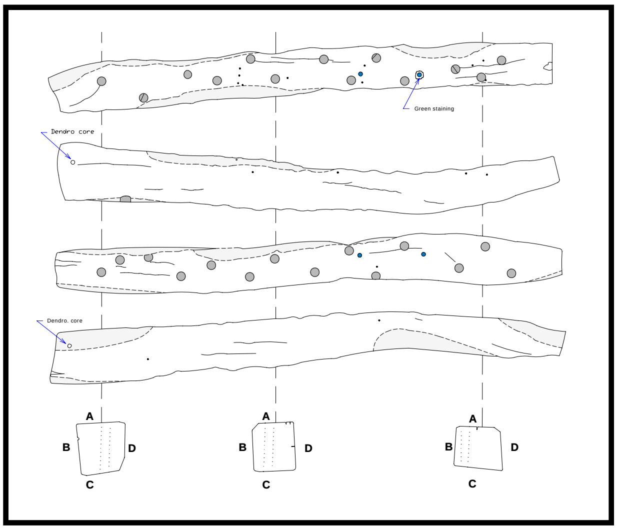
Hayle Timber Report



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INTRODUCTION

Early in 2005, the Cornwall Archaeological Unit contacted the Cornwall & Isles of Scilly Maritime Archaeology Society and requested that they record a group of suspected ships' timbers. These timbers were in the possession of Mr. Tony Fisher, a general builder based in Hayle, Cornwall. Prior to this, the timbers had been inspected by Nigel Nayling who took core samples from the timbers in order to date them using dendrochronology. Unfortunately, there were insufficient growth rings to enable a date to be established. Mr. Nayling was however able to confirm that the timbers had originated from a ship and that all six timbers were oak[*].

BACKGROUND

ORIGIN OF TIMBERS

We were informed by Mr Fisher that all six timbers had been removed from the *Tyringham Arms Public House* in Lelant Downs during renovation work undertaken by him in the late 1990s. Mr Fisher intends to incorporate the timbers as a 'feature' in future building work. Two of the timbers are significantly larger than the other four and were employed as lintels in the building when found. The four smaller timbers were apparently used as packing pieces.

BUILDING HISTORY

The *Tyringham Arms*, from which the timbers were removed, was previously the *Trevarrack County Primary School* and an original dedication stone is still in place on the building's exterior which reads:

"*Trevarrack Board School 1879*"

Assuming the timbers were part of the original building then the vessel from which they came was salvaged prior to 1879. This build date is corroborated by early Ordnance Survey Maps - a map of the area produced in 1877 shows no building at this location; not until a later map of 1908 is the *Trevarrack County Primary School* shown[**].

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[*] Personnel correspondence between Nigel Nayling and Kevin Camidge
[**] Ordnance Survey maps sheet No. LXVIII (1877,1908, 1865 & 1987)

METHODOLOGY

SURVEY TECHNIQUES

Due to a limitation on the amount of time that could be spent with the timbers – we were only permitted accompanied access - it was deemed impractical to draw them using a planning frame. Instead, an alternative method was employed which has been used successfully during previous timber surveys. This technique initially replaces a planning frame with a sheet of clear polythene, thick enough to be secure against accidental tearing and elongation but thin enough to be readily transparent.

This polythene sheeting was laid over each face of the timber being drawn and a permanent marker used to 'trace' both a general outline and any significant details onto the polythene. This method produced full scale depictions of each timber, which were later planned onto drafting film at a scale of 1:5 by placing the polythene sheets over a board, marked with 5 cm squares. These plans were then scanned into AutoCAD as bitmaps and traced before being rescaled into full-size images within the software.

ANALYISIS OF THE TECHNIQUE

This technique, although far less time consuming during the initial drawing, does have drawbacks and poses noticeable limitations. As the subject to be surveyed is effectively being drawn twice before being digitized, there is a greater opportunity for errors to occur. This is especially true for small fastenings such as trenails. What is more, as the polythene sheeting is flexible, distortion can occur if the sheet is not kept taut and flat. If the sheet is allowed to follow any curves or chamfers, the resultant image will be slightly elongated. Discrepancies of this nature are not always easily identified and can prove time consuming and complex to correct if access to the subject is not a practical consideration.

It was thus important that a range of detailed notations were made in conjunction with the tracing: i.e. length; width at numerous points, and the proportions of any significant details. These dimensions were later consulted to ensure accuracy and moreover proved invaluable when correcting any erroneous artefacts.

THE TIMBERS

CONDITION OF TIMBERS

Other than some minor peripheral rot present on all six timbers, they appear to be in sound condition - displaying only very limited signs of wood-worm infestation and slight splitting along the timbers' grain. There is also evidence of more recent human activity, such as: the timbers have been sawn down from their original length; iron nails which do not appear to be part of the original vessel's construction, and some Portland cement staining discernable on several of the timbers.

TRENAILS

All six of the timbers include trenails or trenail holes, all of which are 32mm in diameter. These trenails – which are essentially wooden dowels - were originally in place to secure the ships planking to the framing timbers. The technique by which they were fitted was straightforward and involved the components to be joined being placed together and then bored through with an auger of the same diameter as the trenail. The trenail was then driven through this hole until flush on one side and protruding from the other, slots would then have been cut in the end of the trenail and wedges driven in thus expanding the trenail within its hole[2].

PLANKING TIMBERS

The four smaller timbers are shortened sections of ships planking; each being approximately 0.40m long, 0.20m wide and 0.05m thick. There are two types of fastening visible on the planking timbers, trenails and copper nails. The copper nails are visible on each of the planking timbers, but only on one side. A black, bituminous material is also present on all of these planking timbers, again only on one side – the same side as the copper nails.

FRAME TIMBERS

Of the six timbers, the two largest (both being approximately 2m long and 0.20m in cross section) almost certainly originated from the vessel's frame. This conclusion is supported by the timbers' size, form and the presence of trenails and iron fastenings running through the timbers.

The iron fastenings present on both frame timbers would have been employed to fasten together the futtocks, floor timbers and toptimbers, forming the vessel's frame[1] (see pg 4). All the iron bolts present are 15mm in diameter.

Small ferrous nails are also visible protruding from both of the frame timbers; these are likely to have been added to the timbers as a result of their reuse in the late 19th century.

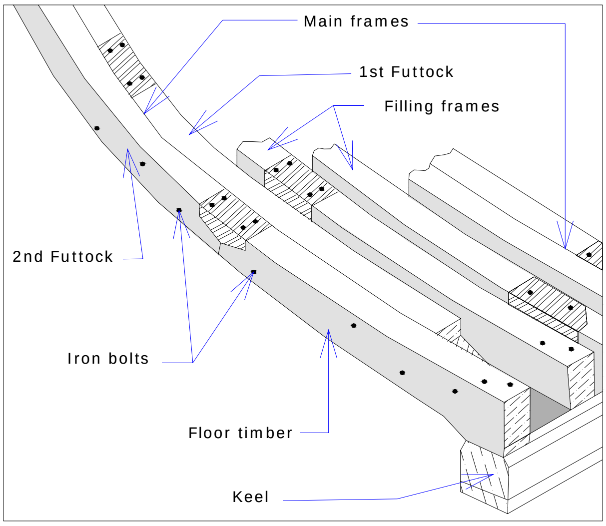
THE DIMENSIONS

The dimensions of all six timbers are listed below – primarily for the purpose of comparison to the dimensions of timbers known to have been utilised in the construction of other vessels. All dimensions shown are in millimetres (mm).

		Timber I	*Timber II*
Sided at middle	-	156	172
Moulded at Middle	-	183	177
Linear Length	-	1890	2010

		Timber III	*Timber IV*	*Timber V*	*Timber VI*
Thickness of plank	-	59	50	51	49
Breadth of plank	-	175	178	189	187
Length of section	-	387	386	373	374

TIMBER FRAME CONSTRUCTION



Example of ship frame construction.

Although being constantly developed, the principles of timber frame construction remained the same for several hundred years. This framing system used double (or main) frames - spaced equal distances apart with (usually) two filling frames between. A main frame would consist of two 'slices', with one half comprising of the floor timber, second futtock (forth futtock*) and lengthening piece – whilst the other half would consist of the first futtock (third futtock) and toptimber[7]. These component timbers would have been secured to each other, and the keel with iron or copper alloy fastenings – depending on the period. Fill timbers were not bolted together into main frames. The size of the timbers used varied greatly depending on the size of the vessel.

The Naval Cutter *Alert* - which was constructed in 1777 - was a vessel 70 feet in length. The size of the timbers and fastenings utilised in the construction of her frame – and the dimensions of her planking – are shown below[8] for comparison with those of the Hayle timbers. It is apparent that the Hayle timbers are slightly smaller than those of the *Alert*. All dimensions shown are in millimetres (mm).

	Floor Timber	*1st Futtock*	*2nd Futtock*	*Toptimber*
Sided at middle -	235	215	203	203
Moulded at Scarf Joint -	*	*	*	140

Thickness of planking – from 51 to 76**
Breadth of planking - from 254 to 304

Diameter of fastening bolts - 13

* The number of futtocks utilised varied depending on the size of the vessel.
** Size of planking used dependant on its position on the vessel.

METHODS OF HULL PROTECTION

THE PROBLEM OF SHIP-WORM

One factor which seriously threatened the integrity of wooden ships prior to the 19th century was ship-worm. The devastating effects of ship-worm are well documented; an infestation could leave a vessels structure honeycombed, greatly reducing its strength[3].

Substances such as tar had been used since the Tudor period to coat ship's hulls in an attempt to poison the worm and prevent such damage. Vessels posted to warmer climates – where ship-worm was more active – also had thin wooden sheathing fastened to their hull as a further means of protection[3].

Whether or not these methods made any substantial difference is hard to establish and the problem was certainly not alleviated completely.

THE INTRODUCTION OF METAL SHEATHING

It was in 1674 that further attempts to palliate the problem were made. Several trials investigated the possibility of using lead sheathing – though they were all deemed disastrous. Unfortunately, the corrosion which occurred between the lead sheathing and the iron nails which fastened it soon resulted in the rapid decay of the nails. Furthermore, the additional weight imparted onto the vessels slowed them considerably[3].

The use of copper sheathing was suggested as early as 1708[3]; however a similar – and in fact far more severe - reaction occurred between the copper and iron. It was not until 1761 that more experimentation with copper sheathing was undertaken by the Admiralty, this time utilising copper nails to fasten it rather than ferrous ones. Numerous vessels were sheathed in this way with some degree of success[4], though as a copper alloy had not yet been found that was strong enough to replace the iron bolts which fastened together the ships frame, iron bolts had to remain in use which resulted in their rapid corrosion. In an attempt to offset this problem tar, horse hair and paper were still applied before the copper sheathing in an effort to prevent the decay of the iron bolts[5]. This layer was also used to help prevent ship-worm infestation should the copper sheathing be dislodged.

In the late 1770's it was decided that copper sheathing was the only method which met the demands of the fleet, not only as it prevented ship-worm but also as it reduced the amount of marine growth on the hull. Both reducing the need for careening* and increasing a ship's speed[3]. By 1783 a suitable copper alloy had been found to replace iron bolts and by 1786 it was decided by the admiralty that all ships should be re-bolted, despite the expense[4].

EXPLANATION OF GALVANIC CORROSION

Often referred to as 'dissimilar metal' corrosion, galvanic corrosion is the degradation prompted by the presence of two or more dissimilar metals in an electrolyte* such as sea-water. If these dissimilar metals are in electrical contact – though not necessarily in direct physical contact – a galvanic couple is formed comprising of an anode and a cathode. The lesser noble of the materials

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* *Careening* – the term given to the removal of marine growth from a ship's hull by way of burning & scrapping
* *Electrolyte* – a liquid which can be decomposed by electrolysis

forms the anode which corrodes quicker than it otherwise would when submersed, whilst the metal of greater nobility forms a cathode which decays slower than it would independently[6].

ANALYSIS

Assuming the timbers were part of the original construction of the Tyringham Arms, we can be confident that they were salvaged prior to 1879.

The presence of iron fastenings *and* the evidence of copper sheathing could indicate that the timbers did not all originate from the same vessel. There are however several other explanations. The frame timbers may have originated from above the ships water line, where copper sheathing would not have been present. Vessels are known to have been constructed in this fashion. The timbers may originate from a vessel employing both copper sheathing and iron fastening bolts throughout – though the number of vessels that did so are limited. Finally, the copper nails may have been used to secure some other form of sheathing. This however is unlikely as it was common practice to use iron nails for fixing earlier lead or timber sheathing in place.

The similarities between the dimensions of these six timbers and the timbers utilised in the construction of the *Alert*, allows us to suggest that the vessel from which these timbers originated would have been slightly shorter in length than the *Alert*.

CONCLUSIONS

As nothing is known for certain about the timbers previous to their removal from the Tyringham Arms, much of that which can be deduced about the vessel from which they originated might be considered little more than hypothesis.

The matching trenail diameters on both the planking and frame timbers imply that they may have come from the same vessel. If this is the case it can be estimated that the vessel was constructed in the mid to late 18th century (post 1761), after the introduction of copper sheathing.

Considering the comparative dimensions of the Hayle timbers and timbers utilised in the construction of the *Alert*– I believe we can plausibly approximate that the vessel from which these timbers originated was seventy feet or less.

ACKNOWLEDGEMENTS

I would like to sincerely thank Kevin Camidge and Honor Thorley for the invaluable part they played in surveying these timbers - and Mr. Tony Fisher for his time and patience whilst we did so. I would also like to thank the owners of the *Tyringham Arms* for aiding me in my research and for allowing me to photograph their property. I also extend my genuine appreciation to the staff of both the Cornish Studies Library (Redruth) and the Bartlet Library (National Maritime Museum Falmouth).

APPENDIX I: PHOTOGRAPHIC RECORD

TIMBER I

ABOVE: Inboard Face (lower) and Face B (uppermost) of Timber I.
BELOW: Outboard Face (lower) and Face D (uppermost) of Timber I.

TIMBER II

Timber II
Face D

Timber II
Outboard face

TIMBERS III - VI

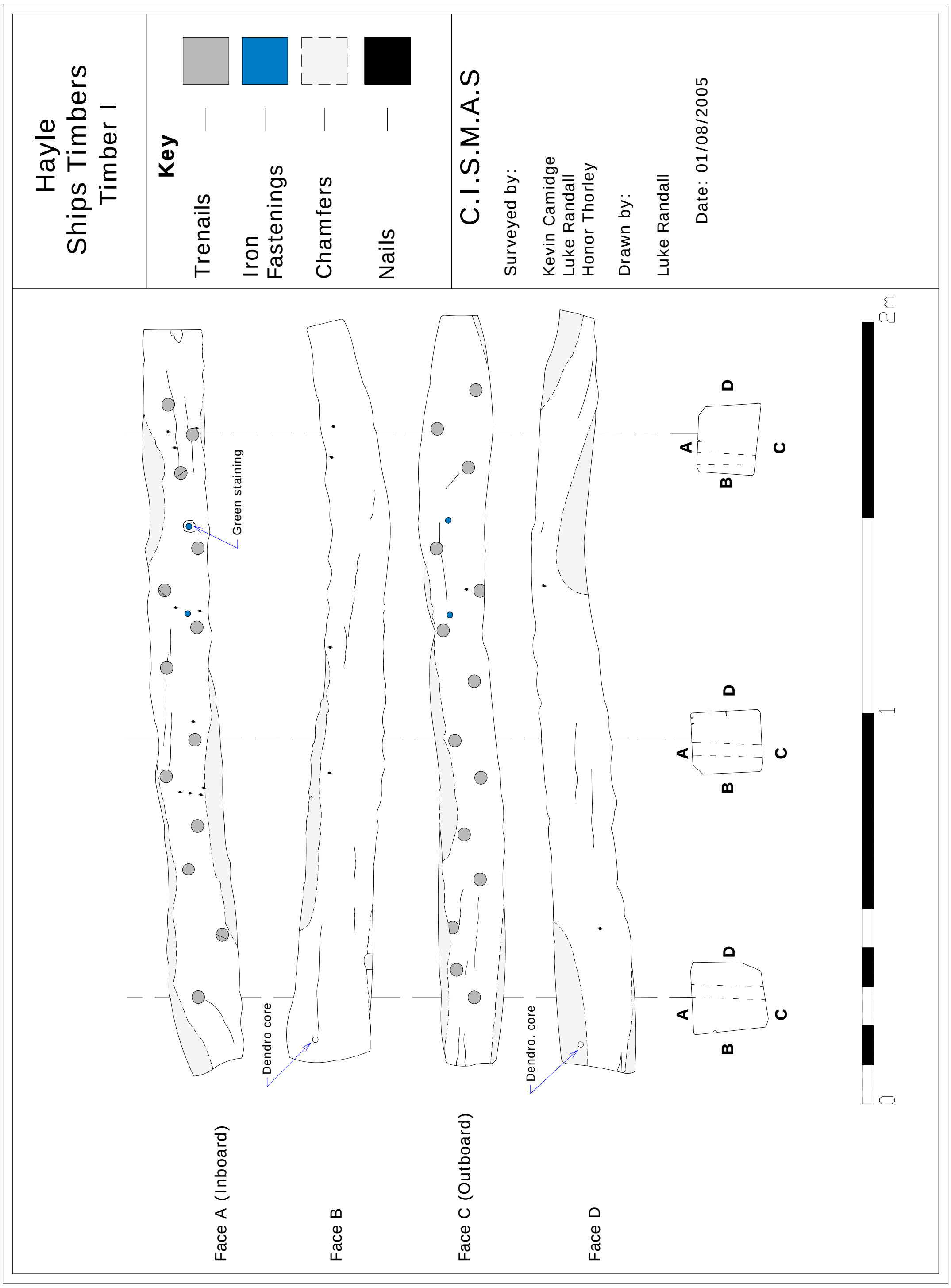
Timber III

Top right to bottom right clockwise - Timber IV, Timber VI,
Timber V, Timber III.

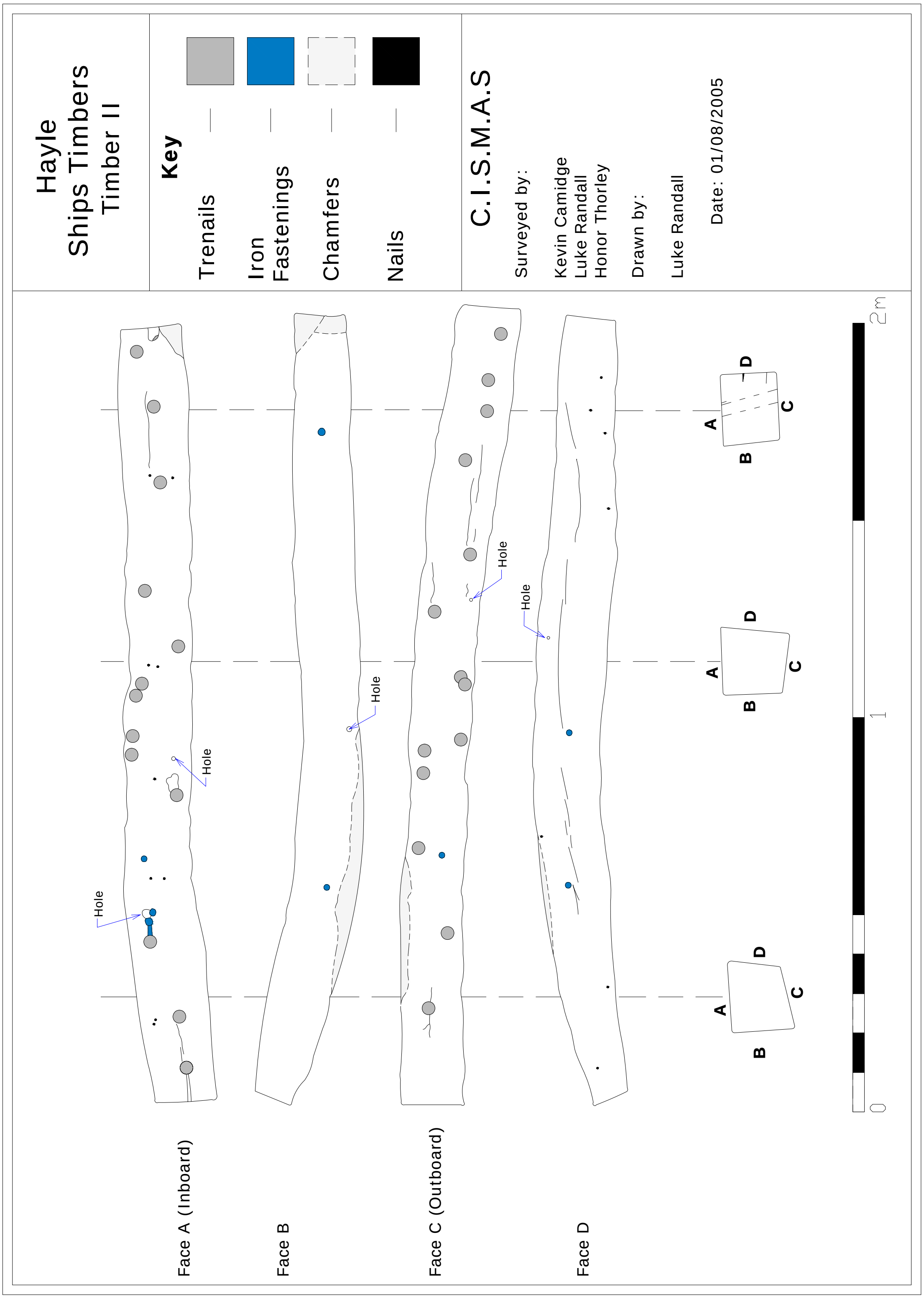
THE TYRINGHAM ARMS

APPENDIX II: THE DRAWINGS

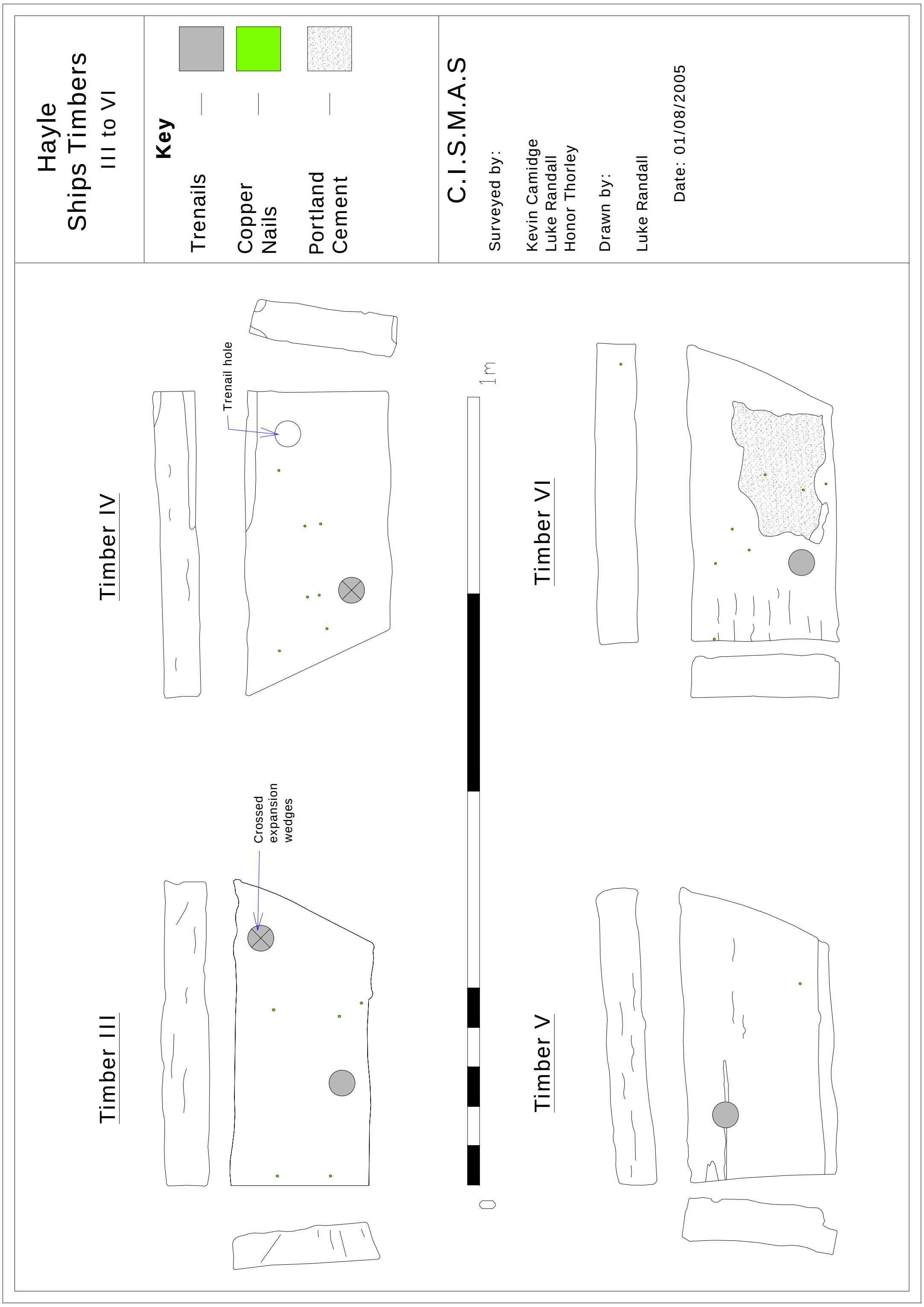
TIMBER I



TIMBER II


Hayle
Ships Timbers
Timber II
Key
Trenails
Iron Fastenings
Chamfers
Nails
C.I.S.M.A.S
Surveyed by:
Kevin Camidge
Luke Randall
Honor Thorley
Drawn by:
Luke Randall
Date: 01/08/2005
Face A (Inboard)
Face B
Face C (Outboard)
Face D
Hole
A
B
C
D
0
1
2m

TIMBERS III - VI



APPENDIX III: SOURCE NOTES

The Construction and Fitting of the English Man of War 1650 - 1850
Peter Goodwin

1 – *Frame Construction* P 16

2 – *Trenails* P 60

3 –*Methods of Protection* P 226 - 227

The Arming and Fitting of British Ships of War 1600 – 1825
Bryan Lavery

4 – *The Success of Copper* P 64

5 – *Replacing the Bolts* P 65

www.corrosion-doctors.org

6 – *Galvanic Corrosion or Dissimilar Metal Corrosion*

The Naval Cutter 'Alert' 1771 (Anatomy of the Ship Series)
Peter Goodwin

7 – *Construction* P 12 – 13

8 – *Principle dimensions and scantlings for the Alert* P 24