

A biographical study of Neolithic hoarding: A regional case study of Funnel Beaker Culture hoards from the Southern Limfjord area, Denmark

Casper Sørensen^{1,4}, Mathias Bjørnevad², Peter Bye-Jensen³

¹ Viborg Museum, Viborg, Denmark

² Department of Archaeology and Heritage Studies, Aarhus University, Aarhus, Denmark

³ Department of Archaeology, University of Southampton, Southampton, United Kingdom

⁴ Corresponding author (c7s@viborg.dk)

ABSTRACT

The tradition of hoarding axeheads is a well-known phenomenon within the first agrarian societies on the North European Plain. Unfortunately, the majority of known hoards have been found as stray finds or under circumstances with poor or no documentation, leading to considerable source critical issues. However, in this paper we analyze four hoards that have either been professionally excavated or have had their find circumstances recorded and found within the same geographical area along the southern Limfjord region of Denmark. The detailed contextual information is used as a foundation for interpreting the hoards and to question the oft-repeated dualistic categorization of hoards as wetland or dryland phenomena. The analytical method employed in this study uses micro- and macro-scopic observations to create biographies for the axeheads in order to shed new light on hoarding practices. This approach challenges the previous macro-scale approaches, which has resulted in extensive catalogues and generalized interpretations of the hoarding practice within TRB society. The results in the study provide a detailed insight on production, use-life, exchange and deposition of axeheads in hoards within the TRB. The aim of the paper is to forward this analytical approach and to offer a fresh perspective on the TRB hoards.

ARTICLE HISTORY

Received 20 June 2019;

Accepted 09 January 2020

KEYWORDS

Hoarding; Funnel Beaker Culture; Object biography; Practice theory; Neolithic; Ritual

Introduction

The hoarding practices of the Funnel Beaker Culture (TRB) are well known within the archaeological community and by amateurs alike, due to several major and macro-regional studies since the 1880's, covering a variety of object types like amber, stone axes and bog pots (eg. Ebbesen 1995; Karsten 1994; Koch 1998; Müller 1886; Nielsen 1977; Rech 1979). A central element within these depositional practices is the hoarding of axeheads. Several hundred of such hoards have been found dating to the TRB in Southern Scandinavia, peaking around the Early Neolithic II (c. 3500-3300 BC) (Karsten 1994, 103-104; Nielsen 1977; Rech 1979, 30-40). The wetland depositional context of a majority of the hoards, coupled with the careful arrangement of some hoards and the often unusually large size of the deposited axeheads has often been used to interpret such features as votive offerings (e.g. Brøndsted 1957, 196-197; Olausson 1983; Rech 1979, 78-92; Tilley 1996, 101-2; Wentink 2006, 42).

A large majority of hoards are found as stray finds during activities such as cultivation or peat cutting. Information regarding content and find context are often inadequate and source critical issues abound (Kristiansen 1985; Nielsen 1985). In addition, the macro-regional perspectives, while important and useful, risk overlooking some of the inherent variability within the practice, as individual hoards or regionalized variations have not been the focus. In this paper, we aim to address these two issues within hoarding research by (I) taking a micro-regional perspective on TRB hoarding, and by (II) only addressing hoards that are comparatively well documented. Within the last 18 years, Viborg Museum have excavated two hoards and documented the find spot and circumstances of one additional hoard. Combined with a hoard excavated by Holstebro Museum in 1972, four professionally documented hoards within the same region along the southern border of the Limfjord in Central Jutland are included in this study (Figure 1).

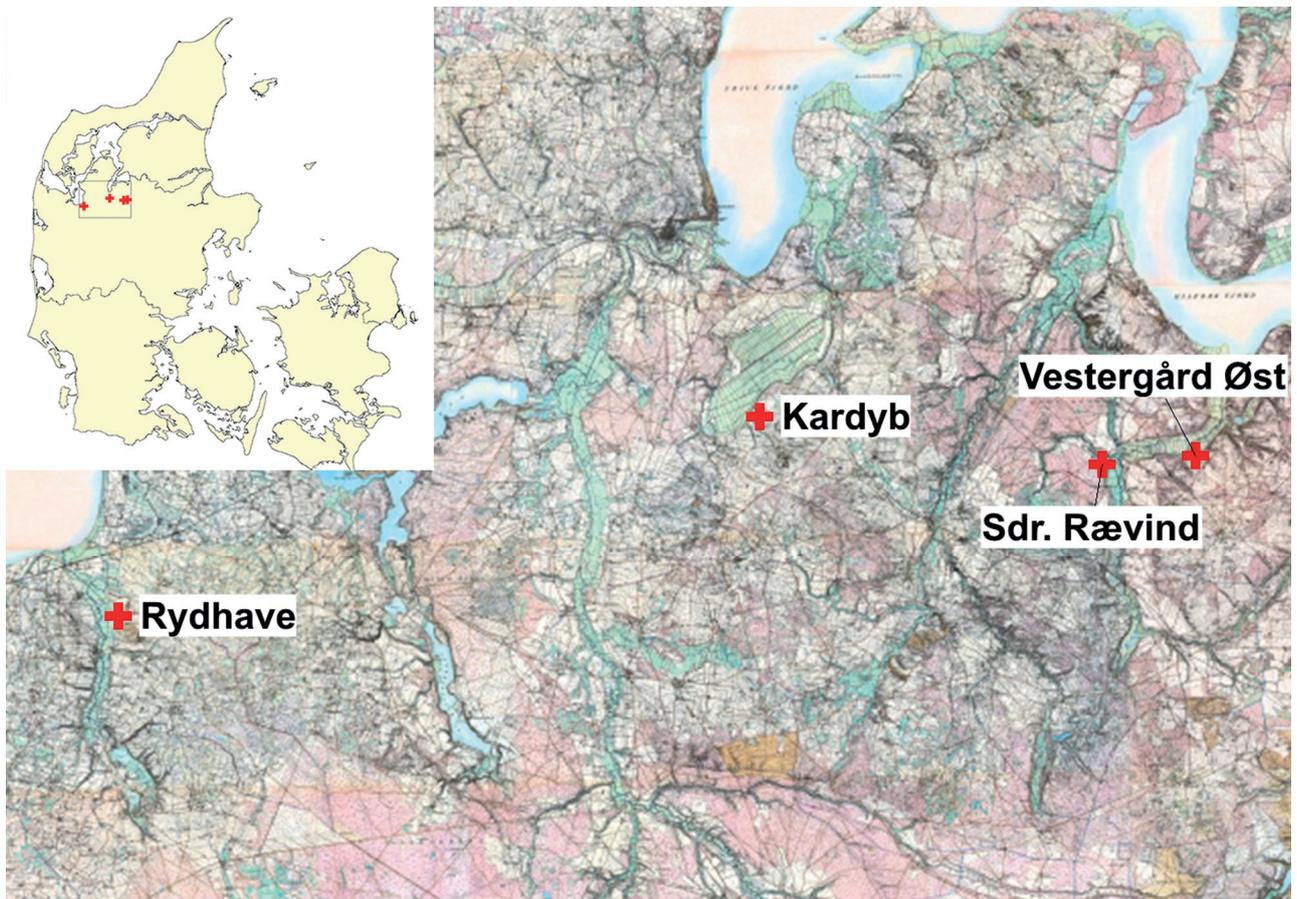


Figure 1. Case study area and distribution of the find spots of the hoards included in this paper. Background: Høje Målebordsblade, drawn before draining was industrialized, thus displaying a more natural extent of wetland areas prior to modern draining (Map: © Styrelsen for Dataforsyning og Effektivisering).

Along with the rich contextual information, all of the hoards are typologically dated approximately within the same chronological frame: the later phase of the Early Neolithic and the first phase of the Middle Neolithic (c. 3500-3100 BC). Beside the valuable contextual information, the knowledge on how the axeheads have been handled since they were found is also very important, as archaeological wear traces can be disturbed through handling, storage or exhibition etc. (Wentink 2006, 59). Thus, the combination of contextual information, a reasonably tight chronology and limited geographic spread provide an excellent inferential foundation for analyzing these hoards. Together, these deposits provide a rare opportunity to add considerable insights into a Neolithic hoarding practice on a regional scale and for a limited time splice. This study aims to release this potential by focusing on detailed lithic analyses with microscopic and macroscopic observations, brought together to create biographies for the axeheads as

well as the assembled hoards. While the approach should be considered new regarding the research of Neolithic hoards in a Danish perspective, similar studies has previously been conducted in the Netherlands (Wentink 2006; Wentink et al. 2011), as well as similar studies performed on Scandinavian Mesolithic hoards (Bjørnevad Forthcoming a; Forthcoming b).

This approach challenges the former line of research into Neolithic axeheads in Danish archaeology, which has had a focus on forming typo-chronologies (Højlund 1975; Nielsen 1977; 1979) or on manufacturing processes (Hansen & Madsen 1983; Madsen 1984). Furthermore, axe hoarding has largely been treated as a part of broader, macro-regional perspectives (e.g. Nielsen 1977; Rech 1979; Sørensen 2014). In seeking overarching patterns, such studies often ignore or downplay regional variability as well as idiosyncrasies within material culture and practice. In the proceeding sections we will begin by outlin-

ing the theoretical and methodological approach used in this paper. After which, we move on to the main corpus of the paper with a description of the case study area, the analyzed hoards and the results of the biographically based analyses. Finally, we summarize and contextualize our results, and by doing so, put forward new interpretations which both adds important nuances to our understanding of the hoarding practices and more broadly it allows us to question some of the previous truisms regarding the Southern Scandinavian Funnel Beaker Culture.

Theoretical and methodological approach: Between things, biographies and practices

The epistemological challenges of studying prehistoric ritual practices have been extensively debated – with varying optimism (e.g. Brück 1999; Fogelin 2007; Fontijn 2002, 13-22; Levy 1982, 12-25). Fully cognizant of the difficulties associated with interpreting prehistoric hoarding, this paper is grounded in practice theory (Bell 1992; 1997; Berggren 2010; Berggren and Stutz 2010; Stutz 2003). Thus, we do not put forward claims as to what the hoards may represent or mean, but instead emphasize the robust identification of actions and the temporality of practice. These hoarding practices, therefore, are not treated as singular events of deposition, but rather as long sequences of acts that make up the entire practice. To better understand the strategies and actions employed during the hoarding practice, and to understand the practices as completely as possible, it is important to study these using a biographical perspective. This perspective is based on an extension of the commonly applied object biography, where objects are perceived to have an inherent cultural biography (Kopytoff 1986) based on different stages and events within their ‘lives’. To better understand the biography of the objects from the hoards, each axehead was analysed macroscopically and microscopically (using a Dino-lite USB portable digital microscope at 20-220x magnification) to identify any observable traces of the manufacturing processes, use, re-use and further treatments of the axeheads prior to deposition. These results

were then interpreted based on prior use-wear studies by Dr. Peter Bye-Jensen and by other researchers (Bye-Jensen 2016, 2019; Jensen 1994; Keeley 1980; Rots 2002; Van Gijn 1990; Van Gijn 2010). This approach allows more detailed observations than those normally gathered in studies on Neolithic axehead hoards from Scandinavia, where the comprehensive studies have focused on generalized patterns or divisions (Karsten 1994; Nielsen 1977; Olausson et al 2012; Rech 1979, 22).

Instead of only focusing on the biography of objects, we here develop a focus on the biography of the deposited assemblage. This biographical approach combines observations about the manufacturing, use, curation, re-use and overall treatment of the individual axeheads, and the assembling of the objects together and their eventual deposition in particular locations as a hoard. The aim is to identify all observable stages of the practice rather than focusing only on the final act and the composition of the hoard. When possible, equal weighting is placed on the treatment of objects prior to deposition as well as the composition and context of these evidently ritualised practices. By deploying an extended biographical approach, we seek to better understand the relative patterning, individualization and variability of societal rules or norms governing practices of production, exchange, use and deposition.

Case study: The southern Limfjord Area

The following section will present the details from the analyses of the axeheads from the hoards as a case study, with a brief overview of the axeheads in Table 1.¹

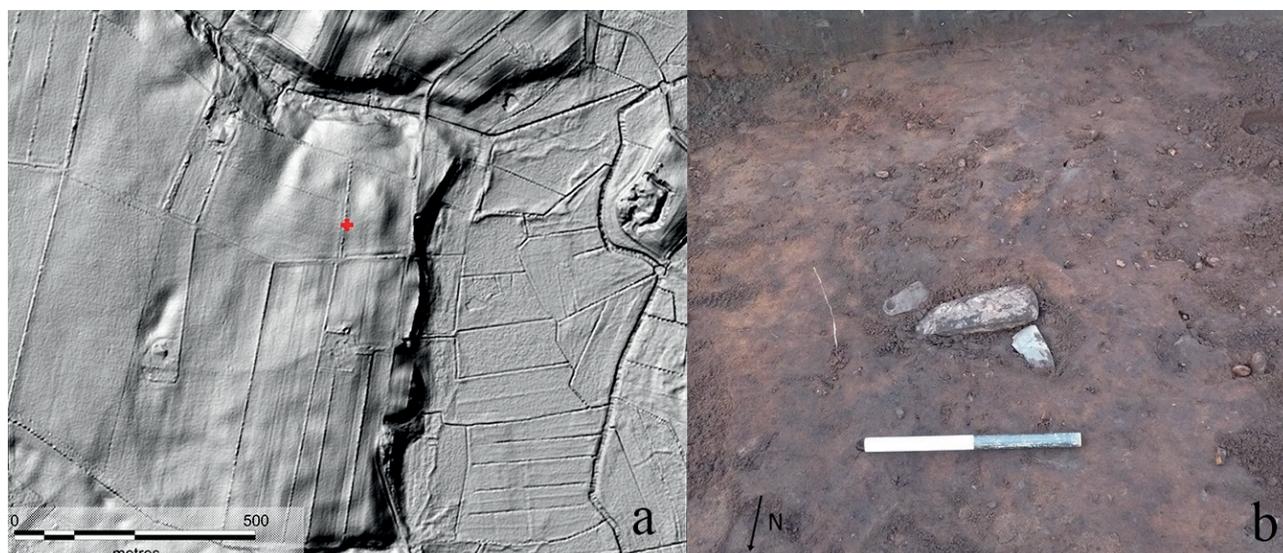
Sønder Rævind

The hoard from Sønder Rævind was found during a trial excavation in 2012 prior to laying a power cable underground.² It was found just below the modern-day plow layer at the edge of a small natural hollow, situated just west of a small hillock (Figure 2 a and b).³ The hollow was about 5-10 cm deep and appeared as a dark brownish layer, which likely derives from decomposed peat. Approximate-

Hoard	Number	Raw Material	Polished	Axehead Type	Length cm	Context
Sønder Rævind	1	Flint		Thin-butted, Type VI	27	Natural hollow, possibly seasonally dry/wet
Sønder Rævind	2	Flint	X	Thin-butted, Type VI	13	Natural hollow, possibly seasonally dry/wet
Sønder Rævind	3	Greenstone	X	Thin-butted with perforated butt, Type III	11	Natural hollow, possibly seasonally dry/wet
Sønder Rævind	4	Greenstone	Partially	Thin-butted, Type IIA	19	Natural hollow, possibly seasonally dry/wet
Kardyb	1	Flint	X	Thin-butted, Type IV	50.5	Peat filled gully
Kardyb	2	Flint	X	Thin-butted, Type IV	(35)	Peat filled gully
Rydhave	1	Flint	X	Thin-butted, Type IV	32.4	Peaty shoreline of a river-valley
Rydhave	2	Flint	X	Thin-butted, Type IV	37.7	Peaty shoreline of a river-valley
Rydhave	3	Flint	X	Thin-butted, Type IV	36.8	Peaty shoreline of a river-valley
Rydhave	4	Flint	X	Thin-butted, Type IV	35.4	Peaty shoreline of a river-valley
Rydhave	5	Flint	X	Thin-butted, Type IV	44	Peaty shoreline of a river-valley
Rydhave	6	Flint	X	Thin-butted, Type IV	34.9	Peaty shoreline of a river-valley
Vestergård Øst	151	Flint		Thin-butted, Type V	18.1	Dryland, possible settlement
Vestergård Øst	152	Flint		Thin-butted, Type V	21.3	Dryland, possible settlement

Table 1. Overview of the axeheads from each hoard presented in the paper. The typology of the flint axeheads are based on Nielsen 1977 and the greenstone axe typology is based on Ebbesen 1984.

Figure 2. Location of the Sønder Rævind hoard with a LiDAR map from 2007 as background. b) Photo of the hoard *in situ*, SR4 had been removed by the machine excavator but was recovered afterwards (Map: © Styrelsen for Dataforsyning og Effektivisering. Photo: Lars Agersnap Larsen, Viborg Museum).



ly 30-40 meters away a small cluster of postholes were found, but no artifacts were found during excavation of the features, making it unclear whether they are contemporary with the hoard (Figure 3).

Given the circumstances being found just on the edge of a small hollow that could have been seasonally wet and dry, means that the hoard could be interpreted to have been deposited in an area that is the combination of a dryland and wetland context. As seen on Figure 2b, the axeheads appear not have been placed in any particular arrangement. However, as the hoard was disturbed by the machine excavator, including the accidental removal of SR4, the original position of only three of the axeheads is known. Of these three undisturbed axeheads, SR1 and SR3 were lying with their edges facing WSW and one SR2 was placed facing SSE.

The hoard consists of a large complete flint axehead, a smaller flint axehead, a small greenstone axehead with perforated butt and a large thin-butted greenstone axehead (Table 1; Figure 4, 5), and is to the authors' knowledge a unique combination of axehead types (cf. Karsten 1994; Larsen 2015, 131-132; Nielsen 1977; Sørensen 2017). Typologically, the hoard can be dated to the transition from the Early Neolithic to the Middle Neolithic TRB culture around 3300-3100 BC (cf. Ebbesen 1984; Nielsen 1977).

The biographies of the axeheads are as varied as their typological composition. SR1, which is entirely unpolished, shows no traces of use. In addition, no traces of weathering from wind, water or sun were observed (cf. Bye-Jensen 2019, Bye-Jensen forthcoming). The lack of weathering suggests that either the axehead was deposited very soon after it was produced, or it was protected from such weathering. The possibility that this axehead was protected from these elements, may be supported by the observation that the edge of the axehead was extremely rounded (Figure 6) and not sharp as should be expected if it had been completely unused; nor would such rounding likely have occurred during any sort of use. Similar observations have been made in the Netherlands, that have been interpreted to have been caused by extensive wrapping and unwrapping in some sort of organic material (Wentink 2008, 156). However, there was no observable rounding on any of the sides or prominent points of

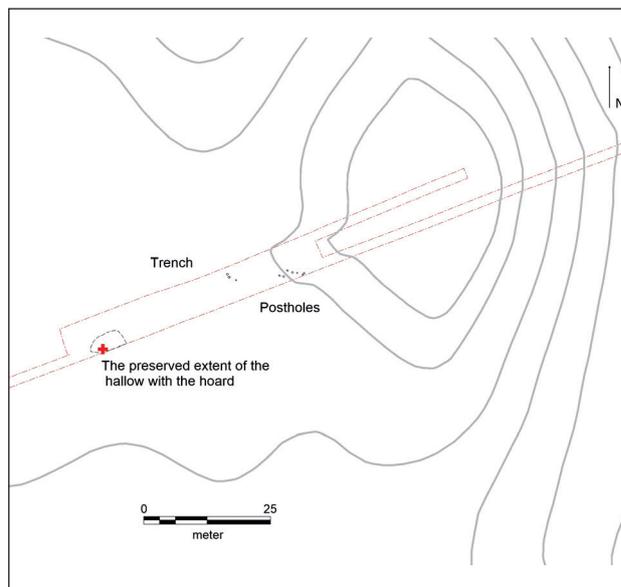


Figure 3. Excavation plan of Sønder Rævind. The features found illustrated, the grey lines illustrating horizontal topographic contour (50 cm). The red cross marks the find-spot (From the original documentation at Viborg Museum).

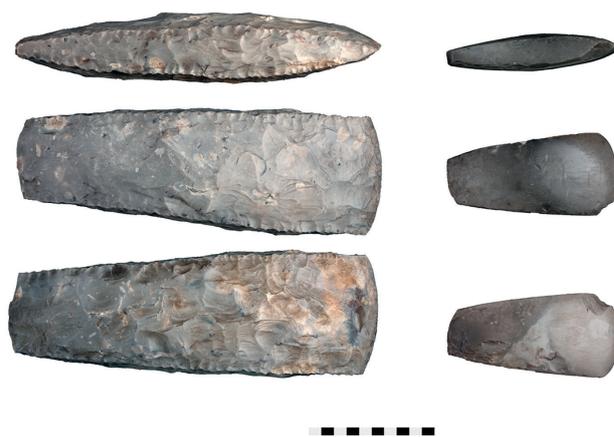


Figure 4. The flint axeheads from Sønder Rævind. Left: SR1, right SR2 (Photo: Casper Sørensen, Viborg Museum).



Figure 5. The stone axeheads from Sønder Rævind. Left: SR3, right: SR4 (Photo: Casper Sørensen, Viborg Museum).

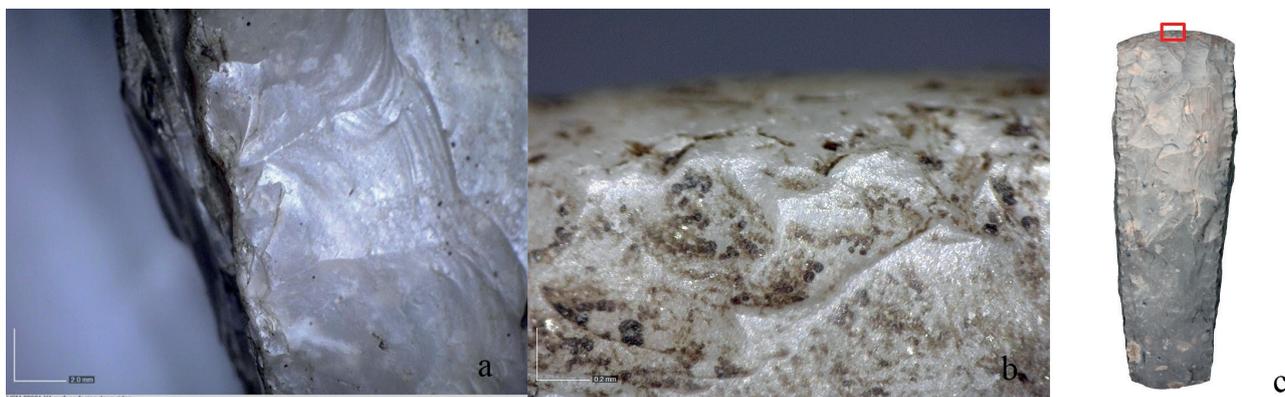


Figure 6. Rounding of blade portion of axehead SR2, 20x (a) and at 200x (b). The location of the micrographs are indicated by the red box on the photo of the entire axehead (c) (Photos: Photos: Mathias Bjørnevad, Aarhus University and Peter Bye-Jensen, Southampton University).

the axehead in this hoard, suggesting that it was not wrapped. Rather, based on these observable traces we hypothesize that the axehead may have been held in a bag (likely dry-hide) and moved repeatedly leading to the observed edge rounding. The location of the rounding suggests that the blade of the axehead was placed facing down in a bag, meaning that it received more contact with greater force than other areas of the axehead, leading to more edge rounding on the blade than elsewhere. Such observations have not been made before in Scandinavia and it would be interesting to see in the future if such traces can be identified elsewhere and can be experimentally reproduced.

SR2 is also a thin-butted flint axehead, but the cross section of this axehead is much thinner than axehead SR1, and also differs by being almost entirely polished. The skewed profile on the narrow sides suggest that the axehead was repeatedly used and re-sharpened. This extensive use of the axe-

head is also attested by the large amount of rounding present along the flake scars near the butt (Figure 7a). The rounding may have been caused by the axehead being held in a socket, that whilst hafted likely had a dryhide 'sock' around the butt of the axehead with each movement of the axehead causing the flint to rub against the socket and wrapping. No obvious traces of use were observed along the re-sharpened edge, which could indicate that it was re-sharpened and reground prior to deposition. Similar traces of re-sharpening of axeheads is seen in the hoard from Rydhave (see below) as well as many of the hoards described in Karsten (1994, 207-360), and even axes found in Dutch megaliths (van Gijn 2010, 175).

Most of the striations from the initial grinding, re-grinding and final polishing are oriented longitudinally. However, a few centimeters from the edge a series of much deeper and wider striations run transversely across a small area of the

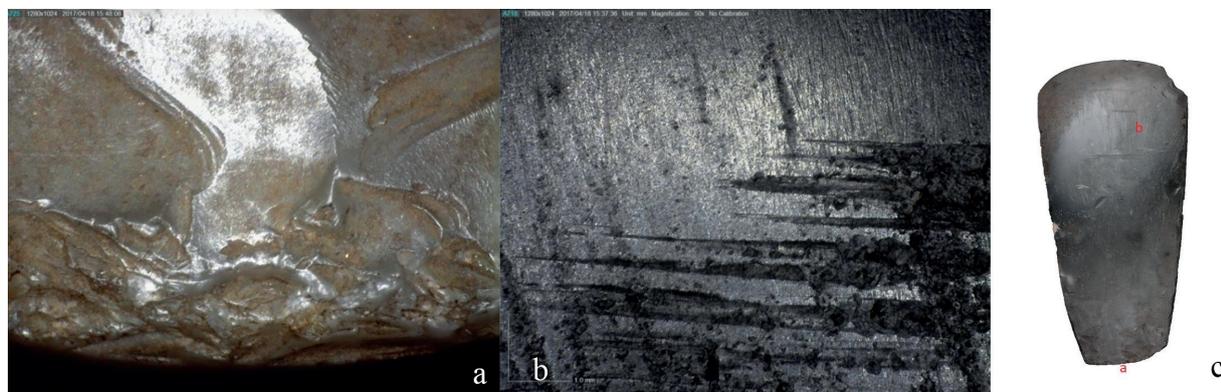


Figure 7. a) Edge rounding on butt of axehead SR2 (50x). b) Fine grinding of the SR2 that is overlain by deep and wide striations running perpendicular across the axehead (25x). c) The location of the respective micrographs are indicated by the red a and b on the photo of the entire axehead (Photo: Mathias Bjørnevad, Aarhus University).

broad side of the axehead (Figure 7b). It is unclear what caused these striations as they are restricted to areas that are highly polished and appear to have been added after the axehead was finely ground. They do not appear to be from use, they also would have no clear functional explanation, nor are they likely to have occurred post-depositionally. Given that this side of the axe was facing down, it is also unlikely that it was caused during recovery. Therefore, we interpret them as one of the last phases of the life of the axehead. We suggest that these striations were added intentionally, with great pressure, using a coarse-grained stone with a small contact area.

SR3 is a small greenstone axehead with perforated butt. The hole shows no evidence of wear from either a pendant or a shaft. These holes have been interpreted to be more symbolic in nature as they do not seem to have had any functional use (Klassen 2014a).

Due to the coarseness of the greenstone, no micro-wear traces of use were observed. However, the edge of the axehead is highly asymmetrical as half of the axehead has been significantly re-ground suggesting that it has been repeatedly used, and then was re-ground. A large crack running on the right corner of the butt extending from roughly midway along the butt ca. 3.5 cm diagonally to the edge of the axehead is also suggestive of its use (Figure 8). In addition, there is some slight damage to the butt possibly due to hard contact with the socket or the haft. As it was not possible to identify micro-wear traces and as there is no edge damage along this re-ground portion, it is not known if the axehead was used after it was re-sharpened or if its treatment was similar to SR2.



Figure 8. Photo of the butt of axe SR4. The large flake scar from an earlier crack is clearly visible, as is the crack in the bottom of the photo (Photo: Casper Sørensen, Viborg Museum).

SR4 is a thin-butted greenstone axehead that, due to the coarseness of the stone, no use-wear traces were identified. However, as the axehead appears to be unfinished and left mostly in its pecked stage, no use-wear traces are to be expected. The unfinished nature of the axehead is indicated by the presence of a 'lip' of stone that has not been removed on one side of the surviving edge (Figure 9a). On the opposing side of the axehead there is a broad curved striation running slightly diagonal to the edge of stone (Figure 9 a and b). Based on the smoothness of this striation it is interpreted that this area of the axehead had been ground in a side-to-side motion. This grinding may have been done to remove the lip, which may have originally been on both sides of the ax-



Figure 9. a) Prominent stone 'lip' on one side of the axehead SR4. b) The slightly curved area of grinding on opposing side of SR4. c) Photograph of the traces of grinding at 20x on SR4 (Photo: Mathias Bjørnevad, Aarhus University).

thead (Figure 9c). The missing corner of the axe near the edge most likely broke off accidentally by the machine excavator.

The Sønder Rævind hoard is remarkably varied in its content, the raw materials and biographies of the axeheads. However, within this variability it is possible to discern a degree of dualism within these same parameters, for example with large unused greenstone and flint axeheads, and small heavily used greenstone and flint axeheads. Furthermore, the small hollow where the hoard was found was probably mostly dry but could seasonally have been flooded and thus been temporarily wetland, which may also be seen as dualistic. Thus, with this level of duality, within the content and the context, the hoard does not seem to have been deposited based on the same structuralized template of the general hoarding practice, as observed in previous studies (cf. Karsten 1994, 171-174; Nielsen 1979; Rech 1979, 16-17).

Kardyb

The hoard from Kardyb was found in 2016 during digging of agricultural drainage ditches.⁴ When the hoard was found, Viborg Museum was contacted and conducted an excavation to search for contextual information and determine if any additional axeheads could be found. The find con-

text of this hoard is a peat-filled gully connected to the former lake, Tastum Sø (Figure 10 a and b).⁵ It was not possible to determine whether it was dug into the peat in a bog, or if the gully still had open water when it was deposited. However, the axeheads were situated in the peat and not the bottom of the bog, making it possible that they were deposited in open water. Based on report from the finders and the location of the break and scars from the machine excavator, they appear to have been deposited lying parallel to each other on the broad sides, aligned by the butts and with the edges pointing east.

The find consists of two thin-butted axeheads that are entirely polished (Figure 11). One axehead, KA1 was complete, while the other, KA2, was accidentally broken by the machine excavator upon discovery. The complete axehead is 50.5 cm long and to the authors' knowledge is the longest stone axeheads in the North Europe⁶, possibly the world. The broken axehead KA2 has a preserved length of 35 cm. Unfortunately, the edge portion of the axehead was not recovered during the subsequent excavation. However, based on the profile of narrow sides the axehead, c. 5-10 cm is missing, giving an estimated total length of 40-45 cm, and thereby still among the longest of axeheads within Southern Scandinavia.

Based on the similarity of the flint, as well as the large chalk inclusions found on both axeheads, the flint probably came from the same source. The

Figure 10. a) Location of the Kardyb hoard with a LiDAR map from 2007 as background. b) The approximate find spot during subsequent excavation by Viborg Museum (Map: © Styrelsen for Dataforsyning og Effektivisering. Photo: Mikkel Kieldsen, Viborg Museum).





Figure 11. The axeheads from Kardyb, left KA1, right KA2 (Photo: Casper Sørensen, Viborg Museum).

axeheads are also almost identical in their form and profile. However, differences in the production techniques of these axeheads may suggest that they were made by two different experienced flint knappers. For example, the negative flake scars left over from the original knapping seen on the body of KA2 are notably deeper and larger than those on KA1. On KA1 very few flake scars are still visible, as they have been ground out, whereas on KA2 many more flake scars are still apparent, especially along the seams of the axehead (See Figure 11 and 12 for a general impression). KA1 is also thicker than the KA2. In addition, the grinding near the butt of KA2 is coarser than seen on the intact axehead. It is possible that these differences in knapping and grinding, but the similarity in overall form and flint material, suggests that these two axeheads were produced by different highly skilled craftspeople that were likely working in close association with each other and had access to the same raw material. Such identification of different craftspeople and the possible situations they were working under is important to understanding the biography of such tools, and the hoards themselves.

The axeheads are completely ground, but they have no traces of further edge polishing. This left the surviving edge more irregular than many axeheads found in hoards that often have their edges more finely polished. After the axeheads had been ground, several flakes were taken off from their butts (Figure 12). Initially this butt flaking seems very similar, but upon closer inspection the angle, thickness, directionality and size of the flakes differ notably, suggesting that it was also done by

different craftspeople, but it seems they were both working off the same mental template about how it should be done and what it should look like at the end. Such flaking of the butt serves no known functional purpose, as it does not produce particularly useable flakes. Nor would there have been any known reason to slightly re-shape the butt, as based on hafted Neolithic axeheads the butt protrudes out of the handle (Becker 1947, 1950; Blinkenberg 1898). Thus, such subtle changes of the shape of the butt would serve no apparent utilitarian purpose. Based on the difference in weathering of these butt removal flake scars and the flake scars elsewhere on the axehead, it is likely that this butt



Figure 12. The butt-ends of the axeheads from Kardyb. Left: KA1, Right KA2 (Photo: Casper Sørensen, Viborg Museum).

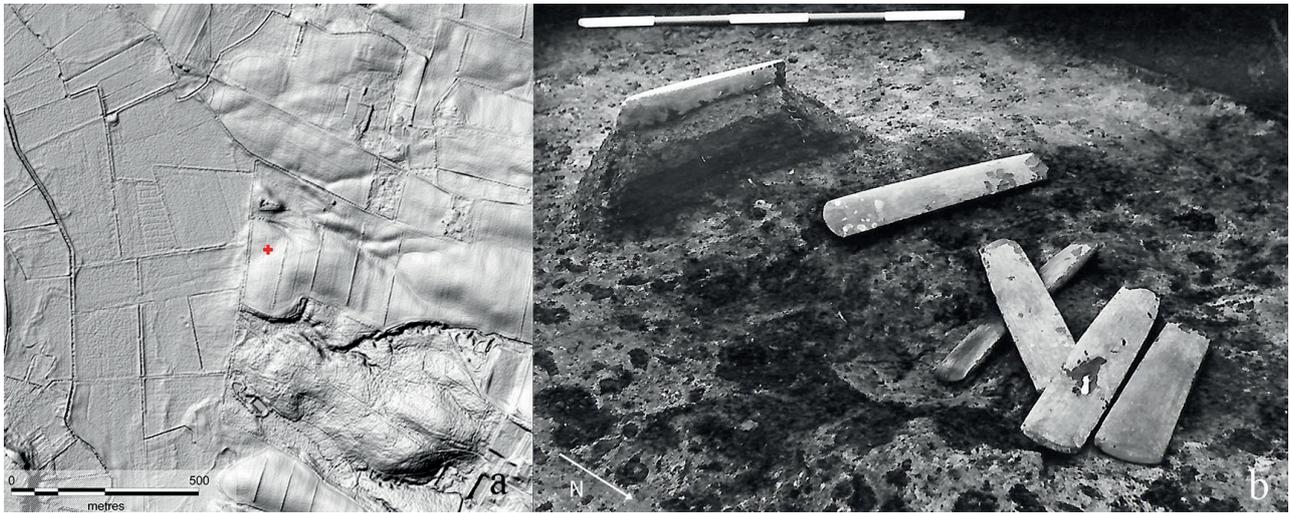


Figure 13. a) Location of the Rydhave hoard with a LiDAR map from 2007 as background. b) Photo of find situation of the Rydhave hoard (Map: © Styrelsen for Dataforsyning og Effektivisering. Photo: Holstebro Museum).

flaking took place significantly later than the initial manufacturing. In the case of the KA1, based on the lack of weathering of the butt removal flakes deems it likely that it took place not long before its deposition. However, the butt flaking scars on KA2 appear more weathered suggesting that this may have occurred at an earlier stage than the intact axe. Thus, although these axeheads were likely produced at circa the same time, their butts were re-worked at seemingly different times suggesting that the temporality of the parallel biographies of these axeheads differs.

The intact axehead KA1 shows no signs of use or re-sharpening along the edge, nor were there any observable hafting traces on either axehead. Thus, it appears that neither axehead was used prior to deposition. Given their extreme size, this result should not be considered surprising. However, as many hoards, even those containing axeheads up to 46 cm, like seen at a nearby hoard of Jegstrup Kjær (Olausson 1983, 28), contain axeheads with traces of use and/or re-sharpening, the oversized nature of such axeheads does not necessary mean that they were not or could not be used.

Unlike other axehead hoards, presented in this paper, which have divergent biographies these axeheads appear to have had parallel and symmetric biographies. Both axeheads were produced in almost identical forms, from the same flint source, albeit perhaps by different craftspeople. Neither of the Kardyb axeheads seems to have been used, but both have had flakes removed from their butts

in similar fashion but seemingly at different times and by different knappers.

Rydhave

The Rydhave hoard (Figure 13) consists of six very similar thin-butted axeheads, found by workers in 1972 when searching for damaged drainpipes with a metal probe.⁷ After finding one of the axeheads, they contacted the local Holstebro Museum, who then excavated a small trench 6m², uncovering the remaining axeheads, which were all situated within a peat layer. Given that no pit-like features were identified, it appears that axeheads were placed directly on the peat. In the original report it was suggested that they were deposited in open water in the small bay present at the time (Skov 1972a; 1972b). The axeheads were found somewhat scattered, all but one lying on the broad sides with the edges facing roughly east (Figure 13b).

At first glance, the axeheads generally appear very similar (Figure 14). This is especially the case for axeheads RY2 and RY4, where the raw material, the overall form and even the amount of cortex preserved on the butt (Figures 14, 15) are remarkably alike. In addition, the similarity in the knapping technique and coarseness of the grinding could suggest that they were produced by the same individual(s). With this near identical production, they have the same point of departure for their biographies. For example, axehead RY2 has clearly

Figure 14. The axeheads from Rydhave, showing both sides and the profile of each axehead. RY1-6 from top to the bottom (Photo: Casper Sørensen, Viborg Museum).

been re-knapped and with one face of the edge re-ground and finely polished, but with the flake scars of the re-knapping still readily visible (Figure 15). On the other hand, axehead RY4 shows no signs of re-working of the edge, has no fine edge polish, and only has a single tiny feathered flake missing from the edge. It is unclear if this edge damage is from use or accidental damage during its life or is post-depositional. Two of the remaining axeheads, RY3 and RY6, have no observable use-wear traces. However, the edge on axehead RY3 has been re-knapped on both sides of the blade, whereas the edge on RY6 appears to have been re-ground.

In the initial report it was noted that three of the axeheads, RY1, RY2, RY6, had hafting traces, visible as isolated bright spots which could be observed in the light with the right viewing angle of the axeheads (Skov 1972a). However, no secure hafting traces were observed during this current analysis. The only possible bright areas were deemed likely to be grease or from the initial grinding of the axeheads. Due to the limited observable modern handling traces on these axeheads, it is unlikely that any use-wear traces, including from hafting, had simply been removed or disturbed since the discovery of the hoard. Thus, we believe that the original observations (Skov 1972a) were erroneous classification of bright spots formed through other processes and there is no direct evidence that any of the axeheads had been hafted.

During up-close inspection of each axehead, it was observed that knapping quality, form and/or the grinding differs between axeheads RY1, RY3, RY5 and RY6 suggesting that these axeheads may not have been made by the same craftspeople or were produced at different times. However, given the overall similarity in the flint, it is likely that all the axeheads were produced from the same flint source. Later on in their life-histories all six of the axeheads, like the aforementioned hoards, also had several flakes taken off from their butts, and once again this knapping took a variety of different forms (Figure 15), for example:



- RY1 – Most of the cortex has been removed with a long flake from one of the narrow sides, but smaller transverse flaking has also been used.
- RY2 – Flaking appears to have been done to leave a large amount of chalk cortex present on the butt. Deep short longitudinal flakes were removed from the butt.
- RY3 – Very coarse flaking is present running longitudinally on the broad sides and running laterally on the narrow side. A chalk inclusion on one side of the axehead has caused the butt not to be knapped in a straight angle.
- RY4 – Flaking appears to have been done to leave a large amount of chalk cortex present on the butt. Long and thin blade-like flakes are taken off from the sides of the axehead and run laterally across the broadside.
- RY5 – The butt has a sharp narrow profile with no remaining cortex, which has been removed with short flakes on the longitudinal direction. The butt has also been knapped on the broad sides.
- RY6 – The cortex on the butt has been removed except for one small area. The flakes on the butt have been knapped from the narrow sides.

All of the axeheads found in this wetland hoard initially appear very similar, however, through up-close analysis of each axehead it became apparent that a remarkable level of differing biographies are observable. Based on differences in the form and production techniques or knapping qualities, it appears that four of these axes may have been produced by different skilled craftspeople, whereas two of the axes appear to have been produced by the same craftspeople. There is no direct evidence that any of these axeheads were hafted or used as axes, thus fitting with the general observations that hoarded axeheads were rarely used (eg. Rech 1979, 163). However, some of the axes had their edges re-knapped and/or re-polished, in addition all of the axes had their butts re-knapped after their production. These results suggest that

Figure 15. Close up photos of the both sides of the edges (top) and butts (bottom) from the Rydhave hoard. From left to right: RY1-6. Notice the similarity between RY2 and RY4 (Photo: Casper Sørensen, Viborg Museum).



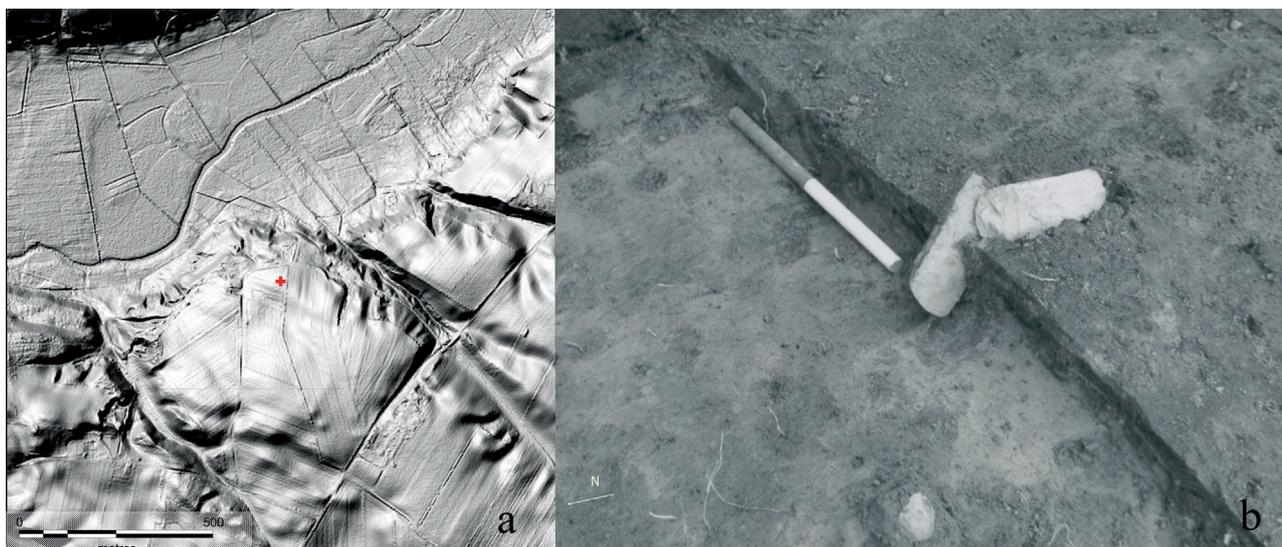


Figure 16. a) Location of the Vestergård Øst hoard with a LiDAR map from 2007 as background. b) The Vestergård Øst axeheads *in situ*. The axehead to the right was initially moved by the machine excavator but was replaced as it was originally deposited to take the photo. This contact with the machine excavator also caused some slight damage to the seam on VØ151. On the left side of the picture, a section of the cultural layer has been dug away to the natural subsoil. The scraper is shown *in situ* in the bottom of the photo (Map: © Styrelsen for Dataforsyning og Effektivisering. Photo: Martin Mikkelsen, Viborg Museum).

although these axeheads may not have had any use as normal axeheads, they did have complex and multi-faceted life-histories that fit general patterns noted elsewhere in this paper, but were also individualized to the particular axehead and the person(s) involved with the treatment of axehead throughout its life.

Vestergård Øst

The hoard from Vestergård Øst (Figure 16 a and b) consist of two unpolished thin-butted axeheads of the same type of flint (Figure 17). The axeheads were found during a trial excavation by the museum prior to the construction of a forest plantation.⁸ The hoard was located in a dryland context, with the axeheads placed parallel in a thin cultural layer, standing on the narrow sides, with the edges pointing north (Figure 16 b). A flint scraper was found close by the axeheads, as well as five smaller flint flakes dispersed in the cultural layer (Figure 18). A settlement site dating from the Late Neolithic or the Bronze Age was found in the same area, with postholes and a storage vessel cutting through the cultural layer with the hoard (Mikkelsen 2001). Thus, this cultural layer predates the Late Neolithic, which

makes it possible that it may reflect a settlement site contemporary with the axeheads.

Both axeheads are produced from the same type of flint, but both the overall shape and curvature of the axeheads are slightly different (Figure 17; 19). The knapping technique also differs, as the flakes along the seams are notably smaller and more neatly knapped on VØ151 than on VØ150 (Figure 19). Furthermore, the directionality of which the flakes along the seams have been taken off differs notably between these two axeheads (Figure 19). This may suggest that the axeheads were produced by differ-

Figure 17. The axeheads from Vestergård Øst. Left: VØ150, right: VØ151 (Photo: Casper Sørensen, Viborg Museum).



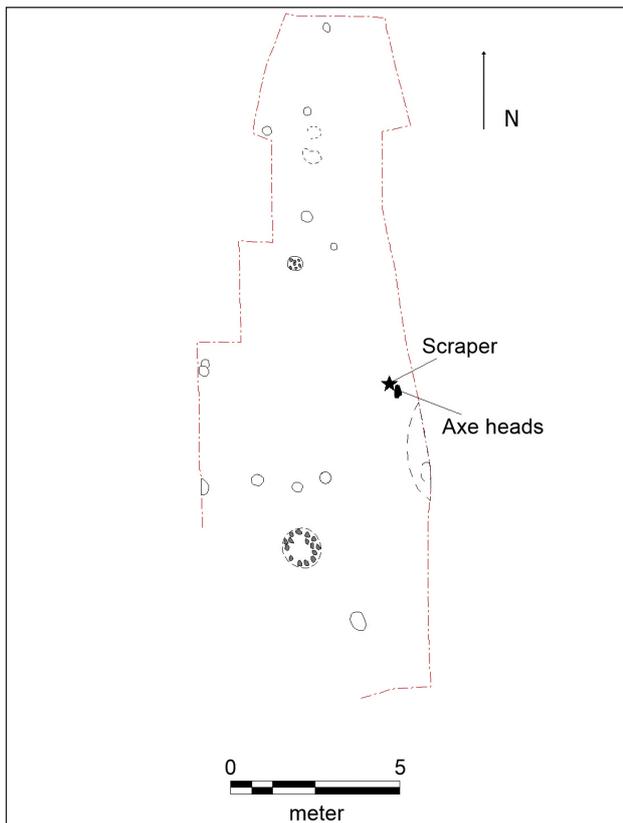


Figure 18. Excavation plan of TRB finds and features as well as undated features from Vestergård Øst. Redrawn plan from the original excavation report (Mikkelsen 2001).

ent knappers. Both axeheads appear unused, with sharp edges, symmetrical profile and no traces of re-sharpening on the edges. This, lack of use-wear is hardly surprising given that it appears that generally unground axeheads were not used (Olausson 1983, 28; Rech 1979).

The overall biography of the hoard is much shorter and less eventful than the other hoards described here. In addition, the seemingly settlement-based dryland context may initially suggest that they are a different practice than the Neolithic wetland hoards. However, like the other hoards, these two axeheads have different observable biographies, not in terms of their use, re-working, source material but instead it appears that they were produced by two different flint knappers. In addition, the placement of both axeheads lying parallel and with the edges facing the same direction, matches a feature seen in a number of other known axehead hoards (Rech 1979, 17-19). Thus, rather than these axeheads representing an entirely different practice as the other TRB hoards, they exemplify the diversity but also the patterning and key features within the hoarding practice.

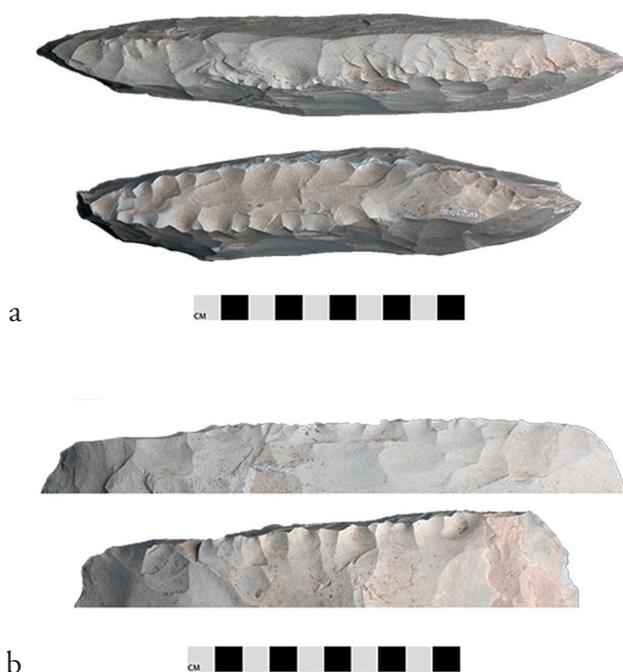


Figure 19. a) Close-up of the difference in knapping technique of the seams of the axeheads from Vestergård Øst. Top: VØ150. Bottom: VØ151. Note that VØ151 appears to be more finely knapped. b) Close-up of the narrow sides of the Vestergård Øst axeheads. Top: VØ150, bottom: VØ151 (Photo: Casper Sørensen, Viborg Museum).

Discussion

Based on the detailed contextual information and results outlined above, we are able to move past many of the source critical issues and to bring out significant details of the practice that may often be overlooked. In the following, different biographical aspects of the hoards will be summed up, discussed and contextualized with the current perceptions of the TRB hoarding practice, in order to highlight the benefits of such an approach to studying TRB hoards.

From object biographies to biographies of hoards and wider social practices

The different analyses of the hoards presented here have resulted in significant new insights into the life histories of the axeheads as well as the biographies of the hoard assemblages. These biographies provide a platform for interpretation of the hoard-

Hoard	Composition	Raw material	Different producers	Degree of finishing	Used vs unused	Re-worked
Sønder Rævind	Two thin-butted axeheads and two stone axeheads (a perforated butted and a thin-butted)	Different flints and stone types	Possibly	Two finished axeheads, and two unfinished axeheads (one unpolished)	Both used and unused	Yes – two axeheads have re-ground edges
Kardyb	Two extremely long polished thin-butted axeheads	Similar	Yes	Both finished	Unused	Yes – butts re-knapped differently
Rydhave	Six very similar polished thin-butted axeheads	Similar	Yes	All finished	Both used and unused	All have had butts re-knapped, some have edges re-knapped and/or re-ground
Vestergård Øst	Two unpolished thin-butted axeheads	Similar	Yes	Both unfinished (unpolished)	Unused	No

Table 2. Summarized overview of the biographies for the hoards.

ing practice as well as some of the social consequences of this practice within the TRB. The biographical observations from this analysis has been summarized to create an overview in Table 2.

The first hoard from Sønder Rævind showed completely different biographies, both regarding the composition and use-life of the axeheads. This variability illustrates how heavily diversified the axeheads can be within the same hoard, where if the axeheads were found as stray finds they most likely would never have been identified as a hoard. Within, this variability, an element of duality is present regarding both material, content and context. There is both a large unused and a small heavily used axehead for the flint as well as the greenstone axeheads. Both the large flint and greenstone axeheads are un-polished, whereas the small flint and stone axehead has been repeatedly ground and polished. In addition, one of the flint and one of the greenstone axeheads has striations ground into the surface after the rest of the axe was complete. The depositional context of this hoard can also be seen as dualistic, as such a small hollow would have likely seasonally transitioned between wet or dry. As this duality is evident through different aspects within this hoard, it appears to have been a deliberate and very conscious choice. Such dualism has not previously been identified as clearly within a single hoard. However, based on the results of this

study, dualism and more generally the combination of contrasting elements and biographies within the same hoard may have been a key, but previously unrecognized aspect of TRB hoarding.

Although the two large axeheads from Kardyb appear very similar, they show subtle differences in the flake scars in both the primary production as well as the secondary re-knapping of the butts, which also appears to have occurred at different times. This could indicate that they were produced in close collaboration, but not necessarily by the same knapper and that they had parallel but temporally distinct secondary modifications. Arguably, similar observations are also present on the Rydhave hoard, where axeheads RY2 and RY4 show such great similarities, that they have been interpreted to be knapped by the same craftsperson, quite possibly in the same workshop flow. Although after being produced by the same flint knapper, their use-life differ as one of them has a re-sharpened edge, showing that it may have been used and then re-worked prior to deposition. The other axeheads from Rydhave differ to a larger degree in both production, use-life and secondary modifications. Unlike, with the other hoards, the two axes from Vestergård Øst do not show any observable differences within their use-lives, raw material sources, or any post-production modifications. Rather their different biographies seem solely manifested by seemingly being produced by different individuals.

A possible explanation of combination of axeheads with different biographies (in terms of: production, use, curation and treatment), is that it may reflect the complex network of exchange and productivity in the Scandinavian TRB. Such networks of exchange have been previously attested by the larger axeheads from the Netherlands which are presumed to come from Southern Scandinavia (Wentink 2006), while exchange of axeheads to Norway also have been documented (Price 2015, 124). The evidence for local and complex networks of production, use, exchange and accumulation in axehead hoards has not previously been identified in detail before in Southern Scandinavian TRB (cf. Knutsson 1988, 77). However, ethnographic studies of tribal societies in Papua New Guinea has documented such intricate networks. Here the procurement and exchange of axeheads is a ritualized and integrated aspect of the cultural practices of different groups. These axeheads play important roles in the economic drivers of society and are used in very complex exchange networks involving commodities, goods and social power. While some axeheads hold a special meaning as, for instance, bride-price or as ceremonial axeheads, it is not uncommon that they were also used for utilitarian work (Højlund 1979; Pétrequin and Pétrequin 2011). These concepts may also be present in the processes underlying some aspects of the hoarding practice. The different use-lives may be ascribed to the different owner's personal choice regarding the use and treatment of the axeheads through time, while the examples of axeheads likely produced by the same knapper illustrate the exchange based on their divergent later biographies. The coming together of the axeheads with different use-lives could also suggest that the practice of hoarding was a communal event, where individuals in society brought together different important objects and where at the end they were assembled together and carefully deposited in the landscape.

Composition, context and topography

Overall, the composition of hoards discussed here largely conform to the well-known picture of TRB hoards (cf. Karsten 1994; Nielsen 1977; Rech 1979). Large polished axeheads were included in the two wetland hoards from Kardyb and

Rydhave, while the hoards from Sønder Rævind and Vestergård Øst that are found in comparatively dryland contexts both contain unpolished axeheads (Table 3). The deposition of both used as well as unused axeheads within the same hoard also fits a general pattern that is observable within southern Scandinavian TRB material (Bjørnevad and Stephansen forthcoming; Karsten 1994, 210-364; Olausson 1983, 28-29), contrary to the common prior assertion that TRB hoards only contain unused axes (e.g. Rech 1979, 163).

However, some of the results of this study do not fit the generalised picture of the composition of TRB hoards. For instance, to the authors' knowledge, the composition of Sønder Rævind stands out as being highly unusual, and if this hoard had not been found *in situ* it is possible that it would have even been considered as hoard. Firstly, the significant difference in the size of the axeheads (11-27 cm) is slightly unexpected, as previously it has been stated that hoards generally contain axeheads that are similar sized (Rech 1979, 20, 39-40). In addition, the majority of greenstone axes from Denmark have been found on Zealand (cf. Ebbesen 1984, 130; Klassen 2014, 201, 204). The inclusion of the greenstone axes in a TRB hoard in the southern Limfjord region is particularly surprising in itself, as generally hoards with greenstone axeheads are found in the areas furthest away from good flint sources. This distribution pattern has been interpreted to indicate that such greenstone axeheads were seen as a possible symbolic replacement of flint axeheads (Ebbesen 1984). This does however not fit with the archaeological material known from the nearby area of the Sønder Rævind hoard, where high quality flint is readily available. As previously stated, the complete axehead from Kardyb is the longest axehead known from Scandinavia, which was found 10.7 km to the west of the hoard from Sønder Rævind. Furthermore, the second largest flint axehead in Scandinavia from Jegstrup Kjær is found 6.4 km to the south east, while a natural occurrence of flint presented by Becker (1993, 124 Fig 8.) is only 9-10 km towards the south west. Thus, in this instance the deposition of the two greenstone axeheads does not appear to have been connected to a scarcity of flint, suggesting that their inclusion within hoard along with two flint axes, held a different significance.

Hoard	Composition	Context	Arrangement
Sønder Rævind	Two flint thin-butted axeheads and two stone axeheads, one with a perforated butt	Natural hollow, possibly seasonally dry/wet and possibly deposited near a settlement	Unclear as the hoard was disturbed but the two in situ large flint and small stone axeheads are facing WSW and the small flint axe SSE, respectively
Kardyb	Two large polished flint thin-butted axeheads	Peat filled gully	Lying parallel in line with edges facing east
Rydhave	Six large polished flint thin-butted axeheads	Peaty shoreline of a river-valley	All lying roughly parallel and pointing roughly east
Vestergård Øst	Two unpolished flint thin-butted axeheads	Dryland, possible settlement	Lying parallel on their narrow sides, with one axe slightly offset. Both axeheads are facing north

Table 3. Overview of the composition, context and arrangement of the hoards included in this paper.

The unusual composition of the Sønder Rævind hoard may be due to the comparatively late date for this hoard, as it is typologically dated to the transition to the Middle Neolithic around 3300-3100 BC. At approximately this stage, the general societal structure seems to also have changed (Sørensen and Nielsen 2018). In addition, many ritual practices changed, including a decrease in the frequency of hoarding (Rech 1979, 19-30), pottery depositions (Koch 1998, 194), human and cattle sacrifices (Sjögren et al. 2017, 116-117), as well as the construction of dolmens and passage graves, cult houses, and causewayed enclosures (Sjögren 2011, 112). Thus, perhaps these wider societal and ritual changes are also mirrored in a change in the composition of some hoards.

The Sønder Rævind hoard also stands out as being unusual in terms of its depositional context, namely being placed in small natural hollow that could have been periodically wet or dry, and that it may have also been deposited nearby to a settlement. This type of depositional context would often be overlooked if it had been found as stray find, given the ephemeral nature of the postholes and the hollow itself and thus likely would have just been considered as dryland find. Similarly, the ephemeral nature of the settlement remains from Vestergård Øst, would likewise not have been noticed if they were found as a stray find – leading the hoard to perhaps be erroneously classified as fitting the classic picture of TRB hoards being extramural in nature. These two finds suggest that perhaps hoards were deposited associated with set-

tlements more often than commonly thought (see also Aarsleff 2011 for another similar example). The apparent near exclusivity of hoards and settlements may instead be skewed due to hoards largely being found as stray finds.

On the other hand, given that the only evidence for these possible settlements are a few artefacts and undated pits and postholes, it could be questioned if these do in fact represent settlements, or if they instead represent other activities that were associated with these locales or the hoarding practice. In the case for the undated postholes nearby to the Sønder Rævind hoard, it is possible that they originate from a palisaded enclosure given the postholes are placed curving around a highpoint of the landscape, that is reminiscent of where some causewayed enclosures have been positioned in Denmark (Klassen 2014b, 23). It is also possible that the few artefacts found nearby to the hoard from Vestergård Øst could have been the remains of wider practices associated with the hoarding event, with such associated practices going previously unnoticed due to the source critical issues discussed above. Without further excavations, these admittedly remain conjecture at this stage. However, they illustrate what type of information may be overlooked when we rely on primarily stray finds of hoards and how this has possibly skewed our understanding of such practices.

This is also further illustrated by the remarkable variability in the topographic placement of the four hoards in this paper (Table 1 and 3). The wet-

land hoards of Kardyb and Rydhavne initially seem to fit what is thought of as the ‘classic’ hoard, however as Kardyb was found in a gully and Rydhavne at a possible beach or open water, the topographical nature of the wetland contexts clearly differ. Vestergård Øst were found at a relatively flat dryland possible settlement context, and differs from the aforementioned hoards as well as Sønder Rævind, where the context could be considered as mixed. The hoard was placed in a natural small hollow, possibly seasonally wet and dry that was located at a highpoint within the landscape. In this sense, the well-documented context of the hoards provides a more detailed account on the circumstances and thereby an interpretation beyond the classic wetland vs. dryland division. Furthermore, the results indicate the extent of the contextual information that is missing from a vast majority of hoards, such as the identification of other possible activities associated with TRB hoarding that may be integral to understanding these practices, the importance of these places and their role within society.

Directionality and arrangement

Another aspect that has been overlooked due to the poor find circumstances of most hoards is a detailed understanding of the arrangement of TRB axe hoards. The arrangement of objects within hoards is a well known feature of Neolithic hoards (Rech 1979, 15-17). The description of the arrangement is often limited to the positioning of the objects in relation to each other, but rarely is the directionality of the axeheads noted. However, as the positioning of the hoards in this paper were either professionally recorded or able to be reconstructed based on the detailed observation of the find circumstances and the artefacts themselves, we are in a better position to gain insights into this aspect of TRB hoarding.

To the authors’ knowledge, the directionality of the objects within hoards, and possible importance of it has not been previously explicitly discussed for Neolithic hoards. However, as directionality of megaliths appears to have been significant (Clausen et al 2008; Clausen 2014; 2016; González-García and Costa-Ferrer 2007, 207; Paulsen 2019) and as hoards often seem carefully placed, it is entirely pos-

sible that directionality of objects within the hoard was also important. In three out of the four hoards discussed in this paper, the axes appear to have been placed lying roughly parallel with each other, a feature that is also observed in a large number of hoards found elsewhere in Southern Scandinavia (Rech 1979, 15-17). Furthermore, in two of the hoards the edges of some or even all of the axeheads were facing east. This directionality fits with the placement of megaliths that also often face easterly (Clausen et al 2008; Clausen 2016, 57, 76; González-García and Costa-Ferrer 2007, 207; Paulsen 2019, 3460). However, due to the small sample size present here, it is difficult to ascertain how significant this trend is, or if it is a localized hoarding feature. In addition, as the axes in the hoard from Vestergård Øst have their edges facing north, and as axeheads in other hoards, outside of this study, are found placed vertical, radiating outwards, or placed in facing opposing directions etc. (Rech 1979, 15-17) it is unclear if it was the directionality, specific positioning or merely the arrangement of the hoards that was the important aspect of the hoarding practice. Thus, future studies should seek to compile a larger dataset of hoards whose arrangement and directionality is known to determine what patterning or variability is present and to contextualize the implications of these observations for understanding the practice at a macro- as well as a micro-scale.

Concluding remarks

The approach used in this paper – combining practice theory, object biography and detailed contextual information – has added a new level of temporality and complexity in the hoarding practices from the TRB and the lives of the objects that are included within them. Hoards cannot be divided up simply to wetland vs dryland, or ritual vs profane, or of ceremonial axeheads vs functional axeheads. Rather, the evidence suggests that this practice is very diverse, with blurred lines, and with considerable individuality in the practice that may go overlooked or downplayed in standard analytical approaches to such hoards. These observations and the interpretation that have been put forward adds to and challenges our understanding of the treatment and role of axeheads, the nature hoard-

ing practices as well as some of the social processes within TRB society.

In closing, it should be noted that the results presented here are not meant to be representative of the practice across the entire southern Scandinavian TRB. The number of hoards discussed in the present paper is small, and the cases all originate from only one small region of Denmark. Instead of seeking generalized claims, we have proffered a novel methodology aimed at interrogating hoarding practices in a detailed and local perspective. This approach offers the possibility of distinguishing and interpreting complex social aspects at the level of the object and the assemblage. Future studies should aim to increase sample size as it would be exciting to apply this methodological framework to an enlarged dataset in order to investigate whether the aspects and patterns can be seen elsewhere and to better understand the variability within this practice on a larger scale.

Acknowledgements

The Agency of Culture and Palaces financed the work carried out by the first author of the article. Furthermore, we really appreciate that colleagues from the Museums of Holstebro made the Rydhave hoard available for analysis and publication, likewise we would like to thank colleagues from the National Museum of Denmark for allowing our analysis and publication of the hoard from Kardyb. And finally, we would like to thank Dr. Felix Riede and the two anonymous reviewers, for useful comments and suggestions that led to the improvement of this paper.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. In the main text, abbreviations for each of the hoards have been used and they are as follows: SR for Sønder Rævind, KA for Kardyb, RY for Rydhave and VØ for Vestergård Øst. The individual axehead numbers given in the main text corresponds with the numbers used in the original museum records, for example SØ1 refers to Sønder Rævind No. 1.
2. The hoard from Sønder Rævind was found and excavated by Viborg Museum in 2012. It is recorded under the journal no. VSM 09981 at the museum. The reference to the National Database of Monuments and Antiquities is 130114-168. SR1 can be defined as Nielsen's (1977) Type VI, dating to EN I-MN I. SR2 is heavily re-sharpened, and harder to define, but it appears to be either Type IIIA or IV. SR3 is Ebbesen's (1984) Type III dating to MN I-MN IV. SR4 is Ebbesen's (1984) Type IIA dating to EN I-MN Ia. Thus, the hoard can be dated to the transition between EN II-MN I.
3. As this hoard was found just below the plow-layer, there is a possibility that the hoard has been post-depositionally disturbed, thus it is possible that any other objects that may have been deposited with the hoard have been accidentally removed.
4. After the two workers found the hoard with their mechanical excavator, Viborg Museum was contacted, after which a small trial trench was excavated to search for the missing part of the axehead and to look for additional axeheads. Unfortunately the museum was not able to recover the missing axe fragment nor were they able to locate any additional axeheads. The hoard is recorded in the museum under journal number VSM 10368. The hoard was later declared as 'Danefæ' and thus belongs to the state of Denmark, managed by the National Museum of Denmark, where the axeheads are stored. The reference to the National Database of Monuments and Antiquities is 130107-368. The complete axe KA I can be defined as Nielsen's (1977) Type IV. KA2 is broken, but the general appearance of the axe is very similar, and the axe can also be defined as the same type, thus dating the hoard to EN II.
5. Lake Tastum was drained and became dry during cultural intensification in the 19th century (Amstrup 1955).
6. The longest axeheads in Rech's (1979) catalogue are RY5 from the Rydhave hoard at 44 cm (Cat. no 242) and an axehead from Jegstrup Kær at 46 cm (Cat. No. 258) found due west of Viborg.
7. After one of the axeheads was found, the local museum, Holstebro Museum, was contacted. The museum then excavated a small area around the find spot, uncovering the remaining five axeheads *in situ*. The axeheads are stored in Holstebro

- Museum under the journal number HOL 15058. Reference to the National Database of Monuments and Antiquities is 180206-128. All the axes can be typologically defined as Nielsen's (1977) Type IV, dating to EN I-EN II.
8. The hoard from Vestergård Øst was found during a trial excavation prior to forest plantation, and as such, the hoard along with other archaeological features was recorded under the journal number VSM G213, find number X150 and X151. The hoard is stored at Viborg Museum. The reference to the National Database of Monuments and Antiquities is 130805-145. The axes can be defined as Nielsen's (1977) Type V, dating to EN II.

Bibliography

- Amstrup, N. 1955. Kultiveringsproblemer på den tørlagte Søborg sø. *Geografisk Tidsskrift*, 54, 24-35.
- Becker, C.J. 1947. Skæftede stenalder-økser. *Fra Nationalmuseets Arbejdsmark*, 1947, 21-28.
- Becker, C.J. 1950. Rafted Neolithic celts II. *Acta Archaeologica*, 20, 231-248.
- Becker, C.J., 1993. 'Flintminer og flintdistribution ved Limfjorden'. In: J. Lund and J. Ringtved, eds. *Kort- Og Råstofstudier Omkring Limfjordsområdet*. Aarhus: Aarhus Universitets Trykkeri, 111-135.
- Bell, C., 1992. *Ritual Theory, Ritual Practice*. Oxford: Oxford University Press.
- Berggren, Å., 2010. *Med kärret som källa. Om begreppen offer och ritual inom arkeologin. Vägar till Midgård*. Lund: Nordic Academic Press.
- Berggren, Å. and Stutz, L.N. 2010. From spectator to critic and participant. A new role for archaeology in ritual studies. *Journal of Social Archaeology*, 10 (2), 171-197.
- Bjørnevad, M., Forthcoming a. *A biographical analysis of Mesolithic hoarding in southern Scandinavia*, (PhD Thesis). Aarhus: Aarhus University.
- Bjørnevad, M., Forthcoming b. *A relational perspective on entangled biographies in southern Scandinavian Mesolithic hoards*.
- Bjørnevad, M., and Stephansen, C.F. Forthcoming. *Continuity, discontinuity and the social role of hoarding over the Mesolithic-Neolithic transition in Southern Scandinavia*.
- Blinkenberg, C. 1898. Skæftede stenalderens redskaber. *Aarbøger for Nordisk Oldkyndighed og Historie*, 1898, 125-156.
- Brück, J. 1999. Ritual and Rationality: Some Problems of Interpretation in European Archaeology. *European Journal of Archaeology*, 2 (3), 313-334. <https://doi.org/10.1179/146195799799726487>
- Brøndsted, J., 1957. *Danmarks Oldtid I. Stenalderen*. København: Gyldendal.
- Bye-Jensen, P. 2016. 'Causewayed Enclosures under the Microscope: Preliminary Results of a Large Scale Use-Wear Analysis Project'. In: J. Müller, M. Hinz and M. Wunderlich, eds. *Megaliths, Societies, Landscapes – Early Monumentality and Social Differentiation in Neolithic Europe*. Kiel: University of Kiel.

- Bye-Jensen, P, 2019. *Causewayed Enclosures Under the Microscope*, (PhD Thesis). Southampton: University of Southampton.
- Bye-Jensen, P, Forthcoming. 'Taking a closer look – causewayed enclosures through the lens of a large scale use-wear analysis project'. In: M. Børnevad and P. B. Jensen, eds. *The Life Biography of Artefacts and Ritual Practice: With Case Studies from Mesolithic-Early Bronze Age Europe*. Oxford: BAR International Series.
- Clausen, C. 2014. Neolithic Cosmology? *Adoranten*, 2014, 68-75.
- Clausen, C., 2016. *The Megalithic Lunar Season Pointer*, (PhD thesis). Copenhagen: Niels Bohr Institute, University of Copenhagen.
- Clausen, C., Einicke, O. and Kjærgaard, P. 2008. The orientation of Danish passage graves. *Acta Archaeologica*, Acta archaeologica supplementa X, 79 (1), 216–229. <https://doi.org/10.1111/j.1600-0390.2008.00115.x>
- Ebbesen, K. 1984. Tragtæggekulturens grønstensøkser. *KUML*, 1984, 113–153.
- Ebbesen, K. 1995. Die nordischen Bernsteinhorte der Trichterbecherkultur. *Praehistorische Zeitschrift*, 70 (1), 32–89. <https://doi.org/10.1515/prhz.1995.70.1.32>
- Ebbesen, K., 2011. *Danmarks megalitgrave*. Copenhagen: Attika.
- Fogelin, L. 2007. The Archaeology of Religious Ritual. *Annual Review of Anthropology*, 36, 55–71. <https://doi.org/10.1146/annurev.anthro.36.081406.094425>
- Fontijn, D.R., 2002. *Sacrificial Landscapes. Cultural biographies of persons, objects and "natural" places on the Bronze Age of the Southern Netherlands c. 2300-600 BC*. Leiden: University of Leiden. <https://doi.org/10.1017/s0003598x00093509>
- Gonzalez-Garcia, A.C. and Costa-Ferrer, L. 2007. Orientation of megalithic monuments in Germany and the Netherlands. *Mediterranean Archaeology and Archaeometry*, 6, 201–208.
- Hansen, P.V. and Madsen, B. 1983. Flint Axe Manufacture in the Neolithic. An Experimental Investigation of a Flint Axe Manufacture Site at Hastrup Vænget, East Zealand. *Journal of Danish Archaeology*, 2, 43–59. <https://doi.org/10.1080/0108464x.1983.10589891>
- Højlund, E., 1975. Stridsøksekulturens flintøkser- og mejsler. *KUML*, 1973-74, 179–196.
- Højlund, E., 1979. Stenøkser i Ny Guineas Højland. *Hikuin*, 5, 31–48.
- Jensen, H. J. 1994. *Flint Tools and Plant Working – Hidden Traces of Stone Age Technology*. Århus: Århus University Press.
- Karsten, P., 1994. Att kasta yxan i sjön: en studie över rituell tradition och förändring utifrån skånska neolitiska offerfynd. Stockholm: *Acta Archaeologica Lundensia*. Almqvist & Wiksell International.

- Keeley, L. H., 1980. *Experimental Determination of Stone Tool Uses*. Chicago: The University of Chicago Press.
- Keeley, L.H. 1982. Hafting and Retooling: Effects on the Archaeological Record. *American Antiquity*, 47 (4), 798–809.
- Klassen, L. 2014a. 'South Scandinavian Neolithic greenstone axes with a perforated butt.' In: R.M. Arbogast and A. Greffier-Richard, eds. *Entre Archéologie et Écologie, Une Préhistoire de Tous Les Milieux. Mélanges Offerts à Pierre Pétrequin*. Annales Littéraires de l'Université de Franche-Comté, No. 928, Environnement, Sociétés et Archéologie. Besançon: Presses universitaires de Franche-Comté, 199-212. <https://doi.org/10.3406/ista>
- Klassen, L., 2014b. *Along the Road. Aspects of Causewayed Enclosures in South Scandinavia and Beyond*. Aarhus: Museum Østjylland & Aarhus University Press.
- Knutsson, K., 1988. *Making and Using Stone Tools: The analysis of the lithic assemblages from Middle Neolithic sites with flint in Västerbotten, Northern Sweden*. Uppsala: Societas Archaeologica Upsaliensis.
- Koch, E., 1998. Neolithic Bog Pots from Zealand, Møn, Lolland and Falster, København: *Nordiske Fortidsminder serie B*. Det Kongelige Nordiske Oldskriftselskab.
- Kopytoff, Igor., 1986. 'The cultural biography of things: commercialization as a process'. In: A. Appadurai, ed. *The Social Life of Things*. Cambridge: Cambridge University Press, 64-91. <https://doi.org/10.1017/cbo9780511819582.004>
- Kristiansen, K., 1985. 'Post-Depositional Formation Processes and the archaeological Record', In: K. Kristiansen, ed. *Archaeological Formation Processes. The Representativity of Archaeological Remains from Danish Prehistory*. København: Nationalmuseet, 6-11.
- Larsen, L.A. 2015. 'Bilstrup-Loldrup'. In: *Arkaologi i Lange Linjer. 92 Km Arkaologi – 73 Fortællinger – 5.000 Års Historie*. Viborg: Viborg Museum, 114-142.
- Levy, J., 1982. *Social and Religious Organisation in Bronze Age Denmark*. Oxford: British Archaeological Reports (International Series).
- Madsen, B. 1984. Flint Axe Manufacture in the Neolithic: Experiments with Grinding and Polishing of Thin-Butted Flint Axes. *Journal of Danish Archaeology*, 3 (1) 47-62. <https://doi.org/10.1080/0108464x.1984.10589911>
- Mikkelsen, M. 2001. *VSM 213G* (Unpublished Excavation Report). Viborg: Viborg Museum.
- Müller, S. 1886. Votivfund fra Sten- og Bronzealderen. *Aarbøger for Nordisk Oldkyndighed og Historie*, 1886, 216-250.
- Nielsen, P.O. 1977. Die Flintbeile der frühen Trichterbecherkultur in Dänemark. *Acta Archaeologica*, 48, 61-138.
- Nielsen, P.O. 1979. De tyknakkede flintøkters kronologi. *Aarbøger for Nordisk Oldkyndighed og Historie*, 1977, 5-71.

- Nielsen, P.O., 1985. 'Neolithic Hoards from Denmark', In: K. Kristiansen, ed. *Archaeological Formation Processes. The Representativity of Archaeological Remains from Danish Prehistory*. København: Nationalmuseets Forlag, 102-109.
- Olausson, D. 1983. Lithic Technological Analysis of the Thin-Butted Flint Axe. *Acta Archaeologica*, 53, 1-86.
- Olausson, D., Hughes, R. E. and Högber, A. 2012. A new look at Bjurselet: The Neolithic flint caches from Västerbotten, Sweden, using non-destructive energy dispersive x-ray fluorescence analysis for provenance determination. *Acta Archaeologica*, 83, 83-103.
<https://doi.org/10.1111/j.1600-0390.2012.00576.x>
- Paulsson, B. S. 2019. Radiocarbon dates and Bayesian modelling support maritime diffusion model for megaliths in Europe. *PNAS*, 116 (9), 3460-3465. <https://doi.org/10.1073/pnas.1813268116>
- Price, T.D., 2015. *Ancient Scandinavia. An Archaeological History from the First Humans to the Vikings*. Oxford: Oxford University Press.
- Rech, M., 1979. *Studien zu Depotfunden der Trichterbecher und Einzelgrabkultur des Nordens*. Neumünster: Karl Wachholtz Verlag.
- Rots, V. 2002. Bright Spots and the Question of Hafting. *Anthropologica et Praehistorica*, 113, 61-72.
- Sjögren, K.-G. 2011. 'C-14 chronology of Scandinavian megalithic tombs'. In: *Exploring Time and Matter in Prehistoric Monuments: Absolute Chronology and Rare Rocks in European Megaliths*. Menga. Revista de Prehistoria de Andalucía. Junta de Andalucía. Consejería de Cultura, 103-119.
- Sjögren, K.-G., Ahlström, T., Blank, M., Price, T.D., Frei, K.M. and Hollund, H.I., 2017. Early Neolithic Human Bog Finds from Falbygden, Western Sweden: New Isotopic, Osteological and Histological Investigations. *Journal of Neolithic Archaeology*, 19, 97-126.
<https://doi.org/10.12766/jna.2017.4>
- Skov, T. 1972a. 15.058 *Rydhave* (Unpublished Excavation Report). Holstebro: Holstebro Museum.
- Skov, T. 1972b. Gudens Gunst. *Skalk*, 1972 (5), 10-12.
- Stutz, L.N., 2003. *Embodied Rituals & Ritualized Bodies. Tracing ritual practices in Late Mesolithic burials*. Stockholm: Acta Archaeologica Lundensia. Almqvist & Wiksell International.
- Sørensen, C. 2017. *VSM 09981 Sønder Røvind* (Unpublished Excavation Report). Viborg Museum.
- Sørensen, L., 2014. From hunter to farmer in Northern Europe. Migration and adaptation during the Neolithic and Bronze Age. *Acta Archaeologica Supplementa*. Vol. 1. Copenhagen: SAXO Institute, University of Copenhagen.
- Tilley, C., 1996. *An ethnography of the Neolithic. Early prehistoric societies in southern Scandinavia. New studies in Archaeology*. Cambridge: Cambridge University Press.

- Van Gijn, A., 1990. *The Wear and Tear of Flint – Principles of Functional Analysis Applied to Dutch Neolithic Assemblages*. Leijden: Analecta Praehistorica Leidensia.
- Van Gijn, A., 2010. *Flint in focus: Lithic biographies in the Neolithic & Bronze Age*. Leijden: Sidestone Press.
- Wentink, K., 2006. *Ceci n'est pas une hache. Neolithic Depositions in the Northern Netherlands* (Masters Thesis). Leijden: Leijden University.
- Wentink, K. 2008. Crafting axes, producing meaning. Neolithic axe depositions in the northern Netherlands. *Archaeological Dialogues*, 15, 151-203. <https://doi.org/10.1017/s1380203808002651>
- Wentink, K., van Gijn, A., Fontijn, D. 2011. 'Changing contexts, changing meanings: Flint axes in Middle and Late Neolithic communities in the northern Netherlands', *In*: V. Davis, M. Edmonds, eds. *Stone Axe Studies III*. Oxford: Oxbow Books, 399-408. <https://doi.org/10.2307/j.ctvh1dv6v.39>
- Aarsleff, E., 2011. *NFHA2862 Novo Nordisk Grundvandskøling* (Unpublished Excavation Report). Hillerød: Folkemuseet.