Forest Research

Invasive forest pests – what risk to the UK?

Daegan Inward

Invasive species can be very economically and environmentally damaging:

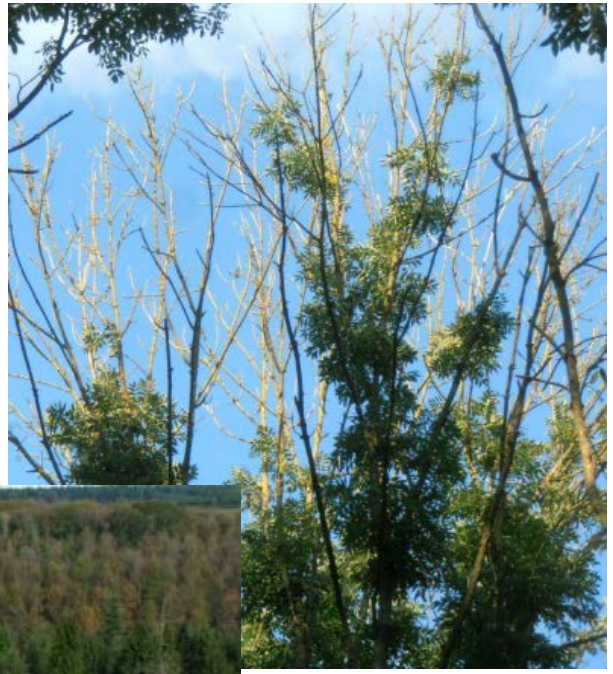
- Predate, compete or hybridise with native species
- Influence loss of native species & ecosystem services
- Most serious pests and diseases of trees and forests are non-native

Invasive tree pathogens in the UK:

Dutch elm disease

Dothistroma needle blight

Phytophthora ramorum



Ash dieback

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Some ‘high profile’ invasive forest pests in the UK:

Horse chestnut leaf miner

Oak processionary moth

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Asian Longhorn beetle (ALB)

•ALB is native to E. Asia, and feeds within a variety of broadleaf trees. It has become a pest across Europe and N. America

• In 2009 a live adult ALB was found by a local resident at Paddock Wood, Kent.

• Inspection of the area located a suspected source: a premises importing stone from China.

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ALB

Eradication actions, 2013

-Initial rapid ground survey; felling & detailed inspection.
-All potential host trees within 100m of an infested tree felled, inspected & destroyed on-site.
-All broad-leaf trees within 500m radius inspected from ground, repeated over next 3-4yrs.

Final Tally:
2166 trees felled (incl. 627 from private gardens)
66 infested trees (10 different tree species)

ALB declared eradicated in 2018 – the ecology of the species made it possible in this case (extended life cycle in UK)

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Scolytinae: Bark & ambrosia beetles

Majority are ‘decomposers’.

Include some of most significant temperate forest pests

Some with capacity to kill mature trees

Key biosecurity threat, easily transported

Increased risk under CC due to increased frequency of drought stress

US has 58 exotic Scolytinae established

Europe has >20 established Scolytinae

Until recently, the UK recorded only 1 (*Dendroctonus micans*)

> 30% of Coleoptera interceptions in the UK are Scolytinae

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Mechanisms of spread

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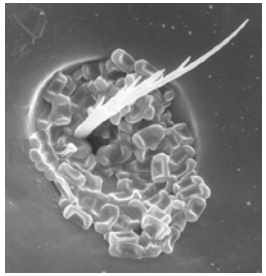
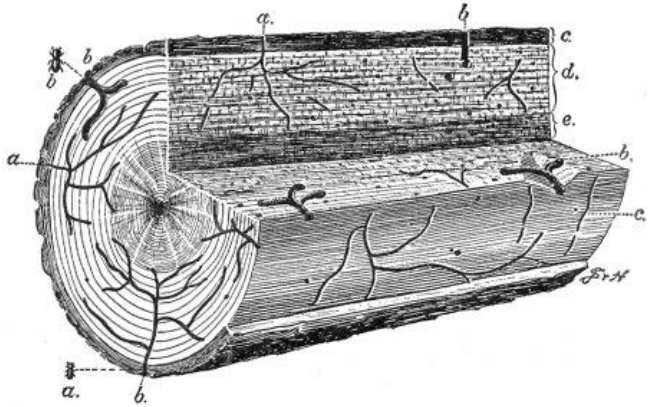
Bark vs ambrosia beetles

Most Scolytinae have a symbiotic relationship with fungi; may be actively or passively vectored.



Some fungi are pathogenic, e.g. bluestain fungi; may assist in weakening host.

Ambrosia beetles have obligate fungal associates which they actively farm as a food resource

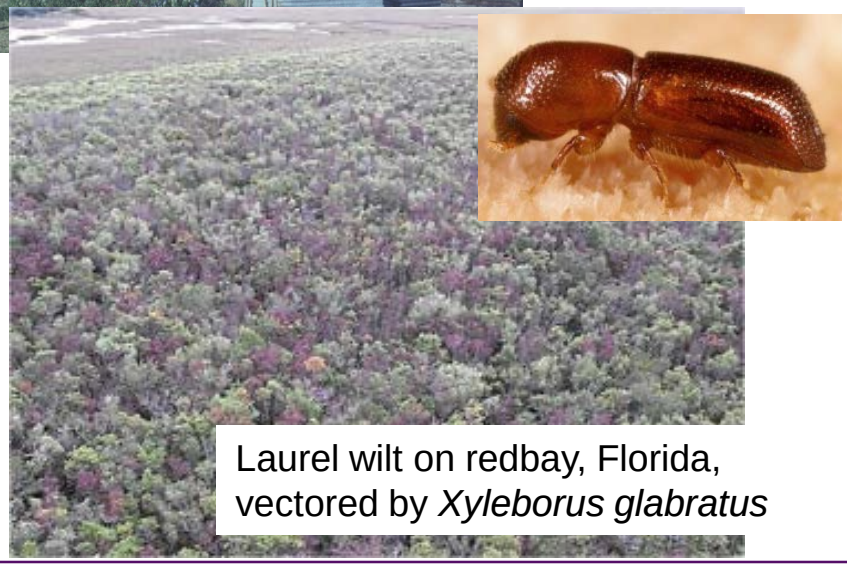


Pathogenic fungal associates

Blue stain fungi vectored by *Ips typographus*

Dutch elm disease, vectored by native *Scolytus* spp

Thousand cankers disease on walnut; *Geosmithia morbida*, vectored by *Pityopthorus juglandis*



Laurel wilt on redbay, Florida, vectored by *Xyleborus glabratus*

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Landscape level impacts

Ips typographus

Southern Pine Beetle *Dendroctonus frontalis*

Mountain pine beetle, *Dendroctonus ponderosae*

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Project objectives

The early detection of invasive bark and ambrosia beetles is an important part of IPM

Survey throughout Britain to look for previously undetected alien Scolytinae

Target 3 important forest types : oak, pine and spruce
+ additional 'high-risk' forests near to ports bringing in timber/forest products

Assess susceptibility of different forest types / regions

Baseline data – re. future effects from invasive spp. and climate change

Additional, with Imperial College:

Determine fungal associates of each species in BB assemblage

Identify potential vectors of pathogenic fungi

= First comprehensive inventory of UK bark beetle communities & their fungal associates

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67 British forest sites surveyed for Scolytinae, 2013-17

Triangles = Coniferous, Circles = Broadleaf

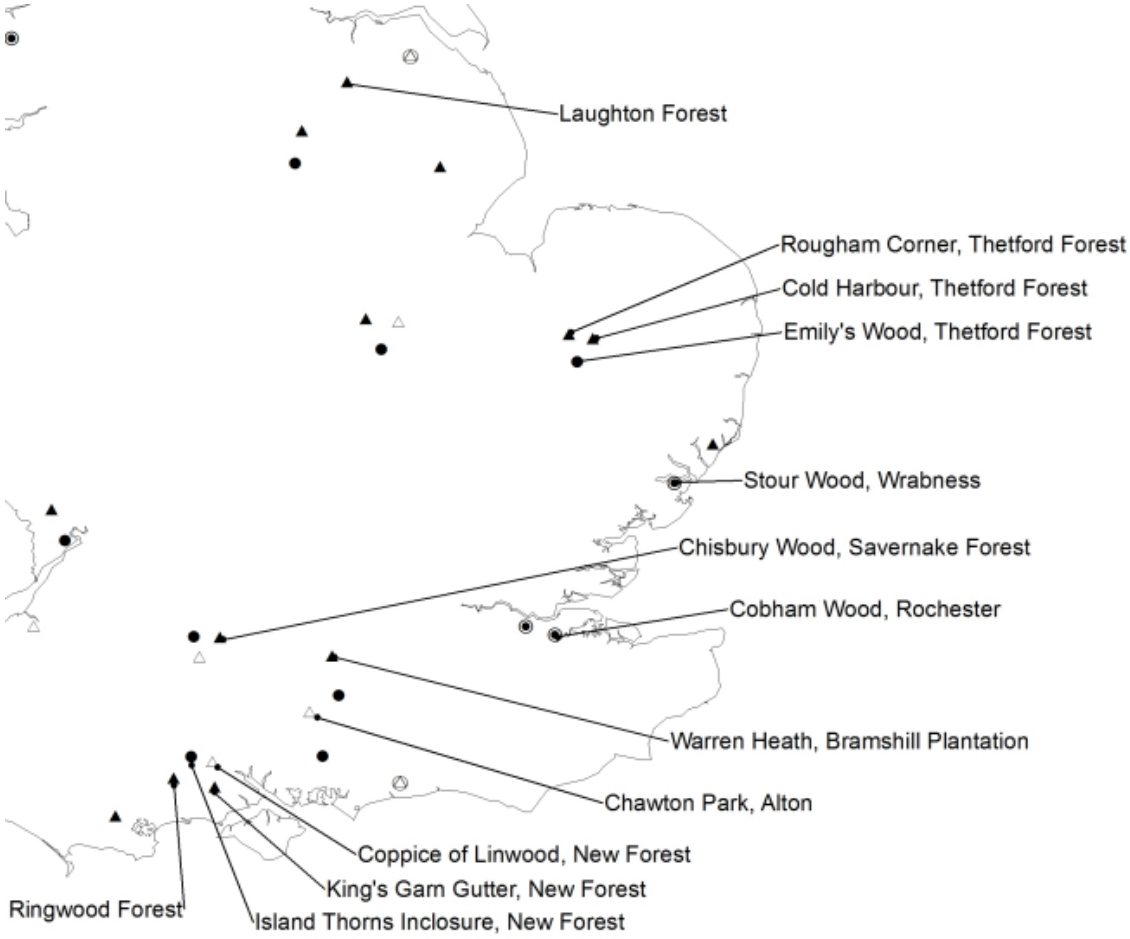
Xylosandrus germanus, Asian
Cyclorhipidion bodoanum, Asian
Gnathotrichus materiarius, N. American

Journal of Pest Science
https://doi.org/10.1007/s10340-019-01137-1

ORIGINAL PAPER

Three new species of ambrosia beetles established in Great Britain illustrate unresolved risks from imported wood

Daegan J. G. Inward[1]



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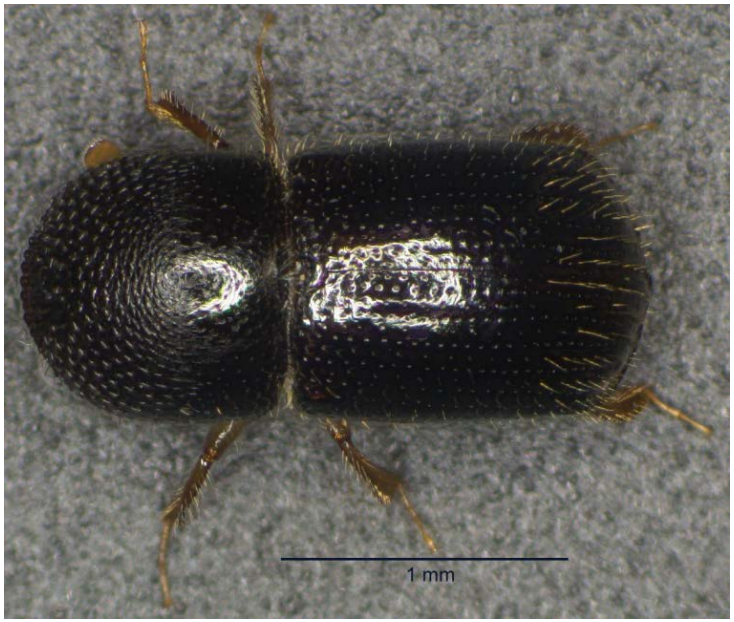
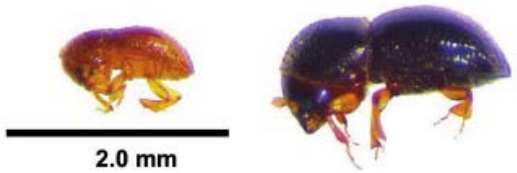
Xylosandrus germanus



Found widely across SE England (in both broadleaf & conifer)

Asian native; now widespread in Europe & N. America

Females inbreed with flightless male siblings (Xyleborini)



Disperse carrying symbiotic fungus

Highly polyphagous, >200 hosts / 51 families

Can become numerically dominant where introduced

Damage to nursery trees and to stored timber recorded,
+ collective attacks on mature beech & grapevine

Outbreaks linked to environmental stress.

Potential for greater impact under climate change.

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Implications for plant health

Gaps exist in the plant health regulations of Britain and the EU, allowing widespread movement of ambrosia beetles in particular…

There are thousands of other potentially invasive spp with uncertain impacts…
e.g. for Oak :

Agrilus bilineatus, two-lined chestnut borer

Massicus raddei, oak longhorn beetle

Platypus quercivorus, Oak ambrosia beetle

Enaphalodes rufulus, red oak borer

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Polyphagous shot hole borer (*Euwallacea* sp)

Jiri Hulcr

Native to Asia (e.g. Vietnam), carries fungal symbiont *Fusarium euwallaceae*

Important invasive pest killing avocado and other trees in Israel, California USA, & S. Africa

Botanical garden survey in USA found >200 woody host spp of 58 families – preference for broadleaves

- including European **oak, plane,** + willow, beech, birch, holly….

Fusarium symbiont is highly pathogenic causing vessel blockage, wilting and dieback

BUT – Climatic requirements (warm & humid) likely to prevent establishment in UK - for now.

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Oak lace bug, *Corythucha arcuata*

N. American species, now spreading across S & C Europe

Nymphs & adults feed on underside of leaves, causing chlorosis

Feeding damage increases through summer, can lead to leaf drop

Photosynthesis, growth & vigour affected

Highest risk of entry to the UK is on infested plants or plant material

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Ips typographus

December 2018...

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Management activities, 2019:

Eradication on site (SPHN)

- Fell, chip & burn all Norway spruce on & around the site
- Pheromone trapping, girdled trap trees, trap logs

Survey (Tree Health team, FR)

-Initially out to 1km, then 50 km by aerial + ground inspection
-Additional sites up to 100 km
-Focus on NS, stressed/dying/dead trees, sites with windthrow

Associated research

- Susceptibility of Sitka spruce
- Life cycle in southern England
- Source of establishing beetles

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Ongoing research

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Final thoughts…

Importing plants poses a serious risk of introducing new and damaging pests and diseases into the UK…

Forest Research

Tree Alert
Tree Pest & Disease sighting reporter

Thanks for listening...

Bill Mayer

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