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Weapons, fighters and combat: spears and swords in Early Bronze Age Scandinavia

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This article deals with the use-wear analysis of 204 weapons of Period I of the Early Nordic Bronze Age. The analysed sample contained 154 spearheads and 50 swords and was made up of approximately one-third of the contemporaneous weapons in Southern Scandinavia. The use-wear analysis was undertaken with a source critical view on corrosion and other taphonomic processes. The information obtained was used to see how use-wear and taphonomic processes influence each other. Use-wear analysis was employed to evaluate statements regarding the functionality, or rather non-functionality, of Early Bronze Age weaponry. According to the results, spears and swords were not only functional but also very frequently used. Further deductions can be made from the material. Despite a difference in the scale of fighting, spears and swords show essentially the same kind of combat wear. It is argued that this relates to essentially similar styles of fighting that employ both cutting and stabbing movements and are perhaps most appropriately termed 'fencing'. This style of fighting possibly emerged from frequent encounters of sword and spear fighters in the closely interconnected world of Southern Scandinavia during Period I of the Early Bronze Age. In these engagements, a partial homogenising effect of warfare and fighting becomes visible. Yet, it is not the only effect that accompanies combat and war. Diversification and homogenisation are not mutually exclusive or contradictive. Accordingly, they took place simultaneously and helped develop fighting styles and weapon technologies.

Keywords: use-wear analysis; spears; swords; Early Bronze Age; Southern Scandinavia

Introduction

The Early Bronze Age of the Nordic sphere has a rich material culture and weapons are among the most spectacular finds. Period I is of special interest. It is a transitional phase rooted in the existence of specialised weaponry and a warrior ideal in the Late Neolithic (Sarauw 2007), but with newly introduced weapons, and the wider spread of bronze technology. The halberd of the Late Neolithic was probably replaced by the sword and the spear around 1800 BC (Horn in prep.). Simultaneously, a slow change of depositional practices took place. The halberds were mostly discovered as single depositions. Weaponry appears more frequently in graves in Period I of the Early Bronze Age (Lomborg 1965, Vandkilde 1996, Johansen *et al.* 2004, p. 43). However, this phenomenon is more closely associated to Jutland. Graves with weaponry become more frequent in Sweden and the Eastern Danish Islands in the subsequent periods. This suggests the transition varied in speed in different regions.

Studies of Bronze Age weaponry are mainly concerned with swords and neglect spearheads. It appears that swords are considered to be more important (Anderson 2011, p. 599). Only within the last 15 years, research is slowly catching up (Tarot 2000, Davis 2006, 2012, Bruno 2007, Laux 2012). This fact is reflected in publications concerned with use-wear analysis. The corpus of studies on swords following Kristiansen's (1978, 1984, 2002) works is impressive (Bridgford 1997, 2000, York 2002, Quilliec 2008, Bunnefeld and Schwenzer 2011, Colquhoun 2011, Matthews 2011, Molloy 2011). In contrast, papers analysing use-wear on spears are scant (Schauer 1979, Anderson 2011). Additionally, the cited accounts on swords mainly deal with swords of later periods neglecting the initial phase of this kind of weaponry.

It is possible that this is the reason why spears are still regarded as clumsy and inappropriate for fighting (Harding 2007, p. 76). If authors consider their use, they generally attribute it to fighting with throwing and thrusting manoeuvres (see Osgood 1998, p. 91, Osgood *et al.* 2000, p. 22, contra Molloy 2007, p. 102 and Anderson 2011, p. 599). In his analysis of the spearhead discovered in an Urnfield burial in Gau Algesheim, Germany, Schauer (1979) argued over 30 years ago for a more complex fighting style. This was later confirmed in a recent publication by Anderson (2011) on Late Bronze Age spearheads from Great Britain. However, early spears are usually regarded as not being fit for fighting and they are therefore interpreted as being employed for other purposes (Mercer 2006, p. 131). Similar claims are made against the swords of the Sögel-Wohlde-complex presumably because they are technically ill-constructed that limits them in their use in fighting (c.f. Fontijn 2005, pp. 146–147).

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This leaves the Early Bronze Age material with some interesting questions: were spears used at all in this early period? If so, how were they used? What is their relation to sword fighting in the same frame of time?

For the study, 154 spearheads and 50 swords of various types from Denmark, Northern Germany, Sweden and Norway were analysed (Figure 1). This sample represents approximately one-third (35%) of the total amount of the spears and swords of Period I (Kersten 1935, Hachmann 1957, Lomborg 1965, Jacob-Friesen 1967, Oldeberg 1974). This article examines the traces of use-wear with a source critical view on taphonomic processes.

Definition of use-wear and problems of recognition

Vandkilde (2003, pp. 135–136, 2011, pp. 374–375) criticised an element in the study of warriors and warfare. According to her, the idealised and heroic image of warfare in mythology and in rock art is overrepresented. Consequently, the ugly side of warfare is neglected, i.e. the actual fighting. Use-wear analysis is an apt way to

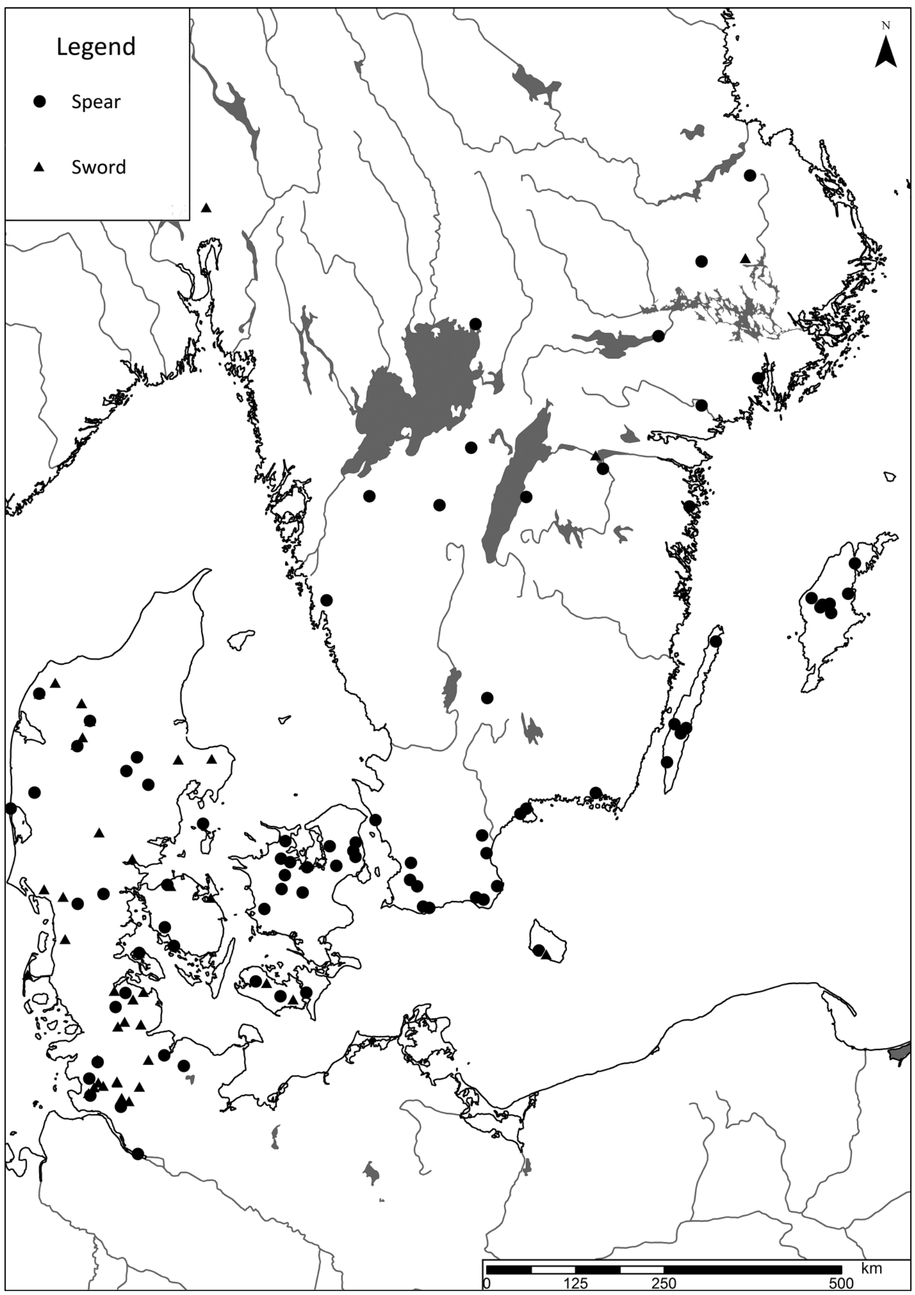


Figure 1. Map showing the find locations of the analysed spears and swords.

research the realities of combat on the weapons themselves (for other approaches, see Molloy (2007)). With this method, it might be possible to separate the warrior who presents an ideal and a myth from the actual combatant.

The material examined for this article is located in the National Museum in Oslo (NMO), the National Museum in Stockholm (SHM), in the Historical Museum in Lund (LUHM), the City Museum of Gothenburg (GAM), National Museum in Copenhagen (NMK), Moesgård Museum Aarhus (MM), Museum East-Jutland Grenaa (MEG) and the County Museum for Art and Cultural History Schloss Gottorf (LMSH). The examination took place macroscopically and microscopically with magnification up to ×300. For this purpose, a microscopic camera was employed (XLoupe G20, Lumos Technology Co. Ltd.). Documentation of the findings was carried out in writing, drawing and photography (macroscopically and microscopically). The results were entered into a database together with other relevant information.

In order to evaluate the observed use-wear, categories had to be built to qualify the results. The categories are based on literature concerned with the categorisation of use-wear (Kristiansen 1984, 2002, Bridgford 1997, 2000, Brandherm 2011, Molloy 2011). Results of experimental work are the base for the understanding of the mechanics of damage formation (O'Flaherty *et al.* 2008, Anderson 2011, O'Flaherty *et al.* 2011). All the observed damage was quantified with a number according to the frequency and intensity of the individual damage categories. The scale usually ranges from 0 to 3, with the exception of indentations; if these are present, they are usually very large and require more force to be created. Therefore, the number 1 was excluded for them. The range of numbers can be translated to 'no damage' (0) to 'highly/intensely damaged' (3). Finally, the numbers were added up. Due to the problems with repairs and corrosion described below, these numbers are of minor importance in the following considerations and are only presented in Table 1, for the sake of transparency and the convenience of the reader. However, the following damage categories have been defined based on previous work in use-wear analysis and experimental archaeology:

Notches have a v-shaped impact profile and are located on cutting edges (Figure 2(a)). Sometimes, notches contain information about the directionality of the blow. The bisection of the angle created by the impact gives the approximate direction of the blow. It is possible that most notches are caused by the edge of a bladed weapon, such as spears, swords or daggers and in some instances maybe also axes (for the mechanics, see O'Flaherty *et al.* (2011)). Some notches are very shallow, being below 5 mm in depth and are caused by a grazing impact. If the impacting blow comes in at a very flat angle relative to the longitudinal axis of the edge, the impacted metal can 'flake off' (Figure 2(b)). However, most notches are sharp and some intrude rather deeply. Sometimes, the notches lead to a material failure in their immediate surroundings or in areas directly connected to them (Figure 2(c)).

Indentations are parallel to notches in their placement along the cutting edge, but in contrast their impact profile is rounded (Figure 2(d) and 2(e)). Usually, they are wider than deep, so on average they are shallower. Due to their roundedness, the directionality of the impact is difficult to determine and in most cases it is not possible at all. Impacts of objects with a more rounded shape are responsible for dents, such as the sides of axes, handles or bones. Repairs give notches and indentations a very shallow and rounded appearance, which makes them hard to spot without other indicators, such as the striations of repair work (Figure 2(f)).

Material displacement is a plastic deformation around an impact zone (Figure 2(c)–(e)). Metal reacts to an impact in specific ways according to different factors: the force of the impact, the form of the impacting objects, their material properties, such as hardness and ductility and so on. An impact is able to leave damage, such as notches or dents on cutting edges, causing the metal of the impact zone to give way in accordance with the ductility of the material. If the ductility of the impacted material reaches its limits, a fracture will occur. Either the object gains fissures or it breaks entirely. The formation of material displacement causes massive stresses in the metal and subsequently the material displacement itself often breaks off. Thus, it can be assumed that the lack of material displacement does not mean that no impact took place. However, the presence of material displacement is a good indicator for an anthropogenic origin of the damage.

Blow marks, notches and dents are damage caused by impact, but blow marks are not located on the edge. They affect the flat side of the weapon (Figure 3(a) and 3(b)). The force of the impact is distributed more evenly due to a larger surface. Consequently, more pressure is relieved. Material displacement occurs less frequently and less significantly as a result. More rounded or oval scars may be attributed to tips (Figure 3(a)), while the edges of blades probably cause elongated damage (Figure 3(b)). Sometimes, it is difficult to distinguish between edge damage and blow marks (Figure 3(c)). However, reworked sinkholes can, in some cases, take on a similar appearance making it necessary to assess features carefully.

Tip pressure (Figure 3(d)) is visible as a flattened point on the weapon. This damage probably originated in an offensive manoeuvre. The point might have met with the side of another bladed weapon. In these cases, pressured tips may be complimentary to blow marks. Protective gear, such as armour or wooden shields, is perhaps another source for this damage (Molloy 2009, Uckelmann 2011, pp. 194–195), but archaeological evidence for such gear remains scant in the period under consideration. Tip pressure can perhaps account

Table 1. Results of the use-wear analysis.

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Algutsrum sn., Öland, SE	Single?	Spear (Valsømagle)	X	3	0	0	1	0	2	1	**7**	—	X	SHM 1304 (1842) 3
Allerup, Holbæk, DK	Single	Spear (Bagterp)	X	1	3	3	1	0	2	0	**10**	—	X	NMK 13315
Årup (I), Hassing, DK	Grave	Spear (Torsted)	X	?	?	?	2	0	1	1	**4**	X	?	NMK 13839
Årup (II), Hassing, DK	Grave	Sword (unknown)	X	3	0	0	1	0	2	1	**7**	—	X	NMK 13837
Assendrup, Vejle, DK	Single	Sword (Sögel)	X	3	0	3	2	0	2	0	**10**	—	X	NMK B938
Attemosegård (I), Copenhagen, DK	Hoard	Spear (Valsømagle)	—	0	0	0	0	0	0	0	**0**	—	—	NMK B670
Attemosegård (II), Copenhagen	Hoard	Spear (Valsømagle)		2	0	0	1	0	1	0	**4**	—	X	NMK B800
Bärbo, Södermanland, SE	Hoard?	Spear (Valsømagle)	X	0	0	0	3	0	1	0	**4**	X	?	SHM 2273
Björke sn., Gotland, SE	Single?	Spear (Valsømagle)	X	0	0	0	2	0	1	2	**5**	—	X	SHM 8400
Böda, Öland, SE	unknown	Spear (Valsømagle)	X	2	3	0	1	1	2	0	**9**	—	X	LUHM 12627
Bohnert (I), Rendsburg-Eckernförde, DE	Grave	Sword (Sögel)	X	0	2	2	1	0	1	?	**6**	—	X	LMSH KS16090
Bohnert (II), Rendsburg-Eckernförde, DE	Grave	Sword (Sögel)	?	0	0	0	0	0	1	?	**1**	X	?	LMSH KS12065I
Bohnert (III), Rendsburg-Eckernförde, DE	Grave	Sword (Sögel)	?	0	0	0	0	0	0	?	**0**	X	?	LMSH KS12101II
Bondesgårde (I), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	0	0	1	0	**2**	X	X	NMK B15101
Bondesgårde (II), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	1	0	0	0	**2**	—	—	NMK B15102
Bondesgårde (III), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	1	0	1	0	1	0	**3**	—	X	NMK B15103
Bondesgårde (IV), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	0	0	0	0	0	**0**	—	—	NMK B15104
Bondesgårde (IX), Torsted, Hind, DK	Hoard	Spear (Torsted)	?	?	?	?	?	0	0	0	**0**	X	?	NMK B15109
Bondesgårde (V), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	?	?	0	1	0	1	?	**2**	X	—	NMK B15105
Bondesgårde (VI), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	2	1	0	1	?	**6**	X	X	NMK B15106
Bondesgårde (VII), Torsted, Hind, DK	Hoard	Spear (Torsted)	?	?	?	?	1	0	0	?	**1**	X	?	NMK B15107
Bondesgårde (VIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	0	1	1	0	1	?	**3**	—	X	NMK B15108

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Bondesgårde (X), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	1	0	0	0	**2**	—	X	NMK B15110
Bondesgårde (XI), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	0	1	0	0	0	2	**3**	—	X	NMK B15111
Bondesgårde (XII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	0	1	1	0	1	?	**3**	—	—	NMK B15112
Bondesgårde (XIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	1	0	0	?	**2**	—	—	NMK B15113
Bondesgårde (XIV), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	1	0	0	1	?	**3**	—	?	NMK B151114
Bondesgårde (XIX), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	3	0	0	1	0	**5**	—	?	NMK B15119
Bondesgårde (XL), Torsted, Hind, DK	Hoard	Spear (Torsted)	?	?	?	0	?	0	1	?	**1**	X	?	NMK B15146
Bondesgårde (XV), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	1	0	0	0	**2**	—	X	NMK B15115
Bondesgårde (XVI), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	0	0	1	0	0	1	**2**	—	?	NMK B15116
Bondesgårde (XVII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	1	1	0	0	0	**3**	—	X	NMK B15117
Bondesgårde (XVIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	0	0	0	0	0	**0**	—	?	NMK B15118
Bondesgårde (XX), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	0	2	1	0	1	0	**4**	—	X	NMK B15120
Bondesgårde (XXI), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	0	0	0	0	1	**1**	—	–	NMK B15121
Bondesgårde (XXII), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	1	0	0	0	?	**1**	—	X	NMK B15122
Bondesgårde (XXIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	1	0	0	0	?	**1**	—	?	NMK B15123
Bondesgårde (XXIV), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	1	1	0	0	?	**3**	—	?	NMK B15124
Bondesgårde (XXIX), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	1	0	0	0	1	**4**	—	X	NMK B15129
Bondesgårde (XXV), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	1	1	0	0	?	**4**	—	?	NMK B15125
Bondesgårde (XXVI), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	2	2	1	0	0	0	**6**	—	X	NMK B15126
Bondesgårde (XXVII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	2	0	1	1	0	0	0	**4**	—	X	NMK B15127
Bondesgårde (XXVIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	2	0	1	0	**4**	—	X	NMK B15128

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Bondesgårde (XXX), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	2	0	1	0	1	1	**6**	—	X	NMK B15130
Bondesgårde (XXXI), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	0	1	0	1	?	**4**	—	X	NMK B15131
Bondesgårde (XXXII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	2	3	1	0	0	1	1	**8**	—	X	NMK B15132
Bondesgårde (XXXIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	2	1	0	1	?	**6**	—	–	NMK B15133
Bondesgårde (XXXIV), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	1	1	0	0	1	**5**	—	X	NMK B15134
Bondesgårde (XXXIX), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	1	0	0	1	0	0	0	**2**	—	X	NMK B15145
Bondesgårde (XXXV), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	0	2	0	1	0	0	0	**3**	—	X	NMK B15135
Bondesgårde (XXXVI), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	0	0	0	0	0	**0**	—	–	NMK B15136
Bondesgårde (XXXVII), Torsted, Hind, DK	Hoard	Spear (Torsted)	—	0	0	0	0	0	0	0	**0**	—	?	NMK B15143
Bondesgårde (XXXVIII), Torsted, Hind, DK	Hoard	Spear (Torsted)	X	2	0	?	0	0	0	1	**3**	—	—	NMK B15144
Bragby, Uppland, SE	Single	Sword (Apa)	X	2	0	0	1	1	0	1	**5**	X	X	SHM 14759
Briksbøl, Ribe, DK	Grave	Sword (Sögel)	?	?	?	?	?	?	?	?	**?**	X	?	NMK B9175
Brux, Rendsburg-Eckernförde, DE	Grave?	Sword (Sögel)	X	1	2	0	3	1	2	0	**9**	—	?	LMSH 9938
Buddinge, Copenhagen, DK	Grave	Spear (Valsømagle)	?	0	0	0	1	0	0	1	**2**	X	?	NMK B11946
Dildaelsgård, Frederiksborg, DK	unknown	Spear (Bagterp)	—	0	0	0	0	0	0	0	**0**	X	?	NMK B13640
Dithmarschen, DE	unknown	Spear (Valsømagle)	X	0	2	0	0	0	1	?	**3**	—	X	LMSH KS8814
Dystrup (I), Djurs, DK	Hoard	Sword (Apa)	?	0	0	1	3	0	1	0	**4**	—	—	MEG B17617
Dystrup (II), Djurs, DK	Hoard	Sword (Apa)	?	0	0	0	1	0	1	0	**2**	—	—	MEG B17618
Dystrup (III), Djurs, DK	Hoard	Sword (Apa)	?	0	2	0	1	0	0	0	**3**	—	?	MEG B17619
Dystrup (IV), Djurs, DK	Hoard	Sword (Apa)	?	0	0	0	1	0	1	0	**2**	—	—	MEG B17620

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Dystrup (V), Djurs, DK	Hoard	Sword (Apa)	?	0	0	0	1	0	1	0	**2**	—	?	MEG B17621
Dystrup (VI), Djurs, DK	Hoard	Sword (Apa)	?	0	0	0	1	0	1	0	**2**	—	—	MEG B17622
Dystrup (VII), Djurs, DK	Hoard	Sword (Apa)	-	0	0	0	0	0	0	0	**0**	—	—	MEG B17623
Dystrup (VIII), Djurs, DK	Hoard	Sword (Apa)	?	0	0	0	1	0	1	0	**2**	—	—	MEG B17624
Estvad, Ginding, DK	Grave?	Spear (Torsted)	X	1	0	1	0	0	1	0	**3**	—	X	NMK B10334
Everöd sn., Scania, SE	Grave?	Spear (Valsømagle)	X	0	2	0	0	0	0	0	**2**	—	—	SHM 7906
Falköping, Västergötland, SE	Single	Spear (Valsømagle)	X	0	2	0	1	1	0	1	**5**	—	X	SHM 4145
Falster (I), Maribo, DK	Hoard	Spear (Bagterp)	X	2	0	0	1	0	0	0	**3**	—	X	NMK 18588
Falster (II), Maribo, DK	Hoard	Spear (Bagterp)	X	2	0	0	1	0	0	1	**4**	—	X	NMK 18589
Flensburg, Schleswig-Flensburg, DE	Grave	Sword (Sögel)	?	0	2	0	0	0	0	?	**2**	X	X	LMSH KS11802
Flistad sn., Västergötland, SE	Single	Spear (Valsømagle)	X	1	0	0	0	0	2	1	**4**	—	X	SHM 10391
Främmestad, Västergötland, SE	Single?	Spear (Ödeshög)	X	2	2	0	0	0	0	0	**4**	—	X	SHM 13035
Funder, Viborg, DK	Grave?	Spear (Torsted)	X	1	0	0	0	0	1	0	**2**	—	X	MM FHM3646
Fur (I), Viborg, DK	Hoard	Dagger (Wohlde)	X	1	0	1	2	?	1	0	**5**	—	X	NMK B5254
Fur (II), Viborg, DK	Hoard	Sword (Sögel)	X	1	2	0	0	?	2	0	**5**	—	X	NMK B10036
Gislinge, Holbæk, DK	Grave?	Spear (Bagterp)	X	0	3	1	1	0	1	1	**7**	—	X	NMK B2402
Glemminge, Scania, SE	Single	Spear (Valsømagle)	—	0	0	0	0	0	0	0	**0**	X	?	SHM 2109:1758
Glüsing, Dithmarschen, DE	Grave	Sword (Sögel)	X	0	0	2	1	0	1	0	**4**	X	X	LMSH 8815
Gokels, Rendsburg-Eckernförde, DE	Grave	Sword (Sögel)	X	2	2	1	0	0	1	?	**6**	X	?	LMSH 11674
Gudendorf, Dithmarschen, DE	Grave	Sword (Sögel)	?	0	0	0	0	0	0	?	?	X	?	LMSH 13766
Guldbjerg, Odense, DK	Grave	Dagger (Apa)	—	0	0	0	0	0	0	0	**0**	—	—	NMK B5022
Haga, Gotland, SE	Hoard	Spear (Valsømagle)	?	0	0	0	1	0	0	0	**1**	—	X	SHM 14954
Hagstad sn, Östergötland, SE	unknown	Spear (Valsømagle)	X	0	0	0	1	0	0	1	**2**	—	X	SHM 14363:6
Halla, Gotland, SE	Grave?	Spear (Bagterp)	X	0	0	3	2	0	2	0	**7**	—	X	SHM 12374
Hälsingborg, Scania, SE	Single?	Spear (Valsømagle)	X	0	2	0	0	0	0	0	**2**	—	—	LUHM 16129
Halsted, Lolland, DK	unknown	Spear (unknown)	X	1	0	3	1	0	2	1	**8**	X	X	NMK B13551
Hammer, Aarhus, DK	Grave	Spear (Torsted)	X	2	0	2	0	0	1	0	**5**	—	X	NMK B12059

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Harresø, Vejle, DK	Grave	Spear (Bagterp)	X	1	2	0	1	0	1	1	**6**		—	MM 5286
Harritslev, Skovby, DK	Single	Spear (Torsted)	X	?	?	0	2	0	1	0	**2**	X	—	NMK B9512
Hindorf, Dithmarschen, DE	Grave?	Spear (Valsømagle)	X	0	0	1	1	0	3	?	**5**	X	?	LMSH KS13767
Hjälmared, Halland, SE	unknown	Spear (Bagterp)	X	1	0	0	1	0	1	1	**4**	—	X	GAM 47679
Hohenaspe, Steinburg, DE	Grave	Sword (Sögel)	X	2	2	0	2	0	2	0	**8**	—	X	LMSH 10800a
Hohenlockstedt, Steinburg, DE	Grave	Sword (Virringe)	X	3	0	0	2	1	1	1	**8**	—	X	LMSH 10802
Holmsland, Hind, DK	Hoard	Spear (Bagterp)	X	0	2	3	0	0	1	0	**6**	—	?	NMK 11337
Homfeld, Rendsburg-Eckernförde, DE	Grave	Sword (Sögel)	X	1	0	0	2	1	1	0	**5**	—	X	LMSH 8824a
Hüsby, Schleswig-Flensburg, DE	Grave	Spear (Bagterp)	X	2	3	0	3	1	2	0	**11**	—	X	LMSH B115.8
Hvarsta, Uppland, SE	Single	Spear (Valsømagle)	X	1	2	1	1	1	0	2	**8**	—	X	SHM 16381
Hvedholm (surroundings) (I), Sallinge, DK	unknown	Spear (Torsted)	X	1	2	0	0	0	1	?	**4**	X	?	NMK B1458
Hvedholm (surroundings) (II), Sallinge, DK	unknown	Spear (Bagterp)	X	?	?	?	1	0	1	0	**2**	X	?	NMK B1459
Hyby, Scania, SE	Single?	Spear (Bagterp)	X	2	2	3	2	0	2	0	**11**	—	X	LUHM 20548
Issehaved Bakker, Holbæk, DK	unknown	Spear (Bagterp)	X	1	0	0	0	0	1	0	**2**	X	X	NMK B10582
Itzehoe, Steinburg, DE	Grave	Spear (Bagterp)	X	2	2	0	1	0	1	0	**6**	—	X	NMK T10
Kerteminde, Odense, DK	Single	Dagger (Wohlde)	X	1	0	0	2	0	1	0	**4**	—	X	NMK 10578
Kisum, Ginding, DK	Grave?	Sword (Wohlde)	X	2	0	0	1	0	0	0	**3**	—	X	NMK B7830
Kokborg, Vejle, DK	Grave	Dagger (Sögel)	X	0	0	0	2	0	2	?	**4**	X	X	NMK B13483
Kragelund, Ribe, DK	Single	Spear (Bagterp)	X	0	0	2	0	0	0	?	**2**	X	X	MM 5786
Krumstedt, Dithmarschen, DE	Single?	Sword (Sögel)	X	2	3	0	1	0	2	0	**6**	—	X	LMSH 11675
Kyrkjuves, Gotland, SE	Single?	Spear (Bagterp)	X	0	0	1	1	0	1	0	**3**	X	?	SHM 15951:2
Liffride, Gotland, SE	unknown	Spear (Bagterp)	X	3	2	1	1	0	1	0	**8**	—	X	SHM 14776
Lilla Beddinge sn., Scania, SE	Single?	Spear (Bagterp)	X	1	3	1	1	0	0	1	**7**	—	X	LUHM 22266
Limensgård, Bornholm, DK	Grave	Sword (Sögel)	?	0	0	0	0	0	2	0	**2**	X	?	NMK B1648
Linköping, Östergötland, SE	unknown	Spear (Bagterp)	X	0	0	2	0	0	1	0	**3**	X	X	SHM 9170:1206

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Lintrup, Ribe, DK	Single	Spear (Valsømagle?)	X	0	3	3	0	1	1	0	**8**	—	X	NMK B561
Löderup, Scania, SE	Single	Spear (Bagterp)	X	1	0	1	2	0	2	1	**7**	—	X	SHM 5886
Løvskal, Viborg, DK	Single	Spear (Bagterp)	X	?	?	?	1	0	1	0	**2**	X	X	NMK B5040
Lund, Scania, SE	unknown	Spear (Bagterp)	X	3	3	0	2	0	2	1	**11**	—	X	LUHM 12718
Lunderskov, DK	Single	Spear (Ödeshög)	X	0	0	1	1	0	1	0	**3**	X	X	NMK B16874
Maglehem sn, Scania, SE	Single?	Spear (Valsømagle)	?	0	0	0	1	0	1	0	**2**	—	X	SHM 8722:814
Maltegård, Copenhagen, DK	Single	Spear (Bagterp)	X	0	0	1	1	0	2	0	**4**	X	?	NMK B18091
Mølgård, Viborg, DK	Grave	Sword (Sögel)	?	?	?	?	?	?	?	?	?	X	?	NMK 7717
Nättraby sn. (I), Blekinge, SE	Grave?	Spear (Bagterp)	X	0	0	0	1	0	1	1	**3**	—	?	SHM 4529
Nättraby sn. (II), Blekinge, SE	Grave?	Spear (Bagterp)	X	0	2	1	0	0	2	0	**5**	—	X	SHM 4529
Neuberend, Schleswig-Flensburg, DE	Grave	Sword (Virring)	X	0	2	0	2	0	1	0	**5**	—	X	LMSH KS9489
Nordborg (I), Sønderborg, DK	Grave	Sword (Sögel)	?	0	0	0	0	0	0	?	**0**	X	?	NMK Z1010
Nordborg (II), Sønderborg, DK	Grave	Spear (Bagterp)	X	0	0	0	1	0	0	0	**2**	X	X	NMK Z1011
Norra Möckleby, Öland, SE	Single?	Spear (Ödeshög)	X	1	3	0	1	0	2	0	**7**	—	X	SHM 1304 (1837) 81
Nørre-Bøel, Ribe, DK	Grave	Sword (Sögel)	X	1	2	0	2	0	2	1	**8**	—	X	NMK B4245
Nygårds, Gotland, SE	Single	Spear (Bagterp)	X	0	0	1	1	0	0	0	**2**	—	X	SHM 11686
Ödeshög, Östergötland, SE	Single?	Spear (Ödeshög)	X	0	0	0	1	0	1	1	**3**	X	X	SHM 11495:494
Ohrsee, Rendsburg-Eckernförde, DE	Grave	Dagger (Sögel)	X	0	0	0	3	0	2	0	**5**	X	?	LMSH 7380
Ölme, Värmland, SE	Single?	Spear (Bagterp)	?	0	0	0	2	0	1	0	**3**	X	?	SHM 8646
Øster-Gasse, Tønder, DK	Grave	Sword (Sögel)	?	1	0	0	0	0	0	?	**1**	X	?	LMSH 4962
Pahlkrug, Dithmarschen, DE	Grave	Spear (Torsted)	X	1	0	0	0	0	1	?	**2**	—	?	LMSH 13125
Rønnerud,Oppland, NO	Single	Sword (Apa)	X	0	0	3	2	0	2	?	**7**	X	?	NMO C54227
Rude Eskilstrup, Sorø, DK	Single	Spear (Bagterp)	X	1	0	3	2	0	0	0	**6**	X	X	NMK 14565
Russee, Rendsburg-Eckernförde, DE	Single	Spear (Bagterp)	?	2	0	0	0	0	0	2	**4**	—	X	LMSH KS14709
Rye, Copenhagen, DK	unknown	Spear (Bagterp)	?	?	?	?	?	0	1	0	**1**	X	?	NMK B10472
Ryssby sn, Småland, SE	Single?	Spear (Ödeshög)	X	1	0	0	3	0	0	0	**4**	—	X	SHM 1304:58

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Schafstedt, Dithmarschen, DE	Grave	Sword (Wohlde)	X	1	0	0	1	0	0	1	**3**	X	X	LMSH 11954.I
Schuby, Schleswig-Flensburg, DE	Grave	Sword (Wohlde)	?	0	0	0	0	0	0	?	**0**	X	?	LMSH 6998
Sengeløse (?), Copenhagen, DK	unknown	Spear (Valsømagle)	X	0	2	0	1	0	0	?	**3**	—	?	NMK B11350
Simris sn, Scania, SE	Single?	Spear (Valsømagle)	X	1	3	3	2	0	0	0	**9**	—	X	LUHM 27463
Smedby,Öland, SE	Grave	Spear (Bagterp ?)	—	0	0	0	0	0	0	0	**0**	—	?	SHM 23307
Søholt, Maribo, DK	Single	Spear (Bagterp)	X	1	3	2	1	0	2	1	**10**	—	X	NMK B14368
Sölvesborg, Blekinge, SE	Single?	Spear (Bagterp)	X	0	2	2	1	0	2	2	**9**	—	X	LUHM 20549
Sörup (I), Schleswig-Flensburg, DE	Grave	Sword (Sögel)	?	1	0	0	0	0	0	?	**1**	X	?	LMSH B23
Sörup (II), Schleswig-Flensburg, DE	Grave?	Sword (Sögel)	?	0	0	0	0	0	2	0	**2**	X	?	LMSH KS12587
Steinbergholz, Schleswig-Flensburg, DE	Grave	Sword (Sögel)	X	1	2	0	2	0	2	0	**7**	X	X	LMSH KS11405
Stenkumla sn., Gotland, SE	unknown	Spear (Valsømagle)	X	0	0	1	0	0	0	0	**1**	—	X	SHM 13457:1
Stora Bernstorp, Scania, SE	Single	Spear (Valsømagle)	X	3	3	0	3	1	0	0	**10**	—	X	LUHM 27042:25
Store Strandbygård, Bornholm, DK	Grave	Spear (Torsted)	?	?	?	0	0	0	1	0	**1**	X	?	NMK B1771
Tange, Viborg, DK	Single	Spear (Valsømagle?)	X	1	3	0	1	0	0	0	**5**	—	X	NMK B10902
Tåning, Skanderborg, DK	Grave	Spear (Bagterp)	X	0	2	2	1	0	1	?	**6**	—	—	MM 5135
Tensbüttel, Dithmarschen, DE	Grave	Sword (Wohlde)	X	0	0	0	2	0	1	0	**3**	—	X	LMSH B290
Thise (I), Viborg, DK	Grave?	Spear (Torsted)	X	1	2	0	2	0	0	0	**5**	—	—	NMK B13233
Thise (II), Viborg, DK	Grave?	Sword (Sögel)	X	0	2	0	1	0	1	0	**4**	X	?	NMK B13232
Thisted (near), Hundborg, DK	Single	Dagger (Sögel)	X	0	3	1	2	0	1	1	**8**	—	—	NMK B13409
Tinnum, Sylt, DE	Grave	Sword (Wohlde)	X	2	0	0	1	?	1	?	**4**	X	X	LMSH KS18092
Tinsdahl, Hamburg, DE	Hoard	Spear (Tinsdahl)	X	2	0	1	1	0	0	1	**5**	—	X	LMSH 6164
Torslunda, Uppland, SE	Hoard	Spear (Valsømagle)	X	0	2	2	1	0	0	1	**6**	—	—	SHM 208984
Tullgara, Södermanland, SE	unknown	Spear (Valsømagle)	X	1	2	0	1	0	0	0	**4**	X	?	SHM 8439
Ullevi, Öland, SE	Single	Spear (Bagterp)	X	0	0	0	2	0	0	1	**3**	—	X	SHM 4321

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Undløse, Holbæk, DK	Single?	Spear (Bagterp)	X	1	0	0	1	0	0	1	**2**	—	X	NMK 13874
unknown (1), Scania, SE	unknown	Spear (Valsømagle)	X	3	2	2	2	1	2	1	**13**	X	X	LUHM 3403
unknown (1), SE	unknown	Spear (Valsømagle)	X	1	3	2	1	0	2	0	**9**	—	X	LUHM 6658
unknown (10), Scania, SE	unknown	Spear (Bagterp)	X	0	2	3	1	0	0	0	**6**	—	X	NMK S135
unknown (10), SE	unknown	Spear (Ödeshög)	X	1	2	0	0	0	0	1	**4**	—	X	SHM 2899
unknown (11), Scania, SE	unknown	Spear (Bagterp)	X	1	0	0	1	0	0	0	**2**	—	X	GAM 2923
unknown (2), Scania, SE	unknown	Spear (Bagterp)	X	0	0	0	1	0	1	0	**2**	—	X	SHM 8970:146
unknown (2), SE	unknown	Spear (Valsømagle)	X	3	2	2	2	0	2	0	**11**	—	X	LUHM 8985
unknown (3), Scania, SE	unknown	Spear (Bagterp)	X	1	0	0	1	1	1	0	**4**	—	X	SHM no Number
unknown (3), SE	unknown	Spear (Valsømagle)	X	0	2	1	0	0	1	0	**4**	—	X	LUHM 10131
unknown (4), Scania, SE	unknown	Spear (Valsømagle)	X	3	3	2	1	0	1	0	**10**	—	X	LUHM 12911
unknown (4), SE	unknown	Spear (Valsømagle)	X	0	0	1	1	0	2	0	**4**	X	?	LUHM 11113
unknown (5), Scania, SE	unknown	Spear (Valsømagle)	X	2	0	3	1	0	0	2	**8**	—	X	LUHM 12913
unknown (5), SE	unknown	Spear (Bagterp)	?	0	0	0	1	0	0	0	**1**	X	X	SHM 2898
unknown (6), Scania, SE	unknown	Spear (Valsømagle)	X	1	0	0	2	0	2	1	**6**	—	X	LUHM 12915
unknown (6), SE	unknown	Spear (Ödeshög)	X	2	3	0	0	1	0	1	**7**	—	X	SHM 3937
unknown (7), Scania, SE	unknown	Spear (Valsømagle)	X	0	2	1	1	0	0	0	**4**	X	?	GAM 47590
unknown (7), SE	unknown	Spear (Bagterp)	X	0	0	0	2	0	2	1	**5**	—	X	SHM 17343:1440a
unknown (8), Scania, SE	unknown	Spear (Torsted)	X	2	0	3	1	1	2	0	**9**	—	X	LUHM 6657
unknown (8), SE	unknown	Spear (Bagterp)	X	0	0	2	1	0	1	0	**4**	X	X	GAM 2343
unknown (9), Scania, SE	unknown	Spear (Ödeshög)	X	1	0	1	1	0	0	1	**4**	—	X	LUHM 11111
unknown (9), SE	unknown	Spear (Valsømagle)	X	0	2	0	0	0	1	0	**3**	X	?	SHM 2893
unknown, Blekinge, SE	unknown	Spear (Bagterp)	X	1	2	0	1	0	2	0	**6**	—	X	SHM 9014
unknown, Lejrskov, Ribe, DK	Grave?	Sword (Sögel)	?	1	0	0	1	0	2	0	**4**	X	?	MM 5147
unknown, Ods H., Holbæk, DK	unknown	Spear (Bagterp)	X	1	0	1	1	1	0	1	**5**	—	X	NMK B10803
unknown, Värmland, SE	Grave?	Spear (Bagterp)	—	0	0	0	0	0	0	0	**0**	X	—	SHM 7577
Vallby sn, Scania, SE	unknown	Spear (Bagterp)	X	0	0	1	1	0	2	2	**6**	—	X	LUHM 11112

(*continued*)

Table 1. (*Continued*).

Find place	Context	Type	Use-wear	Notch	Indentation	Blow marks	Curvature	Twisting	Fractures	Tip damage	**Damage number**	Heavy distortion	Repair	Inventory no.
Valsømagle (I/I), Sorø, DK	Hoard	Spear (Valsømagle)	X	1	0	0	1	0	1	1	**4**	X	?	NMK B3952
Valsømagle (II/I), Sorø, DK	Hoard	Spear (Valsømagle)	X	0	0	0	1	0	1	0	**2**	—	—	NMK B7523
Valsømagle (II/II), Sorø, DK	Hoard	Spear (Valsømagle)	X	0	0	1	1	0	2	0	**4**	—	?	NMK B7524
Varpelev, Præstø, DK	unknown	Spear (Valsømagle)	X	1	0	0	1	1	1	0	**4**	—	—	NMK B8461
Virring (II), Sønderhald, DK	Hoard	Spear (Bagterp?)	X	2	2	1	1	0	1	0	**7**	—	X	NMK B3959
Virring (III), Sønderhald, DK	Hoard	Spear (Torsted)	X	0	0	1?	1	0	1	0	**2**	—	?	NMK B3961
Virring (IV), Sønderhald, DK	Hoard	Spear (Bagterp?)	X	0	2	1	2	0	1	2	**8**	—	X	NMK B3960
Virring (IV), Sønderhald, DK	Hoard	Spear (Rederzhausen)	X	1?	0	1?	1	0	0	2	**3**	—	X	NMK 3958
Virring (V), Sønderhald, DK	Hoard	Sword (Virring)	X	0	0	0	2	0	1	0	**3**	—	X	NMK B3957
Voldtofte, Odense, DK	Grave	Spear (Valsømagle)	X	0	2	0	1	0	1	0	**4**	X	X	NMK 25995
Vreta Monastery, Östergötland, SE	unknown	Sword (Sögel)	X	1	0	2	2	1	2	0	**8**	—	X	SHM 10419:211
Ysane, Blekinge, SE	Single?	Spear (Ödeshög)	?	0	0	0	1	0	0	1	**2**	—	X	LUHM 29767

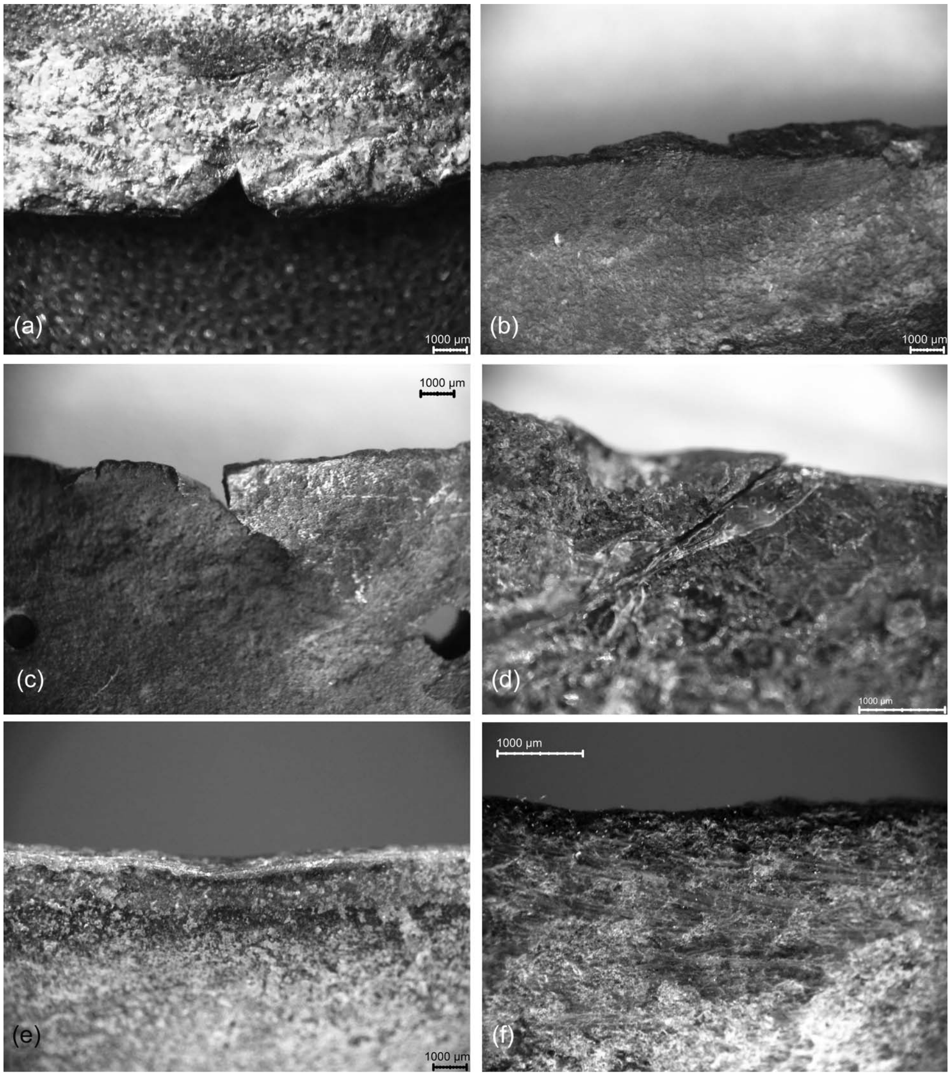


Figure 2. (a) Notch (NM K B 4245); (b) Grazing blow (NM K 9044); (c) Fissure caused by a notch (NM K B 938); (d) Fissure caused by an indentation (SHM 14776); (e) Shallow indentation and material displacement (NM K B 10902); (f) Repaired indentation and related striations (LUHM 20548).

as secondary proof for the existence of such protective gear, but this should not be overstated. It has to be kept in mind that bones or wooden weapons (see, for example, Jantzen *et al.* (2011)) could also have caused tip pressure.

Curvatures (Figure 3(e) and (f)) are caused by stress on the material due to force. The ductility of the metal allows such stress to be relieved by bending. Therefore, this damage is considered to be a plastic deformation. Curvatures usually affect larger portions of the weapon, for example, a tip receiving pressure might lead to a deformation of the upper third of the spearhead. This damage can affect a single part or the weapon as a whole. If a weapon shows just a very slight and even curvature over its whole body, it is attributed to earth pressure affecting the object post-deposition. Material displacement and curvatures are closely related, the main difference being the size of the damaged area.

Twisting is a plastic deformation along the longitudinal axis of the weapon. It is difficult to observe and to document because it is usually very weak due to the amount of force necessary to create it. This kind of damage was previously linked to the intentional destruction of weapons (Horn 2011). However, it could also be caused if the weapon became stuck somewhere, for example, between bones, and it was removed by force in a twisting motion.

Fractures (Figure 4) are caused when stress put on a material exceeds its ductility, ultimately leading to its failure. Such stress might, for example, occur when a tip receives pressure (Figure 3(d)). Complete material failure leads to a detached part and secondary fractures can develop in direct connection (Figure 4(a)). If nothing becomes detached, the fracture is termed a *fissure* (Figure 4(b)). *Hairline fractures* are invisible or barely visible macroscopically (Figure 4(c) and 4(d)).

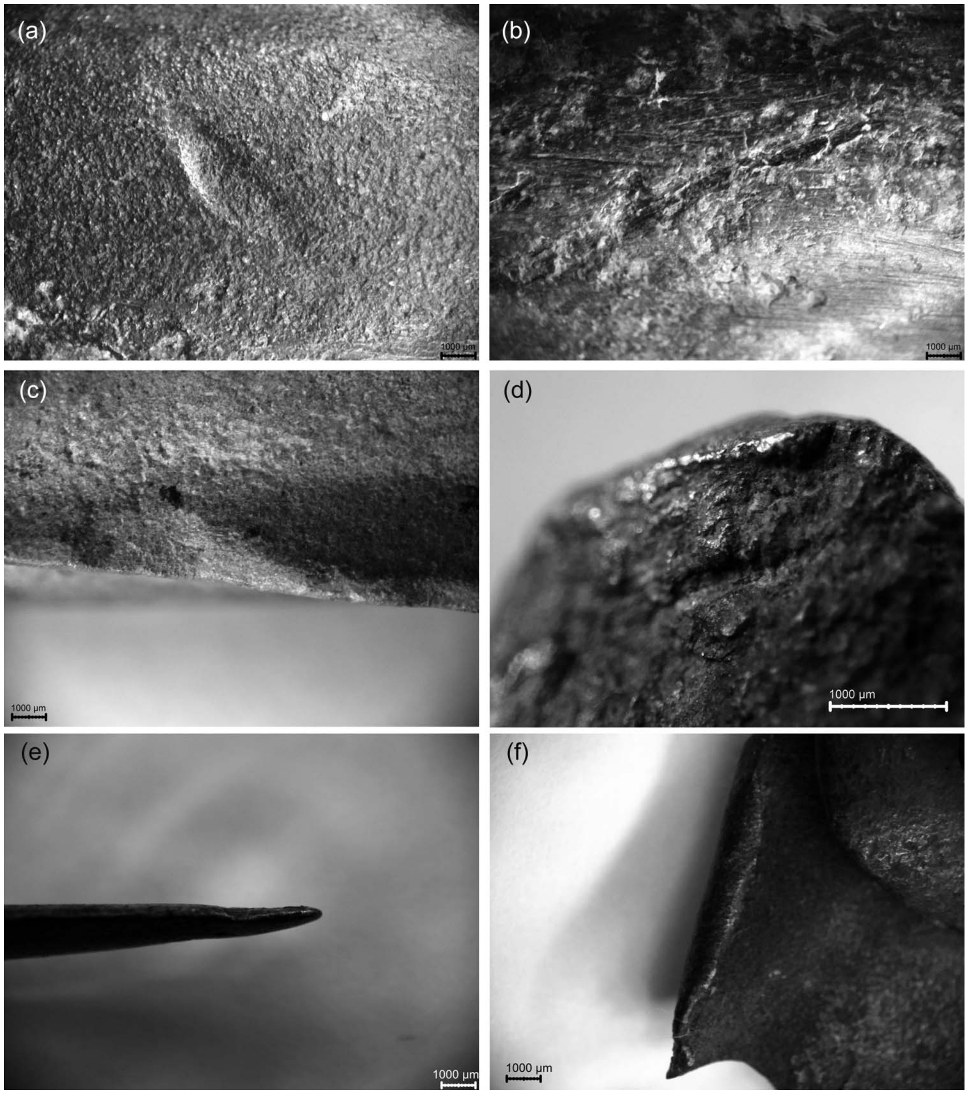


Figure 3. (a) Rounded blow mark (LMSH KS B 330); (b) Elongated blow mark (MM 5786); (c) Blow mark-indentation hybrid (LUHM 12740); (d) Fissure (spear tip) caused by pressure (LUHM 11112); (e) Curved tip (NM K B 10578); (f) Curved hafting plate (NM K B 10578).

Sometimes, it is difficult to distinguish between anthropogenic damage and that caused by corrosion. In these cases, a fracture associated with a curvature is a good indicator for a human origin of the damage (Figure 4(a)). However, not all breaks without a fracture at the apex of a curvature are due to post-depositional processes. An object's hardness, ductility and thickness are important properties preventing or facilitating fractures, curvatures and subsequently the ultimate form of the damage.

Shape reduction is not in itself use-wear damage (Figure 5(a)), because it may appear during production and repair. Despite the important and meaningful difference of which point in time this feature appears, its origin is difficult to distinguish. Both the outline and the cross-section are possibly affected. Several subtractive methods of treatment are known that may lead to shape reduction: *grinding*, *polishing* and *hammering* (Figure 5(b)–(f)).

Grinding has frequently been part of the post-depositional treatment after the objects recovery. Modern grinding is rather straightforward and cuts through patina. Usually, the aim of such grinding was to partially or completely remove patina (Figure 5(f)). Modern striations are often considerably deep and cause displaced material that is substantial, but usually remains on a microscopic level. The reasons for this removal vary and range from the desire of the amateur finder to distinguish the material of his new find, the wish to present the visitors of a museum with a shiny object (Bridgford 1997, p. 96) or the collection of samples by researchers.

In contrast, ancient grinding was probably done more carefully in order, for example, to preserve the sharpness

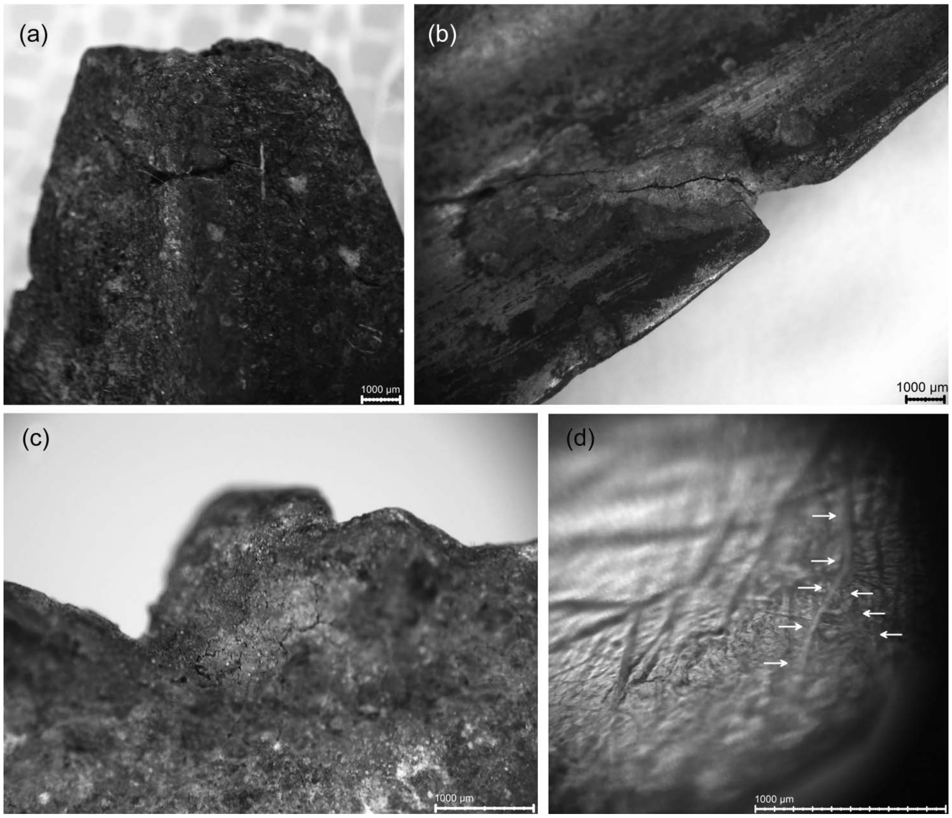


Figure 4. (a) Fissure (spear tip) caused by a curvature (SHM 14776); (b) Fissure (corrosion) induced stress next to a notch (NM K B 10578); (c) Material displacement affected by hairline fractures (corrosion) (LUHM 12627); (d) Hairline fracture (NM K B 15103).

of the edge of the weapon. Thus, ancient striations are probably weaker and take away less material at once. A weapon may be subject to repair more than once in its lifetime. Therefore, striations may be assumed to be less regular in direction. However, certain parts need certain treatment. A distinct directionality of striations can become visible (Figure 5(d)), but multidirectional striation patterns appear too (Figure 5(e)). Striations underneath patina suggest an ancient origin (Figure 6(a), Roberts and Ottaway 2003, p. 120). As grinding and polishing are subtractive, they affect ornamentation (Figure 6(b)). It is not likely that it was desirable to remove ornamentation. If disappearing parts of the decoration are patinated, they are a good indicator for ancient repair processes. However, it should be stressed that corrosion affects decoration too and can lead to its eradication.

Microscopic examination improves the chances of recognising weak striations (Figure 5(c)). However, it should be considered that objects were possibly polished very finely even after repair. For this reason, in a number of cases, no striations were visible up to 300× magnification. This exemplifies the problem of recognition, because there might be a number of cases which were repaired, but the traces of these repairs may not be visible to the modern observer. Assumedly, repairs were carried out from the coarse grinding to the fine final polish. The earlier this process was stopped in ancient times, the more likely it is observable.

A considerable margin of error exists in the assessment of striations, because they do not immediately tell at what point in time they were caused. In order to finish a cast metal object, it needs treatment, including grinding and polishing, for example, to remove casting seams (Binggeli 2011, p. 20). Cutting edges probably received an initial sharpness. So, the edges were ground and polished at least once before they are actually put in a situation where they would receive damage.

According to what has previously been mentioned, it is possible to interpret irregular, multidirectional, variable striations and those directly associated with corrected damage. If the cross-section is reduced severely or the outline is very asymmetrical, a repair process is assumed even without visible grinding or polishing traces (Kristiansen 1984, 2002). It is assumed to be unlikely that a high degree of asymmetry was desired upon production because that would reduce the weapons ability to cut on at least one edge.

The aim of ancient repair processes was presumably to keep the weapon in a usable state. Thus, repairs probably aim at making the transition between a preserved edge and to smooth damage in order to restore

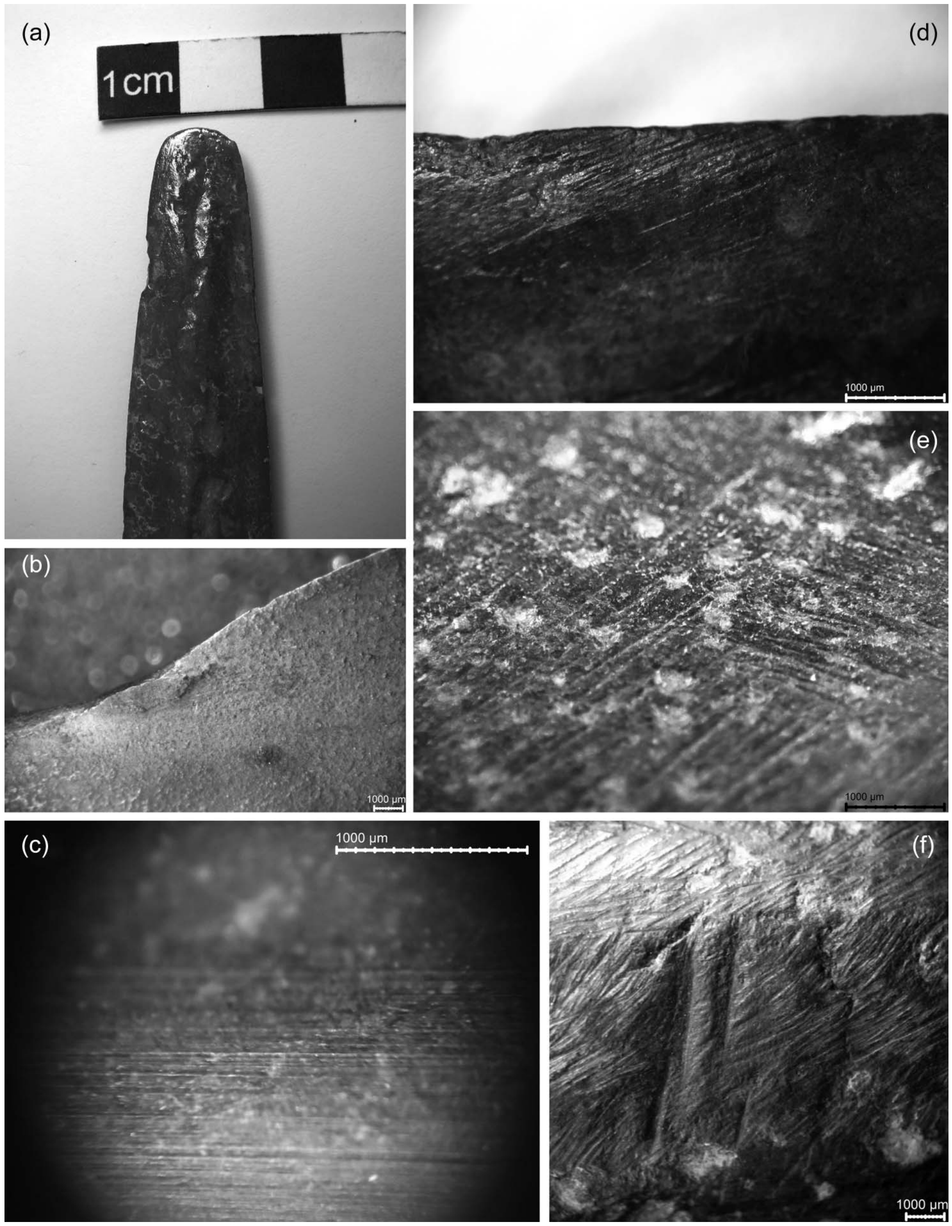


Figure 5. (a) Shape reduction (LMSH KS 11675); (b) Indentation potentially repaired by hammering (NM K B 10803); (c) Polish striation (NM K B 11946); (d) Resharpening striations (LMSH KS 11675); (e) Multidirectional striation pattern (MEG B 17620); (f) Modern grinding over ancient blow marks (SHM 9170).

the capability of the blade to cut. Additionally, this would prevent fissures occurring in sharp cracks jeopardising the physical integrity of the whole weapon. Thus, repairs lead inherently to the disappearance of damage. Accordingly, it should be kept in mind that not all damage received by a spear or a sword may be visible to the modern researcher.

Corrosion is another factor that has the potential to blur evidence for use considerably. It is a process that causes metal particles to oxidise and increase in size. This process puts stress on the microstructure (Spähn 2001, p. 203). Subsequently, the tension is relieved in fractures.

Chlorine and ammonia contribute to dissolving corrosion (Tylecote 1979, p. 350, Spähn 2001, p. 203, Table 1). Both substances are present in the human body, and decay sets them free. Mixed with bodily fluids and intruding water, it creates a highly corrosive solution. Thus, inhumations possess an environment very benign to dissolving corrosion. Sometimes, the corrosion induced by human decay is so severe that the metal dissolves completely into very brittle gypsum remains (Figure 6(c)). If the

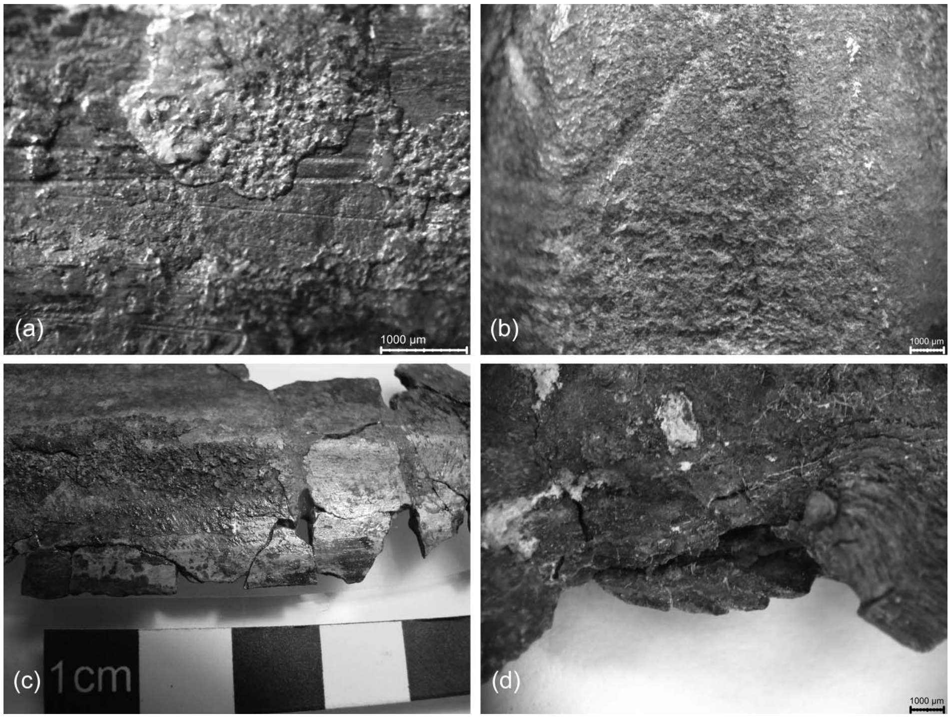


Figure 6. (a) Striations underneath patina (NM K B 5254); (b) Fading ornamentation (LUHM 6658); (c) Advanced stage of corrosion, metal transformed into gypsum (LMSH KS 11802); (d) Heavily corroded cutting edge affecting an indentation (LMSH KS 7380).

amount of pieces with heavy disturbances known from secure contexts is compared, graves (59%, 23) outnumber hoards (18%, 7) and single (23%, 9) finds by far.

Damaged areas are pre-weakened and, thus, more prone to corrosion. Consequently, these parts fracture and dissolve earlier than undamaged parts. (Kirchberg 2001, Spähn 2001). Due to their thinness, edges are especially predisposed to damage (Figure 6(d)). Edge damage exacerbates this, and post-depositional damage due to corrosion is intensified. The same is possibly true for ground parts because striations also provide a higher surface area. This facilitates even more danger to dissolve cutting edges because they provide a larger area for the corrosive elements to attack. In this way, corroded parts and those that received damage prior to corrosion become indistinguishable. This leads to the paradoxical situation that a specimen heavily damaged by past combat is not recognisable as such, because of its higher vulnerability to post-depositional corrosion.

All the remarks about repair and corrosion considered; a weapon might be grouped in the category ‘no damage’, despite having received damage in past combat. Thus, it has to be kept in mind that the category ‘no damage’ should be read as ‘no damage visible’. For this reason, were heavily corroded weapons usually summarised under ‘uncertain’, even if they were recorded with 0 or ‘no damage’. Unless, a weapon showed clear evidence that this particular damage was indeed completely missing. Moreover, if damage is visible it represents the final stage in the actual use of the weapon before it was discarded. Accordingly, it is very difficult to estimate how much fighting actually took place with a particular weapon, and we might never be able to. Furthermore, not all damage has to be seen as originated due to fighting. Perhaps, some damage comes from ritual practices as will be elaborated later on (see also Horn (in prep.)). Thus, any result has to be deduced carefully and interpreted with caution. In the following, the percentage for uncertain pieces is not always mentioned. If the percentage for the categories ‘damaged’ and ‘no damage’ does not add up to 100%, then the category ‘uncertain’ represents the remaining specimen.

Use-wear analysis of spears

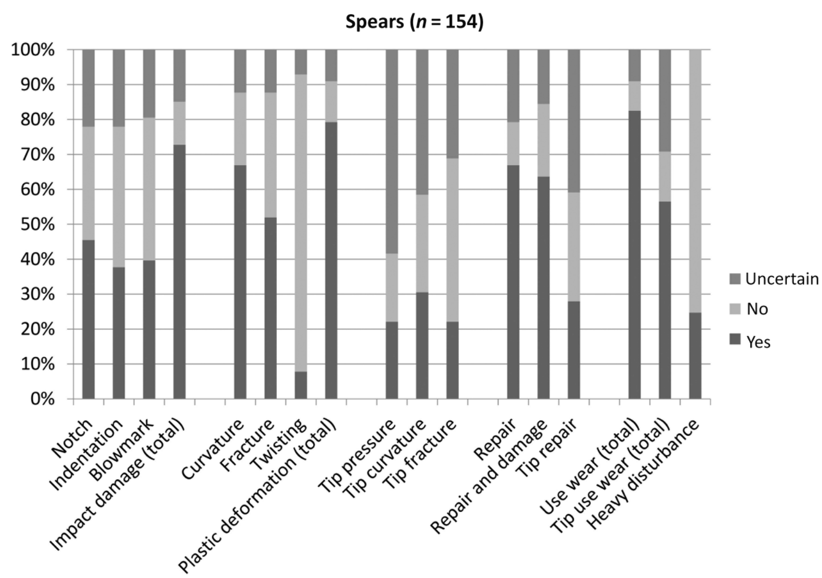
Among the 154 spears are 50 Torsted type, 49 Bagterp type, 39 Valsømagle type (two uncertain) and 9 Ödeshög type. Furthermore, two spears might belong to the Valsømagle type and two potentially to the Bagterp type, but all of them are uncertain in their classification. One spear could not be attributed to any type. Finally, a single Rederzhausen type spear and the spear from the Tinsdahl hoard were also analysed. All these spears belong to Period I of the Nordic Early Bronze Age.

All of the following results have been summarised in one chart and one table (see Figure 7(a)). A majority of the spears possess visible use-wear traces or traces of repair (83%, 127). Only 13 spears (8%) have no observable signs of use or repair, and 14 spears (9%) are too unclear to distinguish whether the damage is of anthropogenic origin.

Notches were observed on almost half of the analysed specimen (45%, 70). Such damages are not identifiable on a smaller number of spears (33%, 50). Indentations are exhibited by over one-third of the spears (38%, 58). Slightly more pieces (40%, 62) have no traces of indentations. 61 spears (40%) display blow marks that were not visible on 41% (63) of the examined pieces.

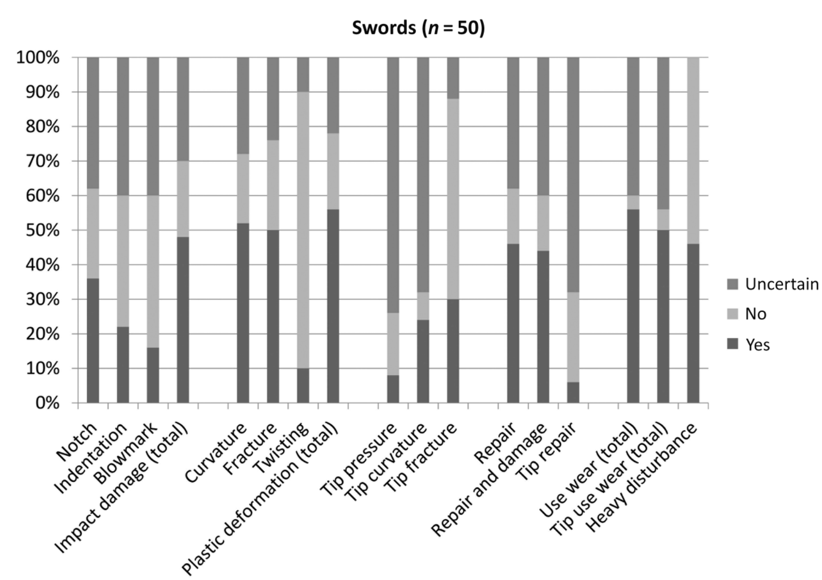
Notches, indentations and blow marks are summarised as 'impact damage' because their origin is probably directly connected to a more or less forceful blow from or to another object, which was very likely a weapon or another object used as such. In this regard, pressured tips could also be counted as impact damage, but since tips received special attention in the analysis they are left out. Almost three-quarters of the analysed spears (73%, 112) have observable traces of such damage. That means they were most likely used in hand-to-hand combat. The number would be even higher if pressured tips were to be

Spears (*n* = 154)			
	Yes	No	Uncertain
Notch	70	50	34
Indentation	58	62	34
Blowmark	61	63	30
Impact damage (total)	112	19	23
Curvature	103	32	19
Fracture	80	55	19
Twisting	12	131	11
Plastic deformation (total)	122	18	14
Tip pressure	34	30	90
Tip curvature	47	43	64
Tip fracture	34	72	48
Repair	103	19	32
Repair and damage	98	32	24
Tip repair	43	48	63
Use wear (total)	**127**	**13**	**14**
Tip use wear (total)	87	22	45
Heavy disturbance	38	116	0



(a)

Swords (*n* = 50)			
	Yes	No	Uncertain
Notch	18	13	19
Indentation	11	19	20
Blowmark	8	22	20
Impact damage (total)	24	11	15
Curvature	26	10	14
Fracture	25	13	12
Twisting	5	40	5
Plastic deformation (total)	28	11	11
Tip pressure	4	9	37
Tip curvature	12	4	34
Tip fracture	15	29	6
Repair	23	8	19
Repair and damage	22	8	20
Tip repair	3	13	34
Use wear (total)	**28**	**2**	**20**
Tip use wear (total)	25	3	22
Heavy disturbance	23	27	0



(b)

Figure 7. (a) Table and chart of the use-wear analysis of spears; (b) Table and chart of the use-wear analysis of swords.

added. Only 12% (19) and 15% (23), respectively, lacked impact damage or the traces were too unclear to identify them as being anthropogenic.

Curvatures, twisting and the fracture of weapons are termed ‘plastic deformations’ in this article. Even though notches, dents and blow marks are in a sense plastic deformation too, the scale of the deformation is larger and affects greater parts of the weapons when it comes to curvatures, twisting and fractures.

A large amount of the examined spears (79%, 122) possessed plastic deformations. If these are split up, then curvatures are the dominant damage exhibited on the spears by two- thirds of the examined material (67%, 103). Half of the analysed spears (52%, 80) have fractures potentially induced by anthropogenic action. Perhaps, the high amounts of damaged pieces for both curvatures and fractures point to a correlation between both.

Interestingly, the amount of fractures potentially caused by human activity in ancient times without association to a curvature is quite high (46%, 37). Conversely, 13 spears (16%) display both fractures on the apex of a curvature, as well as away from the curvature, and 26 specimens (33%) possess only fractures caused by curvatures. Deformations in a twisting manner are rare; just 12 spears (8%) display this kind of damage.

Examining the tips of the spears is difficult, because these tips are very frequently lost either due to human action or post-depositional processes. That takes away the possibility to see whether a break occurred in succession to the tip receiving pressure or after it had already been repaired. Therefore, the analysis of 90 spears (58%) could not lead to any feasible results whether they received pressure because the tips are lost or otherwise subject to heavy disturbance. Yet, it is still possible to make a judgement whether they are lost due to human impact or post-depositional causes.

The spears that received pressure to their tips and those without such damage are broadly balanced with 34 (22%) and 30 specimens (20%), respectively. On a general level, the amounts of tips with curvature repeat this picture, but a slightly higher margin exists between those spears affected by this kind of damage (30%, 47) and those not affected (28%, 43). The amount of spears with fractures, with clear indicators of human activity is surprisingly low (22%, 34). Just two spear tips (1%) were subject to a deformation caused by twisting.

If the use-wear on tips is summarised, we see that the majority of spears (57%, 87) probably received damage on their tips, while only 20 pieces (14%) were free of such damage. As already mentioned, spear tips, along with other parts of any weapon, can be affected by repair processes. These repairs will be addressed in the following.

Traces that point to repair processes have been discovered on almost two-thirds of the analysed spears (67%, 103). For 32 spears (21%), no decision about the origin of traces, such as striations and shape reduction, could be made. However, at least 19 pieces (12%) may show no signs of ancient secondary treatment.

For observation of repairs on the tips, the same difficulties stated earlier apply for tip damage if the tips are lost. Due to these problems, 41% (63) of the spear tips are unclear whether they were repaired in ancient times. Yet, over a quarter (28%, 43) of the analysed spear tips show traces that potentially suggests an ancient repair. However, 48 spear tips (31%) have no visible traces, such as striations or the traces suggest an origin in their production rather than during their repair.

Over two-thirds of all analysed spears (64%, 98) potentially possessed damage acquired in combat and traces of repair processes simultaneously. In this regard, specimens without or with unclear traces are represented with 21% (32) and 15% (24), respectively.

To end this section, we turn to post-depositional disturbances once more. In this regard, spears represent themselves in a distinctly different manner than swords, as we shall see. Only a quarter of the spears (25%, 38) were categorised as possessing heavy post-depositional disturbances. For the remaining 75% (116), it was expected that they are in a good enough condition that most of the use-wear present upon deposition should be visible.

Use-wear analysis of swords

All 50 analysed swords belong to Period I of the Nordic Bronze Age. According to their length, six blades should be classified as ‘daggers’, but morphologically they fit the known sword types very well. For this reason and for the sake of a statistical comparison, these six blades were included in the category ‘swords’. It possible to subdivide the analysed set of swords into Sögel (28), Apa (11), Wohlde (7) and Virring (3) type swords. One sword is not identifiable at all.

All of the following results have been summarised in one chart and one table (see Figure 7(b)). Slightly more than half of the swords (56%, 28) exhibit traces of use or repair and only two swords (4%, 2) are clearly lacking such evidence. The traces on the remaining swords (40%, 20) were not clearly identifiable as signs of ancient use. The different features are represented as follows.

Notches were visible on 18 swords (36%), while 13 blades (26%) were without them. Indentations were exhibited by 11 swords (22%). In total, 19 of the analysed pieces (38%) were without visible traces of indentations. Only 8 swords (16%) possessed observable blow marks. In turn, blow marks could not be detected in 22 cases (44%). If these damages are again summarised as ‘impact damage’, a total of 24 swords (48%) show such damage. A minority of the swords (22%, 11) had no visible traces of impact. Even more swords (30%, 15) were unclear after assessment.

Swords are affected by plastic deformations too. After the analysis, 26 blades (52%) seem to be curved by anthropogenic and not post-depositional influences. Only 10 swords (20%) were probably not affected by curvature caused by humans. The twisting of swords (10%, 5) occurs slightly more often than on spears (8%, 12), but it is still rare in Period I of the Early Bronze Age. A large amount of the swords (80%, 40) was most likely unaffected by this type of damage.

Fractures, whether fissures or broken off parts, have to be assessed cautiously, but 25 (50%) swords were possibly broken due to human action. The origin of the breaks of 12 (24%) swords is uncertain, and 13 (26%) blades are either broken due to post-depositional processes or not broken at all. Most of the fractures (60%, 15) deemed to be of anthropogenic origin occurred at the apex of the curve created during the physical action of breaking. In addition, nine swords (36%) exhibited multiple fractures. Some are connected with a curvature while others are not. In total, 28 specimens (56%) display plastic deformation possibly linked to human activity. In 11 (22%) of the cases, no such damage could be determined, and an equal number is too uncertain to identify.

Swords provide less opportunity to observe tip damage than spears due to the higher frequency of highly corroded pieces. This issue will be addressed later on. Accordingly, only four tips (8%) have clearly received pressure, while nine of the tips (18%) probably have not. The large majority of the tips (74%, 37) remain uncertain in the examination due to transforming processes, such as corrosion, fracture or repair. The result for curvatures on tips is slightly better because they might still be visible on adjacent parts even though the tip itself is lost. Still, the majority of the tips (68%, 34) are unclear in their definition. However, 12 swords (24%) possibly have a curvature of their tips. In respect of fractures, 15 of all analysed swords (30%) have a fractured and detached tip likely to be induced by human interaction. Just one tip was twisted by physical activity. According to this, it can be said in general that half of the blades under examination (50%) are likely to have received some kind of damage on their tips, and that 22 of the swords (44%) are uncertain in their interpretation. Only three tips (6%) could with some certainty be said to be free from any kind of damage.

Traces of repair were detected on 23 swords (46%). Due to the difficulties in distinguishing between grinding taking place during production and that applied as repair, over one-third (38%, 19) of the traces remain uncertain in their interpretation. In eight cases, the swords (16%) were in all probability never subject to a repair.

Repairs of the tips of the swords are again difficult to assess, and most swords (68%, 34) are uncertain in their interpretation. The reasons for that are yet again a result of the loss and transformation of tips due to other influences. Therefore, only three tips (6%) have traces that make an ancient repair probable. Overall, potential repair traces may coincide with combat damage on 44% (22) of the swords under examination. The unclear cases are almost as high with 40% (20). Only 8 swords (16%) are likely without such an association.

Finally, we have to turn our attention again to post-depositional processes, mainly corrosion but also modern grinding. Almost a half of the examined swords (46%, 23) have been blurred heavily by such processes. This problem will be discussed in the following section. However, such swords might still hold valuable information regarding their use, but it is difficult and improbable to make an accurate assessment.

Combat and fighting styles – discussion of use-wear

Perhaps, most of the damage on the spears and swords should be interpreted as combat damage. As will be discussed below, apart from two very special discoveries, any evidence for ritual damage is scant on the examined weaponry. Despite the problems of observing damage, which will also be discussed later on, the amount of present use-wear is impressive. Unfortunately, singular weapons rarely show the full array of possible damage, which makes it difficult to infer for an individual weapon all the different ways it was employed in combat. However, if they are looked upon as a group of weapons and all the damage that potentially occurs on them is described, as was done in the sections above, maybe then it is possible to infer some results. A comparison between the two weapon forms will aid this undertaking, because the damage profiles different fighting styles leave on swords are quite well documented (Bridgeford 2000, Molloy 2006).

Before proceeding, it should be considered that damage occurs involuntarily if not inflicted in a ritual (Molloy 2011, p. 75). It is difficult if not impossible for archaeologists to assess the perceptions and motivations of past individuals. However, when an individual engages in combat, we may assume that he is willing to win it. In this regard, fighting brings with it a certain task-specific rationality. Thus, a fighter would probably not risk the integrity of his weapon as that would put him at a disadvantage and makes it more likely that he will be defeated or in the worst case be killed. All things considered, all damage is accidental and therefore, even a single notch possibly contains valuable information about the style of fighting.

Roughly speaking, impact damage points to a cutting motion while tip damage can be attributed to thrusting and stabbing attacks. The location of the damage is important. Occasionally, a thrusting motion could be intercepted by a direct strike from the side leaving a notch, a dent or a blow mark. Yet, since parries usually make use of the trajectory and relative motion of an attack to divert it (Molloy 2011, p. 75), a thrusting attack would possibly be diverted along a horizontal trajectory. Thus, a parry like this would hardly generate enough force to leave damage behind. Plastic deformation relates to even more specific sets of manoeuvres. Curvatures and the subsequent fractures could stem from thrusting attacks. They would occur when such an attack meets resistance, which could be armour, like hardened leather, or the ground if the attack misses. However, it could also come from strikes in a cutting motion that hit a parrying weapon (Molloy 2011, pp. 75–76).

If the amount of use-wear found on swords and spears is compared, a difference in terms of percentage is apparent. However, a chi-squared test showed that the distribution of impact damage, plastic deformation and tip use-wear does not deviate significantly statistically between spears and swords ($p = 0.82275$). Since the sample can be considered to be large enough, the pattern could be seen as similar. Thus, it could be suggested that these similarities refer back to the way these weapons were handled and therefore demonstrate a related fighting style. However, there are some differences that will be addressed next.

The number of swords with observable traces of ancient use is considerably lower than the total number of spears with such traces. Especially surprising is the considerably lower percentage of blow marks on swords. Perhaps one reason is the quantity of pieces with heavy disturbances, which is, in most cases, induced by corrosion. This corresponds with the swords more frequently being found in graves. As previously mentioned, the inhumation graves generally provide a more corrosive environment (Tylecote 1979, p. 350, Spähn 2001, p. 203, Table 1). Coincidentally, swords are also usually thinner than spears. Therefore, they are more prone to corrosion and dissolve earlier. Corrosion peels off metal in layers from the surface down to the core. Consequently, the topmost layers are lost first which has a severe effect on decoration and weaker blow marks. The further this process advances, the lower the chance is of blow marks being visible.

In contrast to the swords, most spears were discovered in hoards or as single depositions and frequently placed in a boggy environment, which is more likely to create a protective patina layer (Tylecote 1979, Hassairi *et al.* 2010). Even if they are placed on dry land, corrosion is usually less aggressive. Finally, even if spears are part of grave assemblages, their position is usually further away from the body, which may also play a role. In contrast, swords have typically direct contact with the deceased. Accordingly, there is a big difference between swords and spears in the amount of pieces that are too distorted by corrosion to see any impact damage. The trend is repeated in other categories, especially when looking at visible repair. Yet, while the bad conditions of swords possibly account for some of this difference, they are most likely not responsible for all of them. Consequently, the spears under examination could have been used more frequently or in heavier fighting than the swords.

This is emphasised if we consider that the complete spear was a weapon with a more or less long wooden handle. This handle was possibly involved in fighting as well if we assume a fencing fighting style with the spear, as will be argued for below. The chance of hitting a spearhead to leave an observable use-wear trace is lower than a sword blade, because it is shorter and the metal part makes up less of the complete weapon. Thus, the tips of spears seem to be involved more frequently or heavily in combat as well. Yet, the missing tips of swords remain a source of doubt.

Tips are usually lost due to fractures and, as stated earlier, a curvature at the apex of a fracture is a good indicator for anthropogenic damage. This leads to a problem that needs to be addressed. It was observed that fractures and curvatures are more frequently associated with swords. A possible explanation is their dimensional properties. Swords are generally thinner than spears so that such plastic deformation occurs more easily. In contrast, the more sturdy spears do not deform and fracture that easily. Yet, the sheer amount of curvatures on spears is remarkable. Perhaps, the thickness of the spears causes the curvature to absorb the impact. It seems paradoxical, but it could be that the thickness of the spears leads to an either-or reaction to impact, because the impact has to be very high for fractures to occur. Perhaps, the scenario is as follows: the impact is either relieved in a curvature without a fracture occurring, or it is so strong and sudden that it exceeds the ductility of the material too quickly. Subsequently, the impact potentially leads to a snap-break leaving the spear with a fracture, but without curvature. Conversely, the thinner swords cannot maintain their material integrity upon impact even if they deform. Thus, swords tend to instead show a ‘one-and-the-other’ reaction to an impact.

Before the results are interpreted, we need to address the potential for deliberate destruction of weapons in a ritual process. The hoards from Dystrup (Wincentz Rasmussen and Boas 2006), and Bondesgårde, Torsted (Becker 1964) are unified in their uniqueness. Both provided a considerable amount of swords associated with the Apa type and spears of Torsted type, respectively. The number of individual objects in these hoards far exceeds those of any other discovery to date. There are more similarities; the specimens in both ensembles show a considerably lower amount of traces of use.

Furthermore, of the 40 spears discovered in Bondesgårde, 14 are fractured in the upper third below the tip. While this alone might be attributed to corrosion and the brittle nature of the material, all of these fractures are positioned approximately at the same height. Additionally, two are curved and six showed either a fracture on the cutting edge or a blow mark at the same position. This evidence points to a possible anthropogenic origin of these damages.

The damages in the hoard from Bondesgårde become even more intriguing considering that three of the swords in the hoard from Dystrup are broken in the same position, and two more possess suspicious fractures on their cutting edge in a parallel position. So, on both sites, roughly half of the deposited pieces contain such damage. Perhaps, a ritual background can be suspected for these damages, caused by the intentional destruction of a certain amount of the sacrificed weapons just prior to deposition.

These remarks considered, curvatures are potentially intentional destructions. Yet, they usually do not appear to be severe enough on either swords or spears. It has been argued elsewhere that twists along the longitudinal axis could point to such a process (Horn 2011, 2012). Very few spears (12, 8%) and swords (5, 10%) express damage that can be identified as twisting. An ‘ecstatic killing’ of the weapon by repeated blows against the same part also seems to be absent. In the case of Bondesgårde, it is quite certain that the spears were placed in the ground without their handles. They were discovered tightly packed with seven associated axes in a small rectangular stone setting. Additionally, they were probably put into what appears to be a basket (Becker 1964, pp. 117–118). According to Nebelsick (1997, 2000), depositing spears without their handle can also be seen as a deliberate destruction. There are frequently wooden handle remains present in the sockets in various cases. Yet, experimental archaeology shows that spear handles often break during combat (Anderson 2011). Thus, there is no convincing argument to be made to interpret the broken remains as evidence for a deliberate destruction of spears. In this regard, it is interesting to note that in Bondesgårde, where the spears were deposited without handles, such wooden remains are missing.

Apart from the observations in the hoards from Dystrup and Bondesgårde (Torsted), there is little evidence for an intentional destruction of swords and spears from other find contexts of Period I of the Early Bronze Age. This does not mean that nothing like it happened, but it is harder to prove as, for example, on halberds (Horn 2011, 2012), Late Bronze Age weaponry (Nebelsick 1997, 2000, Quilliec 2008) or on La Tene swords (Sievers 2010, pp. 68–69).

Weapons, fighters and combat – an interpretation

The results of the presented use-wear analysis of swords and spears of the Nordic Early Bronze Age Period I show them to be usable and used in prehistory, regardless of modern perceptions about technical design and functionality. They might appear clumsy or too weakly constructed to the modern observer, but the use-wear proves that they were used. Prehistoric combatants considered them fit for fighting, and ultimately, that is what counts in the research of prehistoric warfare and combat. These weapons were the best that was available at the time as the technological evolution of these forms was at its very beginning.

Furthermore, the results yield some light on the nature of prehistoric warfare and combat. There has been some debate over the definition of warfare, in general (Keegan 1994, pp. 3–12, Münkler 2007, pp. 24–28) and prehistoric warfare, in particular (Keeley 1996, pp. 3–24, Carman 1997, pp. 1–20, Peter-Röcher 2007, pp. 14–26, Ferguson 2008, pp. 502–505, cf. Wileman 2009, with older literature). Even though there are many difficulties to come to a simple definition, the following, admittedly oversimplified, definition shall be used for the interpretation of the use-wear analysed in this article:

Warfare is combat carried out by at least two parties in order to achieve an aim or resolve an issue with at least one group lacking the will, ability or opportunity to employ other means than violence. Both sides have to have the will to engage, even if this is only facilitated by the will to survive, in case one side is caught by surprise and defending. Engagement is a prerequisite to establish a state of combat and warfare. Knowledge and the use of technology is a key aspect of warfare and fighting.

Both, spears and swords were used in combat and the high amount of visible combat damage makes it likely that warfare occurred frequently and was intensive. The possibility that spears were more often or more intensely involved in fighting might foreshadow what is possibly the norm with the Early Iron Age hoard in Hjortspring. Here, the number of spears outranks swords indicating a ‘hierarchy of weapons’ that was maybe a reflection of the ‘hierarchy of the warriors’ (Randsborg 1995). Yet, this could only occur where spears and swords are simultaneously present, for example, in Jutland. In other regions, like southern Sweden, the common weapon appears to have been only the spear. So far, there are few discoveries of Period I swords in this region.

However, the simultaneous presence of impact damage on the cutting edges, plastic deformations and tip damage on spears is probably due to the use of these weapons in a fencing style analogous to the swords. Therefore, the results of the presented analysis confirm that the complex fighting style deduced for Late Bronze Age spears by Schauer (1979) and Anderson (2011) was also used with Early Bronze Age spears; even with the smaller spearheads of the Bagterp type. In this case, it also confirms that the dichotomy of cutting versus thrusting does not apply to spears as it does not apply to swords (Clements 2007). The length of the handles probably influenced the style of fighting (Davies 2012, pp. 22–25), but because they are usually not preserved we miss a considerable part of the weapon and with that of the information concerning the style of fighting.

The similarity in the fighting style between both weapon forms could be a result of frequent engagements between sword fighters and spear fighters. A spear tip, possibly of Valsømagle type, embedded in the pelvis of a deceased discovered in Over Vindinge (Kjær 1912) shows that fighting could have taken place with neighbouring groups, because the tip does not deviate from the general distribution. That many spears possess tip damage and that in this case it was a tip embedded in the bone cannot be seen as coincidence. It exemplifies a pattern. In contrast, cutting with a spear does not leave similar anthropological evidence.

Mauss (1950) convincingly showed how material culture necessitates a certain set of motions and is therefore embodied in its user. While Mauss was concerned with everyday objects, Warnier (2011) picked this idea up and applied it to weapons, which are highly specialised tools. Nonetheless, the techniques of the body are not unchangeable. The engagement with an enemy forces any given fighter to potentially adjust to the opponent's respective styles, and thus to act opportunistically. These adjustments probably happen to avoid defeat and to gain an advantage over the opponent. Consequently, successful manoeuvres are likely to be incorporated and effective weapon designs will be copied. The fighting styles converge and gradually develop with respect to each other to a certain degree. Thus, fighting and warfare in part homogenises and hybridises. This process could be responsible for the wider introduction of swords in Southern Sweden, which are more frequently discovered in Period II contexts.

However, every fighter is keen on getting an advantage over his adversary. Therefore, he will possibly invent counters, new moves and introduce new weapon designs. Consequently, warfare has a moment of diversification at the same time. Accordingly, both processes – homogenisation and diversification – are most likely not contradictory. Both could take place simultaneously and be seen as responsible for a gradual development in combat and warfare. Consequently, we can see combat with its motions of attack and defence, action and reaction, movements and countermovements, as creating a kind of communication. Here, fighting styles and weapon technology are negotiated in direct engagement between humans and material culture. A fighter could be seen as in an antagonistic dialogue with his opponent that is mediated not through language, but through material culture; their weapons.

Summary

In this article, use-wear analysis of 204 weapons of the Period I of the Early Nordic Bronze Age has been presented. Not only taphonomic processes intrinsic to deposition contexts, but also ancient repairs and modern grinding have been identified as disturbances. According to the results of the use-wear analysis, these weapons are likely to be functional weapons employed in frequent fighting. Even though swords are more often affected by taphonomic disturbances, spears still seem to be involved more frequently and in heavier fighting. Despite some differences in the scale of fighting between swords and spears, it has been argued, and supported by the results from the use-wear analysis, that they were used largely in the same style of fighting. This fighting was identified as fencing, involving cutting and thrusting motions.

Perhaps, the emergence of this style was due to frequent encounters of sword and spear fighters. Through these engagements, a partial homogenising effect is initialised leading people to take in successful strategies and technological solutions. Yet, diversification and homogenisation have both been taking place simultaneously and influencing fighting styles and weapon technique. In this sense, combat and warfare could be seen as providing room for an antagonistic dialogue in which the technologies of war are negotiated through engagement with material culture.

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