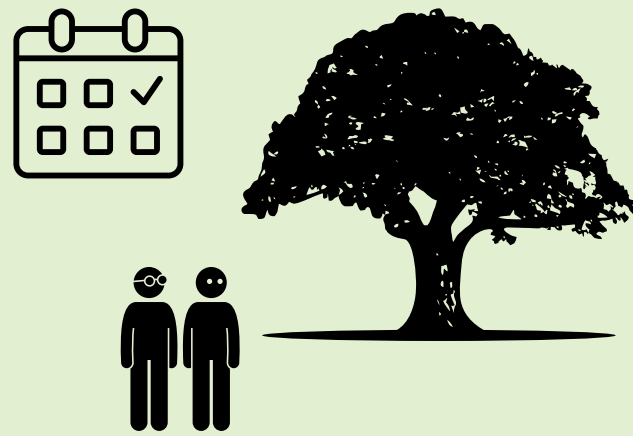
Well adapted to salt spray, air pollution, and a variety of well-drained soils, holm oak is especially suited to challenging environments. Its resilience, combined with its evergreen character, makes it an important species for strengthening urban green infrastructure and supporting climate-adaptive cities in the UK.

However, recent research has identified concerning decline trends across holm oak populations in Europe, including the UK. These are largely attributed to climate change, which weakens trees and increases their vulnerability to secondary threats such as pests and diseases. Hence the importance of establishing effective monitoring systems to track population health and identify emerging threats to ensure the continued vitality and resilience of this valuable species.

Key monitoring details

Purpose: To monitor holm oak trees for signs of pest infestation, helping establish a baseline for presence and enabling early detection and management. This supports the protection of tree health and overall biodiversity.

By following this protocol, staff will help safeguard the health of holm oak trees in their living collections, as regular monitoring is key to early pest detection and effective collection management.



1

When to survey?

The three pests, or symptoms of the pests, may be detected throughout most of the year.

However, the best survey periods would be:

- Spring (Apr-Jun): New leaves emerge, coinciding with the peak activity for many of the pests.
- Summer (Jul-Aug): Holm oak gall midge and Phylloxera are most conspicuous at this time.
- Autumn (Sep-Oct): Before leaf fall, to detect late-season pests.

Frequency:

- Conduct monitoring at least once per season during the periods listed above.
- Increase survey frequency if pests or their symptoms are detected.



2

How many and which trees to survey?

Select a representative sample of holm oak trees across the collection.

- Include trees of different ages and locations (e.g. shaded vs exposed).
- Prioritize old or visible stressed trees as they may be more vulnerable.



3

Visual Inspection

Carefully examine the following parts of each tree for signs of key symptoms (refer to the [following pages](#) for details on each target organism):

- Leaves (inspect both the upper and underside)
- Bark
- Twigs and branches
- Crown (assess overall health, for signs of dieback)



4

Diagnostic Pictures

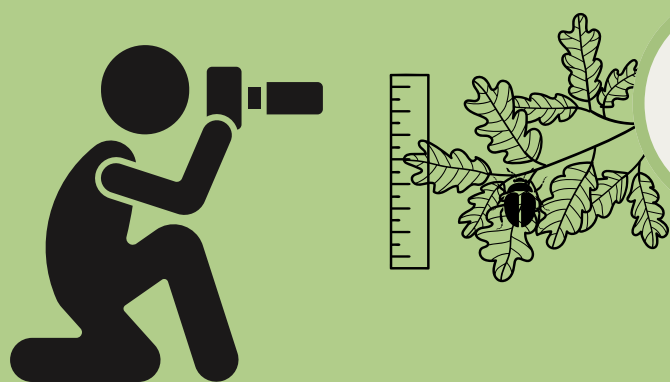
Use a smartphone or digital camera with good resolution. Aim to document both the symptoms and their context for accurate diagnosis.

Take a CLEAR, CLOSE-UP picture of:

- The pest or insect, if visible
- Symptoms of damage (e.g. galls, defoliation, exit holes...)
- The entire affected part (e.g. full leaf, twig, or tree crown)

Tips for Effective Photos:

- Include a scale reference (e.g. ruler or coin) when possible
- Take multiple angles of the same symptom to aid diagnosis



5

Data Recording

Use the [survey forms provided in the Annex](#) to collect monitoring data.

Ensure to include the following:

- Tree ID/ location to be able to do any required follow-ups.
- Date of survey, weather conditions and any signs of pest presence or damage.



6

Who to contact?

If you find ANY SUSPECT pest or unusual symptoms, immediately:

- Notify the Botanic Garden/Arboretum Plant Health Officer or the designated pest monitoring coordinator.
- Email photos and/or key observations to the project coordinators for further assessment: lara.salido@bgci.org or itxaso.quintana@bgci.org.



These reports will be forwarded to the technical team for accurate identification and diagnosis.

Target organism: Holm oak bark scale

Scientific name: - *Nidularia pulvinata*

Distribution: Mainly found in the Mediterranean region (France, Italy, Spain, Portugal, Turkey and Algeria) [See map]. It has recently been found in one location in southern England.

Impact: Infestations weaken trees by draining sap, causing stress and increasing susceptibility to other diseases. Damage appears to be mainly restricted to trees growing in urban environments, where they are likely to be stressed by other abiotic and biotic factors

Symptoms:

- Presence of adult female scales with white ovisacs in the cracks of the trunk and stems (Figure 4 a&b).
- Wilting, yellowing or drooping leaves and branch dieback (Figure 5).
- Abnormal swellings (galls) on the apical stems (Figure 6).
- Reduce growth.
- Occasional death of infested trees.



Figure 4. a,b) Adult females *Nidularia pulvinata* in *Q. ilex* trunk crevices.



Figure 5. Branch dieback and flagging on *Q. ilex* due to *Nidularia pulvinata* infestation.



Figure 6. Galling of apical stems.

Target organism: Holm oak gall midge

Scientific name: *Dryomyia lichtenstenii*

Distribution: Primarily distributed across the Mediterranean Europe (France, Italy, Spain, Portugal) and North Africa (Morocco, Turkey, Algeria), with recent records in southern UK (2022).

Impact: Infestations disrupt nutrient flow by inducing gall formation, , stressing the tree and making it more vulnerable to the attack of diseases and pathogens.

Symptoms:

- Distinctive galls emerging from the leaf surface. These are fleshy, hairy structures often displaying a reddish or yellowish hue (Figure 7 a&b).
- Distortion of affected plant parts/stunted grow (Figure 8).



Figure 7. Galls on *Q. ilex* a) upper side and b) underside on the leaves.



Figure 8. Leaf galling and distorted growth on stems of *Q. ilex*.

Target organism: Holm oak Phylloxera

Scientific name: *Phylloxera quercus* group

Distribution: Mainly found in southern Europe (Italy, Spain, France), North Africa (Algeria), and the Middle East (Iraq).

Impact: Heavy infestation can lead to general decline in the tree's vigour, especially in the case of young or stressed trees. The related species oak leaf phylloxera (*P. glabra*) causes similar symptoms on English oak (*Q. robur*)

Symptoms:

- Small, yellowish or reddish spots on the leaf surface around the feeding zone (Fig. 9a&b), that causes leaf discoloration.
- Tiny (<1mm) orange-yellow aphids (Fig. 10a) and nymphs (Fig. 10b) on leaf underside.
- Premature leaf drop and stunted growth (Fig 11).

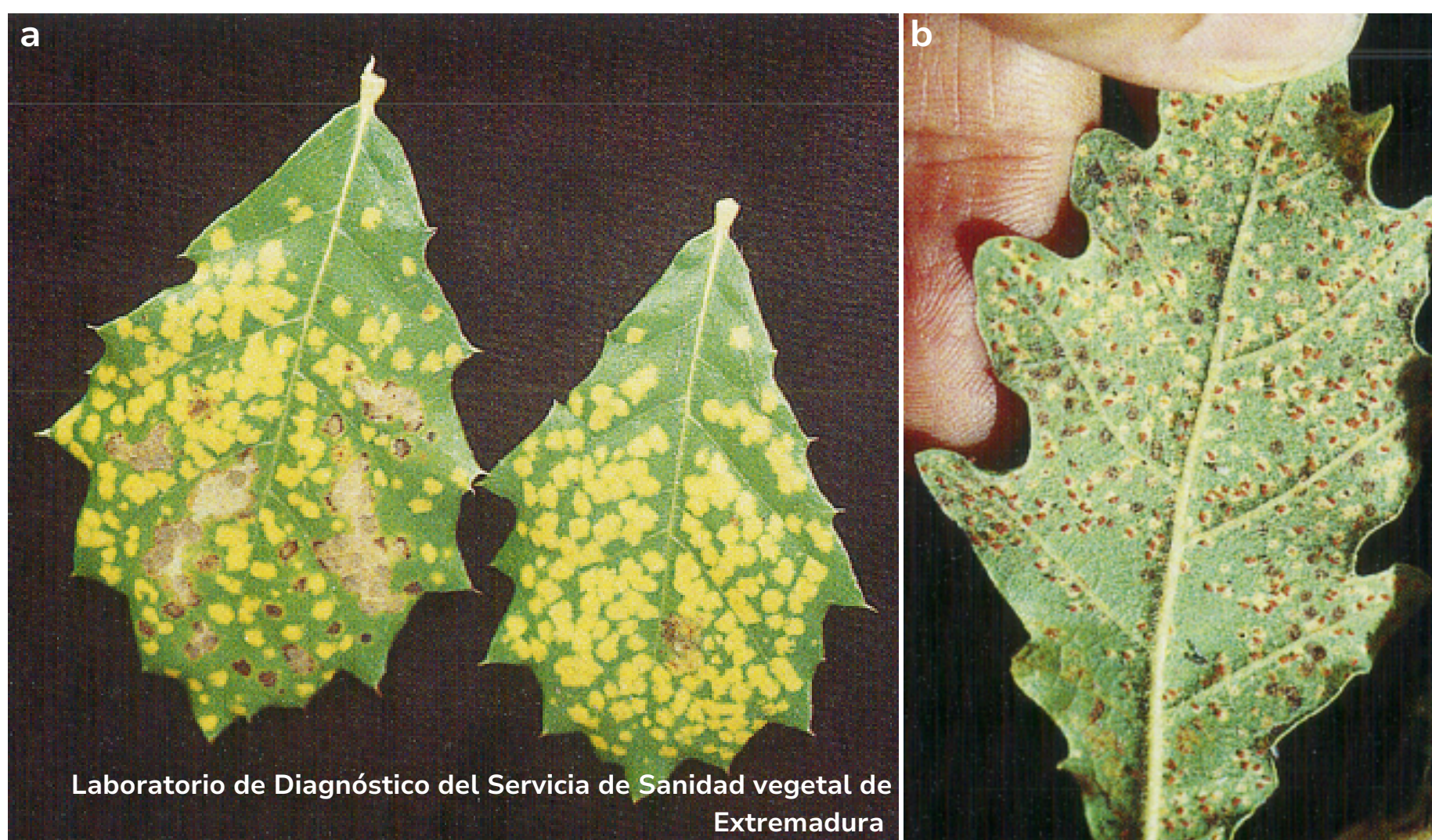


Figure 9. Yellow and brown spots on the a) upper surface and b) underside of *Q. ilex* leaves. .



Figure 10. . Presence of a) aphids and b) nymphs of *Phylloxera quercus*.



Figure 11. . Stunted growth on *Q. ilex*.

Appendix: Survey form



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PESTS of Holm oak

The IPSN is carrying out a survey of Holm oak (*Quercus ilex*) in UK botanic gardens in order to gain a better understanding of the impact of three pests, which are known to impact this oak species both in Europe and potentially in the UK. We would be most grateful if you could survey the holm oak trees in your collection using this survey form. Please use one form per tree and refer to the accompanying protocol, poster and factsheet for further pest identification help.

Pest 1: The Holm oak bark scale is a scale insect that feeds on sap from evergreen oak trees (*Quercus* spp.), particularly Holm oak. Mainly found in the Mediterranean region (France, Italy, Spain, Portugal, Turkey, and Algeria). It has recently been found in one location in southern UK. Infestations weaken trees by draining sap, causing stress and increasing susceptibility to other diseases. Damage appears to be mainly restricted to trees growing in urban environments, where they are likely to be stressed by other abiotic and biotic factors.

Pest 2: The Holm oak gall midge is a small fly whose larvae induce distinctive galls on the leaves of some evergreen oaks (*Quercus* spp.). Primarily distributed across the Mediterranean Europe (France, Italy, Spain, Portugal) and North Africa (Morocco, Turkey, Algeria), with recent records in southern UK (2022). Infestations disrupt nutrient flow by inducing gall formation, , stressing the tree and making it more vulnerable to the attack of diseases and pathogens.

Pest 2: The Holm oak Phylloxera is an aphid-like, sap-sucking insect, that feeds on the leaves of holm oak and other oak trees (*Quercus* spp.). The insect is found in southern Europe (Italy, Spain, France), North Africa (Algeria), and the Middle East (Iraq). These insects feed on the leaves. Heavy infestation can lead to general decline in the tree's vigour, especially in the case of young or stressed trees. The related species oak leaf phylloxera (*P. glabra*) causes similar symptoms on English oak (*Q. robur*)

Survey Details			
Name of Botanic Garden / Arboretum:			
Country: Address:			
Survey carried out by:			
Date of survey:			
Best description of season:			
Tree Details			
Species (cultivar)			
Accession number:			
GPS (if available)			
Country/region species is native to:			
Age (years):			
General Description of Health			
Generally healthy	∨	Some damage	∨
Dying	∨	Dead	∨
Any recent changes in health or overall look:			
<hr/>			

PESTS of Holm oak

Symptoms Check Holm oak bark scale	Symptom observed? If possible please rate the severity of the symptoms from 1-6; 1= symptoms and 6= severe symptoms	Symptoms Check Holm oak gall midge	Symptom observed? If possible please rate the severity of the symptoms from 1-6; 1= symptoms and 6= severe symptoms	Symptoms Check Holm oak Phylloxera	Symptom observed? If possible please rate the severity of the symptoms from 1-6; 1= symptoms and 6= severe symptoms
Symptom 1: Presence of adult female scales with white ovisacs in the cracks of the trunk and stems.		Symptom 1: Distinctive galls emerging from the leaf surface. These are fleshy, hairy structures often displaying a reddish or yellowish hue. Symptom 2: Distortion of affected plant parts/stunted growth.		Symptom 1: Small, yellowish or reddish spots on the leaf surface around the feeding zone that cause leaf discoloration. Symptom 2: Tiny (<1mm) orange-yellow aphids and nymphs on leaf underside. Symptom 3: Premature leaf drop and stunted growth.	
Symptom 2: Abnormal swellings (galls) on the apical stems					
Symptom 3: Wilting, yellowing or drooping leaves and branch dieback					
Symptom 4: Reduce growth					
Symptom 5: Tree mortality					
Do you think this tree is infested with holm oak bark scale?	Yes/No	Do you think this tree is infested with holm oak gall midge?	Yes/No	Do you think this tree is infested with Holm oak Phylloxera?	Yes/No
Notes: _____					



Thank you for your participation!

For any questions, please contact:

FERA:

Chris.malumphy@fera.co.uk

International Plant Sentinel Network (IPSN):

lara.salido@bgci.org

itxaso.quintana@bgci.org