Experimental Textile archaeology – a link to the past?

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Introduction

Textile archaeology is a research field which covers many different aspects of the past. Textiles and textile production have always had an economic, social and cultural impact on societies despite time and region and it is important to include this in our general interpretation of the past, if not, a large part of our history is lost.

Archaeological textile research began by focusing on preserved textiles and techniques but more recently has considered textile tools and production. In textile research it is often stated that "textile researchers have the advantage that many of the tools are still in use by crafts people today" and we know, for example, how to spin with a spindle or weave on a warp-weighted loom. However, the challenge is to transfer this knowledge to the interpretation of tools and production in ancient societies, and one can never presume that the tools and the techniques were exactly the same 1000 or 2000 years ago. A method based on traditional craft is experimental archaeology. Archaeological finds of textile tools have been reconstructed and tested and the results used to interpret which types of textiles that could have been produced at a specific site but the method always provide a range of interpretations and answers. For many years I have, together with crafts people, conducted several experiments with different types of reconstructed tools. In the following I will discuss the possibilities and limitations using this method in textile archaeological research.

Background

The study of tools, textiles and production is complex but textile tools often constitute the most important type of evidence for textile production and technology during prehistory. A textile tool represents a single artefact and can be examined as such. Tools and textiles can be examined from different approaches, separately or together. The numbers of methods which can be chosen are endless and will undoubtedly give various results depending on the questions asked and the material under study.

From my perspective, archaeological objects are actively and meaningfully used in daily life. The textile tools revealed by excavations are not things in themselves, nor are they just artefacts – things made by man –they are representations of ideas.

A textile is the result of complex interactions between resources, technology and society. Therefore it is equally important to put the results of the analyses of textile tools in their context. What type of settlement is the tool from, or is it from a burial? What types of textiles are found, what access did people have to different types of raw materials? Which region and what time period? And depending on the answers, one will of course gain different results (fig. 1).

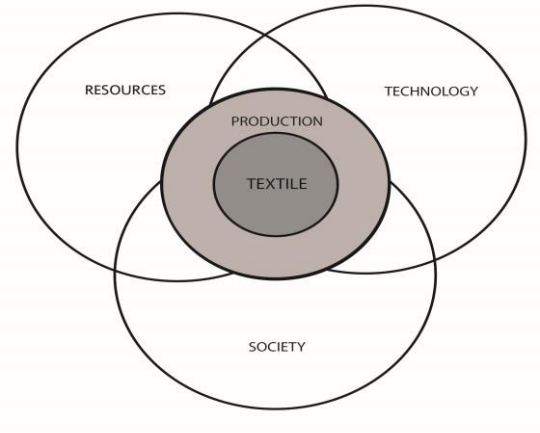

Figure 1. Essential parameters to include when discussing interpreting textiles and textile production in ancient societies. (after Andersson *et al.* 2010)

1994-1999: I recorded c. 10 000 tools from 15 settlements dated to late Iron/Viking Age (AD 400-1050). The majority of the sites were dated to Viking age (AD 750-1050). The research question was very simple: can detailed registration and analyses of textile tools provide us with a better understanding for the production of textiles?

I started to study 7 settlements in southern Sweden, five of the settlements interpreted as ordinary agrarian settlements, small villages while two places were different (fig. 2) (Andersson 1996, 1999, 2000, 2003b). Åhus is a port of trade with specialist craft production like comb and bead making. Löddekopinge is interpreted as a market place at 9th century with a small permanent settlement. During the 10th and 11th century there was a permanent settlement with large farms probably with a strong connection to the Danish king who built a ring fort nearby. However, no traces of a specialist production of craft has been found instead the focus has been on a large scale iron work and textile production.

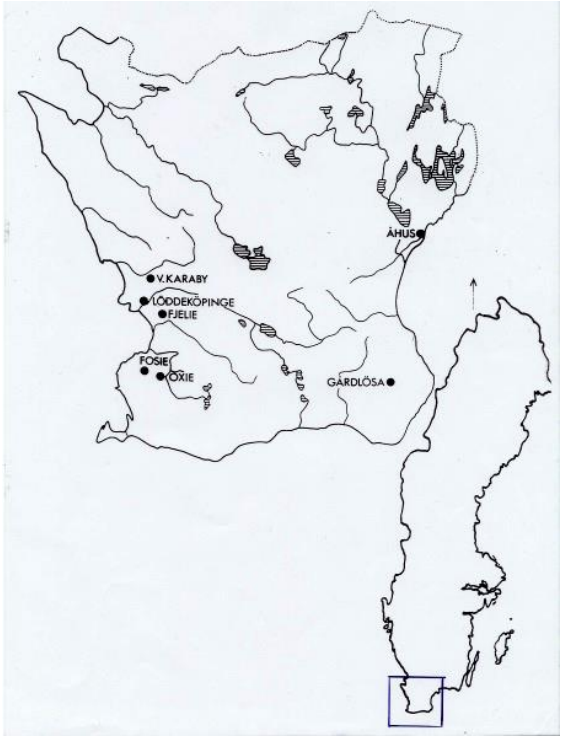

Figure 2. Settlement in Scania. Andersson 1996.

Textile tools were of course found on all settlements in the study and the majority of the tools were from pit houses. Of the total number of 392 houses, textile tools were found in floor layers of 202 and in 141 houses loom weights or fragments of loom weights were found (in floor layers) (fig 3)

Figure 3. Textile tools from pit house 261 Löddeköpinge, Scania, Sweden. Loom weights, spindle whorls, pinbeaters and a tooth from a wool comb.

Later I also studied tools from Birka, 6 agrarian settlements in the Mälar valley and finally Hedeby (fig. 4). Birka and Hedeby are both port of trades or rather, Viking towns with evidence for trade and specialist craft. It should be noted that actually over 50% of all tools I studied are from Hedeby and 25% from Birka, however, it is clear that many tools do not necessarily equal a large production (fig.4) (Andersson 2003a; Andersson Strand 2011). These were sites where many people lived, people who all needed textiles.

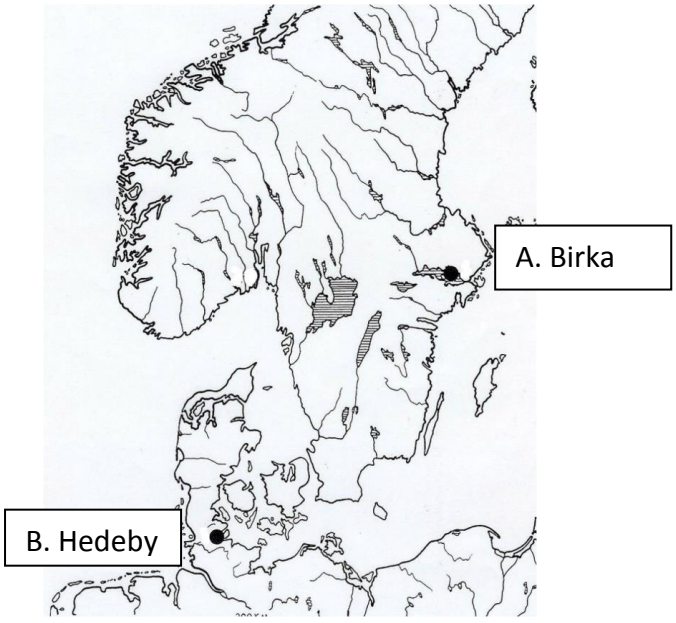

Figure 4. A Birka, B Hedeby.

	Birka	Hedeby
Spindle whorls	429	939
Loom weights	Complete 70 Frag 1406	Complete 520 Frag 3480
Bone needles	414	302
Needle boxes	140	0
Total	**2459**	**5241**

Figure 5. Number of the most common findings of textile tools from Birka and Hedeby (Andersson 2003a).

The most common finds are spindle whorls and loom weights, which, of course, only can be considered as part of a tool. Other types of tools included in the study were for example bone needles, tooth from wool combs, pin beaters, weaving beaters, needle boxes, fine metal needles, tablets, weaving combs, smooth stones, smooth boards but with the exception of bone needles, there were in general very few of these objects preserved. Further, there was a clear difference in the distribution of tools. Spindle whorls, loom weights and bone needles were with some exceptions found on all sites while the other types of tools in general were from the port of trades and from the rich burials in Birka.

It is obvious that spindle whorls and loom weights are only parts of tools and that the parts made of perishable materials in general are missing, such as spindle rods or the wooden parts of the loom. However, in Hedeby, there is a very good preservation for perishable materials so here I also had the possibility to study a large number of spindles, distaffs, tools for plant fibre processing etc..

In order to get as much information as possible the tools were very recorded in a very detailed manner and several observations were made, for example:

- The shape of the spindle whorl clearly depends on the material it was made from
- If one or more spindle whorls are found in the same house they are in general of different sizes
- Clear difference in weight distribution of spindle whorls between different types of sites
- The loom weights were generally very fragmentary
- When loom weights were found in pit houses, most of the fragments in floor layers were from the north east part of the house which might indicate the place for the loom
- There was also different weight distributions – the number of smaller/lighter loom weights were higher in Åhus, Birka and Hedeby
- The clay quality of the loom weights was better in Åhus, Birka and Hedeby

- Same type of decorations on loom weights in Åhus, Birka and Hedeby; decorations very rare on agrarian sites
- Both loom weights and spindle whorls from Åhus, Birka and Hedeby gave a more standardised impression, especially the tools from Hedeby

From an archaeological perspective these observations clearly indicate a different type of production and/or organisation of production at the ports of trade/Viking towns. In order to get a better understanding for the differences and similarities and to come closer to the production, the products and the producers, I decided to combine the results with knowledge of textile techniques and the use of textile tools and to adapt experimental archaeology as a method.

Experimental textile archaeology.

Experimental archaeology is method that has been used in archaeology for a very long time. It has and will always be considered as controversial and be debated. It is clear that the results will always be hypothetical; still they can be applied and discussed in relation to an archaeological material and a context.

In textile research we have the advantage that many of the tools are still in use by crafts people today and we know, for example, how to spin with a spindle or weave on a warp-weighted loom. However the tools used are slightly different from the tools used in ancient societies and the type of textiles produced today is in general not the same type of textiles that were produced then. An important part is therefore the testing of function and efficiency of textile tools and fibres similar to the fibres used.

I have during the years together with a team of craft people conducted several test on spinning and weaving with reconstructed tools (fig. 6)

	Year	**Tools**	**Number of sheep breeds**	**Type of fibres**	**Textile technician**
spinning tests	1994	5 spindle whorls	2	mixed and wool	Carina Holm
test of tools reconstructed from pithouse 1007	1996	2 spindle whorls, loom weights, iron weaving beater	1	hair and wool	Anne Batzer, Carina Holm
spinning tests	1997-98	4 spindle whorls and spindles reconstructed from find from Hedeby	1 but 2 different fleeces	hair, wool, mixed	Anne Batzer, Maria Jirborn
spinning tests	2005-2006	3 spindle whorls reconstructed from find from Nichoria	1	hair/mixed	Anne Batzer Linda Olofsson
Experiments in research program Tools and Textiles - Texts and Contexts at CTR					
weaving test	2005-2006	loom weights recorded from Troia		yarn spun with the the spindles from Nichoria	Anne Batzer Linda Olofsson
spinning/weaving test	2006	loom weights recorded from Troia	flax	yarn spun with the the spindles from Nichoria	Anne Batzer Linda Olofsson

weaving test	2006	tested loom weights same weight different thickness		machine spun wool yarn similar to our spinning tests	Anne Batzer Linda Olofsson
weaving test	2007	two types of spool reconstructed after spools from Khania		machine spun wool yarn similar to our spinning tests	Linda Olofsson
Experiments in research program Vorbasse at CTR					
fibre preparation		prepared fibres, blind test	1 but 3 different fleeces		Linda Olofsson/Lise Raeder Knudsen
Spinning		tested a metal spindle whorl	1		Linda Olofsson
weaving test		reconstructed loom weights from Vorbasse		machine spun yarn similar to the spinning test	Linda Olofsson

Figure 6. Various textile tool experiments (Holm 1996; Andersson 1999, 2000, 2003. Andersson *et al.* 2008; Mårtensson *et al*. 2006a; Mårtensson *et al*. 2006b; Mårtensson *et al*. 2006c; Mårtensson *et al*. 2007a; Mårtensson *et al*. 2007b; Mårtensson *et al*. 2009; Andersson Strand 2012; Andersson and Olofsson in press; Olofsson *et al.* in press.)

From the beginning I have worked according to very general guidelines:

- The test should be made by skilled textile technicians with training in prehistoric textile techniques and/or have been working with textile production professionally
- The test should be made with reconstructed tools - as far as possible
- The fibres should be carefully chosen and if possible chosen in accordance with archaeological textiles
- When using a machine spun yarn, this should always be chosen after comparison with either the original fibres or our spinning tests.
- Also the fibre processing should be done with reconstructed tools
- All tests are based on observations relating to the archaeological material

Today a number of spinning tests with reconstructed spindles have been made. Different types and sizes of spindle whorls and spindle rods have been reconstructed after archaeological originals and wool fibres have been carefully chosen, if possible in accordance with archaeological textiles. All experiments clearly indicate that it is the fibre, the preparation of the fibre and the size of the spindle whorls that affect the output – the spun yarn.

Figure 7. Reconstructed spindles used in the experiments 1998. The reconstructions are based on originals from Hedeby (fig. 8).

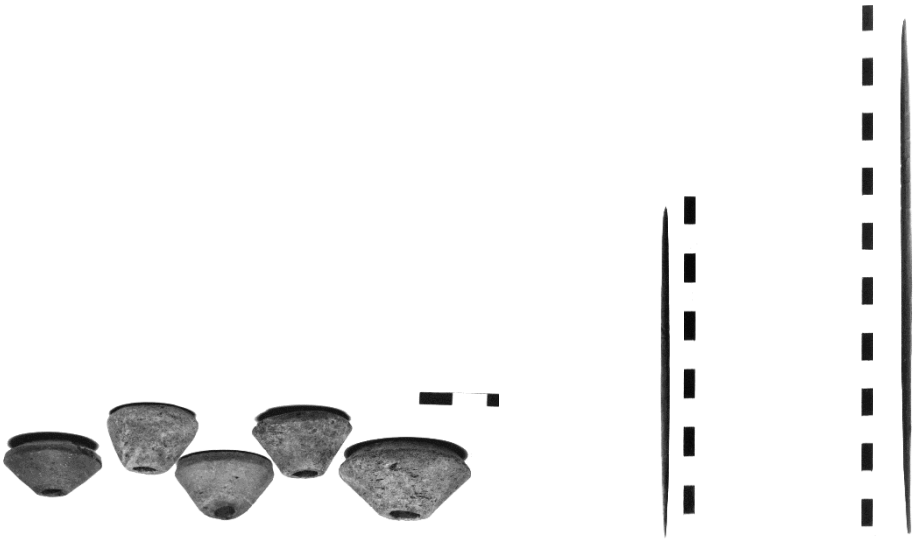

Figure 8 spindle whorls (left) and spindle rods (right) from Hedeby (Andersson 2003)

As demonstrated in figure 9 the test demonstrated that the type of fibre affected the output but further it was clear that also the size of the whorl affected the output of spun yarn (figure 9 and 10).

The tests show that the output of a metre of yarn per 100g wool is larger when using a light spindle the conclusion is that it is the fibre quality and the size of the spindle whorl that determine the output of meters of yarn spun from a specific amount of fibre. The lighter the whorl the higher is the output of metres of yarn. The conclusion is that with a light spindle one spins a thin and light yarn and a heavier spindle is useful when spinning a thicker and heavier yarn. The spinner's experience is, of course, also of importance but our hypothesis is that spinners in general were highly skilled in ancient societies. It is not possible to say that this spindle was used to spin exactly one type of yarn, the variables are too many, for example, the use of different fibres. Further, there will always be a range of different types of yarns even if using the spindle. However, the results clearly suggest different types

spindles could have been used in the production of different types of yarn and the results can be applied to the archaeological spindle whorl and contexts.

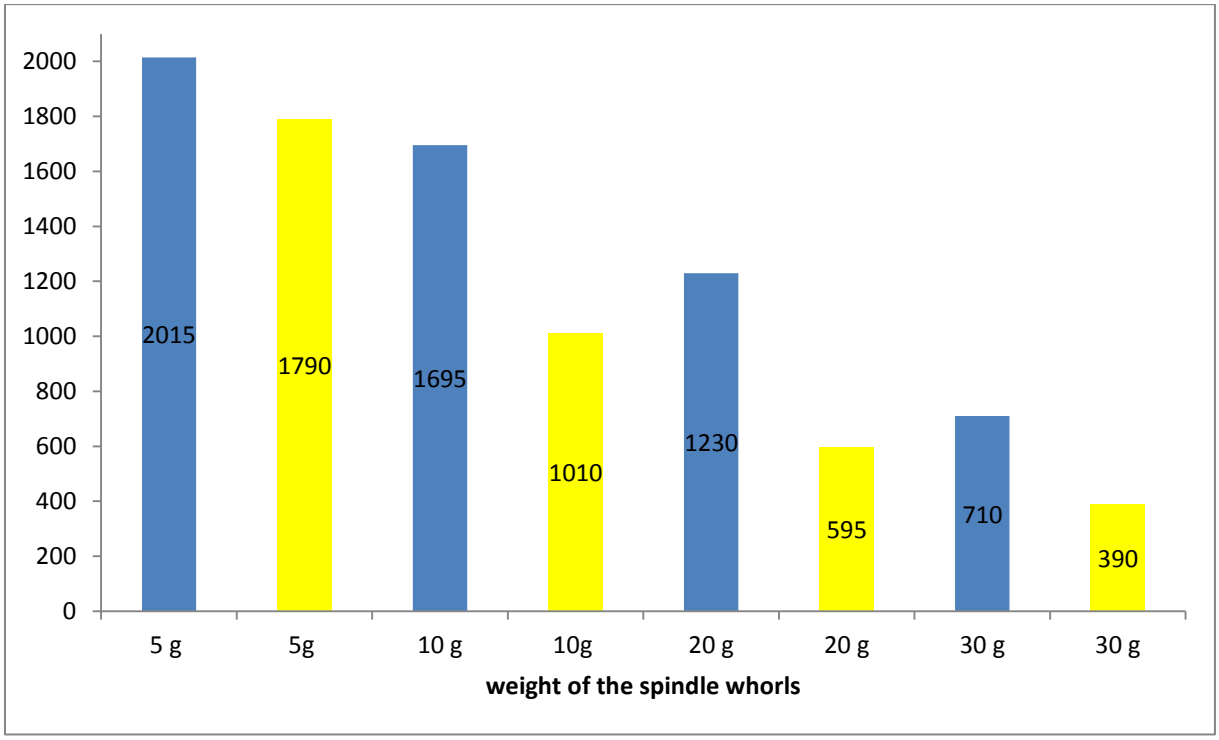

Figure 9. Output, metre of yarn/ 100 g wool spun with spindle whorls weighing 5, 10 20 and 30 g and two different fleeces. fleece 1; fleece 2. The wool was chosen after analysis of Viking Age textiles (Andersson 1999, 2003).

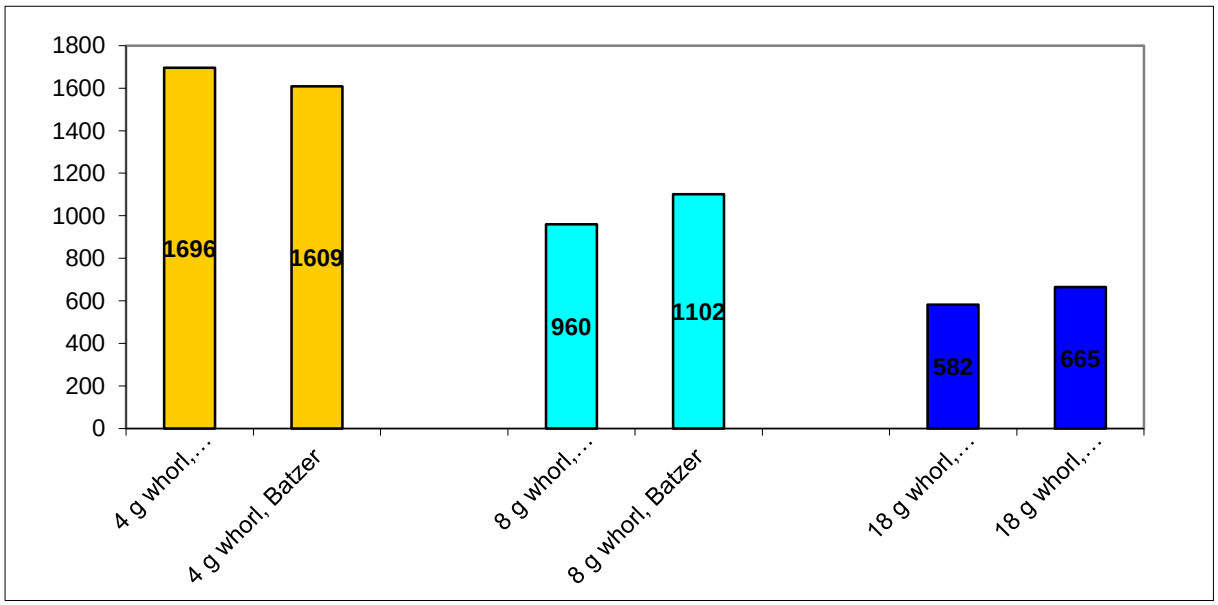

Figure 10. Output, metere of yarn/ 100 g wool spun with spindle whorls weighing 4, 8 and 18 g and two spinners. Since there was no fibre analysis on Bronze Age Mediterranean wool when the experiment started the wool type was chosen after discussion with fibre specialist Carole Christensen (Mårtensson et al. 2007a).

When combining the results from the tests to the recording of the tools from the sites studied, various observations can be made. The results indicate the type of production on

different sites. If the spindles were of different sizes one could suggest a production of many types of yarn while clusters of spindle whorls within the same size group could indicate a more specialist production. When applying these results to the results of the tools from the different sites this make sense. The observation that spindles from the same house were of different sizes suggest a production of different types of yarn (fig. 11). The cluster of lighter and smaller spindle whorls on the port of trade/Viking towns indicate a larger production of special qualities of thinner yarns (fig. 12 and 13).

Figure 11. Groups of spindle whorls from floor layers in different pithouses (Andersson 1996).

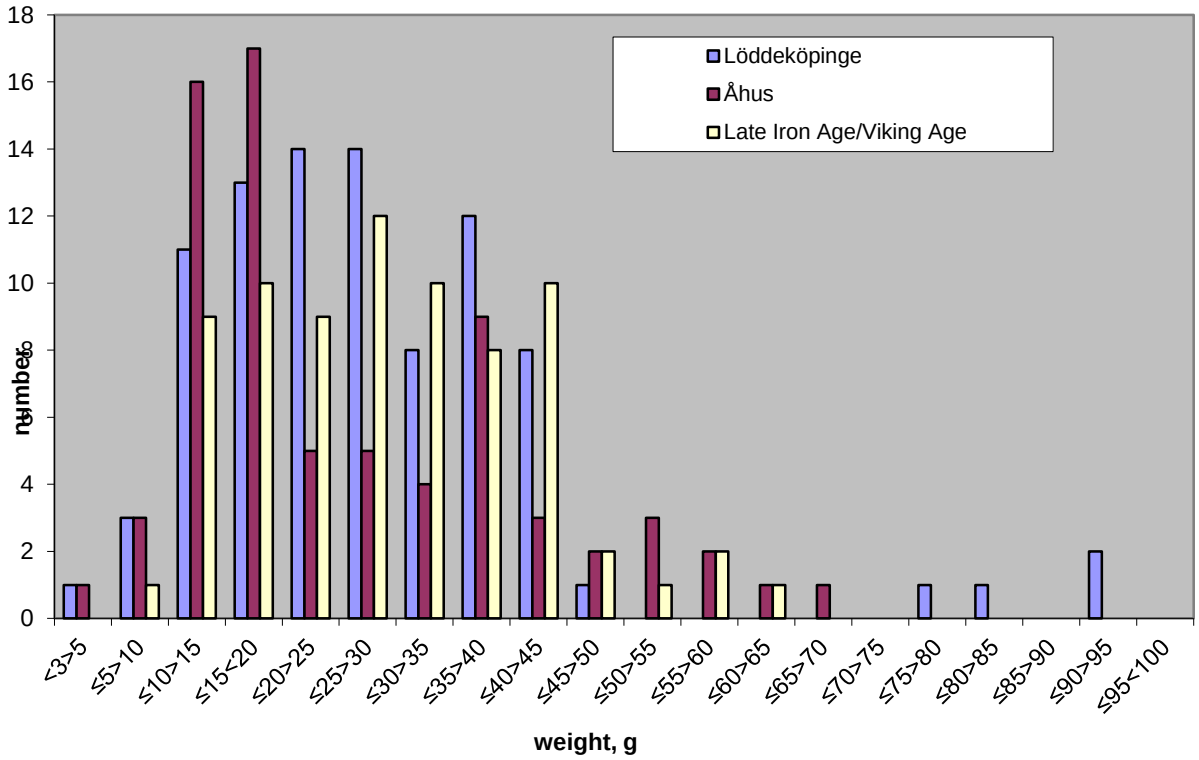

Figure 12. Spindle whorls number/weight Löddeköpinge N=89, Åhus N=72, Late Iron Age/Viking Age settlements N=75.

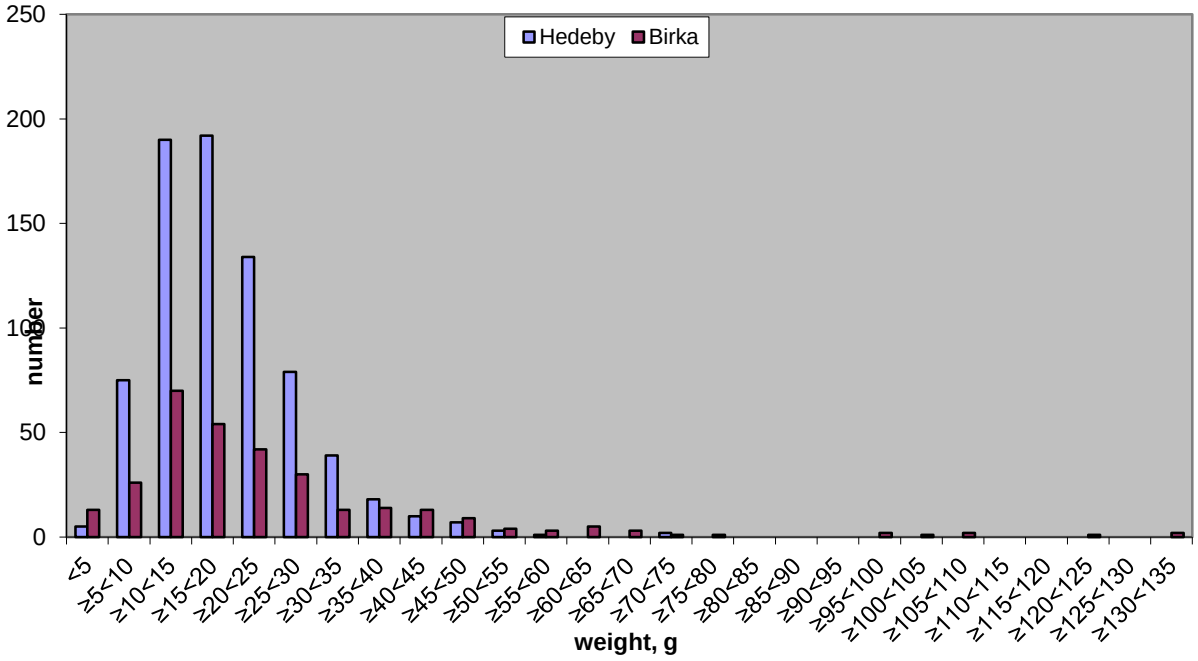

Figure 13. Spindle whorls number and weight from Birka N=289 and Hedby N=755.

We have also executed several tests with different types of loom weights: the aim was to identify which parameters affect the outcome, the finished fabric (Mårtensson *et al.* 2009; Olofsson *et al.* in press). The weavers knew from their experience that the weight of a loom weight dictates how many threads of a particular type can be fastened to it. In the warp weighted loom the loom weights are used to keep the threads taut during weaving, too much or too little tension will make the weaving unnecessarily complicated. Different threads need different tensions, a thin light thread might need no more than 5 g tension while hard spun coarse and heavy threads need 50 g. In the new tests we wanted to understand how much the thickness of the loom weights affected the finished products. The results clearly demonstrated that the thickness of a loom weight controls how closely the warp threads will be spaced in the finished fabric. According to my opinion by recording the loom weight's weight and thickness it is possible therefore to calculate the range of different types of fabrics that could be produced with a specific loom weight and a specific thread. It is Important, however, to recognise that one loom weight could have been used to produce not only one type of fabric but a range of different types of fabrics (Mårtensson *et al.* 2009, Andersson 2012; Olofsson *et al.* in press). Additionally the results can indicate a specific production and if possible be compared with contemporary textiles from the same site. The analyses of the loom weights from Birka and Hedby demonstrated that a range of fabrics could have been produced here, also fabrics that often are considered as imports while the production on the agrarian sites seems more limited in the number of different types of textiles produced.

Conclusion

The experiments form, via traditional craft knowledge, a link between textiles and textile tools and contribute to a better understanding of textile production and its complexity. The

results from experiments form an important basis for the interpretation of the function of different tools and for the evaluation of what textiles have been produced at different sites and regions. These results can further help visualising textiles in places, where none have been preserved.

The results can be confirmed or dismissed by archaeological textile analysis. In Viking age Scandinavia textile analysis demonstrates that many different types of textiles in various qualities were used and produced. This is also confirmed by the tool analysis. However, experimental archaeology is one of several methods that can be applied to the archaeological material, the textile tools, and it is the combination of methods that is essential.

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