

THE MYSTERY WRECK, HAMPSHIRE TREE-RING ANALYSIS AND WOOD IDENTIFICATION OF SHIP TIMBERS

SCIENTIFIC DATING REPORT

Nigel Nayling



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HAMPSHIRE**

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SHIP TIMBERS**

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NGR: nr SZ 675 937

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ISSN 1749-8775

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SUMMARY

This report summarises work undertaken to assess and sample *in situ* timbers of a wreck known as the Mystery Wreck, lying underwater in the eastern Solent, Hampshire, with a view to providing a precise dendrochronological date and anatomical wood identification of non-oak timbers, to assist in characterising, and possibly identifying the wreck. Samples were taken from ceiling planks, framing timbers, and outer hull planks during diving operations in 2008 and 2009. No absolute dendrochronological dates were produced from the ring-width series derived from oak tree-ring samples. Non-oak timbers were identified as elm, larch/spruce and ebony.

CONTRIBUTORS

Nigel Nayling

ACKNOWLEDGEMENTS

I am most grateful to the Hampshire and Wight Trust for Maritime Archaeology and members of the SolMAP dive team for assistance with the sampling. Peter Gasson, of the Jodrell Laboratory, Royal Botanic Gardens, Kew undertook identification of selected non-native hardwood samples. This study was commissioned and funded by English Heritage. Peter Marshall and Cathy Tyers provided useful comments on early drafts.

ARCHIVE LOCATION

Hampshire Museums Service
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DATE OF INVESTIGATION

2008–10

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INTRODUCTION

This document is a technical archive report on the tree-ring analysis and wood identification of samples taken from a wreck provisionally named the 'Mystery Wreck' located off Horsetail Sands in the Eastern Solent, Hampshire (Fig 1). The site lies within an area licensed for aggregate extraction, and has been the subject of study by the Hampshire and Wight Trust for Maritime Archaeology for a number of years under the 'Eastern Solent Marine Archaeological Project' (SolMAP). The aims of this study are to assist in the characterisation of the wreck through analysis of recovered tree-ring samples and anatomical identification of wood samples

METHODOLOGY

The site was dived on a number of occasions by the author during the 2008 and 2009 seasons. Assistance was provided by fellow members of the dive team forming the SolMAP team for that year. Diving was undertaken using standard scuba equipment and samples recovered using hand saws. In a number of instances, loose or displaced parts of framing timbers were recovered entire for subsequent sub sampling. In all cases samples for dendrochronological analysis were only taken where the timber appeared to be oak and a sufficient number of rings appeared to be present. Smaller samples were also recovered from selected timbers which appeared to be derived from non-oak tree species. The locations of samples were marked on interim site plans and sample record sheets completed for each sample.

Prior to measurement, the dendrochronology samples were cleaned with razor blades to expose the fullest ring sequence. Those samples which retained sufficient rings for analysis (i.e. a minimum of 50 rings) were then measured. In the case of slice samples which comprised half or more of the complete cross-section of the parent tree, two radii were usually measured. The complete sequences of growth rings in the samples that were selected for dating purposes were measured to an accuracy of 0.01 mm using a micro-computer based travelling stage (Tyers 2004). Cross-correlation algorithms (Baillie and Pilcher 1973; Munro 1984) were employed to search for positions where the ring sequences were highly correlated. The ring sequences were plotted electronically and exported to a computer graphics software package (Adobe Illustrator CS3) to enable visual comparisons to be made between sequences.

Thin sections of the transverse, radial, and tangential faces of non-oak wood samples were mounted on glass slides and examined microscopically. Anatomical features were compared with wood anatomy atlases (Schweingruber, 1978), reference collections and electronic databases (Brazier and Franklin 1961, IAWA Committee 1989, Richter and Dallwitz 2000). A substantial proportion of the wood samples taken exhibited common anatomical features suggestive of a single non-native hardwood. Two samples from this group were sent to Peter Gasson at the Jodrell Laboratory, Royal Botanic Gardens, Kew for comparison with the extensive reference collection held at Kew

RESULTS

Details of the samples recovered and the results of any subsequent analyses are summarised in Table 1. The position of samples taken from the two main sections of the wreck is shown in Figures 2 and 3. Thirteen of the oak (*Quercus* spp) samples had sufficient rings for measurement and tree-ring width series were measured for these. Two samples (**UNID08_S04** and **UNID09_S30**), taken from opposing ends of the same framing timber (Figure 2) cross-matched with a high computer correlation ($t=12.9$). Two further samples (**UNID08_S14** and **UNID08_S17**) cross-matched with a significant computer correlation ($t=5.9$). Individual sequences were compared with oak ring-width means from Britain and Ireland without success. They were then compared with tree-ring chronologies available through the International Tree Ring Data Bank, again without success.

Non-oak timbers were identified as larch/spruce, elm and ebony (see Table 1). Differential shading of individual timbers in figures 2 and 3 show identifications made either during dendrochronological analysis of oak samples, or following microscopic wood identification of non-oak species. Samples from two non-native hardwood timbers, outer hull plank A265 (**UNID09_028**) and frame A238 (**UNID09_S054**) were identified by Peter Gasson at the Jodrell Laboratory, Kew as matching reference collection material of *Diospyros* sp., ebony. A further 14 samples are identified as ebony as their thin sections exhibited numerous common wood anatomical features with the two samples examined at Kew. Timbers identified as ebony include a ceiling plank and some frames, although the majority were hull planks. Identified softwood elements comprised one of two posts observed protruding through stringers on the eastern section of the ship (**UNID08_S22**), and ceiling plank A263 (**UNID09_S024**), again from the eastern section. Thirteen samples were identified as elm, *Ulmus* spp., including stringers and hull planks from the western section (Figure 3).

DISCUSSION

A range of complementary studies including materials analysis and historical research suggests the vessel may be the Flower Of Ugie, a ship constructed in the North-East of England. A Lloyds Survey Reports for this ship states that the floors and futtocks were made from English, African and 'a little' French oak; that the bulk of the outer planking was African Oak, with some English and 'foreign white oak', except for the outer planking between the keel and 1st futtock heads which was American elm. The ceilings are listed as African Oak and a little French Oak. (Julian Whitewright pers comm). If usage of the term 'African Oak' can be equated with ebony, then this description is consistent with the results of wood identification.

Given the implied diversity of sources for the oaks employed in the ship's construction, it is unsurprising that it proved impossible to construct a site tree-ring master, and that no absolute dating was achieved. During fieldwork, all exposed oak timbers (which

comprised the majority of the framing timbers) were assessed on the seabed and all those which appeared to have sufficient rings were sampled. The vast majority of frames however were derived from fast-grown oaks with insufficient rings for tree-ring analysis.

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FIGURES

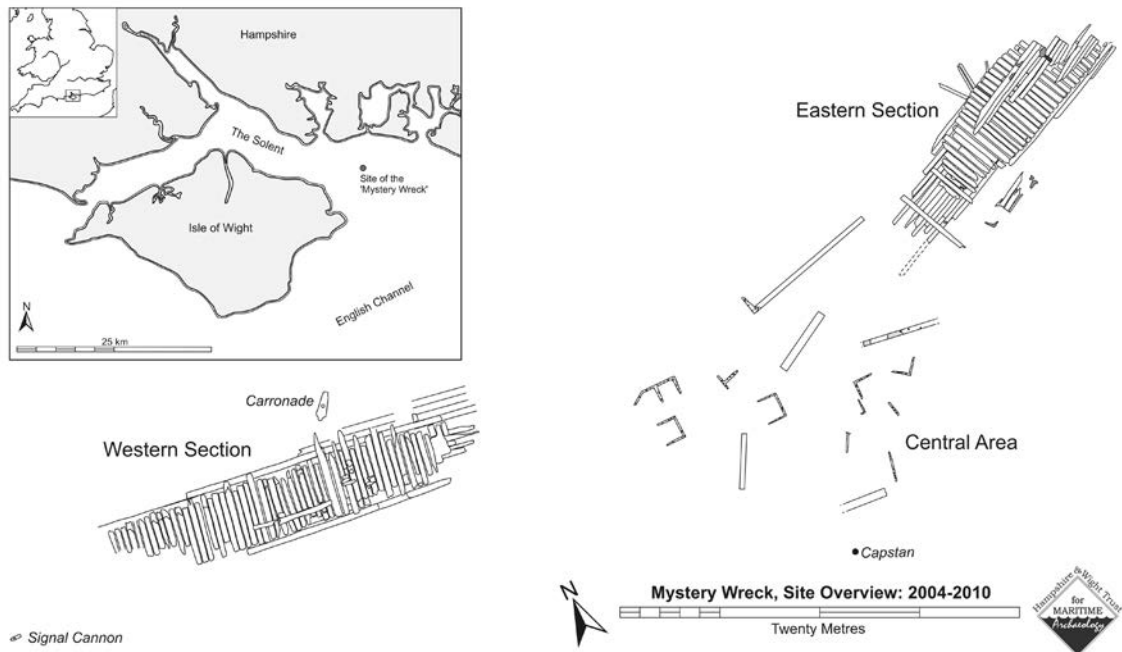


Figure 1 Location and site plans for the Mystery Wreck. Hampshire and Wight Trust for Maritime Archaeology ©

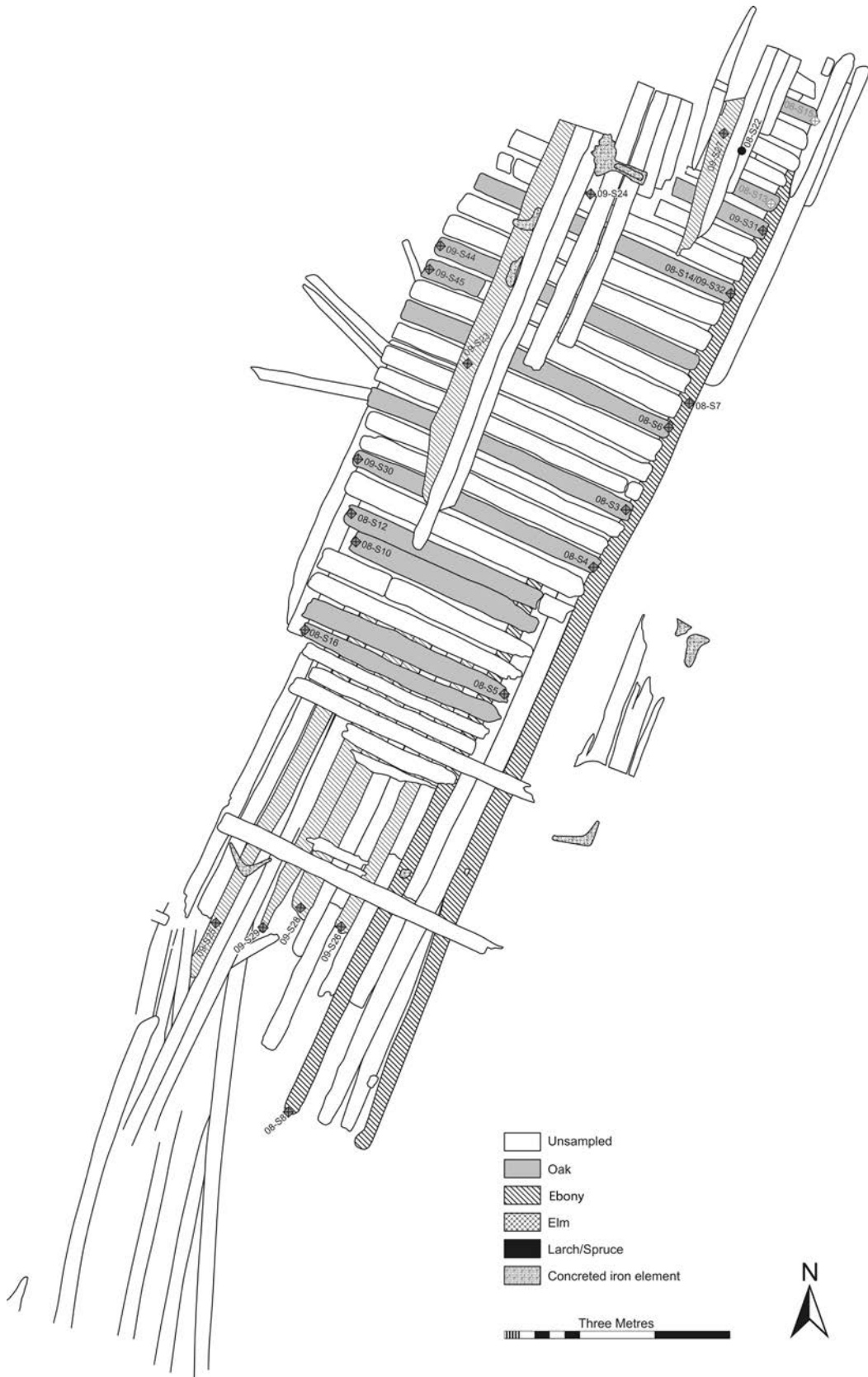


Figure 2 Location of wood samples taken on the eastern section, and results of species identifications. Hampshire and Wight Trust for Maritime Archaeology ©

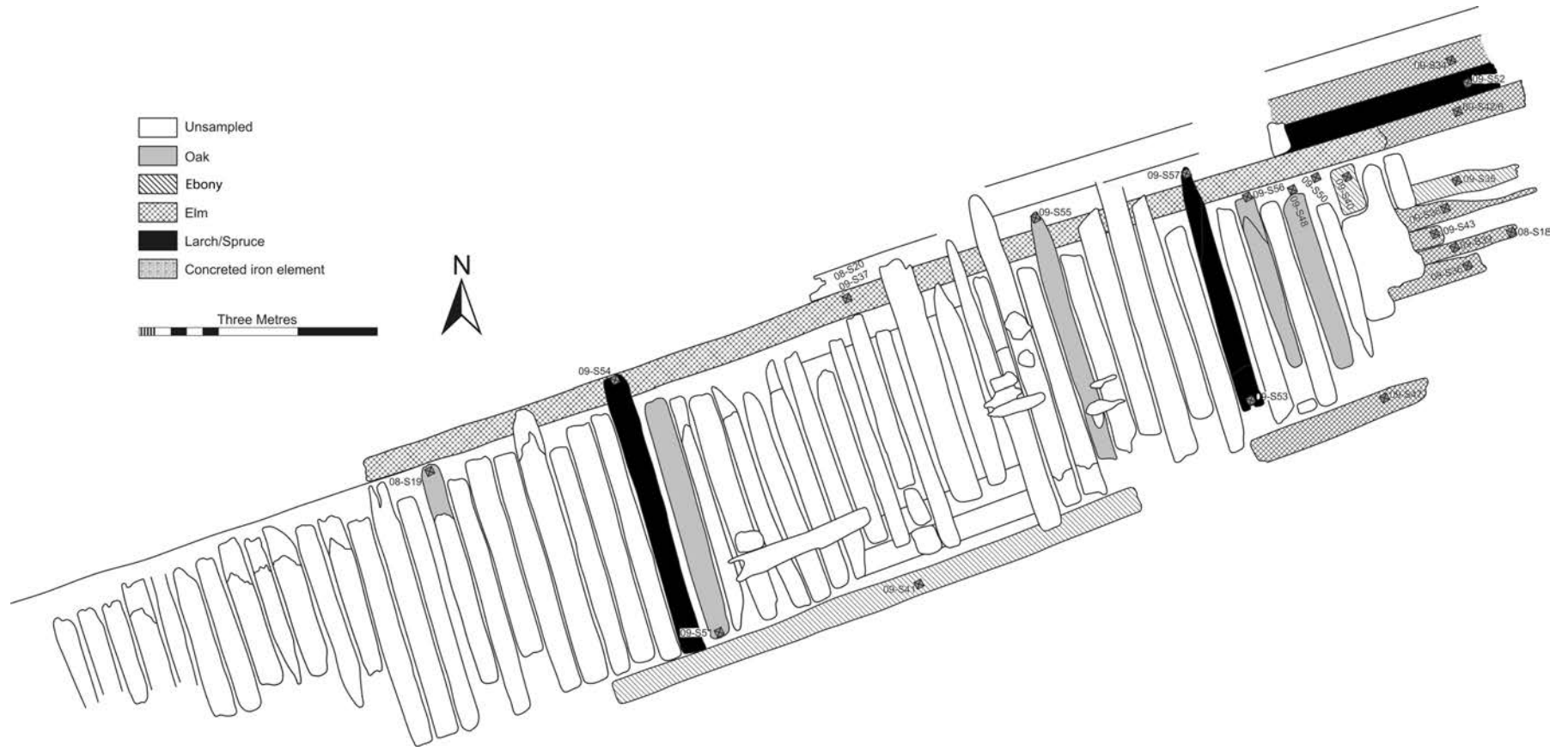


Figure 3 Location of wood samples taken on the western section. Hampshire and Wight Trust for Maritime Archaeology ©

TABLES

Table 1 Sample details, Mystery Wreck

Sample Code	Comments	Conversion	Dimensions	Species	Total Rings	Sapwood	ARW	Dating
UNID08_S01	Non-oak displaced plank recovered near western end of eastern section with copper sheathing recovered in entirety. Not available during analysis							
UNID08_S02	Non-oak ceiling plank, eastern section. Wood identification sample			Ebony, <i>Diospyros</i> sp.*				
UNID08_S03	Southern end of framing timber from eastern section	Halved	185 x 65	Oak	50	11	2.36	Undated
UNID08_S04	Southern end of framing timber from eastern section	Tangential	170 x 90	Oak	68	13	2.33	Correlates with S30
UNID08_S05	Framing timber, eastern section	Halved	200 x 70	Oak	50	-	2.15	Undated
UNID08_S06	Framing timber, eastern end of eastern section	Halved	230 x 58	Oak	33	14+B	2.82	Undated
UNID08_S07	Outer hull plank below the framing timber sample 6			Ebony, <i>Diospyros</i> sp.*				
UNID08_S08	Western end of an outer hull plank with copper sheathing, eastern section			Ebony, <i>Diospyros</i> sp.*				
UNID08_S10	Framing timber, eastern section	Halved	230 x 85	Oak	40	HS	3.10	Unmeasured
UNID08_S11	Framing timber, eastern section. Oak treenail 30mm diameter	Halved	175 x 90	Oak	12		7.5	Unmeasured
UNID08_S12	Remnant of scarfed framing timber, eastern section. Very knotty.	Halved	240 x 65	Oak	Not counted		-	Unmeasured
UNID08_S13	Grab sample of scarfed framing timber, eastern section	Tangential	140 x 50	Oak	36		3.0	Unmeasured
UNID08_S14	Framing timber, eastern section	Halved	230 x 50	Oak	49	16+?B	1.37	Undated
UNID08_S15	Framing timber, eastern section	Halved	185 x 85	Oak	50	8+10s	1.76	Undated
UNID08_S16	Grab sample of scarfed framing timber,	Halved	250 x 60	Oak	40	10	2.8	Unmeasured

Sample Code	Comments	Conversion	Dimensions	Species	Total Rings	Sapwood	ARW	Dating
	eastern section							
UNID08_S17	Grab sample of scarfed framing timber. Western section. 35mm diameter treenail	Halved	280 x 110	Oak	54	9	2.11	Undated
UNID08_S18	Hull plank at eastern and of western section			Elm (<i>Ulmus</i> sp.)	-			
UNID08_S19	Grab sample of scarfed framing timber, western section			Oak	<50			
UNID08_S20	Stringer, western section		-	Elm (<i>Ulmus</i> sp.)				
UNID08_S21	Framing timber, western section	Radial	230 x 20	Oak	59	+HS+15s	1.67	Undated
UNID08_S22	One of two posts through ceiling planks	Whole	125mm diameter	Larch/Spruce? Larix/Picea	40		2.09	
UNID09_S023	Ceiling Plank A264, eastern section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S024	Ceiling Plank A263, eastern section			Larch/Spruce? Larix/Picea				
UNID09_S025	Hull Plank A210, eastern section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S026	Hull Plank A213, eastern section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S027	Ceiling Plank A216, eastern section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S028	Hull Plank A265, eastern section			Ebony, <i>Diospyros</i> sp.**				
UNID09_S029	Hull Plank A211, eastern section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S030	Frame A205, eastern section	Halved	240 x 95	Oak	66	13+?B	2.25	Correlates with S04
UNID09_S031	Frame A295, eastern section	Halved	200 x 55	Oak	40	20	1.75	Unmeasured
UNID09_S032	Frame A260, eastern section	Halved?	126 x 115	Oak	40	20	2.75	Unmeasured
UNID09_S033	Frame, eastern section	Halved	200 x 55	Oak	40	20	1.75	Unmeasured

Sample Code	Comments	Conversion	Dimensions	Species	Total Rings	Sapwood	ARW	Dating
UNID09_S034	Hull Plank A267, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S035	Hull Plank A225, western section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S036	Hull Plank A223, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S037	Hull Plank A228, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S038	Hull Plank A269, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S039	Hull Plank A249, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S040	Hull Plank/Frame A226, western section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S041	Stringer A229, western section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S042	Hull Plank A227, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S043	Hull Plank A224, western section			Elm (<i>Ulmus</i> sp.)				
UNID09_S044	Frame A261, eastern section	Halved	270 x 115	Oak	103	13	1.21	-
UNID09_S045	Frame, west of adjacent frame to A261, eastern section	Halved	155 x 90	Oak	84	-	1.45	-
UNID09_S046	Hull Plank A227, western section							
UNID09_S047	Hull Plank/Stringer A229, west section			Elm (<i>Ulmus</i> sp.)				
UNID09_S048	Frame A262, western section	Tangential	270 x 50	Oak	100	-	1.34	-
UNID09_S051	Frame A254, western section	Tangential	250 x 25	Oak	21	-	3.10	
UNID09_S052	Hull Plank A268, western section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S053	Frame A290, western section			Ebony, <i>Diospyros</i> sp.*				
UNID09_S054	Frame A238, western section			Ebony, <i>Diospyros</i> sp.**				
UNID09_S055	Frame M290, western section	Whole	330 x 125	Oak	75	-	2.34	-
UNID09_S056	Frame A255, western section	Halved	280 x 50	Oak	45	-	4.5	
UNID09_S057	Frame A290, western section			Ebony, <i>Diospyros</i> sp.*				

Total rings = all measured rings ARW = average ring width of the measured rings. Sapwood: ++½Bs = plus unmeasured partial ring before bark edge indicating felling in spring/early summer. +B = bark edge, +?HS = possible heartwood/sapwood boundary. Two wood identification samples identified as ebony, *Diospyros* sp., and marked with a double asterisk were matched against reference material at the Jodrell Laboratory, Kew by Peter Gasson. The remainder of the timber samples given this identification were made by the author through identification of common anatomical features.



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