Curation and Reuse

An Experimental Study of Transverse Arrowheads of the Late Scandinavian Mesolithic

BY JOEN LEFFLER

Abstract

This article aims to examine whether it is possible to rework transverse arrowheads while still hafted, in order to reuse them. Three series, each containing three arrows, were shot into a target consisting of meat and bone. When possible, the arrowheads were retouched and fired again. The results of the experiments demonstrate that it is possible to rework transverse arrowheads while they are hafted and that there may be strong strategic and economic reasons to do so. A discussion of the results and comparison with archaeological material follows the experiment, which indicates that reworked arrowheads can be recognized in archaeological contexts and that reworking changes arrowhead morphology. This suggests that formal typologies of lithic arrowheads that are based on morpho-metric shape, and have been considered to reveal chronological or cultural affinities, may be flawed.

Introduction

In a previous paper the author has suggested that the different shapes and forms of transverse arrowheads that have been discussed in earlier research (e.g. Vang Petersen 1984, 1999) might be a result of curation, reuse and tool maintenance, rather than chronological or cultural markers. This idea was illustrated with a smaller, mostly theoretical experiment, and comparisons with different types of transverse arrowheads in the Scanian archaeological record (Leffler 2012). Similar studies have been conducted, with similar results, for example by Flenniken (1985), who studied North American assemblages and noted that reduction of arrowheads by curation also altered their morphology to an extent where they could be perceived as a different type from the original arrowhead. Flenniken also argues that this fact makes arrowheads uncertain as cultural markers.

At the end of the 2012 article a hypothetical description of a full-scale experiment was presented, and the main purpose of this article to complete such an experiment in order to present more robust arguments for the importance of discussing resharpening and its relation to formal typology.

Purpose and aims of the experiment

The goal of the experiment is:

> To examine whether it is possible to reshape transverse arrowheads after they have been used, without dismounting them from their shafts, and how this affects the morphology of the arrowhead. This will be studied from the initial stage of the mounted arrowheads and after every sequence of firing, until it is no longer possible to reshape the arrowheads.

The results of the fired series will be discussed and compared to archaeological transverse arrowheads. The purpose, however, is not to show or study a general breakage pattern of transverse arrowheads. This has previously been studied with very good results (Fischer *et al*. 1984; Yaroshevich 2012).

About curation

Generally speaking, the most vulnerable part of an arrow is the arrowhead, but it also the easiest part to rework or ultimately replace (Whittaker 1994, 248–251). Tools have a tendency to be reworked and reshaped during hunting and travelling, meaning that a tool might not have the same appearance at the starting location that it has when it is discarded. A tool might travel a long way between where it was first created and where it was later discarded. It has been demonstrated with reference to historical analogies that a toolkit can change appearance, and even function, over time even if it maintains certain formal qualities. This was brilliantly displayed by Binford when he followed and studied how toolkits of the reindeer-hunting Nunamiut Inuit in Alaska changed over the course of forty-seven hunting trips (Binford 1976). Thus, when dealing with equipment that fulfils a specific function, such as hunting gear, one should be cautious about attributing chronological or cultural significance to formal shapes.

Signs and markers of curation in transverse arrowheads

Retouched stone tools often indicate two occurrences. Either the retouch is made to purposely shape a tool into a certain shape, or it is a sign of a reshaping of the edge. Taking into account that the edges of a stone tool are always the most vulnerable part, the edges of a small delicate tool like a transverse arrowhead are retouched to make the broadside edges stronger. Retouched edges are not as sharp as non-retouched edges, but will not break as easily. Therefore two simple main design elements can be identified in a traditional transverse arrowhead: retouched broadsides and a sharp, transverse, unretouched edge, as broad as possible, at the point of the arrowhead.

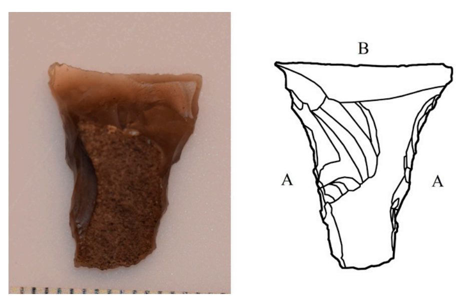

Fig. 1. To the left: an unused transverse arrowhead from Kämpinge (The Historical Museum at Lund University, LUHM 32772:78). Photo by Joen Leffler. To the right: A transverse arrowhead with design elements. A = retouched broadsides, B= Sharp, unretouched transverse edge. Drawing in Fig. 1 by Erika Rosengren.

A damaged transverse arrowhead can therefore be identified, not only by visible damage at the unretouched, transverse edge, but also by the technical elements on the broadsides. A damaged transverse arrowhead without retouch on either one or both broadsides could indicate that it has not been reworked and probably was discarded and discontinued in use. On the other hand, if the arrowhead has changed its morphology, and have retouch on both broadsides, but has irregularities between the hafted part, covered by the wooden arrow-shaft and the exposed part, i.e. the tip of the arrowhead, one could argue that the arrowhead has been reshaped. In the latter case, the arrowhead would be ready for reuse.

The experiment

Design of the experiment
Three series, each containing three arrowheads will be fired. Each arrowhead will be inspected, reworked and reshaped if necessary, and documented after each shot.

The bow
The bow used is a modern recurve bow at about 40 pounds, about the same specifics as a late Scandinavian Mesolithic bow, for example, the Tybring Vig type 1 bow, which is estimated to have a draw weight of around 44 pounds (Andersen 1985). Compared to other bows throughout history, the Late Mesolithic bows in Scandinavia are not so powerful (Rausing 1967). This can be explained by the terrain, mostly consisting of bushland. The distances to the prey were short and more powerful bows were unnecessary (Larsson 1988).

Fig. 2. The transverse arrowheads used in the experiment, before hafting. Photo by Joen Leffler.

The transverse arrowheads
Nine arrowheads were made for the experiment. They were made to reassemble late Mesolithic transverse arrowheads, with some different design elements in mind, just as they are found on the site. Typologically they reassemble the Stationsvej phase, i.e. Late Ertebølle (Vang Petersen 1999). The arrowheads were made by the author, out of Scandinavian Senonian flint from Denmark. The target they are shot at consists of animal meat and bones.

Results of the fired arrowheads

Tables I & II.
Firing diagram and explanations.

Arrow no.	First shot	Second shot	Third shot
1	2 + 4		
2	1	1	2 + 4
3	1	3	3 + 4
4	3*	1	2 + 4
5	2*	3 + 4	
6	3*	2 + 4	
7	2 + 5		
8	1	3*	2 + 4
9	3 + 4		

1: Hit meat
2: Hit bone (not deeper than 1 inch)
3: Hit meat (deeper than 1 inch) and bone
4: Arrowhead destroyed/not possible to rework (end of testing)
*: reshaped during this phase

Fig. 3. Destroyed arrowhead. Photo by Joen Leffler.

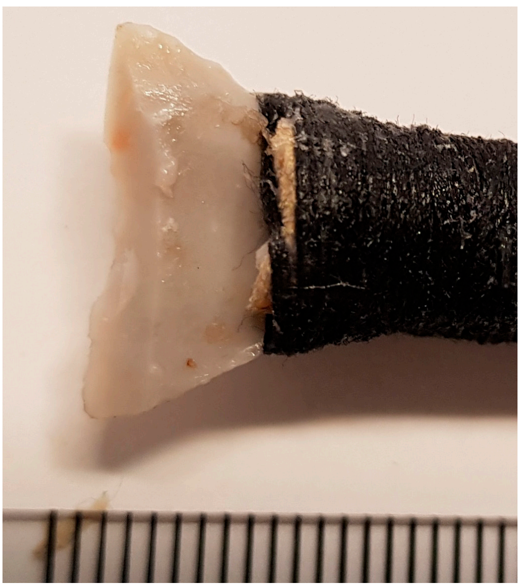

Fig. 4. Arrowhead which hit meat. Photo by Joen Leffler.

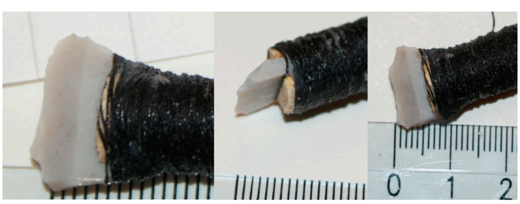

Fig. 5. From left to right: arrow no. 4 before being fired, after being fired but before retouch, after retouch. Photos by Joen Leffler.

Series 1

The arrows in series 1 were fired a total of seven times.

1:1

The arrowhead hit bone directly, and the edge was destroyed. A scatter of small flint pieces could be noted, but was not collected. The arrowhead base was still in its shaft.

2:1

The arrowhead hit meat. Parts of the edge were damaged but still usable, without any need for reworking.

2:2

The arrowhead hit meat at a depth of around ten centimetres. No visible changes to the arrowhead.

2:3

The arrowhead hit bone and was totally destroyed. The base of the arrowhead remained in the shaft.

3:1

The arrowhead hit meat at a depth of around 15 centimetres. No visible damage to the arrowhead.

3:2

The arrowhead hit meat and bone. Some damage to the edge, but still usable without reworking.

3:3

The arrowhead hit bone and incurred the same damage as arrow number 2. The base of the arrowhead remained in the shaft.

Series 2

The arrows in series 2 were fired a total of seven times.

4:1

The arrowhead lost parts of its broadside and the retouch. The arrow hit meat and bone. The transverse edge incurred some damage,

Fig. 3. Destroyed arrowhead.

but not enough to affect its function. One broadside retouched.

4:2
Hit meat. No visible changes.

4:3
Hit bone. Arrowhead destroyed. Parts of the arrowhead and its base remained in the shaft.

5:1
Hit meat and bone. Both broadsides destroyed, but could be retouched. Some damage to the transverse edge. Both broadsides retouched.

5:2
Hit meat and bone. The transverse edge, and thus the arrowhead is destroyed.

6:1
Hit meat and bone, both broadsides destroyed. No visible changes to the transverse edge. Both broadsides retouched.

6:2
Hit bone. Arrowhead destroyed. Parts of the transverse edge lodged in the shaft.

Series 3
The arrows in series 3 were fired a total of five times.

7:1
Hit bone. Arrowhead destroyed. Parts of its base remained in the shaft.

8:1
Hit meat. Minor damage to the transverse edge, otherwise intact.

8:2
Hit meat and bone. More damage to the transverse edge and one broadside destroyed and retouched.

8:3
Hit bone. Arrowhead destroyed. Parts of the arrowhead including its base remained in the shaft.

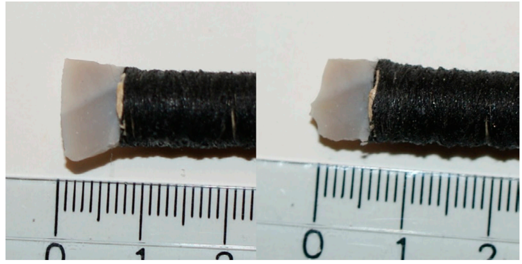

Fig. 6. Arrow no. 5; left: before being fired, left: retouched after the first shot. See fig. 10 for details. Photos by Joen Leffler.

Fig. 7. Arrow 6 before (left) and after (right) retouch. Photos by Joen Leffler.

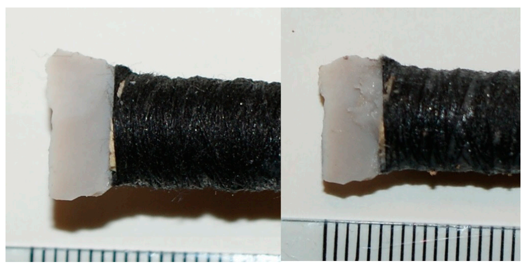

Fig. 8. Arrow 8, before (left) and after (right) retouch. Photos by Joen Leffler.

9:1
Hit meat and bone. Damage to the transverse edge, and the arrowhead itself was broken in half.

Results of the experiment

The nine arrows were fired a total of 19 times, which is an average of 2.11 times per arrow. Four out of nine arrowheads were capable of being reworked in order to regain their original design elements, i.e. retouched broadsides and a sharp transverse edge. The secondarily retouched arrowheads never lasted longer than one more shot. If the arrowheads were not reworked, the total of times fired would be 14, or 1.55 times per arrow. This indicates that reworking an arrowhead has a clear purpose in terms of economy and time consumption. This strategy of rejuvenation and resharpening arrowheads might be one of many strategies for hunting. When travelling far and lacking resources, the strategies might differ (Bleed 2002). The result of this experiment represents a strategy where the arrowheads have been rejuvenated and used, until this was no longer possible, i.e. a maximum amount of possible shots fired per arrow.

Hitting meat did affect the arrowheads. Retouch could be noted on the transverse edge, even in cases where the broadsides were intact, such as arrow 2:1, Fig. 4.

All arrowheads reached their final stage when hitting bone, indicating that hitting bone is the major factor in damage to tools (Patten 1999), and in this case making it impossible to rework an arrowhead. Most spectacular was arrow number 1. It hit bone directly and parts of the arrowhead were pulverized into what can best be described as a small firework of flint dust.

Dividing the arrows into different series shows that the results do not necessarily recur in the same pattern. For example, in the first series of arrows, none of the arrowheads could be retouched and fired again, while the opposite occurred in the second series where every arrowhead was retouched and fired again.

Since it was basically impossible to collect all the debris from the arrowheads – some of them, and parts of them, merely exploded into dust when hitting the target. To illustrate the different stages, a stylized version of the series of arrowheads was made:

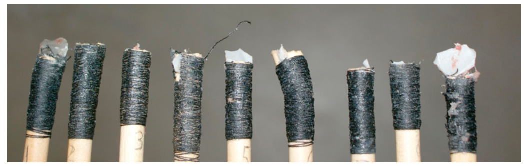

Fig. 9. All of the arrows used in the experiment, mounted in their final stage. Photo by Joen Leffler.

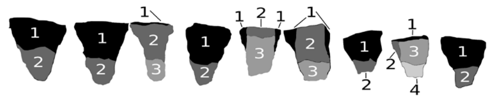

Fig. 10. From left to right: arrowheads 1–9. The numbers/colours show the different stages of the arrowheads as described in the experiment. Drawing by Anna Leffler.

Transverse arrowheads in the archaeological record – a comparison

As references to the archaeological record I have chosen transverse arrowheads from a late Mesolithic site in Kämpinge, south-west Skåne, Sweden. This site has been investigated by the Department of Archaeology and Ancient History, Lund University, for four field seasons. The author of this article has been employed as field assistant during all four field seasons. (e.g. Apel *et al.* 2017). In terms of morphology, a wide range of transverse arrowheads have been found on the site. Also, arrowheads showing use-wear and damage have been found, which gives a good foundation for comparison to the experimental arrowheads. It is also worth mentioning, however, that Late Mesolithic sites with similar toolkits are not uncommon on the south coast of Skåne (Rydbeck 1928; Larsson 1988).

When the transverse arrowheads excavated in Kämpinge were examined, many of them showed signs of damage and curation, and

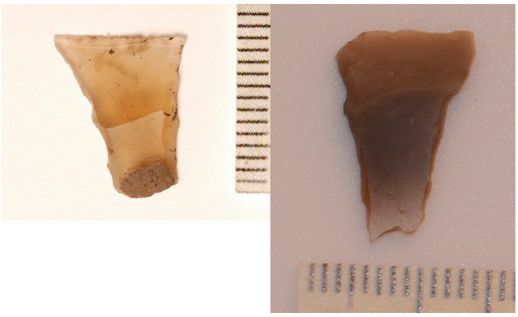

Fig. 11. Possible reshaped transverse arrowheads from Kämpinge. Photo by Lovisa Dal (left) and Joen Leffler (right).

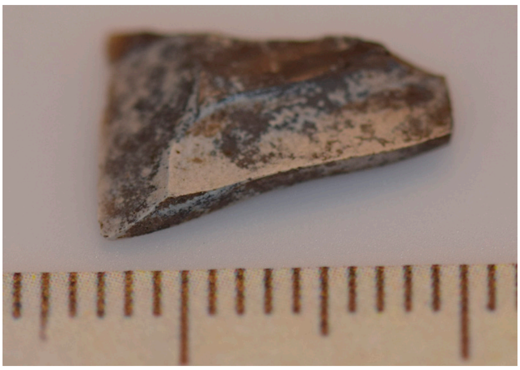

Fig. 12. A transverse arrowhead that incurred damage to one of its broadsides and has been exposed to fire. Photo by Joen Leffler.

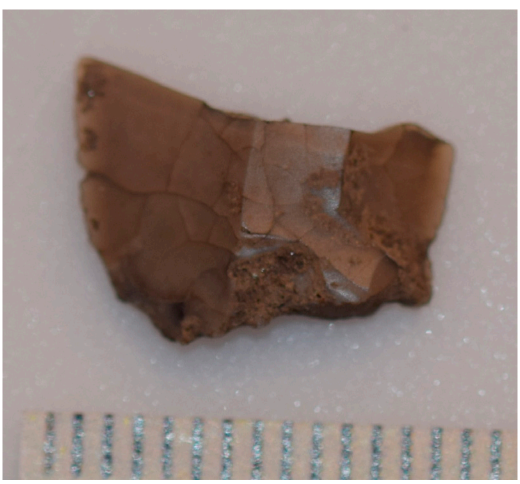

Fig. 13. Fire-exposed arrowhead that has been retouched on one broadside. Photo by Joen Leffler.

four good examples of arrowheads showing the same type of damage as the ones in the experiment were chosen as subjects for further discussion.

The arrowheads in Fig. 10 (The Historical Museum at Lund University, LUHM 32772:79, left and 32429:130, right) have similarities to the experimental arrowheads 6:1 and 8:2, see Figs. 7 & 8, and Table I. The arrowheads also have the two design elements of a transverse arrowhead: retouched broadsides and a sharp transverse, unretouched edge, as shown in Fig. 1. This particular arrowhead is therefore interpreted as having been broken during use, then having had one of its broadsides reworked. Both arrowheads show traces of use-wear in the edge, indicating that they have actually been fired and hit something.

Other arrowheads display types of damage which indicate that they have not been reworked for further use. An example of this is shown in Fig. 11 (The Historical Museum at Lund University, LUHM 32772:138). One of the broadsides on this arrowhead is not retouched, and it has also been exposed to fire. This indicates that this arrow has not been reused after this stage. It was probably shot into a hunting prey and brought to the site with the meat that later was cooked over fire. Similar damage was recorded on arrowhead 4:1, Fig. 5, where the retouch on one broadside disappeared after incurring damage after the first shot.

Another example of an arrowhead that has been discarded and exposed to fire is displayed in Fig. 12 (The Historical Museum at Lund University, LUHM 32772:140). This particular arrowhead has one of its broadsides retouched, similar to arrow 4, see Fig. 5, in the experiment.

Conclusion and final thoughts

- It is possible to rework a transverse arrowhead while it is still mounted.
- A reworked transverse arrowhead can still retain its basic design elements of retouched edges and an unretouched transverse edge.
- There is economic incentive to rework an arrowhead, since an arrow can be used more than once if the arrowhead is reworked.
- When reworked, the transverse arrowheads change shape, especially if reworked more than once, which can lead to faulty interpretations of the arrowheads if compared to their chronological typology.
- Similar arrowheads to those used in the experiment can be found in the archaeological record.

Interpretation is always in the eye of the beholder. Uncommon objects, such as unretouched median pieces of flint blades used as transverse arrowheads, could be used as an example to argue against the two design elements of a transverse arrowhead. Stratigraphy and typology constitute another argument (see Leffler 2012). However, there is no real reason to believe that people in prehistory deliberately made their arrowheads less efficient and expended more work on producing a tool of lower quality, rather than keeping to a simple proven, repeatable design.

In this article, apart from the modern transverse arrowheads used in the experiment, four transverse arrowheads from the Ertebølle site in Kämpinge were used. This can be seen as too small an amount for a good comparison. However, the arrowheads used show similar damage to the ones in the experiment over a wide scale. I believe that this is a good start and that making catalogues of transverse arrowheads and their damage-status can help us to discover and gain a good general idea of different activities on Mesolithic sites.

Acknowledgments

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In loving memory of Rolf Petré. You are missed.

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