A Summary and selective analysis of the Roman Period Woodwork recorded during archaeological investigations at No1 Poultry, City of London

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A SELECTIVE SUMMARY OF THE ROMAN PERIOD WOODWORK FOUND AT No 1 POULTRY, CITY OF LONDON.

(Compiled late 1999-2000 by DM.Goodburn Ancient Woodwork Specialist. MOLSS- Eagle Wharf)

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INTRODUCTION

Some limitations to this summary report

Readers should read this report with copies of, the main site stratigraphic Analysis Report (J. Hill et al. forthcoming), the Tree-ring Analysis report (I. Tyers forthcoming), the Wood Species ID. Appendix by L. Gray-Lees and Conservation report (L. Goodman forthcoming) to hand. If they are not available earlier assessment documents on the same themes will be of some use. Thus, it is clear that prior to completion of some of the above work a few amendments to the following text are likely to be required, before full publication.

A summary of some of the key features of the site as it bears directly on the waterlogged woodwork found

A very brief outline of the nature of the site and the principal sequences of preserved woodwork would be useful here. The excavated area lies near the historic core of the City of London on the west bank of the now infilled Walbrook stream. It was cut across by many small watercourses and despite being many metres above sea level nearly all the lower levels were waterlogged. The presence of waterlogged deposits in this area has been known for many years, and recent work on the neighbouring sites of CID90 and BUC87 showed that much waterlogged timber and roundwood could be expected of Roman date. Evaluation trenches on the site dug in 1994 also showed that a large amount of Roman woodwork was preserved. Indeed during the following excavations in 1995/6 a very large amount of Roman woodwork was excavated and recorded. Alongside this a small amount of early and later medieval woodwork was also found and recorded and is summarized in a companion report to this, divided for ease of editing for the separate intended volumes.

The nature of the Roman woodwork recorded was very varied and differed substantially from that typically found on sites along the main Thames river frontage. The range included; the lower walls and wall collapse from a timber framed building, a large well preserved timber framed cistern, timber piled and rafted foundations, well linings, timber lined drains, water pipes, sumps, fences of various types, a nearly complete plank and ledge door and a large log-cabin style ('lafted') building platform and terrace revetment. A large amount reused or abandoned Roman woodwork was also recorded including; softwood casks, building timbers of very varied types, a dugout trough, hewn dishes, a spade, a wheel spoke, and an elaborately joined chest base. Small finds of wood of all periods were also found, and are summarised in the main finds report (A. Wardle, forthcoming). Many categories of woodwork found have rarely been found elsewhere in London.

In addition some general information touching on several fundamental themes in early woodwork research was recovered. For example much information about the nature of Roman, and late Iron Age trees, 'treeland' and 'woodmanship' (management practices) was gleaned and will be referred to in several sections below. Subtle insights into the production of particular types of timber raw material such as sawn planks and 'riven' or cleft boards used in Roman London were also achieved. This level of information is set with in a framework of what is known from other assemblages of Roman woodwork, particularly from sites very close to No1. Poultry.

THE APPROACH TO RECORDING AND SAMPLING EARLY WOODWORK USED ON THE POULTRY PROJECT

A standardised approach to recording early woodwork during urban excavations has been detailed in the Museum of London Site Manual for many years (Westman ed. 1994) and follows recommended practice set down in the recently up-dated English Heritage 'Waterlogged Wood' Guidelines document (Brunning 1994). However, within the standard approach there is room for some variation in methodology to suit particular conditions. Four special conditions applied to the Poultry field project;

1/ The first was that MOLAS had three large wet site excavations in progress during much of the excavation. This meant that the MOLAS Ancient Woodwork Specialist (this writer now of MOLSS) could not be on hand every day. However visits were made frequently, and work carried out on-site or off-site to record particularly complex reused woodwork, as required. To deal with this particularly busy period an in-house training course was set up for several MOLAS site staff in ancient woodwork recording and sampling. These field workers then provided day to day cover in this subject, dealing with the more straight forward material, and asking for assistance from this writer where necessary. This method generally worked well. The main trained field worker for the Poultry project was T. Mackinder, without whose steady work this summary would not have been possible. J. Minkin also attended the course and his systematic and methodical work scanning and sorting many of the specialist field records from the Poultry project contributed greatly to the initial analysis of this large body of material.

2/ The second variation to standard procedure concerned the sampling of woodwork possibly suitable for tree-ring analysis. It was known from the evaluation work and excavations from just to the west and south of the site (CID90 and BUC87) that very large numbers of piles would be encountered. Whilst some of these were reused and carried rare information about Roman woodwork such as building 'carpentry', many were not, and were perhaps most useful for dating phases of building on site. The funding for very extensive tree-ring studies was also limited. Thus, it was decided with, the support of the then in-house MOLAS Tree-Ring Specialist (I.Tyers, Now of Sheffield ARCUS), that material would be sampled and 'assessed' on site as the recording progressed and only the potentially datable samples would be kept for future study. Assessed in this specific context means, to provide a written notes and a computerized list of the nature of all the samples, approximate annual ring counts etc. (This list of scanned information is part of the site archive). Thus, there is some record even of discarded samples which can be used to characterise aspects of the worked wood assemblage (see I. Tyers forthcoming). This work resulted in a much smaller bulk of samples to store at the end of the project. It has also made the choice of spot dating samples particularly easy.

However, it should also be noted that such a strategy does have one draw back: tree-ring study of larger assemblages designed to investigate some aspects of early 'woodmanship' applied to young trees is not possible such as the investigation of wood and timber produced by long coppice rotations. Such work has been particularly fruitful in some studies of Roman woodwork recently published by MOLAS, (Nayling and Goodburn in Goodburn 1991a, Goodburn and Tyers in Brigham et al. 1995, and Goodburn 1998 etc). Therefore, it is to be hoped that the approach used, for valid reasons, on the Poultry Project will not automatically be applied to all suitable large and middle sized assemblages in future.

3/ The third problem specific to this project was some localised heavy metal contamination which effected one area with woodwork in and made the detailed recording of the effected woodwork very difficult, or impossible.

4/ The fourth special circumstance which sometimes made recording of woodwork difficult was the necessity of working under a new concrete floor slab. Lighting problems sometimes made the recognition of features such as toolmarks difficult.

Finally, one of the more common place problems encountered on most urban rescue archaeology sites in the 1990's also interfered with specialist recording at times, a severe lack of time.

The character of the specialist records

The specialised part of the field record for this project comprises; written pro-format timber sheets, and sketches, several hundred measured timber drawings on gridded film, selected 1:1 tracings on clear sheet, annotated elevations and plans of structures in situ, photographs, and general descriptions of groups of worked timbers and wattlework on context sheets.

N/B Note that the following statistics include a small number of items of Saxo-Norman and medieval date.

The total number of individually recorded structural timbers = 1,363

The total number of wattle structures = 23

(Here the wattle infill panels of building [18192] are considered as one, the rest are pit or well linings, or fences)

The total number of clearly reused timbers = 134+

In many cases the 'reused' or secondhand status of timbers was not absolutely clear and a considerable additional number were classified as "unknown". Together the reused and unknown timbers amount to very roughly one third of the total recorded.

The total number of reused or abandoned casks and other coopered vessels = 5
(and several isolated fragments)

Total number of nautical timbers = 1?

Some distinct general features of the assemblage of worked wood found at No.1 Poultry

A key difference between the proportional character of the assemblage of worked roundwood and timber recorded at Poultry and the Thames side excavations such as Regis House or Pudding Lane, is that more of the woodwork is reused or possibly reused. The trend in the Poultry material is also towards a more domestic and craft function rather than civil engineering in timber as is more familiar from the waterfront zone (Milne 1985, Brigham 1990, and Brigham and Watson et al forthcoming etc.).

THE AIMS OF THE POST EXCAVATION WORK ON THE WOODWORK FROM THE POULTRY PROJECT

Following the completion of the recording and sampling of woodwork on-site a long period of specialist post-excavation work followed. This included the initial checking, sorting and summary listing of over 1,200 individually recorded pieces of Roman woodwork, several wattle structures and some of the larger wooden 'finds' (see above). These initial lists are held with the site archive, and clearly note such features as evidence of earlier use in timbers. This aspect is of crucial importance not just for technological purposes but also to calibrate the tree-ring dating and its meaning for the absolute dating of the site sequence. Following the quantification of the material and its prioritising for further analysis a subsample of the woodwork was selected for summarising in this report after some further analysis. The preparation of a set of checked analysis figures, mostly drawn to scale, was an essential part of this work. Edited and where necessary up-dated, versions of the text and figures for this phase of work will be incorporated in the main publication monographs on the No.1 Poultry investigations. In some cases the specialist work has provided information for the interpretation of the function of timber structures found on site, in other cases it sheds light on more general themes.

SUMMARY OF THE ROMAN WOODWORK FOUND

FOUNDATIONS

More than half the individually recorded timbers found were foundation piles. Many of these were not reused, some were only partially excavated due to logistical difficulties. The principal value then of this material is in the dating and positional evidence it may supply for largely truncated Roman buildings (J. Hill et al., and I Tyers above). The type of conversion used was noted most were hewn boxed-heart mainly from small oaks, whilst a smaller proportion were cleft or appeared to have been boxed halved. Round oak piles of Roman date were rare as is typically the case in London where even the production of piles seems to be fairly standardised. By contrast in medieval foundation piles are usually in the round (as found at Poultry) and quite often of other species than oak such as beech or elm not used by Roman Londoners. Some of the Roman foundation piles were reused building timbers and these are briefly discussed below.

THE REMAINS OF ROMAN BUILDING TIMBERS IN SITU

Some background to the detailed study of Roman building in timber in the NW provinces

Although it has long been recognised that the bulk of buildings built during the Roman occupation of Britain were built of timber, roundwood and earthy materials we know far less about them than the far less common buildings of masonry. Timbers from Roman timber or partially timber built buildings are very rarely found preserved in situ, thus any such material can be taken as extremely important. Indeed in a seminal essay on the subject Richmond wrote, 'Actual remains of Roman timber buildings are rare: timber does not survive for long, except under conditions so unusual as to be ruled out of normal experience.' (Richmond 1961:15).

Fortunately in London and to a lesser extent York and Carlisle these very unusual conditions do apply and insitu and reused timber and roundwood elements of buildings have been recorded in the last few years (Lees 1989, Maloney 1990, J. Spriggs Pers. Com., McCarthy 1991). Waterlogged buildings found on some continental Roman sites have also been explored and provide some comparative evidence particularly the building remains from the Valkenburg Fort in the Netherlands (Glasbergen and Groenman van Waateringe 1974). Detailed studies of groups of reused Roman building timbers excavated in London have also shed much light on the carpentry, the above ground appearance and underlying woodmanship behind some Roman traditions of building in timber (Goodburn 1991a, 1995, Goodburn in Brigham In Press and numerous MoL unpublished archive reports). The well preserved partially collapsed remains of a specialised form of sunken floored timber framed building of AD 153 have also been subject to very detailed study (Brigham et al. 1995).

This still small but increasing body of data is also augmented by careful analytical studies of remains of timber buildings (particularly those damaged by fire) from some dry sites where the stubs of walls have survived partially intact (eg. Frere 1972, Perring and Roskhams et al. 1991, Milne ed. 1992). Thus, although progress has been rapid over the last decade or so solid evidence for the three dimensional inhabited space of Roman timber and earth buildings and the carpentry and materials that went into them is still very scarce. The following summary and discussion of the best preserved in situ timber, roundwood and earth building found at No.1 Poultry concentrates on the themes noted above whilst the plan form, life history, use and associations of the structure are discussed by others (Hill J. et al. above).

The specific nature of the B30 wattle rods and some insights into Roman coppicing practice

The nature of woodland or more accurately 'treeland' (including wildwood, woodpasture, orchards etc.) and management practices in Roman Britain little known until recently. The pioneer researcher in this field O. Rackham used the phrase the 'Dark Ages of Woodland' in his survey of the archaeology and history of British woodlands to refer to the Roman and Anglo-Saxon periods (Rackham 1976:49). However, work of the last 10 years has started to through some light on the subject, showing that a mosaic of treeland types both managed and unmanaged must have existed in SE England during the Roman period (Goodburn 1991a, 1991b, 1995 in Brigham et al. 1995, 1998 etc.). A specific gap in the evidence is for small roundwood management systems, either by coppicing or pollarding. In both these woodmanship practices tree stems are cut at intervals and the resultant fast growing shoots (rods or larger poles and small logs) used for fuel and light constructions. Surveys of the guidance on land management written by Classical authors have shown that coppicing was well known to the Romans (Meiggs 1982: Chapts. 8-9). We also know that it was practiced from the Neolithic in England. However, there are many subtle aspects to the general use of this system in Roman times requiring positive evidence, such as the range of species coppiced and the range of intervals used for cutting.

In contrast to the 2-3 year old rods found in B30, modern cutting intervals for hazel for wattlework in SE England are around 9-10 years, but today many of the larger rods are split in half. This small study is the first of its kind with Roman roundwood from London and can be set against Roman period roundwood studies elsewhere for example in the Carlisle region. There at the other end of Britannia the range of species used was wider mainly oak and alder with some birch cut on a rather longer interval of about 8 years (McCarthy 1991:10). Interestingly some initial studies of later medieval wattle work from London have also shown the use of coppiced hazel, in that case mixed with oak only 3 years old (Goodburn 1994).

OTHER LESS WELL PRESERVED BUILDING TIMBERS IN SITU

A few fragmentary, mainly decayed or charred remains of other building timbers were found in situ (Hill J. et al). However, space and time constraints prevent the summarising of the woodworking aspects of this material here.

REUSED BUILDING TIMBERS

The studs

Sixteen reused vertical timbers from timber buildings were found, all having the recesses for the cross battens around which the vertical rods were woven to form the infill support. Some may even have been taken from the building B30 described above which clearly had similar studs! There were several subtle variations in the raw material of note. Although all the studs were oak there were two quite different types

and methods of conversion used. Some had been carefully hewn from small radially cleft sections taken from large, straight, slow- grown trees that must have grown in high dark wildwood conditions eg. [50780] or [50782]. Some of this type still had a slightly wedged shaped cross section. Other studs were hewn from young fast grown oaks that grew in more open woodland managed to produce small timber fast eg. [50779] or [50781]. All these four timbers were in Group 161 and retrieved from OA9 Period 3 where they had been reused as piles. Some may even have grown up on coppiced stools as was the case with some small Roman building timbers studied in detail from London (Goodburn 1991a:190, and Goodburn in Brigham et al. 1995:37).

Some of these timbers were cut from existing native managed woods and some from woods managed after the Roman invasion. Thus, our view of the early parent trees used at Poultry can give us insights into the late Iron age landscape as well as that becoming Romanised.

There were also some variations in the scantling of the timbers as might be expected, presumably the slighter examples (eg.[51027] Group 915 Road 1 Period 18 phase 1) derive from partition walls or more slightly built structures (Fig.7b.). Some of the studs had three faces cut to accept infil staves indicating that they where from where a partition wall joined a main wall line (eg. [50781] or [50782] Group 161 OA9 Period 3 – see above). Some other studs had small mortice joints cut into them in addition to the sloping recesses these indicate either, two phases of use or possibly the location of fittings such as small windows (eg. [50559] Group 445 make-ups for Building 29 Period 6).

Evidence for how the stud and plate elements were hewn

Both types of building element were clearly cut to a fairly regular rectangular cross section by hewing using the 'notch and chop' method. The finishing was carried out using a medium sized, thin-bladed axe with a blade about 90-100mm wide. Such tools may well have been similar to the pioneer (dolabra) type axe found in an early Roman context at the MoL CID90 excavations just a few metres to the west of No. 1 Poultry. The blade of that tool was thin fairly straight ended and about 100mm wide. Such tools are often seen as a form of mattock and not recognised as fairly fine potential woodworking axes. In a few cases the blade of such an axe has been found with a leather sheath to protect the honed edge (Bishop and Coulston 1993:102. A range of more specialised axe forms are also known from the Roman period but these do not include very broad bladed tools such as are known from the Anglo-Saxon period. In some cases the use of adzes has been recorded for finishing wide oak beams on the Roman waterfront (Goodburn in Brigham and Watson et al Forthcoming). Clear adze marks were not found on these smaller timbers. The same basic approach was clearly used to 'square up' the plate type elements found.

The preparation of straight timbers of rectangular cross section was a key feature of the new Roman woodworking technology and was very rare in the Iron Age. Such an approach to timber conversion required the use of snap lines, squares and rules, and made standardisation possible in timber supply.

Evidence for plaster keying

The surface finish of most of the studs was fairly smooth but in some cases an axe or adze had clearly been used to cut a series of deep nicks in the surfaces. This was clearly to key-in a plaster covering to the wall faces as can often be seen on medieval building timbers later rendered over. Clearly these studs were not designed to be seen. Similarly keyed reused Roman building timbers have also be found at Suffolk House (Goodburn in Brigham in press).

Grooved possible stud or plate elements?

A system of walling employing a different method of infilling where the infill materials are located in continuous grooves in the edges of the studs is indicated by some Roman reused timbers near Winchester Palace in Southwark. Some of the smaller grooved reused timbers from Poultry might be from buildings built in that style.

The plate type-timbers

These timbers were the most numerous class of reused building timber. They varied from rectangular section beams a little larger than the studs with typical squarish Roman mortices in (eg.[50532] Group 485 wall from Building 28 Period 6) to less easily recognised fragmentary timbers that may have derived from a

wooden machine of some type (eg.[50123] Group 853 Building 67 Period 11). The conversion types also varied from the typical boxed heart to boxed halved or even radially cleft and hewn.

It is very likely that many of the plate timbers were top plates as they are more likely to have been reused in practice as they were not sealed under the wall infill and are less likely to have decayed in use. However, little is known of Roman roof carpentry, no medieval type rafter seating joints have been found for example. This means that it is hard to identify top plates with certainty. Some of those initially considered as possible top plate sections are somewhat decayed and can not be unreservedly described as such.

A PROBABLE WINDOW SILL OR LINTEL BEAM FOR A MULLIONED WINDOW

A particularly interesting reused building beam was found reused as a foundation beam in the late 1st century that was almost certainly a window sill or lintel ([50563] Group 362 reused in Building 21 period 6). This beam was punctured by a line of shallow rectangular mortices, parallel to a groove, at the end of that area there was a fairly large square blind mortice. Following medieval parallels, the line of small mortices is interpreted as evidence of a line of mullions, the groove as a shutter groove, and the mortice for a window jamb. The lack of mortices for wall uprights suggests that the timbers may have been set in a mass wall of masonry, or more likely mud brick or pise. The use of beams set within earthen walls is also recorded at Regis House in situ (Brigham and Watson et al forthcoming) and is well known in the vernacular architecture of SE Europe today. A similar reused oak beam was found as a Roman revetment pile at Suffolk House but due to safety constrains it could not be excavated fully and was drawn in situ.

BAULK OFFCUTS

A large number of offcuts were found reused as chocks in building or drain foundations they varied from stacked planks to short lengths of hewn oak baulks around 400mm square. Several groups could be distinguished, the two most common are briefly discussed below.

Offcuts from large grooved beams

Several large baulk off cuts were found associated with the beam grid foundation (see above sub group 8.3.03). Many had one axe cross cut and one saw cut end. Some also had two large grooves cut into them (eg. [50714] Group 445, part of the Building 29 Period 6 platform). It would appear that they derive from a building site near by (large grooved timbers were also found a few metres to the south at the BUC87 site). What the double grooved timbers were originally prepared for is currently unknown. It is however clear that they provide another example of the Roman pattern of timber arriving on site with axe cut ends (top and bottom as the tree grew), which were sawn off at the urban building site. That is the workers at the felling sites did not use saws but the town-based carpenters did.

Plain baulk offcuts and evidence for Roman felling methods

Several other large oak baulk off cuts were also found that did not have any joints cut in them but provide rare evidence of Roman felling techniques. Timber [50652], a driven timber in Group 450 OA40 Period 7 has a particularly clear example of axe felling cut with sloping ends and a clear torn 'hinge'. The axe used left marks 80-90mm wide. It is clear from the way the saw marks run that they were made from both sides. This implies the use of a framed cross cut saw with a cross bar that obstructed deep cutting. No evidence for 'hauling notches' as used at Regis House, were found. This suggests that they were moved by another method, which did not involve dragging them on a skid road any distance.

WOODWORK FOR DRAINAGE AND WATER MANAGEMENT

Roman woodwork associated with water management and drainage is comparatively more common than some of that summarised above, but the nature of many of the timbers involved at Poultry was either unusual or spectacularly well preserved, and therefore worthy of some consideration here. Included in this category are a timber framed cistern, drains, wells, water pipes and related features.

A WELL PRESERVED TIMBER FRAMED CISTERN (S20)

Background

The very well preserved remains of a timber framed, plank-sheathed tank or 'cistern' of some kind were found intact up to its original top ([18226] Group 461 Structure 20 Period 6, see main site assessment report for general description and associations). It lay on the edge of the excavation in area 12 at the extreme E end nearest the Walbrook stream. In plan it was approximately 4.7m square and just under 1m deep and has been dated to the period c.70-100 AD. Unfortunately few of its componant timbers were suitable for tree ring dating and those that were were second hand and lack complete sapwood (Hill J. et al. and Tyers I. above).

The structure was equipped with a series of over flow or feeding features either oak pipes and or hewn troughs, and was sealed outside with sticky clay. The through flow and containment of liquid, probably water, was clearly intended. As it had evidence of a row of central supporting posts and occasional nails in the remains of the top plate it may have had loosely boarded cover of some kind. The precise function of the structure has been much debated with the predominant view being that it was some form of water storage tank or 'cistern'. Another possible interpretation might be that it was some form of 'lavoir' or shallow washing tank. The characteristics suggesting this possible function to this author are:
its shallow depth, and clear (latterly boarded) access down the side, with water in flow and out flow to flush the contents. These lined washing tanks are common features of many French villages and towns and are still occasionally used. However, the principal interest here is the nature of the woodworking evidence it provides. There are no exact parallels from London to date but smaller boarded tank like features are known. Perhaps the most similar was the 3.3 by 2.7m square tank found at Guys Hospital, Southwark. This was dated to the 3rd century and has been interpreted as a shell fish storage tank Taylor-Wilson 1990. However old excavations on the continent have exposed broadly similar shallow tank like features. For example at the Limes kastelle of Saalburg several larger plank lined tanks were found (Jacobi 1934).

As timber framed Roman structures from the London area go this structure is second only to the sunken floored building found at the Courage Brewery site in Southwark for preservation. Indeed as far as the woodworking is concerned there are some similarities. Again due to its importance the structure was recorded in considerable detail with several plans individual timber drawings and extensive photography despite the time pressures. However, it is not possible to give a full description of every detail here but a summary of the key features are provided below with some interpretative comment. Some degree of truncation by modern ground works also prevented some lines of investigation such as the precise measurement of the length of all the 'floor' joists.

Key woodworking features of the cistern

All the timber was oak, several of the frame timbers showed signs of previous use such as redundant joints, for example joist [51181] Group 461. The basic frame consisted of four rectangular section plates cross halved over each other at the corners. Into these plates four double rabetted (one did not lie with in the trench but is supposed) posts were stub tenoned at the corners to receive the side planking. Four intermediate posts were also barefaced tenoned into these plates. The uprights were also through tenoned into the top plate which just survived in the NE corner. Three fairly evenly spaced joists were half-lap dovetailed into the E-W plates and the N-S plates were rebated to receive the edges of the E-W oak plank bottom lining. Although the bottom planking was nailed to the underlying joists with 2-4 small iron nails, the framing joints were not fastened, as is typical of Roman carpentry.

A possible modification

A line of small mortices was cut after the framing of the tank across the bottom through the plank sheathing but not the joists. These were probably to a support a beam that in turn may have supported planks running over it at 90 degrees, to prevent them sagging. Perhaps this work supported boards for easier access for washing?

The production of the standardised planking

It is now known that the use of sawn planking was a Roman introduction to Britain and it had a dramatic effect on the appearance of the built environment, particularly as much of the planking was made in very

large sizes. The oak planks used for the lining were tangentially faced and clearly sawn out as faint saw marks survived. Nine of the planks were of identical proportions 45cm wide and 40-50mm thick. These had clearly all been sawn from a hewn baulk of oak a 'cubit' square as is documented in several other Roman contexts in London (eg. Goodburn 1995 in Brigham et al. 1995:43). This baulk would have weighed an minimum of 1 tonne and have been hewn from a fairly large straight parent oak log about 0.7m at the mid length. One plank, probably the last fitted, was only 30cm or 1' wide, and of different growth characteristics. The production of standardised sawn planking in the Roman world is implied in several documentary sources and sawyers were known as 'sectores materiarum' (Meiggs 1982:355). The thickness might correspond to two 'unciae' or Roman inches.

The production of the oak joists and plates

These timbers were hewn to fairly regular rectangular sections. The N-S plates were larger at about 220mm x 170mm to accommodate the rebate for the plank ends, and cut boxed heart from young fast grown oaks about 35cm in diameter. The E-W examples were slightly smaller and [51179] Group 461 had been hewn from a large cleft section. The top plates were of boxed halved conversion as far as could be judged. Plate [51184] Group 461 had an axe felling cut surviving at the N end and a sawn cross cut S end. Some of the timber was clearly bought second hand for the job whilst other beams were freshly cut.

The production of the posts and studs

These timbers were produced in a similar way to those above and were also of varied conversion type. The larger double rabetted corner posts were hewn boxed heart around 230mm square before rebating. In the case of corner post [51187] Group 461 it was cut from a parent tree about 60 years old and 0.35-4m in diameter. Several of the posts were boxed halved, in the case of [51161] Group 461 the survival of faint saw marks showed that it had been sawn from a hewn baulk. One post was box quartered.

In sum we can say all the surviving frame timbers were prepared in a rather varied way which may suggest the buying of second hand materials and left-overs from other projects. By contrast the planking was clearly new and bought for the job.

The range of joints used

The joints used were known from other Roman timber frame contexts such as the Cannon Street Sta. material (Goodburn 1991a) and are graphically summarized in figure 13.. They comprised barefaced mortise and tenons, where the tenons did not completely pierce the plates. Half lap dovetails for the joist ends. Rebates for the plank ends, and cross halvings for the plate corners. The corner posts used a form of stub tenon. A few toolmarks survived in some of the joints. The mortices often had chisel marks in them but no evidence of augering out first as in medieval practice was found. Clear over cuts with cross cut saws were also noted in the half lap dovetail housings showing that they had been cut out rather rapidly. Several incomplete axe or adze incut marks were also noted on some of the post tenons.

The order of assembly

The frame was clearly prefabricated off site and some standardised dimensions seem to have been used in the layout of the posts for example where they were set on 0.9m centres. During the framing up the N-S plates were laid down first and the E-W jointed over them. The joists were then jointed into them, with the larger butt ends alternating to the N and S as was the practice for the later Courage Brewery sunken floored warehouse (Goodburn 1995:50, in Brigham et al 1995. The posts and studs would then have been jointed into each plate and the top plate fitted. The planking was probably measured out at that stage, but it was not jointed round each wall upright so was relatively easy to fit after the reassembly of the timbers in situ. As the planks were fitted to the frame the holes for nails would have been slightly prebored as iron nails can not be driven into oak without pilot holes.

TIMBER LINED WELLS

Several Roman wells or similar features were found (Hill J. et al. above) with linings built in a number of different ways each style providing some new woodworking information. However, the study of Roman timber well linings is comparatively large and published (eg. Weeks 1982, Wilmott 1991) thus only a few key points are reviewed here.

More elaborate oak plank lined wells found at No. 1 Poultry included structure [4913] Group 725 S38 Period 14. Here the well was given a solid planked bottom but the side planking was notched to let in the water. The corners were jointed using forms of bridle and cogged joints. The sawn planking was some of the narrowest Roman sawn plank yet recorded at about 220mm wide and 30mm thick.

More typical of Roman planked well linings were the two single dovetailed plank lined structures found in area 12. The 'inner' lining was additionally braced across the corners with simple lap jointed offcut of oak spiked into place (eg. plank [51101] Group 856 OA77 Period 22). These corner braces could also have been used as built in ladders to allow access down the well. The investigation of all the wells at poultry was very difficult due to access problems and potential subsidence. Other Roman wells found were lined with second hand casks which are discussed in the cooperage section below.

TIMBER LINED DRAINS AND PIPING

Several forms of drain, conduit and piping were found at Poultry dating to the Roman period, these included unlined ditches and examples revetted with assorted planks set on edge held in place with driven stakes. This form of structure is barely woodwork at all but can be assembled by semi or unskilled workers, thus it is not discussed further here. More elaborate timber lined water features were also found and their woodworking characteristics are briefly discussed below.

PLANKED BOX DRAINS

Several examples of planked box drains or elements from them were recorded at Poultry (Hill J. et al. above). All the planking used was of sawn oak and in some cases the planking survived well enough for the method by which the planking was sawn out to be recorded. Drain plank [50480] Group 487 S16 Period 7 for example had the characteristic step and change in direction of saw marks that indicated the use of a form of trestle sawing. Three systems have so far been reconstructed from Roman tool mark evidence in London, but all involve the lifting of hewn saw baulks onto some form of trestle (Goodburn 1995:45, in Brigham et al. 1995). The timber was then sawn from both ends in the most common two techniques, often leaving a step where the saw kerfs joined up.

Some of the drains used wide saddle timbers which clasped the sides to the bottom, and others had dovetailed spreader elements (eg. [51125] Group 468 S24 period 6). That is even these relatively humble structures were built by carpenters using materials and techniques found in contemporary buildings.

DUGOUT DRAINS

Alongside the more complicated joined plank box drains simpler dugout drains were also found at No.1 Poultry one case the drain was well preserved enough for tool marks from its shaping to survive (eg. [51119] Group 496 S22 Period 6). It was more than 6.1m long and c. 400mm wide 250-300mm deep cut from a whole oak log 6.1m long and about 0.55m in diameter at the mid length. It had clearly largely been hollowed with axes by 'scoring and splitting' in a similar way to a mid C12th dugout drain recorded at Bull Wharf (Goodburn in Ayre and Wroe-Brown forthcoming).

A REUSED OAK DUGOUT TROUGH

A dugout trough was found reused as a silt trap in a drainage system at the NE end of area 12 [51129] (Group 493 OA43 Period 6). It had been hewn from half an oak log almost 0.7m wide and 2.05m long. The sides were extended up ward with thin nailed on cleft oak boards (almost identical to a medieval example from the Fleet Valley project). Although much of the surface was worn tool marks did survive in places. The more pointed end was probably the original felled end of the log and had axe marks from an axe blade about 110mm wide. A small oak roundwood bung was found in situ. Overall the impression given is that it was used for some form of craft use. For its reuse a narrow channel was hewn through the ends to allow the water to flow through.

It was clearly old when reused as old splits had been repaired using thin iron sheet nailed over moss. But the woodworker who made it had hewn down to the perishable sapwood and clearly was not concerned about the vessel lasting very long neither was it well finished.

OAK WATERPIPES

Four examples of waterpipes were found during the evaluation and main excavation phases in area 12 at the E end of the site. The best preserved section was typical [51133] Group 462 OA43 Period 6. This had been hewn about 160mm square from a section of radially cleft oak split from an old slow grown log at least 0.8m diameter. It was bored out to a 50mm bore (2 unciae?). The connector was the typical short length of sharpened wrought iron tube, the pipes to be joined must have been rammed hard together as they were laid.

During the evaluation works a section of similar pipe was found which appeared to have had a double function. In its upper face two simple axe or adze cut 'laft' type joints were cut. Clearly two timbers had been pegged into the joints at right angles. The general appearance suggests that [1121] may have functioned both as a bearer for a board walk and a waterpipe? It has a felling date of AD64 (Tyers I above), and must have been cleft from a parent oak well over 250 years old.

FENCING; NEW LIGHT ON THE APPEARANCE OF LONDINIUMS' BACKYARDS

Roman fencing has rarely survived on London sites other than as isolated reused timbers or lines of small stakes or post holes. Clearly the nature of any fencing would have had quite a visual impact on the appearance of Londinium especially the back plots. Reconstruction drawings of early medieval town sites with wattle fenced property boundaries (such as were found at Poultry see report 2) will be known to everyone. Extensive areas of Roman period wattle fencing have been excavated in Carlisle and at Vindolanda (McCarthy 1991:19) but what of the Roman London equivalent? The Poultry project produced examples of two distinct types, both briefly described below.

Cleft oak pale fencing

In several areas in the Roman sequence on site the bases of radially cleft oak pale fences were found. Usually what survived was a plank on edge base board or a lower pole rail to which thin oak pales about 150-200mm wide and 10-18mm thick were nailed, vertically overlapping along their edges. Because they had decayed in situ the pales were short and were initially confused with shingles (eg. [50118] rail Group 418 OA35 Period 7, and [50069]=6 pales Group 481 OA37 Period 7). The ground boards and rails were jointed and or nailed to earth fast posts set at intervals in a similar manner to that occasionally still used today.

In other cases the fencing had been pushed over and left in wet ground as crude duckboards. The most intact pale found [51195] which appeared complete and was part of the [18256] Group 467 OA44 Period 6, was 1.9m long, 200mm wide and only c.10mm thick. Although thin the radially cleft oak was very strong and weather proof shrinking little. The barrier provided by the pale fence which this pale came from would have been solid to the weather and prying eyes, and have contained animals and children. Even tall men would have to have stood on stools to see over it. This must suggest that privacy and shelter were important issues for the users of the fenced yards. Whilst No1 Poultry has provided the best evidence of pale fencing in Roman London they have also been recognised at the post excavation stage from a site in Moorgate in the City and in Roman contexts at Winchester Palace (MGT87 archive, and B. Yule pers com.). From Wall Garden farm in W London a very similar radially cleft oak pale was found but instead of a flat top it had a spear shaped point. Such a point was also found on two reused cleft oak pole fence pales found in AD 50's contexts at Regis House in the City (Goodburn in Brigham and Watson forthcoming). The [51195] pale was reused in the late 1st century. Pale fences or pallisades are shown in several places on Tragans column, they must have been a common sight in any Roman settlement.

New light on the radial cleaving of oak Roman style

Making boards and planks by splitting straight grained timber is very ancient in N Europe going back to the Neolithic if not beyond. It relies on using the natural planes of weakness in some timbers particularly the medullary rays of oak or beech. The evidence of the fine fence pales found at No.1 Poultry and the neighbouring site of CID90 (Hill and Woodger 1999) show that the old native traditions of cleaving oak timber did continue. Indeed they were carried out to a high standard for quite specific purposes in the London region. Debris from both sites shows that the final phases of cleaving were sometimes carried out in Londinium itself.

The process of radial cleaving requires that large straight grained logs be split using wedges. In the Roman period iron wedges are well known (eg. Adam 1984:93) and would probably have been used with wooden ones. Space procludes a very long discussion of the finer details of early cleaving methods which have been extensively experimented with by this author and others in the last few years (Goodburn 1999:fig. 44), figure 20 is intended as a graphic summary of the procedures used for making Roman radially cleft elements such as those found at No1 Poultry. Once a log has been cleft in half it may then be 1/4'd, and the 1/4s cleft down to 32nds or even 64th or 128th segments by carefully halving of each split section. The finest cleaving to produce thin pales and furniture panels can not be done with ordinary wedges some form of blade like wedge has to be employed. In recent times woodland craftsmen in England have used a tool called a 'froe' for this purpose whilst holding the cleft section in a wooden device called a break (Fig.20). Recently A Reis found such a tool in a Roman tool hoard in a German museum (Reis A. Pers Com.). Thus, it would appear that Roman 'cloviers, probably used this tool for fine cleaving oak. A further Roman refinement appears to have been that the rough axe cut ends of cleft sections split down to between 1/16ths and 1/32nds were cross cut with a saw in urban yards, often creating distinctive offcuts.

Wattle fences

Fragmentary remains of wattle fences of Roman date were found in Roman contexts at No.1 Poultry (Hill J. et al. above) but they were generally only preserved over short distances and to low levels. For example fence fragment [9381] Group 167 OA11 Period 3, the best preserved, had a total height of 170mm, and unfortunately was not sampled for species ID. More typical was fence section [9430] Group 150 OA9 Period 2 which was woven in a plain weave of small whole rods, and only survived up to 80mm high. The lack of survival of these features shows that they were less durable than pale fences.

PILE AND PLANK REVETMENTS

Several low pile and plank revetments were found used to support the edges of terracing down towards the S and E (see main site account Hill J. et al.). The woodworking involved in erecting these structures is minimal and not therefore worth taking up limited space with here. Although we might note that even for relatively small revetments some form of small piling ram might be needed.

JOINERY OR FURNITURE

Joinery and furniture are very rarely found on Roman waterlogged sites but the Poultry project provided several examples of this branch of woodworking which relies so heavily on the use of specialised planes and intricate joints rarely used in structural woodwork ie. 'carpentry'.

A SIMPLE PLANK AND LEDGE DOOR

Although thresholds are quite often found on Roman excavations the doors which actually filled them are extremely rare finds, as they are such reusable items. Indeed the example from No. 1 Poultry was itself reused in a wet building floor where it ended up being waterlogged and preserved. The door comprised the vast majority of a simple 3 plank and double ledge door, without any diagonal bracing. Although simple, the door was carefully made out of slow grown radially cleft oak boards about 30mm thick, which had been planed and then rebated with a plane on alternate faces ([18213] Group 475 B30RC Period 6). The boards were nailed with turned iron nails to neatly champfered oak ledges. Unfortunately no trace of the hinges or any lock were found. It is the most complete Roman door known from London and the southern part of Britannia. It probably totalled about 0.88m wide, with a possibly recut height of 1.4m.

Two almost complete large plank and ledge doors were found at Vindolanda but have not be thoroughly investigated or published in detail (Birley 1994:72 and plate 4:2). Fragments of a Roman door have also recently been found at Hayton in Yorkshire (Millett M. Pers Com.). Several classical authors record the need to season timber for joinery work particularly doors (Meiggs 1982:349), and although radially faced oak is a stable material some seasoning must have taken place before the door was nailed together.

As more complex panelled doors are known to have been in use in some Roman buildings and a fragment has recently been found in Roman London at Regis House (Goodburn in Brigham and Watson et al. forthcoming.) we must see the No.1 Poultry example as well made but plain and relatively humble.

A BURNT AND WATERLOGGED JOINED CHEST BASE

An extremely rare find was the charred and waterlogged base of an elaborately joined chest, initially referred to as the 'tea tray' because of its shallow proportions, however it was clearly originally a relatively deep chest. The chest base was about 660mm long by 400mm wide and survived about 120mm high. All the timber used was oak and must have been carefully seasoned (from [3855] Group 392 S40 Period 7). It was worked in several different ways in a somewhat similar manner to the way that oak was used in late medieval joinery. The panels of the base were radially cleft and planed with edges planed further to a sloping rebate, and edges and ends planed to a bevel. The edges of the chest were made from planed sawn oak about 25mm thick, and a groove had been plough planed near the lower edge to receive the base panels. In one case the edge planking had clearly been widened by edge dowelling it to another piece of plank. Finally the corners of the sides were joined with dovetails finishing in a mitre. In sum it is the most elaborate piece of Roman joinery known from recent excavations in London.

One imagines that the chest may have been used for the storage of valued possessions, it would have been just about watertight and strong. It was found in a shallow pit below a building floor.

TREENWORK FOR DOMESTIC AND CRAFT USE

Wooden items of household and craft use such as vessels utensils and tools handles are also extremely rare finds in Roman London. Poultry has again provided several examples of such rarely found work, three of which are recorded by this author are discussed below. (Others will no doubt be discussed together with small finds?, such as the turned boxwood beads etc, Wardle A. above). Perhaps in the published presentation of the key material found at No.1 Poultry a section could be devoted to Roman treen including both larger and smaller objects?

CLEFT OAK DISHES

Although many household vessels of Roman town dwellers were ceramic or of metal a proportion particularly for poor households must have been of wood but these are rarely found. At Poultry the remains of two similar, slightly charred and squashed oak dishes or platters were found (eg.<4323>). They had been carved out of sections of oak about 45mm thick and cut to a sub-rectangular form about 550mm by 290mm with a protruding lip to make them easier to pick up. Example <4323> was carved from a radially faced section, whilst example <2392> was carved from a tangentially faced section. The dishes were worn and compressed very few clear toolmarks found. The use of the tangential section would have resulted in a dish that would have been likely to have split following washing and drying whilst the radial section dish could last many years as have similar carved oak dishes made by this writer. Of course we can not rule out a craft use for such dishes but it seems unlikely.

AN OAK SPADE

The broken lower half of an oak spade was found lying against the side of a Roman ditch (<3160>). It had been hewn from the whole width of half a fast grown oak log about 250mm in diameter. Surprisingly the sapwood had been left on. The choice of fast grown oak may have been quite deliberate as it is denser, stronger and more shock resistant than oak of slow or medium growth.

The tip had been covered by an iron shoe which was nailed on, and is all that normally survives of such tools on dry sites, such as at the 1985 excavations adjacent to Fishbourne Palace (Down A. Pers Com.). Some thick leather was found stuck to the iron and it is possible that this pomay have been part of a cowl over the tip of the blade. MOLAS conservators X-rayed the iron concretion to ascertain whether the leather was properly part of the object. However the resulting plate was not clear. If the leather were part of the tool then it may have resembled a more recent 'mud scupit' which was used for digging and pulling out mud and silt from ditches. Some partial axe stop marks survived, showing that the spade body was largely shaped with a small axe.

NEW LIGHT ON ROMAN COOPERAGE; IMPORTED SOFTWOOD CASKS FOUND AT No.1 POULTRY

Background

Whilst ceramic amphora are well known as containers of traded goods to Roman Britain it is also known that stave built casks were used, particularly from the late 1st century AD in the Northern parts of the Empire. These vessels have been found in many Roman settlements reused as well linings where they have survived due to waterlogging. However, the systematic study of Roman cooperage has mainly focussed on the casks as markers of wine trading contacts principally from the Rhine and Danube area, and to a lesser extent their size and dating (Ulbert 1959, who listed 80 finds of Roman casks). Ulbert also listed many of the stamps, marks, scraphittos and brands that have been recorded on surviving Roman casks known to that date.

Additionally Boon has reviewed many of the cask finds from Britain principally the 15 from Silchester and a small amount of material from Segontium in SE Wales (Boon 1957, 1975). He was again mainly interested in the vessels as markers of trading contacts but also calculated the volume of wine that the best preserved of the Silchester casks could have carried. This was about 240 gal or 1 ton, possibly the ancient origin of medieval tonnage systems? The the best preserved example found at No.1 Poultry ([50592] Group 371 B22RB Period 6) would have contained about the same amount of wine. Boon also highlighted the use of yellowish resin type materials to help seal the casks and probably flavour the wine (Boon 1957:262). There now appear to have been more Roman cask finds in London than anywhere else in Britannia as might be expected.

Kilby the time served cooper and historian of the craft of cooperage briefly reviewed the Roman historical evidence and agreed with the classical authors such as Gaius Plinius Secundus, that coopering began in the Gaulish Alpine valleys (Kilby 1971). However, the development of the craft of coopering has not yet been explored in detail for our period and it is to this end that the following section is dedicated as the tool mark evidence was well preserved and the recording detailed. Parallel work has also recently been carried out on reworked Roman casks elements found at Vindolanda and which will be published in due course (Reis A. Pers Com.). This information has also been collected after reviewing records for a large number of medieval casks found in London and the evidence for different traditions of cooperage used in that material (Goodburn 1990).

THE No.1 POULTRY CASK EVIDENCE, A SUMMARY

Space does not allow a detailed description of each copperage timber or fragment found but the following should provide a detailed overview. Parts of four articulated casks of Roman date were found at Poultry reused as well linings ([50233] Group 172 well in OA11 Period 3, [50588] and [50592] Group 371 well/cistern in B22RB Period 6, and [51054] Group 114 well in OA6 Period 3, see Hill et al. above for more on the context of their reuse) together with an isolated stave [51059] Group 114 OA6 Period 3 and two 'head' or end pieces ([51241] and [51244] Group 201 found in OA15 Period 4) and many isolated bungs or small stave fragments. As each cask was made up of over 15 rather similar staves and numerous hoops a selective approach had to be employed to recording. After some recording in situ all the elements were lifted and washed (in practice much of the hooping was not retrieved as the salvage of the cask elements was difficult and potentially dangerous in the unstable deposits) and a selection of representative elements made for detailed examination and drawing.

After careful washing several inscriptions were found both inside and outside the staves and on the head piece [51241]. Stamped and branded inscriptions and other scratched marks were recorded by 1:1 tracing and photography ([50592] (11), (12)). Many of the recorded elements were then conserved using standard PEG. impregnation followed by freeze drying (+ ref to Conservation section?). The warm wax solution and freeze drying removed the vast majority of hard resin deposits on the inside faces of the staves. Thus, in June 2000 Museum of London conservators alerted us to the appearance of unrecorded 'marks' on staves from cask [50592] (see below).

The proportions of the casks and staves

From the proportions of the best preserved examples such as [50592] it is clear that in that case the staves were about 1.96m long, often c. 170mm wide and 35mm thick. However, the crossectional dimensions varied considerably and some staves were rather irregular.

The raw materials and tool marks

Although the microscopic botanical identifications and tree-ring analysis of most of the cask materials are awaited (Tyers I. In Prep?) two samples have been examined and found to have been Larch (both head fragments found loose in early Roman deposit [18313] Group 201 OA15 Period 4, Gray-Lees Wood Sp. ID appendix). However, it is clear that all the fragments are of imported softwood almost certainly either larch or silver fir. Both of these tree species are native to the central European mountains, but not NW Europe. In the case of silver fir the range extended down into the Massive Central and Pyranees (Mitchell 1982:63).

The conversion of the staves and heading

All the timbers were radially cleft except for the head piece [51242] which was tangentially faced and had very clear saw marks. The vast majority of the parent trees were clearly tall and straight grained. Many must have been enormous wildwood trees over 300 years old as some staves had over 100 annual rings. However, a few staves were clearly cleft from coarser grained faster grown trees (to clarify when IT report completed). Thus, we get a tantalising glimpse of continental montane treeland of the Roman period. The larger, clearly wildwood trees, used were probably the tallest in Europe at the time, even as late as the mid 20th century silver firs over 200' (65m) tall and 6' (2m) in diameter were known (Boulton and Alwyn Jay 1946:83).

Radial cleaving produces very strong and stable timber compared to sawing tangentially. This stability was an advantage for the making of liquid tight casks a fact clearly well known in the Roman period from archaeological evidence and at least one historical source. Vitruvius describes 'splitting' largely knot free butt logs of fir into quarters to produce high quality 'clear' timber for joinery work where stability was also particularly important (Vitruvius, The Ten Books of Architecture, Book II, Chapt. IX.).

Limited experiments radially cleaving straight butt logs of British grown European larch carried out by the author have shown the process to be far more difficult than the process for straight grained oak as the grain is usually slightly interlocked in the larch. Despite these possible difficulties larch staves were clearly produced in large quantities, alongside the probably more easily worked softer staves of silver fir.

The trimming of the materials

The cleft blanks were then trimmed with axes worked mainly along the grain and the recorded curved stop marks showed that some of the axes used had blades as wide as 190mm. Whilst this is still smaller than the broad axe marks recorded on some medieval cooperage found in London (near complete stop marks there are between 220 and 300mm wide) it is much wider than any axes known to have been used in Roman carpentry in London with only one exception. At least one axe with a thin blade of a similar form and size (around 200mm wide) was used to smooth the beams of the first amphitheatre in AD 70 as found at Guildhall Yard.

The size of the marks probably implies that the tools may well have been rather specialised. The shape of the marks does not suggest that the blades were side ground as in traditional coopers broad axes of the last few centuries, as the axe stop marks are rather more scalloped than the medieval and post-medieval equivalents. The insides of the staves were not hollowed except at the 'howel' were the croze groove was cut (see below).

It is likely that the staves and head pieces were bundled together at this point and some were marked on what would become the inside faces. The roughed-out material cut to nominal standardised dimensions was probably then taken by boat down to the Rhenish vineyards where the coopers actually made up the casks to be filled.

Secondary trimming of the staves

The rough staves were further trimmed, shaved on the out side and clearly planed along the butting edges. The edges were flat almost straight, smooth, with faint chatter marks and elongated striations such as one

sees in hand planing. Once bent the ends would have been trimmed level and the characteristic hollows or howels cut to make a regular internal cylinder prior to the cutting of the croze grooves. It is not clear from the tool marks how the howel was cut but it was probably with some form of adze. Probably like the gouge adze identified as a coopers adze found at Silchester (Boon 1957:283).

No trace of the use of fire was found for softening the staves, as was often used in recent times. The cutting of the croze grooves appears to have been done with specialised tools possible like the fragmentary 'saw crozes' found by Hedges and Wait in British Roman iron work collections (Hedges and Wait 1987). The grooves were clearly not individually chiselled out.

Following the cutting of the croze grooves the bevel edged heading (eg. [51241]) made of at least four elements, would have been inserted.

The hoops

The bent roundwood (oak by preliminary visual examination) hoops would have been fitted next in 8 bands according to the staining found on several of the larger staves. The small recorded sample of hoop fragments (from casks [50592] and [50233]) differ from medieval examples in being thick 'D' section whole rods rather than halved rods. Only a small flat area was shaved where the hoop was laid against the cask. Unfourtunately no clear evidence of how the overlapping ends were made and secured survived the awkward lifting on site.

Sealing with resin

It was quite clear from the No.1 Poultry finds that the next stage was to pour in warm resin to seal the inside of the cask filling any minor gaps and probably resinating the wine (an early form of retsina?). Once the resin had set, the casks were then ready to be filled with wine and the very close fitting main bungs and breather hole bungs driven.

The adding of stamped, branded, and scratched marks and letters and speculations on their meanings

A total of 19 different marks were found on the cask fragments recorded from No1 Poultry, with as many as 11 different examples found on cask [50592] the best preserved cask. The truncation of the stamped inscription on the head timber [51241] clearly shows that cask timbers could be reused at least once in new casks. Thus, any marks found may relate to more than one cycle of production, assembly, sale, transport and possibly customs processing.

Marks on the inside of the staves, from initial production through transport to assembly?

The marks on the inside of the recovered reused staves are varied taking the form of letters, devices and simple scratched symbols. The three letter marks surrounded by partial circles were probably made by the use of hammer-like stamps often made on the butts of axes, the so called axe-stamps (Gaitzsch 1980:268 etc). The longer sequences of letters were probably impressed with bolster shaped stamps (eg. the hammer burred example from the City of London with the letters CVC, Gaitzsch 1980:273, and London Museum catalogue 3, 1946:53). Other fainter marks such as the scratched X on the inside of one of the staves of cask [50592] may be a reference mark used by a cooper for assembling a cask? Other marks might possibly be the initials of merchants selling roughouts for cask making. Ten of the recorded marks were found on the internal faces of the staves.

External marks on the casks

After the assembly of the casks further marks were added. Some may have been added before the resin sealing and filling, but others such as the name CEGFIC on cask [50592] were clearly added after filling as they covered the main bung. The collection of external marks could have been made by, or more likely for, several different individuals, the vineyard owner, the customs officials, the shipper, or the cooper.

A trawl of published inscriptions has been carried out without finding any clear matches as yet with the No1 Poultry material each example of which differs from the others. However, a simple scratched triangle has been found on several cut down softwood staves from Vindolanda (A.Reis Pers Com.) as was found on

stave 11 in cask [50592] at no.1 Poultry. The meaning of this form of mark is as yet unclear, but a practical coopers purpose seems likely.

Further collaborative work with continental scholars will probably eventually produce matches between disparate cask finds and stamping tools as the corpus of published examples grows. Although we have made progress in understanding Roman period cooperage work methods, much remains to be done in tracking the trade routes, and system of production and distribution of cask materials.

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