

Sweet chestnut *Castanea sativa* in Britain: Roman introduction?

Dendrochronology

DNA analysis

Historical ecology

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Sweet chestnut: a Roman introduction to Britain?

The Factoids:

- 'Cæsar... transported them from Sardis first into Italy, whence they were propagated into France, and thence among us' (John Evelyn, *Silva*, 1706)
- 9 Roman period finds of wood and charcoal (Godwin, 1975)
- 'a Roman introduction...an honorary native...' (Rackham, 1980 & 2003)
- 'a Roman archaeophyte' (Preston et al., 2002)
- 'caches of chestnuts found by archaeologists at Roman sites...e.g. Caerwent' (Howkins, 2003)
- 'many Roman sites from Essex to Dorset' (Rackham, 2006)
- 'walnut and sweet chestnut were introduced by the Romans... sweet chestnut probably reached Britain with the Romans, who used the nuts to feed their army' (Stace & Crawley, 2015)
- Various trees and avenues 'planted with nuts from shipwrecked sailors from the Spanish Armada'
– Croft, Llanfihangel Crucorney, Carncastle (Antrim)

The Facts

- None of Godwin's cited sweet chestnut records are correct/verifiable
- 35 reported finds in archaeology: 11 are verifiable, all probably imports
- 1 find of sweet chestnut nuts in all of Britain for any period – definitely sweet chestnut and Roman – but in deposit of exotic food wastes
- 0 caches, 0 Roman legionary food deposits – original Caerwent record was of a find of **hazelnuts** in the Roman town
- 1 dateable find of pollen in all of Britain, for ~AD 680 and reported as 'tentative'
- Earliest written record of sweet chestnut growing in Britain = AD 1113
- Earliest written record of chestnut nuts harvested in Britain = AD 1154
- 1 pre-Anglo-Saxon place name, 'Castiard' = *castein-iarth*, in Dene
- Specific trees and stools are candidates for at least medieval (+/- Norman) antiquity

Sweet chestnut in archaeology: a 'silent' species

- where is the pollen?
 - very localised growth & dispersal
 - short rotation cutting = no pollen
 - confusion with *Filipendula*?
- where are the nut remains?
 - burned/animal feed/bio-dispersed?
- confusion of wood/charcoal with oak?
 - uniseriate medullary rays diagnostic of *Castanea* are also displayed in *Quercus* wood...
- Dendrochronological analysis?
 - insufficient (<50) growth-rings in typically small finds
- aDNA analysis of nut pericarps failed...

Sweet chestnut in the ‘living archive’

- **Tree ring analysis**
 - Living trees
 - Dead trees
- **DNA**
 - Source provenance(s)
 - Clones
- **Historical ecology**
 - Site-specific environmental history
 - Cultural significance

True stories, not ‘factoids’...!

Dendrochronology

- Cores by boring (living wood)
- Radial sections by sawing (dead wood)
- Growth-ring counting & measuring (microscopic)
- Cross-matching within/between trees & sites (*Castanea*)
- Cross-dating with oak *Quercus* across regions
- Accurate tree dates & historic landscape chronologies
- Potential to date archaeological & historical *Castanea* wood finds using oak reference chronologies

Dendrochronology of sweet chestnut in southern Britain

- 28 trees 15 sites
- deadwood hulks, boughs, stumps
- 9 bored living trees
- 47 sawn sections
- 54 measured growth-ring sequences : 59 – 320 rings
- 23 *Castanea* single-tree sequences CROSS-MATCHED [$t > 3.5$]
- 23 *Castanea* trees CROSS-DATED [$t = 5.5–9.01$] with oak *Quercus* reference chronologies from England and N France
- 'CASA23' master chronology AD 1660–2014
- Germination dates AD 1640–1943

Sunninghill, Berks – thanks to Ted & Steve! & Crown Estate



- 162 meas. rings
- pith–sapwood
- 3.74m girth
- mean ring width 1.68mm
- Cross-dated AD 1803–1964
- $t = 5.34$**
- Calc. date AD 1742–1970/5

Jan 1976 windthrow

Croft Castle Park, Herefs

9m basal girth, felled 1981



Penshurst Place, Kent

stump of tree cut ~AD 1970

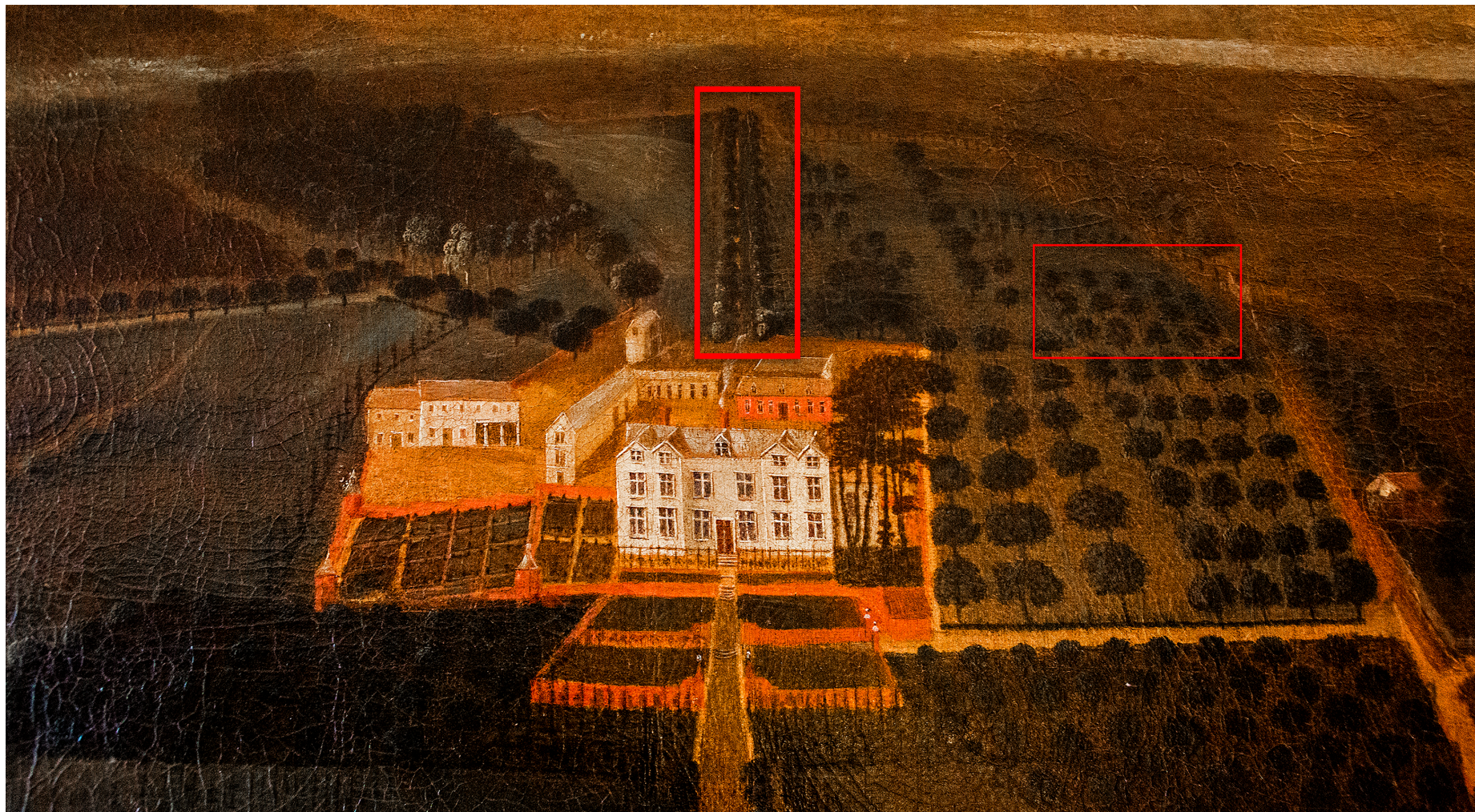
8.2m basal girth 173 measured rings

estim. date AD 1702



Llanfihangel Crucorney Court, Mon.

~AD 1686





Llanfihangel C. avenue
7.8m girth AD 1687–2015





**Llanfihangel
Crucorney
Grove**

AD 1730–1935

Pith – sapwood



Stapleton Lane, Herefs

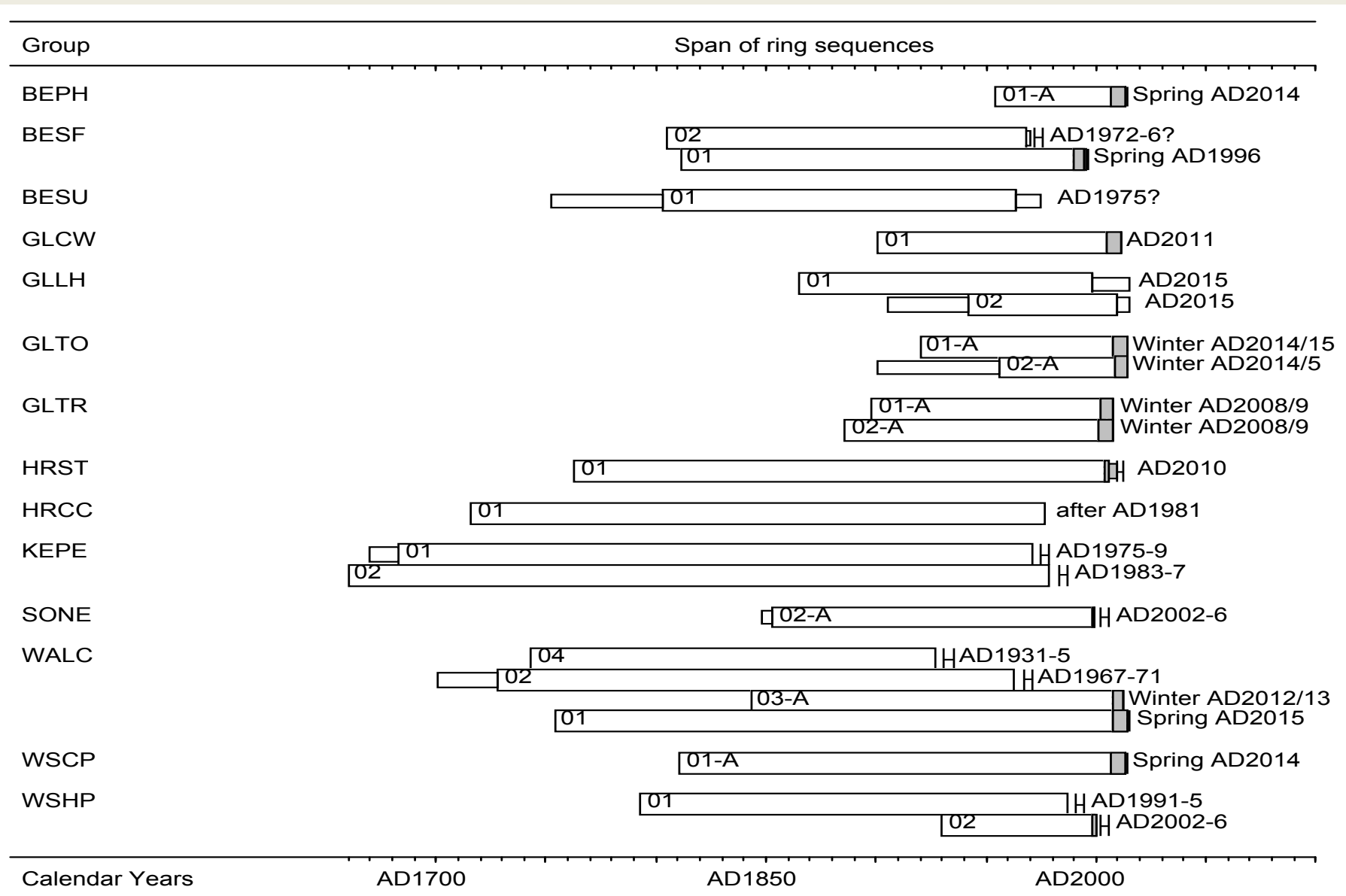
7.45 m girth @ 1.4m 254 y AD 1763–2016

Stapleton:Willey parish boundary

thanks to David Griffiths & Brian Jones

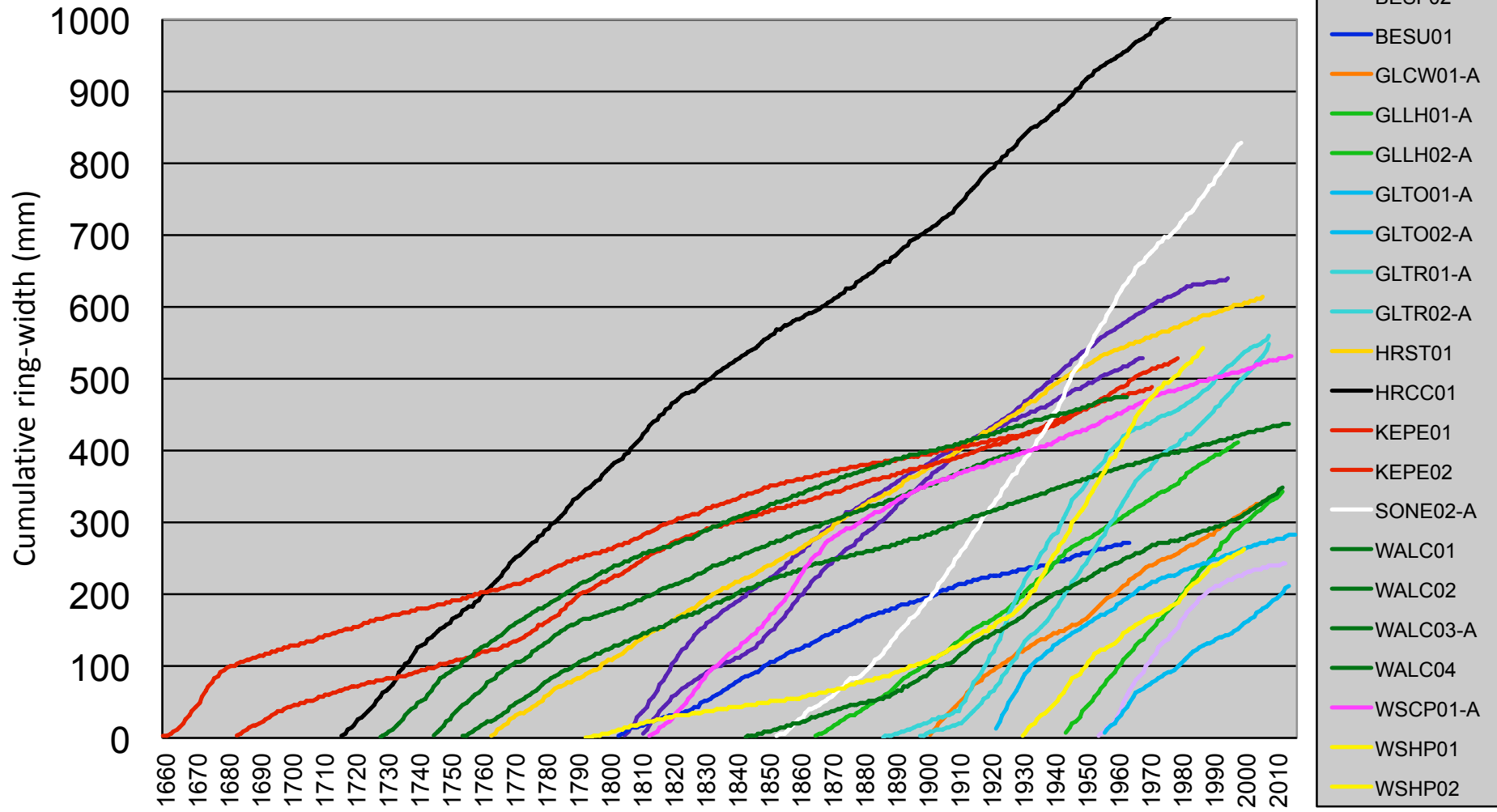


23 growth-ring sequences (AD 1660–2014) cross-dated with oak *Quercus*



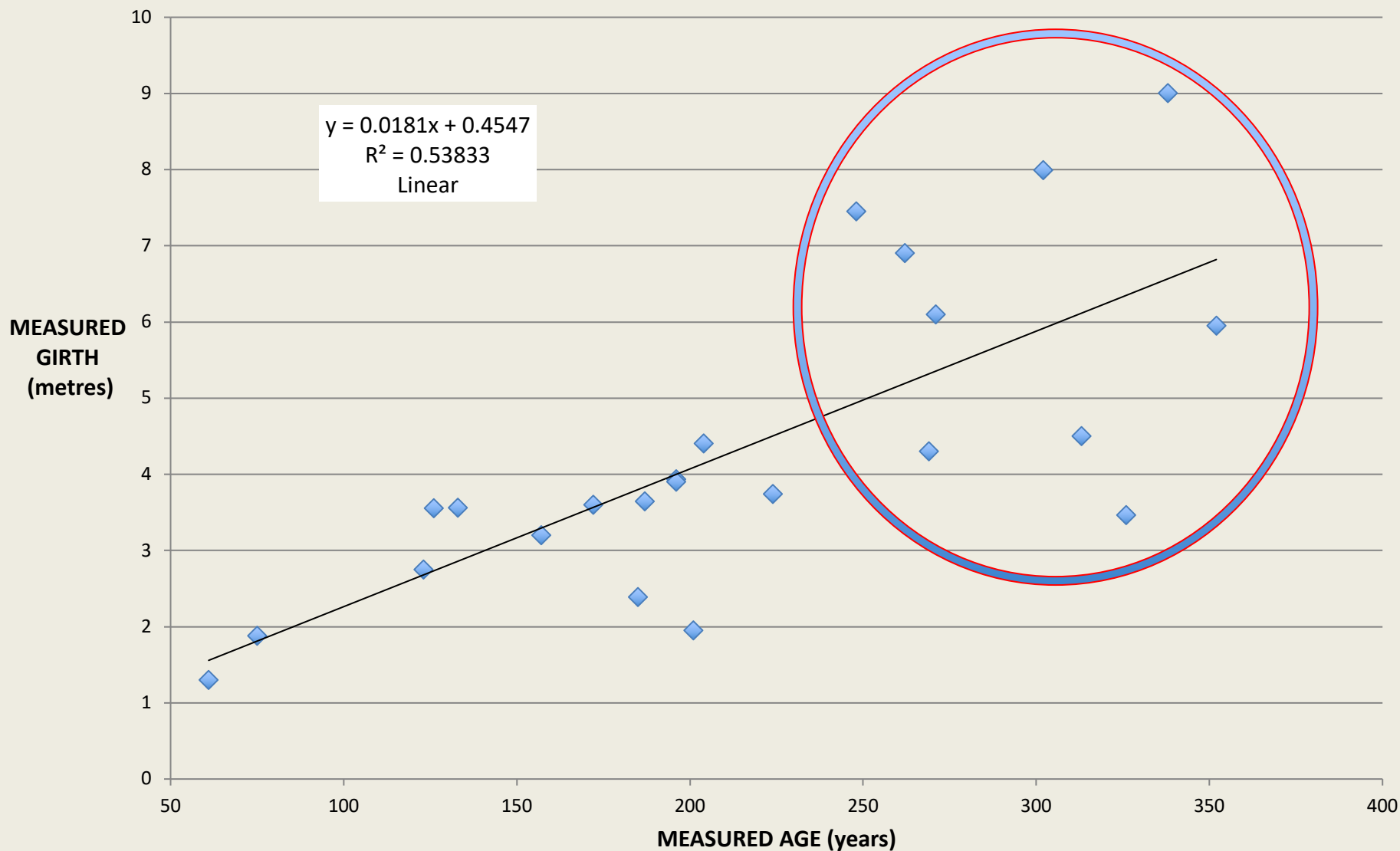
CUMULATIVE GROWTH

23 *Castanea sativa* cross-matched single-tree growth-ring sequences



Age:girth relationship

Castanea sativa in Britain:
23 single-tree growth-ring sequences AD 1660–2014



Bushy House, Middx.

9.7 m girth

3 main stems clonal

The Trees of Bushy House

1. The age of the venerable Spanish chestnut to the SE of Bushy House is often of interest to staff and visitors, but we have not until now had anything but hearsay to go on. It girths about 30 feet at 4 feet height. The files now carry a letter dated 11th February 1970 from Mr. A.F. Mitchell of Alice Holt Lodge, who is described by the Director of Kew as 'the expert on these matters', a title amply confirmed by the knowledge and scholarship he has been good enough to display for us. Briefly the most probable age is in the region of 350 years: the minimum is 210; a rather unlikely maximum 650 years.



Future survey potential?

Previously cut stubs...

Luton Hoo

11.8m basal girth, 8m @ 1.5m

~350 rings bark–pith

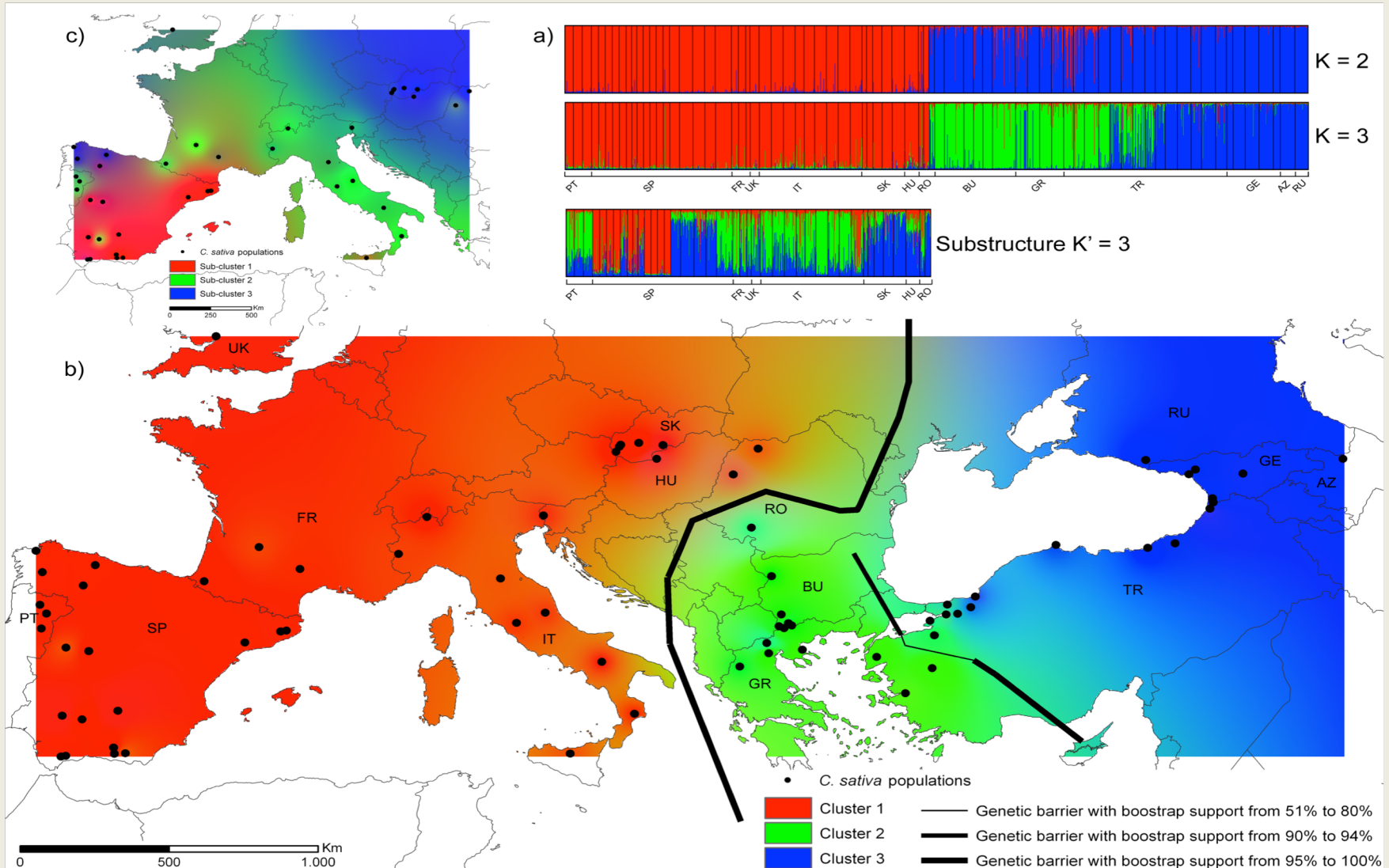


DNA analysis

- 754 samples, 589 trees/stools, 291 sites Britain and Ireland
- Veteran trees & young trees
- ancient semi-natural woodlands
- cultural landscapes
- commercial forests
- 8 polymorphic SSR markers genomic DNA leaves & buds
- UK Regional & W Eurasian comparisons: genepool : genotyping
- Single tree analysis: single & multiple samples
- Clonal analysis
 - Stools
 - Pollards
 - Grafts & Bundles...

W Eurasian genepools for *Castanea sativa*

DNA indicates LGM refugia
also colonisation and human mediation pathways



DNA clonal studies

- Avenues & groves
 - check for vegetative propagation; inter-estate plant / seed transfers
- Veteran trees & pollards
 - check for grafts cf. European orchard practice & bundles & collapsed layers
- Layers
 - collapsed trees & boughs
 - coppice stool extensions
 - transplanted rooted layers
- Ring trees
 - stump regrowth or bundles – rooted cuttings
- Coppice stools
 - linear = layering (rapid expansion)
 - circular = regenerative (slow expansion)
 - single or multiple plant...
- Inexplicables...
 - vegetative reproduction distance – Abenhall (450 metres); Kilshane (110 m)



Layers

**Kateshill House, Bewdley,
Worcs**

Collapsed boughs

10.7 m basal girth

9.85 m @1.5m

4 main boughs (N, W, S, E)

clonal



2^{ary} tree

11.5 m

distant,

clonal with

parent tree

2.85 m girth



Rings

Seven Sisters, Penshurst, Kent

17 m basal girth; 4.3 m @1.5m

7 main stems (6 = **clonal**, 1 = somatic mutation) + 1 stump



Luton Hoo, Beds

18 m basal girth; 4 m @1.5m on biggest stem

6 main stems = **clonal** (+ 1 dead + 1 stump)



Coppice stools

Welshbury, Glos

16 m basal girth 5 m stool diam.

2 m pole girth @ 1.3m WW1 cut

5 main stems **clonal**

Circular = not product of layering
= ancient



Copperas Wood, Essex

collapsed 'ring' stool 16 m basal girth;

not clonal = 2-plant composite



Conclusions

- Historical archives essential for cross-checking identifications, dating and contextual meaning
- DNA analysis of individual trees and stools provides age-class determination, management history and fingerprinting
- Dendrochronological analysis essential for accurate tree dating – at least to provide dates for specific tree components
- Sawn sections from deadwood components – especially bough stubs – a rich seam of information available on many historic sites
- Visualisation techniques can illustrate tree histories

Sweet chestnut – Roman introduction to Britain?... Anyone?