From Landing site to Local Centre

New Insights into the Developments, Activities and Maritime Networks of Aarhus, Denmark, in the Viking Age c.750-1050

Jette Linaa[1,2,3,4]

[1] JL Consulting, Falstersgade 15B, 8000 Aarhus C, Denmark
[2] Department of Archaeology, Moesgaard Museum, Moesgårdallé 15, 8270 Aarhus, Denmark
[3] Department of Archaeology and Heritage Studies, Aarhus University, Denmark
[4] Corresponding Author (jl@cas.au.dk) ORCID: 0000-0002-6563-769X

ABSTRACT

The Viking Age represents a period of significant dynamism, during which local centres and urban sites participated to varying extents in maritime networks. This paper investigates the development, activities, and maritime engagement during the Viking Age of the Danish town of Aarhus, located on the East Coast of Jutland. In previous research, Aarhus has been portraited on the one hand as a late 10th century town of minor importance, and on the other as a prominent 8th century town with substantial ties to maritime networks between the Baltics and the North. This study contributes to the ongoing discourse through a comparative analysis of structures and artefacts from 20 excavations, contextualised alongside findings from Ribe, Haithabu, and Kaupang. The analysis reveals that in the 8th and 9th centuries, Aarhus was primarily an agrarian settlement centred on coastal resource exploitation, with minimal maritime connections. Although the site was fortified in the early 10th century, its activities largely remained unchanged. It was not until the late 10th century that Aarhus began to take on the characteristics of a town, including local trade, denser settlement, and specialised crafts. Even then, significant maritime connections were still absent, and its strategic location between the Baltic and the North Sea remained underutilised during the Viking Age.

ARTICLE HISTORY
Received
28 August 2024;
Accepted
09 December 2024

KEYWORDS
Viking Age; Urbanisation; Maritime networks; Substance; Trade andexchange; Landing site

Introduction

The Viking Age (*c.*750-1050 AD) was a dynamic period characterised by varying levels of engagement in maritime networks among settlements ranging from local centres to towns. Research on Viking Age towns – identified through evidence of trade, specialised crafts, and dense settlement patterns – has evolved over time. Notable Viking Age towns such as Kaupang, Birka, and Haithabu have been extensively studied, with key contributions from scholars such as Arbman (1939), Blindheim, Heyerdahl-Larsen, and Tollnes (1981), and Jankuhn (1986). More recently, research projects employing innovative scientific methodologies have focused on towns such as Ribe, Odense, and Aalborg, yielding significant findings, as highlighted by Lund and Sindbæk (2022), Runge et al. (2020), Runge and Henriksen (2018), Sindbæk (2023a), and Søvsø (2020). Aarhus holds significant potential among these towns due to its wealth of primary sources. The town is rich in Viking Age monuments, with five runic stones, once located in the western part of the settlement, still surviving today. Additionally, a Viking Age rampart, which once encircled the settlement, remained intact until the late Middle Ages, and is still visible in the modern street grid (Jantzen 2013, 103; Roesdahl and Wilson 2006, 210-19). Approximately 250 excavations have been conducted in the city, and several recent publications have examined the town's development, structures, and networks, such as those by Jantzen (2013), Kalmring (2024), Krongaard Kristensen and Poulsen (2016), Linaa (2016), Madsen (1996), Roesdahl (2023), and Søvsø (2020).

Historical mentions and archaeological evidence of Aarhus

Evidence of the status of Aarhus as a Viking Age town first appears in 948, when the settlement is

Figure 1. Major sites mentioned in the text (Map: © MOMU).

referred to as 'Arhuswensis' (Henrichsen 1968, 69-70; Jantzen 2013, 91). However, various publications suggest that the origins of Aros as a town predate this mention by several centuries (Jantzen 2013, 27-32; Skov 1998a, 285-286, 2005b, 16-22; 2008, 2011a). Situated on the Kattegat coast, midway between Haithabu and Kaupang (Figure 1), Aarhus occupied an ideal location for participation in maritime traffic between these significant Viking Age centres. A critical question remains, however: To what extent did the inhabitants of Viking Age Aarhus fully exploit the opportunities presented by this strategic seascape?

Key archaeological discoveries: Excavations and findings

The primary inquiries focus on how and when Aarhus developed into a town, and to what extent its inhabitants engaged in maritime networks. Archaeological investigations in Aarhus have provided early insights. Systematic excavations in Aarhus began in 1963, uncovering a late Viking Age settlement of sunken-featured buildings with evidence of specialised crafts and trade encircled by a rampart, as demonstrated by Andersen, Crabb, and Madsen (1971), and Klindt-Jensen and Madsen (1964). The earliest rampart (Rampart 1) dated to the

first decades of the 10th century, was 2-3 m high and 10 m wide and constructed from turf. The rampart was reinforced to a width of about 18 m around 970 (Rampart 2) (Skov 1992; 2003). This led to the interpretation of a foundation of Aarhus in the 10th century (Madsen 1996, 77-90). However, subsequent research has pushed the settlement's origins back to the late 8th century (Skov 2005a, 16-22, 2008, 215; 2011a, 62-63).

Debates on the function of Aarhus: Town or market?

The function of this settlement has been the subject of debate. Krongaard Kristensen and Poulsen (2016), Roesdahl (2023) and Søvsø (2020) characterised early Aarhus as a marketplace that developed into a town in the late Viking Age. Conversely, others, such as Skov (1998a, 1999a, 2005a-c, 2008, 2011a-b), and Andersen and Krants (qouted in Leth Beiter 2024), have interpreted Aarhus as one of the earliest and most significant towns, alongside Ribe, Haithabu, and Birka, functioning as a gateway to the wider world. Corsi (2020) has even included the town among the emporia. Exhibition catalogues from 2005 and 2011, with contributions from Asingh (2005a-b), Skamby-Madsen and Vinner (2005a-b), and Skov (2005a-c, 2011a-b), further emphasised the town's networks, suggesting that as early as the 8th century, Aarhus maintained extensive maritime connections with the Baltic and North Seas. This coastal town is also presented as being safeguarded by a maritime defence system, which included the Kanhave Canal on Samsø, the Helgenæs peninsula to the north – where numerous place names reference Viking Age ships – and the shipyard/harbour site at Snekkeeng along the Aarhus River (Asingh 2005a, 106-112, 106-108; Skamby-Madsen and Vinner 2005a, 85-95; Skov 2005c, 41-42, 2008, 215)(Figure 1).

The perception of Aarhus as one of the earliest Danish towns and a key node connecting the Baltic and North Seas is prominently featured not only in academic publications but also in the permanent exhibitions at Moesgaard Museum (MOMU), the Viking Museum in the town centre, and in current museum plans (Moesgaard Museum 2024, 6-7). The narrative is based on its geographical location, the runic stones, and a small number of imported artefacts. However, an analysis of four Viking Age excavations by Linaa in 2016 provided robust evidence for the exploitation of coastal resources, while offering minimal evidence for trade, specialised crafts, or maritime contacts. This analysis underscored the need for further research in these areas (Bitsch 2007a; Linaa 2016, 71-74; Ritchie 2019).

Aims and Scope of the present study

The 'Vikings' Aros – New Insights into Viking Age Aarhus' project (2021-2024), funded by the Ministry of Culture, aimed to provide fresh perspectives by transforming the collections into new narratives. This was to be achieved through the systematic cataloguing of the many artefacts stored in archives, integrating them into current research for the first time in the town's history.

The first part of the project involved a cross-disciplinary study of a late 10th-century burned-down sunken-featured building in the town centre (Out et al. in press). The second part of the project, which culminated in this paper, aimed to shed light on the development and functions of Aarhus in the Viking Age, focusing on its spatial layout, economic activities, and on the extent of its engagement in local, regional, and interregional maritime networks. The chronological framework of this study spans from the late 8th century to the end of the Viking Age. Simultaneously, its geographical scope covers primarily the area within the Viking Age rampart 1 and the reinforcement, called rampart 2 (Figure 2), encompassing a total of 40,000 m^2. The investigation analysed structures and artefacts from twenty excavations (1964 to 2022), comparing these findings with those from other Scandinavian Viking Age settlements and towns.

Settlement and seascape

Aarhus is situated at the confluence of sea and land, at the mouth of the Aarhus River, three days' sail from Kaupang and one day's sail from Haithabu (400 km and 200 km, respectively) (Skamby Madsen and Vinner 2005b, 98-101) (Figure 1). The surrounding area provided abundant coastal resources, including timber, fodder, game, grazing land, and access to fish, all ripe for exploitation (Fredskild

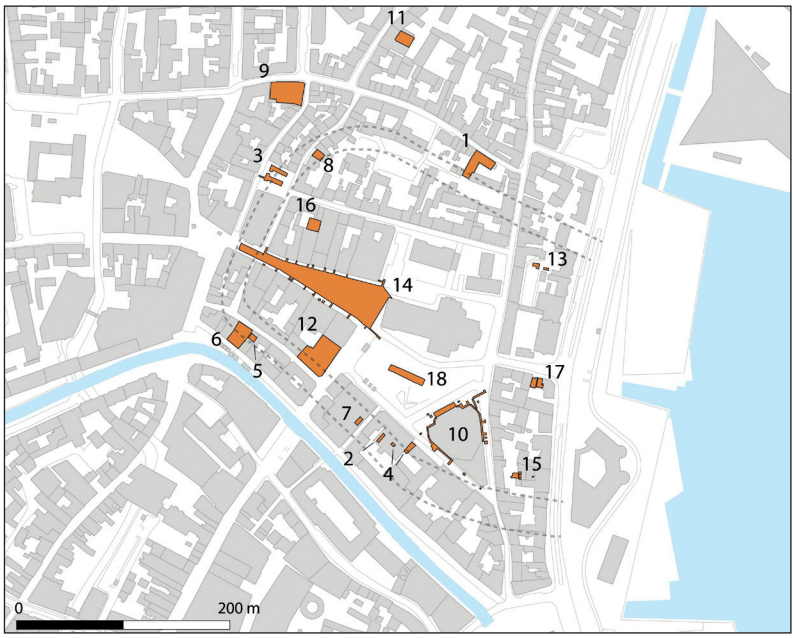

Figure 2. Locations of the excavations in Aarhus.
1: FHM 2664 Rosensgade.
2: FHM 3762 Kannikegade.
3: FHM 3992 Pustervig.
4: FHM 4267 Kannikegade.
5: FHM 4433 St. Clemens Stræde.
6: FHM 4573 St. Clemens Stræde.
7: FHM 5813 Kannikegade.
8: FHM 6211 Volden.
9: FHM 4007 Badstuegade.
10: FHM 4262 Aarhus Teater.
11: FHM 4881 Studsgade.
12: FHM 1393 Aarhus Søndervold.
13: FHM 1600 Katedralskolen.
14: FHM 4880 Store Torv.
15: FHM 4519 Skolegade 19b.
16: FHM 4278 Rosensgade.
17: FHM 4880 Havnegade 2A.
18: FHM 5124 Bispetorv.
Dotted grey lines indicate the location of the rampart (Map: © MOMU).

Figure 3. Map of the hinterland of Aarhus with Aarhus River and Brabrand Sø (Map: © MOMU).

1971; Jantzen 2013, 13-17; Jørgensen 1971; Linaa 2016, 30; Linaa 2020, 41-65; Møhl 1971; Out et al. in press). To the west, the river flows 8 km to the 3 km-long Brabrand Lake, a waterway that connected prosperous Viking Age settlements and magnate farms to the sea (Jantzen 2013, 13-16; Jeppesen 2004, 171-177, 2005b, 52-61, 2011, 87-91) (Figure 3).

Maritime connections and archaeological evidence

This region has long-standing connections to the sea. The Kanhave Canal, which cuts through Samsø at its narrowest point, is one of prehistoric Denmark's most significant engineering feats, indicating the presence of a powerful, possibly royal, authority at the dawn of the Viking Age. The canal, dated to 726, and repaired around 750, has been associated with the movement of ships across Samsø (Asingh 2005b, 116-17; Christensen 1995, 40). Furthermore, the area is rich in names linked to Viking Age warships, such as 'Snekke' (Skamby Madsen and Vinner 2005a, 88-92). Excavations at 'Sneche Eng' [Snekke Meadow], at Brabrand Fjord, uncovered processed wood and a ship's part dated to 797. This site has been interpreted as a shipyard, where the royal fleet may have been assembled (Skamby Madsen and Vinner 2005b, 94-96; Skov 2005c, 41-42).

Approximately 5 km north of Aarhus, a Viking Age agrarian settlement dating to the late 9th and 10th centuries (Skriver 2005) provides evidence of broader contacts. A nearby runic stone, dated to around the year 1000, bears the inscription:

'Alfkell and his sons raised this stone in memory of Manni, their kinsman, Ketill, the Norwegian's estate steward' (Jeppesen 2005a, 79-80).[1] Another Viking Age agrarian settlement, Randlev, located about 30 km south of Aarhus, yielded significant detector finds, evidence of a coastal site that may have connected Randlev to the sea (Jeppesen 2011, 87-90, 2023b). While the surrounding region provides evidence of the significance of maritime contacts, the critical question remains: if, how, and when did the inhabitants of the place later known as Aarhus exploit the opportunities for maritime traffic afforded by its landscape?

Materials and methods

In Aarhus, the past is becoming an increasingly scarce resource. Approximately 8% of the Viking Age settlement has been excavated, with 7% remaining accessible for archaeological investigation. The remainder lies buried beneath medieval and later structures (Jantzen 2013, 30-32; Linaa 2016, 183).

Selection of sites and data criteria

Since 1916, around 250 excavations of varying scale have been conducted in Aarhus. 20 of these were selected for analysis in this project. Given the comparative nature of the analysis, it was essential to select only those excavations, where rigorous and consistent methodologies were employed, to ensure the reliability and usability of the data. The analysis focused on primary occupation layers and secondary waste layers, while tertiary levelling layers were excluded. Based on excavation reports and findings, 18 excavations from Aarhus and two from rural sites were selected for comparative analysis (Table 1). Selection criteria included the nature of the registered structures, recovery methods (e.g., sieving and use of metal detectors), and the quality of reports and documentary materials. The two selected rural sites were the only ones outside Aarhus that met the selection criteria.

Data collection and artefact registration

The excavation reports formed the foundation of the analysis, detailing the year of excavation, site size, methodology, finds, and dating. Few ^{14}C dates were available, so these were supplemented by targeted dating of structures from three excavations (FHM 1393, FHM 4573, and FHM 5124). The artefacts from these excavations, defined as worked items excluding building materials, were catalogued in databases referencing structures and features. These were cross-referenced with site reports to account for discarded objects, with the types of artefacts listed in Table 2. The methodology mirrors that used in previous analyses of Aarhus and has been applied in the study of other towns (Linaa 2016: 42-43, 2021: 333-336).

Specific methods and calculations

The current research includes measurements of the number of artefact types per cubic metre, pottery sherds, and metals to gauge the intensity of on-site activities and facilitate comparison with other sites (Table 2). Cubic metre estimates were derived from the square metres of the excavated area, multiplied by the thickness of the Viking Age deposits, plus an additional two cubic metres of soil per sunken dwelling recorded in the subsoil (Table 1). For partially excavated sunken-featured buildings, a proportional part of the two cubic metres per dwelling was added (Sindbæk 2007a, 121-123).

Limitations and methodological considerations

Comparing the number of items per m^3 involves certain biases, such as soil volume loss due to post-depositional decomposition, uneven or uncontrolled recovery of finds, and changes in preservation conditions over time. To mitigate the uneven recovery of finds, only excavations, where soil was sieved, were included in the analysis. Some material might have been discarded during excavations prior to the 1980s, and to counteract that, the artefact collections from older excavations were compared to the more recent ones. Estimating the post-depositional composition across Aarhus presents a significant challenge. Unlike Ribe, Aarhus

Phase	Site	Year of Excavation	Date	M^3	M^3	Pithouse	Post-built house	Ditch	Rampart 1	Rampart 2
			Sites in Aarhus							
III	FHM 1393	1964	9/10th c	320	245	7			1	1
III	FHM 1600	1969	9/10th c	30	27,5	3				
I	FHM 2664	1982	9/10th c	30	15					
I	FHM 3762	1992	9/10th c	22	26,5					
III	FHM 3880	1994	9/10th c	250	128	7				
I	FHM 3992	1997	8/9th c	15	4				1	1
II	FHM 4007	1998	9/10th c	608	121,6					
III	FHM 4156	1998	9/10th c	50	15	3				
II	FHM 4262	2000	9/10th c	30	37,5	6				
I	FHM 4267	2000	8/9th c	2	17,4			1		
III	FHM 4278	2001	9/10th c	100	30	4				
I	FHM 4433	2002	8/9th c	11	14	2	2	1		1
III	FHM 4480	2003	9/10th c	50	35					
I	FHM 4573	2005	8/9th c	100	85	2	1	1		1
II	FHM 4881	2007	9/10th c	200	154	2	1			
III	FHM 5124	2010	9/10th c	245	197,75	8				
I	FHM 5813	2017	8/9th c	10	2					
I	FHM 6211	2021	8/9th c	6	3		1		1	1
			Rural sites							
III	FHM 4016	2003	9/10th c	3000	30	8	4			
III	FHM 4588	2004	9/10th c	320	48	8	4			
	Total			5399	1236	60	13	3	3	5

Table 1. Selected excavations in Aarhus and rural sites with phase, site number, year of excavation, date, square and cubic metres, and excavated structures. The excavations are ordered by year of excavation, then site number.

has not yet undergone the geochemical analyses that could provide more definitive conclusions as demonstrated by Trant et al. (2024). However, given the small size of the town centre, the sandy subsoil and cultural layers, and the fact that the site is situated on level ground about 1.5 m above mean sea level, it is reasonable to assume that decomposition and decompression levels before the modern period are comparable across Aarhus. Nevertheless, preservation conditions for metals have

Phase	Phase	Local coarseware	Baltic type ware	Reticella glass	Soapstone	Basalt quernstone	Other quernstone	Whetstone	Bone artefact	Glass bead	Segmented/cut beads	Loom weight	Spindle whorl	Smoothing stone	Weight	Coin	Other metal	Total	Finds pr m^3	Pottery pr m^3	Metal pr m^3
I	FHM 2664	31						1									4	36	2,4	2,1	0,3
I	FHM 3762	178						2	1			2						183	6,9	6,7	0,0
I	FHM 3992	12			1													13	3,3	3,0	0,0
I	FHM 4267	80					1											81	4,7	4,6	0,0
I	FHM 4433	107	10					1	6	1		3	1				6	135	9,6	7,6	0,4
I	FHM 4573	1210	22			3	4	2	11	18	1	24	5				13	1313	15,4	14,2	0,2
I	FHM 5813	10			1												2	13	6,5	5,0	1,0
I	FHM 6211	11							22								1	34	11,3	3,7	0,3
II	FHM 4007	87										1					9	97	0,8	0,7	0,1
II	FHM 4262	120					1		18	2		2					1	144	3,8	3,2	0,0
II	FHM 4881	392			4			1	2	2		4	1				3	409	2,7	2,5	0,0
III	FHM 1393	7100	74	1	65	9	5	38	85	60		109	30	1	2		769	8348	34,1	29,0	3,1
III	FHM 1600	439			20		1	8	4	2		7	3			2	127	613	22,3	16,0	4,6
III	FHM 3880	348								1		5	2					356	2,8	2,7	0,0
III	FHM 4156	46							5	25		3	1				10	90	6,0	3,1	0,7
III	FHM 4278	88			4		4	2	2	6		4	1	1			2	114	3,8	2,9	0,1
III	FHM 4480	140			9		23	5	10	15	1	8					56	267	7,6	4,0	1,6
III	FHM 5124	1695			6		11	11	60	121		33	5		1	2	59	2004	10,1	8,6	0,3
	Sum	12094	106	1	110	12	50	71	226	253	2	205	49	2	3	4	1062	14250	12,3	10,4	0,9
	FHM 4016	134			1	2	2	8	1	1		9	7		26	274	362	827	27,6	4,5	12,1
	FHM 4588	550			4		3	5	3	1		12	3		3		325	909	18,9	11,5	6,8
	Sum	684			5	2	5	13	4	2		21	10		29	274	687	1736	22,3	8,8	8,8
	Total	12778	106	1	115	14	55	84	230	255	2	226	59	2	32	278	1749	15986	12,9	10,3	1,4

Table 2. Selected excavations with phase, site number, number and types of artefacts, total number of artefacts and total finds, pottery and metals per cubic metres. The excavations are ordered by phase, then site number.

deteriorated considerably since the 1970s. This shift in preservation conditions is evident in Table 2, where FHM 1393 and FHM 1600, excavated in the 1960s, contain three to four times more metal artefacts than more recent excavations. However, the relative number of non-destructible artefacts has remained consistent.

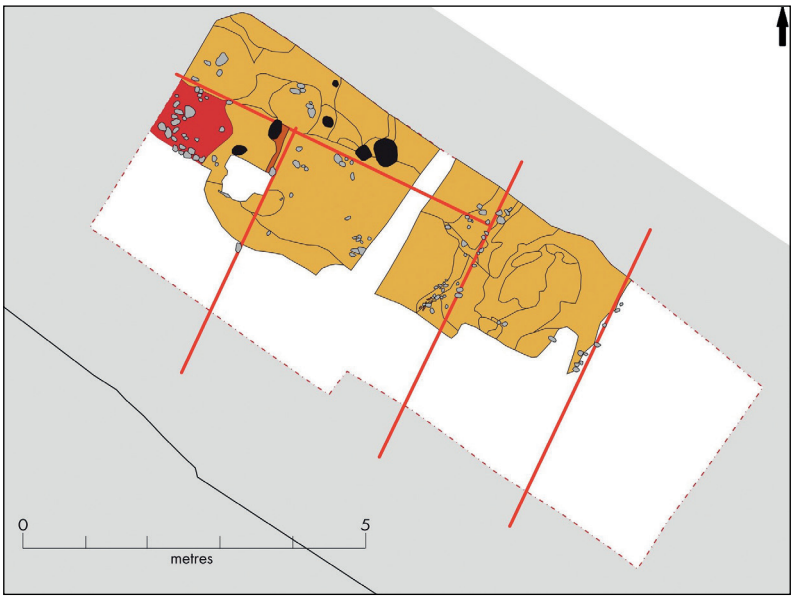

Figure 4. The remains of post-built house at FHM 4573 St. Clemens Stræde. The excavation took place in the basement of a standing building, and the building has been marked in grey. Dotted line marks the boundaries of the excavation. Yellow signature marks a clay floor, and thin black lines mark, where the floor had been repaired during the lifetime of the building. The red square in the west is a fireplace. White indicates disturbances that have destroyed the southern and eastern part of the clay floor. Stones, marked in dark grey, have been interpreted as foundations for partitioning walls, and the position of these walls has been marked as red lines. This house was demolished prior to the construction of the Viking Age rampart (Rampart 1) (Map: © MOMU).

The excavations

The sites are presented below, divided into three phases as established by Skov (2008):

I: Settlement older than Rampart 1
II: Settlement contemporary with Rampart 1
III: Settlement contemporary with Rampart 2

Phase I (c.770-c.900)

During phase I, a ditch was dug at the riverbank, possibly encircling a settlement. The ditch was filled with household waste, and a group of seasonally occupied sunken-featured buildings were constructed on the site. Over time, permanently occupied post-built houses replaced these structures, and further buildings were constructed near the coast to the west and to the north. This settlement has primarily been recovered in excavations that cut through the ramparts.

FHM 2664 Rosensgade (1982) (Figure 2, 1): A rescue excavation in the northern part of the settlement uncovered settlement layers with scattered postholes. Finds included evidence of domestic crafts, such as textile production, small-scale boneworking, and iron fragments (Madsen 1993).

FHM 3762 Kannikegade 12 (1992) (Figure 2, 2): This rescue excavation, located on the eastern part of the riverbank, revealed scattered postholes and fireplaces. The site showed evidence of domestic crafts, textile production, and some comb-making waste (Madsen 1992).

FHM 3992 Pustervig (1992) (Figure 2, 3): Located in the western part of the settlement, this rescue excavation revealed a mixed settlement layer with no registered structures. Activities identified included domestic crafts (Skov 1992; Jantzen 2013, 66).

FHM 4267 Kannikegade 14 (2000) (Figure 2, 4): Another rescue excavation on the eastern part of the riverbank revealed settlement layers dated to the 9th century. Activities at this location were primarily domestic crafts (Larsen 2000).

FHM 4433 St. Clemens Stræde (2002) (Figure 2, 5): This rescue excavation on the western part of the riverbank uncovered an 80 cm deep, 2 m wide ditch running parallel to the riverbank, filled with domestic waste. Oval sunken-featured buildings with fireplaces, possibly permanently occupied, replaced the ditch. These buildings were subsequently replaced by two post-built houses. The activities included domestic crafts and small-scale comb-making (Bitsch 2003). One of the sunken-featured buildings contained a mosaic bead, a type produced around 760-790 in Frisia (X151, Callmer Group G) (Sindbæk 2023b, 272).

FHM 4573 St. Clemens Stræde (2005) (Figure 2, 6): Located 5 m west of FHM 4433,

this excavation also revealed a ditch parallel to the riverbank, which was filled with domestic waste and later replaced by two oval sunken-featured buildings. These buildings yielded evidence of domestic crafts and textile production. A 6 m wide post-built house, dated to the 9th century, replaced the sunken-featured buildings (Linaa 2016: 71-74; Out et al. in press) (Figure 4). Activities included domestic crafts, textile production, and possible traces of metalworking (Bitsch 2007a; Linaa 2016, 71-74). A large number of fish bones indicated local fisheries (Ritchie 2019). A segmented bead with metal foil produced in the Middle East, was also found in the house (X1208 A229) (Sindbæk 2023a, 271-272).

FHM 5813 Kannikegade (2017) (Figure 2, 7): This rescue excavation on the eastern part of the riverbank revealed traces of an open settlement, with fireplaces and postholes (Poulsen 2017). The activities included domestic crafts. The settlement was established in the 8th century, with Rampart 1 dating to the late 9th century, according to ^{14}C dates.

FHM 6211 Volden 9 (2021) (Figure 2, 8): Located in the north-western part of the settled area, this rescue excavation uncovered clay floors and postholes. The findings included domestic pottery and corroded metals (Høgsberg 2022).

Phase II (c.900-c.970)

The settlement constructed in phase I was demolished and Rampart 1 was constructed at the start of phase II. Only a few sites contemporary with this rampart can be identified.

FHM 4007 Badstuegade (1998) (Figure 2, 9): This rescue excavation immediately west of the rampart uncovered three wells dated to the 10th century. The findings included domestic pottery, metals, and a loom weight (Jantzen 2013, 115; Skov 1999b-c).

FHM 4262 Aarhus Teater (2000) (Figure 2, 10): Located near the coast in the southern part of the settlement, this rescue excavation revealed fragmentary remains of six sunken-featured buildings dated to the 10n century. The activities identified included domestic crafts and textile production. Gilded mounts for a drinking horn and a buckle were recovered in the area in the 1890s and were initially interpreted as evidence of a Viking Age burial ground, although no further evidence of such a site has been found (Larsen 2001a; Linaa 2016: 163-65; Skov 2008, 218; 2009, 12).

FHM 4881 Studsgade 8-10 (2007) (Figure 2, 11): This rescue excavation immediately north of the rampart uncovered two oval sunken-featured buildings with fireplaces, later superseded by a post-built house measuring 3 by 7 m, dated to the 10th century (Bitsch 2007b; Linaa 2016; 89-91). The activities at this site included domestic crafts and textile production, and a mould for casting Thor's hammers was also found, though no further evidence of casting was discovered (Jantzen 2013, 95; Poulsen 2011, 32, 118)

Phase III (c.970-1050)

During phase III, Rampart 1 was fortified to become Rampart 2, and the area was densely covered with sunken-featured buildings. Evidence for this phase comes from the following excavations:

FHM 1393 Hotel Skandinavien (1963-64) (Figure 2, 12): This rescue excavation on the eastern part of the riverbank revealed remains of Rampart 2, a street paved with wooden boards along the rampart, and seven sunken-featured buildings dated to the 10th century.[2] The activities identified included domestic crafts, carpentry (evidenced by chisels, hammerheads, and axes), and numerous antlers, possibly used for comb production. Other finds included knives, keys, gaming pieces, and weights for scales, suggesting trade activities. A shard of glass with reticella decoration was also recovered from an undated layer. The excavation was published by Andersen, Crabb, and Madsen (1971), including detailed sections on artefacts and biofacts. One of the sunken-featured buildings, CME, was dated by ^{14}C to

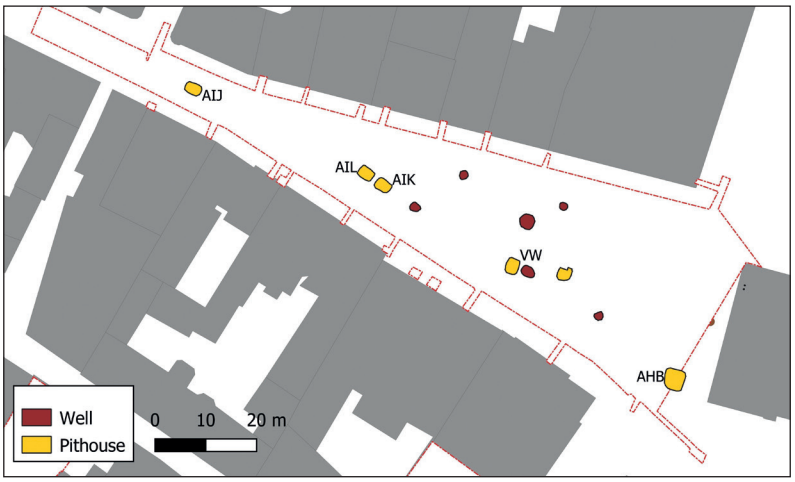

Figure 5. Sunken-featured buildings at FHM 4480 Store Torv (Map: © MOMU).

the late 10th century. Finds from this building included domestic pottery, a key, wooden artefacts, a weight, carpentry tools, whetstones, loom weights, and a comb inscribed with the name *'Hik: uin'*, of Germanic origin. This sunken-featured building is contemporary with a burned-down pithouse at Bispetorv, analysed in Project phase I (Out et al. in press).

FHM 1600 Katedralskolen (1969) (Figure 2, 13): Located in the northern part of the central town, 50 m west of the Viking Age coastline, this excavation covered 30 m^2 and revealed the remains of three sunken-featured buildings along with associated artefacts (Andersen and Madsen 1985; Skov 1997).

FHM 3880 Store Torv (1994) (Figure 2, 14): This rescue excavation in the western part of the settlement revealed seven rectangular sunken-featured buildings (pithouses) with fireplaces, pits, postholes, and wells, all dated to the 10th century (Figure 5). The activities documented included domestic crafts and some comb making (Skov 1994, 1998a, 251, 2005d 652-656).

FHM 4156 Skolegade 19b (1998) (Figure 2, 15): Located at the coast in the southern part of the settlement, this rescue excavation uncovered fragmentary remains of three sunken-featured buildings dated to the 10th century (Skov 1998b). The remaining profiles showed possible clay floors, postholes, and fireplaces. The activities identified included domestic crafts, fishing, and textile production.

FHM 4278 Rosensgade (2001) (Figure 2, 16): This rescue excavation in the northern part of the settlement revealed oval sunken-featured buildings with fireplaces, along with scattered pits and postholes, all dated to the 10th century. The activities included domestic crafts and textile production, evidenced by the discovery of a smoothing stone (Larsen 2001b; Linaa 2016, 66).

FHM 4480 Havnegade 2A (2003) (Figure 2, 17): This site yielded postholes and pits associated with a 10th-century smithy and bronze caster's workshop (Larsen 2004). The findings included slag, corroded metals, and traces of domestic crafts and textile production. A cut bead (Callmer type Q52, X350) was redeposited in a medieval context.

FHM 5124 Bispetorv (2010) (Figure 2, 18): This research excavation, located 200 m north of the riverbank, uncovered seven rectangular sunken-featured buildings with fireplaces (Figure 6). One of these buildings, A334, which was burned, was ^{14}C dated to the last decades of the 10th century and is the subject of Part I of this project (Out et al. in press).[3] The activities identified included domestic crafts and carpentry. A spherical weight for scales and two coins minted by Harald Bluetooth in Haithabu were found, indicating bullion-based trade (Bitsch 2010; Linaa 2016, 99-100).

Rural sites

Two rural sites were included in the analysis for comparative purposes:

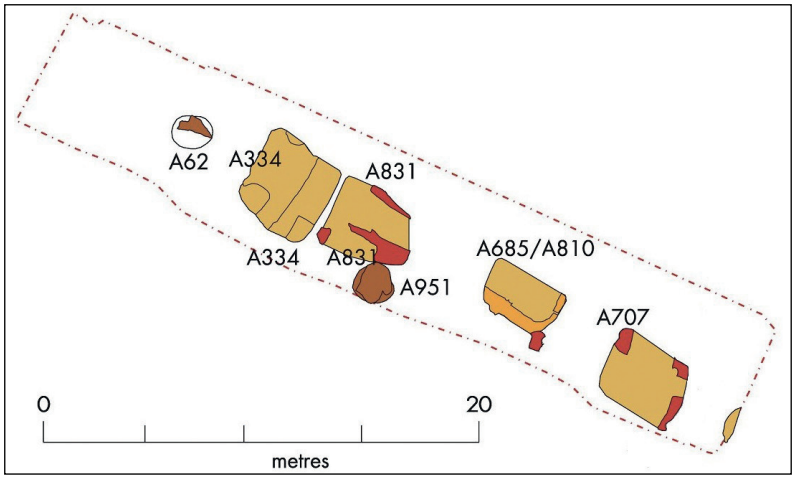

Figure 6. Sunken-featured buildings at FHM 5124 Bispetorv (Map: © MOMU).

FHM 4588 Egå Gymnasium (2004): This rescue excavation, located at the estuary of the Egå River, 5 km north of Aarhus, uncovered longhouses, sunken-featured buildings, wells, and ditches. The activities identified at the site included domestic crafts, textile production, carpentry, and evidence of trade, such as weights for scales. Analysis of the faunal remains indicated on-site meat production (Jeppesen 2005a; Kveiborg 2005; Skriver 2005).

FHM 4016 Randlev (2003): Situated approximately 30 km south of Aarhus and about 2 km from the coast, this rescue excavation revealed longhouses, sunken-featured buildings, and wells. The settlement yielded a large number of metals due to intensive metal detecting, including a miniature sword, a gilded bronze pendant, a bronze belt mount, a silver pendant, hack silver, and 27 weights for scales, all suggesting bullion-based trade. Additionally, three silver hoards containing 237 Arabic coins were discovered at the settlement, with the youngest coin minted in 910/11. A well was dated by dendrochronology to the year 900. The site has been studied extensively by Jeppesen (1998, 2000, 2003, 2011; Jeppesen and Adamsen 2005).

Analysis

The artefacts from the selected excavations

The analysis includes structures and 15,986 artefacts from the selected excavations (Table 2): 14,250 from the 18 selected excavations in Aarhus and 1,736 from the rural sites of Egå and Randlev. On average, the excavations yielded 10 artefacts per m^3, although this number varies significantly: FHM 1393 Hotel Skandinavien yielded 34 artefacts per m^3, while FHM 4007 Badstuegade yielded just 0.7, indicating variations in population density and land use. Pottery constitutes 75 to 98% of the artefacts recovered.

Pottery

The dominant pottery type in the selected excavations is low-fired, hand-shaped, and coiled, featuring hemispherical vessels (Figure 7). In the 8th and 9th centuries, the fabric was thick and tempered with coarse stones, but it became thinner and finer by the 10th century (Andersen, Crabb, and Madsen 1971, 76-87; Knudsen 2023, 35). This pottery type is present in all excavations. The second category in Table 2, Baltic-type pottery, is characterised by incised horizontal or wavy lines. The rims of Baltic Blackware vessels are shaped using a template, and the vessel itself is formed on a slow-turning wheel (Keller 2023, 60; Sindbæk 2014, 280-284; Ulriksen and Brorsson 2023, 1-2). Sherds with Baltic-type decorations are rare, constituting less than 1% of the total pottery. Among the Baltic-type sherds is pottery with Feldberger-type decoration found in phase I in a post-built house on the riverbank (Bitsch 2007a; Linaa 2016, 73). However, these vessels are hand-shaped, and their rims are not template-formed. Comparisons with domestically produced pottery and genuine Baltic Blackware in the study collection of the Department of Archaeology and Cultural Heritage Studies, Aarhus University, reveal that these sherds,

Figure 7. Locally produced, hemispherical pottery vessel from the late Viking Age. Diameter 18 cm (Photo: © MOMU).

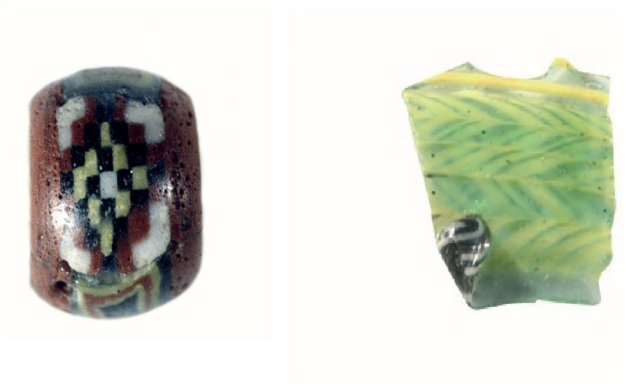

Figure 8. Left: Mosaic bead from Frisia, excavated in FHM 4573, dated to the late 9th century. Length 1,2 cm. Right: Reticella glass, excavated in FHM 1393, dated to the 10th century. Length 3,4 cm (Photo: © MOMU).

and similar examples found at the excavation of FHM 1393 Hotel Skandinavien, were produced locally, and were not imported (Linaa 2016, 163-65). This finding is consistent with results from Zealand, where Baltic-type pottery has similarly been shown to be domestically produced (Ulriksen and Brorsson 2023, 9-10).

Quernstones

Quernstones were an integral part of domestic activities, as noted by Baug (2015) and Pohl (2012), and they are among the artefacts from the selected excavations as well. Of the 69 quernstones identified, 55 are made of Norwegian schist, while the remaining are of basalt from the Mayen area in the Rhineland. Norwegian quernstones are present across all phases and in all but the smallest excavations, just as in sites such as Ribe and Kaupang (Resi 2011, 389-391; Sindbæk and Barfod 2023, 87-89). The number of fragments is generally low, possibly representing one to two quernstones per household. Basalt quernstones from the Rhineland were found at the riverbank in phases I and III (FHM 4573 X671, X261, X1294; FHM 1393 CME/EFR), with additional fragments discovered in Randlev.

Whetstones and soapstone vessels

Whetstones and soapstone vessels from Norway are commonly found in both towns and rural areas, and they were frequent in the selected excavations as well. Specific provenance analysis is not possible, as no petrological analyses have been undertaken. These items are primarily recovered from sunken-featured buildings and on floors in post-built houses across all phases and in all but the smallest excavations. They appear to have been a consistent part of Viking Age household equipment, from the settlement established in phase I to the end of the Viking Age in phase III (Baug et al. 2023, 106-110; Resi 2011, 380-393; Sindbæk and Barfod 2023, 91-93).

Glass beakers and drinking glasses

Glass beakers, bowls, or drinking glasses are notably rare in Aarhus. Only one shard, decorated with reticella and possibly produced in Western Europe, has been recovered from the city. It was found in the selected excavation FHM 1393 (Figure 8, right). Similar shards have been dated to the 8th or 9th century (Feveile 2023, 215). Drinking glasses are often associated with an elite drinking culture involving Tating jugs (Feveile 2023, 215-17; Gaut 2011, 183-195; Henderson and Holand 1992, 220-227; Steppuhn 1998, 64-65). The absence of Tating ware and the recovery of only one shard of glass – potentially transported as raw material for bead production – suggests that this practice was not prevalent in Aarhus.

Textile production

Textile production was a fundamental activity in most, if not all households, as evidenced by the presence of loom weights and spindle whorls in the selected excavations. The loom weights are either low-fired or unfired, while the spindle whorls are made of fired clay and are conical in shape. Loom weights have been found in layers predating the earliest sunken-featured buildings, indicating that textile production was a core activity from the settlement's inception. These items are also frequently found in rural settlements (FHM 4573). Smoothing stones made of glass were found in the burned sunken-featured building CME during the excavation of FHM 1393 Hotel Skandinavien, dated to the late 10th century (phase III). Another smoothing stone was discovered in the excavation of FHM 4278 Rosensgade in a sunken-featured building A1, probably from phase III. Similar stones have been found in Ribe, Kaupang, and Haithabu (Andersson 2003, 82; Croix 2023, 352-364; Øye 2011, 343-356).

Bone artefacts

Bone artefacts, such as combs and needles, along with the waste products from their production, are found in all the selected excavations (Andersson 2003, 127-128; Croix 2023, 369-371; Øye 2011, 356-357). The waste is scattered across the floors of dwellings, and a dedicated workshop has never been identified, although concentrations at Store Torv (FHM 3880) suggest that production occurred there. Analyses indicate that the waste is primarily from red deer, while many finished combs are made of reindeer antler and are likely imported from Norway (Ashby, Coutu and Sindbæk 2015).

Glass beads

Glass beads were a staple in households across all phases, and most of the selected excavations yielded some (Skov 2005d, 655). Beads may have been imported, as no bead-making workshop has been identified, although a few finds of glass threads might suggest occasional bead-making in the 10th century. A gilded segmented bead (Callmer Group E) was found on the oldest floor of a 9th-century post-built house in phase I (FHM 4673, X1287, A229). This bead type is known from recent excavations in Haithabu and Ribe, where 190 such beads have been found, dated to the late 8th and early 9th centuries, as well as from landing sites such as Vester Egesborg on Zealand (Sindbæk 2023b; Steppuhn 1998, 40-41; Ulriksen 2018, 218-219). A mosaic bead (Callmer Group G) (FHM 4433, X151), possibly manufactured in Frisia, was discovered in an undated sunken-featured building on a neighbouring plot, about 5 m to the east (Sindbæk 2023b, 259-264; Steppuhn 1998, 51) (Figure 8, left). An eye-bead (Callmer Group B) (FHM 5124, X1247), possibly produced in southern Europe, was recovered from a late 10th-century context. A small cut bead (Callmer Group Q) was redeposited in a medieval context during the excavation of the bronze caster's workshop at FHM 4480 (phase III). These beads are well-known in Ribe, where 158 have been found in contexts dated to the late 8th and early 9th centuries, as well as in Haithabu (Sindbæk 2023b, 272; Steppuhn 1998, 52-53). The majority of the other beads are plain, predominantly green or blue.

Weights and coins

Weights and coins are notably scarce in Aarhus: only three weights, all spherical, and four coins have been discovered in the selected excavations, all found on the floors of sunken-featured buildings dating to the 10th century (phase III). Among these are two cross coins minted by Harald Bluetooth in Haithabu, found in the burned sunken-featured building A334, dated to the 980s (A736 and A813 (P53)) (Out et al. in press). The coins have been studied by Moesgaard (2011). Similar spherical weights have been found in 10th-century contexts in Ribe (Feveile 2023, 117-121; Croix et al. 2019; Søvsø 2020). An unidentifiable coin and an Arabic dirham were also recovered in a sunken-featured building at FHM 1600 Katedralskolen (phase III) (Andersen and Madsen 1985). In contrast, three weights were found in the rural settlement FHM 4588 Egå Gymnasium, and 26 weights, along with 274 coins, primarily dirhams, were discovered at the rural site of FHM 4015 Randlev, dated to the 10th century. The exceptionally high number of coins here results from the discovery of three hoards (Jeppesen 2011, 87-90).

Phase	Site	Textile production	Bone/antler	Trade	Smith	Bronze caster
Phase I 8/9th c	FHM 3762 Kannikegade 12	■	■			
	FHM 4433 St. Clemens Stræde	■	■			
	FHM 4573 St. Clemens Stræde	■				
	FHM 3992 Pustervig					
	FHM 4267 Kannikegade					
	FHM 5813 Kannikegade					
	FHM 6211 Volden 9					
Phase II Early 10th c	FHM 4007 Badstuegade	■				
	FHM 4262 Aarhus Teater	■				
	FHM 4881 Studsgade 8-10	■				
	FHM 5124 Bispetorv I	■				
Phase III Late 10th c	FHM 3880 Store Torv	■	■			
	FHM 4156 Skolegade 19b	■		■		
	FHM 4278 Rosensgade	■				■
	FHM 4480 Havnegade 2A	■			■	■
	FHM 1600 Katedralskolen	■	■	■	■	■
	FHM 1393 Hotel Skandinavien	■	■	■	■	■
	FHM 5124 Bispetorv II	■	■	■	■	
Rural 9/10th c	FHM 4016 Randlev	■	■	■	■	
	FHM 4588 Egå Gymnasium	■	■	■	■	

Table 3. Occurrence of crafts grouped according to phases. Specialised crafts appear to be introduced in phase III.

Other metal artefacts

The metals listed in Table 2 include tools for carpentry, needles, nails, mounts, and buckles. Although metal artefacts are common in the selected excavations, only one production site has been excavated (FHM 4480 Havnegade 2, phase III). Personal adornments, such as buckles and mounts, are frequently found, particularly in older excavations such as FHM 1393 Hotel Skandinavien (e.g., buckle EQJ from a sunken-featured building, CME, phase III) (Andersen, Crabb, and Madsen 1971, 215-217). A mould for bronze casting in the shape of a Thor's hammer was discovered during the excavation of FHM 4278 Rosensgade 17-19, Studsgade 8-10, but no further evidence of production was registered at other sites (phase III).

Results

Evidence of production, craft, and trade

Evidence of the exploitation of coastal resources such as fishing, animal husbandry, grazing, and possibly agriculture is apparent from the earliest days of the settlement and continues throughout all phases (Fredskild 1971; Jørgensen 1971; Møhl 1971; Out et al. in press; Ritchie 2017). Table 3 reflects the presence or absence of craft and production-related activities. Domestic crafts involving querns, soapstone, pottery, and whetstones are found in all but the smallest excavations across all phases, along with traces of textile production and bone working. A total of 106 combs and associated

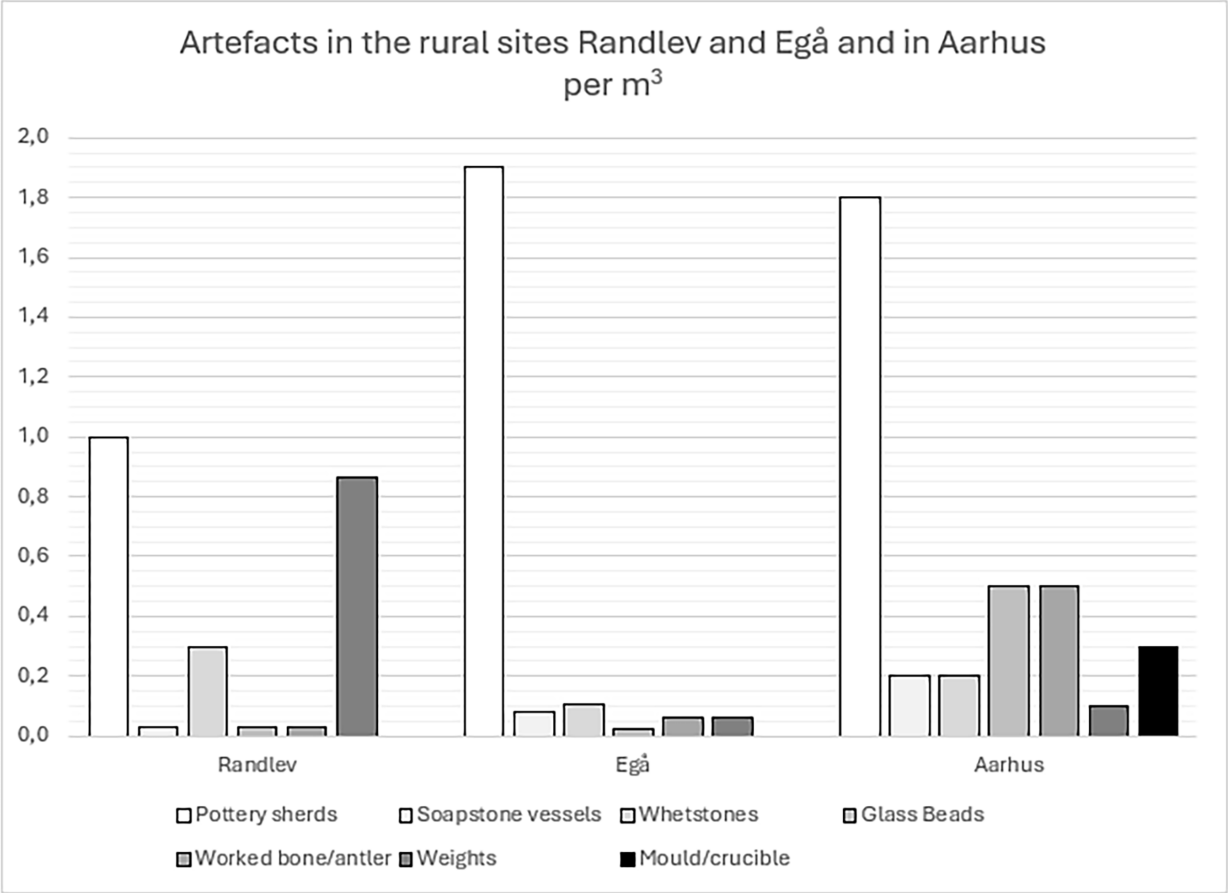

Figure 9. Selected artefacts per m³ in Aarhus and the rural sites of Egå and Randlev. Pottery was reduced by 80% and coin hoards were subtracted from Randlev. Sample size: Aarhus: 1158 m³, 12,3 artefacts per m³, Egå; 48 m³, 18,9 artefacts per m³. Randlev: 30 m³, 18,8 artefacts per m³.

waste material from Aarhus, all from phase III, have been analysed. The raw material for comb production was sourced locally, while a few complete combs were made from reindeer antler, suggesting that these were traded or transported from Norway (Ashby, Coutu, and Sindbæk 2015, 13-14; Out et al. in press).

Bronze casting and metalworking were introduced in phase III, along with tools for trade. However, the number of related artefacts is generally low – constituting less than 1% of the recovered artefacts – and only one specialised workshop has been excavated. All crafts practised in Aarhus were also common in Egå and Randlev, except for bronze casting. Moreover, the evidence of trade-related artefacts in these rural sites surpasses that in Aarhus (Figure 9).

Evidence of imports

Only 255 artefacts, approximately 2% of the 15,986 recovered artefacts, are identified as imports (Table 4). Of these, 245 artefacts (94%) were imported from Norway. Western European imports have been present since the mid-9th century, primarily in the form of basalt querns, while the sole eastern imports are an Arabic coin and a bead. However, most of these imports are also found in Randlev and Egå. Consequently, the only imported artefacts that distinguish Aarhus from the surrounding settlements are a reticella glass shard, two beads from the 9th century, a bead and two glass smoothing stones from the 10th century, and raw material for 10th-century bronze casting.

Phase	Date	Site	Coin	Weight	North			West				East	Total	M³	Imports pr m³	No. of artefacts per m³
					Soapstone	Whetstone	Quernstone	Basalt quernstone	Gilded glas bead	Glass smoothing stone	Reticella glass	Cut bead				
Phase I	8/9th c	FHM 3992			1								1	4	0,25	3,3
		FHM 5813			1								1	2	0,50	6,5
		FHM 4433				1							1	14	0,07	9.6
		FHM 4573				5	4	3	1				13	85	0,15	15,4
		FHM 4267					1						0	17,4	0,00	4,7
		FHM 6211											0	3	0,00	11,3
Phase II	Early 10th c	FHM 3762				2							2	26,5	0,08	6,9
		FHM 4881			4	1							5	154	0,03	2,7
		FHM4262					1						0	37,5	0,00	3,8
		FHM 4007											0	122	0,00	0,8
Phase III	Late 10th c	FHM 4278			4	2	4			1			11	30	0,37	3,8
		FHM4156										1	1	15	0,07	6
		FHM 3880											0	128	0,00	2,8
		FHM 4480			9	5	23						37	35	1,06	7,7
		FHM 1600	2		20	8	1						31	27,5	1,13	22,3
		FHM 1393		2	65	38	5	9		1	1		121	245	0,49	34,1
		FHM 5124	2	1	6	11	11						31	198	0,16	10,1
		Sum	4	3	110	73	50	12	1	2	1	1	255	1144	0,22	12,3
Rural	9/10th c	FHM 4016	274	26	1	8	3	2					314	30	10,47	27,6
		FHM 4588		3	4	5	2						14	48	0,29	18,9
		Total	278	32	115	86	55	14	1	2	1	1	583	1222	0,48	13

Table 4. Imported artefacts grouped according to phases. The selected excavations are ordered by phase, date, and site number. Artefact type and provenance are added, along with cubic metres, imported number of artefacts per cubic metres and total number of artefacts per cubic metre.

Figure 10. Conceptual map of the settlement in the 9th century (phase 1). The map depicts Aarhus as a plot-divided settlement, similar to what is known from Ribe and Haithabu, However, so far, no clear evidence of streets or plot boundaries has been found during excavations in the city. Map from Skov 2011, 63 (Map: © MOMU).

Discussion

Intensity and density of the settlement

The excavated structures and the measurement of artefacts per m^3 provide valuable insights into the density and intensity of the settlement. In phase I, the settlement appears to have been most densely concentrated along the riverbank. Approximately 400 m from the coast, four sunken-featured buildings, possibly seasonally occupied, and two permanently occupied post-built houses have been identified within an area of 15 x 15 m (FHM 4573) (Figure 2, 5, 6). Nevertheless, the excavated areas are small, only 80 m^2, which makes the orientation of the houses difficult, and no ditches or plot boundaries have been excavated (Figure 4). The settlement seems less dense towards the coast, with yards and fireplaces recorded during excavations between Kannikegade and the river (FHM 6813) (Figure 2, 7). Traces of clay floors were found at Volden 9 (FHM 6211) (Figure 2, 7), and fireplaces were discovered at Mejlgade 28 (Skov 2003) (Figure 12). On the latest model of the town, from 2011, this settlement has been reconstructed as a regulated and plot-divided settlement with adjoining streets running along the river (Figure 10). Such a settlement structure is characteristic of early Ribe. However, no traces of neither plots nor streets have been excavated in Aarhus, and the settlement may have been unstructured.

The number of artefacts per m^3 in Aarhus is relatively low: the highest number recorded in phase I is 15.4, and in phase III, 34, whereas Kaupang, Ribe, and Haithabu yielded 93, 459, and 171 artefacts per m^3, respectively (Data from Jankuhn 1986; Kalmring 2010; Radtke 2007; Sindbæk 2023a; Skre 2011) (Table 2 and Figure 11). While differences in preservation conditions might theoretically account for some of this disparity, it is notable that Aarhus yielded a maximum of 8 pottery sherds per m^3 in phase I and 29 in phase III, compared to 17 in Kaupang – where no domestic pottery was produced – and 166 in Ribe. Although pottery use may have been more widespread in Ribe than in Aarhus, the significantly lower number of artefacts of any type per m^3 in Aarhus suggests that activities at this site were much less intense than in the 8th and 9th-century towns.

Identifying a settlement contemporary with Rampart 1 is challenging due to the limited availability of ^{14}C dates. Nevertheless, the settlement appears to have been dominated by sunken-featured buildings, one of which was excavated at Bispetorv (Out et al. in press). Scattered postholes may indicate the presence of larger buildings. In phase III, the settlement seems relatively dense, with eight sunken-featured buildings uncovered within 250 m^2 at Bispetorv (FHM 5124) (Figure 2, 14) and seven within 200 m^2 at Store Torv (FHM 3880 (Figure 2, 14) The northern parts of the area might also have been densely built, as indicated by the remains of several sunken-featured buildings unearthed during excavations there (FHM 4157, FHM 1600, FHM 4278). On the latest reconstruction of the town, from 2011, Aarhus is depicted as a plot-divided settlement of sunken-featured buildings and post-built houses organised around a regulated street grid, similar to what is known from Ribe and Hedeby (Figure 12). However, the larger excavations, such as Store Torv (FHM 3880 (Figure 5) and Bispetorv (FHM 5124) (Figure 6), reflect an unregulated settlement of sunken-featured buildings with no traces of streets or plot boundaries.

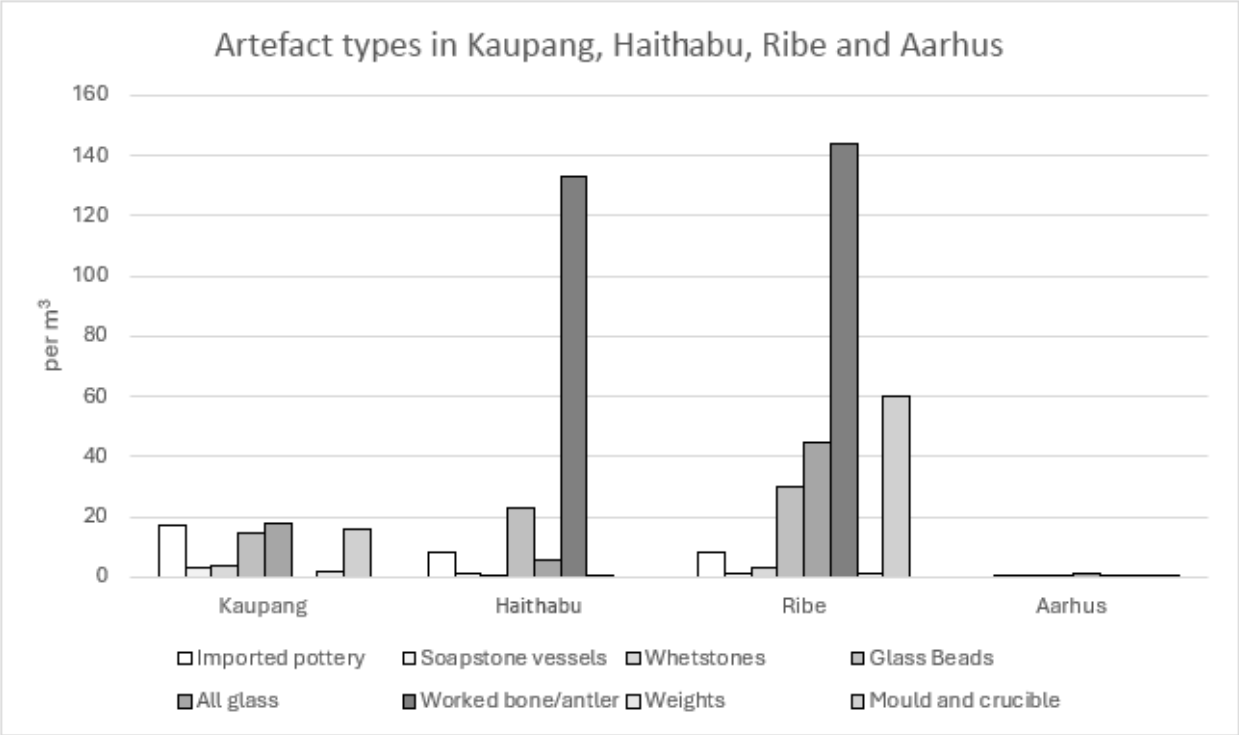

Figure 11. Viking Age Kaupang, Haithabu, Ribe and Aarhus. The proportion of selected artefacts per m^3 of sieved soil. Data: Haithabu after Kalmring 2010. Kaupang after Skree 2011. Ribe after Sindbæk 2023. Sample size: Haithabu: 200 m^3, 171 artefacts per m^3. Kaupang: 215 m^3, 93 artefacts per m^3. Ribe: 160 m^3, 459 artefacts per m^3. and Aarhus 1158 m^3, 12,3 artefacts per m^3.

The number of artefacts per m^3 further illuminates the intensity of the settlement in phase III. Table 2 shows that the number of artefacts per m^3 increased from 15 to 34 from the 9th to 10th century, possibly reflecting an intensification of the settlement and a rise in the number of inhabitants. Additionally, the number of whetstones, loom weights, and spindle whorls doubled during this period, indicating an intensification of the settlement in the 10th century (FHM 4573, FHM 4433,

Figure 12. Conceptual map of the settlement in the late 10th century (phase III). The map illustrates Aarhus as a plot-divided settlement with a regulated street network, comparable to Haithabu and Dorestad, However, excavations in the city have so far not revealed clear evidence of streets or plot boundaries. Map from Skov 2011, 63 (Map: © MOMU).

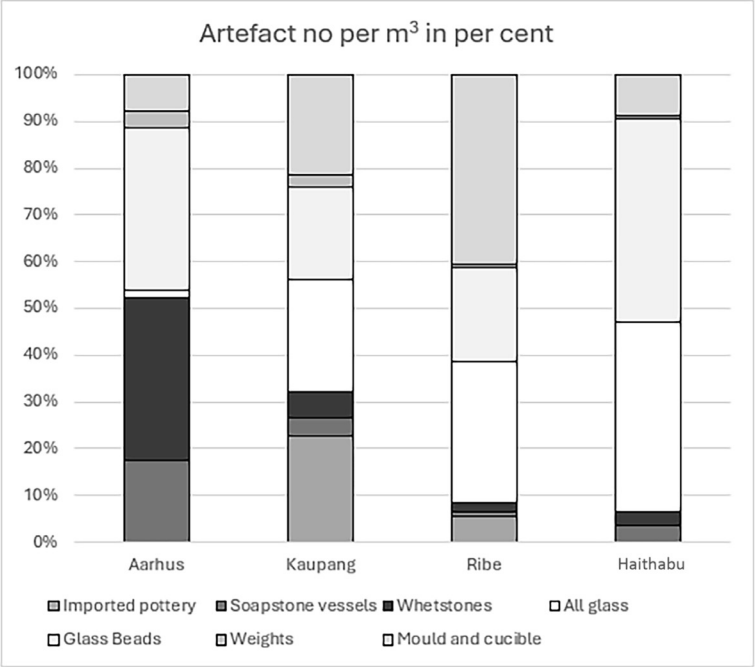

Figure 13. Viking Age Kaupang, Haithabu, Ribe and Aarhus. The relative proportion of selected artefacts per m³ of sieved soil. Data: Haithabu after Kalmring 2010. Kaupang after Skree 2011. Ribe after Sindbæk 2023. Sample size: Haithabu: 200 m³, 171 artefacts per m³. Kaupang: 215 m³, 93 artefacts per m³. Ribe: 160 m³, 459 artefacts per m³. and Aarhus 1158 m³, 12,3 artefacts per m³.

FHM 1393). The 10th-century settlement along the coast north of the cathedral also appears to have been intensively used (FHM 1600), while areas along the eastern part of Kannikegade and the western and northern regions yielded only 2 to 3 sherds per m³, suggesting these areas were less densely occupied.

Despite the increase in settlement intensity from the 9th to the 10th century, Aarhus was still far less intensely occupied than Haithabu, Kaupang, and the slightly earlier Ribe (Figure 11). However, the intensity of settlement at the rural sites of Egå and Randlev, which both yielded 18 artefacts per m³ (Table 2), is comparable to that of Aarhus. The town was hardly bustling with activities compared to these rural settlements.

The development, functions and maritime networks of the settlement

Phase I developments (c.780-c.900): A modest coastal settlement

Archaeological findings indicate that during phase I (*c.*780-*c.*900), the earliest settlement of Aarhus comprised oval sunken-featured structures designed for seasonal use, primarily exploiting coastal resources (Out et al. in press). The absence of plot boundaries suggests a lack of deliberate planning in the site's development (Krongaard Kristensen and Poulsen 2016, 40-44).

In phase I, traces of trade and imports – apart from soapstone, querns, and whetstones found in all settlements – are rare (Table 2). The only exceptions are a few reindeer combs and an eastern bead, possibly brought by visitors (Ashby, Coutu and Sindbæk 2015, 13-14; Out et al. in press). This limited number of imports contrasts sharply with the large volumes found in Ribe, Haithabu, and Kaupang (Figures 11 and 13). Pottery from the Vorgebirge, Mayen, Pingsdorf, and Tating regions account for 25% of the pottery in Kaupang, that had no local pottery production, and 7% in Haithabu and Ribe, yet these West-European pottery types have not been recorded in Aarhus to date (Deckers 2023, 77; Janssen 1987, 27; Knudsen 2023, 25; Linaa 2016: 163-65; Pilø 2011, 285; Pilø and Pedersen 2007, 179-190). The apparent absence of these and other imported artefacts in Aarhus suggests that this settlement had few connections to the maritime networks through which these types were distributed.

Neither the networks linking Ribe, Haithabu, or Kaupang nor the east-west networks extending along the North Sea and through the Eastern Baltic seems to have included Aarhus (Hedenstierna-Jonson 2020, 60-64; Shepard 2008, 143-160; Sindbæk 2007a, 70-71; 2007b, 129. Not only do the imports from Aarhus differ from Ribe, Haithabu, and Kaupang, but the nature of the activities also contrasts with those at the other sites. In these sites, activities are dominated by specialised craft production, such

as bead making, bronze casting, and gold-and-silver smithery, often using imported raw materials (Ashby, Coutu and Sindbæk 2015, 4; Feveile 2023, 233; Gaut 2011, 169; Sindbæk 2023b, 245-248; Steppuhn 1998, 82). No such activities have been documented in Aarhus during phase I and II (Figures 11 and 13).

The site in phase I does not share the characteristics of the towns, but it was hardly an important landing site either; key characteristics of such sites, like weight scales, concentrated production remnants, and imported ceramics – evident at Aggersborg, Vester Egesborg, and Lundeborg – are absent in Aarhus (Sindbæk 2009, 100; Ulriksen 2018: 214-15, 340-45; 409-13). Consequently, there is little evidence to suggest that Aarhus served as a hub for interregional trade or specialised craft production at this point in the 8th or 9th centuries. Instead, Aarhus might have been one of many specialised sites with various, perhaps shifting, functions established in the late 8th or 9th century (Krongaard Kristensen and Poulsen 2016, 37-40; Sindbæk 2007a, 123-126; 2014, 152-153.

Phase II developments (c.900-c.970): Rampart and reorganisation

Phase II marked a significant spatial transformation, characterised by the demolition of the earlier sunken-featured settlement. This was replaced by an oval or horseshoe-shaped rampart enclosing an area of approximately 40 hectares (Bitsch 2010). The rampart, constructed from turf and lacking the inner support structure or stockade characteristic of the ring fortresses, shares similarities in dating, construction, and function with a 10th-century rampart found in Ribe (Christensen et al. 2021, 4-5; Krongaard Kristensen and Poulsen 2016, 47-48; Søvsø 2020, 208-211). While the rampart in Ribe was built to protect a significant town, the rampart around Aarhus appears to have served a different purpose. The settlement within the rampart remained primarily a local landing/outfield site, still characterised by sunken-featured buildings, the exploitation of coastal resources, and domestic, unspecialised crafts. Traces of long-distance contact, apart from the ever-present whetstones, querns, and soapstone vessels, have not been identified at this point.

The continuity of building traditions and activities suggests that, if the construction of the rampart was intended as part of a broader initiative to reorganise or urbanise the site, this plan was ultimately not realised at this time (see Table 3). However, some changes did occur, as the site gained a measure of international recognition. By 948, a bishop's seat was established in town by the archepiscopal seat in Hamburg, though the extent of the bishop's presence in Aarhus remains unclear (Krongaard Kristensen and Poulsen 2016, 48; Linaa 2016, 33).

Phase III Developments (c.970-1050): Urbanisation and increasing specialisation

Sometime around 970, the rampart was refortified, marking the beginning of phase III. This refortification, known as Rampart 2, involved cladding the outer side of the rampart in turf and supporting it with a fascine (Bitsch 2010; Christensen et al. 2021, 4-5; Sindbæk 2014, 187-196). During this period, the area within the rampart appears to have been covered with rectangular sunken-featured buildings (Figures 6 and 7). However, the fence-lined, regulated plots and street grid typical of mercantile quarters in Ribe and Haithabu have not yet been documented in Aarhus, although such a layout is shown in models of the town (Figure 12) (Skov 2004; 552-555; 2011a, 62-63; Søvsø 2020, 153-55, 231-237).

The activities might have intensified in phase III, as the increase in pottery sherds per m^3 from 14 to 29 may indicate a more intense occupation in the late 10th century compared to the 8th or 9th centuries. The late 10th century saw the introduction of specialised crafts (Table 4). However, the waste products from these and other crafts were limited, and most activities – apart from smithing – appear to have occurred in dwellings rather than specialised workshops (Skov 2010, 652-656). The primary economic activities continued to focus on exploiting coastal resources. (Andersen, Crabb, and Madsen 1971, 307-319; Fredskild 1971; Jørgensen 1971; Møhl 1971; Ritchie 2017; Out et al. in press). Nevertheless, tools of trade, including coins from Haithabu, a dirham, and weights for scales, have been recovered from sunken-featured buildings dating to the late 10th century (FHM 1600; FHM 1393; FHM 5124; Out et al. in press) (Table 2). The number of coins and weights is small compared to the large

quantities found in Randlev, suggesting that the modes of trade, exchange methods, and perhaps the nature of traded goods varied significantly between *this site* and Aarhus (Price and Raffield 2024, 39-42). In contrast, Egå has yielded a significantly smaller number of metals, coins, and weights, indicating that this settlement was likely less active. Nonetheless, both rural sites engaged in craft production, including domestic and unspecialised crafts, small-scale bone and antler working, and some smithing – activities similar to those in Aarhus. However, specialised crafts such as bronze casting have not yet been documented at these rural sites (Figure 9)

What distinguished Aarhus from Egå and Randlev at this point may not have been the activities themselves or their scale, but rather the fortification, the settlement structure, its status as an ecclesiastical centre, and later the establishment of a royal mint under the Kings Hardeknud and Magnus the Good (1035-42 and 1043-47) (Skov 2008, 218). These features suggest that by the mid-to-late 10th century, Aarhus, also known as Aros, had emerged as one of many new towns founded at the end of the Viking Age. The development of Aarhus *does not* mirror that of major early towns; Aarhus diverges significantly from the well-known in terms of import volume, composition, and activities. However, Aarhus *does* show similarities to other towns, e.g. Odense, Aalborg and Lund, where settlements of sunken-featured buildings evolved into towns in the latter part of the 10th century or the early part of the 11th (Krongaard Kristensen 2016, 63; Runge and Henriksen 2018, 16-21; Runge et al. 2020, 75-85; Roesdahl 2023, 252-255; Sindbæk 2007a, 128; Søvsø 2020, 253-255; Vrængmose Jensen and Møller 2009, 99-100). However, the rich detector sites around Randlev and Egå (Jeppesen 2023a, 2023b) indicate that some people in Eastern Jutland were integrated into the Viking Age world of trade, travel, and raids – though these activities did not seem to involve either the 10th-century town or the 8th-9th century outfield site.

Defending Aarhus: The role of ramparts and maritime features

The exposed location of Aarhus on the open coast in the middle of Denmark is atypical for the 8th or early 9th-century town suggested in previous research; in contrast, Ribe, Haithabu, and Kaupang were all founded in border regions along traffic corridors some distance from the sea (Sindbæk 2007a, 129, 2009, 105-106). To explain this unusual location, it has been suggested that an advanced maritime defence system involving the Kanhave Canal, bases on Helgenæs, and a shipyard at the Aarhus River may have existed (Skamby Madsen and Vinner 2005b, 94-97; Skov 2005b, 41-42, 2008, 124; 2011, 64-66). However, the Kanhave Canal, dated to circa 726 and repaired around 750, predates the earliest known settlement in Aarhus by several decades, as demonstrated by Christensen (1995). Although the presence of 'Snekke' names on Samsø and Djursland underscores the importance of maritime activities in the area, no evidence links them specifically to Aarhus, as these names are found throughout Denmark. Moreover, the excavated remains at Snekkeeng do not indicate activities on a scale comparable to the massive deposits known from shipyards such as the late Viking Age Fribrødre River on Falster, excavated by Skamby Madsen (2010) (Skamby Madsen and Vinner 2005a, 94-97). Thus far, the existence of a maritime defence for Aarhus is far from proven. However, future investigations may reveal additional evidence.

A defence might have been needed, as written accounts reveal that Aarhus was attacked by the Norwegian king Harald Hardrada in 1046 (Henrichsen 1968, 158-160). Nevertheless, the archaeological evidence of warfare is sparse so far. The first centuries appear to have been peaceful, as there is no evidence of attacks, such as destruction by fire, in phases I-II. However, this may have changed as Aarhus developed into a town in the late Viking Age, as weapons – possibly from an attack – have been found during excavations at Rampart 2 (Andersen, Crabb, and Madsen 1971, 204; Søgaard 1961, 196). Furthermore, two sunken-featured buildings that burned in the last decades of the 10th century (A443, FHM 5124 Bispetorv, and CME, FHM 1393 Hotel Skandinavien) might have succumbed to an attack (Bitsch 2010; Out et al. in press). Finally, a late Viking Age warrior burial, including a shield and battle axe, may indicate a military presence in Aarhus, as might a runic stone from the late Viking Age that mentions a man named Ful, who died in a battle 'where kings fought,' possibly referring to the Battle

of Svolder (Høgsberg 2020; Roesdahl and Wilson 2006, 208-229).[4]

Conclusion: The developments, activities and maritime networks of Aarhus in the Viking Age

This study has provided valuable insights into the development of Aarhus during the Viking Age. By analysing almost 16,000 artefacts from 20 excavations, it is clear that Aarhus did not become a fully-fledged town until the late 10th century. Prior to this, it functioned primarily as a small landing site, focused on exploiting coastal resources, with limited evidence of long-distance trade or specialised crafts. The few imported artefacts, mainly beads and combs, were likely brought by travellers or traders, but they do not suggest that Aarhus played a significant role in broader maritime networks. Such a role might have been played by Randlev and other settlements surrounding Aarhus.

While Aarhus shares similarities with other early settlements, such as Odense and Aalborg, it differs from more prominent Viking Age towns like Ribe, Haithabu, and Kaupang, especially in terms of trade volume and the nature of its activities. Despite its location between the Baltics and the North Sea, which could have been advantageous, the role of Aarhus in interregional trade was largely unexploited until the Middle Ages, when it became part of the Hanseatic network.

The development of Aarhus reflects broader trends seen in settlements like Odense and Aalborg, where small outfield settlements evolved into towns in the late 10th century, without substantial evidence of interregional trade. In contrast, detector finds from Randlev and Egå indicate that people in Eastern Jutland were engaged in Viking Age trade and travel, though Aarhus itself did not seem to participate.

Most of the Viking Age settlement is buried beneath modern structures. What remains of the Viking Age town has been heavily disturbed, while the earlier landing site has been destroyed by modern development. With a significant portion of the settlement inaccessible due to these later constructions, future research will rely heavily on the artefact collections stored in archives. This non-destructive approach offers a valuable means of uncovering new insights. The *Vikings' Aros* project has demonstrated the potential of such studies, activating old collections into new stories about Aarhus in the Viking world.

Acknowledgements

The author would like to express gratitude to the following individuals for their contributions, including information and discussions, access to excavations and materials, assistance with the identification of artefacts, and the creation of maps: Daniel Dalicsek, Casper Skaaning Andersen, Mogens Høgsberg, Peter Mose Jensen, Jens Jeppesen, Sven Kalmring, Marie Kanstrup, Søren Munch Kristiansen, Jacob Kveiborg, Lars Krants Larsen, Birgit Maixner, Welmoed Out, Karin Poulsen, Uffe Rasmussen, Ken Ritchie, Søren Sindbæk, Hans Skov and Morten Søvsø. Finally, the author would like to thank the two anonymous reviewers for their constructive comments, which have greatly improved this work.

Funding

This work was funded by the Danish Ministry of Culture (grant no. 2021-0002). No potential conflict of interest was reported by the author.

Notes

1 The inscription is recorded in the database Danske Runeindskrifter as number MJy 67 (https://runer.ku.dk).

2 AMS ^{14}C Dating Centre Report 2482. FHM 1373, CME, AAR 37191: Charred grain from the floor, ^{14}C age 1050 ± 26: 992-1024 (68.3%) and/or 974-1032 (95.4%). Another charred grain from the same structure and context, AAR37290 ^{14}C Age 1125 ± 29: 979-1022 (68,3%) and/or 973 1026 (95.4%).

3 AMS ^{14}C Dating Centre Report 2842, FHM 5124, AAR37170: charred grain from the flor: ^{14}C age 1062 ± 24, 978-1022 (68.3%) and/or 897-1027(95.4%)

4 The inscription is recorded in the database Danske Runeindskrifter as number MJy 77 (https://runer.ku.dk).

References

Andersen, H., Crabb, P.J. and Madsen, H.J., 1971. *Århus Søndervold: En byarkæologisk undersøgelse*. Copenhagen: Gyldendal.

Andersen, H. and Madsen, H.J., 1985. Byudgravning ved Århus Katedralskole. *Kuml* 1985, 35-95. Højbjerg: Jutland Archaeological Society. http://dx.doi.org/10.7146/kuml.v33i33.109700

Andersson, E., 2003. *Tools for textile production from Birka and Hedeby: Excavations in the Black Earth, 1990-1995*. Birka Studies 8. Stockholm: Riksantikvarämbetet.

Arbman, H. 1939, *Birka. Sveriges Äldsta Handelsstad*, Stockholm: Thule.

Ashby, S.P. Coutu, A.N. and Sindbæk, S. M., 2015. Urban Networks and Arctic outlands: Craft Specialists and Reindeer Antler in Viking Towns. *European Journal of Archaeology* 18:4, 679-704. http://dx.doi.org/10.1179/1461957115y.0000000003

Asingh, P., 2005a. Helgenæs. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 106-114.

Asingh, P., 2005b. Samsø. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 114-117.

Baug, I., 2015. *Quarrying in Western Norway: An Archaeological Study of Production and Distribution in the Viking Period and Middle Ages*. Oxford: Archaeopress. http://dx.doi.org/10.2307/j.ctvr43j4p

Baug, I., Skree, D., Sørlie-Røhr, T. and Heldal, T., 2023. Whetstones and Touchstones. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe*. Aarhus: Aarhus University Press, 103-114. http://dx.doi.org/10.2307/jj.10518934.10

Bitsch, B.R., 2003. FHM 4433 *St. Clemens Stræde*. Moesgaard Museum.

Bitsch, B.R., 2007a. FHM 4573 *Skt. Clemens Stræde 10 og Åboulevarden 60*. Moesgaard Museum.

Bitsch, B.R., 2007b. *FHM 4881 Studsgade 8-10*. Moesgaard Museum.

Bitsch, B.R., 2010. *FHM 5124 Bispetorv*. Moesgaard Museum.

Blindheim, C., Heyerdahl-Larsen, B. and Tollnes, R.I., 1981. *Kaupang-funnene*. Bind I. Oslo; Universitetets Oldsakssamling.

Callmer, J., 1977. Trade Beads and Bead Trade in Scandinavia ca. 800-1000 AD. *Acta Archaeologica* 11. Bonn: Rudolph Halbert Verlag.

Christensen, J., Daly, A., Henriksen, P.S., Holm, N., Jessen, C., Jørgensen, S., Olesen, L., Olsen, J., Schultz, M.K., Sindbæk, S.M. and Ulriksen, J., 2021. Borgring: Uncovering the strategy for a Viking age ring fortress in Denmark. *Danish Journal of Archaeology* 10, 1-22. http://dx.doi.org/10.7146/dja.v10i0.121920

Christensen, K., 1995. Kanhave-kanalen. *In*: H. Hansen and B. Aaby, eds. *Stavns Fjord – et natur- og kulturhistrisk forskningsområde på Samsø*. København, 99-117.

Corsi, M., 2020. *Urbanisation in Viking Age and Medieval Denmark: From Landing Place to Town*. Amsterdam: Amsterdam University Press, 93-134. http://dx.doi.org/10.1017/9789048538706

Croix, S., 2023. Textile production. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe*. Aarhus: Aarhus University Press, 351-378. http://dx.doi.org/10.2307/jj.10518934.21

Croix, S., Gundersen, O.E., Kristiansen, S.M., Olsen, J., Sindbæk, S.M. and Søvsø, M., 2019. Dating Earthwork Fortifications: Integrating five dating methods in Viking-age Ribe, Denmark. *Journal of Archaeological Science: Reports* 26. http://dx.doi.org/10.1016/j.jasrep.2019.101906

Deckers, P., 2023. Tating Ware. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe*. Aarhus: Aarhus University Press, 69-82. http://dx.doi.org/10.2307/jj.10518934.7

Feveile, C., 2023 The numismatic evidence from Posthustorvet. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe*. Aarhus: Aarhus University Press, 115-146. http://dx.doi.org/10.2307/jj.10518934.11

Feveile, L., 2023. Vessel-glass Sherds from Posthustorvet. In: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe*. Aarhus: Aarhus University Press, 201-238. http://dx.doi.org/10.2307/jj.10518934.15

Fredskild, B., 1971. Makroskopiske planterester fra det ældste Århus. *In*: H.H. Andersen, P.J. Crabb and H.J. Madsen, eds. *Århus Søndervold: En byarkæologisk undersøgelse*. Copenhagen: Gyldendal, 307-328.

Gaut, B., 2011. Vessel Glass and Evidence of Glassworking. *In*: D. Skre, ed. *Things from the Town: Artefacts and Inhabitants in Viking-Age Kaupang*. Aarhus: University Press and Kaupang excavation project, 169-280. http://dx.doi.org/10.2307/jj.608256.11

Hedenstierna-Jonson, C., 2020. With Asia as Neighbour. Archaeological Evidence of Contacts between Scandinavia and Central Asia in the Viking Age and Tang Dynasty. *Bulletin of the Museum of Far Eastern Antiquities* 81, 43-64.

Henrichsen, C.L., 1968. *Adam af Bremen, De hamburgske Ærkebispers historie og Nordens beskrivelse*. Copenhagen: Det Schonbergske Forlag.

Henderson, J. and Holand, I., 1992. The Glass from Borg, an Early Medieval Chieftain's Farm in Northern Norway. *Medieval Archaeology* 361, 29-58. http://dx.doi.org/10.1080/00766097.1992.11735547

Høgsberg, M., 2020. *FHM5646 Hovedbiblioteket*. Moesgaard Museum.

Høgsberg, M., 2022. *FHM 6211 Volden 9*. Moesgaard Museum.

Jankuhn, H., 1986. *Haithabu, Ein Handelsplatz der Wikingerzeit*. Neumünster: Wachholz.

Janssen, W., 1987. *Die Importkeramik Haithabu*. Neumünster: Wachholz.

Jantzen, C., 2013. *Middelalderbyen Aarhus*. Aarhus: Aarhus Byhistorisk Fond.

Jeppesen, J., 1998. *FHM 4015 Randlev*. Moesgaard Museum.

Jeppesen, J., 2000. Randlevs vikinger. *Østjysk hjemstavn* 65, 9-20.

Jeppesen, J., 2003. Over Randlev-skatten i arkæologisk sammenhæng. *Nordisk Numismatisk Unions medlemsblad* 3-4, 39-44.

Jeppesen, J., 2004. Stormandsgården ved Lisbjerg kirke, Nye undersøgelser. *Kuml* 36, 1-22. Højbjerg: Jutland Archaeological Society. http://dx.doi.org/10.7146/kuml.v53i53.97497

Jeppesen, J., 2005a. Egå. *In*: A. Damm, ed. *Vikingerne s Aros*. Højbjerg: Moesgaard Museum, 76-79.

Jeppesen, J., 2005b. Lisbjerg. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 52-61.

Jeppesen, J., 2011. Magnate Farms and Lordship from the Viking Age to the Medieval Period in Eastern Jutland. *In*: B. Poulsen and S.M. Sindbæk, eds. *Settlement and Lordship in Viking and Early Medieval Scandinavia*. Turnhout: Brepols, 137-145. http://dx.doi.org/10.1484/m.tmc-eb.4.1008

Jeppesen, J., 2023a. *FHM 6565*. Moesgaard Museum.

Jeppesen, J., 2023b. *FHM 5883*. Moesgaard Museum.

Jeppesen, J. and Adamsen, C., 2005. Randlev. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 62-71.

Jeppesen, J., 2011. Randlev. *In*: H. Skov and J. Varberg, eds. *Aros og vikingernes verden: Syv fortællinger og rejseberetninger fra Aros*. Højbjerg: Moesgaard Museum, 86-91.

Jørgensen, S., 1971. Den pollenanalytiske undersøgelse. *In*: H. Andersen, P.J. Crabb and H.J. Madsen, eds. *Århus Søndervold: En byarkæologisk undersøgelse*. Copenhagen: Gyldendal, 289-304.

Kalmring, S., 2010. *Der Hafen von Haithabu*. Neumünster: Wachholtz Verlag.

Kalmring, S., 2024. *Towns and Commerce in Viking Scandinavia*. Cambridge: Cambridge University Press. http://dx.doi.org/10.1080/00293652.2024.2407777

Keller, C., 2023. Rheinish and other imported pottery. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe*. Aarhus: Aarhus University Press, 53-68. http://dx.doi.org/10.2307/jj.10518934.6

Klindt-Jensen, O. and Andersen, H., 1964. Det ældste Aarhus. *KUML* 1963, 75-87. http://dx.doi.org/10.7146/kuml.v13i13.104002

Knudsen, M., 2023. The Pottery from Posthustorvet. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-Age Ribe.* Aarhus: Aarhus University Press, 21-52. http://dx.doi.org/10.2307/jj.10518934.5

Krongaard Kristensen, H. and Poulsen, B., 2016. *Danske byer i middelalderen*. Aarhus: Aarhus University Press. http://dx.doi.org/10.2307/jj.608318

Kveiborg, J., 2005. *Knoglemateriale fra FHM 4588, Egå Gymnasium: En zooarkæologisk undersøgelse af*

dyreholdet på en vikingetidsboplads. Højbjerg: Moesgaard Museum, Dept. of Archaeological Science and Conservation, report 2005:2.

Larsen, L.K., 2000. *FHM 4267 Kannikegade 12*. Moesgaard Museum.

Larsen, L.K., 2001a. *FHM 4262 Aarhus Teater*. Moesgaard Museum.

Larsen, L.K., 2001b. *FHM 4278 Rosensgade*. Moesgaard Museum.

Larsen, L.K., 2004. FHM 4480 Havnegade 2a. Moesgaard Museum.

Leth Beiter, E. 2024, Byen under byen. *Weekendavisen* 13. september 2024, sektion 4 (Ideer), 3.

Linaa, J., 2016. *Urban Consumption: Tracing Urbanity in the Archaeological Record of Aarhus c.AD 800-1800*. Højbjerg: Jutland Archaeological Society.

Linaa, J., ed., 2020. *Bebyggelse på Samsø i vikingetid og middelalder*. Højbjerg: Jutland Archaeological Society. http://dx.doi.org/10.2307/jj.423446.4

Linaa, J., ed., 2021. *Urban Diaspora: The Rise and Fall of Migrant Communities in Early Modern Denmark and Sweden*. Archaeology-History-Science. Aarhus: Aarhus University Press. http://dx.doi.org/10.2307/j.ctv34wmvnh

Lund, J. and Sindbæk, S.M., 2022. Crossing the Maelstrom: New Departures in Viking Archaeology. *Journal of Archaeological Research* 30 (2), 169-229. http://dx.doi.org/10.1007/s10814-021-09163-3

Madsen, H.J. 1992, *FHM 3762, Kannikegade 12*, Moesgaard Museum.

Madsen, H.J., 1993. *FHM 2664 Rosensgade*. Moesgaard Museum.

Madsen, H.J., 1996. Vikingernes By 900-1100. *In*: I. Geil, ed. *Aarhus Byens Historie -1720*. Aarhus: Aarhus Byhistoriske Udvalg, 197-224.

Moesgaard, J.C., 2011. Cross-motif Coins from Aarhus. *In*: H. Skov and J. Varberg, eds. *Aros and the World of the Vikings: The Stories and Travelogues of Seven Vikings from Aros*. Aarhus: Moesgaard Museum, 67-69.

Moesgaard Museum, 2024. *Prospekt – Nyt international vikingemuseum i Aarhus*. Moesgaard Museum. https://www.moesgaardmuseum.dk/media/1000/vikingetids-prospekt_final-version.pdf

Møhl, U., 1971. Et knoglemateriale fra vikingetid og middelalder i Aarhus. *In*: H.H. Andersen, P.J. Crabb and H.J. Madsen, eds. *Århus Søndervold: En byarkæologisk undersøgelse*. Copenhagen: Gyldendal, 321-329.

Out, W.A., Kveiborg, J., Jensen, P.M., Andersen, C.S., Andonova-Katsarski, M., Hammers, N., Kanstrup, M., Ritchie, K.C., Stenner, C. and Linaa, J., (in press). Interregional Networks in the Late Viking Age? Insights from a burned Pit House in the Viking-Age Town of Aros, Present-day Aarhus, Denmark *c.*980 CE. *Archaeological and Anthropological Sciences* (in press).

Pilø, L., 2011. The Pottery. In: D. Skre, ed. *Things from the Town: Artefacts and Inhabitants in Viking-Age Kaupang*. Aarhus: Aarhus University Press, 281-304. http://dx.doi.org/10.2307/jj.608256.12

Pilø, L. and Pedersen, U., 2007. The Settlement: Artefacts and Site Periods. *In*: D. Skre and S. Brink, eds. *Kaupang in Skiringssal*. Aarhus: Aarhus University Press, 179-190.

Pohl, M., 2012. *Steinreich: Mühlsteine, Tuff und Trass aus der östlichen Vulkaneifel und ihr Markt: Eine Vergleichende Analyse vorindustrieller Produktion- und Handelsstrukturen*. Bochum: Selvstverlag des Deutschen Bergbau-Museums.

Poulsen, K., 2011. *Den middelalderlige bydel nord for Volden i Århus*. Højbjerg: Middelalderarkæologisk Nyhedsbrev.

Poulsen, K., 2017. *FHM 5813 Kannikegade*. Moesgaard Museum.

Price, N. and Raffield, B. 2024, *The Vikings*, Abingdon: Routledge.

Radtke, C., 2007. *Das archäologische Fundmaterial* VIII. Berichte über die Ausgrabungen in Haithabu 36. Neumünster: Wacholtz.

Resi, H.G., 2011. Whetstones, Grindstones, Touchstones and Smoothers. *In*: D. Skree, ed. *Things from the Town: Artefacts and Inhabitants in Viking-Age Kaupang*. Kaupang Excavation Project 3. Aarhus: University Press, 373-393. http://dx.doi.org/10.2307/jj.608256.16

Ritchie, K., 2019. *Zooarkæologisk analyse af dyreknogler fra FHM 4573a, Skt. Clemens Stræde*. Højbjerg: Moesgaard Museum, Dept. of Archaeological Science and Conservation.

Roesdahl, E., 2023: *Fra vikingetid til Valdemarstid. Danmark 950-1200*. Aarhus: Aarhus University Press. http://dx.doi.org/10.2307/jj.10518930

Roesdahl, E. and Wilson, D.M., 2006. The Århus Rune-stones. *In*: P. Gammeltoft and B. Jørgensen, eds. *Names through the Looking-glass: Festschrift in honour of Gilian Fellows-Jensen*. Copenhagen: Reitzels, 208-229.

Runge, M. and Henriksen, M.B., 2018. The Origins of Odense – New Aspects of Early Urbanisation in Southern Scandinavia. *Danish Journal of Archaeology* 71, 2-68. http://dx.doi.org/10.1080/21662282.2018.1475891

Runge, M., Beck, M.R., Bjerregaard, M. and Sarauw, T.B., 2020. *From Central Space to Urban Place: Urbanisation Processes in Viking Age and Medieval Odense and Aalborg, Denmark*. Odense: University Press of Southern Denmark.

Shepard, J., 2008. The Viking Rus and Byzantium. *In*: A. Brink and N. Price, eds. *The Viking World*. London: Routledge, 496-516.

Sindbæk, S.M., 2007a. Networks and Nodal Points: The Emergence of Towns in Early Viking Age Scandinavia. *Antiquity* 81, 19–132. http://dx.doi.org/10.1017/s0003598x00094886

Sindbæk, S.M., 2007b. The small worls of the Vikings: Networks in early medieval communication and exchange. *Norwegian Archaeological Review* 40-1, 59-74. http://dx.doi.org/10.1080/00293650701327619

Sindbæk, S.M., 2009. Open Access, Nodal Points, and Central Places: Maritime Communication and Locational Principles for Coastal Sites in South Scandinavia, *c*.AD 400-1200/Avatud ligipääs, sõlmpunktid ja keskused: veeteed ja Lõuna-Skandinaavia rannaasulate paiknemisloogika aastail 400-1200 pKr. *Estonian Journal of Archaeology* 132, 96-110. http://dx.doi.org/10.3176/arch.2009.2.02

Sindbæk, S.M., 2014. Landbebyggelsen. *In*: E. Roesdahl, S.M. Sindbæk and A. Pedersen, eds. *Aggersborg i vikingetiden: bebyggelsen og borgen*. Højbjerg: Jutland Archaeological Society, 103-184.

Sindbæk, S.M., (ed)., 2023a. *Northern Emporium: The Networks of Viking-age Ribe.* Aarhus: Aarhus University Press. http://dx.doi.org/10.2307/jj.10518934

Sindbæk, S.M., 2023b. Glass beads and Beadmaking. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-age Rib*e. Aarhus: Aarhus University Press, 239-282. http://dx.doi.org/10.2307/jj.10518934.16

Sindbæk, S.M. and Barfod, G.H., 2023. Stone and Shell Products. *In*: S.M. Sindbæk, ed. *Northern Emporium: The Networks of Viking-age Ribe*. Aarhus: Aarhus University Press, 27-102. http://dx.doi.org/10.2307/jj.10518934.9

Skamby Madsen, J., ed., 2010. *Fribrødre Å: A Late 11th century Ship-handling Site on Falster*. Højbjerg: Jutland Archaeological Society.

Skamby Madsen, J. and Vinner, M., 2005a. Skibe, navigation og havne. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 80-97.

Skamby Madsen, J., and Vinner, M. 2005b. Søvejen til Aros. *In*: A. Damm, ed. *Vikingernes Aros.* Højbjerg: Moesgaard Museum, 98-105.

Skov, H., 1992. *FHM 3992 Pustervig*. Moesgaard Museum.

Skov, H., 1994. *FHM 3880 Store Torv*. Moesgaard Museum.

Skov, H., 1997. Udgravningerne ved Aarhus Katedralskole i 1994-95. *Kuml* 1995/1996, 189-206. http://dx.doi.org/10.7146/kuml.v40i40.112341

Skov, H., 1998a. Udgravningerne i Århus Midtby 1994-97. *Kuml* 1997/98, 227-294. http://dx.doi.org/10.7146/kuml.v41i41.113369

Skov, H., 1998b. *FHM 4156 Skolegade* 19b. Moesgaard Museum.

Skov, H., 1999a. Archaeological Evidence of Trade in Aarhus, Denmark, from the 10th to the 17th centuries. *In*: M. Gläser, ed. *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum* II: Der Handel. Lübeck: Verlag Schmidt-Römhild, 603-612.

Skov, H., 1999b. *FHM 4007 Badstuegade*. Moesgaard Museum.

Skov, H., 1999c. Brønde i Århus fra vikingetid til nyere tid. *In*: O. Høiriis, ed. *Menneskelivets mangfoldighed: Arkæologisk og antropologisk forskning på Moesgård*. Højbjerg: Aarhus University Press, 269-280.

Skov, H., 2003. *FHM 4300 Mejlgade* 18. Moesgaard Museum.

Skov, H., 2004. The infrastructure in Århus between 900 and 1600 AD. *In*: M. Gläser, ed. *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum* IV, 551-566. Lübeck: Verlag Schmidt-Römhild.

Skov, H., 2005a. Aros 700-1100. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 15-39.

Skov, H., 2005b. Udgravningerne i vikingernes Aros. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 118-119.

Skov, H., 2005c. Viby. *In*: A. Damm, ed. *Vikingernes Aros*. Højbjerg: Moesgaard Museum, 40-45.

Skov, H., 2005d. Evidence of Crafts in Aarhus AD 800-1600. *In*: M. Gläser, ed. *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum* V, 651-668. Lübeck: Verlag Schmidt-Römhild.

Skov, H., 2008. Det ældste Århus – ca. 770-1200. *UBAS Nordisk* 5, 215-226.

Skov, H., 2009. Det ældste Århus ca. 770-1200. *Århus Stifts Årbøger* 92, 5-20.

Skov, H., 2010. The Defense and Town Fortifications of Aarhus from the 8th to the 15th century. *In*: M. Gläser, ed. *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum* VII, 883-897. Lübeck: Verlag Schmidt-Römhild.

Skov, H. 2011a. Kort om Aros. *In*: H. Skov and J. Varberg eds. *Aros og vikingernes verden: Syv fortællinger og rejseberetninger fra Aros*. Højbjerg: Moesgaard Museum, 62-63.

Skov, H. 2011b. Fremskudt søforsvar af Aros. *In*: H. Skov and J. Varberg eds. *Aros og vikingernes verden: Syv fortællinger og rejseberetninger fra Aros*. Højbjerg: Moesgaard Museum, 62-66

Skre, D. (ed), 2011. *Things from the Town: Artefacts and Inhabitants in Viking-Age Kaupang*. Kaupang Excavation Project 3, Aarhus: University Press. http://dx.doi.org/10.2307/jj.608256

Skriver, C., 2005. *FHM 4588 Egå Statsgymnasium*. Moesgaard Museum.

Steppuhn, P., 1998. *Die Glasfunde von Haithabu*. Neumünster: Wachholtz.

Søgaard, H., 1961. Det ældste Århus. Aarhus: Universitetsforlaget.

Søvsø, M., 2020. *Ribe 700-1050: From Emporium to Civitas in Southern Scandinavia*. Aarhus: Aarhus University Press. http://dx.doi.org/10.2307/j.ctv34wmnw7

Trant, P.L.K., Wouters, B., Croix, S., Sindbæk, S., Deckers, P. and Kristiansen, S., 2024. A multi-proxy geochemical and micromorphological study of the use of space and stratigraphy of a Viking-age house in Ribe, Denmark, *Archaeological and Anthropological Sciences*. 16, 59. http://dx.doi.org/10.1007/s12520-024-01962-1

Ulriksen, J., 2018. *Vester Egesborg: En anløbs- og togtsamlingsplads fra yngre germansk jernalder og vikingetid på Sydsjælland*, Sealand. Aarhus: Aarhus University Press. http://dx.doi.org/10.2307/j.ctv34wmrfz

Ulriksen, J. and Brorsson, T., 2023. Sukow Ware at Vester Egesborg, Denmark? *Danish Journal of Archaeology* 121-1-23. http://dx.doi.org/10.7146/dja.v12i1.133826

Vrængmose Jensen, C. and Bergmann Møller, S., 2009. 'Algade 9 gør Aalborg ældre', *Årsberetning* 2009. Aalborg: Nordjyllands Historiske Museum, 99-105.

Øye, I., 2011. Textile Production Equipment. *In*: D. Skre and S. Brink, eds. *Kaupang in Skiringssal*. Aarhus: Aarhus University Press, 337-370.