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On the War-Path:
Terrestrial Military Organisation in Prehistoric Denmark

Abstract: Through the use of vector-based GIS-technology, quantitative methods, historical and traditional archaeological sources, the authors point to a close relation between the location of Iron and Viking Age finds, sites, and structures related to warfare and the Danish highway network as it is known from the late eighteenth and early nineteenth centuries. It is argued, that this relationship reflects a system of military organisation embedded in the settlement structure and that its roots can be traced as far back as the early first century BC.

Introduction

For a long time the concept of war has been understated in Danish archaeology. During the 1970s and 1980s, the focus was on settlement archaeology, rural economy, trade, and social issues. Mildly exaggerated, one could say that society was described as an essentially peaceful cosy Shire inhabited by pipe-smoking, garden tending hobbits, living in oblivion of the chaotic world outside and only occasionally harassed by external threats. Only in recent years we have witnessed warfare discussed as a prime mover in the formative process of the prehistoric society of Denmark (Otto / Thrane / Vandkilde 2006). This trend is also visible in the study of Iron Age and Viking societies, which increasingly are perceived as *martial societies*, i.e. societies in which preparation for war and conflict was imbedded in the social organisation, or even that social organisation simply *was* military organisation (Hedenstierna-Jonson 2006).

Admittedly, some insights in the structure of prehistoric armies have been uncovered (Ilkjær 1990; Müller-Wille 1977; Näsman 1991; Pedersen 2004). However, attempts to produce a quantitive synthesis of these results and results from the study of the apparently peaceful daily life in the rural settlements are very scarce (Ringtved 1999). Additionally, the study of maritime aspects of military organisation in Northern Europe has achieved many interesting conclusions on maritime warfare (Crumlin-Pedersen 1991; Graham-Campbell et al. 2001; Jørgensen 2002; Skoglund 2002; Varenius 1998). At the same time however, the maritime focus has defined a limited scientific horizon *per se*, focusing on ships, harbours and coastal zones. In this paper, we will focus on non-maritime (terrestrial) aspects only.

A central aspect in the study of war and conflict inland are graves containing weapons and/or riding gear. In previous studies, the spatial distribution has been illustrated by dot-maps. As the background information of the dots, natural – not cultural – parameters, such as coastline, height above sea-level, lakes, and water-drainage were chosen. One of the benefits of GIS-technology is the ease with by which all sorts of geographical information can be overlaid. Compared with paper-based information, GIS-technology offers superior features for spatial exploratory data analysis. The conventional paper-based information management may be the primary reason why nobody seems to have noticed that the distribution of graves of horsemen and warriors in the Iron Age and Viking period strongly associate with the network of major roads known from the end of the 18th century. The aim of this paper is to confirm the observed correlation statistically and to discuss inferences concerning the military organisation in prehistoric Denmark.

The Terrestrial Infrastructure of the Martial Society

From the earliest written sources describing the Germanic tribes, the sources unanimously tell us of societies with an unusually martial ideology. This is clear from the accounts of Caesar, Tacitus, Ammianus Marcellinus or Vegetius, who for instance states:

Even today the barbarians think this art [of war] alone deserves their attention; they are sure that everything

Fig. 1. Example of an original map dating 1786 from the area around Jelling. The land-use and road-systems of that time are clearly marked. The N-S running main road W of the small lake has a special signature. Lines connecting prehistoric (probably Bronze Age) grave-mounds are also visible, as the mounds (as well as church-towers) were used as triangulation points by the surveyors.

else either depends on this art or can be obtained by them through it. (Vegetius: Epitoma Rei Militaris III; 10. From MILNER 1993, 86)

The accounts of continuous Viking assaults on Anglo-Saxon England and the Frankish realm is probably only a continuation of this ideology of war. In the following we will approach the question of the complexity of Iron Age military organisation in Denmark in a long time perspective. This is done in a statistical, logistic and landscape perspective, which will reveal fragments of a complex military organisation of society.

The Relative Permanence of Road Networks

Armies of the size we see reflected in the war-booty collections of the Roman Iron Age and indeed in the Viking Age, cannot have operated without inland roads. Although we can demonstrate roads in the archaeological record – ranging from gravel-filled wheel tracks to stone and plank built roads – the evidence is most often from river crossings or other protected locations. They are sparse and they are not

helpful in reconstructing the communicative lines of the prehistoric landscape. On the other hand, road systems are commonly and rightly regarded as one of the most stable human artefacts. There are good reasons for this being so, culturally as well as naturally. A cultural reason is that roads link settled areas: roads and settlements mutually determine their position in the landscape. A natural reason is that road systems relate to the geomorphology of a given area, which in a human perspective is a very static property of the landscape. Mountain areas for instance are often practically passable through valleys only, which essentially define natural water drainage systems. This relationship between water-drainage vs. road systems is quite the opposite in flatland areas, where ridges/watersheds define the most cost-efficient location for non-local traffic (MØLLER 2005).

Historic Road Systems

Around 1800 AD the Danish Royal Academy of Sciences and Letters produced a series of maps which are considered the first reliable geodetic representa-
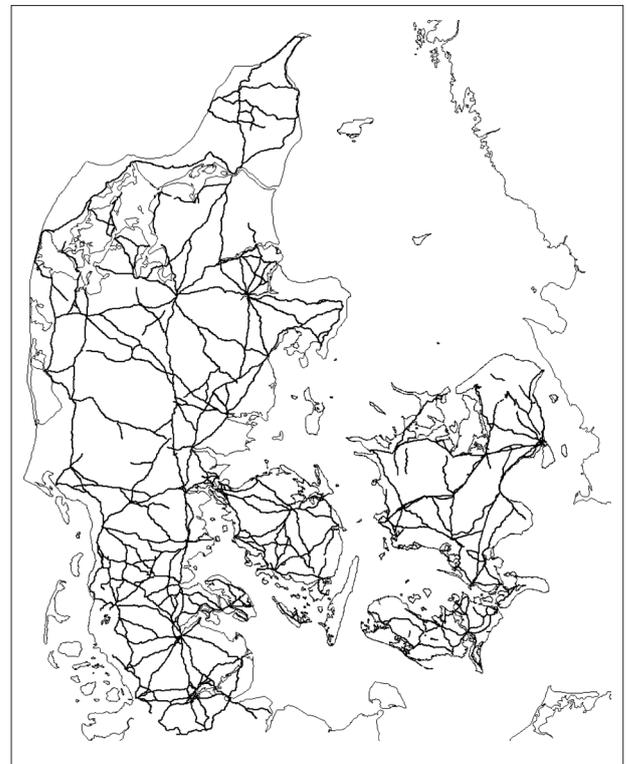

Fig. 2. Main roads in Denmark and Schleswig around 1800 with contemporary coast-lines as depicted on maps produced by the Danish Royal Academy of Sciences and Letters.

tion of Denmark (KORSGAARD 2004). The maps were produced in a scale of 1 : 20,000 *(Fig. 1)*. Subsequently they were reduced to the scale of 1 : 80,000 and 1 : 120,000 printed on copper-plates. The production process took place from 1762 to 1820. The use of this source in a modern GIS-system was made possible by one of the authors of this paper, Jens Andresen. In 1997 he developed a method to geo-reference these and other historical maps. He requested a complete list of the geographic positions of Danish church-towers from the Danish Ordnance Survey (KMS). Because a substantial part of the churches were used as geodetic reference points on the old maps too, they easily can be identified and used as reference points. This made it possible to digitize (vectorize) features from the maps and transfer the features to geo-referenced map-layers in a GIS-system. The coastline and the highways of Denmark on the map *(Fig. 2)* were created with this technique.

The resulting map of historic road networks is a quite heterogeneous historical source. It is very noticeable that the latest mapped area of the duchy of Schleswig displays a much denser highway-network than the rest of the Jutland peninsula. This causes the suspicion that the surveyor mapped some byways as highways. Also, some local roads might have been "upgraded" in this period due to royal provisions dating 1784 (Duchy of Schleswig) and 1793 (Kingdom of Denmark) (KRÜNITZ 1773–1858; MØLLER 2005). This provision resulted in the improvement of the highway-system which also straightened out former roads. Either version of the highways was depicted on partly revised copper-plates, clearly visible on the island of Zealand on *Fig. 2* (DAM 2005, 41). By consulting the originals in 1 : 20,000 some of these "new artefacts" could be eliminated. What is left is the closest we can get to the medieval highway-system, which generally speaking connected market towns, harbours and other important locations but by-passed rural settlements, which were fenced at night.

Dykes and the Hærvejen

An important, but less investigated type of structure in Danish Iron Age research are the so-called dykes. The few dated fall in the period of the first to the early fourth centuries. The dykes are characterised by V-shaped ditches, an earthen rampart and a palisade often stretching several kilometres closing passages through wetland areas. The dykes have an interesting distribution, since they form a straight line up through the middle part of Jutland consistent with the so-called *Hærvej*, the major medieval road used for oxen export from Denmark to Germany and the Netherlands (JØRGENSEN 1988; RINGTVED 1999; JØRGENSEN 2003, see *Fig. 3*). The name of the road, as well its association to the dykes, is not that peaceful. The road was located at the main watershed of the Jutland peninsula, and it was also the main channel for the transport of land-based troops in times of war. It ran through sparsely populated areas ending at the most southern part of our study area – the *Dannevirke* near present-day Schleswig. The earliest dated phase is from the early part of the eighth century, but there is an earlier undated phase. This was the focal point controlling essentially all kinds of north-south traffic to and from the Jutland peninsula at the *Karle-gat* – the gate of the warriors. Interestingly, name and function seem paralleled in the anglo-saxon *here-path*, the route primarily used by campaigning (Viking) armies (HALSALL 2005, 148).
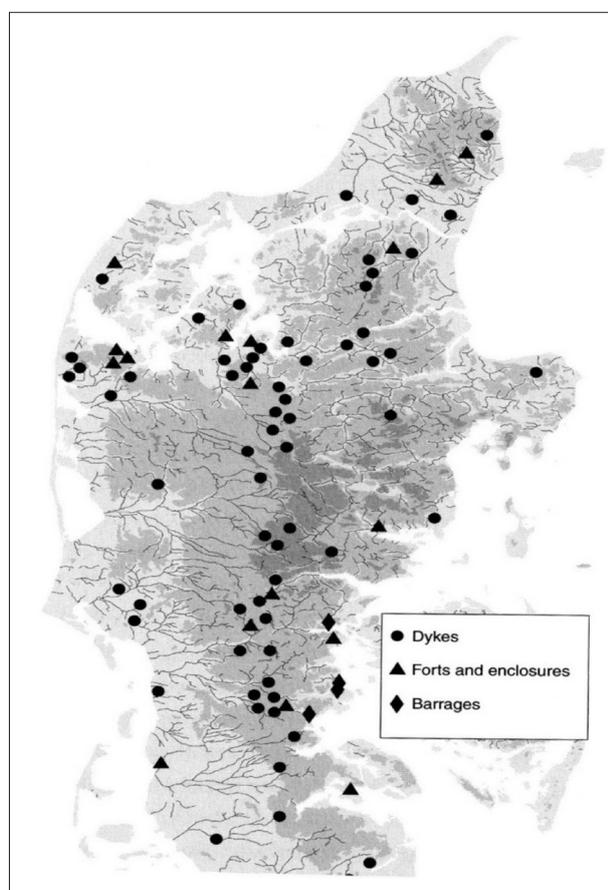

Fig. 3. Dykes, barrages and other defensive features (after RINGTVED 1999). Approximate position of the structures.

Iron Age War Booty Offerings and Historic Highways

Already in the early Iron Age we find the first offerings of war booty that become common in predominantly the late Roman and Migration period. Approximately 20 locations containing war booty offerings are known and typically each has numerous, up to five depositions, covering the whole period in question. The finds are characterised by a large amount of weapons, personal equipment for warriors, tools, often wagons or boats, and other artefacts needed for an army in the field; commonly, the objects are ritually destroyed and are always found in lakes or bog sites. By reference to the writings of Caesar, Tacitus and Orosius, they are interpreted as gifts of gratitude to the gods after successful victories over invading armies, and the equipment is thus seen as the equipment belonging to a beaten army, at some locations of at least 200–400 men (ILKJÆR / LØNSTRUP 1982). Compared to the distribution of the medieval highway network on *Fig. 4*, we find a striking association between war booty offerings and the highways. Only very few sites are not located nearby the roads.
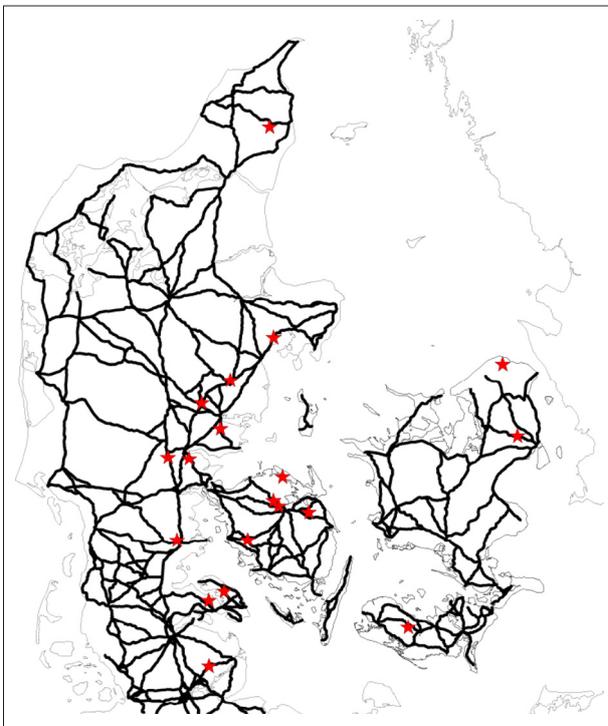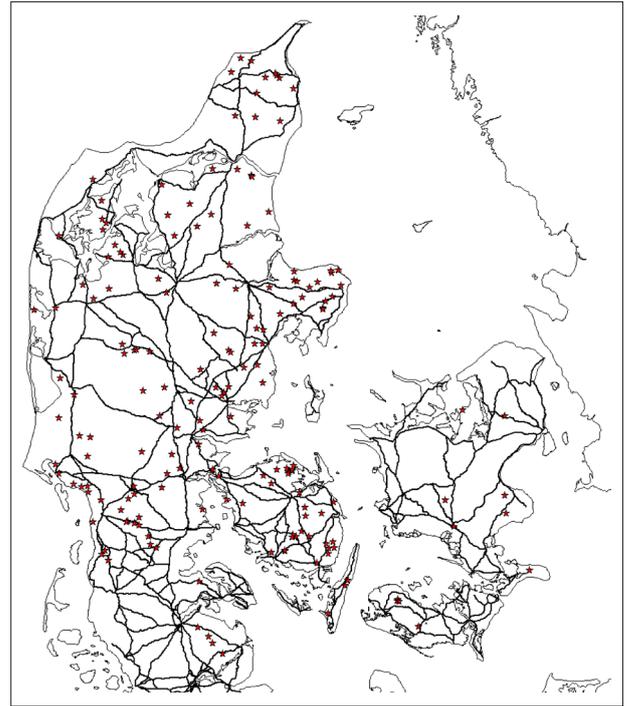

Fig. 5. Burials with weapons from the Iron Age and historic highways (Burial information mainly from ILKJÆR 1990 supplied by Rasmus Birch Iversen).

Fig. 4. War booty offerings from the Iron Age. Exact positions. Highway network simplified.
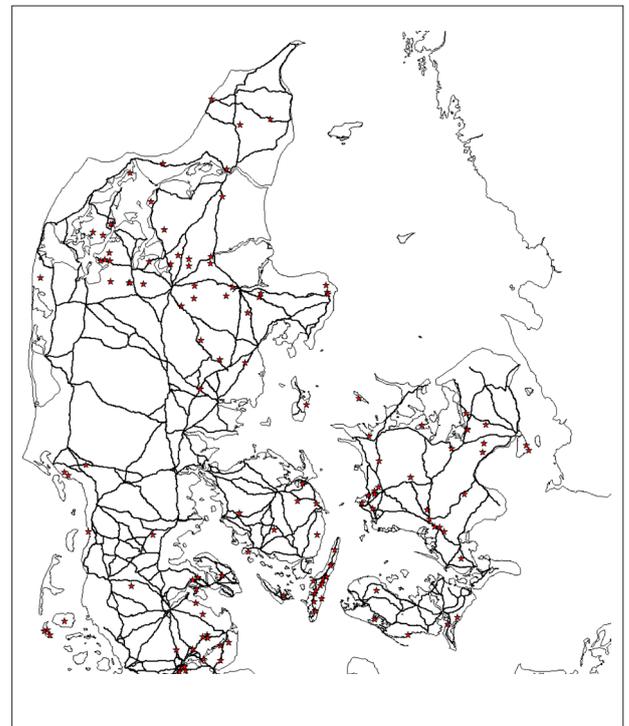

Fig. 6. Burials with weapons and/or riding gear from the Viking period and historic highways (Burial information from KLEIMINGER 1993; EISENSCHMIDT 2004). Uncertain graves are excluded.

Prehistoric Weapon Graves and Historic Highways

In spite of the clear signs of earlier warfare the Iron Age weapon graves only appear as part of anonymous burial customs towards the end of the Pre-Roman Iron Age, during the last 100 years or so BC. In this initial phase they are very common, which is also true for the first half of the second century and to a degree again in the second part of the third century. In the fifth century we only know of one grave field with weapons, and after 500 AD and for the next 250 years only four weapon graves are known from all of Denmark *(Fig. 5)*. This is due to the fact that grave fields from this period are missing almost completely. Weapon graves reappear as a common trait in the Viking Age in the late ninth and the first half of the tenth century clearly discernable into two categories: weapon graves with riding equipment, commonly rich chamber graves, and more ordinary weapon graves without association to horse gear *(Fig. 6)*.

The weapon grave custom also shows a distinct regional distribution. From the outset, weapon graves are almost totally absent on the island of Zealand until the Viking Age, whereas the weapons disappear from graves on the island of Funen before the middle of the third century. As in the previous cases, we find an overall visually discernable association of the archaeological find-spots and the historic highways. A more rigorous test is needed in this case, so we adopted the method described by Hodder / Orton (1976) for the statistical analysis of distances between linear features and point phenomena. In contrast to Kvamme (1990; 1992), who advocated a raster-based GIS solution, we decided
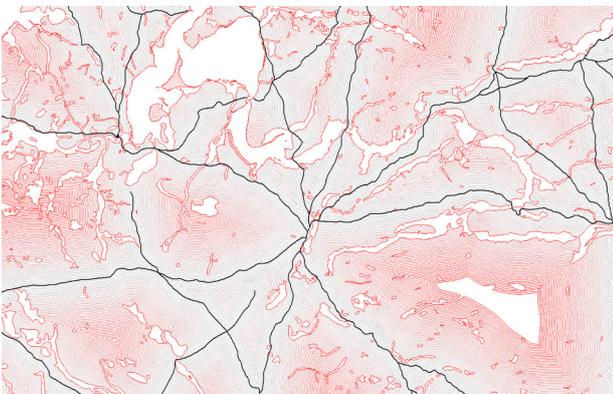

Fig. 7. Buffer-analysis of the highway-network. The distance between buffers is 200 meters. Sea, lakes and larger wetlands are subtracted.

Fig. 8. Cumulated percentage of distances from burials to nearest highway. Cumulated percentage of buffer-areas around historic highways. Jutland only. D_{max} of Iron Age = 0.154 with N = 163. D_{max} of Viking period = 0.212 with N = 65.

to use a vector-based solution. The advantage is that vector operations are much more accurate and scalable without loss of accuracy.

A short description of the operative part follows here: The position of the graves from published sources was collected from www.dkconline.dk. An unedited version of digitized highways from Jutland was used for the computation of the background information (the area covered by the buffers around the highways). The buffers in 200 m increments were created and their area computed in MapInfo *(Fig. 7)*. Open water and larger wetlands were subtracted, as no grave can be placed there. Only graves from Jutland were considered, in order to minimize the influence of coastal defence systems. The distance from the graves to nearest highways was computed as described by Reilly (1988) and was performed with a freely available program developed by Peter Jensen in dotNet. The bin-size of the cumulative percentage of distances was set to 200 m like the background information *(Fig. 8)*. The Kolomogorov-Smirnov one sample test was made in Microsoft Excel. This resulted in a confirmation that the association between graves and highways is statistically significant at the 1% level.

Highways and Weapon-graves – Where is the Link?

Due to space limitations, data bias issues cannot be thoroughly discussed, although they have been investigated very carefully. Since many graves are found in gravel and gravel is used for constructing highways, this may influence the observed asso-

ciation. Furthermore areas near highways are more likely to have a higher rate of recovery of archaeological material due to construction activities. In a previous study it has been documented, that there is no spatial correlation between Iron Age graves and large-scale gravel mining (Hedeager 1985). A test on graves containing Roman imports produced no association in their spatial position to highways (D_{max} = 0.085. Critical value at the 5% level with N = 80 is 0.152).

In medieval times the highways were used for non-local transportation and communication. The eldest Danish legislative sources from 1241 explicitly differentiate between local roads and *kongens hærstrate* – the king's armies street, translated to modern Danish as highway – *landevej* (Kroman / Iuul 1967; Schovsbo 2002). This is exactly paralleled for instance in England "cyniges heiweg" and Germany "Königs-Straße" (OED 2007; Krünitz 1773–1858). The maintenance of these roads was in medieval Denmark delegated to local peasants, since there was no public administration to take care of those matters. From the 16th and 17th century it is known, that peasants were not allowed to use these roads in general – unless the king or someone under his authority claimed their right for transportation and in which case the peasants were regarded as tools, not independent agents.

From our analysis it seems as if the medieval highways have their roots in prehistory. They seem to have served as a place of assembly in times of peace and in times of war. The traffic along these roads was watched over by armed men living in settlements at or nearby the road system. These settlements seem to have been fortified in the older Iron Age, while the settlements from about 150 AD and onwards seem to have been unfortified, indicating that internal conflicts were taken care of by some sort of legislation or by superior powers.

Recent investigations in ancient military history add to the subject (Speidel 2004). A certain type of roads amongst the Roman *Via Publicae* was named *Via Militares*. These were highways frequently used by the Roman military, primarily for communication purposes. If no public houses – *Taberna* – were erected along the streets, people living at or nearby had the obligation to grant military persons free meals and lodging – the so-called *hospitium*. Excluded from these obligations were senators and present and former armed men. As in previous cases, we find exact parallels in medieval Scandinavian sources. The *hospitium* is called *gæstning* (as in English *guest*) in medieval Scandinavia and nobility and other armed men are excluded from the obligation to grant it (Danstrup 1956–1978).

Combining sources from separated disciplines and subsequent analysis with means of GIS-techniques and quantitative methods thus seem to qualify aspects of military organisation in past societies.

Acknowledgements

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