“A Winter’s Tale”:

A Comparative Analysis of the Artefact Assemblages from the winter camps of the Viking Great Army at Torksey and Aldwark

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Abstract

Until the early years of the 21st century, Viking camps were a poorly-understood phenomenon. Sites were envisaged as small, fortified enclosures, almost entirely associated with military activity and with limited archaeological potential. However, the identification of the winter camps of the Great Army at Torksey, Lincolnshire, and Aldwark, North Yorkshire, has changed this perception. Large finds assemblages have been recovered from both locations, showing a wide array of activities at each site, and with trade and manufacturing clearly as important to the occupying forces as the resupply of equipment and *materiel*. Uniquely in early medieval archaeology, both camps can be closely dated, pinpointing the assemblages against the background of the Great Army's campaigns.

This thesis presents a comparison of the finds assemblages from these two camps. The overwhelming majority of artefacts considered were recovered by metal-detecting, and the methodological implications of this form of data collection are considered. The analysed assemblages show the wide variety of trade systems present at each location, as well as demonstrating how each economy began integrating with the respective local areas. They also illustrate the targeting of certain resources, either for specific materials or social capital, and show the degree of control that each camp exerted on its hinterland. In analysing the evidence for manufacturing, the production of both culturally-defined and 'hybrid' dress accessories and fittings are examined, illuminating how these may have been used as expressions of personal identity and group unity. The assemblages are analysed through broad categories of use: this approach highlights the functional fluidity of some of the artefacts, whilst also showing how these were used to bridge the different cultural groups which made up the Great Army.

Online access to the artefact databases for both sites is provided in Appendix 1.

"Amid the transformation of winter… is an abundance of life"

- Katherine May, *Wintering* (2020)

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Declaration of authorship

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

Mark James Randerson

1. Introduction

1.1 Outline

One of the most frequently-referenced entries in The Anglo-Saxon Chronicle is that of the year 865 AD. As part of the record, the chronicler states that ‘a great raiding-army came to the land of the English and took winter-quarters in East Anglia’ (Swanton 1996, 68). Scandinavian-derived forces had been recorded as establishing camps and overwintering in Britain before this date. However, the arrival of this ‘Micel Hæðen Here’ or ‘Great Heathen Army’ marked a crucial change in their activities. After this point, a Scandinavian presence became permanently established on the British mainland, with the Army, under various leaders, active for the following fifteen years. The Great Army was a powerfully disruptive force, with the ability to throw entire kingdoms into chaos (Edmonds 2019, 51). The effect of its arrival was profound: within a decade and a half, the kingdoms of East Anglia and Northumbria were effectively destroyed, Mercia partitioned, and a swathe of the eastern side of England ceded to the Scandinavian incomers. The presence of the force provoked other, deeper changes, with towns and urban sites revitalised, new settlement patterns established across the countryside, and with economic and social implications felt for generations. However, although these factors are clear, the Great Army itself remains relatively poorly understood. Until recently, the force was seen as archaeologically elusive, little known other than through documentary records.

In the first two decades of the twenty-first century, two important camps of the Great Army were recognised for the first time (Figure 1). These were principally identified by amateur metal-detecting, with enthusiasts viewing them as ‘productive sites’. Although the histories of the two sites are somewhat different, numerous early medieval artefacts were ultimately reported from both, leading to their identification. The camp at Torksey, Lincolnshire is a documented location, with the Army recorded as overwintering there in 872-3 AD. Conversely, no records exist for the site at Aldwark, in North Yorkshire: the artefact assemblage indicates that it was occupied during the mid-870s, after Torksey (Williams 2020d, 81). The assemblages from both locations are remarkably similar, reflecting the archaeological Great Army signature of artefacts defined by Hadley and Richards (2020; 2018). However, clear differences are also immediately apparent. Aldwark is significantly smaller than Torksey, possibly mirroring the split in the Army recorded after the force left Repton in 874, and several variations in the artefact assemblages can be observed, potentially indicating material differences between the occupation of the two locations. Although two publications have catalogued the ongoing collection of artefacts from Torksey (Hadley and Richards 2016; Blackburn 2011), new finds have been added to the databases in the intervening time, enhancing the archive. The production of the Aldwark report (Williams 2020a) means that this site is now in the public domain. Both locations differ substantially from previous models of Great Army camps, and present a new form of type site. A comparison of the two assemblages can now be undertaken.

1.2 Aims and Objectives

This thesis intends to compare select elements of the artefact assemblages from Aldwark and Torksey to determine the degree to which the two sites are related, whilst also identifying any unique elements or areas of divergence. The Great Army itself represents some of the first wave of Scandinavian settlers in England. An examination of both sites, and a knowledge of the activities evident at each location, will better inform an understanding of the Army as a force, engaged in both campaigning and in the subsequent settlement.

I intend to:

- Undertake a quantitative comparison of the two assemblages by artefact type, collating and contrasting different classes of identified find.

- Attempt to understand the degree to which any differences may be the result of differential recovery and recording, or to what extent they may reflect genuine material differences between the sites.

- Analyse artefact categories to determine whether individual objects can be seen to be closely related.

- Examine the degree to which artefact groups may have been drawn from the same overall population.

- Investigate any apparent regional differences between the two assemblages. This will be achieved by exploring such factors as the presence of Mercian or East Anglian material in the Northumbrian location and vice versa; the presence of identifiable Hiberno-Scandinavian links at Aldwark; the comparative quantities and dates of Northumbrian stycas at the two sites; the evidence for industry and production in each location; and the relative quantity and fragmentation of dirhams.

1.3 Overview

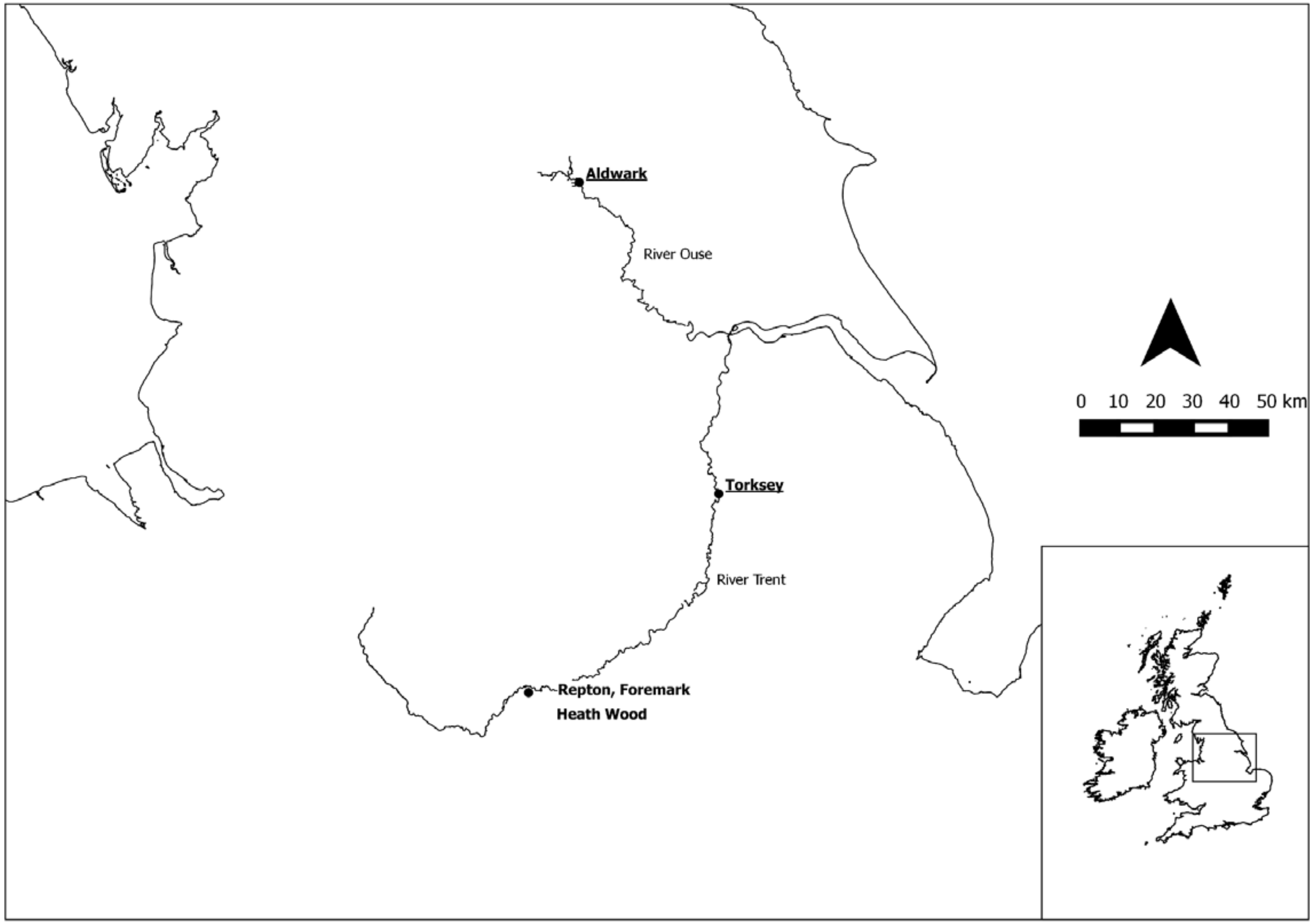
A synopsis of the archaeological study of the Great Army will be presented in Chapter 2, with the assemblages from both study locations introduced and explored in the succeeding chapters. The comparison of the two sites considered herein has been undertaken as a desk-based exercise, working with and expanding existing artefact databases. The history of these databases will be fully detailed in Chapter 3. In addition to cleaning and consolidating each catalogue, I have also expanded both as part of this thesis. New finds have been added, and over 200 iron objects have been studied, recorded, and included in the Torksey database. Five categories of artefacts will be considered in Chapters 4 to 8, broadly categorised by the activities to which the respective finds would have related. Many of these artefacts have been published previously, or have had identifications suggested as a part of their inclusion in the databases. Where necessary, appropriate reference is made to prior analyses. Other interpretations are mine, and have been identified as such. This thesis therefore presents both new artefacts and new identifications, in addition to compiling and building on existing work. The results of the comparative analysis will be given in Chapter 9.

1.4 Terminology

This thesis presents a study of two locations interpreted as Viking camps. The use of the word ‘Viking’ has been the subject of scholastic scrutiny in recent years (e.g. Jesch 2015, 6-8), with its application as a cultural description questioned. Whilst accepting the limitations of any hard-and-fast definition, I intend to apply the term only as a description of military activity, and the undertaking of this activity by autonomous, transnational groups, without any ethnic or regional implication. Thus, ‘Viking armies’ and ‘Viking camps’ will be used, as these can accurately express the nature of the forces and locations under analysis. Equally, ‘Viking-Age’ will be employed as a broad chronological description, as this term usefully encompasses the wider period from *circa* 800-1050 AD wherein these military activities occurred. Where appropriate, any specific cultural or geographical references will attempt to use more definite terminology, as a means of separating Viking activity from any perceived ‘homeland’ or origin. However, rather than use potentially anachronistic national labels, I intend to apply broader geographical terms whenever possible. ‘Southern Scandinavia’ will be used to describe the cultural area defined by present-day Denmark, the southern tip of Norway, and the south-western side of modern Sweden, including the Skagerrak strait and the site of the *emporia* of Kaupang. Similarly, ‘western Scandinavian’ will be applied to the areas of contemporary Norway lying north of Utsira, with ‘eastern Scandinavian’ describing the east coast of Sweden, the Gulf of Bothnia, and the Baltic islands. The application of such terms as ‘Frankish’, ‘Frisian, and ‘Insular’ will follow normal usage.

This thesis will use ‘-Scandinavian’ as a broad ethnic description, in an attempt to avoid the pitfalls of more precise but nationally-delineated terms such as ‘Anglo-Danish’ (Downham 2013, 41-71). Thus, ‘Hiberno-Scandinavian’ will be applied to the cultural zone encompassing the Irish Sea, Scandinavian settlements in the areas of present-day Ireland and mainland Scotland, and the island archipelago of northern and north-western Britain. ‘Anglo-Scandinavian’ will equally be used to describe an area of similar cultural activity across the eastern side of modern England, very loosely bound by the Rivers Thames and Tees, and extending very roughly from London to the Wirral. As chronological terms, in addition to ‘Viking-Age’, ‘early medieval’ will be applied as a descriptor for the broad era from 500 to 1000 AD, with ‘Mid Saxon’ and ‘Late Saxon’ employed for the periods between 650-850 AD and 850-1050 AD in England. Again, the constraints of such designations are acknowledged, and other terms may be used where they provide more clarity.

Figure 1.1: Locations and artefact assemblages associated with winter camps of the Great Army 872 - 876 AD



2. Background: Viking Camps and the Great Army

2.1 Introduction

The force known as the Great Army overwhelmed three Anglo-Saxon kingdoms in the late ninth century, fundamentally altering the face of England. The common stock of the Anglo-Saxon Chronicle traces a yearly itinerary for the Great Army, making it possible to establish a chronology of the force's campaigns. Whilst it is not necessary to recount these movements in detail, a brief outline is worthwhile. The year after their arrival in 865 AD, the Army moved from East Anglia into Northumbria, taking advantage of a civil war to twice attack York and ultimately kill both rival claimants to the throne (Rollason 2003, 212). This swift, decisive movement set the pattern for the coming decade, with the Army traversing Britain and establishing itself in a new winter camp each year (Baker and Brookes 2013, 137). With Northumbria subjugated, the Army moved into Mercia and East Anglia, with the latter suppressed late in 869 AD (Abels 1998, 125). The following two years were spent harrying the kingdoms of both Wessex and Mercia. After this, the force rapidly returned to Northumbria, before then moving south to Torksey and establishing a winter camp in 872-3 AD. The next year, they moved further into Mercia, occupying Repton and delivering the final blow which saw King Burgred abdicate and retire to Rome (Williams 2001, 306-7). Here, the Army split, with a section of the force, following Halfdan as a leader, retiring to a base described only as being 'on the Tyne'. By 876 AD, this group, in the words of the chronicler, 'were ploughing and providing for themselves' (Swanton 1996, 74-5). The operational section of the Army continued to campaign before establishing a peace accord with King Alfred: part of this group then withdrew to eastern England, whilst others moved operations to the Continent (Coupland 1995, 196: Baker and Brookes 2012, 23).

It has been recognised for several decades that the Great Army was not drawn in entirety from the Scandinavian homelands, and many who travelled with it were not 'Scandinavian' by birth. Viking armies were conglomerate forces, composed of a variety of warbands following different leaders, and emanating from numerous points of origin (Raffield *et al.* 2016, 36; Townend 2014, 39; Abels 1988, 110). A substantial section of the Army appears to have arrived in East Anglia from campaigns in Francia, after raiding activities in the Marne basin were hampered by coordinated defensive action, prompting them to move their sphere of operations (MacLean 1998, 74; Nelson 1992, 207; Coupland 1991, 1). Other members almost certainly came from Scandinavian fiefdoms in Frisia and northern Francia (McLeod

2014, 132-158), whilst more were derived from Scandinavian colonies and outposts in Ireland (McLeod 2014, 112-132; Downham 2007, 63-64). Although the various factional leaders would undoubtedly have competed for hierarchical position, or for influence over the forces' manoeuvres, it was not a conventional 'army', and it is hard to imagine that any form of central discipline or command applied to its different contingents (Abels 2003, 265). Organisation would almost certainly have been comparatively loose, reflecting the autonomous nature of the groups which comprised the whole. This autonomy would equally have been reflected in the size of the force, which would have fluctuated as bands joined and left: the Chronicle observes that the force was joined by 'a great summer-fleet' during 870 AD (Swanton 1996, 72-3), with further divisions and additions visible in the documentary sources (Raffield 2020, 183-4). It has been observed that all these elements hold great implications for how the Great Army should be viewed archaeologically (Raffield 2016, 311). However, these considerations have often been subsumed by other strands of debate.

2.2 The study of the Great Army in Britain

For much of the twentieth century, academic interest in the Great Army was primarily focused on the size of the invading force. Whilst not an outstanding issue in its own right, the topic was seen as tied to the wider question of the scale of Scandinavian settlement, where argument raged. The main proponent of a stance which challenged the accepted idea of sizable armies was Peter Sawyer, who expanded on this theme in his book *The Age of the Vikings* (Sawyer 1971). In opposition to previous positions, he stated that 'ninth-century Viking armies were relatively small, numbering, at most, a few hundred men' (Sawyer 1971, 131). The questions this statement raised framed any discussion regarding the Great Army for several decades, with the debate on numbers dominating. It is not necessary to delve deeply into the arguments for either side here, although it is worthy to note that such a diverse range of evidence was called upon that, as McLeod (2014, 11) observed, no single person was able to master all the elements. Although several authors have provided assessments of the various positions, the condition of the debate at the end of the twentieth century was neatly summarised by Trafford (2000, 21), who categorised it as remaining divided into two camps, and observed that the fixation on numbers had 'effectively stalled' any further study. A reluctant compromise was agreed regarding the probable size of the Great Army, and Keynes (1997, 54) was willing to concede that 'we might be tempted to suppose it comprised perhaps two or three thousand men'. However, it should be noted that this slightly grudging concession was based purely on an interpretation of the historical evidence.

Whilst Trafford characterised the debate over settler numbers as ‘stalled’, with little resolution within the established framework of the discussion, he did note developments across the wider discipline of archaeology, particularly with reference to the use that had been made of migration theory in early Anglo-Saxon studies. In relation to this, he observed that the parameters of the debate finally began to change toward the turn of the century, with a greater understanding of notions of ethnicity and migration moving the field of study beyond a simplistic search for ‘Scandinavians’. In respect of these changes, he particularly noted a paper by Hadley (1997), wherein she examined the shortcomings of the standing parameters of debate and questioned many of the assumptions which underpinned them. With reference to the Great Army, this paper emphasised the likely disparate nature of the force, composed of warbands of ethnically-mixed peoples drawn from many diverse, different regions, and operating under ‘a multiplicity of Viking leaders’ (Hadley 1997, 86). Whilst this idea had been expressed before (e.g. Smyth 1977), Hadley also observed that any expression of ethnic origin by these forces may have been short-lived, and most probably became irrelevant after the forces separated (Hadley 1997, 87). This understanding, coupled with a far wider analysis of notions of ethnic expression and of the changing nature of group identity, represented a clear move away from previous positions, and presented a far more coherent view of the diverse, changeable composition of the Great Army.

However, despite this evolving view of the evidence, the Great Army generally featured in a secondary role, discussed mainly in terms of subsequent Scandinavian settlement. Occasionally, discussions acknowledged the force’s role in the genesis of these settlements, but it was rarely considered in its own right (Hall 2000a, 148) and was seen almost solely as a mechanism for the colonisation which followed in its wake (Raffield 2016, 311). Graham-Campbell, in surveying ‘The Archeology of the Great Army’ for the Aarhus Vikingesymposium in 2004, did assess the force independently in a paper which not only traced the route of the army’s campaigns, but also considered the potential sites of camps. Even so, he concentrated his efforts principally on chronicle entries and hoards, and began his observations by noting that ‘the matter of the so-called ‘Danish Great Army’ is, in the first place, an historical one.’ (Graham-Campbell 2004, 30). In essence, this uncontested statement was a recognition of the obvious difficulties in establishing an archaeological framework for a fifteen-year period. However, it does also suggest a certain oversight, or an academic reticence to pursue other potential sources.

To a degree, this reticence reflects a general dearth of study in the field of Viking warfare in Britain (Raffield 2009, 23). The survival of historic texts has meant that studies of Anglo-Saxon warfare have been possible (Lavelle 2010; Abels 1988), particularly regarding Wessex (Baker and Brookes 2013). However, no similar works exist for Viking forces (although cf. Williams 2008 and Hjardar and Vike 2016 for pan-European synopses). This lack of attention has affected the associated topic of Viking camps, which have been treated as a subsection of military studies (e.g. Clarke 1999). A preconception of camps as 'fortifications' has, to a degree, defined their study: antiquarian research often advanced undated earthworks as 'Danish camps', frequently with no supporting fieldwork (e.g. Goddard 1903), and with dating often constructed from historic sources. Equally, it was suggested that the Great Army did not construct its own fortifications, but instead preferred to invest sites with existing defences (Brookes 1979, 10). Whilst this statement may contain some truth, it also demonstrates a presumption of such camps as fortified, military sites. This supposition limited expectation, and had a notable impact on research.

2.3 The archaeological background

As a result of this expectation of military character, parallels for Viking camps in England have been sought with the *longphort* sites of Ireland. Although there is still debate surrounding the precise meaning of their name (Harrison 2013, 61), these fortified sites were primarily documented as Viking encampments by Irish annalists (Sheehan 2008, 282). The sites were commonly enclosed by a D-shaped earthwork, prompting the assumption that the monuments were defensive (Kelly 2015, 57). The locations are so ubiquitous that the central third of the ninth century has been described as 'The Time of the *Longphort*' in Ireland (Mytum 2003, 118). However, by the tenth century, the meaning of the term clearly changed to encompass military fortifications in general (Downham 2010, 96), reinforcing the idea that *longphuirt* related to martial activities. A number of *longphuirt* were abandoned and destroyed during the 860s, actions perceived as demonstrating an exodus to England to join with the Great Army (Downham 2004, 76). As in England, many Irish locations were identified through historic sources or antiquarian research (Griffiths 2010, 31-32). However, the partial excavation in 2003-4 of an undocumented site at Woodstown, County Waterford provided a clearer insight into these camps. The site was bounded by two possibly connected D-shaped earthworks, encompassing 2.91 ha. in total. It is debatable whether these enclosures performed a defensive role: limited excavation suggests they were poorly maintained, and evidence of wooden structures may show either palisades or supportive revetments (Russell 2014, 28-34). The remains of at least one building and several decades of use were identified (Hurley 2014, 349-351), with the main period of occupation in the ninth century (O'Brien and Russell 2005, 10 & 121-122). Extensive metal-working material was found across the enclosed area, with evidence for the working of iron, copper alloy, and silver (Sheehan 2015, 163), while an assemblage of hack-silver and weights was also recovered. Trial excavations at a similar site in County Louth, Linn Duachaill, identified similar industrial activity and metal-working debris, hack-silver, weights, and evidence of habitation clustered around a D-shaped earthwork interpreted as a 'citadel' for the camp (Kelly 2015, 79-84). However, despite this evidence for industry and trade, it must be noted that a view remains that *longphuirt* were primarily defensive strongholds (Simpson 2010, 418).

By contrast, one noteworthy factor in the debate around the Great Army and Scandinavian settlement in England has been the comparatively minor role played by archaeology. In the earlier decades of wider discussion, archaeological material was not a major factor. In part, this was an effect of a perceived paucity of evidence. The comparative poverty of Scandinavian-style burial in England was cited by Sawyer, who saw it as evidence to support his 'minimalist' position. This position was seen to be supported by developments in the field. Excavations begun in 1973 by Biddle and Kjølbye-Biddle at St Wystan's church, Repton, revealed features which were interpreted as a Viking camp. The excavations proposed an enclosure adjacent to an archaic course of the River Trent, identified by the excavation of a section of a substantial, 'V'-shaped ditch and with the course of this feature subsequently extrapolated from geophysical survey. This ditch was probably augmented by an internal embankment, fortifying the enclosure, with the church itself visualised as a central gateway (Biddle & Kjølbye-Biddle 1992, 40). Several furnished burials, equipped with Scandinavian-style grave goods, were excavated within both the church and the enclosed area, with several showing evidence of violent death (Biddle & Kjølbye-Biddle 2001, 61-65; 1992, 40 - 45). To the west of the enclosure, a 'mausoleum' structure was exposed, formed from a partially-demolished building. This contained a mass deposit of disarticulated bone, representing a minimum of 264 individuals (Biddle & Kjølbye-Biddle 2001, 68). Whilst the radiocarbon dating for this charnel deposit has proved problematic (and may have been recently resolved: see Jarman *et al.* 2018), coin evidence from both the mound and from the furnished burials indicated depositional dates of the early- to mid-870s (Hadley and Richards 2021, 151-2 & 156). The enclosure was identified as the 873-4 AD winter camp of the Great Army, recorded in *The Anglo-Saxon Chronicle* (Swanton 1996, 72).

Even before the excavations at Repton, Sawyer (1971, 129) had asserted that ‘The little that is known about ninth-century Viking encampments supports the argument that their armies were small.’ Repton appeared to give credence to this statement, with the proposed D-shaped embankment enclosing an area of only 0.4 ha. (Hadley & Richards 2021, 85), and, excepting the ‘mausoleum’ structure, with little sign of activity outside the presumed camp (Williams 2020g, 93). Despite the somewhat limited nature of the evidence, this form of enclosure became established as a standard type site for Viking encampments in England, with expectations focusing on similar fortifications (e.g. Baker and Brookes 2013, 104-5). Throughout the latter decades of the twentieth century, Repton remained the only positively-identified Viking encampment in England. Although final publication of the results are still awaited, and the interpretation of the enclosure may be open to some question (Hadley and Richards 2021, 114), the association of the site with the overwintering of the Great Army has never been seriously questioned.

This association was strengthened by the re-discovery of the cemetery site at Heath Wood, Ingleby. The history of this site is complex, with excavations from the nineteenth century and into the 1950s exposing Scandinavian-style artefacts (Redmond 2007, 95; Posnansky 1956; Posnansky 1955; Clarke, Fraser, and Munslow 1949; Clarke and Fraser 1946) which were taken as signifying the presence of the Great Army (Clarke & Fraser 1946, 2 & 13). However, the cemetery was effectively ‘forgotten’, and was overlooked during the excavations at Repton (Hadley & Richards 2021, 167). Attention was re-focused by a paper and subsequent fieldwork in the closing years of the twentieth century (Richards 2004; Richards *et al*., 1995). Previous interpretations concluded that the cemetery’s scale meant it must post-date the Great Army’s presence (Shetelig 1954, 91). The more recent works suggest that the initial phase was contemporary with the occupation of Repton (Richards 2004, 47-87 & 92). The different modes of burial expressed between the two sites have been taken as potentially demonstrating different factions or expressions of ethnic identity within the Army (Richards 2001, 101-02). Following the re-identification of the cemetery, a series of metal-detected finds between Repton and Heath Wood identified a concentration of silver dirhams, lead gaming pieces, cubo-octahedral weights, and other artefacts centred on the region of Foremark, Derbyshire (Jarman 2021, 53-56, 63). Like the Repton enclosure, Foremark lies on an escarpment against an archaic course of the Trent. Limited fieldwork has been undertaken, but excavation has produced a gaming piece, a probable Anglo-Saxon coin, and a ploughshare (Jarman 2019), indicating that the main focus of the Great Army’s occupation may centre on this area, with the force potentially dispersed across the landscape. The emergence and nature of this site has prompted Jarman (2021, 86) to describe previous work to identify the camps of the Great Army as ‘a fruitless hunt for fortifications’.

Whilst academic expectation focused on small, defensive sites for early Viking camps, other studies began examining the force itself. Abels (1998, 110 & 132; 1997, 258-9) briefly looked at the Great Army, considering its composition and considerations of supply, and Halsall (2003, 106-7) also contemplated the changeable nature of the force. This latter study recognised that the Great Army typically occupied a new camp in the Autumn and appeared to target church centres and royal *villae*, locations where food would have been gathered in defendable precincts (Halsall 2003, 154-5). Expanding on these themes, McLeod (2006) focused on the provisioning of the Army as a way of analysing the force, and both he and Halsall considered potential interactions with local populations. These recognitions of systematic movement and coherent planning and provisioning lay counter to previous ideas, notably expressed by Stenton’s (1971, 246-7) statement that the Army’s actions did not indicate ‘that its leaders were following anything that can be called a plan of campaign.’ Despite this expanding focus, the accepted model of a compact, fortified enclosure as a base remained unchallenged by these studies. McLeod (2014; 2011) has focussed a great deal of attention on the Great Army as a whole. However, his studies have very deliberately excluded ‘the military aspects of the campaign’, a category wherein the author clearly saw the winter camps (McLeod 2014, 5). Raffield (2013) has produced an assessment of possible Viking fortifications in England. Given this precisely-defined focus, it is hardly surprising that his study again identifies such camps as primarily military centres, although the paper does observe that it would be a mistake to expect Viking forces to construct uniform bases of set type (Raffield 2013, 4). Despite these observations, the compact, D-shaped enclosure has continuously been advanced as an ‘obvious choice’ for the form of Viking encampments (Raffield 2013, 16). Even when studying potential Viking camps in an area as removed from the Insular sphere as Brittany, Price (1989, 55-63) remained focused on fortifications. Additionally, this study further drew on comparisons to Irish *longphuirt* to suggest that the two identified camp sites in the region could only have accommodated modest forces, further echoing the expectations of previous works.

2.4 Torksey and Aldwark

Whilst Graham-Campbell’s 2004 presentation touched only lightly on archaeological evidence it did, significantly, note the work of Blackburn and the identification of the site at Torksey, also briefly considered by Raffield and McLeod. In 2002, Blackburn published a paper detailing the unique collection of metal-detected artefacts from an area to the north-west of the modern village. At this stage, the location was merely identified as a ‘productive site’, and the concentration of artefacts had been noted before (Leahy and Paterson 2001, 190). Blackburn connected the location with the overwintering of the Great Army in 872-3, and by 2011 he was confident to state that five fields adjacent to the Trent were the site of the camp (Blackburn 2011, 221). An archaeological evaluation of this area was undertaken throughout 2011-2015 (Hadley and Richards 2016, 24). The site remained undeveloped after the departure of the Army, and thus has produced a comparatively unmasked view of the winter camp, which occupies a prominent ridge of high ground adjacent to the River Trent. To the west, a steep buff rises away from this watercourse, while more gentle slopes occupy all other sides. Geoarchaeological coring has established that the land to the east sits on an archaic course of the river which would have been waterlogged in the ninth century, effectively creating an island. The camp is roughly 55 ha. in total, with no evidence of any defensive embankments or ditches. Whilst both these elements confound expectation, the size of the potential force which could be accommodated, and the island location, would presumably have dispensed with the need for fortifications (Hadley and Richards 2016, 31-34 & 36). Both geoarchaeology and limited trial trenching have established that the site is sealed by a substantial deposit of wind-blown sand, extending to a thickness of 4 metres in some areas. This deposit may have both masked and insulated archaeological features, protecting them from disturbance. However, it is equally possible that the temporary nature of the camp meant that no permanent structures, leaving significant remains, were ever constructed. Geophysical survey of the site has not identified any anomalies which appear to be related to camp structures, although both a rectilinear settlement and a rabbit warren were located toward the northern part of the island. This settlement appears to be a Roman farmstead, explaining the concentrations of Roman pottery found during fieldwalking in this area and the background concentration of Roman artefacts. No suggestion of any significant prior Anglo-Saxon activity has been identified (Hadley and Richards 2021, 96; 2016, 33-36).

As noted above, the assemblage from the site is overwhelmingly composed of metalwork, gathered by detector over several decades. The coins in this assemblage have allowed very close dating, confirming a concentration of activity in the early 870s, with no material from later in this decade (Woods 2021, 397-402). Some of the characteristic finds from the camp, detailing the ‘archaeological signature’ of the Great Army, have been extensively published already (Hadley and Richards 2020; Richards and Haldenby 2018; Hadley and Richards 2018; Hadley 2017). Several of these classes of artefacts, particularly the lead gaming pieces which were almost certainly first produced at Torksey (Richards and Haldenby 2018, 342), have also been used as a mechanism for tracing early Scandinavian settlement. The fact that these gaming pieces form one of the most abundant categories of artefact from the camp indicates that lead casting was undertaken on the site. Evidence of other industrial processes are equally plentiful. Melted droplets of gold, silver, copper alloy, and lead have been recovered from across the area, as have punched lead trial pieces, a *pressblech* die, iron tools, and profuse fragmentary copper-alloy artefacts, many of which were presumably intended to be melted down (Hadley and Richards 2016, 51-53). Some material suggests that coins were being struck, and certainly extensive trading was undertaken: a sizable assemblage of silver pennies and dirhams, base and precious metal ingots, hack-silver and -gold, and scale weights has been catalogued (Hadley and Richards 2016, 46-51). The silver recovered is highly fragmented, indicating regular economic use (Woods 2021, 406), whilst the materials together suggest that a 'mixed economy' of base metal, weighed bullion, and coin was being practiced (Hadley and Richards 2016, 49). Many of the weights are of the cubo-octahedral type, a form not adopted in Scandinavia before *circa* 860 AD (Kilger 2008, 306), demonstrating a surprising degree of contact and connectivity within the Great Army's markets. Whilst iron hilt furniture from swords have been recorded, a hoard of iron tools for woodworking is also believed to come from the site, in addition to three hoarded ploughshares. Further tools associated with domestic activities and textile working have been recovered (Hadley and Richards 2016, 53-54). In all, the artifactual profile of the site lies far closer to trade and industry than to any obviously military activity.

The site at Aldwark, recognised considerably later than Torksey, was also identified by metal detecting. However, The history of this process was markedly different, with few of the finds being reported until relatively recently, after detecting had continued for several years. Despite this, the assemblage is complete enough to have been published (Williams 2020a). As with Torksey, the site has been subject to archaeological investigation, with targeted trial trenching and geophysical and Lidar surveys conducted across the area. These surveys identified a poorly-defined sub-rectangular earthwork enclosure orientated along the north-eastern bank of the River Ure: no western side was identified, although this may have been obscured by modern field boundaries or lost through erosion (Hall 2020a, 9). However, it may be equally probable that the natural escarpment of the river was used as a boundary. Excavation exposed elements of a double ditch defining this enclosure to the south, possibly interset with posts, and an entrance was identified in the centre of the eastern side. The northern extent and western return of the ditches remained poorly defined. Nevertheless, the enclosure appears to encompass the area of the camp, spanning approximately 31 ha. in total. Radiocarbon dates indicate a first phase of occupation between 610-770 AD, suggesting that some of the features, and therefore the enclosure ditch, may reflect Anglian activity (Hamilton *et al.* 2020, 80), and a collection of early Anglo-Saxon metalwork has been recovered from the area.

A camp at Aldwark is not mentioned in the historic literature, although the Anglo-Saxon Chronicle entry for 866-7 does specifically note conflict within the walls of the city of York (Swanton 1996, 68), and it is probable that a garrison force was maintained in the area after the conquest of Northumbria (Hadley and Richards 2021, 203-204). However, given the sparse nature of Northumbrian records for the era, and the southern English focus of documents like the Anglo-Saxon Chronicle, this omission is perhaps not surprising (Downham 2013, 11). Certainly, a force encamped ‘at York’ could well have been based outside the city, even by some distance. The finds assemblage recovered from Aldwark is extremely similar to that of Torksey, comprising the ‘Great Army Signature’ noted above. The coin assemblage, in particular, allows for reasonably close dating, demonstrating a peak of activity in the middle of the 870s (Williams 2020e, 81). This dating is supported by a second range of radiocarbon results, which indicate that occupation ended between 700-920 AD (Hamilton *et al.* 2020, 81). These date ranges coincide with the settlement of Northumbria by Halfdan’s faction of the Army, a force which presumably fractured and divided further as they spread across the conquered kingdom: the smaller size of the enclosure, when compared to the Torksey camp, is very probably linked to this division of the main force (Williams 2020e, 81). Given the possible dating of the enclosure, it may be that the offshoot group, on returning to York, occupied an abandoned or sparsely-inhabited earthwork, utilising the compound as a convenient base: members of the Army most probably also occupied the remains of the Anglian trading site at Fishergate (Hadley and Richards 2021, 204). Certainly, the smaller size of the Aldwark site, in comparison to Torksey, has been taken as indicating a reduced force (Williams 2020f, 92).

Again, the assemblage from the site is dominated by metalwork. Trial trenching of the interior of the enclosure mainly exposed pits containing butchery waste and metal-working material, with no evidence of permanent structures related to the camp. Excavations in the centre of the site, an area initially suspected of containing a ship burial, were focused on a collection of finds later interpreted as a hoard (Ager and Williams 2020, 11). However, it seems more probable that these artefacts represent merely a small sample of the whole assemblage, rather than a specific cache of material (Hadley and Richards 2021, 215). Metal-working waste from lead, copper alloy, and ironworking was recovered, as was litharge cake, indicating that silver was refined on the site. Melted droplets of silver, lead, and copper alloy have been catalogued, in addition to a substantial, heterogeneous collection of coins and ingots of both copper alloy and silver. In addition, hack-silver and -gold, and a collection of scale weights, again indicates that a 'mixed economy' was in practice. Wood- and metal-working tools, textile-working implements, and a single ploughshare have been recovered, as have a significant collection of strap-ends, some of which appear to have been produced on site. Fragmented parts of decorative metalwork, and many of the Anglo-Saxon strap-ends, were clearly intended as raw material for re-processing, with three of the recovered strap-ends apparently converted from other objects (Hadley and Richards 2021, 216; Rogers 2020d, 53-54). In contrast to Torksey, the remains of two sword blades are included in the recovered material, in addition to hilt fittings. Despite this, once again the impression derived from the assemblage is of a site dominated by trade and industry rather than military occupation.

2.5 Wider connections

The two main sites analysed by this thesis have been convincingly identified as camps associated with the Great Army: Torksey, the location of the main force during campaign; Aldwark, the base of an offshoot faction engaged in settling a subjugated land. Both sites are at odds with previous models of Viking encampments, particularly in regard to their overall size and lack of military character. However, many of the disputes which underpinned the concepts of these earlier models have been resolved, with other assumptions challenged by more recent study. In England, the sheer volume of Scandinavian-style jewellery discovered by metal-detecting, and analysed by the work of Kershaw (2013), has provided evidence which clearly supports the idea of a large-scale settlement across the north-east of the country. This has carried implications for how the first waves of Scandinavian settlers have been seen, reflecting on not only the size of the Great Army but also the composition of the force. The scale of the camps identified at Aldwark and Torksey, and the developing understanding of the Repton/Foremark/Heath Wood area, support this model of large-scale immigration and settlement by comparatively culturally diverse groups. Equally, the variety of artefactual material from both Aldwark and Torksey has prompted a wider re-appraisal of the purposes of Viking encampments: recent interpretations of *longphuirt* have stressed the complex, multi-faceted nature of their occupation, moving toward a more nuanced understanding of these sites beyond mere 'raiding camps' (O'Sullivan 2016, 22). Furthermore, although a focus on fortification and the archetype of the D-shaped enclosure retains an allure (Heijnis 2018, 35), the concept of Viking encampments as defensible but not necessarily *fortified* sites has gained a wide acceptance (Cooijmans 2020, 142), along with the conceptualisation of these locations as being more akin to bazaars than military billets (Horne 2022, 24). Thus, the two sites considered in this thesis have already proved instrumental in helping redefine the parameters of study for such encampments: indeed, in the report for Aldwark, Williams (2020f, 92) asserts that 'Torksey provides a more representative model for Viking camps than the established interpretation of Repton'.

Nonetheless, although these changes have seen new light cast on both the nature of Viking armies and on the wider understanding of the Scandinavian settlement, the fact remains that relatively little study has been devoted to the winter camps as archaeological entities in their own right. This is not to say that academic focus has bypassed the locations: several authors have identified them as being integral to Viking activity, and a major contributing factor to the success of Viking armies. As example, Price (2016, 164-5) has not only noted that Viking camps appear to have operated as mobile polities, to a degree reflecting a form of 'micro-state' idealised by their inhabitants, but has also more pertinently observed that later Scandinavian settlements must have been heavily influenced by the specific encampments from which they evolved. This concept has been echoed by Horne (2022, 228-9) who suggests that the camps can be seen as an 'intermediate stage' in the establishment of larger, permanent sites, with locations like Torksey key to understanding the deliberate planning and control of markets such as York. Within these models, the winter camps form a vital link in the development of later Scandinavian activity in Britain, with the individual encampments leaving unique, regional footprints on subsequent settlement. These suggestions mirror the line of development traced by Hadley and Richards (2021, 249-265), wherein both the camps and the presence of the Great Army itself are seen as prompting the growth of industry and urbanism in later Anglo-Saxon England.

Nonetheless, it must be noted that although Horne and Price's works have examined the circumstances of Viking camps, they have mainly concentrated on the organisational and social structures present at each location, or on analyses of their markets and economic profiles. The more prosaic details of day-to-day existence have not been remarked upon, with little specific focus on the sites themselves beyond a general recognition of their individuality. More in-depth examinations of Viking camps have been undertaken by Cooijmans (2021; 2020), with his most recent work in particular paying attention to the unique situations of a series of historically- or archaeologically-attested encampments. These studies have clearly stated the central importance that camps must have held for the highly mobile, transient forces which composed Viking fleets, and have also identified the secondary purposes that the sites served beyond mere rest and resupply. As such, both works have provided a welcome springboard for ongoing study, establishing the varied, multi-strand activities at the camps as being central to the success of Viking armies. It should be noted that both Cooijmans' studies maintain a very broad overview, with his initial assessment of the encampments (2020, 141-151) placed within a framework of theoretical models of Viking activity in the Frankish kingdoms. Although a more evidence-based approach is evident in his later review (2021, 191-2 & 195-200), a heavy reliance on historical sources is apparent, necessitated by a very broad, pan-European approach to the phenomena of encampment as a whole. Whilst these minor shortcomings are understandable, particularly given how recently much of the archaeological material has come to light, they do highlight the necessity for assessment and analysis of archaeological assemblages from the identified sites.

Links to other European locations can be seen in the assemblages from both camps considered by this thesis. The unenclosed Torksey site, with its clear emphasis on economic activity, is directly comparable to such Scandinavian central places as Kaupang and Uppåkra (Woods 2021, 405-6), whilst Williams (2020f, 87) has observed typically Irish manufacturing activity at Aldwark, suggesting, at the very least, considerable interaction with wider Insular culture. Both sites display far more focus on industry and trade than any martial function. Indeed, in discussing Torksey, Hadley and Richards (2016, 54) very clearly note the paucity of weapons, and observe that the assemblage as a whole indicates that research 'needs to broaden its focus beyond the purely military'. It is apparent that previous expectations, focused toward small, fortified sites of clear military character, have been reassessed in the light of these new discoveries. However, whilst a wider focus, examining aspects such as manufacturing, trade and exchange, and the interaction with local populations is evident in more recent analyses, Cooijmans (2021, 191) specifically observes that any wider research into Viking camps faces an enduring struggle 'with a dearth of available data'. This is equally true of the potential links which the camps have with the evolution of individual urban settlements, and with any wider associations with economic growth or technological development: no analysis of these connections can be seriously contemplated without a thorough review of the specific situations of the camps themselves, and an assessment of the activities unique to the individual sites. Furthermore, Cooijmans (2021, 203) also notes that, as collaborative establishments created by disparate campaigning groups, collective experience would have helped shape camps across western Europe. This factor means that the similarities shared by individual camp sites may be as important as their differences, revealing some of the dynamics of the first Viking Age and the interplay between regional factions. Thus, in order to contribute to these expanding fields of research, the assemblages recovered from Aldwark and Torksey need to be compared with each other, a requirement noted by Williams (2020d, 41) in his publication of the Aldwark material. This thesis seeks to address this need.

3. Methods Statement

3.1 Data Sources

Both Torksey and Aldwark were initially identified through amateur metal detecting. Archaeological trial trenching has been undertaken at each location, with artefacts recovered from secure, discrete contexts. Additionally, finds have been recovered by surface collection through field walking at Torksey (Richards 2013). However, these investigations have been limited (Hall 2020b; Hadley and Richards 2016) and unstratified, metal-detected artefacts form the bulk of both assemblages: these items are the main focus of this thesis. A substantial amount of the detector finds from Torksey have been drawn from voluntary reports logged with the Portable Antiquities Scheme. These reports have been submitted to Finds Liaison Officers across north-eastern England. Whilst the artefact assemblages are dominated by Viking-Age material, the dating of both sites is reliant on the recovered coins. These indicate date ranges with clear, pronounced peaks of activity in the mid 870s, corresponding with the recorded overwintering at Torksey and the division and settlement of Northumbria. Many classes of finds are without closely-datable characteristics, however, and have been recovered without context from ploughsoil horizons.

3.2 Database History

To date, the Torksey database has been compiled and maintained by the Viking Torksey Project. It was based on a primary catalogue of reported finds assembled by Mark Blackburn at the Fitzwilliam Museum, Cambridge, which included artefacts reported to both him and to Derby Museums. Subsequently, Rachel Atherton at Derby Museums and Andrew Woods at the Fitzwilliam have also collated material from the site. Torksey finds recovered by David Stanley, Peter Stanley, Neil Parker, and the group operating as ‘Leeds Detectorists’ were also recorded with the Portable Antiquities Scheme (PAS) in South Yorkshire, and further material was registered with the PAS in Lincoln and York. Other finds were reported to Kevin Leahy at North Lincolnshire Museum. Whilst it is a given fact that further material will have been recovered and removed from the site without ever being reported, this long history of methodical recording means that the Torksey database can be viewed with confidence: the catalogue may be seen as reasonably complete, providing a reliable assessment of the finds recovered from the location. This catalogue has been further expanded by the archaeological works on the site, and by later organised, recorded metal-detector surveys.

An earlier version of this database (complete to Aug 2016) has been curated by the Archaeology Data Service. For Aldwark, the database was established by Prof. Julian D. Richards using the catalogue of artefacts compiled for the site report (Williams 2020a). This has been supplemented by information from third parties and collectors who have been involved with the site, and material recorded by Lee Toone and Gary Johnson has been brought into the database. However, this catalogue is known to be incomplete: lacunae in recording are apparent, and unrecorded finds are known to have been removed from the site. Whilst the finds which are included in the database can be confidently attributed to the site, the completeness of the catalogue is more open to question.

As part of this thesis, I have added further information to both databases. I have recorded recent detector finds and subsequently added these to the Torksey archive, in addition to a collection of catalogued artefacts recorded by Kevin Leahy at North Lincolnshire Museum: these latter items were reported before the site was identified or its significance fully appreciated. I have also incorporated a catalogue of artefacts recorded by the York Archaeological Trust into the Aldwark database, in addition to further finds collated by Andrew Woods at the Yorkshire Museum. Both of these sources include finds not assessed as part of the published site report, but which can be credibly established as having come from the winter camp. In addition to this, I have cleaned both databases of multiple, duplicate, or erroneous entries, and standardised the terminology applied across all categories of artefacts. Additionally, as noted above, I have also examined and recorded a corpus of over 200 iron finds from Torksey. This work represents the first analysis of this material. Thus, this thesis includes finds unavailable to all previous publications, with both databases representing the most complete catalogues of the two study sites to date. A cut-off date of September 2021 has been maintained for the addition of new finds, with no artefacts included after this point. Both databases will be made available via the Archaeology Data Service in due course.

Entries into both databases have been organised on a progressive number system, with artefacts categorised according to a series of descriptive criteria. Finds from Torksey have been added in the order in which they were reported and recorded, with Aldwark finds added to the existing artefact catalogue. Both databases therefore operate the same basic cataloguing system, using a ‘Database Number’ to identify individual items, prefixed with the site name. Finds from either database will be referred to hereon using this system. Finds from Aldwark are identified by the designation ‘ADB’ (for **A**ldwark **D**ata**b**ase), with Torksey material identified as ‘TDB’ (signifying **T**orksey **D**ata**b**ase). Access to both databases is provided in Appendix 1.

3.3 Biases

The popularity of metal-detecting as a hobby, coupled with schemes pioneering the promotion of ‘responsible detecting’ and the subsequent creation of the PAS, has had a profound impact on Viking-Age archaeology in England (Richards and Naylor 2010, 338). Although the term itself is open to some question (Richards 2003, 155), the locations known as ‘productive sites’ have revealed hitherto-unknown archaeological resources to academic research. Equally, detected stray finds account for almost 90% of all Scandinavian-style jewellery recovered in England (Kershaw 2013, 11 & Fig. 1.1). However, many biases can affect detector-derived material, both on a wider and a site-specific scale.

The tendency for detectorists to favour certain landscapes and particular districts has been widely observed. Relatively flat, low-lying agricultural land, improved by regular ploughing, is the predominant choice. This factor has an unquestionable impact on the visibility of metal-detected sites across the country, with significantly more sites identified in eastern England (Griffiths 2003, 63). Other factors apart from topography and agricultural use also limit detecting, with urban centres, lakes, forests, and danger zones all clearly influencing the choice of location (Richards, Naylor, and Holas-Clark 2009, 2.4.1). Transport networks also play a part, with areas served by major trunk roads exhibiting a higher percentage of finds recovery. Additionally, land access also serves as a major limiting factor, given that landowner permission is required for legal detecting: the northern extent of the former Northumbrian kingdom has been identified as an area where this is particularly pronounced (Richards and Naylor 2011, 133). The ‘productive site’ phenomenon itself may be a false concept, with the description often masking complex, multi-focus settlements, and with the term itself echoing current metal-detecting practice rather than historic activity (Richards 2003, 155-6).

Other elements apply within the realm of site-specific constraints. Significantly, the preservation, and thus recognisability, of finds may be a notable consideration. The identification of artefacts, and the knowledge and agenda of the detectorist, can play a significant role in the process. This is demonstrated with the Torksey assemblage, where the identification of a single detected styca led to the recognition of the unusual nature of the site (Hadley and Richards 2021, 89). Good preservation, and a predominance of recognisable shapes and surface decoration, is believed to positively affect the recovery of Scandinavian artefacts (Kershaw 2013, 14). However, heavily corroded material, or items which cannot be easily identified, are more likely to be discarded. In the instance of the Foremark site, anecdotal evidence suggests that several of the distinctive lead gaming pieces, a key element in the 'Great Army assemblage', were disposed of by a detectorist who was not aware of their significance (Jarman 2021, 85). The recovery rates of ferrous items are also an issue with detected data. Detectorists routinely programme their machines to exclude iron, or discard iron finds, allowing them to focus on items which have more personal interest. Archaeological involvement with Torksey has served to counter both these factors, reducing the recovery bias. This was not the case for the first eight years of detecting at Aldwark. Although ferrous material was later catalogued, many of the artefacts are categorised as 'hedgerow finds', collected from field boundaries where they had previously been abandoned (Hadley and Richards 2021, 209-10). This material discrimination has had an effect on the assemblage, with iron objects both under-represented and poorly recorded.

Although both the assemblages and the duration of occupation are different, a comparison can be made with the Woodstown site, where metal-detecting was only undertaken as part of the archaeological investigations, and can credibly be claimed not to have occurred earlier. From a total of 6,007 finds, over 90 percent were metal. Whilst more than 5,000 finds in total were recovered from the topsoil, some of these were identified through a sieving programme. However, the ratio of metal against other materials is noted as being 'disproportionately high', primarily due to the use of detectors (Scully 2014, 125). With over 3,560 items, iron forms roughly 59% of the total assemblage. In comparison, iron items form approximately 7% of the recorded Torksey finds, and 19% of the Aldwark assemblage. Not all these iron objects are of archaeological value, and the proportions at Woodstown were undoubtedly affected by a railway line bordering the site. Nonetheless, the differences are still pronounced, indicating a very probable bias in recovery.

The reporting of finds is also a major limiting factor in the use of metal-detected data, and one which is particularly pertinent to this study. The choice to report and record artefacts is a personal one, and may often be affected by the finders' perception of archaeological significance (Lewis 2016, 131). The site at Torksey was reported relatively early in its history. However, detecting had been in progress in the area for several years prior to this, with descriptions of finds of 'Viking' material circulating within the metal-detecting community (Hadley and Richards 2021, 88). By contrast, the reporting of Aldwark occurred very late in the history of the site, after substantial amounts of material had been removed. This fact was the source of considerable friction after the finds were declared, and was also the reason for the location being initially reported under the fictitious name ‘Ainsbrook’ and ultimately published using the designation ‘A Riverine Site near York’, shortened to the acronym ‘ARSNY’ (Williams 2015, 99). On both sites, significant, and unassessable, amounts of material is known to have been removed and distributed without being recorded. As illustration, although Williams (2020d, 38-9) records 90 stycas from Aldwark, it has been claimed that ‘hundreds’ were actually found, but subsequently sold (Hadley and Richards 2021, 214).

This dispersal of material may also promote a further bias in the available data. As noted, many artefacts have been recovered from the sites, recorded, and returned to their finders. In some instances, particularly of more historic finds, this recording is only partial, with significant gaps in the information. These omissions cannot now be corrected, as these finds have passed into private ownership, typically without any details of the new owner. Again, the ferrous material from Aldwark is a case in point, where over one hundred items are recorded on the archive database as merely ‘Objects’. No further information is available, and thus over 35% of this particular section of the assemblage cannot be subject to any form of analysis. Whilst no other lacuna is so pronounced, similar omissions occur throughout the two archives, with sparse recording particularly noticeable amongst the earliest objects recovered from Torksey.

Where appropriate, items which fall on a late ninth-century to early tenth-century date range have been assumed to derive from the occupation of the camps, as have less diagnostic objects with broadly early medieval characteristics. However, small-scale early medieval activity is inferred at Aldwark, pre-dating the camp, and the enclosure may potentially be Anglian in origin. Equally, the broader dating of several categories of artefacts may indicate that intermittent activity either continued or resumed at both sites into the early tenth century. Given these factors, it is possible that both earlier and later artefacts have been assumed to belong to the brief, concentrated phases of Great Army occupation, potentially over-emphasising the impact of the force. Nonetheless, the evidence suggests that any such activity which preceded or followed the winter camps was of limited scale and impact, and that therefore the potential distortion caused will be minor.

3.4 Data sets

This study will focus on and compare specific groups of artefacts within the two assemblages. These groups have been organised according to six categories, principally characterised by object function (Chapters 4 - 8). Clearly, these constitute very specific samples of the two assemblages, focused on the early medieval material: later or earlier artefacts will be enumerated in some categories, but these will not be included in the overall analysis. This thesis does not intend to assess the entirety of each assemblage, and a significant proportion of the catalogued artefacts will be excluded. The identified early medieval items in all six categories of study are shown in Figures 3.1 and 3.2, presented as percentages of each individual assemblage. In these figures, the category of 'Remaining artefacts' encompasses the assemblages of prehistoric, Roman, high medieval, post-medieval, and modern finds recovered from each site, in addition to the small number of early medieval artefacts not assigned to any of the six categories of study. The data set of each site represents the total assemblage as of September 2021.

Figure 3.1: Proportions of examined finds from Aldwark

Total data set: 1464 artefacts

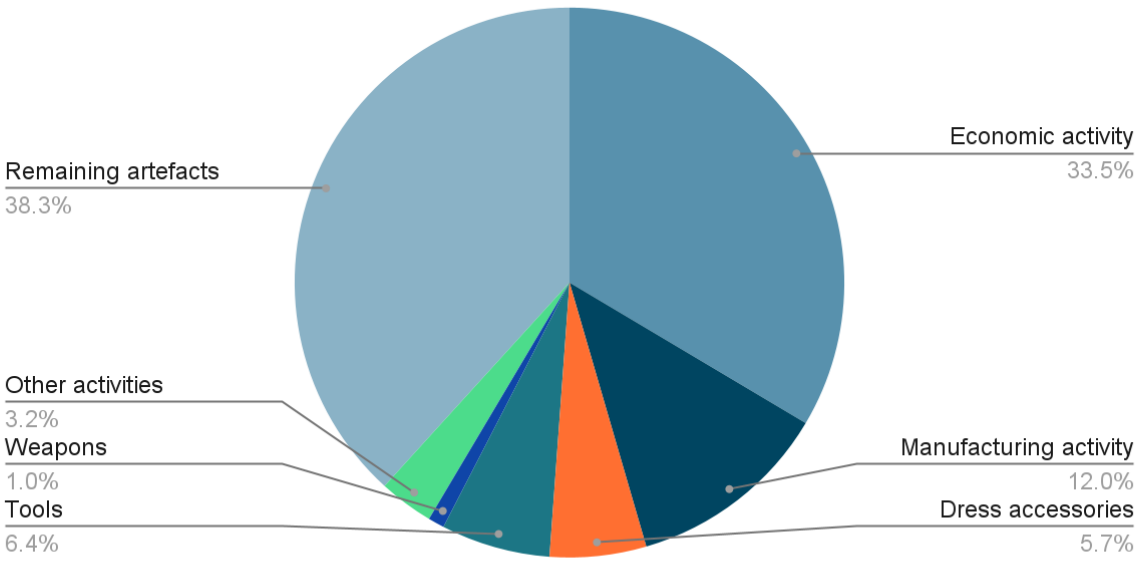


Figure 3.2: Proportions of examined finds from Torksey

Total data set: 3550 artefacts

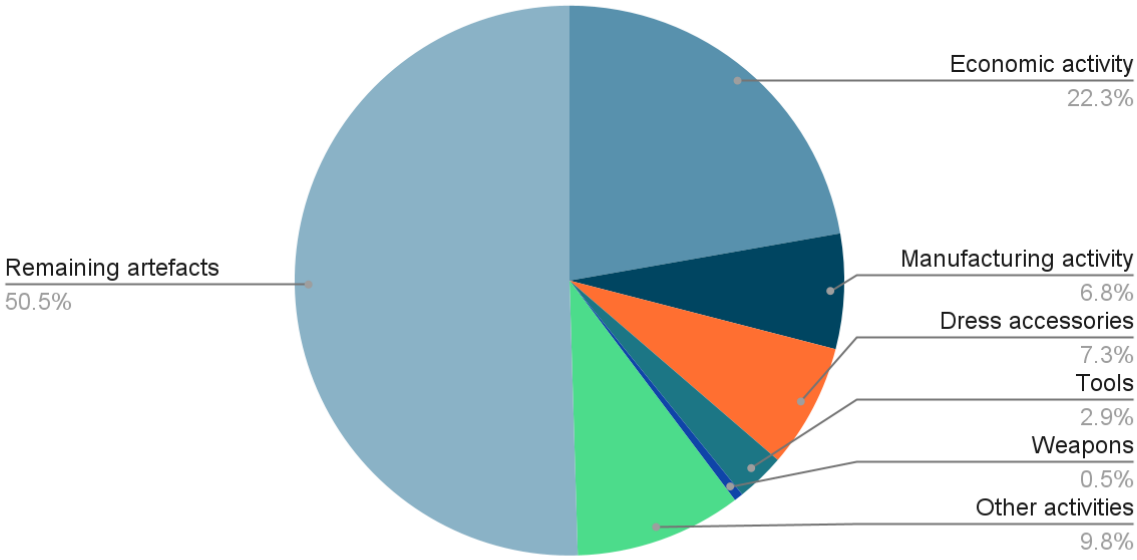


Figure 3.3: Principal locations referred to in the text (Britain and Ireland)

Figure 3.4: Principal locations referred to in the text (mainland Europe and Scandinavia)

4. Economic activity

4.1 Introduction

This chapter reviews the evidence for the largest and most distinctive elements of the two camp assemblages; those related to economic exchange and trade. By necessity, it addresses a large volume of material, illustrating the clear prominence of these activities at both locations. The coins, weights, and bullion from both camps have already been the subject of various studies. In addition to the extensive work undertaken by Blackburn (2002, 2011), the Torksey coins, particularly the stycas, have more recently been examined by Woods (2021). The Aldwark coins were published by Kelleher and Williams (2020), the bullion by Ager and Williams (2020), and the weights by Williams (2020c). A wider study of lead inset weights by Hiett (2020) included finds from both camps, and this section also makes use of examinations of balances by Ager (2020, 15) and Rogers (2020a, 19-20). The following analysis builds on these works, but aims to expand on these by introducing the Torksey material in detail, and by introducing artefacts from both assemblages which were unavailable to or not considered by the previous authors. Comparisons will also be sought with other analogous locations, in an attempt to provide a broader overview of the economic activities of the Great Army, and to position them within a wider context.

4.2 Coins

4.2.1 Anglo-Saxon and continental silver coins

This section includes both genuine and counterfeit silver coins. Two silver-plated copper-alloy pennies are recorded from Torksey: these forgeries are almost certainly contemporary with the camp and would have been circulated with other ‘broad’ pennies, and are therefore included in the discussion. The proportions of silver coins from each location are shown in Table 4.1. Whilst they are absent at Aldwark, sceattas make up over a quarter of the assemblage from Torksey. One of these is a Series D coin, whilst a further 11 are Series E ‘porcupine’ sceattas. Both of these Series were minted in Frisia, but also have a wide distribution in England (Naismith 2017, 87-90), so their presence is not surprising in itself. Nonetheless, the concentration of these coins is curious, given that there is no other evidence for either a pre-existing settlement or market at Torksey (Hadley and Richards 2016, 23). Whilst the single Northumbrian sceat, TDB 713, might possibly be related to background activity on the site, it seems more probable that all these coins were brought by the Great Army. Production of both the D and E series appears to have started around 690 AD: the D series was relatively short-lived, ceasing in roughly 715 AD, whilst the E series extended to at least 760 AD (Naismith 2017, Figure 5). All these sceattas would therefore obviously have been of some antiquity. However, while sceattas are not found in Viking-Age hoards, it is worth noting the presence of Anglo-Saxon or Frankish mounted crystal spheres in both the Leominster and Galloway hoards. Whilst both of these assemblages are dated to the later ninth century, with the Leominster hoard linked to Great Army activity in 879 AD (Goldberg and Davis 2021, 78-9; Hoverd *et al.* 2020), the spheres are commonly dated from the fifth to seventh centuries, indicating that 'heirloom' objects were curated or remained in circulation. Other artefacts from the two camps also suggest that comparatively antique items were obtained by the Army (Sections 5.3.4 and 7.2.4), and sceattas may have been acquired and used as bullion elsewhere: an eighth-century sceat from the initial Anglo-Scandinavian phase at Cottam B, North Yorkshire, displays a peck mark, signalling that this earlier coin was tested for silver content in the late ninth century, presumably when a faction of the Great Army visited the site (Hadley and Richards 2020, 117). The relative dates and totals of the remaining silver coins are presented in Tables 4.2 and 4.3.

Table 4.1: Silver coins from Aldwark and Torksey

Site	Sceattas	'Broad' pennies	Continental coins
Aldwark	-	14	-
Torksey	14	39	1

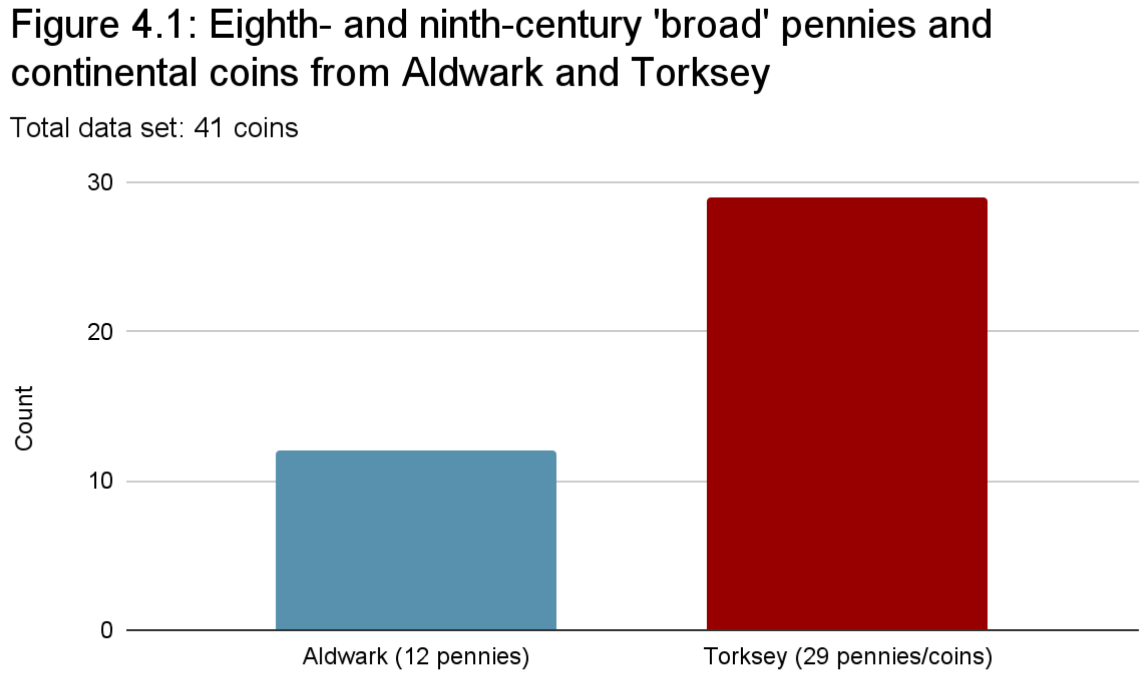
Published age structures of the English coins from Torksey (Hadley and Richards 2021, 98; Woods 2021, Fig. 19.1) highlight the absence of coins dating to between the 870s and the late tenth century. The same is true of Aldwark: both Alfredian pennies are of the 'Lunette' series, which ceased production in 875 AD (Naismith 2017, 159-60), and no later ninth- or tenth-century coins are recorded from the site. The greater occurrence of eleventh-century coinage at Torksey is almost certainly linked to the presence of a prosperous borough south of the site. These later coins clearly do not relate to the occupation of the camps, and are not discussed further. The comparative amounts of the remaining eighth- and ninth-century silver and counterfeit silver coins are shown in Figure 4.1. Both counterfeit coins from Torksey are included in this total: whilst one of these cannot be conclusively identified, it is a copy of a penny of either Burgred, Æthelred I, or Alfred, so can be reliably dated to the late ninth century.

Table 4.2: ‘Broad’ pennies from Aldwark

Issuer		Reign dates	Count
Mercia:	Burgred	852-74	9
	Ceolwulf II	874– *circa* 879	1
Wessex:	Alfred	871-99	2
Continental:	-	-	-
Later:	Edward the Confessor	1042-66	2
Unknown:	-	-	-

Table 4.3: ‘Broad’ pennies and Continental coins from Torksey

Issuer		Reign dates	Count
Mercia:	Offa	757-96	1
	Coenwulf	796-821	2
	Burgred	852-74	13
Wessex:	Æthelberht	862-65	1
	Æthelred I	865-71	1 (forgery)
	Alfred	871-99	9
Continental:	Lothar I	840-55	1
Later:	Æthelred II	978-1016 (two reigns)	2
	Cnut	1018-35	4
	Harold I	1035-40	1
	Edward the Confessor	1042-66	2
Unknown:	-	-	3 (1 forgery)

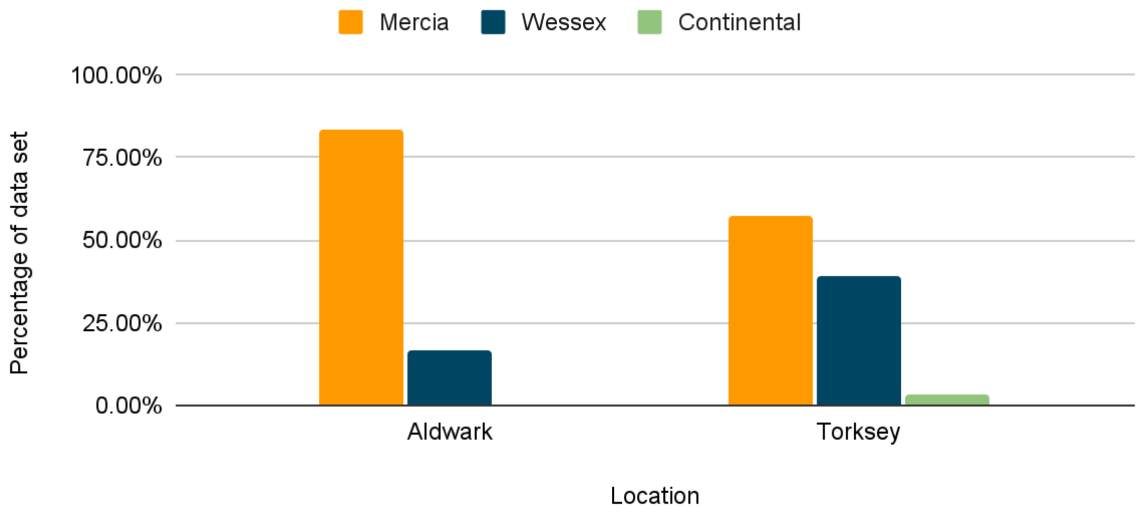


The single continental silver coin from Torksey is an issue of Lothar I, minted at Dorestad in the Netherlands (Blackburn 2011, 252). None of the earlier English issues are present at Aldwark. Whilst this accords with the later dating of the site, it does also suggest that the Torksey camp had access to a broader range of currency, particularly in regard to Mercian issues. Given the location of the site, this is not necessarily surprising. However, it does imply a degree of involvement with the local economy, with commercial interactions most probably conducted into the hinterland of the camp. The regional sources of these coins are shown in Figure 4.2, expressed as relative percentages of the total on each site. The ninth-century forged penny TDB 2149, noted above, has not been included in this figure due to the difficulty in attributing this coin to one region.

The Mercian issues at Aldwark are drawn from a narrower range of dates and sources than those at Torksey, and contain proportionally more coins of Burgred than in the Torksey assemblage. This may imply a limited circulation of coinage at Aldwark, with decreased access to new reserves of coined silver. However, it may simply indicate that members of the Great Army rarely carried whole silver coins for long. Whilst ‘broad’ pennies do not appear to have become fragmented, they may have been rapidly melted down or traded out and replaced. Such a regular turnover of coins would mean that the Army might have mainly carried issues which were minted in areas where the force had recently overwintered. Although a series of hoards and coin deposits can be credibly linked to the activities of the Great Army (Williams and Naylor 2016; Brooks and Graham-Campbell 1986), their varied sizes and compositions make comparison difficult. However, the ‘broad’ pennies from several comparable assemblages are shown in Table 4.4. Again, the unattributable ninth-century forgery TDB 2149 has been excluded.

Figure 4.2: Comparison of the proportions of silver pennies from Aldwark and Torksey

Total data set: 40 pennies



Whilst no clear pattern can be seen between the relative proportions of different issues, comparatively more Mercian coins, particularly coins of Burgred, are evident in these assemblages. A high proportion of Burgred coins is also a common feature of the Croydon and Beeston Tor hoards, although these contain a far greater range of other issues (Brooks and Graham-Cambell 1986, 93 & 110). Metcalf and Northover (1985, 160) have suggested that, given the high variations in silver content found in Burgred’s ‘lunettes’ series, certain issues may have been struck specifically to pay off the Great Army. This proposition may be supported by the assemblages from the two camps, although the high proportion of Burgred pennies at Aldwark may merely reflect material gathered during the recent overwintering of the force at Repton. However, the presence of a coin of Ceolwulf II, almost certainly struck after this faction of the Army left Repton, does indicate that some Mercian coinage was brought to Aldwark after the force divided.

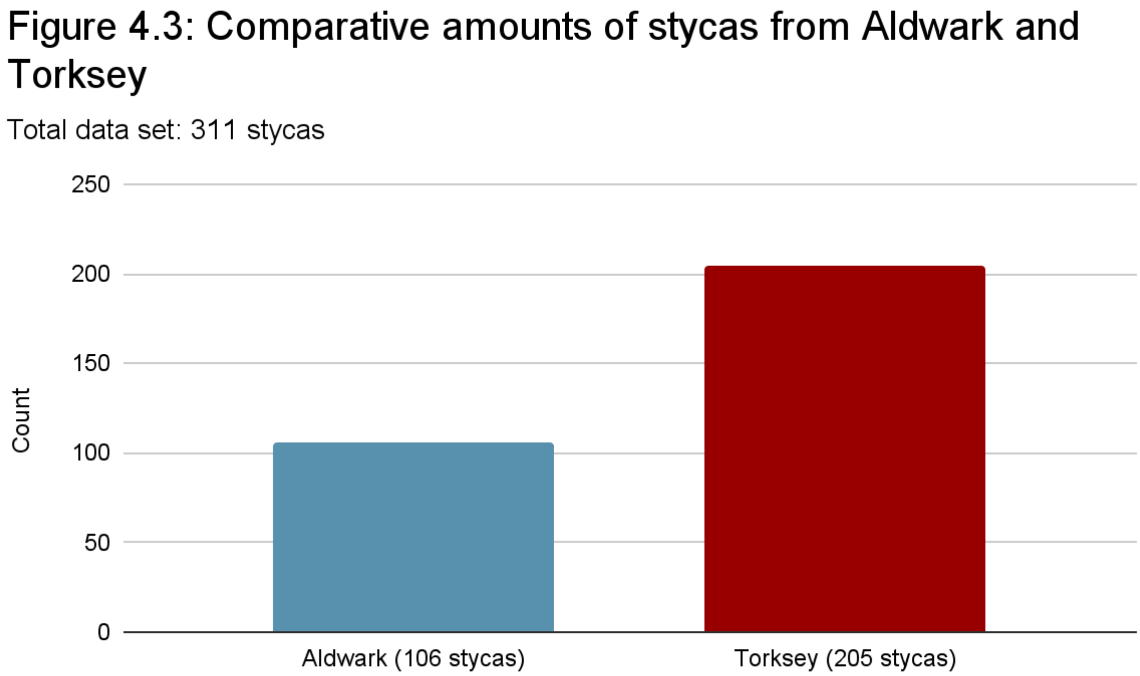
Table 4.4: Comparative assemblages of ‘broad’ pennies

Location	Issuer						
	Mercia				Wessex		
	Offa	Ceolwulf II	Coenwulf	Burgred	Æthelberht	Æthelred I	Alfred
Aldwark	-	1	-	9	-	-	2
Torksey	1	-	2	13	1	1 (forgery)	9
Gainford, Co. Durham	-	-	-	1	-	-	3
Dunsforth, N. Yorks.	-	-	-	6	-	2	6
Repton, Derbyshire	-	-	-	4	-	1	5
Talnotrie, Galloway	-	-	-	4	-	-	-
Totals:	1	1	2	37	1	4	25

‘Repton’ refers to coins recovered from the charnel deposit and from a parcel of pennies in Grave 529.
Sources: Brooks and Graham-Campbell 1986, 106-109; Biddle *et al*. 1986a; 1986b.

4.2.2 Stycas

The term ‘styca’ is used in this thesis to describe the coinage circulating in Northumbria throughout the ninth century: in contrast to the ‘broad’ silver pennies used in the southern Anglo-Saxon kingdoms, stycas were small, thick coins with increasingly reduced silver content, eventually struck entirely in copper alloy (Naismith 2017, 113-20). The numbers of stycas from both sites are given in Figure 4.3. Whilst the total from Torksey may be taken as representative of the assemblage as a whole, stycas from Aldwark are believed to be under-represented: early finds of stycas from the site were not reported, with ‘hundreds’ allegedly dispersed without recording (Hadley and Richards 2021, 208).



Northumbria operated a closed currency system for over a century before conquest by the Great Army (Blackburn 2004, 344), so the number of stycas at Aldwark might be expected to be greater than that recorded from Torksey. However, this is clearly not so, suggesting that the assemblage from Aldwark is indeed under-represented. The ranges of different issues from both sites are given in Tables 4.5 and 4.6. The regnal dates and chronology used in both tables has been taken from Pirie 1996, p.25, Table 1. Figure 4.4 compares the relative proportions of stycas from the two camps against five other hoards, all approximately dated to 850/860 AD: the Kirkoswald hoard found in 1808, the two Bolton Percy finds from 1847 and 1967, and the York hoards from Bootham and St Leonard's Place, found in 1831 and 1842 respectively. There has not been sufficient recent work on stycas to be able to confidently distinguish between all blundered, derivative, and double-reverse coins in these assemblages, and therefore these issues have all been included in the 'Irregular' category. Variations in the hoard profiles can be attributed to both different patterns of circulation and differences in recording: at Kirkoswald, the high proportion of Æthelred coins is presumably a result of the 'irregular' issues being tallied alongside these, whilst all but the 1967 Bolton Percy hoard were only partially or inadequately recorded. Despite this, certain

Table 4.5: Stycas from Aldwark

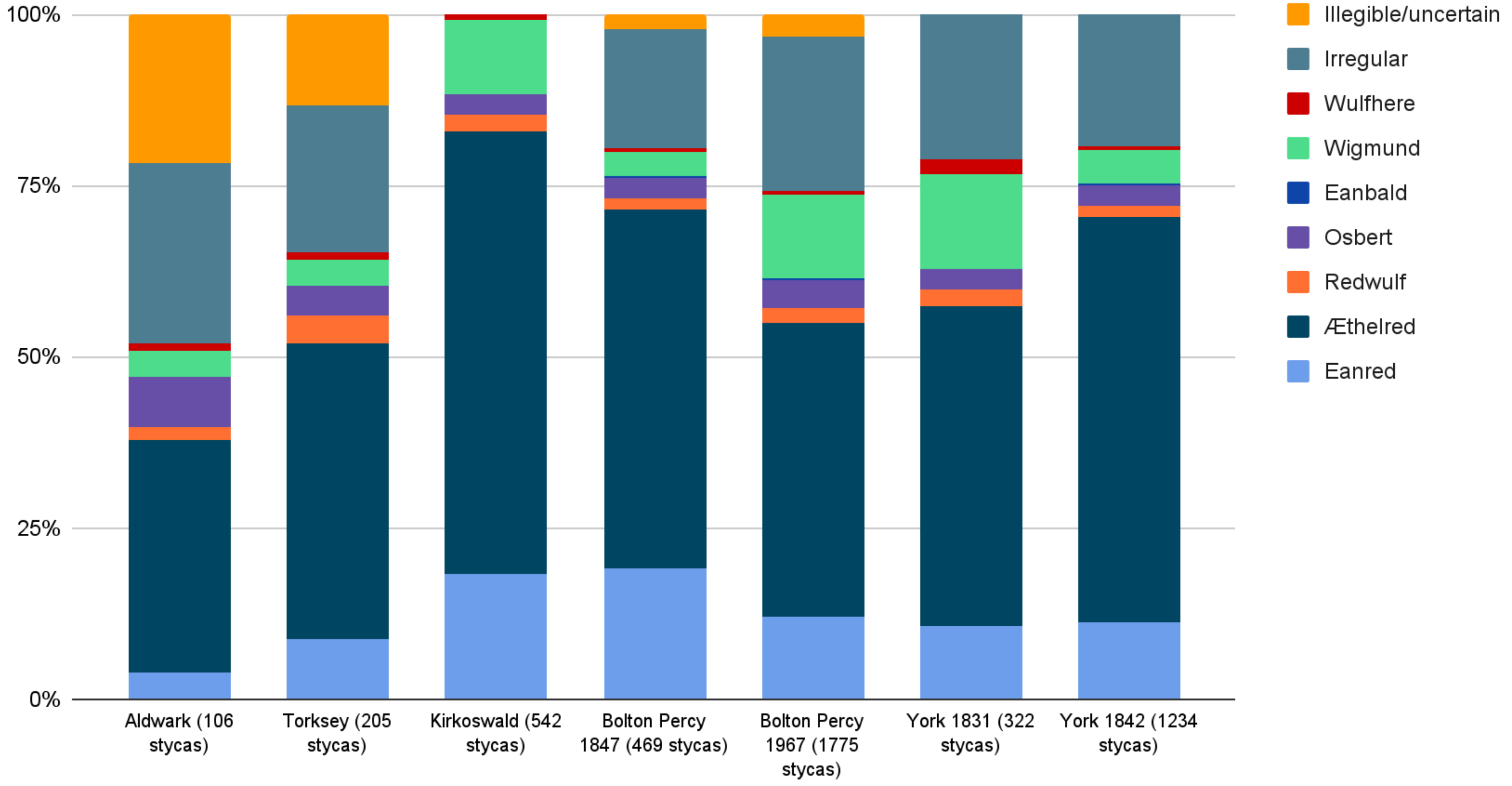
Issuer		Dates	Count
Kings:	Eanred	*circa* 810-41	4
	Æthelred	841- *circa* 849 (two reigns)	36
	Redwulf	844	2
	Osbert	849-67	8
Archbishops:	Wigmund	837-54	4
	Wulfhere	*circa* 854- *circa* 900	1
Other:	Derivative/blundered	850s/860s?	27
	Double reverse		1
	Illegible/uncertain		23

Table 4.6: Stycas from Torksey

Issuer		Dates	Count
Kings:	Eanred	*circa* 810-41	18
	Æthelred	841- *circa* 849 (two reigns)	89
	Redwulf	844	8
	Osbert	849-67	9
Archbishops:	Wigmund	837-54	8
	Wulfhere	854-900(?)	2
Other:	Derivative/blundered	850s/860s?	43
	Double reverse	-	1
	Illegible/uncertain	-	27

Figure 4.4: Proportions of stycas from Aldwark, Torksey, and comparable hoards

Sources: Woods 2021, p.401, Table 19.3; Pirie 1996, 16; Pagan 1987, p.157; Pirie 1986a, 75-81; Pirie 1981, 32-51



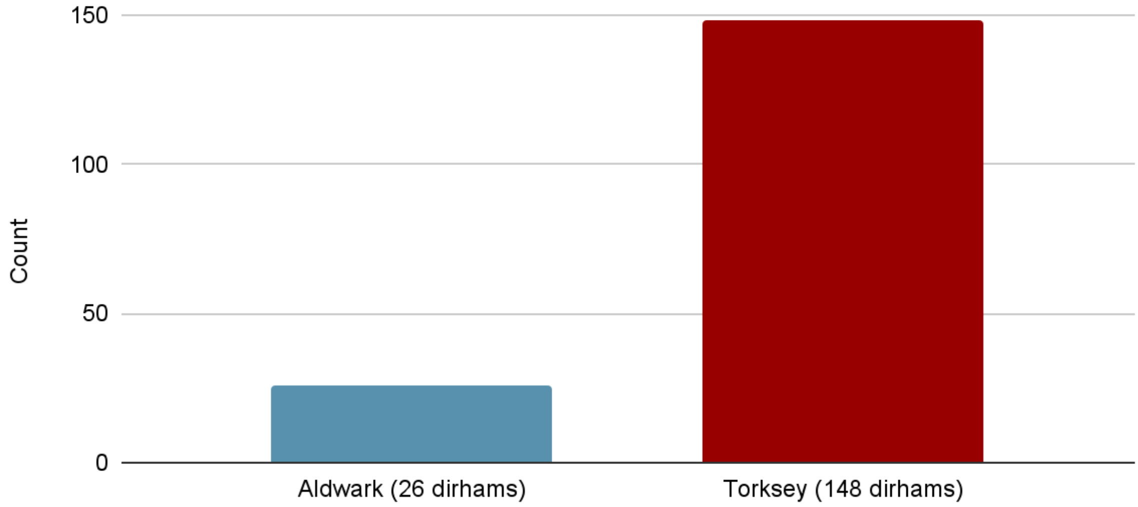
differences are clear between the hoard profiles and the ones from the camps. The proportions of the earlier Eanred stycas are notably low from both study sites, especially at Aldwark, where the proportion of late Osbert coins is also increased. Equally, both camps show high percentages of 'irregular' coins: blundered stycas in particular are common at both sites, accounting for 18.9% of the whole Aldwark assemblage, a fact which may support the suggestion that these show styca production by the Great Army itself (Hadley and Richards 2021, 103; Woods 2021, 402; Williams 2014b, 22). Generally, the range of issues from both camps suggest assemblages which were gathered late in styca chronology, and which almost certainly represent collections of coins that were in contemporary circulation in late ninth-century Northumbria. Moreover, if the blundered issues do indicate Great Army styca production, then this process may have accelerated at Aldwark: the lack of high-silver content Eanred coins, coupled with elements of the metal-working evidence (Section 6.3.5), may indicate melting and possible re-coining of earlier styca series. The profile of styca issues from the camps clearly differs from the hoards. Nonetheless, the two camp assemblages are very broadly consistent with each other, particularly in regard to issues of Archbishops. This may show that the relative proportions of different issues at Aldwark are representative of the camp's original assemblage, despite the reduction in the total recorded.

4.2.3 Dirhams

The numbers of dirhams from both camps are presented in Figure 4.5. These figures include 21 dirhams from Torksey and 12 from Aldwark which were not available to previous studies. The majority of the Torksey dirhams have been identified, making it possible to assess the age structure of the assemblage. Woods (2021, 398-9) observes that their date profile is similar to that of several sites in Scandinavia, with an obvious divergence in the latter part of the ninth century: no dirhams post-date the occupation by the Great Army. The latest dirham is TDB 526, struck in 866-68 AD (Blackburn 2011, 258). This not only demonstrates the speed with which Islamic silver could arrive in western Europe, but also shows the wider connections were maintained by the Great Army: this coin, struck after the Army arrived in England, was presumably brought from Scandinavia by one of the groups that periodically joined the force to trade or campaign. By contrast, most of the dirhams from Aldwark are either too worn or too fragmentary to identify. ADB 155, from the 'hoard', is an Umayyad dynasty coin dating from AD 661–750. Four Umayyad coins were also present at Torksey, a phenomenon which mirrors assemblages from Scandinavia and hoards from the Baltic and Russia: dirhams might circulate for centuries before deposition, with comparatively antique issues used for everyday transactions, and earlier dirhams are frequently recovered from later contexts (Gustin 2011, 241; Horsnæs 2014, 65). The presence of this coin potentially demonstrates that a typically broad collection of currency was in circulation at Aldwark, with the range of dirhams comparable to those commonly used in Scandinavia. Although no date profile can be constructed for the Aldwark dirhams, it is notable that, like the Torksey assemblage, no peck-marks are visible on the coins. This method of testing silver is first seen on the Stamford hoard, generally dated to 890 AD (Archibald 2011, 64), so its absence provides a rough *terminus ante quem* for the circulation of dirhams at Aldwark.

Figure 4.5: Comparative numbers of dirhams from Aldwark and Torksey

Total data set: 174 Dirhams



The dirhams in both assemblages are all fragmented, with no complete coins recovered. A survey of early medieval Islamic coins in England by Naismith (2005, 212-17) reviewed both single pieces and hoard assemblages, including some of the reported finds from Torksey. If one removes these Torksey finds, then an assessment of the 78 fully-recorded dirhams from both sources produces only 31 fragmentary coins, a ratio of 1:2.5. Although very approximate, this comparison highlights the particularly fragmented nature of both camps' assemblages. The weights of dirham fragments from both Aldwark and Torksey are presented in Figures 4.6 and 4.7. For clarity, nine fragments of unknown weight from Torksey have been excluded from this figure. One further Torksey piece with a riveted-on suspension loop, TDB 2907, has also been excluded as this fitting distorts the fragment's weight.

Figure 4.6: Weights of fragmented dirhams from Aldwark

Total data set: 26 dirham fragments

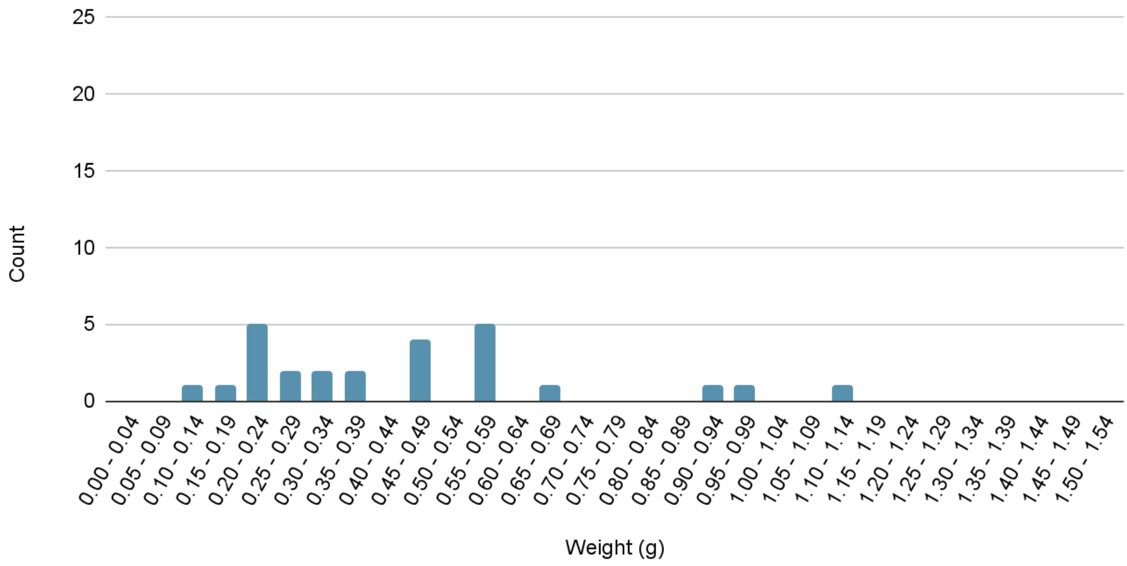
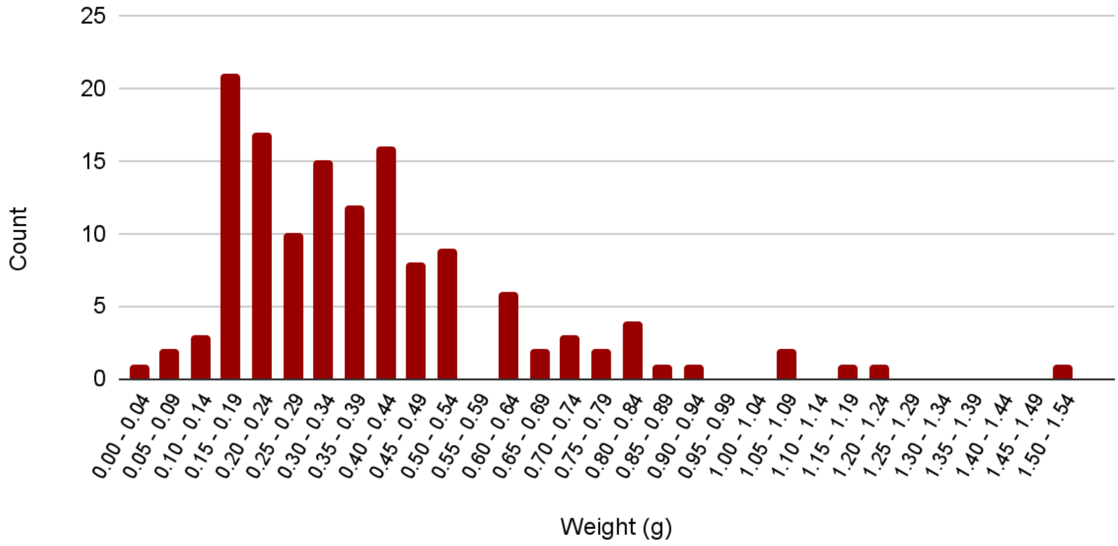


Figure 4.7: Weights of fragmented dirhams from Torksey

Total data set: 138 dirham fragments



The average weight range of the Torksey assemblage is obviously affected by the single outlying fragment over 1.25g. However, even with this distortion, the mean weight of the 138 known-weight dirhams is low. A comparison with the weights of fragmented dirhams recovered from sites in Scandinavia is given in Table 4.7.

Table 4.7: Comparative assemblages of fragmented dirhams

Site	Number of dirhams	Number of whole coins	Number of fragments of known weight	Mean average weight of fragments
Aldwark	26	-	26	0.45g
Torksey	148	-	138	0.40g
Kaupang (pre-833 AD)	51	8	43	0.63g
Kaupang (834-890 AD)	16	1	15	0.74g
Hedeby	49	6	42	0.68g
Birka: 1990-95 excavations	86	18	65	0.58g

Sources: Merkel 2016, Appendix A, Table 1; Blackburn 2008, 66, Table 3.14; Rispling 2004, 43-56

Blackburn (2008, 65) warns against comparing fragmentation between different sites, observing that variations in preservation and recovery will inevitably affect the results. Moreover, he also notes that silver was adversely affected by soil conditions at Kaupang, with corrosion reducing the mass of many of the coins. Given this fact, it is notable that the average weight at Kaupang still remains greater than that at either Aldwark or Torksey. This lower average weight, coupled with the lack of whole coins, demonstrate that the dirhams from the two camps are more fragmented than those found in Scandinavia. The distribution of fragments from both Aldwark and Torksey are mainly around the 0.20g - 0.54g weight ranges. However, the finds from Aldwark are slightly heavier, concentrated between 0.20g to 0.59g, whereas the Torksey fragments are focused toward a lighter 0.15g - 0.54g range. A comparison of these distributions, expressed as both numbers of finds and relative percentages, are given in Figures 4.7 and 4.8: as before, nine fragments from Torksey of unknown weight have been excluded. The very different sample sizes make comparison difficult, and mean that the Aldwark result may not be statistically significant. Nonetheless, the Aldwark dirhams do not appear to be more fragmented than those from Torksey. In assessing hoards from the tenth and eleventh centuries, Hårdh (1996, 89) concluded that coins became increasingly fragmented with circulation. If the low number of dirhams at

Aldwark were taken to indicate a reduced access to imports of silver from Scandinavia, this does not appear to have noticeably affected the weights of the fragments in circulation.

Figure 4.8: Comparison of weights of fragmented dirhams from Aldwark and Torksey

Total data set: 164 dirham fragments

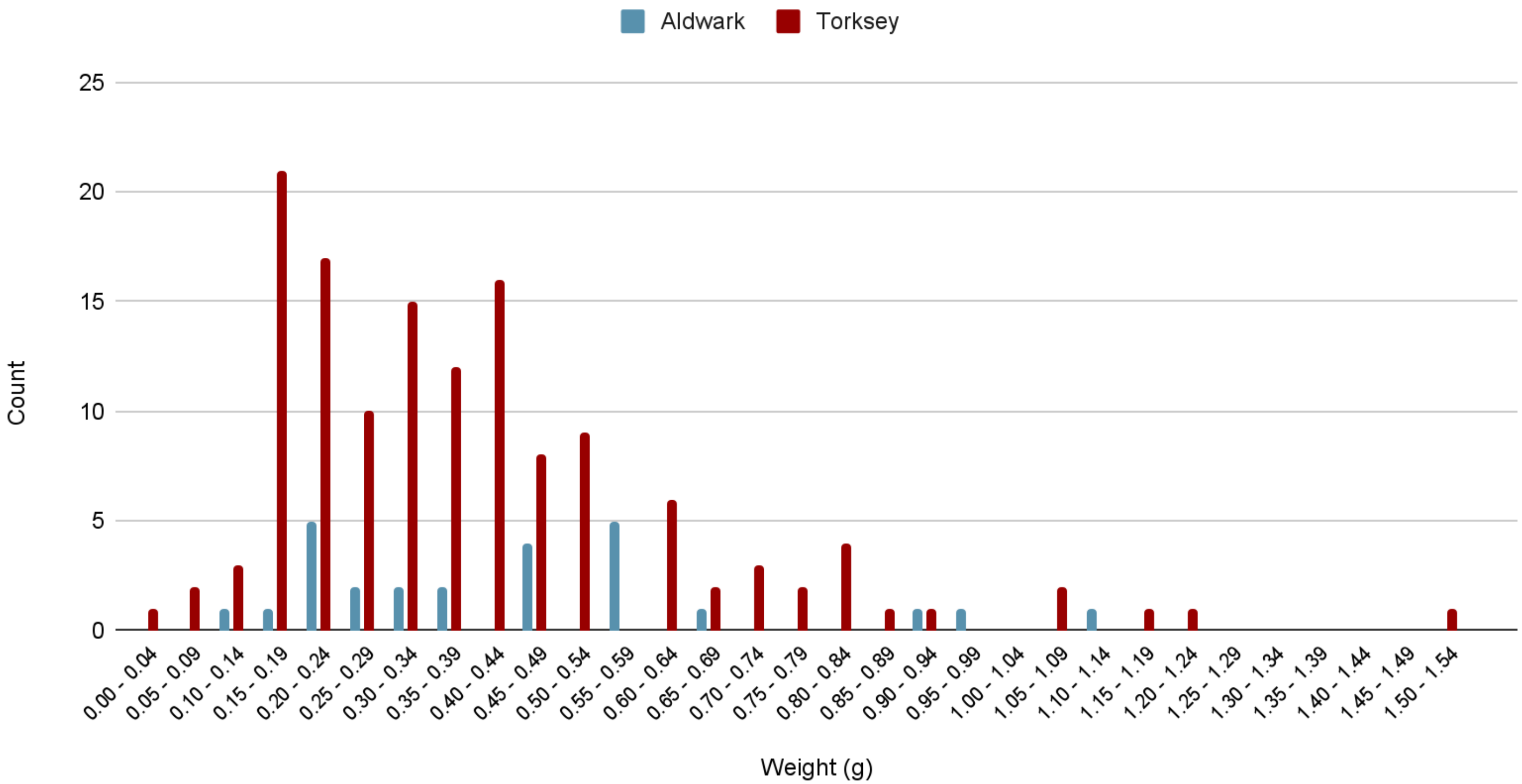
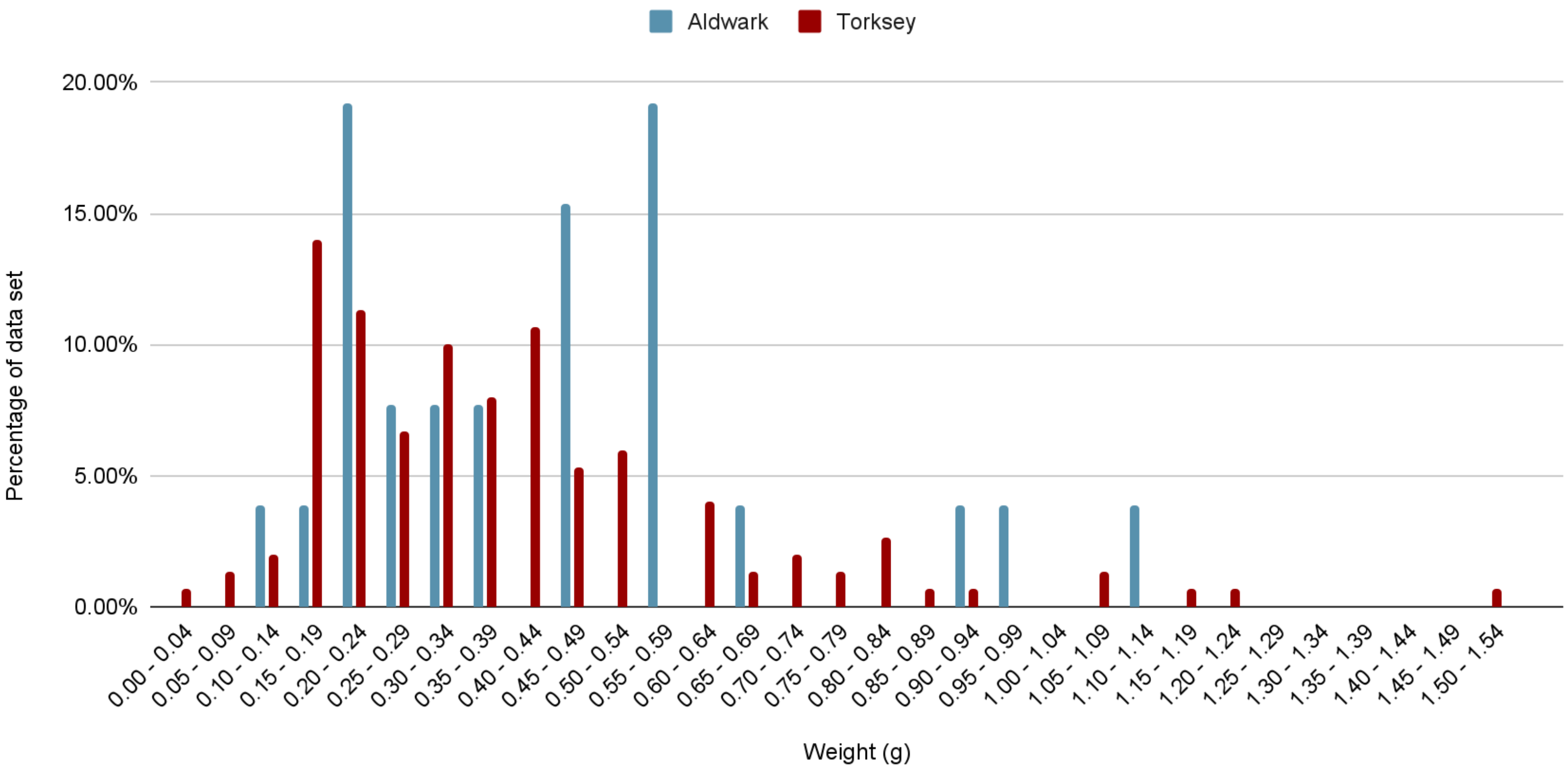


Figure 4.9: Comparison of proportions of fragmented dirham weight ranges from Aldwark and Torksey

Total data set: 164 dirham fragments



4.2.4 Discussion of coins

The marked division between whole silver pennies and fragmented dirhams at Torksey has been taken to show that a parallel economy of coined silver was in operation at the camp (Hadley and Richards 2021, 102), with the former coins potentially passing by tale (according to their established face value, rather than their intrinsic worth) and the latter used as bullion. Many of the pennies have weights greater than the dirham fragments, indicating that they could have been cut into smaller pieces if required (Woods 2021, 408). It therefore seems unlikely that the 'broad' pennies were viewed solely as bullion. The evidence of a similar situation is not so strong for Aldwark, especially given that all the 'broad' pennies on the site would have been outside their former areas of controlled circulation. Three Burgred coins recovered as part of the 'hoard' were pierced centrally, and thus may have been effectively demonetised, although it appears that none of the remaining English pennies from the site were deliberately fragmented: whilst Williams (2020b, 13) proposes that the entire assemblage of silver coin in the camp should be taken as representing bullion, the 'broad' pennies generally remain whole, and are once again recorded with greater weights than the fragmented dirhams. This suggests that they were still recognised as components of a monetary economy, and may have been retained for use in external transactions, outside the immediate locale of the camp. Although the physically smaller size of stycas argues against them ever being fragmented, the number recorded at Aldwark also points to them being used in a managed economy, with copper alloy circulating alongside silver. By this measure, the substantial number of stycas recovered from Torksey equally suggests that these coins were used in a similar way at the Army's camp in Lindsey, and that economies of different metals operated at both locations. In examining the coins alone, it is difficult to assess whether these economies were monetary or oriented more toward metal weight: at Torksey, the assemblage of stycas recovered from the nearby settlement at Littleborough may show the use of these coins for external transactions, albeit outside of their usual area of circulation (Hadley and Richards 2021, 128; 2016, 61). However, although the Eanred issues were alloyed with bronze, the majority of stycas were an admixture of silver and brass, with the brass content reaching 97-98% by Æthelred's reign (Metcalf 1987, 1-2). Such good-quality brass would have made these very attractive as a raw material, with brass the preferred alloy for casting Scandinavian dress accessories, and brass bars and ingots used as both trade goods and a commodity money in Southern Scandinavia and the Baltic (Kershaw 2013, 36-7; Sindbæk 2001, 55). Given these factors, is it entirely possible that the circulation of stycas shows their function as a commodity money in the camps, although the reality may be one of a far more fluid system, with the use of coin governed by individual transactions.

Figure 4.10: Comparative proportions of silver pennies and dirhams at Aldwark

Total data set: 38 coins

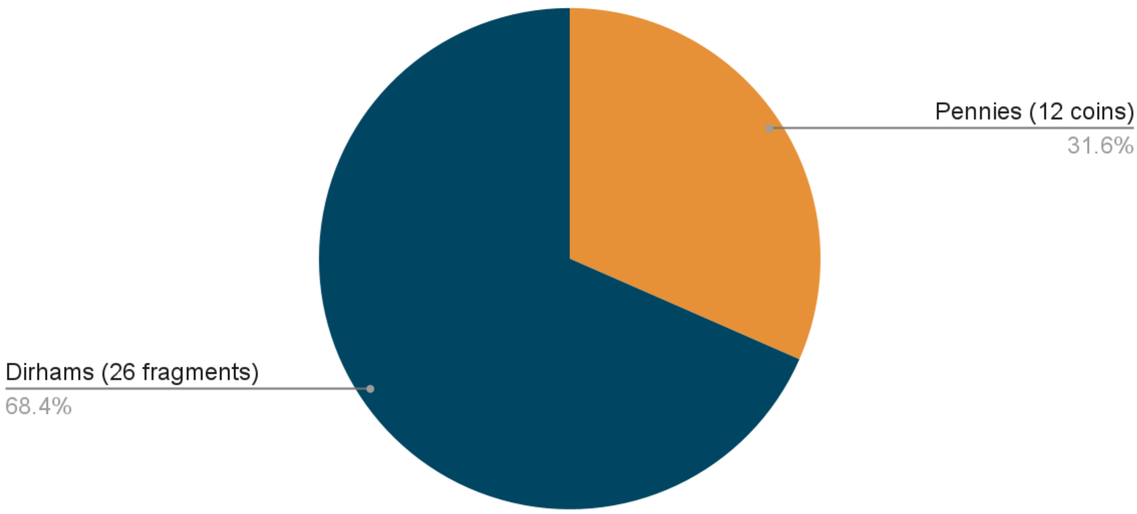
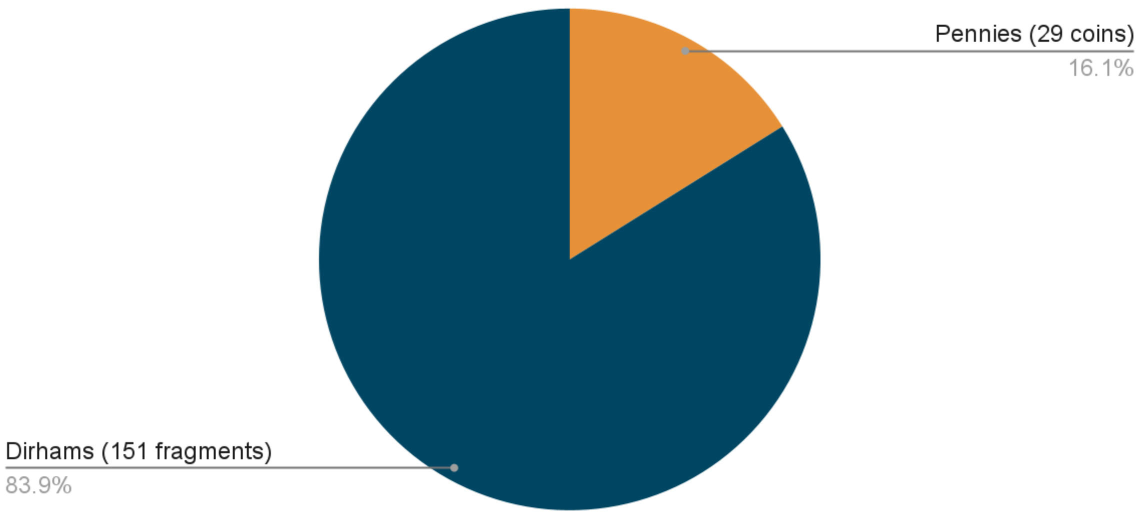


Figure 4.11: Comparative proportions of silver pennies and dirhams at Torksey

Total data set: 180 coins



There is considerable variation in the comparative amounts of all three coin types. Whilst the bias in recording stycas at Aldwark has been noted, no such distortion is known for the dirhams, suggesting that their apparent low number at Aldwark represents a genuine difference. However, it is illuminating to compare the proportions of fragmented dirhams to those of contemporary silver pennies (compiling ‘broad’, counterfeit, and Continental coins) at both locations (Figures 4.10 and 4.11). Although the number of dirhams at Aldwark is comparatively low, they still form the bulk of the finds of coined silver from the site. Obviously, other factors must be taken into account when considering this: the fact that all the silver pennies are outside their areas of controlled circulation can clearly be seen as contributing to their reduced numbers, and the differences in fragmentation suggest that pennies and dirhams were used in different types of transactions. Nonetheless, it appears that dirhams remained in circulation at Aldwark, with no appreciable impact on their degree of fragmentation. Both Kershaw (2019a, 3) and Jankowiak (2019, 27-8) note that coin fragmentation may have served social functions, with dirhams automatically cut to authenticate transactions or whenever new groups of coins entered the market. Thus, it seems probable the Aldwark dirhams show continued access to Scandinavian silver, with ‘new’ dirhams entering circulation rather than older, increasingly fragmented coins remaining in use. In light of this, it would seem reasonable to conclude that the Aldwark camp remained connected to Scandinavian markets.

4.3 Weights

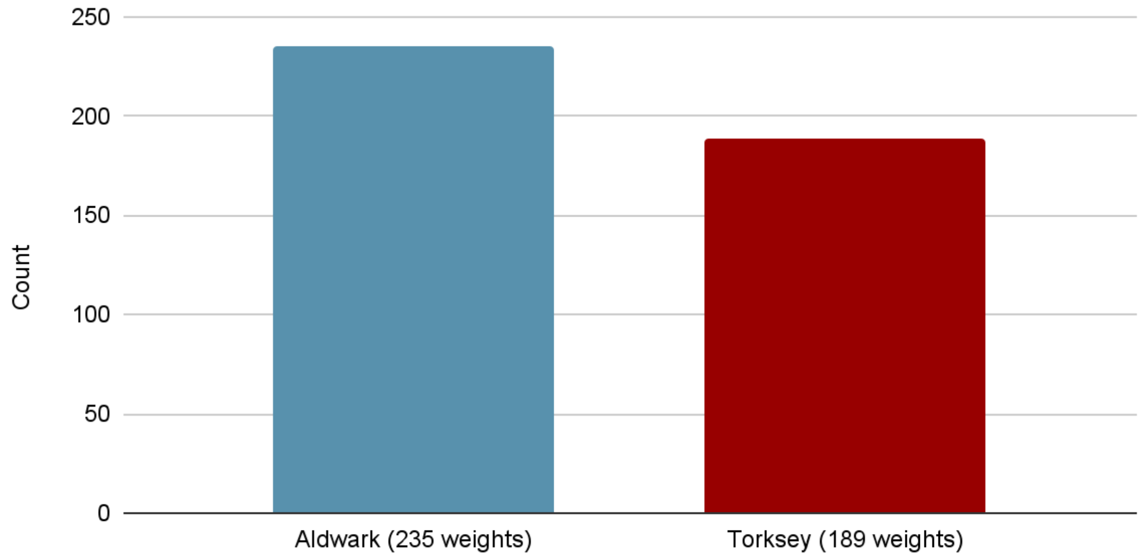
This section reviews three main types of metrological weights recovered from each location: lead, inset lead, and cubo-octahedral. A very small number of oblate-spheroid weights have been recovered from each site. This clearly corresponds with the dating of this form, which only attained widespread use in the Baltic *circa* 870-880 AD (Pedersen 2008, 132), post-dating the occupation of both camps. Therefore, these weights form such a small group that they are not considered here. The cubo-octahedral weight series is also first seen in the Baltic, with the introduction of the form dated to roughly 860-870 AD. The weights are generally seen as being based on an Arabic system of measurement (Mikkelsen 1998, 45), closely connected to the trade in dirhams. Lead weights are a far more universal type, recorded in a wide variety of forms and with an equally wide distribution: Gustin (1997, 169) observed that the North Sea region was ‘characterized by a large number of different types of lead weights’. At Kaupang, lead weights are recorded alongside the first appearance of hack-silver, leading to the suggestion that they were intrinsically connected with the metal-weight economy (Pedersen 2008, 133 & 162). In accord with this, Wallace (2013, 308) observed that the Woodstown hack-silver appears to have been targeted on the same unit as many of the lead weights, suggesting a strong link between the two. Conversely, Wallace (2014, 223) also proposes that the lead weights from Dublin were used for measuring different commodities, including copper-alloy, whilst Gustin (2004a, 21) observes that lead weights have been found in close association with bronze-casting activity at both Birka and Ribe, Denmark. However, Haldenby and Kershaw (2014, 119) have noted that a similar corpus of weights from the site of Cottam B is not associated with any evidence of metal-working. All these interpretations serve to underline the ubiquity of lead weights, whilst also highlighting the fact that they may have been used for many different systems of exchange. Inset lead weights, frequently capped with decorated Insular metalwork or coins, form a distinctive sub-set of lead weights. The practice of insetting began in the mid-to-late ninth century, and is very strongly associated with the Great Army, suggesting that this weight type originated within the force (Hiett 2020, 1). Whilst the reason for insetting is unknown, it does not appear to be connected with any form of weight adjustment, although an association with bullion systems is indicated by the recovery of weight sets and balances from burial contexts in Ireland and Scotland (Heen-Pettersen 2021). The Insular distribution of these inset weights suggests that they are unconnected with any Baltic system, although a standard connected to the Scandinavian *øre* weight has recently been proposed for the form (Kershaw 2020, 121). Thus, all three types of weight reviewed here can be seen to have strong, if not necessarily exclusive, connections with metal-weight transactions. Whilst finds of numerous weights are typical of Viking-Age urban sites in Scandinavia, the presence of the four recorded forms at both camps shows that several different, possibly conflicting, systems of weight measurement were routinely used at each camp, almost certainly reflecting the varied composition of the Great Army itself.

4.3.1 Lead

This section reviews plain, metrological lead weights. Inset weights and forms widely associated with fishing and spinning have been excluded, but not weights with narrow piercings or recesses. Some of these may have formerly held insets, but it has not been possible to examine the finds to confirm this: to prevent any confusion with the ‘lead inset’ category discussed below, all such pieces are included here. At Aldwark, domed and conical lead pieces, with or without moulded decoration on the top, were recovered in both hollow and solid forms. These finds have been categorised morphologically as either weights or gaming pieces: in instances where they were solid, the pieces were classified as weights, whilst hollow items were recorded as gaming pieces. Blackburn (2011, 236) observed that this division was uncertain. Equally, I recognise that the categorisation of other weights may be similarly inexact. This section therefore represents an ambiguous grouping, where some of the pieces may not have been metrological, or may have been used for dual purposes.

Figure 4.12: Lead weights from Aldwark and Torksey

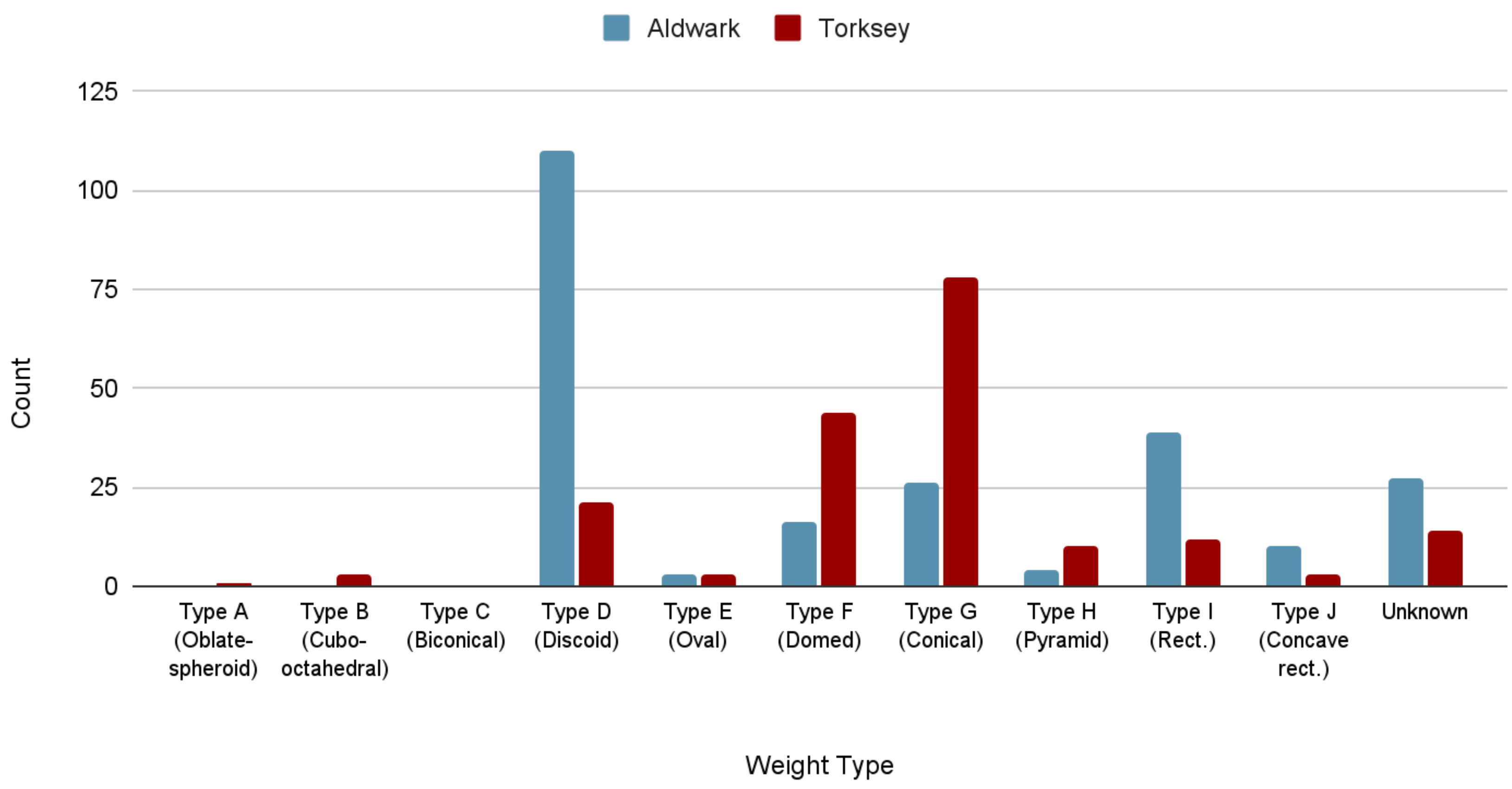
Total data set: 424 weights



The numbers of lead weights for both camps are given in Figure 4.12. The relative quantities are striking, with the smaller site at Aldwark producing 24% more lead weights than Torksey. The metrological weights from Aldwark have received intensive study, with Williams (2020c, 20 and Table 1) categorising them according to a proposed typology for all Viking-Age weights. This system primarily identifies weights by shape, with sub-classifications dependent on material and decoration. I have followed Williams' typology in this thesis, and have catalogued the Torksey weights according to the same system. The relative proportions of all weight types are illustrated in Figure 4.13. In this Figure, the small amounts of Type A (oblate-spheroid) and Type B (cubo-octahedral) weights are all of the Type 3 sub-classification: imitative lead skeuomorphs of the copper-alloy/iron originals.

Figure 4.13: Classification of lead weights from Aldwark and Torksey

Total data set: 424 weights



The very high proportion of Type D (cylindrical/discoidal) weights at Aldwark is immediately apparent, as is the dominance of Type F (domed) and G (conical) weights at Torksey. However, the correspondingly low numbers of Type D weights at Torksey and Types F and G at Aldwark are equally striking, indicating a clear difference in the forms of lead weight used at each camp. Types F, G, and H (pyramid) weights are the forms most likely to have been mis-classified in Williams' typology, with Torksey-style lead gaming pieces taking similar shapes. This thesis has identified some gaming pieces within the Aldwark assemblage (Section 8.3), but their numbers are not high enough to distort the overall proportions of weights. It therefore seems unlikely that these differences can be attributed to contrasting classification systems. Equally, it is hard to perceive how such a difference could be due to recovery: whilst gaming pieces are believed to have been discarded by the detectorists at Aldwark, it seems improbable that discoid lead weights would have been rejected by their counterparts working at Torksey. Lead weights are a common find on Viking-Age sites, particularly in urban contexts. Although different classification terms are often used, the cylindrical/discoid form is almost universally described, making wider comparisons possible. Figure 4.14 compares the relative numbers of cylindrical/discoidal metrological lead weights from the two camps with assemblages from three other sites, whilst Figure 4.15 presents the same data as proportions of complete assemblages.

Figure 4.14: Comparative amounts of cylindrical/discoidal lead weights

Sources: Gustin 2004, p.19, Table 1; Pedersen 2008, p.123, Table 6.4; Wallace 2014, p.226

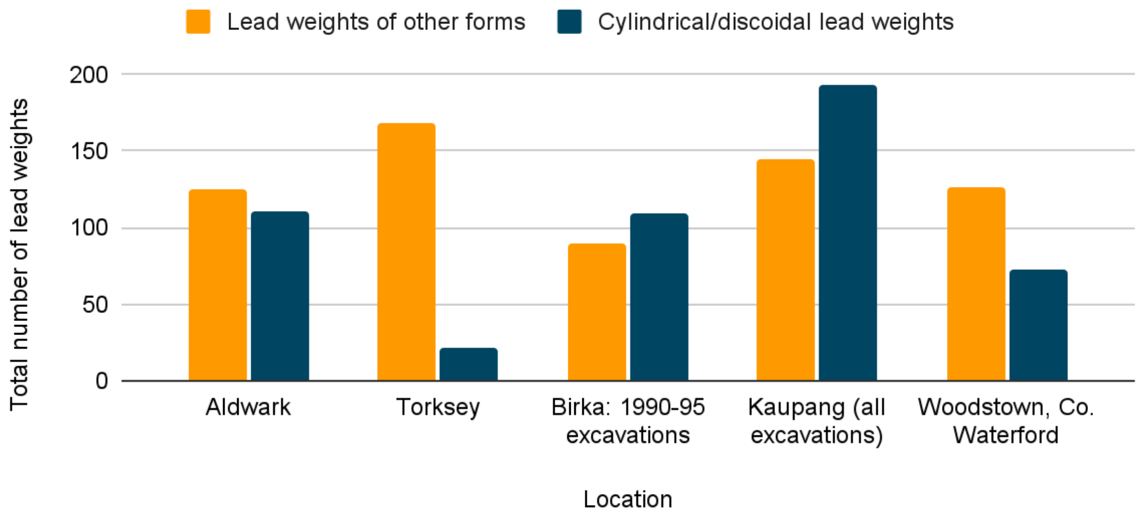
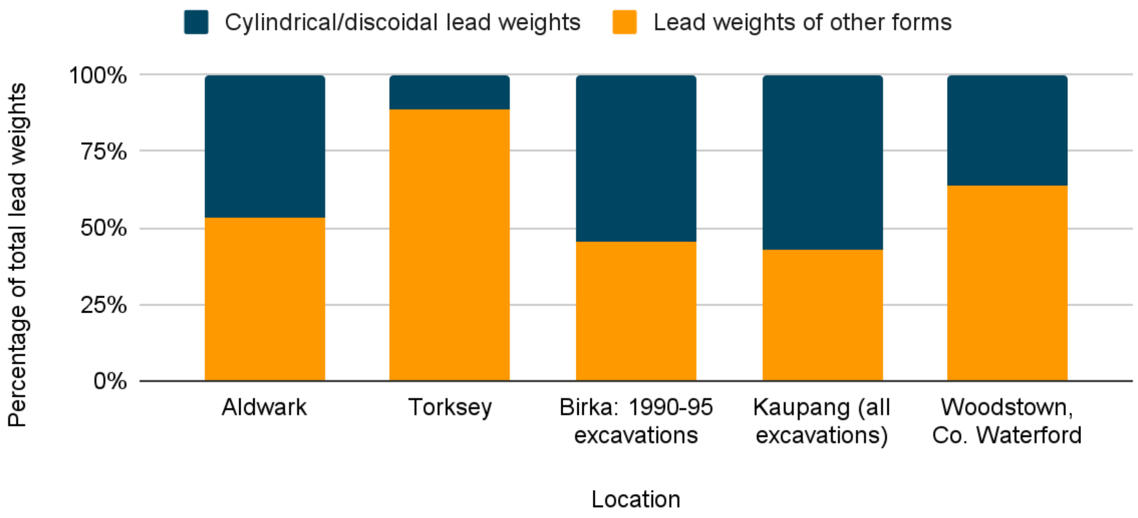


Figure 4.15: Comparative proportions of cylindrical/discoidal lead weights

Sources: Gustin 2004, p.19, Table 1; Pedersen 2008, p.123, Table 6.4; Wallace 2014, p.226



The proportion of discoidal weights at Aldwark lies at a very approximate mid-point between the percentages recorded at Birka and Woodstown, although the percentage is slightly higher at Kaupang. Pedersen (2008, 132) suggests that the discoidal shape represents an early form in Scandinavia, with both lead and copper-alloy weights of this type dominating the assemblages on Migration Period sites and at the settlement at Helgö: this longevity may contribute toward the high proportions of the form at both Kaupang and Birka. Wallace (2014, 229) observes that the discoidal weights at Woodstown cluster close to half- and whole-units of a proposed standard of 26g, and also proposes that complete ‘runs’ can be observed from around 36g to below 20g, including specific weights which are not represented by other forms. This suggests that the discoidal shape may have been reserved for a specific use on the site. It is notable that, within the Woodstown assemblage, discoidal weights are prevalent across the lighter weight ranges, particularly around the 3g mark. Wallace (2014, 232) states that the correlation between hack-silver weights and the lighter metrological weights shows that the smallest weights at the site were clearly intended to weigh small amounts of silver. Given this, it is tempting to suggest a specific link between discoidal weights and silver: this potential connection has not been observed at any other location, but if any significance can be attached to weight forms, Aldwark could be said to inhabit an intermediate point on a range between urban market and *longphort*.

The very low number of cylindrical/discoidal weights at Torksey is hard to explain. There is clear evidence for the use of hack-silver at the camp (Section 4.4), so the comparative dearth of these weights cannot be linked to this form of exchange. Equally, it seems unlikely that there is any connection to the chronology of the two encampments. Although it has not been possible to examine the phasing of the metrological weights from Birka and Kaupang as part of this thesis, the early appearance of the discoidal form in Scandinavia has already been noted. Whilst residual, pre-Viking-Age discoidal weights might have affected the proportions recorded at the two Scandinavian locations in Figure 4.13, the later dating of the Woodstown site suggests that the form remained common in the late ninth and early tenth centuries: at least five discoidal pieces are also recorded amongst the assemblage of nineteen Viking-Age lead weights and lead inset weights recovered from the settlement at Llanbedrgoch, Anglesey. showing that the form was popular in other, similarly-dated Insular settings (Redknap 2004, 158-9). Furthermore, it seems improbable that chronology alone could explain the abrupt change in the use of Type D weights between the overwinterings at Torksey and Aldwark. An explanation may lie in the higher proportions of Type F and G weights recorded at Torksey. The morphological similarity between these and the Torksey-style lead gaming pieces indicates that, like the gaming pieces, many of the Types F and G weights were produced on the site. It is impossible to know whether discoidal weights were melted down and recast as a means of aiding this production, or whether they were simply either not used or excluded from the camp. However, the Types F and G weights clearly served a specific function at Torksey, with their dominance apparently coming at the expense of the Type D form. This will be further explored below.

4.3.2 Lead inset

This category includes lead weights inset or capped with other materials, pierced with pins or studs, and decorative metalwork filled with lead. The comparative numbers of these weights from the two camps are given in Figure 4.16. Inset weights are, typically, a small category compared to the more common plain lead forms. Figure 4.17 compares the relative amounts of inset weights and plain lead weights at both camps, contrasting these totals with analogous assemblages from five other locations. Figure 4.18 shows the same data as proportions of complete assemblages. Although the proportion of inset weights at Aldwark is low when compared to Torksey, this figure is clearly affected by the disproportionately high amount of plain lead weights in the assemblage: the relative number is comparatively high, suggesting that inset weights may have been more prominent at Aldwark, or in more frequent use: it may also suggest that their manufacture was more focused within the camp, with some production concentrating on these objects (see Section 7.2.2). As it stands, the Aldwark result is proportionally very close to the far smaller assemblage from Llanbedrgoch, whilst the proportions of inset weights from Torksey and Woodstown are remarkably similar. All four of these sites clearly exceed the proportions from Scandinavia, emphasising the Insular nature of inset weights.

Figure 4.16: Comparative numbers of lead inset weights from Aldwark and Torksey

Total data set: 59 weights

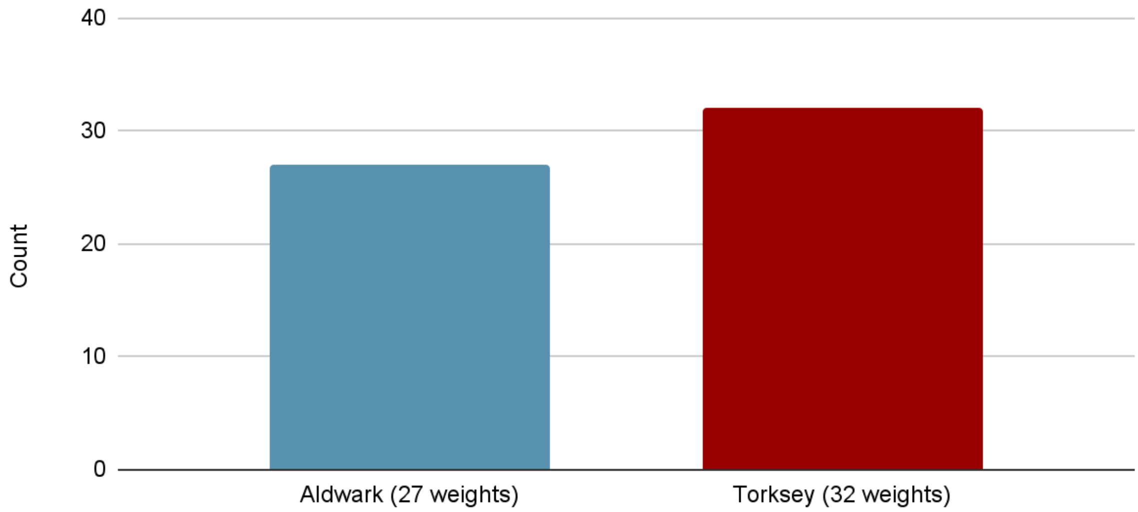


Figure 4.17: Comparative amounts of lead and lead inset weights

Sources: Pedersen 2008, Appendix 1; Hilberg 2011, p.218; Gustin 2004, p.19; Wallace 2014, p.233-255; Redknap 2004, p.159

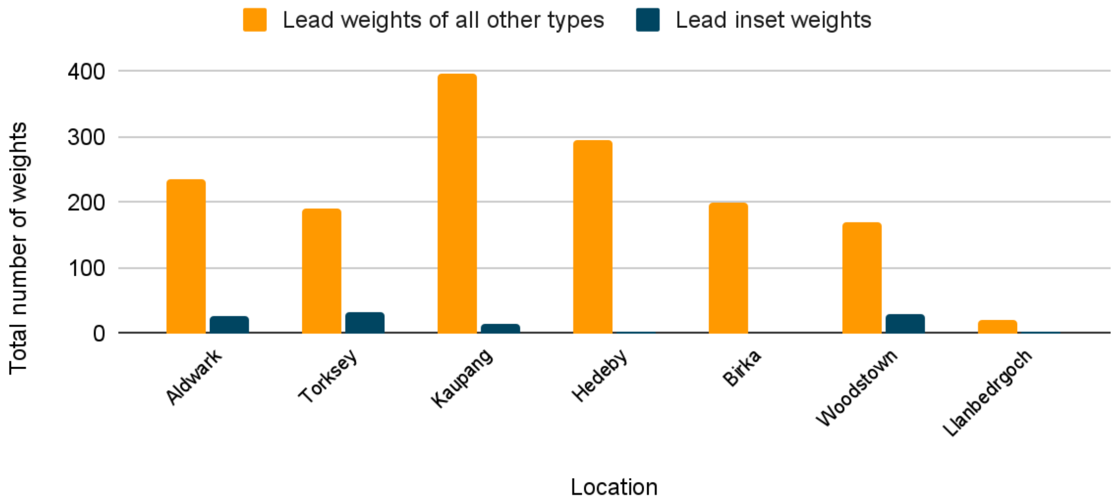
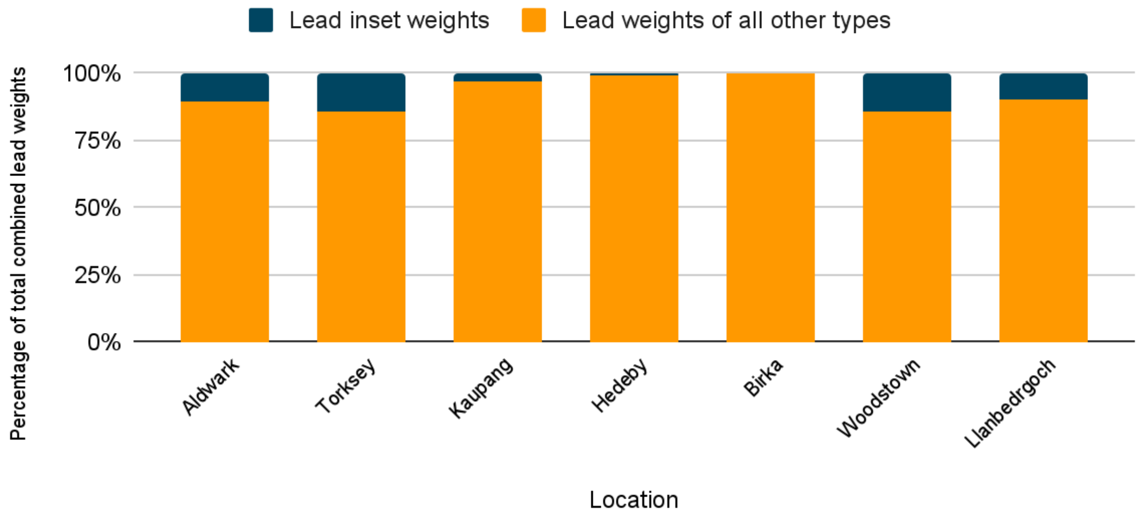


Figure 4.18: Comparative proportions of lead and lead inset weights

Sources: Pedersen 2008, Appendix 1; Hilberg 2011, p.218; Gustin 2004, p.19; Wallace 2014, p.233-255; Redknap 2004, p.159

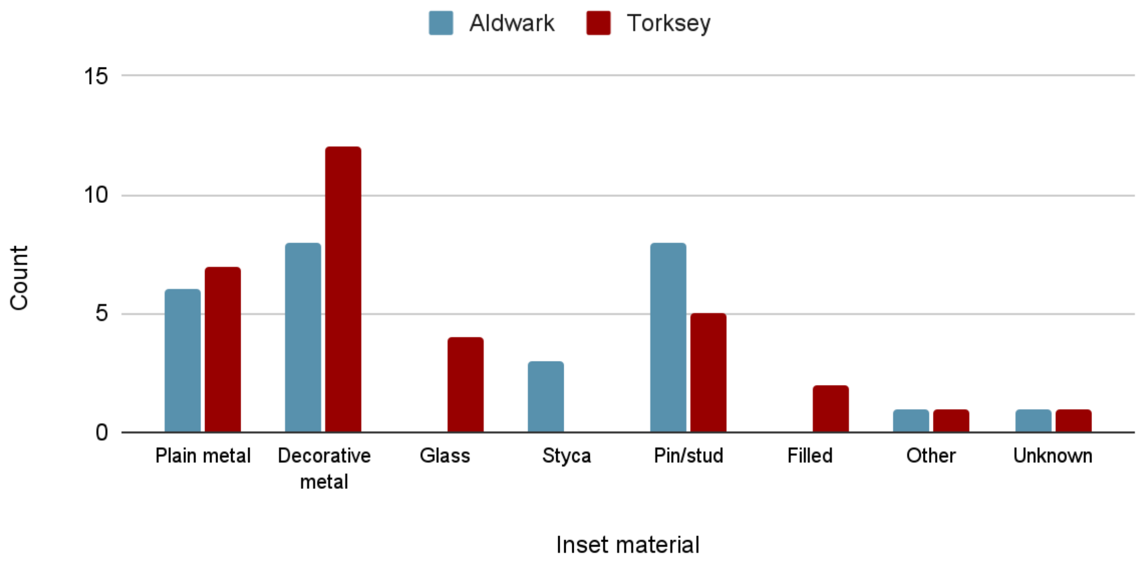


The narrow date range of the weights' production has been noted by several authors (e.g. Williams 2020c, 23), as well as their close association, and probable origin, with the Great Army (Hadley and Richards 2021, 102). Williams (1999, 34) argues that the purpose of all forms of insetting was to personalise weights, making specific pieces recognisable to their owners. If the practice was indeed developed in the winter camps, then the nature of the insets may potentially reflect this environment. The different types of inset materials on the Aldwark and Torksey weights are summarised in Figure 4.19: 'Decorative metal' refers to fragments of Insular fittings, generally embellished with chip-carved or interlaced designs, whilst 'Filled' describes pieces where lead has been poured into a copper-alloy receptacle (Williams' Type K).

Despite both assemblages being small, none of the materials used for the insets appears to be unique to either camp, and parallels for all the weights can be found at other locations: for example, whilst glass-decorated weights are not recorded at Aldwark, similar pieces are known from locations other than Torksey, including two from Woodstown and one from Kaupang (Wallace 2014, 233 & 236; Pedersen 2008, 170). It is tempting to see a significance in the presence of styca-capped weights in only the Northumbrian assemblage. However, although it is not included in the site database, Williams (1999, 25) records a metal-detected weight inset with a styca from the Torksey area, and two styca-mounted weights are known from Aust-Adger in southern Norway (Pedersen 2008, 168-9). Equally, whilst Williams (2020c, 22) suggests that the distribution of the filled, Type K-weights points to their emergence in either Ireland or Scotland, Heen-Pettersen (2021) observes that the very portability of these items precludes any detailed analysis of their potential origins.

Figure 4.19: Inset weight materials from Aldwark and Torksey

Total data set: 59 lead inset weights

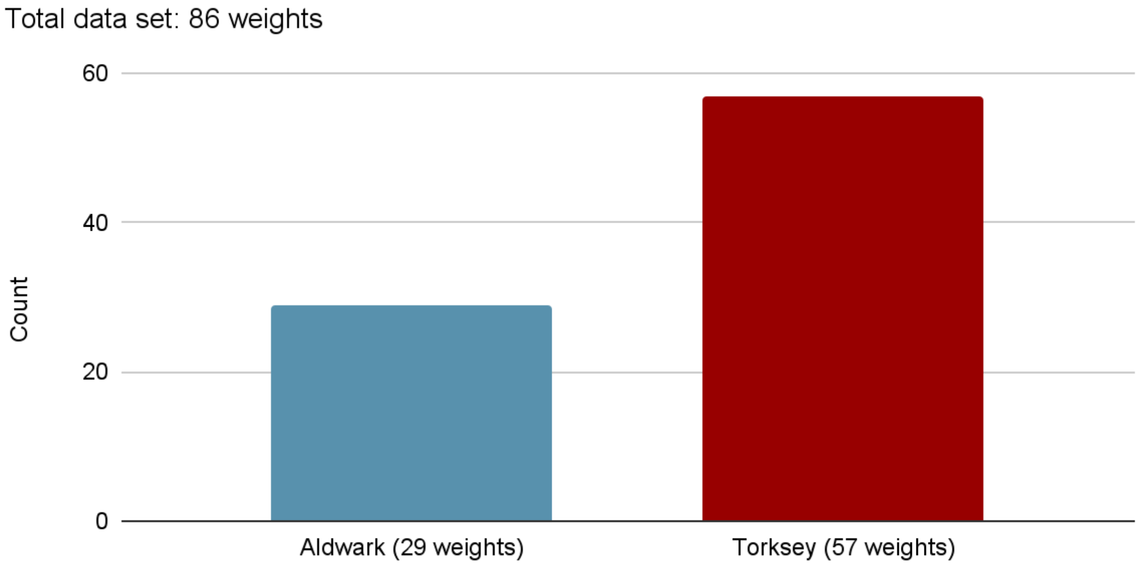


Some of the materials used to personalise the weights are comparatively roughly finished, particularly the fragments of glass or plain metal. This practice potentially represents the use of scrap material, indicating that the decorative qualities of the insets were not a prime consideration. Hiett (2020, Appendix 1) notes that, in the Torksey corpus, a single piece of decorated metalwork has been split and set into two separate weights. This reflects the ‘Insular’ practice of random, comparatively careless fragmentation identified by Heen-Pettersen (2021), with such metalwork regarded as a raw material or a commodity money. In this respect, the inset materials may be said to reflect the environments of the camps. However, it must be noted that the utilisation of Insular metalwork or glass may demonstrate that insets were chosen to reflect either elite materials or socially significant commodities (Hiett 2020, 37): whilst the emphasis appears to have been on utilitarian practicality rather than overt display, a degree of symbolism appears inherent in the choice of inset material. Nevertheless, even if these weights were manufactured at Aldwark and Torksey, none of the insetting materials appear to be exclusively related to the winter camps’ environs.

4.3.3 Cubo-octahedral

The numbers of copper-alloy cubo-octahedral weights from both sites are presented in Figure 4.20. Cubo-octahedral weights are typically classified according to the number of dots or annulets punched onto each sub-square face: as mass increases with these markings, they are usually assumed to indicate a weight unit, although they may merely have signified a place within a set (Pedersen 2008, 149-50). The cubo-octahedral series is widely recognised as being 'standardised' to a certain degree, with weight ranges normalised around a shared unit derived from Islamic systems. Analyses of the potential unit employed have arrived at several targets (e.g. Geake 2010), and no universally-accepted range has emerged. The weights from both camps are compared in Table 4.8, arranged against three suggested possible units.

Figure 4.20: Comparative numbers of cubo-octahedral weights from Aldwark and Torksey



All the mean ranges for the Aldwark weights fall below those from Torksey, but it is difficult to know whether this is significant. The total mean mass per marking at Aldwark is 0.62g, suggesting a loose connection with the 0.65g unit suggested by Blackburn. At Torksey, the higher total mean mass per marking of 0.69g lies closer to the 0.71g unit proposed by Sperber (Pedersen 2008, 150), although the comparatively high standard deviation of the 6-mark weights casts a degree of doubt on the reliability of this result. Blackburn (2011, 237) proposed that two different weight units might be present in the cubo-octahedral series, with

Table 4.8: Comparison of cubo-octahedral weights from Aldwark and Torksey

Number of markings		Weight ranges	Count	Mean weight	Standard deviation	Mean weight per marking	Target weight at 0.65g per marking	Target weight at 0.71g per marking	Target weight at 0.8g per marking
6	Aldwark	3.26g - 4.05g	7	3.65g	0.26	3.9g	4.26g	4.8g
	Torksey	2.02g - 8.87g	10	4.16g	1.90			
5	-	-	-	-	-	-	-	-
4	Aldwark	1.29g - 3.13g	9	2.33g	0.52	2.6g	2.84g	3.2g
	Torksey	2.06g - 3.62g	15	2.60g	0.41			
3	Aldwark	1.81g - 1.99g	6	1.92g	0.06	1.95g	2.13g	2.4g
	Torksey	1.66g - 2.62g	10	1.99g	0.31			
2	Aldwark	1.25g - 1.51g	5	1.38g	0.12	1.3g	1.42g	1.6g
	Torksey	1.16g - 1.62g	14	1.41g	0.14			
1	Aldwark	-	-	-	-	0.65g	0.71g	0.8g
	Torksey	0.73g - 1.08g	5	0.85g	0.20			
0	Aldwark	0.58g	1	0.58g	0	-	-	-
	Torksey	-	-	-	-			
Unknown	Aldwark	-	1	-	-	-	-	-
	Torksey	-	3	-	-	-	-	-

lower-value pieces conforming to a 0.8g standard: this may be visible in the 1- and 2-dot/annulet weights. Although the variations in these ranges make it impossible to be certain, the low standard deviations recorded for 1- and 2-dot/annulet pieces on both sites may suggest that the weights were manufactured to closely-controlled targets, potentially supporting Blackburn's suggestion. Whilst other standard deviations remain comparatively low, even amongst larger data sets such as the 3- and 4-dot/annulet pieces from Torksey, all the weight ranges vary and overlap to a notable degree. A reading that suggests one weight unit at Torksey and another, smaller unit at Aldwark is therefore too simplistic. Moreover, this lack of uniformity also suggests that different weight units were present within the cubo-octahedral series at both locations. Whilst this may merely show natural variation, it might also indicate that the series was altered within the sphere of Great Army activity, with weights adapted to conform to the local market. Nonetheless, the presence of cubo-octahedral weights in general does demonstrate a clear connection between both the camps and markets in Scandinavia, as does the absence of 5-dot/annulet weights: no such pieces have been recovered from Kaupang, Birka, or Hedeby (Pedersen 2008, 150-1).

The unmarked weight from Aldwark, ADB 1449, potentially shows a need for an even lighter unit, below the usual standard. Whilst cubo-octahedral weights can be prone to corrosion, with pitting occasionally removing dots and annulets (Sperber 2004, 70-1), this piece is in good condition and the faces are not obscured. Rather than indicating an unfinished piece, Williams (2020c, 32) states that the small size of ADB 1449 suggests that the lack of marking is deliberate and that it was manufactured to lie below the ranges of 1-dot/annulet weights. No deliberately unmarked cubo-octahedral weights have been recorded at Kaupang: whilst there are two heavily corroded pieces which now lack markings, these are both over 2.5g in mass and are thus notably heavier than ADB 1449 (Pedersen 2008, 149 & Table 6.11). Steuer (as cited in Sperber 2004, 75) recorded unmarked cubo-octahedral weights at Hedeby, although it has not been possible to view his study while compiling this thesis, and it is therefore unclear whether these weights were deliberately left blank or are merely corroded. Sperber (2004, 74-5) states that five unmarked cubo-octahedral weights from Birka 'are uncertain' and poorly preserved. Intriguingly, while three of these are heavier, and thus most probably represent corroded, formerly-marked pieces, the remaining two both lie close to a mass of 0.5g, very similar to the 0.58g recorded for ADB 1449. The presence of this unmarked weight at Aldwark may therefore suggest that the Scandinavian cubo-octahedral system was adapted at the camp, with a new weight class produced to accommodate highly-fragmented silver (see Section 4.5.5). This may show that the camp was closely connected to the eastern Scandinavia and Baltic economies, although it may again show that the cubo-octahedral system was adapted and enlarged within the Great Army.

4.3.4 Discussion of weights

The relative proportions of each of the three categories of weight are shown in Figures 4.21 and 4.22. Whilst not considered above, oblate-spheroid weights have been included in these figures in order to present the complete assemblages of identified weights from both camps. The difficulties of categorising undecorated lead weights have already been outlined, as have the potential for such pieces to perform a number of interchangeable functions. It is therefore perhaps not surprising that the proportions of these weights vary between the two study sites, particularly given the mutability of the Torksey lead gaming pieces. The comparative percentages of inset lead weights in each assemblage are, however, relatively close. Although the numbers of oblate-spheroid weights are negligible, the proportions of cubo-octahedral weights recovered from each camp are notably different. In particular, the greater proportion of cubo-octahedral weights at Torksey may be linked to the equally greater percentage of fragmented dirhams from the site: both suggest that this camp saw a higher degree of integration with southern Scandinavian and Baltic economies when compared to Aldwark.

Kilger (2008, 325) considers that the introduction of cubo-octahedral weights in Scandinavia involved a new method of measuring value, intrinsically linked to the ability to weigh to a calibrated standard. Whilst the exact unit used is still open to debate, the adoption of a widely-accepted weight system is seen as a necessary aspect of the proliferation of dirhams and fragmented hack-silver as trade media in 860-870 AD (Horne 2022, 107). In this respect, the use of a recognisable and reliable weight type served to ensure trust in metal-weight transactions, enabling trade to cross international borders (Kershaw 2013). However, the variety of weight forms and types contained by the camp assemblages strongly suggest that multiple different weight standards were in use at both locations (Blackburn 2011, 235-6). As noted, lead weights recovered from Ireland have been linked to different weighing systems, with Wallace (1987, 212) proposing a 'Dublin unit' as a basic measure, potentially derived from a late ninth-century standard, but with a lighter 'Woodstown unit' postulated for earlier *longphuirt*-era activity and for related hack-silver trade between Scandinavians (Wallace 2013, 308-311). Whilst no basic unit has been reliability proposed for the wide variety seen in inset lead weights, a series from the Kilmainham-Islandbridge

Figure 4.21: Proportions of weight types from Aldwark

Total data set: 292 weights

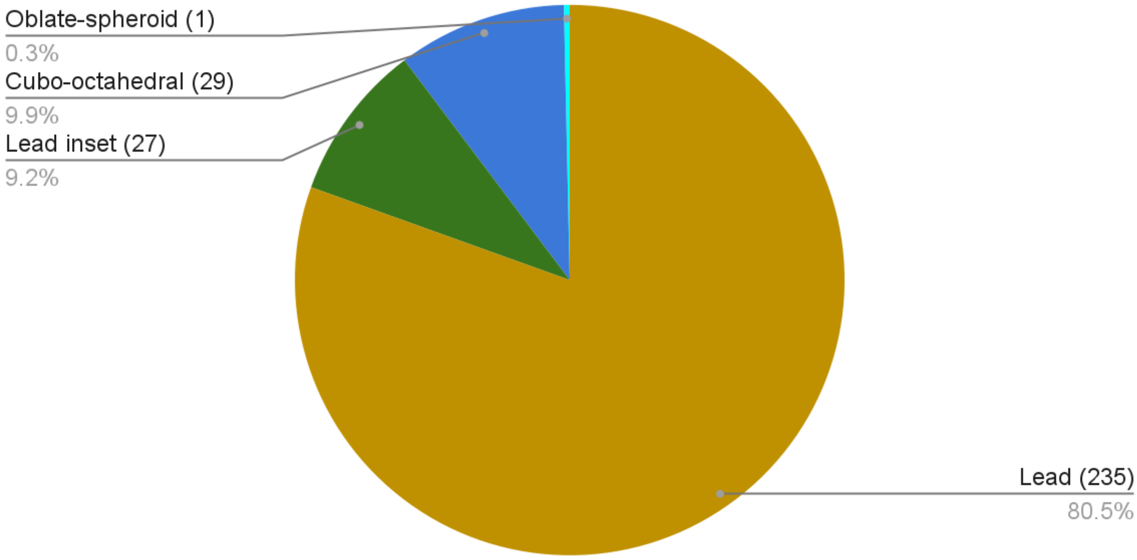
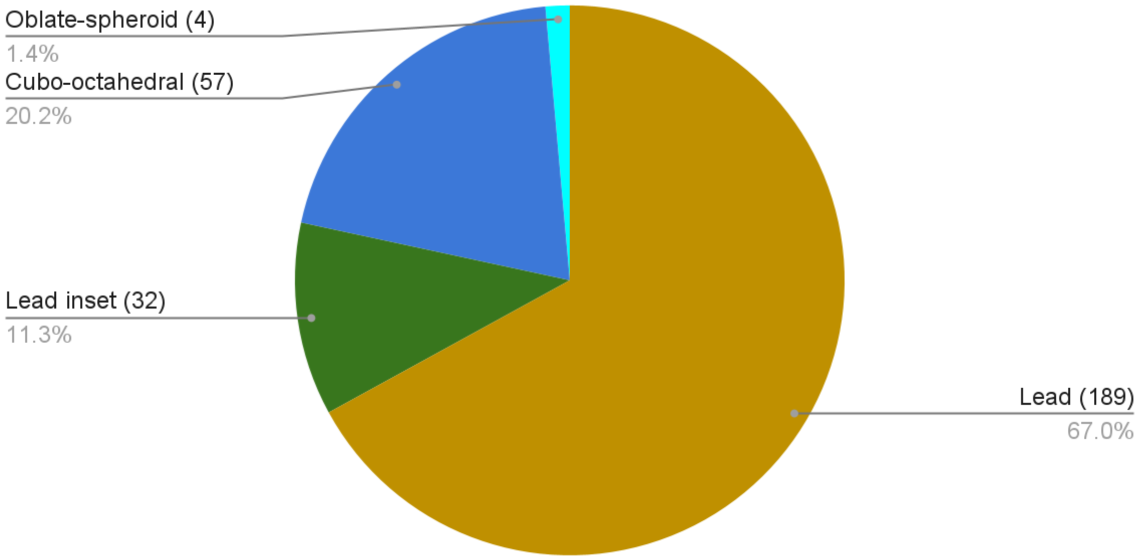


Figure 4.22: Proportions of weight types from Torksey

Total data set: 282 weights



cemetery complex west of Dublin have been identified as conforming to the Dublin unit (Wallace 2013, 307). Irish weight units were almost certainly in use at both Aldwark and Torksey. Although Wallace (2013, 313-14) presents the 'Woodstown unit' as an introduction from Scandinavia, and Horne (2022, 154) proposes that it represents an inter-regional 'Silver Route unit', linked to the standards of southern Scandinavia, it is worth observing that the lead weights used in this system are of both a different form and material to the cubo-octahedral series. Even where similar base units might have existed, operating within comparable systems of ‘standardised’ weights, unfamiliar and untrusted weights would have created a barrier to exchange. Differing base units, potentially combined with different methods of identifying group affiliation and trading norms, would have compounded this issue and been a possible source of conflict. The wide variety of weights described above show that such a situation almost certainly existed at both Aldwark and Torksey.

Kruse (1993, 196) notes that some weights may have been specifically designed for use in specific markets, further adding (Kruse 2007, 170) that ‘agreed objects’ may have also been used as intermediaries, weighed by both parties in a transaction and used as a reference between different weight systems. In light of this, it is interesting that the Type F (domed) and G (conical) weights, many of which appear to have been produced at Torksey, are the most common forms of lead weight in the camp. The link between these distinctive weight types and the visually similar, possibly interchangeable gaming pieces will be explored in Section 8.3. However, it seems possible that these weights may have been manufactured in an attempt to negotiate a mutually-acceptable, recognisable form which both southern Scandinavia/Baltic and Insular weight-unit traders could use to interact. Trade was inherently an activity which was conducted with strangers, with little commonality between people who were socially or geographically removed from each other (Gustin 2015, 29). The interlinked Type F and G weights and gaming pieces could conceivably form the ‘symbolic communication through artefact style’ which is suggested by Sindbæk (2008, 155) to be one of the necessities for facilitating trust in exchange. As noted by Williams (2020c, 21), the only necessity for parties in a transaction was a mutually-agreed standard, even if this were a unique or personal one. Such a scenario would provide a strong rationale for the dominance of the Type F and G weights at Torksey and, whilst it is unlikely that these pieces formed a common unit of exchange, they may have held a position as a site-specific measure of commonality: distinct, recognisable pieces of material culture used to promote confidence and credibility between traders in the environs of the camp.

A different situation appears to have arisen at Aldwark, although a similar array of weight types and fragmented dirhams appear in the assemblage. The comparative proportions of both these dirhams and cubo-octahedral weights are clearly reduced when compared to Torksey, potentially indicating that the camp saw less direct involvement with traders from eastern Scandinavia. It is tempting to read this as a reason for the Type F and G weights being comparatively poorly represented in the camp: with less divergence amongst the trading base, there may have been less need for intermediate weight forms. However, this interpretation remains unconvincing: cubo-octahedral weights are still present in the assemblage, and it cannot be assumed that the remaining lead and inset lead weights all pertain to a single system. Furthermore, the abundance of the Type D (cylindrical/discoidal) weights at the camp is particularly striking. Whilst these discs may have been mutable objects, also serving as gaming counters or trade tokens, their high total number does suggest a deliberate action. This concentration on a specific form may have been for purely technical reasons, with flat discs or cylindrical shapes being easy to cast. However, the form is seen in over half of the identified weights recovered from the site, implying a degree of standardisation in use or production: a single, universal weight type may have been either imposed or adopted at the camp. Given the high proportions of discoidal and cylindrical weight forms recorded at Kaupang and Birka, it is tempting to relate this to a move toward a typically 'Scandinavian' system, rather than the more diverse weight series evident at Torksey. However, it may merely reflect a degree of centralised control over the market, with different specific weight forms mandated as 'agreed objects' at either camp.

4.4 Bullion and other currency metals

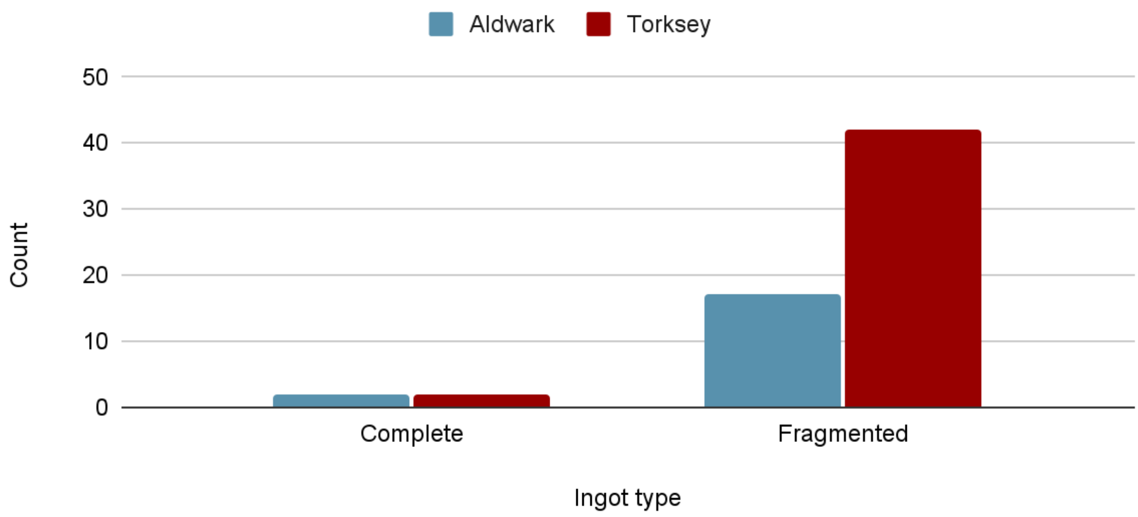
The next three sections follow the typology of ingots proposed by Kruse and Graham-Campbell (2011, 74). However, given the plethora of casting material recovered from both sites (Section 4.2.2), potential Type 2 'droplet' ingots have been classified as metal-working debris and are not included here. Ingots of three different metals have been identified from the two camps: Silver, copper alloy, and gold. These are reviewed according to the volumes of material recovered, starting with the most numerous.

4.4.1 Silver ingots

The numbers of whole and fragmented silver ingots from each camp are set out in Figure 4.23. The high degree of fragmentation in both assemblages is immediately apparent. However, the comparatively low number of complete, uncut ingots from Torksey is perhaps more striking: these are illustrated in Table 4.9. Of these complete pieces, ADB 144.1, ADB 1267, and TDB 1717 all class as Type 1 ingots: cast, unworked or minimally-worked bars of varied cross-section. Wiechmann suggested that the distribution of this form centred on historically Danish territories, Oslofjord, and Gotland (Hårdh 2008, 104): however, the type also occurs in Insular contexts (Williams and Naylor 2016; Williams and Ager 2010). Sheehan (2011a) has identified TDB 79 as an early 'bullion ring', a hammered and rolled bar fulfilling roughly the same economic function as an ingot. Whilst these have previously been seen as originating in Ireland, prototypes are now seen as developing in southern Scandinavia. This can be classed as Type 4 ingot as defined by Kruse and Graham-Campbell (2011, 74), worked on all sides to the point where the original technique or cross-section cannot be determined.

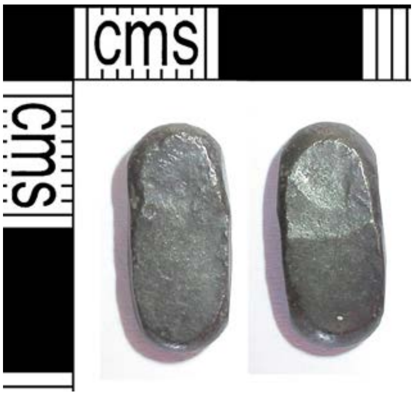
Figure 4.23: Complete and fragmented silver ingots from Aldwark and Torksey

Total data set: 63 ingots and fragments



A number of metrological assessments have attempted to determine a weight standard in Viking-Age bullion, although no universal measure has yet been established. Kruse (1988, 293) has noted that meaningful analysis will be frustrated if more than one weight unit is present: the weights assemblages set out above clearly suggest that this is the case for the two camps. Sheehan (2011a, 402) has proposed that a rough target weight of approximately 25-26g may be assumed for the Insular bullion economy, with Kruse (1993, 193) more broadly observing that British Isles silver ingots cluster toward weights in the mid-20g region. If so, then ADB 144.1, ADB 1267, and TDB 79 might be seen as positioned within this unit, with each representing a very approximate quarter of the proposed target weight. However, none of the values seem particularly convincing, and TDB 1717 does not appear to conform with the proposed range, suggesting that the silver ingots were not made to any particular weight. All four ingots are small when compared to the majority of hoard finds, with low weights which do not suggest a strong association to any weight unit. Thus, all four Type 1 and Type 4 pieces appear to fall into what Hårdh (2011a, 284-5) has categorised as 'workshop ingots': suitable for storing and conveying silver, but not intended as measured means of payment.

Table 4.9: Complete silver ingots from Aldwark and Torksey

Database No.	Material	Image	Weight
ADB 144.1	Silver	 Image: British Museum	6.96g
ADB 1267	Silver	Image not available	6.74g
TDB 79	Silver	 Image: Viking Torksey Project	6.38g
TDB 1717	Silver	 Image: Viking Torksey Project	4.70g

The fragmented silver ingots consist of either terminal or central sections from straight bars. However, one piece, TDB 1301, is a curved section of sub-square bar, approximately 6mm thick (Table 4.10). This thesis proposes that this is part of a fragmented bullion ring, and it is therefore included here rather than being considered amongst the assemblage of hack-silver. The recorded weight ranges for the fragmented ingots from both camps are shown in Figure 4.24 and 4.25.

Table 4.10: Possible fragmented bullion ring from Torksey

Database No.	Length (mm)	Width (mm)	Weight (g)	Image
TDB 1301	12.32	5.95	1.92	 Image: Viking Torksey Project

Figure 4.24: Weights of silver ingot fragments from Aldwark

Total data set: 17 ingot fragments

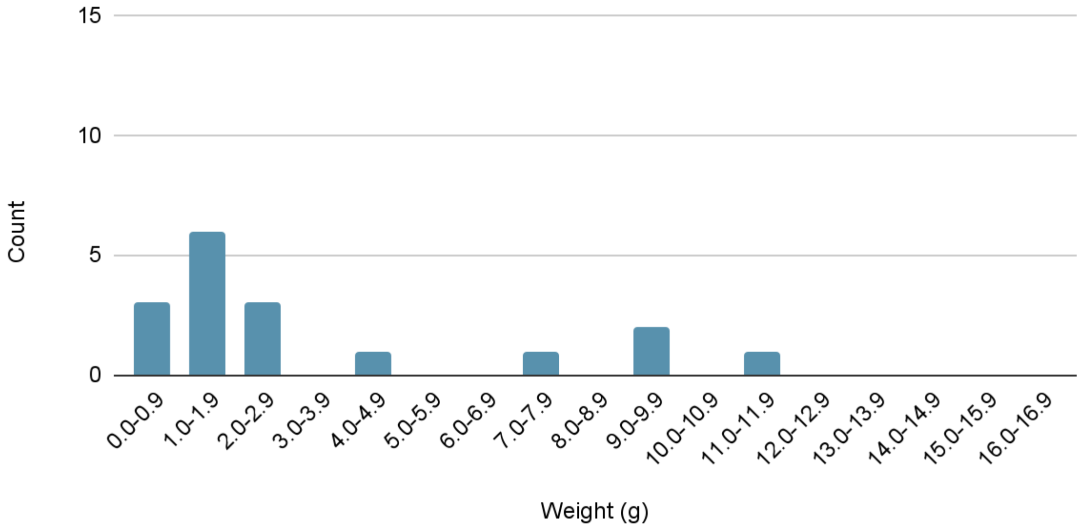
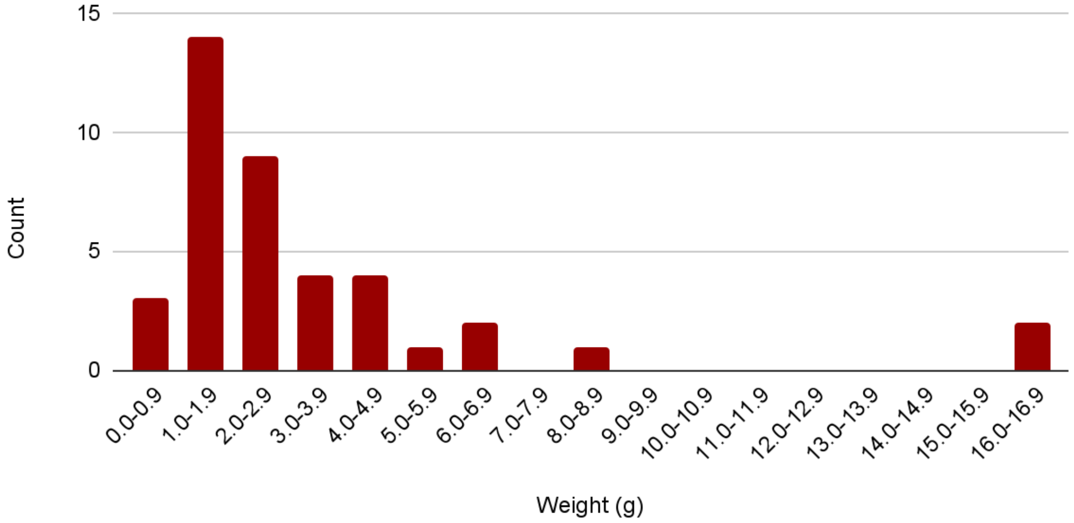


Figure 4.25: Weights of silver ingot fragments from Torksey

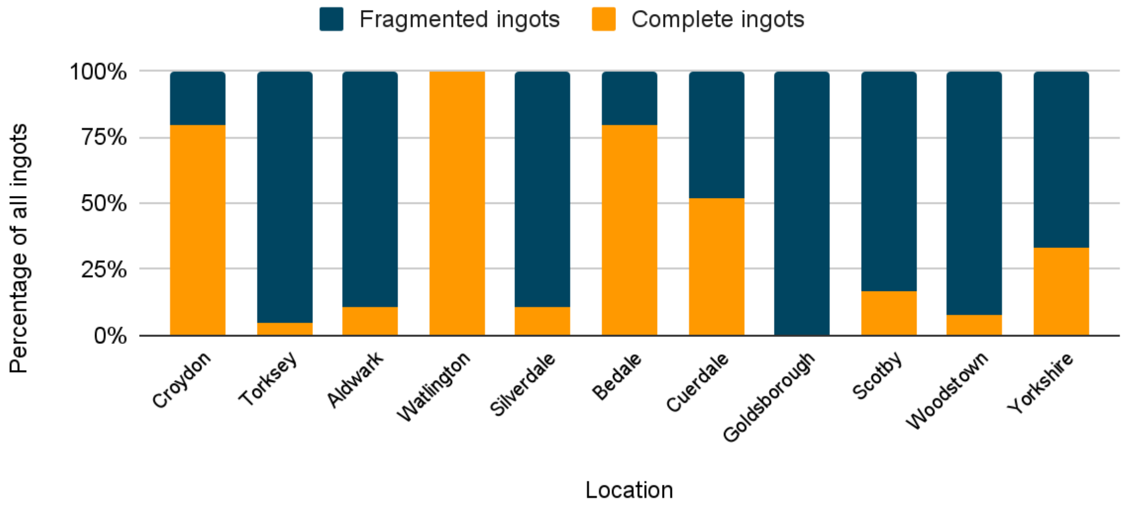
Total data set: 40 ingot fragments



Despite the different sizes of the two assemblages, the degree of fragmentation of the silver ingots appears relatively consistent, with both camps displaying clusters around the 1.0g-2.9g range, and with only two weights greater than 10.0g. Even with the distortion caused by these outliers, the mean average weights for the two assemblages are remarkably similar. The 40 fragments of known weight from Torksey produce an average of 3.40g, with a slight increase to 3.52g at Aldwark. The modal average for both sites is in the 1.0g-1.9g range. Comparatively few British hoards contain silver ingots, although they are more common elements in Irish and Danish assemblages (Sheehan 2014, 197; Kruse 1986, 80). When ingots are recovered from hoards, their degree of fragmentation is frequently different from that seen at the two camps. A review of comparative assemblages of ingots is presented in Figure 4.26 and Table 4.11: this includes very broadly contemporary hoard finds, a composite field composed of single finds from Yorkshire, and the assemblage from the *longphort* site at Woodstown. The relative proportions of complete and fragmented ingots from all these locations are shown in Figure 4.26, with their actual numerical values detailed in Table 4.11.

Figure 4.26: Proportions of complete and fragmented silver ingots in comparative assemblages

Total data set: 628 complete and fragmented ingots (numerical breakdown given in Table 4.11)



Clearly, the variations in the relative sizes of these assemblages makes direct comparison challenging. The proportion of cut ingots is greatest in the tenth-century hoard from Scotby, Cumbria, although this result is rather deceptive as it involves both halves of a single, bisected ingot classified as two fragments. The proportion of fragmentation in the hoard from Silverdale, Lancashire, suffers no such distortion, and is remarkably close to that seen at Aldwark. However, the mean average weight of the fragmented ingots in the other assemblages is far greater than that seen at the two camps. This once again emphasises the particularly high degree of fragmentation evident in the silver finds from Aldwark and Torksey, and also suggests that ingots at the camps were used as currency, rather than solely as a mechanism for storing silver. In terms of mean fragment weights, the closest comparable site is Woodstown, potentially suggesting that silver ingots played similar roles in the economies of Great Army camps and of *longphort* sites: certainly, the earliest English occurrences of ingots in Scandinavian silver assemblages are at Aldwark and Torksey (Horne 2022, 164), demonstrating that they were almost certainly introduced by one or more of the factions within the Great Army.

Table 4.11: Comparative assemblages of whole and fragmented silver ingots.

Location	Number of complete ingots	Number of fragmented ingots	Mean average weight of fragments
Croydon, Surrey (871-72 AD)	4	1	14.80g
Torksey (872-73 AD)	2	42	3.40g
Aldwark (post 874 AD)	2	17	3.52g
Watlington, Oxfordshire (878-79 AD)	15	-	Not applicable
Silverdale, Lancashire (*circa* 900 AD)	13	107	11.46g
Bedale, North Yorks. (late 9th to early 10th centuries)	23	6	79.91g
Cuerdale, Lancashire (*circa* 905 AD)	182	168	15.72g
Goldsborough, North Yorks. (*circa* 920 AD)	-	2	Unknown
Scotby, Cumbria (*circa* 935-40 AD)	1	5	18.70g
Woodstown, Co. Waterford (*circa* 850-950 AD)	2	24	6.00g
Yorkshire (single finds, unknown dates)	4	8	12.00g

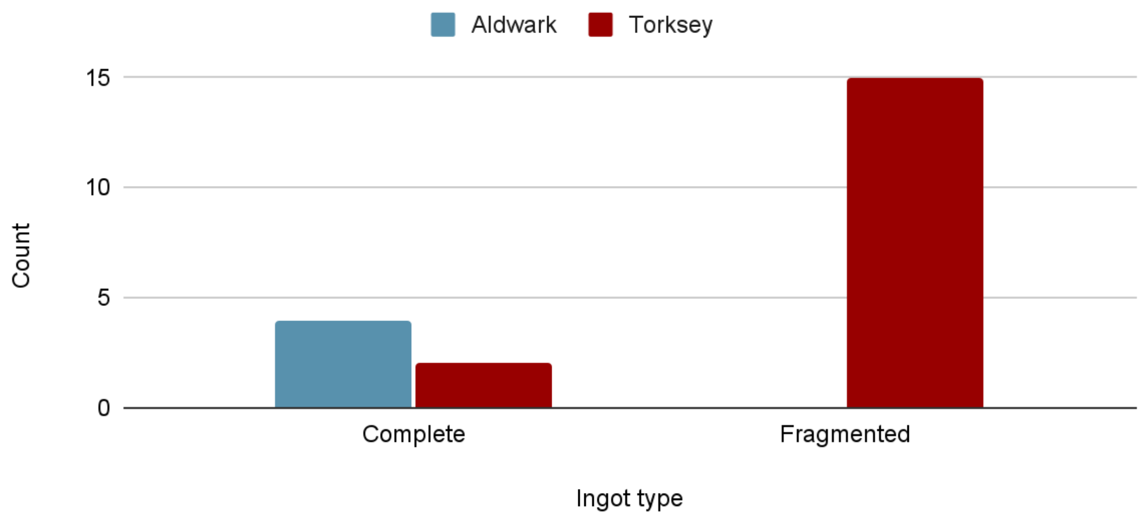
Sources: Naylor and Standley 2022, 120; Kershaw 2020, p. 114, Table 13; Sheehan 2014, 198-200; Graham-Campbell 2011, 180-237; Graham-Campbell 2001b, 213; Brooks and Graham-Campbell 2000, p. 92, Fig. 20; Kruse 1986, 79-80; PAS YORYM-CEE620; PAS LANCUM-65C1B4.

4.4.2 Copper-alloy ingots

Whole and fragmented copper-alloy ingots have been recovered from both camps. Whilst copper alloy is not widely regarded as bullion, several authors have highlighted its apparent use as a currency metal within the sphere of the Great Army (Woods 2021, 406-7; Blackburn 2011, 235-6). These ingots are included here due to their connection with economic activity, although it is accepted that they may also have held a dual function as billets of raw materials for metal-working. The complete and fragmented copper-alloy ingots from both locations are presented in Figure 4.27. The absence of fragmented ingots at Aldwark is particularly striking, as is the higher number of complete pieces recovered from the same site. Some care should be taken with this result, as there appears to have been some confusion in the recording of these finds. It is a possibility that fragmented copper-alloy ingots may have been either discarded unrecognised or been removed from the site without record (Hadley and Richards 2021, 216), and it is also true that there appears to have been accidental duplication in some early recording, leading to the same ingots being counted multiple times (cf. Hadley and Richards 2021, 216). Nonetheless, the low number of complete ingots at Torksey cannot be attributed to the same circumstances, so this appears to form a real difference between the two locations.

Figure 4.27: Complete and fragmented copper-alloy ingots from Aldwark and Torksey

Total date set: 21 ingots and fragments

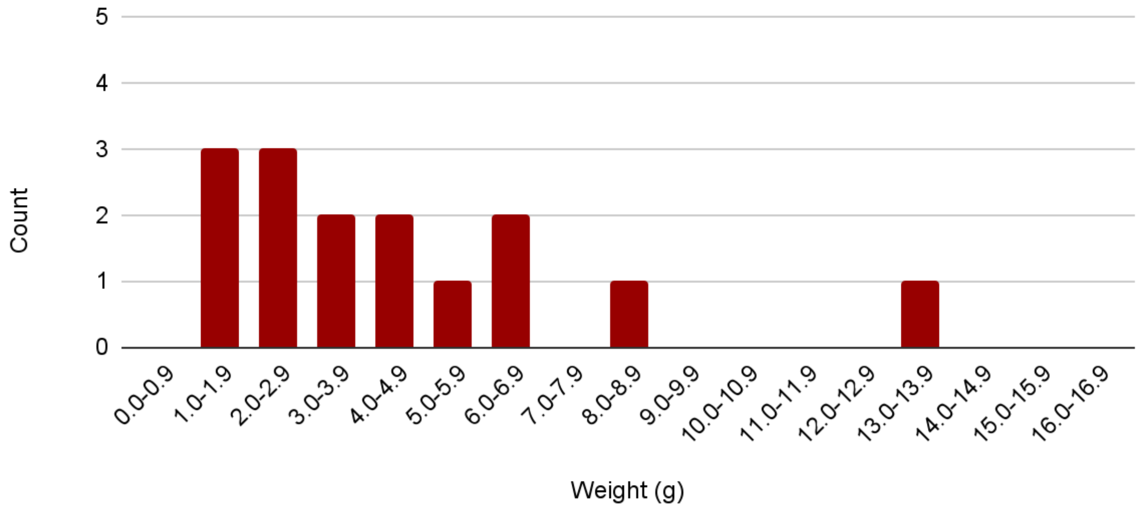


Copper alloy ingots are not common artefacts, and their use as an economic medium has only been examined comparatively recently (Williams 2011, 354). Previously, assemblages of similarly-sized and apparently standardised bars of copper alloy have been interpreted as hoarded stocks of raw materials or merchandise for metal-working, without direct economic function (Bayley *et al*. 2014, 128; Ulbricht 1992, 252). However, as noted, it is increasingly recognised that copper alloy generally fulfilled a dual purpose and that ingots functioned as trade media in themselves (Sindbæk 2001, 50). Within the context of the two camps, the association of cut ingots with stycas and similarly-fragmented Insular copper-alloy metalwork (Sections 6.2 and 7.4) strongly implies their inclusion in a metal-weight system. Although it is more difficult to extend this argument to the complete ingots, Blackburn (2011, 236) perceptively notes that three of the Aldwark pieces have been worked to sub-square cross-sections, with ADB 881 displaying the characteristic transverse hammer marks often seen on silver bars: he interprets this as a deliberate attempt to make these pieces resemble precious-metal ingots, demonstrating their inclusion in a three-tier exchange system. Fragmented copper-alloy ingots have been recovered from other locations in Britain, including Coppergate and Fishergate in York, Flaxengate in Lincoln, and the Royal Opera House site in London (Bayley 2008, 22; Blackmore and Dennis 2003, 2740; Rogers 1993, 1237-8; Bayley 1992, 781), and Pestell (2013) notes an increasing number of individual finds from across East Anglia. Amongst all these examples, cut fragment No. 5290 from Fishergate also shows evidence of transverse hammering and surface working, with transverse hammering again seen on ingots from Bawsey and Billingford, Norfolk (Pestell 2013, 249; Rogers 1993, Fig. 610). Although none of these individual sites approach the same volume of finds as the Torksey assemblage, they do support Williams' (2015, 113; 2011, 354) suggestion that copper alloy was used as a commodity money in the ninth century.

It is difficult to be certain that all the fragmented ingots from Torksey were deliberately cut: in several cases corrosion means that it is hard to identify post-depositional damage, and other pieces (e.g. TDB 245) were clearly only partially cut before being broken. Nonetheless, the weights of the fragmented Torksey ingots displayed in Figure 4.28 show a relatively close grouping. This suggests that many pieces were intentionally cut to a target weight range, rather than showing random fragmentation through accidental damage. Equally, although direct comparison between the two metals may not be practical, the weight distributions for copper-alloy and silver fragmented ingots are reasonably close. Whilst exchange in these metals may have followed different systems, the similarity of the fragment weights does imply the existence of roughly equivalent trading processes, and therefore suggests that the Torksey assemblage shows a reasonably accurate representation of the original weight ranges.

Figure 4.28: Weights of copper-alloy ingot fragments from Torksey

Total data set: 15 ingot fragments

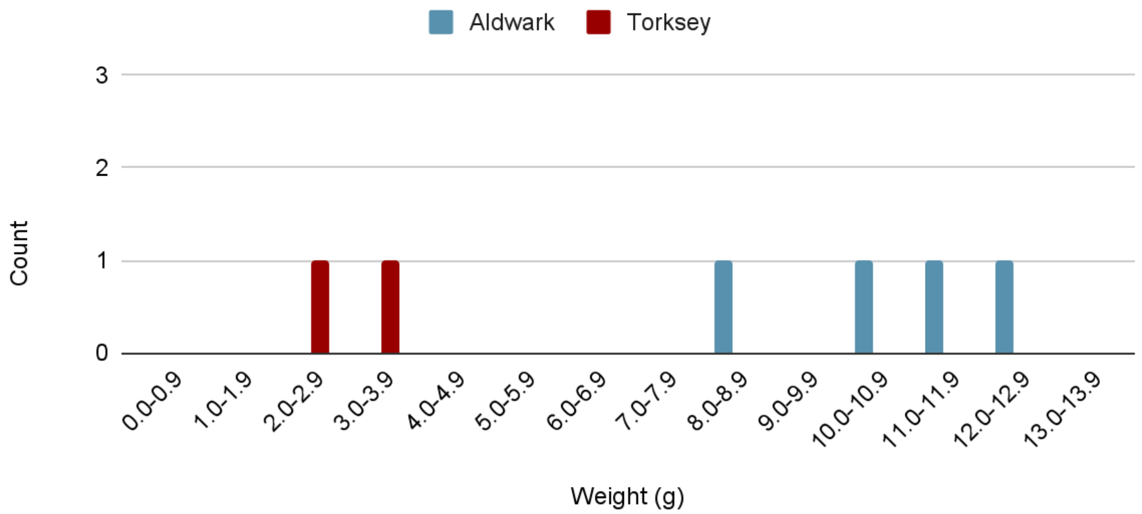


Although the number of complete ingots is low, it is illuminating to compare the two assemblages (Figure 4.29). Both the Torksey ingots are small. TDB 443 is a heavily-worked wedge-shaped bar showing evidence of transverse hammering on the surface, whilst TDB 1725 is a small, bean-shaped piece which has been partially worked: the former conforms to Kruse’s Type 4 whilst the latter can be classified as a Type 1 ingot, despite effectively being a reworked droplet. The four Aldwark pieces are all of Type 1 form, being standard mould-cast ingots with comparatively minor working. Both the Torksey pieces can be comfortably categorised as ‘workshop ingots’, with the Aldwark assemblage showing forms which would more typically be seen in hoards (Hårdh 2011a, 284-5). These morphological differences are clearly reflected in the weight ranges shown in Figure 4.29, with the Torksey ingots falling toward the lower end of the scale and the Aldwark material spread between 8.0g and 12.9g. The lower weights from Torksey echo the assemblage of fragmented pieces shown in Figure 4.28 suggesting that, although complete, these two ingots would have been interchangeable with the cut material already described. There is some overlap between the weights of the complete Aldwark ingots and the fragmented pieces from Torksey. Nonetheless, the higher weight ranges of the Aldwark assemblage suggest that these ingots may have been used for different transactions, and were not intended for ‘everyday’ exchange. The sample size is too small to establish whether they were cast to a target weight, and their dimensions do not suggest any particular standardisation in size. Thus, it is difficult to determine whether they were intended to form a means of payment in themselves, or whether they were produced as a way of storing metal with the intention that it could be fragmented in the future.

Nonetheless, the dominance of fragmented ingots at Torksey, coupled with the apparent exclusive use of complete ingots at Aldwark, does imply that this material featured in different exchange systems at the two camps.

Figure 4.29: Weights of copper-alloy ingots from Aldwark and Torksey

Total data set: six ingots



4.4.3 Gold ingots

The assemblage from Torksey contains one complete and six fragmentary gold ingots, with none recovered from Aldwark. The single complete ingot, TDB 857, is hammered and folded and appears to be a reworked bullion fragment rather than a deliberately-cast ingot. As such, it conforms to Kruse's Type 4, with such heavy working as to obliterate the original form: once again, this can be classed as a 'workshop ingot' of in-use metal rather than a piece designed to store and transport a means of payment. This complete ingot is shown in Table 4.12, with the weight range of the fragmentary ingots given in Figure 4.30: one fragment with an unrecorded weight has been excluded from this figure.

Gold ingots are extremely rare, particularly in complete condition, so it is very difficult to provide comparative material for TDB 857. One pure cast gold ingot recovered with the Galloway hoard weighed 28.90g (Goldberg and Davis 2021, 56), whilst a review of similar pieces recorded by the PAS produces weights ranging from 39.00g to 3.11g. Although these

Table 4.12: Complete gold ingot from Torksey

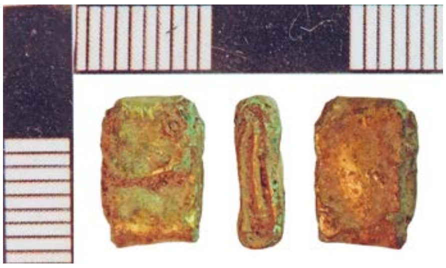
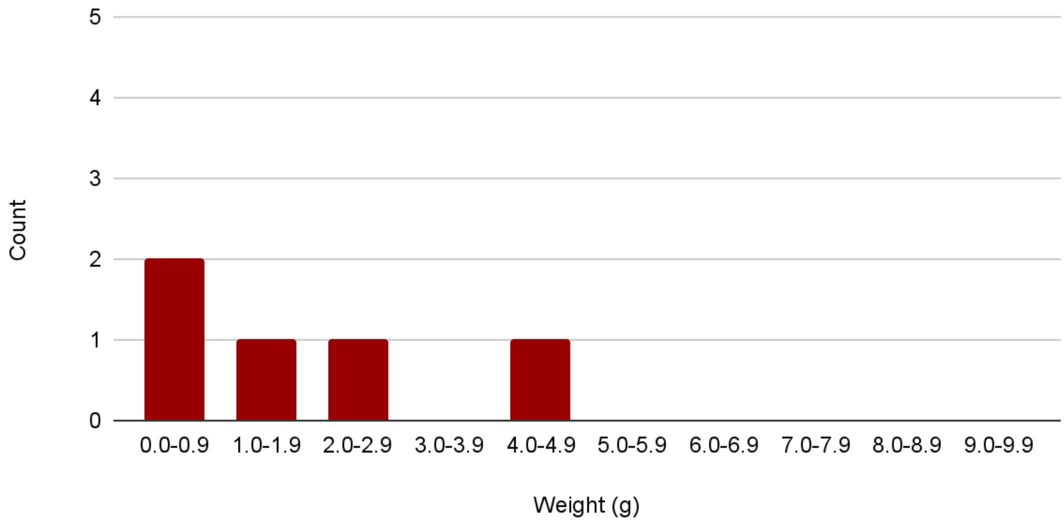
Database No.	Material	Image	Weight
TDB 857	Gold	 Image: Portable Antiquities Scheme	1.00g

Figure 4.30: Weights of gold ingot fragments from Torksey

Total data set: five fragmented ingots



data are unstructured, they do suggest that TDB 857 falls towards the lower end of any potential weight range. Equally, it is difficult to draw many conclusions from the small sample provided by the fragmented ingots. The mean average weight for these is 2.08g, with the mode at merely 0.0g-0.9g, and with all pieces weighing below 4.90g. When set against the 1.0g weight of the single complete ingot, this again suggests that TDB 857 is actually a reworked fragment, shaped for convenience rather than to any economic standard: like the complete copper-alloy ingots from Torksey, it would have been usable alongside fragmented ingots of the same metal. As such, this assemblage demonstrates the use of a gold economy by the Great Army at Torksey: whilst this may have been on a limited scale, all the pieces considered imply a use in direct economic transactions rather than the storing and transportation of precious metal. The very light weights recorded suggest that gold may have been used in relatively small-scale exchange, potentially alongside silver (Kershaw 2019b, 246). By comparison, the lack of gold ingots at Aldwark suggests a real difference between the two locations, and may indicate a diminished role for gold as a currency metal.

4.4.4 Discussion of ingots

One of the essential characteristics of ingots is that they form portable, anonymous stores of metals, reworked and removed from anything which might suggest an origin for the material they contain. This uniform quality has prompted Gaimster (1991, 119; as Thurborg 1988, 303) to describe ingots as ‘primitive money’, suggesting that their universal form meant that they were a practical medium for higher-level, possibly inter-regional exchange. Whilst this may be true for some of the ingots reviewed above, the degree of fragmentation seen in the assemblages of silver and gold ingots, and amongst the copper-alloy ones from Torksey, more strongly implies lower-level transactions within the camps. Obviously, these exchanges may have involved different regional groups: the southern Scandinavian and Irish associations of the two bullion rings in the Torksey assemblage do show connection to wider, international economies, although the dating of these objects means that they cannot be used to identify any more specific cultural derivations. However, several of the other complete ingots from Torksey appear to be more makeshift: the ‘workshop ingots’ described by Hårdh, unrelated to formalised trade or standardised systems. In general, these can be seen to show an active economy within the camp, with metal melted and reworked for swift, easy exchange. The situation is not so clear at Aldwark. It is possible that trade using ingots was more structured in this camp, with their market at Torksey less regulated. Equally, whilst a similarly dynamic economy is indicated by the fragmented ingots, Aldwark appears to be an exception in the exchange of copper alloy. It is very tempting to relate this to the pre-existing economy of Northumbria, with low-value, base-metal transactions potentially restricted to stycas, and with copper-alloy ingots retained whole.

4.4.5 Hack-silver

This section includes cut pieces of jewellery, and fragments of worked gold and silver, such as rods, bars, or strips. The proportions of fragmented hack-silver from both sites are given in Table 4.13. Remarkably little of this material appears to be derived from more decorative items of jewellery: TDB 700 and 808 are fragments of penannular and disc brooches respectively (Section 6.2), and ADB 1266 and TDB 1727 are both pieces of finger-rings with bezels decorated with Trewhiddle-style beasts, broadly indicating a ninth-century English origin (Thomas 2006, 156-7). Other original forms can be established with greater or lesser confidence. Typologically, the seven broad-band armring fragments are comparatively easy to identify. Two spiral-striated and stamped rods, TDB 3346 and 1715, appear stylistically to be ‘Permian’-type rings. Other twisted, circular-section rods have been identified by this study as fragments of arm- or neckrings.

Table 4.13: Hack-silver from Aldwark and Torksey

Location	Hack-silver fragments	Jewellery fragments			Total
		Broad-band armrings	Armrings	Other	
Aldwark	21	5	3	1	30
Torksey	28	2	6	3	39

Although both samples are small, there is potentially some significance in the attribution of the identifiable fragments. Amongst the armring fragments, TDB 118 has a lozenge-shaped cross-section, and several other examples are twisted along their length. Rings of these forms are ubiquitous in the Viking Age, and are abundant in Scandinavia (Graham-Campbell 2006, 79; Hårdh 1996, 56). Very little consequence can be attached to their presence other than to signpost the ‘Scandinavian’ character of these pieces. However, TDB 3346 and TDB 1715 have cross-sections of only 4.2mm and 3.7mm respectively, suggesting that they are rings of the ‘Duesminde’ form (Hårdh 2008, 113). These rings are related to the eastern ‘Permian’ type, but appear to have been manufactured in the west to a lighter, weight-adjusted standard of *circa* 50g, connected to economic activity at Hedeby and Ribe (Hårdh 2011a, 286). Fragments of similar rings are included in the Croydon hoard (Brooks and Graham-Campbell 1986, 95-6), demonstrating that they circulated in the economy of the Great Army. The seven fragments from broad-band armrings form the largest collection of identified jewellery in the assemblages. Sheehan (2011b; 2009; 1998) has published extensively on these armrings, demonstrating that, although the form is most closely associated with Hiberno-Scandinavian production, it too derives from a southern Scandinavian prototype. The presence of both these armring types demonstrates an association with the trading practices of southern Scandinavia. However, there is potential to read wider economic connections into the assemblages. The eastern origins of the ‘Duesminde’-type fragments, and the concentration of complete examples on Gotland (Hårdh 2016, 45), suggest a further link to the Baltic. Conversely, with Irish production commencing *circa* 880 AD (Sheehan 2009, 61), the dominance of broad-band armrings at Aldwark may indicate a focus toward the Irish Sea region. The weight ranges for all hack-silver fragments are presented in Figures 4.31 and 4.32.

Figure 4.31: Weights of hack-silver fragments from Aldwark

Total data set: 30 fragments

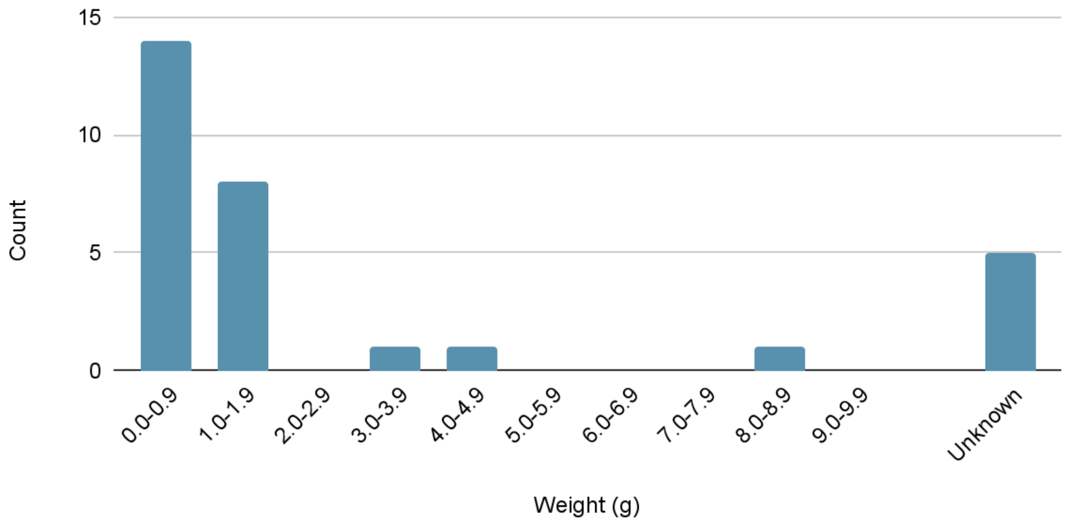
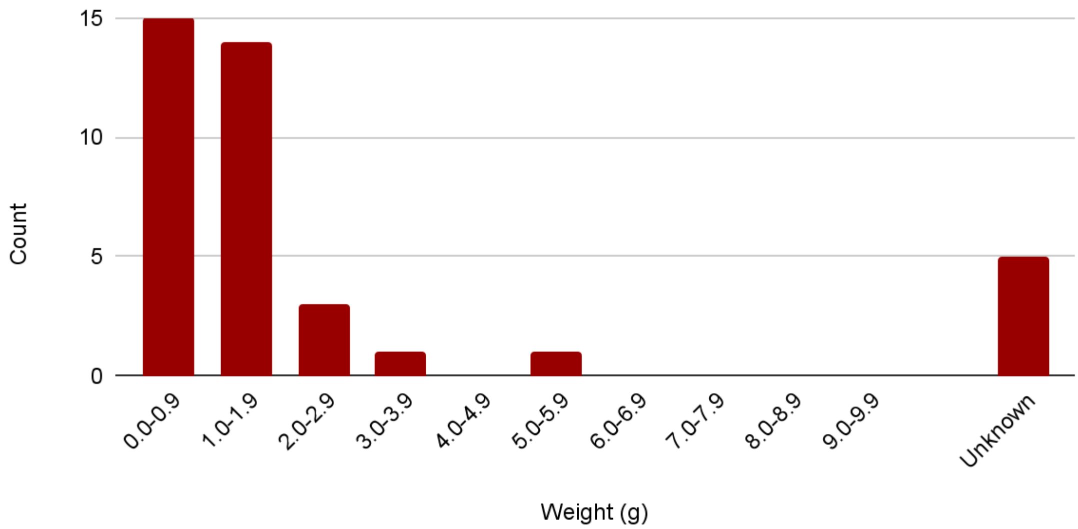


Figure 4.32: Weights of hack-silver fragments from Torksey

Total data set: 39 fragments



In both assemblages the vast majority of fragments fall within the 0.0g-1.9g ranges, with very few pieces of greater weight. Again, an exceedingly high degree of fragmentation, centred toward low weight ranges, is visible at both camps. This is particularly pronounced in the smaller assemblage from Aldwark, although both locations show modal averages of fragments under 1.0g weight. Table 4.14 presents these fragments against assemblages from Uppåkra, Sweden, and Kaupang. All entries show the weight ranges expressed as percentages of each site's total.

Table 4.14: Proportionate distribution of hack-silver fragments at Aldwark, Torksey, Kaupang, and Uppåkra

Weight range	Location			
	Aldwark	Torksey	Kaupang	Uppåkra
0.0g - 0.9g	56.0%	44.1%	25.3%	28.4%
1.0g - 1.9g	32.0%	41.2%	27.6%	24.6%
2.0g - 2.9g	-	8.8%	6.9%	18.7%
3.0g - 3.9g	4.0%	2.9%	11.5%	9.7%
4.0g - 4.9g	4.0%	-	10.4%	9.0%
5.0g - 5.9g	-	2.9%	1.1%	2.2%
6.0g - 6.9g	-	-	3.5%	1.5%
7.0g - 7.9g	-	-	3.5%	3.0%
8.0g - 8.9g	4.0%	-	2.3%	-
9.0g - 9.9g	-	-	3.5%	0.7%
>10g	-	-	4.4%	2.2%
Total number of fragments	30	39	87	134

Source: Hårdh 2008, p.101, Tables 5.3 & 5.4

Although the economic use of hack-silver mirrors practice in Scandinavia (Pestell 2013, 245), the weight ranges seen in the two camps are notably lower than those at Kaupang and Uppåkra. This may simply be due to the increased fragmentation of silver from Scandinavian sources, with pieces repeatedly broken down as they travelled westward. Only four of the cut fragments listed above can be confidently identified as coming from Insular sources, and weights are only recorded for two of these: finger-rings ADB 1266 and TDB 1727, listed at 0.40g and 0.20g weight respectively. Whilst these show that some Insular material was also fragmented to very low weights, such a small sample cannot be taken as representative. Nonetheless, the silver ingots from the camps also show low weight ranges and a high degree of fragmentation, with the modal averages for fragments in the 1.0g-1.9g range at both locations. These ingots potentially show 'fresh' sources of silver, melted and manufactured on site and without a history of travel and associated fragmentation. Their low weights suggest that the corresponding weight ranges seen in the hack-silver may reflect genuine economic practice at Aldwark and Torksey, rather than solely showing the increasing fragmentation of a circulating stock of hacked silver. Furthermore, the unmarked cubo-octahedral weight from Aldwark examined in Section 4.3.3 is only 0.58g, a value which lies within the 0.0g-0.9g modal average weight range seen for hack-silver at both camps. Although we cannot be certain that this weight was used to measure silver, the roughly concurrent introduction of the cubo-octahedral weight form with the circulation of fragmented dirhams and hack-sliver has already been noted: it seems probable that this weight series was linked to the economic use of fragmented silver, and that the Aldwark camp saw a need for a lighter weight unit, almost unparalleled in Scandinavia. These elements all imply that both camps may have seen more frequent, smaller-scale transactions than were enacted at Kaupang and Uppåkra.

4.4.6 Hack-gold

Hack-gold has also been recovered from both locations, and is listed in Table 4.15. Due to the highly-fragmented nature of this material, positive identification of these finds is difficult, although some provenances can be suggested. The two coins are fragments of different *solidi* of Louis the Pious, one an official issue and the other an imitative copy. These have both been deliberately cut, suggesting that they were intended to be used as bullion, leading to their inclusion in this section. Whilst the punch-decorated and shaped piece TDB 82 is classed as 'Unknown' above, it appears to represent an offcut from a thin appliqué foil, presumably taken from a decorative fitting. ADB 1717 is a fragment of Anglo-Saxon filigree work, indicating that it was part of a piece of jewellery such as a brooch. TDB 306 is a short piece of circular-section rod, with little to differentiate it from the other bar fragments in either assemblage. However, a slight spiral twist is evident, signalling that it most probably was cut from a Scandinavian-style arm- or neckring. Four further short sections of rod or bar may be workshop waste, as the two remaining unidentifiable fragments most probably are, although they may equally be very highly fragmented neck- or armrings. Finally, TDB 743 is part of the bezel of a flat-band finger-ring, decorated with a design of overlapping punched circles: cut marks are apparent on either side and on the reverse of this piece, demonstrating that it was deliberately fragmented. A very similar, complete punch-decorated gold ring was recovered from Grave 529 at Repton (Biddle and Kjølbye-Biddle 2001, 67), and a further, sadly contextless example is known from Thetford, the recorded site of the Great Army overwintering in 869-70 (Goodall 1984, 68). In a review of annular finger-rings of this form, Graham-Campbell (2011, 106) suggests that they were a comparatively early and short-lived fashion in Viking-Age Britain, connected with the Army. Rather than being drawn from another source, it is possible that this ring was therefore manufactured and fragmented entirely within the sphere of the Great Army.

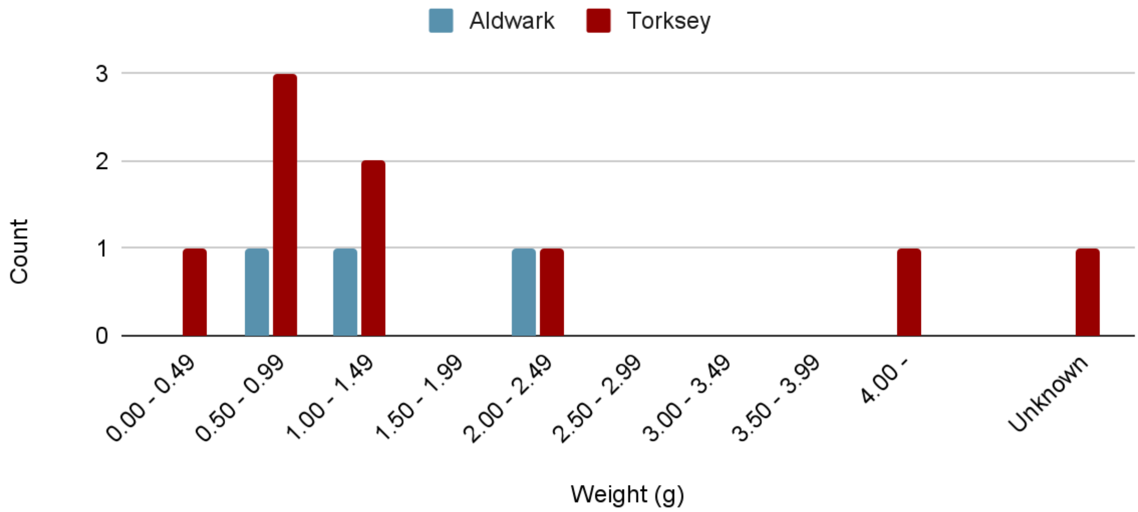
Table 4.15: Hack-gold from Aldwark and Torksey

Location	Bar/rod fragments	Jewellery fragments			Coins	Unknown	Total
		Finger-ring	Armring/neckring	Other			
Aldwark	2	-	-	1	-	-	3
Torksey	2	1	1	-	2	3	9

The weights of the hack-gold fragments are shown in Figure 4.33. While it is unwise to draw firm conclusions from such a small sample, the low weights of all the pieces can be easily seen, echoing both the high degree of fragmentation observed amongst the hack-silver and the low weights of the gold ingots. The mean average weight for the known Torksey fragments is 1.46g, lying very close to a mean of 1.48g at Aldwark, although the Torksey total falls to only 1.08g if the outlying, heavy fragment of *solidus* TDB 1696 is excluded. Both of these averages are below the mean weight of the fragmented gold ingots, potentially demonstrating that hack-gold from objects was used in a different way to that cut from ingot bars. This suggestion is arguably supported by the presence of hack-gold at Aldwark, given the absence of gold ingots there: economic transactions involving gold were clearly still undertaken on the site, although the apparent dearth of ingots may point to a decreased importance for the metal. The low weights of all these pieces does suggest that gold was utilised in everyday trading at both sites.

Figure 4.33: Weights of hack-gold fragments from Aldwark and Torksey

Total data set: 12 fragments



Hack-gold is, of itself, a very rare class of artefact. Gold is thought to have more typically functioned as a medium for prestige jewellery throughout the Viking Age, with Hårdh (1996, 132) noting that gold objects tend to be recovered complete, without any fragmentation, and either singly or in conjunction with other gold objects. This suggests that gold was not commonly seen as having a direct economic role, with Graham-Campbell (2001a, 55-6) raising the question of whether finds of fragmented gold genuinely reflect economic activity, rather than representing raw materials for jewellers. Nonetheless, Blackburn (2007, 77-8) observed that gold appears to have experienced a period of increased use in later ninth-century England, with hack-gold forming a higher proportion of all recorded gold finds than anywhere else within the sphere of Scandinavian influence. The presence of hack-gold in Britain in assemblages connected with the Great Army has been noted by several authors (e.g. Kershaw 2019b, 234): in addition to the finds from Aldwark and Torksey, a single curved fragment from a tapering rod terminal of a gold arm- or neckring was recovered as part of the Watlington hoard, thought to have been deposited by a member of the Army *circa* 879-80 AD (Naylor and Standley 2022, 131-2; Williams and Naylor 2016, 12 & 29-30). In conjunction with the fragmented ingots described above, the presence of hack-gold at both camps, coupled with its highly fragmented nature, suggests the regular use of gold by the Great Army. The employment of such a high-value medium for what are clearly small-scale payments is exceptional, and is not paralleled by any other recognised economic activity in mainland Europe or Scandinavia. Kershaw (2019b, 246) suggests that this fragmented gold may have been used alongside silver, with its low weights signalling a series of small-scale transactions. Whether gold was used independently of or in conjunction with silver, a metal-weight economy of gold was clearly practiced at both camps.

4.4.7 Counterfeit gold

Fragments of gilded copper alloy, contemporary forgeries of hack-gold, have been recorded at Torksey, in addition to two gold-plated counterfeit coins: these are listed in Table 4.16. Both coins are gilded, copper-alloy forgeries of imitative *solidi* of Louis the Pious. TDB 1695 is of Frisian origin, and TDB 2147 appears to be a derivative English copy of an earlier imitative coin: this piece has previously been published as coming from 'Nr Gainsborough' [sic] (Blackburn 2007, 82, no. A17). On this coin the copying is crude, with the portrait apparently based on southern English coinage of the 840s (Blackburn 2011, 252). This suggests that this piece was manufactured in the mid-ninth century, and was circulating prior to the arrival of the Great Army: a review of other material relating to *solidi*, including their potential use in England, is presented in Section 6.4. Unlike the two gold *solidi* described above, both of these coins are complete. Any fragmentation would, obviously, reveal the base-metal cores of such pieces, indicating that they were intended to be passed as single, high-value items: of the ten imitative gold *solidi* from England catalogued by Blackburn (2007, 81), none are fragmented, suggesting that *solidi* were typically retained whole.

Table 4.16: Counterfeit gold from Torksey

Location	Coins	Faked hack-gold			Total
		Ingot	Ingot (uncertain)	Rod	
Torksey	2	1	1	3	7

Faked hack-gold has not been identified at any other site, making its recovery from Torksey unique (Blackburn 2011, 234). It is included here because of the obvious association with economic activity, as such counterfeits cannot have been intended for metal-working: indeed, their presence does provide a convincing counterpoint to Graham-Campbell's aforementioned proposal that fragmented gold was workshop scrap. One of the ingots, TDB 1788, has clearly been manufactured to be a convincing forgery: it takes the form of a terminal from an octagonal-section ingot, cleanly cut with a chisel, and with gilding applied to all faces, obviously intended to disguise the copper-alloy core. The other uncertain ingot, TDB 738, is a stubby, sub-rectangular piece less than 9mm long, with no signs of cutting. Gold plating is only preserved on what appears to be the upper face: whilst gilding may have corroded off other faces, it is equally possible that this piece is unfinished, or was manufactured for another, unknown purpose unconnected with any intended forgery. The three thin rods are all either bent or curved, presumably with the intention of making them appear as if they were waste offcuts or had been fragmented from a Scandinavian-style neck- or armring.

The large assemblage of metrological weights from Torksey gives very clear evidence that metal-weight exchanges were common in the camp. It is difficult to see how pieces of counterfeit hack-gold might have been accommodated in such a system. Although the two fake *solidi* might have passed by tale, the morphology of the remaining five pieces of faked hack-gold suggests that they were intended to be passed off as fragmented bullion, carrying an expectation that they would be assessed by weight. However, the comparative density of the copper-alloy cores would mean that all the fragments would be far lighter than their equivalent volumes of gold. Given that copper alloy is typically one-third of the weight of 90% pure gold, it seems unlikely that these forgeries would have been convincing: their weight would have marked them out either as clear fakes or, at best, as heavily-debased alloys with low grades of purity (George Easton, *pers. comm*). However if, as Blackburn (2007, 78) suggests, the later ninth century saw a sudden increase in the use of gold, then such faked pieces may potentially have been accepted by people who were unfamiliar with the metal. As detailed above, it seems clear that gold was traded in both camps, included as part of an economic system which used multiple and overlapping forms of exchange. Furthermore, the rarity of hack-gold has also been highlighted above, suggesting that, despite its comparative abundance at the two camps, gold had only a marginal role in wider commercial transactions. The presence of these forgeries supports the suggestion that the Torksey camp saw a comparative glut of gold, with the metal suddenly available as a medium for trade. The fact that it was considered worthwhile to counterfeit both ingots and smaller items clearly testifies toward a role for gold in exchange, but also suggests a status as a relatively new, less familiar currency metal.

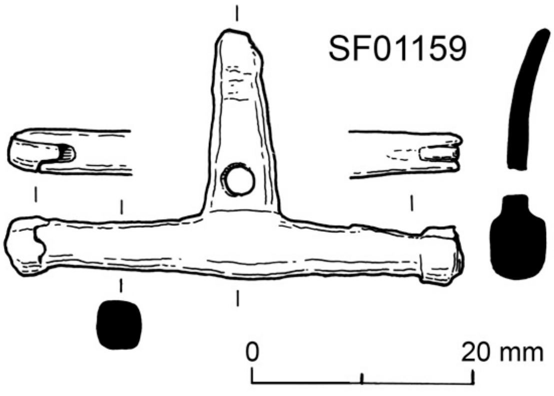
4.5 Balances

Two incomplete balances have previously been identified from Aldwark. This thesis proposes that Torksey find TDB 699 is also part of an incomplete balance. The typology of balances established by Steuer (1987, Abb. 2) is followed here, as is the terminology used by Kruse (1992, Fig. 1).

ADB 156 was recovered with the material of the 'hoard'. The stirrup, pointer, and part of the central beam survive, with a knotted wire loop passed through the top of the stirrup for suspension. The stirrup is fixed to the beam by means of a copper-alloy rivet, set at the base of the pointer, which would have acted as a pivot. The beam is rectangular in section, with a piercing and the remains of an iron rivet visible at the end of one of the arms. The opposite arm is broken at roughly the same length, with the piece forming an inverted 'T'-shape: it has been suggested that this may have prompted a secondary use as a pendant (Ager 2020, 15). ADB 1159 comprises a single-piece central beam and pointer of a balance, with the stirrup absent and the pivot-point marked only by a piercing toward the base of the pointer. The beam is complete and is sub-square in section, with vertical slots for the hinging arms visible in thickened collars on each terminal (Table 4.17). Although Ager (2020, 15) classifies ADB 156 as belonging to Steuer's Type 6, this seems unsatisfactory. Whilst the Viking-Age Type 6 balances were divided into further sub-types, all forms were manufactured with folding arms. This is clearly not the case with ADB 156. Although the beam now has arms of equal length, this is an effect of later damage, demonstrating that the piece was clearly not designed to be symmetrical. Only one rivet hole is visible on the beam: were this to originally have been a hinge, an equivalent hinge on the now-broken end would require the beam itself to be asymmetric and unbalanced. Equally, there is no evidence of hinge recesses. All the sub-types of Type 6 balance have recessed slots on the ends of the beam, designed to accommodate the foldable arms by way of a pivoting mortise and tenon joint. Whilst no information is available on rivet materials used on early medieval balances, Kruse (1992, 68) records only one iron balance in Britain, stating that the remainder are copper alloy. The remains of an iron rivet on the beam therefore appear anomalous, and at odds with the copper alloy composition of the rest of the piece. Given these factors, it seems more probable that this rivet-hole represents a repair, rather than the location of a former hinge. Although Horne (2022, 171) has subsequently included this find in a review of Insular folding-arm balances, it seems apparent that the piece was originally of the fixed-arm type.

By contrast, ADB 1159 is very clearly of Steuer's folding Type 6. The lack of arms or any remaining decoration means that it is impossible to identify it as any of his proposed sub-types. Although Kruse (1992, 76-8) recognises the considerable variety within the corpus of English material, she does suggest a preference for slightly smaller sizes of balances and pointers in the late Anglo-Saxon period, noting that longer examples are more typical of seventh century and later medieval dates. Without the arms, it is difficult to gauge the relative length of either of the Aldwark pieces. Whilst ADB 156 appears to have a long

Table 4.17: Balance from Aldwark, probable balance arm from Torksey

Database No.	Length (mm)	Height (mm)	Image
ADB 1159	41.5	22.5	 Image: York Archaeological Trust
TDB 699	31.07	11.24	 Image: Viking Torksey Project

pointer, a similar feature can be seen on the complete balance from Kiloran Bay (Graham-Campbell and Batey 1998, 120). The beam of ADB 1159 is large when compared to dated examples from Thetford and York (Mainman and Rogers 2000, 2559-61; Goodall 1984, 69), with the collared, rounded hinge-points at odds to the more angular terminals seen elsewhere. However, the three folding balances recovered as grave-goods from Dublin all have beams of equal or greater length than ADB 1159 (Harrison and Ó Floinn 2014, 172). Thus, broad ninth-century parallels can be suggested for both pieces.

Although TDB 699 is of a very different form to the two balances already described, it again appears to be of the fixed-arm type. The cast, rectangular-section copper-alloy bar is broken at both ends, but retains a short, pierced triangular projection which I interpret as the combined pointer and suspension hole for an absent stirrup (Table 4.17). This pointer is small when compared to both Aldwark examples. The slightly 'stepped' profile of the projection suggests that it may have been broken and re-shaped, but a low pointer might also indicate a late Roman date for this piece (Kruse 1992, 76; Steuer 1987, 416). The upturned curve of the surviving arm is clearly paralleled by a complete ninth-century balance beam from Ipswich (Kruse 1992, Fig.2a). However, another upturned fixed-arm balance from Coppergate, No. 10415, was recovered from a twelfth- to thirteenth-century context: whilst this piece has been interpreted as either residually Roman or Anglo-Scandinavian, this confusion serves to illustrate the difficulties in dating such comparatively undiagnostic designs (Mainman and Rogers 2000, 2561 and 2646). Despite this uncertainty, the presence of a balance would accord with the high number of weights associated with the Great Army's overwintering, and TDB 699 has been included in this section.

Wallace (1987, 214) notes that folding-arm balances were initially the more popular type in Ireland, replaced by rigid-beam models in the later Viking Age: the opposite is the case in Scandinavia (Kruse 1992, 72). Steuer (1987, 462) saw his highly-decorated Type 3 sub-type of Type 6 folding balances as being introduced from the east and copied in the Scandinavian homelands. He considered the plainer, often tinned, Type 2 sub-type to be a product of the west, drawing on Merovingian traditions: others (e.g. Harrison and Ó Floinn 2014, 174; Blindheim 1976, 23) have seen the Type 2 sub-type as potentially produced in an Insular, Hiberno-Scandinavian environment. Whilst Steuer proposed an early tenth-century origin for this sub-type, this was based on material recovered from Norway, and there is some evidence to suggest that insular production began earlier than he anticipated. Both the Kiloran Bay balance and two of the Dublin examples are of the Type 2 sub-type. These are associated with groups of inset weights, suggesting that these date to the late ninth century, the proposed floruit of this weight style (Williams 2020c, 23), and the period of greatest popularity for the folding balance in Ireland. Other than noting these broad eastern and western influences, it is impossible to suggest an origin for either of the Aldwark balances. However, both are atypical, and neither displays craftsmanship of the proficiency that might be expected of a Scandinavian workshop. This is particularly true of the comparatively simple construction of ADB 156, with evidence of repair implying that this piece saw extensive use. Both were probably made in western Europe, and formed part of the standard metrological equipment carried by the Great Army. Equally, little can be said about any possible origin for the single Torksey piece, other than suggesting a possible Insular connection. All three finds appear to be broken or worn-out items and, as such, may well have been discarded at the end of a long use, rather than showing casual losses. Balances were essential for everyday mercantile activity (Westholm 2009, 146), and a Viking force on the Seine was also recorded as using their own scales to assess a large silver payment in 866 AD (Nelson 1991, 130). Such items must have been present in both camps.

4.6 Summary

Although other aspects of the assemblages are concerned with the necessities of maintaining an army in the field, material related to economic activity relate to what can be seen as the objective of the Great Army: the accumulation of portable wealth was, at least initially, the prime goal of the force. The size of the assemblages reviewed above highlight the central importance of economic activity within the camps. Whilst this activity was not fundamental to day-to-day life, it was clearly one of the main activities during the force's overwinterings. Nonetheless, it must be noted that the assemblages are so large because they are so varied: by necessity, a wide scope of material is considered, making this particular category larger than the others considered by this thesis. This wide range of evidence suggests that no single form of exchange dominated at either site. Economic activity at both locations quite evidently encompassed complex, multi-faceted economies, with different weight and exchange systems operating simultaneously, and with multiple metal economies practised (Hadley and Richards 2016, 49 & 62). As Williams (2015, 105) observes, 'Forms of exchange were as varied as forms of wealth'. However, this does not mean that these systems overlapped. Different forms of silver are generally taken as reflecting different types of economy (Kershaw 2015, 157), and the same may be said for trade using different weights or metals. To some extent, this variety must reflect the compartmentalisation of the Great Army, and the diverse groups of which the force was composed. Given this, it is telling that both locations contain broadly the same collections of artefacts, differing only in number: if the variety of the evidence for economic activity is demonstrative of different groups or populations within the Great Army, the same groups do appear to have been present at both Aldwark and Torksey.

The silver 'broad' pennies at Aldwark, and the stycas at Torksey, are perhaps the clearest examples of objects from one region of the Army's campaigning present at another. It is difficult to know how these items were used in either camp: the economies in which they were employed may have been quite fluid, potentially encompassing both coin and metal-weight or commodity-money transactions. Nonetheless, if coin was used by tale, it is hard to see how fixed transactional values would have been enforced and maintained outside of each currency's standard area of circulation. As noted, this may account for the pierced pennies recovered with the Aldwark 'hoard', with these coins demonetised at the point that their form ceased to be useful, signalling their transition to a metal-weight economy. However, whilst 'broad' pennies clearly possessed an innate value in a silver economy, the presence of stycas at both camps indicates that the Great Army considered these coins to also be of worth (Williams 2015, 113), and not merely for transactions outside the camp. Whilst this perceived value may once again have been connected to a metal-weight economy, it demonstrates that stycas were not merely seen as a fiat currency (cf. Abramson 2018, 176). This is notable when viewed against the apparent lack of fragmented copper-alloy ingots at Aldwark, one of the few appreciable differences in economic activity between the two locations. As observed, this absence suggests a difference of use, and one which may show an increased emphasis on stycas in small-scale exchange at Aldwark.

The presence of both the fragmented dirhams, ingots, and hack-silver shows clear connections to Scandinavian economic systems, and ones of relatively recent origin: as Williams (2015, 104) notes, the development of Viking camps occurred during a period of major economic change, with fragmented silver a comparatively new medium of exchange. Whilst some of the finds suggest that Torksey may have been more directly connected to the economic systems of southern Scandinavia, this may be somewhat illusory, and a result of the comparative sizes of the assemblages: however, clear connections to Scandinavian economies are evident in these aspects of the assemblages. Whilst casual loss almost inevitably prejudices the dirham, ingot, and hack-metal assemblages toward the smallest fragments, it is nonetheless notable that all these fragments remain appreciably smaller than those recovered from comparable sites in Scandinavia. Even though the fragmented silver from the camps may derive from the practice of 'topping up' larger weights for transactions, the dearth of similar material elsewhere does strongly suggest that this was not a routine occurrence at other locations. The Great Army was clearly able to process, re-cast, and refine silver, (see Chapter 6), and the metal does not appear to have been in short supply in either camp. It therefore appears unlikely that the high degree of fragmentation seen in these assemblages reflects the intensive use and re-use of a limited pool of currency metal. Given this, it does seem probable that these smaller, lighter fragments were instead used in transactions in their own right.

Both camps therefore show evidence of regular, small-scale exchanges in fragmented silver. The intense fragmentation of hack-silver has been proposed as showing a penultimate intermediate step between barter and coin (Sheehan 2007, 159; Hårdh 1996, 86). Whilst this may be true for wider economies, it is hard to see how it might be the case for either Aldwak or Torksey: both camps were not only located in areas which already operated well-established and closely-controlled coin economies, but whole coins clearly circulated alongside fragmented silver at each site. It is possible to argue that the intense fragmentation of silver demonstrates that the inhabitants of the camps were familiar with monetised economies and the use of small-denomination coins and that, rather than showing an immediate pre-coin stage, these low-level transactions indicate that both locations operated a metal-weight system directly alongside a coin economy. Furthermore, I suggest that it also shows the adaption of existing Scandinavian systems: weight-traded silver would have been familiar within any economy connected to Scandinavian trading, ubiquitous as a shared medium of exchange. As such, it would be able to bridge the different groups which made up the Great Army, leading to very small fragments being used as a means of conducting everyday commercial transactions within the camps. Conversely, the recovery of hack-gold, particularly as finely fragmented pieces, is a clear difference from Scandinavian economies (Hårdh 1996, 161). Although the small sizes of the respective samples make firm conclusions difficult, it does seem probable that fragmented gold, like fragmented copper alloy, had a secondary role in the economy of the camp at Aldwark. Equally, it seems reasonable to conclude that Torksey saw a comparative abundance of this metal, with the use of hack-gold frequent enough to make the manufacture of counterfeits profitable.

The dominance of Type D cylindrical/discoid weights at Aldwark, and their comparative scarcity at Torksey, is one of the clearest differences between the two assemblages. It is very tempting to link this difference to the partitioning of the Great Army following the split at Repton, with the faction at Aldwark expressing shared norms and a group identity through the use of a common series of weights. However, this interpretation ignores the proliferation of Type F and G weights at Torksey, and the fact that these are also concentrated at one particular camp. The use of specific weight forms may well have been a standard feature of individual camp locations and, rather than being related to any divisions within the force, the choice of these weights may instead reflect the distinct situation of each camp. The potential use of Type F and G weights as ‘agreed objects’ for common trade has been discussed above. Following this interpretation, such weights would clearly be well suited to the market at Torksey, and would help to facilitate exchange across the numerous competing factions, weight systems, and metal economies present at the camp, particularly in regard to the aforementioned highly fragmented silver. The overwhelming use of Type D weights may have served a different purpose at Aldwark, with this long-established form used to invoke reliability and trust in a more straightforwardly Scandinavian-based system, with less use of fragmented gold and copper alloy. In both instances, the dominance of specific weight types suggests a degree of centralised control in each market.

5. Tools and weapons

5.1 Introduction

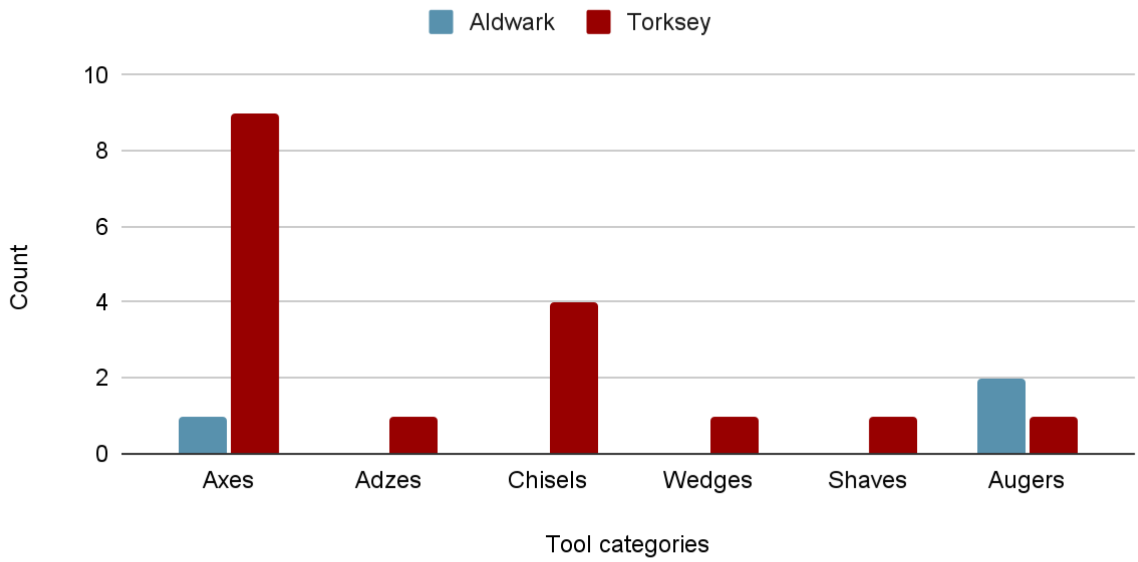
Tools and weapons may appear to correspond to very different spheres of activity, but the assemblages detailed in this chapter relate to activities which can be seen as the primary purposes of the two camps (Cooijmans 2020, 141): the resupply and repair necessary for any large, long-lasting expedition, and the military force which enabled the Great Army to campaign so effectively. As such, these form interrelated categories, illustrating aspects of the day-to-day existence of both locations. The following sections review tools for wood-working, textile working, for other activities, and the knives and weapons from both camps. Analysis of the Aldwark material is informed by several studies: the tools by Rogers (2020b & c), the weapons by Ager (2020) and Rogers (2020f), and the textile-working material by Walton Rogers (2020b). The Torksey iron hoard has previously been reviewed by Carhart (2015). This chapter builds on these works but introduces new artefacts, unavailable for previous study. Whilst the Torksey iron hoard has been previously studied by Carhart (2015), the majority of the remaining ironwork has been recorded and analysed as part of this thesis, and this chapter presents some of this material for the first time. However, it does not examine the metal-working tools: these have been included with evidence of manufacturing activity, and are analysed in Chapter 6.

5.2 Wood-working tools

The categories considered in this section are axes, adzes, chisels, wedges, shaves, and augers. The relative proportions of each category are given in Figure 5.1.

Figure 5.1:Wood-working tools from Aldwark and Torksey

Total data set: 20 tools



5.2.1 Axes

The classification of axeheads has previously attracted considerable debate, arising over whether they should be classed as weapons or tools. Some attempts have been made to distinguish between ‘tool’ or ‘weapon’ types, but such definitions have proved elusive and it is generally accepted that most early forms were multifunctional (Harrison and Ó Floinn 2014, 114). Although there is plentiful evidence for the use of axes as weapons from the ninth to eleventh centuries, particularly by forces of Scandinavian character or ancestry (Hjardar and Vike 2016, 162; Halsall 2003, 165-6), the only form specifically identified as a weapon is the Type M broad axe, developed in the later tenth century (Pedersen 2012, 205-6). Therefore this thesis follows the example of Halpin (2008, 165), with all axes classed as tools. The terminology follows that used by Goodall (2011, Fig. 3.2).

Early medieval axes took two basic forms, broadly related to their intended functions. Heavy, wedge-shaped axes were a general tool, used for felling, splitting, and for rough shaping. Lighter axes with expanded, ‘T’-shaped heads were more specialised, designed for hewing and dressing converted timbers (Leahy 2003, 17). A single ‘T’-shaped axehead was recorded from Aldwark. A similar axehead and two probable broken ‘T’-shaped axes were included in the Torksey hoard, as was an axe hammer. The dimensions of these pieces are presented in Table 5.1; weights are not available for any of the artefacts. All the finds of wedge-shaped axes are from Torksey. All the complete axeheads of this form have thick, narrow blades with very little flare and with short cutting edges. Two complete examples and one fragmentary socket were recovered from the site, and a further two were included with the hoard: these are presented in Table 5.2. Although a second axe was reportedly recovered from Aldwark, this item was not recorded and the form of the piece is unknown (Williams and Hall 2020, 84).

Table 5.1: 'T'-shaped axes from Aldwark and Torksey

Database No.	Blade length (mm)	Blade width (mm)	Width of neck (mm)	Total length (mm)
ADB 130	126	41	26	160
TDB 1649	Incomplete	Incomplete	28	Incomplete
TDB 1657	202	32-60	34	135
TDB 1673	Incomplete	Not applicable	Not applicable	125
TDB 1677	Incomplete	Incomplete	22	Incomplete

Table 5.2: Wedge-shaped axes from Torksey

Database No.	Blade length (mm)	Blade width (mm)	Total length (mm)	Length/width ratio	Offset
TDB 1422	55.6	28	161	2.9:1	None visible
TDB 1650	41	27	140	3.4:1	Right
TDB 1660	60	31	174	2.9:1	None visible
TDB 2557	55	28	165	3:1	Left
TDB 2558	Incomplete	Unknown	Incomplete	Unknown	Unknown

Axe typologies focus on their use and weapons and can be difficult to apply to tools. The typology of Scandinavian axeheads formulated by Petersen in 1919 remains the standard reference, but this mainly focuses on the evolution of wedge-shaped types and scarcely considers the ‘T’-shaped axe, which was classed as Type W. In his later typology, Wheeler (1927, 24) included the ‘T’-shaped axe as Type II, although his classifications are somewhat narrow and limited to only six forms in total. There has been no wider review of axe typologies since these works were completed (Ottaway 2016, 8). Wheeler considered the ‘T’-shaped axe to be a Frankish ‘tool’ form, and stated that earlier examples were smaller and had thicker, shorter necks, supporting this with rather arbitrary dating of unstratified finds (Ottaway and Cowgill 2009, 257). Nonetheless, this supposition appears to be broadly correct, with the ‘T’-shaped axe thought to develop from the much smaller axe hammer during the eighth century (Wilson 1976, 255-7). Where datable, earlier forms have similar thick, often slightly curved cutting edges (Morris 2000, 2108), with the blades developing toward the narrowest and most elongated forms in the eleventh century (Ottaway 2016,10).

Like other tools, ‘T’-axes are not common finds at excavated sites, and so the main comparative pieces are drawn from hoards (Lewis 2019, Appendix 5.7.5; Leahy 2003, 16). Morris (2000, 2108) discussed 11 dated examples, but this was prior to the discoveries of the Flixborough, Scraptoft, and Lea Green hoards. The majority she listed were broken, such as a late eleventh-century axe excavated from a refuse pit at Milk Street, London (Prichard 1991, 135), or Coppergate Nos. 2254 and 2256, both split longitudinally through the sockets in a similar manner to TDB 2558 (Ottaway 1992, 527). The Aldwark find is very similar in form to a further broken axe recovered with the Crayke hoard. Comparative examples of the ‘T’ form of axehead are presented in Table 5.3, drawn from published sources where dimensions are available. This comparison shows that the Aldwark and Torksey ‘T’-shaped axes are broadly similar, with dimensions suggesting that they are of the earlier, somewhat smaller and more robust forms, fitting well into the established dating of both camps.

The narrow, wedge-shaped axes from Torksey are not a good fit for the Petersen typology, falling somewhere between the Types A and G, dating to between 800 and 950 AD. They can be accommodated by the more general Wheeler Type I, a form which he considered to be a universal cutting axe, little changed from prehistory to the eleventh century (Wheeler 1927, 23). Ottaway (2016, 8) considers this narrow form to principally be a felling axe and a carpenter’s tool during the Anglo-Saxon period. Of the four complete axeheads, two show a very strong offset, with the blades aligned onto one side of the socket: this is particularly pronounced on TDB 1650 (Carhart 2015, Fig. 3). This feature indicates that both these axes were designed as shaping tools, with the offset head providing clearance for the user’s hand and allowing a cleaving action to cut close to the plane of the timber. The two remaining

Table 5.3: Comparative ‘T’-shaped axes

Find location	Catalogue/ reference number	Blade length (mm)	Blade width (mm)	Width of neck (mm)	Total length (mm)
Flixborough, Lincs	2453	145	36	20	181
	2454	160	37	22	140
	2455	195	45	21	164
	2456	200	46	22	126
Milk Street, London	MLK76	Incomplete	44.8	20	160
Scraptoft, Leics	5	255.5	45	22	161
Crayke, N. Yorks	17	Incomplete	38	Unknown	151
Lea Green, N. Yorks	LANCUM-085845	125.1	36.2	22.4	155

Sources: Leahy 2013, 229; Ottaway and Cowgill 2009, 263; Pritchard 1991, 250; Sheppard 1939, 280; PAS LANCUM-085845

complete axeheads show the typical asymmetrical form of early medieval pieces, but without any definite offset. This suggests that these were more general hewing axes, designed to chop and split timber: on TDB 1660, a thickened, square poll is visible on the butt of the axe, adding weight for chopping and strength to receive hammer blows when used for riving. All four axes have a blade width to length ratio of roughly 3:1, with cutting edges which are shallowly curved and set near to perpendicular with the socket. Widely-flared, broad-bladed axes with width/length ratios nearer 1:1 have sometimes been seen as felling tools, although they may have been more of a universal implement, used for general carpentry and slaughtering livestock (Ottaway 2016, 8; 1992, 527). Tool-mark analysis at Staunch Meadow, Suffolk, demonstrates that narrow-bladed axes were used to fell large trees in the eighth century (Darrah 2014, 136). Felling axes need long hafts: a handle of over 0.9 m was used for experimental work at West Stow (Darrah 1982, Fig. 12.7). Two narrow, wedge-shaped axes from the Oseberg burial, both listed as No. 140 and catalogued with the kitchen utensils, were equipped with long hafts. The larger of the two was 0.78 m long, set on a head with a blade length of 95mm (Grieg 1928, 162). With similar shafts, both TDB 1650 and 2557 could easily have served as felling axes.

5.2.2 Adzes

A single adze, TDB 1672, was recovered as part of the Torksey iron hoard. Adzes are, again, rare finds from excavated sites (Lewis 2019, Appendix 5.7.5), with examples from Thetford (Goodall, Ellis, and Gilmour 1984, 77-8), and Grave 1 at Ballinaby (Grieg 1940, Fig. 15). Amongst hoard finds, a comparative piece can be found from Flixborough, with narrower examples from Hurbuck and Lea Green. Like 'T'-shaped axes, adzes were also used for dressing timber, and for shaping hollow areas where axes could not reach. Despite the paucity of comparative finds, it is reasonable to assume that they would have also been common woodworking tools.

A further example of an adze from the Mästermyr hoard has pronounced, triangular lugs projecting from the underside of the neck (Arwidsson and Berg 1983, Pl. 26). Similar, pointed lugs can be seen on the Thetford adze, and such lugs are characteristic of most Scandinavian socketed tools of this form (Waterman 1959, 72). In contrast, Carhart (2015, 30) observed that all of the socketed tools in the Torksey iron hoard were made with either simple, cylindrical sockets or ones which possessed low, rounded lugs, and that this feature could also be observed on the majority of comparative British tool hoards. While the two Oseberg axes noted above display rounded lugs similar to those seen on TDB 1677 and TDB 2557 (Grieg 1928, Fig. 100), rounded lugs generally suggest a very strong Anglo-Saxon character for the Torksey hoard, with the implication that the Great Army may have been using locally-acquired material culture (Hadley and Richards 2016, 53). The same feature can be observed on the other axes from both camps, suggesting that these, too, are of Anglo-Saxon origin, and potentially signalling that this adoption of material culture was a widespread phenomenon.

5.2.3 Chisels

This thesis proposes that the four Torksey finds listed in Table 5.4 are chisels. Chisels are unusual items among hoards (Leahy 2013, Table 1), and they are typically the tangless type, possibly used as punches or gouges, much like many of the pieces recovered with the Crayke hoard (Sheppard 1939, 280). As a class, gouges and chisels together are comparatively common as excavation finds, with three recovered from Coppergate (Ottaway 1992, 530 & 536). The two positively-identified chisels from Torksey are both noteworthy. TDB 2535 is an unusual tanged form. The closest parallel to this find can be seen in Object 59 from the Mästermyr hoard, although this is roughly twice the size of the Torksey example (Arwidsson and Berg 1983, Pl. 26). A similarly-sized chisel, although with a far more substantial tang, was also recovered as part of a suite of grave goods from Tinghaugen, Bryne, Norway (Schetelig 1912, Fig. 462).

Although damaged, the second Torksey piece, TDB 2787, is clearly socketed, with a projecting, fan-shaped blade. Broadly similar items have been found with the Crayke and Lea Green hoards, where they are interpreted as a socketed gouge and a probable hoe respectively. However, a ninth-century Coppergate find, No. 2258, is a far closer parallel. This is listed as a socketed chisel, although the difficulties of this description are acknowledged (Ottaway 1992, 529-531). While further comparative pieces are known from Britain, the majority come from Scandinavia, including 11 from Hedeby (Schietzel 2014, 92), two from Aggersborg (Roesdahl 2014, 313) and one from Gjermundbu (Grieg 1947, Pl. X Fig. 9). Where the blades are curved widthways, these implements are variously described as mattocks, hoes, and adzes, while examples with straight blades are commonly interpreted as bark scrapers or slices. Slices are relatively specialised tools, used for preparing timber and severing wood fibres when splitting logs (Leahy 2003, 18). McGrail's (1987, 156) claim that the slice was specifically a boatbuilder's tool is unsupported: given the near-universal use of riven timber in the early medieval period, it may have been a more general implement, and Goodall (2011, 23) notes two later examples which derive from contexts associated with general carpentry rather than shipbuilding. Morris (2000, 2109) describes the Coppergate example as a slice, but suggests it may also have been used as a paring chisel, demonstrating the versatility of such an item.

Table 5.4: Chisels from Torksey

Database No.	Length (mm)	Width (mm)	Weight (g)	Image
TDB 2511	40.8	25.4	30.2	
TDB 2535	118	31.2	51	
TDB 2787	130	50	133	
TDB 2800	65.6	12.1	11.4	

The identifications of the other potential chisels are less secure, as these are both incomplete pieces. TDB 2800 is a length of square-section bar, narrowing toward a point at one end. The opposite end tapers and widens to a flat, wedge-shaped terminal with the tip missing. TDB 2511 is a sub-rectangular piece of iron with a 'V'-shaped profile, tapering to a point along one shorter edge, forming the tip of a shaped chisel. Elements of both pieces are closely paralleled by Nos. 2269 and 2270 from Coppergate, which are classed as small woodworking gouges (Ottaway 1992, 536-7), although TDB 2800 also shows clear similarities with No. 2143, identified as a paring chisel (Morris 2000, 2110). If these identifications are correct, it suggests that fine woodworking was undertaken at Torksey. Tools of these forms may have been used for cutting rebates or grooves, seen on items such as chests and buckets, or to smooth hewn surfaces.

5.2.4 Wedges

Table 5.5: Iron wedge from Torksey

Database No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Image
TDB 2475	134.5	38.9	25.7	418.5	 Image: Viking Torksey Project

I propose that TDB 2475 is a splitting wedge. In the early medieval period, timber was almost universally converted by splitting, and a review of surviving English medieval timbers has identified only axe-hewn wood prior to the twelfth century (Fleming 2012, 35). However, splitting wedges are rare finds (Lewis 2019, Appendix 5.7.5), and whilst 16 have been identified from Anglo-Scandinavian levels in York, only one of these is iron, with the remainder being made of oak (Morris 2000, 2106; MacGregor 1982, 147). Eighteen iron wedges were recorded from Flixborough, although seven of these were unstratified. Two of the largest, at 97mm and 60mm long, show signs of repeated striking, leading to the suggestion that they were splitting wedges. However, the majority of these finds were far shorter, with lengths between 20-50mm, and were interpreted as fixings for tool handles (Ottaway and Cowgill 2009, 255). In addition, three iron wedges are known from the Scandinavian levels at Dublin, with further securely-dated individual examples from Oxford, Winchester, and Birka. Morris (2000, 2108) observes that all these examples are also small, with lengths between 37-95mm. Leahy (2003, 27) states that these would not have been large enough to split timber, but also notes that wooden wedges between 130-300mm long have been used to split trunks in experimental works. TDB 2475 sits inside this size range, and is of comparable dimensions to wooden wedge No. 8179 from Coppergate. An iron example of a wedge this size is unique. Morris (2000, 2106) considered iron splitting wedges to be unnecessary, with their expense meaning that seasoned oak was a natural alternative. However, iron wedges would unquestionably have been usable, and both their size and value might have equally meant that they were more carefully curated, not entering the archaeological record so readily. TDB 2475 may show a specialised but comparatively common tool, lost, like so much other metalwork, in the muddy and confused environment of the winter camp (Hadley and Richards 2016, 45).

5.2.5 Other wood-working tools

Two augers have been catalogued from Aldwark. I propose that a further auger is present in the Torksey assemblage. The width of the spoon-shaped bit determines the diameter of the hole which each auger creates, so it is assumed that a variety of sizes would have been used, as suggested by the multiple examples found in the Flixborough and Mästermyr hoards. Wider holes would have been necessary for placing wooden treenails into large frames and structural timbers, whilst smaller pieces may have been used for starting mortice cuts, establishing pilot holes for nails, or for boring into knife or tool handles to insert whittle tangs (Goodall 2011, 23). Given this need for pieces of different sizes, augers are unsurprisingly a comparatively common find: 13 Anglo-Scandinavian examples are recorded from Coppergate alone (Morris 2000, 2113).

One of the Aldwark examples, ADB 762, is described as 'definitely of early medieval date' by Rogers (2020b, 49), although no reasons are given for doubting the provenance of the second. The spoon bit of ADB 762 is 9.6mm wide, with the blade worn and twisted in such a way as to suggest it was typically turned in an anti-clockwise direction. TDB 2798 has been identified as a possible spoon auger. This find is a short length of iron bar with a sub-rectangular section, tapering slightly at one end to a spatulate tang with a broken point. The opposite end is flattened, but with a visible curve, suggesting that it is an abraded spoon bit, asymmetrically worn by repeated sharpening and use, much like Coppergate pieces No. 2264 and 2265 (Morris 2000, 2113; Ottaway 1992, 543): it is unlikely that this shape has

Table 5.6: Other wood-working tools from Aldwark and Torksey

Database No.	Length (mm)	Width (mm)	Weight (g)	Image
ADB 305	Unknown	Unknown	Unknown	Unavailable
ADB 762	160	9.6	Unknown	Unavailable
TDB 2516	61.3	11.6	14.5	 Image: Viking Torksey Project
TDB 2798	128.6	18.8	53	 Image: Viking Torksey Project

been caused by the metal fracturing, as spoon bits typically break at the tip (Berryman 1998, Pl. 2:3). Whilst the sub-rectangular central section of this piece is unusual, it can be compared with augers with flattened sections from Thetford (Goodall *et al.* 1984, Fig. 117:15) and York (Ottaway 1992, Fig. 208: 2266). The surviving width of the spoon bit is 18.6mm. Morris (2000, 2113) states that the Coppergate finds were of a comparable size to 32 further early medieval augers, all with bit widths between 9-35mm and lengths of 140-451mm. The two spoon augers discussed above also align with these ranges: whilst TDB 2798 is roughly 11mm below the lowest limit of the lengths, this can be explained by the broken terminal of the tang. This auger could have been used for boring pilot holes and peg holes for large-scale works, although ADB 762 would have been more suited to lighter work.

TDB 2516 is a short, thin length of iron bar, broken at each end. It has a triangular section with an edge on one side, forming a blade. There is a slight swelling apparent along the cutting edge. I propose that this find is part of a shave blade. There are similar blade profiles on draw-knives and shaves from the early medieval period, with particularly close parallels in the blades from shave No. 54 and mounding iron No. 57 from Mästermyr (Arwidsson and Berg 1983, Pl. 27). The Mästermyr shave-blade is rounded, as are examples from Coppergate (No. 2259) and the Flixborough hoard (Nos. 2460 and 2461). A further rounded shave has been recovered immediately to the south of the Torksey camp, during a monitored detector survey on land south of Torksey Castle (Richards and Hadley 2020, 18). This find, sf180, is comparatively small, with a draw width of *circa* 65mm, so must have been used for delicate or fine work. Although rounded shaves are commonly interpreted as coopering tools, Leahy (2003, 22) rejects the idea that they were pieces of specialised equipment, and suggests that skilled hands could have used these implements to work on a range of objects. However, there is no evidence of a curve on TDB 2516, suggesting that the blade of this piece was originally straight.

Straight-bladed shaves and draw-knives are also known, often with pierced ends which would presumably have functioned as fixing points. Ottaway (1992, 589) records an Anglo-Scandinavian shave of this type amongst the Coppergate assemblage, and notes two more unpublished examples from Biddle's excavations at Repton, sfs 3331 and 5708. A very close parallel to the blade profile of TDB 2516 can be seen in a complete shave from Flixborough, No. 2449 (Ottaway and Cowgill 2009, Fig. 7.1 & 256). Whilst terminology is not used consistently within the literature, Leahy (2003, 22) suggests that straight blades should be described as draw knives: the term 'shave' is applied here due to the find's incomplete preservation, which makes the original form unclear. Nevertheless, straight-bladed shaves and draw knives would have had a limited range of applications, and would principally have been used for rounding and chamfering pieces of wood. However, when mounted, the pierced-ended shaves would also have been able to smooth flat timbers, working along the line of the grain. The presence of a very small shave at Torksey suggests that rough, converted timbers were worked and smoothed into their final forms on the site.

5.2.6 Nails

The nails from Aldwark were not available for examination, and the majority of nails from Torksey were discarded as undated finds, so a full comparison between the two sites is not possible. Nonetheless, the retained Torksey nails have been analysed as a part of this thesis. Nails are difficult artefacts to assess within a metal-detected assemblage. Later finds are almost certainly included with earlier material, but the little-changing nature of nail-making technology means that it is almost impossible to accurately date all but the most modern, clearly machine-made items. These considerations have been discussed in relation to the extensive metal-detected assemblage recovered from the Woodstown site (Bill 2014, 141-3). The procedures established for the Woodstown assemblage were followed for the Torksey nails. Obvious post-medieval and modern material has been recognised and undiagnostic headless nail shanks categorised as ‘Unknown’, with both these categories enumerated but not considered further. Clench nails have been identified at both sites.

Figure 5.2: Nails and clench nails from Aldwark and Torksey

Total data set: 106 nails and clench nails

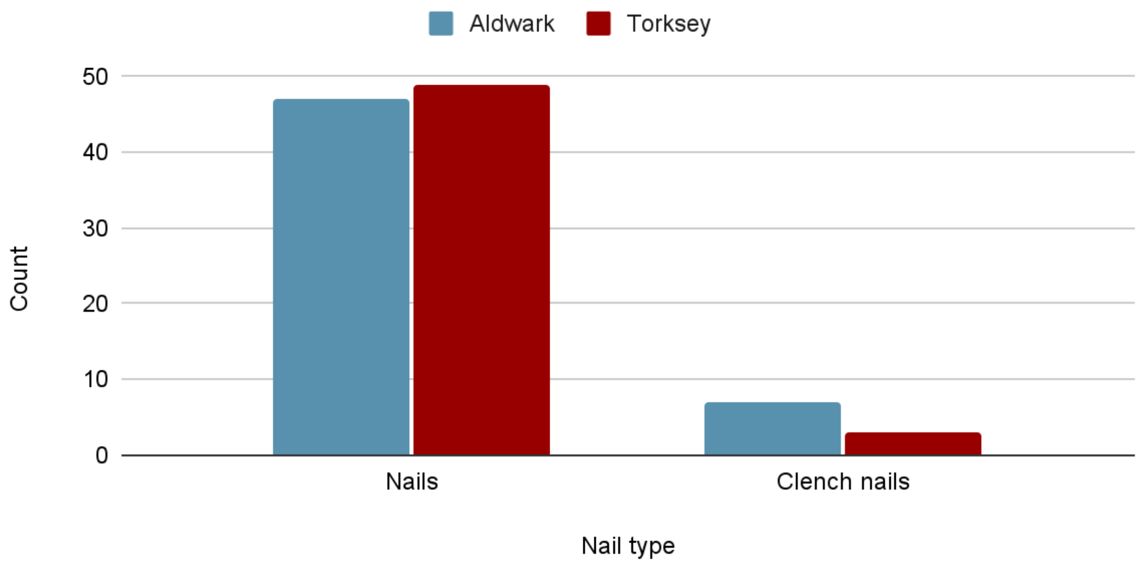


Table 5.7: Classification of nails from Torksey

Possible medieval nails	Post-medieval and modern nails	Unknown	Overall total
31	16	2	49

The possible medieval nails all had squared, faceted, or circular-section shanks. The heads were generally flat and varied between circular and sub-circular, although three nails had rounded, domed heads. The diameters of these heads, and the widths and lengths of the surviving shanks, are presented in Figures 5.3 to 5.5: nails have been excluded from these figures where the relevant dimensions were not recorded.

Figure 5.3: Known diameters of nail heads from Torksey

Total data set: 30 nails

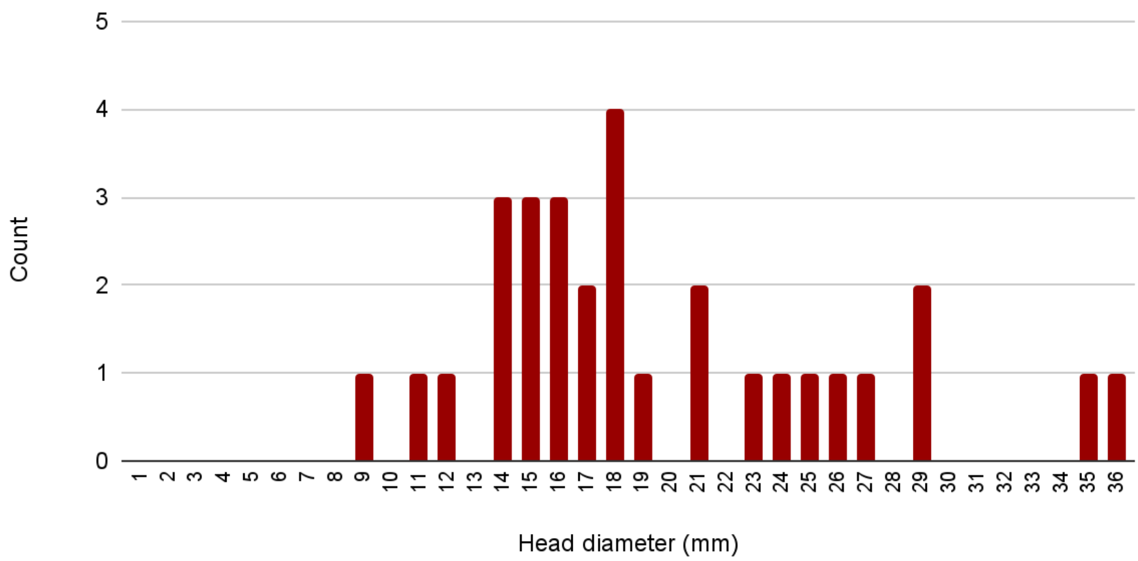


Figure 5.4: Known shank thickness of nails from Torksey

Total data set: 29 nails

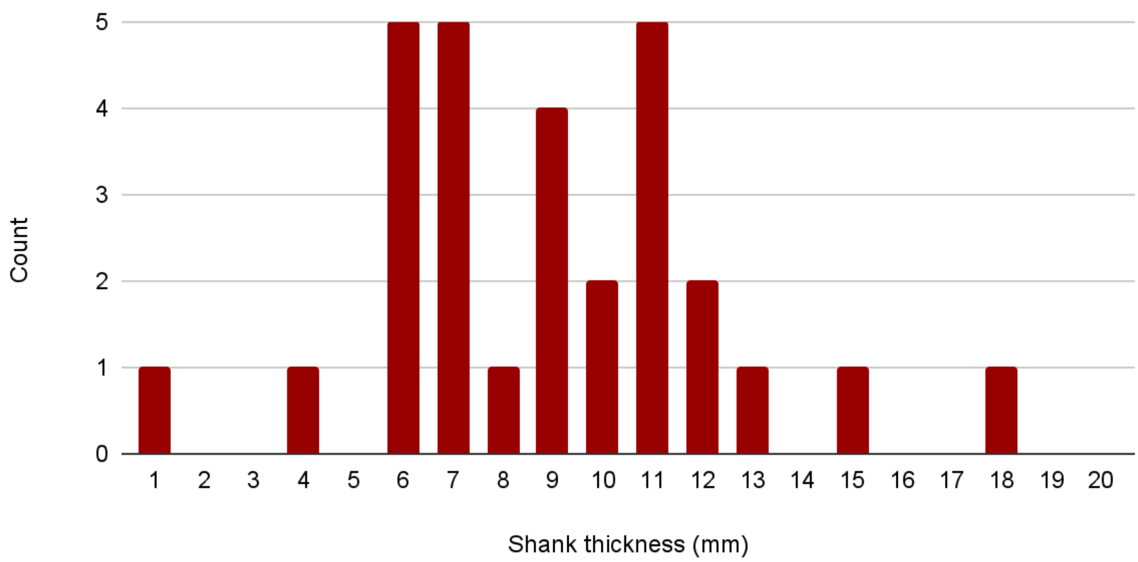
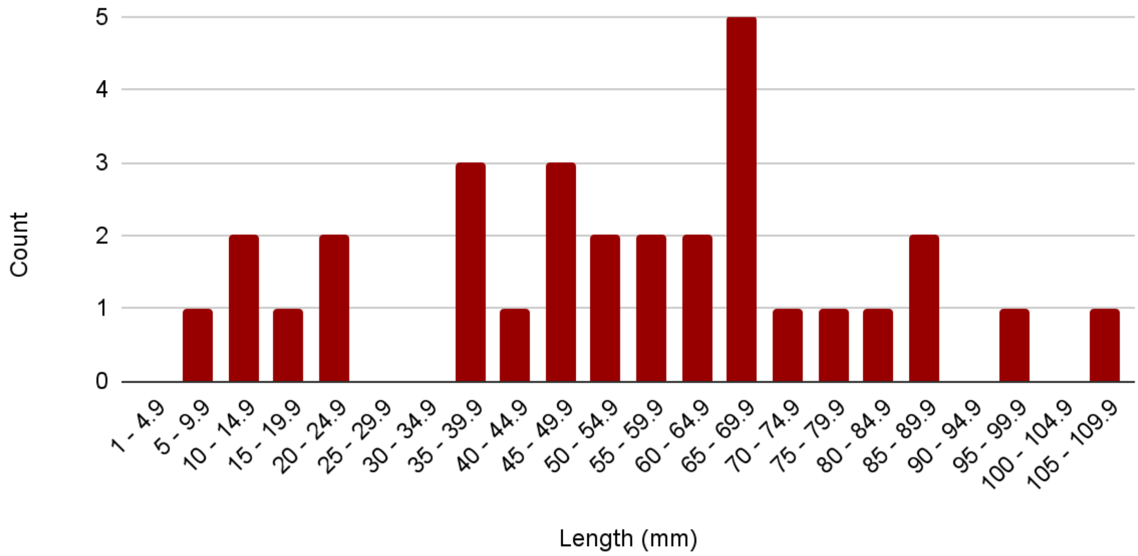


Figure 5.5: Known lengths of nails from Torksey

Total data set: 31 nails



Whilst this data set is small, it is possible to recognise some potential trends. The diameters of nails heads show an erratic distribution, but with sizes generally falling between 9-29mm. Within this, a slight emphasis can be seen for nail heads in the 14-18mm range. A clearer emphasis is evident for the thicknesses of shanks, spanning a range from 6-12mm. This can be further refined, with groupings at 6-7mm and around the 11mm marks. The shank lengths show a far more varied distribution, clearly reflecting the incomplete and fragmentary nature of some of the finds.

Leahy (2003, 23) suggests that early medieval nails were generally made flat-headed, with a square-section shank; this is broadly true of the Anglo-Scandinavian assemblage from Coppergate, which comprised 1300 pieces, 320 of which were complete (Ottaway 1992, 608-9). The nails from Torksey also generally conform to this description, with two-thirds of the assemblage having square or sub-rectangular shanks. At Coppergate, a shank thickness of 4-6mm was recorded for approximately 73% of the nails (Ottaway 1992, 609). This increases slightly in the Woodstown assemblage, where over half the possible Viking Age square-section nails were 6-7mm thick, with only 17% having shanks 5mm thick (Johnson 2014, 149). The small cluster of Torksey nails with 6-7mm thick shanks conform to these models, suggesting that they may be from the occupation of the camp. Wide ranges of head diameters were recorded at both Coppergate and Woodstown. Despite this variation, over half the Coppergate nail heads ranged diameters of 12-17mm, with a cluster at 14-15mm evident in the Woodstown material (Johnson 2014, 148; Ottaway 1992, 609). A similar distribution can be seen in the Torksey assemblage, again potentially indicating nails discarded by the Great Army.

Ottaway (1992, 613) suggests that the majority of the Coppergate nails would have been used for furniture, specifically for attaching locks and fittings to chests and boxes, with the nail sizes generally corresponding with the published dimensions of those used on chests from finds such as Oseberg and Mästermyr. The assessment of the Torksey ironwork undertaken as part of this thesis has identified at least six probable chest fittings and two hollow-stem keys. Two keys, several box mounts, and two chest handles have been previously recorded from Aldwark (Rogers 2020c, 49-50). Furthermore, another find of a decorative domed, tinned nail-head, TDB 2284, has clear parallels with similar pieces recovered from Coppergate and seen securing fittings on chests from Oseberg and Fyrkat (Ottaway 1992, 614). Whilst the presence of large, fitted chests might seem incongruous in a fast-moving and mobile force such as the Great Army, surviving ninth-century ships do not have thwarts or beams above the decking. It is therefore assumed that rowers sat on chests, which would double as both rowing benches and as containers for their belongings (Crumlin-Pedersen 1997, 141). Finds of padlocks and box mounts from the 'garrison' hall at Birka has also led to the suggestion that warriors there commonly kept their personal possessions in individual locked chests (Hedenstierna-Jonson, Holmquist, and Olausson 2013, 297).

Dimensions, shank cross-sections, and rove shapes for the clench nails are given in Tables 5.8 and 5.9. Some of these data are unavailable for the Aldwark finds. Considerable variety can be seen, particularly in the shapes of the roves. Evidence from Hedeby suggests that roves were manufactured from iron strips, producing groups of similar forms (Crumlin-Pedersen 1997, 121): the variety evident at the camps suggests that the surviving roves did not originate from the same place of manufacture. More interestingly, both rounded and square-section shanks are evident, with different internal lengths recorded for the surviving nails.

Although primarily for shipbuilding, clench nails were also used in the construction of some cart bodies and in doors. However, it seems unlikely that these two other uses could account for the number of finds from both sites, particularly given their riverine locations, so it is perhaps safe to assume that the clench nails all derive from clinker-built ships. This seems particularly true of TDB 2367, with its very short internal length. This dimension shows the thickness of the plank which the nail was used to secure: a length of 15mm can only have

Table 5.8: Clench nails from Aldwark

Database No.	Length (mm)	Internal length (mm)	Shank width (mm)	Shank cross -section	Head diameter (mm)	Rove shape
ADB 138	60	Unknown	Unknown	Unknown	Unknown	Square
ADB 139	Unknown	Unknown	Unknown	Unknown	25	Square
ADB 140	28	Unknown	Unknown	Unknown	Missing	Rectangular
ADB 383	Unknown	Unknown	Unknown	Unknown	Missing	Rhomboid
ADB 384	Unknown	Unknown	Unknown	Rounded	Unknown	Square
ADB 386	Unknown	Unknown	Unknown	Unknown	Missing	Rhomboid
ADB 760	Unknown	Unknown	Unknown	Square	Missing	Square

Table 5.9: Clench nails from Torksey

Database No.	Length (mm)	Internal length (mm)	Shank thickness (mm)	Shank cross -section	Head diameter (mm)	Rove shape
TDB 2367	27.5	15.3	10	Rounded	24.9	Rhomboid
TDB 2821	44.5	27	8.8	Square	Broken	Broken
TDB 2822	52	36	8.7	Square	Broken	Broken

been a plank scarf, joining two planks end-to-end to increase their overall length. This procedure would be unnecessary for the short lengths of timber required for carts or doors, so must show evidence of the use of continuous strakes along the hull of a clinker vessel. Examples of plank scarfs secured with clinker nails can be found in Hedeby Wreck I, where seven of the 13 measurable strakes had thicknesses under 16mm (Crumlin-Pedersen 1997, 225-6). Furthermore, Bersu and Wilson (1966, 13-14) noted concentrations of nails with internal lengths grouping around 38mm and 25mm in the Balladoole boat burial, both of which can be seen to roughly accord with the remaining Torksey finds.

Bill (1994, 58) proposed that Scandinavian clinker construction overwhelmingly used nails with rounded shanks, with square-section nails representing a Baltic tradition. By contrast, Goodburn (1994, 102) suggested small, square-section clench nails as a characteristic of later Anglo-Saxon maritime technology. However, evidence from Hedeby harbour demonstrates that square-, round-section, and multifaceted nails could all be used in the same vessel (Crumlin-Pedersen 1997, 123), suggesting a more complex situation than these broad rules allow. The clench nails from Balladoole were 8mm thick on average, and shank thicknesses from 7-10mm were recorded for the Oseberg ship. The three Torksey clench nails, and particularly TDB 2367, lie comfortably within the distributions found in these excavated vessels. However, the Woodstown clench nails showed thicker shanks in use, with the most common diameters found between 8-11mm, and square-section nails with shank thicknesses around 11mm were used as clench nails on the site. Many of these clench nails also had heads with diameters of between 14-19mm, whilst larger nails with head diameters of up to 20-30mm were found on the Gokstad ship (Johnson 2014, 149-53). Similar dimensions can be seen amongst the Torksey nails, with a possible shank thickness grouping around 11mm already noted. It is therefore entirely likely that some of the larger nails recovered were formerly used in ship construction, with the broken shanks showing where clenched ends and roves were removed.

5.2.7 Discussion of wood-working tools

Even if the presence of the ironwork hoard is discounted, the numbers of wood-working tools are notably higher at Torksey. As observed, this imbalance is almost certainly due to the piecemeal and erratic recording of ironwork at Aldwark, which will have undoubtedly introduced a bias. Despite this disparity in numbers, the tools recovered broadly suggest that the same activities were undertaken in each location, with the clench nails recovered from both sites showing clear connections with ship repair. The variation shown in the forms of the clench nails suggest that they probably derive from several different vessels. However, different rove shapes and shank cross-sections were sometimes used on the same vessel, a fact which has been related to the construction and repair of ships in zones of technological and cultural contact (Ravn 2016, 38). A similar factor may have influenced the choices of shank and rove for the clench nails from Torksey and Aldwark, with the different methods used illustrating the different cultural groups which made up the Great Army, or the different areas where the vessels had been repaired.

The presence of ‘T’-shaped axes suggests that timber was shaped into planks at both locations: this would obviously have been a universal process, but in the context of the Great Army, one of the main uses for such planks would have been in repairing ships. With this borne in mind, a similar connection can be made with several further groups of tools. Spoon augers could also have been used for a variety of tasks, and whilst Goodall (2011, 23) notes that the breast auger was only mentioned for ship building in later medieval accounts, this refers to the specific method of mounting the auger bit, rather than the tool itself. Crumlin-Pedersen (1997, 123) observes that treenails do not appear to have been standardised, although they were typically the same size within individual ships. The majority of treenails recovered from Hedeby harbour were between 14-22mm in diameter, and standard diameter of 20-25mm identified on the frames of the Hedeby 3 and Skuldelev 2 wrecks and the Ladby ship (Ravn 2016, Figs. 41 and 43; Sørensen 2001, 223). Auger TDB 2798 could certainly have been used to bore holes which would receive pegs of this diameter. Equally, ADB 762 could have been used to make pilot holes, used for square-section nails with shanks up to 11mm thick: the Hedeby harbour wrecks all had pre-drilled nail holes, accommodating shanks of all shapes (Crumlin-Pedersen 1997, 123). Additionally, whilst the size of shave blade TDB 2516 implies that it would only have been used for comparatively light work, toolmarks on preserved ship timbers show that drawknives and shaves were sometimes employed to finish planks. In particular, marks suggesting the use of a small shave have been identified underneath a tongue scarf on plank 10B of the Skuldelev 1 ship, with the joining faces smoothed to provide a tight seal (Crumlin-Pedersen 2002a, 59 and Fig. 14): as noted, the fabrication of similar scarf joints at Torksey are suggested by clench nail TDB 2367.

The presence of trimming axes TDB 1650 and 2557, slice TDB 2787, and wedge TDB 2475 show even more clearly that timber was processed at Torksey, with large pieces riven and converted. The splitting of tree trunks was a winter task: the eleventh-century document of estate management known as the *Gerefa*, part of the *Rectitudines Singularum Personarum*, states that timber should be cleaved when there is a frost (Swanton 1993, 32). Although the same document lists woodcutting as a task for early summer, this may refer to pruning, or may be an instance where the alliterative form of the text has influenced the content (Harvey 1993, 8). More usual practice, particularly in shipbuilding, would be to fell trees in winter, when low sap limits the amount of potential warping of converted timbers (Ravn 2016, 26). Importantly, clinker construction requires the use of unseasoned planks, which can be easily bent and which resist splitting (Goodburn 2019; McGrail 1987, 108). Whilst timber can be kept in a workable ‘green’ condition for up to two years (Darrah 1982, 219), this requires careful storage, often with the timbers submerged (Ravn 2016, 29). It seems unlikely that a changing and mobile force like the Great Army would have been able to maintain such conditions, and so would almost certainly have worked recently-felled trees, with planks riven from fresh timber.

This aspect of wood-working carries interesting considerations for the winter camps. Primarily, the identification and gathering of suitable timber would take time, and would imply ready access to the surrounding countryside. Oak would have been the preferred wood for ship-building (Ravn 2016, 56) and, whilst frame components could be produced from the natural curves found on field trees or those grown in open-canopy woodlands, components such as planks and stringers would require large trunks with straight growth (Crumlin-Pedersen 2010, 43). These trees would need dense, closed-canopy environments, with the undergrowth cleared and grazing or browsing animals excluded (Ravn 2016, 88). Well-managed woodlands produced high-quality timber throughout the Anglo-Saxon period in England (Berryman 1998, 7), with woodland management specifically mentioned in contemporary legal documents and estate memoranda (Hooke 2010, 156-9). However, for the Great Army, the location of such woodland sites would have been reliant on local knowledge, with regional inhabitants aware of where specific timber could be obtained (Baker 2013, 97). Access to these supplies would therefore require considerable interaction with the population surrounding each camp location. Once felled and lopped, trunks may have been immediately moved. However, this would be a difficult and slow process, and it seems more probable that the time would have been taken to split and partially dress timbers before transporting them to either camp. This exposed, outlying activity suggests that members of the force felt confident of a high level of security outside of the main encampments. The final shaping and fitting of timber would presumably be undertaken within the camps, where the vessels were, and where specialised craftsmen would have conducted the repairs (Ravn 2016, 26-7). The necessary access to resources and skills demonstrate a significant degree of organisation on the part of the Great Army, alongside a high degree of local integration.

Shipyards and timber-processing locations are difficult to identify archaeologically. Fieldwork at the eleventh-century ship-handling and repair site at Fribrødre Å, Falster, Denmark, recovered very few tools, despite high numbers of worked timbers indicating that the area saw intense and extensive woodworking activity (Ravn 2016, 28; Klassen 2010, 306). More notably, no evidence of any long-term structures were identified, suggesting that the location only saw short-term or single-season occupation (Klassen 2010, 302). Although this may be an effect of the limited scale of the excavations, it may equally be related to the military character of the site (Klassen 2010, 351), with itinerant craftspeople only working for limited time periods. Such a situation holds clear parallels with both Aldwark and Torksey, suggesting that any worksites near the two camps may be equally devoid of metal finds or structural remains. Nonetheless, the location of large-scale woodworking or timber splitting would be determined by the availability of resources. At Torksey, charcoal samples recovered from pottery kilns to the south of Torksey Castle show the use of large-diameter oak branches or trunks as fuel (Simmons 2022). Although these remains post-date the camp, they clearly show the existence of mature oaks in the immediate area. The rounded shave sf180, mentioned above, was also recovered from the same location. Whilst this tool has previously been tentatively interpreted as being related to the later pottery industry, two lead weights/gaming pieces and a clench nail were also found during the same detector survey: all three of these items show links to the camp to the north (Richards and Hadley 2020, 18). In particular, the clench nail carries obvious associations with ship repair and the replacement of planking, an activity evidenced on the Skuldelev 3 and 5 wrecks (Crumlin-Pedersen 2002b, 207 and 276). The fixing of overlapping strakes would require delicate workmanship to ensure a watertight fit, and tool-marks showing surface smoothing are visible on all the replacement planks used in Skuldelev 1 (Crumlin-Pedersen 2002b, 105). Shave sf180 would have been eminently suitable for such work, suggesting that it, too, may be linked to the occupation of the Torksey camp: one of the few tools recovered from Fribrødre Å was an iron scraper (Klassen 2010, 359), demonstrating that similar items were present in other ship-handling locations. Given these factors, it seems possible that the area south of Castle Field was used as an outlying boat-repair yard when the Great Army occupied Torksey.

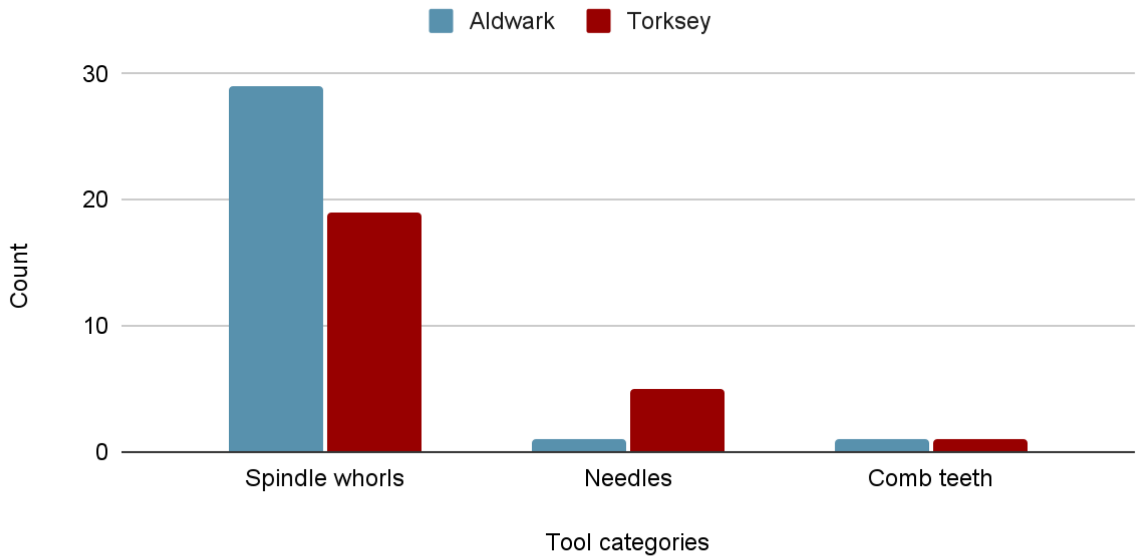
The Domesday survey records large acreages of woodland at thirteen places near to Torksey, with locations such as Lea, Bole, Knaith, and Brampton all within easy reach of the Trent (Stein 2014, 313) and thus suitable for the transportation of converted timbers. However, not only is the management of these woodlands unknown, but it is also impossible to establish whether they existed in the later ninth century. Equally, whilst Stein (2014, 308) suggests that the medieval deer park at Stow Park may have been part of an eleventh-century estate, this again does not demonstrate woodland longevity. A limited number of hunting parks, enclosing red deer, are believed to have existed in later Anglo-Saxon England (Flight 2016, 322-3). However, whilst a deer park may show the presence of established woodland, the majority of such parks were created in the twelfth century to accommodate fallow deer (Sykes 2018, 52-3): given that this species prefer a woodland-edge habitat, characterised by copses of trees and open-canopy coverage, it seems unlikely that formerly managed, high-density woodland would have been a preferred location for emparkment. Nevertheless, whilst specific sites cannot be identified with certainty, place-name evidence suggests that woodlands were particularly abundant across central England and Yorkshire (Hooke 2010, 129), suggesting that both camps would have had good regional access to resources of managed timber.

5.3 Textile-working tools

For textile-working tools, the categories present are spindle whorls, needles, and comb teeth. The numbers of these are given in Figure 5.6. Part of a possible weaving beater may be contained in the Torksey iron hoard, although this interpretation is uncertain: this find is discussed in Section 5.6.3.

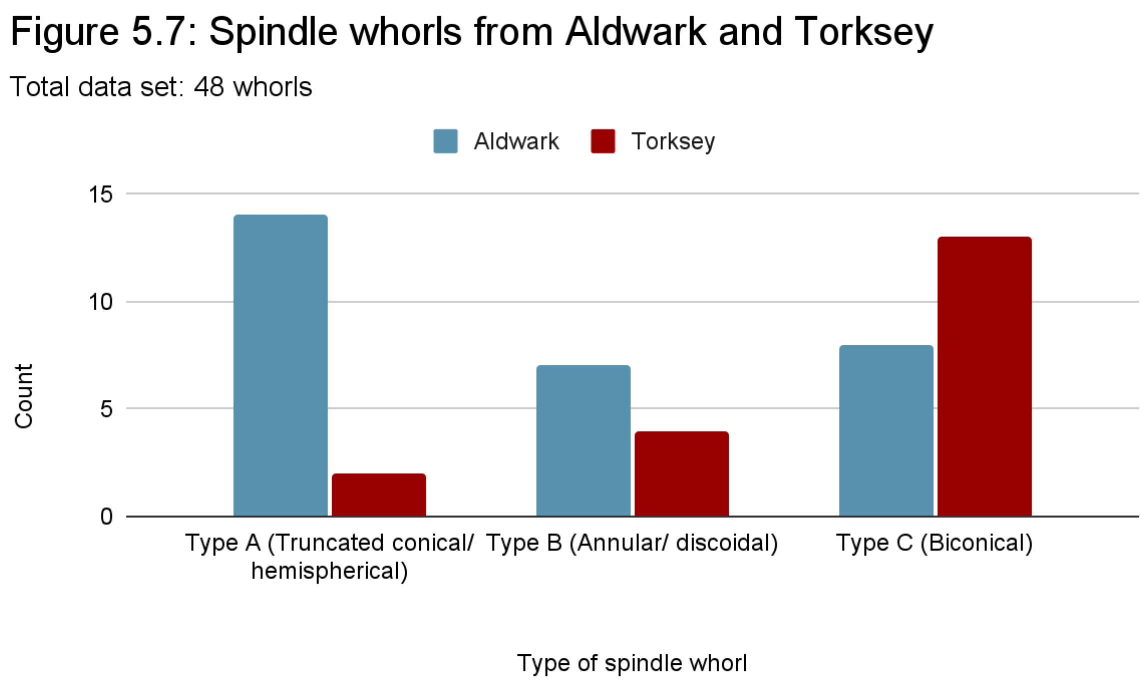
Figure 5.6: Textile-working tools from Aldwark and Torksey

Total data set: 56 tools



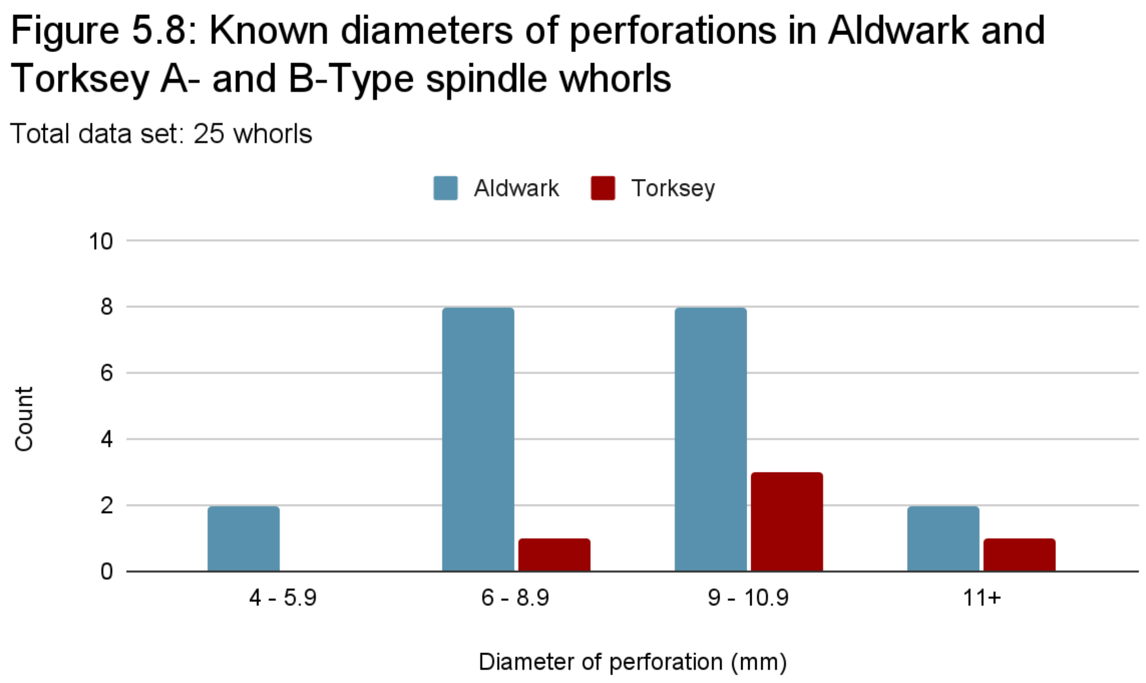
5.3.1 Spindle whorls.

All the recovered spindle whorls are made of lead, with three main types broadly distinguished by their form. Walton Rogers (2020b, 48-9) identified 28 spindle whorls at Aldwark, but considered an additional 27 lead-alloy objects to be too crude to have been usable for spinning and classified them as weights: these artefacts are not considered here, although this thesis does include an additional Type B whorl from Aldwark which was unavailable to the previous analysis. A total of 24 artefacts were recorded as possible spindle whorls from Torksey. This thesis proposes that five of these are again too crude to have performed as whorls: these have also been excluded. The remaining identified whorls from both sites are presented in Figure 5.7.



The Type A (truncated conical/ hemispherical) spindle whorl form was introduced to Britain during the sixth century AD, and remained in use in East Anglia, Norfolk, and Yorkshire until the tenth century (Walton Rogers 2014, 286). Although Type B (annular/discoidal) whorls are known from the Iron Age and Roman periods, at Coppergate the majority were dated between the later tenth and early twelfth centuries (Walton Rogers 1997, Fig. 805). Walton Rogers (2020b, 49) identified eight of the Aldwark spindle whorls as a biconical form, dating to the fifteenth century or later. I have analysed the 13 biconical Type C whorls from Torksey as part of this thesis and suggest that one may be a Roman form and another, TDB 1545, is potentially post-medieval. The others are decorated, identifying them as dating from the later medieval period (Standley 2016, 278-9). Given these date ranges, the Type C whorls from both camps are not discussed further.

Spindle perforations are typically narrower for earlier periods, with the smallest representing Roman pieces, the 6mm to 9mm range demonstrating Early and Middle Saxon use, and diameters larger than 9mm signifying the Late Saxon period (Walton Rogers 2020b, 49). The ranges of these perforations for both sites are shown in Figure 5.8: two whorls with unknown perforation sizes, one from each site, are not included.

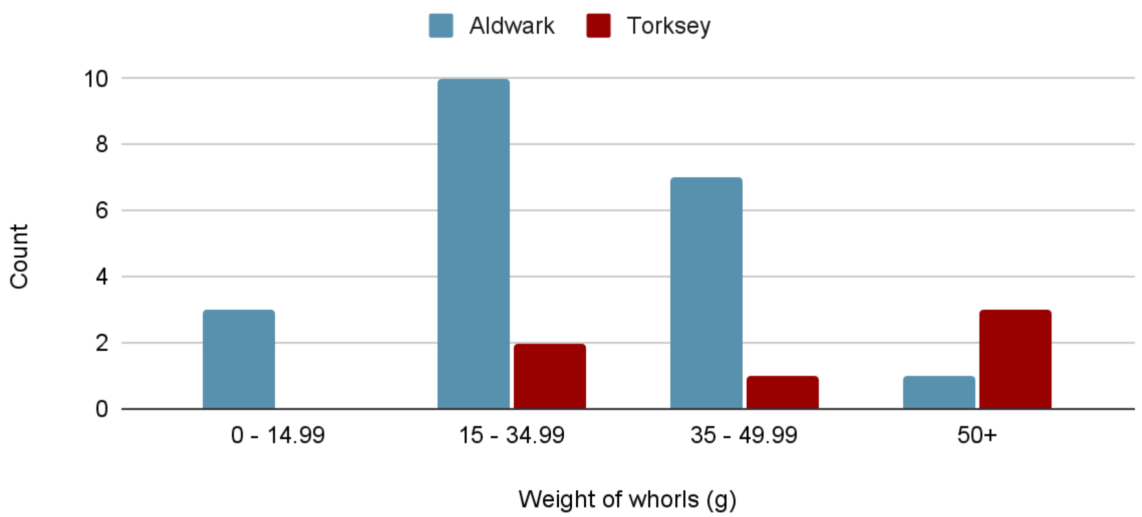


At Aldwark, these dimensions suggest that both Type A and B whorls are equally present across the Middle and Late Anglo-Saxon periods, with a Type B whorl with a very narrow perforation, ADB 985, probably a residual Roman artefact. This wide spread of dates may reflect the pre-camp activity noted at the site. Of the Torksey material, the majority of the measured whorls suggest a later date. Only TDB 1448 falls into the 6mm-9mm range, and as this is also a Type B whorl, this is again most probably a residual Roman piece. However, it must be noted that this is the lightest whorl recovered from the site, indicating that it may also have been made at a later date with the intention of producing a particularly fine thread. The weight distributions of whorls for both sites are given in Figure 5.9.

Whilst it remains only one of several factors, the weight of the whorl influences the type of thread spun, with a heavy weight preferable for a thicker thread (Andersson Strand 2011, 5). The weight distribution at Aldwark is spread across the middle ranges, suggesting that a variety of threads and yarns were produced on the site: again, this may in part reflect the earlier activity at the location. At Torksey, there appears to have been little need for fine or delicate material, and the heavy whorls that dominate may indicate a concern with producing thick, plied yarns: Henry (1999, 72) notes that whorls over 30g are particularly suitable for spinning hemp, used for sailcloth and heavy fabrics.

Figure 5.9: Weights of Type A and B spindle whorls from Aldwark and Torksey

Total date set: 27 whorls



Whilst the assemblage for Torksey is very small, the fact that half of the recovered whorls weigh over 50g is exceptional. At Coppergate only two outlying pieces of 55g and 63g were noted (Walton Rogers 1997, 1743), and of the 121 whorls of all materials recovered from the 1998-2003 investigations at Kaupang, once again only two weighed over 50g. On the same site, Blindheim's 1956-74 excavations recovered 46 whorls, of which 42 were below 40g, with the other four whorls weighing over 60g (Øye 2011, Figs. 13.6 & 13.12). At Birka, of the 309 whorls where a weight could be measured, only 8% were over 50g. Interestingly, these 25 whorls displayed a similar distribution, with the range between 80-94g absent: 17 pieces were 50-79g, whilst the remaining eight were significantly heavier, varying between 95-134g. Of the assessable 755 whorls from Hedeby, eight were in excess of 50g, a total of only 0.8% (Andersson 2003, Figs. 30 & 54). Øye (2015, 43) states that historically, Norwegian whorls above 50g were used for plying yarn. The presence of outlying heavier weight groups at Kaupang and Birka possibly imply specialist production, requiring a specific tool. Andersson (2003, 142-3) speculated that the very heavy whorls from the Mälaren region were used for producing hemp ropes, whilst the absence of both heavy whorls and evidence for hemp suggests that the inhabitants of Hedeby may have instead used lime bast.

Even with such a small data set, it may be that a similar process is evidenced at Torksey, with heavier whorls producing strong, thick yarns to re-supply the Great Army. As with Birka, it is tempting to link this to the production of rope, but repairs to heavy woollen sailcloth are also a possibility. A further nautical use for thickly-spun thread is shown in a series of surviving ship finds: on the Hedeby 1 and Skuldelev 3 and 5 ships, woollen yarns were used as caulking material. These yarns were made deliberately coarsely, with between two and seven threads plied together to create strands with an average thickness of 2mm-5mm. Some yarns were laid in caulking grooves, indicating that they were part of initial construction, whilst others were clearly inserted during maintenance and repair work. In discussing these yarns, Ravn (2016, 53-4 and Fig. 33) observes that the strands are so coarse and thick that they could not have been used for making textiles, so were almost certainly deliberately spun for direct use as caulking material. Clearly, a link can be drawn between this specific manufacturing and the aforementioned suggestion that heavy whorls were tools for specialist production. Equally, a connection can be made between the evidence for ship repair at the camps suggested by the wood-working tools and a need for caulking. Although the finds of caulking yarns discussed above all date to the late tenth or the eleventh centuries, this appears to be connected with archaeological survival rather than reflecting a narrowly-dated practice: it seems entirely plausible that ninth-century shipbuilding also used rough yarn as caulking, despite the lack of empirically dated finds. The production of heavy yarns for caulking, rope manufacture, or sail repair would have been of prime importance to a ship-based force such as the Great Army.

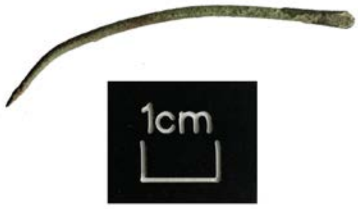
Spindle whorls are a common class of artefact across early medieval sites, and Henry (1999, 72) notes that there is little difference in whorls found in rural and urban contexts. However, lead is one of the least-used materials for their manufacture: fired clay, stone, or osseous materials are far more common, with reworked potsherds occasionally employed. Lead whorls account for only 8.8% of the Anglo-Scandinavian assemblage from Coppergate, and 11.3% of the total recovered from Flixborough (Walton Rogers *et al.* 2009, 283-7; Walton Rogers 1997, Table 146). This proportion changes for Staunch Meadow, where slightly under a third are lead, although this may relate to poor survival rates amongst organic whorls (Walton Rogers 2014, 286). No lead spindle whorls were recorded at Hedeby, whilst only 2% of the total 429 whorls from Birka are classed as 'other materials': these include metal alongside glass and amber, and are all dated to the tenth century (Andersson 2003, 74 & 118, Fig. 45). However, for Kaupang, just over 20% of the 169 identifiable whorls are of lead (Øye 2011, Table 13.12). Caution should be advised before reading too much substance into this. Andersson (2003, 141) noted the huge difference in relative proportions of stone and pottery whorls between Hedeby and Birka, but observed that various factors could influence this choice, with the availability of raw materials as important as any local tradition. However, it seems unlikely that lead was unavailable at either of these locations, which suggests that there may be some regional significance in its popularity at Kaupang, particularly given that the proportion of lead whorls there exceeds their occurrence in Norwegian grave-finds of the period (Øye 2011, 367). The assemblages of lead whorls recovered from Aldwark and Torksey almost certainly show a recovery bias, as non-metallic whorls must have also been present in the camps. As such, the lead whorls almost certainly represent only a share of the original total. Nonetheless, if the use of these pieces was based on regional custom, or focused on specialist production, then lead whorls may have formed a comparatively high proportion of the total number of whorls used.

Most of the stratified lead whorls from Flixborough were Type A, from Middle or Late Saxon deposits, although one was recovered from an eleventh-century context (Walton Rogers *et al.* 2009, 287). At the smaller site of Staunch Meadow, the lead whorls were all Type A, and dated to the Early and Middle Saxon periods (Walton Rogers 2014, 286-8). The lead spindle whorls from Coppergate encompass both A and B Types, and were mainly dated to Periods 4A and 4B (late ninth century to *circa* 975 AD). This suggests that the Type B whorls were introduced by the population who occupied the site's four tenements and represent a specifically Anglo-Scandinavian tradition: an absence of Scandinavian influence has been seen as a reason for the recovery of only Type A whorls from Fishergate (Walton Rogers 1993, 1268). It is possible that a similar process is reflected in the whorls from the two camps, with the earlier settlement at Aldwark producing an Anglian-influenced assemblage, and with Torksey displaying a more Scandinavian character. Evidence suggests that lead spindle whorls were manufactured at Coppergate (Walton Rogers 1997, 1743), and it is almost certain that lead whorls were produced in the camps: in particular, TDB 216 has a worn octagonal shape which suggests hand-finishing, a feature noted on many of the Coppergate whorls.

5.3.2 Needles.

Only one needle has been identified amongst the Aldwark material, whilst five are recorded from Torksey. All the needles are made of copper alloy, and are presented in Table 5.10. Walton Rogers (1997, 1782) established a 50-80mm length range and a 2mm maximum width as the standard dimensions for copper-alloy needles at Coppergate, noting that they were generally longer and thinner than the iron examples. The Torksey needles all fall within this length range, although three are thicker, with TDB 139 substantially so. The known dimensions of the single Aldwark needle indicate that it was designed for finer, more delicate stitching, whilst the Torksey pieces may have been intended for coarser work. TDB 2361 has a regular, even curve, suggesting that this may be an intentional feature rather than

Table 5.10: Needles from Aldwark and Torksey

Database number	Length (mm)	Diameter (mm)	Weight (g)	Image
ADB 1196	46	Unknown	Unknown	 Image: York Archaeological Trust
TDB 139	61	4	2.36	 Image: Viking Torksey Project
TDB 140	51	2	1.96	 Image: Viking Torksey Project
TDB 2361	64	2	1.36	 Image: Viking Torksey Project
TDB 2462	61.2	2.7	2.47	 Image: Viking Torksey Project
TDB 2966	77.18	2.16	2.5	 Image: Viking Torksey Project

post-depositional damage. It is possible that this needle was designed for specific tasks, such as sewing sailcloth. Walton Rogers (1997, 1785) suggests that the especially large medieval needles from Coppergate may have been used to sew canvas.

Needles were manufactured by two techniques, producing either circular or rounded-rectangular eyes. Both forms were common throughout the early medieval period, with the circular-eye type becoming increasingly dominant throughout the tenth century. Both types are present amongst the surviving pieces from both sites, and little dating evidence can be inferred from their presence. Copper-alloy needles are typically far less numerous than iron ones. At Coppergate, iron accounts for almost 97% of the Anglo-Scandinavian metal needles. Whilst this proportion is reduced to just over 90% at Flixborough, this may be a result of the specialised production of fine textiles identified at the site (Walton Rogers 2009, 298-300; 1997, Table 150). In light of this, the absence of iron needles from both Torksey and Aldwark is noteworthy. This may be due to either post-depositional decay, or to issues associated with their recovery and the already-mentioned screening out of iron detector finds. However, as with the spindle whorls, it is highly probable that the pieces listed above represent only a fraction of the original total of needles used.

5.3.3 Comb teeth.

I have identified an iron spike from Torksey, TDB 2851, as a tooth from a wool comb. Although its form is similar to many nails from the site, it is longer than the 65mm established as the division between comb teeth and headless nails within the Coppergate assemblage. Furthermore, the piece has a curving tip and a ‘bearded’ head, displaying the characteristic lip which was identified as being a product of the manufacture of these teeth (Ottaway 1992, 540). Whilst it is shorter than the 90-110mm postulated as a standard size for wool comb teeth by Walton Rogers (1997, 1727), this can be attributed to the tip of the tooth being broken. A similar spike from Aldwark, ADB 338, has also been identified as either a comb tooth or a flax heckle (Walton Rogers 2020b, 48). If the identification of TDB 2851 is correct, then it suggests that fleeces were processed at Torksey, as well as flax or hemp at Aldwark. As with other textile-processing material, comb teeth and spikes are relatively common finds, with a fragmentary comb set in a wooden card recovered from Cottam B (Ottaway 1999, 74-5). Walton Rogers (2007, 248) stresses that textile production would have engaged much of the population throughout the year. These tasks obviously could not stop even when the Army was campaigning: indeed, the comparative peace of the winter camps may well have provided the best opportunity to undertake such activities.

Table 5.11 : Wool comb tooth from Torksey

Database No.	Length (mm)	Width (mm)	Image
TDB 2851	82.5	8.5	 Image: Viking Torksey Project

Whilst it is impossible to know whether the primary procedures of fibre preparation were undertaken at the camps, both do occupy waterside locations suitable for fleece washing and flax retting. The presence of combs or heckles indicates that fibres were sorted and prepared for spinning on both sites: these were skilled tasks, important for determining both the quality and the type of thread produced (Øye 2022, 37). Thread and yarn would have been an essential resource for the Great Army, and were clearly produced at both locations, with particularly substantial yarns implied by the Torksey finds. We cannot know whether cloth was woven on either site, although if a weaving beater is present in the Torksey tool hoard, this would have been an effective tool for producing a heavy, tight fabric such as sailcloth (Øye 2022, 52).

5.3.4 Discussion of textile-working tools

The presence of Type B lead whorls at both camps is notable. Whilst the form was not the only shape of whorl used in Scandinavia, its appearance in later Anglo-Saxon England is seen as an indication of Scandinavian influence. Of the identified Kaupang finds, lead is more commonly used for Type A whorls than Type B (Øye 2011, Table 13.1). However, the 'thin' Type B form also appears as a native Irish form, and the prominence of the Type B shape in the 'northern Danelaw' area has been linked to contact with Scandinavian Dublin (Walton Rogers 2020c, 95-6). A similar process may lie behind the use of these whorls by the Great Army, with their presence potentially signalling a link to not only Scandinavian material culture in general, but also to Irish or Hiberno-Scandinavian factions within the force. However, the very high proportion of discoidal/cylindrical metrological weights at Aldwark has already been noted (Section 4.3.1), and a similar dominance of the shape is apparent amongst lead pieces identified as fishing weights (Section 8.2): discoidal lead castings were clearly produced for a variety of functions at the camp, so the Type B whorls recovered there may merely reflect these general manufacturing processes. Nonetheless, lead casting at Torksey seems to have concentrated on different forms, most notably the domed or conical shapes seen amongst the weights and gaming pieces. In this instance, it seems less convincing to argue that any Type B whorls made in the camp were merely a result of standardised production. Therefore, whether they were manufactured in or imported to the camp, the Type B whorls at Torksey may more probably reflect deliberate cultural choices.

Viewing textile tools as purely female-gendered artefacts is too simplistic a reading, and Hayeur Smith's assertion (2020, 23) that men were excluded from textile production equally seems too extreme a view. Spindle whorls were recorded in four male graves at Kaupang, and weaving tools are found in men's graves across western Norway, suggesting male involvement in textile manufacturing processes (Øye 2011, 371-2). The connection of weaving tools with male-gendered contexts has led to the suggestion that men may have participated in the production of sailcloth (Øye 2022, 4). This assertion can be linked to the heavy whorls in the assemblages from Aldwark and Torksey, and the suggestion that these were used for the specialist production of yarns for caulking: whilst not sailcloth, caulking still shows a nautical usage, and one which required the manufacture of a specific product. Nonetheless, Walton Rogers (2020c, 89) accepts that textile production was largely controlled by women. Textile products have long been viewed as a sign of Scandinavian influence in Insular contexts (Bender Jørgensen 1992, 38-40), with spinning seen as a culturally conservative tradition (Hayeur Smith 2015, 27). These factors argue that the movement of textile tools relates to the movement of women, and the presence of Scandinavian-influenced Type B whorls may be seen to reflect observations by Kershaw (2013, 173-178: 2021, 111) on the role of women as the bearers of cultural tradition, maintaining distinct methods of textile production. When viewed in conjunction with evidence for the use and manufacture of female-gendered dress accessories (Sections 6.3.4 and 7.2), these whorls might indicate the presence of Scandinavian women at Torksey. However, despite the difference in form, the comparatively high incidence of lead whorls at Kaupang, coupled with the possible use of heavy whorls for specialist production, may indicate a link to maritime technology. In this instance, any potential link to gender seems far more speculative, with the whorls merely reflecting broader cultural trends.

5.4 Knives

Three knives were catalogued from Aldwark. Of the 13 recovered from Torksey, three are clearly modern, with a further five of later medieval or post-medieval form. These eight knives are therefore enumerated below, but not discussed further. No information was available for two knives from Torksey, and no detailed information was available for two from Aldwark, although both were catalogued as early medieval. The terminology and typology followed here is that of Ottaway (1992).

Table 5.12: Knives from Aldwark and Torksey

Location	Probable early medieval	Later medieval/ post-medieval	Modern	Unknown	Total
Aldwark	3	0	1	0	4
Torksey	4	5	2	2	13

Knives were universal, everyday tools throughout the early medieval period, and are common finds. The Coppergate assemblage totaled 211 knives and seven unattached tangs. Of the five possible early medieval knives from Torksey, three were of the ‘angle-back’ form, Ottaway’s Type A. The A2 sub-type could be identified on two of the knives, where the rear part of the blade back angled upwards relative to the cutting edge. Two further knives could be identified as Ottaway’s Type C, with backs which were straight and with convex curves toward the tip. Both of these appeared to be of the C1 sub-type, with horizontal backs, although wear on the cutting edges means that this is not entirely certain. The Torksey example, TDB 2479, was broken near to the angle of the choil (the ‘step’ in the blade between the tang and the cutting edge), with the tang absent.

The angle-back shape is believed to have an English origin, developed from the late Roman period, with the form evolving into two distinct variations by the later Anglo-Saxon period: the ‘long’, weapon seax and the shorter ‘common’ seax of the Type A form. Whilst ‘long’ seax blades are found in Scandinavia from the eighth century, after the start of raiding activity westwards, the ‘common’ seax is unknown there. The A2 sub-type was a development of the late eighth or early ninth centuries, becoming common in the later ninth to eleventh centuries, when it is the most frequently-identified sub-type of the Type A back form. A1 and A2 knives together comprised 19% of the identifiable assemblage at Coppergate, with the Type A shape most common in Periods 3, 4A, and 4B, indicating that it was a popular early

Table 5.13: Type A knives from Torksey

Database No.	Length (mm)	Width (mm)	Type/Sub-type	Image
TDB 288	134	24	A2	Unavailable
TDB 843	Unknown	Unknown	A	Unavailable
TDB 1427	95	21	A2	 Image: Viking Torksey Project

Table 5.14: Type C knives from Aldwark and Torksey

Database No.	Length (mm)	Width (mm)	Type/Sub-type	Image
ADB 1050	100	15	C1	Unavailable
TDB 2479	105	18	C1	

Anglo-Scandinavian form: the A2 sub-type comprises roughly 33% of the identified mid-late ninth-century/early tenth-century Period 3 knife blades from the site (Ottaway 1992, 563-4 & Table 36). The presence of this sub-type at Torksey conforms very strongly to the date of the occupation of the camp, so both these knives can be credibly linked to the Great Army's overwintering. Both these A2 knives also fit the length range that Gale (1989, 72) used to define the ‘common’ seax, lying between 80-360mm. This also accords with knife length ranges from Coppergate, with a concentration between 80-115mm. The presence of three Type A knives at Torksey may indicate that the Anglo-Scandinavian preference for this form began early, and also demonstrate the same adoption of local material culture as suggested by the socketed woodworking tools, discussed above. Even within such a small assemblage, the proportion of these Type A knives agrees with the popularity of the form seen in mid-Saxon settlements (Rogers 2014, 267).

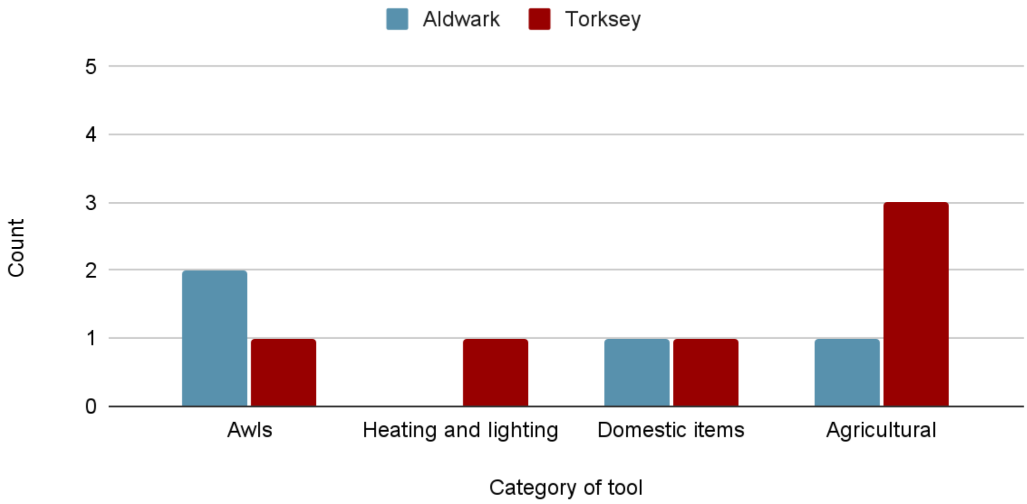
The Type C is a far more generic knife form, which developed in the mid-Saxon period and was popular throughout the ninth to eleventh centuries. Ottaway (2013, 114) observes that the form is the most common type encountered in both the middle and late Anglo-Saxon periods, comprising 55% of the identifiable assemblage from Coppergate and as many as 77% of the blades from Flixborough. Whilst the C1 form is the dominant sub-type encountered in mid Saxon contexts, this situation is reversed in the later Anglo-Saxon period, when the C3 form became more popular. However, this difference may be somewhat illusory, as many later C3 knives potentially began use as blades of C1 form, with the shape altered by repeated sharpening (Ottaway 2013, 116-7): thus, the presence of these two C1 knives accords with the dating of both camps, and both can again be linked to the Great Army’s presence. ADB 1050 displays the ‘S’-shaped wear pattern along the blade which characterised many of the Coppergate group of C1 knives, and a similar pattern of wear, although not as pronounced, can also be discerned on TBD 2479. The Coppergate Type C knives varied considerably in size, with total lengths between 87 and 200mm, often with long tangs. The unbroken blades showed a similarly wide range of lengths, between 57 and 125mm, although the majority measured between 60 and 80mm (Ottaway 1992, 565-70). The Aldwark and Torksey knives lie toward either end of these ranges, although neither is exceptional.

5.5 Other tools

This section includes several smaller categories of tools associated with leatherworking, heating and lighting, domestic items, and agricultural equipment. The comparative proportions of these categories are shown in Table 5.16.

Figure 5.10: Other tools from Aldwark and Torksey

Total data set: ten tools



5.5.1 Awls

Awls are typically classed as leatherworking tools, due to their diamond-shaped or sub-rectangular cross-section, designed to make a clean cut through leather. Two Aldwark iron finds were catalogued as leatherworking awls. One of these, ADB 766, is recorded as having a rectangular cross-section, whilst ADB 814 was assessed as being stylistically early medieval (Rogers 2020c, 49). Two other finds from Torksey, TDB 141 and 142, have been suggested as potential awls (Hadley and Richards 2016, Fig. 25). Whilst the forms of these pieces do hold strong similarities with early medieval awls, particularly the sub-square cross-section of TDB 142, both are made from copper alloy for which no parallels have been found. These pieces presumably have some other function, and are not discussed further.

I have identified a single iron awl from Torksey, TDB 2505, that has a circular section. Ottaway (1992, 552*)* notes that circular-section awls would have been less effective as leatherworking tools: whilst they may have been used as tanged punches, they may also have been used for piercing materials such as bone, wood, or heavyweight cloth. Circular-section awls from both Coppergate and Pavement in York are notably short in comparison to diamond- or rectangular-sectioned Anglo-Scandinavian awls. This find conforms with that model: although the tip of the tang may have been broken, it is shorter than the 68mm of the longest Coppergate example (Ottaway 1992, 554; MacGregor 1982, 80). The awl does not display a gentle taper, but swells swiftly from the tip and maintains a regular diameter of roughly 5mm along the length, suggesting that it was designed for enlarging a hole rather than for initial piercing. This piece may have been used for making wide holes in a robust and relatively open-weave material, and accords with the suggestion that heavy, coarse textiles may have been worked at Torksey.

Table 5.15: Awls from Aldwark and Torksey

Database number	Length (mm)	Width (mm)	Image
ADB 766	Unknown	Unknown	Unavailable
ADB 814	Unknown	Unknown	Unavailable
TDB 2505	67.15	5.02	 Image: Viking Torksey Project

5.5.2 Domestic items

This thesis interprets iron object TDB 2837 as a strike-a-light or firesteel. This has a flat, tapering shank, with a curving arm projecting from the wider end with an angled 'lip' at the base. This piece has not been X-rayed, but corrosion products suggest that there may be a piercing approximately midway along the shank. There are two very strong parallels for this piece from Coppergate. TDB 2837 conforms to the larger size of No. 3681, which has a central piercing, suggested as a suspension point. A similar 'lip' on the base of the shank is visible on No. 3682 (Ottaway 1992, Fig. 293).

Object TDB 2794 is a roughly triangular piece of iron, with a lenticular longitudinal section and a sub-rectangular cross-section. One end comes to a clear, sharp point, whilst the other forms a curved, wedge-shaped blade. I propose that this is a mill pick, used for dressing quernstones. This interpretation was suggested for a similarly-sized and shaped object from

Coppergate, No. 2271 (Ottaway 1992, Fig. 211). TDB 2794 is not an exact parallel for the Coppergate example, but it does resemble the later, larger forms noted by Ottaway. Goodall (1987, 181) identified elongated, square-sectioned bar No. 33 from Goltho as a possible mill pick, but noted that it could also have been used for pecking holes in slates. Part of a sandstone rotary quern, ADB 259, was recovered from Aldwark (Rogers 2020c, 49). Pick TDB 2794 would have been used to maintain the corrugated grooves on such a quern, necessary for the effective milling of grain. Like strike-a-light TDB 2837 above, these pieces give us a glimpse of the ongoing daily necessities of life within the camps.

5.5.3 Agricultural equipment

Four complete ploughshares have been recovered from the two camps, as shown in Table 5.18: three were recovered as a group from Torksey, with two of the shares slotted together. All four shares are of a roughly symmetrical, triangular shape, with open flanged sockets

Table 5.16: Ploughshares from Aldwark and Torksey

Database No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
ADB 160	Unknown	Unknown	Unknown	Unknown
TDB 2330	312.5	110	23.5	2427.5
TDB 2331	308.5	103	29	2115
TDB 2332	250	90	26.4	1584.4

where they would have been attached to the plough frame. This form is seen as a development of the Roman period, although its use continues beyond the tenth century, with Graham-Campbell (1980, 12) cataloguing a Viking-Age example from Furnes, Hedmark, Norway. Comparable ploughshares in Britain are known from St Neots (Addyman 1973, 94), Thetford (Goodall *et al.* 1984, 81), Parliament Street, York (Tweddle 1986, 195-6), and Flixborough (Ottaway 2009a, 245). A ploughshare was also recovered as part of the stratified hoard at Bishopstone, Sussex (Ottaway, Barber, and Thomas 2010, 130; Thomas and Ottaway 2010, 102) and further examples were found with the Westley Waterless and Nazing iron hoards. Another ploughshare was deposited with other goods in a ninth-century boat grave at the cemetery at Westness, Rousay, Orkney, whilst a final example was recovered during recent excavations at Foremark (Hadley and Richards 2021, 115;

Maldonado 2021, 65 & Fig. 3.23; Graham-Campbell and Batey 1998, 136-7). The circumstances of these artefacts lead to an interesting consideration: with the exception of the examples from St Neots, and possibly Foremark, the remaining ploughshares have been recovered from contexts which suggest either hoarding or other forms of deliberate deposition.

Written sources such as the *Gerefa* indicate that shares were judged to be so valuable that they were kept separately from the ploughs themselves (Banham and Faith 2014, 48). The intrinsic worth of the metal must have contributed to much of this value (Leahy 2003, 171). The ploughshare in the Nazing hoard was cracked and almost certainly unusable when buried. This follows the general character of the hoard, with several crushed and broken items suggesting that it may have been a deposit of scrap metal. The Thetford share was accompanied by three iron bars: these objects may again have been regarded as a resource for recycling, as the share was also fractured and one of the associated bars had been cut with a chisel. However, the remaining finds listed above all appear to have been deposited in good condition. Whilst valuable tools may have been hoarded or retained purely for their metal, more nuanced interpretations of these deposits are also possible. Recent study has challenged the interpretation of iron hoards solely as deposits of expensive, potentially reusable material (Thomas *et al*. 2016, 753-55; Thomas and Ottaway 2008, 386). These works have also noted the symbolic aspects of many of these hoards, which may be seen to have structured contents of carefully-chosen items. The deposition of ploughshares may therefore be seen to reflect more than merely their value as a source of usable metal. The possible symbolism of the Torksey ploughshares has been observed by Hadley and Richards (2021, 200), with the group associated with fragments of calcined bone, possibly indicating their attachment to a cremation: Thomas *et al.* (2016, 754) specifically note apparent connections between two buried ploughshares and ninth-century funerary chapels, suggesting that these formed cult foci within settlements. Furthermore, the inclusion of a share in the No. 11 boat grave at Westness demonstrates that these items could also find a place in Hiberno-Scandinavian funerary contexts. Whilst the three shares recovered from Torksey could be seen to fit this model, the single find from Aldwark is more uncertain. However, the Foremark example reinforces the association of single ploughshares with the winter camps of the Great Army.

Cooijmans (2021, 192) suggests that finds of agricultural tools at Viking camps may indicate that the inhabitants ‘adopted agricultural practices’. Whilst this may be true of the assorted agricultural implements recovered from the site at Péran, Brittany (Nicolardot and Guigon

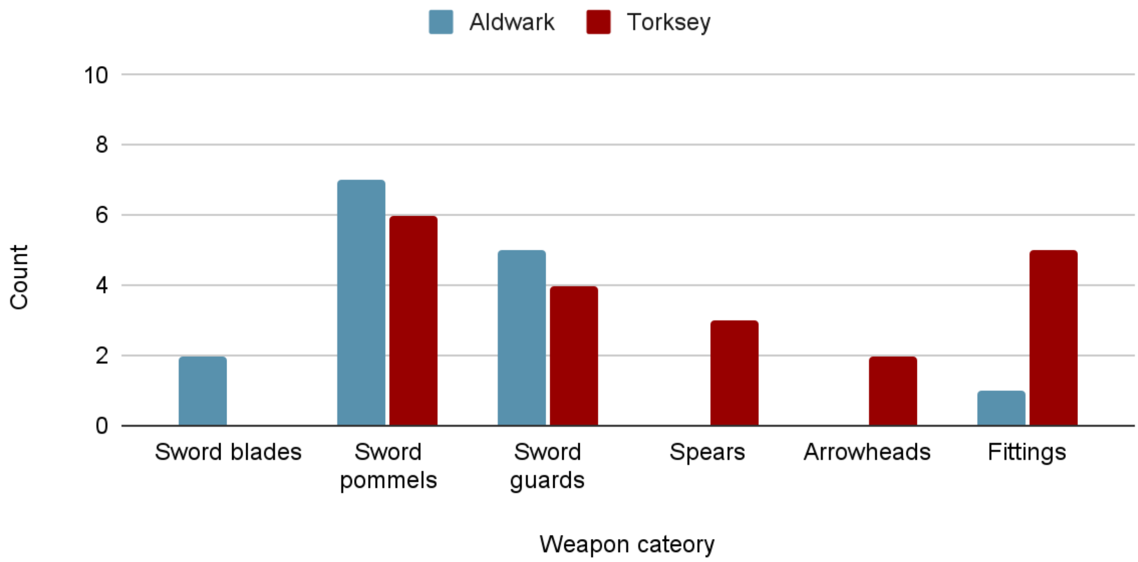
1991, 137-8 & Fig. 14), it is difficult to see the shares from Aldwark, Torksey, and Foremark being used for ploughing within the context of these locations: the comparatively limited areas of the two study sites, coupled with their short spans of occupation, make any attempt at longer-term cultivation unlikely. However, Thomas *et al*. (2016, 754-5) note that the agricultural roles of such items represent only one potential 'use' within early medieval society, with ploughshares featuring in rituals signifying long-term ties to, and ownership of, arable land. It seems improbable that such large, heavy items were casual losses, and the three grouped shares from Torksey almost certainly indicate deliberate deposition. Their retention may therefore signify the expression of a more symbolic relationship with the land by factions of the Great Army.

5.6 Weapons

This category has been taken to include swords, spears, arrowheads, and associated fittings. Some of the same issues of typology that were noted with axes also attend to swords and spears: again, the standard reference remains that of Petersen, composed in 1919. However, this work almost exclusively detailed Norwegian finds, for all that it has subsequently been applied in a pan-European context. New hilt forms, unknown to Petersen, have been identified since his work was completed (see Haldenby, Hadley, and Richards 2022), and he included spear types which were either rare or unknown in Britain. Wheeler (1927) attempted to produce basic typologies of British spearheads and 'Viking' swords, but this work is affected by both simplification and problems with dating. Although Swanton (1973) produced a detailed analysis of earlier Anglo-Saxon spearheads, there are no more recent reviews of later Insular sword or spear typologies: whilst Solberg updated Petersen's work on spears, and Geibig undertook the same for swords, these studies were focused on Germany and Norway respectively (Androshchuk 2014, 13-27; Halpin 2008, 148-9). Petersen's typologies are broadly followed here, but with references to other works. The numbers and categories of weapons are presented in Figure 5.11.

Figure 5.11: Weapons from Aldwark and Torksey

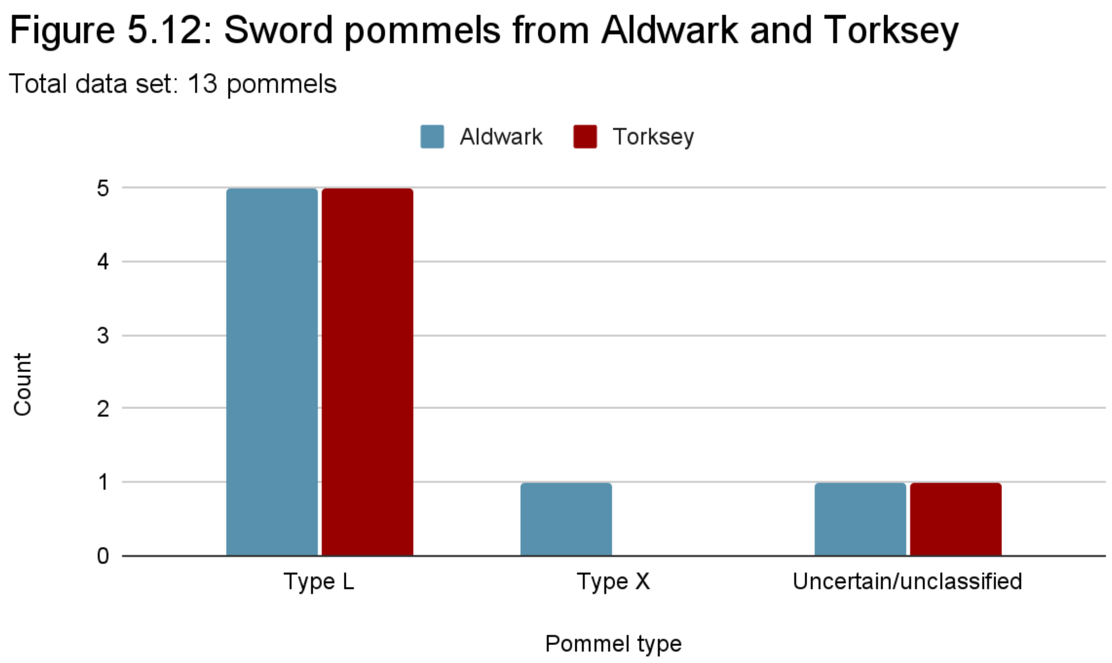
Total data set: 35 items



5.6.1 Sword blades

The blades from Aldwark comprise three broken sections of one complete blade, ADB 132.1, and a fragment of another, ADB 911. Although ADB 132.1 was recorded as associated with a pommel, this was not attached to the blade: given that no lower guard was recovered, it seems unlikely that these represent elements of the same original weapon. A herringbone/chevron structure is visible on the x-rays of both blades, indicating pattern welded cores (Ager 2020, 17-18; Rogers 2020f, 63). The pattern welding technique was most common in England during the fifth to seventh centuries, with its use increasingly declining into the tenth century (Mortimer 2019, 95-96). There has been considerable debate over whether this method of forging produced a structurally superior blade (Ellis Davidson 1962, 30), or whether such swords were primarily valued as markers of rank and social hierarchy, prized for the complexity of their construction (Lang and Ager 1989, 110). In either instance, pattern-welded blades were highly-valued and valuable items (Brunning 2019, 86). This is especially pertinent when considering TDB 132, which was almost certainly preserved whole in antiquity and damaged only after deposition (Ager 2020, 17). Fleming (2012, 24-7) observes that pattern-welded blades required a complex mix of a minimum of four ferrous alloys to forge. If the blades were melted down for recycling, however, the resultant iron would only be usable for utilitarian items, as the swords themselves could only be produced from freshly-smelted metal. Thus, it seems highly probable that both these blades were kept for their perceived innate worth, rather than for any potential scrap value, and it equally seems unlikely that they could be easily lost. These pieces appear to be hoarded items, deliberately buried and not recovered.

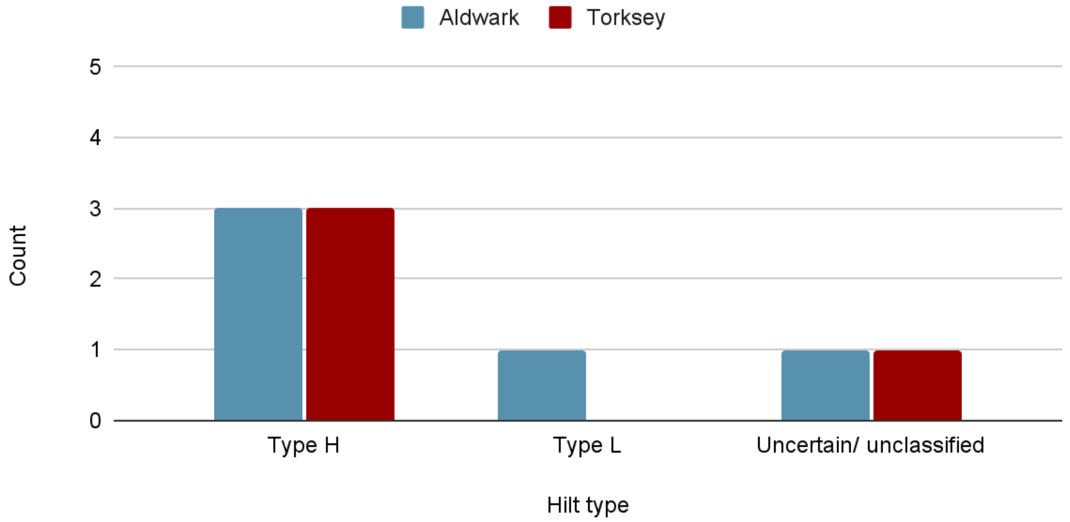
5.6.2 Hilt furniture



The comparative numbers and Types of sword pommels are shown in Figure 5.12. Although ADB 1053 has been previously identified as a Petersen Type L pommel (Rogers 2020f, 63 and Figure 23), I have catalogued it as ‘Uncertain/unclassified’. Whilst the upper profile of the piece displays some of the classic tripartite form, with suggestions of a higher central knop, the shoulders are low and lack the concave hollows which typify the Type L. Equally, the base has only a very slight arch, so gentle as to almost be flat, at odds with the ‘strong curve’ characterised by Petersen. The piece is also very thin, with pointed lateral terminals, unlike the rounded, sturdy pommels which generally distinguish the form. To some degree, the profile suggests an earlier piece, perhaps a Petersen Type A or a Behmer Type 8 (Behmer 1939), both dating to the eighth century. As such, it would be more representative of the background Anglian activity identified on the site. However, these parallels are not strong, and a pommel of either type would be notably outside the usual distribution, centred on Germany. Androshchuk (2007, 161) has suggested that the Type L may be divided into two sub-types: a ‘British’ form of the more typical Type L, and an ‘Irish’ group with straighter guards and with thin, narrow pommels of a more triangular profile: only two examples are cited for this latter sub-type, with only one found in Ireland (Androshchuk 2014, 67-68). Nonetheless, the plan and section of ADB 1053 are paralleled reasonably closely by these two examples. Whilst the upper profile of the piece is not so convincing, lacking the rounded central knop and lateral terminal projections, this may be due to the general poor condition and active corrosion of the find. More notably, ADB 1053 would have received a tang which passed through the entire pommel, a feature absent from the two examples cited by Androshchuk. Nonetheless, it is possible that this unclassified piece may be a regional, 'Irish' variant of the Type L.

Figure 5.13: Sword guards from Aldwark and Torksey

Total data set: nine guards



The numbers and forms of the recorded guards are given in Figure 5.13. Four definite guards are recorded from Aldwark. One of these, a strongly curved Petersen Type L, was associated with pommel ADB 133.1 and the remains of a tang, indicating a complete hilt stripped whole from a sword blade. Three other pieces are Type H guards (Rogers 2020f, 62), one of which is decorated with inlaid wire. A final piece of iron, ADB 232.1, appears to be part of a guard, broken across the blade aperture and with only one quillion remaining: it is not possible to suggest a type for this piece with any certainty, although the flat, lenticular form suggests it is derived from Scandinavian models. One of the Torksey Type L pommels, TDB 2582, was associated with guard TDB 3483. Although these two finds were recovered within one metre of each other, it seems unlikely that they are elements of the same hilt. The guard is of flat, lenticular form, with small, sub-circular piercings located at either end, flanking the central slot. This slot formerly held the tang, whilst the piercings accommodated rivets attached to the pommel: the presence of these holes indicate this is an upper guard, and therefore not a match for a curved Type L pommel. It seems more probable that this piece was part of a Petersen Type H sword. The two remaining identified Torksey guards are also of Type H form. Both are lower guards, and the remains of bands of inlaid wire are visible on one.

TDB 1428 has been previously interpreted as a soldering lamp. Although two very broadly similar finds are known from Coppergate, these are both much smaller, and the slight lip present at one end of the Torksey piece appears to be a product of damage rather than design. The x-ray of TDB 1428 shows a sub-rectangular slot in the centre, suggesting a hole for a tang, and I suggest that this artefact is the upper guard from a sword. The curve of the piece is suggestive of a Type L hilt, although the 'dished' shape, with a central bowl approximately 18mm deep, weakens this comparison. However, a parallel can be seen on a Type L sword with a 'boat-shaped' upper guard from Vardal, Oppland (Androshchuk 2014, 474 and Plate 121). Morphological parallels can also be drawn with several cast copper-alloy guards recorded by the PAS, particularly with SUSS-A6ADE2, a find from 'near Chichester', Sussex. TDB 1428 is again slightly larger than both these pieces. However, the dished central recess is of a comparative size to those found on some of the copper-alloy guards. These guards are associated with a highly standardised form of five-lobed cast copper-alloy pommel, overwhelmingly found in England, and unknown to Petersen. It has been suggested that hilts of this form are connected with the Great Army, lost either through poor production or the deliberate stripping of sword furniture (Haldenby *et al.* 2022). Although other known upper guards are of copper alloy, it is possible that this iron fitting was manufactured to house one of the copper-alloy pommels, and at least one complete hilt of this form survives with mixed iron and copper-alloy guards (Vlasatý 2018).

All the identified guards and pommels of Types H and L can be dated to the later ninth century. The Type X hilt is also thought to exist in the later ninth century (Jones 2002, 20), although this is contested, with suggestions that the Type originated at the start of the tenth century (Hjardar and Vike 2016, 169: Androshchuk 2014, 81-82). Pommel ADB 241 may therefore relate to later activity at Aldwark. However, given the concentration of uncontested ninth-century sword furniture on the site, it seems more probable that it was deposited during the Great Army's occupation. The relative abundance of pommels on both sites is striking, and may relate to the use of these fittings as a source of scrap. Type L swords frequently have precious metal foils applied to the hilts (Ellis Davidson 1962, 69), so it is possible that these pommels were collected for their valuable metalwork and discarded after this was removed. A unique Type L pommel, embellished entirely with gold, was included with the Bedale hoard, and was presumably retained for this decorative material rather than any inherent value in the iron (Brunning 2019, 11). Equally, both faces of an unattached Type L pommel from Coppergate have circular central indentations from where decorative mounts have presumably been removed (Ottaway 1992, 716 and Fig. 312).

The Type L has been classified since Petersen as an ‘English’ form (Bone 1989, 66; Dunning and Evison 1961, 129), and is still seen as having an origin in either England or Ireland, despite a notable presence in Scandinavia (Androshchuk 2014, 68). However, the presence of straight, Type H guards at both camp sites demonstrates that swords of a perceived ‘Scandinavian’ character also had their fittings removed. In the cases of the two decorated pieces, ADB 913 and TDB 1424, this may also have been done in order to remove and recycle the inlaid metals. A guard with similar inlay, No. 3941, was excavated at Coppergate, and another guard, No. 257, was recovered from Wharram Percy (Webster 2000, 138-39; Ottoway 1992, 716-718). Two further inlaid Type H guards are recorded from Staunch Meadow (Rogers and Ottaway 2014, 265-6): all these pieces are associated with contexts involving metal-working, and have been interpreted as probable sources of scrap. However, the presence of plain Type H guards at both camps may indicate that swords were also stripped for more functional reasons of refitting and repair. The Great Army certainly appears to have changed fittings on usable blades, as illustrated by the fragments recovered from Mound 1 at Heath Wood, where a straight lower guard and a curved, Type L-style upper guard appear to have been used on the same sword (Richards 2004, 29). This combination is extremely unusual, and is almost certainly a product of refitting: a single comparison can be found in a sword from Hegge, Norway, which has a decorated, Type L pommel and grip but a plain lower guard, and which is also believed to have been altered in antiquity (Wilson 1965, 36-37).

5.6.3 Spears

TDB 25 is an intact spearhead, damaged at the tip and at the end of the socket. It was described by Blackburn as a Petersen Type A, with a leaf-shaped blade (Blackburn 2011, 243). Although leaf-shaped blades are not universally early forms (Haplin 2008, 143), the Type A is classified as a late eighth- and early ninth-century shape, which would clearly pre-date the activities of the Great Army. However, sharply-angled shoulders are apparent at the base of the blade, indicating that Blackburn most probably misjudged his description. This angled form is echoed by a second spearhead, TDB 1423, which is of slightly smaller dimensions, although retaining a pointed tip. Both have what appear to be split sockets, and display central ribs along the blade, producing a diamond-shaped section.

In Scandinavian contexts, angled shoulders on spearheads are common from 850-1100 AD (Hjardar and Vike 2016, 176). However, the comparatively short blades of the Torksey spearheads find their most apparent parallel in the later Petersen Type G, equating roughly with the Solberg VII.3B. These forms occupy a date range beginning *circa* 950 AD and extending through much of the eleventh century, which would again place both finds outside the occupation of the camp. Earlier angled spearheads have markedly longer blades and long sockets. The Petersen Type F, equating to the Solberg Types VII.1 and VII.2, has a date range starting in the early ninth century, whilst the Types I and K are later, commencing around 900 AD. Insular examples of these Types can reach lengths of 500mm or more (Bersu and Wilson 1966, 57 & 76), with one in excess of 630mm recovered from Kiloran Bay (Grieg 1940, 50). Whilst the sockets of both the Torksey finds are broken and corroded, making assessments of their former length impossible, it is hard to imagine that either blade originally measured over 300mm.

Another typological problem is the split sockets evidenced on both spearheads. Scandinavian spears are typically seen with closed sockets, riveted across the spear-shaft or, more infrequently, secured with multiple pins. Although little work has been undertaken on later Anglo-Saxon spears, the split socket has classically been seen as an ‘English’ form, established by the universal open sockets of the earlier types (Dalton 1923, 91) and presumed to continue into the later period (Wheeler 1927, 27). The Type E2 spearhead described in Swanton’s typology provides a good parallel for both finds. This spearhead is characterised by a short, slender head of between 200-350mm total length, with a solid neck separating the angular, diamond-section blade from the socket. These sockets are split for almost their entire length. Whilst Swanton (1973, 81-3) dates the floriut of this type in the seventh century, he suggests that it was still extensively used for later Anglo-Saxon spears. A potential parallel can be seen in a ninth- to tenth-century spearhead with a split socket and pattern-welded blade core recovered from the River Thames at Cookham (Williams 2014a, 108, fig. 52; British Museum No. 1868,0128.2). Additionally, a split-socket spearhead on the PAS from Putney, London is described as ninth century Anglo-Saxon (PAS LON-920814: illustrated in Naylor 2015, Fig. 9). The former find is clearly a more ornate, expensive weapon than the Torksey examples, and the latter appears to have been designated ‘Anglo-Saxon’ purely on the basis of the split socket, a distinction which Wheeler (1927, 26-27) noted as unsatisfactory. However, the presence of split sockets does suggest that both the Torksey pieces may be of English origin.

Although the short length of both spear blades has been noted in comparison with Scandinavian types, this may be due to depositional biases. Halpin has observed that the Dublin settlement material contains a very high percentage of exceptionally small spearheads (Halpin 2010, 128 & Fig. 12.4), a feature particularly noticeable when arrayed against the dimensions of grave finds (Harrison and Ó Floinn 2014, 93 & Chart 1). He notes that this may echo cultural factors, and the adoption of Irish fighting styles. However, it is also true that smaller spearheads would be easier to lose in a busy, urban environment. Similarly, the comparatively smaller size of both Torksey spearheads may indicate that they were lost in the disordered surroundings of the winter camp. However, if both the spearheads were looted 'English' types, regarded more as a source of iron scrap than as weapons, then this may also explain why they were discarded.

The probable spearhead TDB 1675 from the Torksey iron hoard was analysed by Carhart (2015, 34), who noted the unusual profile and apparent lack of a midrib. Her suggestion that this blade fragment may be the tip of a mid-tenth to eleventh-century Giebig Type 5 sword blade seems unsatisfactory. At 60mm, the width of TDB 1675 is greater than the maximum dimensions of Type 5 blades outlined by Jones (2002, 23) in his updated classification of Geibig's typology. Given that this fragment is clearly a blade tip, the long, tapering nature of Type 5 blades would mean that any such piece would necessarily widen toward the sword base, expanding this measurement further. More notably, Carhart observes that there is no fuller on the surviving fragment. Type 5 blades typically have comparatively short fullers, extending between 79% and 84% along the total length of the blade and leaving an elongated tip (Jones 2002, 22-3). Nonetheless, TDB 1675 is 277mm long. If this piece were a sword tip beyond the fuller, this would require a blade which was 1.319m at the shortest extent, and 1.731m at the maximum. Both of these lie outside the standard Type 5 blade lengths of 840-910mm, and are greater than any known lengths for early medieval swords.

It is possible that TDB 1675 is part of an iron weaving beater (Harrington 2016, 339). Weaving beaters can have either pointed and tanged tips, making it difficult to differentiate them from weapons, particularly as several are known to have been manufactured from sword blades (Mazow 2017, 11). The steel cutting edges visible on TDB 1675 (Carhart 2015, 33) suggest that it was not manufactured as a weaving beater. Whilst it may be a converted blade, the edges and the point appear relatively sharp, unlike weaving beaters known to have been ground down from sharpened blades (Hawkes 1958, 34). Equally, the blade width is greater than comparable Norwegian beaters (Øye 2022, 52). Nonetheless, the presence of a weaving beater would agree with the collection of other tools contained by the hoard, and this interpretation remains a possibility.

The lack of a midrib does not exclude this object from being part of a spearhead, as Anglo-Saxon spearheads do not always have the diamond-shaped cross-section universally seen on Scandinavian forms. Swanton's Group C3 typically has a flattened lentoid section, often with near-parallel faces (Swanton 1973, 55-59 & Fig. 13), as do some of his Group E3 (Swanton 1973, 83-87 & Fig. 27e). Both Groups are straight-sided, with regular curves toward the point, comparable with the blade tip of DB 1675. While the sixth- to seventh-century dates of the C3 group would raise questions about the date of the hoard as a whole, Group E3 extends well into the later Anglo-Saxon period. Two spearheads of this type were found in the late tenth-century tool hoard from Westley Waterless (Swanton 1973, 85), and another, albeit with a diamond section, was included with the late Anglo-Saxon iron hoard from Nazeing (Morris 1983, 30 & Fig. 2g). Both these assemblages also parallel the 'English' character of the hafted tools contained in the Torksey hoard, as well as the inclusion of a spearhead amongst the ironwork: given these factors, it seems reasonable to also interpret TDB 1675 as a spearhead.

Although their absence from Aldwark is noteworthy, the one possible and two definite spearheads recovered from Torksey compare favourably with other settlement sites. Only one possible complete example and one stratified fragment were recorded from Anglo-Scandinavian Coppergate (Ottaway 1992, 715), one broadly-dated find was identified from Goltho (Goodall 1987, 186), and 29 spearheads span the whole Hiberno-Scandinavian settlement period in Dublin (Halpin 2008, 132). Furthermore, one spearhead was recovered from Cottam B, and two were recorded from Woodstown, one of which was deposited as a grave-good (Haldenby 1992, 39; Harrison 2014b, 161).

5.6.4 Arrowheads

TDB 287 is the best-preserved of the two finds from Torksey. Although the point is missing, the tanged, leaf-shaped form corresponds with Jessop's Type T1 and Halpin's Type 1. Although Jessop (1996, 195) dates his form broadly across the ninth to eleventh centuries, Halpin (2008, 91) sees the type extending into the late twelfth century. However, Halpin also recognises that, in Ireland, the bulk of the Type 1 form is found in the earliest part of this date range, with the type accounting for 80% of the arrowheads known from pre-950AD contexts. Given that archery is believed to have been reintroduced to Ireland by

Scandinavian settlers in the ninth century (Halpin 2008, 35 and 93), this dating accords with Scandinavian usage of these arrowheads. Additionally, Halpin (2010, 129) also identifies tanged arrowheads as being a typically Scandinavian form. The use of broad-bladed arrowheads has attracted considerable debate: whilst they are generally seen as a hunting type, similar blade forms are equally effective in warfare. However, a more compact, lighter arrowhead is taken as a 'military' type, capable of penetrating body armour over a long distance. In studying the Dublin arrowheads, Halpin (2008, 79-80) has suggested that blades under 14mm maximum width can reasonably be classed as intended for war, although he acknowledges the somewhat arbitrary nature of this distinction. Nonetheless, at 22mm wide, this arrowhead most probably represents a hunting or multi-purpose type.

TDB 2569 is broken at both ends, leaving the interpretation as an arrowhead open to question. What remains is the top of a broken socket, extending into a square-section rod which begins to swell before it terminates in another break. The socket is malformed, making the profile difficult to determine: two roughly parallel sides remain, suggesting that it may have had a square section, although the socket is cracked and has been crushed. If this is an arrowhead, the square-section rod would form the base of the blade, indicating a 'bodkin' shape. This is typically seen as a military form, with a long, narrow head designed to penetrate mail armour. With Jessop's typology, a rounded socket would place it in either the Type M7 or Type M8. Date ranges for both Types run from the eleventh to fifteenth centuries. Whilst Jessop describes a Period 5 Type M7 recovered from Goltho as 'surprisingly early', questions surrounding the phasing of this site suggest that this find may date from considerably later than the 1000-1080 AD suggested by the excavators (Jessop 1996, 198; Goodall 1987, 186;).

A socketed bodkin would fit with Halpin's Type 7, with broadly comparable pieces seen in arrowheads Nos. 3918 and 3916 from Coppergate (Ottoway 1992, 711-13 & Fig. 309), both of the tenth century. A similar arrowhead may be present in ninth-century material recovered from the Kilmainham-Islandbridge grave complex in Dublin. Given the provenance, this cannot be taken as coming from a secure context, and it is also possible that the piece was mis-catalogued in the late nineteenth century (Harrison and Ó Floinn 2014, 131 & 416: arrowhead Wk18). However, a Type 7 was recovered from a securely-dated ninth-century burial at Kaupang, supporting a possible early date for the Type (Halpin 2008, 125). Given these issues with dating, it is hard to be certain that TDB 2569 is related to the occupation of the camp.

This arrowhead and potential arrowhead from Torksey stand in sharp contrast to the more than five hundred recovered from the Hiberno-Scandinavian levels at Dublin (Halpin 2008, 75) or the twenty-five stratified examples from Coppergate (Ottaway 1992, 710). However, arrowheads are somewhat rarer finds from rural sites: eight were recorded from Flixborough, one from Cottam B, and only a single iron socket of a possible arrowhead at Staunch Meadow (Haldenby and Richards 2016, Plot No. 0312; Rogers and Ottaway 2014, 266; Ottaway 2009b, 123). All three of these sites were metal-detected, and thus may provide a more balanced comparison for the assemblages from the two camps: in locations characterised by long-term urban settlement, comparisons with the briefly-occupied camps may not be entirely proportionate. Nonetheless, Halpin (2010, 129 & Table 12.2) observes that, compared to burials from Dublin, archery material dominates the weapons assemblage recovered from settlement contexts in the city. Whilst this may give a misleading impression of the importance of archery in Viking-Age warfare, it may also suggest a more credible model for both everyday use and casual loss, suggesting that arrowheads are under-represented at both camps.

5.6.5 Fittings

This category reviews a series of items which are intrinsically associated with weaponry: sword grip ferrules, scabbard fittings, and shield fittings. The numbers of these are laid out in Figure 5.14, with the sword grip ferrules presented in Table 5.27.

Figure 5.14: Weapons fittings from Aldwark and Torksey

Total data set: six fittings

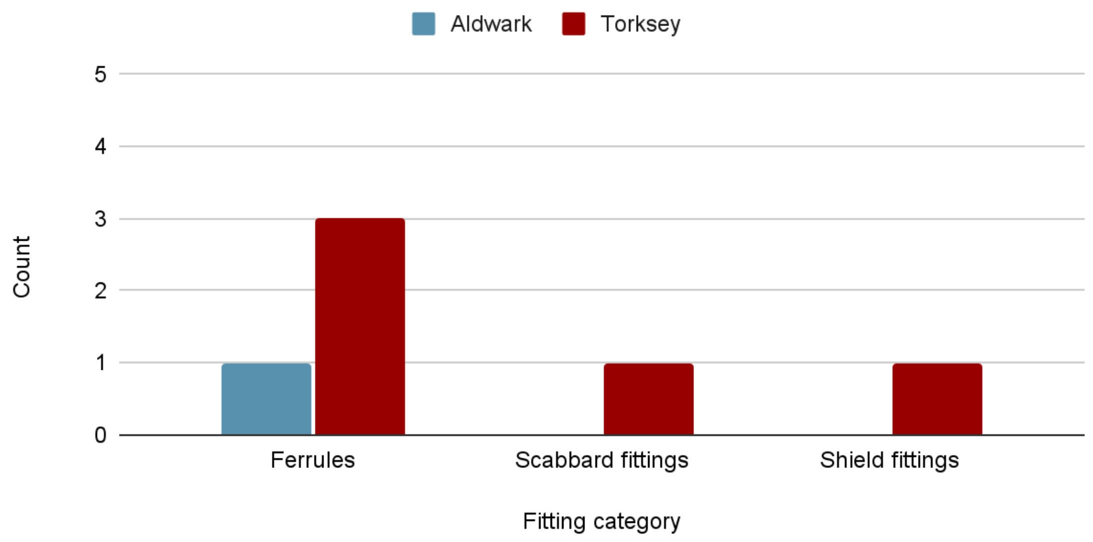
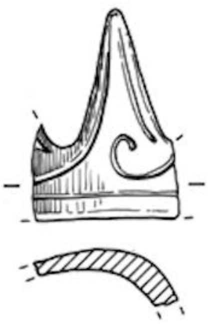
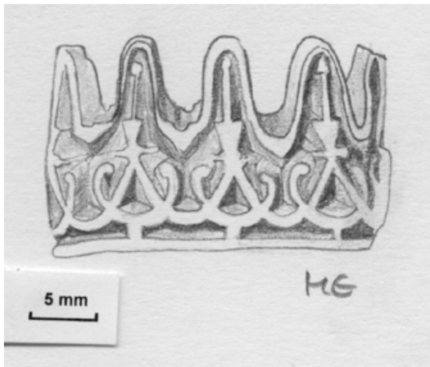


Table 5.17: Ferrules from Aldwark and Torksey

Database No.	Image	Database No.	Image
ADB 1107	 Image: York Archaeological Trust	TDB 130	 Image: Viking Torksey Project
TDB 1790	 Image: Viking Torksey Project	TDB 804	 Image: Viking Torksey Project

Three fragments of decorative ferrules have been recovered from Torksey, with a further possible fragment from Aldwark. The Aldwark piece, ADB 1107, was previously identified merely as a fragment of decorative metalwork (Rogers 2020e, 60), whilst no interpretation was suggested for the very similar TDB 1790. I suggest that both are the remains of ferrules. Although the dagged shapes of each fragment are different lengths, they are both morphologically very close to the paired ferrules on a sword hilt from Lough Derg, County Tipperary, Ireland: these pieces have the same wide, acutely-pointed dags and an incised, inlaid decoration (Ó Floinn 1992, 340-41 and Fig. 431). However, close parallels can also be seen in a series of copper-alloy knife ferrules recorded on the PAS, with particularly well-preserved examples seen in NMS-00360D from Norfolk and HESH-4B4686 from Shropshire. These complete ferrules show the same tight curves and narrow, sub-cylindrical profiles observable on ADB 1107 and TDB 1790. They also have combinations of repeating long and short dags and display similar decorative motifs of spirals and close curves. In describing the Lough Derg hilt, Ó Floinn observed that Anglo-Scandinavian influences were evident on the design, but the decoration was ‘purely Irish’. A further Irish connection is suggested by a group of gaming pieces from Lough Sewdy, County Westmeath, which are all crowned with dagged, decorative copper-alloy caps (Forsyth and Hall 2020, 57-8 and Figure 2.7). These fittings display dags of identical lengths, all of which are attached to raised, domed knops, making them a less persuasive parallel: nonetheless, the comparison remains plausible. However, whilst these gaming pieces are undated, both the knife ferrules and the Lough Derg hilt date to the eleventh century: whatever the exact functions of ADB 1107 and TDB 1790, it seems certain that they both post-date the Great Army. Therefore, these two ferrules are not discussed further.

The remaining two Torksey pieces are far easier to identify as decorative sword ferrules. TDB 130 is of copper alloy, and features a design of zoomorphic interlace, forming a series of stylized beast heads. It can be paralleled by a fitting on a Type H sword from Swandro, Rousay, Orkney (Grieg 1940, 89 & Fig. 51) which features more naturalistic animal masks. TDB 804 is of heavily gilded copper alloy, and constructed with the same dagged shape as TDB 130, although with a more abstract interlace design. A close comparison can be made with the lower ferrule associated with a Petersen Type D sword from Kilmainham, Dublin (Harrison and Ó Floinn 2014, 78 & 334 Fig. 33). However, even closer parallels are two ferrules on the hilt of one of the swords in the Hedeby boat burial, a Petersen Type K blade designated ‘Bb’ (Müller-Wille 1976, 67-69 and Abb. 31 & 32). These are also of gilded copper alloy, with a design almost identical to the Torksey example, suggesting that they may have been produced in the same workshop. The Type K sword itself is a comparative rarity in Denmark, but has a prominent distribution in southern Norway and in Ireland (Müller-Wille 1976, Abb. 23).

TDB 131, is a thin, flat copper-alloy bar with a raised central section designed to accommodate a strap. The bar is decorated with transverse grooves, and has pierced zoomorphic birds'-head terminals. It has very strong parallels in a series of Merovingian scabbard fittings of late sixth- to early seventh-century date, described by Menghin (1983). They conform to a comparatively narrow distribution, spread across north-eastern France and the Ardennes, with only one known north of the Rhine, located off the south-western coast of the Danish peninsula (Menghin 1983, Karte 14). No other examples are known from Britain (M. Bunker *pers. comm*). It seems certain that this piece was transported to Torksey through the actions of the Great Army. Other anomalously-dated items are highlighted in this thesis (Sections 4.2.1 and 7.2.4). In common with these finds, this scabbard fitting demonstrates that comparatively ancient objects were acquired by the Army, with some of these items clearly being transported a considerable distance.

Table 5.18: Scabbard fitting from Torksey

Database No.	Length	Width	Image
TDB 131	50mm	10mm	 Image: Viking Torksey Project

Within the Torksey database, TDB 115 has previously been interpreted as both a possible trefoil brooch and an unspecified mount: I propose that this piece may be part of a shield grip. Occasionally, grips were attached to the rear of Viking-Age shields by means of a pair of ‘Y’-shaped cast copper-alloy fittings, used as terminals on either end of a wooden bar. These terminals had two short, flat arms which lay flush to the shield board and a third, curved extension which formed the means of attachment to the rounded grip. TDB 115 is clearly incomplete, but the two surviving arms, each pierced by an iron rivet, would easily serve to attach the piece to a flat surface. A break is clear on the find, roughly at the point where the third terminal would typically start to curve: whilst this change in shape would obviously form a weak spot in any such casting, the absence of the characteristic curve means that the identification of this piece is not secure. However, the decoration of TDB 115 has parallels with several finds of shield-grip fittings from Birka, and particularly the terminals recovered from Graves 942 and 1151 (Arbman 1940, Taf. 19, 3 & 4). Whilst this comparison may seem geographically remote, it can be noted that a find of silver-wire embroidery from Mound 11 at Heath Wood is paralleled by artefacts from both Birka and Gotland (Richards 2004, 44).

Table 5.19: Possible shield fitting from Torksey

Database No.	Length	Width	Image
TDB 115	35mm	21mm	 Image: Viking Torksey Project

5.6.6 Discussion of weapons

The numbers of weapons recovered from both sites appears surprisingly low. At Aldwark, this may in part be an effect of recovery practices surrounding iron objects. In particular, if unrecognised arrowheads were included in the material discarded in hedgerows, such comparatively small items may have quickly deteriorated or been missed on retrieval. More seriously, items of weaponry may have been recovered but not recorded at Aldwark: Williams and Hall (2020, 84) report that both an axe and a shield boss were allegedly sold prior to archaeological involvement with the site. However, it seems unlikely that similar issues affected recovery at Torksey. The weapons assemblage here is small, particularly when compared to the wood-working tools and some of the metal-working assemblage (Sections 5.2 and 6.3). Whilst the high proportion of sword hilt fittings in both assemblages stands in contrast to this low general recovery, it is notable that the assemblage of artefacts relating to swords is smaller at Torksey than at Aldwark. Given the known discrepancies in recovery and recording, this very probably shows a material difference between the two locations. This may be an effect of depositional differences, with swords more carefully curated and less readily discarded at Torksey. However, it may also show that weapons were generally less prominent at the camp.

The possibility that iron hilt fittings were viewed as sources for recycling has been noted above, particularly in regard to Type L pommels. However, not all Type L hilts were embellished with precious metals, nor was it necessary to disassemble the sword to remove any foils. A complete Type L blade from Torbeckhill, Kirkcudbrightshire is decorated with only stamped ornamentation (Grieg 1940, 13 and Fig. 2), and a similar sword from the River Escaut, near Ghent, retains a valuable pattern-welded blade despite the clear removal of plates from the pommel (Bjørn and Shetelig 1940, 124 and Fig. 82). The pommels recovered from both camps may therefore have been removed for other reasons.

Swords were not necessarily made as complete items. A series of six separate Carolingian legislative *capitularia*, including an interdict of Charles the Bald, prohibiting the sale of arms to 'foreign men' have been highlighted by many authors (e.g. Williams 2014a, 102). It is assumed that unfitted sword blades were included amongst these traded items, and regional forms of hilt furniture are often found on imported Frankish blades (Kleingärtner and Williams 2014, 64; Owen-Crocker 2011, 211). Furthermore, Brunning (2019, 84) also notes that pommels and hilt fittings were especially prone to wear: separate hilt furniture, particularly pommels, have been identified at multiple sites across Europe, such as Dorestad (Willemsen 2021, 103-07), suggesting that the refurbishment of sword blades may have been commonplace. In the context of the winter camps, the stripping and refitting of swords may have been a standard practice. Indeed, the two fragments of appropriately-dated decorative grip ferrules in the assemblages can be read as a strong indication of such activity, with the broken fittings showing cast-offs from maintenance and repair. However, this does not necessarily explain the concentration of Type L pommels from both sites. In addition to the fittings from Coppergate noted above, a further Type L pommel and lower guard were recovered from Fishergate, possibly both from the same sword. Although these were related to earlier Anglian activity by the excavator, the dating of these fittings makes it seems more probable that they were deposited by an offshoot of the Great Army occupying the site (Hadley and Richards 2021, 204). This suggests that Type L swords may have been routinely processed and disassembled by members of the Army. Such activity may demonstrate the handling of a communal 'stock' of weaponry, similar to that suggested for the garrison warriors at Birka (Hedenstierna-Jonson 2006, 54). Conversely, it may indicate that the fittings were more prized and personal items, with hilts swapped or altered to reflect the owner's status or to construct an identity for the blade (Sayer, Sebo, and Hughes 2019, 542).

Although swords are typically excluded from discussions of status metalwork, Heen Pettersen (2018, 61) proposes that, in western Scandinavia, the Type L hilt possessed a similar social cachet to that of other decorated Insular items. The Type L was clearly a prized item, with the corpus of whole or disarticulated weapons of this form from present-day Norway outnumbering those recovered from England (Aksdal 2017, Fig. 8). Whilst this figure is clearly affected by different depositional factors, particularly in terms of burial practice, it does also very broadly demonstrate the popularity of the Type in western Scandinavia. Heen Pettersen (2018, 61) also states that the quality of both sword blade and hilt were linked to not only the wealth but also the social standing of their owners. In such circumstances, the possession of Type L swords or hilt furniture could be used to signal the owner's involvement in overseas expeditions, with the distinctive, highly-recognisable pommel design used to manifest power and social status within elite society. The single Type L sword fitting recorded from Iceland, a curved, inlaid, and decorated guard recovered as a stray find from Knafahólum, Rangárvallahr, may demonstrate similar behaviour (Eldjárn 2016, 329 & 630). If a particular status was attached to the distinctive form of Type L sword fittings, then it may be that the accumulation of these pommels at both sites represents a manifestation of this activity.

Disassociated pommels are known from other contexts. The single, richly-furnished burial at Woodstown contained a Petersen Type N sword which had been deliberately broken in three places, including the removal of the pommel (Harrison 2014a, 92). Two other sword pommels, of Types O and X, were also recovered from the site (Harrison 2014b, 156-7). Two further detached pommels, both of Type H, recovered from the Kilmainham-Islandbridge cemetery at Dublin, have prompted the suggestion that the dismemberment of swords may have formed part of a funerary rite (Harrison and Ó Floinn 2014, 378 and 399). Fabech (2006, 29) has noted that swords in Scandinavia were sometimes closely associated with individuals, with these weapons occasionally disposed of in such a way as they could not be recovered when the owners could no longer use them: a similar motivation has been proposed for the re-emergence the practice of depositing swords in 'watery' contexts in Viking-Age England (Reynolds and Semple 2011, 46; Lund 2010, 55). Equally, Brunning (2019, 87-88) has observed that similar notions of 'personality' could lead to the swords of vanquished warriors being destroyed as a means of bestowing an enduring, symbolic defeat onto their former owners. Both these concepts intersect with the known 'ritual killings' of early medieval weaponry, and could account for the burial of dismembered swords: Hedenstierna-Jonson (2006, 66) suggests a similar motivation behind the deliberate burial of a scabbard chape in the main hall building of the garrison at Birka. These actions would not seem out of character in an encampment of a militarised force, establishing itself in a hostile territory. A similar symbolic action may have lain behind the aforementioned deposition of ploughshares.

Swords are one of the few Viking-Age artefacts to which concepts of ethnicity are still attached, despite Halsall's observations (2000, 269) on the difficulties of assigning origins to such artefacts: following on from Petersen's characterisations, certain forms of hilt have been persistently seen as signifying national origins. The perceived 'English' nature of the Type L hilt has been noted above, and has led to the wide Continental and Scandinavian distribution of these swords being interpreted as plunder, or trophies of war. Whilst this is potentially true of some examples, this narrative may obscure more nuanced readings. Ystgaard (2021, 285) discusses the intensely personal nature of military obligation in the early medieval period, with service in a retinue or warband essentially formed as a contract between individuals: concepts of nationality or national origin would have been little understood in such contexts, with social roles holding more significance that ethnic allegiance (Downham 2013, 54; Innes 2000, 81). Whilst the dominance of Type L pommels in both assemblages may be seen in terms of the disposal of the arms of a defeated enemy, their presence does also conform with the Anglo-Saxon character of some of the tools and metal-working material at Torksey. The conglomerate composition of the Great Army was discussed in Chapter 2. Hadley (2000, 112) notes that the leaders of the various factions probably relied on indigenous support to secure their authority, particularly as the forces fragmented and began to settle, while Innes (2000, 81) observes that existing local structures almost certainly served as an organisational basis for the settlers. The presence of such high numbers of Type L pommels at both camps suggests that these processes of integration began in advance of the settlement, with Anglo-Saxon warriors, drawn from the local military elite, seeking service with the mixed, multinational groups of the Army whilst it was actively campaigning. With this reading, it is possible to see the pommels not merely demonstrating the adoption of local material culture by the Great Army, but suggesting the presence of Anglo-Saxons as active participants within the force.

5.7 Summary

As Cooijmans (2020, 141) observes, 'no early medieval mariner would have been on the move indefinitely', and the repair and resupply of both *materiel* and weaponry would have been a foremost necessity during the overwinterings of the Great Army. As noted in the introduction, both tools and weapons relate to the day-to-day practicalities of the Army's existence. Notably, the assemblages recovered from each camp are remarkably similar and, whilst there are lacunae, these can generally be accounted for by different recovery practices. In essence, this demonstrates that everyday necessities remained unchanged at each location, with the occupants of the two sites concerned with the practicalities of protection and provision. Both assemblages also contain examples of items preserved through deliberate deposition, such as the tool hoard from Torksey, the sword blades from Aldwark, and the ploughshares from both locations. This hoarding may indicate the value of some of these items, and that both tools and weapons were viewed as sources of stored wealth. However, it may also show other, more symbolic actions, related to conquest and to the acquisition of land.

Both the wood-working and textile-working tool assemblages contain material which can be related to the replacement and repair of ships, indicating that this was a clear priority at each location. The presence of Type B spindle whorls, and particularly their import or manufacture at Torksey, suggest the continuation of deep-seated Scandinavian cultural traditions, with the use of heavy lead whorls potentially showing a link to particular methods of yarn production also seen at Kaupang. Although textile tools can be seen as culturally conservative, the presence of these whorls is not unequivocal evidence of the presence of Scandinavian women, and these items may instead be more reflective of broad cultural traditions (Kershaw 2021, 103). However, the continued use of Scandinavian-influenced textile tools stands in contrast to the presence of other tools and weapons with distinct Anglo-Saxon characteristics at both camps. Whilst it is acceptable to identify these artefacts using an ethnic description it is not, as Thomas (2000b, 240) observes, equally acceptable to classify the people who used them in a similar way. In many ways, the presence of such ‘Anglo-Saxon’ items might be expected: after years of campaigning, the core of the Great Army must have needed to replace worn-out or lost tools with available ‘local’ types, irrespective of where these basic implements were produced. Nonetheless, although the assemblages of wood-working tools, knives, and weapons might suggest the widespread adoption of Insular material culture by the Army, they may equally demonstrate that local peoples were integrated into the force as active members.

Procuring and processing suitable timber for ship repairs almost certainly required the establishment of satellite camps or workstations. Subsidiary encampments are recorded by Frankish annalists, and it was clearly not uncommon for Viking fleets to subdivide when overwintering in the Frankish kingdoms (Cooijmans 2020, 125-7). Even so, the ability to locate and use specific areas of woodland does signify a high degree of interaction between the Great Army and the areas in which it was campaigning, suggesting that the force was able to gain both detailed local knowledge and considerable control of each camp's hinterland. Similar conditions must also have governed trade for fleece or flax for textile production. As such, the assemblages indicate the central position of both Aldwark and Torksey for dispersed activities. The implied existence of such secondary encampments forms a link with the economic activities discussed in the previous chapter, highlighting the position of the main camps as 'central places' and markets. Although the martial characteristics of the winter camps have been overestimated in the past, they clearly existed within a military context, with expressions of armed force enabling the Great Army to establish itself on hostile territory (Raffield 2022, 428-9). The comparatively small assemblages of weapons from Aldwark and Torksey may also be connected to this dispersal of the force: military activities may have been more evident at the smaller, potentially more vulnerable subsidiary camps, with these exposed locations also acting as effective guard points and picquets for the principal encampments. Despite the known issues attending to the recovery of iron artefacts at Aldwark, a difference between the two sites can be seen in the relatively high numbers of sword hilt fittings from this camp. This disparity may suggest that Aldwark was a more secure location, with military artefacts concentrated on a single site rather than dispersed to satellites. However, it may more simply show a concentration of manufacturing technology at the site, with smithing and weapons repair focused on a single location. Further evidence for manufacturing will be considered in the next chapter.

6. Manufacturing activity

6.1 Introduction

This chapter examines a wide range of evidence for manufacturing recovered from the two camps. Various processes are present in the finds assemblages, relating to different stages and forms of manufacturing. For ease of analysis, these have been broadly grouped into three separate categories: the collection of scrap metal as raw material; the processing, working, casting, and refinement of metals; evidence for coin production. The following examination draws on studies of the Aldwark brooches, fittings, and tools by Rogers (2020d & 2020e), the litharge and metal-working waste by Mortimer (2020), and of elements of the Torksey metal-working and coin-production material by Blackburn (2011). As previously noted, the metal-working tool assemblages have been reviewed separately from the other tool groups studied in Chapter 5. However, the Torksey metal-working tools were analysed as part of this thesis, with my identifications and interpretations presented here. Some of the artefacts categorised below overlap with those of other chapters. In particular, the assemblages of decorated Insular metalwork contain fragments of brooches and strap-ends. These are enumerated and discussed, but are more fully analysed with the other dress accessories in Chapter 7.

6.2 Scrap metal

6.2.1 Offcuts and fragments

As part of the analysis of the Torksey ironwork, I have identified over twenty pieces of possible scrap iron. However, the dating of this material is not secure, and some of it will almost certainly derive from late post-medieval or modern agricultural activity. No detailed record of iron scrap exists for Aldwark. Elements of disassembled iron swords have been recovered from both sites, and it is possible that some of these were retained as sources of scrap: these items have been considered in Chapter 5. Fragments of probable scrap of other metals have also been recovered. Once more, these are affected by issues of datability and recording, making assessment and comparison complicated. Some pieces, such as the narrow copper-alloy rods TDB 277 and 278 and lead rod TDB 257, have clear parallels in the material recovered from Coppergate (Bayley 1992, 781-88), suggesting that these finds may genuinely be related to Viking-Age metal-working activity. Equally, fragments of lead sheet have been recovered from both camps. Such sheets were identified as a main source of lead scrap at Coppergate (Bayley 1992, 787), suggesting that these finds, too, may well be connected to the activities of the Great Army: later medieval treatises describe the use lead sheet as part of the cupellation process, considered below (Hawthorne and Smith 1979, 146). However, other than recognising that individuals at both Aldwark and Torksey appear to have collected ferrous and non-ferrous scrap, the nature of the assemblages mean that it is not possible to make a more detailed comparison of this material.

6.2.2 Insular metalwork

It is possible to be far more confident in the dating of the Insular metalwork in both assemblages, with items clearly drawn from the single 'cultural province' of northern Britain and Ireland which existed in the late seventh and eighth centuries (Ó Cróinín 1989, 15-17). This category includes metalwork decorated with various techniques, but generally characterised by dense areas of chip-carved or repoussé interlace, grid patterns, spiral elements, or extremely stylised foliate ornament (Webster and Backhouse 1991, 109 & 133). Fragmented metalwork decorated with the ninth-century Anglo-Saxon Trewhiddle style has also been included in this section: whilst this differs from earlier artistic traditions, it remains unique to the British Isles, and unlike any decorative mode employed in Scandinavia or Continental Europe (Cramp 1997, 283 and 294). However, similarly-ornamented complete and fragmented strap-ends are considered separately (Section 7.4).

Table 6.1: Insular metalwork from Aldwark and Torksey

Location	Copper-alloy	Silver
Aldwark	27	-
Torksey	69	4

The majority of this Insular metalwork is fragmentary, with pieces having been either removed from original settings or further divided by later cutting. Because of this fragmentation, two of the silver pieces from Torksey have also been included in the discussion of hack-silver (Section 4.4.5). The two remaining silver items, TDB 1637 and 1687, are both complete, suggesting that they were retained intact for other purposes. Amongst the copper-alloy items, several pieces from both camps are clearly parts of fragmented brooches and pins: these are also included in the review of dress accessories

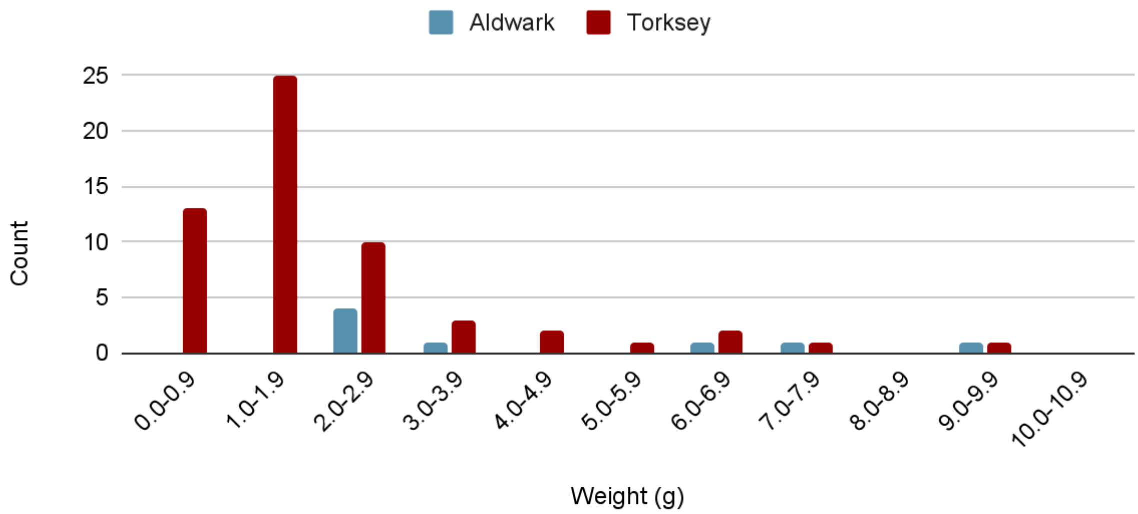
(Sections 7.2 and 7.3). Other elements of these metalwork assemblages were almost certainly cut for mounting in inset weights. Whilst all loose fragments are considered here, pieces which have already been converted into weights are not included: these have previously been comprehensively reviewed by Hiett (2020).

Many of the fragmented mounts and decorative fittings from Aldwark have been analysed, with origins and possible former uses discussed (Rogers 2020e). This thesis draws on this previous assessment whilst also suggesting provenances for much of the Torksey material and for finds unavailable for the previous study of Aldwark. Occasional pieces of ecclesiastical metalwork can be identified amongst the assemblages. The remains of a hinged fitting, ADB 1174, was most probably originally attached to a house-shaped shrine or a reliquary. ADB 1141 may be a suspension mount from a hanging bowl, although the outward-turned loop at the top of the piece is unusual (Bruce-Mitford 1987, Fig. 4). The geometric, ‘chambered’ cells evidenced on TDB 348 are also suggestive of either a hanging-bowl mount or a decorated escutcheon. Although three formerly-connected strips of openwork sheet ADB 276, ADB 277, and ADB 290 have been previously interpreted as a possible box mount (Rogers 2020c, 49-50), they may have originally been removed from a bronze-decorated *situla* bucket: they are very closely paralleled by the sheet fittings on the ninth-century Clonard pail, and by a panel of binding recovered from the River Blackwater in Ireland, dated to the second half of the ninth century or the early tenth century (Bourke 2010, 39 & Fig. 6:59; Youngs 1989, 121 & 159). Pieces ADB 1224, ADB 1140, TDB 44, TDB 736, and TDB 1137 are all categorised here as harness fittings, with strong morphological similarities to other finds of horse furniture (Spearman 1993, 139). Other items can be identified as roundel mountings, a fragment of a vessel, and possibly part of a set of decorated tweezers. Nine of the copper-alloy pieces from Aldwark show evidence of gilding, whilst 27 of the Torksey finds are gilt. The heterogeneous nature of these finds is very much in keeping with the substantial collection of artefacts known as the Shanmullagh Assemblage, recovered during dredging of the River Blackwater at County Tyrone and County Armagh, Ireland (Bourke 2010). However, the presence of ecclesiastical material contrasts with the assemblage from Woodstown, where such items were absent (Ó Floinn 2014, 190).

There is a long history of the recycling of metalwork across post-Roman Europe (Fleming 2012, 17), with the practice equally as evident in Scandinavia as on the mainland (Hårdh 2011b, 59). Whilst Insular metal ornaments were prized in Scandinavia (Wamers 1998, 41-2, Heen-Pettersen 2014), the assemblages from Aldwark and Torksey display the style of fragmentation which more commonly characterises practices in Britain and Ireland, with pieces cut without any apparent consideration for their original form (Heen-Pettersen 2021). This suggests that many of these items were potentially gathered as scrap, and were certainly fragmented with little consideration for any subsequent re-use. Bourke (1993, 24) considers that the majority of the fragmented pieces contained by the Shanmullagh assemblage were destined for recycling, with the same purpose suggested for the more fragmentary Insular metalwork excavated from the settlement at Kaupang (Wamers 2011, 93). Unfortunately, weights have only been recorded for eight of the 27 Insular copper-alloy fragments from Aldwark, and for 60 of the 70 from Torksey. The weight ranges of these known values are shown in Figure 6.1; for ease of visualisation, two fragments from Torksey with atypically high weights of 15.32g and 40.25g have been excluded.

Figure 6.1: Recorded weight ranges of Insular copper-alloy fragments from Aldwark and Torksey

Total data set: 66 fragments (Aldwark 8, Torksey 58)



The gaps in recording make direct comparison unworkable. Nonetheless, a predominance of smaller fragments at Torksey is readily apparent, even when accounting for the two additional outliers. Although only a visual inspection has been possible, the unweighed Aldwark pieces do not appear to be as highly fragmented as the Torksey assemblage, which may suggest a different use of Insular metalwork in the two camps. Offcuts of metal are typically the preferred source of casting material (Sindbæk 2001, 51), so the smaller, potentially lighter pieces recorded at Torksey may have been convenient for melting in crucibles and reworking into new objects. However, copper-alloy was clearly melted and cast at both locations (see below), suggesting that this is unlikely to be the sole reason for the greater fragmentation of the Torksey assemblage. Whilst the Insular metalwork from both camps is classified here as scrap, an additional economic use cannot be discounted. The intrinsic value of scrap as a raw material may have led to many of these pieces being used as commodity money (Pestell 2013, 249), or they may have functioned as a currency in their own right: the similarity in the weight ranges of the Insular fragments and the complete and fragmented copper-alloy ingots from Torksey (Section 4.4.2) does strongly suggest that both these items fulfilled similar roles. Furthermore, the copper-alloy ingots from both camps have been taken as showing the presence of a three-tier metal-weight system, with copper-alloy serving as a tertiary currency (Blackburn 2011, 235-6). In such a system, small chips of copper-alloy fittings might have been used to make up larger transaction weights.

Given the status afforded to Insular metalwork in Scandinavia (Aannestad 2018, 8; Wamers 1998, 43), it seems reasonable to suggest that these fragments may have also served in economic transactions by themselves. The decoration of these Insular pieces almost certainly acted as an additional signifier of their quality. Sheehan (2013, 818-19) stresses that the bullion value of Insular metalwork was comparatively small, with the items consisting almost entirely of bronze, although the quality of the design and the casting was typically far higher than that seen in contemporary Scandinavian ornament. Insular pieces were clearly imbued with a prestige value, and the decoration appears to have carried a social significance and impact in excess of any inherent worth. The technical quality and exotic nature of the metalwork may have contributed to this value, making fragments a suitable medium for exchange where undecorated metal would not serve. Furthermore, Wamers (1998, 47) observed that Insular items appear to primarily reflect military activity: whilst the fragments here have presumably been broken for use in metal-working or trading, it may be that their decoration was perceived to imply acquisition through plunder, and added a symbolic significance greater than their intrinsic value (Ashby 2015, 94-6). Within the milieu of the Great Army, this may have made them suitable for use as currency or given them increased value as figurative capital. In this instance, the less-fragmented assemblage at Aldwark suggests that Insular metalwork had a reduced economic role at the camp.

In contrast to the aforementioned metalwork from Kaupang and Shanmullagh, Ó Floinn (2014, 188-90) argues against interpreting the decorated fragments from Woodstown as scrap for recycling, suggesting instead that all pieces from this site were destined for re-use as caps on lead inset weights. Several metalwork fragments from Aldwark and Torksey may have also been earmarked for mounting on weights. Fragments ADB 1169, TDB 116, TDB 333, and TDB 346 all display piercings which do not respect their original design or decoration, indicating that these are secondary holes which may have been made to fix the pieces to lead blocks. Equally, both ADB 1143 and TDB 113 are pierced by ferrous pins, suggesting that these may have become separated from weights which they were formerly mounted on. Ó Floinn (2014, 190) proposes that this may have happened to several of the Insular fragments from Woodstown, with one enamelled mount from the site identified as being the original inset from a separately-recovered weight. At Aldwark, several fragments of annular or penannular brooches may have also been cut for mounting, as these are morphologically similar to a fragment set in one of the weights recovered from the burial at Kiloran Bay, Colonsay (Grieg 1940, Fig. 32): one of the Aldwark brooch fragments, ADB 1169, has a secondary piercing, clearly indicating an intention for re-use (Section 7.2.2). It is possible that one further fragment, a silver-gilt zoomorphic beast-head terminal TDB 1637, may have been mounted on a weight, although this is not certain Pedersen (2008, 175-77) has noted the preference for inset mounts of animal form, with Ó Floinn (2014, 187) postulating that castings of human or zoomorphic heads were deliberately selected for this purpose: TDB 1637 would have suited such a use. Two complete inset weights from the Torksey assemblage have zoomorphic mounts, one of which is silver, and a sliver-gilt human mask is also mounted on a weight recorded as PAS SWYOR-EF9E81 from Tadcaster, Yorkshire, all of which provide parallels of similar pieces. However, although TDB 1637 is pierced twice, the locations of both holes are consistent with the design. Furthermore, one of these piercings retains a gilded rivet with a conical head, suggestive of an original fixing rather than a secondary alteration. Nonetheless, this does not preclude this piece from use on a weight, and the complete nature of the terminal indicates that it may have been intended for a specific use. The appearance of comparatively larger, less fragmented pieces in the Aldwark assemblage does suggest that insular fittings here were more commonly broken up for modification and conversion, rather than serving as scrap or low-value commodity money. The comparatively high amount of inset weights at Aldwark has already been noted (Section 4.3.2). There may have been a greater degree of production of these weights at the camp, and thus a different imperative behind the fragmentation and repurposing of Insular metalwork.

Redknap (2013, 188-90) observes that ‘Irish’ bridle fittings in England and Scotland have typically been seen as indicative of trade, and of the recycling of metalwork. However, Leahy (2014, 38) notes that some Insular finds, particularly elements of horse harness, may have actually been personal possessions. As such, it is possible that the five pieces identified as harness fittings are casual losses of equipment by Irish or Irish-Scandinavian members of the Great Army, rather than material collected as scrap: only one of the pieces of harness is fragmentary, and that appears to have been broken rather than cut. However, more than one of these fittings appears to have been lost during the process of conversion into a brooch (Section 7.2.4), suggesting a more deliberate approach to their acquisition. Wamers (2011, 96-7; 1998, 38; 1983, 293) observes that the wearing of converted Insular metalwork was very fashionable in western Scandinavia, with harness mounts forming the overwhelming majority of items which were adapted as brooches. Heen-Pettersen (2020, 438) records at least 44 individual re-used harness mounts from Norway. The harness fittings from the two camps may have been collected with the express intention to rework them into dress fittings to suit Scandinavian tastes.

Secondary piercings do not unequivocally show that fragments were solely intended for use on weights. Heen Pettersen (2018, 69-71) catalogues three ninth-century burials from the Trøndelag region of central Norway where reworked Insular fittings appear to have been worn at the waist as an element of female dress. To accomplish this, secondary holes were made in these fittings, two of which preserved the remains of ferrous nails or rivets. A review of similar material from south-eastern Norway identified ten further pieces of Insular metalwork with piercings or surviving iron rivets: these were fittings for suspension loops, indicating their use as pendants (Heen Pettersen 2018, 69). Obviously, this practice is mostly evidenced in Norway, using metalwork which generally displays the more carefully-considered cutting which characterises ‘Scandinavian’ fragmentation (Heen-Pettersen 2021). However, this does not mean that all such reworking was only undertaken in Scandinavia, and the presence of secondary piercings and ferrous pins on the metalwork from the camps shows clear similarities with this Norwegian material. The two aforementioned harness mounts clearly demonstrate that Insular fittings were processed into dress accessories at the two camps: finds of Insular mounts modified into dress fittings have been recorded across the British Isles, suggesting that this practice was commonplace amongst the Scandinavian diaspora (Aannestad 2018, 6). If Insular metalwork was converted into dress accessories such as brooches at Aldwark and Torksey, then, by extension, it seems possible that similar pieces may have also been altered for use as pendants or belt fittings, even if these items were ultimately destined for export: Ashby (2015, 96) suggests that reworking may have been undertaken before such pieces were taken to Scandinavia. Some of the smaller fragments of pierced or pinned Insular metalwork may represent material which was either discarded or lost during this activity, and thus represents the detritus of manufacturing rather than the processing of raw materials.

6.3 Metal-working evidence

6.3.1 Metal-working waste

Slag, hearth material, and furnace linings were identified at Aldwark, whilst only slag was recovered from Torksey. The proportions of this waste material are given in Table 6.2. Although Aldwark shows an obvious difference in the amounts of hearth material recovered, this mainly reflects the higher proportion of archaeological trial trenching undertaken on the site, with metal-working waste present in several of the excavated areas. Mortimer (2020, 48) describes five hearth bases amongst this material, although no further details are provided: it has not been possible to reconcile the published metal-working waste finds with the information held in the database. Some of the Aldwark assemblage may ultimately derive from the earlier occupation of the site, particularly given the comparatively early radiocarbon dates produced by a feature containing fragments of burnt clay oven lining in Trench 22 (Hall 2020b, 70). However, slag deposits from this trench were associated with a punch and with clench nails and roves (Section 6.3.2), strongly suggesting that these can be associated with the presence of the Great Army. Equally, Williams and Hall (2020, 83) state that there is no reason to suppose that the metal-working evidence pre-dates the Great Army occupation. The ferrous slag from both locations can be classed as smithing waste, either metal-working by-products or broken-up hearth bottoms, clearly demonstrating that ironworking was practiced in both camps.

Table 6.2: Iron-working waste from Aldwark and Torksey

Location	Slag		Hearth material	
	No. of pieces	Combined weight	No. of pieces	Combined weight
Aldwark	32	Not available	15	Not available
Torksey	5	601.9g	-	-

Mortimer (2020, 48) catalogues four fragments of vitrified furnace lining amongst the Aldwark material, with one piece containing copper-alloy deposits: the other three are undiagnostic, and could have been used in any metal-working process. The same is true for the fragments of slag, with only three pieces from Torksey being confidently attributed to non-ferrous working. The comparative numbers of pieces of slag and furnace material from both sites are shown in Table 6.3. Although this waste material shows some difference between the two camps, it is difficult to know whether this is genuine. Metal-working in the earlier settlement at Aldwark remains a possibility, while the recovery of both hearth bases and furnace lining here is clearly a product of the proportionally greater amount of excavation. Although no hearth or furnace material has been identified from Torksey, this does not mean that such activity was not practiced in the camp: the thick overburden of wind-blown sand which seals the site could easily mask any metal-working remains from geomagnetic survey,

Table 6.3: Non-ferrous metal-working material from Aldwark and Torksey

Location	Slag			Furnace material	
	Copper-alloy	Silver	Unknown	Copper-alloy	Unknown
Aldwark	-	-	6	1	3
Torksey	1	2	2	-	-

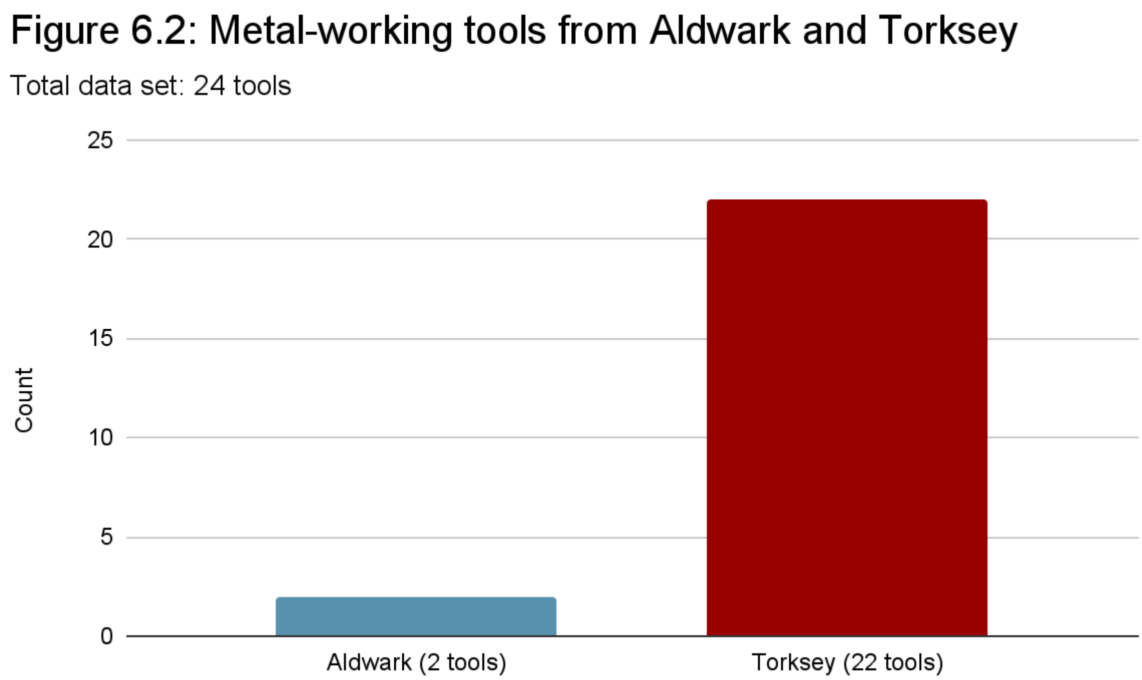
and the programme of trial trenching has not currently achieved the same coverage seen at Aldwark (Hall 2020b, 66; Hadley and Richards 2016, 35). However, the high-temperature working of both iron and copper-alloy was clearly undertaken at both locations.

6.3.2 Metal-working tools

This section includes hammers, anvils, and punches. The categories and numbers of metal-working tools from both sites are presented in Table 6.4. This thesis has identified two hammerheads from Torksey as late medieval or early post-medieval: these are enumerated below, but are not discussed further. The relative amounts of probable early medieval metal-working tools are shown in Figure 6.2.

Table 6.4: Metal-working tools from Aldwark and Torksey

Location	Hammers		Anvils	Punches
	Early medieval	Late medieval/ post-medieval		
Aldwark	0	0	0	2
Torksey	2	2	1	19



The terminology used for hammerheads follows that of Goodall (2011, Fig. 2.3).
Both TDB 1426 and 2829 are small hammerheads, and are similar in shape. They are sub-square in cross-section, with squared striking faces. The bases and sides are parallel, whilst the tops display clear angles where they narrow to sub-rectangular cross-panes: the cross-pane of TDB 1426 is broad, whilst TDB 2829 is thinner and flatter. The eye of TDB 1426 is narrow and sub-oval, whilst that of TDB 2829 is not discernable.
Both these pieces find an easy parallel in hammerhead 2201 from Coppergate (Ottaway 1992, Fig. 196), so are almost certainly early medieval in date. Early medieval hammers generally conform to a standard shape, with a narrow, elongated body, long and straight

cross-panes, and, commonly, raised cheeks on the upper face, bracketing the eye (e.g. Goodall 2011, 14-15). Hammerheads of this form are known from locations such as Thetford, Goltho, and Soham (Goodall 1987, 177-8; Goodall *et al*. 1984, 76-7; Wilson 1976, 265). Like the Coppergate find, both of the Torksey hammerheads are atypical, suggesting that they may show more basic, utilitarian tools, not produced for any specific task.

Table 6.5: Early medieval hammerheads from Torksey

Database No.	Length	Width	Weight
TDB 1426	26.20mm	30.08mm	269.50g
TDB 2829	69.00mm	31.60mm	199.00g

Arwidsson and Berg (1983, 30) suggest a weight range of 400g-750g for smiths' 'hand hammers', with Goodall (1984, 77) suggesting the term 'hand sledges' for hammers within the same range. Both the Torksey hammerheads fall below this and, as such, it seems unlikely that they would have been used for welding, drawing out bars, or other heavy tasks. However, they would have been useful for light works in either iron or non-ferrous metal, including shaping wires, driving nails, or striking other tools such as punches and chisels (Ottaway 1992, 514). Given that neither hammerhead possesses the very elongated form seen on tools designed for more delicate work, it is unlikely that either was used for chasing or shaping metal sheet. The striking faces of both hammerheads are burred, and that of TDB 2829 is dished in the centre, suggesting that it has been used to repeatedly strike narrow bars or rods. The narrow cross-pane of this hammerhead would also have been ideally suited to producing the thin, linear strike-marks seen on 'transverse hammered' Viking-Age ingots (Kruse and Graham-Campbell 2011, 79-80), such as those reported from Aldwark (Blackburn 2011, 235).

Table 6.6: Possible anvil from Torksey

Database No.	Length	Width	Weight
TDB 2298	94.09mm	51.61mm	217g

TDB 2298 is a substantial, nail-shaped object. It consists of a broad, wedge-shaped shank of sub-rectangular cross-section, set orthogonally onto a wide, slightly domed sub-square head. Whilst this object may be an extremely large nail or a hitch-pin, I suggest that it is an anvil. It is very closely paralleled by the anvil recovered from the seventh-century ‘smith’s grave’ at Tattershall Thorpe, Lincolnshire (Hinton 2000, 23-25). This inhumation has been interpreted as the burial of an itinerant craftsman, travelling with portable equipment, and possibly without a pack-animal: such a description could equally apply to any metalworkers accompanying the Great Army, who would presumably value comparatively lightweight, transportable tools. Anvil TDB 2298 would have been driven into a block of seasoned hardwood for use, a resource which Hinton (2000, 24) observes is not always readily available. The fact that such a portable item was carried clearly suggests that members of the Army expected good access to a wide range of supplies, and to be able to procure a suitable mounting at any location.

Early medieval anvils are very rare objects. A possible stone anvil, ADB 327, was proposed at Aldwark, but this identification was subsequently discounted and the object disposed of. An iron anvil, No. 2200, is known from Anglo-Scandinavian levels at Coppergate (Ottaway 1992, 512-13). This is of an ‘L’-shaped, ‘beaked’ form, as is the heavily-beaked anvil No. 75 from the Mästermyr tool hoard, Gotland. However, the second, smaller anvil No. 72 from Mästermyr is a straight, wedge-shaped piece, lacking the wider head evident on both TDB 2298 and the Tattershall Thorpe find: a similar anvil appears to be depicted on the front panel of the Franks Casket (Arwidsson and Berg 1983, 15 & Pl. 21: Webster 2012, 10). Furthermore, a wedge-shaped, square-headed anvil with an additional, narrow beak has been recovered from Hedeby (Armbruster 2004, 111). Practical considerations almost certainly influenced the shape of any anvil, with form being most probably determined by the intended use of the piece. Anvil TDB 2298 would not have been suitable for heavy blacksmithing work, but would have been serviceable for lighter metal-working of the types suggested by hammerheads TDB 1426 and 2829. The Tattershall Thorpe anvil has a pritchel-hole in one corner, showing that it could be used for punch-work and for manufacturing nails: a projecting, flattened corner on the head of TDB 2298 may possess a similar feature, although the find has not yet been x-rayed to confirm this.

Whilst punches have been included in this section, it is accepted that these are not exclusively metal-working tools. Goodall (2011, 27 & 45) also lists punches amongst the equipment necessary for woodworking and stoneworking, and MacGregor, Mainman, and Rogers (1999, 1954) describe the use of a double-pointed punch to decorate rib-bones on a casket lid from Coppergate. Rogers (2020c, 49) catalogues one of the Aldwark punches as a leather-worker's tool, but does not expand on the reasons behind this classification: in the same publication, this find is also listed alongside a concentration of 'metalworking debris' recovered from Trench 22 (Hall 2020b, 69). The description of all these objects as punches may be inexact. The same basic form can encompass a variety of more specialised tools, including hot and cold tangless chisels, drifts, sets, and pritchels.

It has not been possible to examine either of the two punches from Aldwark, or other potential punches identified as 'rods' or 'bars' in the assemblage. However, definite uses can be proposed for several of the Torksey pieces. TDB 2474 is almost certainly a pritchel. This piece is sub-square in cross-section, with a long, tapering point extending from a wider, shouldered body. The centre of this body has chamfered corners, creating a roughly octagonal cross-section: Ottaway (1992, 516) notes that this feature indicates that the punch was designed to be held by tongs or rods, and so was intended to be used hot. Pritchels are most commonly used in forging horseshoes, although this object could also have been employed in the manufacture of roves, matching the square-section clench nails recovered from the site (see 4.4.1 (e), below). Eight further punches are wedge-shaped, so might more accurately be described as chisels, although Ottaway (1992, 517) classifies very similar pieces as punches: these would be of use when cutting up metal objects, or when making decorative grooves, with several of the smaller examples most probably used on non-ferrous material. Two of the Torksey punches, TDB 2552 and 2834, are thicker toward the centre and taper to the ends, suggesting that they were formerly set into organic handles: the remainder all appear to have been tangless, with several showing clear burring and other signs of striking on the upper ends.

Punches are relatively scarce in Viking-Age contexts, with large collections exceptional. Two punches were recorded from Thetford, and a further three from Winchester, although both of these sites also produced morphologically similar items, such as chisels, reinforcing the difficulties of classification outlined above (Goodall 1990, 199; Goodall 1984, 77). This comparative paucity of finds is also seen in Scandinavia, although rare assemblages such as the tool collection from an inhumation at Bygland, Telemark, clearly demonstrate that punches were integral to the toolkits of specialised craftworkers (Blindheim 1963, 34). Some larger assemblages are known: 12 tangless and 15 tanged punches were recorded at Flixborough, Lincolnshire, whilst the largest corpus in the Insular sphere comes from the Coppergate excavations (Ottaway, Starley, and Loveluck 2009, 318; Ottaway 1992, 515-19). Here, 23 tangless and 16 tanged punches were recovered, many of which provide close parallels for the Torksey finds. In assessing the Coppergate assemblage, Ottaway (1992, 519) observed that a wide variety of designs would have been required, with smiths clearly using a far greater range of punches than had been found: the production of coin dies was particularly noted as needing a broad range of tip forms.

6.3.3 Casting waste

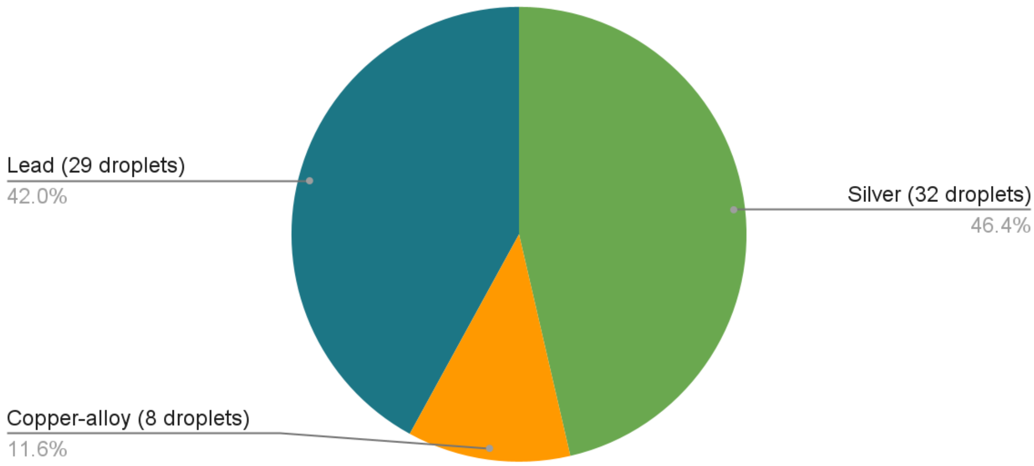
Irregular droplets and spills of various metals have been recovered from both locations: these are all interpreted as waste from melting and casting activity. This material generally takes the form of small, sub-rounded, irregular lenses of metal. The majority of these are unworked, although a few show signs of being flattened or pressed whilst semi-molten. The silver pieces could all be typified as Type 2 ingots under the typology devised by Kruse (2011, 74). However, such a classification would create an artificial division, separating the silver finds from morphologically identical fragments in other metals: for this reason, all such droplets and ‘melts’ have been listed here.

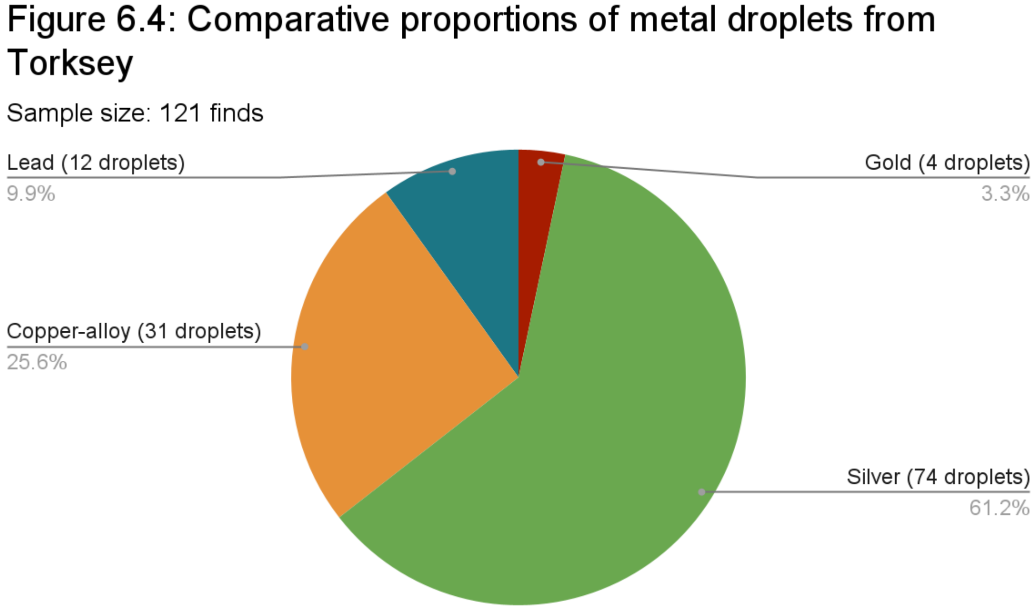
The recording of droplets from both camps is known to be incomplete, with recovery practices introducing a considerable bias. Small amounts or shapeless melts of copper-alloy were either screened out or discarded by detectorists at both locations, particularly during the periods without direct archaeological oversight. Equally, high volumes of very small lead droplets are known to have been recovered at Torksey, but neither counted nor weighed. Therefore, the recorded material in both databases does not give an accurate representation of either location. Further to this, Pedersen (2017, 128) observed a significant discrepancy in the relative proportions of cast metals presented by different forms of evidence at Kaupang. Here, the volumes of droplets recovered suggested that metal-working was almost exclusively conducted in copper alloy and lead, with limited use made of silver. However, archaeometallurgical analysis of crucible fragments revealed very different proportions, with silver as abundant as copper alloy: the recovered droplets and ‘melts’ clearly reflected the comparative care with which craftspeople handled various metals, rather than an accurate record of which materials were cast. Thus, not only are the recorded finds from Aldwark and Torksey incomplete, but the Kaupang evidence suggests that even a well-recorded assemblage would still provide an inaccurate picture of activity on either site. The comparative proportions of the recorded finds from Aldwark and Torksey are shown in Figures 6.3 and 6.4. These are presented to illustrate the metals recovered, and not to provide any quantitative analysis.

Bayley (1992, 779) observes that metal droplets are not, in themselves, incontestable evidence of casting: waste of this form can occur casually, without deliberate action. However, Pedersen (2016, 161) states that a high proportion of the droplets at Kaupang were probably the result of casting spills. Technical considerations require an over-allowance of molten metal when casting, and whilst spillage can obviously occur when filling the narrow inlets of closed, two-piece moulds, Kruse, Smith, and Starling (1988, 90-1) also suggest that droplets can form even when casting ingots in open moulds. Given the abundance of evidence for metal-working at both camps, it seems probable that the recorded droplets do show evidence for casting. Nonetheless, the silver droplets may not all be related to this activity, or may not have been produced on the site. In reviewing six pieces of silver casting

Figure 6.3: Comparative proportions of metal droplets from Aldwark

Sample size: 69 finds





waste from Woodstown, Sheehan (2014, 206) observed that droplets and 'bean-shaped' Type 2 ingots are sometimes found as components in silver hoards, occurring in the Cuerdale hoard and in several finds from Ireland. The dating of these assemblages suggests that silver droplets circulated in the Irish Sea area in the later ninth and tenth centuries, and were used in economic activity. Although they may have been unusual, droplets were clearly incorporated into the range of low-weight, fragmented silver used for small-scale transactions or top up larger amounts. At Torksey, 53 of these droplets have recorded weights which lie between 0.0g-1.9g, mirroring the range seen in the fragmented hack-silver. Whilst this may be a purely accidental occurrence, it does also suggest that many of the Torksey droplets would have been usable in everyday transactions, so may show economic, rather than manufacturing, activity. These droplets may potentially have been brought to the site for use in trade, rather than produced *in situ*.

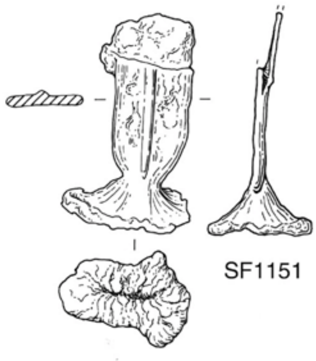
Pedersen (2016, 161) records only a single droplet of gold from Kaupang. Again, this recovery diverges from the archaeometallurgical evidence, which suggests that gold was worked on the site almost as frequently as silver (Pedersen 2017, 128). However, this single droplet contrasts with four recorded from Torksey. It seems reasonable to assume a good standard of recovery of gold from both of the study sites, with detectorists unlikely to screen out even the smallest pieces: therefore, unlike other metals, it seems probable that the Torksey droplets show an accurate representation of deposition. It is difficult to assess whether these might have been used in exchange, as the scarcity of gold in Viking-Age trade makes comparisons with other assemblages unworkable. Although the use of droplets in conjunction with hack-gold must be considered a possibility, it seems more probable that the Torksey pieces show casting overspill from goldworking. Whilst the Kaupang droplet was recovered during excavations in a defined workshop plot, the temporary, seasonal occupation of the site does not automatically suggest that such a location would be inherently more stable or controlled than the more mobile camp at Torksey. Pedersen (2017, 128) suggests that 'every tiny fragment of valuable gold was taken care of' at Kaupang. The presence of four droplets at Torksey therefore suggests that gold was either very extensively used in the camp, leading to proportionally higher rates of unrecovered waste, or that the metal was particularly abundant, leading to careless handling: both these propositions suggest that gold was comparatively frequently cast on the site.

Table 6.7: Casting debris from Aldwark and Torksey

Location	Failed castings	Casting gates
Aldwark	6	1
Torksey	0	4

Copper-alloy casting debris and waste was recorded at both camps. At Aldwark, these finds principally took the form of failed castings, where the cast objects were poorly-formed and had clearly been discarded. One of these failed castings also retains a casting gate, the solidified lump of metal which forms at the entrance of a two-piece mould. One further gate, presumably cleaned off a successful cast, was recovered from Aldwark, whilst four were recorded from Torksey. The failed castings from Aldwark include two strap-ends and two strap-guides: both strap-ends are of the tongue-shaped Thomas Type E series (Table 6.8), with all four items displaying the characteristic raised medial rib of the E3 sub-type. Strap-end ADB 920 was almost certainly discarded because it failed, as the tip is incomplete, and the same may be true of the partial split end remaining on ADB 1151. Both strap guides were badly cast, and still retain untrimmed casting flash. Whilst members of the Great Army clearly collected metal dress fittings, and particularly strap-ends (Section 7.4), it seems highly improbable that these pieces of workshop waste would have been gathered with this material: such items would have been recycled at the point of production, so would not have left the area of manufacture. Williams and Hall (2020, 82-3) saw the metal-working evidence at Aldwark as dating to the late ninth century, and specifically related the casting of these strap-ends and guides to the core period of occupation. It is not possible to be as certain regarding the Torksey assemblage, as the casting gates do not, of themselves, so strongly show that casting was actually undertaken on the site: these pieces could potentially have been carried as sources of scrap, or been used as part of the metal-weight economy. However, it seems unlikely that such items would have been transported far from a workshop environment, or, in their uncut form, would have been particularly useful as a source of currency metal. When combined with the other evidence for casting, discussed below, it seems reasonable to conclude that copper-alloy was also cast at Torksey, with some items produced in two-piece moulds.

Table 6.8: Failed Type E3 strap-end castings from Aldwark

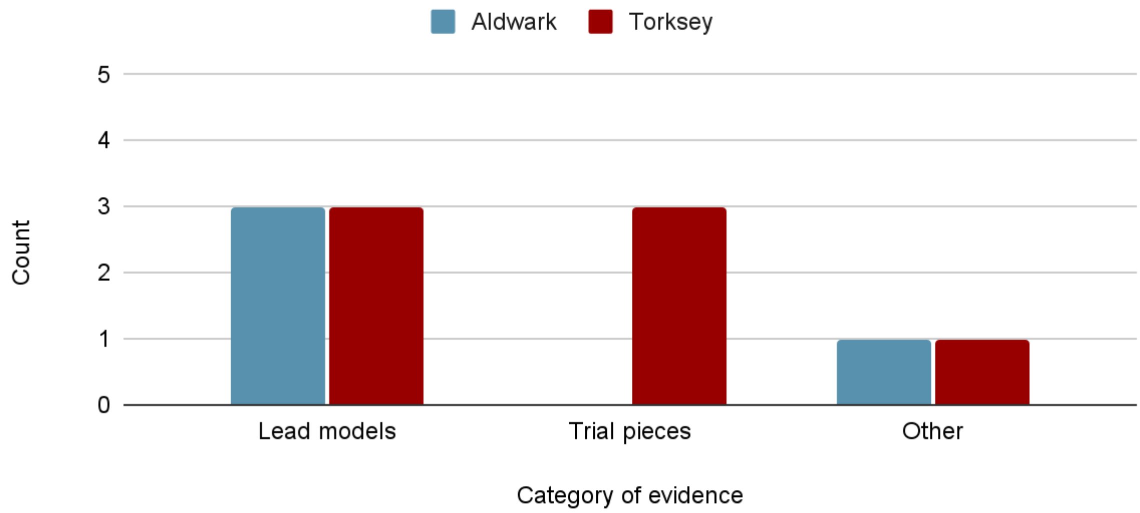
Database No.	Image	Database No.	Image
ADB 920	 Image: York Archaeological Trust	ADB 1151	 Image: York Archaeological Trust

6.3.4 Other metal-working evidence

Other finds associated with the production of metal castings were recorded at both locations. These are detailed in Figure 6.5 and Tables 6.9 - 6.11.

Figure 6.5: Lead models, trial pieces, and other metal-working evidence from Aldwark and Torksey

Total data set: 11 finds



Lead models are widely seen as being used in the production of clay moulds, although their exact function is unclear. The identification of similar items as models or trial pieces for mould-making has been scrutinised in recent years, with questions raised about their suitability and place in the casting process (e.g. Ager 2006, 248). Despite this debate, these artefacts are generally recognised as an intermediate stage in the creation of cast items, most probably used to form basic mould shapes to which fine detail could be added (Coatsworth and Pinder 2002, 74). Whilst lead does appear to have been occasionally used to produce wearable belt fittings (Thomas *et al.* 2008), lead strap-ends are in the main viewed as production models: the three lead strap-ends from Aldwark and Torksey all lack rivet holes, and would not, in their present form, have been wearable items.The rudimentary trilobate palmette motif on TDB 1459 bears a strong resemblance to the simplified design impressed onto a strap-end mould fragment from Carlisle (Taylor and Webster 1984, 179), suggesting that the Torksey find could have been used as a master matrix in the manufacture of similar moulds. Equally, Leahy (2003, 143-4) observes that models could be of very specific use in producing items with pronounced ribs, a feature seen on all three of the Aldwark pieces. In this context, it seems highly probable that all of these were also used as patterns for mould-making.

Table 6.9: lead casting models from Aldwark and Torksey

Database No.	Image	Database No.	Image
ADB 927	 Image: York Archaeological Trust	ADB 1155	Image not available
ADB 1764	 Image: Lee Toone		
TDB 280	 Image: Viking Torksey Project	TDB 281	 Image: Viking Torksey Project
TDB 1459	 Image: Viking Torksey Project		

Although other lead dress accessories are known, these items are rare, and can be distinguished by the different form which they take. Later Anglo-Saxon lead and lead-alloy brooches are well-finished, with holes drilled for hinge fittings and catchplates bent to retain pins (e.g. Mainman and Rogers 2000, 2573-4): models of brooches are generally distinguished by the lack of these features, again indicating that the items would have been unwearable (Mortimer 1994, 27-29). It should be noted that not all lead models appear to have been casting blanks. A lead disc bearing an unfinished spiral design from the Brough of Birsay, Orkney, has been interpreted as a ‘designer’s sketch’, used to work out and finalise a design (O’Meadhra 1993, 432-3), indicating that models could be employed at other stages of the production process. Nonetheless, all such items are generally associated with workshop activity, with their presence taken as being indicative of on-site manufacturing. All three lead models recovered from Aldwark relate to belt fittings associated with the Thomas E3 sub-type. Two are strap-ends, whilst the third is a strap guide, suggesting that they were intended for the production of suites of fittings. These pieces are clearly related to the failed castings of E3 belt fittings noted in Section 6.3.3: further evidence surrounding the production of Type E3 belt fittings at Aldwark is discussed in Section 7.4.3. Only the proximal end of the lead strap-end model from Torksey remains, fashioned with a bifurcated terminal, and with two design panels outlined on the main body. Although no fine detail can be seen in the larger panel, the smaller surviving trilobate palmette design indicates an Anglo-Saxon, Trewhiddle-inspired influence characteristic of the Thomas A1 Type (Thomas 2000a, 193-4). The presence of this casting model strongly suggests that English-style belt fittings were produced at Torksey, whilst the Carolingian-inspired E3 fittings were manufactured at Aldwark.

TDB 281 is a fragment of lead alloy, broken on all sides and with a flat reverse. On the front, the surviving design shows the remains of a lozenge-shaped field, divided by four raised arms: these arms define a quatrefoil shape, with hollows which lead to piercings, arranged around an elliptical central projection. Morphologically, this very strongly resembles a decorative openwork boss, a characteristic feature of several classes of Scandinavian jewellery: I propose that this lead model is the remains of a casting prototype for such an item. The low profile and clear framing field of the design mean that this piece is unlikely to have been intended for the production of the separately-cast bosses which were affixed to Type P51 oval brooches: whilst these were typically of a similar open quatrefoil form, they also exhibit a more rounded, uniform shape and are highly domed (Jansson 1985, Fig, 56). The lower, more angular pattern of TDB 281 suggests that it was the central boss of an equal-armed brooch. Kershaw (2013, 93-4) notes that no comprehensive study of these brooches exists, limiting the possibility of suggesting parallels. However, clear similarities can be seen with the central fields of the Type III F:1 and Type III H:1 brooch forms identified by Aagård (1984, 99), both of which were classified at Birka. Some similarities can also be seen with the central bosses recorded on both the Type II B1 and II B2 large round brooches from Birka (Jansson 1984a, 76), although the slightly asymmetrical design of TDB 281 makes this comparison unsatisfactory. Nonetheless, the presence of this piece of workshop material very strongly suggests that Torksey also saw the production of at least one item of classically Scandinavian jewellery. In Scandinavia, all three types of brooch listed above are typically associated with female dress (Kershaw 2013, 171-2; Hayeur Smith 2004, 71).

This thesis proposes that TDB 280 is also a lead model. It is formed of two small, conjoined, slightly flattened lead spheres of 5.5mm diameter, with a lip of casting flash passing around their circumference. These pieces have been cut at one end, suggesting that they were formerly part of a longer section, potentially made up of similar globules: together, the spheres have a marked similarity to the rods and wires used as 'beaded' elements on early medieval metalwork. Beaded wire was a very popular constituent of jewellery in the early middle ages (Whitfield 1998, 57). Whilst beading for jewellery was manufactured by either impressing or filing sub-spherical divisions into round-section wires, these wires were typically narrow, resulting in granulated beads with diameters ranging from 0.5mm to 2.5mm, most commonly toward the lower end of this range (Duczko 1985, 17-22 and 32-104). However, larger 'beaded' borders do exist, such as the gilded copper-alloy frames of the so-called Rupertus Cross housed at Bischofshofen, Austria (Wilson 1984, 133-4). Although it would have been inefficient and wasteful to produce thicker sections of beading by the techniques outlined above, a longer arrangement of the spheres seen in TDB 280 could have been used as a model to cast large-diameter beaded rods. Experiments by Coatsworth and Pinder (2002, 75-6) identified lead as being particularly suited to the production of such beaded borders, with the metal's malleability producing results which were indistinguishable from Anglo-Saxon originals. Beaded or pelleted borders were also featured on dress items such as hooked tags or buckle frames (e.g. TDB 3566, Paterson and Tweddle 2014, 212). Therefore, sections of beaded lead rod, used to create larger models, could be seen to be a useful component of a craftworker's toolkit.

Viking-Age lead models are not common artefacts: Pedersen (2016, 38) catalogues them as occasional finds, either in single or low numbers, from sites in Scandinavia, York, and at Huntingdon in Cambridgeshire, before noting the exceptional collection of 26 pieces recovered from Kaupang. The Kaupang assemblage contains only two pieces which can be assigned to secure contexts, and clearly represents material deposited over a far longer period of occupation than at the two camps: the majority of the remaining models have been broadly dated to 800-875 AD on stylistic grounds, although some may date to as late as 950 AD (Pedersen 2016, Figure 4.28). Furthermore, not all pieces in the Kaupang assemblage can unequivocally be said to be casting models, and the author notes that several fragments are missing the diagnostic elements which would prove they were 'unfinished': it is therefore possible that some of the artefacts were functional lead jewellery. Nonetheless, the size of this assemblage remains unique.

The Kaupang finds were principally collected through the use of metal-detectors: similar detector surveys at Hedeby have not produced a comparable assemblage, suggesting that there may have been a strong element of regionality in the use of lead models (Pedersen 2016, 39-40). Given that metal detectors were employed at all locations, broad comparisons may be drawn between Kaupang, Hedeby, and the study sites. Whilst the numbers of lead models from Aldwark and Torksey are significantly lower than the total recovered from Kaupang, both assemblages appear substantial when viewed in an Insular context: by contrast, only a single lead model was recovered from 16-22 Coppergate (Tweddle 2004, 453, Fig. 112). It is possible that the presence of lead models at the two camps reflects the potential regional bias noted above. Eight of the 26 pieces from Kaupang relate to the production of equal-armed brooches, with three of these identified as definite models. No other class of object is so heavily represented in this assemblage (Pedersen 2016, 67). Whilst only a single model for an equal-armed brooch has been proposed from the two camps, this is also the only piece designed to manufacture a characteristically Scandinavian item. If the high proportion of lead models for equal-armed brooches at Kaupang shows a standard production technique or a regional manufacturing tradition, then it is possible that this practice is reflected in the presence of a similar model at Torksey.

Whilst the similarities noted above may suggest a relationship between manufacturing techniques at Aldwark, Torksey, and Kaupang, the use of lead casting models may equally be a reflection of the mobile nature of the Great Army. Lead models would be durable and robust, and available for use whenever a suitable workshop could be established: in contrast, wax is fragile and easily damaged, suggesting that any completed models for the 'lost wax' casting process would be difficult to transport as the Army moved (Pedersen 2016, 70; Coatsworth and Pinder 2002, 75). That lead models were portable is evidenced by a complete artefact from the Kaupang assemblage, find C52517/635 (Pedersen 2016, 61-2). This is interpreted as a model for manufacturing base-frames for decorative glass studs, and both the morphology and isotope analysis of the piece suggest that it had an Insular origin, with the lead most probably sourced from Scotland. This innate portability may explain the concentration of lead models at Kaupang, rather than indicating a regional tradition. Across the entire Kaupang settlement, models for equal-armed brooches appear to have been used in several distinct workshop areas throughout Site Periods I and II, dating from the first half to the middle of the ninth century. Within these periods, occupation at the site was either wholly or partially seasonal (Pedersen 2016, 68; Pilø 2007, 192-200), potentially indicating that the models were utilised by travelling traders. Lead models, suitable for storage and transportation, may have been particularly attractive to itinerant craftworkers, who may also have prized the ability to use such pieces repeatedly. This final aspect also informs one of the more important implications of the presence of lead models at Aldwark and Torksey: such items were designed for repeated use. These artefacts do not only merely demonstrate that manufacturing was undertaken at each site, but also that some of this manufacturing involved the serial production of closely-related sets of products.

In discussing the Kaupang corpus, Pedersen (2017, 125-6) observed that moulds for equal-armed brooches would require lengthy, complicated preparation, even with the use of lead models. She concluded that this timescale meant that such brooches were made in advance, and prepared for general, anonymous sale. If this interpretation also holds true for Torksey, then it carries profound implications for the nature of the market within the camp, suggesting that Scandinavian-style jewellery was produced as stock, with the expectation that it would be purchased at a later point. However, Pedersen (2017, 129-30 & 134) also saw serial production as representing a purely technical option, giving the craftsworker flexibility and the ability to adapt to a given market: whilst complex items could be made in advance, the use of models also created the ability to cast large volumes of more straightforward products, with closely-linked series of objects produced individually to order. Although the bifurcated terminal of TDB 1459 also implies an extended mould-manufacturing process, the simple forms of the Aldwark models all speak of easy, swift casting. This would potentially show a difference between the two camps, with some objects at Torksey made in advance but with castings at Aldwark produced more reflexively. Equally, the recovery of only Thomas E3 sub-type models from Aldwark suggests that manufacturing at the camp was strongly focused toward belt fittings, to the exclusion of other dress accessories: the fact that all three models are from the same sub-type implies the production of a high volume of these objects.

All three trial pieces from Torksey are made from lead sheet, and have been used to test a variety of decorative punches. In analysing the punch designs on TDB 85 and 2087, Blackburn (2011, 242) noted that all four were common elements of decoration on Scandinavian silver jewellery. More notably, the undulating, wave-like lines visible along the centre and reverse faces of TDB 2087 are closely paralleled by the decoration on a lead model for a flat, broad-band style arm-ring from Kaupang, C52519/21224 (Hoffmann 2021, 37 and Figs. 4.1.15 and 5.6). Although TDB 2067 has been previously interpreted in the

Table 6.10: Lead trial pieces from Torksey

Database No.	Length	Width	Weight	Image
TDB 85	24.00mm	20.00mm	5.83g	
TDB 2067	47.45mm	46.01mm	54.87g	
TDB 2087	70.22mm	26.68mm	47.80g	

Torksey database as a piece of horse harness, this thesis proposes that it is also a trial piece. The ‘C’-shaped punch used on this object is closely paralleled by the decoration on iron disc fitting No. 3408 from Coppergate (Ottaway 1992, 633-4). Whilst the Coppergate fitting was probably part of a small chest or casket, punched decorations of this form are occasionally used on Scandinavian jewellery. Graham-Campbell (2011, 146) catalogues similar ‘C’-shaped punches amongst other uncommon, ‘miscellaneous’ designs, noting that they were commonly employed to form undulating, transverse grooves. As a motif, such designs are generally seen on Type A band arm-rings with sub-group (i) designs, characterised as ‘Scandinavian and related’ ornament (Graham-Campbell 2011, 91). These arm-rings have a distribution which is strongly centred on Scandinavia: in Britain, they are only known from four fragments in the Cuerdale hoard, although one further fragment appears in the Dysart Island hoard from Co. Westmeath, Ireland. However, similar crescent-shaped punched designs are also seen on flat-band finger rings: the suggestion by Graham-Campbell (2011, 106) that annular rings of this type were an early Viking-Age fashion in Britain, associated with the Great Army, has already been noted in Section 4.4.6. The punch used on TDB 2067 could have been used to decorate such a ring. Although the specific manufacturing punches themselves have not been identified, it seems highly likely that all three trial pieces were produced on site. Given the relationship that the punches have with established forms of jewellery, it seems reasonable to suggest that Scandinavian-style finger rings and broad-band arm rings were manufactured in both silver and gold at Torksey.

Table 6.11: Other metal-working evidence from Aldwark and Torksey

Database No.	Image	Database No.	Image
ADB 1080	 Image: York Archaeological Trust	TDB 2124	 Image: Viking Torksey Project

Rogers (2020d, 56) suggests that ADB 1080 is an unfinished disc brooch or mount. A similar disc-shaped blank has been recovered from the metal-detected ‘productive site’ of Bawsey, Norfolk, again with a single, central perforation and a demarcated quadrant showing a sketched-out Trewhiddle-style beast (Pestell 2014, Fig 3:4). The Bawsey piece has been interpreted as a trial-piece for a disc brooch, although it seems equally as possible that, akin to ADB 1080, it was a work in progress, either lost or discarded by its maker before completion. The Bawsey site shows some similarities to Staunch Meadow and Flixborough, with fragmented Insular ecclesiastical metalwork and transverse-hammered copper-alloy ingots recovered from the location, and with the finds assemblages showing a terminal decline in the tenth century (Pestell 2014, 143): although they are not conclusive, these elements are highly suggestive of the activities of the Great Army. At Aldwark, the presence of this unfinished piece, worked in an English style, may indicate an Anglo-Saxon craftworker in the camp. More broadly, it suggests the production of dress accessories which would appeal to local tastes.

A broken copper-alloy *pressblech* die, TDB 2124, was recovered from Torksey. This would have been used as a patrix for producing embossed decorative metal foils in copper-alloy, silver, or gold (Webster and Backhouse 1991, 56-7). The surviving face is decorated with a two-strand interlace ornament and a roundel containing a contorted beast, both elements related to the Trewhiddle style (Thomas 2000a, 71; Wilson 1961a, 103-5), indicating an English origin for the piece. The use of the *pressblech* process has received comparatively little study in Insular contexts. In England its flourit appears to have been in the early Anglo-Saxon period, with little later material (Leahy 2003, 157). The majority of foils and dies are dated stylistically to the seventh century and earlier, although Webster (1984, 109) suggests a possible eleventh-century die from Hammersmith. Laing (1993, 7) observes that the few later examples of *pressblech* foils are all found on material which appears to have originated in Northumbria, suggesting that, although largely abandoned elsewhere, the technique was preserved in the Northumbrian kingdom between the seventh and ninth centuries. A good example is provided by the Hexham ‘pail’, a small copper-alloy *situla* bucket decorated with a series of triangular *pressblech* plates: although these have been dated to the eighth century on stylistic grounds, the pail itself was used as the container for a styca hoard in the mid-to-late ninth century (Bailey 1974, 149). Similar triangular mounting plates are found on the binding of the Codex Bonifatianus I manuscript kept at Fulda, Germany: again, art-historical dating suggests that these mounts were produced in eighth-century Northumbria (Wilson 1961b, 213). Whilst ninth-and-tenth-century copper-alloy and stone *pressblech* dies are also known from Kaupang, Birka, Hedeby, and other sites in Scandinavia, these were either used to make small foils for decorative nail-heads or to shape brooch blanks (Pedersen 2016, 78-81). A collection of later tenth-and-eleventh-century die matrices from Hedeby and the Baltic were used to form brooch and pendant blanks to which filigree and granulation were added (Armbruster 2004, 113-122). Both these uses show a very different form of production in comparison to the English manufacture of larger sheets. It is possible that larger foils were manufactured on organic formers in Scandinavia, as they may have been in Ireland, but again, this difference of technique re-enforces the attribution of TDB 2124 to an English style of metal working (Craddock 1989, 179).

Coatsworth and Pinder (2002, 110) note that the production of multi-use copper-alloy dies required considerable time and expense, suggesting an association with large-scale, highly organised production. Whilst it is not possible to know whether this patrix was actually used in manufacture at Torksey, its presence in itself is unusual. The find is a valuable, specialised metal-working tool, almost certainly brought to Torksey from Northumbria. The majority of Northumbrian *pressblech* work is found on ecclesiastical objects, examples of which include the panels on the aforementioned Rupertus Cross. Whilst clearly not a direct link, the Cross does demonstrate that pressed foils were sometimes used on metal objects in conjunction with the beaded borders suggested by TDB 280. The presence of both these items arguably shows that metal-working techniques and materials were brought from Northumbria by the Great Army, but more clearly demonstrate that highly-skilled metalworkers were amongst the inhabitants of the camp at Torksey.

6.3.5 Litharge

Ten pieces of litharge were recovered from Aldwark. Litharge cakes are a by-product of cupellation, wherein silver or gold is refined through high-temperature oxidation. This process results in the creation of base lead litharge, partially absorbed into hearth or crucible material, with precious metal separated on the surface. Whilst cupellation can be performed to recover silver from freshly-smelted argentiferous lead, it is also used in the purification of debased silver (Merkel 2016, 24). It seems likely that the second process was practiced at Aldwark. No evidence for cupellation has been recorded at Torksey. This is unlikely to show a deficiency in recovery, as the lead oxide litharge cakes would be easily identified by metal detector. Thus, their absence shows a clear material difference in practice between the two camps.

Cupellation has been identified at Woodstown, demonstrating that evidence for the process at Viking camps is not unique to Aldwark. However, the Woodstown remains consist of four fragments of ceramic cupels (Young 2014, 270-82). These small vessels are more commonly used to assay the purity of silver, rather than to refine it. Assaying is a small-scale process, and no litharge cake was found on the site, despite an extensive metal detector survey. Cupels have been identified at Viking-Age urban sites such as Kaupang, Birka, and Hedeby, and have also been recorded at Coppergate (Bayley 1992, 750). Early medieval litharge, indicative of larger-scale refining, is far rarer, with cakes found at Coppergate, Winchester, and at Fröjel on Gotland (Kershaw and Merkel 2022, 127; Bayley 1992, 749; Bayley and Barclay 1990, 181): although a total of 27 fragments of litharge cake have been collected from Flaxengate, Saltergate, and Silver Street in Lincoln, many of these are poorly dated and it is believed that they show residual Late Roman activity, despite many being recovered from later Anglo-Saxon or Saxo-Norman contexts (Bayley 2008, 29-30). The ten litharge cakes from Aldwark weigh a combined total of 1380g. Medieval treatises suggest a ratio of three parts lead to one of material for refining, which suggests that at least 340g of silver was purified on the site. However, a greater proportion of lead is required for material which contains high amounts of copper. Mortimer (2020, 48) observes that several of the recovered litharge cakes have a greenish tinge, indicating high levels of copper compounds which would have altered the aforementioned ratio. Whilst any attempt to determine the amount of silver refined is, perhaps, of little import, the presence of so much material related to refining is striking. The scarcity of evidence for cupellation on Viking-Age sites makes the Aldwark material unique, with the ten separate pieces recovered greater than the total assemblage of litharge from Coppergate Periods 3-6.

Cupellation is a skilled and labour-intensive process, with Merkel (2016, 31) suggesting that it would only be undertaken if completely necessary. Kershaw and Merkel (2022, 127) note that silver in the Viking Age was not routinely assayed by cupellation, with nicking or pecking far more common methods of assessing purity and debasement. Although silver purity was of clear importance in the bullion economy, cupellation was not the sole available method to improve metal quality. Whilst silver coinage in England became increasingly debased throughout the third quarter of the ninth century (Metcalf and Northover 1985, 150), the Great Army was able to access imports of dirhams, sources distinguished by extremely high levels of silver purity. Not only were dirhams demonstrably in circulation at Aldwark, but the number of finds and their degree of fragmentation suggests that the occupying force was still able to access fresh supplies from the east (Section 4.2). The routine melting and reworking of silver which characterised the Scandinavian economy would mean that any low-grade metal could be purified by the addition of a higher-grade source such as dirhams, removing the necessity for refining. Cupellation is in itself wasteful, with the crucible rendered useless and the resulting lead oxide contaminated (Hoffmann 2021, 34). All purified silver is usually removed from this oxide waste. Nonetheless, several of the Aldwark litharge cakes retain fragments of precious metal, some visible to the naked eye (Mortimer 2020, 48). This carelessness suggests an abundance of silver on the site. If this is so, then it further suggests that cupellation was undertaken for reasons beyond the purely economic, and that the large-scale refining of silver at Aldwark was a deliberate, calculated action.

At Fröjel, large-scale cupellation has been linked to the casting of silver arm-rings and penannular brooches (Kershaw and Merkel 2022, 127). Whilst the production of broad-band arm-rings can be inferred at Torksey (Section 6.3.4), no evidence from Aldwark suggests that silver jewellery was routinely manufactured at the camp. Cupellation is often seen as a step in the process of coin making, frequently performed when old coin is re-minted (Merkel 2016, 31-2). The silver content of stycas declined progressively throughout the ninth century (Gilmore 1981, 97), implying that earlier issues were typically collected and retired with each new striking, systematically debasing the coinage. Whilst Naismith (2017, 125) notes that silver was deliberately excluded from later ninth-century Northumbrian coins, both Pirie (1997, 333) and Metcalf and Northover (1987, 212) observe that stycas of very varied silver content circulated in Northumbria throughout the mid-ninth century: the Hexham hoard of *circa* 860 AD may show evidence of the deliberate collection of older, higher-silver issues, suggesting that later 'bad' money had not previously driven the 'good' out of circulation. Nonetheless, the comparatively low proportion of Eanred stycas at Aldwark has been observed above, as have possible reasons for the general dearth of regal issues at the camp (Section 4.2.2).

None of the Eanred stycas in the Aldwark assemblage are from the earlier, high-silver issues (Haldenby *pers. comm*). Whilst this is conceivably related to the aforementioned hoarding activity, it may also show that the Great Army itself was instrumental in removing Eanred stycas from circulation, collecting them for melting and refining in order to extract the silver. Metcalf and Northover (1987, 192) have noted that cupellation would have wasted the brass alloyed into most styca issues, leading to the suggestion that it would have been uneconomic to recover silver by this method. However, they also observe that the costs associated with the process may only have discouraged *private* enterprise: if Aldwark saw a formalisation of exchange in copper alloy, focused on stycas, then the leaders of the force may have deemed it necessary to bear the expense of removing the older, higher-silver

Eanred stycas from general circulation. Equally, refining activity may have been directed toward the ‘broad’ pennies at Aldwark. Equally, the higher proportion of Burgred coins in the camp has also been noted (Section 4.2.1), as have the high levels of debasement found in the ‘lunettes’ series of his reign. The evidence of cupellation may show the elimination of these coins, serving the dual function of removing currency which was outside its area of standard use while also improving the overall quality of stocks of silver. Whilst none of these actions would have been an economic necessity, regional control of the coin economy may have been politically desirable, with the leaders of the Aldwark camp instigating a programme to standardise the content of local styca issues and remove silver ‘broad’ pennies from circulation. In wider terms, even if the cupellation evidenced at Aldwark was not directed toward coins, this evidence of a systematic programme of silver refining implies a centralised control over bullion quality and the market.

6.4 Coin production

Evidence suggesting coin production has only been recovered from Torksey: this takes the form of two ‘trial’ coins and two irregularly-shaped, angular pieces of lead sheet. One of these sheets, TDB 1697, is a sub-square fragment which has been struck with the obverse and reverse dies of an imitative *solidus* of Louis the Pious (Blackburn 2007, 71). These are on opposing faces of the sheet, but not accurately aligned, indicating that the striking was comparatively careless. A tear in the sheet has removed roughly a quarter of each die face: whilst this may be post-depositional damage, it may also indicate a deliberate attempt to deface or destroy the impression. In reviewing four similar lead-sheet strikings, Dolley (1954, 177) presents the accepted view that such pieces are a by-product of the die-cutting process, used to assess the quality of dies during or after production. Whilst Dolley also proposes that these artefacts should only be associated with die manufacture, rather than minting, the separation of these two activities seems an unlikely proposition for the camp. By contrast, Pol (2011, 186) suggests that such struck pieces may have served as a method of cleaning coin dies during the minting process: as such, this would suggest a use during actual coin manufacture, rather than prior to it.

The second lead sheet, TDB 84, cannot have functioned in the same way as TDB 1679. Whilst the trapezoidal, torn fragment shows a pair of poorly-aligned obverse and reverse faces, these are retrograde, showing that an actual coin or coins, rather than a die, were used to create the impressions. The impressed coin is clearly one of the Type A ‘lunettes’ series issued by Burgred of Mercia. However, the inscription is blundered (Hadley and

Richards 2021, 103), suggesting that it was most probably created from an imitative coin rather than a legitimate issue. It is unclear what place such an impression might have had in the manufacturing process. Whilst it may have been used to create an imitation die, the purpose of a negative image in this activity is unknown, and a derivative, blundered coin seems an unlikely candidate for duplication. Four similar pieces of coin-impressed lead from the London area are discussed by Archibald (1991, 326-8). Whilst these artefacts differ in that they were formed on regular, discoidal lead flans, and one is only impressed on a single side, the technique of making the impressions appears the same, suggesting that a similar process might be represented. Two of these examples are copies of different coins of Coenwulf of Mercia, another is a copy of an Essex-type sceat, and the single-sided piece bears the obverse of a coin of Athelstan I of East Anglia, leading to the suggestion that the creation of such incuse impressions was restricted to earlier periods, and potentially practiced only in the south-east of England. The Torksey impression could be seen to broadly agree with this proposition, although it falls toward the latter end of the date range, and northward of the broad geographical distribution, potentially expanding both these criteria. Archibald (1991, 328) does note that the early use of this relief-impression technique differs from contemporary Merovingian custom, potentially indicating that it shows an uniquely English practice. TBD 84 may therefore demonstrate the presence of an experienced Anglo-Saxon die-manufacturer at Torksey.

The two trial coins are clipped and shaped to form circular flans. One, TDB 3577, is bent double, making it impossible to view the obverse side. Although the visible legend on the reverse is blundered and illiterate, the simplified design is distinct enough to have also been identified as an imitative Louis the Pious *solidus* (Andrew Woods *pers. comm*). The lead of the second trial coin, TDB 83, has degraded, making a definite identification difficult: it is a 'lunettes' series coin, but it is unclear whether the depicted ruler is Burgred, Æthelred I of Wessex, or Alfred. Pirie (1986b, 38) suggests that later trial coins, from the reigns of Edward the Confessor and William II, are final-stage proofs of dies, hammered out before they were used for striking in silver. In legitimate mints, this may have been done to create record copies of authorised dies, used as references in cases of dispute, although Archibald (1991, 332) dismisses this idea, along with the suggestion that lead coins show attempts at forgery. Despite Archibald's dismissal, it does seem possible that these were demonstration pieces, used to confirm that convincing coins could be produced by finished dies. A concentration of similar lead trial coins from Billingsgate, London, has been taken as evidence that such proofs did not move far from their place of production (Archibald 1991, 331), with the same proposal advanced for impressed sheet 'trial pieces' and die cleaners (Pol 2011, 187). Thus, these finds indicate that a minimum of three separate coin dies were present within the Torksey camp, with this workshop detritus suggesting that coins were struck from each die.

The imitative *solidus* die shown on TDB 1697 is accomplished and literate, indicating a high level of craftsmanship. However, the workmanship of the die used for the trial-coin *solidus* TDB 3577 is of a significantly lower grade. *Solidi* appear to have been originally produced on a small scale, most probably to mark the coronation of Louis in 816 AD, although it is possible that minting continued for a protracted period of time (Naismith 2010, 219). Whilst the genuine coins do not appear to have been particularly significant within the Carolingian economy, numerous imitations are known to have circulated in the Netherlands (Coupland 2007, 27). Single finds of imitative *solidi* are concentrated in Frisia, with one recorded from Hedeby. Examples are also known from three separate hoards in the Netherlands, one of which contains die-duplicate copies of *solidi* from the mid-ninth-century hoard from Hoen, Norway (Blackburn 2007, 68; Wilson 2006, 16). This indicates that a demand for gold coins persisted on the borders of the Carolingian empire until well into the ninth century, with twenty Insular finds of imitative *solidi* suggesting a similar requirement in the British Isles (Coupland 2016, 264). In addition to the aforementioned pair of coins from Torksey, gold-plated counterfeit imitative *solidi* are known from Exeter, and Hingringham, Norfolk: this final example is a precisely-cut halved coin which has been gilded over the line where it was bisected, suggesting that it was intended to pass as cut bullion. Pagan (1988, 72) notes that the *solidus* was customarily a heavier coin than the Anglo-Saxon gold *mancus*, indicating that it is unlikely that it would have been recognised as holding a fixed domestic value, and that the coins may therefore have been restricted to international commerce. Blackburn (2007, 80) proposes that the variable weights and qualities of all imitative *solidi* suggest that they were probably employed as a form of bullion, viewed as more convenient or familiar than ingots. Despite this suggestion, genuine *solidi* from the British Isles are most commonly found complete, suggesting that, if they were used in domestic exchange, the coins may have been used in formalised, high-value transactions: other than the single fragmented counterfeit coin described above, only one further cut imitative *solidus* is known outside the Torksey assemblage (Naismith 2010, 217).

The two cut fragments and two whole gilded counterfeits of *solidi* from Torksey have already been mentioned in Section 4.4.6. Only one of these is an official issue, whilst two of the others are probably Frisian in origin, with the remaining piece apparently an English forgery of a Firsian imitative coin (Blackburn 2011, 252). Various forms of *solidi* were therefore clearly in circulation at Torksey. Whilst one of these pieces was of Insular origin, the fragmentation of the two gold coins suggests that they were all integrated into the camp's bullion economy, rather than following more typical Insular usage. As Blackburn (2011, 228) observes, the presence of such a volume of material relating to *solidi* in one location is highly unusual. This concentration further reinforces the suggestion in both Chapter 4 and Section 6.3 that gold was particularly abundant at Torksey. From a purely practical perspective, it is hard to see what function would be served by minting gold *solidi* for transactions inside the Torksey camp: in an environment where a metal-weight economy was clearly practiced, and where hack-gold was in circulation, the processing of gold into coins would be superfluous. Equally, it seems improbable that such high-value coins would have been useful for local trade in the camp environs. The *solidi* may have minted to apportion loot within the Army, an activity often attributed to winter camps (eg. Horne 2022, 77). However, even in this scenario, the manufacture of struck coin rather than ingots appears curious, and suggests a deliberate, pointed action.

Archibald (1991, 336) suggests that both lead trial coins and impressed coins on trimmed lead sheets functioned as customs receipts. Both the nature of the finds and the circumstances of the Torksey camp make this interpretation seem unlikely. Although the function of the coin impression TDB 84 is unknown, the presence of trial coin TDB 83 strongly suggests that at least one type of 'lunettes' coinage was struck at Torksey, with a further imitative die of Burgred either planned or manufactured. Neither of these two pieces appear to relate to the two contemporary forgeries of 'broad' silver pennies recorded from the camp (Section 4.2.1) and it is impossible to know whether the intention was to produce silver, debased silver, or base-metal coins. The poor silver content of many of the 'lunettes' issues has been observed by numerous authors (e.g. Williams 2009, 78). The suggestion that certain issues of Burgred's 'lunettes' series were struck specifically to pay the Great Army has already been noted, as has the high proportion of these coins recovered from both camps. Metcalf and Northover (1985, 159-60) also observed that the low silver content of many issues may be related to a general overproduction of the series. Whilst they link this to a proliferation of official mints, the presence of this material at Torksey must equally suggest that imitative copies produced by the Great Army itself may have contributed to the decline in quality.

Merkel (2013, 77) observes that the production of coins requires an outlay of labour and materials, with minting holding no economic benefits in economies where hack-silver also circulates. This therefore strongly suggests that the coins struck at Torksey were not intended for use in the Great Army's internal market, but were instead oriented toward other economies. I propose that minting at Torksey fulfilled two different functions, each related to the material from which the coins were produced. In silver, the production of imitative 'lunettes' coins indicates a significant degree of integration with neighbouring economies, with these coins almost certainly struck to facilitate local trade (Williams 2020g, 95). In the Frankish kingdoms, written sources imply that mercantile exchange between Viking forces and local populations was comparatively common (Gullbekk 2008, 164). Charles the Bald's interdict on the sale of military hardware to Scandinavian forces has been noted in Chapter 5: Stalsberg (2017, 266-7) observes that, unlike previous *capitulare,* this particular act specifically banned direct trade in arms, rather than merely their export. Cooijmans (2020, 160) astutely notes that this embargo carries the implication that such items had previously been commercially available to Viking armies within Francia. Furthermore, he also suggests (2020, 181) the 'redistribution' of tribute into the local economy as a reason behind Carolingian rulers' willingness to pay in coin, with Coupland (2011, 123-6) also seeing the retention of Carolingian coins in western economies as a reason for their dearth in Scandinavia after 865 AD. If some of the factions of the Great Army were accustomed to purchasing supplies using a host nation's currency, then a move toward striking their own coins may have been a logical step. The aforementioned debasement of some of the 'lunettes' series may have been an effective way to recoup some of the outlay required by this minting.

In gold, it is tempting to see the presence of the two *solidus* dies at Torksey as showing an eye toward overseas markets. This could indicate a focus on Frisia, the centre of gravity of imitative *solidus* finds and an origin-point for many members of the Army. However, Coupland (2016, 266) observes that imitative coinage in Frisia may well have been produced by sojourning Scandinavians, and furthermore it is hard to understand why two variants of such a high-value coin might be needed for potential overseas transactions. I suggest that the production of *solidi* at Torksey instead served a non-economic function, with these items tied into the gift/display economy, independent of any metal-weight or monetary transactions (Askjem 2011, 180). Saga evidence suggests that gold rings were sometimes given out by kings as rewards to military followers (Ager 2011, 127-8), and gold was clearly seen as a suitable material by which monarchs could distribute largesse in a martial sphere. Following on from this, Merkel (2013, 76-7) states that minting coins carried political advantages above the economic, opining that 'it takes a state to make coins'. In a similar vein, Williams (2007, 180) posits the idea that the mere act of issuing coins might be seen as an expression of a ruler's legitimacy. Whilst the Torksey evidence clearly does not signify conventional notions of kingship or state formation, Coojimans (2020, 32) observes that the leaders of autonomous forces such as the Great Army would have largely relied on personal prestige to recruit and maintain their retinues: the production of high-value prestige objects could serve as a way to amass followers, and the distribution of wealth was vital for leaders who wished to accrue and retain retinues. In this scenario, whilst not objects as imposing or prestigious as complete rings, the manufacture of discrete, individual coins may be seen to link into Kilger's (2008, 292-3) outlining of the significance of 'wholeness' when attached to gold objects in Viking-Age society, imbuing the person who distributed them with a high degree of social capital. Given the importance of 'patronage generosity' within leadership (Urbańczyk 2009, 504), the added social or political value of minting may have meant that it was conducted irrespective of any wider financial considerations. The presence of two different *solidus* dies implies a degree of competition, and it is tempting to read the evidence as showing two leaders jostling for position, influence, and allies (Samson 1991b, 132).

As noted above, no material directly related to the manufacturing of coins has been identified at Aldwark. However, the evidence of cupellation may indicate that coins were processed for their silver at the camp, an activity strongly associated with minting. The high proportions of later blundered and irregular stycas at both locations has prompted the suggestion that the Great Army were minting their own issues of these coins (Hadley and Richards 2021, 103; Kelleher and Williams 2020, 36). The evidence from Torksey shows that the force was clearly accustomed to producing coins in other metals, and that some of the factional leaders had the authority to initiate and control minting. Equally, craftspeople with knowledge of die-cutting were potentially active within the camp. Whilst this evidence is circumstantial, it does show that the Army had both the knowledge and the experience to produce coins at Aldwark.

6.5 Summary

Whilst the artefacts assessed in the previous two chapters suggest that economic activities and basic necessities and tasks remained relatively unchanged in both camps, the assemblages reviewed above show that the same locations saw considerable differences in manufacturing activity. Once again, issues with recovery appear to attend to the iron finds from Aldwark, with very low numbers of metal-working tools identified at the camp. This lack is particularly striking when placed against the evidence of iron smelting, slag-tapping furnaces, and blacksmithing hearths identified by excavations on the site, alongside finds of crucible fragments (Williams 2020f, 87). Equally, the numbers of lead models and failed castings also indicate that Aldwark saw considerable metal-working activity. Therefore, although the disparity in recovered tools is a clear difference between the two locations, it does not appear to be a material one. Other differences do, however, appear to reflect genuine divergence. Aside from the scrap metal offcuts and fragments, the manufacturing assemblages broadly divide into two main groups: items related to economic activities, such as coin manufacturing and the refining of silver, and artefacts associated with craft production, such as dress accessories. Pieces of decorated Insular metalwork may have been converted into Scandinavian-style jewellery at both locations, but at Aldwark the re-use of this Insular material may have been more deliberately focused toward the production of insets for lead weights. Furthermore, the higher degree of fragmentation of Insular metalwork at Torksey parallels the pattern of fragmentation seen in the copper-alloy ingots reviewed in Chapter 4. This suggests that these Insular pieces may have also held a more direct role within the camp economy, a use less evident at Aldwark.

Punch-decorated Scandinavian-style jewellery appears to have been manufactured at Torksey. Such items were commonly produced in silver, although similar gold finger rings are particularly associated with the Great Army. Although the problems of recovery and recording the casting waste have been detailed, the assemblage of droplets and spills do support one conclusion drawn in Chapter 4: gold does appear to have been in good supply at Torksey, with the metal both cast and struck into coin. As noted by other authors (Hadley and Richards 2016, 50), the evidence for coin production is surprisingly early. Despite the clear use of gold in economic transactions at Torksey, I suggest that the minting of *solidi* at the camp was principally a symbolic action, undertaken as an expression of the 'display economy' (Williams 2007, 178; Gaimster 1991, 119) and related to the aspirations of leadership between competing factions of the Army. As such, this relates more to the internal social economies of the Great Army. The production of silver pennies appears to have a far more direct monetary function: these coins were presumably intended to be spent *in situ* rather than retained or exported, and as such suggest a high degree of engagement and interaction with local economies. Comparable evidence of coin production is absent at Aldwark. However, the refinement of silver and the production of lead litharge at the camp clearly represents activity not identified at Torksey, and one which is frequently seen as related to coin manufacture. Members of the Army were clearly willing to use coinage, and to produce silver coins in order to trade with the neighbouring economies at Torksey. Although there is no proof that this willingness extended to the manufacturing of copper-alloy stycas, the scale of cupellation at Aldwark does indicate that a developed, sophisticated economy was present, with labour put into the management and purity of silver stocks. Whilst coin manufacturing is not evidenced at Aldwark, nor silver refining at Torksey, both activities also suggest the presence of centralised direction or control similar to that implied by the comparative popularity of the different lead weight forms reviewed in Chapter 4.

Other differences between the two assemblages can be seen in the lead models and failed castings. Whilst these show that copper-alloy dress accessories were manufactured at both camps, some of the final products and the production methodologies appear to differ between the two locations. Although it is unwise to draw too many conclusions from such a small sample, the different forms of lead model may show that Torksey saw the advance production of dress accessories in anticipation of sale, whilst belt fittings at Aldwark were manufactured more reflexively by craft workers reacting to direct demand. The use of lead model TDB 281 to produce equal-armed brooches may show a link with regional manufacturing techniques evidenced at Kaupang, but if these brooches were also made as stock at Torksey, this suggests there was a reliable market for typically Scandinavian female-gendered jewellery at the camp. Although there is evidence to suggest that Scandinavian women travelled with the Great Army (Richards 2004, 91), it is too simplistic to see this brooch production as conclusively demonstrating their presence at Torksey. However, the manufacture of such established brooch forms contrasts strongly with the evidence for the mass-production of Type E3 belt fittings at Aldwark. The Carolingian origins of this sub-type will be more thoroughly explored in the next chapter. However, it is notable that although these fittings are placed within the Scandinavian cultural sphere, they are little known outside Insular contexts. As such, this may potentially show more ‘traditional’ Scandinavian production at Torksey, with more hybrid styles favoured at Aldwark.

Despite these differences, the unfinished brooch or mount and the Type A1 strap-end lead model, ADB 1080 and TDB 1459, suggest that Insular-styled dress accessories were also manufactured at both Aldwark and Torksey. Whether these items were produced for members of the Great Army, or were intended to appeal to a market amongst the surrounding populations, is perhaps not as important as the fact that they were made at all: they indicate that a demand for English-style dress accessories was recognised at both camps. This should not be entirely surprising, as similar adaptations of Anglo-Saxon dress items are evidenced by the production of B5.3 and ‘Wooperton-type’ A1avii strap-ends at York shortly after the arrival of the Great Army (Haldenby *et al.* 2022, 2). Nonetheless, the production of similar pieces *outside* the Northumbrian capital does imply the existence of very open, diverse markets at each camp, with manufacturers catering to a variety of different regional styles. Whilst these English-styled pieces may show established craft workers within the Great Army incorporating local designs into their repertoires, the *pressblech* patrix from Torksey may also show a Northumbrian metalworker at the camp. More broadly, these pieces again express the heterogeneous nature of the force, and imply that Anglo-Saxons may have been integrated into the Army.

7. Dress accessories

7.1 Introduction

This chapter describes and categorises the brooches, pins, strap ends, and hooked tags from both camps. As already noted, several of these classes overlap with Section 6.2.2 in that they contain decorated Insular metalwork, collected for re-use or recycling. Furthermore, the disproportionate relative amounts of strap-ends and collared pins at Torksey has led to the suggestion that many, if not most, of these items were also collected as scrap (Hadley and Richards 2021, 100). Therefore, many of the pieces analysed in this chapter do not represent items of personal dress lost by camp inhabitants: instead, they show collected plunder, retained as raw materials or as metal-weight currency. However, both assemblages still illuminate activity within the winter camps, providing insight into both the practices at and the occupants of each location. The brooches, collared pins, hooked tags, and a ringed pin from Aldwark have been previously catalogued by Rogers (2020d), whilst a second ringed pin was analysed by Ager (2020, 15) and a converted brooch studied by Graham-Campbell (2015; 2020). The only previous analysis at Torksey was of a penannular brooch fragment, described by Leahy (PAS number FAKL-3AE235). The following sections build on these works, with this thesis identifying further items within the two assemblages, suggesting provenances for the material in the Torksey assemblage, and expanding on the previous analysis from Aldwark. The relative proportions of each category of dress accessory are given in Table 7.1.

Table 7.1: Proportions of dress accessories from Aldwark and Torksey

Site	Brooches	Pins	Strap ends	Hooked tags
Aldwark	17	17	54	9
Torksey	63	81	174	33

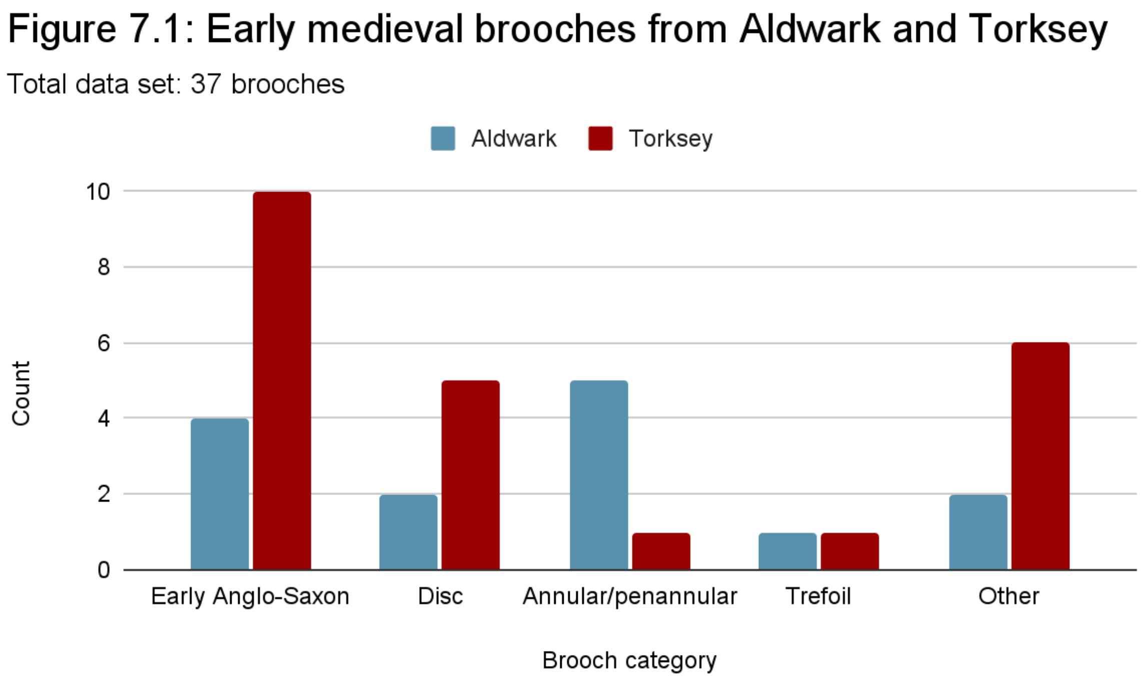
7.2 Brooches

As might be expected for extensively metal-detected locations, high numbers of brooches have been recorded from both sites. The proportions and dates of these are given in Table

7.2. The Roman brooches at both locations are most probably residual, with those at Torksey derived from the earlier occupation on the site. Whilst the absence of later medieval and post-medieval brooches at Aldwark is curious, this may be linked to differences in metal-detecting practice between the two sites, or more probably related to the close proximity of a prosperous medieval borough at Torksey. These items are not discussed further. A probable unfinished disc brooch from Aldwark has been considered in Section 6.3.4. Categories for the remaining early medieval material are presented in Figure 7.1.

Table 7.2: Brooches from Aldwark and Torksey

Site	Roman	Early medieval	Later medieval	Post-medieval	Unknown/ brooch pins
Aldwark	1	14	-	-	2
Torksey	26	23	6	1	7



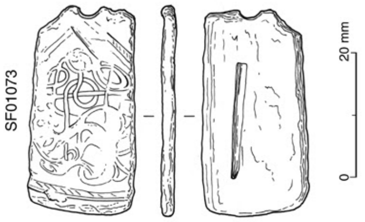
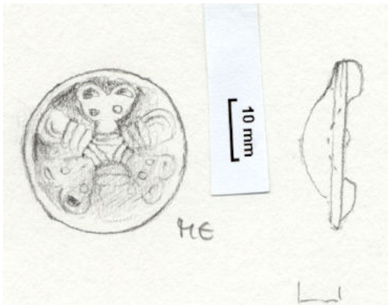
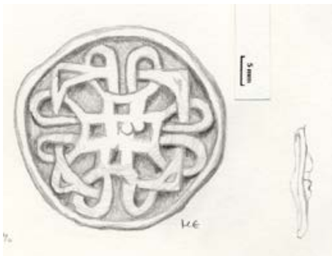
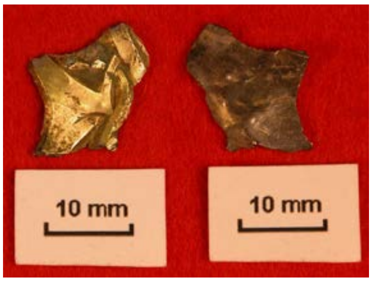
The early Anglo-Saxon material comprises fragments of cruciform, square-headed, annular, small-long, and button brooches, all clearly pre-dating the activities of the Great Army. At Aldwark, these finds are again almost certainly residual, related to the Anglian occupation of the enclosure. At Torksey, this material may signify low-level background activity, or it may derive from a disturbed, isolated burial or small cemetery, unconnected with any settlement (Hadley and Richards 2016, 45). These brooches are not discussed further.

7.2.1 Disc brooches

This section broadly follows the terminology used by Kershaw (2013). The disc brooches from both camps are shown in Table 7.3. Although ADB 1073 has previously been identified as a mount (Rogers 2020e, 61), I suggest that it is part of a fragmented disc brooch. In this interpretation, the central perforation could serve to hold a bossed rivet, securing part of a one-piece pin plate, whilst the quartered, chip-carved interlaced tendrils of the design echo the Mercian-inspired brooches of the Pentney Hoard (Webster 2001, 275-77). A strong parallel can be seen in a more complete copper-alloy disc brooch from Leicester (Webster and Backhouse 1991, 228-9, No. 186): this brooch has similar dimensions, although it appears to have originally been tinned rather than gilded. ADB 1108 is probably from an openwork Trewhiddle-style brooch, suggesting that it was late eighth-to-ninth-century manufacture: a similar copper-alloy brooch of the ninth century from Elmsett in Suffolk is described by West (1998, 26 and Fig. 24:6). Unlike ADB 1073, this piece does not show the same evidence of deliberate cutting, although its fragmentary nature does not mean this is certain. Both these brooches would have been of English manufacture.

In contrast to the Aldwark fragments, the Torksey disc brooches are complete or near-complete pieces, with TDB 808 the only heavily fragmented find in the assemblage. This fragment is also the only item of silver, suggesting that it was deliberately broken for use as bullion, although again no clear cut marks are evident. The surviving decoration forms part of a Trewhiddle-style beast, once more indicating an English manufacture: although this artistic style appears to have extended into the tenth century in the north of England, a ninth-century date is more universally assigned to such designs (Thomas 2006, 156-7). TDB 307 may also be an English piece. The body of the brooch is clearly made from a re-used flat-headed pin, identifiable by the two opposed piercings on the sides of the face. These would have formerly held connecting chains, and indicate that the brooch originally formed the central part of a three-pin suite. Other pins of this form are discussed in Section 7.3.1: by virtue of its conversion, this find is considered here. The floruit of linked-pin suites is generally believed to be in the eighth century (Bailey 1970, 406), and a similar date is suggested by the design, which echoes the spiraling tendrils seen on eighth-century pin-heads from Yorkshire and Suffolk (Parsons 1992, 169; Hinton 1974, 24). However, a long life is evident in the re-use of the pin-head as a brooch: the small catchplate is secured by a

Table 7.3: Disc brooches from Aldwark and Torksey

Database No.	Image	Database No.	Image
ADB 1073	 Image: York Archaeological Trust	ADB 1108	 Image: York Archaeological Trust
TDB 307	 Image: Viking Torksey Project	TDB 773	 Image: Portable Antiquities Scheme
TDB 790	Image not available	TDB 798	 Image: Portable Antiquities Scheme
TDB 808	 Image: Portable Antiquities Scheme		

rivet passing through a third piercing in the disc, the location of the original pin shank, whilst an adjacent area of discoloration presumably marks the position of a soldered-on, absent pin assembly. Whilst it is not possible to date the point at which this conversion occurred, the twisted strip of the catch copies English brooch fastenings of the eighth and ninth centuries (e.g. the Ixworth and Beeston brooches: Wilson 1964, 120 & 137). However, TDB 307 does not feature the full-width integral pin-and-catchplate strips of these brooches, even though it would have been possible to fit one using the opposed piercings on the plate. The conversion may therefore show a hybrid form of fitting, for all that the surviving catch suggests an Anglo-Saxon influence. The conversion of discs of Insular metalwork into brooches by Scandinavians is an established phenomenon (e.g. Bakka, 1963, 6-7).

A very different form of pin-fitting may be evident on the reverse of brooch TDB 773, although the pin-lug and catchplate of this piece are abraded, and their exact forms were not recorded in detail. Nonetheless, the remains of a small attachment loop survives. This loop, and the convex shape of the brooch, are two of the distinctively Scandinavian characteristics identified by Kershaw (2013, 23-4), indicating Scandinavian manufacture. However, Kershaw (2009, 310) also notes 25 examples of small convex brooches in England where a single, transverse pin-lug is employed, suggesting local copies of Scandinavian originals, manufactured in an Insular style. However, these local copies do not feature the attachment loop evident on TDB 773, and, although eroded, the brooch does appear to be fitted with a typically Scandinavian 'H'-shaped pin-lug. The Borre-style decoration of inward-facing animal heads identifies this piece as one of Jansson's Type II A (Jansson 1984b, Abb. 8.2). This type has a wide distribution across both southern and eastern Scandinavia, with concentrations at Birka, Hedeby, and at Uppåkra, Sweden, with manufacturing remains discovered in Birka and on Gotland (Kershaw 2013, 50), demonstrating a strong Scandinavian influence.

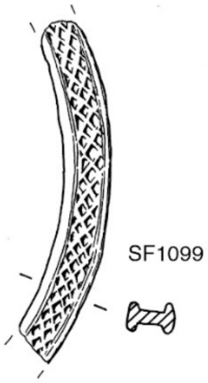
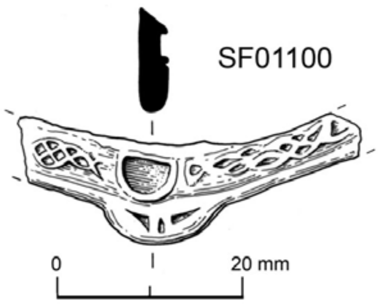
Little information exists concerning TDB 790, although the description notes the presence of an attachment loop on the reverse (PAS number LIN-909EA2). This feature suggests the brooch may be Scandinavian, or influenced by Scandinavian design. A similarly Scandinavian-influenced design can be seen on TDB 798. This brooch has been studied by Kershaw (2013, 74-5), who classified it as a variant of a 'Terslev' Type V, whilst noting that no exact parallel has been found for the design in Scandinavia. The atypically large, flat form of this brooch, coupled with its lead-alloy composition, indicate strong English influences in the manufacture, with Kershaw suggesting that it was modelled on a higher-quality Scandinavian prototype. Whilst TDB 773 may be a Scandinavian import, carried by a member of the Great Army, TDB 798 is a hybrid Anglo-Scandinavian form. More importantly, the decorative style of this brooch is dated to the middle of the tenth century (Kershaw 2013, 148) and, as such, this piece clearly post-dates the occupation of the camp.

Of all these pieces, TDB 773 can be argued to have been almost certainly produced in Scandinavia: although a Scandinavian influence may be present on TDB 790, the form and fittings of TDB 773 suggests that it was carried to England by a member of the Great Army. Of the three brooches of this style recovered from graves at Birka, two were also equipped with oval brooches, whilst the third inhumation was that of a child with grave-goods of a needle, knife, and clay pot (Arbman 1940, i. 151-1, 393, & 458; ii. Taf. 70). This strongly suggests that such brooches were gendered items in Scandinavia, worn as part of female dress. The remaining brooches are all English forms. The majority of these were presumably gathered to be either converted or broken apart, and a secondary conversion can be seen on TDB 307: the method of this conversion may indicate the presence of an Anglo-Saxon craftsperson at Torksey, echoing some of the manufacturing evidence discussed in Section 6.3.4.

7.2.2 Annular/Penannular brooches

The Annular and Penannular brooch fragments are presented in Table 7.4. Whilst the penannular brooch form was adopted by Scandinavians from Irish dress (Wamers 1998, 38), with distinct, locally-manufactured types swiftly developing, all the examples from the two camps appear to be of Insular manufacture. All are also fragmentary, indicating that they were most probably broken up for re-use rather than employed as dress fasteners. This is particularly true of the single Torksey find, a silver-gilt fragment which was presumably fragmented for use as bullion: this find is paralleled by a complete ninth-century brooch from Kilkenny, Ireland (Youngs 1989, 99). In contrast to the Torksey piece, all five Aldwark fragments are of copper-alloy. Both ADB 1065 and 1079 appear to be penannular brooches of Graham-Campbell's Type G3 (Dickinson 1982, 44-5), although the heavily-corroded nature of ADB 1079 makes this identification somewhat tentative: whilst four raised pellets are visible, the shapes of both their enclosing field and the terminal itself are obscured. The Type G brooch is typically found across western Britain, with examples known from Cornwall to the Hebrides, but is generally absent from Ireland (Edwards 1990, 135-6). All three remaining fragments may derive from either penannular or annular/pseudo-penannular brooches, with parallels suggested from Co. Louth, Ireland and Orkney, Scotland suggested by Rogers (2020d, 56). ADB 1169 is distinguished by the presence of a secondary piercing, drilled through the reverse of the brooch hoop where a setting appears to have been removed. This reworking suggests that the piece was intended for re-use, rather than viewed solely as a source of scrap.

Table 7.4: Annular and penannular brooches from Aldwark and Torksey

Database No.	Image	Database No.	Image
ADB 1065	 Image: York Archaeological Trust	ADB 1079	 Image: York Archaeological Trust
ADB 1099	 Image: York Archaeological Trust	ADB 1100	 Image: York Archaeological Trust
ADB 1169	Image not available.	TDB 700	 Image: Portable Antiquities Scheme

It is tempting to read the contrast in both distribution and composition of these fragments as showing a difference between the two camps. Given the presence of fragmented Insular metalwork at both locations, it is difficult to be certain what this difference might be, and it is equally unwise to draw strong conclusions from such a small sample. Nonetheless, the relatively high proportion of inset weights from Aldwark has already been noted (Section 4.3.2). It is possible that the brooch fragments in Table 7.4 were intended for use in such weights: in addition to the secondary piercing in ADB 1169, the morphological similarities of these pieces with a mounted weight from Kiloran Bay have been observed in Section 6.2.2. The comparative prominence of Inset weights at Aldwark may mean that their manufacture was more carefully considered, and that objects such as annular and penannular brooches were deliberately selected and intentionally set aside for use as insets.

7.2.3 Trefoil Brooches

Two fragments have been identified as probable trefoil brooches, one from each camp (Rogers 2020d, 56-7; Blackburn 2011). This section will attempt to categorise these using the typology devised by Maixner (2005). ADB 923 is a bent, curving fragment of a probable brooch arm. The surviving decoration shows two tiers of scrollwork, bound along a central stem. Whilst this strongly echoes Carolingian acanthus ornament, the additional overlying bars which bind the scrolls to the frame are characterised by Kershaw (2013, 81) as a typically Borre-style feature. This Scandinavian element demonstrates that the decoration is not solely derived from Carolingian military belt fittings, although the design is clearly heavily influenced by such pieces (e.g. Zuyderwyk and Besteman 2010, 92-5). However, the design is inconsistent, and appears blundered. The two scrollwork volutes nearest the terminal turn in opposite directions, with the second pair of volutes deformed and compressed, passing underneath the second framing bar. Whilst asymmetric layouts are known for trefoil brooches, they are not seen on forms which feature foliate design, which universally display parallel or mirror-image motifs. The reverse of the piece is plain: although scored with filing marks, there is no evidence of either a pin-lug, catchplate, or attachment loop, any of which would be expected on a brooch in this style. Whilst the scoring may suggest that former fittings have been filed off, this process usually leaves traces of the original fixtures, such as those seen on the trefoil mount from Wymondham, Norfolk (Kershaw 2011, 215). Similar file-marks are evident on several of the Type E3 strap-ends from Aldwark (Section 7.4.3), where they are indicative of rough finishing on newly-cast pieces rather than the repurposing of older items.

Given the apparent lack of fittings, coupled with the fact that the piece shows little of the characteristic broadening which defines the arms of some classes of trefoil brooch, it is possible that ADB 923 is a strap-end of the Thomas E4 series (Haldenby *et al*. 2022, 111). The lack of fittings is particularly pertinent in this reading: such fixtures would have been integral to casting a brooch, and so their absence argues against such an interpretation. However, on the front face, two small, sub-rounded pellets are visible at the furthest extension of the foliate design, truncated at the point where the fragment is broken. Whilst some E4 strap-ends do feature panels of cast ring-and-dot decoration near the butt, these pellets appear to be the remains of decorative false rivets and are thus more probably skeuomorphs of the rows of functional domed-headed rivets originally used to secure trefoil strap fittings. Such false rivets, categorised by Maxiner (2005, Abb. 39) as design KP1, are a common stylistic element of early trefoil brooches, frequently found on the Type P series. Therefore, this thesis agrees with Rogers' (2020d, 56) tentative identification of ADB 923 as a trefoil brooch, whilst accepting that this interpretation remains somewhat speculative. Stylistically, ADB 923 broadly aligns with Maixner's Type P4, although no Scandinavian parallel exists: whilst the execution of the design recalls the rare P4.2 form, seen on an example from Lakenheath Warren, Suffolk, the devolved, asymmetrical scrollwork is only found on P4.5 brooches, unknown in England (Maixner 2005, Taf. 4 & 33). A broader parallel may be seen in the silver trefoil 'ornament' from Kirkoswald, Cumbria, recovered with a hoard of poorly-recorded stycas. This artefact also lacks any form of fitting on the reverse, and the filigree decoration, whilst clearly based on Carolingian originals, shows characteristically Northumbrian design elements unknown on any Continental examples (Haseloff 1950, 173).

TDB 123 is again a single brooch arm, broken near to an arcing junction at the base. The initial assessment on the Torksey database suggested that it may have been burnt or subject to heating, a use that would potentially question whether this was originally a wearable brooch or a fragmented piece of scrap, intended for remelting. However, Bersu questioned whether the visually very similar finds from the inhumation at Hesket-in-the-Forest, Cumbria were burnt, concluding that the pieces were merely affected by corrosion (Cowen 1967, 31-2): a related process may well be at play with TDB 123, leading to the eroded decoration seen on the face. The remains of a slightly offset pair of perforated cast lugs are visible on the reverse. Whilst these may have formed part of a series of identical lugs, positioned on each arm of a flat trefoil fitting (Paterson 1997, 654), the raised centre is indicative of a brooch, showing that they form part of a Scandinavian-style pin assembly (Kershaw 2013, 15). Although the deterioration of TDB 123 makes identification difficult, the abraded remains of a parallel scrollwork design are evident, suggesting that it may belong to

Maixner's Type P4.8. However, this is a very rare type, known only from a single example from Lolland, Denmark (Maixner 2005, 255).

Table 7.5: Trefoil brooches from Aldwark and Torksey

Database No.	Image.	Database No.	Image.
ADB 923	 Image: Viking Torksey Project	TDB 123	 Image: Viking Torksey Project

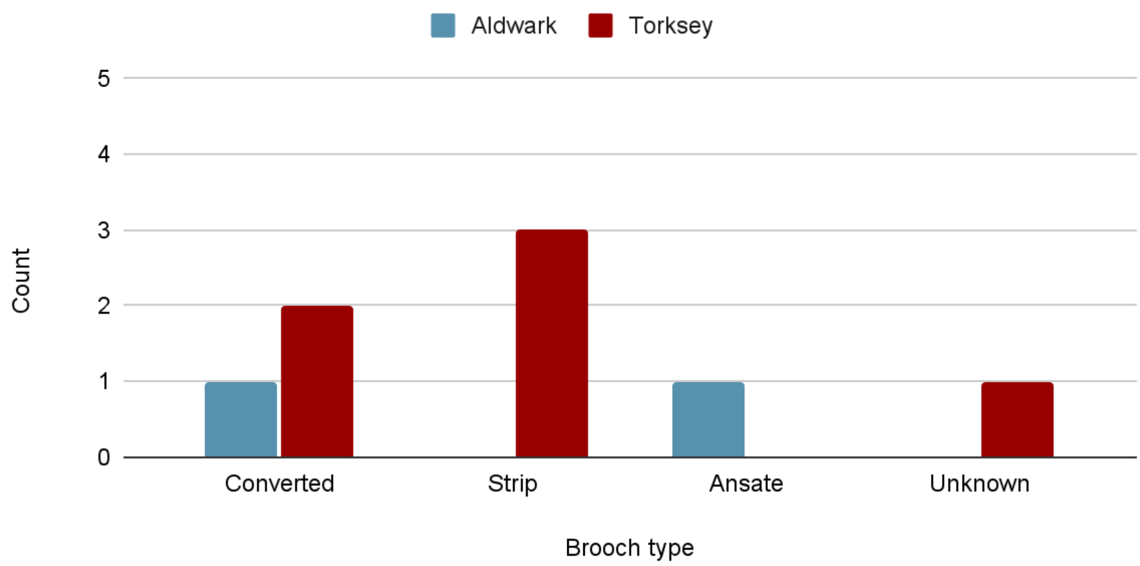
Trefoil brooches are a uniquely Scandinavian artefact, unknown in Insular contexts prior to the start of Viking activity. Although their form was adapted from elaborate Carolingian sword-belt fittings, the brooches are almost exclusively seen as a component of female dress (Graham-Campbell 1980, 93). Whilst over 70 have been found in England, none are known from stratified archaeological contexts (Kershaw 2013, 79 & 144), and the most common forms show evidence of tenth-century, Anglo-Scandinavian production (Pestell 2013, 233-5) with later models following geometric Scandinavian designs. The Aldwark and Torksey fragments are decorated with scrollwork, a direct evolution from the acanthus-vine designs of the Carolingian originals. Whilst such scrollwork is difficult to date, it appears to be broadly contemporary with Borre-style artwork, and is seen as a development of the mid-to-late ninth century. Plant-ornamented trefoil brooches were introduced to England at the start of the Scandinavian settlement, suggesting both finds can be credibly dated to the occupation of the camps (Kershaw 2013, 146-7). Although TDB 123 may have been made in Scandinavia, the blundered design of ADB 923 is more suggestive of derivative copying, particularly given that no direct Scandinavian parallels can be found. This brooch may have been produced in England, with the misformed design and lack of any fitting showing an imitative, possibly hybrid piece, potentially made by a craftsperson unfamiliar with Scandinavian production techniques (Kershaw 2013, 130-132). If this piece was produced at Aldwark, the apparent poor understanding of Scandinavian originals shows a distinct contrast to the manufacture of equal-armed brooches at Torksey (Section 6.3.4).

7.2.4 Other brooches

A variety of further brooch forms are present at both camps, including several pieces which were converted or part-converted from other artefacts: unlike TDB 307, these pieces do not conform to standard classification, so they have been collected as a separate category here. This section follows the terminology proposed by Weetch (2014). The relative proportions of these finds are given in Figure 7.2.

Figure 7.2: Other brooches from Aldwark and Torksey

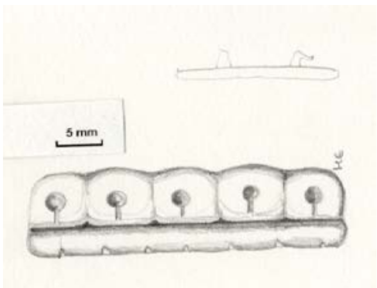
Total data set: eight brooches



Of the converted or part-converted brooches, two appear to be in an intermediate state, whilst the third has been converted and then subsequently broken. ADB 1224 is an anthropomorphic Insular mount, originally part of a horse bridle. On the reverse, three perforated lugs would have originally served to connect the piece with other mounts set along a strap, forming an interlocking, flexible group: Youngs (2017, 266) considers these lugs to be indicative of manufacture in Ireland or northern Britain, indicating either an Irish or Pictish workshop. Two of the lugs are set parallel to each other at one end of the fitting (Graham-Campbell 2015, 248). Whilst this arrangement echoes the 'H'-shaped pin-lugs of Scandinavian brooches, the intricate cast interlace decoration on the front of the mount demonstrates a clear Insular origin. Wilson (2008, 43) suggests that such fittings were made in Ireland, most probably in Dublin, although it must be noted that he was describing slightly later bridle-mounts of sheet bronze construction. Wamers (1998, 38) notes that most of the forty Insular harness fittings catalogued from Norway were re-used as brooches, forming part of female dress. It seems highly probable that this mount was intended for similar use, separated from a harness but never fitted with a pin (Graham-Campbell 2020, 64).

A similar origin appears probable for TDB 44, illustrated in Table 7.6. Again, a pair of parallel lugs are visible on the reverse of this find, suggesting a Scandinavian-style brooch fitting. However, no catchplate is visible, and there appears to be no evidence that one was ever fitted. Therefore these two lugs strongly suggest an original use on either a strap or a reliquary: Youngs (2017, 271) describes the mounting of decorative studs on the Monymusk

Table 7.6: Converted brooches from Aldwark and Torksey

Database No.	Image	Database No.	Image
ADB 1224	Image not available	TDB 44	 Image: Viking Torksey Project
TDB 799	 Image: Portable Antiquities Scheme		

Reliquary by the use of pierced lugs and cotter pins. Two smaller, irregular projecting stubs on the reverse of the piece may be the bases of filed-down attachment points: the remains of filed-down lugs are visible on the reverse of a converted eighth-century harness fitting from South Shields fort, Tyne and Wear (Croom and Youngs 2021, 6). Although an exact parallel has not been found, the basic form of this piece is similar to two fittings recovered as part of a bridle set from Balladoole, Isle of Man (Bersu and Wilson 1966, Plate V:F). These roundells feature central perforations and a similar ‘stepped’ profile, although their faces are decorated with rosettes rather than simple crosses. A further sexfoil rosette is visible on an unpierced circular copper-alloy fitting recovered from North Yorkshire, and mounted as an inset on a lead weight (PAS DUR-181FC7): this fitting has also been interpreted as a bridle mount. Again, it seems probable that TDB 44 was intended as a brooch, but was lost before a pin was fitted. By contrast, TDB 799 clearly once had a pin, as the remains of a pair of fittings are preserved on the reverse: unfortunately, the exact form of these attachments are not recorded. The piece itself appears to be one half of a heavily-gilded early Anglo-Saxon wrist clasp, converted into a brooch. Whilst it is impossible to determine when this conversion occurred, this brooch is included here due to its similarity with the finds described above, indicative of the re-use of Insular metalwork by the Great Army. Equally, this item falls in with the pattern of anomalously-dated, comparatively antique objects seen in assemblages associated with the force (Sections 4.2.1 and 5.3.4).

ADB 1203 is part of a copper-alloy ansate brooch, with one terminal and a section of the bow surviving, and a single iron rivet indicating the location of the catch. The ring-and-dot decoration, coupled with the remains of an incised saltire, indicates that this is a Weetch Type XI:D, a ribbon-shaped brooch unique to England (Weetch 2014, 168). The majority of ansate brooches are recovered through metal-detecting, and none of this particular type have been found in a dateable context. However, Type XI brooches are generally seen as a later form, dating to the late ninth and tenth centuries (Weetch 2014, 40 & 165). TDB 304 is poorly described in the site database and thus is difficult to assign to any type. Nonetheless, the description refers to decoration with gilt, chip-carved interlace, almost certainly indicating an eighth-century date (Webster and Backhouse 1991, 220).

Both TDB 1052 and 1684 are strip brooches with narrow, flattened plates, corresponding to the Type 31.B described by Weetch (2014, 139). This thesis proposes that TDB 2997 is also a fragment of a strip brooch, broken from a lozengiform Type 31.C with a wider, highly decorated plate (Weetch 2014, 140). Whilst no exact parallels for this piece have been found, similar gilded ‘Greek key’ motifs can be seen on a brooch recovered from Ilam, Staffordshire and an unprovenanced example kept in the British Museum. Weetch (2014, 183-4) connects these designs with Mercian-style decoration and the production of ‘Mercian’ metalwork. Type 31.B strip brooches have a dense concentration in East Anglia and Lincolnshire, with Weetch (2014, 189) noting that a cluster at Flixborough clearly indicates that the settlement served as a manufacturing centre. The 31.C form has a more general distribution across eastern England, south of the Humber: although the type remains

Table 7.7: Other brooches from Aldwark and Torksey

<table>
<tr><th>Database No.</th><th>Image</th><th>Database No.</th><th>Image</th></tr>
<tr><td>ADB 1203</td><td>

Image: York Archaeological Trust</td><td>TDB 304</td><td>Image not available.</td></tr>
<tr><td>TDB 1052</td><td>

Image: Viking Torksey Project</td><td>TDB 1684</td><td>

Image: Viking Torksey Project</td></tr>
<tr><td>TDB 2997</td><td>

Image: Viking Torksey Project</td><td></td><td></td></tr>
</table>

comparatively scarce within the Mercian heartlands (Weetch 2014, Figure. 4.6), one example was recently recovered during excavations at Repton (@CatJarman 2019). Thus, it seems fair to suggest that all three of these brooches derive from the area immediately surrounding the Torksey camp. Strip brooches are broadly dated to the eighth century, extending into the beginning of the ninth, although the lozengiform Type 31.B iron examples from Flixborough have been recovered from stratified tenth-century contexts (Weetch 2014, 138; Ottaway 2009c, 6). All of these finds appear to sit comfortably within the general sphere of Great Army activity.

These ansate and strip brooches are most probably items collected by members of the force, destined for reworking: given the absence of any definitively eighth-century dress accessories at Aldwark (Section 7.3), it seems unlikely that ADB 1203 relates to the earlier occupation of the site. Although TDB 1684 is also broken, it is notable that the highly-decorated TDB 2997 is the most fragmented amongst the strip brooches: it is possible that the strong Insular decoration and gilded front face of this piece caused it to be particularly valued by members of the Army. This idea will be further explored in the next section.

7.3 Pins

Base-metal dress and hairpins are an ubiquitous item of early medieval material culture, found in large numbers across the British Isles. Substantial assemblages are known from locations such as Flixborough, York, and Southampton, Hampshire (Rogers, O'Connor, Ottaway, and Panter 2009; Mainman and Rogers 2000; Hinton and Parsons 1996), with over 200 recovered from Staunch Meadow, Suffolk alone (Riddler, Evison, and Rogers 2014, 229). Whilst the dating of several classes of pins has been refined in recent decades (Haldenby and Richards 2016), there is no agreed naming convention or typology for many of these artefacts. The early medieval pin assemblages from both camps have been divided into broad categories: the definitions of these will be addressed in the relevant sections below. The dates and relative proportions of all pins are presented in Table 7.8.

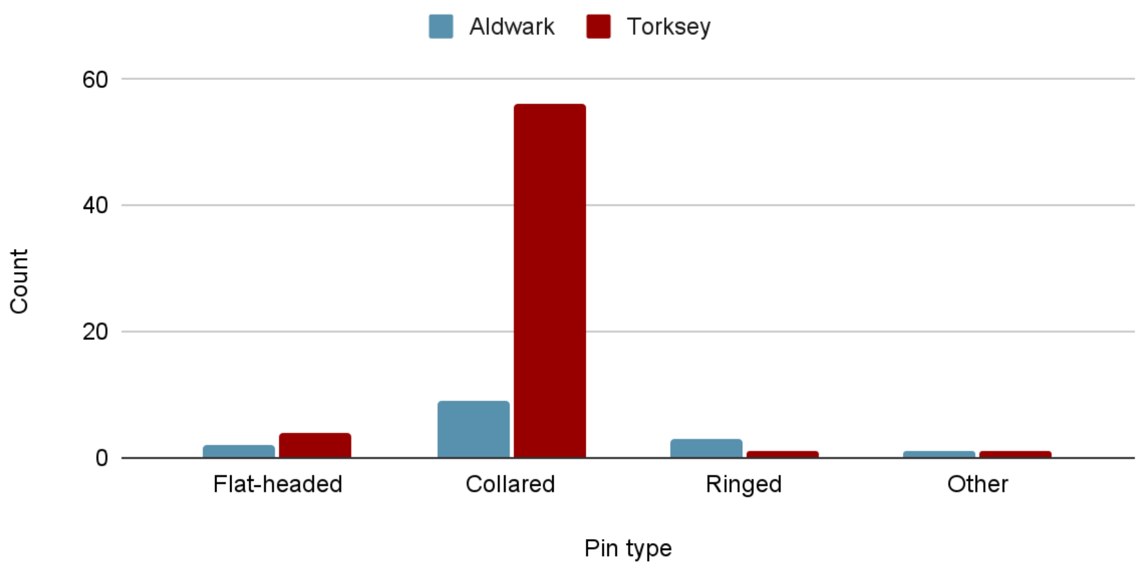
Table 7.8: Pins from Aldwark and Torksey

Site	Roman	Early medieval	Later medieval/ Post-medieval	Unknown
Aldwark	-	16	-	1
Torksey	9	62	6	4

As before, the Roman pins at Torksey are most probably residual, with the same true of one of the early medieval finds from Aldwark, which has been identified as a trefoil-headed pin of fifth-to-sixth-century date (Walton Rogers 2020a, 47-8). The occurrence of later medieval and post-medieval pins mirrors that of the brooches already noted. Whilst the absence of later medieval and post-medieval pins at Aldwark is curious, this may be related to differences in metal-detecting practice between the two sites, or to the close proximity of a prosperous medieval borough at Torksey. These items are not discussed further. The remaining early medieval pins are categorised in Figure 7.3.

Figure 7.3: Early medieval pins from Aldwark and Torksey

Total date set: 77 pins



7.3.1 Flat-headed pins

This category is taken to describe a series of pins with large, flat heads, typically discs measuring between either 20-35mm or 45-55mm in diameter (Cramp 1964, 92), and often riveted to separate pin shanks. These heads are generally highly decorated on one face, often with chip carving, and frequently have perforations on the plate edges, suggesting a use in linked pairs or suites: more occasionally, pierced projecting lugs serve the same function (Parsons 1992). Where attachment points are identified, the heads are discoidal, although a similar series with unpierced, trapezoidal heads, often decorated with animal ornament, can reasonably be associated with this group. Terminology for this pin type is particularly confused and inconsistent (cf. Haldenby 2012; Rogers *et al.* 2009). The term 'flat-headed pin' will be used here as a way of establishing a clear difference between these pins and a later form sometimes described as 'disc-headed' (Haldenby and Richards 2009). Whilst the body of TDB 307 is almost certainly derived from a pin-suite of the type discussed here, it has been catalogued according to its subsequent re-use as a brooch (Section 7.2.1) and is not included in this section.

Only one complete example of a flat-headed pin has been identified from either site. This pin, TDB 1068, has a circular head, separated from the pin shank by two triangular projections. Two small perforations are visible on one side of the head, one of which is broken: the smaller, cruder perforation was presumably intended as a replacement. No decoration is visible on either side of the hammered head.

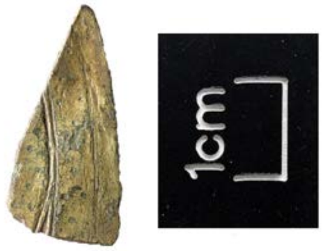
Table 7.9: Flat-headed pin from Torksey

Database no.	Image
TDB 1068	 Image: Viking Torksey Project

This thesis suggests five pieces of metalwork as fragments of flat-headed pins. These fragments are all cut or broken from discoidal plates of copper-alloy, and are gilded on one decorated face. The remains of a central rivet hole are visible on ADB 1098, and a small, pierced projecting lug survives on TDB 1543, but no other perforations or remains of pin shanks have been identified. It is possible that these may not be pin-heads, and are instead from mounts or other decorated metalwork: one of the Aldwark finds has been previously identified as a possible mount (Rogers 2020e, 61). However, the decoration and gilding on these pieces is consistent with more complete examples of this pin type, and I propose that all these fragments are the remains of detached pin-heads: a similar possibility was considered by Hinton and Parsons (1996, 32) for the Southampton material, and by Goodall (1993, 95) for a find from Thetford. The incised radial lines on fragment ADB 1071 strongly echo those on a silver pin from Flixborough, No. 673 (Rogers *et al.* 2009, 67). The Flixborough pin has perforations on both sides of the head, indicating that it was originally the central element of a three-pin suite, and a related function would explain the evident larger diameter of ADB 1071. Equally, the cast, splayed-arm cross on ADB 1098 bears a strong similarity to Flixborough pin No. 562: although the Flixborough design is more ornate, this can be explained by the slightly larger head of this pin allowing space for more elaborate decoration. Additionally, the 'speckled' border of TDB 873 exactly parallels that of Flixborough pin No. 560 (Rogers *et al.* 2009, 67). The chip-carved decoration on the remaining two fragments was commonly employed on pin-heads (Haldenby 2012, 3), and a similar rope-work border to TDB 2417 can be seen on one of the outer elements of the pin suite from the River Witham, Lincolnshire (Wilson 1964, Pl. XVIII).

Pins of this type are usually recovered as single finds (e.g. Bailey 1970, 405-6; Hinton and Parsons 1996, 30), with assemblages of multiple items only recorded at Flixborough, Meols, and Cottam B (Rogers *et al.* 2009 36-7; Griffiths 2007, 66; Haldenby 1990, 51-3). However, it must be noted that these three sites produced collections of complete or near-complete pins, whilst the majority of the finds from Aldwark and Torksey are fragmented. This fragmentation strongly suggests that the pins were not used for their intended function in the camps, but were instead gathered and broken apart for reworking, as described in Section 6.2.2. If the identification of all these finds is secure, then it is notable that the only complete pin, TDB 1068, is also the only one without any decoration or gilding. This may show that this plainer

Table 7.10: Flat-headed pin fragments from Aldwark and Torksey

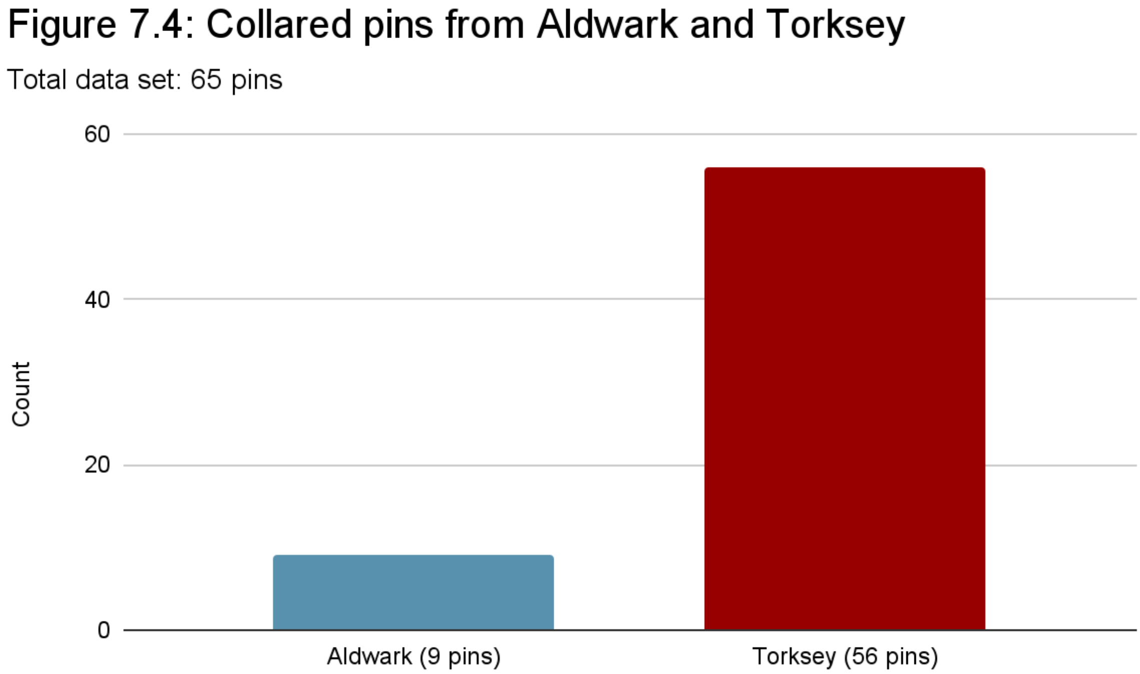
Database No.	Image	Database No.	
ADB 1071	 Image: York Archaeological Trust	TDB 873	 Image source: Viking Torksey Project
ADB 1098	 Image: York Archaeological Trust	TDB 2417	 Image source: Viking Torksey Project
TDB 1543	Image not available		

item was perceived as less valuable, and thus was never broken down for re-use: although not as clear, a similar pattern can be observed in the assemblage of strip brooches from Torksey (Section 7.2.4). Although it is hard to see why a lack of surface decoration would affect value in a metal-weight economy, it is worth recalling Sheehan's observation (2013, 819) of the prestige which the Scandinavian world attached to *decorated* Insular metalwork. This point is reiterated by Aannestad (2018, 8-9), who states that such metalwork appears to have been valued for more than merely its aesthetic qualities. Furthermore, Wamers' (1998, 47) observation that such items appear to primarily reflect military activity is equally relevant. If Insular decoration was perceived as associating objects with martial endeavour and the ability to attract success and wealth (Aannestad 2018, 10; Ashby 2015, 94-96), then the absence of decoration on TDB 1068 may have effectively 'devalued' this item, rendering it devoid of symbolic capital and therefore inappropriate for transactions within the Great Army's sphere. The same circumstances may have equally applied to strip brooch TDB 2779.

As already noted, the flat-headed pin form is generally dated to the eighth century. However, a degree of continuity into the ninth century is evident (Webster and Backhouse 1991, 83), meaning the presence of these pin-heads in either camp is not particularly anomalous. A matched pair of silver one-piece flat-headed pins were included in the mixed hoard of 'Scandinavian character' from Talnotrie, Kirkcudbrightshire (Graham-Campbell 1995, 4). This hoard is generally dated to *circa* 875 AD (Blackburn and Pagan 1986, 293), and has recently been associated with Great Army activity (Hadley and Richards 2018, 15; 2021, 80). Ross (1991, 334) notes that the Talnotrie pins are unusual, lacking the standard decoration of the remainder of the group, and with smaller pin-heads: a copper-alloy pin with a comparably small head and an attached chain, No. 559, was recovered from a tenth-century context at Flixborough (Rogers *et al.* 2009, 65). Whilst the small head is not echoed by TDB 1068, the lack of any decoration may signal a similar break from the established form of earlier styles. Cramp (1964, 92) suggests that simply-constructed flat-headed pins, without gilding or elaborate decoration, date to the ninth century. This artefact may therefore be a very late example of this type, worn and lost by an inhabitant of the camp.

7.3.2 Collared pins

This section follows the terminology defined by Haldenby (2012), used to describe a series of pins of different head form, generally characterised by a distended ring separating the head and the shank. Further classification is based on pin-head morphology. Two broken pin shanks from Torksey are included in this section: although their head forms are unknown, the dimensions of the surviving shanks indicate that they are part of the collared series. The relative numbers of all collared pins are shown in Figure 7.4. The numbers of head forms from both camps are given in Figure 7.5: the two unidentifiable pin shanks are not included in this figure, or in subsequent discussions.



Polyhedral pins (sometimes termed 'facetted' pins) are characterised by cuboid, chamfered heads. Ring-and-dot or punched-dot ornamentation is typical, although undecorated heads are known, and are most common in East Anglia (Haldenby 2012, 7). A small sub-group has a flattened head, able to accommodate multiple ring-and-dot designs on the opposing faces: only one pin of this form, TDB 2103, has been identified in the two assemblages. The proportions of all these forms are given in Figure 7.6.

Decorated pin-heads, including the flattened sub-type, are overwhelmingly the main form of polyhedral pin from Torksey. Haldenby noted that 46% of East Anglian pins on the PAS database were undecorated. By contrast, plain pin-heads comprise roughly 23% of the copper-alloy polyhedral pins in the Flixborough assemblage (Rogers *et al.* 2009, 51-55), and just over 19% of the same group from Southampton (Hinton and Parsons 1996, 21-25). At Staunch Meadow, undecorated copper-alloy pins accounted for just below 34% of the polyhedral forms, although it has been suggested that many of these were unfinished

Figure 7.5: Collared pins from Aldwark and Torksey

Total data set: 63 pins

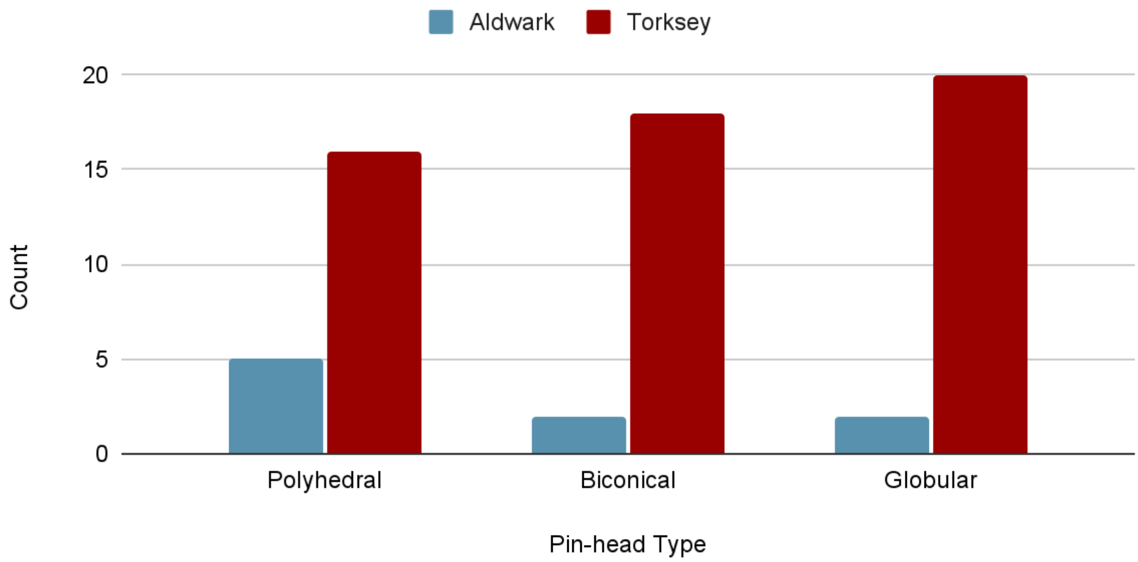
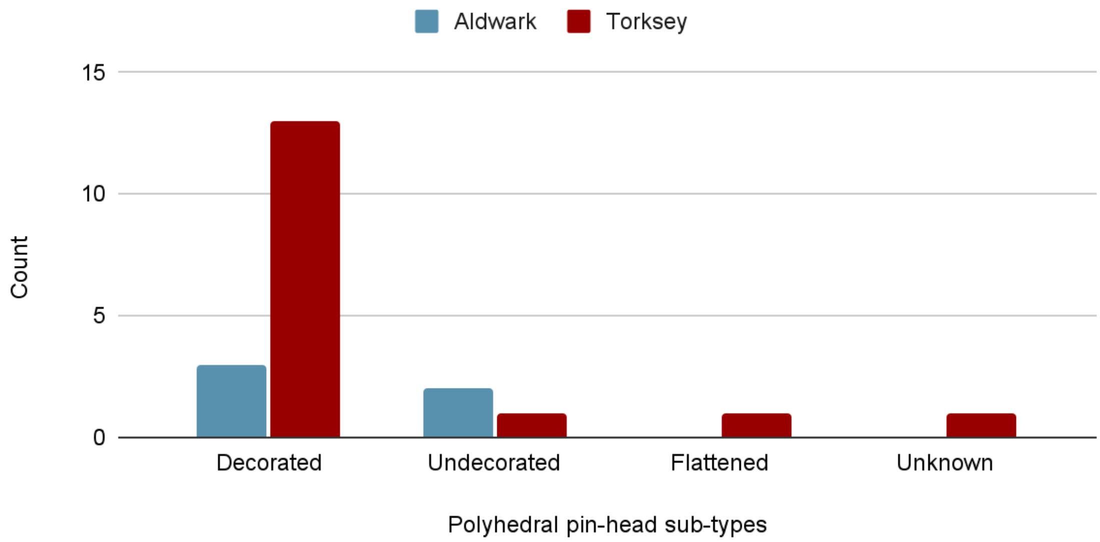


Figure 7.6: Polyhedral pin forms from Aldwark and Torksey

Total data set: 21 pins

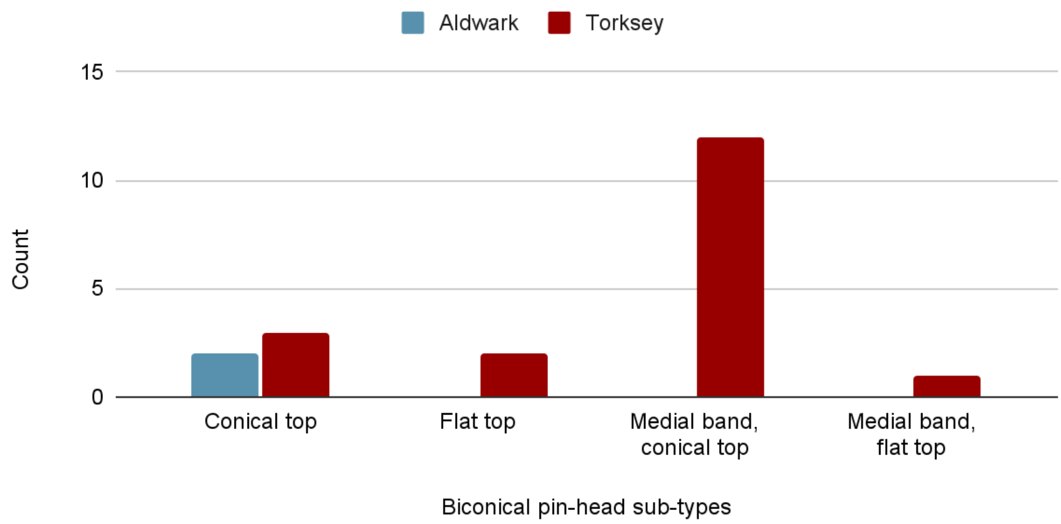


discards from the production process, indicating that this figure may not be representative (Riddler *et al.* 2014, 234). At just over 6%, the proportion of undecorated polyhedral pins at Torksey appears significantly lower than all of these, although it remains higher than the mere 5% amongst non-ferrous pins recorded at Cottam B (Richards 1999, 102-3). Given the established Great Army presence at these last two sites, these low percentages may show that the force selectively targeted polyhedral pins with decorated heads, although it could merely indicate that such pins were more eye-catching and noticeable when loot was collected. Whilst the data set for Aldwark is very small, some comparison with similarly-sized assemblages may be attempted. Of three polyhedral-headed pins known from London, only one is undecorated (Cowie and Blackmore 2012, 282), whilst all six catalogued from Meols, Wirral, have decoration (Griffiths 2007, 67). At York, all six pins of this form from Fishergate were also decorated, and a corpus of five from Coppergate contained only one undecorated example (Rogers 1993, 1361; Mainman and Rogers 2000, 2577). Against these sites, the number of undecorated pins at Aldwark appears high, although it is illuminating to note the comparative sizes of the two other York assemblages, which are in keeping with the low amount of pins recovered from the camp.

Biconical pins are characterised by a 'double cone' head with a conical top, with sub-groups displaying flat medial bands, flattened or rounded crowns, or a combination of both: a rare sub-group, with an inverted conical head, is not present in the assemblage. The proportions of the observed sub-groups are presented in Figure 7.7.

Figure 7.7: Biconical pin forms from Aldwark and Torksey

Total data set: 20 pins

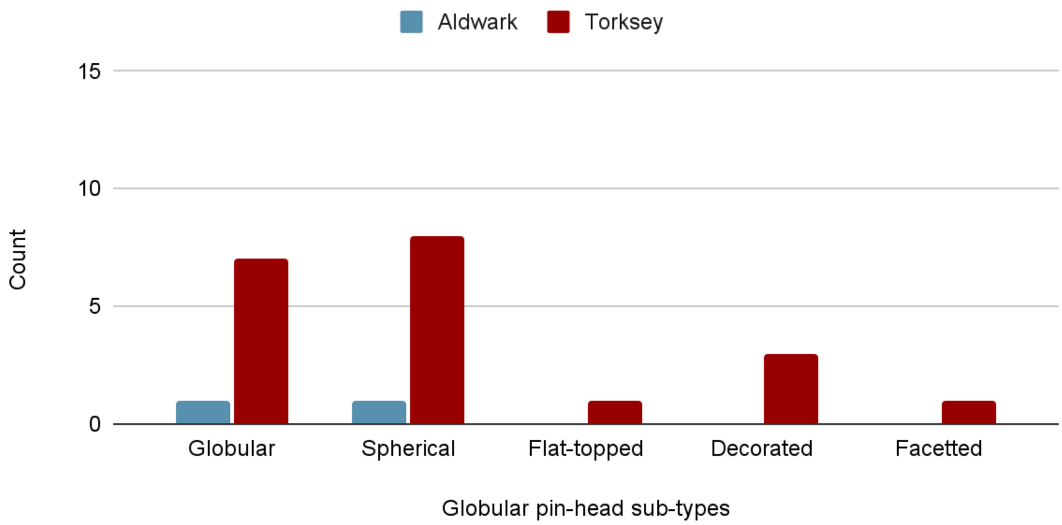


As can be seen, the sub-group with a medial band and conical top dominates the Torksey assemblage. Haldenby (2012, 8) notes that 57% of biconical pins in his survey possessed a medial band. At Flixborough, the proportion is slightly over 55% of non-ferrous pins, taking account of both conical and flat-topped forms (Rogers *et al.* 2009, 55-9). Whilst the exact forms of some of the Cottam B biconical pins are unknown, the proportion of copper-alloy pins with medial bands is at least 58% (Richards 1999, 71 & 102-4). The assemblage of 30 biconical pins at Southampton differs from the recognised national distribution, with the type more commonly encountered in the north and east (Haldenby 2012, 8). However, medial bands only account for just over 23% of this assemblage, suggesting an element of regionality in the form: this may also be a factor at Staunch Meadow, where the proportion is slightly below 32% (Riddler *et al.* 2014, 233). These results stand in clear contrast to Torksey, where just over 70% of the total have medial bands. Such a high proportion suggests a strong element of selectivity, showing pins with medial bands and conical tops preferred over other forms.

Globular pins are characterised by a variety of spherical and sub-spherical head forms. Both regional and chronological distributions can be seen in several sub-groups, (Haldenby 2012, 8-9; Haldenby and Richards 2016, 4.3), with ring-and-dot decoration universal, but more uncommon. The relative proportions of the recorded head shapes and sub-groups are shown in Figure 7.8.

Figure 7.8: Globular pin forms from Aldwark and Torksey

Total data set: 22 pins



Globular pins are a widespread and numerous group on many Middle Saxon sites: whilst they were the second most frequent form at Flixborough, they were dominant at Southampton, Fishergate, Coppergate, and Staunch Meadow (Riddler *et al.* 2014, 230; Rogers *et al.* 2009, 33). None of the sub-types found at Torksey suggest any notable regional bias, although the absence of heads with spiralling ‘wrythen’ decoration is surprising: this form has concentrations in Lincolnshire and East Anglia, comprising 16% of the copper-alloy globular pins from Flixborough and 13% from Staunch Meadow (Haldenby 2012, 9; Rogers *et al.* 2009, 50-51; Riddler *et al.* 2014, 230-31). However, the single examples of flat-topped and longitudinally facetted pins are entirely in keeping: both these forms are far more common north of the Humber, where they become more prevalent in the Anglo-Scandinavian period (Haldenby 2012, 8). The 15% of Torksey pins decorated with ring-and-dot compares favourably with Staunch Meadow and Fishergate, where the proportions were 15.9% and 15.3% respectively: the Flixborough assemblage contained far less, at 7.7%.

Whilst the unusual disparity in proportions of collared pins to strap-ends has already been highlighted, closer analysis further supports the suggestion that the assemblages of pins are atypical. Only two silver pins, globular forms ADB 1268 and TDB 135, have been identified. At Torksey, this means that precious-metal pins comprise only 1.7% of the whole assemblage. When measured against 3.5% and 9% for comparable material at Staunch Meadow and Flixborough, this proportion appears very low (Rogers *et al.* 2009, 43; Riddler *et al.* 2014, 230-236), implying that silver pins were selectively collected and removed. Although the small size of the Aldwark assemblage makes statistical comparisons difficult, the single precious-metal pin-head here has clearly been treated as hack-silver. At Torksey, biconical pins with medial bands appear over-represented. In the Southampton assemblage, simple biconical pins and those with medial bands were identified as being made of brass, a different alloy to other pin forms (Wilthew 1996, 67). Whilst other studies (Roxburgh and Van Os 2018) have not observed as strong a correlation between alloy choice and pin-head type, it must be noted that these did not analyse sub-types of pins, and that one examined pin-group from Domberg, Walcheren, contained no biconical pins with medial bands (Capelle 1976, Taf. 13-14). Kershaw (2013, Table 2.1) identifies the frequent use of brass as one of the characteristic elements which distinguishes Scandinavian jewellery. If the collection of collared pins was driven by a desire to accumulate metal for recycling, then it seems a strong possibility that conical-topped pins with medial bands may have been identified and collected for their specific alloy content. Amongst the biconical pins in the assemblage, the two flat-topped pins that lacked medial bands were also the only gilded pins, suggesting that they may have been selected for other reasons.

No iron pins have been identified at either camp. Ross (1991, 15) suggests that pins of this material were probably comparatively common, with poor survival affecting recovery, and iron pins have generally been seen as an unusual class of artefact. However, in the Fishergate Period 3 deposits, spanning the eighth and ninth centuries, 15 iron pins and pin fragments were recovered, compared to only nine of copper-alloy (Rogers 1993, 1361 & 1367). At Coppergate, just under a quarter of a total of 79 complete and fragmentary pins were iron, although this proportion falls to 17% when concentrated on Periods 3 to 5B (mid-ninth to mid-eleventh centuries), and excluding ringed-pin types (Ottaway 1992, 693-9; Mainman and Rogers 2000, 2576-82). At Cottam B, approximately 20% of the 92 excavated and metal-detected pins were iron (Richards 1999, 71-78 & 102-106), and a similar proportion was observed at Flixborough, where iron pins comprised approximately a fifth of the total assemblage. Whilst over 45% of these were either unstratified or recovered from topsoil, iron pins of polyhedral, biconical, and globular forms also made up over half of all dateable pin types from the later ninth-to-tenth-century Periods 5 and 6 (Rogers *et al.* 2009, 42-3). Given that metal-detectors were routinely used at the last two locations listed above, a lack of iron pins at the study sites cannot be purely an effect of recovery methods. It therefore seems probable that their absence shows a genuine gap in the assemblage, with iron pins not present at either camp: as with the non-ferrous pins, their exclusion may reflect their low metal value, with more substantial pieces of iron preferred as sources for scrap.

Other collared pin forms have not been recorded, although it is possible that they are represented by the broken shanks. Plate-headed pins are a comparatively late development in the series, and their absence accords with the dates of the camps (Haldenby and Richards 2016, 4.3). The spiral-headed pin is broadly dated to the eighth century, with ninth-century examples known from Flixborough (Rogers *et al.* 2009, 34) and ninth-to-twelfth-century dates recognised at York (Mainman and Rogers 2000, 2578) although residuality there cannot be discounted (Cowie and Blackmore 2012, 279). The lack of both these and headless pins again agrees with a late ninth-century date for occupation: at Aldwark, the absence of any eighth-century forms may also indicate that the previous settlement was abandoned before the camp was established.

7.3.3 Ringed pins.

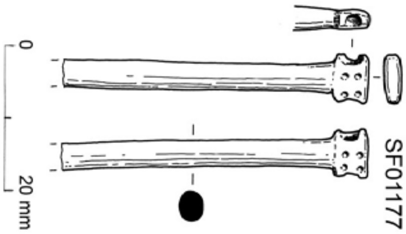
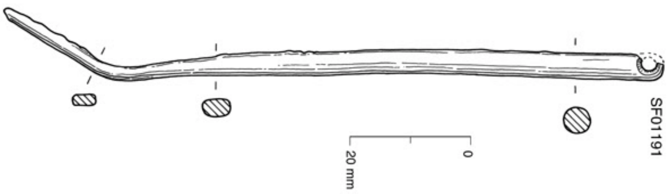
This section follows both the terminology and typology established by Fanning (1994), with a ‘ringed pin’ defined as any pin with a loose, swivel ring held captive by the pin-head. A catalogue of the ringed pins from both sites is presented in Table 7.11. Like penannular brooches, ringed pins were adopted by Scandinavians from Insular dress, gaining popularity during the ninth century (Wamers 1998, 38). In this early period, the common form of ringed pin was comparatively simple, with a plain ring and a looped head, following Irish models (Fanning 1994, 19). Whilst there is a wide distribution of this form across Scandinavia, with a marked concentration in Norway, a high proportion of examples appear to be locally manufactured, with the design of pin components altered (Graham-Campbell 1984, 36).

Fanning (1991, 53) observes that these alterations typically take the form of oval-shaped rings, widely fanned looped heads, and splayed pin shanks: these characteristics can be seen on Danish pins, and on those from Kaupang and Birka. A further development can be seen in the production of ringed pins of the ‘Vestfold type’ described by Blindheim (1976, 20). These pins are characterised by a flat plate head, pierced to hold a captive wound-wire ring, and frequently feature a polyhedral swelling on the shank, below the head: these are a specifically Scandinavian form, unknown in Insular contexts.

ADB 141 is a clear example of the earlier form of pin, displaying a plain ring and simple loop. One of the broken pin shanks from Aldwark, ADB 1191, can also be safely assumed to represent this form, despite part of the loop and the ring being absent. The final Aldwark example, ADB 1177, is also broken. However, it can be identified as a crutch-headed pin, albeit with a somewhat smaller T-shaped head than is often recorded, and lacking the characteristic ring-and-dot decoration (Fanning 1994, 42). The indentations on either side of the head indicate this would have held a stirrup-shaped ring, rather than functioning as a stick-pin. Fanning (1994, 44-5) principally dates this form to the eleventh century, with a degree of later survival. Four other examples of the type are known from England, one of which is from Wharram Percy, Yorkshire: it seems certain that ADB 1177 is unconnected with the occupation of the camp, and must relate to later activity on the site.

TDB 1627 has a slightly flattened, oval-shaped ring, an element suggesting some Scandinavian influence. No parallel has been found for the decorated shank of this pin. The biconical, octagonal swelling under the head is a separate piece, slotted onto the pin shank before the loop was closed. It is hard to interpret this object: a similar metal find from Staunch Meadow with seven uneven facets has been identified as a possible weight, but this is made of lead, and lacks a central perforation (Cowgill 2014, 274). The perforation on the original object attached to TDB 1627 may suggest a primary use as a bead. The biconical, faceted shape does echo some beads from Scandinavia (e.g. Arbman 1940, Taf. 116 and 119), and cylindrical, octagonally-faceted beads of carnelian are known from England (Evison 1969, 340). Callmer (1977, 35 & 55) describes the form as his shape 144, but only noted it in beads of rock crystal and carnelian. The shape is not reproduced in metal, and metal beads themselves are very rare in Insular contexts (Hickey 2014, Tables 10 and 11). A single globular copper-alloy bead was recorded from Coppergate (Mainman and Rogers 2000, 2596), but no other finds in this material have been identified. Only two further metal beads, both of silver and probably imported from Scandinavia, are known from Britain (Evison 1969, 340; Hickey 2014, Table 12).

Table 7.11: Ringed pins from Aldwark and Torksey

Database No.	Image
ADB 141	 Image: British Museum
ADB 1177	 Image: York Archaeological Trust
ADB 1191	 Image: York Archaeological Trust
TDB 1627	 Image: Viking Torksey Project

It is notable that this faceted object appears to have been placed on the shank of TDB 1627 during manufacture: it forms an integral part of the design, rather than being a later adaption. The position of this object strongly resembles the polyhedral swellings seen on the 'Vestfold type' pins. This may have been a deliberate action, expressing an element of Scandinavian identity or affiliation by recalling a pin form common in Kaupang (Blindheim 1976, 22). However, it may have been intended to signal more than merely a broad cultural affiliation. Several authors (e.g. Gustin 2015, 33-35) have noted the development of faceted, cubo-octahedral decorations on weighing equipment in the latter part of the ninth century. In the Baltic area, these decorations subsequently featured on penannular brooches, with faceted, weight-like knobs used as terminals: it is postulated that these were intended to convey a social identity, signalling involvement in a common system of weight-trading across wider cultural divisions. Whilst these brooches were an eastern fashion, similar developments can be seen in Insular ringed pins. In particular, the plain-ringed, polyhedral-headed pins which became highly popular in the early tenth century have been taken as markers of group identity, signalling membership of a mercantile class (Horne 2022, 106). These pins (and the related baluster-headed type, also displaying a faceted terminal) have a wide Insular distribution, centred on the Irish Sea (Fanning 1994, Fig. 12). However, Fanning (1994, 34-36) opines that these pins were not objects of trade in themselves, with their deposition instead signalling losses of personal items by traders from York or Dublin. Polyhedral-headed pins, penannular brooches, and 'Vestfold type' pins were all therefore worn to signify both regional affiliation and membership of a wider mercantile system, with the polyhedral knops and terminals intended to connect with the notions of trust and reliability evoked by commonly-used weight forms (Section 4.3.4): they were ways to 'signal trustworthiness and knowledge of payment transaction using weighed silver' (Gustin 2015, 36). The faceted 'bead' on TDB 1627 can be read as a foreshadowing of this activity. Although Horne (2022, 227) suggests that the pin itself may 'indicate the presence of a *longphort*-based trader' at Torksey, its decoration seems to speak far more strongly of an eastern influence, reflecting a morphological similarity with the polyhedral swellings seen on the 'Vestfold type' pins. Whilst this piece appears to be a very early, and important, precursor to the Insular polyhedral-headed pin, the use of a faceted 'bead' appears to be a reference to the cubo-octahedral weights introduced from the east and related to southern Scandinavian economies.

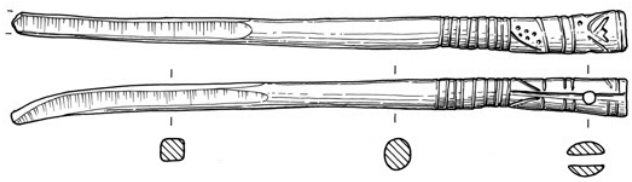
Although Fanning was specifically referring to tenth-century types when he characterised pin finds as personal losses, the comparatively low number of ringed pins from the two camps does suggest that ADB 141, ADB 1177, and TDB 1627 are also casual losses from items of personal dress, rather than pieces of collected scrap. Two loop-headed, plain-ringed pins were recovered from Coppergate, although the majority of British examples of this early type are from the west of the country: finds include three from the assemblage at Meols and a single pin from Aspatria, Cumbria (Griffiths 2007, 68; Mainman and Rogers 2000, 2580). However, several of these western examples display elements suggesting Scandinavian manufacture: splayed shanks with lozenge-shaped cross-sections are evident on pins from Brigham, Cumbria and Balladoole, Isle of Man, and on all four from the cemetery group at Cumwhitton, Cumbria (Paterson *et al*. 2014, 142-4), with another probable example amongst the Meols material (Griffiths 2007, 69). Fanning (1994, 21) suggests that these Scandinavian variants developed during the ninth century and would have been worn concurrently with the plainer versions: this is evident with the example from Mound 56 at Heath Wood, which displays a Scandinavian-influenced design of vertical grooves decorating a fanned pin-head (Richards 2004, 75-6). The corpus of ringed pins from Dublin contains 60 examples of iron and copper-alloy loop-headed, plain-ringed pins. Of these, 38 are of the plainer, 'simple' form, without any Scandinavian-influenced design elements.

Although the plain-ringed, loop-headed pin was a long-lived form, with use extending well into the eleventh century, the three examples of this type shown in Table 7.11 are of the simpler form, consistent with a ninth-century date. The predominantly Insular styling of the two from Aldwark is noteworthy, particularly when compared with the Scandinavian-influenced design of the Heath Wood example. Once again, care must be taken when interpreting such a small assemblage, but it may be of consequence that the uniquely-decorated, Scandinavian-influenced pin TDB 1627 was found at Torksey, whilst the simpler plain-ringed, loop-headed pins were recovered from Aldwark. Whilst these two Aldwark pins are not necessarily of Irish manufacture, they do reflect the fashion of early Irish design, and may suggest a more Insular focus. Glørstad (2014, 161 & 167) observes that ringed pins were clearly found to be suitable for communicating identity, with subtle differences in design conveying meaning to the trained eye. The presence of only loop-headed, plain-ringed pins at Aldwark may signify the expression of an 'Insular' identity, potentially centred on Ireland. Conversely, the pins from Torksey and Heath Wood may invoke more 'Scandinavian' personas, reflecting designs and identities embodied further to the east and the construction of a shared mercantile identity.

7.3.4 Other pins

Two further pins do not fit the previous categories. Whilst their dating is not certain, they most probably relate to the occupation of the camps, so are included here. The basic form of ADB 1192 is similar to many bone and antler pins of the early medieval period, although these more typically have spatulate ends (cf. Schietzel 2014, 206-7). The sub-square, faceted point of the pin recalls the Scandinavian-influenced designs of earlier ringed pins, and the arrangement of a decorated head and squared-off lower shank is comparable to many of the later, more ornate plain-ringed, polyhedral-headed ringed pins. However, it seems more probable that the pierced head of this find originally held a cord rather than a captive ring. The incised design is difficult to parallel in this material, although similar arrangements of radial rings and transverse lines can be seen on organic pins. A tinned iron pin from Coppergate, No. 3810, displays similar mouldings along the length of the

Table 7.12: Unclassified pins from Aldwark and Torksey

Database No.	Length (mm)	Image
ADB 1192	96	 Image: York Archaeological Trust
TDB 32	19.8	 Image: Viking Torksey project

shank (Ottaway 1992, Fig. 300); it is probable that the Aldwark find echoes a similar process, with an unusual form used for a dress pin.

The quatrefoil design on TDB 32 holds some similarities with unusually-decorated biconical pins, such as Flixborough No. 408 (Rogers *et al.* 2009, 57) or a find from Ipswich catalogued as 96.15 by West (1998, 67). Similarities can also be seen with several ‘Hiberno-Norse’ club-headed stick pins from Whithorn, Galloway (Nicholson and Hill 1997, 366-7; Nicholson

1997a, 418-9), although the non-ferrous examples here post-date the occupation of the Torksey camp. Another equivalent can be found with two copper-alloy stick pins from Lagore Crannog, Co. Meath, one of which shares a near-identical head form (Hencken 1950, Fig 13 No. 1195). However, both of these finds are unstratified, making them unsatisfactory as close parallels. Ultimately, TDB 32 may be a unique form, or may be the head of a decorative stud or fitting, unrelated to dress.

7.4 Strap-ends

Unlike the brooches and pins, the assemblages of strap-ends extend over a comparatively narrow date range. The lack of Roman strap-ends is notable at Torksey, given not only the background activity on the site but also the fact that other belt fittings of this date have been recovered. It seems highly unlikely that any such strap-ends would have been misidentified, and equally improbable that they would have been either discarded or not reported: their absence may relate to the dating of the earlier settlement, indicating that it was not occupied in the later Romano-British period. Once again, the later medieval pieces from Torksey can be reasonably connected with subsequent settlement to the south. The numbers and dates of all strap-ends are presented in Table 7.13, and the relative numbers of early medieval strap-ends from both camps shown in Figure 7.9.

Table 7.13: Strap-ends from Aldwark and Torksey

Location	Early medieval	Later medieval	Post-medieval	Unknown	Total
Aldwark	43	2	0	5	50
Torksey	154	19	1	0	174

This section principally uses the typology devised by Thomas (2000a). The early medieval strap-ends have been classified by Dave Haldenby, with the numbers of identified Thomas types set out in Figure 7.10. A total of 16 strap-ends were either unidentifiable or unclassifiable, and are not included in this Figure: the four unclassified ‘irregular’ pieces from this total are discussed in Section 7.4.5. The two assemblages show notably dissimilar profiles of identified strap-ends. Although the Thomas Type A is dominant on both sites, it is overwhelmingly so at Torksey, whilst the comparative ratios of Type B to Type E series strap-ends differ between the two sites. This suggests two different regimes at the camps, with the Aldwark evidence relating to the manufacture of Type E3 belt fittings already noted in Chapter 6.

Figure 7.9: Early medieval strap-ends from Aldwark and Torksey

Total data set: 197 strap-ends

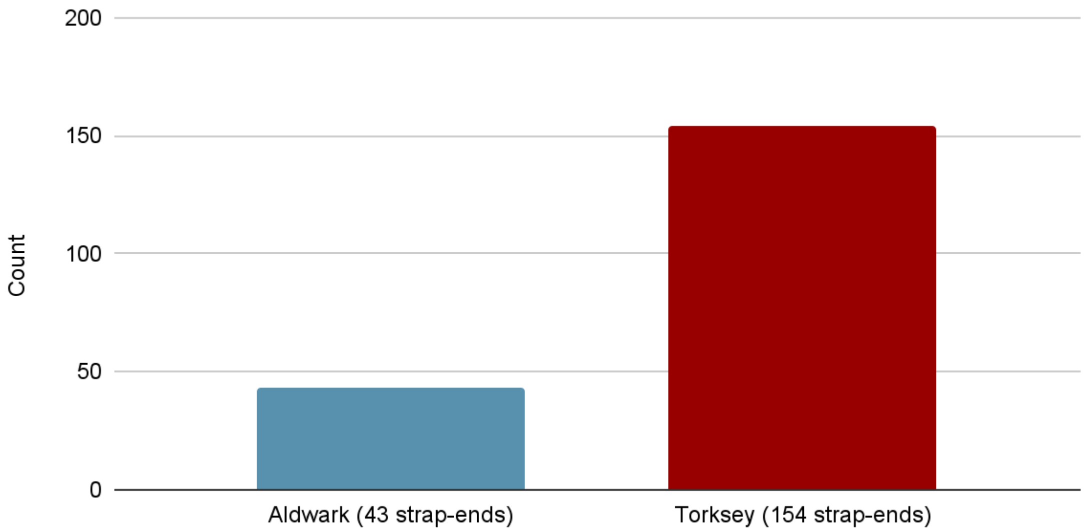
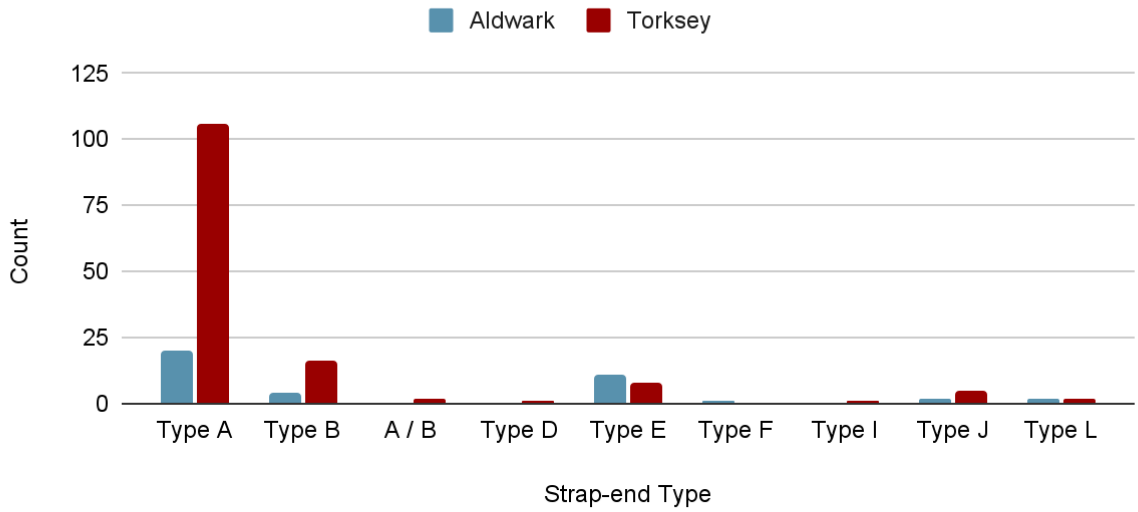


Figure 7.10: Identified Thomas strap-end types from Aldwark and Torksey

Total data set: 181 strap-ends

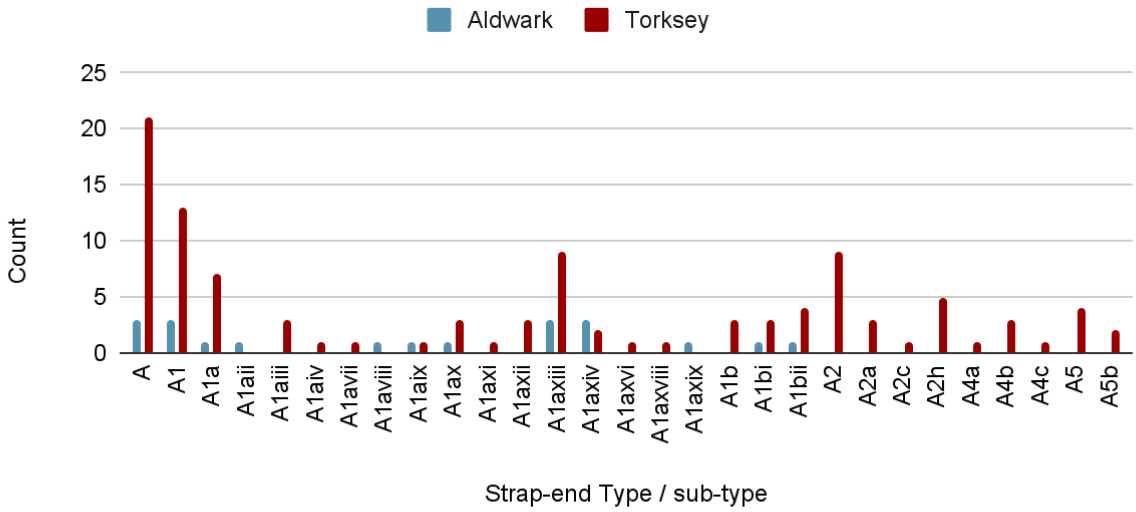


7.4.1 Type A strap-ends

Type A strap-ends are characterised by a convex form, with bifurcated butt-ends and zoomorphic terminals. The A1 sub-types are decorated with Trewhiddle-style artwork, the A2 series features geometric designs, and the A4 and A5 pieces are respectively enamelled or embellished with silver wire (Thomas 2000a, 69-99): no anthropomorphic Type A3 strap-ends have been identified from either camp. The date range for the Type A series is reasonably narrow. The Trewhiddle-style decorative artwork which characterises the Type A1 strap-ends is commonly dated to the ninth century, with the style seen as passing out of use by 900 AD. An extended date for Trewhiddle-style metalwork has been convincingly argued for northern England (Hall 2000b, 320; Thomas 2006, 157), with strap-ends of this form recovered from both settlement foci at Cottam B. However, this has been seen as a survival in an 'artistically conservative region' and does not necessarily indicate a prolonged use across the remainder of Anglo-Saxon England: Thomas (2000a, 229-31) notes evidence of a slight northern bias in the distribution of the A1 Type. Both Types A2 and A5 can be more reliably dated to the ninth century on archaeological grounds, with a Type A5 strap-end recovered from the charnel mound at Repton (Thomas 2000a, 187). Type A4 strap-ends are less chronologically secure, but are also dated to the ninth century on art-historical grounds (Thomas 2000a, 199-202). All these pieces can therefore be confidently assumed to relate to the occupation of both camps.

Figure 7.11: Thomas Type A strap-ends from Aldwark and Torksey

Total data set: 126 strap-ends



In viewing Figure 7.11, it is notable that A2, A4, and A5 strap-ends are absent from Aldwark. Although these forms may be amongst the pieces which were too corroded or worn for sub-type identification, these remain too few to make up any significant proportion of the overall total. Whilst this absence may merely reflect the comparative size of the assemblage, with less-common types missing, it may also be related to the northern distribution of the A1 series observed by Thomas. Otherwise, the assemblages from both locations are generally unremarkable, distinguished only by their sizes when compared to other common categories of Anglo-Saxon artefacts. However, the single Type A1avii strap-end from Torksey is of note (Table 7.14). This form is more typically known as a 'Wooperton type' strap-end, named after the find spot of the first described example. The series is characterised by a high degree of homogeneity, with Bailey (1993, 90) suggesting that their pronounced similarities pointed to manufacture in a single workshop, most probably in York. Further to this, Haldenby *et al*. (2022, 104) identify a concentrated northern bias for the distribution of the 44 known examples, with the overwhelming majority recovered from Yorkshire. The Torksey piece is therefore a rare southern outlier. All the aforementioned authors have suggested, with varying degrees of certainty, that the Wooperton series was produced almost entirely by casting: Haldenby *et al*. (2022, 111-12) link this process with Scandinavian methods of manufacturing, at variance with the extensive hand-finishing frequently evident on the majority of the Type A series, made by Anglo-Saxon craftworkers. They further suggest that the Wooperton type strap-ends were cast in workshops operated by members of the Great Army, or which had come under the control of the force after the occupation of York. This strap-end therefore reflects not only a Northumbrian presence at Torksey, but also shows an object which was probably lost by its owner rather than being collected as a source of scrap. It additionally shows that dress fittings which were produced in an English style, or which would appeal to Anglo-Saxon tastes, were being worn by members of the Army before they arrived at Torksey.

Table 7.14: Thomas A1avii strap-end from Torksey

Database No.	Image
TDB 741	 Image: Viking Torksey Project

As already observed, the numbers of strap-ends are notable when compared to the assemblages of collared pins. The proportions of these two categories of artefact remain reasonably consistent across both sites. At Aldwark, the ratio of combined Type A and B strap-ends to collared pins is 2.67:1, decreasing to 2.10:1 at Torksey. If only Type A strap-ends are examined, these ratios fall to 2.22:1 and 1.83:1 respectively. However, a high proportion of the Type A strap-ends from Torksey cannot be assigned to any clear sub-type, whilst a smaller amount can only be identified as either Type A1 or Type A2. This is at odds with the assemblage from Aldwark, where there are proportionally far fewer uncategorizable Type A pieces. This difference does not appear to be due to the relative sizes of the two assemblages. Just under half of the Torksey Type A pieces are fragmented to such a degree as to make definite identification impossible, compared with only 20% of Type A strap-ends from Aldwark. Furthermore, many of the fragmented strap-ends from Torksey show signs of deliberate cutting, a feature absent in the Aldwark assemblage. This echoes the pattern of fragmentation observed amongst other Insular metalwork (Section 6.2.2). Whilst the relative totals of collected strap-ends remain comparatively constant at each camp, the higher degree of deliberate fragmentation at Torksey does suggest that this material was used differently at each location.

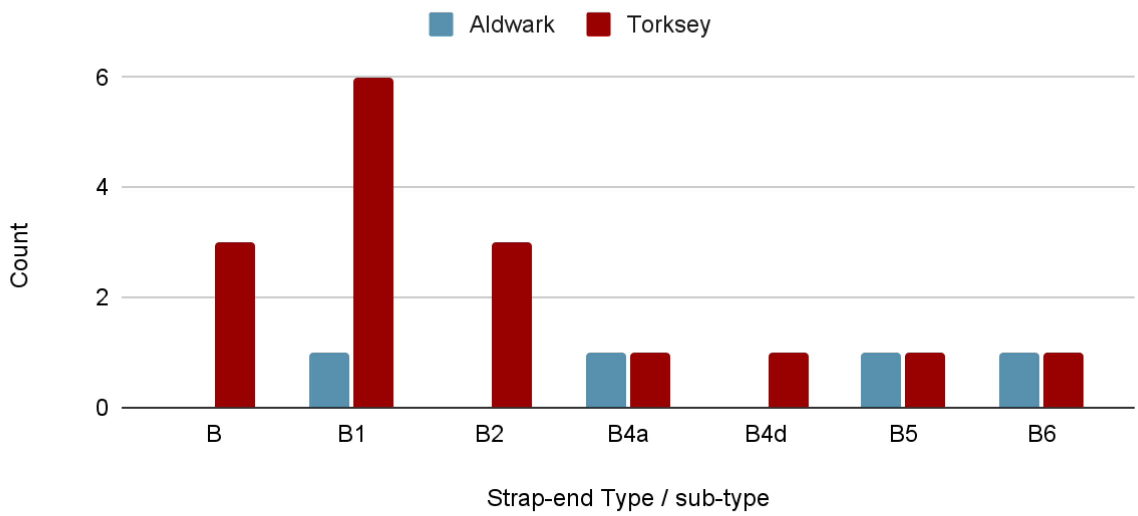
7.4.2 Type B strap-ends

Type B strap-ends are broadly defined by split butt-ends and zoomorphic terminals similar to the Type A series, with the important difference of having parallel-sided bodies and a longer, narrower form (Thomas 2000a, 99-100). However, as opposed to the almost entirely Anglo-Saxon nature of the previous series, elements of Scandinavian art styles are prominent in many Type B strap-ends, with distinctive Borre-style animal masks and either Ringerike or Urnes designs evident on the B4 and B6 sub-types respectively. The Type B series therefore spans a far wider date range than the Type A, with individual sub-types occupying quite different chronologies. Nevertheless, the B1 and B2 sub-types which form the bulk of the Torksey assemblage are characteristically Anglo-Saxon, with date ranges centred on the ninth century (Thomas 2000a, 202-05). It seems reasonable to conclude that these particular strap-ends derive from the occupation of the camp, and were again collected by members of the Army as a source of scrap. Both sub-types show a strong southern distribution, concentrated to the south of The Wash, and with Thomas (2000a, 244) suggesting that their production may have focused on centres such as Winchester and Canterbury. These geographical factors almost certainly account for the recovery of only a single B1 strap-end from Aldwark, in addition to the absence of any B2 forms. By contrast, the two B6 strap-ends date to the eleventh century, and must show later, casual losses at each location.

As noted, the animal masks which characterise the B4 sub-type are strongly indicative of Scandinavian design, with the B4a class particularly showing a heavy relief decoration which Thomas (2000a, 154) interpreted as being produced by casting. These elements, coupled with a distribution which includes both northern Scotland and the Irish Sea region, led Thomas (2000a, 245-6) to suggest that the B4a strap-ends were a Hiberno-Scandinavian introduction, originally developed and produced around the Irish Sea but widely adopted across northern England and further circulated in Scandinavia (Thomas 2001, 45). This particular class shows a long period of use, with examples dated from the mid-ninth century into the early tenth century, (Haldenby *et al*. 2022, 110) and with derivative examples distributed across eastern England and two possible lead casting models from Essex (Thomas 2000a, 147). An equally broad date range can be proposed for the B4d class, represented by a single find from Torksey: one strap-end of this form was recovered from a

Figure 7.12: Thomas Type B strap-ends from Aldwark and Torksey

Total data set: 20 strap-ends



pre-840 AD deposit at Whithorn, whilst another derives from the later ninth-century to late tenth century 'middle Norse horizon' at the Brough of Birsay (Nicholson and Hill 1997, 373-4; Curle 1982, 78). The B4d class has an even wider distribution, with examples known across northern and eastern Britain. Although the three B4 strap-ends recovered from the camps were almost certainly worn by members of the Great Army, both the date ranges and wide dispersal of each form mean it is not credible to associate them with any particular faction of the force. However they do illustrate some of the wider Scandinavian cultural affiliations and hybrid styles present in the Army.

The parallel-sided, heavily-cast B5 sub-type, produced with stepped butt-ends and with occasional simple peripheral grooves decorating the reverse, likewise demonstrates cross-cultural and Scandinavian-influenced traits. However, a narrow date range has recently been advanced for this form, spanning roughly 866 to 876 AD. In this, Haldenby *et al*. (2022, 95) suggest that their production followed a similar model to that of the Wooperton type A1avii strap-ends, with Scandinavian colonists developing the series as a means of

Table 7.15: Probable B5-3 strap-ends from Aldwark and Torksey

Database No.	Image
ADB 929	 Image: York Archaeological Trust
TDB 745	 Image: Portable Antiquities Scheme

expressing a new identity without mimicking Anglo-Saxon designs. The distribution of B5 strap-ends shows a relatively compact northern bias, centred on York, the presumed location of the manufacturing workshops: a probable lead model of a B5 strap-end was recovered from Coppergate, indicating casting in the locale (Mainman and Rogers 2000, 2569. The Aldwark example of this sub-type, ADB 929, belongs to a new B5-3 sub-class proposed by Haldenby *et al*. (2022, Figure 4). It is postulated that this sub-class is a development of slightly earlier B5 patterns, with a comparatively varied artistic repertoire incorporating aspects of Anglo-Saxon and Irish design. Given this proposed dating, it is possible that ADB 929 was produced after Halfdan's force occupied the Aldwark camp, meaning that this piece may not have ever left Northumbria. The Torksey example, TDB 745, is very eroded. Whilst a deeply-contoured interlace is visible on the face of the strap-end, suggesting that it also belongs to the B5-3 sub-class, the split butt-end is irregular and does not fit the proposed definition (Haldenby *et al*. 2022, 100). Although the eroded tip and ring-and-dot decoration near the butt indicates that this may be a Type E4 strap-end, Thomas' earlier definition (2000a, 104) included a split end. Therefore, whilst irregular, the decoration conforms most closely to the B5 sub-type. It is possible that this piece is a very early version of B5-3 designs, carried south by a member of the Army, or it may be a later derivative model, made as a copy after production started in York.

Although it is not as pronounced as in the Type A series, a difference can still be seen in the fragmentation of the Type B strap-ends. Whilst none of the observed pieces show any clear evidence of deliberate cutting, only the B1 and B2 sub-types are broken, with three Torksey finds once again so fragmented as to make sub-type identification impossible. The break in the single B1 strap-end from Aldwark may show post-depositional damage, but the absence of any further B1 or B2 pieces makes any comparison with the degree of fragmentation at Torksey impossible. Nevertheless, it is notable that the Scandinavian-influenced B4 and B5 material remains complete: if deliberate fragmentation is present in the assemblages of Type B strap-ends, it can only have been practised on the Anglo-Saxon sub-types of the series.

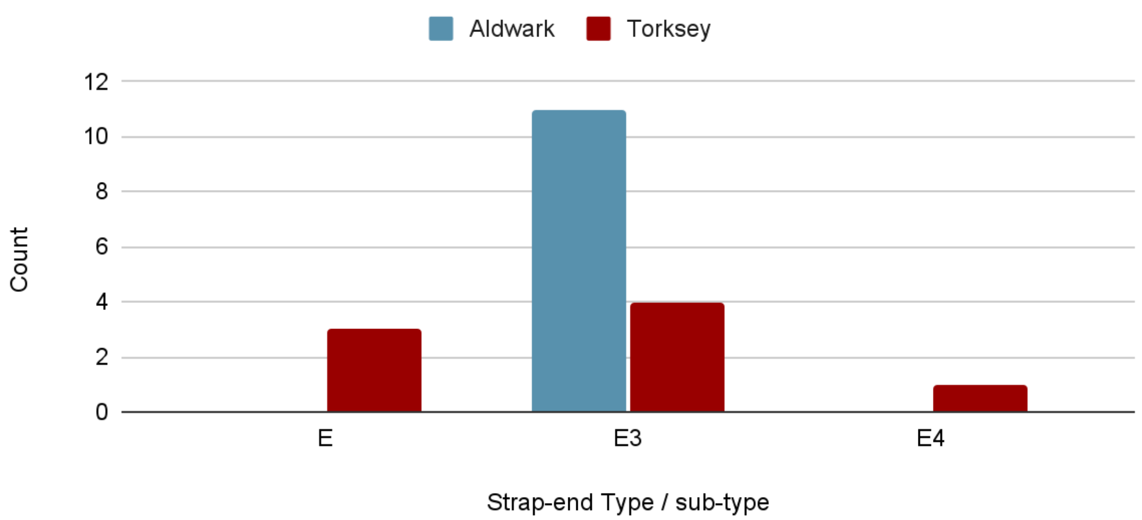
7.4.3 Type E strap-ends

The wide, tongue-shaped Type E series forms a point of departure from the majority of pieces already discussed. Whilst Anglo-Saxon fashions appear to have mainly favoured unbuckled textile girdles, fitted with pairs of Type A or B strap-ends, the broader, heavier Type E fittings were most probably attached to leather straps, worn with buckles and sometimes strap-slides (Thomas 2000a, 278-9). This style originated in the Carolingian kingdom, and was widely adopted in Scandinavia. However, it does not appear in England until the late ninth century, with the bulk of the Type E series dated to the tenth and eleventh centuries (Thomas 2000a, 208). This late introduction is clearly reflected in the low recovery of the series from Torksey illustrated in Figure 7.13, with the larger assemblage of the E3 sub-type at Aldwark showing a clear difference between the two sites. Given their later dating, and the fact that the Type E represents a divergence from Insular clothing of the time, all these pieces can reasonably be seen to reflect a Scandinavian presence. The majority will have functioned as dress items although two iron E3 strap-ends, ADB 134 and TDB 2572, were more probably used on horse harnesses.

Three Type E strap-ends from Torksey have no clear sub-type: these appear to be generic tongue-shaped pieces, with few further defining characteristics. TDB 757 is an undecorated silver strap-end only 11mm wide. Smaller examples of the Type E series are often associated with buckles fitted with strap guides, used to secure spurs or, more occasionally, garters or footwear (Thomas 2000a, 269). A similar use can be suggested for this piece, although it may have also been retained as a piece of bullion: two silver Type E strap-ends were included in the Trewhiddle Hoard (Wilson 1961a, 81). Both the remaining strap-ends are broken, with TDB 20 poorly described, adding to the difficulties in classification. The butt-end of TDB 1759 is absent, and only the lower half of the body and tip survive. This remaining section is very sparsely decorated, with traces of a simple peripheral groove

Figure 7.13: Thomas Type E strap-ends from Aldwark and Torksey

Total data set: 19 strap-ends



visible: the profile of the strap-end suggests that this groove may be on the reverse, but this is not certain. Peripheral grooves are occasionally seen on the reverse of E3 and E4 strap-ends (Haldenby *et al*. 2022, 103), but both these sub-types also display heavy relief decoration on the front face. This decoration is typically cast, so TDB 1759 is unlikely to be an unfinished version of either form. It may be a derivative piece or a trial casting, used to test one side of a two-piece mould. The single E4 sub-type from Torksey TDB 801 is very fragmentary, and has been truncated on all sides. However, elements of a cast Borre-style ring knot are visible on one side, along with two rivets aligned against a framing bar, enabling the piece to be confidently identified. The E4 sub-type was a long-lived design, which Thomas (2000a, 213-14) dates from the late ninth to tenth centuries. If TDB 801 is connected with the overwintering at Torksey, it must therefore be an early product of the series, with a date comparable to the A1avii and B5-3 strap-ends discussed above. Whilst the cast production and Scandinavian-influenced design of the E4 has clear commonalities with the B5 sub-type, the longevity of the former series has created a far wider distribution, principally in eastern England but with further finds to the west and in the Irish Sea region (Thomas 2000a, 252; Haldenby *et al*. 2022, Figure 11). Given this distribution, it is not possible to see a direct link between this sub-type and the Great Army, although the strap-ends were clearly worn by members of the force.

All the Type E straps-ends recovered from Aldwark are of the E3 sub-type. The presence of lead models and failed castings of both E3 strap-ends and related strap-slides has been discussed in Section 6.3, with the comparatively high amounts of these items suggesting the concentrated production of large numbers of these fittings at the camp. The volume of complete copper-alloy E3 strap-ends accords with this, as do nine strap guides with medial ribs also recovered from the site: as noted, this type of guide is assumed to form a suite with the E3 fittings. Furthermore, several of the strap-ends and slides are scored with deep, parallel file marks and striations, suggestive of rough finishing: these pieces were presumably lost or discarded at an intermediate stage of production, after casting but prior to final polishing.

Previously, the E3 sub-type has been seen as having a very polarised distribution, which Thomas (2004, 2) identified in two distinct regions. He defined a clear concentration in the Irish Sea area (Thomas 2000a, 251; 2001, 44), a region which includes examples from sites at Carlisle Cathedral and Cumwhitton, Cumbria, Peel Castle on Mann, and Golden Lane, Dublin (Paterson and Tweddle 2014; Paterson *et al.* 2014; Graham-Campbell *et al.* 2002; O'Donovan 2008). Thomas (2001, 44) also mapped a broader distribution of individual finds across the eastern 'Danelaw' area: Leahy (2007, fig. 68:1-3) illustrated three examples from Lincolnshire, one of which was reworked into a pendant, whilst amongst the further instances are specimens from Cottam B, Cowlam, and Ryther in Yorkshire (Haldenby 1992, 31 & Fig 3:9; Richards and Haldenby 2018, Table 2) and Swinhope and Binbrook in

Lincolnshire (Hadley and Richards 2020, 123). Thomas (2001, 44) proposed that these eastern examples were later introductions, with the style originating in the west, and other authors have also seen the E3 as a product of the Irish Sea area. Paterson (*et al.* 2014, 149; 2014, 217) proposed that the regional concentration suggested by the near-identical examples from Carlisle, Peel Castle, and Golden Lane shows a manufacturing centre within Cumbria. However, the assemblage recovered from Carlisle Cathedral is now matched by the four E3 strap-ends from Torksey, whilst the twelve complete examples recovered from Aldwark provide the densest concentration yet identified from a single location.

In common with the E4 sub-type, Thomas proposed a wide date range for the E3 strap-ends, originating in the late ninth century and remaining popular throughout the tenth century. Nevertheless, he did suggest that instances of ring-and-dot decoration supported an attribution more toward the latter date (Thomas 2000a, 213). Graham-Campbell dated the Peel castle example in broad agreement, judging the inhumation assemblage to reflect objects from the late ninth to the second half of the tenth centuries, and a similar range has been advanced for the material from Carlisle Cathedral (Graham-Campbell *et al.* 2002, 95; McCarthy 2014, 244). However, the early ninth-century date proposed for the Golden Lane example does raise questions, particularly given the very close stylistic similarity of these fittings with the suite from Carlisle (Griffiths 2010, 151-2 & 157-8). The Dublin dating is based on a radiocarbon result obtained from the accompanying burial, which suggests an interment before 832 AD (O’Donovan 2008, 52-3). Whilst analysis of this result lies outside the scope of this thesis, it is worth noting the recent revision of the dates of the Repton charnel, achieved by applying a marine reservoir correction (Jarman *et al.* 2018). No other Insular material currently supports a dating of E3 strap-ends any earlier than the late ninth century. Thomas linked his concept of an Irish Sea origin for the E3 sub-type to the occupation of York by Irish-Scandinavian forces in 919 AD (Higham 1992, 24-25; Thomas 2001, 44), proposing that the belt fittings were only introduced to eastern England at this point. Whilst this dating perhaps reflects his perception of the E3 as a predominantly tenth-century product, the fact remains that this interpretation suggests that the E3 assemblages from both camps do not relate to the Great Army’s overwinterings.

Whilst some later activity is recognised on the site, only three of the eleven complete copper-alloy E3 strap-ends from Aldwark have the ring-and-dot decoration with which Thomas (2000a, 213) characterised tenth-century production. However, it should be noted that Thomas specified *punched* ring-and-dot as signifying this date. The Cumwhitton grave-finds feature *incised* ring-and-dot, and may date as early as the late ninth century (Paterson *et al.*

2014, 93 & 155). It has not been possible to study the Aldwark items to determine how their decoration was produced, but material from Cottam also demonstrates that ring-and-dot designs can be found on late ninth-century artefacts (Haldenby and Richards 2016). The three decorated pieces from Aldwark may show the continuing, small-scale activity identified at the site. Nonetheless, only ADB 949 can truly be said to display a design suggestive of later, derivative copying, with an incised medial rib and roughly-scored motifs: this piece alone may signify a later stray find, comparable with the eleventh-century crutch-headed pin ADB 1177. All the remaining copper-alloy E3 strap-ends from Aldwark are comparatively plain, with decoration confined to only 'nail-head' notches or doubled, raised medial ribs. A similar pattern can be seen at Torksey, where TDB 739 again shows a design with an incised rib: the remaining examples from the camp have raised medial bands and are without ring-and-dot decoration. Although these plainer forms may merely reflect the partially-finished nature of several of the pieces, similar E3 fittings are known from other contexts.

A single, undecorated E3 strap-end with a raised medial rib, No. 307, from the emporium site at Domburg on Walcheren shows very strong parallels with several of the Aldwark finds and with TDB 42 (Capelle 1976, 26 & Taf. 18). Whilst this find is unstratified, the Domburg emporium is believed to have operated throughout the eighth and ninth centuries, with its importance decreasing sharply in the latter ninth century after a period of Scandinavian overlordship. Given this, it seems highly probable that this strap-end is of a ninth-century date. Three E3 strap-ends have been recovered through metal-detecting at Hedeby. These all lack depositional context, and have therefore been dated to the late ninth and tenth centuries purely on art-historical grounds (Hilberg 2009, 98 and Fig. 18). One of these pieces, Hb 2003/827, decorated with multiple ring-and-dot designs and 'nail-head' notches along a double medial rib, displays a marked similarity to the aforementioned strap-ends from Carlisle Cathedral and Golden Lane. However, the remaining two (Hb 2003/679 and Hb 2003/4202) are plain, both with raised doubled medial ribs and with one displaying evidence of a split butt-end, characteristics seen on seven of the Aldwark examples. Although these finds lack refined dating, it should be noted that three Torksey-style lead gaming pieces have also been recovered from Hedeby, leading to the suggestion of a 'backflow' of Great Army-associated material to the site (Dobat 2017, 599-602). Two further E3 strap-ends have also been recovered from Kaupang. One of these, C52517/844, has a doubled medial rib and features simple ring-and-dot decoration, showing a striking similarity to an Aldwark find, ADB 924. The second strap-end, C52517/1724, is made of lead/lead-alloy. Wamers (2011, 71) suggests this piece was used as a functional fitting, although notes that it may not have been cast and lacks a rivet or rivet-hole in the split end. This piece has a strong similarity with ADB 927 (Section 6.3.4), and the lack of any attachment point indicates that it was also probably used as a casting model: this clearly carries the implication that E3 strap-ends were also manufactured at Kaupang. All the E3-related material from the site was found during field survey, so lacks specific archaeological context: it is dated, on broad typological grounds, to the period 820-880 AD (Wamers 2011, 91). Whilst the lower end of this proposed range may be early for items with ring-and-dot decoration, the occupation dates for Kaupang suggest that craft production on the site occurred in the mid-to-late ninth century, continuing into the very early tenth century (Pedersen 2016, 14). It can therefore be argued that stylistically, the plain or simply-decorated E3 strap-ends with raised medial ribs from both camps show ninth-century manufacture, pre-dating Thomas' suggested tenth-century introduction of the sub-type to eastern England.

Although the subject is debated, recent work suggests that the Isle of Man did not come under Scandinavian control until the later ninth century, most probably after 870 AD. This would imply that the E3 belt set from the Peel grave post-dates the occupations of both Aldwark and Torksey. Steinforth (2018, 87; 2020, 103) suggests that the original Manx settlers, personified by heterogeneous 'pagan' grave assemblages such as Peel and Balladoole, originated from Scandinavian colonies in either Britain or Ireland. A similarly diverse collection of artefacts is apparent in the burials contained in the Cumwhitton cemetery: in particular, the inhumation which contained the E3 strap-ends, Grave 5, also included a possible inset lead weight and a base-silver styca of Eanred struck before 830 AD, two items which recall the Great Army assemblages (Paterson *et al.* 2014, 112-13). Furthermore, the disparate assemblage from Carlisle has been seen by McCarthy (2014, 244) as signifying a 'melting pot' of mixed cultural traditions. Whilst not strictly 'colonies' as Steinforth describes them, similarly heterogeneous collections of artefacts typify the sites visited by offshoots of the Great Army across the Humber region (Hadley and Richards 2018; 2020): these associations suggest an eastern origin for the Manx and Cumbrian cemetery groups. Moreover, the manufacturing evidence from Aldwark strongly suggests that the E3 fittings, and particularly the strap-ends, were first introduced from the east. Thus, rather than representing an Irish Sea style, it now seems possible to read the suites of E3 fittings as an introduction of the Great Army, derived and imported from a Continental model and, in Britain, first produced in the east of England before being adopted in the west. A similar re-orientation has occurred with the artefacts previously known as 'Norse Bells' (Richards and Schoenfelder 2011, 155). With the possible exception of strap-ends ADB 949 and TDB 739, this thesis is confident in assigning the E3 fittings from both camps to the periods when the sites were occupied by the Great Army.

This production of E3 fittings at Aldwark shows a clear difference between the two camps: with the exception of a potential E4 strap-end (Section 7.2.3), no other sub-types have been identified on the site. Even though the E3 form remains the most common, a slightly more varied assemblage is present at Torksey. It is tempting to see this focus on E3 fittings as demonstrating a deliberate decision at Aldwark, with manufacturing intentionally directed toward the sub-type, whereas Torksey presumably shows more general pieces carried by members of the Army. Nonetheless, the E3 clearly remained a popular form of accessory. Although strap-ends from both locations are broken, there are no signs of deliberate cutting, with the broken E3 fittings from Aldwark potentially the result of casting flaws and faults. This suggests that Type E fittings were not broadly regarded as a suitable source of scrap metal: as with the aforementioned B4 and B5 sub-types, this presumably reflects their Scandinavian-inspired origin, devoid of any Insular influence.

7.4.4 Other Thomas strap-end Types

The most numerous of the other identified strap-ends is the Type J, of which five were recovered from Torksey and two from Aldwark. Although comparatively rare, the Type J is an extremely long-lived form, dating from the seventh to eleventh centuries, so it is unsurprising that it is comparatively well-represented. The design of the Type J is very simple, consisting of a doubled-over sheet of copper-alloy, with the open end secured by rivets. In many ways, these strap-ends are the least securely dated of the whole assemblage: although the shaped J1 sub-type can reasonably be attributed to the late Anglo-Saxon era, the more basic J2 is an almost universal design with very few datable stylistic elements. Whilst these artefacts could therefore derive from other periods, the general volume of early medieval strap-ends recovered from each camp suggests that it is reasonable to associate them with the presence of the Great Army. Certainly one Torksey piece, TDB 366, appears to be a variant of the J1 sub-type, decorated with punched ring-and-dot and with a roughly wedge-shaped main panel and a circular attachment end. Another Torksey strap-end with an elongated shape, TDB 97, is more difficult to determine, although a stylised foliate design incised on the front of the piece does suggest an Anglo-Saxon origin.

A further J2 strap-end is ADB 956. This is a simple rectangle cut from a sheet of tinned copper alloy (Table 7.16), with two notches forming a small rounded projection in the centre of both attachment edges. Thomas (2000a, 125) observed this feature on several Type J2 strap-ends, noting that it recalls the sub-triangular palmettes of the Type A: similar notches and sub-triangular projections can be seen on securely-dated ninth-century examples from Southampton and Flixborough (Hinton 1996, 43; Thomas *et al*. 2009, Fig. 1.4). This particular stylistic feature suggests that ADB 956 is related to the occupation of the Aldwark camp. On one face, a crude motif of a bird has been scratched into the tinned surface. Although both the head and tail of this are obscured, it displays thin, curved-tipped wings and a lozenge-shaped body demarcated by horizontal lines. Whilst no exact parallels have been found, the design clearly echoes the common bird-of-prey or raven device often used in Scandinavian art. Similar wing-shapes are shown on picture stones, whilst more complete forms can be seen on two separate classes of sword chape and on the 'Raven-series' coins of Olaf Guthfrithsson (Ambrosiani 2001, 12-20; Blackburn 2004, 336). Tinned copper-alloy sheets are closely associated with Insular manufacturing. The re-use of this material finds an intriguing parallel in the Type J2 strap-end No. 66 from Flixborough, another site where a Great Army presence has been suggested (Hadley and Richards 2021, 129-31). The Flixborough strap-end also has a notched attachment end with a sub-triangular projection, but the bronze sheet from which it was cut was already ornamented with a finely incised pattern of flowing spirals and trumpets. The Flixborough sheet was originally used to bind an Insular *situla* pail, similar to complete examples found in Viking-Age graves in Norway and Sweden (Youngs 2001, 211-216; Thomas *et al*. 2009, 10-11). Whilst ADB 956 was probably marked with a *graffito* after conversion, rather than being decorated beforehand, both the design and the material shows obvious Scandinavian influence. This piece connects to the wider pattern of adapting Insular objects as dress accessories seen across the assemblages.

A single Type F strap-end, ADB 931, was recovered from Aldwark (Table 7.16). The Type F has a very distinctive form, with double-sided decoration, decorative roundels, and zoomorphic terminals (Thomas 2000a, 120). Although ADB 931 is heavily corroded, with any surface decoration now obscured, X-rays show a piercing in the centre of the roundel, indicating that it is of the F1 sub-type. Thomas (2001, 45) suggested this to be the original form, manufactured in Ireland, with Dublin subsequently proposed as a centre of production (Paterson 2021, 332). The Type F series are purely Insular artefacts, unknown in Scandinavian contexts. Although the series is broadly dated from the late ninth century to the first half of the tenth (Thomas 2000a, 216), Graham-Campbell (1973, 131) suggests that the F1 sub-type ‘cannot be much later than *c*. 900’, with Nicholson (1997b, 623) similarly suggesting that the strap-ends must have been in use by at least 890 AD Like the Type E3 material already discussed, Type F fittings appear to have been manufactured in sets, with a companion buckle also recovered from Aldwark. Haldenby *et al.* (2022, 97) propose that these paired buckles and strap-ends, alongside a corresponding series of fittings and distributors, were produced as sword-strap fittings. This connection with specifically military usage signals that F1 strap-ends can be viewed as indicative of early Viking incursions, particularly those related to the Great Army. Whilst a solely martial connection might be questioned for some of the associated strap fittings, both this strap-end and the corresponding buckle are strong evidence for an Hiberno-Scandinavian presence at Aldwark.

Table 7.16: Selected miscellaneous strap-ends from Aldwark

Database No.	Strap-end Type	Image
ADB 956	Type J2	 Image: Ebay sale listing
ADB 931	Type F1	 Image: Ebay sale listing

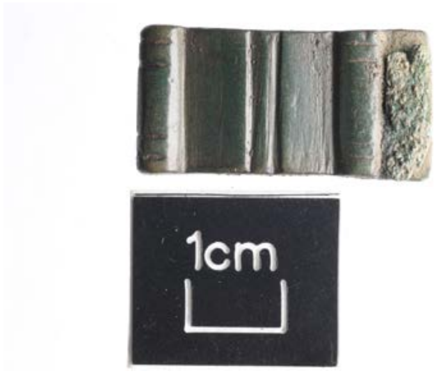
One Type D strap-end was recovered from Torksey. This is a small class, with no refined dating. The few finds of the type are concentrated in Lincolnshire and the southern side of the Humber, and are broadly seen as dating to the eighth to tenth centuries. Another single example is the Type I TDB 750. Thomas (2000a, 124) dated this Type to the eleventh century on purely stylistic grounds: the similarity of this form to a well-dated example of the late fourteenth century (Egan and Pritchard 1991, 132 & Figure 86) casts some doubt on this interpretation. In either case, this piece clearly post-dates the occupation of the camp. Four Type L strap-ends are all 'unclassified' pieces, with forms that do not readily fit into any of the other Thomas types. One of these, TDB 371, made of a cast, faceted bar decorated with crude saltires, may in fact be a converted mount. Another example, ADB 950, is possibly a broken and re-worked Type B strap-end (Dave Haldenby *pers. comm.*). Little can be said about any of these four pieces, other than they demonstrate the tendency to re-use and adapt objects seen in other aspects of the camp assemblages, such as brooch TDB 307 or the aforementioned strap-end ADB 956.

7.4.5 Irregular strap-ends

In addition to the pieces which were too damaged or fragmentary for any typological identification, unusual or irregular strap-ends were recovered from both camps. Two of these are converted or adapted items, re-used as strap fittings. ADB 948, recovered from Aldwark, is a single piece of sub-rectangular plate, decorated with roughly-cut longitudinal and transverse grooves, and with three irregularly-spaced piercings for attachment points. The Torksey example, TDB 1003, is a more complex piece made from two separate sheets of copper-alloy, one of which is partially decorated with a curving chip-carved design (Table 7.17). These sheets are joined by two rivets, and would presumably have been placed on either side of a strap, creating a fitting akin to a more conventional Type J strap-end. A similar fitting, composed of two shaped, riveted-together sheets attached to a re-used mount decorated with a gilt interlace design was recovered from Grave V at St. Patrick's Isle, Mann. This Manx piece has also been interpreted as a strap-end (Graham-Campbell *et al.* 2002, 92-3), providing a parallel for the Torksey example: a similar composite buckle-plate is also known from Islandbridge cemetery in Dublin (Harrison and Ó Floinn 2014, 448-9).

ADB 945 was identified by Rogers (2020d, 54) as another re-worked piece, cut down from a larger fitting. However, several parallels for near-identical strap-ends come from the Carolingian world. Two iron objects from the Île de Groix boat burial show very similar decorative profiles: these are sometimes identified as ‘casket mounts’ (e.g. Price 1989, 96/414), but their forms are far more characteristic of the suites of fittings used on Type III Carolingian sword-belts (Robak 2018a, Fig. 6). In England, a very strong parallel to ADB 945 can be found in a Carolingian strap-end recovered from Wiltshire, PAS WILT-6E9825. Although the Aldwark piece lacks the incised foliate decoration of the Wiltshire example, the two share the same semi-circular horizontal ridges and stepped butt-end. This step was previously misidentified as a partially-broken split on ADB 945, a confusion clearly caused by the fractured remains of a separate retaining plate: this break suggests that the fixing failed, and that the strap-end therefore shows a casual loss from a Carolingian-style sword belt. Another strap-end from Aldwark, ADB 1719, has also been catalogued as Carolingian by the PAS (SWYOR-FD18C1). This piece is broken, with only the stepped butt-end and an adjacent fragment of deeply-cast symmetrical tendril ornament remaining. No direct parallels have been found, although it does bear some similarities to Carolingian and ‘Carolingian-type’ fittings described by Robak (e.g. 2018b, Figs. 2 and 3), suggesting that it could be classified as a Thomas Type E6. However, equal similarities exist with the E4 strap-ends described above, so it is impossible to be certain whether this is an Insular or Continental piece. Although no equivalent Carolingian strap-ends have been recovered from Torksey, this does not indicate any particular difference between the two camps. Torksey has produced two sword belt mounts, one of silver, and a further silver strap guide, all of which are decorated in the distinctive florid acanthus designs which characterise mid-to-late ninth century Carolingian metalwork, and particularly sword-strap and bridle fittings (Wamers 2005a, 129-141; Mitchell 1994, 146). These items show that Caroligian military fittings were present at both locations, and that a more complete fitting suite may have been in use at Torksey. Within the Carolingian Empire, the fashion for such suites was restricted to the ninth century (Wamers 2005b, 173), so these fittings clearly correspond with the dates of the Great Army’s occupation of the two camps.

Table 7.17: Selected irregular strap-ends from Aldwark and Torksey.

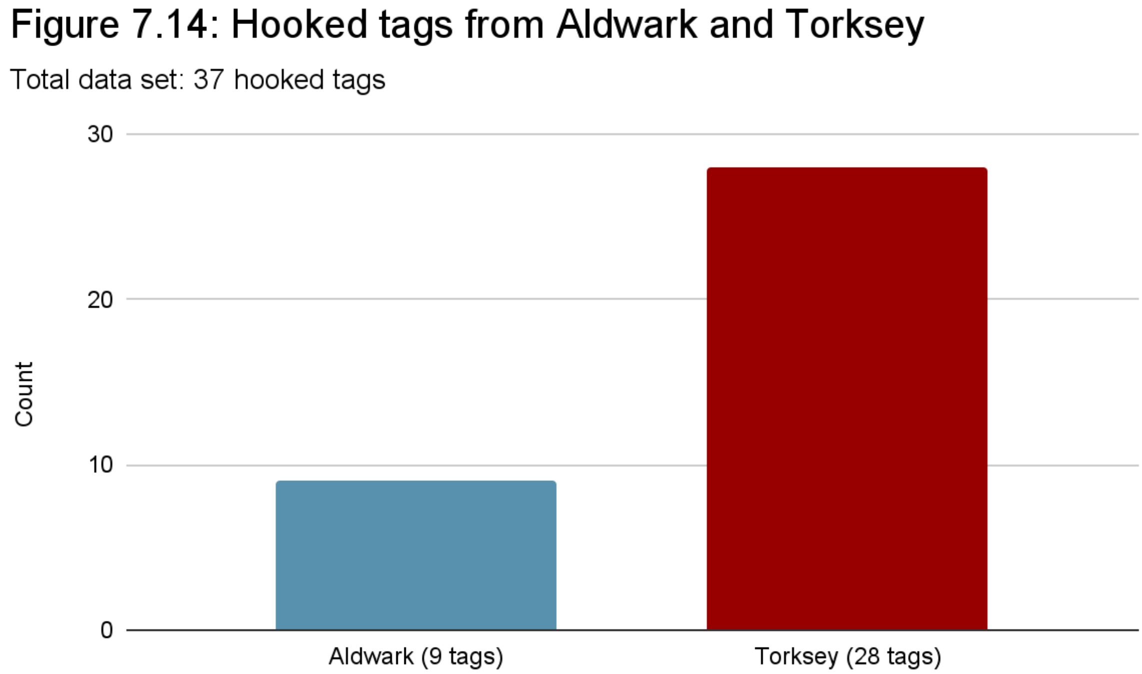
Database No.	Image
ADB 945	 Image: York Archaeological Trust
ADB 1719	 Image: Portable Antiquities Scheme
TDB 1003	 Image: Torksey Viking Project

7.5 Hooked tags

Early medieval hooked dress tags have received little study, and have largely proved resistant to classification. This section follows the morphological categories suggested by Thomas (2009), with the relative numbers and basic forms of tags from each site set out in Table 7.18. Four hooked tags from Torksey are either of unknown date or are post-medieval: these are not included in this table. One of the remaining early medieval hooked tags from Torksey has been converted from a cut-down silver coin of Æthelred II of England, and must be a later loss, post-dating the camp: this is enumerated in Table 7.18, but is not discussed further. The comparative amounts of the remaining tags are shown in Figure 7.14. The triangular hooked tag is believed to be the earliest form, originating in the seventh century, with the circular type becoming popular in the late eighth century: both forms continued in use until the later eleventh century (Thomas 2009, 17). This pattern may be broadly reflected in the assemblage from Torksey, although the Aldwark material is not so illuminating. Whilst the use of hooked tags on garments is suggested by some burial evidence, other forms appear too delicate to be used on clothing. Occasional finds from hoards and graves imply a connection between hooked tags and pouches. A particular link to coin purses is suggested by the English hoard from the Forum in Rome, and the hoard from Tetney, Lincolnshire (Graham-Campbell and Okasha 1991, 222-25): hooked tags appear to have served as purse fasteners in both instances. Whilst this was clearly not the only use of these items (Griffiths 1988, 45-6), larger assemblages of hooked tags have been seen as associated with urban, commercial centres and market locations (Webster and Backhouse 1991, 221). The proportions and materials of hooked tags from a series of comparable locations are presented in Table 7.19: 'Central York' refers to combined finds from Coppergate, Wellington Row, and 22 Picccadilly, whilst 'Lincoln' collects evidence from ten sites across the city, catalogued by Ten Harkel (2018, 18-20).

Table 7.18: Hooked tags from Aldwark and Torksey

Location	Tag form				Total
	Triangular	Circular	Other	Unknown	
Aldwark	1	2	1	5	9
Torksey	10	16	2	1	29



The amounts of hooked tags from both camps are surprisingly high, particularly given that these artefacts are not seen as typically Scandinavian. The assemblage from Torksey comprises the largest corpus from a single site in Britain. More finds are recorded from the city of Lincoln as a whole, but these include evidence from a probable workshop on Flaxengate: whilst this location produced 16 iron and 46 copper-alloy hooked tags, only one and nine of these, respectively, were finished items. The numbers from the camps appear particularly striking when measured against the collared pins: whilst several of the Lincoln hooked tags have been identified as being made of brass (Ten Harkel 2018, 19-20), it seems highly improbable that these far smaller items would have been collected for scrap where pins were discounted. The presence of a silver hooked tag at Torksey is notable, as is the absence of iron examples from both camps. Whilst Thomas (2009, 19) states that the Flixborough finds suggest that iron is under-represented in other assemblages, metal-detecting at both Cottam B and Staunch Meadow did not identify any ferrous hooked tags, indicating that they may not have originally been present. It is possible that more robust iron tags may have been used on garments, and that their absence from the camps indicates a less utilitarian assemblage, a suggestion supported by the single silver example. Given the long period of use for hooked tags, interpretation of these artefacts is difficult: several of the finds, particularly of the triangular form, may derive from background early Anglo-Saxon presence at both locations. However, the volume of the assemblages does

Table 7.19: Comparative assemblages of hooked tags

Material	Location									
	Southampton	Winchester	Central York	Fishergate	Meols	Lincoln	Flixborough	Staunch Meadow	Aldwark	Torksey
Copper-alloy	9	18	5	3	7	14	14	15	9	27
(Unfinished copper-alloy)	-	-	-	-	-	(40)	-	-	-	-
Iron	-	2	3	-	-	2	10	-	-	-
(Unfinished iron)	-	-	-	-	-	(19)	-	-	-	-
Silver	-	2	-	-	1	1	2	3	-	1
Totals: (Unfinished)	9	22	8	3	8	17 (59)	26	18	9	28

(Sources: Hinton 1996, 9-11; Hinton 1990, 549-52; Mainman and Rogers 2000, 2576; Moulden, Logan, and Tweddle 1999, 265; Ottaway 1992, 697; Rogers 1993, 1359-60; Griffiths 2007, 65; Ten Harkel 2018, 18-20; Thomas 2009, 17-19; Riddler *et al.* 2014, 227-229) suggest some specific activity. One possible reading of the high numbers of hooked tags is as an indication of economic activity, signifying the presence of pouches and coin purses, linked to economic transactions in both camps.

7.6 Summary

In broad terms, the dress accessories discussed above illustrate two different aspects of life at the winter camps. The majority of the material appears to have been collected by the Great Army for re-use and recycling: these sections of the assemblages are composed of Insular items, so it is possible to identify them with reasonable certainty. Elements of regionality can be seen amongst some of these, with the collared pins, strip brooches, and Type A1, B1, and B2 strap-ends broadly reflecting their established national distributions. However, rather than showing a randomly-gathered representative sample of common dress accessories in the environs of each camp, it is possible to say that some objects were collected selectively. Whilst strap-ends were presumably preferred over pin-heads for the mundane reason of their greater metallic content, the higher proportion of annular/penannular brooch fragments at Aldwark may indicate that these items were collected for more symbolic purposes. Equally, at Torksey, the apparent focus on collared pins with medial bands and conical tops may also show that specific alloys were identified and deliberately targeted. Both these actions demonstrate an engagement with the collected Insular material, indicating that the assemblages do not merely show indiscriminate looting, but that both metal composition and figurative meaning may have also been factors in objects' collection. A further symbolic element may be illustrated by the fragmentation of some of this material, with both the flat-headed pins and strip brooches potentially showing that the Great Army had a preference for highly-decorated and gilded metalwork. The composite nature of the force would have meant that the Army was composed of allied but competing factions, and Section 6.4 has already observed that the production of imitative *solidii* at Torksey can be read as showing the leaders of two branches jockeying for position. Glørstad and Røstad (2021, 101) note that, in the unsettled political situations caused by intensive Viking activity, there may have been a raised emphasis on exclusive or symbolic objects as a way of cementing social distinction. Within this environment, Insular decorated metalwork may have carried an additional social or figurative capital which extended to its economic use. Whilst the prestige value of such metalwork has already been discussed in Section 6.2.2, it is possible that this desirability came at the expense of plainer, more functional items.

A difference of use may also be visible within this decorated material. Section 6.2.2 has already noted that the general assemblage of Insular metalwork from Torksey appears to display a higher degree of fragmentation than that seen at Aldwark. A similar pattern can be observed amongst the Type A and B strap-ends, with notably fewer fragmented pieces recovered from Aldwark. Whilst corrosion and post-depositional damage mean that it is difficult to be absolutely certain about the degree to which this fragmentation is deliberate, pieces with multiple cut lines such as TDB 1747 and TDB 3545 have only been identified at Torksey: the opposed cut marks on these strap-ends demonstrate that they were broken up into multiple fractions, clearly indicating that this damage was not accidental. Although pieces of Insular metalwork were deliberately cut at Aldwark, it seems apparent that not only were these reduced to larger fragments than at Torksey, but also that smaller items such as strap-ends were not broken apart in the same way. I suggest that this is connected to the use of this Insular material as currency or commodity money. Casting in copper-alloy was clearly undertaken at both camps, so the difference in fragmentation cannot relate solely to the use of small pieces in crucibles. Furthermore, Insular decoration clearly retained a symbolic quality at both locations, suggesting that the degree of fragmentation was related to the use of this material rather than its perceived social value. Therefore, it seems reasonable to say that Aldwark saw lower-scale copper-alloy transactions formalised toward a more exclusive use of stycas, with the very small cut metal fragments seen at Torksey considered unsuitable for exchange. This interpretation would accord with the lack of fragmented copper-alloy ingots from Aldwark, observed in Section 4.4.2: although the complete ingots recovered from the camp were almost certainly used as economic media, it has already been observed that they do not appear to have been intended for ‘everyday’ exchange, indicating that a different form of currency fulfilled this function.

A smaller subset of the dress accessories appear to have been worn or used by people within the camps, rather than gathered from the surrounding populations. Several of these lie inside the broader Scandinavian cultural sphere, such as the horse harness fittings or other items converted into brooches and strap-ends. Nonetheless, it is notable that the only pieces which can be classed as unequivocally Scandinavian in origin are both present at Torksey and are both typically seen as female-gendered: trefoil brooch fragment TDB 123 and small disc brooch TDB 773. Their presence accords with the evidence for the production of equal-armed brooches discussed in Section 6.3.4. The promotion of a specifically ‘female’ Scandinavian identity may have been of lesser importance at Aldwark. Whilst fragment ADB 923 may show the presence of archetypal female-gendered Scandinavian dress accessories, this interpretation is not without doubt. However, in many ways it is immaterial whether this piece is classed as part of a trefoil brooch or a strap-end: the key element is contained in the derivative design, based on Scandinavian originals but either blundered or refashioned by the maker. This may indicate an unfamiliarity with fundamentals of Scandinavian manufacture and design, but more probably shows the desire to create a hybrid piece conveying a more individual identity. A similar desire is far more obviously expressed in the production of E3 sub-type strap fittings at Aldwark, where these items were clearly made in considerable numbers. Unlike the A1avii and B5.3 strap-ends, the E3 series drew no inspiration from Anglo-Saxon models. The Carolingian-influenced design can be said to reflect the fashionable ‘military look’ proposed by Wamers and expanded on by Thomas (2012, 490): these adapted belt fittings may have been connected with the ‘currency of power’ which Thomas (2012, 507) saw in the assimilation of Carolingian material. Nonetheless, a more important element may have been their use to signal a group identity, either within a specific faction or more generally across the camp as a whole. Cooijmans (2020, 33) states that the heterogeneous composition of Viking forces may have made the adoption of group-specific material culture a necessity, used as a means of establishing solidarity and a collective identity. Furthermore, he suggests that membership of defined military groups may have been signalled by adopting material derived from previous ‘host cultures’ encountered by these forces, an idea also advanced by Price (2014, 62; 2016, 167). I propose that both the ringed pins and E3 strap fittings show the deliberate communication of group identity, with the Aldwark strap-ends in particular being used to demonstrate group affiliation and a specific association with the Great Army. These ideas will be further discussed in Chapter 9.

8. Other activities

8.1 Introduction

This chapter reviews two categories which initially seem to characterise more peripheral activities at the camp sites: objects associated with fishing and with gaming. However, to a certain degree the occupation of the winter camps represents a period when more typical activities would stop, and the Great Army would cease active campaigning and remain in a single location for several months. To this end, the gathering of extra food and 'leisure' activities would have been the norm for many of each camp's occupants, with these pursuits signifying regular occupations rather than incidental pastimes. Thus, these two categories contain important information about daily life at both locations.

The majority of the items considered are lead, and have not previously received any analysis: the identification and assessment of all the material associated with fishing has been undertaken as part of this thesis. However, no such review has been undertaken for the gaming pieces. Whilst a comprehensive evaluation of these items would be highly desirable, such a detailed assessment lies beyond the scope of the present study. Therefore, only a brief review of both numbers and morphology will be undertaken here, although the potential link between gaming pieces and weights identified in Chapter 4 will be explored further.

8.2 Fishing

This category has been taken to include iron hooks and lead weights. The relative proportions of these finds are given in Table 8.1.

Table 8.1: Items associated with fishing from Aldwark and Torksey

Location	Weights	Hooks
Aldwark	32	1
Torksey	21	5

8.2.1 Fishing weights

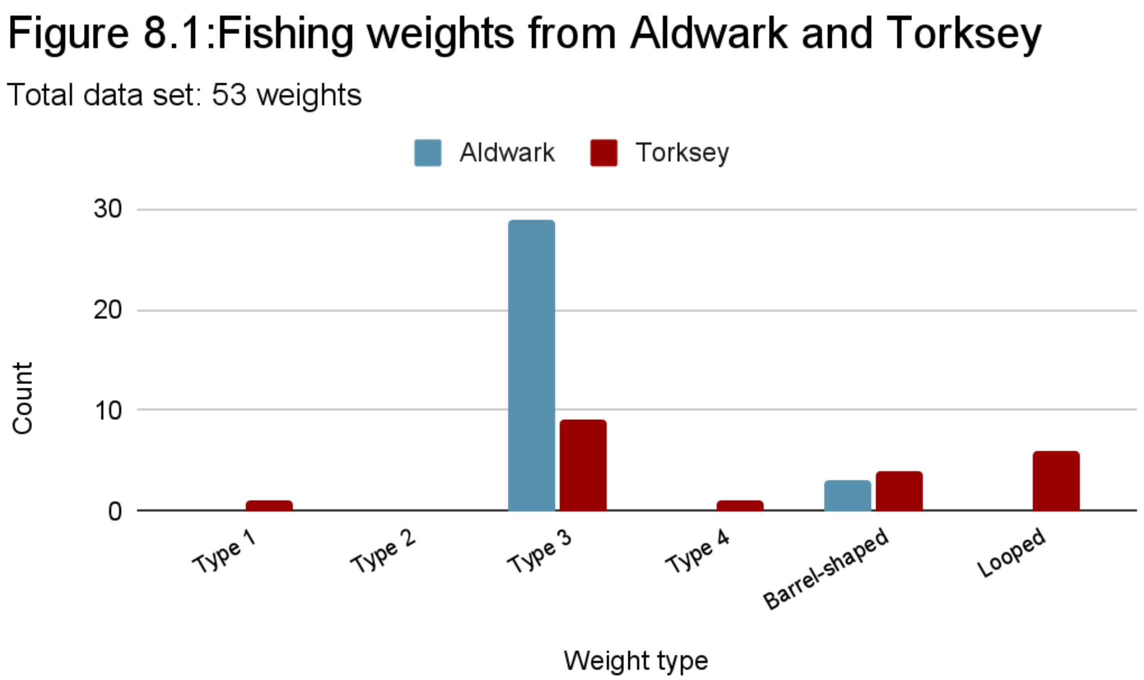
For this thesis, fishing weights have been classified as lead weights with single or multiple piercings or integral suspension loops. Four weights from Torksey with suspension loops of other metals have been excluded. Three of these, with the remains of embedded iron loops, are almost certainly steelyard weights. The final example is conical, and retains a copper alloy loop: the function of this object is uncertain. The typology designed for the Aldwark weights primarily relates to their use as metrological equipment, with weights for other purposes little considered (Williams 2020c, 30). Although poorly described, a series of weights with large central holes are catalogued as Type L ('Miscellaneous lead'). These are generally discoidal weights, thought to be too roughly made to function as spindle whorls (see 5.1.2 (a)). I propose that these are fishing weights, with the same interpretation applied to similar pieces from Torksey. One of these Type L weights, ADB 1519, is described as having a raised pattern on one face. Whilst it is difficult to establish a parallel based on this description, broad comparisons may be drawn with a series of discoidal lead weights from the Thames valley. Several weights from Barton Court Farm, Oxfordshire and one from Hammersmith, West London are decorated with raised radial lines, whilst moulded crosses feature on weights from Hanwell, Middlesex (Cowie and Blackmore 2008, 204-5). The function of these weights has not been established. However, they all date from early Anglo-Saxon contexts, suggesting that the Aldwark find may similarly date to the Anglian occupation of the site: for this reason, this find is not discussed further. Another Aldwark weight with an embedded iron suspension loop is, again, almost certainly a steelyard weight, and is again not considered here.

Early medieval fishing weights have received little in-depth study or consistent classification. This thesis follows the typology for Dublin line weights suggested by Wallace (1998), and further categories of lead weights from Flixborough are referred to (Wastling 2009, 249-52). The types/categories of the weights are given in Table 8.2, with the relative amounts illustrated in Figure 8.1.

Fishing weights are used on either nets or lines, with these two functions producing some morphological differences. Wallace defined the pierced Type 1-4 weights with reference to their use in line fishing, and no looped weights were identified in his study of the Dublin material. However, the integral attachment rings on the looped weights from Torksey suggest that they were designed to be suspended, indicating that they were probably line sinkers.

Table 8.2: Fishing weights from Aldwark and Torksey

Location	Classification					
	Type 1 (Boat-shaped)	Type 2 (Bar)	Type 3 (Vertically-perforated)	Type 4 (Anchor-shaped)	Barrel-shaped (rolled)	Looped
Aldwark	0	0	29	0	3	0
Torksey	1	0	9	1	4	6



Barrel-shaped weights are formed from rolled sheets of lead, and were probably made by bending a lead strip directly around netting cords (Wastling 2009, 249). Although the very basic nature of these weights makes exact dating difficult, they have been widely recorded from early medieval sites such as Meols, Llangorse Crannog, Whithorn, Fishergate, Coppergate, and Flixborough, with two partially-unrolled examples recovered from late Anglo-Saxon contexts at Stoke Quay, Ipswich (Gaimster, Popescu, and Waxenberger 2020; Mainman and Rogers 2000; Redknap 2019; Wastling 2009; Egan 2007; Nicholson 1997c; Rogers 1993). Similar rolled weights from the monastic site at Dacre, Cumbria have been suggested as weights for ceremonial robes or wall-hangings, or for use on net bags (Newman, Howard Davis, and Leech 2022, 74). Whilst it is possible that the barrel-shaped weights from the two camps were also used for such purposes, the riverside locations of both sites suggests an association with fishing, and their interpretation as net weights has been followed here.

The Type 3 (vertically-perforated) weights are the most frequent type from both sites. These have also been identified at both Dublin and Flixborough, with further examples noted from Fishergate and Coppergate (Mainman and Rogers 2000, 2535; Rogers 1993, 1320). Their frequency at the two camps is mainly due to the broad range of shapes encompassed by the type, with discoidal, cylindrical, spherical, irregular, and conical/domed shapes all represented. The relative numbers of each shape are presented in Table 8.3.

Table 8.3: Type 3 fishing weight forms from Aldwark and Torksey

Location	Form				
	Discoidal	Cylindrical	Irregular	Spherical	Conical/domed
Aldwark	25	0	0	1	3
Torksey	1	1	1	1	5

Section 4.2 of this thesis established the discoidal form as the main category of metrological lead weight at Aldwark, so it is perhaps not surprising to see this shape also predominant amongst fishing weights. However, McDonnell (1981, 31) states that cylindrical or discoidal shapes were specifically used for net fishing, suggesting that these weights were manufactured for a particular function, rather than merely being an adaptation of a common product of the camp. The single irregularly-shaped weight from Torksey, TDB 195, may also have been a net weight, although the narrow aperture of the piercing suggests that it was attached to a thin cord and thus was more probably a line sinker. The conical/domed shape distributes mass unevenly, suggesting that this form was made to be suspended. Fryer (1998, 34-5) considers it possible that these weights were attached to nets, although this assessment is based on later medieval material with an average weight of 46g: four similarly-shaped finds from Meols have an average weight of 93.9g (Egan 2007, 286). The Torksey weights are far lighter, averaging at 21g, suggesting a different use. It seems more probable that these, and the spherical forms, are line weights. Therefore, it can be seen that the Type 3 definition appears to include both line and net weights. The weight ranges for all net weights from both sites are shown in Table 8.4.

Table 8.4: Net weight forms and weights from Aldwark and Torksey

Location		Form		
		Discoidal	Cylindrical	Barrel-shaped (rolled).
Aldwark	Count	25	0	1
	Weight range (g)	5.94 - 51.9	-	45.22
Torksey	Count	1	1	4
	Weight range (g)	12.96	82.04	15.95 - 25.43

Whilst line weights serve only a single function, net weights can be employed for two different techniques. For seine netting, weights are employed alongside floats to form vertical mesh barriers, whilst cast netting involves the use of thrown nets, weighted to fall horizontally. Rogers (1993, 1320) suggests that weights ranging between 80-430g were used on seine nets, whilst lighter weights, from 3-60g, were reserved for cast netting. Only the single cylindrical weight, TDB 196, falls into the heavier range, suggesting that hand-casting was the main netting technique employed at both locations.

Table 8.5: Type 1 fishing weight from Torksey

Database No.	Length (mm)	Width (mm)	Thickness (mm)	Image
TDB 1781	108.92	28.91	16.61	 Image: Torksey Excavation Project

Eight examples of the Type 1 (boat-shaped) line weights have been identified at Dublin (Wallace 1998, Figs 3-4), all from Viking-Age contexts. The Torksey example, TDB 1781, is a close parallel to Dublin finds DFW 5 and DFW 6, both of which display defined keels and gunwales and closely resemble clinker-built vessels. However, both of these have transverse piercings at each end, whereas the Torksey example is perforated vertically. This characteristic is shared with the less boat-like weights amongst the Dublin finds, suggested as a potential sub-group by Wallace. Another vertically-pierced weight with clear parallels to this possible sub-group has been recovered from the River Charente in France (Mariotti *et al.* 2013, 217). However, a similar, more rounded boat-like weight from Whithorn also has a vertical piercing at each end, echoing the Torksey model (Nicholson 1997c, 395). Both these comparative examples were most probably cast in single-piece moulds. Wallace suggests that the more defined boat-shaped Dublin pieces would require two-piece casting. The same can be proposed for TDB 1781, suggesting that, despite this object sharing the vertical piercings of the less well-modelled examples, it was manufactured with some care.

Table 8.6: Possible Type 4 fishing weight from Torksey

Database No.	Length (mm)	Width (mm)	Weight (g)	Image
TDB 1628	23.74	22.96	6.64	 Image: Torksey Excavation Project

The Type 4 (Anchor-shaped) pieces have only been identified as fishing weights in Dublin, where they were initially interpreted as metrological weights before being proposed as sinkers for handlines (Wallace 1998, 13; 1987, 212). Although he has now moved back from this second position, proposing that the pieces are actually functionless ornaments, Wallace does allow that they may have been used as ‘grip’ weights for line fishing (Wallace 2015, 271-2). Anchor-shaped lead objects from other locations have similarly attracted a variety of interpretations. A single, incomplete example from Chester was merely viewed by the excavators as a ‘hook-shaped piece’ of lead, whilst a collection of 11 similar objects from Hedeby have been interpreted as possible amulets (Axworthy Rutter 1985, 62; Koktvedgaard Zeitzen, 2002). A further piece from Coppergate, No. 10583, has been variously described as anchor-shaped or boat-shaped and is presently interpreted as a metrological weight, although it has previously been published as a pendant (Mainman and Rogers 2000, 2563; Hall 1984, 106). Similarly, the Torksey database has previously interpreted TDB 1628 as a ‘Thor’s hammer’ pendant or amulet.

The Dublin examples all have longer stems than the Torksey piece, and three lack perforations for suspension. However, six of the Hedeby finds have either single or double perforations with No. 9 displaying a short stem with a pierced, rounded terminal, and providing the closest parallel to the Torksey find (Koktvedgaard Zeitzen 2002, Taf. 2). The Coppergate find also has a short stem with a now-broken perforation at the terminal and, although it is decorated with incised lines on one side, it is morphologically very close to the Torksey piece. The current interpretation of the York example as a metrological piece is based on the find’s weight of 26.37g, extremely close to the basic Dublin weight unit of 26.6g (Wallace 1987, 212). Although the Torksey find is far lighter, it may be significant that, at 6.64g, it is almost an exact quarter of this Dublin unit, possibly casting doubt on an interpretation as a fishing weight. However, as already noted, all the Type 4 examples from Dublin have been reclassified as non-metrological pieces, despite two of the four lying roughly on the Dublin unit weight scale. Any relationship to weight units may be entirely coincidental. Although weights are not available for the Hedeby examples, the Dublin Type 4 weights are heavier than TDB 1628. However, all the identified Torksey and Aldwark line weights are lighter in comparison to the Irish material, suggesting that the Dublin examples may have been designed for use in stronger currents: the remains of deep-water Cod and Ling have been identified in environmental remains from Dublin (Henderson 1987, 37), potentially indicating that fishing here was practised in faster-flowing coastal waters rather than rivers. This thesis maintains an interpretation of TDB 1628 as a fishing weight, whilst acknowledging the close manufacturing style and potential mutability of all the anchor-shaped objects discussed above. If this interpretation is secure, it seems possible that TDB 1628 was influenced by the same design processes evident in the Dublin assemblage, but was made for the specific conditions of the Torksey camp.

The looped weights from Torksey are only paralleled by a single unstratified find from Flixborough. No further comparative pieces with integrally-cast suspension loops have been identified, although Wallace (1998, Fig. 2) does illustrate a very similar weight on an historic handline from the Aran Islands, Co. Galway. It is possible that other, similar weights have been classified as plumb bobs, or have not been identified during excavations.

8.2.2 Hooks

Ælfric's *Colloquy*, a tenth-century teaching dialogue, describes baited hooks being used by fishermen (Swanton 1993, 171), and an iron hook bound with the mineralised remains of an attached line was recovered from the ninth-century burial at Balnakeil, Sutherland (Batey and Paterson 2013, 646-7). However, fish hooks are generally poorly represented in the archaeological record: they occasionally occur as individual finds, most commonly as grave goods, with the seven from Coppergate forming the largest single-site assemblage in Britain (Ottaway 1992, 600-1). Iron hooks were recovered from both study sites, although no information is available for the single Aldwark example. All the hooks from Torksey are substantial, and four appear to be either tow hooks or suspension hooks, most probably post-medieval/modern in date and unrelated to fishing. The final hook, TDB 2525, may be a fishing hook. A similarly-sized find from London has been identified as a fishhook (Pritchard 1991, 138). However, the Torksey example lacks both the pointed barb and looped eye evident on this piece, so may be a hook for a different function. Equally, the majority of fish remains from Saxo-Norman London are from marine species: if TDB 2525 is a fish hook, then it was almost certainly designed for sea fishing, and therefore would have been unlikely to have been used within the immediate environs of the camp. No smaller hooks were recovered.

8.2.3 Discussion of fishing equipment

It is difficult to date fishing weights with certainty. Weights can be reused, and many forms are long-lived: in particular, barrel-shaped weights have been reliably dated from the Iron Age through to the post-medieval period (Redknap 2019, 393). However, it is possible to be reasonably confident in associating several classes of weights from each site with the presence of the Great Army. It is hard to see the high number of discoidal weights at Aldwark accruing solely through gradual loss, which therefore strongly suggests a relationship to the camp. Equally, the Type 1 and possible Type 4 weights at Torksey are only paralleled on sites which exhibit strong Scandinavian influence. By comparison, the lack of dated early medieval parallels for the looped weights indicates that this form should be treated with caution.

Weights for netting are the dominant form from Aldwark, with the majority of these of discoidal form. McDonnell (1981, 30) states that ring-shaped weights were used for seine nets (vertically-hung nets, buoyed by floats and weighted at the bottom edge) with only the rolled, barrel-shaped form used for hand-casting. However, the comparatively light weight range recorded from the Aldwark assemblage stands at odds with Rogers' suggestion (1993, 1320) that seine nets require weights in excess of 80g. All of the discoidal weights are less than 60g, with over 75% of the total less than 30g. It is difficult to imagine these weights successfully securing a seine net, even against a moderate riverine current. The weight range of these discoidal pieces is broadly similar to a series of stratified early medieval barrel-shaped weights from Llanbedrgoch, Anglesey, suggesting that they may have had a similar function (Redknap 2019, 395). It therefore seems probable that the Aldwark discoidal weights were used on hand-cast nets, with their shape reflecting the most commonly-produced form of cast lead in the camp. By contrast, even if looped line weights are discounted, net weights remain the less popular form from Torksey, and the discoidal shape is almost entirely absent from the assemblage: again, this mirrors the popularity of discoidal metrological weights at the camp.

This apparent difference in net types may signal different practices at the two camps. The *Colloquy* describes the use of cast nets by wild-fowlers as well as fishermen (Swanton 1993, 171-2), and Wastling (2009, 250) suggests that lighter barrel-shaped weights might have been employed for birding. The area surrounding the Torksey camp would have been dominated by wetlands in the early medieval period, with a saturated peat bog to the east of the site. Whilst the vegetation of these areas is unknown, it seems probable that both peatlands and floodplain formed grassy marshes (Stein 2014, 247). This would have been a suitable environment for wading birds and waterfowl, and the area would have been more extensive than the small alluvial basin identified to the east of the Aldwark site (Howard 2020, 5). Cast nets were clearly not common at Torksey, and may have been reserved for fowling. However, at Aldwark, hand-cast nets appear to have been the main practice, and it may be assumed that these were used for fishing in the River Ouse. Although there is little to indicate that seine netting was common at either location, it seems possible it was undertaken at Torksey. However, the low recovery of both seine and cast net weights here may again indicate different practice at the site. Strong tidal fluctuations are common in the River Trent (Stein 2014, 161), creating an ideal environment for fish trapping. Early medieval fish weirs have been documented in several locations along the river, including a series excavated in an archaic channel at Hemington Quarry, Castle Donington (Cooper and Ripper 2017, 4-20). Whilst these structures are all upriver from Torksey, similar conditions would have existed in the vicinity of the camp, indicating that wooden weirs and traps may have been a more favoured method of fishing on the site: such methods would have been particularly useful in the autumn months leading to December, when silver eels would have been migrating downstream *en masse* (Cooper and Ripper 2017, xii). Whilst the comparative dearth of net weights on the site may therefore merely be an effect of the loss of these items in the river, hampering recovery, it may also indicate that other methods were used for fishing.

Despite the lack of hooks, the presence of line sinkers shows that line fishing was practiced at both camps, and may have been marginally more popular at Torksey. Although pole angling is depicted on a single Anglo-Saxon manuscript (Hagen 2006, 158), it is more probable that early medieval line fishing was conducted by using either simple hand lines or with long lines, where multiple hooks are attached to a main line: Hall (1984, 94) suggests that the Coppergate fish hooks were used on long lines. In rivers, both line types can be deployed from boats, with such fishing known from literary sources and inferred from the size of fish remains (Reynolds 2015, 185; Bond 1999, 186). The *Colloquy* lists pike, trout, minnows, and burbot as common elements of a river catch (Swanton 1993, 171). Freshwater species typically dominate the fish bone assemblages of Middle Saxon sites, although these bones are seldom recovered in high volumes. The *Colloquy'*s list is partially reflected by evidence from Staunch Meadow, where both pike and carp remains were major finds, with perch and trout also present (Humphrey and Jones 2014, 312). Pike have also been identified at the fenland settlement at Clampgate Road, Fishtoft, Lincolnshire, although this location principally produced remains of estuarine flatfish (Reynolds 2017, 140). Trout, carp, and minnows were amongst the few freshwater taxa from the coastal settlement at Stoke Quay, Ipswich (Locker 2012, 100-1; Nicholson 2020, 385). Pike were again present on the Norwich waterfront, with some remains of probable trout and fish of the Cyprinidae family also recorded (Jones 1983, 33). Whilst the assemblage from Flixborough may show the monastic nature of the settlement, with atypical species such as sturgeon and dolphin present, freshwater taxa such as pike, carp, and trout also formed the majority of finds (Dobney *et al*. 2007, 207-211). Pike, trout, and burbot were all recorded at Coppergate. The freshwater species from all these locations are often accompanied by remains of migratory flatfish such as flounder and plaice, with this broad range appearing to demonstrate opportunistic, unselective fishing of the local environment, without any apparent targeting of specific resources. This practice is almost certainly true of line fishing at both Aldwark and Torksey.

Eel bones are ubiquitous on all the above sites, comprising as much as 85% of the total assemblage for Later Saxon Ipswich (Nicholson 2020, Fig. 7.29). Even accounting for the fact that eels possess roughly twice the number of vertebrae when compared to other fish species (Locker 2012, 98), the volume of recovered eel bones demonstrates their importance as a food source. Whilst eel was also prominent at Coppergate, O'Connor (1989, 198) suggests that this was the result of estuarine fishing in either the Humber or the lower reaches of the Ouse: given this, it seems unlikely that eel would have been locally available at the Aldwark camp, situated on a far smaller watercourse. Eels can, however, be caught by hooked lines (Stone Gaines 2007, 8), so the presence of line weights at Torksey may show an attempt to capitalise on the autumnal migration. If long lines were in use at both camps, this may have been a deliberate decision. The close connection evidenced between land forces and boats (McLeod 2006, 153-4) would suggest that the Great Army valued open, unobstructed riverbanks as landing-points. Whilst permanent fish traps would foul such areas, temporary long lines would present no such obstacle.

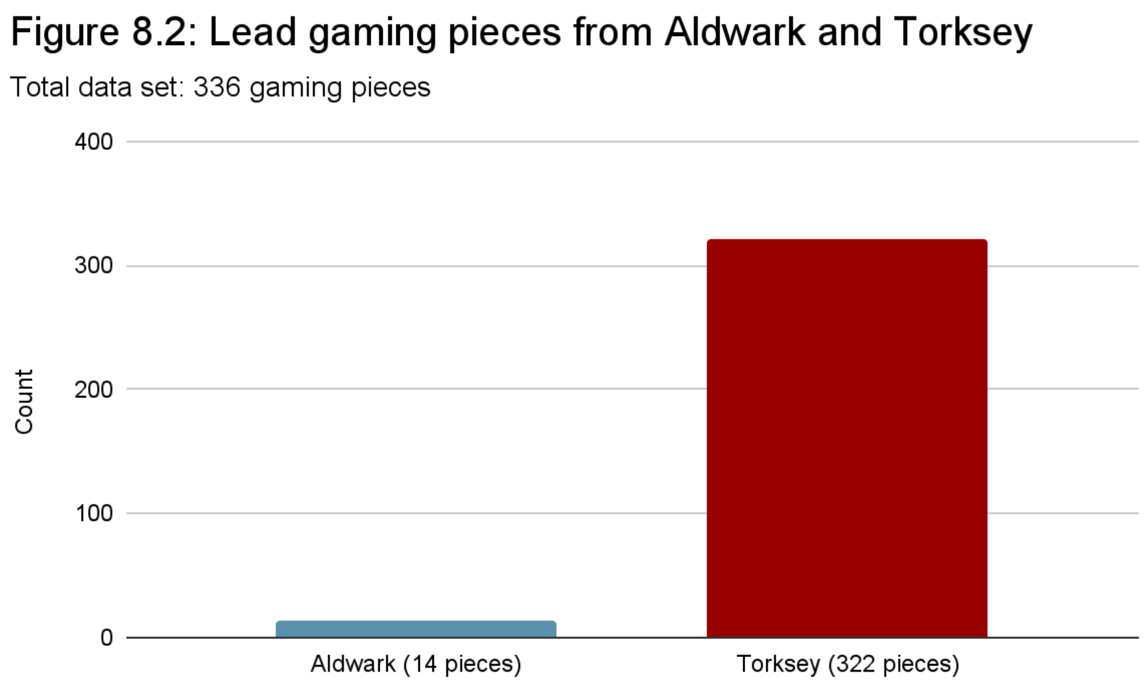
Given the dating of the site, the presence of a boat-shaped Type 1 line weight from Torksey is particularly noteworthy. Whilst this form was first identified in Ireland, all eight Dublin examples are dated to the tenth and eleventh centuries (Wallace 2015, 270). The comparative piece from the Charente was recovered from an area identified as a probable Viking camp: a Viking base on the river is recorded in the *Annals of St-Bertin* for 865 AD (Nelson 1991, 128). The location has also produced an inset lead weight, a Scandinavian-style annular single-rod silver finger-ring with twisted ends, and three Petersen Type L swords, finds strongly reminiscent of the assemblages from both Aldwark and Torksey (Dumont and Mariotti 2013, 137 and 186). As with Torksey, this material forms an unstratified assemblage, and therefore shares some of the same difficulties with refined dating. Despite this issue, it seems almost certain that both the Torksey and River Charente Type 1 weights pre-date the Dublin material. Whilst the use of these weights may be linked to an Hiberno-Scandinavian presence in both locations, they more probably represent an artefact which was created amongst the disparate groups which formed the Great Army, and which later gained popularity in Dublin. The use of the boat form is clearly deliberate: one of the Dublin weights is decorated with incised longitudinal lines, presumably intended to depict clinker-built strakes (Wallace 1998, 4), whilst other bar-shaped line weights from Dublin, or one example recovered from Jarrow, North Tyneside, are plainer and more functional, without decorative shaping or embellishment (Cramp 2006, 304-6).

Both the Type 1 and potential Type 4 weights from Torksey reflect a maritime theme. Wallace (1998, 4) viewed the Dublin Type 1 weights as depicting specifically Scandinavian vessels. Seen as such, it is possible to read the Torksey example as expressing a social grouping, self-consciously invoking a Scandinavian-derived social identity which recalls the use of the ship as a cultural symbol (Crumlin-Pedersen 2010, 145). The identification of Type 4 pieces as fishing weights is more uncertain. Despite this, Horne (2022, 208) sees the distribution of these items as demonstrating ‘Eastward metrological links emanating from Dublin’, with Kruse (1992, 84) suggesting that the Coppergate and Chester examples belonged to ‘an Irish owner, probably a merchant who also worked in Dublin’. However, the dataset appears both too small and too morphologically diverse to draw such definite conclusions. Dating for many of these Type 4 finds is also unclear, with no information available for either the Dublin or Hedeby assemblages. As with the Type 1 weight from Torksey, a ninth-century date can be assumed for TDB 1628. This predates both the Coppergate example, recovered from a mid-tenth-century dump, and the Chester piece, found in an eleventh-century backfill deposit (Mainman and Rogers 2000, 2563; Axworthy Rutter 1985, Table 8). Again, it seems probable that, even if this form of weight did not originate within the Great Army, it was introduced to England by the force. Although it is impossible to say whether this introduction stemmed from Irish or Scandinavian-derived factions within the Army, the highest concentration of these artefacts is in southern Scandinavia, indicating that their centre of gravity may lie more to the east than the west: the close parallel from Hedeby certainly suggests a potential origin in this region. Whatever the ultimate function of these anchor-shaped pieces, TDB 1628 appears to have again been deliberately selected to indicate a Scandinavian cultural affiliation, and may show specific links to southern Scandinavia.

8.3 Gaming pieces

Unrecognised gaming pieces are known to have been discarded during early, unrecorded metal-detecting surveys at Foremark, and the same is almost certainly true with items recovered from Aldwark (Hadley and Richards 2021, 115-118 & 217). Equally, the lead artefacts from Aldwark have been almost exclusively categorised as either weights or spindle whorls, with little consideration of other functions: Williams (2020c, 30) acknowledges that some of the finds classified as metrological weights may have been wrongly or too stringently identified, suggesting gaming pieces as one possible alternative use. The criteria for determining gaming pieces within the Torksey assemblage has been described in Chapter 4: principally domed or conical cast lead pieces, with or without mounded decoration on the crown, and with a hollow body. Based on the descriptions provided in the Aldwark database, I have identified a limited number of gaming pieces in the assemblage. The amounts from both camps are shown in Figure 8.2.

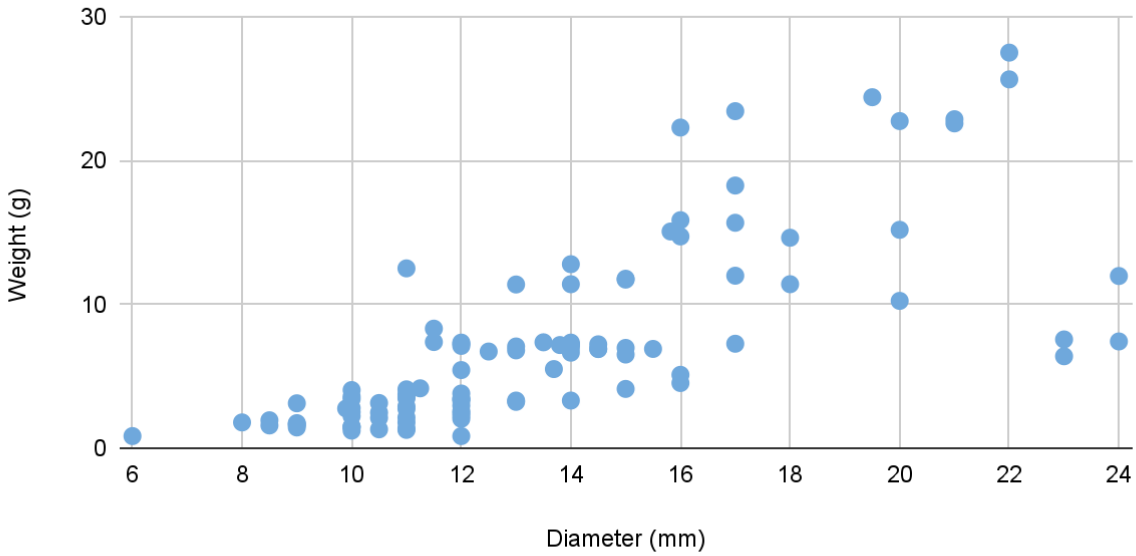
It is clear that the Torksey-type pieces are extremely poorly represented at Aldwark. However, this does not mean that gaming pieces of other forms are not present: Williams (2020c, 30) suggests that these might potentially be recognised through the identification of



'clusters of lead pieces of more or less uniform size, shape and weight'. As already noted (Section 4.3.1) the most common weights from the site are of Type D cylindrical/discoid form, comprising 46.8% of the total assemblage. Basic, disc-shaped pieces would have been easy to manufacture, and Williams (2020c, 30) notes that weights may have only been one category of object produced in this shape: the discoidal form is the most frequent amongst Type 3 fishing weights from the camp, clearly demonstrating that different classes of product were cast with the same basic appearance. Given how abundant these discoidal pieces are at Aldwark, the form is a good candidate for containing items which were produced as gaming pieces rather than weights. Discoidal counters, often described as 'tablemen', are a widely-recognised form of early medieval gaming piece, with such tokens often manufactured from stone, reworked pottery sherds, or bone and antler (e.g. Mainman and Rogers 2000, 2564-67; MacGregor *et al*. 1999, 1982, Fig. 940: 7728). An assessment of the Type D pieces of known diameter and weight is presented in Figure 8.3.

Figure 8.3: Type D weights from Aldwark

Total number of weights: 104



Four Type D weights have been excluded from Figure 8.3 for the sake of clarity: two with unknown weights, and two outliers which weigh in excess of 70g. Equally, it should be noted that the heights of the illustrated pieces have not been taken into consideration, meaning that cylinders are also included alongside flatter, more discoidal ‘tablemen’ forms. Nonetheless, whilst this assessment is not wholly representative, it demonstrates that there is no obvious clustering in the distribution. Potential ‘runs’ might be seen between the 10mm and 12mm diameter ranges, with weights gathered below roughly 5g. However, these pieces all show considerable variation in height, with the 10mm - 11mm diameter range recorded between 2mm and 8mm thick, suggesting that they were not made to any particular degree of uniformity. Furthermore, when compared against the Torksey gaming pieces, these discoidal forms all appear very small and light, speaking against their use as counters. Although they may be present in other forms, it seems unlikely that many of the Type D weights from Aldwark were intended for use as gaming pieces.

The recovery of sets of gaming pieces from high-status funerary contexts, with pieces often made from exclusive materials, has frequently led to the interpretation of game-playing as an elite occupation connected to the display of an aristocratic lifestyle (Solberg 2007, 268). The same associations have also led to the suggestion that such activity constituted an aspect of military training, versing the player in ‘tactics and strategy’ (e.g. Hedenstierna-Jonson *et al*. 2017, 854). Whilst the playing of boardgames does appear to have been an intrinsic aspect of military life in early medieval Scandinavia, other authors have seen it as being a more universal activity, practiced across all strata of society. For example, Dobat (2017, 600-1) notes that finds of *ad hoc* boards and of pieces made from everyday materials suggest that game-playing was an integral part of all echelons of warrior life, with games used to stave off boredom and to gamble for booty. Equally, the use of board games does not appear to have been confined solely to military groups. A recent review of the gaming evidence from Dorestad also concludes that the low-grade and improvisational nature of some gaming pieces suggests that board games were played across the whole of the port's social hierarchy (Hall 2021, 38). A set of bone gaming pieces, recovered from a harbourside or jetty in the Hoogstraat area of Dorestad, echo similar osseous sets recovered from Insular graves such as Balnakeil in Sutherland, both Scar and Westness on Orkney, and the burial at Île de Groix, Brittany (Maldonado 2021, 52; Batey and Paterson 2013, 650-51; Owen and Dalland 1999, 127-132; Clason 1980, 240-42; Du Chatellier and Le Pontois 1909, 150-51). However, the Dorestad find is a rare example of what is assumed to be a complete set from a non-funerary context: whilst the pieces in the set are comparable to those recovered from high-status or elite burials, the context is completely different, showing a mercantile, and possibly domestic, setting. Further individual gaming pieces have been recovered from across the harbour area of Dorestad, leading to the suggestion that playing tokens were in ready supply, and that sets of gaming pieces were everyday items within the port (Hall 2021, 36-39 and Figure 1).

The use of lead, a material otherwise unknown in Scandinavian contexts, is a unique element of the Torksey gaming pieces (Dobat 2017, 600). However, despite their metal content, they appear to have been perceived as low-value items: their crude manufacture, leading to short use and casual disposal, is one of the main contributing features toward their inclusion in the archaeological signature of the Great Army (Hadley and Richards 2018, 3). Hall (2021, 43-44) considers the widespread use of comparatively low-value pieces to be a key factor regarding the playing of board games at Dorestad. In particular, he cites the ability of gaming to cross cultural boundaries, with mutually-recognised sets of rules creating spaces for interaction, facilitating both communication and exchange. The Hoogstraat gaming set was recovered from a seasonally-occupied wharfside, the setting for multi-national trade and a seasonal market, equipped with shelters which may have been used for the overwintering of various ship's companies. Such a setting provides an obvious comparison with the camps of the Great Army. The low-value, apparently mass-produced gaming pieces from Torksey are on a par with the Dorestad assemblage, suggesting that game-playing was popular across all social levels of the force, and may have been seen as an adjunct to both mercantile and military activity.

Although there is a wide degree of variation in the decoration of the individual objects, the basic conical or domed forms of the Torksey gaming pieces have numerous parallels from across early medieval Europe, produced in both osseous materials and glass. Decorated capping, presumably used to mark specific pieces, can be seen on such finds as the aforementioned domed set from the Hoogstraat, or the conical pieces from the Storhaug boat burial at Gunnershaug, Avaldsnes, Norway (Opedal 1998, 54). Thus, although they are unusual in that they were made in lead, the Torksey pieces were clearly manufactured following well-established forms, and would have been easily recognisable as gaming pieces. Blackburn (2011, 241) observed that the ‘crowned’ domed pieces, decorated with three to five pinnacles on the top, are unknown in Scandinavia, but Hall (2021, 41) perceptively notes that two parallels exist. Both are made from glass and derived from Insular, non-funerary contexts: one from the Pictish hillfort at Dundurn, Perthshire, the other from recent excavations at Lindisfarne Priory, Northumberland (Alcock, Alcock, and Driscoll 1989, 216 & Illus. 14:26; Hall, Graham-Campbell, and Petts, forthcoming). Both of these are low domes, topped with five small glass nodules evenly distributed across their crowns. Given that other lead gaming pieces from the two camps are clear skeuomorphs of common Scandinavian forms, it seems highly probable that the ‘crowned’ pieces were directly inspired by northern British originals, used in Northumbria and the Pictish kingdoms.

Whilst Hall (2021, 43-4) draws attention to the ability of game-playing to cross cultural boundaries, he also comments on the dangers of attempting to assign ethnicities to different cultural elements. Nonetheless, given that these ‘crowned’ gaming pieces appear to have been based on Insular originals, it seems highly likely that they were made to be recognisable to northern British eyes. When viewed against a multinational, highly heterogeneous force such as the Great Army, it is very tempting to read this as a deliberate attempt to provide Insular players with familiar pieces: although the craftspeople creating these items may have been of Insular origin, and thus making objects which fitted their own cultural norms, it seems unlikely that any manufacturer would have produced unknown, ‘alien’ styles of gaming pieces when more traditional forms were clearly popular. If this premise is accepted, it once again carries the strong implication that both native Britons and Anglo-Saxons were active within the camp at Torksey, most probably drawn from a Northumbrian or northern British cultural background.

One further aspect of the gaming pieces, linked to both cross-cultural communication and to trade, may indicate a scenario wherein game-playing fulfilled an additional function at the camps. Although the criteria for categorising lead objects as gaming pieces are well defined, the numerous common elements of form and decoration shared with the Type F and G weights has also been highlighted in Section 4.2.2, particularly the similarity between the 'crowned' weight from the Kiloran Bay burial and the aforementioned Insular-styled gaming pieces. Within a mercantile setting, game-playing may have served as a way of introducing Type F and G weights as intermediary pieces, familiarising participants with these weight forms and establishing them as trustworthy whilst simultaneously removing them to a more relaxed social setting. Gustin (2015, 30) lists the various routines and rituals which accompanied trade in the late Viking-Age and medieval Baltic, undertaken with the aim of establishing a social relationship between trading partners. The establishment of such a partnership reduced the inherent frictions which accompanied exchanges between socially- or geographically-distant parties, creating commonality and establishing mutual trust. Equally, the creation of shared mercantile identities signalled by dress accessories displaying cubo-octahedral designs has been noted (Section 7.3.3). Although both of the above examples relate to the tenth and eleventh centuries, post-dating the activities of the Great Army, ringed pin TDB 1627 has already been highlighted as a probable precursor to the polyhedral-headed pins adopted by Irish Sea traders. This, and the production of dress accessories linked to group identity at Aldwark (Section 7.4.3), suggests that the projection of identifiable mercantile and social identities was of equal importance within the sphere of the Great Army in the later ninth century. Similar behaviours would have helped trading relations and facilitated exchange across the widely-drawn, multinational populations of the camps. In this situation, game-playing may have been used as a method of establishing a baseline cultural connection. Hall (2021, 43) observes that northwestern Europe appears to have been a network of shared gaming practices: within this context, mutually-understood playing rules could cross boundaries created by cultural differences or the lack of a common language.

Gustin (2015, 31) notes that one of the main factors for establishing reliability in weights was the use of unchanged, traditional forms and shapes. Whilst lead is an uncommon material for the manufacture of gaming pieces, it was a near-universal medium for Viking-Age metrological weights. The Great Army gaming pieces thus effectively bridge a divide between two classes of object, combining the material of metal-weight trade with the common, easily-recognised shapes of playing equipment. The previously-noted observation by Kruse (2007, 170-71) seems pertinent here: certain markets may have adopted 'agreed objects' as a method of negotiating discrepancies and differences in weights and weight systems. Whilst neither the Torksey weights nor gaming pieces would have been presented in previously-encountered and trusted forms, they would still have contained familiar elements, making them easy to accept and use. Both would have reflected traditional, common cultural standards whilst also signalling an interchangeability of use. Therefore, I propose that the mutable, ambiguous connection seen between gaming pieces and Type F and G lead weights was a deliberate quality. It is possible that this quality was a product of the market at Torksey itself, encouraged by traders with an eye toward the varied and disparate groups who were encamped, and who saw the opportunity to produce a cheap, interchangeable series of items to smooth out some of the inevitable frictions within their environment. However, it seems equally possible that these weights and gaming pieces were introduced by factional leaders of the Army, acting as overseers of trade: temporary market sites require regulation, if only in the form of an overall authority who can guarantee a local monopoly on violence (Barrett 1995, cited in Horne 2022, 49). Beyond this guarantee, further central control to promote easy trade corresponds well with both the multi-factional nature of the Great Army and the indications of intra-regional trade suggested by the assemblages of coins, ingots, and hack-sliver (Section 4). I suggest that figures with the authority to mint coins could equally guarantee weights, potentially to the extent of mandating the use of specific weight forms, and that both actions accord strongly with the political and economic vision seen in many aspects of the Great Army's activities.

8.4 Summary

Although both fishing weights and gaming pieces may appear, at first glance, to be quotidian items, both categories reveal considerable detail about the camps, illuminating the complex organisation of both locations. The fishing weights again show how well-connected the Great Army was to the environment surrounding each location, responding to both local differences and also potentially aware of seasonal regimes. The proposed dating of the single Type 1 (boat-shaped) line weight suggests that these intriguing objects may have originated with the Army, rather than being an introduction from Ireland, although the anchor-shaped Type 4 pieces are more indeterminate. However, this second weight form points to far broader cultural links, spanning both southern Scandinavia and the wider Scandinavian diaspora. The gaming pieces also show broad cross-cultural reach, with what appears to be a traditional British design incorporated in the repertoire of forms. Rather than merely reflecting the presence of native Britons, these Insular-styled 'crowned' gaming pieces demonstrate the cultural hybridity of the force: whilst there would have been some compartmentalization between the various factions, these groups also interacted, creating new forms of material culture as ways of expressing individual and collective identities. Whilst the use of lead for gaming pieces does not reflect conventional Scandinavian practice, the production of these pieces in a Viking camp suggests that they could be classed as one of the very earliest examples of an 'Anglo-Scandinavian' identity. This cross-cultural communication may also be shown in the interchangeability of the gaming pieces and the Type F and G weights, with these related items potentially fulfilling a role in creating trust and profitable trading relationships. The lack of the Torksey-type gaming pieces and the dominance of discoidal weights at Aldwark may indicate certain weight/gaming piece forms were specifically endorsed at the two camps. This once again raises the possibility of central control of the Great Army markets, in addition to considerations of factionalism and group identity.

9. Discussion

9.1 Introduction

In drawing together artefacts collected from the Viking camps at Aldwark and Torksey, this thesis presents the most comprehensive catalogue of these locations to date. This work is also the first to compare the two sites, seeking to not only set the camps in a national context, but also to provide an analysis of differences and similarities with an intention of understanding their individual settings. An attempt has been made to assess the assemblages through the use of broad categories, with artefacts grouped according to an assumed function or perceived use. Paradoxically, this attempt at classification has highlighted the 'fluidity' of certain classes of object: whist some items clearly cross categories or can suggest several interpretations, others, such as the Type F and G lead weights and/or gaming pieces, can more intriguingly be seen to display a malleability of interpretation and probable use. Nonetheless, this analytical approach has generally been successful, providing a framework for studying a high volume of material. This chapter will now draw out some of the main findings of this research, both through the broad criteria suggested in Section 1.2, and by examining trends and specific themes apparent across the categories more generally. Other aspects of the results will then be considered, as will a few wider thoughts and suggestions for potential future research.

9.2 Differences in the assemblages connected with recovery

Differential recording is, as anticipated, most obvious amongst the iron artefacts. This is particularly prominent in the metal-working and wood-working tools in the Aldwark assemblage, with metal-working tools also appearing under-represented at Torksey. Although similar deficiencies are not so obvious amongst the assemblages of knives, sword blades, and sword fittings, this is almost certainly due to these items being more easily recognisable and identifiable, leading to improved rates of recovery and recording. Whilst the numbers of other weapons do still appear low, this may in part be an effect of long-standing assumptions as to what should be expected from these 'military' locations. Even so, it is true that the comparative dearth of sizable weapons like spearheads and sword blades seems at odds with the recovery of other larger iron tools such as axes, punches, and an anvil. This presumed shortfall can also be contrasted with the aforementioned sword fittings, which clearly indicate the presence of substantial numbers of weapons at both camps. Although comparisons with urban settlements or those with protracted occupation may not be entirely proportionate, the smaller assemblages of hilt fittings recovered from established sites such as Coppergate, Fishergate, Staunch Meadow, and Woodstown do suggest a comparative 'baseline' of similar actions. The refitting of swords can be convincingly argued as a background activity at many locations. Given this, the comparatively higher numbers of hilt fittings recovered from Aldwark and Torksey argue that the two camp assemblages are therefore entirely consistent with military activity, and may be representative of original activity at each site.

It is possible that the amounts of fragmented copper-alloy ingots and Torksey-type lead gaming pieces have also been affected by differential recording at Aldwark. However, this is not clear-cut, and other factors suggest that the lack of these artefacts may show an actual, material difference between the two sites. Although fragments of copper-alloy ingots may well have been discarded during the period of unrecorded metal-detecting at Aldwark, whole ingots of the same material were clearly identified and sold during this same phase (Hadley and Richards 2021, 216). It is difficult to imagine that fragmented pieces would have gone entirely unrecognised when complete ingots were recovered. Smaller fragments of copper-alloy are also lacking in other categories of the camp assemblage, indicating that their absence amongst the ingots may be part of a wider trend. In the same vein, although some hollow-based lead gaming pieces are believed to have been disposed of unreported at Aldwark, solid weights of near-identical Type F and G forms were clearly retained. Whilst these forms do make up a far lower proportion of the total assemblage of weights, it seems unlikely that substantial numbers of the equivalent gaming pieces would have been disposed of without any record. In this instance, it seems probable that the relative dearth of these two classes of object are related, with both categories of object present in greatly reduced numbers when compared to Torksey. No such questions attach themselves to the numbers of stycas from Aldwark, however: whilst the remaining coins may show a reasonably accurate impression of the issues and date ranges contained in the original assemblage, there seems no reason to dispute the suggestion that significant numbers of stycas were removed from the site without any record.

9.3 Material differences in the assemblages

Some of the most prominent material differences are amongst assemblages which are broadly connected with the economies of the camps. Chapter 4 illustrates the clear preference for different forms of lead weights at the two locations. This variation does not appear to be the result of any chronological factor. In fact, given the very short time period between the occupation of each camp, the dramatic change in dominant weight form appears all the more extraordinary. Chapters 4 and 8 of this thesis propose that the Type F and G weights and related gaming pieces fulfilled a dual role at Torksey, serving as intermediaries and 'agreed objects' to promote trust and facilitate trade between users of different metal-weight systems. If this interpretation is correct, then it is difficult to understand why it would be necessary to either abandon or renegotiate this entire system at Aldwark, even after the split in the Great Army recorded at Repton. Even so, the main forms of weight used at either camp do unquestionably change. One explanation is that this is related to the constantly-changing makeup of the Great Army: Aldwark might have hosted a comparatively 'new' population when compared to that which had previously inhabited Torksey, with many of the occupants of the former camp having left the sphere of the force. This reading is attractive for two reasons. Not only would it explain the move away from the Type F and G weights amongst Halfdan's followers in Northumbria, with the former role of such pieces unknown by new traders and colonists, but it would also explain the dearth of the associated gaming pieces in the wider assemblage. However, although their numbers are undoubtedly reduced when compared to Torksey, it is difficult to square this interpretation with the continued presence of both weight types and lead gaming pieces, with these recorded not only at the Aldwark camp but also across the wider region (Hadley and Richards 2020). Given that these items were undoubtedly carried north from Torksey and Repton, the suggestion that their previous use was unknown rings rather hollow.

The nature of the marketplace itself at each camp may have been a contributing factor in the choice of different weight forms. Each location was a new establishment, occupying a site which had not hosted a market before. Moreover, each was also located on land which was only provisionally or temporarily controlled by the hosting force. When Berdan (1989, as cited in Gustin 2004b, 254) described the conventional development of early medieval trading centres as occurring in politically and militarily neutral environments, this envisaged exchange taking place exclusively between foreign merchants and local rulers. Although one can question whether such a rigidly-defined system of trade existed at any location, this scenario would clearly not have been the case at either of the camps considered by this thesis. Local inhabitants may have been largely excluded from the markets at Aldwark and Torksey, or at least have been relegated to a subordinate status rather than trading as equals. Furthermore, the factional leaders of the Army who acted as guarantors of the markets would have been principally foreign, with the weights, coins, and bullion on each site demonstrating the presence of multiple different trade systems: all of the participants would have arrived at locations where there was no pre-existing structure for trade, and where the local weight systems and currency were not those used by the market's hosts. Neither Aldwark or Torksey, nor any location associated with the Great Army, would therefore have been a 'neutral' market in any conventional sense: they would have been social and economic blank slates, very different from emporia or trade towns where norms of behaviour were the results of long-standing processes. Thus, it may have been expected that entirely new patterns of trade would be negotiated in each camp, including new 'approved' weight forms, even if different systems had been established at previous locations. This reading, with certain weight types only employed for specific, transitory markets, would also help to explain why the Torksey-type gaming pieces were not curated: removed from their situational context at Torksey, these would have lost their auxiliary purpose, adding to the careless handling seen amongst the pieces (Hadley and Richards 2018, 3).

Even if the establishment of new trade conventions were not expected, they may have been necessary. As observed above, each camp was a new foundation, located in a new area. These situations would have been comparatively unstable, without the weight of accustomed practice or the assurance of reliability. To this end, this inherent instability may have been reflected in a need for factional leaders to assert their authority. It has already been observed that long-distance trade was an essentially risky activity, conducted between people from different social groups. Not only would exchange between such groups introduce the difficulty of finding mutually-acceptable forms of bargaining, but it would also present the possibility of either party maximising their gains through underhand behaviour (Samson 1991a, 93). Breaches of trust would have held few long-term repercussions in one-off transactions between otherwise distant groups, and both counterfeit coins and bullion are present in the Torksey assemblage, showing that deception must have at least been considered a possibility when engaging in trade on the site. In more regulated trading centres, these issues were reduced by central administration of the market and of exchange (Gustin 2004b, 263-65). Within the camps of the Great Army, a similar outcome may have been achieved by the mandated use of particular weight systems or weight forms, used as an expression of jurisdiction over the site as a whole. Whilst I have envisaged this as reflecting the leadership at each location, with dominant personalities at each site using their authority to both implement and guarantee specific trade systems, I accept that it may have been a product of the market itself. Certainly at Torksey, this thesis has suggested that evidence for the production of two different imitative *solidi* shows competition for influence between separate factions, a situation which may argue against there being a single, unified leadership at the camp. Nonetheless, as stated in the previous chapter, the figures at Torksey with the power to mint coins would also be able to assure and authorise weights. At Aldwark, activities such as the laborious refining of silver shown by the litharge cakes speak far more strongly of a centralised control over economic activity: such a controlling power would have easily been able to endorse a particular weight form. If this was the case, then it is also possible that the change to discoidal weights illustrates a desire for this central leadership to show a distinct identity, separate from the faction of the Army which remained campaigning in southern England. However, it seems far more probable that the use of a new weight form merely shows the demonstration of personal power and influence, expressed as a way of regulating and assuring the Aldwark market.

A difference in the fragmentation of copper-alloy is evident between the two locations, as highlighted in Chapters 4 and 6. Although varied recording standards hamper direct comparison, the absence of deliberately cut Thomas Type A and B strap-ends at Aldwark supports the observation that other decorated Insular metalwork appears to be far less fragmented at the camp. Equally, as outlined above, the lack of fragmented copper-alloy ingots at Aldwark also appears to be a material difference between the two sites, corresponding with the heavier weights recorded for the complete ingots at the same site. As discussed in Chapter 6, this difference in fragmentation seems to be unconnected with the potential use of these items as scrap or raw material for casting. I suggest that it is, in fact, linked to the use of this metal as a commodity money, with other forms of copper-alloy either suppressed or completely excluded in economic transactions at Aldwark and replaced by stycas. Although other authors have seen stycas as entirely fiduciary, their presence at Torksey indicates that the Great Army perceived them as having intrinsic worth in addition to use value. Thus, if these coins were deemed acceptable to trade *alongside* other forms of copper-alloy, it seems reasonable to conclude that they could equally *replace* those forms, particularly in a region where they were already accepted as the conventional currency (Thomas 2005, 43). Whilst the styca assemblage from Aldwark must be treated with caution and not taken as a categorical record, the high proportion of both irregular and illegible/uncertain coins is noteworthy: these issues have been pinpointed as the most probable to contain Scandinavian-manufactured imitations and blundered derivatives (e.g. Kelleher and Williams 2020, 36). The evidence of cupellation at Aldwark can be taken to not only show the presence of a dominant, central leadership within the camp, but also of one with an involvement in the wider economy. It does not seem amiss to suggest that this involvement could also extend to control of the currency, and to attempts to formalise the use of copper-alloy and stycas amongst the settlers.

Despite the implied production of stycas in Northumbria, direct evidence for coin manufacture is only evident at Torksey. This thesis has proposed that any *solidi* minted at the camp were the products of political manoeuvrings, unrelated to more general economic factors. Williams (2007, 181) notes that gold coins appear to have been used differently to silver in the Anglo-Saxon and Frankish economies, and were restricted to transactions linked with status and ceremony. This use would have evoked the symbolic role of gold objects within Scandinavia, so may have struck a chord with various leaders within the Great Army. Nonetheless, the evidence for the production of silver 'broad' pennies speaks of a far more direct interaction with the economies of the region. The presence of this evidence for coin production does not necessarily show a material difference in the economy at Torksey, however: as observed, the abnormally high degree of fragmentation seen in the assemblages of dirhams and hack-silver may show that both camps were bridging typical Scandinavian metal-weight trade systems and small-transaction coin economies, and both locations were certainly familiar with coin. However, it may be argued that the economy at Torksey was more fluid than that at Aldwark. The evidence suggesting a diminished economic role for fragmented copper-alloy in Northumbria has already been described. Furthermore, whilst hack-gold is recorded in the assemblages from both sites, counterfeits and carelessly-handled casting waste are only present at Torksey, suggesting that the metal was more abundant and more frequently traded at the camp. As noted, the existence of faked hack-gold implies something of a glut, with the metal both plentiful and unfamiliar enough to make forgeries viable. The reduction in gold at Aldwark may be simply down to questions of supply, with a regional surplus distorting the picture at Torksey. Nonetheless, whilst the regional coin economies surrounding the two camps were based on different metals, the production of 'broad' pennies at Torksey does not appear to be accompanied by any reduction in the exchange of metal-weight silver. In contrast, the suppression of copper-alloy at Aldwark speaks of a far more deliberate economic strategy. In broad terms, it may be said that Torksey was producing silver coins for local trade, without any impact on the internal market of the camp, whilst Aldwark was moving toward integrating at least part of its economy with that of Northumbria.

9.4 Elements indicating regional differences

It has not been possible to identify any directly-related items across the two camps. Quite obviously, the 'broad' pennies at Aldwark and the stycas at Torksey are the clearest instances of items from different regions in each location. Amongst other categories of artefact, it is possible to identify potentially Northumbrian pieces at Torksey, but with the exception of the Torksey-type gaming pieces it is not so easy to see Mercian or East Anglian material at Aldwark. Whilst this may, in part, be a reflection of the comparative sizes of the two assemblages, it is also almost certainly tied to the artistic conservatism of Northumbria in the ninth century: for instance, the *pressblech* patrix shows a manufacturing technique which appears to have been abandoned in all other Insular areas, and so can be attributed to a Northumbrian craft worker, but no equally distinctive process can be pinpointed as being unique to an area south of the Humber. The iron assemblages mainly contain universal pieces: whilst items such as the socketed tools from the Torksey hoard do display Anglo-Saxon traits, these are not associated with any particular region. Where more refined distributions can be established, many of the Anglo-Saxon dress accessories appear to reflect the environs of each camp, rather than importation from other areas. This is most apparent in the assemblages of strip brooches and collared pins, but can also be seen amongst the Type A and B strap-ends. This carries the clear implication that the majority of these collected items were not retained whole, most probably being swiftly melted into more convenient and portable forms or broken up into fragments too small to identify. Some evidence for targeted collection may be evident amongst the biconical pin heads at Torksey, suggesting that some pieces were selected with care, even if they were ultimately destined for recycling. Nonetheless, there appears to have been very little regional transfer amongst these items.

Selectivity may also be evident amongst the decorated Insular metalwork, and this thesis has suggested that the fragments of annular or penannular brooches from Aldwark may have been gathered with the specific intention of using them as insets for lead weights. However, it is perhaps more noteworthy that the Aldwark assemblage contains five of these fragments, whilst only one has been identified at Torksey. Moreover, the Torksey fragment is silver, almost certainly used as bullion, so can be seen as relating to a different economy. The production of penannular and pseudo-penannular/annular brooches was concentrated in Ireland and western Scotland in the eighth and ninth centuries (Grigg 2007, 161; Ó Floinn 1989, 89). Whilst the penannular brooch was, like the ringed pin, adopted and extensively copied across Scandinavia, the wearing of Insular styles remained strongest in the west (Wamers 1998, 38). The Aldwark fragments were therefore almost certainly collected in Ireland or the Pictish regions and subsequently transported to the camp, a clear contrast with the far more localised gathering seen amongst the Anglo-Saxon dress accessories at both locations. In addition, the two plain-ringed, loop-headed pins from Aldwark were probably manufactured in the Irish Sea region, and so also show a link to the area, as were the Type F1 strap-end and companion buckle: the same may be true of the single B4a strap-end, although the wide date ranges and distributions of this sub-type make it harder to argue a direct connection. Whilst this assemblage of dress accessories is small, it is proportionally far greater than the equivalent corpus from Torksey, containing only the aforementioned silver penannular brooch fragment and single Scandinavian-influenced ringed pin, with two Type B4 strap-ends again only showing a broader connection. When considered alongside the evidence of Irish metalworking techniques at Aldwark, it is easy to read these finds as indicating a connection with the Hiberno-Scandinavian cultural sphere, an element of regionality not so evident at Torksey.

Another reason that Northumbrian material is easier to identify is the existence of Scandinavian-controlled workshops at York. As related in Chapter 7, these locations are believed to have manufactured the distinctive series of A1avii strap-ends, with production beginning shortly after the Great Army occupied the city. Thus, the Wooperton type strap-end recorded at Torksey, TDB 741, can only have been brought to Lindsey by a member of the Army, as might the probable B5-3 strap-end TDB 745. One of the defining characteristics of the Wooperton type series is the fact that the strap-ends are mainly produced by casting, resulting in a homogeneity which is at odds with the hand-finishing evident on the majority of Anglo-Saxon pieces. This process has been seen as showing Scandinavian manufacturing techniques, indicative of the new ownership of the workshops (Haldenby *et al*. 2022, 18-19). Chapter 6 of this thesis has outlined the use of lead models as patterns for mould-making, highlighting the presence of these artefacts across Scandinavia and their regional concentration at Kaupang. As observed, one benefit of using these models would be the ability to swiftly manufacture large volumes of closely-related products. These two factors raise interesting considerations about the lead strap-end casting model from Torksey, TDB 1459. Whilst the use of lead models is not an exclusively Scandinavian technique, no other Type A strap-end models have been identified, and the only other evidence for production of the Type A series in England remains the single, simple clay mould from Carlisle. By contrast, three lead strap-end casting models for E3 strap-ends and a strap-slide are present at Aldwark, demonstrating that the technique was in common use at another site occupied by the Great Army. Furthermore, other British finds of probable strap-end casting models, such as the two fragments from Fingringhoe, Essex or pattern No. 10599 from Coppergate, all show clear Anglo-Scandinavian stylistic elements (Thomas 2000a, 147; Mainman and Rodgers 2000, 2569). Thus, it seems reasonable to link the use of lead strap-end models with Anglo-Scandinavian, rather than Anglo-Saxon, production. In light of this, I propose that the Type A lead model at Torksey also shows the presence of hybrid, Anglo-Scandinavian manufacturing, used to produce homogeneous series of strap-ends in a manner similar to the Wooperton type series. This relationship with the Type A1avii strap-ends suggests that, rather than being manufactured at the camp itself, the model may have been brought from York, although further links can be seen with techniques commonly employed at Kaupang.

9.5 Elements related to wider populations

The ringed pins and the A1avii and B5-3 strap-ends discussed above can be seen as being intended to communicate cultural identities. Other artefacts from the two camps clearly fulfilled similar roles. Amongst these, it is notable that only Torksey has produced unquestionably Scandinavian-style dress fittings and that, furthermore, these are pieces of female-gendered jewellery: trefoil brooch fragment TDB 123 and small round brooch TDB 773, with lead model TDB 281 also implying the production of equal-armed brooches. It is overly simplistic to merely read these pieces as showing the presence of Scandinavian women. Nonetheless, the use and potential production of traditionally ‘female’ jewellery raises intriguing considerations for not only the demographic profile of the camp, but also the desire to project a Scandinavian cultural identity. Female cremations and burials associated with the Great Army have been identified at both Heath Wood and Repton (Richards 2004, 77 and 102-3), and it seems certain that women were present with the force and resided at both the camps studied by this thesis (Kershaw 2021, 103; McLeod 2011, 332). Even so, this clearly does not mean that all these women were Scandinavian. The close association between women and textile-working tools has been observed in Chapter 5. Whilst it is again reductive to interpret such items as solely female-gendered, the presence of Scandinavian-influenced Type B whorls at both locations can be seen to reflect culturally conservative craftworking techniques, potentially tied to the movement of women. However, these whorls are not wholly diagnostic, and even if they do show the presence of a Scandinavian tradition, the link between heavy lead whorls and sailmaking suggests that they may just have easily been carried by men. Definitive evidence for the presence of Scandinavian women is therefore extremely slight. Nevertheless, there appears to have been a desire to emphasise a strong Scandinavian-based identity by some inhabitants of the Torksey camp, with this shown in female-gendered dress accessories. Neither of these aspects are altogether surprising. Women are typically poorly represented in ‘first wave’ migration, and late ninth-century ‘female’ metalwork in Britain was more likely than ‘male’ to display Scandinavian cultural symbols (Kershaw 2021, 101; 2013, 175). However, if Pedersen’s (2017, 125-6) assessment is correct, then the use of lead model TDB 281 implies that equal-armed brooches were made as stock items at Torksey, manufactured with the expectation of a market. Production in advance does not automatically equate to the production of high volumes, and no other finds relating to equal-armed brooches have been identified: if these brooches were cast, they were almost certainly produced in very low numbers. Nonetheless, the manufacture of such a typically Scandinavian accessory clearly implies the existence of a reliable market of either Scandinavian women or women who wished to convey a Scandinavian identity.

Other items in the Torksey assemblage appear designed to assert a similar identity, although these are not so heavily gendered nor so emphatically Scandinavian: the boat-shaped Type 1 lead fishing weight and the Type 4 anchor-shaped object reviewed in Chapter 8 both carry strong cultural associations with Scandinavia, as does the aforementioned ringed pin TDB 1627 and the two Type B4 strap-ends. Although a desire to state a direct cultural association with Scandinavia is evident at Torksey, it is not so clear at Aldwark. This is not to say that Aldwark shows no indication of the projection of cultural identity. Whilst Scandinavian affiliations can be seen in the Type B4a and B5-3 strap-ends, one of the most striking elements of the camp assemblage is the wealth of evidence relating to Type E3 belt fittings: the full range of production, spanning from lead models to failed castings and completed pieces have been recovered. In addition to strap-ends, it is notable that matching strap-slides have also been identified amongst the models and finished castings. E3 strap-ends are believed to have been made as parts of suites of fittings, with the previously-mentioned Peel Castle and Golden Lane examples associated with flat, square-framed belt buckles: although very similar, the Carlisle Cathedral finds were unstratified and recovered separately, and are only assumed to form a paired set (Paterson and Tweddle 2014, 216). Smaller strap-ends of the E3 sub-type are often associated with strap-slides, and are believed to have been used to secure spurs, garters, or footwear (Thomas 2000a, 269). Matched waist-belt suites were a foreign introduction to England in the late ninth century, replacing an existing local fashion for lighter, unbuckled girdles finished with paired strap-ends (Thomas 2006, 158).

Whilst E3 strap-ends are present at Torksey, only Aldwark has evidence for the manufacture of the fittings. Given that the core dating of the site corresponds to the partition of Northumbria by conquering forces, it seems possible that the production of these pieces shows an attempt to establish a distinct identity by the inhabitants of the camp. The diverse and changeable nature of the Great Army has been discussed in Chapter 2: it is tempting to view the manufacture of these fittings as part of a process of uniting disparate groups, providing a cohesive identity that was also visually different to popular Northumbrian dress.

The adoption of particular dress fittings as a statement of social identity has been proposed for other Anglo-Scandinavian artefacts (Pestell 2013, 235-380), and has been postulated as a method of forming group solidarity within Viking forces (Raffield *et al.* 2016, 41). Whilst gender assignations can be rather arbitrary, sets of waist belt fittings are generally seen as items of male dress (Kershaw 2013, 173), and equestrian equipment such as spurs are typically included with male-gendered grave goods, particularly in the ninth century (Pedersen 1997, 125). Ornamental metalwork is a clear way in which to express or project a cultural identity. The dearth of Scandinavian-styled belt fittings in ninth-and-tenth-century England has been commented on, with Kershaw (2013, 175) suggesting that this may be due to members of Viking armies losing or discarding such culturally-distinctive items long before they arrived in Britain. However, it could also be argued that these items were replaced by others which expressed a different cultural identity, and one which showed wider influences than just a Scandinavian background. Equally, it has been suggested that men may have more readily adopted 'hybrid' identities within the Scandinavian diaspora (Downham 2012, 7), and such an identity is clearly reflected in the E3 fittings.

It is worthwhile to explore this hybrid identity a little further. As recounted in Chapter 7, the E3 series have previously been seen as originating in the Irish Sea region. Whilst many may have subsequently been made in this area, the finds from Aldwark very clearly contradict this as a point of origin. In discussing the two E3 strap-end examples from Kaupang, Wamers (2011, 71-73) identifies the pieces as Carolingian rather than Insular, and notes that such ridged strap-ends were introduced from the middle third of the ninth century: two similar strap-slides at Kaupang are also seen as Carolingian spur fittings. Although other E3 strap-fittings from Hedeby and Domburg have been interpreted as imports from the Irish Sea region, these merely reflect existing notions of the form's origins, based on previous distribution patterns. The suggestion of a 'backflow' of material from the Great Army to Hedeby has been mentioned in Chapter 7. It is worth noting that Domburg would have also been connected to the network of North Sea trade and craft production (Roxburgh & Van Os 2018, 308-9; Willemsen 2004, 70-1), so the single strap-end there could have arrived through a similar 'backflow', or via wider contacts. Skre (2015, 239) has asserted that 'there are no indications that immigrants from the west settled' at Kaupang. Although this statement could be questioned, it does lend weight to the suggestion that the E3 style developed outside the Irish Sea region. I suggest that the Carolingian influences seen on the sub-type are in fact products of direct contacts with the Frankish realm, typified by the activities of forces such as the Great Army. The development of the form is indicative of the contacts with and adaptations from overseas 'host cultures' postulated by Cooijmans (2020, 33), and it is worth reiterating his perceptive comment that members of Viking forces may have shown group allegiance by adopting specific styles of dress from these societies. The mass of manufacturing evidence for the E3 form at Aldwark, coupled with the possible casting model at Kaupang and the wider spread of strap-ends across the North Sea littoral, combine to considerably change the accepted distribution of the sub-type. The E3 strap fittings at both camps therefore reflect a Carolingian-influenced, ‘North Sea’ identity rather than an Irish origin, almost certainly linked to the elite status conferred by the ‘military look’ associated with Frankish dress accessories (Kershaw 2016, 98). Furthermore, this identity is implicitly connected with the Great Army, and the faction that occupied Aldwark, with the fashion for these fittings at the camp used to express a coherent group identity associated with the travels and former contacts of parts of the force.

More evidence of hybrid, Frankish-influenced manufacturing at Aldwark can be seen in the possible trefoil brooch or strap-end ADB 923. Whilst the difficulties in identifying this piece need not be revisited, the conclusion stated in Chapter 7 remains relevant: the function of this artefact is less important than the fact that it was produced at all. The ornament on the fragment’s face shows adaptations of both Carolingian acanthus and Scandinavian Borre-style designs. Although the possible blundering of these elements may indicate a misunderstanding of Scandinavian originals, the competence of the workmanship suggests that these variations were intentional. This would signify a deliberate attempt to rework Scandinavian design into a freer, potentially hybrid piece. I suggest that this echoes the individual identity invoked by the E3 fittings produced at the same site, in addition to the hybrid, cross-cultural elements seen in the B4a and B5-3 strap-ends. Whilst further hybridised Anglo-Scandinavian material akin to the Wooperton type strap-ends has not been identified at Aldwark, the possible unfinished disc brooch ADB 1080 does show evidence for the production of Anglo-Saxon dress accessories. Other elements of both assemblages also show cultural links from across Britain. As Raffield (2022, 424) has recently observed, evidence suggesting the presence of Anglo-Saxon craftworkers does not automatically indicate that these were free persons. Viking armies would have required large workforces to meet the demands of everyday life, and captives would have been a readily available source of labour for the more menial tasks associated with wood-working and textile-working. However, skilled workers may also have been taken hostage, and artisans were often not free within Anglo-Saxon society to begin with (Walton Rogers 2020d, 254; Hinton 1998, 10). The presence of captive Anglo-Saxon metalworkers would certainly explain items like ADB 1080, or the pressblech patrix TDB 2124 and beaded model TDB 280. However, I contend that the high volume of Type L sword fittings noted in Chapter 5, and the presence of the bossed, British-derived gaming pieces discussed in Chapter 8 indicate that free members of the local populations were active members of the Great Army. Obviously, both these classes of object are mutable, and could be carried across cultural boundaries: Hall *et al*. (forthcoming) have concluded that the original bossed glass gaming pieces were most probably produced in Ireland, with their use potentially changing when they were initially brought to northern Britain. Nevertheless, the derivative lead gaming pieces would appear to have been manufactured to appeal to the same population that were familiar with the glass examples, and the associations that these pieces have with trade and economic exchange do not suggest a use by unfree persons.

It is easy to overstate all these elements, so my final conclusions are perhaps tentative readings at best. Nonetheless, whilst the assemblages from both camps show both Anglo-Saxon and Scandinavian cultural influences, it can be said that dress accessories which suggest a direct Scandinavian identity are only present at Torksey, whilst connections to the both the Irish Sea region and the wider Scandinavian diaspora are far clearer at Aldwark. Equally, the Aldwark assemblage also contains items which suggest some movement toward the creation of a single unified identity, in contrast to the more disparate cross-cultural contacts evident at Torksey. These factors show elements of different cultural identities present in the populations of both camps and must, to some extent, reflect the composition, nature, and deliberate intentions of the groups which occupied Torksey, and which chose to settle in Northumbria.

9.6 Insular metalwork and anomalous objects

Insular metalwork is prominent at both camps. Chapter 6 has proposed that many pierced or pinned fragments of this metalwork were lost or discarded whilst being adapted as pendants, fittings, or insets for lead weights, whilst Chapter 7 has identified several pieces which have either been wholly or partially converted into brooches. Small fragments at Torksey may have been used as commodity money and, even if it had a diminished function as currency at Aldwark, fragmented Insular metalwork was clearly still present at the camp: an increased role for inset lead weights has been suggested at the site, and metalwork related to specific Insular populations or regions may have been deliberately sought or selected for these pieces. The concept that notions of exclusivity, prestige, and social standing were attached to decorated Insular metalwork has been explored by various authors (e.g. Heen Pettersen 2018; Ashby 2015; Sheehan 2013), and has been discussed elsewhere in this thesis. Examples of the use of this metalwork found in both camp assemblages tie in with these ideas: as Aannestad (2018, 8) observes, functions were found for Insular metalwork precisely because of the associations the objects carried within society, and with secondary working most frequently concerned with making the items available for display (Baastrup 2014, 357). In particular, these associations appear to have been related to raiding and military endeavour, with the social value of the objects proportional to the risk involved in obtaining them: even if one accepts the view proposed by Mikkelsen (2019, 166-67) that many Norwegian finds show missionary activity and not plundering, within the context of the Great Army camps the idea of a military focus is inescapable. However, if additional value was attached to metalwork because it bore Insular decoration, by extension an *absence* of these designs may have reduced the appeal of an item, making it less prestigious and devoid of social capital. I have proposed this concept as the reason for the lack of fragmentation seen on flat-headed pin TDB 1068 and strip brooch TDB 1052, discussed in Chapter 7. Furthermore, this principle carries implications for the remainder of the collected metalwork. Evidence for selectivity has already been mentioned, with the suggestion that both specific alloys and particular dress accessories were targeted. Such selectivity could also work in reverse, with certain classes of artefacts passed over or neglected. This is particularly true if one follows Ó Floinn's (2014, 188-90) statement that the Insular metalwork from Woodstown was not gathered as scrap: if the prime consideration in collection was the desirability of Insular decoration, rather than any intrinsic value of the metal, then this might lead to the over-representation of certain artefacts in the two camp assemblages. In particular, the low proportion of collared pins to strap-ends has been highlighted at Torksey (e.g. Hadley and Richards 2021, 100), with Section 7.4 of this thesis identifying similar ratios of the same artefacts at Aldwark. Whilst the modest weights of the collared pin series would obviously affect their worth as a source of scrap, their lack of distinctive decoration may also have made them less desirable objects as a whole. This might be another factor for their reduced numbers when compared to the highly-decorated Anglo-Saxon Type A and B strap-ends.

At both locations, many of the Insular metalwork fragments are decorated in artistic styles which suggest an eighth-century origin. Whilst the conflicting dating of similar material has been largely resolved since it was questioned by Myhre (1993, 186-88; c.f. Heen-Pettersen 2014, Chap. 4.1), the Torksey assemblage contains further anomalous artefacts which appear at odds with either the occupation date of the camp or its geographical location: the reworked Anglo-Saxon wrist clasp TDB 799, scabbard fitting TDB 131, and the assemblage of sceattas briefly described at the start of Chapter 4. Whilst it is impossible to propose a date for the conversion of wrist-clasp TDB 799 with any certainty, it is entirely in keeping with the personalisation and repurposing of objects seen elsewhere in the camps' assemblages: a parallel can easily be drawn with TDB 307, adapted into a brooch from a linked flat-headed pin suite. It seems reasonable to relate the similar reworking of TDB 799 with the activities of the Great Army. The scabbard fitting is far more exceptional. However, McLeod (2014, 171) specifically notes a 'strong link' between members of the Army and northern Francia and Frisia, and it is difficult to imagine how such an out-of-place object could have arrived at Torksey if it were not carried there by a Continental member of the force: although the sceattas might conceivably have been lost at an unrecognised and unrecorded earlier market at the location, this fitting remains a unique find in Britain, with no comparable pieces recorded at any other Insular emporia. As already discussed, the mounted crystal balls in the Leominster and Galloway hoards demonstrate that the Army and its successors were able to access comparatively antique items, clearly regarding them as viable, valuable objects. Scabbard fitting TDB 131 must have been regarded in an equivalent manner and been carried from the Continent for similar reasons, although it is possible that it was part of an heirloom artefact. By extension, it also seems entirely reasonable to suggest that most, if not all, of the sceattas were also brought to Torksey by the actions of the Army. The majority are Series E coins, and thus have a corresponding Continental origin to fitting TDB 131, whilst their silver content would have made them immediately more accessible as media for trade: as already acknowledged, an eighth-century sceat appears to have been handled by members of the Great Army at Cottam B. Taken together, these items can all be seen as being analogous with the aforementioned crystal balls, whilst the balls themselves lend support to the suggestion that this collection of anomalous objects could have been brought to Torksey by members of the force. If we accept this, then it stands against Williams' (2020e, 81) statement that the coins from Torksey do not provide support for a close dating of the site: considered as a whole, these incidences of seemingly-aberrant finds can be taken as illustrating a pattern of behaviour within the Army, and therefore do not contradict the proposed narrow date of the camp's occupation.

9.7 Conclusions and further study

Whilst Cooijmans (2020, 145) suggests that market activity represented a secondary 'diversification' for Viking camps in the Frankish realm, the high economic impact of such sites in western Francia has been observed by several authors (eg. Halsall 2003, 37). Much of the evidence discussed by this thesis shows that both Aldwark and Torksey also operated as markets, with an incredibly broad range of exchange systems and media in use, and with skilled craftspeople clearly accompanying or following the Great Army. Both locations saw sophisticated economic activity, with Aldwark exhibiting signs of unified top-down control and with Torksey showing evidence of competing social economies of patronage and display. These aspects all support the observation that ‘Viking leaders… possessed economic and political vision’ (Sheehan, quoted in Horne 2021, 70), with the camps secure and stable enough to support both craft production and trade. To an extent, this stability ties in with the control of the countryside discussed in Chapter 5: if members of the Great Army felt able to establish satellite camps and working stations, the same confidence clearly also extended to activities within the camps, with items produced which were unrelated to the needs of basic maintenance or resupply of the force. However, the differences in these processes suggest that manufacturing activity was also strongly related to the particular circumstances of each location. As such, Coojiman’s suggestion that these were ‘secondary’ activities holds true: whilst the markets may have been of central importance to the Army economy, the force was clearly able to adapt these activities to the situation of each individual camp, manufacturing items in response to local demand. However, Williams’ (2020e, 81) observation that Viking camps in England appear to have been based at pre-existing central places is also pertinent here: the importance of markets, and thus manufacturing activity, may have grown significantly after sections of the Army left Francia, leading to market access being considered as a factor when siting the camps. Whilst markets may have been a secondary activity, the size and variety of the economic and manufacturing assemblages from Aldwark and Torksey suggests that they may also have been a primary consideration.

The stability of the camps, and the obvious control of their environs, goes beyond the awareness of suitable locations and caches of stored food identified by Halsall (2003, 154-5) and McLeod (2006, 144). The sites appear remarkably connected to their respective hinterlands, able to identify and access specific resources: these were not isolated, inward-facing locations, hedged behind fortifications, but were secure and open environments, accessible for trade and able to control and respond to their surroundings. Again, this is not entirely surprising. The implication that Viking camps engaged in local trade in the Frankish realm has already been mentioned in Chapter 6, and Carolingian sources record Viking forces hosting markets (e.g. Nelson 1991, 185). However, some of the actions at Aldwark and Torksey go beyond merely participating in local commerce. Evidence suggests a close understanding of coin economies at both sites, with a probable move toward formalising trade in copper-alloy stycas at Aldwark contrasting with the minting of silver pennies at Torksey. Obviously coins do not automatically equate to trade, and could serve a variety of functions within Viking-Age society (Gaimster 1991, 119; Samson 1991b, 127). Indeed, this thesis has proposed that the evidence for striking *solidi* at Torksey should be taken as a sign of the ‘social economy’ and not commerce. Nonetheless, it is hard to see why a location like Torksey, so heavily engaged in a weight-based bullion economy, would go to the labour of producing copies of Anglo-Saxon silver coins if they were not for trading. Therefore, not only do these actions appear indicative of trade, but they can also be read as showing the camps at least partially merging with their respective regional economies. The incorporation of Frankish and Frisian elements into the Great Army has been noted in Chapter 2, and a similar process also appears to have occurred with the local population in Britain. Obviously, the regional intelligence noted above could have been gained from captives (Raffield 2022, 428). However, as already discussed, other elements of the assemblages do suggest the presence of free Anglo-Saxons as traders or members of the force, implying a far deeper integration than would be seen with hostages. This level of assimilation would not only help inform the camps about their environs, but would also lead to much deeper cultural transmissions. Anglo-Saxons who were active members of the force would be accustomed to the regular use of coin, and would form a ready market for Insular-styled objects such as the Wooperton type strap-ends: such actions would have an impact on the acculturation of the Great Army as a whole. Whilst the observation that Torksey saw the statement of direct, ‘Scandinavian’ identities far more than the hybrid expressions at Aldwark still stands, it would be naive to see this merely as evidence of progressive assimilation, reflective only of the amount of time which the force had spent in England. Nonetheless, even within a composite, multinational body such as the Great Army, the presence of individuals from the local populations must have contributed to the integration of the force into the norms of Insular culture, potentially amplifying or accelerating a process already begun in Francia, Frisia, and Ireland.

In addition to integrating with their local environs, the camps and their markets must also have adapted to them. This concept has already been considered in Section 2.5, with other authors envisaging the sites as ‘regional footprints’ with influence on subsequent settlements. In regard to this, if one assumes a developmental connection between Aldwark and York, it is illuminating to examine the classes of objects which transfer between the two locations. Although dirhams were clearly in common use at the camp, they appear to have been excluded from circulation in the city, with evidence for other weight-based silver transactions also remarkably slight (Kershaw 2020, 125). More pertinently, the E3 sub-type of strap fitting is very rare: a single derivative copper-alloy strap-end was identified at Wellington Row, and six iron strap-slides with medial ribs were recovered from Coppergate (Moulden *et al*. 1999, Fig. 86j; Ottaway 1992, 688-9). However, although metrological weights are only recorded in low numbers, cylindrical and discoidal lead weights continue to be the dominant form across York: whilst numbers are difficult to ascertain, Type D weights appear to make up between 45% and 50% of the recorded assemblages (Mainman and Rogers 2000, 2652; Kruse 1992, Table 1). Some of these differences may relate to the compartmentalisation of the Great Army, with pieces such as specific dress fittings only fashionable amongst certain factions of the force, or only enjoying a brief period of popularity. Equally, the decline in use of some items accords with the short-scale curation of the lead gaming pieces and associated Type F and G weights at Torksey. Even so, it is notable that some of the most distinctive elements of the material culture of the Aldwark encampment are almost absent from the later settlement. In considering this, it is worthwhile revisiting Price's observation (2016, 164-5) that Viking camps may have been idealised micro-states, operating as models for the societies which their inhabitants wished to build: in short, the influences which the camps exerted on subsequent settlements may well have been more social than material. In York, the lack of evidence of dirhams and metal-weight trading can be read as showing that the economic integration seen at Aldwark continued, with the city ultimately embracing the use of Insular-styled silver coin for transactions. Equally, the continued popularity of a specific weight form can show that a central authority continued to exert control over the economy. These demonstrations of centralised control, combined with expressions of unified identity amongst the settlers, can be seen to reflect the development of the Kingdom of York: in contrast, the more dispersed organisation and freer economic systems evident at Torksey can be read as showing an influence on the later development of the 'Danelaw' areas.

This chapter will conclude with some suggestions for future areas of study. The Williams typology for weights (Williams 2020c, Table 1) has been used throughout this thesis to describe the majority of the lead objects recovered from the camps, and has generally proven adequate to the task. Nonetheless, whilst the lead gaming pieces broadly fit into Williams' typology, the Type F and G forms' sub-classification does not encompass the wide variations in decoration and size seen amongst the Torksey assemblage. The only existing typology of gaming pieces, designed by Petersen for osseous materials (Hennius *et al.* 2018, 618-22), merely encompasses basic forms and thus provides an equally poor fit for the Great Army corpus. Given the importance of the Torksey-type gaming pieces in identifying the activities of the Army, it seems certain that these items would gain from further study and a better-defined classification. Furthermore, although I accept that many categories of object are ambiguous and difficult to define, an attempt at a deeper categorisation of the wider assemblages of lead artefacts into forms that represent weighing, fishing, gaming, and textile-working could be beneficial. The gaming pieces in particular are very equivocal objects, with this thesis arguing that their fluidity of use was intrinsic to their function, and Hall *et al*. (forthcoming) have recently highlighted the functional complexity of similar items within the early medieval world. Nonetheless, Williams' suggestion that the Aldwark weight assemblage might contain as-yet unrecognised gaming pieces still stands, and more detailed analysis may help resolve this question.

Although a brief comparison of potential weight ranges has been undertaken in Chapter 4, any wider analysis of metrology is beyond the scope of a comparison of the two camps. Given the variety of weight types recovered from both locations, and the prospect that 'agreed objects' were used as mutually-acceptable weights to bridge different systems, a more in-depth review of the two assemblages may be able to establish common trends or distinguish universal weight units. Again, such a study would not be without difficulties, particularly given the potential for the lead weights to have been affected by corrosion or damage. Nonetheless, the assemblages from both sites are diverse enough that elements could be credibly compared with other collections, such as the presumed 'sets' of inset lead weights from Kiloran Bay or Islandbridge, or the corpus of cubo-octahedral pieces from Kaupang. Not only might this help assess and define potential weight units brought to the sites, but it may also help situate the metrology of the two camps within a wider context. Given that the cubo-octahedral series may have been adapted to suit Insular trading at Aldwark, and that the lead Type F and G weights were probably produced to span multiple systems at Torksey, an understanding of these elements may help contextualise the wider links of both camps. Equally, although the dates and issues of the stycas from both locations have been briefly reviewed in Chapter 4, deeper examination once again lies outside the range of this thesis. The later, blundered coins of these assemblages would certainly reward further study. 'Irregular' styca issues have historically been neglected, seen merely as affirming the decay of the Northumbrian kingdom prior to the advent of the Great Army (Lyon 1955, 235). However, the proposal that many of these coins were produced by the Army themselves is becoming more widely accepted. Whilst no conclusive proof for the manufacture of stycas has been identified at either location, the evidence of economic control and integration from both camps does lend weight to this proposal. In particular, the Aldwark assemblage contains elements which clearly imply a formalisation of the use of stycas. This site would therefore be a prime location to study the potential production of stycas, despite the known issues which have affected their recovery.

One of the most surprising elements to have emerged from this thesis has been the recognition of the Aldwark camp as a manufacturing centre for Type E3 strap fittings.

The dating of other Insular examples of this sub-type has been discussed in Chapter 7, showing that the form can be seen as spreading from an introduction at the east: although a small number of E3 strap-ends were recovered from Torksey, the concentration of material at Aldwark surpasses any other location, indicating that the camp was the main point of origin. This represents a major shift in the established distribution of these artefacts, affecting both their dating and their presumed cultural connections. This move will have a notable impact on the future interpretation of this sub-type: finds can now be seen as reflecting far more nuanced cultural influences, associated with the Great Army and Anglo-Scandinavian production, in addition to their previous connection to the Irish Sea region. Given the presence of the E3 sub-type at sites such as Kaupang and Hedeby, this new distribution and dating should be given a wider dissemination, enabling it to be incorporated into broader discussions of trade, travel, and the activities of Viking armies.

Appendix 1

Access to databases

The following links provide access to the Aldwark and Torksey artefact databases, available online via the Archaeology Data Service (ADS). Both of these are the most recent and complete versions of each site assemblage, so contain artefacts which were included after the September 2021 cut-off date applied to this thesis.

Aldwark database (ADB):

Julian D Richards, Dawn Hadley, Mark Randerson (2023) *Aldwark Viking Camp* [data-set]. York: Archaeology Data Service [distributor] https://doi.org/10.5284/1115933

Torksey database (TDB):

Julian D Richards, Dawn Hadley, Mark Randerson (2023) *Torksey Viking Camp 2024* [data-set]. York: Archaeology Data Service [distributor] https://doi.org/10.5284/1115932

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