The Bishop's Brick House

Remains of Medieval Buildings on the River Bank of Koroinen, Finland

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Abstract

The article re-examines the remains of medieval buildings located on the river bank at the Cape of Koroinen in Turku, where the episcopal see of Finland was located in the 13th century. We take a new look at the structures with a special focus on the use of brick. It seems that a stone keep with a brick floor and a small brick house with grand brick decorations as well as a large wooden house with a heat-storage hypocaust were constructed before 1429. The stone keep and the wooden house with a hypocaust appear to date from the 13th to early 14th century. Another large wooden building preceding the keep may be one of the bishop's first buildings, or it might even be older than that. The masonry buildings suffered from tilting, which may be the reason they were not repaired after a possible fire.

Introduction

The present article[1] re-examines the remains of medieval masonry buildings – the so-called bishop's palace and a defensive tower – as well as other structures located on the bank of the River Aurajoki on the Cape of Koroinen in Turku, Finland (Fig. 1). It takes a new look at the structures with a special focus on the use of brick. Along with the remains of a cathedral and an associated cemetery at the centre of the site, these building remains may constitute the earliest cases in which masonry structures were built and brick was applied in mainland Finland in the 13th century (Koivunen 2003, 78 f.; Hiekkanen 2007, 185 f.; Ratilainen 2016). Some scholars argue, however, that the purpose of the masonry buildings on the river bank is still unknown, and all the remains of masonry structures at the site might actually be late medieval in date (Hiekkanen 1994, 239 f.; 2007, 185 f.; Palola 2003, 110).

The present-day Cape of Koroinen is separated from the mainland by a partly reconstructed dry moat and embankment, originally built sometime during the Middle Ages. Beyond the cape lay the estate of Koroinen. On the river bank, inside the fortified area, it is still possible to see the remains of two masonry buildings and a brick structure between them. About 20 m to the north, at the centre of the cape, there are foundation stones for two consecutive wooden churches and the remains of a

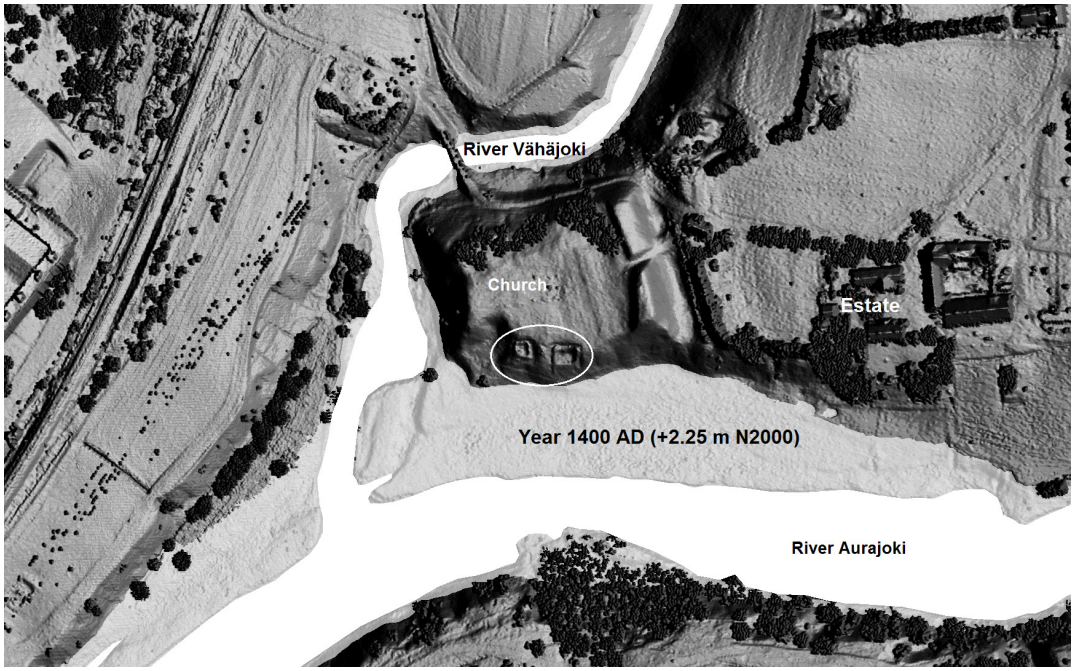

Fig. 1. The Cape of Koroinen and the shore level in 1400 AD (+2.25 m N2000) (Vuorela et al. 2009, 89). Contemporary river level (+0.153 m N2000) marked in white. Map contains data from the National Land Survey of Finland Laser scanning data 3/2012. Modelling by J. Kinnunen.

masonry building to their east (Fig. 1).

The very first episcopal see in Finland was probably located in Nousiainen, about 20 km north-west of Turku (Fig. 2). Sometime after 1229, it was transferred to a more suitable place, presumably to Koroinen. It is a cape formed by the branches of the rivers Aurajoki and Vähäjoki (Fig. 1). However, the final present-day location of the see was 1.6 km downstream, in the town of Turku, to where the see was moved around 1300 (FMU 72; Gallén 1978, 321 f.; Nilsson 1998, 72, 84 f.; Gardberg 2000, 27 ff.; Palola 2003, 109 f.; Hiekkanen 2007, 184, 188; Salonen 2014, 14 ff.).

The bishops of Turku had several medieval residences. The Cape of Koroinen was the earliest main residence; however, the surrounding lands belonged to the office. Outside the fortified cape was the bishop's estate with a stone house. Carl Jacob Gardberg (1973, 74) suggests that it was in use at the same time as the cape, while Christian Lovén (1996, 264) argues that the stone house was built only after the cape fell out of use. Since 1295, the bishops had another important residence, the Kuusisto Castle in Kaarina, about 15 km south-east of Turku (REA 17; Läntinen 1978, 99; Suna 1994, 6; Uotila 1994, 30; Paarma 2015, 27 ff. On the construction history, see Uotila 1998, 87 ff.; 2000) (Fig. 2). The third episcopal residence had been situated in the town of Turku since the 1340s, when Bishop Hemmingus bought land on the northern side of Turku Cathedral in order to create "a nearby temporary residence" (REA 108, 112, 116) and had a town house built there (Gardberg 1973, 184; 2000, 28, 125; Kuujo 1981, 186 ff. On the construction history, see Brusila & Lepokorpi 1981). It has been suggested that Kuusisto Castle developed into the bishop's principal base, and the fire of

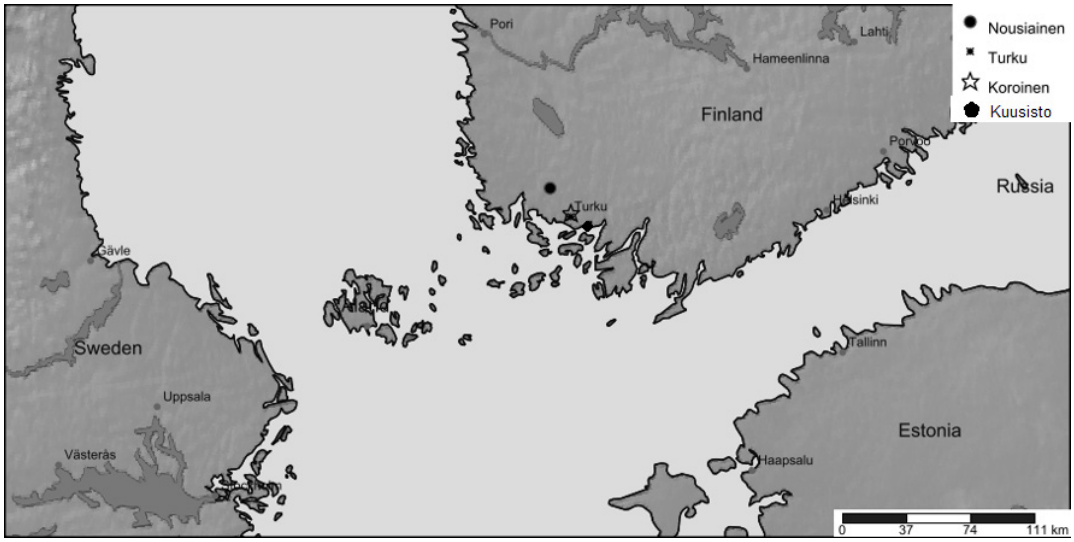

Fig. 2. Location of Koroinen, Nousiainen, and Kuusisto near Turku in south-west Finland. Map by T. Ratilainen and Shorthouse, David P. 2010. SimpleMappr, an online tool to produce publication-quality point maps. [Retrieved from http://www.simplemappr.net. Accessed April 13, 2016.]

1429 in Koroinen drove the bishop to build a stone house in Turku (Palola 2003, 111; see also Seppänen 2012, 660 ff.; Paarma 2015, 23 ff.). Nonetheless, episcopal letters signed in Koroinen show that bishops resided there even at the end of the 15th century (Gardberg 1973, 74).

The complexity of the history of Koroinen and the scarcity of medieval written sources makes the interpretation of the few surviving references to the site difficult (see, e.g., Gardberg 1973; Gallén 1978; Koivunen 2003). In fact, Koroinen as Kurusum is not mentioned until as late as 1303 (REA 19), but the cape also was referred to by the name of the village Räntämäki (e.g. REA 135, 680; Koivunen 2003, 76 f.). When either of the two place names is mentioned, it is impossible to distinguish whether the source is referring to the bishop's estate outside the embankment or the buildings on the cape. Moreover, there is no surviving early written evidence of buildings on the cape. Petrus Gyllenius (1653 [1962], 160) was the first to describe the cape in detail in 1653, and on the basis of his account, buildings on the cape and beyond it were already in ruins at that time.

There is somewhat of a scholarly consensus that, after the cathedral was transferred to Turku, the church on the Cape of Koroinen continued to function as a parish church of Maaria. The coin finds from the site suggest that it indeed remained in active use until the end of the 14th century (Riska 1964, 58 f.; Koivunen 1979, 7 ff.; Ehrnsten 2013b; Ratilainen 2016, 75; for a numismatic discussion of the coins, see Koivunen 1980; Sarvas 1979, 1980; Malmer 1980, 23 ff., 206 f.; Klackenberg 1992; Talvio 2009). The masonry buildings on the river bank, in turn, continued to serve as the bishop's residence until 1396 when, as assumed, the Vitalian brothers burnt down the whole of Koroinen. Another possibility for the final destruction of Koroinen is the fire of 1429, which is attested in written sources (Juusten, catalogus, 60; Gardberg 2000, 28; Palola 2003, 110 ff.).

In this article, the wooden and masonry structures on the river bank, their stratigraphy, and the find assemblages are scrutinized.

Fig. 3. Locations of the structures at Koroinen: 1–3 = brick-walled grave; 4 = altar foundation; 5 = foundation for a baptismal font; 6–8 = subsurface drain; 9 = foundation of a masonry building; 10–12 = stone foundations of wooden naves; 13 = line of stones, function open; 14–15 = stone foundations of wooden naves; A, B = possible corner stones of a narrow chancel; 16 = western masonry building; 17 = wooden level; 18 = rubble stone area; 19 = eastern masonry building; 20 = wooden building with a heat-storage hypocaust; 21 = vague building remains excluded from the article. Scale bar 5 m. Map by J. Rinne, National Board of Antiquities, modified by T. Ratilainen.

Subsequently, their function and dating are studied in detail, and the early use of brick as a building material is discussed. Due to the large amount of material, all limestone fragments as well as the finds excavated outside the cape have been excluded from the analysis. Mostly coins and pottery are utilized for the dating of the structures; however, the available results of radiocarbon dating are helpful. The coins were re-analysed by Frida Ehrnsten (2013), and the ceramics by Aki Pihlman (2016), and thus the respective datings are based on their work.

First excavations

The first archaeological excavations were conducted by Hjalmar Appelgren in 1898–1899 and by Juhani Rinne in 1900–1902. The total uncovered area was 3,500 m^2, and roughly 3,000 finds were recorded (Koivunen 2003, 71 ff.). The quality of the documentation was unusually high. For instance, a coordinate system was established, all the excavated soil was sieved, section drawings and maps were recorded, and extensive notes were written down, although no excavation report was compiled (Koivunen 2003, 41 ff.; Ratilainen 2016). However, Rinne published the principal results only in 1941 (1941, 35 ff.; see also Rinne 1914; 1926). After him, many other scholars, of whom Pentti Koivunen must be especially mentioned (Koivunen 1977, 1979, 1980, 1987; 2003), have dealt with Koroinen (on the research history, see Koivunen 2003, 67 ff.; recently, e.g., Kostet 2011, 30 ff.; Paarma 2015, 23 ff.; Seppänen 2016), but the original material was never thoroughly analysed and published. Notably, the building remains and structures on the river bank have been left without a proper scholarly treatment.

Use of brick at the centre of the cape

It seems feasible that a brick altar (no. 4 in Fig. 3) was built in the narrow chancel of the first wooden church, probably 20 by 10.5 m (nos. 11–12, 14 in Fig. 3), located at the centre of the cape. One of the three known brick-walled graves (no. 2 in Fig. 3) was constructed in the chancel. The second wooden church (nos. 10, 12, 14–15 in Fig. 3) measured approx. 27.5 by 14.5 m, and it probably had a narrow wooden chancel as well. A brick podium, or the simple foundation of a baptismal font (no. 5) as well as the sub-surface drain (nos. 6–8), made mostly of bricks, were probably contemporaneous with the second church. The cemetery was used before and after the drain was built. The wooden chancel must have been located at the same place where the masonry building, presumably a chancel of stone (no. 9), was built at the end. It is very likely that the chancel was not designed to be tower-height, and perhaps it was never completed because there are neither remains of an altar nor proper foundations for a chancel arch. Moreover, the remaining foundation seems to penetrate through the eastern wall of the wooden nave, and the brick-walled grave (no. 1 in Fig. 3) was actually probably built inside the wooden chancel (Ratilainen 2016). Rinne (1902) states that no layer[2] of brick waste was found in the area of the stone chancel, which may indicate that the vaulting and the brick details were never laid.

Results of radiocarbon dating

The main principle of dating has been the utilization of a wide range and amount of materials and methods as possible. There are certain crucial restrictions for dating. First, the organic material has not been preserved well in Koroinen, and there is no material

Table I. AMS dating results. Table by Tanja Ratilainen.

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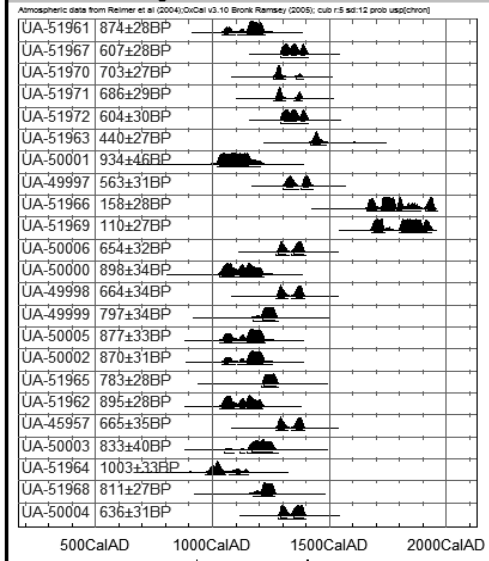

Sample	Material	Depth	Rinne's coordinate (square 5x5 meters)	CalAD probability 95.4%
without no.	wood/post?	-	Found in an envelope with a writing "Kor pillar"	**1040-1230**
52100:1935A	pig tooth	-	029-09	1290-1410
52100:2406	burnt ungulate bone	clay on the surface	103a-102, 103-102	1260-1390
52100:2536A	pig tooth	-	128-125	1260-1390
52100:2637A	cattle tooth	-	near 245*	1290-1410
52100:1538	burnt ungulate bone	1.	189-219	1420-1485
52100:488	wood/coffin?	1.*	24-14	**1020-1210**
52100:246b	textile	2.	152-180, six coins (1360s) wrapped inside**	1300-1430
52100:1894	cattle horn	2.	23-15	1660-1890
52100:2004	indet burnt bone	2.	52-26	1680-1902***
52100:2488	charred wood	2.*	232-245	1270-1400
52100:366	wood/coffin?	2.-3*	145-151	**1030-1220**
52100:263	wood/post	2-3*	190-218	1270-1400
52100:2431	wood/floor?	3.	246-105	**1030-1230**
52100:284	wood/coffin?	3.	187-221	1175-1280
52100:1879	partly burnt indet bone	3.	16-22	1210-1280
52100:616	wood/coffin?	3.	54-24	1040-1260
52100:285	wood/post	3.-4*	187-221	**1030-1220**
52100:387	textile	3.-4*	146-150	1270-1400****
52100:666	wood/coffin?	3.-4.*	22-16	1050-1280
52100:1672	**burnt sheep/goat bone**	4.	146-150	**970-1160**
52100:1969	indet burnt bone	4.	55-23	1175-1270
52100:713	bee wax/calix	6.-7.*	21-17	1280-1400

Bones analysed by Bläuer & Liira 2014.
* given in cm in the original documentation, or later deduced from Rinne's notes.
** hoard, coin datings by Ehrnsten 2013
*** end of the range deduced from the excavations.
**** result published in Ratilainen 2016, 76.

for dendrochronological analyses. Moreover, the variety of such organic materials as seeds and leather is highly limited, hence the only available material for dating are two fragments of textiles. Second, Rinne apparently discarded most of the bones he found in the burials, and even many of those bones he saved are currently missing (Koivunen 2003, 57). Third, the documentation of find contexts is occasionally vague, and Rinne's notes and maps can provide contradictory information. Fourth, Rinne saved a large assemblage of brick and some mortar samples, but part of this is now missing. The principal scientific dating methods in the project are accelerator mass spectrometry (AMS), and optically stimulated luminescence (OSL). Both have their limitations (Aitken 1985, 30 ff.; Schiffer 1986; Weiner 2010, 19 ff., 252 ff.), but applied together and in combination with the information provided by such finds as pottery, coins, and glass finds, the best possible results will be obtained.

At the moment, we have received the results of 23 AMS datings (Table I). Five out of the 10 wood samples clearly belong to the period before 1230 (samples nos. 285, 366, 488, 2431 and without no.). This may indicate a burial or construction activities taking place prior to the episcopal period. However, their ranges are wide, 1030–1230, and we have not been able to choose samples from the wood's most recent tree rings. Moreover, some of the wood may have been reused. Consequently, the wooden samples alone may provide results that are too old.

In support of the early dates obtained from wood, one burnt sheep/goat bone (no. 1672) found in the deepest excavation layer has given a very early date of 970–1160. In all, 14 of the 23 samples are dated to the 13th–14th centuries or at least to the period before 1430. There is only one burnt ungulate sample (no. 1538) dated to 1420–1485, and two of the bone samples (nos. 1894, 2004) were dated to 1660–1902.

All three samples with dates falling to the post-1430 period derive from the two uppermost layers, but there are also three samples (nos. 488, 2406, 2488) dated to 1020–1210, 1260–1390, and 1270–1400 (Table I). This shows that the soil is somewhat mixed in the two surface layers, probably due to modern agriculture. Nevertheless, the dating results are in concordance with earlier scholarship suggesting that Koroinen was in active use until the end of the 14th century, or 1429. The date of the earliest use of the site remains unresolved, although it may have been already before the 1230s.

Buildings on the river bank

Rinne's notes on the buildings on the river bank are partly detailed, but partly he did not record his discoveries at all. In such cases, we must follow his publication of 1941 as well as the archived photographs and drawings. Moreover, Rinne occasionally did not record the depth of the finds, and there are a lot of contradictions between section drawings and written documentation. Not surprisingly, after Rinne, only Gardberg (1973; 1976), Koivunen (1979, 1980), Hiekkanen (1994; 2007) and Lovén (1996) have presented new interpretations of the two masonry buildings.

Rinne (1941, 39 ff.) argued that the remains of a masonry building in the west were used as a keep or a defensive tower (no. 16 in Fig. 3), while a wooden storage house was built on its eastern side (no. 17). The rubble pavement (no. 18) near the buildings led from the shore into the fortress. The remains of the building to the east was the bishop's palace (no. 19), also used for defensive functions. The remains of an oven and stone foundations between the two masonry buildings belonged to a post-medieval drying barn (no. 20). The stone structure (no. 21) on the northern side

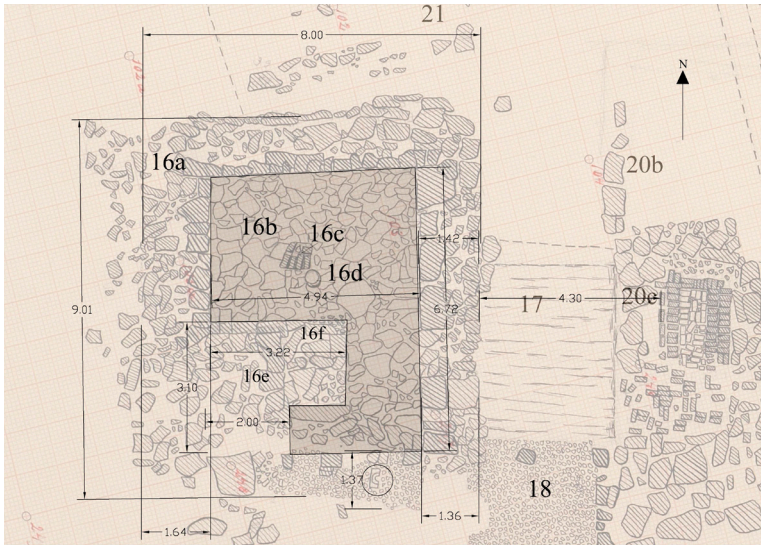

Fig. 4. Plan of the western masonry building. 16a = foundations; 16b = stone floor; 16c = brick floor; 16d = wooden post; 16ef = hearth/staircase. Map by J. Rinne, National Board of Antiquities, modified by T. Ratilainen.

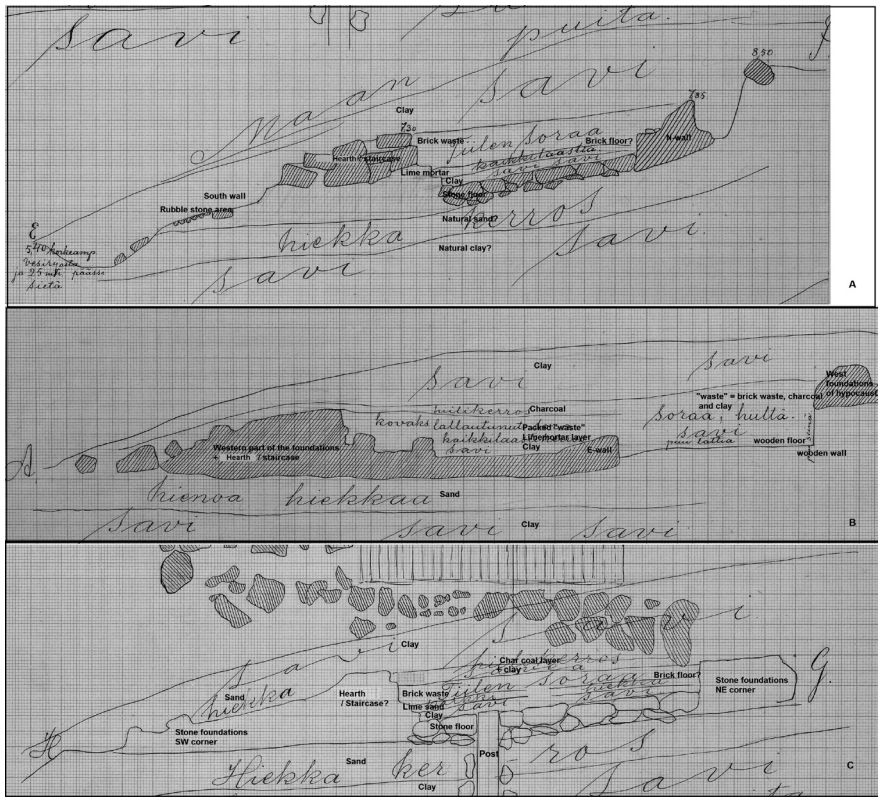

Fig. 5. (A) Section from north to south; (B) section from east to west; (C) section from the south-west corner to the north-east corner cut from the original map at a scale of 1:50. Map by J. Rinne, National Board of Antiquities.

of the tower belonged to a group of wooden buildings located between the church and the river bank. These rather vague remains (no. 21) are excluded from our analyses, as they do not relate to brick use. Rinne (1941, 39 ff.) dated the western masonry building to the end of 12th century and the eastern one to the second half of the 13th century.

Western masonry building

According to Rinne (1941, 39 ff.), building no. 16 (Fig. 4) was found covered with a layer of clay, which was more than 1 m in thickness. The room inside the building measured 5 by 5 m, while the walls were 1.25 m thick. The foundations were somewhat wider under all the other walls except for the northern one. The stone walls had been preserved only as 0.7 m in height. The masonry structure as a whole was meant to remain underground.

The structure found in the south-west corner of the building (no. 16ef in Fig. 4) measured 2 by 2 m and was interpreted as a hearth. Two floor levels were discovered. The lower and better preserved one was laid with stones (no. 16b), which were set on top of natural clay. In contrast, the upper floor could be detected on the basis of only a few bricks (no. 16c). According to Rinne, a wooden post (no. 16d) supporting the ceiling had been dug through both floors, but this is not how it is presented in his documentation (Fig. 5c).

Rinne suggests that these remains had once formed a keep (*dongione*). He interpreted the first subterranean storey as a kitchen. Rinne thought there were at least two more storeys above it: the second intended as the bishop's residence, and the third, the attic storey, for defensive purposes. Stairs between the storeys were built into the wall, and the entrance was on the second storey. The rooms were not vaulted. The brick floor belonged to the second construction phase, which was contemporaneous with the building remains no. 19 (in Fig. 3), i.e. the bishop's palace.

In contrast with Rinne, Koivunen (1979, 54 f.) argues that the western building had three construction phases. The first comprised the defensive tower of stone with a stone floor and a hearth. After destruction by fire, in the second phase, the building was laid with a brick floor and perhaps with brick vaulting. In the third phase, a wooden building was constructed on top of the masonry ruins. Koivunen basis his conclusions on coin finds and the stratification.

Stratigraphy and finds

According to the section drawings, the thickness of the top clay layer varied between 0.25 and 1.5 metres and was found all over the building remains. Under the clay, a layer of charcoal mixed with clay, and a layer of brick waste was detected. The former was about 15–25 cm and the latter 25–50 cm in thickness. Under them, a roughly 15 cm thick layer of lime mortar was recorded (Fig. 5a–c).

The remains of the brick floor were so vague that it was documented only in the plan (no. 16c in Fig. 4). Rinne mentions that it was best preserved on the northern side of the room (Rinne 1941, 39 f.). The level of the brick floor must have been located above the layer of lime mortar and another, 10–20 cm thick layer of clay covering the stone floor (Fig. 5a). Later Rinne (1941) describes the lower stone floor as being set on natural clay, but in the section drawings a layer of sand is marked instead (Fig. 5a–c).

Over 300 finds were discovered in the building. The context information provided in the find catalogue is fairly indefinable. Artefacts found in the "charcoal and brick waste layer" were mixed with the clay above, or the context is indicated only as "the tower at the corner". Coins collected from the

KM52100:	Brick type	Moulded type	Context
1343	moulded	?	Western masonry building
1418	moulded	mullion	Western masonry building
1419	moulded	window jamb?	Western masonry building
1420a	moulded	window jamb?	Western masonry building
1420b	moulded	window jamb?	Western masonry building
1421a	moulded	?	Western masonry building
1421b	moulded	window jamb?	Western masonry building
1431		Floor?	Eastern masonry building
1432a-f	moulded	ridge band / pillar?	Eastern masonry building
1433a-q	moulded	1/4 circle, pillar? jambs	Eastern masonry building
1434a-g	moulded	mullion?	Eastern masonry building
1435a-c	moulded	jambs?	Eastern masonry building
1436a-g	moulded	ribs	Eastern masonry building
1437b	moulded	window jamb?	Eastern masonry building
1437c	moulded	window jamb?	Eastern masonry building
1438b	moulded	concave forms	Eastern masonry building
1439a	moulded	ribs	Eastern masonry building
1440a	moulded	carved with fingers	Eastern masonry building
1441a-c	moulded	mullion	Eastern masonry building
1450a	moulded	carved with fingers	Heat storage hypocaust and the wooden building
1450b	moulded	carved with fingers	Heat storage hypocaust and the wooden building
1469	moulded	same as 1437c	Eastern masonry building
1471a	wall brick or moulded?		Eastern masonry building
1471b	moulded		Eastern masonry building
1471c	moulded		Eastern masonry building
1475	missing		Eastern masonry building

Table II. Moulded bricks discovered on the river bank. Table by Tanja Ratilainen.

surface layers include a Viking Age coin, two coins dating to the 13th century, and two coins from the 1360s. Seven coins discovered in the brick waste layer or on top of the hearth date to the 1340s–1360s. Three coins with the context information "from the brick waste of the floor, or 80 cm deep" date to 1220/1265–1280/1332. The only coin found under the brick waste in the lime mortar layer was minted in 1220–1280.

In the topmost clay and the brick waste layer are ceramics dating to the 13th and 14th centuries but also to the late medieval and early modern periods. In the brick waste layer, ceramics dating to the 13th and 14th centuries dominate. In the clay layer above the stone floor, mostly ceramics dating to the second half of the 13th century or first half of the 14th century and only 14th century were recorded There are pieces from the same vessels – the sherds fit together – from the lower clay layer and the brick waste layer and even in the area outside the building.

Bricks

Rinne marked only five of the 23 brick fragments to have been found "in the brick waste layer above the mortar layer inside the building", but the rest he recorded to be "discovered in the building in the south-west corner". Among the five brick samples uncovered in the structure, there is only one moulded brick (1343 in Table II). In a wider spatial context, however, there are bricks used as the building's window jambs (1420ab, 1421b) and mullion (1418) (Koivunen 2003, 55; cf., e.g., Lindberg 1919, 32; Rinne 1941, 183, Fig. 36, B). Three bricks of the similar type were found in connection with

Fig. 6. Western masonry building from the south-east. Structure 16ef on the left and the niche on its south side. Photo by J. Ailio, Museum Centre of Turku.

the eastern masonry building (1418=1441, 1419=1434, 1421b=1437c in Table II). There are no rib bricks.

Interpretation of the western building

The stratigraphy of the structure is complicated. The discovery of both older and younger finds from the topmost clay can be explained by human activities, which have transferred soil from somewhere else, and by the early modern cultivation. However, ceramics of different periods were found also under it, showing that the layers inside the structure have become mixed. The stratigraphy of the building is not as clear as shown in the section drawings. Consequently, they cannot be used in a straightforward manner to determine the construction phases as Koivunen assumes. The stratigraphic relation of the wooden post with the layers remains similarly uncertain. It is possible that Rinne just assumed that the post had penetrated both the floors.

On the basis of brick fragments found in the western structure, it seems probable that building waste was moved there from the eastern building at some point. On the other hand, the fragments may suggest that the same kind of bricks were used in both buildings. At least part of the waste probably originates from the brick floor. It is conceivable that ploughing also moved the fragments around. In sum, the complexity of the formation processes makes the interpretation and the dating of the building highly complicated. Nevertheless, the principal building material seems to have been stone.

According to excavation maps, the outer measurements of the building were approximately 9 by 8 m (Fig. 4). It is impossible to confirm the original thickness of its walls and thus Rinne's statement of 1.25 m is the only

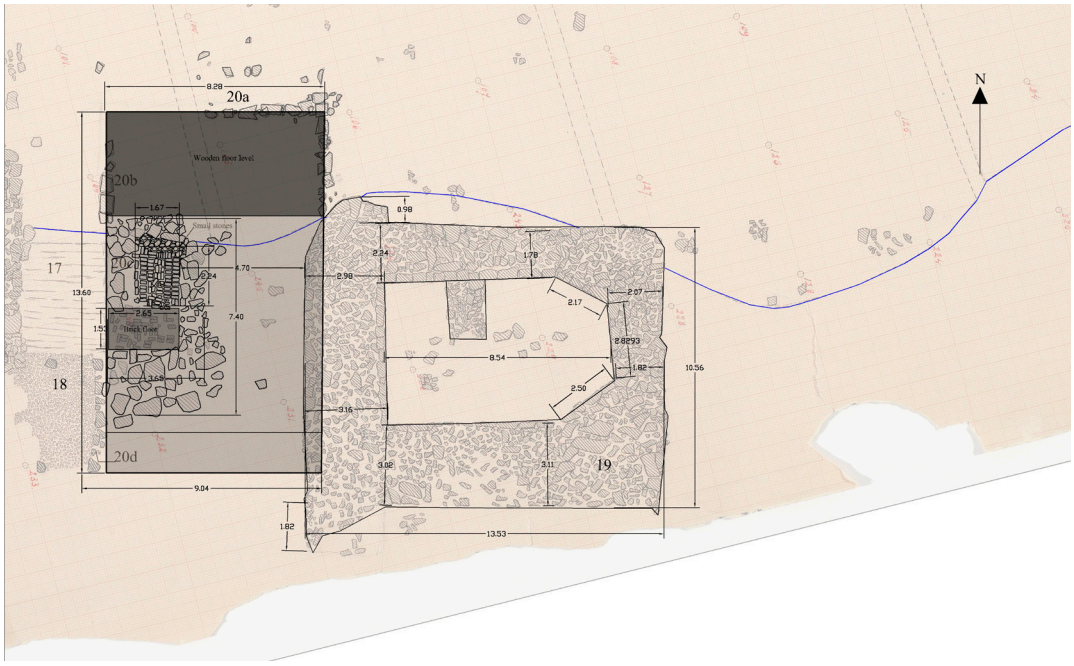

Fig. 7. Plan of the eastern masonry building and the adjacent wooden building with the hypocaust. Map by J. Rinne, National Board of Antiquities, modified by T. Ratilainen.

information available. The thickness of the foundations varies between 1.35 and 1.65 m. The size of the structure in the south-western corner measures roughly 3 by 2–3 m. The photographs show that the feature (no. 16f) that Rinne did not consider to be part of the hearth (no. 16e) was, in fact, *in situ* and belongs to it. Furthermore, a large east–west-oriented stone along with other stones around it on the southern side of the structure was on the same level as the stone floor. They therefore formed some sort of a niche in the structure (no. 16ef) (see Figs. 4 and 6), and the inner measurements of the room were actually around 6.7 by 5 m. If the structure in the corner is excluded, the size of the room was roughly 24 m^2.

The original width of the foundations of the southern wall seems to be about 1.4 m. The foundations are defined by a large stone near the south-west corner and the width of the rubble stone area (no. 18 in Fig. 4) as well as other wall foundations. A stone house with more than 1 m thick walls is usually considered to have had one or two more storeys above the first one (Uotila 1989, 45; 1998, 40; 2002, 8; Lovén 1996, 239). In sum, Rinne's interpretation of three storeys seems appropriate.

The reasons why Rinne interpreted that the structure in the south-west corner was a hearth are not known. It seems equally plausible that the remains were the foundations of a staircase. Rinne informs us that the wall was 1.25 m in thickness, but that seems just barely wide enough for stairs fitted inside the wall. If the wall width is the same as the thickness of the lower parts of the foundations, 135–165 cm, the staircase could have been built inside the wall, too. Because there are no remains of the upper storeys, and most of the bricks, among which there are no rib bricks, appear to originate from elsewhere, it is not certain whether bricks or brick vaulting were used in the upper parts of the building. However, a wooden post erected in the centre of the room suggests that the building was not vaulted. Consequently, the structure in the corner seems more likely to be the foundations of a hearth. The two floor levels discovered inside the building suggest that there were two phases of construction.

Rinne (1941, 39 ff.) dates the building to the end of 12th century because only stone was applied in the first building phase, indicating a prestigious inhabitant presumably there before 1229. Gardberg, in contrast, argues that the see was transferred to Koroinen only after 1229 and, thus, the western building was erected subsequently (Gardberg 1973, 74). Koivunen similarly interprets that the first phase dates to the 13th century, but the building was then destroyed in 1318. The second construction phase dates possibly to the beginning of the 14th century. The third phase took place during the same century, and the building was finally destroyed in 1396. Hiekkanen dates the building to the second half of the 13th century or to the 14th century – or even later (Hiekkanen 2007, 186).

The coins and pottery found in the fills between the floor levels were deposited after the 13th or in the first half of the 14th century. Accordingly, the first construction phase could be dated prior to that, *c.* 1300 or possibly even to the 13th century. The post provided a radiocarbon dating to 1040–1230. However, the context of the dated sample remains somewhat uncertain (Table 1). The coin finds in the brick waste layer suggest that the building was not used after the second half of the 14th century. However, if most of the brick waste derives from the eastern masonry building, it must be kept in mind that the same is probably true of most of the coins and other finds. The existence of a third construction phase appears unlikely. On the basis of its plan and the thickness of the walls, the building might have been a defensive tower as also interpreted by Lovén (1996, 365). Another possibility is that it was used as a clock tower, but the location for such a structure is unlikely.

Fig. 8. Foundations of the of the eastern masonry building from the north-west. Note the bricks in the structure. Photo by J. Ailio, Museum Centre of Turku.

Fig. 9. The foundations of the eastern masonry building seen from the east. In the middle the layer of lime and clay covering the whole building. Photo by J. Ailio / neg. 58372 in Archives of the National Board of Antiquities.

Eastern masonry building

Under a massive layer of brick waste (50–100 cm) Rinne discovered the underground foundations of a masonry building divided into two spaces. The eastern one was not rectangular in shape and had three sides (no. 19 in Fig. 7). The remains measured 9 by 5.5 m, and the lower parts of the foundations were 2–3 m in thickness. The remaining walls were mostly erected of stones (Rinne 1941, 42 f.), but Rinne (1902) also recorded that some bricks were used as wedges, and, on the basis of photographs, entire bricks were utilized in the foundations as well (see Fig. 8).

Rinne argued that, on the northern side, the level of solid ground outside the foundation was 1.5 m above its floor level. A staircase was built inside the wall in the north-western corner. On the inside surface of the foundation, Rinne uncovered stones moulded in such a way that they were meant to be seen (see Fig. 9), and he identified a 1 cm thick layer of plaster covering the stones. He also suggests that the stone building had a brick floor (Rinne 1941, 42 f.).

Rinne argued that the building had four storeys. The first was reserved for the bishop's servants, the second for the bishop, and the third storey was used as a banqueting hall and a chapel. The fourth, the attic storey was built for defensive purposes. On the basis of the moulded bricks he discovered on the upper layers of the ruin, Rinne (1941, 42 f.) suggests that the second and third storeys were vaulted and richly decorated with bricks.

Stratigraphy and finds

Under the foundations, Rinne discovered a roughly 10–30 cm thick layer of mortar mixed with clay. He described the layer as being hard as rock. Under that, there was another 10 cm thick layer of clay with mortar. Both layers were distributed across the whole surface of the structure (Fig. 10). Small stones, fragments of brick, and even a few intact bricks were sprinkled on top of the upper layer, visible under the southern wall. The natural clay under the building was strong and solid, but there was also sand. This stratigraphy described in the notes corresponds with the layers documented in the drawings, except for the natural clay layer, which was not marked on them but to the sections of the western masonry building (Fig. 10).

The locations of most of the finds found in connection with the eastern building were identified only either as "from the tower on the river bank" or just "from the brick waste

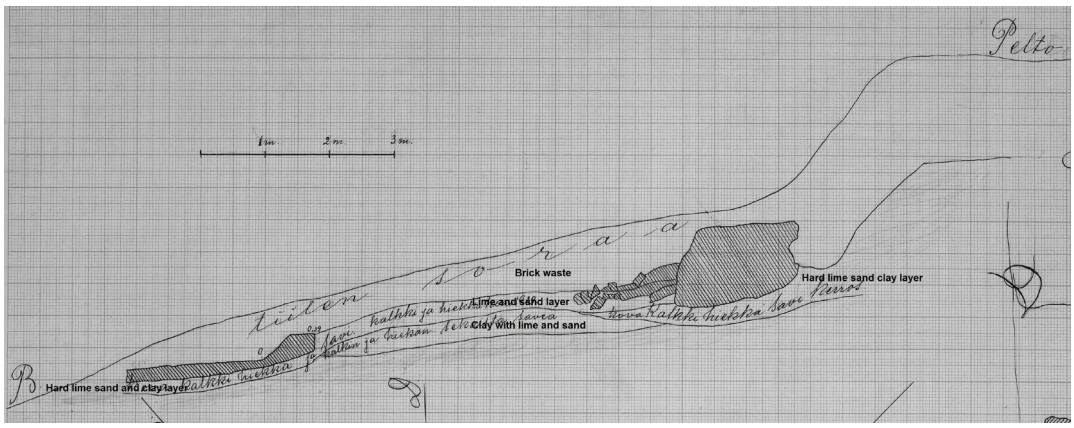

Fig. 10. Section of the eastern masonry structure showing the stratigraphy. Note also the tilting mortar level. Photo by J. Ailio, Archives of the National Board of Antiquities.

layer". No information on the depth of the finds was recorded at all. We must therefore rely on Rinne (1941), who mentions that modern finds such as two copper coins and a fragment of a post-medieval roof tile were discovered from the surface of the ruin. All three medieval coins from the building were found in the brick waste layer. Two of the coins were minted in the 1340s–1350s, and the third in 1363–1370. Most of the discovered fragments of pottery date to the 14th century, but there is one or two dated to the 13th century and one to the end of the 15th and the first half of the 16th century.

Bricks

About 450 fragments of bricks were saved in connection with the eastern building. Most of them were small fragments of moulded bricks, and 28 were from ordinary wall bricks. Nine different types of moulded bricks can be distinguished (Table II): (1) Fragments of at least 10 pointed bricks, which had been used either in a faceted pillar, or to form a ridged band (1432a–f). (2) Bricks of the shape of a quarter of a circle were possibly used in round pillars. Fragments of at least 20 such bricks were found (1433a–q). (3) Bricks with a B-shaped form appear in two sizes. The diameter of the rounded part in the larger ones was 11–13 cm (1434a–g), and in the smaller ones 6–8 cm (1435a–c). Such bricks were possibly used in windows or door jambs. The pointy, narrow part in the middle section of the brick suggests that they were utilized in mullions, but with two bricks back to back. At least 15 larger and two to three smaller B-profiled bricks were found. (4) There were at least 10 triangular rib bricks (1436a–g). (5) Two flat bricks of a semicircular shape with a height of only 4 cm (1437b); a fragment of the same type is also known in connection with the western building (1421a). (6) One brick was a fragment with a concave shapes (1438b), and (7) one fragment form a pointed rib brick with rounded sides (1439a). (8) At least three mullion bricks (1441a–c), and (9) a rounded profile brick (1471a–c), which was used, e.g., in pillars or in the profiles of doors or windows (cf., e.g., Lindberg 1919; Rinne 1941, Andersson & Hildebrand 2002). Last (10), there was one potential floor brick measuring (23 by) 20.5 by 9 cm (1431).

Interpretation of the eastern building

The construction date of the eastern building cannot be extrapolated from the coins and other finds discovered inside it. They suggest merely that the building may have fallen out of use at the end of the 14th century.

On the basis of the huge amount of brick material, it is likely that the eastern masonry building was a brick house. This is also supported by the fact that bricks were used in the wall foundations as well. Because only one possible loose floor brick was discovered, it is not certain whether there was a brick floor; on the other hand, ordinary wall bricks could have been used.

The brick house was likely vaulted. At least one or two different types of rib profiles were applied on the vaults, while the pointed and the rounded bricks were suited for pillars. However, because no foundations for pillars were found, it is more likely they were intended for some other purpose. For instance, pointed bricks could have been utilized for a ridged band of a gable. Mullion bricks and other bricks suitable for window jambs show that the building had richly decorated windows and probably profiled portals as well.

The size of the smaller room was about 13 m^2, whereas the faceted room was roughly 22 m^2 in size. Both rooms appear fairly small for banqueting. Stairs between the storeys

Fig. 11. Heat-storage hypocaust from the south. In front the remains of the brick floor. Photo by J. Ailio, Museum Centre of Turku.

were probably built inside the wall due to the vaulting. Based on the thickness of the walls, there might have been at least three to four storeys. The thick walls and the lack of entrance on the first storey suggest that it was made for defensive purposes, as pointed out by Lovén (1996, 365).

Buildings with faceted plans were rare in medieval Finland. Only five of them are known, all in churches and all dated to the 15th century or the beginning of the 16th century (Hiekkanen 1990; 2007, 121; Drake 2006; 2009; Ratilainen 2005). Hence, despite the considerable age difference, the faceted/sided space in the eastern building probably served ecclesiastical functions.

Wooden building with a heat-storage hypocaust

Several smaller structures were erected between the two larger buildings on the river bank (no. 20 a–d in Fig. 7). Rinne documented an oven made of bricks, which was a rectangular structure, measuring 2.25 by 1.70 m (no. 20c). Further, if the stone parts of the structure are included, the length was about 7.5 m and the width 3.65 m. The section drawings (Fig. 5b) show that the structure was located on a higher plane than the wooden floor 17, and the northern part of the structure was much higher than the southern part. The stratigraphic relation of the oven to the stone foundation 20ab remains unknown, but the structure seems to fit inside the foundation and be in alignment with it. The character of

the north–south-oriented foundation 20d is not clear, but it may have formed part of the western foundation.

The height of the vaulted firebox was 57 cm, while the width varied between 50 and 60 cm. The side walls had six layers of bricks. On the excavation plans, small stones have been marked on the northern side of the structure, in between the bricks and the large foundation stones (Fig. 7). A brick level, though partly collapsed, appears to have been on the southern side of the firebox (Fig. 11). On the north side of the oven, between the foundations 20ab, a layer of charred wood was found at a depth of 45 cm. According to Rinne, it was limited by the foundations and laid on the same level with the stones (dark grey area in Fig. 7).

Citing the limestone hypocaust hotplate found on the southern side of the western masonry building (Fig. 4), Gardberg (1976, 332) argues that the oven is the oldest heat-storage hypocaust in Finland. Based on the eastern masonry building, he dates the feature to 1250–1275. Koivunen, instead, points out that the coins found in front of the oven suggest a dating to the end of the 13th century (Koivunen 1979, 55 f.). He also argues that the only 15th-century coin found at the site dates the remains of the floored wooden building (Fig. 7, 20ab) to the 15th century.

Stratigraphy and finds

No information on the depth of the artefacts found near the oven was recorded, except for the statement "above the stones". This likely referred to the remains of the oven. However, three coins collected in the area date to 1220–1332 and four to 1340–1363. Most of the pottery finds date to before the beginning of the 15th century, although a couple of younger fragments are included in the assemblage. The AMS dating of a fragment of wood above the stones provided the date 1270–1400 (Table I, 2488).

In the northern part of the wooden building, the first shovelling layer revealed some modern finds. In the second layer, two 17th-century copper coins and four silver coins from 1220–1318 were unearthed. One coin minted in 1478–1503 was discovered at a depth of 60–70 cm, suggesting that it was deposited under the floor level. However, the same third shovelling layer also revealed fragments of pottery of which most were dated to the 13th century and the beginning of the 14th century. No post-medieval pottery was found in the northern part of the building. A sample from the floor structure in the third shovelling layer was radiocarbon-dated to 1030–1230 (Table I, 2431).

Bricks

Twelve fragments of bricks were collected either "in front of the oven" or "among the stones in front of the oven" (Table II). Ten were wall bricks and two moulded bricks (1450). Five of the bricks formed a distinctive group in which the upper flat surface of the brick had been carved lengthwise with fingertips before firing. The moulding was made by bevelling the side of a normal wall brick (1450a–b). Their texture was compact but porous, and all the bricks contained particles of charcoal.

Interpretation of the structures

In earlier scholarship, medieval hypocausts with heat storage were considered to be used only in such high-status buildings as castles, monasteries and private stone houses. However, in Tallinn, Estonia, hypocausts were built even into the modest dwellings of craftsmen. Moreover, they are known also

from wooden buildings in North Germany and Estonia (Mahler 2001, 23; Ring 2001, 33; Tvauri 2009, 53, 74). In Finland, they have been mostly found in masonry castles (Gardberg 1959, 68 f., 163; Drake 1968, 133 ff.; Uotila 2001, 189; 2003, 125), but fragments of hotplates and their covers may suggest that heat-storage hypocausts were also used in the town of Turku (Rinne 1908, 126 ff.; Seppänen 2012, 731 f.).

The size of the structure in Koroinen does not invalidate Gardberg's (1976) idea that the vaulted oven was indeed a heat-storage hypocaust. Moreover, along with the plate fragment, the vaulting, and the small stones on the northern side of the structure (Figs. 7 and 11), comparisons with similar architectural features support the identification (Bingenheimer 1998; Mahler 2001; Ring 2001; Tvauri 2009). The plane of bricks in front of the oven could be a brick floor (Figs. 7 and 11), showing the size of the stoker's room, roughly 2.65 by 1.5 m. The stone construction around it belongs to the foundations and the wall structure of the oven, above which hotplates might have been installed. Hence, the wooden building probably had two storeys.

The hypocaust was likely used primarily to warm up the wooden building. The distance between the oven and the masonry buildings was 3–5 m. It is possible that special ducts were constructed to channel warm air to the adjacent eastern building or even both of them (cf. Bingenheimer 1998).

Because the southern foundation stones of the wooden building are missing, it is difficult to estimate its size. It might have been 13 by 8 m, giving a surface area of 104 m^2. In addition to the brick floor, the north part of the building probably had a wooden floor as well (Fig. 7, building indicated with light grey, floor with dark grey).

The finds make it evident that Rinne's interpretation of a post-medieval drying barn is not correct. The building is clearly a medieval wooden house warmed up with a heat-storage hypocaust. Due to the level of documentation, the building cannot be dated only on the basis of one late 15th-century coin. Instead, the AMS dating (1030–1230), 13th-century coins, and the pottery suggest that it was first used in the 13th century and beginning of the 14th century, while the AMS dates (1270–1400) and the coin assemblage may indicate that it was abandoned around 1400 AD.

Floor levels from the oldest building?

One of the structures between the two larger buildings is a layer of burnt wood (no. 17 in Fig. 12), measuring 4.10 by 3.35 m, while the size of a rubble stone area was 8.10 m in length (no. 18 in Fig. 12), the width varying between 0.70 and 4.50 m. There is no other documentation of the rubble stone area other than the plan, but Rinne's interpretation of a passageway suggests they were found on the same level. The wooden level, in turn, was discovered from the third shovelling layer. In section drawings, it is marked on a slightly higher level than the foundation stones of the masonry building. If this was the case, it is completely implausible that the underground stone foundations stood against the floor of a wooden building (see wooden floor and E-wall in Fig. 5b). This suggests that the wooden level is actually older than the masonry wall.

In the area of the structures, altogether 21 coins were collected. The depth at which the coins were found was documented only in four cases. Three of the coins lay at a depth of 60–70 cm, and they date to 1340–1380, but the oldest coin was found at a depth of 100 cm, just about 50 cm outside the wooden level. It dates to 1220–1280. Fourteen coins date to the 1340s–1360s, two to 1220–1280,

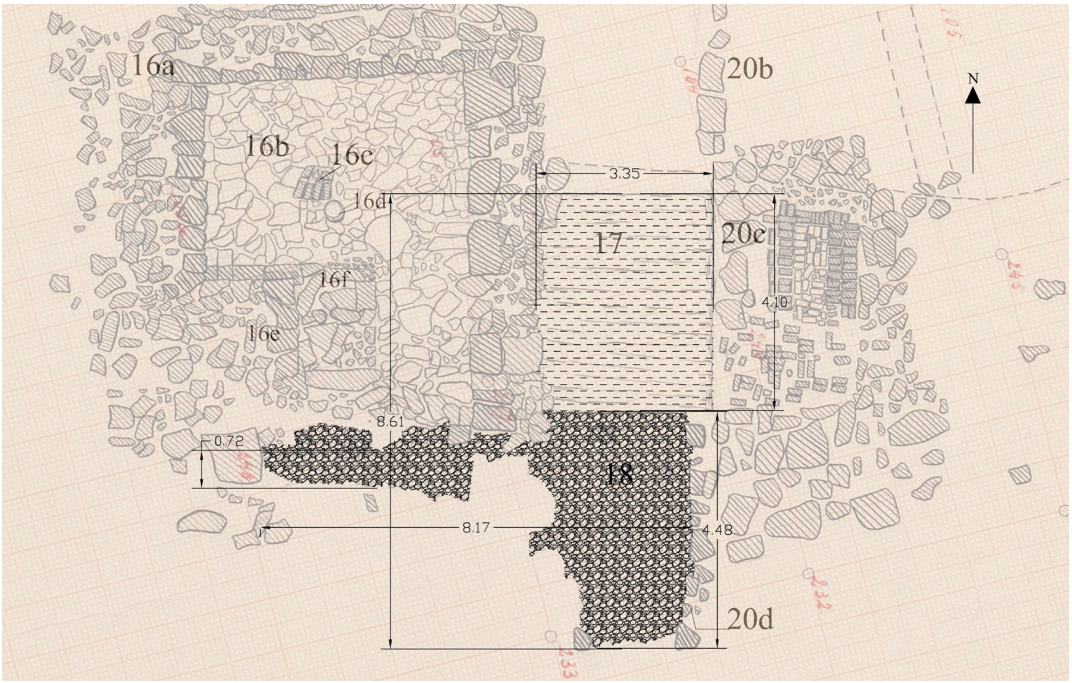

Fig. 12. First building phase by the river bank. Rubble stone area (18) and wooden level (17) were possibly from a wooden building. Map by J. Rinne, National Board of Antiquities, modified by T. Ratilainen.

and one to 1290–1318. The depth of the pottery finds was not recorded at all, but they date mostly to the period before 1400. There are, however, also more recent finds.

Interpretation of the wooden floor structure

It seems likely that the wooden level was cut when the foundations of the western masonry building were dug. Hence it is older than the masonry building. It is possible that the rubble stone structure was put in place to make the ground more solid for the masonry foundations, but as it covered a much larger area, it is more plausible that it was older than the masonry building. Together both structures cover an area of 64 m^2, which may indicate the size of the original building (Fig. 12).

It is difficult to estimate the age of the structures, as the depth at which the finds were recovered is mostly unknown. However, based on the coins, they may have been in use in the 13th century, but the structures might be even older as the later building activities have probably disturbed the remains. Nevertheless, it fell out of use when the western masonry building and the hypocaust oven with heat storage were built.

Observations on the bricks and masonry structures

The visual analyses of bricks bear witness to at least two sets of brick production. One distinctive group of bricks had charcoal particles in their mixture and finger carvings on the top surfaces. These were found near the hypocaust. The second group, to which most of the bricks belong, was compact and hard in material, but

there are no other distinctive features among the bricks, although the mixture in a few of them included ground burnt bone.

The systematic visual study of the mortar was difficult to carry out due to the large amount of material and the remains of salt, which often resemble mortar residues. Nevertheless, at least two different kinds of mortar could be detected even in the same brick (e.g. 1449b), indicating two construction phases and reuse of bricks. Mortar remains in the cut surfaces of bricks show that some of the building material was used in the core of the wall (e.g. 1430i). Moreover, some traces of whitewash were observed in some of the moulded bricks (1432, 1436).

The comparison of the floor levels in the section drawings of both buildings show that they were tilting severely. The northern side of the stone floor of the western masonry building was about 55 cm higher than the southern part. The tilting from north-east to south-west was also roughly 50 cm. In the eastern building, the tilting was from north to south and from north-west to south-east 70–80 cm. In addition, the lack of soil in the southern parts of the two foundations suggests a landslide as well (Figs. 5a and 10). Hence it seems that both buildings tilted severely to the south as well as to the west, which might be the main reason they were abandoned.

Reinterpretation of the structures on the river bank

Several conclusions can be drawn from our analyses. First, levels of rubble stone and wood were built on the river bank, and these floors possibly belonged to a wooden building. The size of the building may have been about 64 m^2. We do not know whether it was a house because later construction activities have likely disturbed the structure. The remains of the rubble-stone area were probably reused when the foundations of the southern wall of the western masonry building were constructed. Consequently, there was no contemporaneous wooden storage house next to the western masonry building, as Rinne interprets, and the entrance to the fortified area must have been somewhere else. The dating of the building is difficult. One possibility is that it was built in the 13th century, or even before that, because the radiocarbon dates suggest that the use of the cape started before the episcopal see was transferred to Koroinen.

The western masonry building was likely built after the first wooden building. It was probably a stone keep with three storeys, as Rinne argues. The outer measurements of the building were 9 by 8 m, and the room inside was 24 m^2 in surface area. On the basis of two floor levels, of which the younger one was made of bricks, the building had two construction phases. Most of the brick material found on top of the building does not seem to relate to the keep but rather to the eastern masonry building. It is likely that the brick waste was spread out from east to west along the river bank, which explains why the same kind of moulded bricks were found in connection with both buildings. Consequently, it is not certain whether the western building was ever vaulted with bricks or had brick walls. The structure in the south-west corner of the building could, after all, be a hearth, as Rinne interprets. There is just barely enough room for stairs to be fitted inside the wall, but because the wooden post suggests there probably were no masonry vaults, the space might have been used for living and cooking as well as defensive purposes. The fills under the brick floor were put in place after the 13th century and the first half of the 14th century; therefore the first construction phase must be older than that. Hence, Koivunen is on the right track considering the dating of the structure, but his suggestion of a third construction phase seems unlikely due to

the disturbed stratigraphy and the level of documentation.

The wooden house with the heat-storage hypocaust was roughly 100 m^2 in size. It cannot be concluded whether the hypocaust belonged to it in the first construction phase or if there was another hearth before that. Nonetheless, because of the hypocaust, the building must have had two storeys. In front of the firebox there probably was a stoker's room with a brick floor. In the northern part of the building there was a burnt wooden floor.

The eastern masonry building was probably a brick house divided into two spaces. The west one was roughly 13 m^2 in size, and the eastern 22 m^2, giving a total of 35 m^2 for each storey. The building seems to be fairly small compared with other brick houses known, e.g., from Turku (e.g. Uotila 2003, 127 f.; Ratilainen 2007, 17 ff.; 2010, 46 footnote 6). Based on the moulded bricks, at least two types of rib vaults were utilized in the construction. The gable may have been decorated with a ridged band, while other moulded bricks were likely used in the window mullions. The window and door jamb bricks reveal that the building was richly decorated. The thickness of the walls and the lack of an entrance on the ground floor may relate to defensive functions. On the other hand, they may have been the result of the building's height and placement on the clayey riverbank. The particular plan of the building suggests that it had ecclesiastical uses, perhaps a chapel, as Rinne suggested.

The brick house and the wooden house with a brick hypocaust stand neatly next to each other. It is not possible to deduce for certain which of them was built first (see Fig. 7). The wooden building was probably in use already in the 13th century and the beginning of the 14th century; thus it is conceivable that the hypocaust oven also is from the same period, as Koivunen suggests. The construction period of the brick house cannot be determined. However, both buildings seem to have fallen out of use at the same time. It seems feasible that a comfortable wooden house was used for dwelling and the stone house next to it for other purposes (see, e.g., Uotila 1989, 49). It appears that, together, they constituted a residence, i.e. the palace of the bishop.

At least two sets of brick production were detectable. The bricks with charcoal particles may have been used to construct the hypocaust oven or the floor in front of it. The mortar remains also indicate that there were at least two construction phases, and some of the bricks were reused. More traces of fire should be expected in the brick material, if the buildings on the river bank were destroyed by fire. There are only some traces of soot on the bricks found near the hypocaust, which is quite reasonable considering their context. On the other hand, Rinne did not necessarily collect fire-damaged bricks. Hence, the only clear sign of fire is the burnt wooden floor in the hypocaust building. However, the material clearly shows that the masonry buildings suffered from tilting, which may be the reason why they were not repaired after the possible fire. Another possibility is that a sudden landslide resulted in their abandonment.

The finds as well as radiocarbon datings show that later soil-moving activities have disturbed the two topmost surface layers and the brick waste layer above the keep. However, when the information on the depth of the finds is recorded, it suggests that post-medieval finds were found mainly in the first two excavation layers. Consequently, it is also likely that, in those excavation squares in which the depth was not documented, the situation was similar. In sum, there is no clear evidence showing that the buildings on the riverbank were used in the late medieval period or later. In addition to the radiocarbon dating, results so far are in concordance with the earlier interpretation that Koroinen was in active use till the end of the 14th century, or

up to 1429. There is even a strong consistency showing that it might have started already before the 1230s.

Discussion

Many earlier scholars have argued that the first whole brick building in Finland was the nave of Turku Cathedral erected at the end of the 13th century (Kronqvist 1948, 34; Gardberg 1987, 53; Hiekkanen 1994, 225 ff.; Gardberg *et al.* 2000, 38 ff.). However, this dating has recently been questioned and a much later dating to the beginning of 15th century has been suggested instead. Brick was applied only in the details of the interrupted construction of a stone cathedral at the end of the 14th century – not in the 13th century (e.g. Drake 2003b, 138; 2006, 17 ff.; 2009, 182 ff.; Hiekkanen 2007, 191 ff., but see Lindroos *et al.* 2011, 115). While the brick-built phase of Turku Cathedral is rather late, there is evidence of brick making and building in masonry elsewhere in the town from the early 14th century (Uotila 2002, 8 ff.; 2003, 123 ff.; Ratilainen 2010; Seppänen 2012, 649). In contrast to the urban development, according to Hiekkanen (1994; 2007), stone churches started to be built in the parishes, convents, and monasteries of mainland Finland only from the beginning of the 15th century. Accordingly, the two major brick buildings, Häme Castle and the Holy Cross Church of Hattula, are currently dated to the end of the 15th century (e.g. Drake 2001, 217; 2003a; 11 ff.; Ratilainen 2003, 157; 2006, 278; Hiekkanen 2003, 168). The preceding grey stone castle of Häme, with minor use of brick, dates to the end of the 14th century (e.g. Drake 2001, 217; 2003a, 12 f.).

In addition, such Iron Age hillforts as Vanhalinna in Lieto and Hakoinen in Janakkala continued to be used at least till the 14th century (Drake 1967, 33; Luoto 1984, 128 f., 152 f.; Gardberg & Welin 1993, 21 ff.; Taavitsainen 1990, 140 f., 236 f.), which raises doubts about the views of their early 13th-century brick structures. Consequently, other early 13th-century remains of masonry structures, in places such as Turku Castle and the Cape of Koroinen, have come into question (Drake 1994, 49 ff.; Hiekkanen 2003, 89, note 7; 2007, 185 f.). However, in contrast to these recent interpretations, so far our results do not indicate that the brick structures at Koroinen were late medieval in date. In fact, the brick house on the river actually could be one of the first buildings entirely made of bricks in Finland.

Conclusions

On the river bank of Koroinen, a stone keep with a brick floor, a small brick house with grand brick decorations, and a large wooden house with a heat-storage hypocaust were constructed before the end of the 14th century or 1429. The stone keep and the wooden house with a hypocaust seem to date to the 13th century or beginning of the 14th century. A large wooden building preceding the keep might be one of the bishop's first buildings, constructed on the cape after 1229, or it might even be older than that. The hypocaust house together with the brick house constituted a bishop's residence. The keep and the brick house suffered from tilting, which may be the reason they were not repaired after a possible fire.

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Notes

1 Ratilainen analysed the brick material and composed the original manuscript, while others have made revisions and commented on it.

2 If materials are not mentioned, layer or excavation layer refers to technical shovelling layers applied by Rinne. The first layer = approximately 0–20 cm, the second = 20–40 cm etc.

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