Dendrochronological analysis of timbers found during excavations in Læderstræde, Copenhagen. KBM 4466

Aoife Daly, Ph.d.
Dendro.dk report 2 : 2022
Commissioned by Nikolai Johannes Fenger Pedersen, Museum of Copenhagen.

Samples from a ship plank (reused) and a post found during excavations in Læderstræde in Copenhagen were submitted for analysis. The results of this analysis are described in this report.

The ship plank is identified as oak (*Quercus* sp.). The sample contains 132 tree-rings including 18 sapwood rings. The sample is dated. Its tree-ring curve covers the period AD 1520-1651. Allowing for missing sapwood the felling date for the tree from which the sample comes is placed at c. AD 1652-58.

Filenames	-	-	Z3050019	
-	start	dates	AD1520	
-	dates	end	AD1651	
Master and site chronologies				
GO10LZ01	AD1485	AD1631	5.79	Güstrow 6 timbers (Göttingen Uni revised Daly 2007)
E_German	AD1343	AD1968	5.69	East Germany Climate project sites 339 timbers (Daly unpubl)
GO10EZ01	AD1451	AD1591	5.26	Güstrow 5 timbers (Göttingen Uni revised Daly 2007)
GO104Z01	AD1478	AD1603	5.02	Güstrow 4 timbers (Göttingen Uni revised Daly 2007)
HO14ZF01	AD1387	AD1661	5.02	Gadebusch Schloss 17 timbers (Hamburg Uni revised Daly 2007)
G3719Z01	AD1393	AD1613	5.01	Jork 6 timbers (Göttingen Uni revised Daly 2007)
H115YF01	AD1433	AD1649	4.67	Moelln Marktstr. + Haupfts. 11 timbers (Hamburg Uni revised Daly 2007)
GO10TZ01	AD1493	AD1731	4.50	Güstrow 7 timbers (Göttingen Uni revised Daly 2007)
DM100008	AD457	AD1723	4.49	Lübeck (Hamburg Uni)
G341CZ02	AD1455	AD1667	4.10	Wennigsen 8 timbers (Göttingen Uni revised Daly 2007)
GO103Z01	AD1455	AD1589	4.09	Güstrow 5 timbers (Göttingen Uni revised Daly 2007)
G350RZ01	AD1523	AD1668	4.02	Celle 4 timbers (Göttingen Uni revised Daly 2007)
G361CZ01	AD1535	AD1708	4.02	Holto 5 timbers (Göttingen Uni revised Daly 2007)
HO13AM02	AD1561	AD1655	4.45	Wismar Luebschestr. 10 timbers (Hamburg Uni revised Daly 2007)
HO11ZM01	AD1441	AD1678	4.43	Gadeb. Mühlenstr. 15 3 timbers (Hamburg Uni revised Daly 2007)
H1137M02	AD1468	AD1615	4.23	Gross Groenau 3 timbers (Hamburg Uni revised Daly 2007)
H115SM01	AD1542	AD1695	4.20	Moelln Hauptstr. 1 10 timbers (Hamburg Uni revised Daly 2007)
GO10VZ01	AD1513	AD1682	4.17	Güstrow 6 timbers (Göttingen Uni revised Daly 2007)
Chronologies from ships and barrels				
BAT6047a	AD1426	AD1586	5.14	Batavia Western Australia 6047 frame (Daly et al 2021)
Z1815M01	AD1471	AD1644	4.83	Kirkestræde 6 A57 Tønde2 latrine 4 timbers (Daly & Nielsen 2016)
Z213005&17 s	AD1489	AD1687	4.48	Mönchgut FPL63 5 17 same tree (Daly 2017)
Z0923M01	AD1404	AD1623	4.46	Vasa group 1 63 timbers (Daly 2018)
bauM002	AD1519	AD1669	4.45	Ventjager ship (van Daalen & van der Beek 2003)
Z239002a	AD1477	AD1592	4.17	Tunnelvraket Karlskrona 103 p1 bordlægning (Daly 2018)

Table 1. Læderstræde, Copenhagen. Result of the correlation between the tree-ring curve from the ship plank (Z3050019) and diverse Northern European site and master chronologies. The source of the chronologies is given. The grey tone highlights the high *t*-values.

The plank is dating against a range of northeast German tree-ring datasets and with several other northern European ship finds (table 1). On the basis of a single sample, it is not possible, however, to narrow down a specific provenance for the timber.

The post is identified as *Alnus* sp., alder. This sample is not analysed further.

Methodology

Measuring and analysis of the material is carried out using the program ”DENDRO” (Tyers, 1997) in which the calculation of the *t*-value (”*t*-test”) ”CROS” (Baillie & Pilcher, 1973) is embedded. A sapwood average of c. 10-25 sapwood rings is used for estimating the felling date of the tree used to make the plank. Several calculations of the average sapwood in oaks in different regions in Northern Europe have been published, and as the provenance analysis of the plank points to southern Scandinavia, I have here chosen to use a combination of the estimate for Northern Germany (ca. 20 sapwood years (-5+10) (Hollstein 1980)) and for Norway (c. 15 sapwood years (-8+6)) (Christensen & Havemann 1998). In the analysis master and site chronologies for Northern Europe are consulted.

Literature

Baillie, M.G.L. and Pilcher, J.R., 1973. A simple crossdating program for tree-ring research. *Tree-Ring Bulletin* 33, 7-14.

Christensen, K. & Havemann, K. 1998. Dendrochronology of oak (*Quercus sp*.) in Norway. *AmSVaria* 32, Stavanger, 59-60.

Daly, A., 2007. *Timber, Trade and Tree-rings. A dendrochronological analysis of structural oak timber in Northern Europe, c. AD 1000 to c. AD 1650.* Ph.D. thesis submitted February 2007, University of Southern Denmark.

Daly, A., 2017. Dendrochronological analysis of timbers from two shipwrecks found at Mönchgut, Darss, Germany – Fpl63 and Fpl64. *Dendro.dk report* 2017:61, Copenhagen.

Daly, A., 2018. Dendrochronological analysis of ship timbers from ‘Tunnelvraket’, at Karlskrona. *Dendro.dk report* 2018:68, Copenhagen.

Daly, A., 2021. Timber supply for Vasa – new discoveries. in G. Boetto, P. Pomey, P. Poveda (ed.), *Open sea, closed sea: Local traditions and inter-regional traditions in shipbuilding, Proceedings of the Fifteenth International Symposium on Boat and Ship Archaeology (ISBSA 15), Marseille 2018, Paris*, CNRS editions, Archaeonautica 21, p. 263-268.

Daly, A., Domínguez-Delmás, M. & van Duivenvoorde, W., 2021. *Batavia* shipwreck timbers reveal a key to Dutch success in 17th-century world trade. *PLoS ONE* 16(10): e0259391. https://doi.org/10.1371/journal.pone.0259391

Daly, A. & Nielsen, J., 2016. Dendrokronologisk undersøgelse af tønder fra Kirkestræde 6, Nibe, ÅHM 6252. *Dendro.dk rapport* 2016:75, Copenhagen.

Hollstein, E. 1980. *Mitteleuropäische Eichenchronologie.* Trierer Grabungen und Forschungen 11. Mainz am Rhein.

Tyers, I.G., 1997. Dendro for Windows Program Guide, *ARCUS Report* 340, Sheffield.

van Daalen, S. & van der Beek, J., 2003. *"So long, and thanks for all the fish" - the dating and provenancing of all timbers of a 18th century fish carrier*. Thesis: Chair Group of Forest Ecology and Management AV 2003-11: F 500 753. May 2003

Catalogue

Filename	sample title and number	rings	start yr.	end yr.	pith	sapwood	bark?	Conversion	extra end	Ave. ring width mm	Interpretation / felling
Z3050019	Læderstræde Copenhagen KBM4466 st5019 pd11 ship plank QUSP	132	AD1520	AD1651	G	18	N	R	S1	1.47	AD1652-58
	Læderstræde Copenhagen KBM4466 st5022 pd9 pæl										*Alnus* sp, alder

Conversion: R = radial split plank, T = tangential plank, W = whole timber, S = squared whole timber, H = half timber, Q = quarter timber, O = other conversion.
Pith: C = centre, V = less than 5 rings, F = 5 – 10 rings, G = greater than 10 rings.
QUSP = *Quercus sp*., oak. PISY = *Pinus sp*., pine. PCAB = *Picea sp/Larix sp*., spruce/larch. ABAL = *Abies sp*., fir. FASY = *Fagus* sp., beech

Aoife Daly, Ph.D. 14 January 2022

When quoting these results please add the following:

in publication bibliography/literature lists:	Daly, Aoife, 2022. Dendrochronological analysis of timbers found during excavations in Læderstræde, Copenhagen. *dendro.dk report* 2022:2, Copenhagen.
In blogs and social media:	*dendro.dk report* 2022:2