Arrowheads as indicators of interpersonal violence and group identity among the Neolithic Pitted Ware hunters of southwestern Scandinavia

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ABSTRACT

The three main types of tanged flint arrowheads (A, B, and C) characteristic of the Neolithic Pitted Ware hunter, fisher and gatherers of southwestern Scandinavia are traditionally viewed as chronologically conditioned. However, recent studies have shown their simultaneity during the early 3rd millennium BC. Based on a study of more than 1500 arrowheads from Denmark and western Sweden, this paper explains the stylistic variation of the Pitted Ware arrowheads as functional determined representing two main categories: relatively short and wide hunting arrowheads (type A) and long and slender war arrowheads (type C). Type B represents a multifunctional group of arrowheads that mixes features from type A and C. Furthermore, diverging production schemes (schema opératoire) used for the shaping of hunting arrowheads has helped to identify social groupings within the larger southwestern Scandinavian Pitted Ware complex and contact across the Kattegat during the Middle Neolithic.

1. Introduction

Tanged flint arrowheads stand as the most widespread and iconic features of the Neolithic Pitted Ware complex in southwestern Scandinavia. In spite of that, the social and stylistic functions of these arrowheads have never been dealt with as the stylistic variation among the Pitted Ware arrowheads has been seen as chronologically rather than socially determined (Becker, 1951, 1955, 1982). However, new recordings and evidence from a series of radiocarbon dated settlement layers and sealed grave finds have shown that the different arrowhead types were used simultaneously within the Pitted Ware area (Iversen, 2010). This has left us with the very important and not previously posed question on how to understand the stylistic variation of these significant arrowheads from a functional and social perspective.

Based on analyses of the flint arrowhead inventory of the southwestern Scandinavian Pitted Ware complex, this paper addresses the question of stylistic variation by considering the different arrowhead types as the outcome of task specialisation, such as hunting and warfare, and production processes in which different group identities were integrated components.

2. The Pitted Ware culture – Neolithic hunters, fishers, and gatherers

The Pitted Ware culture is a widespread and rather heterogeneous cultural phenomenon occupying the later Scandinavian Neolithic. It was distributed from the Åland Islands and eastern Sweden to the north and east and to southwestern Norway to the west. To the south, Pitted Ware sites are found in northeastern Denmark and in Scania, southern Sweden (Fig. 1). In central and southern Scandinavia, the Neolithic started around 4000 BCE by the occurrence of the first agricultural societies, the Funnel Beaker culture, with its northern limit reaching central Sweden and Jylland. Isotopic data from eastern central Sweden, Gotland, Öland and the Åland Islands show that people buried in Pitted Ware contexts had a distinct diet based on seals and other marine protein sources...
This marked predominance of seals in the diet has even given the Pitted Ware people of Gotland the nickname ‘Inuit of the Baltic’ (Eriksson, 2004: 154).

In southern Scandinavia we face a rather different situation. Except from some larger settlements located in northeastern Jutland, sites are mostly recognised by collections of cylindrical blade cores and tanged flint arrowheads and reflect a mobile lifestyle with seasonal or short-lived camps closely related to the coastal zones, fjords, and watercourses. Sites are almost exclusively distributed in the northern and northeastern parts of Denmark and only in eastern Jutland have larger sites been recorded with traces of all-year occupation including culture layers. Pottery is mainly related to such occupation layers and pits on larger settlements. No clearly distinguishable or unambiguous Pitted Ware house structures are known as are any proper graves. Arrowheads are on the other hand found in large numbers in megalithic tombs indicating a preferred reuse practice of these graves, in particular in eastern Denmark. From radiocarbon dated sites and a limited number of contact finds relating the Pitted Ware culture to other cultural groups, the Pitted Ware horizon in southern Scandinavia has been dated to c. 3000–2450 BCE (Iversen, 2010, 2013).

Only a few sites such as Kainsbakke and Kirial Bro on Djursland, eastern Jutland, have revealed preserved fauna remains showing a broad-spectrum economy consisting of husbandry, hunting, fishing, and gathering with a certain importance attached to marine resources (including seal, fish, and shellfish), which have been extensively exploited. In all, wild species constitute a larger quantum than the domesticated among which cattle dominate. However, dog, pig, and sheep are also present. The wild species include a range of aquatic birds, otter, beaver, fox, roe deer, red deer, wild boar, horse, aurochs, and the youngest specimens of...
Cereal grains have been found at Kainsbakke and farming is fur-
thermore indicated by the existence of quern-stones (Rasmussen,
1991). Indications of agriculture have also been recorded from
the southwest Swedish Pitted Ware sites at Jonstorp in the form
of quern-stones and pottery with impressions of wheat and emmer
cereal grains (Jennbert, 2014, 2015; Lidén, 1940: 89–93). Because
of striking similarities in pottery forms and ornamentation, scholar-
ses have reasonably referred to the east Jutland and southwest
Swedish sites as the Kainsbakke/Jonstorp group (Edenmo et al.,
1997: 141–144, Fig. 5:3).

In addition, the small island of Hesselø in the Kattegat Sea has
revealed seasonal hunting sites specialised on seal resembling
the situation in eastern central Sweden, the Åland Islands, Gotland,
and Öland. Hesselø shows occupations of both Funnel Beaker and
Pitted Ware groups and have provided a large number of tanged
flint arrowheads of which the majority unfortunately are lost (cf.
Becker, 1951; Nielsen, 1979).

In western Sweden, Pitted Ware sites are mainly found along
the cost, but sites have also been recorded further inland. Only a
few sites such as Anneröd, Daftet, Sandhem, and Rörvik contain
preserved organic material and mollusc shells that can tell us
something about the subsistence economy. Sites are mainly
located via the existence of tanged flint arrowheads and cylindrical
blade cores but also slate arrowheads are known as is Pitted Ware
pottery. In general, Pitted Ware is sparse but it has been recorded
in larger quantities at some sites (Edenmo et al., 1997; Hernek,
2007).

Tanged blade arrowheads and cylindrical blade cores were
probably introduced into western Sweden as early as the Early
Neolithic (c. 4000–3300 BCE) under influence from southern Nor-
way. The early occurrence of this, otherwise typical Pitted Ware
assemblage, is apparently confirmed by a few radiocarbon dates
made on food-crust on Pitted Ware vessels. However, these dates
derive from one site (Olas in Halland). If we consider the accumu-
lation of dates made on food-crust and bones from western Swe-
den in general, these all group within the Middle Neolithic, ranging
between c. 3300 and 2500 BCE, which must be representative for
the Pitted Ware horizon in the region (Edenmo et al., 1997; Strinnholm,

Even though the available number of sites with preserved fauna
material is limited, the west Swedish subsistence economy was
certainly predominated by marine resources including seal, fish,
shellfish, dolphin, and other whale species together with aquatic
birds. However, analyses of the 13C-values of food crust on Pitted
Ware sherds show preparation of terrestrial animals or plants
and a range of terrestrial animals are also present at the sites
including red deer, roe deer, elk, marten, beaver, squirrel, and
pig/wild boar. Domesticated animals are few and include sheep,
cattle, and dog. The scare representation of these animals indicates
that livestock did not play a significant role in the subsistence
economy. Furthermore, agriculture seems to have been practised
during the Early Neolithic but most probably abandoned during the
Middle Neolithic (Edenmo et al., 1997; Jonsson, 2007; Kaelas,

3. Neolithic arrowheads

The Early Neolithic arrowheads of southern Scandinavia basi-
cally continued the late Mesolithic tradition composed of trans-
verse arrowheads, which pursued throughout the Funnel Beaker
period. First with the occurrence of the Pitted Ware culture in the
early 3rd millennium BC were tanged blade arrowheads intro-
duced into Neolithic contexts. These are made from long slender
blades struck from bipolar cylindrical cores. The significant cylin-
drical shape of these cores with a platform in each end is a conse-
quence of the flint knapping technique, by which the core is
regularly turned 180° in order to produce long, slender, and
straight blades for the production of tanged arrowheads (Becker,
1951; Thorsberg, 2007).

The Pitted Ware tanged arrowheads were succeeded by techni-
cally poorer and generally shorter tanged but completely chipped
arrowheads known from the late Single Grave (Corded Ware)
culture c. 2500 BCE. From this time onwards we also see lancet-
shaped bifacial pressure-flaked arrowheads and from the late
Neolithic (c. 2350 BCE) classical barbed and tanged Bell Beaker
type arrowheads occur. Various barbed arrowheads, including
those with concave bases, are found in Late Neolithic and Bronze

The Neolithic tanged arrowheads are divided into four main
types (A–D) originally considered a typo-chronological sequence
with type A as the oldest and type D as the youngest (Fig. 2).
Whereas type A–C are defined as markers of the Pitted Ware cul-
ture in southern Scandinavia and western Sweden, type D is affili-
ated with the late Single Grave and Battle Axe cultures of Denmark
and Sweden respectively (Becker, 1951; Lidén, 1940: 81–95).

Type A-arrowheads are plain points with a chipped tang (prox-
imal end) and slightly retouched point (distal end). Carl Johan
Becker has defined three subtypes on the basis of the chipping of
the tang (Becker, 1951). Type A1 is chipped from the backside of
the blade, A2 from both sides and A3 from the front (Fig. 3). Another
type, A0, lacks the tang (cf. Fig. 2). Type B has been separated in two
subtypes: B1 are chipped at the tang and at the point-end from
three sides (edges and backside) while B2 in addition has been
formed with coarsely toothed edges. Type C is made up of carefully
made three-sided arrowheads almost totally chipped from all sides;
these can reach lengths up to 18 cm. Type D is technically poorer
than type C with which they share great similarities. These are short
(often 5–7 cm) three-sided completely chipped arrowheads. Three
subtypes have been defined (1–3) but as these are not related to the
Pitted Ware culture I will not discuss them further.

The natural deduction that simple arrowheads were succeeded
by more elaborate types was already outlined by Müller in the late
19th century (1888: nos. 174–176) and has provided the basis for
Becker’s typology and derived division of the Pitted Ware horizon into
two late Funnel Beaker stone-packing graves dated to the early
Funnel Beaker period c. 2900 to 2500 BCE (Edenmo et al., 1997;

In southern Norway the tanged arrowheads seem to have been used contemporarily as shown by the investigations of the rich Aue site located in the archipelago on the western side of the outer Oslo Fjord. However, type A occurs more frequently in the earlier phases whereas type B and C became more common in the later phases on the site. Radiocarbon dates show that Pitted Ware pottery was in use from c. 2900 to 2500 BCE (Östmo, 2008: 83, 156–158, Fig. 73; 2010).

In southern Scandinavia radiocarbon dates from settlement lay-
ers with type A- and/or B-arrowheads range from c. 2900 to 2500
BCE. Correspondingly, type C arrowheads occur in a restricted
number of Single Grave culture interments, covering the entire
period c. 2850–2600. Besides, C-arrowheads have been found in
two late Funnel Beaker stone-packing graves dated to the early
3rd millennium BC. Thus, it is reasonable to consider a syn-
chronous use of types A-, B-, and C-arrowheads between c.
2900–2500 BCE when the derived D-type occurs. However, a few
somewhat disputable finds from Denmark such as Rispebjerg and Lilleborg on Bornholm, Sølager and Kornerup on Zealand and Selbjerg in northern Jutland indicate that A-arrowheads might have been the earliest type to appear around 3000 BCE (Iversen, 2010 with references).

In Denmark, the use of tanged flint arrowheads is not exclusively bound to the Pitted Ware culture as it is also known from the late Paleolithic. In particular, the slight variants of the Bromme culture arrowheads bear resemblance to the Pitted Ware A-types. Tanged arrowheads were not part of the Mesolithic projectile point repertoire in southern Scandinavia, which was focused on microliths, rhombic, and transverse arrowheads (cf. Madsen, 1983; Mathiassen, 1946; Petersen, 1993: 76–78, 82–90).

In Norway the situation is somewhat different. Here, tanged arrowheads are known from the Early Mesolithic and again from Late Mesolithic sites in the south Norwegian highlands. However, these seem to be made on flakes rather than blades. The cylindrical core technique appears as early as 4000 BCE together with tanged blade arrowheads. Both tanged blade and flake arrowheads seem to have been used throughout the Neolithic, at least in some parts of southern Norway (Bergsvik, 2006: 41; Indrelid, 1994: 187–188). In western Sweden atypical cylindrical blade cores have been found in Late Mesolithic and Early Neolithic contexts as have a few pieces from southern Sweden and Denmark. Varieties or ‘sub-cylindrical cores’ even occur sporadically before that time, e.g. in Late Paleolithic Bromme contexts (Andersen, 1975;
Additional to the flint arrowheads tanged slate arrowheads are known from Pitted Ware contexts in Norway, Bohuslän in western Sweden, and from eastern Sweden including the island of Gotland where slate arrowheads have been found in graves. In general, the use of slate objects is characteristic for the hunter-gatherers of northern Scandinavia and slate arrowheads are generally rare in western Sweden. However, tanged slate arrowheads occur on the larger shell midden sites such as Sandhem, Äneröd, Rörvik, and Dafter, where they make up to 50% of the arrowheads (Bergsvik, 2006: 42–43; Callanan, 2013; Hernek, 2007; Nielsen, 1979; Taffinder, 1998: 103–111, 144, Fig. 4:1).

Various kinds of tanged bone arrowheads were also used throughout the Neolithic. The most spectacular find was made in 1946 in a bog at Porsmose, south Zealand, Denmark (Fig. 4), see further below. Tanged bone arrowheads are also known from Pitted Ware graves and settlements on the east Swedish islands of Gotland and Öland, the Alvastra pile dwelling in Östergötland, and from the Middle Neolithic Battle Axe culture in southern Sweden (Becker, 1952; Browall, 2011: 303–304 with references; Larsson et al., 2014: 94; Malmer, 2002: 161, Fig. 85).

4. Arrowheads for hunting and war – the distribution and function of Pitted Ware arrowheads

As the tanged arrowhead typology no longer can be considered chronologically conditioned we must consider alternative explanations for the typological variation of these arrowheads. One proximate explanation could be that the different main types (A, B, and C) mirror different Pitted Ware groups who used the arrowhead shapes as ‘ethnic’ signifiers. A logical consequence of this scenario would be that the different arrowhead types follow tribal boundaries as it is known from ethno-archaeological studies (González-Ruibal et al., 2011; Lemonnier, 1986; Levi, 1998; Wiessner, 1983).

However, one quick look at the distribution of the different types of arrowheads in Denmark shows a rather muddled picture with all three arrowhead types occurring within the same areas (Figs. 5–7). A partly overlapping picture could be explained away by the inclusion of arrows in exchange networks and by wounded game transporting arrowheads across tribal boundaries but such scenarios would not result in the distribution shown in Figs. 5–7. Furthermore, if we consider sites with more arrowheads (five or more), these are not restricted to certain geographical areas either. Thus, the different main Pitted Ware arrowhead types (A, B, and C)
cannot be taken as reflections of group-based or tribal borders even though some sites are almost totally dominated by one type.
As regards the subdivision of the A-arrowheads, which are carried out on basis of the shape of the tang, I will return to this variability in manufacturing practice below.

Another obvious possibility is that the different arrowhead types are functional determined mirroring different aspects of Pitted Ware life. Task specialisations are usually expressed in the shape of the arrowhead and this might explain the morphological differences of type A-, B-, and C-arrowheads.

Looking at the arrowheads in functional terms the long and straight type C with a triangular cross section resembles later pre-historic and historic arrowhead types specialised for combat. A similar interpretation might suit subtype B2 with its serrated edges, whereas the simpler and flat type A could have served as hunting arrowheads alongside with the transverse arrowheads. Such an overall dichotomy between war and hunting arrows is also well known from several ethno-archaeological and archaeological studies and does also apply to other objects than arrowheads. Moreover, war arrowheads tend to be more complex than hunting arrows due to the enhanced significance of killing a human being compared to an animal (Bosc-Zanardo et al., 2008; Chapman, 1999; Guilaine and Zammit, 2005: 172; Keeley, 1996: 54; Mercer, 1999; Nicolas, 2016; Orme, 1981: 209; Pétrequin and Pétrequin, 1990, 2006; Rosner, 1967; Weule, 1899: 52–53).

On the basis of a small group of very long and nicely worked type C arrowheads, ranging from 14 cm up to c. 18 cm, it has been suggested that some of these were in fact spearheads. However, the long and delicate nature of these points would likely make them break before penetrating if not fired with great power. This would indicate that we are dealing with arrowheads rather than spearheads. Furthermore, bone arrowheads of similar length and shape have been recorded in the Danish Roman Iron Age war-booty sacrifices. The distribution of very long type C arrowheads are centred in areas holding natural deposits of good Senonian flint, which made

![Fig. 4. Cranium from Porsmose, southern Zealand, Denmark, with the bone arrowhead still in place, c. 3630–3375 cal. BC. Photo Lennart Larsen, © The National Museum of Denmark.](image)

![Fig. 5. Distribution of type A arrowheads in Denmark. Own registrations supplemented with data from Becker (1982: Fig. 2).](image)
possible the execution of such pieces (for further discussion and references see Becker, 1957).

In comparison, experimental research and wear analysis carried out on A-arrowheads show that these were suitable for hunting and that they were hafted and probably used solely as arrowheads (Bye-Jensen, 2011).

Before, I go deeper into the empirical evidence I will first briefly comment on war as a phenomenon in the Neolithic and then pursue the analogy to the later prehistoric and historic war arrowheads a bit further.

The use of the term ‘war’ to describe violent encounters in the Neolithic might seem a bit excessive as war is usually defined as organised and armed contests between political units (see Ferguson, 1984: 3–5 with references). Nonetheless, interpersonal violence surely occurs within small-scale societies (Fry, 2013; Keeley, 1996; Orme, 1981: 194–209; Otto et al., 2006) but it most likely took the shape of raids or set up, formal, ritualised, and even non-lethal combats as indicated by the high number of healed cranial injuries known from the European Neolithic (Schulting and Fibiger, 2012; Varberg, 2014: 40–64).

However, evidence of intentional killing is certainly also present in the archaeological record from Neolithic Europe as shown by arrowheads embedded in human bones, skulls with multiple traumas, and traces of regular massacres such as the spectacular mass graves at Talheim in southwestern Germany, Schöneck-Kilianstädten in central Germany, and Asparn/Schletz in Lower Austria (Beyneix, 2012; Christensen, 2004; Meyer et al., 2015; Teschner-Nicola, 2012; Wahl and Trautmann, 2012). However, the named examples given above all belong to the Linear Pottery culture and it might be that we face a certain, socially unstable, situation in some regions within the late Linear Pottery culture that promoted a high frequency of violence and even cannibalism as has been argued for at Herxheim, southwestern Germany (Bickle and Whittle, 2013: 399; Boulestin et al., 2009).

During the Late Neolithic and early Bronze Age we see an increase in the production of weapons including daggers, axes, halberds, and swords. Furthermore, indications of larger conflicts resulting in regular warfare and a battle field counting more than 100 casualties bearing traces of both face-to-face fighting and long distance attacks has been recorded at Tollense, northeastern Germany. The site dates to the 13th century BC corresponding to the Nordic Bronze Age Period III (Jantzen et al., 2011). Due to a non-institutionalised and supposed limited geographical and lethal (?) scale, I will refer to Neolithic interpersonal violence as ‘low-intensive warfare’ (e.g. Ahlström and Molnar, 2012).

When discussing the use of hunting versus war arrowheads it should, first of all, be noted that arrowheads designed to kill mammals of course also will be effective against human beings and for this reason any distinction between the two must be somewhat diffuse. This is in particular the case in a period such as the Neolithic, which has not provided any traces of armour or shields acquiring specialised arrowheads with high penetration power. However, such weapons of defence could easily have existed in the form of thick clothing and light wooden shields or animal skin shields. Anyhow, one might still request different functionalities and seek different outcomes whether one engage in low-intensive warfare and interpersonal violence or in hunting and killing wild animals.

Based on the study of late Iron Age and Viking Age arrowheads, two technologically distinct main groups can be identified: cutting and penetrating points. The cutting points are arrowheads made for hunting and are formed with broad edges designed to cause a
large wound and following heavy blood loss that will kill the animal quickly or at least prevent it from running far. War arrowheads are penetrating points, which are designed to have a long shooting range and good fly and penetration properties. These properties are obtained through a long, thin and narrow design as the air resistance is reduced during flight as is the friction during impact. Based on analyses of arrowheads from the Danish war booty sacrifices and central Swedish boat-burials, the division between slim war arrowheads and broad hunting arrowheads is placed at a width around 14–15 mm. From the latter study, an additional group of multipurpose arrowheads has been defined having a width between 14 and 18 mm. Shooting experiments have shown their suitability as both war and hunting arrowheads (Jensen, 2007, 2009: 126–127; Lindbom, 1995). In addition, categories of multipurpose arrowheads have been defined among medieval English archery equipment (Jessop, 1996; Wadge, 2012: 189–90, 195).

Now, how do these morphological characteristics match the different Pitted Ware arrowheads? In this study I have analysed 1567 tanged arrowheads from 14 Danish and west Swedish Pitted Ware settlement sites resulting in altogether 1186 A-arrowheads, 237 B-arrowheads and 144 C-arrowheads. Of these, 531 arrowheads are intact and could therefore be measured according to both length and width. On the remaining 1036 arrowheads only the maximum width could be measured due to various fragmentations, mostly broken off tips.

Table 1 shows lengths and widths of the intact arrowheads whereas Table 2 shows widths of all arrowheads recorded within this study. In particular type A arrowheads display a great variation in length and width covering miniature pieces measuring no more than $21 \times 7$ mm up to large pieces of $75 \times 25$ mm and $93 \times 19$ mm. Whereas all three types show great variations in length it is evident, in particular when consulting Table 2, that type A stands out according to variations in width ranging over 20 mm. In comparison, the width of type B arrowheads varies within 15 mm and type C arrowheads only within 10 mm.

In general, type C is the longest and narrowest of the three types displaying a median width of 12 mm, type A is the shortest and broadest with a median width of 14 mm (Table 2). Type B falls in-between type A and C regarding both length and width. The smaller width of type A arrowheads in Table 1 compared with Table 2 is caused by the presence of a relatively high share of smaller and miniature pieces within the group of intact arrowheads compared with the entire group of arrowheads.

To allow for the possibility that miniature pieces distort the general picture of width distributions, and in order to make the three arrowhead types readily compatible, I have calculated the ratio of width to length in per cent for each type. This clearly confirms the overall picture of type C arrowheads being long and slender (the width only makes 19% of the length) whereas type A constitutes relative short and broad arrowheads (the width makes

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1 The available arrowheads from the following sites have been studied: Hesselø, more sites (Rørvig parish): 41 type A, 4 type B, 1 type C; Løsø, Vr. Højmandshoved (Vestere parish): 4 type A, 2 type B, 3 type C; Smedegaarde (Nørre-Tranders parish): 151 type A, 1 type B, 1 type C; Livø (Ranum parish): 10 type B, 15 type C; Anholt, more sites (Anholt parish): 22 type A, 33 type B, 31 type C; kiräl Bro (Enslev parish): 90 type A; Kainsbakke (Gømerup parish): 74 type A, 2 type B, 1 type C; Mursfæld (Vejpræder parish): 21 type A; Aargaaard (Øster Tørslev): 18 type A, 1 type C; Højvang 1 (Øster Tørslev): 286 type A, 4 type B, 1 type C; Fiskevik (Skredsvik parish): 291 type A, 115 type B, 45 type C; Rørvik (Kvivle parish): 173 type A, 51 type B, 37 type C; Dafter (Skeie parish): 6 type A, 3 type B, 2 type C; Ánnerrød (Skee parish): 9 type A, 12 type B, 6 type C.

Fig. 7. Distribution of type C arrowheads in Denmark. Own registrations supplemented with data from Becker (1982: Fig. 3).
Width distributions of all the Pitted Ware tanged flint arrowheads recorded within this study from Denmark and western Sweden.

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum length in mm</th>
<th>Maximum length in mm</th>
<th>Median length in mm</th>
<th>Minimum width in mm</th>
<th>Maximum width in mm</th>
<th>Median width in mm</th>
<th>Width/length ratio in percent (all pieces/ intact pieces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>5</td>
<td>25</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td>28.6</td>
</tr>
<tr>
<td>Type B</td>
<td>7</td>
<td>22</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>24.5</td>
</tr>
<tr>
<td>Type C</td>
<td>8</td>
<td>18</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

Total number: 1567.

In Table 2, I have calculated the width to length ratio on the basis of the length of the intact pieces and the width of all pieces; the result further accentuates the figures presented above. Thus, the three arrowhead types clearly represent three groups in regards to width and length proportions.

The Pitted Ware arrowhead proportions seem to fit the same categories as the specialised arrowheads of the Iron Age with slim war arrowheads (type C) as opposed to broad hunting arrowheads (type A). The great diversity found within the A type probably reflects the existence of specialised arrowheads for hunting birds and smaller furred animals such as squirrel, marten, and fox on the one hand and large game including bear, elk, aurochs, and red deer on the other as evident from the diversified fauna remains recorded on the Pitted Ware sites.

The in-between, or hybrid, type B arrowheads might constitute a multipurpose type of arrowhead, which combines features from both type A and C. As mentioned above, multipurpose arrowhead types are also known from the Iron Age and Medieval archery material as well as from ethnographic studies (e.g. the Inuit, see Luik, 2006 with references). From these analogies it is obvious that multipurpose arrowhead types are to be expected within sophisticated archer’s arrowhead repertoire. Thereby, the Pitted Ware arrowheads can be grouped according to John Chapman’s classification of artefacts following the categories: tools (type A), tool-weapons (type B), weapon-tools (type B2, with serrated edges) and weapons (type C). Tool-Weapons constitute a specific class of objects that cannot be classified solely as tools, which lack potential for warfare, nor as weapons, which do not have any common or ‘civil’ functions. Weapon-Tools, on the other hand, are objects with a primary martial function but which also have a secondary ordinary or peaceful function (Chapman, 1999).

Still, how should we perceive the use of multipurpose arrowheads in a Pitted Ware context? A clarification of this issue can be sought in ethnographic studies of the relationship between resource acquisition strategy, mobility, and technology among present hunter-gatherers. A good example is the Pumé Hunters of Venezuela. Analyses of Pumé hunting demonstrates that the functions of Pumé bows and arrows are situational flexible and multifunctional. Multifunctionality seems to increase with the mobility range and is a response to the resulting increased variety in resources that should be encountered. In other words, the multifunctionality of the archery equipment mirrors the need for various technical properties on the one hand and the restriction on number of items that is possible to carry on the other hand. Thus, the number of functions related to arrows correlates with travel distance among the Pumé (Greaves, 1997).

In the light of these observations, it seems reasonable for Pitted Ware hunters to produce multifunctional arrowheads if they travelled longer distances. That this was the case is indicated below by the existence of contacts across the Kattateg. In addition, long travels have also been proven in earlier studies of Pitted Ware flint exchange taking place between southern Scandinavia and eastern Sweden (see Becker, 1953; Iversen, 2010; Olausson et al., 2012). The production of multifunctional hybrid arrowheads mixing features of hunting and war arrowheads would in particular be relevant if one could expect to meet hostile groups on e.g. hunting trips and exchange journeys (see further below).

5. Distribution of Pitted Ware arrowheads

One thing of course is the arrowhead’s morphology and their functional usability, another thing is the archaeological evidence for task specialisations. In this connection it is evident to consider the distribution of the various arrowhead types and their association with different archaeological contexts. In this part of the analysis I focus on Denmark, as this is the only part of southwestern Scandinavia where arrowheads are found both at settlements and in graves (megalithic tombs).

In order to go a bit further than the overall geographical distribution of the different arrowhead types, I have focused my analyses on sites with five or more finds (marked by diamonds in Figs. 5–7). As it appears, the number of sites holding more than five arrowheads is not equally frequent on the three maps. A total of 24 sites contain five or more A-arrowheads whereas the corresponding numbers of sites with B- and C-arrowheads are 13 and 7 respectively.

If we then consider the distribution of sites with five or more arrowheads from different contexts we see that settlements dominate among sites with A-arrowheads (Fig. 8). Type A is also found on sites with fewer arrowheads, it occurs among the single finds, and it is present in megalithic tombs, however, only in restricted numbers within each tomb (compare Fig. 5). Sites holding more B-arrowheads are, on the other hand, dominated by megalithic tombs and not very many settlement sites are rich in B-arrowheads (Fig. 9). Type B occurs widely on sites with fewer arrowheads and as single finds (compare Fig. 6). The very restricted group of sites containing five or more C-arrowheads are dominated by settlements (Fig. 10). However, type C is also frequent in megalithic tombs but only in restricted numbers within each tomb, it occurs among the single finds, and on sites with few arrowheads (compare Fig. 7). Only B- and C-arrowheads have been deposited in hoards.

26.5% of the length). Type B falls in-between type A and C (Table 1).
Now, if we take a closer look at the settlement category (Fig. 11) we see that the number of sites holding more than five A-arrowheads is considerably higher than the corresponding number of sites holding B- and C-arrowheads. Furthermore, the actual number of A-arrowheads found on settlements is also substantially higher than the number of B- and C-arrowheads. Five sites contain more than 75 A-arrowheads of which a couple holds more than 200 pieces (for enumeration see Iversen, 2010). No sites have even close to that many B- or C-arrowheads indicating that real differences in the use of A-arrowheads and B/C-arrowheads existed. This picture corresponds with the assumption that hunting implements were generally accessible, or at least far more accessible than weapons of war, including ceremonial weapons (cf. Lindman, 1985: 68).

Fig. 12 presents the distribution of arrowheads in megalithic tombs holding five or more specimens. The maximum number of A-arrowheads recorded within a single tomb is 10 and the corresponding number of C-arrowheads is 12. B-arrowheads, on the other hand, occur in more tombs and in somewhat larger numbers reaching 36 arrowheads in a single grave (for enumeration see Iversen, 2010). The predominance of B-arrowheads in megalithic tombs is hard to explain immediately. One might expect a high percentage of ‘war arrowheads’ (i.e. type C) in the megalithic tombs as direct results of violent encounters. However, the remains from these tombs are not easy to interpret as human remains and grave goods are mixed up due to reorganisation of burials and human bones and clearings in succeeding periods. Thus, it is not to say whether the arrowheads found within these tombs represent arrows logged into the deceased, grave-goods or, most likely, combinations of the two. Moreover, the disparate preservation, excavation, and registration of many of these tombs complicate these matters further.

The above presented analyses of the distribution and frequency of tanged arrowheads on settlements and in megalithic tombs supports the assumption that A-arrowheads were made and used for hunting. As opposed to the A-arrowheads, C-arrowheads occur mainly in low numbers on each site and they are generally not as numerous as the A-arrowheads. A relatively wide geographical distribution and few specimens on settlement sites are to be expected if the C-arrowheads were in fact weapons. A somewhat comparable picture is seen in the distribution of another type of
contemporary weaponry; the double-edged stone battle axes of the northern Funnel Beaker culture (cf. Ebbesen, 1975: Figs. 142 and 161). The relative scarcity of B-arrowheads on settlements (however, still more numerous than the C-arrowheads), their affiliation with megalithic tombs and their ‘hybrid form’ mixing type A and C features indicate that these had a multipurpose usage as also indicated by their morphology.

From these more general analyses of the Danish tanged arrowheads I will look more closely at specific finds that connect tanged arrowheads with violent encounter in the Middle Neolithic.

6. Arrowheads and indications of violent encounters in the Middle Neolithic

Direct traces of interpersonal violence within the Pitted Ware culture are generally rare but the many burials known from Gotland have provided some basic information. Analyses of skulls from 109 individuals have shown that 11% bear evidence of traumatic lesions; the majority being male. The head traumas generally show healing and only in one case was the trauma lethal (Ahlstrom and Molnar, 2012). However, none of these injuries were caused by projectile points even though slate, bone, and tanged flint arrowheads are present in the Pitted Ware cemeteries on the island. Type B and C flint arrowheads have been found in graves from Västerbjerjs and Visby. Whereas the location of arrowheads within the graves from Västerbjerjs favour an interpretation as grave-goods, a tanged flint arrowhead (type C) and a bone arrowhead were found in the chest region of an individual buried at the Visby cemetery (Janzon, 1974: 295, plate 24; Stenberger, 1943; Wennersten, 1909). The evidence from Visby strongly suggests that we are dealing with vestiges of a violent encounter in which a type C arrowhead was used.

As Pitted Ware graves are rare outside of Gotland we are usually left with indirect proofs of the possible war-related function of the Pitted Ware arrowheads. As briefly mentioned above, type C arrowheads have been located in four Single Grave culture burials and in two late Funnel Beaker stone-packing graves. Unfortunately, none of these interments contained preserved human bones, which of course makes it hard to prove that these arrowheads were the result of interpersonal violence. However, the location of the arrowheads in the single graves, and in two cases also their transverse orientation compared to the longitudinal direction of the grave, render possible that they were in fact logged in the body at the time when the burial took place (for further details see Becker, 1951: Fig. 20; Davidsen, 1978: Fig. 81; Ebbesen, 1975: Fig. 181).

The fact that only single arrowheads were found indicates that we are dealing with the results of violent encounters. More arrowheads found within a limited space must instead represent remnants of archery equipment (probably originally including bow and quiver) as might have been the case with the above referred burials from Västerbjerjs. At both Västerbjerjs and Visby bundles of bone and slate arrowheads have been recorded in graves indicating the presence of arrows among the grave-goods. Additionally, in a richly furnished Pitted Ware grave from Köpingsvik on Öland containing three individuals, two adults and a child, a bundle of bone arrowheads was placed next to one of the adult’s shin-bone (Schulze, 1978; Stenberger, 1939: 73, 88–90, Figs. 9, 21–22).

The evidence from the stone-packing graves is not as straightforward as that from the Gotland graves or the Single Grave inhumations due to the somewhat uncertain nature of these features. Stone-packing graves are found in northwestern Jutland and are made up of one or more pairs of oval pits (‘graves’) in extension of a roughly rectangular pit termed the ‘mortuary house’ (Fig. 13). The graves and the mortuary house are filled with stones and a stone pavement covers the whole feature. Unfortunately, no direct traces of human bones have ever been discovered but pottery and often well-made thick-butted flint axes, point-butted adzes, and stone battle axes occur in the mortuary houses. Besides, ox teeth have been recovered from more of the graves. Hence, the stone-packing graves likely represent the remains of wagon burials (the ‘mortuary house’) with teams of oxen buried in the pits (Johannsen and Laursen, 2010).

Type C arrowheads have been found in two stone-packing graves. However, in one of these the C-arrowhead was not recovered from a sealed context but does by all accounts come from a disturbed ‘mortuary house’ in which we would expect the deceased to be placed (Jørgensen, 1977: 61–63, 184, 207–208). In the other case a C-arrowhead was recovered from one of the ‘graves’ (Damm, 1989), which according to the interpretation of these features would have contained an ox. Of course nothing conclusive about the function of the two C-arrowheads can be said from the two stone-packing graves but their singly presence within these presumed burials are best explained in the context of violent encounters.

A direct proof of interpersonal violence comprising a tanged flint arrowhead has been provided by a find from Gjerrild on Djursland, eastern Jutland. Here, a stone-slab cist contained successive burials of at least 10 individuals, six adults, one youth and three children, related to the late Single Grave culture, c. 2500–2250 BCE. A 40–50-year-old male bear witness of a healed trepanation and another individual, a 20–30-year-old male, had a type D-arrowhead logged into his breastbone (Fig. 14). The bone shows no signs of healing and the shot is likely to have been lethal. Another D-arrowheads was found next to the trepanised male’s right hip and was probably sitting in the soft parts at the time of burial (Vebæk, 1957). The evidence from Gjerrild clearly illustrates the effectiveness and penetration power of such three-sided flint arrowheads.

It is noteworthy that it is only the three-sided arrowheads (type C and D) that have been found in graves under circumstances indicating that violent encounters had taken place. Furthermore, it is only type C which reaches external length (up to c. 18 cm) and never type A and B. This indicates that this particular arrowhead type was associated with a certain function that made it meaningful to create well-made and prestigious specimens or ‘show-pieces’. Such a function could very well be warfare in which the display and use of certain elaborate and over-sized, but not necessarily very usable, versions of the ordinary weaponry could be part of the competition between groups (Lindman, 1985: 66–69, 89–90; Orme, 1981: 215–217).

Based on the presented analyses and comparison with evidence from later period’s specialised arrowheads I find it reasonable to consider the Pitted Ware arrowhead types (A, B, and C) functional conditioned. Type A must be considered as hunting arrowheads due their relative large width, compared with the length, their clear association with settlements and their numerous presence on these sites as opposed to type B and C. In contrast, type C most likely comprises specialised war arrowheads designed to have high penetration power. In every case when arrowheads have been found in graves under circumstances that indicate a violent encounter the arrowhead has a triangular cross-section (type C or D). The Pitted Ware type (C) is furthermore well made, slender and can reach oversized lengths. Such arrowhead shapes are known from other archaeological contexts to be war arrowheads.

This does not mean that C-arrowheads could not have been used for hunting and A-arrowheads not for warfare but generally we must expect them to represent two distinct types designed for different tasks. Type B most likely represents a multipurposed type of arrowhead as it mixes properties from both type A- and C-arrowheads. The predominance of type B in the megalithic
tombs as well as its concurrent substantial presence on a few settlements underlines this assumption. However, subtype B2 might be affiliated with the group of war arrowheads (or *Weapon-Tools* following Chapman’s terminology) due to its often coarsely-toothed edges, which gives them a ferocious appearance.

7. Socio-cultural implications of Pitted Ware warfare

With the definition of Pitted Ware war arrowheads, it seems obvious to consider the wider socio-cultural implication of this new discovered warring element of the Neolithic. One of the first questions we have to ask ourselves is if we actually face an increase in weaponry with the occurrence of Pitted Ware type C arrowheads compared to previous periods? If this were actually the case, the second question would be – what may have caused the need for such an ‘armament’? In order to address these questions, we will first have to consider the heterogeneous cultural milieu of the early third millennium BC.

In southwestern Scandinavia the first half of the 3rd millennium BC was characterised by four archaeologically-defined culture groups: The late Funnel Beaker culture, the Pitted Ware culture, the Jutland Single Grave culture and the Swedish-Norwegian Battle Axe culture. The two last mentioned belong to the larger group of

![Fig. 13. Stone-packing grave consisting of a 'mortuary house' (C) and a pair of graves (A and B). Vroue Hede I, feature XI, northwestern Jutland (Jørgensen, 1977: Fig. 70).](image)

![Fig. 14. Human breastbone with tanged flint arrowhead (type D) embedded. From a late Single Grave (Corded Ware) stone cist at Gjerrild, Djursland, eastern Jutland (Vebæk, 1957: Fig. 3).](image)
Corded Ware societies that spread rapidly across most parts of northern, eastern and central Europe during the early 3rd millennium BC.

The Funnel Beaker period is usually believed to have come to an end around 2800 BCE, when Single Grave communities introduced individual interments in small burial mounds, cord-decorated beakers and new types of stone battle-axes to the Jutland Peninsula. However, radiocarbon dates show that the late Funnel Beaker phase continued for another c. 200 years (until 2600 BCE) in eastern Jutland and on the Danish Islands. As mentioned earlier, substantial Pitted Ware sites have hitherto only been recorded in northern and northeastern Jutland (Iversen, 2010, 2015). Considering the cultural situation, there are obvious potentials for a tense socio-cultural situation with three different groups occupying a restricted geographical area simultaneously. This is most clearly seen on the Jutland Peninsula. Even though the subsistence economic basis differed between the three cultural groups we must expect conflict to be a potential consequence of this heterogeneous cultural patchwork.

The question is if the occurrence of type C arrowheads represents an increase in weaponry compared to the previous Funnel Beaker period? Additionally, how warring was the 4th millennium BC compared to the early 3rd millennium BC? And did the type C arrowheads represent a new type of arrowhead at all? There can be no doubt that the elongated and straight form was new in flint but it clearly resembles long and slender tanged bone arrowheads of the 4th millennium BC. Thus, it might be that the Pitted Ware C- arrowheads were more or less just a flint version of an already present arrowhead type known from the Funnel Beaker culture. Given the perishability nature of bone we do not have many bone arrowheads from southern and western Scandinavia. However, a few significant finds indicate that such bone arrowheads were in fact specialised war arrowheads existing concurrently with the transverse flint arrowheads, the only recognised type of flint arrowhead of the Funnel Beaker culture. That bone projectile points were used in violent encounters is also known from the Baltic Late Mesolithic, Neolithic, and Copper Age (Chapman, 1999) and from the abovementioned grave find from Visby holding a type C flint arrowhead and a bone arrowhead.

The most prominent find of bone arrowheads from the Scandinavian Neolithic is that of the Porsmose bog in southern Zealand. Here, one arrowhead has penetrated the nose section of a man whereas another has gone through his breastbone (cf. Fig. 4). The skeleton has been radiocarbon dated to the mid-fourth millennium BC via the skeleton (Becker, 1952; Bennike and Ebbesen, 1987: 101). A similar type of arrowhead was just recently recovered during excavation in the Salpetermosen bog in northern Zealand. In this case a 15 cm long arrowhead (Fig. 15) was found together with human remains of a 25–30 years old male dating to c. 3600–3500 BCE who had suffered an unhealed blow to the head. The arrowhead was not logged into any of the bones but the find context make probably that the man was hit by the arrowhead as no other artefacts were found in relation to the deceased (Jørgensen and Hagedorn, 2015). A fragment of another tanged arrowhead of bone was found in a dolmen at Stasevång, also northern Zealand, together with three skeletons. Similar arrowheads have been recorded from other parts of eastern Denmark, though all stra...
violence occurred between Pitted Ware and Single Grave groups is indicated by the aforementioned Single Grave culture interments containing single Pitted Ware type C arrowheads.

The question is how serious these violent encounters actually were, are we talking about actual warfare or rather transient raids and periods of warmongering. No evidence has hitherto been presented indicating that substantial warfare took place resulting in battlefields, mass graves or the like (cf. discussion on Neolithic warfare above). Thus, from the archaeological record at hand, we must expect violent encounters to have taken place in the form of raids or short-lived feuds between different Single Grave and Pitted Ware groups, presumably in areas of mutual interests. In this context, it is worth noticing that the four single graves containing type C-arrowheads all are located in the border zone between Single Grave and Pitted Ware areas in northern and northwestern Jutland just south of the Limfjord. In fact, three of the graves are among the most northerly recorded single graves intruding into what must be considered Pitted Ware ‘heartland’.

8. Production techniques, contacts, and group identity among the Pitted Ware people of northeastern Denmark and western Sweden

Above I have argued for a functional and task specific explanation for the three typological distinct main Pitted Ware arrowhead types. However, a significant feature of the A-arrowheads is the diverging chipping of the tang that has resulted in a typological division into subtypes A1-3 (cf. Fig. 3). As already pointed out, such differences in production techniques could be assumed to have been carried out randomly as neither functional nor emblematic reasons are obvious (but see Malmer, 1969 for discussion of the arrowheads from the Jonstorp sites). However, the distribution of the various sub-types is far from random as different sites are predominated by certain sub-types. How should we then explain the different production techniques visible among the A-arrowheads?

Just such aspects as production and technique constitute essential links between practice and material culture. Material styles, or what can basically be described as ‘types’, are in fact the objecification of techniques and production – the result of ‘ways of doing things’. Hence, material style is the outcome of a production process (chaine opératoire) and the producer’s ideas about the final product (schema opératoire) (Pelegrin, 1990). As techniques, like other social activities, create and are created by the habitus of their executor(s), the material style that comes out of the production process must include group identity as an active component – but not necessarily a direct intentional display of such an identity. In this context habitus should be conceived as the commonly shared dispositions and perceptions of the world shared by a group of people that result in congruent behavioral patterns (Dietler and Herbich, 1998; Iversen, 2015: 141–142 with references; Lemonnier, 1993; Lucy, 2005).

That cultural and identity-shaping aspects can be connected to archery equipment is evident from more ethnographic-archaeological studies. Observations among modern hunter-gatherers show how the making and using of arrows can take up ontological dimensions to those who engage in these activities. Thus, the making and using of bows and arrows can be inseparable from the self-concept of tribal members and individual identity can be displayed through the arrows and the associated production process – even though arrows immediately look the same to outsiders. Furthermore, culturally inflected meanings of arrows and bows can be reflected in rituals and world views and find expression in what we can broadly refer to as ‘hunting magic’ (González-Ruibal et al., 2011; Levi, 1998).

The vast majority of the Pitted Ware archery equipment has not survived until today. Bows, bowstrings, arrowshafts, feathers, etc. are all elements that could have contributed considerably to uncover the social meanings of arrows and bows within the Pitted Ware societies had they been preserved and uncovered. The only things left of the presumable rich and significant Pitted Ware archery equipment are the arrowheads. However, even insignificant differences in the production technique of the A-arrowheads, such as diverging chipping of the tang, can hint at the existence of different social groupings among the producers of the tanged arrowheads. Other studies have shown that it is often the proximal end of lithic arrowheads that contains the highest degree of variability and is therefore suitable for studying cultural and technological variations (Edinborough et al., 2015 with references; Saintot, 1998).

It is the assumption of this paper that the A-arrowhead sub-types reflect different, and probably unconscious, ways of producing arrowheads instead of having a functional explanation. Following this line of thought certain ways of doing things, or rather certain practices or ‘craft traditions’, can, even though differences are unintended, reflect different communities of practice (Lave and Wenger, 2003: 97–100). In this way, the typological subdivision of the A-arrowheads can help us to define different craft traditions characteristic of different social groupings within the southwest Scandinavian Pitted Ware complex.

Fig. 16 shows the distribution of A1, A2, and A3 arrowheads on larger Pitted Ware sites in northeastern Denmark and western Sweden. As it appears, the west Swedish sites are dominated by subtypes A1 and A2 whereas type A3 makes less than 20% of the A-arrowheads. The same pattern can be seen on the small island of Hesselø in the Kattegat where type A1 predominate and A3 hold a share of only 10%. In comparison, the situation is rather different on another Kattegat island, Anholt, and on the rich east Jutland sites of Kainsbakke and Højvang 1 where subtype A3 makes more than half (up to 66%) of the recorded A-arrowheads. In addition, the A3-arrowhead is the dominant subtype on the Smedegaarde site. However, the small Musefælden site resembles the picture known from some western Swedish sites rich in A1-arrowheads.

Thus, the A-arrowhead subtypes are very unevenly distributed with subtype A3 dominating eastern Jutland and subtypes A1 and A2 predominating the western Swedish sites. This regional distribution indicates that certain production schemes were preferred when producing tanged A-arrowheads in western Sweden and eastern Jutland respectively and that we face two different ways of producing tanged arrowheads roughly divided by the Kattegat. In this context the south Norwegian Auve site stands out with a distribution resembling that seen on the large eastern Jutland sites.

When considering such regional differences, we also need to look more into the arrowhead material and not only the distribution of types. In Table 3, I have listed the median length and width of all type A-arrowheads and of each of the arrowhead subtypes from each site. If we take a look at the A-arrowheads in general, we see clear regional differences partly corresponding to those seen in the distribution of subtypes. All south Scandinavian sites have median lengths of around 50 mm or more and widths of 14 mm or more whereas the west Swedish sites and the Auve site have median lengths of maximum 45 mm and median widths of maximum 13 mm. Data from undeterminable A-arrowheads and A0-arrowheads lacks from the Jonstorp sites but judged from the dimensions of the A1, A2, and A3 subtypes, the Jonstorp material likely corresponds to that of the Danish sites.

These regional differences do not reflect the two different landscapes. Whereas southern Scandinavia is rich in good quality flint, western Sweden and southern Norway generally lack natural flint resources just like eastern Sweden that saw import of south
Scandinavian flint during the Middle Neolithic mainly in the form of numerous flint axe rough-outs (e.g. Olausson et al., 2012).

Returning to Table 3 and the length and width distributions of subtypes A1-3, it appears that in all cases, except for Kainsbakke and Auve, the A3-arrowheads are the longest and often also the widest of the three subtypes. On Kainsbakke subtype A2 is the longest, however, only two such pieces have been recorded, which makes the result statistically uncertain.

In overall terms, the A3 subtype, that dominates the eastern Jutland sites, is the longest and generally also the widest among the A-arrowheads. If we assume that the A3 subtype represented an eastern Jutish production scheme (schema opératoire) – a certain locally favoured way of producing tanged hunting arrowheads, then the presence of subtype A3 on the west Swedish sites might indicate the existence of exchanged production schemes across the Kattegat. In this context it is significant that the enhanced length of subtype A3 compared to subtype A1 and A2 generally follows the type. At e.g. the rich sites of Fiskevik and Jonstorp in western Sweden the median length of subtype A3 is considerably bigger than the lengths of subtypes A1 and A2 (see Table 3). Thus, when making A3-arrowheads in western Sweden the flint knappers applied a greater size compared to the, for these areas, ordinary arrowheads (subtypes A1 and A2).

This exchange of production schemes worked both ways, the application of subtype A3 in western Sweden and A1 and A2 in eastern Jutland, and was probably the result of regular group contacts between Pitted Ware hunters across the Kattegat as also indicated by similarities in the pottery.

Fig. 16. Distribution of tanged arrowhead subtypes A1–3 on larger Pitted Ware sites in Denmark, western Sweden and southern Norway. Numbers refer to Fig. 1. As not all of the excavated material from each site was readable accessible for study, information on the number of subtypes has been supplemented/specified from other recordings. The following figures indicate the number of determinable type A arrowheads (subtypes A1, A2, A3) on each site: Hesselø (73, data from Iversen, 2010: 36, no. 17), Smedegaarde (121). Anholt (31 data from Iversen, 2010: 36, no. 3), Koral Bro (76), Kainsbakke (70), Musefælden (15), Augaard I (48, data from Iversen, 2010: 36, no. 7), Heijvang 1 (250), Jonstorp sites H, M, M2-3 [386, Malmer, 1969: Table 10], Jonstorp RA [177, Malmer 1969: Table 10], Fiskevik (264), Bövik (154), Dafner (6), Ånneröd (13), Auve (62, Østmo, 2008: 82). Two sites (Læsø and Liva) held too few A-arrowheads to be included in the analysis.
After the refutation of a chronological explanation of the Pitted Ware arrowhead types (A, B, and C) functional and social perspectives are proposed. The study of c. 1500 tanged arrowheads from Denmark and western Sweden have revealed that real differences exited in the length and width proportion of the different types of tanged arrowheads. Type A is relatively short and wide whereas type C is long and slender. Type B forms a hybrid of the two. This division fits defined categories of hunting, war, and multifunctional arrowhead types known from later prehistoric periods. Coupled with the archaeological evidence of task specialisation as seen in graves it seems obvious that the Pitted Ware arrowhead types are functional conditioned representing two main categories: hunting arrowheads (type A) and war arrowheads (type C).

Differences in the production techniques subdividing type A into A1, A2, and A3 arrowheads cannot be explained as random, functional, or emblematic. Instead the subdivision of type A-arrowheads represent different production schemes (schema opéraire) among Pitted Ware social groups in northeastern Denmark and western Sweden respectively causing slight and at first sight insignificant differences in the production of hunting arrowheads. However, the exchange of production schemes across the Kattegat indicates regularly contacts between the Pitted Ware groups of southwestern Scandinavia.

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