NEW TECHNOLOGY OR ADAPTATION AT THE FRONTIER? BUTCHERY AS A SIGNIFIER OF CULTURAL TRANSITIONS IN THE MEDIEVAL EASTERN BALTIC

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Abstract

This paper focuses on a number of examples of cut marks on animal bones from a range of sites associated with the cultural transformations in the eastern Baltic following the Crusades in the 13th century. Recorded observational and interpretational characteristics are quantified and explained through more detailed selected case studies. The study represents a pilot project, the foundation for a more detailed and systematic survey of a larger dataset within the framework of the ecology of Crusading project. Relatively clear differences between sites are observable on the basis of the cut marks; however, the initial trends do not suggest a straightforward connection between butchery technology and colonisation in the east Baltic region.

Key words: zooarchaeology, butchery, technology, Crusades, colonisation, Teutonic Order, eastern Baltic.

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Introduction

Some of the most important socio-economic changes to occur in the frontier societies of medieval Europe (the Near East, the eastern Baltic and Iberia) arose as a consequence of crusading, and the accompanying processes of colonisation and cross-cultural interaction (Bartlett 1994). Archaeologists have explored multiple aspects of these processes (Boas 1999, 2006; Ellenblum 1998; Pluskowski 2012), and whilst historians have investigated military provisioning and the economies of these frontier societies, there has been relatively limited interest in the material culture of resource exploitation and responses to local environments (Pluskowski *et al*, 2011). As a result, more pragmatic aspects have been neglected or under-represented. The part played by efficacious food provisioning and the impacts on local agrarian environments constitute an important line of inquiry, as they underpin the success or failure of the colonisation process at the frontier. The crusader states became defined by the activities of the military orders, particularly the Templars, Hospitallers and the Teutonic Order. These institutions combined monastic and military characteristics in a paradoxical embodiment of the medieval Christian ideology of holy war. In the context of foodways, monastic and military groups, and the military orders, had specific attitudes toward alimentation, particularly meat. Meat, derived predominantly from cattle, but also from pigs, sheep and goats, formed an important component in the provisioning of crusading armies, as well as the indigenous and colonising rural and urban settlements within these frontier societies (Ervynck 2004; Pluskowski 2010).

While we are keenly aware of the significance of *what* was eaten by different groups, both incoming and indigenous, we often overlook *how* it was processed and prepared, perhaps assuming a normative approach to butchery and the treatment of animal carcasses. However, the technological and technical aspects of food culture provide significant insights into aspects of food culture, processing, and the diversification of, and specialisation in, various trades. Moreover, the process of colonisation is often associated with the introduction of different technologies, such as metalworking, building styles and heating systems (e.g. Mugurēvičs 1990, on the colonisation of Livonia following the crusades). These introductions may have been restricted to the colonists, and the extent to which surviving indigenous communities adopted selected cultural elements from the incoming population remains a subject of intense debate. One technology which is often neglected or generalised in discussions of cultural interaction, assimilation and hybridisation in colonising contexts is meat processing. The preparation of animal carcasses for consumption and industrial use is strongly linked with tool use, the demands of the market, distinct ideologies associated with culinary traditions, and values attached to different species. Assuming these are directly translated from the colonists' homelands, how do they relate to indigenous practices? To what extent does the introduction of new practices result in chang-

es beyond the implanted community? The process of colonisation varied between the three main frontier regions of medieval Europe, which were theatres of crusading, but in virtually every case there was some form of sustained, protracted interaction between indigenous and incoming populations. In Prussia, it resulted in the complete assimilation of the indigenous culture, and the eventual extinction of the local Baltic language. Elsewhere, parallel and composite cultures developed. This trend has been referred to as 'Europeanisation' and the transmission of West European practices and values, linked to the idea of a supra-regional society united by a common set of values defined by Catholic or Latin Christianity. The crusading movement was certainly pan-European, and in this respect the issue of meat processing, which can be investigated from abundant animal bone fragments recovered from a range of sites, provides a new window on to intercultural exchange within frontier societies. Using a techno-cultural approach, this paper addresses the issue of socio-cultural and economic transformation in frontier sites, by providing a model for understanding the many facets of carcass processing.

Drawing on case studies from selected sites in the eastern Baltic, it questions the extent to which new methods for processing were introduced, and whether this coincided with evidence for new technological advancements. It also addresses the outcomes and consequences, and the drivers that were a catalyst for the observed transitions. In other words, were changes in carcass processing a result of the introduction of larger, or simply *more*, animals? Ultimately, by careful analysis of carcass processing marks, this study provides an important contribution to understanding the movement of people, their ideas and technology in the formation of frontier societies. It is not intended as a comprehensive survey, but rather as a template for more detailed, comparative studies within and beyond medieval Europe.

The problematic transition from pre-Christian to Christianised societies

Indigenous groups in the east Baltic had been the target of missionary activity and military campaigns framed in the language of holy war in the 12th century before the onset of papally sanctioned crusades, which were sustained throughout much of the 13th century. From 1231 to 1283, the Teutonic Order and its allies led crusades against Prussian tribes in a region corresponding to modern northeast Poland, the Russian Kaliningrad Oblast and the southwest of Lithuania. The crusades in Latvia and Estonia, regions which came to be known as Livonia, had begun earlier. Missionary efforts from 1180 led to conflict with local tribes, and prompted the arrival of crusading armies. Bishop Albert, with the collaboration of tribal allies, organised crusades in the early years of the 13th century, forming the Sword Brothers, a local military order which would spearhead the military conquest of the region. Following the disastrous Battle of Saulė, the remnants of the Sword Brothers were incorporated into the Teutonic Order in 1237, often referred to as the Livonian Order. Northern Estonia and its islands were conquered by Danish armies, and partitioned between King Valdemar and Bishop Albert in 1222, with the territory subsequently acquired and ruled by the Livonian Order from 1346 (Urban 2003). In both Prussia and Livonia, the Order took over these tribal territories and established a theocratic state, held as a papal fief. Throughout the 14th century, the Order conducted hundreds of military expeditions (*reisen*) in the manner of an 'eternal crusade' from its Prussian and Livonian territories against the Grand Duchy of Lithuania, which remained pagan and independent. In 1309, the Order annexed Christian Gdańsk (Danzig) and Pomeralia (the eastern region of Pomerania), maintaining its expanded state until the 15th century, when successive wars with Poland and Lithuania resulted in the gradual shrinkage of its territories, and its eventual dissolution as a crusading institution in 1525 in Prussia. In Livonia the Order was dissolved in 1561. Although the crusader states in the east Baltic were dominated by the Teutonic Order, they also included territories belonging to bishops, which were particularly extensive in Livonia.

During the crusading era, the Teutonic Order organised itself in a specific way, arranging its activities around particular defensive structures referred to as *castra*. These took a number of different forms, initially as timber and earth strongholds, and later as brick and stone castles, although timber structures continued to be built into the 15th century (Poliński 2007). The conquered tribal regions were reorganised under a system of commanderies, controlled by the largest castles, effectively functioning as fortified monasteries. The construction of fortified structures was accompanied by the development of colonising settlements, which were largely laid out and governed under German town laws. A number of these grew into flourishing urban centres actively engaged in international trade. The process of colonisation accelerated after the crusading era, particularly throughout the 14th century. However, it was far less pronounced in Livonia than Prussia, where a significant proportion of the indigenous population survived. In Prussia, colonisation by Polish and German settlers gradually resulted in ethnic reconfiguration and the complete disappearance of the indigenous culture. By contrast, no mass colonisation occurred in Livonia, where the incomers were gener-

ally restricted to a small number of towns and castles, resulting in a newly stratified society governed by a German (and in the north Danish) élite.

The Order's monastic castles dominated the conquered landscapes visually, but they centralised and concentrated military and economic activities. Of these, the provisioning of livestock and dead-stock underscored the success of the campaign, aimed at extending political, military and cultural hegemony. In the case of livestock, there were animals that were fundamental to the success of military expeditions, the horse, and animals that fed the movement of the crusading hosts and colonists, cattle. While cattle were a critical food species, horses could also play this role, depending on the circumstances. During the pre-crusader period, horse was noted as a constituent of indigenous Baltic dietary regimes, albeit largely within public, ritualistic contexts (Wyczółkowski and Makowiecki 2009); however, during the Order's rule, it only appears to have been eaten at times of dietary stress, despite the widely perceived Christian taboo against eating horse meat. This displays the complexity of the situation, underlining the need to look beyond ideological differences in determining the intrinsic value of animals utilised in alimentation.

Aside from the idiosyncrasies of dietary preferences, there is also a need to better understand the techno-cultural dimension of the transition from indigenous non-Christian to Christian cultures. The motivations behind the related processes of crusading, colonisation and Christianisation were complex and variable. While the supposed aim of the crusades was to protect Christian converts, and subsequently evangelise indigenous populations, this was generally unsuccessful in the eastern Baltic, where pre-Christian practices are widely documented as surviving into the post-medieval period. This suggests that the transmission of religious ideas, of Christianity, was either largely restricted to the colonists themselves, or was misunderstood, rejected and/or modified by the surviving indigenous population, or both. But inter-cultural contact was invariably far more complex, and the alimentary dimensions of contrasting religious systems may shed new light on the impact of the crusades. It is difficult to disentangle food culture from religious thought, although Christian identity brought with it a certain level of commitment to specific fasting foods, such as consuming fish at certain times in the calendar, and abstinence from meat observed by religious communities (Pluskowski 2010). At the same time, the gradual abandonment or modification of the pre-Christian ritual year amongst the indigenous population may have resulted in noticeable shifts in alimentation. In this respect, the study of meat processing and consumption can shed an important light on the transmission of ideas between the incoming and the indigenous populations. What is clear is that the process of colonisation, the development of castles, towns and villages, with an increasing, concentrated population, resulted in significant new provisioning requirements. This intensification in the agrarian and pastoral economies of the eastern Baltic clearly had its own local rhythms, which are being investigated by the 'Ecology of crusading' research programme, but the contrast between a dispersed, rural, indigenous population and an urbanised colonising population would have prompted a new approach to the organisation of environmental resources, both plant and animal.

Case studies in the eastern Baltic

The case studies chosen for this research consisted of assemblages made available in the spring of 2011, which had secure archaeological contexts[1]. The majority of sites were located in the Teutonic Order's state in Prussia, today in northern Poland and western Lithuania (Lithuania Minor), with examples from Livonia represented by sites in Cēsis, today in north-central Latvia (Fig. 1).

Poland

Five sites were selected from northern Poland; the majority are from the Kulmerland. In this paper, these sites are referred to as beginning in Prussia, insofar as the region was ultimately included in the Teutonic Order's state. In fact, the Kulmerland was initially colonised by Slavic groups in the early medieval period, and it was the target of Prussian military incursions in the later 12th and early 13th centuries. It subsequently became one of the most densely settled regions of the Teutonic Order's state, following the crusades against the Prussian tribes. The first is Kałdus, which is a Slavic complex situated in the western part of the Kulmerland. The site consists of a stronghold, basilica and settlement, dating from the eighth to the 13th century. The Teutonic Order occupied the site briefly during the first wave of crusading campaigns. Excavations at the site were directed by Wojciech Chudziak, and the faunal assemblage was studied by Daniel Makowiecki and Marzena Makowiecka (Makowiecki 2010). The second and third sites are the Order's castle and the associated town of Toruń (Thorn), dating from circa 1300 to 1466. This is situated on the north bank of the Vistula, and represents the earliest and one of the most

[1] Two assemblages (Toruń and Kałdus) were available thanks to several projects undertaken by the Institute of Archaeology at Nicolaus Copernicus University in Toruń, and one (Mała Nieszawka) by the Museum of Toruń. The assemblages from Cēsis were made available thanks to Zigrīda Apala from the Institute of Latvian History, University of Latvia.

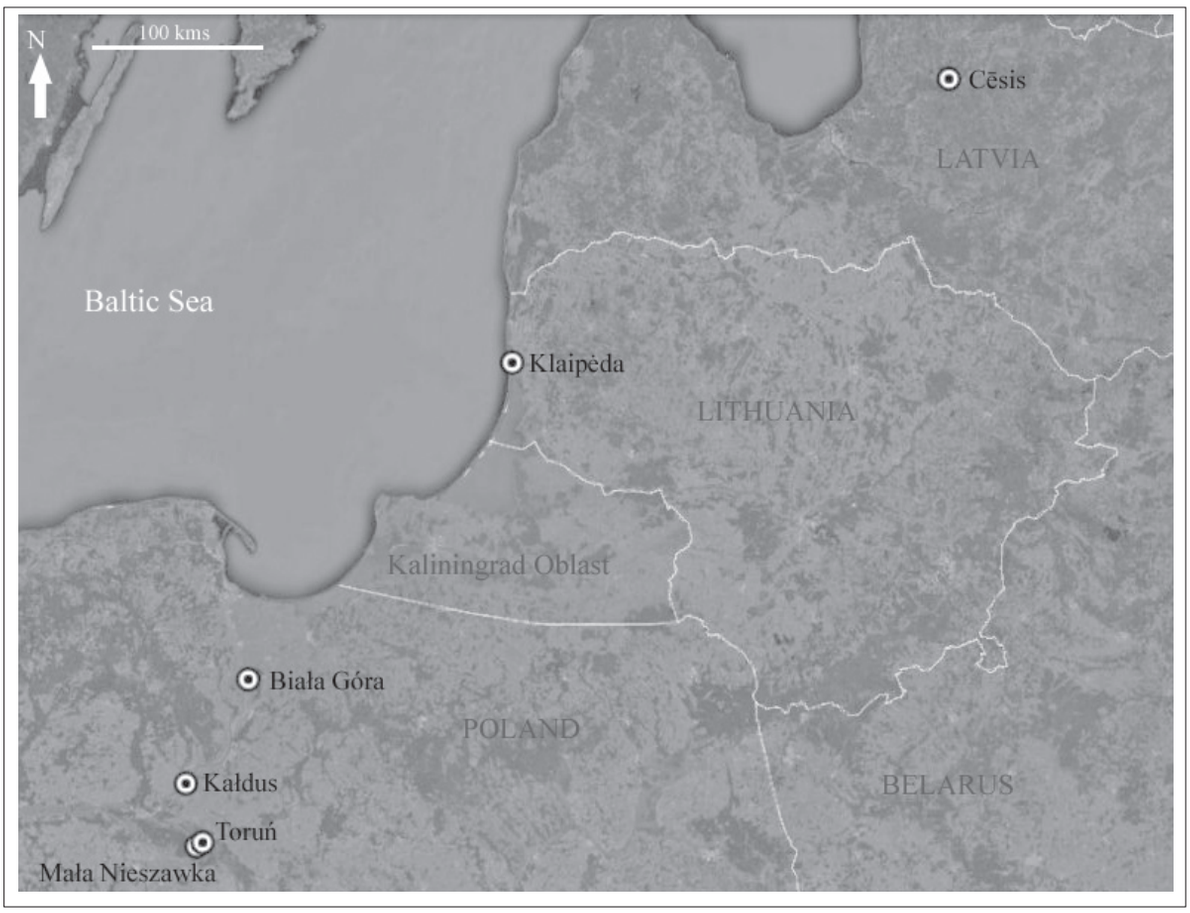


Fig. 1. A map of the region, with sites from which materials are derived highlighted. (map by A. Pluskowski).

important colonies and commandery centres in the Order's state. The excavations here were led by Adam Chęć, whilst Daniel Makowiecki is in the process of analysing the faunal assemblage. The Teutonic Order reused an earlier Slavic stronghold when constructing their castle, and material from this pre-crusade phase has also been recovered. The fourth site is the Order's castle situated just across from Toruń on the south bank of the Vistula at Mała Nieszawka (Klein Nessau), a short-lived occupation dated broadly to the 14th century. The site was dismantled by the Order in 1422, and excavated by Romulda Fronczuk. The extensive assemblage of mammal bones was studied by Marian Sobociński (1991a). The final site is the rural colony of Biała Góra, within the commandery of Marienburg, south of the castle at Malbork. Here, excavations were led by Zbigniew Sawicki and Waldemar Jaszczyński, and the faunal assemblage is being studied by Krish Seetah, Aleksander Pluskowski, Mirosława Zabilska and Daniel Makowiecki. The most intensive phase of occupation has been tentatively dated to the 13th century, representing a relatively short-lived Slavic (Pomeranian) and Teutonic Order colony, with activity continuing on a significantly reduced scale into the 15th century (Pluskowski *et. al*, 2014).

Lithuania

Faunal material from one site in western Lithuania was included in the study. This was recovered from excavations at the Order's castle at Klaipėda (Memel), which is situated on the northern edge of the Curonian Lagoon, and in the 14th century was beside the frontier with Lithuania, separated by a belt of depopulated land known as the 'Great Wilderness'. In 1525, the Teutonic Order was dissolved, and its Prussian territories were reorganised as a duchy. The castle has been excavated most recently by Vladas Žulkus, and the animal bones were studied by Linas Daugnora (Žulkus, Daugnora 2010). The material sampled for this pilot study derived from the post-dissolution (i.e. post-medieval) phase of the castle, from the 17th century.

Latvia

Two sites were chosen in Latvia, both in Cēsis (Wenden). Excavations were led by Zigrīda Apala, and the faunal assemblages are currently in the process of being analysed, and have, in the past, been studied by Valentina Danilchenko, Ilze Renga and Arnis Mugurēvics. The first site is the hill-fort (Riekstu hill) located to the west of the castle, and which is tradition-

ally associated with a settlement of the local Wendish tribe (not to be confused with the West Slavic group). The hill-fort was occupied from at least the seventh century AD until the mid-13th century. In around 1209, the Sword Brothers settled here, and lived alongside the Wends for a brief period of time. The second site is the adjacent castle and town. In 1214, a castle was built by the Sword Brothers on the plateau to the east of the hill-fort, and was expanded by the Livonian Order from 1237. The castle remained in the possession of the Order until 1561. The town grew up close to the castle with a mixed German and indigenous population. The hill-fort was abandoned shortly after the construction of the stone castle; however, this chronology remains to be verified in more detail (Kalniņš and Kļaviņš 2011).

Overall, the samples from each assemblage represented: a) different domestic and wild species, predominantly the main sources of meat; b) assemblages from pre-crusade (i.e. early medieval/Late Iron Age[2], up to the 13th century AD), medieval (13th to 16th century) and post-medieval (from the 16th century) contexts; c) assemblages from different types of site; early medieval/Late Iron Age settlements, medieval castles, towns and rural settlements.

Trade and provisioning: techno-cultural transitions through cut mark analysis

Each animal bone assemblage was sampled for fragments with clear cut marks. The aim was to record and analyse the range of butchery technology through a number of variables. The rationale behind the data collection was the need to place more emphasis on 'interpretation' from the mark, rather than ending the analysis at the point of description. In effect, the cut mark represents activity that is more complex than the relationship between the knife and the mark on a bone, and it is important to recognise that butchery data are a collection of different types of information. The task of the analyst is to decipher these various strands. The cut marks are a means to an end, and this must be kept at the forefront of any applied methodology (Seetah 2008).

The initial recording process followed the standard zooarchaeological protocol, using the Bournemouth System Database. This was essential for the comparison of recorded data between the sampled sites, to analyse if there were any anomalies that might be present in the sampled assemblages, and to facilitate the comparison between the data collected for this study and previous research. The results of the standard zooarchaeological study are not presented here. The emphasis was then placed on the recovery of butchery evidence from the various assemblages. This took the form of a methodological approach that has been developed by Krish Seetah, and aims at extracting three distinct lines of evidence from the butchery marks: details of the cut mark, the tool used, and the function for which the process was performed. These lines of data are derived from recording the following criteria (full details in Seetah, unpub).

Observational characteristics: practical details of the cut marks that can be noted directly from the surface of the bone, i.e. the location on the bone; which surface it appears on when the bone is *in the correct anatomical position* (e.g. anterior or posterior); the direction of the mark *relative to the correct anatomical position*; the number of marks of that type; the depth of the mark and the implement used.

Interpretational characteristics: parameters that required a degree of interpretative appraisal, based predominantly on the observational characters. These included the type of mark (chop, slice, fine slice, etc); whether the mark was produced prior to, during or after gross disarticulation; the actual position of the bone itself (on the ground, suspended?); the direction of travel of the cut mark *relative to the practitioner*; and the function, i.e. what was the underlying reason for the butchering?

As can be seen, each parameter contributes a small component to the overall view of the type of butchery activity taking place. This, coupled with the standard zooarchaeological appraisal, led to discrete groupings indicating different modes of butchery on different species/classes of fauna, i.e. wild *vs.* domestic.

In terms of the physical recognition of the cut marks, this was performed initially with the naked eye and/or a standard hand lens at 10x magnification; images were captured using a Fujifilm finepix S2800HD (14mp, 18x zoom) digital camera. Subsequently, a more detailed analysis was performed under high magnification, using a Nikon SMZ-10A microscope at 0.5-15x magnification. Using the microscope's built-in camera attachment, a Casio Powershot A95 digital camera (5mp, 3x zoom) was used to capture specific idiosyncrasies of the cut mark, i.e. striation lines that would indicate the direction of travel of the implement, or precise information on the width of the tools used for butchery and bone working.

In combination with the detailed analysis of the butchering data, and as discussed previously (Seetah 2004;

[2] The former term is used in Polish archaeology; the latter is more widely used in the eastern Baltic to refer to the period before the crusades.

2007), the approach used herein also integrates evidence from available tools recovered from archaeological excavations. This was performed to provide an indicator of the types of tools directly from the sites being studied. However, the disposal of metal artefacts follows a completely different pattern than that of animal waste; tools are moved with individuals from site to site, and have a much longer use-life. The survey of tool types serves only to provide an indication of the technology potentially available, and whether this corroborates the evidence derived from the appraisal of the cut marks.

In summary, the methods outlined above aimed to:

- Compare and characterise butchery on animal bones in Late Iron Age/early medieval, medieval and post-medieval periods in Prussia (northeast Poland, western Lithuania) and Livonia (Latvia, southern Estonia).
- Compare and characterise blade technology in Late Iron Age/early medieval, medieval and post-medieval periods in Prussia (northeast Poland, western Lithuania) and Livonia (Latvia, southern Estonia).
- Determine whether there is zooarchaeological evidence for the establishment of butchers *per se* in areas with concentrated populations, i.e. castles, towns and larger settlements (e.g. Biała Góra). There are sporadic references to butchers in later sources, largely from the end of the 14th and the 15th centuries (e.g. in the extramural suburbs of late medieval Toruń [Thorn], Czacharowski 1985, p.65); however, significantly more information can be extracted from the large quantities of faunal material recovered from sites across the east Baltic region. Also, does this evidence, indicated by the nature of the animal bone assemblages, indicate links with other industries using dead-stock: horn, antler, leather (including vellum), fur and bone?

Results

The following results are split into two sections, incorporating tables and graphs that detail the quantitative butchery data, followed by a series of short case study presentations that focus on the qualitative butchery evidence.

Quantitative results

The following graphs and tables are arranged broadly by period; thus, earlier sites are towards the left of the tables/graphs; this is combined with regional groups, i.e. Latvian sites are furthest to the left, followed by Lithuanian, and finally Polish to the centre and right.

Overall, the occurrence of butchered bone was predominantly found on domestic food species, cattle, sheep/goat and pig. Of these, cattle evidenced the highest butchery count (Table 1). Biała Góra is particularly interesting in the diversity of species present and the

Table 1: Proportions of butchered bone per site

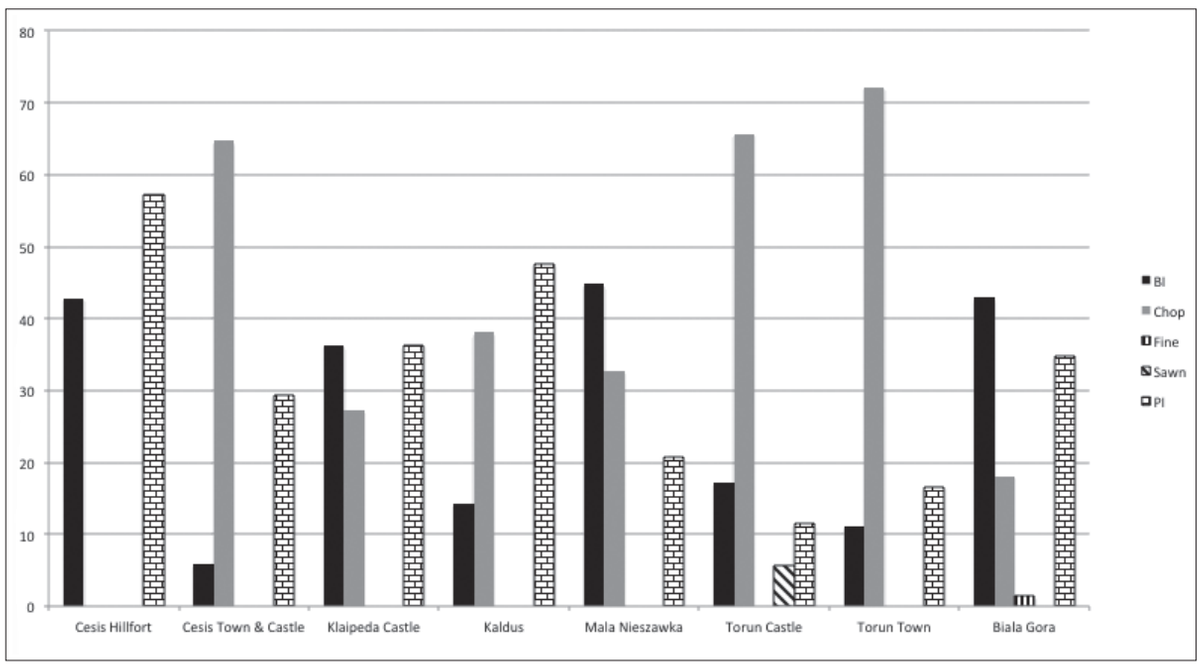
	CH		CTC		KC		KA		MA		TC		TT		BA	
Species	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
Aurochs	-	-	-	-	-	-	3	14	-	-	-	-	-	-	-	-
Beaver	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	7
Cat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
Cow	8	57	11	61	12	57	6	27	39	46	18	62	47	98	20	36
Dog	-	-	-	-	-	-	2	9	-	-	-	-	-	-	-	-
Fox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
Horse	-	-	-	-	-	-	2	9	-	-	-	-	-	-	2	4
Marten	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4
Pig	6	43	3	17	8	38	8	36	19	23	5	17	-	-	20	36
Red deer	-	-	-	-	-	-	-	-	2	2	1	3	-	-	2	4
Roe deer	-	-	-	-	-	-	-	-	5	6	-	-	-	-	-	-
S-G	-	-	4	22	1	5	1	5	19	23	5	17	1	2	4	7
Σ BONES	14		18		21		22		84		29		48		56	

Key. Site codes: CH = Cēsis hill-fort; CTC = Cēsis town and castle; KC = Klaipeda castle; KA = Kałdus, complex of stronghold and settlement; MA = Mała Nieszawka castle; TC = Toruń castle; TT = Toruń town; BA = Biała Góra settlement. Σ refers to the number of individual animal bones demonstrating butchery, not the number of cut marks (prepared by authors).

Table 2: Proportions of recorded cut mark typologies

	CH		CTC		KC		KA		MA		TC		TT		BA	
Cut mark	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	2	11	Σ	%
BI	6	43	1	6	8	36	3	14	26	45	6	17	13	72	31	43
Chop	-	-	11	65	6	27	8	38	19	33	23	66	-	-	13	18
Fine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Knick	-	-	-	-	-	-	-	-	1	2	-	-	-	-	2	3
Sawn	-	-	-	-	-	-	-	-	-	-	2	6	-	-	-	-
PI	8	57	5	29	8	36	10	48	12	21	4	11	3	17	25	35
Σ MARK	14		17		22		21		58		35		18		72	

Key. Site codes: refer to Table 2. Cut mark codes: BI = blade insertion; PI = point insertion. Σ refers to the global cut mark count, which may be greater than the number of records, as multiple occurrences can be noted on a given bone (prepared by authors).



Graph 1. Proportions of recorded cut mark typologies.
NB: Knick marks not shown on graph; BI = Blade insertion; PI = Point insertion (prepared by authors).

occurrence of butchery on these animals. Generally, however, with the exception of Klaipėda castle and the town of Toruń, there is a degree of homogeneity in the occurrence of cut marks present across the sites.

Looking at the butchery data themselves, it is possible to see that while some congruence exists in basic proportions, the details of the type of marks, the tools used and the functions show a high degree of variation. Blade marks, which are indicative of less sophisticated methods, are generally associated with early period sites, while two of the three castle assemblages show evidence of intensive processing (Table 2, Graph 1).

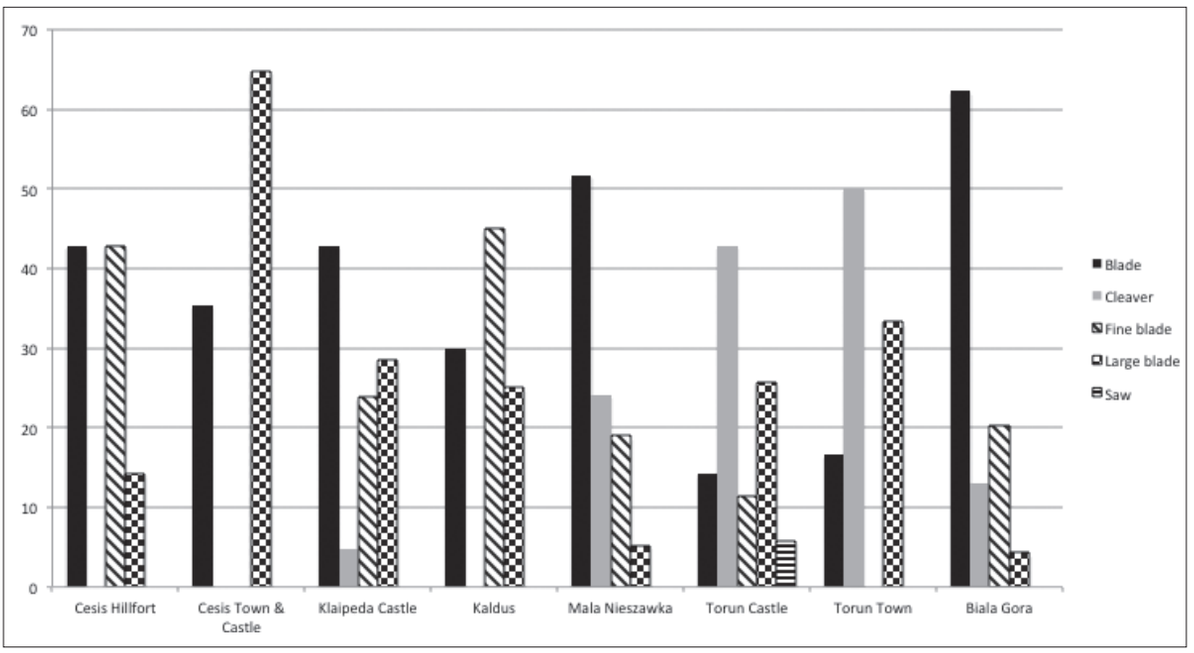
When this initial evidence is overlaid with the data from the types of tools present (as indicated by the butchery), the situation becomes more complicated, and it is apparent that while intensive butchering may be taking place at Cēsis, the Livonian late period site, it is being performed with less advanced tool technology. In contrast, the Prussian sites, particularly the two at Toruń, show distinct evidence of cleaver use (Table 3, Graph 2).

The later period sites, particularly the town of Toruń, show the greatest variation in the types of butchering practices (Table 4, Graph 3). Toruń is also the only site that shows evidence of bone working, although at present this is likely an artefact of sample size. The castle

Table 3: Proportions of recorded implement marks

	CH		CTC		KA		KC		MA		TC		TT		BA	
Implement	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
Blade	6	43	6	35	9	43	6	30	30	52	5	14	3	17	43	62
Cleaver	-	-	-	-	1	5	-	-	14	24	15	43	9	50	9	13
Fine blade	6	43	-	-	5	24	9	45	11	19	4	11	-	-	14	20
Large blade	2	14	11	65	6	29	5	25	3	5	9	26	6	33	3	4
Saw	-	-	-	-	-	-	-	-	-	-	2	6	-	-	-	-
Σ IMPLE.	14		17		21		20		58		35		18		69	

Key. Site codes: refer to Table 2. Σ refers to the sum of occurrence of implement type, where one record equates to a count of one assigned to that implement type. Only one tool will be used at any one time (prepared by authors).



Graph 2. Proportions of recorded implement marks
NB: Undetermined figures not shown in graph (prepared by authors).

sites in particular are likely to have served as locations for both craft specialisation and the working of bone.

Qualitative results

The following are presented as discrete case studies illustrating the strength that individual cut marks, or small cohorts of marks, have for informing on the specifics of processing, trade and diet. These samples have been chosen specifically for their representation of idiosyncratic practice, and are not generally representative of the assemblages under investigation.

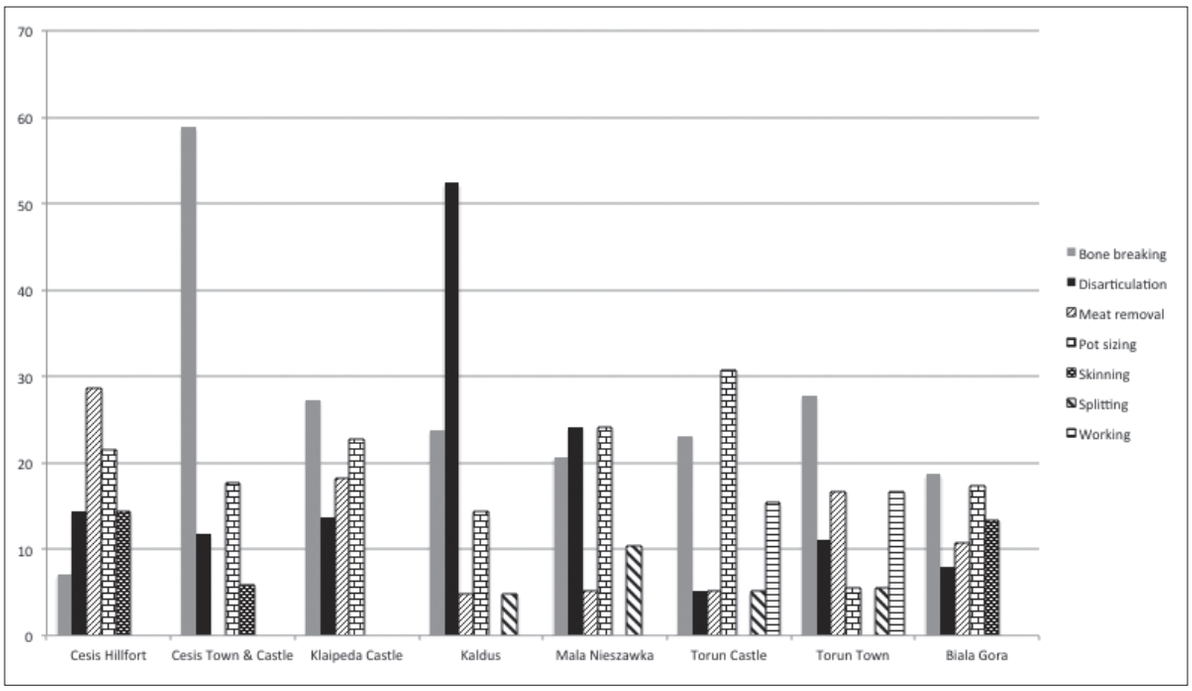
Case study 1: Cēsis

The material from Cēsis hill-fort gives an indication of the type of iron tools present; perhaps surprisingly, the technology as interpreted from the cut marks is highly descriptive of sharp, hard-edged implements (Fig. 2). The slight lifting, but importantly unbroken, flake of bone points to the use of an implement sharp enough to *slice* into the bone without actually causing it to fracture. The end point of the cut also illustrates the sharpness of the blade, with a very fine edge evident in the profile of the cut. These features are usually more typical of steel-edged tools.

Table 4: Butchery function

	CH		CTC		KA		KC		MA		TC		TT		BA	
Function	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
Bone breaking	1	7	10	59	6	27	5	24	12	21	9	23	5	28	14	19
Disart.	2	14	2	12	3	14	11	52	14	24	2	5	2	11	6	8
Meat removal	4	29	-	-	4	18	1	5	3	5	2	5	3	17	8	11
Pot sizing	3	21	3	18	5	23	3	14	14	24	12	31	1	6	13	17
Slaughter	-	-	-	-	-	-	-	-	-	-	-	-	1	6		-
Skinning	2	14	1	6	-	-	-	-	-	-	-	-	-	-	10	13
Splitting	-	-	-	-	-	-	1	5	6	10	2	5	1	6	-	-
Working	-	-	-	-	-	-	-	-	-	-	6	15	3	17	-	-
Undet.	2	14	1	6	4	18	-	-	9	16	6	15	2	11	24	32
Σ FUNC.	14		17		22		21		58		39		18		75	

Key. Site codes: refer to Table 2. Σ refers to the total number of recorded 'functional' interpretations of the cut marks. Disart refers to disarticulation (prepared by authors).



Graph 3. Butchery function (graph by K. Seetah)
NB: Undetermined and slaughter figures not shown in graph (prepared by authors).

Larger implements were also used (Fig. 3), although these appear to be more typical of large Iron Age blades, with the characteristic striation indicative of an edged tool with fairly pronounced notches to its cutting surface. These do not appear to be cleavers *per se*, they were used on the margins of the bone, and not through the dense cortical bone.

From Cēsis castle/town we have clear evidence of tool diversification, including the presence of cleavers. Figure 4, from the castle, shows a set of horn-cores with a portion of the cranium attached. The marks indicate the use of fine blades for skinning (Fig. 4, inset left), and subsequent chopping of that specific portion of the skull, most likely using a cleaver, based on the precise and smooth nature of the chop marks (Fig. 4, inset right). Interestingly, these were found with some regularity, indicating that the horn-cores were probably transported with the cranium. The mode of butchering requires two blows, resulting in a 'V' formation on the frontal bone, and the easy removal of the double horn-cores. This perhaps indicates that a butcher carried out this primary stage, leaving the removal of the horn-core itself either to an intermediary or the horn worker.

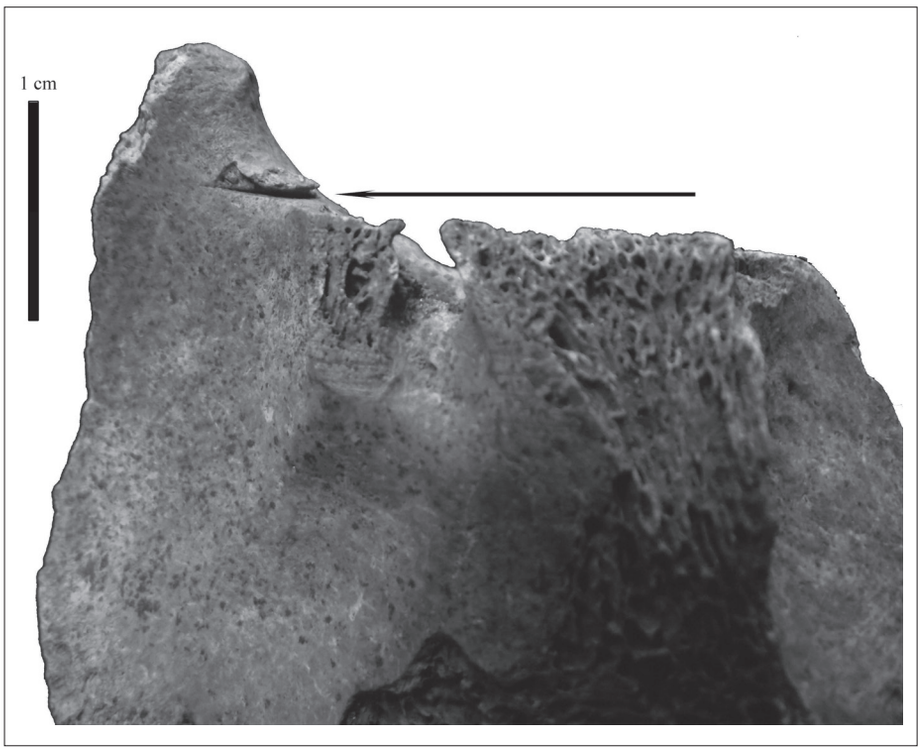


Fig. 2. Detail of a cut mark employing a fine-bladed implement on a pig axis. Note the lifted but unbroken edge of the bone, and the end profile of the cut mark (Cēsis hill-fort) (photograph by A. Pluskowski)

Fig. 3. Light chop/blade marks on a cattle radius (Cēsis hill-fort) (photograph by K. Seetah)

Case study 2: Klaipėda

The material from this site presents indications of butchery practices suggestive of sophisticated tools, potentially with the inclusion of steeled edges. Figure 5 illustrates butchery on a cattle vertebra. The mark indicates a blade of particular sharpness, and a thin blade. These marks are indicative of 'point insertions', where only the tip and front edge of the blade is used. In this instance, the cuts appear to have been made to both sides of the spine, to remove meat. The bone has itself been cut (unintentionally), and the knife used was sharp enough to flake the bone without breaking the fractured edge (arrowed).

A range of tools was evidenced from Klaipėda castle, including cleavers. Figure 6 shows clear indications not only of within bone resource exploitation, through fracturing of long-bone shafts, but also the presence of cleavers. The type of repetitive chopping evident on this bone, with clean-cut surfaces, is suggestive of large heavy-bladed implements, perhaps with steeled edges. The use of the axe cannot be ruled out in this instance.

Case study 3: Kałdus

Of the Polish sites, Kałdus offers a crucial pre-crusader assemblage from the Slavic-Prussian borderland, with one example being descriptive of dietary (although arguably atypical) practice. Figure 7 illustrates butchery at the distal end of a large canid humerus. In this instance, not only do we have clear indicators of disarticulation (inset A), we also have characteristic 'chatter' marks (inset B) that are distinctive of meat removal at sites where the flesh is attached tightly to the bone. Whilst most instances of carnivore butchery can be

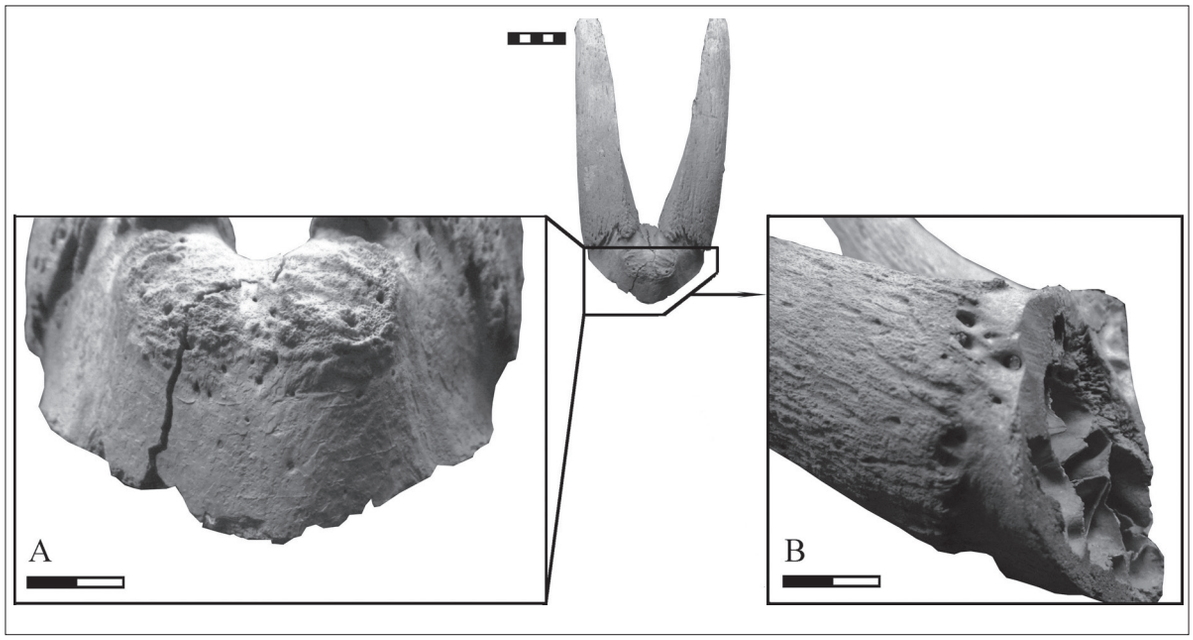


Fig. 4. Fine skinning marks and deep cleaver marks for horn-corn transportation (not removal *per se*) (Cēsis castle/town) (photograph by K. Seetah)

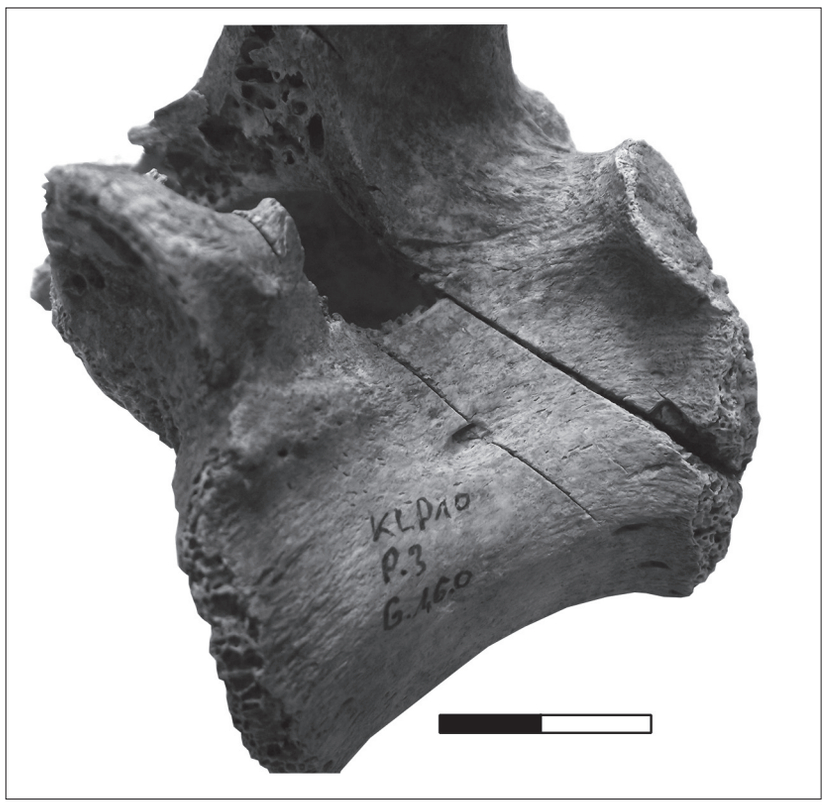


Fig. 5. Blade use on a cattle vertebra (Klaipėda castle) (photograph by K. Seetah)

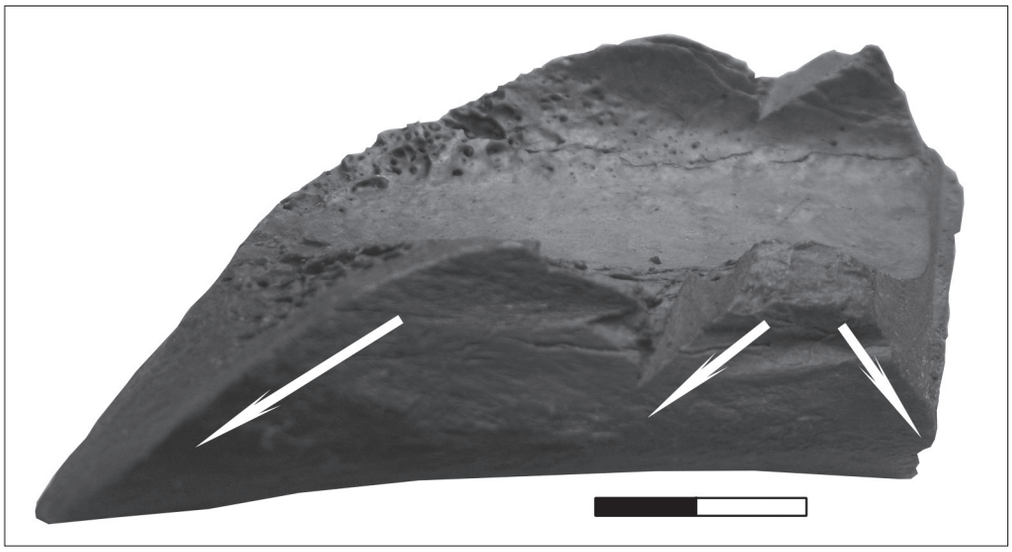


Fig. 6. Chopping activity on a cattle shaft bone (Klaipėda castle) (photograph by A. Pluskowski)

linked to fur exploitation, in this case the evidence strongly suggests consumption.

Case study 4: Toruń town

Given the extent of settlement at Toruń, it should come as no surprise that craftspeople and their trades were well established in this area. However, through the cut mark data, we gain at least one unique and detailed insight into how animals and their body parts quite literally *moved through* the tradespeople' hands. Figure 8 demonstrates evidence, potentially, of at least two different tools in use on a bovid scapular. The lower inset illustrates a tool with a relatively smooth and sharp cutting edge (the images are at 15x magnification), an implement of some weight, probably a cleaver, although it is not clear whether it is steel-edged. Furthermore, this mark is indicative of activity, most notably observed from Romano-British sites (Maltby 1989), suggestive of rapid meat removal practices (Seetah 2006). The upper inset, by contrast, indicates a wholly different tool, still a heavy implement, but most likely with an iron edge, given the greater degree of striations along the cut surface. More revealing is the fact that this type of cut mark has no butchering correlate: it is a mark indicative of working. This is not surprising, given the fact that the bone, and numerous others from the site, was a (discarded?) working blank.

Thus, this one bone shows evidence both of butchering and bone working, and of at least two different tools used for different purposes (the upper inset is suggestive of general preparation and smoothing work to remove the rough edges of bone that would have been left by the first [lower inset] mark). This bone is likely witnessing two separate trades, and indeed, different craftspeople in action.

Interactions through culture and technology

A specific approach to cut marks from sub-sampled assemblages was adopted for the purposes of this pilot study. The majority of marks derive from only three domestic species, cattle, sheep and pig, and of these, cattle tended to be the species on which the majority of marks were noted (Table 1). Ultimately, the aim of this study was to use cut mark data in a novel way, in order to better understand techno-cultural transitions; and in this regard, the results are significant. There are clear differences between Iron Age, medieval and post-medieval periods, and between Prussia and Livonia. These observations are based on discrete and limited sample sizes, and the findings represent a hypothesis that can be tested with quantitative, comparative studies of larger assemblages.

Spatial and temporal trends

From Cēsis, we have clear variation, indicative of a relatively dramatic shift in the type and intensity of processing, between the earlier hill-fort and later period sites: the town and castle. The details of this transition are best expressed with the types of cut marks themselves. In general, blade marks (BI and PI) are usually synonymous with less intensive types of butchery, and employ less sophisticated tool technology in the production of the implements. In contrast, chop marks are *usually* indicative of more intensive processing, and rely on a greater level of tool development and spe-

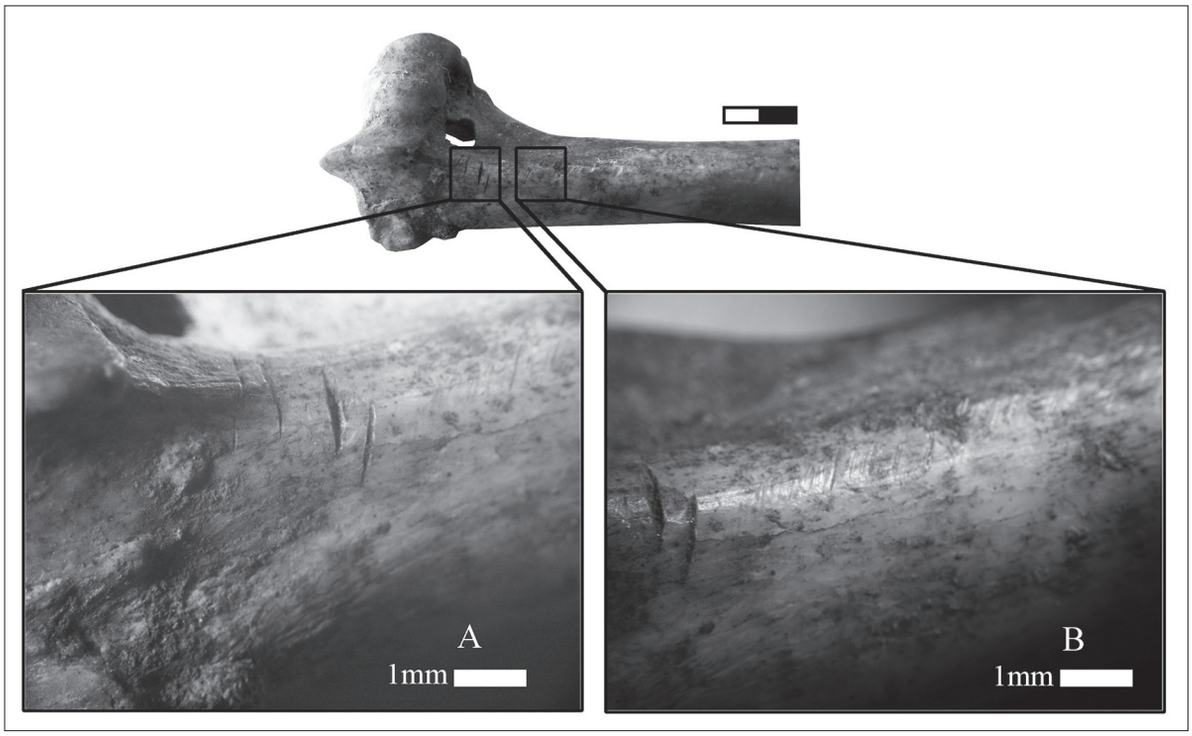


Fig. 7. Butchery of a canid humerus (indicative of consumption?) (Kałdus) (photograph by A. Pluskowski)

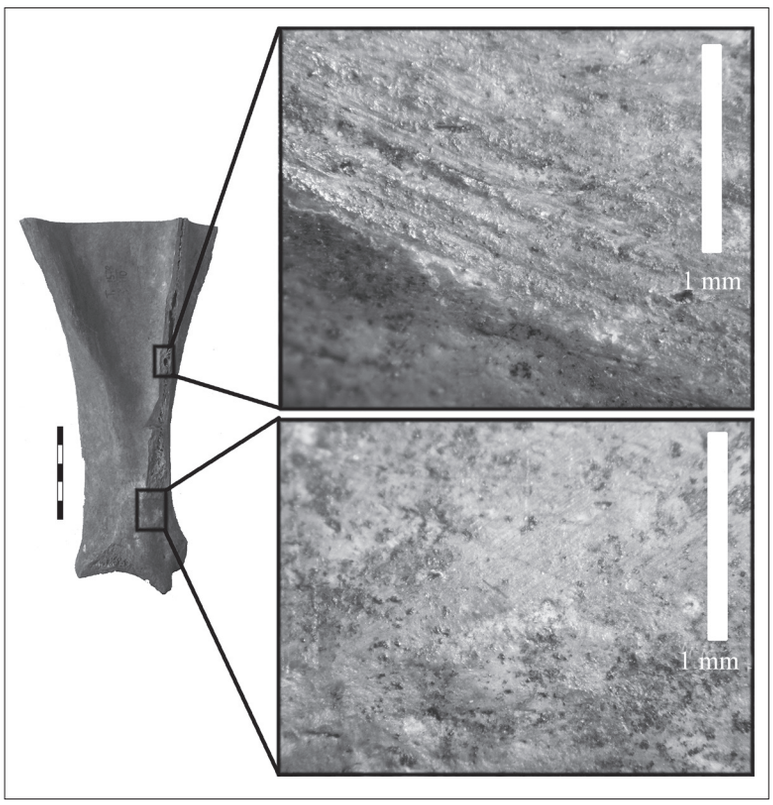


Fig. 8. Cattle scapular blank with marks both of butchering (lower inset) and working preparation (upper inset) (Toruń town) (photograph by D. Makowiecki)

cialisation. With the hill-fort assemblage there were no chop marks recorded at all, which stands in marked contrast to the town/castle assemblage, with a high percentage of chop marks (65%), and a small blade count (6%). Interestingly, 'cleavers' are not noted from either assemblage, although there was a high percentage of 'large blade' marks from the town/castle. In effect, the *process* of butchering was altered in favour of increased bone breaking activity (see Functions in Graph 3), which is itself suggestive of intensification and greater exploitation of within bone nutrition. Staying with the interpretations of function, a clear regional variation is noted between the two Iron Age settlements. Livonian Cēsis shows no evidence of intensive marrow exploitation, that is, the splitting of long bones, which is evident from Kałdus.

Turning to three of the Prussian assemblages, Kałdus, Mała Nieszawka castle and Biała Góra, the evidence effectively suggests the opposite of what might be expected, apparently with more intensive processing taking place on the early site of Kałdus. A more detailed appraisal reveals that, although there is a higher level of chopping activity (Table 2, Graph 1) on the early medieval site, this was predominantly performed with large blades, not specialist cleavers, although these are indicated on this site. On the Order's sites and during the post-crusader period, those specialised tools are evident and in use.[3] Toruń castle and the post-medieval town of Toruń align more closely with expectations, with evidence for intensive processing, specialist tools used to perform these tasks, and clear indications of bone-working crafts, again with specialist tools.

The Lithuanian case of Klaipėda castle provides an important and valuable comparative dimension: the processing methods identified at this site indicate the use of sophisticated tools. Despite its earlier frontier location, by the 16th and 17th centuries, Klaipėda was comparable to other European towns, and the presence of contemporary 'post-medieval' butchery activity is far from surprising. But whilst it is comparable to the earlier evidence from Toruń castle in relation to 'function', it is *not* in terms of how the butchery was performed, or the implements used. What is interesting is that Toruń castle demonstrates a greater level of sophistication in terms of tools, the degree to which the bones are processed and comminuted, and the evidence for the presence of crafts. This may well relate to the relative levels of demand at Toruń and Klaipėda, suggesting that alongside the established history of technological development from the medieval to post-medieval periods, each site must be considered within its own context.

Technology, culture and animals

Perhaps surprisingly, in the context of Late Iron Age/early medieval assemblages, the early sites suggest tool technology (as seen through the cut marks) indicative of relatively advanced metallurgy. The cut marks were regularly made with fine-blade knives, with a high degree of edge maintenance. Knives with thin blades were popular in northern Europe as a general-purpose tool. The technique of layering metal gave way to simpler smithing techniques after the ninth century, and the blades themselves became thinner (Peets 2007). However, the most sophisticated tools, and those with the highest degree of specialisation, are to be found on the later period sites, particularly those from the castles and towns included in this study. This is arguably a trend typical of this period for sites associated with colonisation.

The presence of saw marks, a tool identified with working and trade/craft specialisation, facilitates a more specific interpretation. Beyond being indicative of specialised craft activities, these tools detail a level of technological and economic sophistication, attained through and driven by commerce. The absence of this type of tool on all but the castle site of Toruń does not imply that bone-working crafts were not present on these other sites, or indeed that saws were not produced. The critical point is that saws have many uses, but require subtle modification from a standard tool, i.e. one that might be used to cut wood (and for which there would be infinitely greater demand given the context), to make them suitable for working on bone. The blade needs to be relatively thin, hard and rigid, and to have small teeth for use on hard, dense material (similar to a modern metal-working saw). If commodities that necessitate specialised tools to produce them are not commonly required, then it is logical that they are purchased/traded from larger enclaves, rather than being produced locally. Furthermore, focusing specifically on the tool itself, we see precisely the type of specialised 'bone-working' saw that indicates this level of specificity present at Toruń castle. Referring to Figure 9, we can infer that the blade itself was thinner than one milimetre in width (given the slight deviation from the centre whilst sawing to produce the mark). Speculatively, this tool had the small teeth discussed above: the saw mark in the image is not the mark that the artisan wanted to make. The cut was started, stopped after relatively few strokes, realigned and repositioned, and the cutting recommenced to produce both the required offcut and the discard we see in Figure 9. In those few

[3] This highlights the fact that this approach does not merely replicate lines of data, but actually extracts new evidence from the same material source.

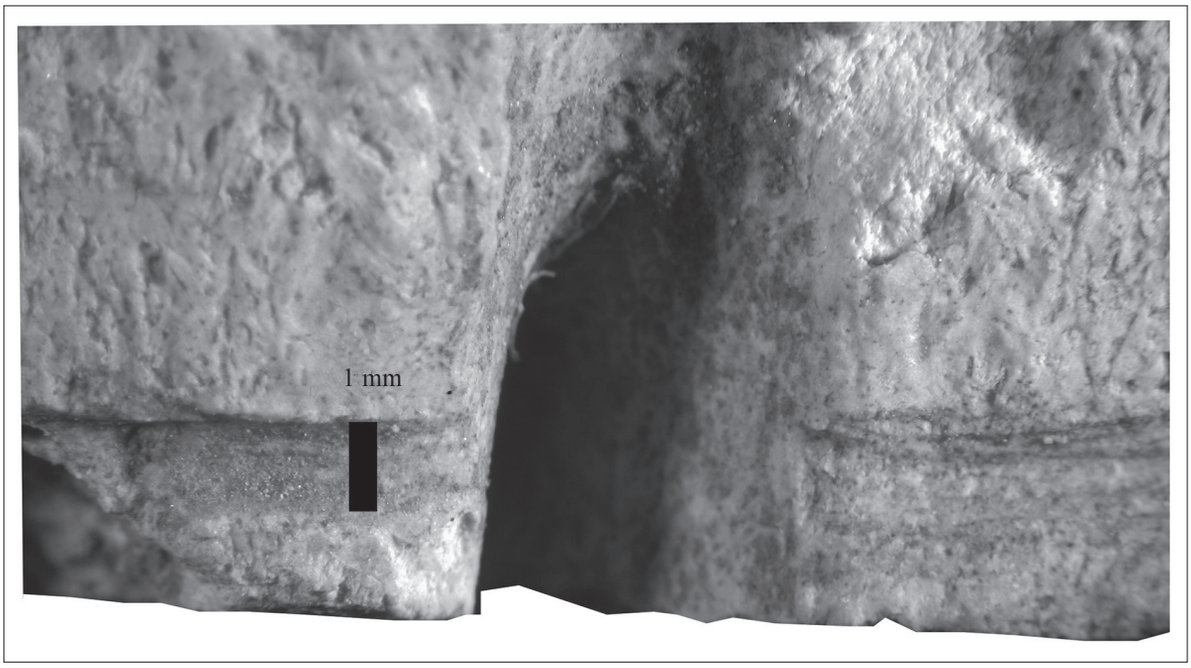


Fig. 9. Detail of a saw mark from Toruń castle (photograph by A. Pluskowski)

strokes of the saw, it was able to produce the cut we observe, and it seems probable that the tool was efficient at this task (hence with small teeth).

Thus, when proposing a hypothesis for technological change associated with the cultural transitions in the medieval east Baltic on the basis of preliminary research, it is evident that tool technology undergoes a transformation, but the underlying *techno-cultural* basis for this transition is far more complex. Evidently, there were good-quality tools in production, both prior to and during the Order's rule. However, while other similar military conquests provide much stronger evidence of broader changes, including to the animals themselves, i.e. the Roman conquest of Britain, for which there is good evidence of changes in tool technology (Seetah 2005), no such clear trend can be demonstrated in the present case. An initial survey of the blades in the collections of the National History Museum in Riga, as well as the published literature on archaeological sites in northern Poland, Lithuania and Latvia, indicates that a new form of metallurgy was associated with the colonists. There is a general difference between Late Iron Age/early medieval blades, which are smaller, and medieval and post-medieval blades, which are larger and heavier, although this observation requires systematisation through a more detailed, synthetic study. Crusading retinues, settlers and merchants would have brought these tools into the east Baltic region, and by the late medieval period there had been a clear adoption of larger, heavier steel blades, as well as blades with riveted handles. However, for the north-central Polish context at least, there is no evident improvement in cattle in the medieval period in this region (Makowiecki and Makowiecka, this volume). Thus, changes in tool technology are not necessarily consequential to modifications in animal morphology. The tendencies visible in sites associated with colonisation can now be tested with contemporary indigenous settlements, to determine the extent to which this technology diffused beyond the new ruling elite and colonising population. In this respect, butchery represents as fundamental a barometer of cultural change and interaction relating to colonisation as other diagnostic indicators, such as agricultural tools, heating systems and architectural traditions (Mugurēvičs 1990).

A similar situation is evident in the case of butchering technology. While the actual butchery processes themselves demonstrate variation, there is little to suggest significant change on the level witnessed, for example, in the Romano-British context. The situation in the Baltic region is complex: at Cēsis castle/town, for example, there is no evidence for intensive marrow exploitation, i.e. the splitting of long bones, which one might expect within such a nucleated centre. However, these practices are evident in early medieval Slavic Kałdus. Is this evidence of a context-specific cuisine, or simply the need to exploit within bone nutrients? The extent to which fragmented animal bones express distinctive food cultures remains to be explored in more detail in the case of the Baltic region. In terms of relative species exploitation, the main domesticates,

cattle, sheep, goats and pigs, are staples on either side of the crusading period. But the ways in which their bodies are disarticulated and specific cuts of meat prepared may be linked to culinary traditions as much as to technology. The diversity of cuts observed across the surveyed sites invariably represents a combination of tool use, demand and alimentation. The latter can be tentatively linked to the ecological and social value systems of the specific communities, and hence their broader world-view (Pluskowski 2010). But the extent to which the individual elements of this combination can be identified from cut marks, let alone isolated, remains to be seen with more detailed studies.

Conclusions and future research

This paper has focused on select examples of cut marks from a range of sites associated with cultural transformations in the eastern Baltic following the crusades. It represents a pilot project, a foundation for a more detailed and systematic study of a larger dataset within the framework of The 'Ecology of Crusading' project. On the basis of the observed cut marks, relatively clear differences between sites are observable. This cannot be reduced into a generic pre- and post-crusade or Iron Age/early medieval *versus* later medieval trend.

The present study has considered cut marks from all species, as the initial focus was on a broad sample of butchery technology. This in fact dilutes the level of variation expected between the pre- and post-crusade periods, and it is essential to shift the focus to more specific processes that are carried out relative to species, as well as time and place. Cattle were chosen as the most important point of comparison across all the sites in this study. This species, which is comparatively well represented on all sites, is economically important, and therefore more likely to show variations based on economic and social drivers. Smaller domestic ungulates and wild species represent animals that could be less significant economically (and potentially more homogenous in terms of processing *across* settlement types, regions and time).

Future research would firstly benefit from including a larger sample from a range of sites in Lithuania, which remained independent throughout the crusading period, testing whether there was continuation in Iron Age traditions, or whether the presence of neighbouring crusader states to the north and west influenced what was happening in the grand duchy. Secondly, a comparable study of changing butchery technology from Novgorod and Pskov would provide essential comparative information on potential influences from traditions in the east, and the permeability of the borderlands between the Russian principalities, Livonia and Lithuania. The sites sampled for the purposes of this pilot study are comparable insofar as they represent broadly similar indigenous and colonist cultures in the east Baltic region; however, the model of technological change proposed in this paper can now be tested with a more detailed, systematic study of sites across the entire region. The results must be integrated with a parallel study of changing blade technology, and the development of specialised trades and commerce that defines the cultural transformations in the Baltic region following the crusades.

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NAUJA TECHNOLOGIJA AR ADAPTACIJA PASIENYJE? SKERDIMAS KAIP KULTŪRINGUMO IŠRAIŠKA VIDURAMŽIAIS RYTŲ BALTIJOS REGIONE

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Santrauka

Straipsnyje aptariama Kryžiuočių ordino kolonizacijos įtaka Rytų Baltijos regiono gyvulių skerdimo technologijoms. Į XIII–XVI a. kultūrų tarpusavio sąveiką stengiamasi pažvelgti per zooarcheologinę medžiagą ir Kryžiuočių ordino platinamas gyvulių skerdimo technologijas. Kaip su Ordinu besiribojęę pasienio gyventojai perėmė ar darė įtaką Ordino teritorijos gyventojų gyvulių skerdimo technologijos kultūrai? Šiuo metu galime gana tiksliai nusakyti, ką valgė atvykėliai iš Ordino teritorijos ir jų užkariautų teritorijų gyventojai, tačiau dažniausiai negalime pasakyti, kaip mėsa buvo apdorota ir paruošta, kaip Ordino kolonizacijos procesas veikė įvairių technologijų atsiradimą, pvz., mėsos perdirbimą, gyvulių skerdenų paruošimą vartoti ar transportuoti. Todėl straipsnyje nagrinėtos to meto kulinarinės tradicijos, maisto kultūra, technologiniai ir techniniai gyvulių skerdimo sprendimai, mėsos tiekimas, perdirbimas, taip pat su tuo procesu susijusių naujų profesijų atsiradimas ir specializacija. Kartu gvildenami ir kiti klausimai, susiję su gyvulių skerdenų paruošimu, vartojimu bei transportavimu, su naujų įrankių naudojimu šiame procese, rinkos poreikių nustatymu ir skirtingomis kulinarinėmis tradicijomis bei vertybėmis. Mėginama gvildenti naujai pasiūlytą hipotezę apie Ordino skerdimo technologijų paplitimą rytinėje Baltijos jūros dalyje viduramžiais ir nustatyti, ar yra tiesioginis ryšys tarp skerdimo technologijų ir Ordino kolonizacijos Rytų Baltijos regione. Straipsnyje bandoma lyginti ir nustatyti, kaip įvertinti vėlyvajame geležies amžiuje, ankstyvuoju, viduriniu ir vėlyvuoju viduramžių laikotarpiais Prūsijos (Šiaurės rytų Lenkija (8–9 pav.), Vakarų Lietuva (5–6 pav.)) ir Livonijos (Latvija (2, 3, 4 pav.), Pietų Estija (7 pav.)) teritorijose ant osteologinės medžiagos skerdimo metu atsiradusias kirtimų žymes ir įkartas, kokiais įrankiais naudojosi gyvulių skerdikai. Kartu straipsnyje bandoma nustatyti, kaip zooarcheologiniai tyrimai gali paaiškinti, kiek užimtose Ordino teritorijose būta mėsininkų pilyse, miestuose ir didesnėse gyvenvietėse, pvz., Biała Góra miestelyje? Nustatyta, kad ne įrankiai keitė gyvūnų skerdimo morfologines technologijas. Straipsnyje griaučių įkartos tirtos naudojant tris naminių gyvulių rūšis: galvijus, avis ir kiaules, tačiau pagrindinį dėmesį skiriant galvijų griaučiams (1 lentelė). Galvijas buvo pasirinktas kaip pagrindinis naminis gyvulys, naudojamas kareivių mitybai ir randamas visose gyvenvietėse, miestuose ar pilyse. Ši rūšis buvo ekonomiškai svarbi ir galėjo turėti įtakos ekonominiams ir socialiniams gyventojų gyvensenos pokyčiams. Kitų naminių ar laukinių kanopinių gyvūnų ekonominė svarba ir tvarkymo sistema yra ne tokia reikšminga. Buvo nustatyta, kokiu mastu ir kaip nauja skerdimo technologija plito tarp Ordino naujojo valdančiojo elito ir kolonizacijos paveiktų vietos gyventojų, kaip formavosi ir atsirado mėsinės.

Vertė Linas Daugnora