

We can draw on the global diversity of ash trees

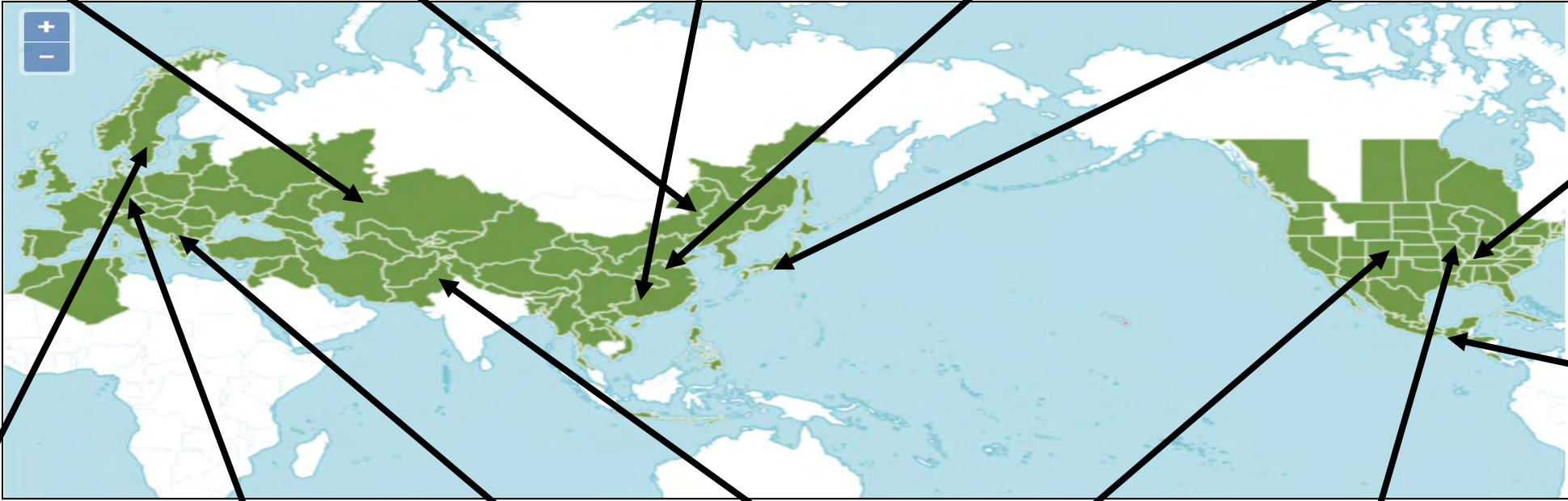
Fraxinus sogdiana

Fraxinus mandschurica

Fraxinus chinensis

Fraxinus platypoda

Fraxinus apertisquamiferas



Fraxinus nigra

Fraxinus albicans

Fraxinus excelsior

Fraxinus angustifolia

Fraxinus ornus

Fraxinus micrantha

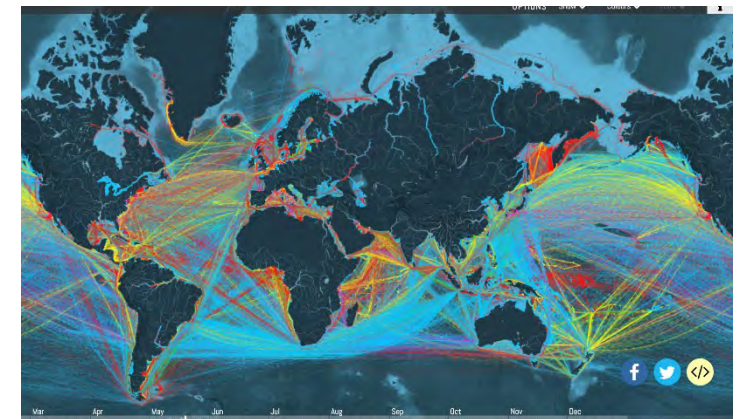
Fraxinus americana

Fraxinus pennsylvanica



Suggestion

The solution to the blending of worldwide pests and pathogens by trade is the blending of worldwide host genomes



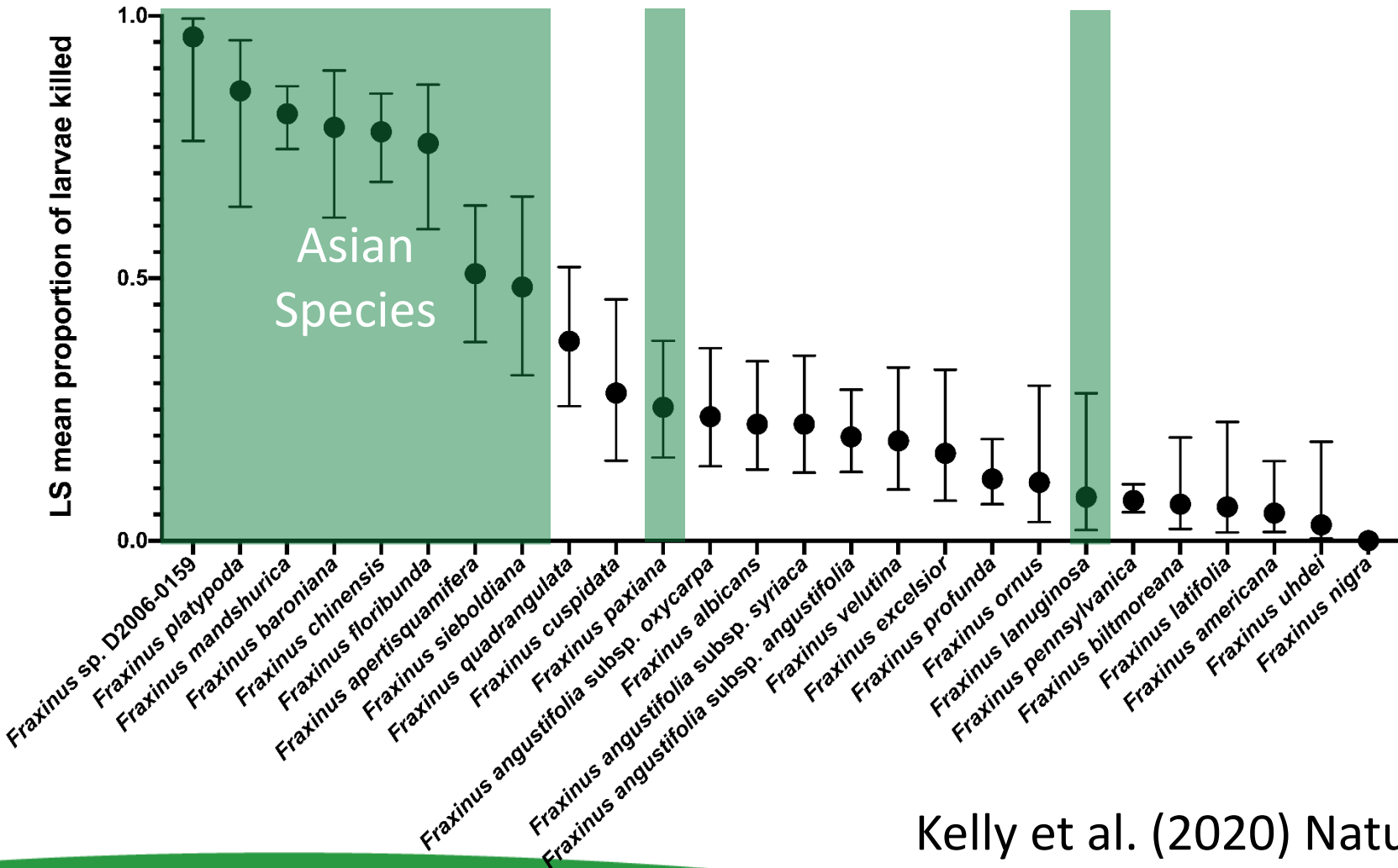
Worldwide ash genomes

- We sequenced the genomes of 29 species of ash from around the world
- Mainly using collections in Botanic Gardens
- We made a phylogenetic tree
- We tested the susceptibility of different species to emerald ash borer
- We compiled data about their susceptibility to ash dieback



Kelly et al. (2020) Nature Eco. Evo.

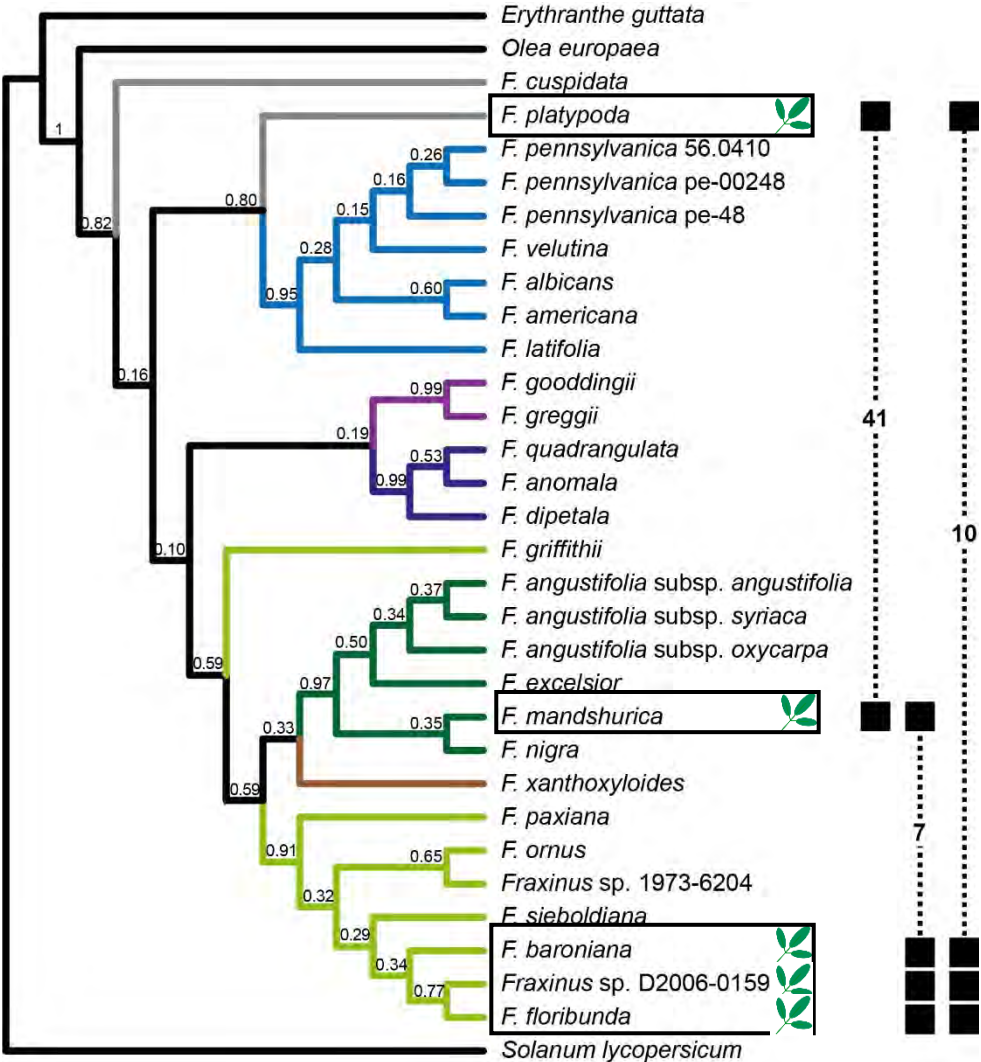
Emerald ash borer resistance in global ash species



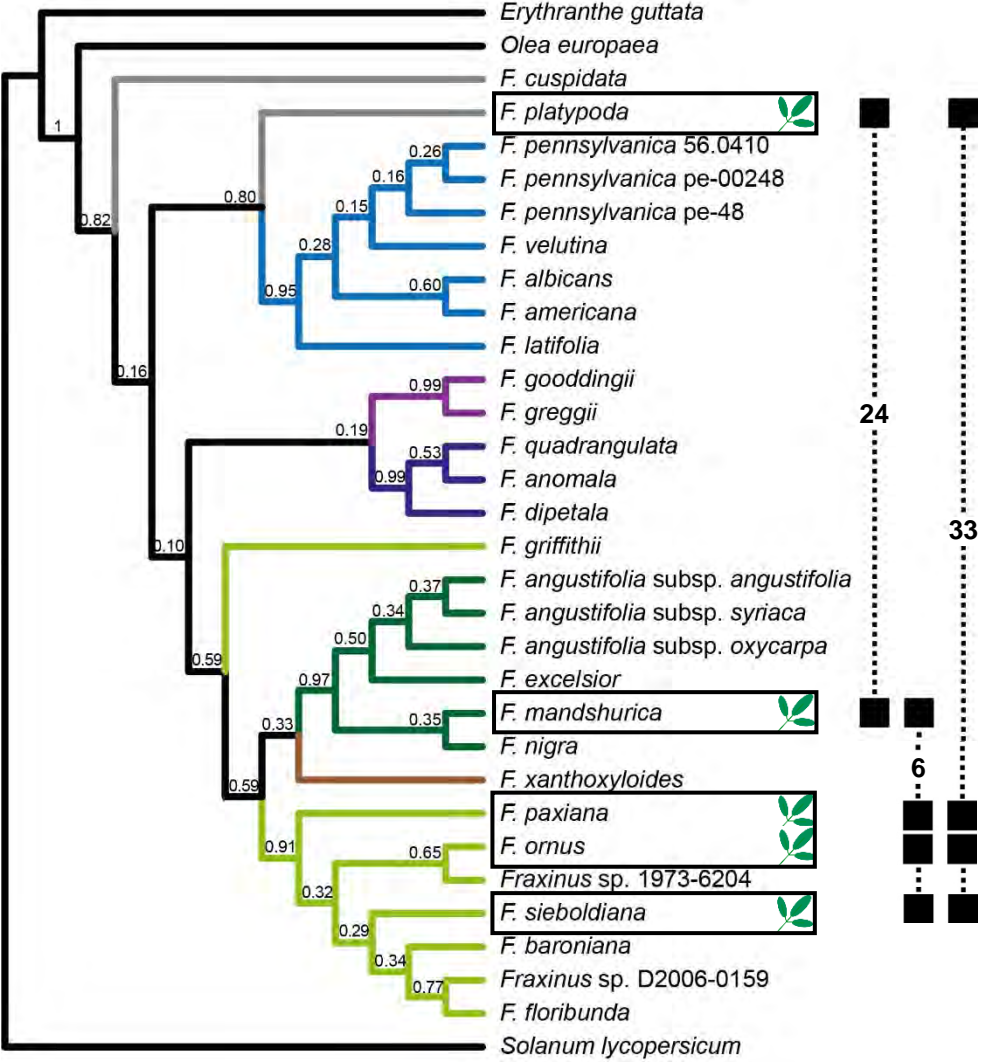
Kelly et al. (2020) Nature Eco. Evo.



Emerald ash borer



Ash dieback



Candidate genes

Emerald ash borer resistance

- 64 amino acid variants in 53 genes
- Putative gene functions include herbivore perception, defence signaling and programmed cell death



Ash dieback resistance

- 69 amino acid variants in 62 genes
- 16 genes with putative function in immunity/defence response; 8 linked specifically to fungi
- 1 gene in common with EAB candidate loci (involved in calcium ion binding)



Kelly et al. (2020) Nature Eco. Evo.
Kelly et al. in preparation

How do we use this knowledge?

1. Grow Asian species of ash in Britain
 - Would they be adapted to our climate?
 - Would they support local species?
 - Danger of other pests and pathogens?
2. Hybrid breeding programme
 - Need to overcome reproductive barriers
 - Adaptation to climate & local species
3. Genetically engineer UK ash trees
 - Protocols now developed at Rothamsted Research
 - Public acceptability issues



**This is all difficult and expensive
BETTER TO PREVENT PESTS AND PATHOGEN
INTRODUCTION IN THE FIRST PLACE**

Postdocs



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