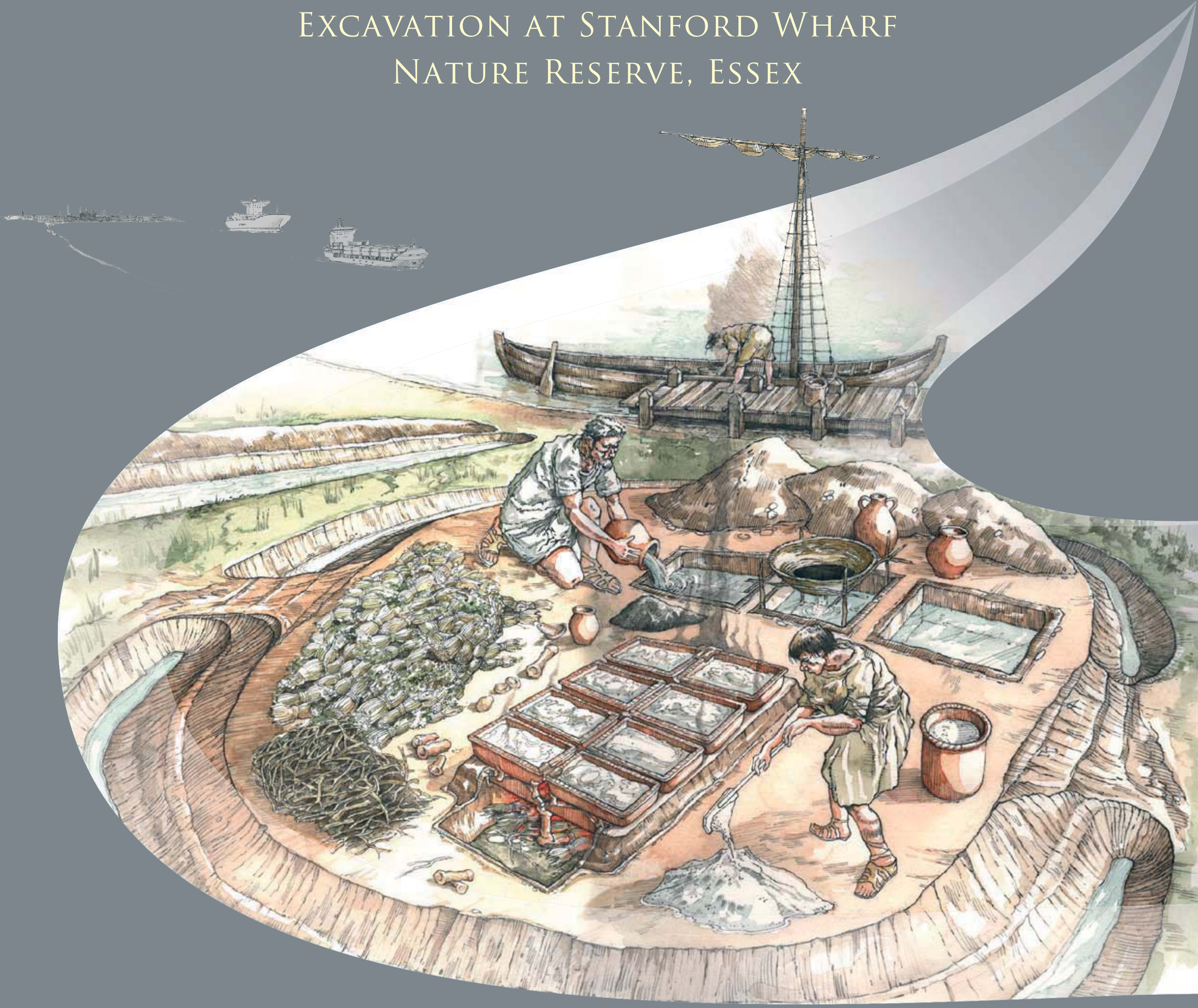
London Gateway

Iron Age and Roman Salt Making in the Thames Estuary

Excavation at Stanford Wharf Nature Reserve, Essex



Specialist Report 20

Wood Charcoal

by Denise Druce

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Introduction

The assessment of 274 bulk samples by W Smith (2010) demonstrated the presence of well-preserved and abundant charcoal in many of the features excavated at the site. Fifteen samples were selected for charcoal analysis, which came from various features and layers associated with Iron Age and Roman-period salt working and associated activities. All of the samples came from Area A of the excavations, except one, from posthole 4763, which came from Area B. The purpose of the analysis was to identify the type of fuels used in the various stages of the salt making process, which, in turn, may be related to changes in the salt-extraction process.

Methods

The samples were processed using a modified Siraf flotation machine, where flots were retained in a 0.25mm mesh sieve, and the residue on a 0.5mm mesh. Both the flots and residue were air-dried. Analysis of the samples followed standard procedure where *c* 100 fragments (or the entire flot if less than this) >2mm in size were extracted and identified. The charcoal was initially sorted into groups based on the features visible in transverse section using a Leica MZ6 binocular microscope at up to x40 magnification. Representative fragments of each group were then fractured to reveal both radial and tangential sections, which were examined under a Meiji incident-light microscope at up to X400 magnification. Identifications were made with reference to Schweingruber (1990), Hather (2000), and modern reference material.

Results

The wood taxa

The charcoal results of the 15 samples are shown by fragment count in Tables 20.1 and 20.2. The taxonomic level of identification varied according to the observed genera/family and/or the state of preservation. In many cases the fragments could only be taken to an approximate level of identification, as some of the key diagnostic features that are needed to distinguish between species were not observed. For example, many of the alder (*Alnus glutinosa*) and hazel (*Corylus avellana*) fragments, which can only be differentiated by observation in radial section, were infused with sediment making identification to species difficult.

In other cases, the level of identifications was limited due to the similarities of species within a family or sub-group, eg Leguminosae (referred to as gorse/broom type in text), which, in the south-east of Britain, could be broom, greenweeds, or gorse (Hather 2000) and cannot be separated anatomically. The fragments identified as *Prunus* cf. *avium* (wild cherry) lacked the wide rays typical of *Prunus spinosa* (sloe/blackthorn), and although *Prunus avium* is anatomically similar to *Prunus padus* (bird cherry), the site is likely to be out of the latter's geographical range (Gale 1996; Hather 2000). In general preservation was excellent. The fragments categorised as indeterminate coming from either distorted wood or charcoal infused with sediment. Many of the samples also contained frequent indeterminate bark fragments.

Eleven taxa were positively identified, including six to species level, the most dominant taxa in many of the samples being oak (*Quercus* sp), or oak together with alder/hazel or alder. Hazel was fairly well represented in fill 6225, from hearth 6061. Two of the samples, from hollow 1408 and the basal fill of beamslot 1644 were dominated by gorse/broom type charcoal, which was also recorded in relatively low quantities in a number of the other samples. Other taxa recorded in low quantities (<15 fragments) include sloe/blackthorn and/or wild cherry, willow/poplar (*Salix/Populus*), birch (*Betula* sp) and field maple (*Acer campestre*). A few ash (*Fraxinus excelsior*) fragments were identified in deposit 1375. The most diverse assemblages came from the various ‘layers’ and occupation spreads, and ditch 5010.

Relatively few of the oak charcoal fragments recorded on site possessed tyloses, which suggests much of it consisted of immature wood (tyloses develop in wood once the tree reaches roughly 50 years in age). This, coupled with the fact that many of the rays exhibited a definite curve suggests that much of the oak came from small roundwood. Exceptions here are the oak from beamslot 1569, posthole 1889, and ditch 5010. Much of the alder/hazel and broom/gorse type wood also consisted of small ‘twiggy bits’ or ‘rods’ less than *c* 10mm in diameter. Slightly larger oak, alder and hazel roundwood, with up to six or seven growth rings dominated the assemblage from fill 6225, from hearth 6061. Given that there is a long tradition of harvesting rods on a seven-year cycle (Rackham 2003), it is quite feasible that this material represents coppice wood.

The woody environment

The taxa represented is consistent with the pollen data from the site (Peglar, specialist report 23), which shows local woodland dominated by oak, hazel, and alder. Low amounts of willow, wild cherry-type and maple pollen were also recorded. Given that the site straddles the interface between the intertidal zone and the higher river terrace deposits, it is possible that areas of both carr and dry woodland existed fairly nearby. The presence of broom/gorse type charcoal is interesting and although the species included in this type may grow in a fairly wide range of habitats including open woods, rough ground, and grassland, they are also commonly associated with maritime cliffs and heathland. The occasional pollen grain of heather (*Calluna vulgaris*) and bilberry-type (*Vaccinium*-type) recorded at the site (Peglar, specialist report 23) also provides limited evidence for heathland or heathland resources.

Discussion

Given that the majority of the charcoal assemblages came from late Roman features it was not possible to gauge any changes in wood fuel use over time. However, this, coupled with the general lack of wood charcoal from the earlier phases of occupation (Smith 2010), may indicate a shift in the type of fuel used at the site. Evidence from a Roman saltern at Morton Fen, Lincolnshire, for example, suggests that plant material such as bracken (*Pteridium aquilinum*), horsetail (*Equisetum* sp), and cereal processing waste, rather than wood, was more commonly used for fuel in the salt-making process (Murphy 2001). The small amount of charcoal that was recorded at the site included a high proportion of very narrow stems, which Gale (2001, 155) suggests may indicate fuel shortages that necessitated the frequent gathering of small woody stems.

It may not be a coincidence that this shift in fuel use at recorded at Stanford Wharf corresponds with a change in the methods used for salt-making extraction. Perhaps marking a period when activities diversified or intensified, leading to extra demands in fuel supply. The abundant roundwood on the site may be significant here and reflect the regular collection of small brushwood, possibly supplemented by the production of coppice wood. Either way, it is possible the wood selection at Stanford Wharf may have been partly influenced by the availability of local resources. As Edlin (1949) suggests, salt drying itself would have made heavy demands on neighbouring woodlands.

Both coppice wood and brushwood is the traditional material used by charcoal burners (Edlin 1949), and although it is difficult to identify the use of charcoal, as opposed to wood, in archaeological contexts, it is possible that charcoal fuel would have been preferable in the salt-making process. Both in terms of the intense and sustained heat it would have provided, together with reduced smoke levels (Edlin 1949). Much of the charcoal from Morton Fen and the Iron Age saltern at Cowbit, also in Lincolnshire, consisted of alder and willow/poplar roundwood, which Gale (2001, 98, 156) suggests was likely to have been converted into charcoal prior to use, given that neither makes particularly good wood fuel.

Oak and alder appear to be the most common wood used at Stanford Wharf. However, there are a couple of exceptions, such as the broom/gorse type charcoal that dominated the possible oven rake-out deposits in hollow 1408 and beamslot 1644. This is potentially interesting given that gorse used to be the traditional wood used for firing ovens in the past (Gale 2001, 236).

As expected, the most diverse assemblages came from the various layers and occupation spreads, which, along with the basal fill in ditch 5010, may represent material from more than one activity/firing. Postholes 4763 and 1889 and beamslots 1569 and 1644 either contained a range of taxa and/or small roundwood inconsistent with posts/beams that had been burnt *in situ*. It would be reasonable to suggest therefore that much of the charcoal in these features, like the various ‘occupation layers/spreads’, represent general floor debris, which incidentally ended up in the surrounding voids the post/beam left behind.

A Roman saltern at Middleton, Norfolk, like Stanford Wharf, produced a wide range of wood taxa including alder, birch, hazel, hawthorn-type, blackthorn-type, oak, willow/poplar and yew. Ericaceae (heather family) and gorse/broom were also recorded, indicating wood fuel collection from a wide variety of habitats, including dry and wet woodland, and heathland (Murphy 2001). As with other salt production sites, much of the charcoal from Middleton consisted of narrow roundwood.

Conclusion

The charcoal evidence from Stanford Wharf suggests that oak and alder were the main woods utilised at the site, alongside gorse/broom type wood, which appears to be the preferred wood fuel for firing some of the ovens. The fact that the charcoal-rich samples come largely from the late Roman features, and from very few earlier features, suggests that a shift in fuel use took place at the site, which may have been influenced by an increased demand and/or shift in the methods used in salt production.

As with other Iron Age and Roman salt production sites, the charcoal from Stanford Wharf was dominated by small roundwood, representing a combination of brushwood and possible coppice wood. As with historical evidence, salt-production was likely to have exerted heavy demands on local woodland, which itself may have already been under pressure. It is possible, therefore, that some form of management may have been in operation to ensure continuous supplies of fuel wood. Similarly, as with other sites, some wood may have been converted into charcoal prior to use.

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Wood Charcoal Tables

TABLE 20.1: RESULTS OF THE CHARCOAL ANALYSES FROM STANFORD WHARF, AREA A (EXCEPT SAMPLE 4099). FIGURES ARE ACTUAL COUNTS. R = ABUNDANT ROUNDWOOD, H = NUMBER OF HEARTWOOD FRAGMENTS IN COUNT

Period		MIA	Roman	ER	LR	LR1	LR2	LR2	LR2
Feature type		Charcoal layer	Posthole (Area B)	Layer. Possible hearth/oven rake-out	Occupation spread	Layer	Hollow containing possible oven rake-out	Fill of furnace/salt making kiln	Fill of furnace/salt making kiln
Cut number		**6028**	**4763**	**1437**	**5134**	**5536**	**1408**	**6061**	**6061**
Sample number		1373	4099	1037	1166	1208	1029	1344	1346
Context number		**6028**	**4764**	**1437**	**5134**	**5536**	**1374**	**6225**	**6092**
Notes		Twigs	Immature roundwood ‘rods’, abundant >10mm fragments	Large flot. Abundant >10mm fragments. Immature roundwood	Immature roundwood. Few fragments of burnt bone		Twigs	Very Large flot. Abundant >10mm fragments. Possibly coppiced wood (6/7 growth rings)	Very large flot. Immature roundwood., abundant >10mm fragments. Contained metallic waste
	field maple	5				cf 1r			
Corylus avellana	alder/hazel	29r		57r	16		1		4
Alnus glutinosa	alder	2	26r		8	52		20r	
Betula sp	birch							cf 2	
Corylus avellana	hazel	1	9r		3r		cf 1	23r	1
Leguminosae	gorse/broom type				10r		96r		
Prunus sp	sloe/blackthorn or wild cherry	5	cf 2r						
Prunus cf *avium*	wild cherry				15				
Prunus spinosa	sloe/blackthorn					2			
Quercus sp	oak	55r	99r	62r	70r (6h)	58r (5h)	11	59r (13h)	133r
	willow/poplar		8			cf 1			
Indeterminate/bark		13	88 (mostly bark)	5 (bark)	36	13	16	12r (mostly bark)	28 (mostly bark)
Total		**110**	**232**	**124**	**158**	**127**	**125**	**116**	**166**

TABLE 20.2: RESULTS OF THE CHARCOAL ANALYSES FROM STANFORD WHARF, AREA A. FIGURES ARE ACTUAL COUNTS. R = ABUNDANT ROUNDWOOD, H = NUMBER OF HEARTWOOD FRAGMENTS IN COUNT.

Period		LR2	LR2	LR2	LR2	LR2	LR2	LR2
Feature type		Industrial waste, possibly from hearth **1406**	Possible hearth rake-out	Layer within beam slot. Possible oven-rake-out or burnt timber	Basal fill of beamslot. Possible oven rake-out	Posthole	Basal fill of ditch	Oven (outer wall)
Cut number				**1569**	**1644**	**1889**	**5010**	**5551**
Sample number		1030	1153	1060	1096	1121	1218	1286
Context number		**1375**	**1538**	**1567**	**1643**	**1890**	**5563**	**5951**
Notes		Common daub fragments	Some immature wood. Few fragments of burnt bone and daub		Large flot. Roundwood ‘rods’, abundant >10mm fragments. Few fragments of burnt bone			Immature roundwood
Corylus avellana	alder/hazel		33	15		40	33	
Alnus glutinosa	alder	7	1	4	4		24	
Betula sp	birch		cf 2				3	
Corylus avellana	hazel					9	5	
Fraxinus excelsior	ash	3						
Leguminosae	gorse/broom type	24r		1	102r	4r	4r	
Maloideae	hawthorn type						1	
Prunus sp	sloe/blackthorn or wild cherry		1r					
Prunus cf *avium*	wild cherry	3		4r				
Quercus sp	oak	104r (20h)	53r (1h)	61 (3h)	9r	109 (9h)	86	>100r (5h)
sp	willow/poplar		5					
Indeterminate/bark		15	46	18	15r	12	12	2 (bark)
Total		**147**	**141**	**103**	**130**	**174**	**168**	**102**

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