

Thinking inside the box. A dendrochronological and archaeobotanical survey on a 14th century chest made in Antwerp



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The city of Antwerp (northern Belgium) developed as an important trade centre along the river Scheldt already in the 13th century. In 1221 CE Antwerp received city rights from the Dutchy of Brabant. From that moment onwards a collection of historical documents started to build up that archive the city's privileges, liberties and other institutional rights. At some point this archive required safe and secure storage.

The 'chest of privileges' is believed to have served as the safe deposit of the city's most important historical documents. It is a strongbox that measures 227.5 x 62 x 59.5 cm. So far, the exact age and construction date of this chest remained uncertain, and its authenticity was questioned.



- The lid and sides of the chest are constructed with wide (5-6 cm) Silver fir (*Abies alba*) planks. The bottom plank and the inner compartments are constructed with oak timbers (*Quercus* spp.).
- Wrought iron bands, braces and nine locks make this chest a secure container for valuable items.
- The chest was probably made by 'fortsiemakers' – members of a small guild, specialised in producing reinforced chests (Van Damme 1985) – whom only used wrought iron nails to join the timbers.
- No wood joints were used in the chest's construction. Using wooden joinery was allowed exclusively to the guild of carpenters (joiners) and coopers.
- Inside the chest, a collection of small wooden boxes is stored.
- Some of these wooden boxes have inscriptions on the sliding lids.



The end-grain of the side planks and the bottom plank is not accessible. Their tree-ring patterns could not be measured.



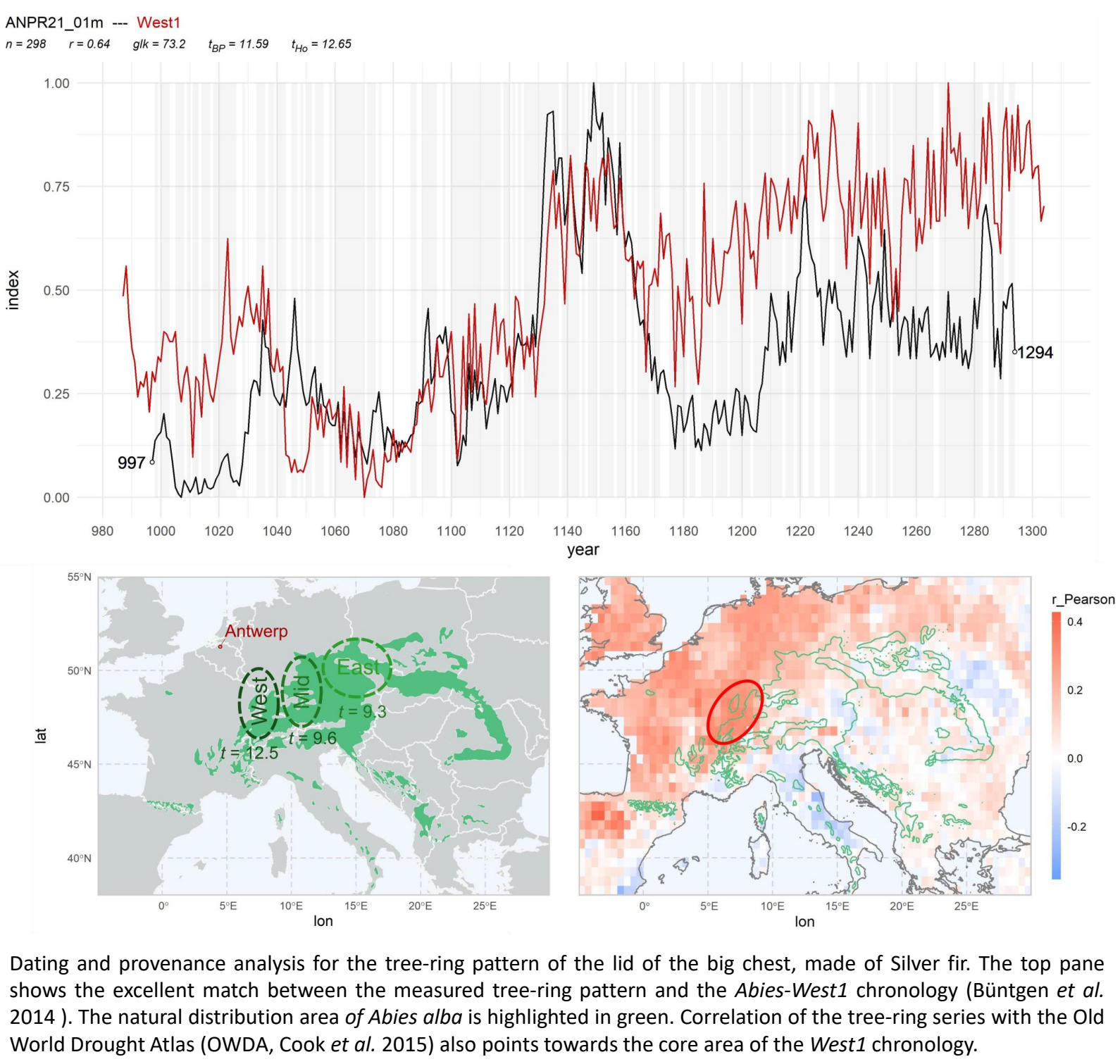
The chest is divided into two inner parts, each having a side compartment with a lid. The tree-ring pattern of the lids could be recorded.



Detail of the bottom plank showing two cracks that were filled with (1) moss caulking, (2) covered with a wooden lath and fastened with (3) sintels.



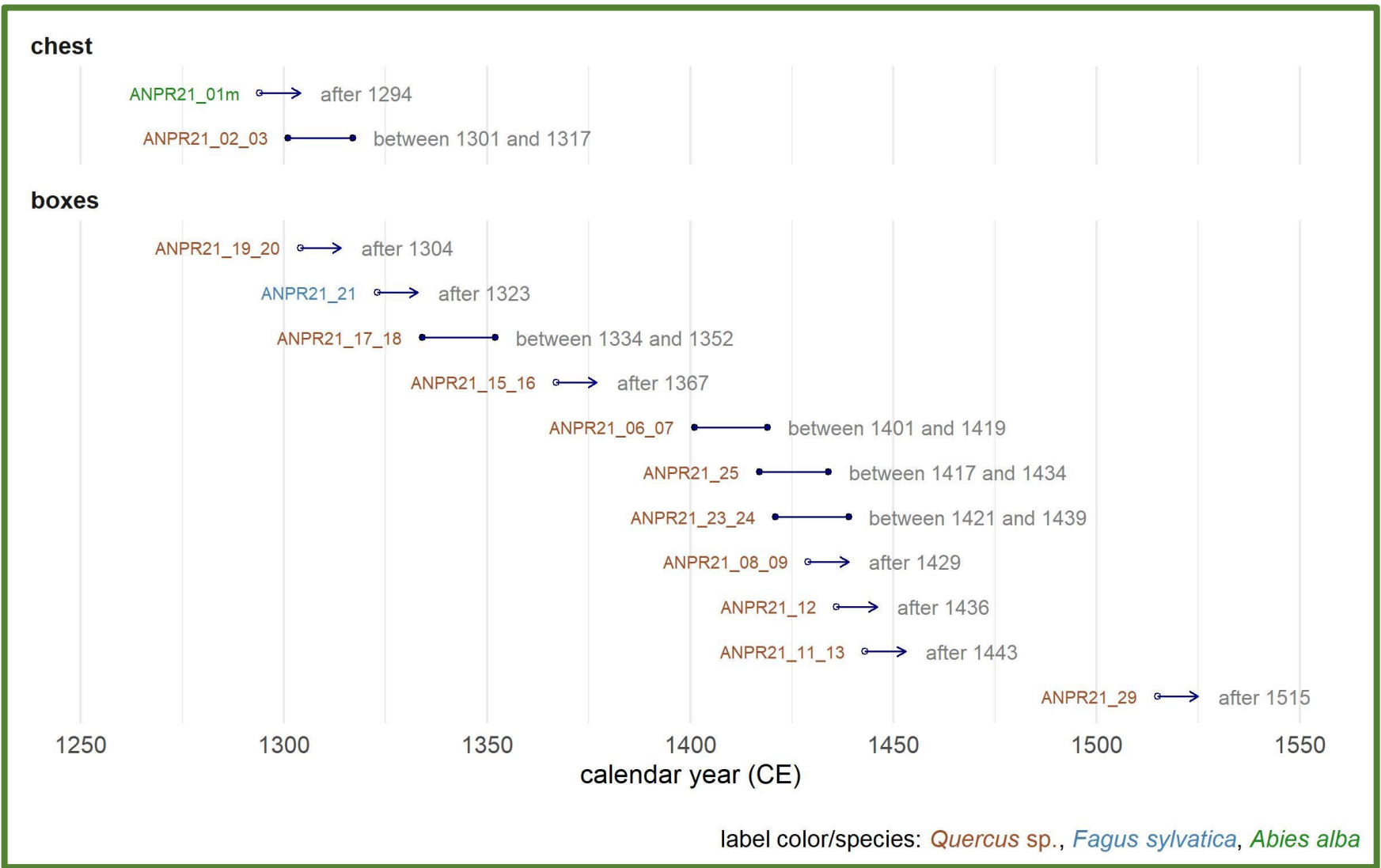
- A dendrochronological survey on the chest and some of the wooden boxes stored inside the chest was performed to provide more detail on the construction history of these historical objects.
- The lid is made from a large timber originating from a +298 year old Silver fir.
- The tree-ring pattern could be dated to 1294 CE, with chronologies from the northern Alpine Arc (Büntgen *et al.* 2014).
- Highest correlation was found with a chronology from the Vosges mountains.
- The lids of both side compartments date to 1301 CE, including 10 sapwood rings, and their tree-ring patterns display a high similarity to Southern Baltic oak chronologies.
- The felling date for the wood of the inner compartments is situated between 1301 and 1317 CE.



Dating and provenance analysis for the tree-ring pattern of the lid of the big chest, made of Silver fir. The top panel shows the excellent match between the measured tree-ring pattern and the *Abies-West1* chronology (Büntgen *et al.* 2014). The natural distribution area of *Abies alba* is highlighted in green. Correlation of the tree-ring series with the Old World Drought Atlas (OWDA, Cook *et al.* 2015) also points towards the core area of the *West1* chronology.



- Tree-ring patterns of the small boxes were registered using macro-photography of the end grain.
- Nine boxes were selected for analysis, on which 24 tree-ring series were recorded.
- Often two or more elements from a box originate from the same tree/plank.
- The tree-ring series (n = 20) date to the early 14th up to the 16th century.



- From the early 14th century onwards this chest served as a secure storage for important historical documents.
- The archaeobotanical analysis of the caulking material from the bottom plank confirmed that this plank originally served as a ship timber, despite the impossibility to perform tree-ring and provenance analysis.
- It is striking to see that the whole chest was originally assembled with imported and/or recycled timbers:
 - imported Silver fir planks for the lid and sides
 - a repurposed ship timber for the bottom
- Tree-ring analysis of the small wooden boxes demonstrates that the content of the big archival chest changed repeatedly during the 14th, 15th and early 16th centuries.
- The dendrochronological survey, the technical analysis and the inscriptions on the boxes now provide anchor points that might allow us to bring together historical documents that were originally stored inside the wooden boxes.

Archaeobotanical analysis on the caulking material

Botanical remains

- Samples were first soaked in a water-soap solution allowing a slow and gentle disintegration of the compacted material.
- The caulking material consists exclusively of moss.
- Most cracks were filled with a single species: *Drepanocladus aduncus*, a characteristic moss species for lowland fens and bogs.
- One crack was filled with *D. aduncus* and a mixture of three other moss species: *Neckera crispa*, *Plagiochilla porelloides* and *Plagiomnium cuspidatum*.
- These three species grow on solid substrates, often on limestone, in shaded conditions or on (old) trees with an alkalic outer bark pH.
- *D. aduncus* does not naturally grow together with the other three identified moss species.

Pollen analysis

- Moss polsters act as natural pollen traps.
- The pollen assemblage therefore reflects the 'local' vegetation where the mosses were harvested as caulking material.
- In samples dominated by *Drepanocladus* the pollen assemblages originate from a treeless environment.
- Pollen analysis of the sample with a mixture of moss species on the other hand points towards a wooded landscape, although the pollens assemblages are most probably a mixture of two vegetation types.

Combined interpretation

- The macro- and microbotanical analysis show that the cracks in the bottom plank of the chest were waterproofed with moss caulking originating from different locations and ecotypes.
- The archaeobotanical analysis support the interpretation as a re-purposed ship timber that was caulked several times, at different locations.
- The region of origin of the caulking material is probably situated outside the Antwerp region, as this area was already heavily deforested in the early 14th century.
- This interpretation is further confirmed by the presence of pollen from *Abies* and *Picea* – both tree species do not naturally occur in the Low Countries.

sample	#1		#2		#3		#4	
MARCOBOTANICAL ANALYSIS								
Drepanocladus aduncus			dom		dom		oc	
Neckera crispa							dom	
Plagiochilla porelloides							sp	
Plagomnium cuspidatum							sp	
POLLEN ANALYSIS								
	n	%	n	%	n	%	n	%
trees and shrubs								
Abies	-	-	-	-	1	0,2	3	0,5
Alnus	7	1,4	4	0,7	3	0,6	58	10,4
Betula	1	0,2	3	0,5	-	-	21	3,8
Carpinus betulus	-	-	-	-	1	0,2	21	3,8
Corylus avellana	1	0,2	2	0,4	1	0,2	22	3,9
Fagus sylvatica	1	0,2	-	-	-	-	11	2,0
Fraxinus excelsior	-	-	-	-	-	-	2	0,4
Picea	-	-	-	-	-	-	1	0,2
Pinus	1	0,2		0,0		0,0	6	1,1
Populus	-	-	-	-	1	0,2	1	0,2
Quercus	3	0,6	8	1,4	2	0,4	209	37,5
Salix	1	0,2	4	0,7	1	0,2	9	1,6
ΣAP	15	3,0	21	3,8	10	1,9	364	65,4
ΣNAP (herbs)	488	97,0	538	96,2	526	98,1	193	34,6