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THE EARLY HISTORY OF THE FORTRESS OF KÄKISALMI, RUSSIAN KARELIA, AS EVIDENCED BY NEW DENDROCHRONOLOGICAL DATING RESULTS

Abstract

Dendrochronological analyses were made of seven timber samples collected at archaeological excavations at the Fortress of Käkisalmi. The samples were taken from a layer containing timber 1.5–2.5 m below the present surface. All samples were of pine, and their annual rings could be dated precisely to cover the time period AD 1184–1373. In most cases the outermost rings had been carved off or decomposed, and thus the felling date could only be estimated to an accuracy of 5 to 50 years. The approximated felling dates of this material vary between 1332 and ca. 1420. Only one sample had the bark present and its felling date could be dated exactly to the winter season (September–April) 1363/1364. All dating results presented here do not agree with earlier datings from this timber layer, but our material is still too limited for final conclusions.

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Introduction

The Fortress of Käkisalmi is situated in the middle of the town on an island in the (now) shallow River Vuoksi, about four kilometers from the shore of the Lake Ladoga. The first written record of Käkisalmi dates from 1294/95. Archaeological excavations have been carried out at several occasions in order to investigate the earlier building phases of the Fortress (Fig. 1; Schvindt 1898; Kirpičnikov 1979; 1984; Saksa 1992; Uino & Saksa 1993).

Our aim is to present the dendrochronological dating of timber samples collected at the archaeological excavations conducted in 1989 and 1990 by A.I. Saksa and P. Uino,[1] and to discuss the results in comparison with earlier datings in order to get additional information concerning the phases of construction (see Kankainen et al. 1995). The dendrochronological dating was performed at the University of Joensuu Laboratory of Dendrochronology and financed by the Academy of Finland Research Council for the Humanities.

[1] The samples were collected by P. Zetterberg (sample 01), A.I. Saksa and P. Uino (02–06), and Matti Saarnisto (07).

Methods and material

The dendrochronological dating method is based on the examination of the annual rings observed in samples of wood. Even if conditions of other kinds have an effect, the width of each annual ring of a tree mainly reflects the weather conditions prevailing in the particular growing season. Bad years grow narrow and favourable years wide tree-rings. Because weather conditions show similar variations within large regions, also the series

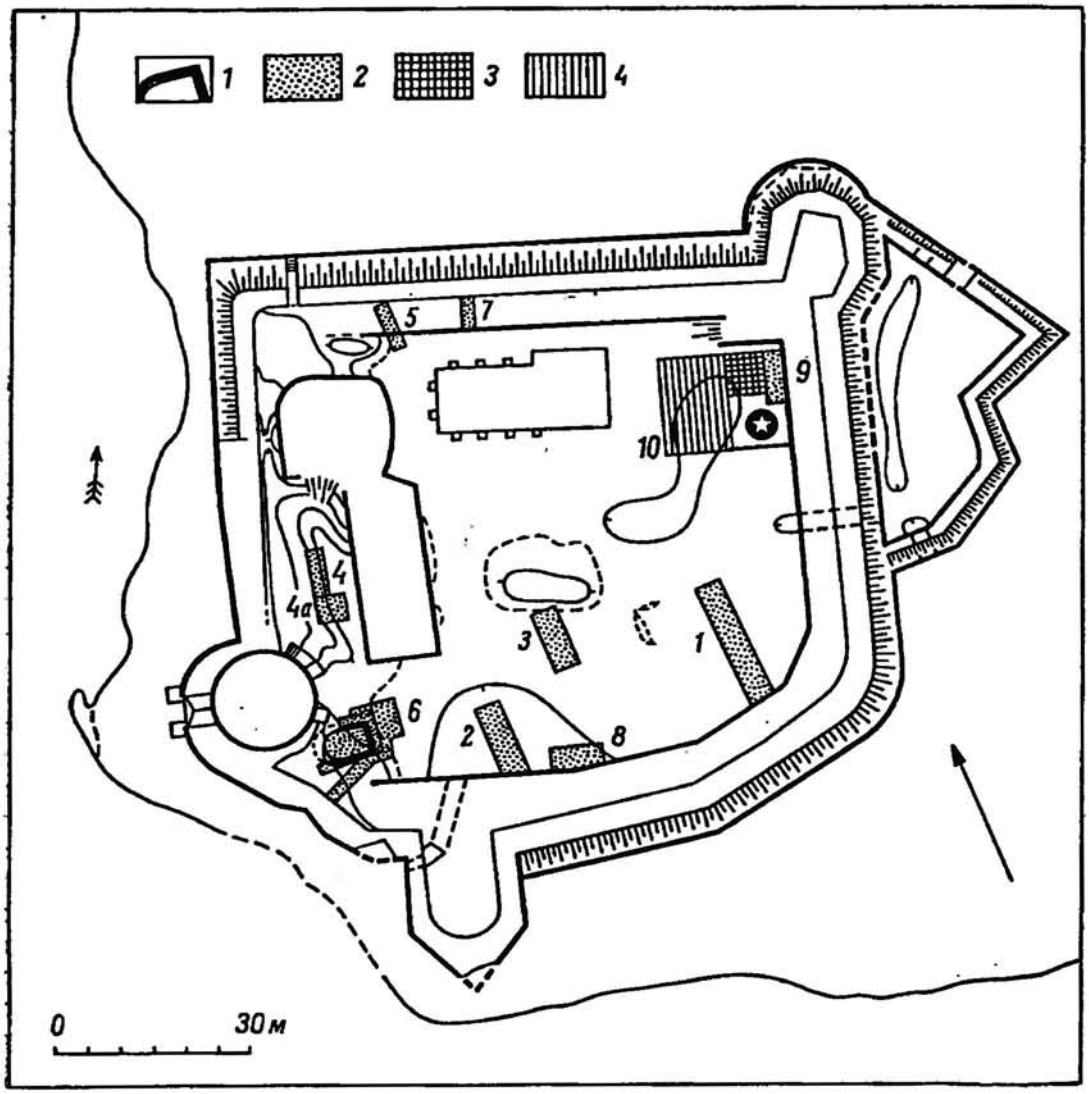

Fig. 1. Plan of the Fortress of Käkisalmi. 1. The fundament of the stone tower from AD 1364; 2–4. The excavation areas of 1972–73, 1975–76. Asterisk: the excavation area of 1989–90.

of annual rings of trees of one species living at the same time in a given region are closely similar. This similarity is used in dendrochronological dating.

It is possible to determine the period of growth of a series of tree-rings of a sample of unknown age by comparing with a series of tree-rings of which the calendar years of growth are known. In favourable cases the outermost ring of a sample is also the last ring grown by the tree. This makes it possible to date the felling with an accuracy of one year, and sometimes it is even possible to determine the month of felling if it took place during the growing season. For further information about dendrochronological methods, see e.g. Zetterberg (1991).

Except for one the samples from the Fortress of Käkisalmi (Fig. 2) were taken from timber where the original surface under the bark was missing. In such cases the outermost surviving tree-ring represents the year before which the felling can not have taken place, but it is not possible to determine the actual year of felling. Besides decay the missing of the original surface may be due to peeling the bark off or hewing in connection with building. Excavation, sampling, and transporta-

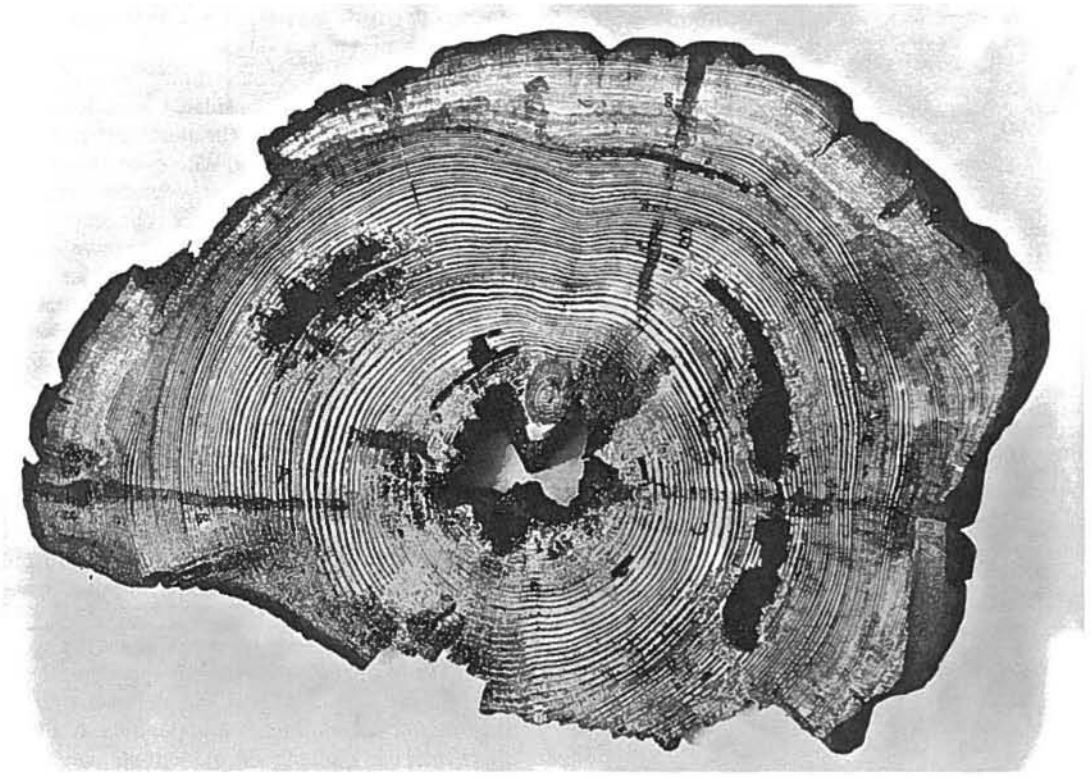

Fig. 2. Dendrochronological sample number 04 from the Fortress of Käkisalmi. The growth rings measured from three radii date to the period AD 1215–1351. Photo P. Zetterberg.

tion may also damage a softened surface.

The "winter season" refers to the period between two growing seasons when no radial growth takes place, i.e. from September to April. On the other hand the radial growth may begin only late in June and cease in early August. As the annual variation is considerable this definition of the winter season is suggestive only. In trees felled during a winter season the ring grown the preceding summer is the last complete one.

Several pine master chronologies, all of them highly representative and based on tens of earlier datings, and stretching back to the 11th-13th centuries, were used in this study as reference material (Zetterberg, in print).

At the Laboratory of Dendrochronology seven samples were investigated. While sample 07 derives from the eastern part of the 1989 excavation samples 02–06 were taken in the western part of the 1990 excavation. All of the samples represent horizontal logs (Fig. 3). The samples 02–05 and 07 represent a horizon with horizontal logs (at a depth of 1.5–1.9 m) assumed to date from the early 14th century. The structure in question may have been a quay or floor of some kind. Sample 06 originates from a horizontal log belonging to a timber structure of unknown function discovered beneath the former structure (at a depth of 2.5 m), and with an earlier radiocarbon date.

Sample 01 is a core taken from a log in the historical exhibition at the Fortress, the original location of which is not exactly known. It was already badly affected by decay and wearing as were the samples mentioned above.

Dating results

The dating results given below are based on dating report no. 90 of the Laboratory of Dendrochronology (Zetterberg 1992). Fig. 4 presents the time span covered by the tree-rings observed in the samples hereby dated as well as an estimate of the felling date.

The last complete ring observed in sample 01 dates from AD 1332. There is, however, some lat-

Fig. 3. The upper horizon of wooden structures in the Fortress of Käkisalmi in the western part of the 1990 excavation. The samples 02–05 (timber no 05 is still unseen in the profile). View from the south. Photo P. Uino 1990.

er wood present, but it is not suitable for study because of decay. It is possible that the tree was felled soon after the last complete ring had grown, but it is also possible that the felling took place considerably later. Because the question cannot be solved from the available core sample, the date mentioned above represents a *terminus post quem* for the felling.

While in sample 02 some bark was still present it was possible to determine the felling date exactly to the period between September 1363 and April 1364.

The last observed rings in samples 03–05 scatter within the period AD 1335–1373. Because the surface of the logs were severely affected by decay and wearing it is difficult to estimate the real felling date. However, it is assumed that 5–50 rings were lost although, in principle, even more rings could have disappeared. Thus the felling dates were estimated as follows: sample 03 — AD 1378–1423, sample 04 — AD 1356–1401, and sample 05 — AD 1340–1385.

In sample 06 only 55 annual rings were present, which in this case was considered insufficient for the determination of the chronological position. Sometimes it is possible to date even shorter sequences, if the rings show considerable variation in thickness thus allowing for a connection with other ring series representing trees grown at the same time. In this case the average thickness of the annual rings is nearly 2 mm, indicating that the tree grew fast, and lacking determining characteristics the series is not conclusive. The series shows some consistency with samples 02, 03, 05, and 07, suggesting that the last ring would represent the year 1332. However, as the testvalues of fitness remain below t= 4.0 in each case, this sample is given no dendrochronological date. According to high precision radiocarbon determinations the present surface ring of this log derives from AD 1225±12 years (Kankainen in print; Kankainen et al. 1995).

In sample 07 the last observed ring dates from AD 1348. As decay and wearing apparently have affected the surface of this sample less severely than that of several others it is possible to give a more precise estimate of the felling date: AD 1350–1360.

Discussion

It appears from the results, that the earliest possible felling dates fall between AD 1340 and 1378. Only one tree, represented by sample 05, may have been felled before AD 1350. The trees represented by samples 02–04 and 07 were, again, definitely felled in the latter half of the 14th century, or even later, by AD 1423.

Our present results do not entirely correspond with the dates of the samples collected at the excavations of 1972–73. According to Kolčin and Černyh (1977, 62) fourteen timber samples were taken. Their results point to the existence of two distinct horizons of wooden structures, viz. an earlier from AD 1310–1360 and a later from the 1360's and 1380's, the turning point being the fire in AD 1360, mentioned in written records (Kirpičnikov 1979, 59; 1984, 126).

The dating of the earlier and later Fortress of Käkisalmi is based on a comparison of the tree-ring series with corresponding material from Novgorod, Orešek and Pskov (Kolčin & Černyh 1977, 60–63). The oldest logs of the lowermost stratum of the earlier horizon would date from the period AD 1305–1313 (Kolčin & Černyh 1977,

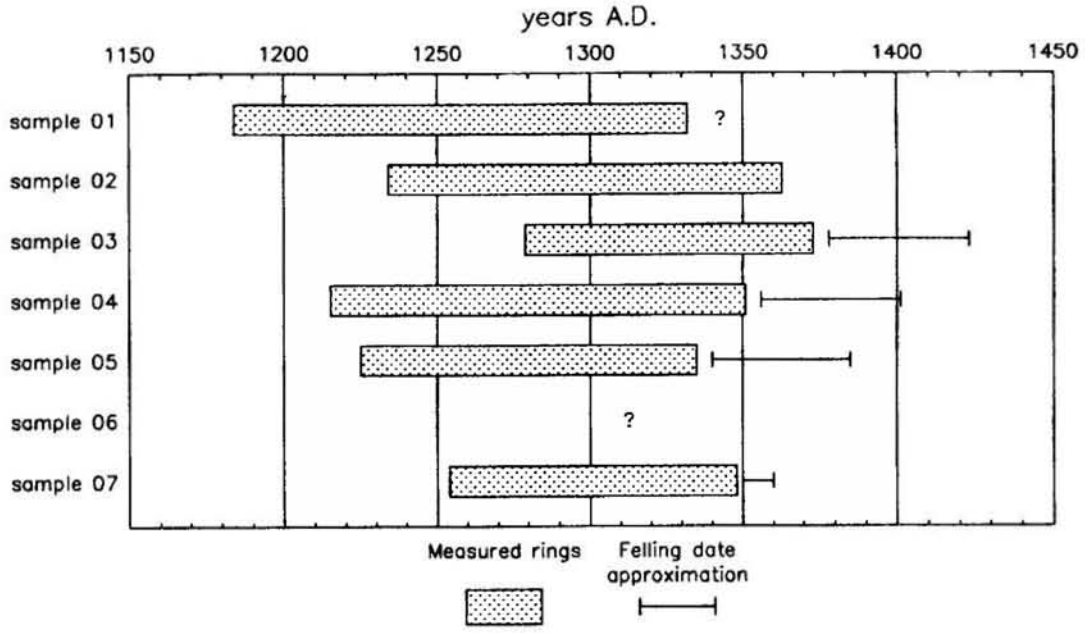

Fig. 4. Tree-ring sequences and felling date estimates of the dendrochrological samples from the Fortress of Käkisalmi.

113–114). However, while the surface was reported intact for one sample only (AD 1312), the loss of rings was not estimated for the others, and thus it is not possible to determine with certainty the felling dates of the latter (Kirpičnikov 1979, 59 note 46, where the felling dates are AD 1303–1313). Consequently the given dates are not satisfactory for a reliable dating of the structure. The outermost rings of the logs from the upper horizon date from AD 1360, 1366, and 1389, i.e. to the building phase following the fire of AD 1360.

In the first place the published results represent the situation in the W part of the fortress (excavation area 4), not the NE part, viz. excavation area 10 (cf. Taavitsainen 1990, 241), next to which the excavations of 1989–90 were carried out. According to Kirpičnikov (1979, 59 note 46) 30 discs taken from area 10 were sent to Moscow for dating, but no results are available so far. However, Kirpičnikov (1979, 60 Fig. 2) interpreted the timber layer discovered in area 10 as explicitly representing the building phase preceding the fire of AD 1360. The level of this layer corresponds with that of the timber layer excavated in 1989–90. Lying in each others extension they form a section of a large structure, part of which is still uncovered.

The divergence of the Finnish and Russian results must at least to some extent depend on the fact that the samples derive from opposite sides of the courtyard. Kirpičnikov's interpretation of two different 14th century building horizons is not necessarily valid in all parts of the Fortress island. The building activity probably continued gradually over a period of time and not within two restricted phases, even if the fire of AD 1360 must have called for large scale rebuilding. The correspondence of the dendrochronological curves used by Russian and Finnish investigators is not examined, so far.

Kirpičnikov connects his dendrochronological dates with records in the Novgorod Chronicle according to which the Russians would have fortified the island AD 1310 and again after the fire. As such the inference is logical. However, of our samples, only 04 and 05 may represent a building horizon earlier than the fire, but neither of them may have been felled before 1335. On the other hand, all samples in question (02, 03, 04, and 05) belong stratigraphically as well as visually to one and the same timber structure. We are inclined to think that the timber layer at issue represents the building activity that followed the fire, and in connection with which also older timber was reused.

Considering the dates it is important to note that the dendrochronological method only dates the ring series of a sample. In interpreting the re-

sult it is necessary to take into account that the sample may in fact represent reused timber from some earlier structure. If so, the direct use of a tree-ring date results in a date too early for the object at issue. Reuse of timber has been common, and clear marks of this are present also among the timber referred to here. E.g. in the trunk sampled as 02 a cut is clearly seen, probably indicating an earlier use as a log in a building. Reuse explains also why this log was felled at least 15 years before the log found beneath it and sampled as 03 was felled.

On sampling technique

Even though a trunk has a sufficient number of annual rings a bad technique can result in a sample containing too short a sequence, i.e. less than fifty rings. Because of this a correct sampling technique is particularly important. Timber from too young a tree would also contain an inadequate number of rings, as our sample 06.

Thus, provided that several trunks are present, a representative number of samples should be taken, as the possibility of accurate dating will improve when more material is available. At a site like the Fortress of Käkisalmi samples should ideally be taken from every possible log. While dating may be successful on the basis of a couple of samples only, chances of failure are very much greater.

Difficulties in the interpretation of the dating results may arise from the reuse of old timber in new structures or the use of new timber for repair of old structures. Because of this there is a considerable risk of a sample to differ in age from the rest of the timber of the structure.

Conclusions

The Käkisalmi dendrochronological dates do not shed light on the question, whether there was a fortress on the island already in the 13th century (the Karelian phase, indicated by artefacts discovered at different excavations). The results provide data for the study of the 14th century Novgorodian building activity only. The sample series is also too restricted for far-reaching conclusions. In order to solve problems concerning the building phases of the island, more extensive excavations are also needed.

References

Kankainen, T., (in print): The early history of Käkisalmi fortress as revealed by high-precision ^{14}C analyses of the lowest wooden structures. *PACT Journal.*

Kankainen, T., Saksa, A. I. & Uino, P. 1995: The early history of the Fortress of Käkisalmi, Russian Karelia — archaeological and radiocarbon evidence. *Fennoscandia archaeologica* XII.

Kirpičnikov, A.N. 1979: Istoriko-arheologičeskie issledovanija drevnej Korely ("Korel'skij gorod" XIV v.). *Finno-ugry i slavjane.* Leningrad.

Kirpičnikov, A.N. 1984: *Kamennye kreposti Novgorodskoj zemli.* Leningrad.

Kolčin, B.A. & Černyh, N.B. 1977: *Dendrohronologija Vostočnoj Evropy.* Moskva.

Saksa, A.I. 1992: Käkisalmen maasta esiin kaivettu historia. *Viipurin Suomalaisen Kirjallisuusseuran toimitteita* 10.

Schvindt, Th. 1898: Käkisalmen pesälinnan ja entisen linnoitetun kaupungin rakennushistorian aineksia. *Analecta Archaeologica Fennica* II, 2.

Taavitsainen, J.-P. 1990: Ancient Hillforts of Finland. *SMYA* 94.

Uino, P. & Saksa, A.I. 1993: Results and Perspectives of Archaeological Investigations at the Castle of Käkisalmi/Kexholm. *Castella Maris Baltici* 1. *Archaeologia Medii Aevi Finlandiae* I.

Zetterberg, P. 1991: Dendrokronologia — puun näkökulma ihmisen ja luonnon historiaan. *Saimaalta Kolille. Karjalan tutkimuslaitoksen 20-vuotiskirja* (Hakamies, P., Jääskeläinen, V. & Savijärvi, I., eds). Joensuu.

Zetterberg, P. 1992: Käkisalmen linnan arkeologisten kaivausten puulöytöjen ajoitus, dendrokronologiset näytteet SUL0101–SUL0107. Joensuun yliopisto, Karjalan tutkimuslaitos, ekologian osasto, Dendrokronologian laboratorion ajoitusseloste 90 (dating report, manuscript).

Zetterberg, P., (in print): Dendrochronological dating in Finland. In Time and Environment, a PACT seminar, September 25–28 1990, Helsinki, Finland. *PACT Journal.*

ABBREVIATIONS

FA	Fennoscandia archaeologica
FFT	Finska Fornminnesföreningens Tidskrift
FM	Finskt Museum
HyalM	Helsingin yliopisto arkeologian laitos Moniste
SKS	Suomalaisen Kirjallisuuden Seura
SM	Suomen Museo
SMYA	Suomen Muinaismuistoyhdistyksen Aikakauskirja

TRANSLITERATION USED IN THIS VOLUME

Cyrillic alphabet		**Latin alphabet**
А	а	a
Б	б	b
В	в	v
Г	г	g
Д	д	d
Е	е	e
Ё	ё	jo
Ж	ж	ž
З	з	z
И	и	i
Й	й	j
К	к	k
Л	л	l
М	м	m
Н	н	n
О	о	o
П	п	p
Р	р	r
С	с	s
Т	т	t
У	у	u
Ф	ф	f
Х	х	h
Ц	ц	c
Ч	ч	č
Ш	ш	š
Щ	щ	šč
Ъ	ъ	"
Ы	ы	y
Ь	ь	'
Э	э	é
Ю	ю	ju
Я	я	ja