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The *London* protected wreck, The Nore, off Southend-on-Sea, Thames Estuary, Essex: Wood identifications and recording of wooden remains recovered between 2014 and 2016

Zoë Hazell and Emma Aitken

Discovery, Innovation and Science in the Historic Environment



THE *LONDON* PROTECTED WRECK
THE NORE, off SOUTHEND-ON-SEA
THAMES ESTUARY, ESSEX

Wood identifications and recording of wooden remains recovered
between 2014 and 2016

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SUMMARY

Nearly 300 wood identifications were carried out on wooden artefacts recovered from the wreck of the *London* during phases of surface recovery and archaeological excavation between 2014 and 2016. A total of 16 wood (/wood group) types were identified, of which 14 were hardwoods and two were softwoods. Patterns of wood selection preferences for some of the artefact types have been recognised, in particular for the handspikes and pulley blocks. Wood choices likely reflect characteristics of the wood types themselves (for example, ease of working, comfort in use) as well as their availability.

ACKNOWLEDGEMENTS

Many thanks to A. Middleton for her assistance with – and valuable discussions about – the artefacts, and to G. Campbell for her help confirming some of the identifications. Thanks to Historic England for the funding and to Cotswold Archaeology for managing the project. Thanks also to Cotswold Archaeology for allowing E. Aitken the time spent as a work-based training placement with Z. Hazell at Fort Cumberland.

ARCHIVE LOCATION

The archive will be deposited with Southend Museum Services. Please note that at the time of writing (Autumn 2018), the assemblage was still being worked on and held at Historic England, Fort Cumberland, Portsmouth and – in the case of the gun carriage – at York Archaeological Trust, York; so has not yet been deposited.

DATE OF RESEARCH

2016 to 2018

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1 INTRODUCTION

The wreck of the *London* is fully submerged in the greater Thames Estuary, off Southend-on-Sea, Essex. It sank in AD1665 following an explosion, and was designated in 2008 under the Protection of Wrecks Act (site ref. 1000088). It is at on-going risk of loss through erosion, and so to mitigate for this, a programme of surface recovery (by the licensing team) and limited excavations (led by Cotswold Archaeology and funded by Historic England) took place from 2014–2016.

A total of around 700 small finds (SFs) have been recovered so far, of which almost half are made of wood. These were first examined and described by Allen (2016a and b) at York Archaeological Trust. Since then, samples have been stored at Fort Cumberland, Portsmouth under the care of A. Middleton (Archaeological Conservator, Historic England) and Eric Nordgren (former Archaeological Conservation Assistant, Historic England).

2 SAMPLE SELECTION

Work on the material took place in phases, starting with those remains/artefacts identified as a priority for analysis. The decision was made for some particularly good examples not to be sub-sampled (i.e. complete, undamaged artefacts), including handspikes: SF3333 and SF3559, and two of the four concreted handspikes comprising SF3558. In addition, SF3469, SF3472, SF3526, SF3527, SF3581 and SF3601 (powder bottles), SF3730 (tuning peg), and SF3342 (pipe stopper) were examined under low power magnification only because they were such good and/or rare examples.

For artefacts that consisted of multiple components – the single and double blocks (with the cheek, sheave(s) and peg) and any paired bodies and lids of powder bottles – the wood of each separate component was examined.

3 SUB-SAMPLING AND IDENTIFICATION METHODS

3.1 Sub-sampling methods

Wood identifications of the artefacts were carried out at Fort Cumberland, Portsmouth. All artefacts were examined initially under low power magnification (x6.3 to x40) using a Leica MS5 microscope. Where possible, thin sections were then taken by hand, using a double-edged razor blade. Care was taken to remove the minimal sample necessary for identification, and as far as possible, samples were taken from discreet and/or already-damaged areas of the artefacts. Ideally, thin sections were taken from the three planes of wood required for secure identifications; the transverse section (TS), radial section

(RS) and the tangential longitudinal section (TLS). Sometimes this was not possible, particularly for the pegs in the pulley blocks. Where no areas conducive to thin section sampling were present, identifications were made from low magnification observations. The thin sections were examined under high power magnification (x100 to x400) using a Leica DM2500.

3.2 Taxonomic identifications

The wood identifications were made using a combination of the texts and keys by Schweingruber (1982) and Gale and Cutler (2000) and the reference material from Historic England's *Wood and Charcoal Reference Collection* (held at Fort Cumberland, Portsmouth, England). As far as possible, identifications were made to genus level, as is standard practice for identifications made on the basis of microscopic anatomical features. Exceptions to this are as follows:

- The wood taxonomy type *Populus/Salix* (poplar/willow) was used as it is not possible to reliably distinguish between these two genera on the basis of their microscopic wood anatomical features.
- The Maloideae (Pomoideae) group consists of the Pomaceous fruits, and includes: *Crataegus* (hawthorn), *Cotoneaster* (Cotoneasters), *Pyrus* (pears), *Malus* (apples) and *Sorbus* (whitebeams); these cannot be readily distinguished on the basis of their wood anatomy.
- Betulaceae: this refers to the Birch family, which includes *Betula* (birch), *Alnus* (alder), *Corylus* (hazel) and *Carpinus* (hornbeam). Some could not be identified to genus level, but depending on the selection of taxonomic features visible, it was possible to narrow down some identifications to:
 - a) Betulaceae Group 1 (*Alnus/Betula/Carpinus/Corylus*) where no aggregate rays nor perforation plates were seen/present/preserved,
 - b) Betulaceae Group 2 (*Alnus, Corylus* or *Carpinus*, but not *Betula*) where aggregate rays were seen/present, but no perforation plates were seen
 - c) *Alnus* or *Betula*; this applied to a single artefact, where only limited wood anatomical features were visible (including a diffuse porous structure, and scalariform perforation plates with multiple, narrowly-spaced bars) but it was otherwise too poorly preserved, in particular to be able to count the cell width of the rays.
- Where some of the vessel pattern was visible in the TS, but it was not possible to identify even to family level (for example, if destructive sampling was not appropriate), this is noted; in particular, 'diffuse porous' or 'ring porous' hardwood.

Where a wood identification could not be made with absolute certainty, but it was considered most likely (for example, if most but not all of the diagnostic features could be seen), the result is reported as: cf [taxon].

3.3 Floristic interpretations

Given that the artefacts were recovered from a shipwreck, no inferences about probable species (based on those known to be native to the British Isles) have been made. In terms of the *Castanea* sp. there are no chestnuts native to the British Isles, and the only species native to Europe is *C. sativa* (sweet chestnut). *Juglans* sp. (walnut) is also not native to the British Isles.

4 ADDITIONAL RECORDING OF THE POWDER BOTTLES

4.1 Condition assessment of the powder bottles

A condition assessment was carried out on all the powder bottle¹ remains by A. Middleton and Z. Hazell (see results in Table A1). The categories used are defined in Table 1. The three spouts were classified as Category 2 in order to ensure that they were not omitted from later analyses; despite being only a small part of an artefact, they were a relatively rare find. Where broken-off necks were present within a lid, these have been (re)categorised as Category 3 (i.e. a fragment of a body), having initially been categorised based on the lid's condition (i.e. Category 2). Examples of remains from each of the condition categories are shown in Figure A1 (a to f).

Table 1. Category name and definitions used for the condition assessment of the powder bottles.

| Category name | Definition |
|--------------------|---------------------------------------|
| Category 1 | Complete powder bottle (body and lid) |
| Category 2 - body | (Near) complete |
| Category 2 - lid | (Near) complete |
| Category 2 - spout | (Near) complete |
| Category 3 - body | Fragment |
| Category 3 - lid | Fragment |

4.2 Volumes of the powder bottles

Prior to any conservation, the volume (internal capacity) of the powder bottle bodies was also measured where possible (by E. Aitken)². Only Category 1 and 2 bodies were suitable for this. Broken and incomplete bodies were recorded as such, and for those, volumes are therefore minimum values. In total, volumes of 72 powder bottles were recorded.

¹ Also sometimes known as cartridge or 'Apostle' bottles; used to store the gunpowder for muskets.

² The volume of SF3601 was recorded post-conservation (by A. Middleton) as it had not been available at the initial time of recording; it was undergoing analysis at the University of Southampton.

The carrying capacity was measured by filling the powder bottle body with water, and then measuring the volume of water held, by transferring it into a measuring cylinder. Volumes were recorded to the nearest 1 ml.

5 RESULTS

5.1 Wood identification results

A total of 307 wood identifications were carried out on the material³, of which:

- 7 were duplicates between analysts or sampling phases (either inadvertently, or revising the decision to then destructively sample something that had previously been examined non-destructively);
- 25 identifications – or attempts at identifications – were carried out macroscopically as they could not be destructively sampled. Although sometimes it was not possible to produce a wood identification in this way, it does not preclude successful identifications in the future using alternative methods (e.g. micro-CT scanning);
- the remaining (282) identifications were done using destructive sampling i.e. by removing thin-sections.

In total, 14 hardwood (deciduous) and two softwood (coniferous) taxa/taxonomic groups were recorded (see Table 2).

³ This number does not equate to SF numbers, for reasons explained below.

Table 2. A list of the wood types identified. Details follow Stace (2010).
* = genera not native to the British Isles.

| | Family | Genus | Common name |
|----------------------------|------------------|---------------------------|---|
| Angiosperms (hardwoods) | Aquifoliaceae | <i>Ilex</i> sp. | holly |
| | Betulaceae | <i>Alnus</i> sp. | alder |
| | | <i>Betula</i> sp. | birch |
| | | <i>Carpinus</i> sp. | hornbeam |
| | | <i>Corylus</i> sp. | hazel |
| | Fagaceae | <i>Castanea</i> sp.* | sweet chestnut |
| | | <i>Fagus</i> sp. | beech |
| | | <i>Quercus</i> sp. | oak |
| | Juglandaceae | <i>Juglans</i> sp.* | walnut |
| | Oleaceae | <i>Fraxinus</i> sp. | ash |
| | Rosaceae | Maloideae/Pomoideae | Pomaceous fruits (incl. hawthorn, apple, pear, whitebeam) |
| | Salicaceae | <i>Populus/Salix</i> spp. | poplar/willow |
| | Sapindaceae | <i>Acer</i> sp. | maple |
| Ulmaceae | <i>Ulmus</i> sp. | elm | |
| Gymnosperms (softwoods) | Pinaceae | <i>Pinus</i> sp. | pine |
| | Taxaceae | <i>Taxus</i> sp. | yew |

A summary of the results are presented in Table 3, where they are grouped into the following four artefact categories: Gunners' equipment, Small arms, Rigging, and Other. Details of all the characteristics recorded are presented in the Appendix (Table A2).

The detailed results are shown as graphs in Figures 1, 2, 3, 4 and 6: Gunners' equipment (Figure 1), Small arms (Figure 2 and 3), Rigging (Figure 4), and Other (Figure 6). However, it should be noted that the number of 'small find' records does not necessarily represent the number of artefacts [i.e. a 'minimum number of individuals']. Usually, there was one wood identification result for each allocated small find (number), however:

- some artefacts had multiple component parts, yet a single SF number – for example pulley blocks (each with the cheek, sheave(s) and peg);
- SF3655 was a group of multiple lids together with a flask spout;
- occasionally, when SFs that consisted of multiple fragments were examined closely, it became clear that they were not the same woods, and therefore not from the same individual artefact or component. In such cases, it was necessary to carry out multiple identifications from a single SF number. This was the case for some of the powder bottles, where fragments were grouped together;
- some separate small find numbers could be refitted;
- not all SF numbers represented complete artefacts, meaning that there is likely an over representation where partial remains could not be refitted. This is especially in the case of the powder bottles and the handspikes.

Table 3. Summary of the wood identifications. The indeterminate results for artefacts that were not destructively sampled, are excluded. Artefacts have been grouped into the following four categories: Gunners' equipment, Small arms, Rigging, and Other. ^a = includes both secure and 'cf' identifications, and excludes any duplications in determining the wood type that occurred during the multiple phases of analysis. ^b = minimum number of wood types (taking into consideration the possibilities in the grouped Betulaceae). * = identification has since been refined by micro-CT scanning. The total number of identifications for the powder bottles includes all the identifications (i.e. condition categories 1, 2 and 3).

| Artefact type | Wood types present | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|--------------------|-----------------------------------|---|------------------------------------|-------------------|--------------------|----------------------|---------------------|----------------------|-------------------|----------------------|------------------|---------------------|----------------|------------------------------------|---------------------------|---------------------|-------------------|-------------------|-----------------------|--------------------------|----------------------------|--|
| | cf / <i>Acer</i> | cf / Betulaceae (undiff.) Group 1 | Betulaceae (not <i>Betula</i>) Group 2 | Betulaceae (<i>Alnus/Betula</i>) | cf / <i>Alnus</i> | cf / <i>Betula</i> | cf / <i>Carpinus</i> | cf / <i>Corylus</i> | cf / <i>Castanea</i> | cf / <i>Fagus</i> | cf / <i>Fraxinus</i> | cf / <i>Ilex</i> | cf / <i>Juglans</i> | cf / Maloideae | cf / <i>Pinus sylvestris</i> group | cf / <i>Populus/Salix</i> | cf / <i>Quercus</i> | cf / <i>Taxus</i> | cf / <i>Ulmus</i> | Ring porous wood type | Diffuse porous wood type | Total number of wood types | Total number of identifications ^a |
| Gunners' equipment | | | | | | | | | | | | | | | | | | | | | | | |
| Flexible rammer | | | | | 2 | | | | | | | | | | | 1 | | | | | | 2 | 3 |
| Gun carriage truck | | | | | | | | | | | | | | | | | | | 1 | | | 1 | 1 |
| Handspike (incl handspike part) | | | | | | 4 | | | 1 | 38 | | | | | | | | | | | | 3 | 43 |
| Linstock | | | | 1 | 1 | 14 | | | 2 | 9 | | | | | 1 | 1 | | | | | | 6 ^b | 29 |
| Ram rod shaft | | | | | | | | | | 1 | | | | | | | | | | | | 1 | 1 |
| Total | | | | | | | | | | | | | | | | | | | | | | 77 | |

| Artefact type | Wood types present | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|--------------------|-----------------------------------|---|---|-------------------|--------------------|----------------------|---------------------|----------------------|-------------------|----------------------|------------------|---------------------|----------------|------------------------------------|---------------------------|---------------------|-------------------|-------------------|-----------------------|--------------------------|----------------------------|--|
| | cf / <i>Acer</i> | cf / Betulaceae (undiff.) Group 1 | Betulaceae (not <i>Betula</i>) Group 2 | Betulaceae (<i>Alnus</i> / <i>Betula</i>) | cf / <i>Alnus</i> | cf / <i>Betula</i> | cf / <i>Carpinus</i> | cf / <i>Corylus</i> | cf / <i>Castanea</i> | cf / <i>Fagus</i> | cf / <i>Fraxinus</i> | cf / <i>Ilex</i> | cf / <i>Juglans</i> | cf / Maloideae | cf / <i>Pinus sylvestris</i> group | cf / <i>Populus/Salix</i> | cf / <i>Quercus</i> | cf / <i>Taxus</i> | cf / <i>Ulmus</i> | Ring porous wood type | Diffuse porous wood type | Total number of wood types | Total number of identifications ^a |
| Small arms | | | | | | | | | | | | | | | | | | | | | | | |
| Powder bottle body | 6 | 1 | 2 | | 1 | 4 | 16 | | | 26 | 39 | | 1 | 1 | | 14 | | | | | 2 | 9 ^b | 113 |
| Powder bottle lid | 2 | | 1 | | 2 | 3 | 9 | | | 13 | 17 | | | | | | | | | 1 | 1 | 8 ^b | 49 |
| 'Flask' stopper/spout | | | | | | | | | | | 3 | | | | | | | | | | | 1 | 3 |
| Pistol grip handle | | | | | | | | | | | | | 1 | | | | | | | | | 1 | 1 |
| Total | | | | | | | | | | | | | | | | | | | | | | 166 | |
| Rigging | | | | | | | | | | | | | | | | | | | | | | | |
| Pulley double block: cheek | | | | | | | | | | | | | | | | | | | 2 | | | 1 | 2 |
| Pulley double block: sheave | | | | | | | | | | 2 | | | | | | | | | 2 | | | 2 | 4 |
| Pulley double block: peg | | | | | | | | | | | 1 | | 1 | | | | | | | | | 2 | 2 |
| Pulley single block: cheek | | | | | | | | | | | | | | | | | | 3 | | | | 1 | 3 |

| Artefact type | Wood types present | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|--------------------|-----------------------------------|---|------------------------------------|-------------------|--------------------|----------------------|---------------------|----------------------|-------------------|----------------------|------------------|---------------------|----------------|------------------------------------|---------------------------|---------------------|-------------------|-------------------|-----------------------|--------------------------|----------------------------|--|
| | cf / <i>Acer</i> | cf / Betulaceae (undiff.) Group 1 | Betulaceae (not <i>Betula</i>) Group 2 | Betulaceae (<i>Alnus/Betula</i>) | cf / <i>Alnus</i> | cf / <i>Betula</i> | cf / <i>Carpinus</i> | cf / <i>Corylus</i> | cf / <i>Castanea</i> | cf / <i>Fagus</i> | cf / <i>Fraxinus</i> | cf / <i>Ilex</i> | cf / <i>Juglans</i> | cf / Maloideae | cf / <i>Pinus sylvestris</i> group | cf / <i>Populus/Salix</i> | cf / <i>Quercus</i> | cf / <i>Taxus</i> | cf / <i>Ulmus</i> | Ring porous wood type | Diffuse porous wood type | Total number of wood types | Total number of identifications ^a |
| Pulley single block: sheave | | | | | | | | | | | | | | | | | | | 3 | | | 1 | 3 |
| Pulley single block: peg | | | | | | | | | 1 | | 1 | | | | | | | | | | 1 | 3 | 3 |
| Total | | | | | | | | | | | | | | | | | | | | | | 17 | |
| Other | | | | | | | | | | | | | | | | | | | | | | | |
| 'Fire log' | | | | | | 1 | | | | | | | | | | | | 1 | | | | 2 | 2 |
| Bar | | | | | | | | | | 1 | | | | | | | | | | | | 1 | 1 |
| Branch wood | | | | 1 | | | | | | | | | | | | | | | | | | 1 | 1 |
| Bung | | | | | | | | | | 1 | | | | | | | | | | | | 1 | 1 |
| Cask: cant stave | | | | | | | | | | | | | | | | | 1 | | | | | 1 | 1 |
| Cask: hoop | | | | | | | 1 | | | | | | | | | | | | | | | 1 | 1 |
| Cask: stave | | | | | | | | | | | | | | | | | 7 | | | | | 1 | 7 |
| Hammer handle/shaft | 1 | | | | | | | | | | | | | | | | | | | | | 1 | 1 |

| Artefact type | Wood types present | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------|-----------------------------------|---|------------------------------------|-------------------|--------------------|----------------------|---------------------|----------------------|-------------------|----------------------|------------------|---------------------|----------------|------------------------------------|---------------------------|---------------------|-------------------|-------------------|-----------------------|--------------------------|----------------------------|--|
| | cf / <i>Acer</i> | cf / Betulaceae (undiff.) Group 1 | Betulaceae (not <i>Betula</i>) Group 2 | Betulaceae (<i>Alnus/Betula</i>) | cf / <i>Alnus</i> | cf / <i>Betula</i> | cf / <i>Carpinus</i> | cf / <i>Corylus</i> | cf / <i>Castanea</i> | cf / <i>Fagus</i> | cf / <i>Fraxinus</i> | cf / <i>Ilex</i> | cf / <i>Juglans</i> | cf / Maloideae | cf / <i>Pinus sylvestris</i> group | cf / <i>Populus/Salix</i> | cf / <i>Quercus</i> | cf / <i>Taxus</i> | cf / <i>Ulmus</i> | Ring porous wood type | Diffuse porous wood type | Total number of wood types | Total number of identifications ^a |
| Handle | | | | | | | | | | | 2 | | | | | | | | | | | 1 | 2 |
| Moulded strip | | | | | | | | | | | | | | | 1 | | | | | | | 1 | 1 |
| Pipe stopper | | 1* | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| Plank | | | | | | | | | | | | | | | | | 1 | | 1 | | | 2 | 2 |
| Plank - ?box edge | | | | | | | | | | | | 1 | | | | | | | | | | 1 | 1 |
| Shaft (incl shaft part) | | | | | | 1 | | | 1 | 1 | | | | | | | | | | | | 3 | 3 |
| Shaft/handle | | | | | | | | | | 1 | | | | | | | | | | | | 1 | 1 |
| Spade handle | | | | | | | | | 1 | | | | | | | | | | | | | 1 | 1 |
| Timber with notch | | | | | | | | | | | | | | | 1 | | | | | | | 1 | 1 |
| Total | | | | | | | | | | | | | | | | | | | | | | | 28 |
| Grand total | | | | | | | | | | | | | | | | | | | | | | | 288 |

In the following text, where multiple identifications were made for an artefact, and where both secure and insecure (i.e. cf) identifications were made within an artefact type these are discussed as “(cf) [taxon]”. Where either secure or insecure identifications were made, but not both, these are reported as “[taxon]” or “cf [taxon]”, respectively.

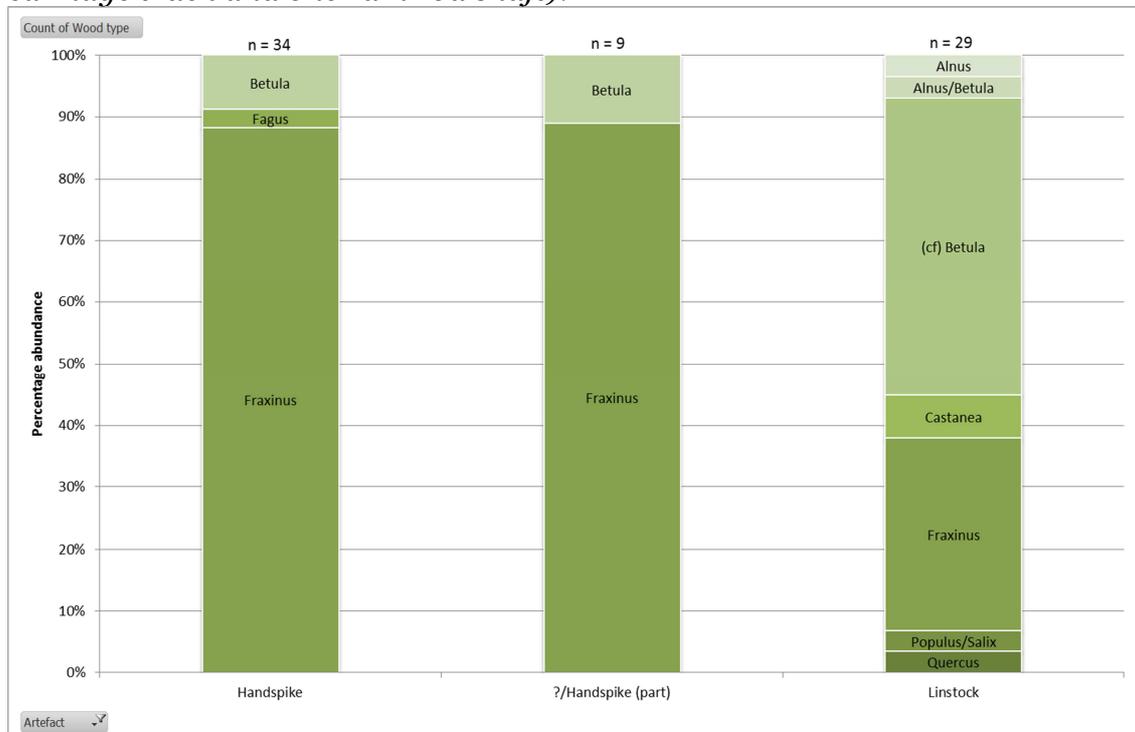
Note that many of the interpretations of the finds were assigned during the excavation; some may subsequently be revised during the course of the project.

5.1.1 Gunners’ equipment

Most of the remains examined within this category were from handspikes and linstocks, although three flexible rammers (2 *Alnus*, 1 *Populus/Salix*), a ram rod shaft (1 *Fraxinus*) and one of the gun carriage trucks (wheels) (1 *Ulmus*) were also included.

Figure 1 shows the wood types identified from the gunners’ equipment. The **handspikes** were made mostly from *Fraxinus* but with a few from *Betula* and a single example from *Fagus*. A range of wood types was used for the **linstocks** – mostly (cf) *Betula* and *Fraxinus*, but with single occurrences each of *Populus/Salix*, *Alnus*, *Quercus* and *Alnus/Betula*. Two were made of *Castanea*.

Figure 1. Wood identification results of the Gunners’ equipment artefacts, shown as percentages of each artefact category. Not showing artefact types with five or fewer identifications (i.e. the three flexible rammers, one gun carriage truck and one ram rod shaft).



Whilst handling the handspikes it was possible to refit some of the fragments (Table A4).

5.1.2 Small arms

The small arms examined consisted almost entirely of **powder bottles**, together with a few flask spouts (3 (cf) *Fraxinus*) and a single **pistol handle** (1 *Juglans*). Whilst handling the artefacts, the following additional information was recorded:

- six were complete powder bottles (i.e. a paired lid and body) of which four had their lids still *in situ* on the body⁴. These were: SF3469, SF3472, SF3526, SF3527, SF3581 and SF3601;
- six powder bottle lids still had the broken-off neck associated them; some of the necks remained inside their lid. These were: SF3506, SF3587, SF3656, SF3657, SF3658 and SF3700. Note that the neck for SF3587 was not analysed as it was not possible to get access to the fragment to sample (without removing it from inside the lid).

Figure 2 shows the wood identifications associated with the small arms. The powder bottles were made using a variety of wood types: (cf) *Acer*, (cf) Betulaceae Groups 1 and 2, *Alnus*, (cf) *Betula*, (cf) *Carpinus*, (cf) *Fagus*, (cf) *Fraxinus*, *Juglans*, Maloideae and (cf) *Populus/Salix*. Some diffuse and ring porous hardwoods (which could not be resolved further) were also recorded.

⁴ As well as the six examined, there is an additional paired powder bottle lid and body; SF3470.

Figure 2. Wood identification results of the Small arms artefacts, shown as percentages of each component. Not showing artefact types with five or fewer identifications (i.e. the three flask spouts and the single pistol grip handle).

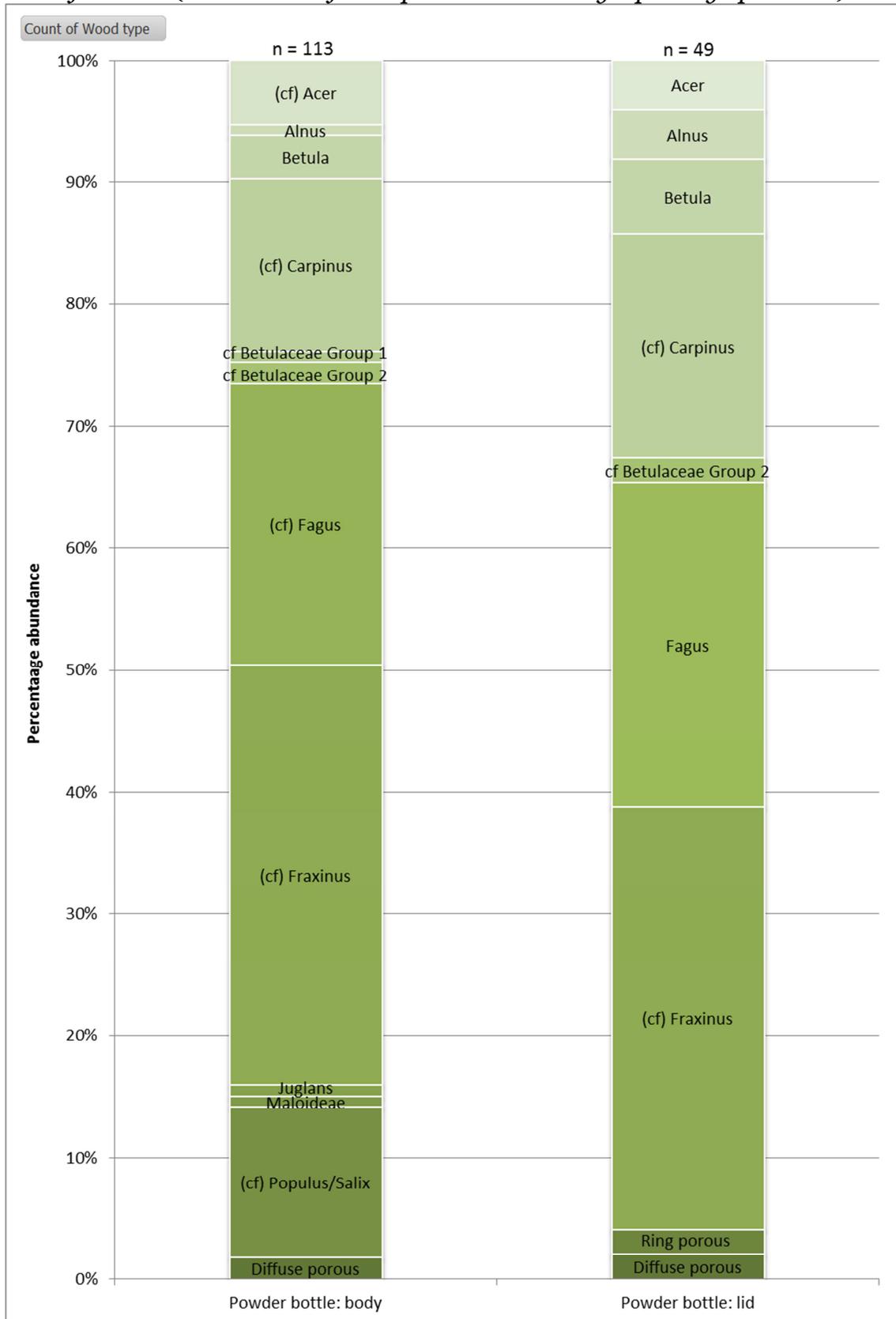
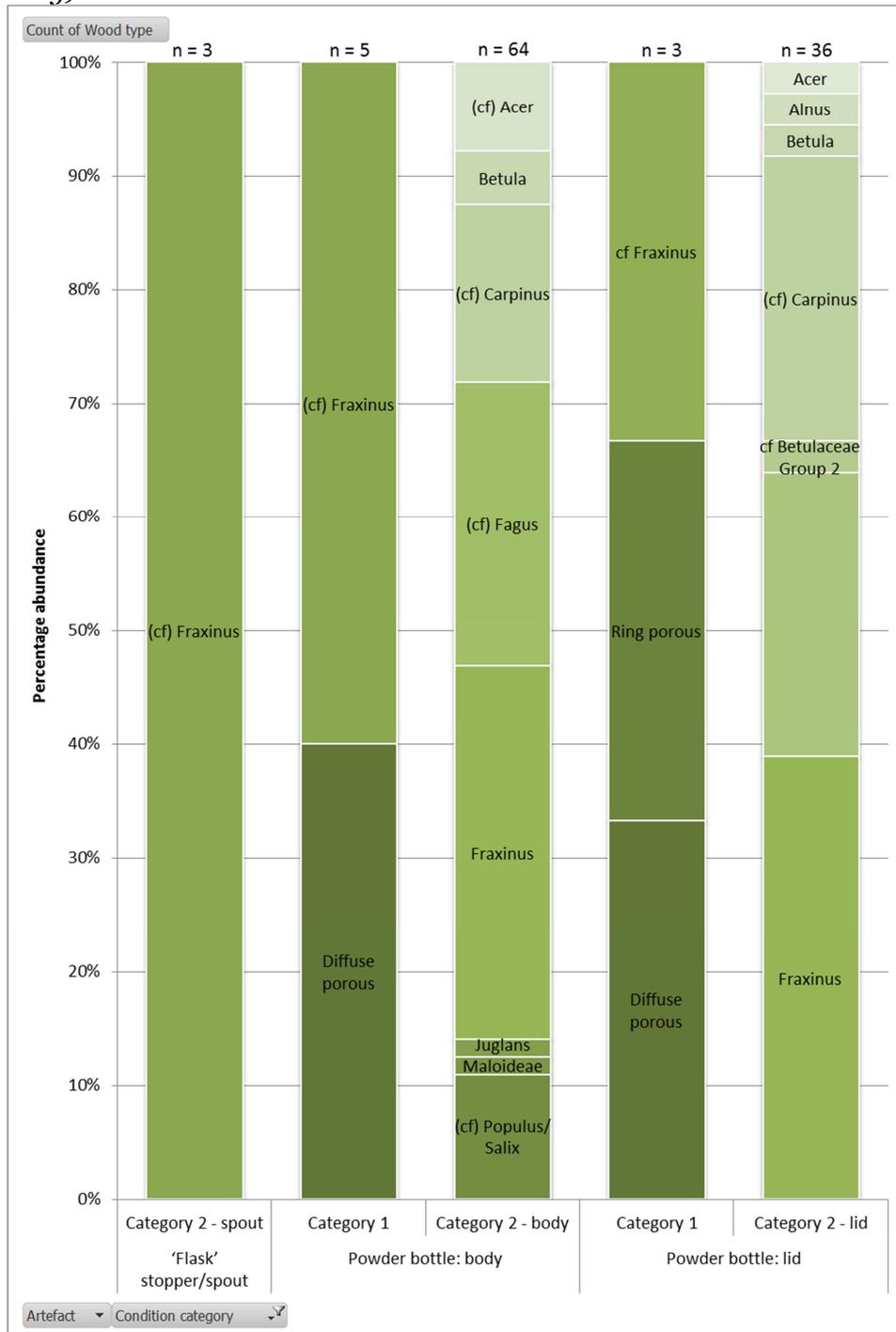


Figure 3 shows the powder bottle identifications, but only of condition Category 1 and 2 (see Table A1). Omitting the Category 3 remains, which are generally very fragmentary, aims to try and minimise over-counting. Overall, the majority of the remains were made from (cf) *Fraxinus*, (cf) *Fagus* and Betulaceae taxa (although no identifications of *Corylus* were made). In addition to these, there were some examples of (cf) *Populus/Salix* and (cf) *Acer*, and single examples each of *Juglans* and Maloideae.

Figure 3. Wood identifications of the powder bottles (condition categories 1 and 2 only).



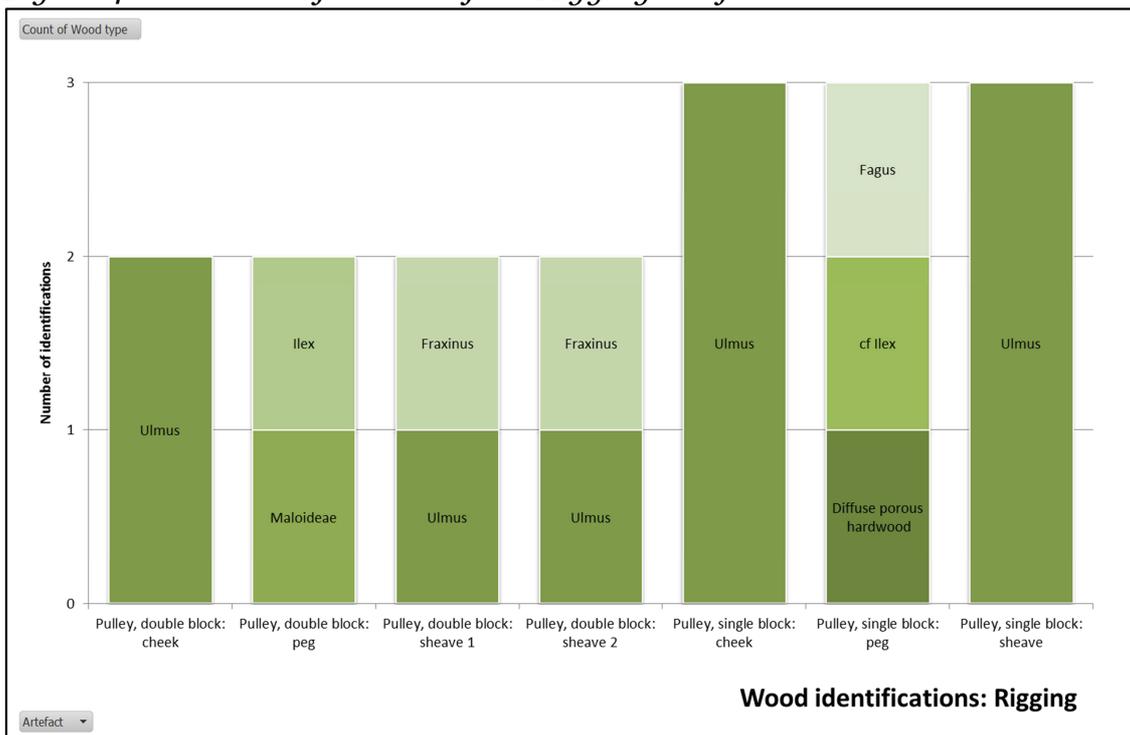
Of the powder bottles with paired lids and bodies – where it was possible to determine the wood type sufficiently – the same wood types are used for the separate components; for example SF3472 – cf *Fraxinus*, SF3656 – *Fagus*, and both SF3506 and SF3658 – (cf) *Carpinus*. An exception is SF3469 which consists of a *Fraxinus* body and a diffuse porous wood lid (although both were examined macroscopically).

The three flask spouts were made from (cf) *Fraxinus*, and the pistol handle was made from *Juglans*.

5.1.3 Rigging

The rigging components made of wood consisted only of **pulley blocks**; three single blocks, and two double blocks. Every pulley block had three different elements; the cheek (the main body of the pulley block), the sheave(s) (the moving disc(s)) and the peg (to hold each pulley together). Figure 4 shows the wood identifications associated with these; *Fagus*, *Fraxinus*, (cf) *Ilex*, Maloideae and *Ulmus*. A diffuse porous hardwood (which could not be resolved further) was also recorded.

Figure 4. Wood identifications of the Rigging artefacts.



All the cheeks were made of *Ulmus*, and both *Ulmus* and *Fraxinus* were used to make the sheaves. For the double pulley blocks, each pair of sheaves was always made of the same wood, likely to ensure even wear and function; both *Fraxinus* and both *Ulmus*. A mix of woods was used for the pegs: (cf) *Ilex* (two), Maloideae (one), *Fagus* (one) and a wood type that could not be identified, but which had a diffuse porous structure (one). Two of the pegs (one of cf *Ilex* and

that of Maloideae) were almost complete small diameter roundwoods, with bark still intact around some/most of their outer edge (Figure 5).

Figure 5. Pulley block SF3052 (cf *Ilex*) showing bark around part of the peg's outer edge (highlighted in the close-up by the dashed white line).



5.1.4 Other

The remainder of the artefacts examined here were all included in this category. They consisted of: **fire logs**, a **bar**, **branch wood**, a **bung**, **cask** elements (cant stave, hoop and stave), a **hammer handle**/shaft, various other **shafts and handles**, a piece of **moulded strip**, a **pipe stopper**, a **plank**, a piece of plank thought to be a **box edge**, a D-shaped **spade handle** and a piece of **timber with notch**.

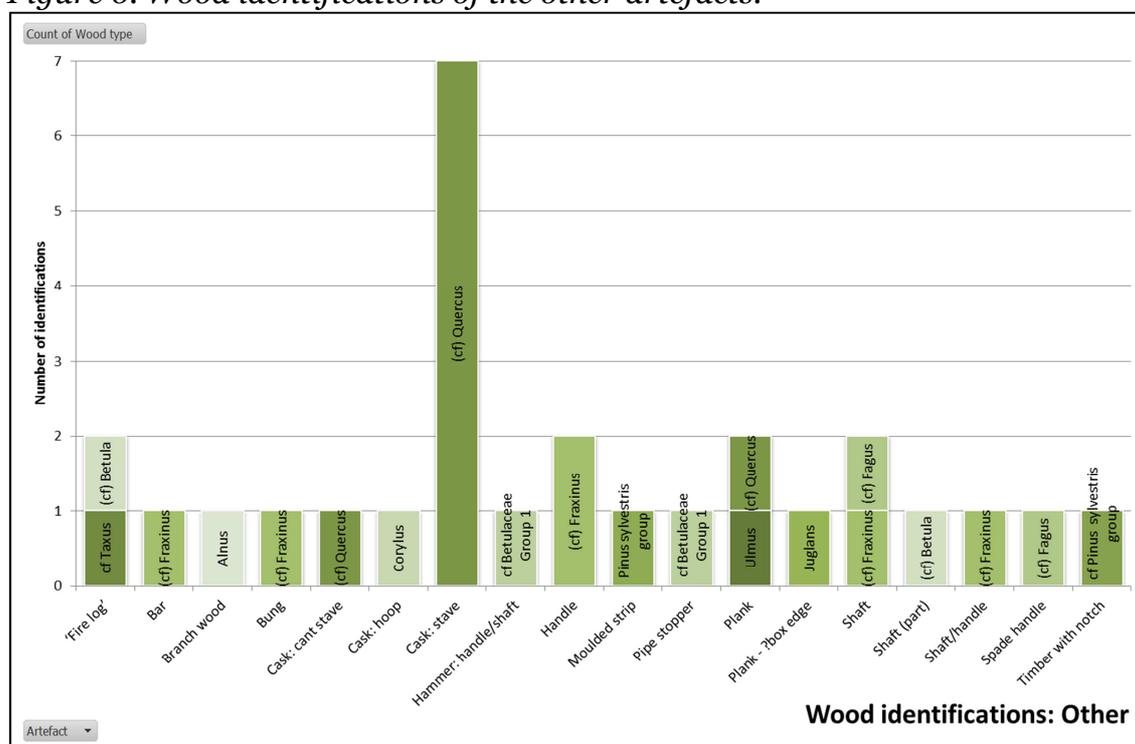
Figure 6 shows the wood identifications of this 'Other' category of finds. In particular, the cask consists of multiple elements – the staves were (cf) *Quercus* and the hoop around it was *Corylus*. The possible box edge was *Juglans*. The assemblage also included multiple tool handles: the hammer handle was cf Betulaceae Group 1, and a D-shaped handle (from a spade, for example) was made of cf *Fagus*. Pieces of branchwood that are thought to have been for firewood⁵ were cf *Taxus* and *Betula*. The pipe stopper could not be sampled, but by examining it under low power magnification, it was possible to identify it as one of the Betulaceae family (i.e. *Alnus*/*Betula*/*Carpinus*/*Corylus*). Subsequent analysis and investigation of the artefact, using micro-CT scanning⁶,

⁵ Although these were recorded as possible firewood at the time of excavation, other uses, such as running repairs, cannot be discounted.

⁶ This work with the 'µ-VIS X-Ray Imaging Centre' at the University of Southampton is currently in progress.

has meant that it has since been possible to refine the identification. The detailed methods and results of this investigation will be reported separately.

Figure 6. Wood identifications of the other artefacts.



5.2 Other wood characteristics

Indications of wood maturity were possible from the presence[heartwood]/absence[sapwood] of tyloses in the long-lived tree types *Quercus*, *Castanea* and *Fraxinus*, and the curvature of the growth rings (at least in the areas of artefact sub-sampled for thin sections):

- For the linstocks, from the presence and absence of tyloses it seems that both *Fraxinus* and *Castanea* heartwood and sapwood were used. Some of the *Fraxinus* linstocks were made from the central part of the tree element used, seen from presence of the pith and the associated strong growth ring curvatures.
- In terms of the hand spikes, most of those examined had weak ring curvatures, indicating that they were made from larger tree elements. An exception was the handspike made from *Betula* (SF3439) (refitted with other fragments, see [Table A4](#)) – a central piece of wood with strong growth ring curvature.
- The (cf) *Quercus* cask components had tyloses present too, indicative of heartwood.
- The only sample of *Ulmus* where the presence/absence of tyloses was recorded (most of the artefacts had been examined at low power magnification), was for the plank (SF3138), where the presence of tyloses suggests heartwood was used. If this was a structural element of the ship, then heartwood could have been favoured since deposits within the heartwood make it more durable (Ridout 2000, 15).

The observations indicating that the larger sized equipment (notably the handspikes) used bigger tree/wood elements, and that smaller artefacts were fashioned from smaller sized elements, represent logical and efficient use of the wood; multiple large objects could be made from a single larger tree element, and using smaller diameter wood elements for smaller objects (eg the powder bottles) would require minimal working and less wood wastage.

Where ring widths were recorded, there seems to be a mix of both wide and narrow growth rings, indicating fast and slow growth, respectively. The handspikes included a mix of ring widths, but most were wide rings (i.e. fast growing). The linstocks, in comparison, although mixed, were mostly narrow ring widths (slow growing).

Most of the remains were not suitable for determining the season of felling, primarily because they did not contain the real outermost growth ring. Of the exceptions that did still have bark attached (two of the pulley block pegs, the cask hoop and the branch wood), all were taxa that do not have readily-distinguishable early- and late-wood vessel patterns.

Generally, the condition of the wood itself was good enough to allow wood identifications to some level; in terms of samples that were destructively sampled, none were completely unidentifiable due to poor preservation. Again, for sub-sampled artefacts, in only a few examples were identifications only possible to family level; notably the cf *Betulaceae* level identifications of, for example, the handle hammer (SF3732) and part of a powder bottle (SF3690c).

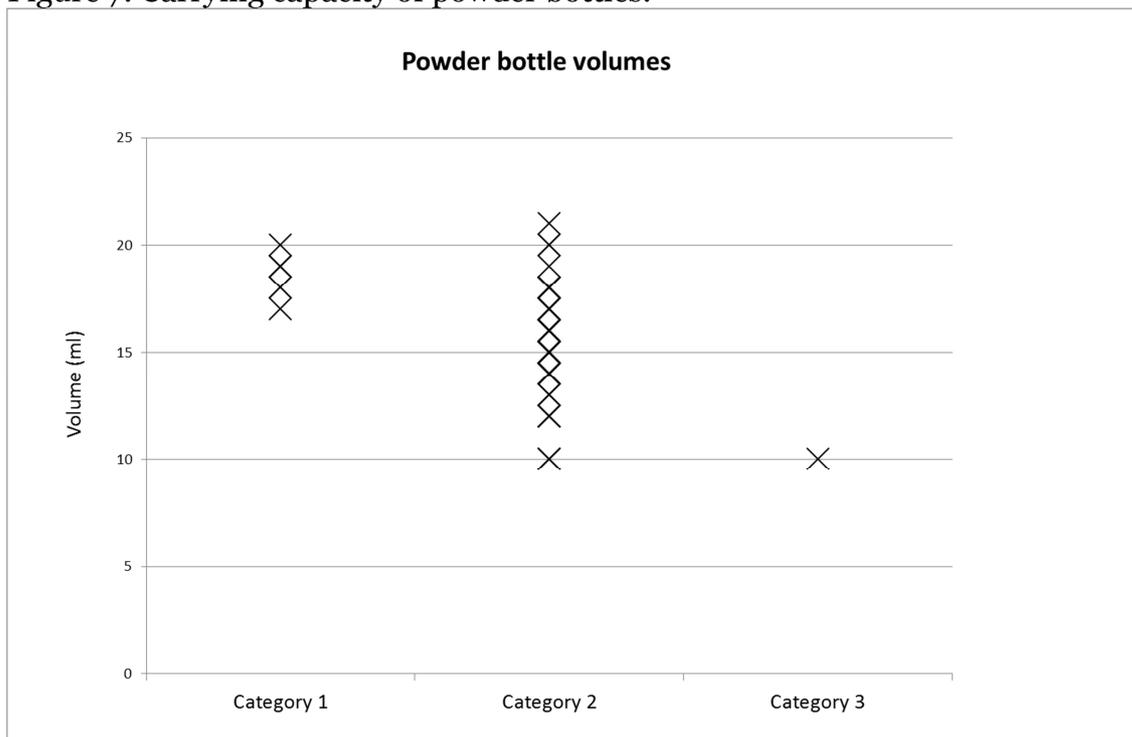
During sampling and examination under the microscope, three fragments were recorded as having evidence of possible insect damage: the moulded strip (SF3144) and two fragments of handspikes (SF3449 and SF3716). The evidence on the sub-sampled thin sections from the handspikes consisted of a circular hole on one (c 1mm diameter), and an oval hole on the other (as possibly it was compressed). Whilst refitting handspike fragments, macroscopic insect damage to fragments SF3176, SF3253, SF3293 and SF3439 was also recorded. Of these, only SF3253 was not examined microscopically. The fact that no insect damage was recorded from the microscopic examination of the others simply reflects the limited area of the thin-sectioned sample.

The *Ulmus* gun carriage truck had multiple knots, visible macroscopically.

5.3 Powder bottle volume results

The volumes of the powder bottles are presented in Figure 7 and Table A3, together with details on conditions of the bottles, that are relevant to the volumes recorded. The majority of the volumes are between 10–20 ml, with the volumes of the best condition bottles (Category 1) in the upper end of that range, from 17–20 ml.

Figure 7. Carrying capacity of powder bottles.



6 DISCUSSION

6.1 Wood type and characteristics

A range of wood types was used throughout the ship, although very much dominated by hardwood types, including both short- and long-lived taxa. In this section probable reasons for any preferential selection of wood types are discussed; other than where specific artefacts are referred to by SF number, the named genera are mentioned generally (with no consideration as to whether identifications of artefacts at this site were secure, insecure, or both).

For the majority of artefact types with multiple individuals, a mix of wood types was used; an exception is that of the pulley block cheeks, which were all made from *Ulmus* (elm). In terms of wood diversity for artefact types with the greatest number of individuals, the powder bottles (bodies and lids) showed the most diversity (9) (not including the Betulaceae groups for which an individual genus could not be differentiated), followed by the linstocks (6) and then the handspikes (3).

There are multiple reasons for the wood types used and selected for different uses throughout the ship; both practical and/or aesthetic:

- durability: all the cheeks, and some of the sheaves, of the **pulley blocks** were made of elm, as it copes well with repeated wetting and drying (oak would crack and

likely fail if subjected to the same conditions). Elm was also used for the **gun carriage truck** (wheel), likely for similar reasons. Although Cutler and Gale (2000, 139) state that *Ilex* (holly) is ‘rather perishable’, it is also slow-growing and a close-grained wood – therefore dense and hard, and suitable for a **pulley block peg**. *Fagus* (beech) (used for one of the handspikes, a peg of one of the pulley blocks, and the D-shaped handle, as well as for the powder bottles) is a stable, strong wood (Gale and Cutler: 110).

- handling comfort: many of the **handles/shafts** were made from *Fraxinus* (ash) whose “resilience and resistance to stress produces an ideal medium for tool handles” (Gale and Cutler, 2000: 120); in particular, the **handspikes** were made from ash – the large vessels in the earlywood, together with relatively narrow rays, help make it flexible and absorb impact/stresses, and therefore make it comfortable to use. *Juglans* sp. (walnut) was used for the **pistol handle**, agreeing with Gale and Cutler (2000: 146) that: “It [walnut] is shock-resistant and resilient, and is one of the foremost woods for gunstocks”. Walnut was also used for one of the **powder bottle** bodies.
- attractiveness of the wood grain: walnut was used for the **pistol handle**. It was also used for the (?)**box panel**. It is also a durable wood;
- ease of working: the **linstocks** were each individually turned, with great detail, and many of the wood types selected for them were easy to work (eg ash, *Populus/Salix* (poplar/willow)). Beech can be split even when seasoned, and it “has a straight, even grain” (Gale and Cutler, 2000: 110) – characteristics which would make it amenable for working. What is thought to be the **cask’s hoop** was made of *Corylus* (hazel), a flexible wood;
- availability: *Quercus* (oak) (with tyloses present, indicating oak heartwood) was used for the body of the **cask**. This is a wood commonly used for such objects, due to its strength and widespread availability; it is also noted by Gale and Cutler (2000: 205) that the presence of tyloses makes it nearly impermeable. The **pulley block pegs** of cf holly (SF3052) and Maloideae (SF3358) both had bark attached; these could be running repairs, in which case whatever was suitable (the right size and diameter, requiring no/minimal working) and easily obtainable would have been used. The pieces of branch wood (possibly used for **firewood** (fire logs) or running repairs) were also probably sourced from what was around when needed.

Two types of wood were identified which are not native to the British Isles; *Juglans* (walnut) and *Castanea* (sweet chestnut). Given the sea-faring history of the ship, and that both would have been growing in the British Isles by this time, it was not possible as part of this investigation to determine whether these artefacts were made from wood that had been grown in Britain or abroad.

6.2 Further work

Whilst the selection of wood types have been discussed here in terms of their artefact use, it will be of interest to compare wood selection as evidenced from the *London* with information derived from comparable sites (age and military

use); such an inter-site comparison will be done as part of subsequent project reporting.

It should be noted here that further analysis, using other investigative techniques, for example micro-CT scanning, could result in identifications for artefacts that cannot be sampled destructively; as well as those already mentioned within this report (namely the pipe stopper and tuning peg) other suitable candidates could be the small wooden pegs used to hold the leather shoe heels and soles together.

Other wooden items listed in the original project finds list, but could not be located for this analysis, are SF3019 to SF3023 – listed as parts of a small rope-handled wood box. Their location remains unknown, never having been passed to Fort Cumberland for conservation.

7 CONCLUSIONS

Around 300 wood identifications were carried out on wooden artefacts recovered from the wreck of the *London*. The remains were dominated by artefacts associated with warfare; notably gunners' equipment (mostly handspikes and linstocks) and small arms (dominated by powder bottles). 16 wood (/wood group) types were identified; dominated by hardwood types *Ilex* sp. (holly), *Alnus* sp. (alder), *Betula* sp. (birch), *Carpinus* sp. (hornbeam), *Corylus* sp. (hazel), *Castanea* sp. (sweet chestnut), *Fagus* sp. (beech), *Quercus* sp. (oak), *Juglans* sp. (walnut), *Fraxinus* sp. (ash), Maloideae/Pomoideae (Pomaceous fruits incl. hawthorn, apple, pear, whitebeam), *Populus/Salix* spp. (poplar/willow), *Acer* sp. (maple) and *Ulmus* sp. (elm), together with two softwoods *Pinus* sp. (pine) and *Taxus* sp. (yew). Two of the taxa are not native to the British Isles; *Juglans* and *Castanea*.

The patterns of wood selection for the main artefact types are:

- *Fraxinus* (ash); for the handspikes and many of the shafts/handles
- *Ulmus* (elm); for pulley blocks
- *Quercus* (oak); cask

Wood selection was likely influenced by the characteristics of the wood types themselves (for example, ease of working, comfort in use) – in turn affected by the anatomical structure of the woods – as well as their availability.

The pulley blocks also show evidence of possible running repairs; the wood used for two of the pulley block pegs still had some bark attached.

This analysis has demonstrated the wealth of information that can be obtained from identifying the woods from which the artefacts were made. Where identifications were not possible (on artefacts that were not destructively subsampled) further analysis with alternative methods can be considered.

8 REFERENCES

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9 APPENDIX

Table A1. Results of the powder bottle condition assessment; categorisations made by A. Middleton and Z. Hazell, with additional notes by Z. Hazell.

^a = information from the finds photograph. ^b = where it was initially categorised as Category 2 (based on the lid's condition) but has since been re-categorised as Category 3 (because the neck is the only remaining fragment of its body). ^c = where the neck was not analysed. For category definitions see Table 1 in this report's main text.

| SF number | Category | Notes |
|-----------|--------------------------------|---|
| 3469 | Category 1 | |
| 3470 | Category 1 | |
| 3471 | Category 2 - body | Most present; all neck missing |
| 3472 | Category 1 | Body still has fibres in (?)both lug holes |
| 3473 | Category 3 - body | Most missing. Only 1 lug attached to a small fragment remains |
| 3474 | Category 2 - body | Most present; all neck missing |
| 3475 | Category 3 - body | Missing bottom half; most of neck and both lugs present |
| 3504 | Category 2 - body | Most present; missing part of neck |
| 3505 | Category 3 - body | Top half only present, with some of neck missing. Both lugs present |
| 3506a | Category 2 - lid | Complete; with neck that had been inside. Additional fragment in bag - unclear if related to lid/neck |
| 3506b | Category 3 ^b - body | Neck only; 2 refitted fragments, formerly inside lid |
| 3507 | Category 2 - lid | Complete |
| 3508 | Category 2 - lid | Complete |
| 3509 | Category 2 - lid | Complete |
| 3510 | Category 2 - lid | Complete |
| 3511 | Category 2 - lid | Nearly complete |
| 3512 | Category 2 - lid | Complete |
| 3513 | Category 3 - body | Most missing; only a third of the neck present |
| 3514 | Category 2 - body | Most present, all neck missing. Some damage to top edge of bottle |
| 3515 | Category 2 - body | Most present, neck nearly all missing. Bottom half of body is squashed to an oval shape |
| 3516 | Category 2 - body | Most present; top damaged. Most of neck missing |
| 3517 | Category 2 - body | Most present, all neck missing |
| 3518 | Category 2 - body | Most present, nearly all neck and one lug missing |
| 3519 | Category 2 - body | Most present, all neck and one lug missing. Top of remaining bottle has some missing |
| 3520 | Category 2 - body | Most present; all neck missing |
| 3521 | Category 2 - body | Most present; missing more than half of neck |
| 3522 | Category 2 - body | Most present; all neck missing |
| 3523 | Category 2 - lid | Complete |

| SF number | Category | Notes |
|-----------|-------------------|--|
| 3524 | Category 2 - lid | Complete |
| 3525 | Category 2 - body | Most present, neck mostly missing |
| 3526 | Category 1 | Lid has fibres present in one lug hole |
| 3527 | Category 1 | |
| 3528 | Category 3 - body | Most present; neck and base missing |
| 3538 | Category 3 - body | Most missing; base only |
| 3566 | Category 3 - lid | Very damaged; missing lugs and most of neck column. |
| 3567 | Category 2 - body | Mostly complete; one lug broken. Neck broken, missing more than half |
| 3572 | Category 2 - body | Most present, only neck missing |
| 3573 | Category 2 - body | Most present; top damaged. Neck and top edge missing |
| 3574 | Category 2 - body | Most present, all neck missing |
| 3575 | Category 2 - body | Mostly complete, most of neck missing |
| 3576 | Category 2 - body | Most present, neck missing, some damage to top of remaining bottle |
| 3577 | Category 2 - body | Complete |
| 3578 | Category 2 - body | Complete |
| 3579 | Category 2 - body | Mostly complete, about half the neck missing |
| 3580 | Category 2 - body | Complete |
| 3581 | Category 1 | |
| 3582 | Category 2 - body | Most present, more than half neck missing, lots of iron deposit |
| 3583 | Category 2 - body | Mostly complete, most of neck missing |
| 3584 | Category 2 - body | Mostly present. Neck broken, most missing. Some small fragments in the bag have broken off the neck. |
| 3585 | Category 2 - body | Mostly complete, all of neck missing |
| 3586 | Category 2 - body | Mostly complete, most of neck missing, some damage to top of remaining body |
| 3587 | Category 2 - lid | Complete [with some of the neck still inside it ^c] |
| 3588 | Category 2 - lid | Most present, part of bottom edge broken off |
| 3599 | Category 2 - lid | Complete, from 3 refitted fragments |
| 3601 | Category 1 | |
| 3602 | Category 2 - body | Most present; more than half neck missing |
| 3603 | Category 2 - body | Complete |
| 3604 | Category 2 - body | Mostly complete; neck broken, missing just under half. A small fragment in the bag has broken off the neck |
| 3606 | Category 2 - body | Complete |
| 3607 | Category 2 - body | Most present; all neck missing |
| 3608 | Category 3 - body | About a third present lengthways; 1 lug present. Neck missing |
| 3609 | Category 2 - lid | Mostly complete, from 3 refitted fragments |
| 3610 | Category 2 - lid | Complete |
| 3611 | Category 2 - lid | Complete |

| SF number | Category | Notes |
|-----------|--------------------|---|
| 3612 | Category 3 - body | Most present; both lugs and most of neck present; missing base |
| 3613 | Category 3 - body | Missing bottom half; top half present (including neck and both lugs) |
| 3614 | Category 2 - lid | Complete |
| 3615 | Category 3 - body | Most missing; base only |
| 3616 | Category 2 - body | Most present; all neck missing |
| 3617 | Category 3 - body | Bottom half missing; neck and both lugs present |
| 3618 | Category 2 – spout | Spout only |
| 3619 | Category 3 - body | Most missing; base only |
| 3620 | Category 3 - body | Bottom half missing; most of neck and both lugs present |
| 3621 | Category 3 - body | Most missing; both lugs and some side of body present, (from 3 refitted fragments). Also in the bag were 7 fragments too fragmented to ID, and 1 fragment that did not look like part of a powder bottle |
| 3622 | Category 2 - lid | Mostly complete, from 2 refitted fragments |
| 3630 | Category 2 - lid | Complete |
| 3635 | Category 2 - body | Mostly complete, neck damaged with about half missing |
| 3636 | Category 3 - body | Mostly complete. Missing top section (neck and both lugs) |
| 3637 | Category 2 - body | All present, except neck |
| 3638 | Category 2 - body | Mostly complete, over half neck missing |
| 3639 | Category 2 - body | Mostly complete, all neck missing, one lug broken |
| 3640 | Category 2 - body | Mostly complete, one lug broken, all neck missing, some damage to top of remaining body |
| 3641 | Category 2 - body | Mostly complete, most of neck missing |
| 3642 | Category 2 - body | Mostly complete, over half neck missing |
| 3643 | Category 2 - body | Mostly present, one lug broken, no neck present |
| 3644 | Category 2 - body | Most present, all neck missing, some damage to top of remaining body |
| 3645 | Category 2 - body | Mostly complete, all neck missing |
| 3646 | Category 3 - body | Bottom half including the base present. Upper half and lugs missing |
| 3647 | Category 3 - body | Half present lengthways; 1 lug and all base present; neck missing |
| 3648 | Category 3 - body | Most missing; base and small part of side present |
| 3649 | Category 2 - lid | Mostly complete, damage to bottom of edge of lid - some missing |
| 3650 | Category 2 - body | Mostly complete, neck missing, damage to top of remaining body |
| 3651 | Category 2 - body | Mostly complete, hole in side of body, a little loss/damage to neck |

| SF number | Category | Notes |
|-------------------|--------------------------------|--|
| 3652 | Category 3 - body | Missing neck and bottom half of bottle |
| 3653 ⁷ | Category 2 - body | Mostly complete, with both lugs present. Neck missing. |
| 3654a | Category 3 - body | Most missing; one lug and some side present as 2 refitted fragments |
| 3654b | Category 3 - body | Most missing; only part of side, lengthways, present |
| 3654c | Category 3 - body | Most missing; only part of side and part of base present |
| 3654d | Category 3 - body | Most missing; only fragment with part of lug on it present |
| 3654e | Category 3 - body | Most missing; only fragment of side, lengthways, present |
| 3654f | Category 3 - body | Most missing; only fragment of side, lengthways, with part of a lug, present |
| 3654g | Category 3 - body | Most missing; 2 refitted fragments, each with a lug present |
| 3655a | Category 2 – spout | Spout only |
| 3655b | Category 3 - lid | More than half the lid missing, widthways. 1 lug missing |
| 3655c | Category 3 - lid | Most of neck missing. Both lugs present |
| 3655d | Category 3 - lid | More than half the neck missing, widthways. Both lugs present |
| 3655e | Category 3 - lid | Most of neck missing. Both lugs present |
| 3655f | Category 3 - lid | All of neck missing. Both lugs present |
| 3655g | Category 3 - lid | Most/all neck missing. 1 lug missing |
| 3655h | Category 3 - lid | Most of neck missing. Both lugs present |
| 3655i | Category 3 - lid | Most/all neck missing. 1 lug missing |
| 3655j | Category 3 - lid | Most/all of neck missing. Both lugs present |
| 3655k | Category 3 - lid | Half the neck missing, widthways. 1 lug missing |
| 3656a | Category 2 - lid | Complete (slightly damaged); with neck still inside |
| 3656b | Category 3 ^b - body | Neck only, inside lid |
| 3657a | Category 2 - lid | Complete; with neck still inside |
| 3657b | Category 3 ^b - body | Neck only, inside lid |
| 3658a | Category 2 - lid | Complete; with neck still inside |
| 3658b | Category 3 ^b - body | Neck only, inside lid |
| 3659 | Category 2 - lid | Complete |
| 3660 | Category 2 - lid | Complete |
| 3661 | Category 2 - lid | Complete |
| 3662 | Category 2 - lid | Complete |
| 3664 | Category 2 - body | Mostly complete, most of neck missing, some damage to top of remaining body |
| 3665 | Category 2 - body | Mostly complete, most of neck missing |
| 3666 | Category 2 - body | Mostly complete, one lug broken, all neck missing, damage to top of remaining body |
| 3667 | Category 2 - body | Mostly complete, all of neck missing |
| 3668 | Category 2 - body | Mostly complete, neck mostly missing, both lugs damaged |
| 3669 | Category 2 - body | Mostly complete, all neck missing |

⁷ Some of the early project documentation refers to this as SF3563. SF3563 is a handspike (fragment).

| SF number | Category | Notes |
|----------------|-------------------|---|
| 3670 | Category 2 - body | Mostly present, no neck present |
| 3671 | Category 2 - body | Most present, missing from above lugs, both lugs present but one damaged |
| 3672 | Category 3 - body | Missing neck and bottom half; both lugs present |
| 3673d | Category 3 - body | Small fragment with 1 lug |
| 3673a | Category 3 - body | Small fragment with part of a lug. Smallest of the 3 fragments |
| 3673b | Category 3 - body | Small fragment with 1 lug. The middle-sized of the 3 fragments. |
| 3673c | Category 3 - body | Side half of body, including part of a lug and part of the base. Largest of the 3 fragments. |
| | | The 3 fragments seem to refit, but not with absolute certainty. |
| 3673e | Category 3 - body | Base only |
| 3674 | Category 2 - lid | Complete |
| 3675 | Category 2 - lid | Complete |
| 3676 | Category 2 - lid | Complete |
| 3678 | Category 2 - body | Most present; top damaged. Neck present but damaged, with more than half missing. 1 small fragment has broken off, but refits |
| 3679 | Category 3 - body | Top with both lugs and 1 side present. Neck, base and rest of body missing |
| 3680 | Category 2 - body | Mostly complete, most of neck missing |
| 3681 | Category 2 - body | Mostly complete, one lug missing, some damage to top of remaining body |
| 3682 | Category 2 - body | Mostly complete, all of neck missing |
| 3683 | Category 2 - body | Mostly complete, all neck missing |
| 3684 | Category 2 - body | Mostly complete, all neck missing |
| 3685 | Category 2 - body | Mostly complete, neck missing |
| 3686 | Category 3 - body | Top half only present (including both lugs and most of neck) ^a |
| 3687 | Category 3 - body | 2 fragments refit to form most of the top half; missing bottom half, base and most of neck too |
| 3688 | Category 3 - body | Bottom half only present |
| 3689 | Category 3 - body | Missing most of top half; some upper side present (but lug missing) |
| 3690a (=3690b) | Category 3 - body | 2 fragments refit to form incomplete body (part of side missing); no neck or base. Both fragments have |
| 3690b (=3690a) | Category 3 - body | 1 lug present |
| 3690c | Category 3 - body | Most missing; 1 lug present |
| 3696 | Category 2 - lid | Complete |
| 3697 | Category 2 - lid | Complete |
| 3698 | Category 2 - lid | Complete |
| 3699 | Category 2 - lid | Complete |

| SF number | Category | Notes |
|------------------|--------------------------------|---|
| 3700a | Category 2 - lid | Mostly complete, one lug mostly missing. Neck inside lid |
| 3700b | Category 3 ^b - body | Neck only, inside lid |
| 3702 | Category 2 - body | Mostly complete, all of neck missing |
| 3703 | Category 2 – spout | Spout only. Rest of body missing |
| 3712 | Category 2 - lid | Complete |
| 3737 | Category 2 - body | Most present; top damaged. Most of neck missing |
| 3794 | Category 2 - lid | Complete |
| 3795 | Category 3 - body | Most missing; only part of neck remains. Multiple fragments were in the bag (x4); only the neck fragment was analysed as the others were too small |

Figure A1. Examples of remains from each of the powder bottle condition categories; 1, 2 and 3.

(a) Category 1 – SF3469 body and lid (before conservation) (ref. DSCN5476).



(b) Category 2 – SF3567 body (before conservation) (ref. DSCN5361).



(c) Category 2 – SF3614 lid (before conservation) (ref. DSCN5510).



(d) Category 2 – SF3703 spout (before conservation) (ref. DSCN6333).



(e) Category 3 – SF3620 body (before conservation) (ref. DSCN5492).



(f) Category 3 – SF3655 multiple lids (before conservation) (ref. DSCN6377).



Table A2. Wood identifications carried out on the London Wreck wooden artefacts. Results are listed in Small Find numerical order. cf = possible; Indet = indeterminate (unidentifiable); n/r = not relevant. The presence of tyloses usually indicates the presence of heartwood, although they can also occur in damaged wood. Samples in [...] are fragments refitted based on macroscopic characteristics (and not sub-sampled/identified). ^a = not sub-sampled, examined at low magnification; ^b = the identification has since been refined by micro-CT scanning.

2016 = August 2016 (all Z. Hazell), 2017i = Dec 2016–Jan 2017 (all Z. Hazell), 2017ii = May 2017 (Z. Hazell and E. Aitken), 2018i = May 2018 (Z. Hazell and E. Aitken), 2018ii = June 2018 (Z. Hazell and E. Aitken).

See reports Hazell (2016, 2017) and Aitken and Hazell (2017).

Duplicate identifications have been paired and highlighted in the table with a bold boxed outline.

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|-----------------|-------------------------------|-----------------|----------------------|-------------------------------|---|
| 2016 | SF3052 (already conserved) | Single block | Cheek | <i>Ulmus</i> ^a | |
| | | | Sheave | <i>Ulmus</i> ^a | |
| | | | Peg | <i>cf Ilex</i> ^a | Small diameter roundwood with bark still present (visible around c. 1/3 of the peg hole). Damage by marine borers revealed the internal wood structure. |
| 2016 | SF3120 | Single block | Cheek | <i>Ulmus</i> | |
| | | | Sheave | <i>Ulmus</i> ^a | Based on comparison with the cheek, when examined at low magnification. |
| | | | Peg | <i>Fagus</i> | |
| 2016 | SF3127 | Double block | Cheek | <i>Ulmus</i> | |
| | | | Sheave 1 | <i>Ulmus</i> | |
| | | | Sheave 2 | <i>Ulmus</i> | |
| | | | Peg | <i>Ilex</i> | |
| 2016 | SF3132 | Branch wood | n/r | <i>Alnus</i> | A branching branch. Near-complete bark present. |
| 2018i | SF3133 | Ram rod shaft | n/r | <i>Fraxinus</i> | Wide rings. Tyloses present. |
| 2018i | SF3138 | Plank | n/r | <i>Ulmus</i> | Tyloses present. Narrow rings. Poorly preserved. |
| 2016 | SF3144 | Moulded strip | n/r | <i>Pinus sylvestris</i> group | Insect damaged |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-----------------------------|-------------------------------|--|------------------|---|
| 2017ii | SF3149 | Gun carriage truck | Main wheel (part) | <i>Ulmus</i> | Multiple knots in the artefact. |
| | | | Separate fragment | <i>Ulmus</i> | Occasional tyloses. |
| 2017ii | SF3159 | Tail end of handspike? | n/r | <i>Fraxinus</i> | Weak ring curvature. Wide rings. Tyloses present. |
| 2017ii | SF3160 | Tail end of handspike | n/r | <i>Fraxinus</i> | Weak ring curvature. Wide rings. Tyloses present. |
| 2017ii | SF3164 [=SF3217, SF3193] | Linstock | n/r | <i>Betula</i> | Additional characteristics Indet. |
| 2017ii | SF3174 | Part of handspike | n/r | <i>Fraxinus</i> | Weak ring curvature. Mixed ring widths, with some very narrow. Tyloses present. |
| 2017ii | SF3175 | Part of tapering wooden shaft | n/r | <i>Betula</i> | Weak ring curvature. |
| 2018i | SF3176 | Handspike | n/r | <i>Betula</i> | Possible roundwood. |
| 2017ii | SF3184 | Linstock | n/r | <i>cf Betula</i> | Narrow ring growth. |
| 2016 | SF3186 | Linstock | n/r | <i>Betula</i> | Red iron stain in cells. Silver grey deposit (lead) on outside of artefact. |
| 2017ii | SF3187 [=SF3189] | Linstock | n/r | <i>Fraxinus</i> | Pith present. Strong ring curvature. Narrow ring growth. Occasional tyloses. |
| 2017ii | SF3188a [=SF3188b] | Linstock | (Examined the fragment with the taper hole). | <i>cf Betula</i> | Not a roundwood. |
| 2017ii | SF3190 [=SF3183] | Linstock | n/r | <i>Betula</i> | Narrow ring growth. Red/brown iron deposit in vessels. |
| 2017ii | SF3191 [=SF3181, SF3185] | Linstock | n/r | <i>Betula</i> | Not a roundwood. |
| 2017ii | SF3192 [=SF3268, SF3245] | Linstock | n/r | <i>Fraxinus</i> | Narrow ring growth. Occasional tyloses. |
| 2018i | SF3196 | Handspike | n/r | <i>Fagus</i> | Medium ring width. |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-----------------------|-------------------|--|----------------------|---|
| 2017ii | SF3197 [=SF3202] | Linstock | n/r | <i>Fraxinus</i> | Pith present. Strong curvature. Medium ring width. |
| 2017ii | SF3198b [=SF3198a] | Linstock | (Examined the fragment with the taper hole). | <i>cf Betula</i> | Not a roundwood. |
| 2016 | SF3199 | Linstock | n/r | <i>Castanea</i> | Tyloses present in the subsample examined. |
| 2016 | SF3200 | Linstock | n/r | <i>Betula</i> | Very degraded (in sampled section). Some iron staining. |
| 2016 | SF3201 | Linstock | n/r | <i>Castanea</i> | Tyloses present in some of the subsample fragments. |
| 2017ii | SF3203 [=SF3195] | Linstock | n/r | <i>cf Betula</i> | Moderate ring curvature, narrow ring width. Not a roundwood. |
| 2017ii | SF3204 | Part of handspike | n/r | <i>Fraxinus</i> | Weak ring curvature. Wide rings. Tyloses present. |
| 2017ii | SF3205 | Part of handspike | n/r | <i>Betula</i> | Indet. ring curvature. |
| 2016 | SF3206 | Flexible rammer | n/r | <i>Populus/Salix</i> | Pale grey/cream coloured wood where not oxidised. |
| 2016 | SF3207 | Flexible rammer | n/r | <i>Alnus</i> | Wide growth rings. Iron stain in cells. |
| 2016 | SF3213 [=SF3310] | Linstock | n/r | <i>Betula</i> | |
| 2017ii | SF3216 | Linstock | n/r | <i>Fraxinus</i> | Weak ring curvature. Narrow rings. Tyloses present. |
| 2017ii | SF3218 [=SF3170] | Linstock | n/r | <i>Betula</i> | Not a roundwood. |
| 2017ii | SF3219 [=SF3270] | Linstock | n/r | <i>Fraxinus</i> | Pith present. Strong ring curvature. No tyloses. Wide rings (fast growing). |
| 2017ii | SF3221 | Linstock | n/r | <i>Betula</i> | Wide growth rings. |
| 2017ii | SF3223 [=SF3215] | Linstock | n/r | <i>Betula</i> | Moderate ring curvature. Narrow growth rings. |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|--|--------------|---------------|---------------------------------|---|
| 2017ii | SF3226 [=SF3263, SF3277] SF3279 | Linstock | n/r | <i>Fraxinus</i> | Weak ring curvature. Medium ring width. Occasional tyloses. Iron concretion. |
| | | | n/r | <i>Fraxinus</i> | Pith present. Moderate-strong ring curvature. Narrow rings. Identified separately. |
| 2017ii | SF3229 [=SF3225, SF3262] | Linstock | n/r | <i>Fraxinus</i> | Weak ring curvature. Wide growth ring. Not a roundwood. Tyloses present. |
| 2017ii | SF3233 | Spade handle | n/r | <i>cf Fagus</i> | |
| 2016 | SF3234 | Bar | n/r | <i>Fraxinus</i> | Sampled. |
| 2017ii | SF3234 | Bar | n/r | <i>cf Fraxinus</i> ^a | Ring curvature weak-moderate. Mostly narrow growth rings. Duplicate identification, not sampled. |
| 2016 | SF3235 | Handspike | n/r | <i>Fraxinus</i> | Tyloses present |
| 2016 | SF3236 | Handspike | n/r | <i>Fraxinus</i> | |
| 2016 | SF3237 | Handspike | n/r | <i>Fraxinus</i> | Tyloses present in places |
| 2017ii | SF3252 | Linstock | n/r | <i>Alnus</i> | Compressed and poorly preserved. |
| 2016 | SF3257 | Single block | Cheek | <i>Ulmus</i> | |
| | | | Sheave | <i>Ulmus</i> | |
| | | | Peg | Indet. ^a | Not possible to sample. A diffuse porous hardwood |
| 2017ii | SF3259 [=SF3287] | Linstock | n/r | <i>Fraxinus</i> | Strong ring curvature. Narrow growth rings. Occasional tyloses present. Pith present. |
| 2017ii | SF3267 [=SF3288, SF3265, SF3247] | Linstock | n/r | <i>Fraxinus</i> | Strong ring curvature. Medium ring width. Occasional tyloses. SF3247 has since broken into two fragments |
| 2017ii | SF3273 [=SF3258, SF3246, SF3275] | Linstock | n/r | <i>Alnus/Betula</i> | Narrow ring growth. Very poor preservation. |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|--|-------------------|---------------|--|---|
| 2017ii | SF3282 [=SF3280, SF3264, SF3261] | Linstock | n/r | <i>Populus/Salix</i> | No pith. Moderate ring curvature. Medium and wide rings present. |
| 2018i | SF3293 | Handspike | n/r | <i>Betula</i> | Roundwood, with possible pith. Strong ring curvature. Medium width rings. |
| 2017ii | SF3305 | Part of handspike | n/r | <i>Fraxinus</i> | Weak ring curvature. Wide rings. Tyloses present. |
| 2017ii | SF3306 | Part of handspike | n/r | <i>Fraxinus</i> | Weak ring curvature. Mixed ring widths. Tyloses present. |
| 2016 | SF3307 | Handspike | n/r | <i>Fraxinus</i> | Tyloses present |
| 2018i | SF3308 | Handspike | n/r | <i>Fraxinus</i> | Weak-no ring curvature. Tyloses present. Narrow rings. |
| 2016 | SF3309 | Linstock | n/r | <i>Quercus</i> | Very degraded (in sampled section). Some iron staining. |
| 2016 | SF3311 | Handspike | n/r | <i>Fraxinus</i> | |
| 2017ii | SF3312 | Linstock | n/r | cf <i>Betula</i> | Not a roundwood. Knot present. |
| 2016 | SF3324 | Flexible rammer | n/r | <i>Alnus</i> | Lots of iron deposit in cells. |
| 2016 | SF3327 | Handspike | n/r | <i>Fraxinus</i> | |
| 2016 | SF3333 | Handspike | n/r | n/r | Not sampled – a complete, good example. |
| 2017i | SF3342 | Pipe stopper | n/r | cf <i>Betulaceae</i> Group 1 ^{a,b} | Wide growth rings, with weak curvature. |
| 2016 | SF3358 | Double block | Cheek | <i>Ulmus</i> | Red iron deposit in cells. |
| | | | Sheave 1 | <i>Fraxinus</i> | Tyloses present |
| | | | Sheave 2 | <i>Fraxinus</i> ^a | Based on comparison with the other sheave, when examined at low magnification. |
| | | | Peg | Maloideae | Pith present, off centre. Near complete roundwood cross-section; bark present for 5/6 of the circumference. |
| 2017ii | SF3389 | Plank - ?box edge | n/r | <i>Juglans</i> | Tyloses present. |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|--|---------------|------------------------------|--|
| 2018i | SF3399 | Plank | n/r | <i>Quercus</i> | Tyloses present. |
| 2017i | SF3431 | Shaft | n/r | <i>Fraxinus</i> | Very wide growth rings, with weak/no curvature. Tyloses present. |
| 2017i | SF3435 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with no curvature. Tyloses present. |
| 2017i | SF3437 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Tyloses present. |
| 2017ii | SF3437 | Part of ?handspike | n/r | <i>Fraxinus</i> | Weak ring curvature. Wide rings. Tyloses present. Duplicate identification. |
| 2017i | SF3438 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak/no curvature. Occasional tyloses. |
| 2018i | SF3439 | Handspike | n/r | <i>Betula</i> | Roundwood. Strong ring curvature. |
| 2017i | SF3443 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak/no curvature. Tyloses present. |
| 2017i | SF3448 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings. Tyloses present. |
| 2017i | SF3449 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Occasional tyloses. ?insect hole (circular, 1mm diameter). |
| 2018i | SF3459 | Handspike | n/r | <i>Fraxinus</i> | Occasional tyloses. Heavily concreted with iron. |
| 2017i | SF3463 | 'Fire log' | n/r | <i>Betula</i> | Moderate ring curvature. Some distinctive bark still attached. |
| 2017i | SF3465 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Tyloses present. |
| 2018i | SF3466 | Wooden shaft (possible tool/implement) | n/r | <i>cf Fagus</i> | Poorly preserved. |
| 2017i | SF3469 | Powder bottle | Lid in situ | Indet. ^a | Not a roundwood. [?Betulaceae type vessel pattern: diffuse porous, aggregate rays?] |
| | | | Body | <i>Fraxinus</i> ^a | Not a roundwood. |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|---------------|---|---------------------------------|---|
| 2018ii | SF3471 | Powder Bottle | Body | <i>Fraxinus</i> | Narrow-medium rings. Weak curvature. Tyloses present. |
| 2017i | SF3472 | Powder bottle | Lid in situ | <i>cf Fraxinus</i> ^a | Not a roundwood. |
| | | | Body (hole in side) | <i>cf Fraxinus</i> ^a | Fibres still present in one (probably both) of the holes. |
| 2018i | SF3473 | Powder bottle | Body | <i>Fraxinus</i> | Narrow-medium ring widths. Tyloses present. |
| 2018ii | SF3474 | Powder Bottle | Body | <i>Fraxinus</i> | Very narrow rings. Tyloses present |
| 2018i | SF3475 | Powder bottle | Body | <i>Alnus</i> | Medium width rings. |
| 2017i | SF3487 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Tyloses present. |
| 2018i | SF3489 | Handspike | n/r | <i>Fraxinus</i> | Weak curvature. |
| 2018i | SF3490 | Handspike | n/r | <i>Fraxinus</i> | Weak-no ring curvature. Tyloses present. |
| 2018ii | SF3504 | Powder Bottle | Body | <i>Populus/Salix</i> | |
| 2017i | SF3505 | Powder bottle | Body | <i>Fagus</i> | Not a roundwood. Weak/none ring curvature. |
| 2018i | SF3505 | Powder bottle | Body | <i>Fagus</i> | Narrow rings. Occasional tyloses present. Duplicate identification. |
| 2018ii | SF3506a | Powder Bottle | Lid (complete; with neck that had been inside). | <i>Carpinus</i> | Weak curvature |
| 2018ii | SF3506b | Powder Bottle | Body (neck only, formerly inside lid) | <i>cf Carpinus</i> | Moderate curvature |
| 2018ii | SF3507 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Wide rings. Indet. curvature |
| 2018ii | SF3508 | Powder Bottle | Lid | <i>Carpinus</i> | |
| 2018ii | SF3509 | Powder Bottle | Lid | <i>Fraxinus</i> | Narrow rings. Degraded |
| 2018ii | SF3510 | Powder Bottle | Lid | <i>Carpinus</i> | Weak curvature |
| 2017i | SF3511 | Powder bottle | Lid | <i>Fraxinus</i> ^a | Not a roundwood. Ring curvature weak/none. |
| 2018ii | SF3512 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses. Narrow ring. Weak curvature |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|---------------|---------------------------|-------------------------|---|
| 2018ii | SF3513 | Powder Bottle | Body | <i>Populus/Salix</i> | |
| 2018ii | SF3514 | Powder Bottle | Body | <i>Populus/Salix</i> | Medium-large rings. Weak curvature. |
| 2017i | SF3515 | Powder bottle | Body | <i>cf Populus/Salix</i> | Not a roundwood. Weak ring curvature. Dark stain around outer edge of rim where the closed lid would have been in contact with the body. Compressed (oval). |
| 2018ii | SF3516 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. |
| 2017i | SF3517 | Powder bottle | Body | <i>Fraxinus</i> | Not a roundwood. Weak/none ring curvature. Tyloses present. Dark stain around outer edge of rim where the closed lid would have been in contact with the body. |
| 2017i | SF3518 | Powder bottle | Body | <i>Fraxinus</i> | Not a roundwood. Weak ring curvature. Dark stain around outer edge of rim where the closed lid would have been in contact with the body. Tyloses present. |
| 2017i | SF3519 | Powder bottle | Body | <i>Juglans</i> | Not a roundwood. Hard wood. ?Weak ring curvature (growth ring boundaries were undulating). Dark stain around outer edge of rim where the closed lid would have been in contact with the body. |
| 2018ii | SF3520 | Powder Bottle | Body | <i>Populus/Salix</i> | Medium-wide rings. |
| 2018ii | SF3521 | Powder Bottle | Body | <i>Fagus</i> | |
| 2018ii | SF3522 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Narrow rings. Weak/no curvature |
| 2018ii | SF3523 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Narrow rings. Weak/no curvature |
| 2018ii | SF3524 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present |
| 2017i | SF3525 | Powder bottle | Body | <i>Carpinus</i> | Not a roundwood. Weak/none ring curvature. |
| 2017i | SF3526 | Powder bottle | Lid (not <i>in situ</i>) | Indet. ^a | Fibres still present in one of the holes. |
| | | | Body | Indet. ^a | Not a roundwood. Wide ring. [Diffuse porous hardwood] |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|---|--------------------|---------------------------|---------------------|--|
| 2017i | SF3527 | Powder bottle | Lid (not <i>in situ</i>) | Indet. ^a | |
| | | | Body | Indet. ^a | Not a roundwood. Wide ring. [Diffuse porous hardwood] |
| 2017i | SF3528 | Powder bottle | Body | <i>Fraxinus</i> | Not a roundwood. Weak/none ring curvature. Some very slow growing rings. |
| 2018i | SF3528 | Powder bottle | Body | <i>Fraxinus</i> | Narrow rings. Tyloses present. Duplicate identification. |
| 2018i | SF3533 | Handspike | n/r | <i>Fraxinus</i> | Weak-no ring curvature. Medium ring width. Tyloses present. |
| 2018i | SF3536 | Handspike | n/r | <i>Fraxinus</i> | Weak-no curvature. |
| 2017i | SF3537 | 'Fire log' | n/r | <i>cf Taxus</i> | Branch (c. 30cm long) with (broken off) side branches. |
| 2017i | SF3538 | Powder bottle | ?Base only | <i>Fraxinus</i> | Not a roundwood. Moderate ring curvature. Occasional tyloses. Black, circular stain in centre of base (where would have been in contact with gunpowder stored inside). |
| 2018i | SF3538 | Powder bottle | Body | <i>Fraxinus</i> | Occasional tyloses. [Only TS used for ID, as fragment small]. Duplicate identification. |
| 2017i | SF3551 | Shaft or handle | n/r | <i>Fraxinus</i> | Very wide growth rings, with weak ring curvature. Occasional tyloses. |
| 2017ii | SF3555 | Part of ?handspike | n/r | <i>Fraxinus</i> | Tyloses present. |
| 2018i | SF3556 | Handspike | n/r | <i>Fraxinus</i> | Tyloses present. |
| 2017i | SF3558 (four concreted together) | Handspike (a) | Longest fragment | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Tyloses present. |
| | | Handspike (b) | Shortest fragment | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Tyloses present. |
| | | Handspike | n/r | Not sampled | (Complete) |
| | | Handspike | n/r | Not sampled | (Complete) |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-----------------------------|---------------|--------------------|-------------------------|--|
| 2017i | SF3559 | Handspike | n/r | Not sampled | (Complete) |
| 2017i | SF3561 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings. Tyloses present. |
| 2018i | SF3562 | Handspike | n/r | <i>Fraxinus</i> | Weak curvature. Tyloses present. |
| 2017i | SF3563 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings. Tyloses present. Lots of iron deposition. |
| 2018i | SF3564 | Handspike | n/r | <i>Fraxinus</i> | Weak-no ring curvature. Tyloses present. Wide rings. |
| 2017i | SF3566 | Powder bottle | Lid only | <i>Fagus</i> | Not a roundwood. Weak/none ring curvature. |
| 2018ii | SF3567 | Powder Bottle | Body | <i>Fagus</i> | Narrow rings. Weak curvature. |
| 2017i | SF3569 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Tyloses present. |
| 2018i | SF3570 (fragment 2 of 2) | Handspike | n/r | <i>Fraxinus</i> | Tyloses present. |
| 2017i | SF3571 | Handspike | n/r | <i>Fraxinus</i> | Weak/no growth ring curvature. Occasional tyloses. |
| 2018ii | SF3572 | Powder Bottle | Body | <i>Fagus</i> | Medium-wide rings. Weak/no curvature. Occasional tyloses |
| 2018ii | SF3573 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Medium rings |
| 2018ii | SF3574 | Powder Bottle | Body | Maloideae | Narrow rings. Weak curvature. |
| 2018ii | SF3575 | Powder Bottle | Body | <i>cf Populus/Salix</i> | Weak curvature |
| 2018ii | SF3576 | Powder Bottle | Body | <i>Populus/Salix</i> | Wide rings. Weak/no curvature. |
| 2018ii | SF3577 | Powder Bottle | Body | <i>Fraxinus</i> | Moderate curvature. Medium ring width. No tyloses |
| 2018ii | SF3578 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present |
| 2018ii | SF3579 | Powder Bottle | Body | <i>Acer</i> | Medium rings. Weak/no curvature. |
| 2018ii | SF3580 | Powder Bottle | Body | <i>Fagus</i> | Narrow rings. Weak/no curvature. |
| 2017i | SF3581 | Powder bottle | Lid <i>in situ</i> | Indet. ^a | [No wood structure visible due to sediment cover] |
| | | | Body | Indet. ^a | [TLS: wide rays] |
| 2018ii | SF3582 | Powder Bottle | Body | <i>Carpinus</i> | Medium-wide rings. Weak curvature. |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|---------------|--------------------|---------------------------------|---|
| 2018ii | SF3583 | Powder Bottle | Body | <i>Fagus</i> | Narrow ring. Moderate curvature. Occasional tyloses |
| 2018ii | SF3584 | Powder Bottle | Body | <i>Betula</i> | Weak curvature |
| 2018ii | SF3585 | Powder Bottle | Body | <i>Carpinus</i> | Weak curvature. |
| 2018ii | SF3586 | Powder Bottle | Body | <i>Carpinus</i> | Medium rings. Weak/no curvature. |
| 2018i | SF3587 | Powder bottle | Lid | <i>Fagus</i> | Tyloses present. |
| 2018ii | SF3588 | Powder Bottle | Lid | <i>Fraxinus</i> | Narrow rings. Weak curvature. Tyloses present |
| 2018ii | SF3599 | Powder Bottle | Lid | <i>Fagus</i> | Wide ring. Indet curvature |
| 2017i | SF3601 | Powder bottle | Lid <i>in situ</i> | Indet. ^a | [TS: looks ring porous] |
| | | | Body | <i>cf Fraxinus</i> ^a | Not a roundwood. Weak/no ring curvature. |
| 2018ii | SF3602 | Powder Bottle | Body | <i>Fraxinus</i> | Very narrow rings. Tyloses present. Weak/no curvature |
| 2018ii | SF3603 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Narrow-medium rings. |
| 2018ii | SF3604 | Powder Bottle | Body | <i>Carpinus</i> | Very narrow rings. Weak curvature. |
| 2018ii | SF3606 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Narrow rings. Weak/no curvature |
| 2018ii | SF3607 | Powder Bottle | Body | <i>cf Acer</i> | Narrow rings. Weak/no curvature. |
| 2018i | SF3608 | Powder bottle | Body | <i>Fraxinus</i> | Narrow rings. Tyloses present. |
| 2018ii | SF3609 | Powder Bottle | Lid | <i>cf Carpinus</i> | Poor preservation |
| 2018ii | SF3610 | Powder Bottle | Lid | <i>Fraxinus</i> | Narrow rings. Weak curvature. Tyloses present |
| 2018ii | SF3611 | Powder Bottle | Lid | <i>Betula</i> | Indet. curvature and ring width |
| 2018i | SF3612 | Powder bottle | Body | <i>Populus/Salix</i> | Medium-large ring widths. |
| 2018i | SF3613 | Powder bottle | Body | <i>Betula</i> | Wide rings. |
| 2018ii | SF3614 | Powder Bottle | Lid | <i>cf Carpinus</i> | Degraded |
| 2018ii | SF3615 | Powder Bottle | Body | <i>Populus/Salix</i> | |
| 2018ii | SF3616 | Powder Bottle | Body | <i>cf Fagus</i> | Indet. curvature (cannot get good sections of other planes for a secure identification) |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|---|------------------------|----------------------------------|---|
| 2018i | SF3617 | Powder bottle | Body | <i>Fraxinus</i> | Narrow growth ring. Tyloses present. |
| 2017i | SF3618 | 'Flask' stopper/spout | Pointed spout/tip only | <i>Fraxinus</i> ^a | Not a roundwood. Weak/no ring curvature. Very wide rings i.e. fast growth. |
| 2018ii | SF3618 | Powder Bottle | Body (spout only) | <i>Fraxinus</i> | Indet. tyloses (degraded). Indet. ring curvature. Duplicate identification, here sampled. |
| 2018i | SF3619 | Powder bottle | Body | <i>Fraxinus</i> | Narrow-medium ring widths. Tyloses present. |
| 2018ii | SF3620 | Powder Bottle | Body | <i>Fagus</i> | Wide ring. Indet curvature |
| 2018ii | SF3621 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present |
| 2018ii | SF3622 | Powder Bottle | Lid | <i>Alnus</i> | Medium rings. Weak curve |
| 2018ii | SF3630 | Powder Bottle | Lid | <i>Fagus</i> | |
| 2018i | SF3631 | Timber with notch; and SF3632 (cordage) | n/r | cf <i>Pinus sylvestris</i> group | Wood degraded. |
| 2017i | SF3634 | Pistol grip handle | Handle | <i>Juglans</i> | Tyloses present. Hard to sample. |
| 2018ii | SF3635 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Weak ring curvature. Medium ring widths |
| 2018ii | SF3636 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Weak curvature. Medium rings |
| 2018ii | SF3637 | Powder Bottle | Body | cf <i>Fagus</i> | Occasional tyloses |
| 2018ii | SF3638 | Powder Bottle | Body | <i>Fagus</i> | Occasional tyloses |
| 2018ii | SF3639 | Powder Bottle | Body | <i>Fraxinus</i> | Medium ring width. Weak/no curvature. Tyloses present |
| 2018ii | SF3640 | Powder Bottle | Body | <i>Fraxinus</i> | Narrow-medium ring. Weak/no curvature. Tyloses present |
| 2018ii | SF3641 | Powder Bottle | Body | <i>Fagus</i> | Weak curvature. Occasional tyloses |
| 2018ii | SF3642 | Powder Bottle | Body | <i>Fraxinus</i> | Very narrow-medium ring width. Weak curvature. Tyloses present |
| 2018ii | SF3643 | Powder Bottle | Body | cf <i>Acer</i> | |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|-----------------|--------------------------|-----------------|----------------------|----------------------|---|
| 2018ii | SF3644 | Powder Bottle | Body | <i>Fagus</i> | Medium ring width. Weak/no curvature. Occasional tyloses |
| 2018ii | SF3645 | Powder Bottle | Body | <i>Betula</i> | Weak curvature. Wide rings |
| 2018i | SF3646 | Powder bottle | Body | <i>Populus/Salix</i> | |
| 2018i | SF3647 | Powder bottle | Body | <i>cf Fagus</i> | |
| 2018i | SF3648 | Powder bottle | Body | <i>Fraxinus</i> | Narrow growth ring. Occasional tyloses present. Moderate ring curvature (not from a roundwood piece). |
| 2018ii | SF3649 | Powder Bottle | Lid | <i>Carpinus</i> | Medium rings. Weak curvature. |
| 2018ii | SF3650 | Powder Bottle | Body | <i>Fagus</i> | Medium ring width. Weak/no curvature. Occasional tyloses |
| 2018ii | SF3651 | Powder Bottle | Body | <i>Acer</i> | |
| 2018i | SF3652 | Powder bottle | Body | <i>Acer</i> | |
| 2018i | SF3653 | Powder bottle | Body | <i>cf Carpinus</i> | |
| 2018ii | SF3654a | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present |
| 2018ii | SF3654b | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present |
| 2018ii | SF3654c | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present |
| 2018ii | SF3654d | Powder Bottle | Body | <i>Populus/Salix</i> | |
| 2018ii | SF3654e | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Medium width rings. |
| 2018ii | SF3654f | Powder Bottle | Body | <i>Fagus</i> | Occasional tyloses |
| 2018ii | SF3654g | Powder Bottle | Body | <i>cf Fagus</i> | Occasional tyloses |
| 2018ii | SF3655a | Powder Bottle | Body | <i>Fraxinus</i> | Narrow rings. Tyloses present. |
| 2018ii | SF3655b | Powder Bottle | Lid | <i>Fraxinus</i> | Narrow rings. Tyloses present. Weak/no ring curvature |
| 2018ii | SF3655c | Powder Bottle | Lid | <i>Acer</i> | Wide ring |
| 2018ii | SF3655d | Powder Bottle | Lid | <i>Betula</i> | |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|---------------|----------------------------------|----------------------|--|
| 2018ii | SF3655e | Powder Bottle | Lid | <i>Alnus</i> | |
| 2018ii | SF3655f | Powder Bottle | Lid | <i>Fagus</i> | |
| 2018ii | SF3655g | Powder Bottle | Lid | <i>Fagus</i> | Narrow rings. Tyloses present |
| 2018ii | SF3655h | Powder Bottle | Lid | <i>Betula</i> | |
| 2018ii | SF3655i | Powder Bottle | Lid | <i>Fraxinus</i> | |
| 2018ii | SF3655j | Powder Bottle | Lid | <i>Fagus</i> | Narrow rings |
| 2018ii | SF3655k | Powder Bottle | Body | <i>Populus/Salix</i> | |
| 2018ii | SF3656a | Powder Bottle | Lid | <i>Fagus</i> | Medium ring width. Weak curvature. Occasional tyloses |
| 2018ii | SF3656b | Powder Bottle | Body | <i>Fagus</i> | Medium-large ring. Occasional tyloses. Weak/no curvature |
| 2018ii | SF3657a | Powder Bottle | Lid | <i>Carpinus</i> | Narrow rings. Moderate ring curvature |
| 2018ii | SF3657b | Powder Bottle | Body | Betulaceae Group 2 | Wide rings. Indet. ring curvature. |
| 2018ii | SF3658a | Powder Bottle | Lid (complete, with neck inside) | <i>Carpinus</i> | Narrow ring |
| 2018ii | SF3658b | Powder Bottle | Body (neck only, inside lid) | <i>Carpinus</i> | Poor preservation |
| 2018ii | SF3659 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Narrow rings. Weak curvature |
| 2018ii | SF3660 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Very narrow rings. Weak curvature |
| 2018ii | SF3661 | Powder Bottle | Lid (complete) | <i>Acer</i> | Weak curvature. |
| 2018ii | SF3662 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Medium ring width. Weak/no curvature. |
| 2018ii | SF3664 | Powder Bottle | Body | <i>Acer</i> | Wide-medium rings. Weak/no ring curvature. |
| 2018ii | SF3665 | Powder Bottle | Body | <i>Fagus</i> | Weak curvature. Occasional tyloses |
| 2018ii | SF3666 | Powder Bottle | Body | <i>Fraxinus</i> | Very wide ring. Weak curvature. Tyloses present |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|--------------------------|---------------|---------------|----------------------|---|
| 2018ii | SF3667 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Weak/no ring curvature. Narrow-medium rings |
| 2018ii | SF3668 | Powder Bottle | Body | <i>Fagus</i> | Tyloses present. Weak/no ring curvature. Medium-wide rings. |
| 2018ii | SF3669 | Powder Bottle | Body | <i>Fagus</i> | Weak/no ring curvature. Occasional tyloses |
| 2018ii | SF3670 | Powder Bottle | Body | <i>cf Carpinus</i> | Weak/moderate ring curvature. Medium ring widths. |
| 2018ii | SF3671 | Powder Bottle | Body | <i>Betula</i> | Narrow-medium rings. Weak ring curvature |
| 2018i | SF3672 | Powder bottle | Body | <i>Fagus</i> | |
| 2018i | SF3673a [?=3673b, 3673c] | Powder bottle | Body | <i>Fraxinus</i> | Tyloses present. |
| 2018i | SF3673b [?=3673a, 3673c] | Powder bottle | Body | <i>Fraxinus</i> | Narrow rings. Tyloses present. |
| 2018i | SF3673c [?=3673a, 3673b] | Powder bottle | Body | <i>Fraxinus</i> | Tyloses present. |
| 2018i | SF3673d | Powder bottle | Body | <i>cf Carpinus</i> | |
| 2018i | SF3673e | Powder bottle | Body | <i>Fagus</i> | |
| 2018ii | SF3674 | Powder Bottle | Lid | <i>Fagus</i> | Narrow rings. Weak curvature. Tyloses present |
| 2018ii | SF3675 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Narrow-medium rings. Weak-moderate curvature |
| 2018ii | SF3676 | Powder Bottle | Lid | <i>Fagus</i> | Weak curvature. Occasional tyloses |
| 2018ii | SF3678 | Powder Bottle | Body | <i>Fagus</i> | |
| 2018i | SF3679 | Powder bottle | Body | <i>Populus/Salix</i> | |
| 2018ii | SF3680 | Powder Bottle | Body | <i>Fraxinus</i> | Medium curvature. Narrow-medium rings. Tyloses present |
| 2018ii | SF3681 | Powder Bottle | Body | <i>Populus/Salix</i> | Weak/no curvature. Medium rings |
| 2018ii | SF3682 | Powder Bottle | Body | <i>Carpinus</i> | Medium-wide rings. Weak curvature. |
| 2018ii | SF3683 | Powder Bottle | Body | <i>cf Carpinus</i> | Medium-large ring. Weak/no curvature |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|---|-----------------------|---------------------------------|---------------------------------|--|
| 2018ii | SF3684 | Powder Bottle | Body | <i>Fraxinus</i> | Weak curvature. Tyloses present. Very narrow rings |
| 2018ii | SF3685 | Powder Bottle | Body | <i>Carpinus</i> | Medium ring width. Weak curvature |
| 2018i | SF3686 | Powder bottle | Body | <i>cf Carpinus</i> | |
| 2018i | SF3687 | Powder bottle | Body | <i>cf Carpinus</i> | |
| 2018i | SF3688 | Powder bottle | Body | <i>Fagus</i> | Narrow-medium ring widths. |
| 2018i | SF3689 | Powder bottle | Body | <i>cf Carpinus</i> | |
| 2018i | SF3690a (piece with smaller lug) [=3690b] | Powder bottle | Body | <i>Fagus</i> | Wide rings. |
| 2018i | SF3690b (piece with larger lug) [=3690a] | Powder bottle | Body | <i>Fagus</i> | |
| 2018i | SF3690c | Powder bottle | Body [not part of 3690a and b]. | <i>cf Betulaceae Group 1</i> | Very poorly preserved. Compressed wood structure. |
| 2018ii | SF3696 | Powder Bottle | Lid | <i>Fagus</i> | Weak curvature |
| 2018ii | SF3697 | Powder Bottle | Lid | <i>Fagus</i> | Narrow-medium rings. Weak-moderate curvature. |
| 2018ii | SF3698 | Powder Bottle | Lid | <i>Fraxinus</i> | Tyloses present. Moderate ring curvature |
| 2018ii | SF3699 | Powder Bottle | Lid | <i>Fraxinus</i> | No tyloses. Indet. ring width and curvature (poor condition). |
| 2018ii | SF3700a | Powder Bottle | Lid | <i>cf Carpinus</i> | Medium ring width. Weak curvature |
| 2018ii | SF3700b | Powder Bottle | Body | <i>cf Betulaceae Group 2</i> | |
| 2018ii | SF3702 | Powder Bottle | Body | <i>cf Fagus</i> | Weak curvature. Poor preservation. |
| 2017i | SF3703 | 'Flask' stopper/spout | Pointed spout/tip only | <i>cf Fraxinus</i> ^a | Not a roundwood. Weak/no ring curvature. |
| 2017i | SF3705 | Handle | n/r | <i>Fraxinus</i> | Not a roundwood. Moderate ring curvature. Some very wide rings i.e. very fast growth. |
| 2018ii | SF3712 | Powder Bottle | Lid | <i>Fagus</i> | Wide rings. |
| 2017i | SF3716 | Handspike | n/r | <i>Fraxinus</i> | Wide growth rings, with weak curvature. Occasional tyloses. ?insect hole (oval - ?compressed). |

| Analysed | Small find number | Artefact | Sub-component | Wood type | Notes |
|----------|-------------------|---------------|--------------------------------|---------------------------------|--|
| 2017i | SF3730 | Tuning peg | Peg body | Indet. ^a | Dark reddy/brown wood. |
| | | | Circular insert | Indet. ^a | Paler wood (decoration?). |
| 2017i | SF3732 | Hammer | Handle/shaft | cf Betulaceae Group 1 | Hard to sample. |
| 2017i | SF3733 | Bung | n/r | cf <i>Fraxinus</i> ^a | Weak curvature growth rings. Wide growth rings. Iron deposit. |
| 2018i | SF3733 | Bung | n/r | cf <i>Fraxinus</i> | Tyloses present. Very degraded. Iron deposit present. Moderate-weakly curved growth rings. Duplicate identification, but here, sampled. |
| 2018ii | SF3737 | Powder Bottle | Body | <i>Fraxinus</i> | Tyloses present. Weak curvature |
| 2018i | SF3764 | Wooden handle | n/r | cf <i>Fraxinus</i> | Very poorly preserved |
| 2018i | SF3781 | Cask | Stave | <i>Quercus</i> | Narrow rings. Tyloses present. |
| 2018i | SF3782 | Cask | Stave | <i>Quercus</i> | Narrow rings. Tyloses present. |
| 2018i | SF3783 | Cask | Stave | cf <i>Quercus</i> ^a | Narrow rings. |
| 2018i | SF3784 | Cask | Stave | <i>Quercus</i> | Narrow rings. Tyloses present. |
| 2018i | SF3785 | Cask | Stave | <i>Quercus</i> | Medium width rings. Tyloses present. |
| 2017i | SF3786 | Cask | Stave | <i>Quercus</i> | Narrow growth rings, with weak/no curvature. Tyloses present. |
| 2018i | SF3787 | Cask | Stave | cf <i>Quercus</i> ^a | Narrow rings. |
| 2017i | SF3788 | Cask | Cant stave (curved head piece) | <i>Quercus</i> | Narrow growth rings, with weak/no curvature. Tyloses present throughout. |
| 2017i | SF3789 | Cask | Hoop | <i>Corylus</i> | Some bark attached. Pith present. Half section of a small diameter roundwood. Strong ring curvature (≥ 9 rings based on those counted in the sampled section). |
| 2018ii | SF3794 | Powder Bottle | Lid | cf Betulaceae Group 2 | |
| 2018ii | SF3795 | Powder Bottle | Body | <i>Fraxinus</i> | |

*Table A3. Powder bottle body volume results (Categories 1 and 2 only). * = volume was measured post-conservation.*

| Small Find number | Condition category | Volume (ml) | Notes on completeness relevant to capacity |
|--------------------------|---------------------------|--------------------|---|
| 3469 | Category 1 | 18 | |
| 3470 | Category 1 | 17 | |
| 3471 | Category 2 | 16 | Neck broken |
| 3472 | Category 1 | 18 | |
| 3474 | Category 2 | c10 | Body broken, neck broken |
| 3504 | Category 2 | 15 | |
| 3514 | Category 2 | 16 | Neck broken |
| 3515 | Category 2 | c10 | Bottom cracked [water escaped] |
| 3516 | Category 2 | 18 | Neck broken |
| 3517 | Category 2 | 17 | Neck broken |
| 3518 | Category 2 | 17 | Neck broken |
| 3519 | Category 2 | 14 | Neck broken |
| 3520 | Category 2 | 16 | Neck broken |
| 3521 | Category 2 | 18 | Neck broken |
| 3522 | Category 2 | 19 | Neck broken |
| 3525 | Category 2 | 14 | Neck broken |
| 3526 | Category 1 | 19 | |
| 3527 | Category 1 | 19 | |
| 3567 | Category 2 | 14 | Neck broken |
| 3572 | Category 2 | 16 | Neck broken |
| 3573 | Category 2 | 14 | Neck broken |
| 3574 | Category 2 | 18 | Neck broken |
| 3575 | Category 2 | 15 | Neck broken |
| 3576 | Category 2 | 14 | Neck broken |
| 3577 | Category 2 | 18 | Neck broken |
| 3578 | Category 2 | 17 | |
| 3579 | Category 2 | 13 | Neck broken |
| 3580 | Category 2 | 16 | |
| 3581 | Category 1 | 19 | |
| 3582 | Category 2 | 17 | Neck broken |
| 3583 | Category 2 | 18 | Neck broken |
| 3584 | Category 2 | 18 | Neck broken |
| 3585 | Category 2 | c12 | Body broken, neck broken |
| 3586 | Category 2 | 15 | Neck broken |
| 3601 | Category 1 | 20* | |
| 3602 | Category 2 | 18 | Bottom and neck broken |
| 3603 | Category 2 | 15 | |
| 3604 | Category 2 | 14 | Neck broken |
| 3606 | Category 2 | 17 | |

| Small Find number | Condition category | Volume (ml) | Notes on completeness relevant to capacity |
|--------------------------|---------------------------|--------------------|---|
| 3607 | Category 2 | 16 | Neck broken |
| 3616 | Category 2 | 14 | Neck broken |
| 3635 | Category 2 | 20 | Neck broken |
| 3637 | Category 2 | 17 | Neck broken |
| 3638 | Category 2 | 15 | Neck broken |
| 3639 | Category 2 | 15 | Neck broken |
| 3640 | Category 2 | 17 | Neck broken |
| 3641 | Category 2 | c14 | Body and neck broken |
| 3642 | Category 2 | 15 | Neck broken |
| 3643 | Category 2 | 18 | Neck and body broken |
| 3644 | Category 2 | 16 | Neck broken |
| 3645 | Category 2 | 12 | Neck broken |
| 3650 | Category 2 | 16 | Neck broken |
| 3651 | Category 2 | c12 | Body broken |
| 3664 | Category 2 | 18 | Neck broken |
| 3665 | Category 2 | 13 | Neck broken |
| 3666 | Category 2 | 15 | Neck broken |
| 3667 | Category 2 | 14 | Neck broken |
| 3668 | Category 2 | 15 | Neck broken |
| 3669 | Category 2 | 20 | Neck broken |
| 3670 | Category 2 | 13 | Neck broken |
| 3671 | Category 2 | 16 | Neck broken |
| 3678 | Category 2 | 15 | Neck broken |
| 3680 | Category 2 | 15 | Neck broken |
| 3681 | Category 2 | 12 | Neck broken |
| 3682 | Category 2 | 16 | Neck broken |
| 3683 | Category 2 | 14 | Neck broken |
| 3684 | Category 2 | 14 | Neck broken |
| 3685 | Category 2 | 14 | Neck broken |
| 3689 | Category 2 | c10 | Broken in half |
| 3702 | Category 2 | 21 | Neck broken |
| 3737 | Category 2 | 15 | Neck broken |

Table A4. Refitted handspike fragments (by Z. Hazell and E. Aitken, June 2018)

| Refitted handspike fragments | Details of refitting |
|--|--|
| SF3555 SF3489 | Do not physically join. Tentative match based on growth rings. |
| SF3570 [fragment 1 of 2] SF3570 [fragment 2 of 2] SF3465 SF3438 | Physical match. Growth ring match. |
| SF3205 SF3175 | Physical match Growth ring match |
| SF3305 SF3307 | Physical match |
| SF3174 SF3716 | Tentative physical match Growth ring match |
| SF3490 SF3557 | Physical match Growth ring match |
| SF3253 SF3293 SF3439 SF3176 | Physical match Tentative match with other three fragments, based on: from a roundwood (centre), and same woodworm damage. |
| SF3532 SF3535 SF3536 | Physical match Growth ring match |



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