The medieval Thames: fishing net production and technology, and their connection to economy and environment

Lucy Granger

The Thames was an essential resource for medieval London. The river functioned as the city's most important means of transportation, as one of its most critical defences and as a valuable food source. A review of 15th-century net sinkers,[1] held at the Museum of London (Fig 1), and found from a ship that had sunk in the Thames at Blackfriars, leads to a consideration of their wider context: their manufacture, the types of net and the technology of the fishing industry, the role of fish in Londoners' diet (and possible changes after the Black Death), and local responses to dramatic climate change in the 15th century.

The Blackfriars ship excavation

On 25 November 1970, in a cofferdam for the building of a new river wall between Trig Lane and Blackfriars Bridge, Peter Marsden and a small team of volunteers uncovered the wreckage of a 15th-century ship (known as Blackfriars 3) embedded in the Thames riverbed. The Guildhall Museum was given three days to excavate the site and remove as much of the vessel as possible for analysis at a secondary location.[2]

Dendrochronology showed that the ship had been built locally between 1380 and 1415 while associated pottery and other finds suggested that it had sunk towards the end of the 15th century.[3] The ship was found to be in an excellent state of survival, measuring 14.64m in length, 4.3m in width and 0.88m in depth.[4] The wreckage did not show any obvious damage, perhaps suggesting that the ship had been swamped with water upon collision and had sunk. Further evidence of this was seen through the discovery of a similar vessel nearby (known as Blackfriars ship 4) that had sunk at approximately the same time and so may have been involved in a collision with Blackfriars ship 3.[5] The shape and construction of the vessel led to the conclusion that the ship was likely to be the popular 14th- and 15th-century river transporter – the 'shout' (Fig 2).[6]

It was during the excavation that a considerable number (some 1,109) of small lead weights, or net sinkers, were recovered.[7] It was concluded that the net sinkers came from a net that had become caught on the vessel shortly after it had sunk and that it had not formed part of the ship's contents.[8] Furthermore, no other indicators of fishing were found on the wreck, casting further doubt that the vessel had been involved in the fishing industry. However, this cannot be conclusively ruled out.

The lead weights

Lead was an ideal manufacturing material in both the Roman and medieval world as its melting temperature is relatively low (at 330°C).[9] Small-scale medieval manufacturers found it to be a cheap, workable material that could be easily acquired and fashioned into artefacts.[10] In the 15th century, a 'fother' or a cartload of lead, about one ton, cost £5.[11] So one penny could have bought two pounds of lead, enough to make a great many weights!

The lead-worker would have used prepared sheets of lead cut into strips with a pair of shears or knife. The malleability of lead allowed him to produce these small weights rolled into cylinders, likely around a cord, rope or other fibre.[12] Cylindrical net sinkers, such as those reviewed here, can be traced back to Roman contexts. Their production differs little from Roman net sinkers, as can be seen in a detailed analysis of the different forms used in the Roman world.[13] By the end of the

Fig 1: sample of 18 of the lead weights from Blackfriars ship 3, threaded on to modern string for display purposes (Museum of London)

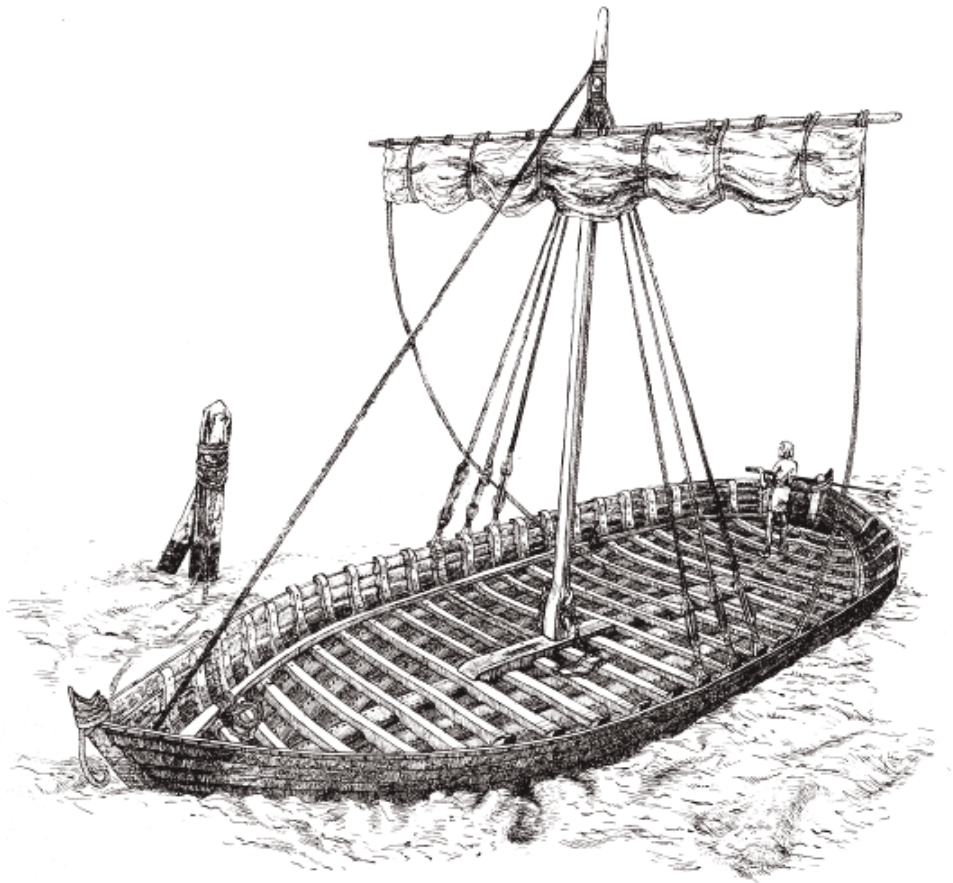

Fig 2: reconstruction of the Blackfriars ship 3 (Karen Guffogg/Historic England)

15th century, the majority of net sinkers were being produced in oval or triangular shapes, with a single hole in the top point for attachment.[14]

Length, size and weight

The majority of the Blackfriars lead weights measured between 30mm and 33mm in length, yet the full collection ranged between 14mm and 45mm.[15] Such a disparity between the lengths of the weights was unlikely to have been the result of lead abrasion, long term use or deterioration. They survived in near prime condition, as did the ship itself, due to the anaerobic conditions.[16] It seems unlikely that the overall difference in size and weight would have been deliberate and that any lead-worker or fisherman making his own weights would have been producing these weights without bothering to check their size or weight.

Not all of the weights, however, were recovered during the excavation.[17] Due to the time constraints of the three-day excavation imposed upon the Guildhall Museum, it was estimated that some 300 weights were not salvaged. So, the data published by Peter Marsden did not necessarily reflect the type or entire length range of the net to which the sinkers were attached. Nonetheless the data suggested that the net sinkers formed part of a medieval Seine net. By understanding the type of net to which these sinkers would have been attached, it might be possible to gain a greater insight into the changes in fishing-net technology during the 14th and 15th centuries.

The Seine net

In medieval England there were countless ways of catching fish, either as an individual catch or by gathering in large shoals, within the major methods of fishing practised. These included the use of nets, traps, baits, hooks, lines, spears, harpoons and even explosives.[18]

In the London area, fixed structures along the Thames such as the numerous fish traps of middle to late Saxon date have been recorded,[19] the two best-preserved examples having been found at Chelsea (FKN01) (Fig 3) and Isleworth (FHL04).[20] Medieval examples must also have existed but very few have been found or recorded, possibly because of the official banning of such structures but also because of a major shift away from freshwater fishing. Small-scale portable wicker fish baskets may have become the norm from the 15th century onwards with, also, a greater use of line fishing.[21]

The Seine net is one of the oldest types of net used in riverine and estuary fishing and was particularly effective for catching fish in shallow waters.[22] In the early medieval period, such nets were used by fishermen from boats as well as from the shoreline (Fig 4). It is possible that the net to which the sinkers were attached was used from the Thames bank and it then became caught on the shipwreck located some 6m from the modern Thames shoreline.

However, it is also possible that such a net was thrown from a boat. Its long netting train, estimated possibly to have been around 56.5m (185ft) in length, would have been thrown in a semi-circle into the water.[23] This enabled fishermen to pull together the 'wings' or 'sleeves' of the net that were closer to the surface and thus gave the fish less opportunity of escaping as they became trapped in the deeper part of the net.[24]

It could be suggested that the disparities between the sizes and weights of the net sinkers found in the Blackfriars excavation might show that the shorter lighter weights might have deliberately been attached to the ends of the net while the longer and, therefore, heavier weights might have been attached to the middle. If there were two distinct sizes of weight, 'short' ones and 'long' ones, these should have shown up as two distinct peaks in Marsden's graph with a trough between them. However, there is a single peak of some 66% of the retrieved weights clustering around the 'average' size (between 25–33mm).

The quality and production technique of the sinkers might reveal a shift not only in the technology of fishing nets and tackle during the medieval period, but also in boat design. There was a need for larger ships and longer sailing distances in search of new fishing grounds or for the purposes of warfare. The Blackfriars ship was a clinker-built sailing vessel, probably used as a river barge on the Thames and less suited for distant travel.[25]

Drift and trawl nets

Advances in ship technology created larger ships leading to changes in fishing techniques and the types of nets, with the development of both drift and trawl nets in the mid–late medieval period.[26] These nets may have developed from the Seine net in order to be more effective in catching large quantities of fish in deeper waters.

The drift net may have developed in conjunction with the initial shift towards sea-fishing in the 11th and 12th centuries. The net was designed to float on top of the water and lie directly in the path of shoals of fish, with oval or triangular weights suspended in the water below.[27] The size of the mesh was designed to catch fish by allowing them to push their head and gills through the holes, but not allowing the rest of the body to continue through, thus leaving the fish trapped in the net.

Alternatively, the trawl net, which developed in the late medieval period, was designed to scoop fish from the water.[28] The trawl net was in essence a large bag that was pulled through the water and then brought together to enclose the fish. These nets became far more efficient in catching fish out at sea and did not require constant attention. For example, the drift net could be left suspended in the water for several hours before it was hauled in by fishermen, thus proving more efficient regarding time management and product yields. The Seine net may have been somewhat 'outdated' by the 15th century as more efficient and cost-effective technology developed.

Therefore, the Blackfriars fishing net had been produced for relatively small-scale use. The sinkers had been made using a traditional technique, and may not reflect the changes seen in the production of nets, and thus in sinkers, by the 15th century. Further evidence of this can be seen through other surviving sinkers from the period where the archaeological evidence suggests that the majority of later medieval net sinkers used in the Thames were oval or triangular in shape,[29] similar to an example found on the Tower of London foreshore (Fig 5). Unlike the cylindrical rolled weights from Blackfriars, such weights were made using moulds that could produce several sinkers at a time.

A number of other contributing factors influenced the changes in late medieval net technology. By relating the Blackfriars net sinkers to the cultural and economic implications of the Black Death in London, it may be possible to gain a greater insight into how demand for food and changes in diet influenced the shift in net technology.

Fig 3: fish trap found on the Chelsea foreshore, dated to AD 730–900 (TDP)

Food and Diet

It has been pointed out that 'food in the Middle Ages was not so very different from food today.' Although it is true that the medieval diet included similar staples to today's diet, namely meat, fish, vegetables and fruit, the diversity in the foods available in medieval London is frankly incomparable to the modern world.[30]

For some 200 years after the Domesday Survey, the increasing number of meat-free days in the church calendar required everyone to eat more fish. The various drying, salting, pickling or smoking processes to preserve fish allowed more marine fish, such as herring and cod, to be consumed. With this increased consumption, commercial sea fisheries had expanded rapidly after *c.* AD 1000. Deep-water fisheries found further away increasingly played a larger role and imported North Atlantic fish may have also affected local fishing.[31]

Quantitative analysis of excavated cod bones from London has mapped the changes in the consumption of this type of fish, indicating a change to imported fish. Cod, typically decapitated as part of the drying process to allow for long-distance transport, came from further afield, whereas locally sourced fish retained their heads. By the early 14th century, Norwegian North Sea fish was being imported into the country and subsequently German trade can be identified in London by the possible introduction of Baltic cod. By the early 15th century English fishing boats had also expanded into Icelandic waters and in the 16th and 17th centuries, with English fishing boats sailing as far as Newfoundland, London's market also indicates that distant trade.[32]

Differences in social standing and wealth had a profound impact on access to food and quality of diet in the medieval period. One of the most significant shifts in the demand and supply of food in the medieval world occurred after the Black Death. It has been estimated that the population of

London, which was approximately 80,000–100,000 people in 1300, dropped to around 50,000 in the 1350s.[33] As a consequence, the range of food that was available, and those ranks that it was available to, shifted greatly in the mid- to late 14th century.

Again, cod fish bone analysis in London might show the effect of the mid-14th-century Black Death on late 14th-century London. There was scarcely a drop in the number of cranial bones suggesting that the fish was being provided more locally rather than being imported in a preserved state.[34] Inshore and fixed-weir fishing may even have expanded after the Black Death in response to the demand for fresh fish.[35]

Local food production

As shown above, food was increasingly imported into London from considerable distances via merchant ships, yet the reliance on local food sources from London's hinterlands remained of great importance well into the early-modern period.[36]

Up to the mid-14th century, meat and fresh fish were often unaffordable for the average London citizen, who instead would have relied on preserved goods, rather than fresh fish, pulses, fruit and vegetables to survive. On the other hand, both lay and ecclesiastical nobles would have spent approximately half their annual income on food and drink. Grains such as oats, barley, wheat and rye, were crucial to the health of all medieval people, regardless of their social background, and the consumption of grains formed 60–75% of the average medieval diet. These grains were most commonly consumed in the form of bread and ale.[37] Most studies of food and diet in medieval England have focused on the agrarian economy and reveal that most of the grains consumed within London originated from its hinterlands.[38]

An example of such production can be seen in the area surrounding the Thames estuary, such as at Barking and Erith, where the fertile marshlands were increasingly ploughed to grow grain.[39] The grain was then shipped via Barking Creek to be sold to the growing urban community in London.[40] Although much is known about the production and consumption of grain in the medieval period, there is a notable absence of large-scale studies on other aspects of provisioning medieval cities.[41]

Although no reasonable estimates regarding the demand for fish products have been calculated, it has been suggested that some varieties of fish became more accessible following the Black Death. The economy of London and the social mobility of its inhabitants shifted significantly in the later 14th century as the population of London was reduced by nearly a half.[42] Due to the decreased number of labourers, wages increased. These higher wages raised the average standard of living within London, thus enabling a better quality of life for many of those who had been at the lowest ranks of society – if only temporarily. Higher levels of wealth created greater access to products such as meat, wine and some types of fish, leading to more diverse food being demanded by the citizens of London.[43]

However, it must be noted that some varieties of fish continued to be reserved for the nobility, such as salmon and sturgeon.[44] From the 13th century onwards these species of fish had been reserved for the royal family in order to maintain social distinctions in eating habits. However, the most abundant varieties of fish in the medieval Thames were sturgeon, salmon, gudgeon and smelt.[45] With two of these varieties reserved for the highest classes, it can be argued that the limited varieties of fish would not have appealed to a post-plague population.

Furthermore, in 1327 the Staples (the medieval system of trade and taxation) allowed foreign merchants into the City to trade goods that had previously been protected by royal decree.[46] In 1335, Edward III reiterated this free trade legislation by declaring that 'all merchants – foreign or native – who wish to buy and sell corn, wines, meat, fish, wools, clothes and other merchandises, whatever the origin of

Fig 4: fishing scene depicted in the Queen Mary's Psalter, early 14th century (British Library)

Fig 5: mould-made triangular fishing weight (LON-75FE0D), found during the Tower of London Foreshore Survey in 2010 (PAS under CC License)

such goods, should freely sell "to what persons it shall please them."'[47]

The increased availability and diversity of fish from foreign markets may have pushed local fishermen, using the Thames as a product source, out of the market. By taking into consideration the socio-economic shift demonstrated above, a cultural shift in regards to food and diet can be traced. This cultural shift, alongside the earlier changes to the trading status of London, would have ultimately caused greater demand for sea fish and therefore the foreign fishing industry. This may have contributed to their reduced use of the Seine net for river fishing, but as nets are rare in the archaeological record, this would be difficult to prove due to the lack of sufficient evidence.

Environmental Change

The environmental changes of the later 14th and 15th centuries, have made it possible to trace further influences on the shift in fishing-net production and technology. These centuries were a time of great environmental turmoil for the medieval world. Succeeding the Medieval Warm Period 12, the 'Little Ice Age' lasted from 1350 to 1850.[48] During this period the average temperature dropped by 1°C, causing significant environmental disturbance.[49] Storm surges in the North Sea caused widespread flooding and river-bank damage across England, particularly along the Thames. It is possible to gain an insight into the socio-economic effects of these environmental changes on the Thames marshlands and on the Thames fishermen.

On a localised level, the flooding caused economic instability, as seen through surviving documentary evidence from Barking Abbey and the estates of Erith and Swanscombe. Throughout the late 14th century, the Abbess of Barking Abbey applied for various financial exemptions due to the damage caused by the storm surges:

> 'By the flooding of the Thames they [Barking Abbey] have lost great part of the profit for their possessions at Berkyng and elsewhere in Essex'.[50]

The cost of similar repairs reveals the extensive expenditure on the maintenance of the Thames riverbanks at Erith and Swanscombe.[51] On a wider scale, the destruction of the arable land of Barking and Erith would have led to significant implications for the provisioning of the City.

The storm surges also had a significant impact on the Thames fishermen in both practical and economic terms. Firstly, the storm damage created navigational problems for the vessels on the Thames:

> '[the Thames was] in a large part blocked and filled up by logs, stones and sand… to the peril of ships'.[52]

This debris also exacerbated the flooding of the marshlands as the blockages displaced the Thames water and pushed it over the burst river banks. Due to the extended boundaries, fish were congregating on flooded lands, culminating in a depletion of fishing stocks.

As a result, some of the Thames fishermen attempted to seek out these fish, as evidenced by a petition sent to King Henry VII in March 1489 which sought to control illegal fishing taking place on the flooded marshlands.[53] By tackling this illegal activity, the authorities forced the Thames fishermen to search further afield. To do so, they would have required drift or trawl nets, leading to a decline in the demand for the Seine net.

Over-fishing?

Furthermore, earlier evidence suggests that the tenants of Barking Abbey also caused a decline in fishing stocks. The abbess had made use of the expensive repairs to the river banks by installing illegal fish traps, similar to earlier medieval versions (Fig 6).[54]

The use of fish traps and weirs was common across the medieval world and archaeological evidence of these 'fixed engines' is increasingly being found in freshwater rivers, sea shallows and tidal estuaries, such as the Thames.[55] Examples of Saxon and early medieval traps have been recorded by the Thames Discovery Programme (TDP) along the Thames (Figs 3 and 6).[56]

The City of London had long been attempting to eradicate the use of these traps in the Thames as they obstructed navigation.[57] As early as 1197, Richard I had ordered that all fish weirs, which projected into the river and impeded the passage of boats, were to be removed from the Thames. In 1237, the City of London was granted jurisdiction over the waters of the Thames from Staines downstream as far as the Medway, and this remained the case during the later medieval period.[58]

In 1327, the king allowed the City to remove all weirs in the Thames and Medway and the City also held rights over fishing on the Thames and confiscated nets that had too small a mesh, some of which were publicly burned in Cheapside.[59] Evidence of this can be found in close roll records from 24 July 1380 in which the abbess was ordered not to install 'improper engines or mesh of smaller nets than the season of the year requires' that caught 'young fish at improper times, before they be fit for food.'[60]

Not only does this give an insight into the complicated political nature of fishing in the Thames during the late 14th century, but it also gives a further indication of the effects of environmental change on the medieval fishing industry. Furthermore, in the light of illegal activity, it is likely that the reduction in fishing stocks that resulted from the installation of illegal fishing weirs would have also forced a shift in the practices of medieval Thames fishermen. Therefore, it might be possible to suggest that the social, economic and environmental impacts of the 'Little Ice Age' influenced the

Fig 6: reconstruction of a Saxon fish trap (Essex CC)

decline in the production of the Seine net in the 14th and 15th centuries.

Conclusion

Without the full collection of weights, which would allow some form of modern reconstruction to take place, it is difficult to firmly conclude that the Blackfriars net sinkers were once part of a medieval Seine net. However, from the available evidence it is highly likely to have been the case, making it possible to chart the shifts in medieval net technology through socio-economic, cultural and environmental evidence.

The socio-economic implications of the Black Death clearly caused a cultural shift as regards food and diet. This, alongside the changes to the trading laws of the city, can be seen as a significant factor in changes to net technology seen in the late medieval period. By understanding the importance of London's hinterlands in grain production, it is possible to gain an insight into the importance of the Thames marshlands for the provisioning of London. The environmental changes of the 14th and 15th centuries had a vast impact on these marshlands, leading to implications for both grain production and the fishing industry. The flooding of the marshlands caused fish stocks to decline, leading to a rise in illegal fishing.

Once this illegal industry was under control, it was likely that medieval fishermen were forced to move out to sea to source their produce. Further to this, the installation of illegal fishing equipment in the repaired banks may also be seen as a contributing factor for the changes in the Thames river fishing industry and this environmental change can be linked directly to the various changes in fishing-net production and technology. Despite the considerable barriers discussed above, it might be possible to conclude that the Blackfriars net sinkers reveal a significant insight into changes in fishing-net production and technology in the 14th and 15th centuries.

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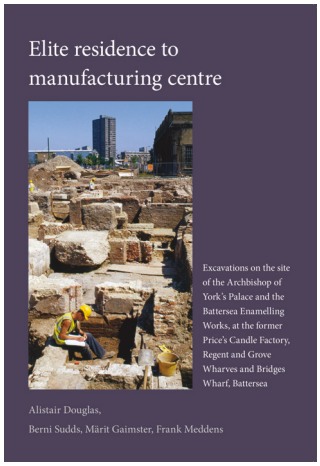
Elite residence to manufacturing centre: Excavations on the site of the Archbishop of York's Palace and the Battersea Enamelling Works, at the former Price's Candle Factory, Regent and Grove Wharves and Bridges Wharf, Battersea



Alistair Douglas with Berni Sudds, Märit Gaimster & Frank Meddens

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Reviewed by Peter Rowsome

This new publication is a welcome addition to PCA's monograph series, reporting on the results of excavations at the Price's Candle Factory, Bridges Wharf and Regent's Wharf sites on the Thames waterfront in Wandsworth. The fieldwork, which took place between 2002 and 2006, revealed a sequence of important residential properties dating from the late 15th century onwards, followed by significant evidence of 18th- and 19th-century industrialisation and manufacturing.

Development began in earnest just before the Tudor period with construction of a moated manor house known as Bridge Court and later as York House. The manor house was built as an episcopal residence, acting as a country retreat for the bishops of York but conveniently near to London and the Royal Court. Detailed structural evidence of the 16th-century building included several rooms and a corner tower in its southern range. A contemporary foreshore revetment and a cellared building lay to the north. Bridge Court underwent extensive modification and was partly replaced by York House in the late 17th century. A large sugar house was recorded further north at Regent's Wharf.

Residential use of the area declined in the 18th century as industrial activity increased. York House was used for a time as a prison, private housing and manufacturing. The surviving southern part of Bridge Court became the home of the Battersea Enamelling Manufactory. This factory operated for just three years, between 1753 and 1756, but was highly innovative and influential, producing high-quality English products. It is the first early enamelling works to be archaeologically excavated. Between 1790 and 1850 the area was occupied by a variety of industries, including a distillery, a piggery and a butcher. By the mid-19th century it was the location of Price's, one of the country's foremost candle manufactories.

The monograph contains an introduction (Chapter 1), a chronological narrative divided into period chapters (Chapters 2–9) and conclusions (Chapter 10). Each period chapter consists of a documentary section, a detailed description of the sequence supported by excellent phase plans and a discussion of the significance of the findings. Specialist information is integrated into the narrative and accompanied by drawings and photographs. Some readers may lament the absence of specialist reports. While these will presumably form part of the site record deposited at the Museum of London Archaeological Archive, it would be good if the detailed findings from such important sites could also be made available through the ADS.

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