STONE AGE COMPANIONS

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Humans and animals in hunter-gatherer burials in north-eastern Europe

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Preface

When coming to the end of the long process of writing a book, you start to think how this journey began. The origins of this dissertation and the topic actually go far back. The death of animals and the handling of their remains have been part of normal life as long as I can remember. I grew up in Īdeņa, a small place that in the Stone Age was an island in Latvia's largest lake, Lake Lubāns, where life to this day revolves around fishing, hunting and foraging. It is a place where values are clear, traditions are strong and relationships essential. My late father was a role model to me and many others in how to forge relationships with the environment, animals and people. Thanks to him for being that!

Archaeology has also been around me since I can remember. Excavations of classic Latvian Stone Age sites such as Zvidze, Kvāpāni, Abora and Zvejsalas took place around Lake Lubāns, and my mother and many relatives and neighbours participated in these studies. However, it was Professor Andrejs Vasks of the University of Latvia who really turned my interest in history towards archaeology, and Stone Age archaeology in particular. I am grateful to him for giving me the opportunity to take part in the excavations at Zvejnieki (2005–2009), which were life-changing in many ways. During the Zvejnieki excavations I met Professor Lars Larsson of Lund University, who further influenced my path in archaeology. Besides being a fantastic excavation leader, he has always inspired me in my studies and encouraged me to continue research on the Zvejnieki burials and their animal remains. Lars has been of great help, commenting on my texts, looking for Skateholm material in the storage facilities and giving me information about the excavation documentation and photographs – I really appreciate this, *stort tack* and *liels paldies*!

This dissertation could not have been completed without the help of my supervisors. My main supervisor, Karl-Göran Sjögren, was always there to talk and write countless recommendations for grant applications. I thank Liv Nilsson Stutz for encouraging and challenging me with theoretical discussions and offering much-appreciated alternative ways of supervising. Ola Magnell has been an invaluable aid in analysing the material and starting my personal reference collection. He has been extremely patient in answering all my questions and verifying the identification of some obscure bones, as well as thoroughly reading my writing. I am deeply thankful to all of you! My initial supervisors, Tove Hjørungdal and Per Cornell, are thanked for introducing theoretical perspectives that changed the course of this study.

I am extremely grateful to Ilga Zagorska for all her engagement during this work and for being an endless source of information about the Zvejnieki excavations and providing field diaries and photos. Elena Kostyleva invited me to study the Sakhtysh material, which led to major changes in the dissertation project. She has been very helpful in answering all my questions, provided illustrations and field documentation,

and hosted me in her home during the material studies in Ivanovo. I thank Leif Jonsson for the kind permission to use his unpublished data about animal remains from the Skateholm burials. Leif has been a great support with osteological questions, assisted in identifying specimens and in particular shared his knowledge of fish remains. I appreciate the constructive comments of Professor Charlotte Damm during the final seminar – these were very valuable in the last stages of this work.

This work would not have been possible without extensive studies of archaeological collections and archive material. I am grateful to the staffs of the Department of Archaeology at the National History Museum of Latvia (especially Normunds Grasis) and the Repository of Archaeological Material of the Institute of Latvian History, University of Latvia (Silvija Tilko, Inga Doniņa and Aigars Vāvere) in Riga, as well as the Lund University Historical Museum at Gastelyckan. In Russia, Ekaterina Kashina provided invaluable assistance in introducing me to various materials. Many thanks to the participants of the Tver Archaeological Seminar and its organizer Igor Chernykh, who provided a real gateway to Russian Stone Age archaeology. In addition to Ivanovo, comparative materials were studied in Istra and Vologda (Marina Ivanishcheva and Nadezhda Nedomolkina), Samara (Aleksandr Vybornov and Arkadiy Korolev), Perm (Nataliya Bryukhova, Evgeniya Lychagina and Aleksey Sarapulov), St. Petersburg and Petrozavodsk (Dmitriy Gerasimov and Aleksey Tarasov), as well as in Minsk in Belarus (Maksim Charnyauski) and Tartu in Estonia (Aivar Kriiska). Theis Jensen is thanked for his help with the ZooMS analysis.

Colleagues at the Department of Historical Studies in Gothenburg are thanked for facilitating the scientific and social environment during my PhD studies. My closest colleagues, with whom we started PhD studies, are Anna, Irene, Mari, Avigail, Yuan and Lars – thanks for this time together! Anna Gustavsson shared the journey with me and was invaluable in the final stages of the work and helping with the Swedish translations. Malou Blank, my main Stone Age companion in Gothenburg, Frida Norstein, Linnea Åshede and Frida Wikström provided company and assistance in many ways over the years. Other fellow PhD students – Martina Hjertman, Andrine Nielsen, Cecilia Sandström, Sonja Tolmacheva, Emma Nordström, Anna Locke, Palle Borenberg, Henrik Alexandersson and Sari Nauman – thank you! Together with Sophie Bergebrant, Elisabeth Arvill-Nordbladh and Anna Wessman, we had very fruitful and encouraging theoretical discussions during our group meetings on human–animal relations. Sophie has always been a person to turn to with any questions and for help.

I am very happy for all the encounters this journey has created. While attending conferences and courses and visiting museums, I met Marja Ahola, Mari Tõrv, Rita Peyroteo Stjerna and Sara Gummesson, among others, who shared my interest in studying hunter-gatherer burial practices in the Baltic Sea area. Mārcis Kalniņš, Irina Khrustaleva, Ildikó Pilán and Vanda Visocka are also acknowledged for their companionship. A big thank you to Anja Mansrud, who has been there and supporting from the moment I got to know I have the PhD position. Carine Rosenvinge accompanied me while studying some materials in Russia and thanks also to Synnøve and Svein,

Hilde and Torgeir, Judyta, Guro and others in Oslo for their friendship and discussions about the Stone Age in the North.

The *Dialogues with the Past* courses were an excellent opportunity to widen my horizons. It was a great pleasure to discuss various scientific topics with the fantastic participants and lecturers during the courses in Berlin (2014), Athens (2016), Riga (2017), South Africa (2018) and Rome (2018). I am very grateful to have met you all! The two field seasons in the *Riņņukalns research project* (2017–2018) were a great pleasure and taught me a lot about shell midden excavation, as well as providing an opportunity to excavate some hunter-gatherer burials. Thanks to Kristiina Mannermaa and the *Animals Make Identities* project for giving me the possibility to continue work on the osseous materials and hunter-gatherer graves of Northern Europe – I'm looking forward to dive deeper into the research of animal remains from the burials! The thesis was finalized while learning new methodological approaches at the PalaeoHub, York university. Many thanks to Aimée Little, Harry Robson and Anđa Petrović for giving me a sense of home in York. I thank Valdis Bērziņš for his help with improving my English and all his assistance in studying the Latvian Stone Age. Laura Melne and Ilze Pintāne contributed by translating the summary into Latgalian and proofreading the Latvian version. Thomas Ekholm's help with the layout was irreplaceable: his professionalism and calmness were essential during the very last weeks of this project and in turning the many Word, Excel and image files into a real book. The numerous beautiful pictures of animals and birds contained in the book are by Andrejs Jesko – I am thankful for his friendship and for the kind permission to use these photos.

This research was carried out with the financial help of various foundations. I am very grateful for the support provided for analysing materials in various museum collections, presenting my research at conferences and completing this work. I thank the Helge Ax:son Jonsson stiftelse, Svenska Fornminnesforeningen, Anérs stiftelsen, Lundgrens stiftelse, GU (Filosofiska fakulteternas gemensamma) donationsfond, Berit Wallenberg Stiftelse, Lennart J. Hägglunds stiftelsen, Kungliga och Hvitfeldtska stiftelsen, Kungliga Vitterhetsakademien internationaliserings stipendium, Oscar Montelius minnnesfond, Lars Hiertas minne, Adlerbertska fond GU, Wallenbergsstiftelses fond and Svenska Institutets Visby Program.

Ulla and Hasse have been my family in Gothenburg through the years, making me feel at home and supporting in all possible ways. I am happy I had the chance to meet and live together with Ekaterina; thanks for all the conversations and good food we shared, and also thanks to your family in Moscow for hosting me while studying the materials in Russia. Thanks also to Valērija, Rachel and Asja for non-archaeological company in Gothenburg, and Pauls for the good rhythms and concerts. My friends and family in Latvia, Sweden, Germany, England, Norway, Denmark, Finland and elsewhere are thanked for their interest in my work and for giving a non-archaeological perspective on life. Special thanks to Raminta for regularly checking the progress of the project and keeping up my spirits. Linda – thanks for hosting me in Lund and for all the nice chats about life. I am also so lucky to have such supportive friends

as Gunda, Gunita, Lilija, Līga, Ria, Kristin, Aurora, Sanita, Terēze, Cāļuks, Zaķis, Zvēriņš and my other spirit animals.

Īdeņa 16 deserves a special mention for being the best companions since childhood (Iveta, Andris and Jānis, also Justīne and Rihards). We have experienced and shared many things in life, good and not so good. Thanks for reminding me who I am and what values are important. Thanks also for the best memories of hunting, fishing, crazy hiking tours on the bog islands and the best parties on the Īdeņa hillfort. It's a good feeling to know that you are always there! I am very grateful to Kerkko Nordqvist for his help in creating illustrations and for seeing that my ideas of a visually beautiful book also became a reality. Thanks for sharing these crazy times of *väitöskirja*, for proofreading and commenting on my texts.

The biggest thanks go to my roots – my family! I am very lucky to have such strong and wonderful kin! You have given me a good base, freedom and the feeling that everything is possible. You have always supported and encouraged me in everything I do, even if you did not always understand what I'm really doing and why I have to deal with dead animals and people. I am very grateful to my parents for the opportunity to grow up in such a special place with such a particular lifestyle. From my own experience I can say that fishing, hunting and foraging is the best and most sustainable way of life. My mom has always been there, supporting and helping with many practical things – even cleaning wild boar teeth with a tooth brush and tooth paste when I needed some teeth for the reference collection. My father gave me a perspective on life. His wisdom, humour and positive attitude towards life, other people, animals and the environment were admirable. I am sad that you are not able to see this book finished, but I hope you can be proud of it as you always have been of me. This book is dedicated to you – one of the last true hunter-fishermen in modern-day Latvia.

York, April 2022
Aija Macāne

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PART 1

Chapter 1.
Introduction

The cemeteries of hunter-gatherers dated to the Mesolithic and Neolithic (ca. 7500–2600 cal BC) around the Baltic Sea and in central Russia reveal complex, multispecies mortuary practices. Animal remains frequently occur alongside human bodies in hunter-gatherer burials. A wide range of unworked and modified bones, teeth (mainly incisors and canines), antlers, jaws, phalanges, astragali, claws and other body parts from a variety of species have been identified. Through a detailed investigation of the animal remains deposited in the graves, in particular tooth pendants, this thesis aims to explore how relationships between humans, animals and their environment were expressed and given form in the burial practices of hunter-gatherers from a relational perspective. In this thesis, animals are considered not just as a source of food and raw materials. Humans were co-inhabiting a Stone Age landscape with an abundance of flora and fauna. Animals were part of the naturescape, they were companions and they embodied ideals, fear and respect. These relationships developed through continued interactions, which were inevitable in the close co-existence within this shared environment (e.g. O'Connor 2018; Overton & Taylor 2018; Pilaar Birch 2018).

In previous research on hunter-gatherer burials in north-eastern Europe, the focus has often been on humans (Nilsson Stutz 2003, 2006, 2008; Kriiska et al. 2007; Nilsson Stutz & Larsson 2016; Tõrv 2018), or on the grave inventory and burial arrangements (Гурина 1956; Albrehtsen & Brinch Petersen 1977; Larsson 1988a; Zagorska 2006a, 2008, 2016; Костылёва & Уткин 2010; Butrimas 2012; Brinch Petersen 2015; Ahola 2019). Animal remains from burials have been assigned aesthetic and symbolic values, and have been interpreted as valuable grave goods or remains of feasts connected with the funerary ritual (Zagorska & Lõugas 2000; Karsten & Knarrström 2001; Larsson 2006a; Mannermaa 2006, 2008a, 2013; Zagorska 2016; Mannermaa et al. 2019, 2021). The previous studies have mainly concentrated on various economic (Jonsson 1986, 1988; Rowley-Conwy 1998; Lõugas 2006) and technological aspects (Larsson 2006a; Mannermaa et al. 2021). The social importance of human–animal relations has rarely been discussed (Larsson 2006a; Mannermaa 2008a, 2013; Jonuks & Rannamäe 2018). This thesis seeks to complement the previous research on animals in the hunter-gatherer burials in north-eastern Europe and offer a more comprehensive

understanding of the hunter-gatherer relationship with animals and the surrounding environment. By employing a relational, multispecies approach, the human-centred view of burials is problematized.

Animal body parts contain a vast amount of information that can enrich our understanding of hunter-gatherers and their relations with the environment. In previous studies, the identities and life stories of the animals whose bodies became the material for a range of artefacts have largely been ignored (Conneller 2011: 49). An animal tooth chosen for deposition with the deceased represents the selection of a certain animal species or an individual animal, its modification into a pendant or other decoration and the ceremony through which it was deposited in the burial. Tooth pendants embody multiple aspects of animals and their hunters, and through their materiality they can tell a much more complex story about the life and death of hunter-gatherers and their relationship with animals. Detailed examination of animal remains and tooth pendants from burials can give more evidence about animal identities and the ways in which they emerge individually, collectively and through interactions with other species (Conneller 2011: 52). Tooth pendants mirror the act of hunting or acquisition of the desired material, bone handicraft and the expertise of somebody who knew how to turn them into pendants, the preparation of the deceased with these adornments and their placement in the burial. Thus, these tooth pendants, like other finds from the grave, serve as tools for communication, manifesting the transformative process of materials and their relationship with the buried person.

The multi-layered relationships between humans and animals in this study are approached through the keyword *companions*, which constitutes the main focus of how I perceive the research material. This term originates from Donna Haraway's work on companion species, where the term *companions* "designates webbed bio-social-technical apparatuses of humans, animals, artefacts, and institutions in which particular ways of being emerge and are sustained" (Haraway 2008: 134). However, the term *companion(s)* includes an underlying aspect of dependence on humans, since often animals (at least some) have been considered as helpmates or companions in the hunt, assisting humans in this activity and thus serving or helping to achieve human goals or intentions. However, I do not see the term *companions* only with this underlying notion, and instead consider all living beings inhabiting the Stone Age naturescapes as companion species and companions. The relationship between humans and animals during the Stone Age thus involved multiple levels of engagement. The lived environment represented one way of relating to animals, while another set of relations could be shaped in the cosmological realm, where symbolic aspects had an important role. It can be so that in nature animals were dominant (since they were in the majority), while in burials and through ritual activities humans had the possibility of affecting and manipulating their environment and animal world.

1.1 Background

"Previously, environmental and symbolic perspectives have been used to interpret animals in archaeology, while art and representation have been in focus discussing

animal materials. Species maybe have been mentioned in the material analyses, while their life story, sex, age, and transition from animal body to material have been neglected" (Conneller 2011: 50).

In the early stages of this research, I found Chantal Conneller's (2011) work on the archaeology of materials very inspiring. Especially with regard to animals and their bodies that become materials, my intentions in this study agree with Conneller's ideas of giving more attention to animals and focussing on various relations between humans and animals. There must have been specific relations between animals and humans, affecting the ways in which humans have selected animals, which thereafter became materials for creating tooth pendants or other adornments and artefacts. Even though Conneller (2011: 3) advocates technological studies in order to trace human–material interactions and material transformations, such studies are not undertaken in this work. Here, the focus is on tracing the relationality between humans and animals based on materials in burial assemblages and how certain animals became meaningful materials and objects.

Conneller's (2004, 2011: 59) studies of animal materials, particularly red deer frontlets and barbed points from Star Carr (Great Britain), exemplify hunter-gatherers' good knowledge of animals, their lives and identities. The human–animal encounters during daily life, as well as the process of transforming the animal body parts into objects which were then placed in the burials, are very important for understanding the materials. Animals as well as humans undergo a transformation process by dying and become objects. A dead body does not mean that the person's agency has been lost (Jenkins 2008: 17; Robb 2013). Similarly, animals may have retained their identity and other particular features after death. Conneller (2011: 20) looks at materials as a "becoming that always exists in relation to something else". Relations, transformations and encounters stay in focus when approaching materials. Several levels of encounter can be distinguished when approaching my research material: the relationship between the deceased and the adornments, between tooth pendants and other grave goods, as well as relations between the human and the animal from which these tooth pendants were made. Understandings of materials depend on our engagement with them, and material properties could have embodied different meanings for people in different regions and periods of time (Conneller 2011: 3).

Animal tooth pendants resemble the example of masks, costumes, body paintings and tattoos presented by Elizabeth DeMarrais and John Robb (2013: 11). Such adornments of the body could transform the body temporarily or permanently, and their purpose was probably to draw attention or generate certain impressions for viewers. One of the issues I wish to discuss with the help of animal materials is identity and how animal remains can act as a powerful medium in constructing human identities and interactions. Animal tooth pendants can be regarded as bearers of the animal identity as well as tools for creating and maintaining the identity of the individual or group, and, as illustrated by DeMarrais and Robb (2013: 11), making objects of art can be an activity that forges bonds of solidarity between the participants in this shared activity.

With these examples I wished to illustrate the potential that animal remains offer for discussing various aspects of relationships between humans and animals with the help of animal remains and animal-derived artefacts. The reasoning and aspects considered above are relevant to my research, as is one more, often underexamined topic. The relationship with the landscape and surrounding environment must have been of essential importance for Stone Age hunter-gatherers. These issues have been explored and extensively discussed in the context of northern archaeology and cosmologies in a recent study by Vesa-Pekka Herva and Antti Lahelma (2020), who see the emergence of cemeteries and burying the dead as a way to incorporate them and become part of the surrounding naturescapes. The landscape and place where the bodies were disposed were also shaping hunter-gatherers' relationship with the world around them, including various companion species. Such notions are important not only for the group, but are strongly based on each individual and their particular relation to certain animals, places or natural features. To illustrate the variety of these, ethnography offers a useful resource for additional information, since it is based on research into the interactions and observations of living communities. The ethnographic record from north Eurasian forager communities (e.g. Zvelebil & Jordan 1999; Jordan 2003; Willerslev 2007; Herva & Lahelma 2020) appears to provide a suitable basis for inquiries into various hunter-gatherer ontologies, which are further discussed in Chapter 2.

1.2 Material, geographical and chronological setting

North-eastern Europe, including the Baltic Sea region and the forested areas of central European Russia, are the main areas of research. The thesis studies animal remains from hunter-gatherer burials at Zvejnieki (Latvia), Skateholm I and II (Sweden) and Sakhtysh II and IIa (Russia). Since the study sites are situated in different geographical settings, comprising southern Scania, the Eastern Baltic and western Russia, in this work I choose to use the term *north-eastern Europe* for designating the whole study area (Fig. 1.1). The location of Skateholm reflects a marine environment, while areas to the east of the Baltic Sea comprise mostly forests, lakes, bogs and other wetland areas, thus providing unique and diverse settings for exploring interactions between humans and the animal world.

The pace of the Stone Age in the Eastern Baltic and western Russia differs from the processes that took place in other parts of Europe (Nordqvist 2018; Herva & Lahelma 2020). The periodization commonly used in Western Europe to divide the Stone Age is not suitable for this particular region, and the concepts *Mesolithic* and *Neolithic* do not convey the same meanings as in the rest of Europe (see e.g. Piezonka 2017; Nordqvist 2018). The appearance of pottery rather than agriculture and stock-keeping is used to differentiate between the Mesolithic and the Neolithic. Indications of a livelihood based on food production occur starting from the 4th millennium in southern Sweden (The Funnel Beaker Culture; Price 2015), and the 3rd millennium cal BC in the Eastern Baltic and western Russia (Corded Ware Culture; Nordqvist & Heyd 2020; Kriiska & Nordqvist 2021; see also Kriiska 2009; Alenius et al. 2017 for pollen data). Even in later periods, hunting, fishing and foraging were more important than agriculture in

Figure 1.1. Map of north-eastern Europe showing the location of the main study sites. Map: K. Nordqvist.

many areas to the east of the Baltic Sea, and in some areas play an important role in people's lives and subsistence even at the present day. The chronological framework of the thesis comprises the time period ca. 7500–3000 cal BC, covering the Mesolithic, Neolithic and Eneolithic periods in accordance with the various periodizations used in the study area (Fig. 1.2) (Larsson & Zagorska 2006; Костылёва & Уткин 2010; Nordqvist 2018; Macāne et al. 2019; Kriiska 2020a, 2020b). Therefore, in this work, I try to avoid these terms and use an absolute chronology when possible. The dates presented in the text have been calibrated using OxCal v4.4.4 (Bronk Ramsey 2009), with the IntCal20 atmospheric curve (Reimer et al. 2020). Instead, for designating the temporal context in which I work, I choose to refer to *hunter-gatherers*, since this term corresponds to the general way of life that was pursued in the investigation area, despite various cultural or chronological designations, which for some readers would involve other connotations and perhaps call into question the comparability of the research materials.

The empirical research material consists of tooth pendants and other modified and unmodified remains of animals from hunter-gatherer cemeteries at Zvejnieki, Skateholm I and II, as well as Sakhtysh II and IIa, providing an abundance of animal remains (Fig. 1.3), which are an excellent source for exploring human–animal relationships. In order to obtain a better understanding of these materials, all available excavation documentation, reports, plans, drawings and diaries were studied. Dr Ilga Zagorska provided additional clarification with regard to Dr Francis Zagorskis' field diaries; the data on the Skateholm excavation documentation was provided by the

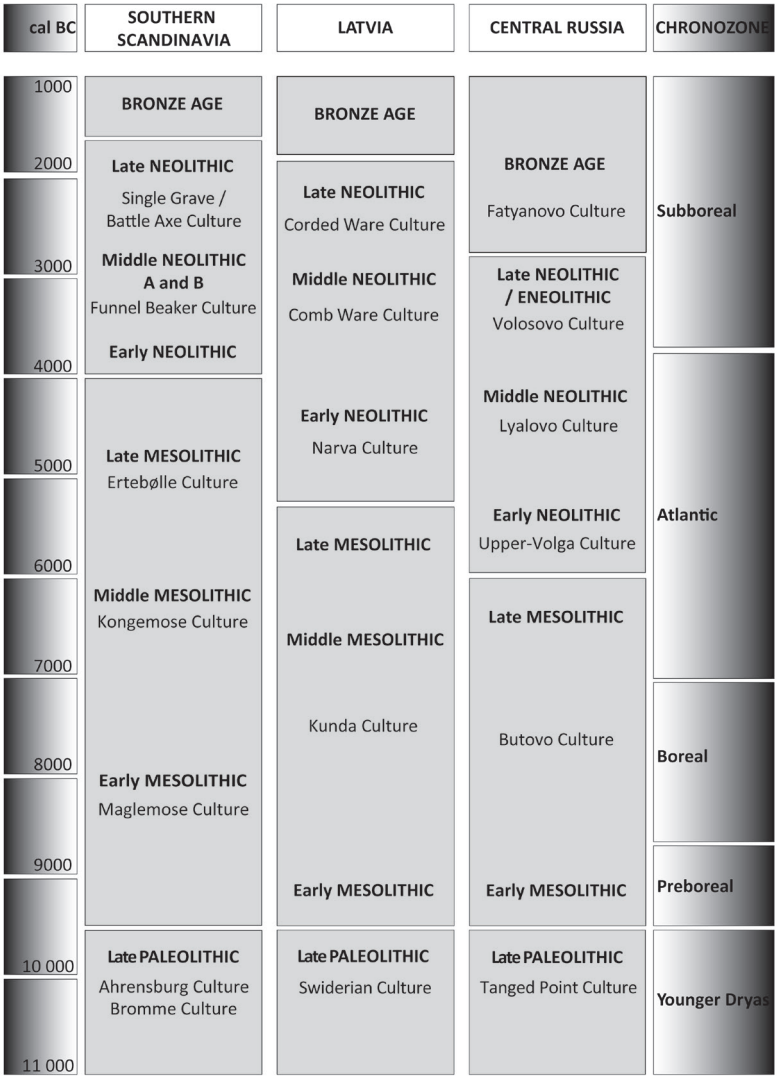


Figure 1.2. Periodization of the Stone Age in southern Scandinavia (in this study referring mainly to southmost Sweden and Denmark), Latvia and central Russia (after Larsson & Zagorska 2006; Hartz et al. 2010; Price 2015; Rosentau et al. 2017; Macāne et al. 2019). Illustration: A. Macāne.

excavation leader, Prof. Lars Larsson, while the Sakhtysh documentation was provided by Dr Elena Kostyleva.

The Zvejnieki cemetery, with 330 burials, is the largest hunter-gatherer cemetery in Northern Europe and provides the largest number of animal-derived materials (Fig. 1.3, 1.5, 1.6; see also Chapter 4.1). The material from Zvejnieki is outstanding also because the chronological framework stretches over five millennia, from the 8th to the 3rd millennium cal BC, although several burials from later periods have also been documented (Zagorska 2006a). Most of the Zvejnieki collection is stored at the

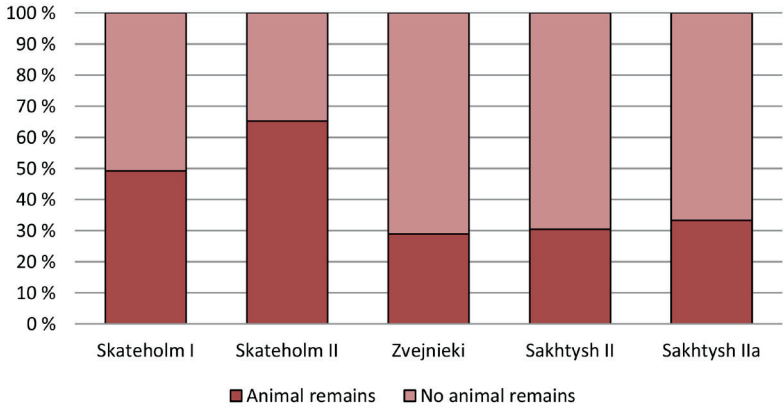


Figure 1.3. The percentage of burials with animal remains at Skateholm, Zvejnieki and Sakhtysh included in the study.

Figure 1.4. Work on the Zvejnieki animal remains at the National History Museum of Latvia. Photo: A. Macāne.

Department of Archaeology of the National History Museum of Latvia (NHML) (Fig. 1.4), and some pieces are on display in the permanent exhibition. Finds from one burial are exhibited at Valmiera Museum, while a few more were located at the Department of Archaeology, Institute of Latvian History (ILH). All finds were studied at the location where they are kept. Although animal remains from Zvejnieki have previously been identified to species (Zagorska & Lõugas 2000; Lõugas 2001, 2006), more detailed analysis of animal tooth pendants has been carried out, providing much more in-depth information about animals and their life histories.

The use period of the Skateholm cemeteries is ca. 5600–4800 cal BC, Skateholm II being older than Skateholm I (Andersson et al. 2004: 130; Larsson 2016). Sixty-four burials were discovered at Skateholm I, and 22 at Skateholm II, including burials of dogs and abundant remains of animals and fish (Chapter 4.2). The Skateholm material has been studied at Lund University's Historical Museum. The poor preservation of the animal remains from the Skateholm burials and difficulties of locating them in the museum collections have forced me to rely mainly on published sources and unpublished reports on animal remains (Jonsson n.d., 1986, 1988; Larsson n.d., 1988a, 1988b).

The studied burials from Sakhtysh II and IIa belong to the time period from the 5th to the early 3rd millennium cal BC. Sixty-seven burials have been excavated at Sakhtysh IIa, while 23 burials of humans and three dogs were discovered at Sakhtysh II (Chapter 4.3; Костылёва & Уткин 2010; Piezonka et al. 2013; Macāne et al. 2019). The Sakhtysh sites contain a variety of animal body parts deposited in burials as well as in pits associated with the cemetery areas (Крайнов 1987a; Крайнов et al. 1994a). The osteological analysis of animal-derived materials from burials was carried out at the Ivanovo State University Museum and Ivanovo City Museum.

The Zvejnieki cemetery occupies a central place in this investigation, since it provides the largest assemblage of animal remains and covers the longest time period (Fig. 1.3, 1.5, 1.6). The material from Skateholm and Sakhtysh contributes some fascinating examples of human–animal interactions from more narrowly delimited time periods

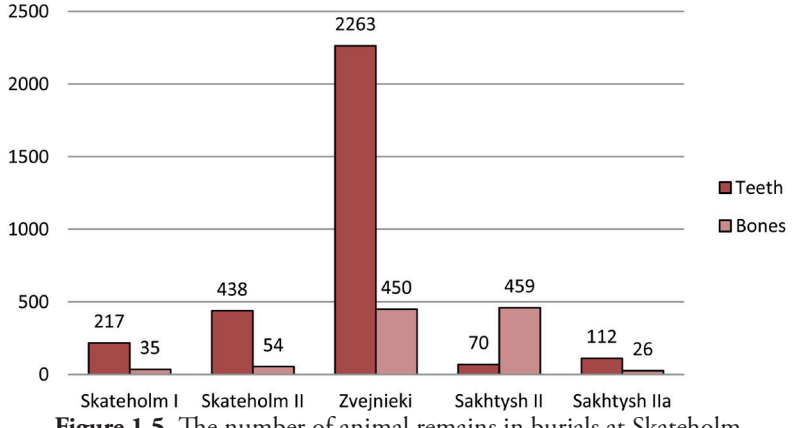


Figure 1.5. The number of animal remains in burials at Skateholm, Zvejnieki and Sakhtysh included in the study.

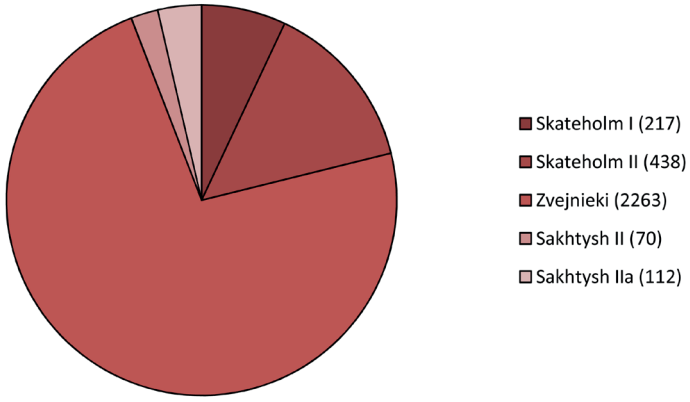


Figure 1.6. The number of animal teeth in burials at Skateholm, Zvejnieki and Sakhtysh included in the study.

and particular geographical areas. Along with osteological analysis, which was the main method employed in this study, radiocarbon dating was also undertaken, in order to clarify the chronology of animal-derived materials from hunter-gatherer burials. Bulk stable isotope ($\delta^{13}C$ and $\delta^{15}N$) as well as ZooMS analysis were also undertaken in the course of this study (see Chapter 3.2 for more detailed information; also Macāne et al. 2019).

In order to obtain a better understanding and provide the setting for the Zvejnieki finds, an investigation of all Latvian Stone Age burials has been carried out (including more than 10 sites with hunter-gatherer burials, the main ones marked in Fig. 1.7). Some of the results have been published previously (Macāne & Nordqvist 2021), while data on the animal remains is presented here and serves the purpose of contextualization (Macāne 2019). Animal tooth pendants from the settlement layers of other sites at Sakhtysh, as well as several other hunter-gatherer sites dated approximately to the 4th–3rd millennium cal BC in central European Russia (e.g. Chornaya Gora, Maslovo Bolota IV, Shagara II, Velikodvorye, Volodary and Volosovo) were also studied to obtain a better understanding of the Sakhtysh finds (Macāne 2017). Finally, other published materials are used as comparative material for additional examples, primarily coming from hunter-gatherer burials in north-eastern Europe (Гурина 1956; Janzon 1974; Albrehtsen & Brinch Petersen 1977; Burenhult 1997; Kjällquist 2001; Nilsson Stutz 2003; Kriiska et al. 2007; Brinch Petersen 2015; Gumiński 2014; Gumiński & Bugajska 2016; Oshibkina 2016; Tõrv 2018; Ahola 2019; Mannermaa et al. 2021).

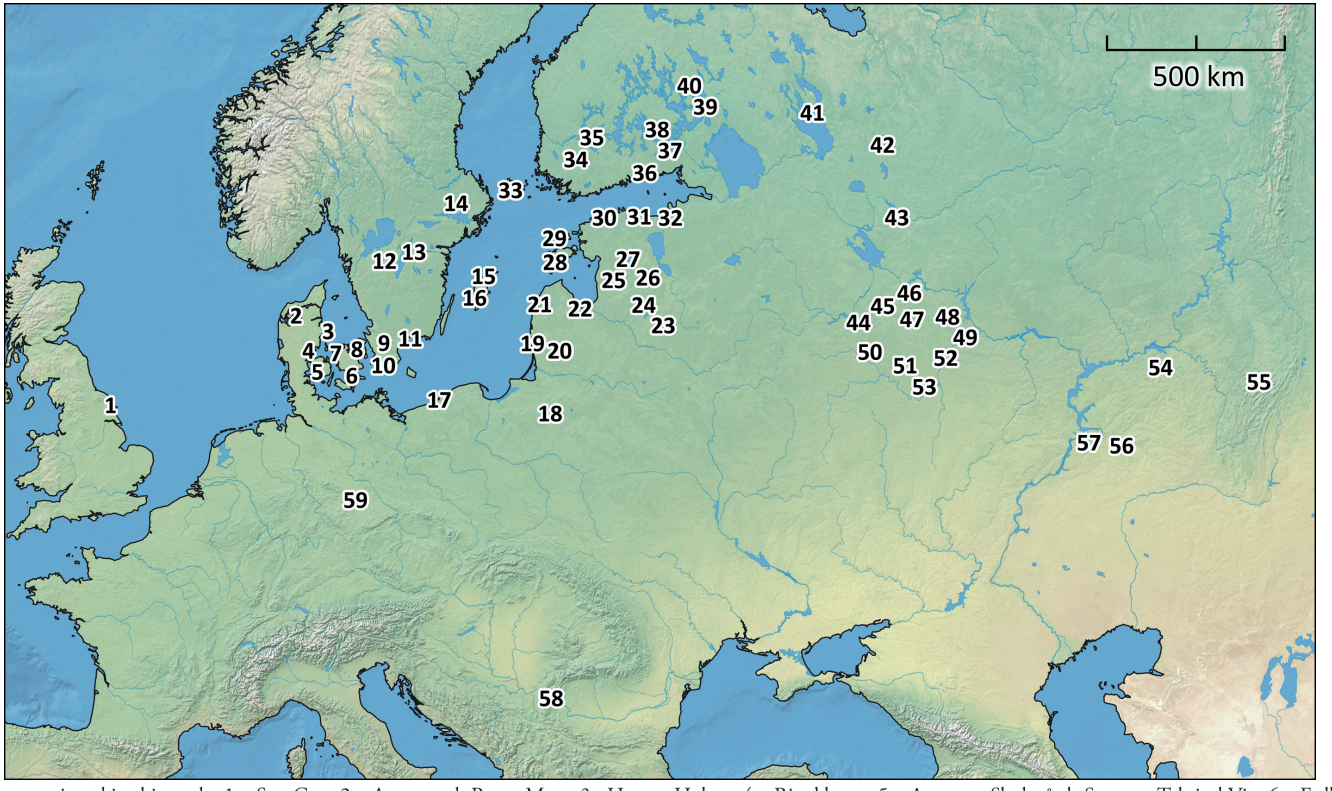


Figure 1.7. All sites mentioned in this study: 1 – Star Carr, 2 – Aggersund, Resen Mose, 3 –Havnø, Holme, 4 – Ringkloster, 5 – Agernæs, Sludegårds Sømose, Tybrind Vig, 6 – Fælleseje tørvemose, Sværdborg I, 7 – Egemarke, Præstelyngen, 8 – Gøngehusvej 7, Henriksholm-Bøgebakken, Nivågård, Vedbæk, 9 – Ageröd I and V, Arlöv I, Bökeberg III, Hässleberga, Rönneholms mosse, Segerbro, Sjöholmen, Tågerup, 10 – the Skateholm sites, 11 – Ljungaviken, Norje Sunnansund, 12 – Almeö, Ytterberg, 13 – Kanaljorden, Strandvägen, 14 – Åloppe, 15 – Ire, Västerbjers, 16 – Ajvide, Stora Förvar, 17 –Dąbki 9, 18 – Dudka, 19 – Šventoji sites, 20 – Donkalnis, Spiginas, 21 – Sārnate, Sise, 22 – Siliņupe, 23 – Jurkova, Kreiči, 24 – Abora I, Lagaža, Malmuta, Zvejsalas, Zvidze, 25 – Kaulēnkalns, Riņņukalns, Zvejnieki, 26 – Kääpa, Tamula, 27 – Valma, 28 – Kõnnu, Naakamäe, 29 – Kõpu I, 30 – Jägala Jõesuu V, Vabaduse väljak, 31 – Kunda Lammasmägi, 32 – Lommi III, Narva Jõaorg, Riigiküla I and III, Tõrvala, 33 – Jettböle I and II, 34 – Järvensuo 1, 35 – Pohtiolampi ja Tiilitehdas, 36 – Pykinkoski, 37 – Vaateranta, 38 – Astuvansalmi, 39 – Pörrinmökki, Vihi 1, 40 – Lintutorni, 41 – Yuzhniy Oleniy Ostrov, 42 – Peschanitsa, Popovo, Veretye 1, 43 – Kubenino, Minino I, 44 – Zamostye 2, 45 – Berendeevo, Ivanovskoye 3 and 7, 46 – Stanovoye 4, 47 – the Sakhtysh sites, 48 – Strelka I, Utreh 3, 49 – Volodary, 50 – Maslovo Bolota IV and V, 51 – Chornaya Gora, Shagara II, Velikodvorye, Vladychino, 52 – Volosovo, 53 – Iberdus I, 54 – V Mellyatamakskiy, Russko-Shuganskiy, 55 – II Ust-Katavskoy, 56 – Maksimovka, 57 – Ekaterinovskiy Cape, 58 – vVlasac, 59 – Bad Dürrenberg. Map: K. Nordqvist.

1.3 Aim and research questions

The rich record of animal remains from hunter-gatherer burial contexts in north-eastern Europe provides an excellent basis for investigating the complexity of relationships between humans and animals from a relational approach. The lack of comprehensive study into hunter-gatherer relations with animals in north-eastern Europe, particularly the social aspects of these relations, as reflected in burial practices, is an argument for the necessity of this research and its contemporary significance. This study provides a novel perspective for approaching animal remains and makes an important contribution to expanding our understanding of relationships between hunter-gatherers and animals in the Stone Age of north-eastern Europe. It also addresses the chronological and geographical variation of the study areas and the diversity of research materials. The thesis does not intend to reconstruct all aspects of the mortuary rituals of hunters-gatherers. Instead, the focus here is on the animals whose body parts were chosen for deposition in graves, considering their age, sex and other characteristics which could have been of importance for their selection and deposition with the deceased.

The main goal of this dissertation project is to shed light on Holocene hunter-gatherers' relationship with the animal world and the surrounding environment, and on how the world of animals and humans co-existed, confronted and affected one another. The ultimate task is to investigate the diversity of relationships between humans and animals and how these relations can be studied through animal remains from hunter-gatherer burial contexts in north-eastern Europe. In order to achieve this aim, modified and unmodified animal remains from hunter-gatherer burials at Zvejnieki, Skateholm I and II, and Sakhtysh II and IIa have been investigated through an interdisciplinary approach (Chapter 3) and interpreted in a theoretical framework grounded in posthumanism and a relational perspective (Chapter 2).

To achieve the main goal, three research objectives are set:

Objective 1 is a careful investigation of the primary excavation documentation and published materials, with a particular focus on data relating to animal remains. The current study emphasizes the need for thorough investigation of the archaeological material, also including the archival sources and excavation documentation. It is important to provide a solid frame for the basic research data, which has lately been overshadowed by the explosion of natural scientific methods and their application in archaeology in the frame of the "third scientific revolution" (see Kristiansen 2014). Even though animal remains form the basis for this investigation, the contexts are human burials. Therefore, during data collection other parameters concerning the burial, the dead individual and funerary practices have also been reported (see Appendices 1–4 and Chapter 4 for more details), since animal remains and artefacts cannot be interpreted outside of their context (see also Tõrv 2018; Ahola 2019). Much of the documentation and many publications have been written in the national languages (Latvian, Swedish and Russian), and due to the linguistic or political barriers the material has not been available or is little known to foreign scholars. It is crucial to incorporate this material into the wider scholarly discourse in order to broaden our understanding of local, regional and inter-regional burial practices and human–animal relations in the Stone

Age. In doing so, this thesis contributes novel information about the hunter-gatherer communities inhabiting vast areas of the forest zone of north-eastern Europe.

Objective 2 is the investigation of archaeological material and osteological analysis of faunal remains from hunter-gatherer burials. Re-evaluation of previous analysis and additional osteological analysis were undertaken in order to obtain more detailed information about animal remains at Zvejnieki, Skateholm I and II, and Sakhtysh II and IIa (presented in Chapters 5–10 and Appendices 2). The degree of previous investigation of animal remains differs for each site. The animal tooth pendants from Zvejnieki have been identified to species (Zagorska & Lõugas 2000; Lõugas 2001; 2006); the animal remains from the Sakhtysh burials have not been subject to osteological analysis before; those from Skateholm have been meticulously documented (Jonsson n.d., 1986, 1988). As mentioned above, the research material from each site shows considerable variation in the number of available animal remains, as well as level of preservation and documentation, affecting how much information can be obtained from them. In addition to osteological analysis, other analyses (radiocarbon dating, stable bulk isotope analysis and ZooMS) were undertaken in order to clarify certain questions that could not be answered through osteological analysis (see Chapters 3 and 4).

Objective 3 is the exploration of the different roles of animals in hunter-gatherer burial contexts. The study discusses the dynamics of the relationship between hunter-gatherers and animals, and changing attitudes towards different animal species during various time periods and in different geographical areas (Chapter 11). The relational approach and hunter-gatherer ontologies form the interpretative framework (Chapter 2). They reveal multiplicity in interactions between humans and animals and their co-existence in nature, until animals or parts of animals were transformed into meaningful objects, which were deposited in the graves. The fragmentation of animals and the preference for depositing particular body parts in graves are discussed, as are the expressions of animal individuality and personhood. Transformations and identity-shifting through the use of animal-derived materials are explored, as are the dynamics of the companionship between hunter-gatherers and animals in the shared naturescapes.

More detailed research questions include:

- Which animal species are present in hunter-gatherer graves?
- How did hunter-gatherers fragment the animals, and which parts of animals were chosen to be processed or used for different purposes?
- Which animals were combined together in burial arrangements?
- How do burial arrangements of animal remains differ between various sex and age groups, as well as diverse geographical and temporal settings?
- How can animal remains from hunter-gatherer burials be used to investigate the multi-layered relationship between humans and animals?
- What kinds of attitudes towards certain animal species can be detected in the hunter-gatherer burials (preferences for food, clothing or symbolic significance)?

1.4 Outline of the thesis

The thesis is divided into three parts. Part One provides the background information and contextualization of the research topic. The introduction (Chapter 1) sets the frame for the study and gives an overview of the temporal and geographical setting of the study sites and materials. It also presents the points of departure of the interpretative framework (Chapter 2) and sets out the methodological approaches and terminology used (Chapter 3). The study sites and research materials are introduced in Chapter 4.

Part Two is devoted to the main research material and presents animal remains from Zvejnieki, Skateholm I and II, and Sakhtysh II and IIa. These chapters are organized according to taxonomic groups of animals. Chapter 5 discusses carnivores, Chapter 6 ungulates and Chapter 7 rodents at all sites. Chapter 8 presents fish and reptiles, while bird remains are discussed in Chapter 9. Modified human remains are briefly presented in Chapter 10. The chapters are essentially organized following the same pattern. Each briefly presents the biological characteristics and other properties of the animal species. There follows an overview of finds of each animal species in hunter-gatherer burial and settlement contexts in north-eastern Europe. Animal remains from the secure burial contexts at each study site are presented, and the importance of each animal species is thereafter discussed in more detail. The concluding part of each chapter summarizes the occurrence and distribution patterns of the animal group at the studied sites and contextualizes it on a more general level.

Part Three is devoted to the interpretation of animal materials. The discussion is framed according to geographical and temporal patterns in the hunter-gatherers' relationship with different animal species (Chapter 11.1). The multi-layered relations between animals and humans are further explored in Chapter 11.2. It discusses the fragmentation of animal bodies, animal individuality and personhood, and transformations and social identification using animal materials. Chapter 11.3 traces the dynamics of the companionship between hunter-gatherers and animals in north-eastern Europe during the Stone Age. It illustrates different attitudes to companion species, varying spatially, temporally and across different cultural contexts.

Chapter 2.
Interpretative framework

The nature–culture (animal–human) duality and the notion that nature and animals have been considered as subordinate to people are central to this thesis, which explores novel perspectives for approaching the relationship between the animal and human world. This division is a Western construct, the origins of which can be found in the Cartesian worldview. Such an approach, with dichotomies separating nature–culture, non-human–human, animality–humanity, has for a long time dominated archaeological and anthropological studies and has strongly affected how we see and perceive ourselves and the world around us, including non-human animals (Ingold 1991, 1994, 2000; Thomas 1996, 2004; Boyd 2017; Harris & Cipolla 2017; Harris 2018).

What is human and what is animal or non-human? The status and relationships of these categories remain quite unclear in Western thought (Ingold 1991, 1994). Are humans just an animal species, and is animality a domain that includes humans, or is humanity a moral condition that excludes animals (Viveiros de Castro 2015: 260)? The terms *non-human animals*, *non-humans* and *non-human persons* have been widely used in many of the current writings concerning animals, but not many authors give an explanation for using such terminology (see e.g. Fredengren 2013; Boyd 2017; Bird David 2018; Crellin et al. 2021). The origins of these terms can be connected with Alfred Irving Hallowell (1988), who used the term *other-than-human persons* when describing the worldview of the Canadian Ojibwa. This manifests an opposition to the Western hierarchy, where humans are perceived as outstanding individuals, while for Ojibwa, a person was an overarching category, including natural objects and beings (Bird-David 2018: 307). Nerissa Russell (2012: 2), however, is one of the few scholars who uses the word *animals* as shorthand for non-human animals, pointing out that the opposition of humans and animals (and all other species) is an artificial and anthropocentric construction. Also, Nurit Bird-David (2018: 307) has suggested moving away from categorizing humans and non-humans and instead focusing on the relations and relatings between the individual and the surrounding environment. Recent theoretical discourse, especially on materiality and relation-oriented ontologies, illustrates attempts to overcome these dichotomies and dualities. Instead, it focuses on the entirety, perceiving humans and non-humans as more equal participants in these

interactions and relations (Barad 2003, 2007, 2010, 2012; Haraway 2003, 2008; Conneller 2004, 2011; Armstrong Oma 2010; Wolfe 2010; Hodder 2012; Fowler 2013; Fredengren 2013; Fowler & Harris 2015; Mansrud 2017a; Herva & Lahelma 2020). This is in agreement with my intention in this study to focus on relationships and the ways they emerge.

Numerous ethnographic and anthropological studies show that there are no strict boundaries existing between nature and culture, or animality and humanity; instead, hunter-gatherers perceive themselves as a part of the larger unity of the surrounding environment (Bird-David 1992: 29–30; Ingold 2000: 42; Willerslev 2007: 19; Zvelebil 2008; Viveiros de Castro 2015: 226). Tim Ingold (2000: 42) writes that hunter-gatherers do not approach their environment as an external world of nature that has to be "grasped" conceptually – the separation of mind and nature has no place in their thought and practice.

Indeed, I believe that instead of separating certain categories, it is more constructive to look at all involved parties as equal entities engaged in multi-layered relationships. My study investigates animal remains from hunter-gatherer burial contexts in order to provide a more holistic view of Holocene hunter-gatherer relations with animals and the surrounding environment. Therefore, the theoretical framework is built on conceptions and discussions based on relational ontologies, animal life histories and their roles in the environment, and aims to move away from the previously widespread human-centric perspectives. Here, posthumanism serves as a point of departure. Traditional hunter-gatherer ontologies, such as animism, totemism and shamanism, have often provided the main approaches for discussing and interpreting the conceptual world of hunter-gatherers (e.g. Strassburg 2000; Zvelebil 2003, 2008; Lahelma 2008; Mansrud 2017a; Fuglestvedt 2018). This thesis will explore alternative ways to approach and interpret animal remains in hunter-gatherer burials.

The recent study by Herva and Lahelma (2020) provides an excellent discussion of northern archaeology and cosmologies, framed by a perspective of relational thinking. With the help of numerous archaeological and historical examples, they illustrate how such an approach can be suitable and how it can be operationalized for areas covering the boreal biogeographical region, where hunting, fishing and foraging have been the main occupations of the people inhabiting it. The perspective of relational thinking allows us to engage with animal materials in depth and provides new aspects and layers of relations between all entities inhabiting environment. The need to look at animals as agents that constitute society has been actively employed in social anthropology (Ingold 1994) and now also in archaeology (Fuglestvedt 2011; Hill 2013: 118).

The diversity of animal roles and meanings in hunter-gatherer ontologies will be discussed in the following. Firstly, an overview is given of the complexity of hunter-gatherers' relations with animals and nature, described mainly on the basis of the ethnographic record from circumpolar Eurasia. This is followed by a short review of the traditional ontologies and how they have affected hunter-gatherer archaeology and our view of prehistoric hunter-gatherer communities. In the concluding part of the chapter, I introduce posthumanism and the relational approach as another way to

look at animals and humans. The interpretative framework operationalized in these perspectives permits the revelation of new aspects of interactions and relationships existing between members of the Stone Age naturescapes in north-eastern Europe.

2.1. Hunter-gatherer relations with animals and environment

The conceptual world of many north Eurasian hunter-fisher-gatherer groups is based on a tripartite model (Fig. 2.1), where land, water and sky are important dimensions (e.g. Zvelebil 1997, 2003, 2008; Zvelebil & Jordan 1999; Jordan 2003, 2011; Lahelma 2008; Herva & Lahelma 2020). It has served as an interpretative framework for some recent contributions in hunter-gatherer studies, especially when discussing animal materials (Conneller 2011; Overton & Hamilakis 2013; Mansrud 2017a; Blinkhorn & Little 2018).

Figure 2.1. Land, water and sky are important dimensions of the tripartite model, which occurs in the conceptual world of many north Eurasian hunter-fisher-gatherer groups. Migrating swans resting on the Rēzekne River in the Lake Lubāns wetlands. Photo: A. Macāne.

Hunter-gatherers have often been unfoundedly regarded as passive participants in their social relations with the surrounding environment, especially in comparison to farmers, who transform the landscape (Zvelebil 1996; Finlayson 2009; Marciniak & Pollard 2015; Nordqvist 2018). Hunter-gatherers have been compared to animals or assigned animalistic characteristics, and sometimes referred to as just a bit better than animals (Ingold 1994: 61–62). The active role of hunter-gatherers should not be underestimated, as illustrated by the ethnographic record (Jordan 2003: 18; Grøn 2012: 59). Even if the skills and the scale are different from later farming communities, hunter-gatherers affected the environment by living in it. The shared environment with animals was crucial in developing close relations with the animal world. Even if the focus has been on humans and their relations with other non-human beings in

the surrounding environment, animals also had relations with humans (Ingold 1994: 61; Fuglestvedt 2011). In the following, I will present some important aspects of the relationship between the environment and humans, but first the use of ethnographic material in archaeology will be briefly discussed.

2.1.1. The use of ethnographic analogies in archaeological research

The use of ethnographic analogies in archaeological research has been a widely discussed and hotly debated topic. Although ethnographic analogies are useful for gaining additional scope for archaeological interpretation and to widen the horizons of the researcher (e.g. Ucko 1969), the need for critique and caution in using them in archaeological contexts has also been emphasized (Chapman 1987: 203; Bird-David 2018: 313). Even though the use of analogies taken from ethnographic contexts has been questioned as inapplicable to archaeological materials (e.g. Trigger 1989), lately ethnography and anthropological parallels are regaining attention in the archaeological research (e.g. Pasarić & Warren 2018). In particular, the works of Brazilian anthropologist Eduardo Viveiros de Castro (1998, 2015) have been fundamental for legitimizing and encouraging the use of ethnographic analogies through the theoretical approach of perspectivism (see Chapter 2.2.4). Similarly, Erica Hill advocates the use of ethnographic parallels and indigenous narratives, which can complement archaeological interpretations. She calls for a "re-evaluation of the existing assumptions about the ontological positions of both humans and animals and exploration of the alternatives furnished by ethnographies and current philosophical debates over the constitution of humanity and animality" (Hill 2013: 127). Given the potential that ethnographic data contains, I consider it an important tool for approaching and interpreting my study material. The ethnographic material provides examples which permit us to explore the local diversity of hunter-gatherer relationships with different animal species (Косарев 2003; Pasarić & Warren 2018).

2.1.2. Interaction with animals

Interactions between animals and humans were relational, they were social in nature and they involved reciprocal exchanges. In other words, a relational perspective emphasizes animals as an essential component of the environment (e.g. Pilaar Birch 2018; Crellin et al. 2021). In some societies, humans recognized certain animals as persons possessing sentience, intentionality and agency (Hill 2013: 127). The level of engagement in relationships, whether with animals or with things, is indeed a very important aspect. The closer we are to them, the closer and more personalized the relationship becomes (Gell 1998: 18–19; Willerslev 2007: 16). For example, Siberian Yukaghirs tend to assign qualities similar to those of humans also to animals and other non-humans. This is a result of close mutual engagement, which may not only involve direct contact or interaction, but may also occur in dreams, for example (Willerslev 2007: 19, 174–178).

The relationship between animals and humans, and attitudes towards animals are affected by the subsistence strategies, such as hunting or herding. It has been considered that only in the relationship with domestic animals can trust and intimacy

be reached between humans and animals (see e.g. Armstrong Oma 2007, 2010; for opinions on Mesolithic animals see Pasarić & Warren 2018). This view takes the hunt as a short-term activity that hinders the possibility of developing a close relationship with wild animals. However, considering the process of the hunt, the time spent observing, tracking, killing and processing animals, engagement in a direct or indirect relation with animals can be very substantial (McNiven 2010, 2013). Furthermore, the hunt is just one facet of engagement with animals (Willerslev 2004, 2007, 2011). For circumpolar hunter-gatherer groups, the hunt and rituals connected with hunting have a special importance (see Ingold 1986; Jordan 2003; Pasarić & Warren 2018). However, the interaction does not end with the death of an animal, and the hunter and animal continue to engage throughout the various stages of processing, consumption and discard of the animal body. Indeed, in many cases the relationship develops through life-long encounters, engagements and interactions, especially with animals that can reach a considerable age (e.g bears or birds). It can constitute life histories for both humans and animals. Even if the relationship with the dog as the only domesticated animal demonstrates an ongoing and long-term engagement and constant nearness, I consider that hunter-gatherers' relationships with wild animals were of comparable importance.

2.1.3. Attitudes to animals and treatment of animal bodies

Respect for animal bodies and correct treatment of them was crucial in establishing relationships between animals and humans, and hunters in particular. The ethnographic material provides a rich record, which shows that not all animals were perceived or treated in the same way among north Eurasian hunter-gatherer communities (Jordan 2003; Косарев 2003; Hill 2013; Pasarić & Warren 2018; Herva & Lahelma 2020). Diverse factors influence attitudes towards both living and dead animals. These aspects are partly dictated by ecology and geography, and, for instance, in Arctic and circumpolar regions the bear, elk, walrus and whale are animals of special importance. The significance of these animals is associated with kin or ancestors, or alternative forms of humans, which play key roles in myths, cosmology, kin relations and social organization (Hill 2013: 119). Nevertheless, the same animals are often also the ones which play the key roles in everyday life.

The following examples illustrate several aspects which were important in hunter-gatherers' relations with animals and certain animal species. They underline that the ways humans had treated animals in life, for example the ways hunters had spoken of them, and the ways they handled their remains, were noted by animals (animal persons), and provide cases where taboos, for instance, were violated (Hill 2013: 126). For the Siberian Khanty, there is evidence of animals remembering their treatment after death, and this can be reflected even in the health and well-being of the human (Jordan 2003: 105). Careful treatment of animal remains is crucial not only for ensuring future hunting success, but also to make sure that the animal's soul will not be damaged by careless treatment (Jordan 2003: 101). Gender-regulated differences in the treatment of various animals and their body parts are also documented in several other indigenous communities (see Russell 2012: 54).

The bear's importance for circumpolar peoples is illustrated in Ainu origin myths and Sámi bear burials, where the personalized perception of the bear as a relative or a human-like person further emphasizes the close relationship between bears and humans (Myrstad 1996; Hill 2013: 119; Herva & Lahelma 2020). For the Sámi, bears maintained their individual identities and were not to be spoken badly of, as also illustrated by the numerous names for the bear known from Finno-Ugric mythology and folklore (Ingold 1986: 243–276; Jordan 2003: 106; Piludu 2019). Among the Khanty, too, the bear is considered more as a fellow, more human-like, while the elk is just a source of meat (Jordan 2003: 132). The interaction and relationship with the bear and respectful treatment of its body parts have been carefully documented among the Khanty. The bear hunt and treatment of the body involves detailed performance of various practices, which are not similar for other animals. This includes (gender specific) ritual engagement using particular bear body parts and festivities to venerate the bear, during which special tools are used to ensure the well-being of the bear (Jordan 2003: 115–123; Pasarić & Warren 2018 and references therein). This means that such parameters as the age, sex, occupation and life experience of humans can also be crucial in defining the relationship with certain animal species.

2.1.4. Animal personality and personhood

Personhood is one of the notions that is common in many hunter-gatherer ontologies and is relevant in approaching human–animal relations in the past. This concept is central for the framework of this thesis. A being needs to have an active role and engagement to give rise to and manifest personhood. The potential for animals to have a personhood and personality, assigning characters typically human to animals, distinguishes relational ontologies from modern Western perceptions (Hill 2013: 120). In archaeology, Benjamin Alberti (2016: 171) strongly links the investigation of personhood with the concept of the *new animism* (see also Živaljević 2015; Fuglestvedt 2018; Mansrud & Berg-Hansen 2021 and Chapter 2.2.1).

There are different ideas about personhood and the ways it comes into being. Either it is an intrinsic value or property which all humans and non-humans may possess, or it can be achieved or obtained during the lifetime due to certain processes and interactions with other beings or environments. It may also shift and can be lost. According to Rane Willerslev (2007: 21), personhood is relational; it is constituted through the relationships between humans and other beings (things), since personhood is not an inherent property (an animal can be a subject-person with a mind of its own). The relationship context in which it is placed and experienced determines its being. Through interactions and relations with others (most notably humans), animals and things gain personhood, since they are not self-sufficient persons. For the Siberian Yukaghirs, animals and other non-humans are conceived as persons not because personhood has been bestowed upon them by some kind of cognitive processing but because they reveal themselves as such within relational contexts of real-life activities, such as hunting (Willerslev 2007: 19–20). Examples from Amazonia reveal similar patterns. This property of human as well as non-human beings is linked to the context and level of involvement. Some animals or non-human beings can possess this trait

and the power of agency in greater measure than humans, and may thus be persons to an even greater degree than humans (Viveiros de Castro 2015: 203).

On the other hand, Ingold (2000: 48) considers that personhood cannot be open to animals and non-human beings, but instead is *added on* or *superimposed* upon them. Russell (2012: 3–4) likewise views the extension of personhood to animals as problematic in a way, since persons are entities with whom humans enter into social relations, and this makes their utilization for human needs problematic. She also points out that personhood applies to some but not all animals, and not all the time. It rather has an individual than a species basis. The personhood of animals can be a projection of individual characteristics of certain animals, which may have led to their different treatment by humans. Keeping this critique in mind, I find the concept of animal personhood important when discussing relationships between animals and northern hunter-gatherers (see Chapter 11.2.2 for further discussion).

2.2. Hunter-gatherer ontologies

The ontological question, with focus on *what is*, instead of the epistemological inquiry *how we know*, has marked the necessity to re-evaluate the previous theoretical considerations (see Bird-David 2018: 307). The works of Bruno Latour (1993, 1999) and Viveiros de Castro (1998, 2015) have marked a shift towards ontological approaches in archaeological and anthropological research. Alberti (2016: 164) summarizes ontology as a theory of reality or being that exists implicitly in all archaeological practice and theory. He considers that the difference in approaching ontologies lies in peoples' beliefs about reality or what people consider a reality.

Ontologies have been especially important in anthropology, when referring to indigenous people's interpretations of reality, worldviews and beliefs. Here, the concern with ontology has been focused on methodological development and creating a new conceptual framework and vocabulary. One outcome of fusing the contemporary ontological concerns with relational anthropologies is an extended sociality that includes animals, spirits and things (Alberti 2016: 170). During the last decades the perspective of relational ontologies has also been more widely employed in archaeology, including discussions on animal-derived materials from hunter-gatherer contexts (Strassburg 2000; Conneller 2004, 2011; Fowler 2004; Warren 2005; Overton 2014; Mansrud 2017a; Cobb & Gray Jones 2018; Jensen 2020; Mansrud & Berg-Hansen 2021).

The central point in most of these ontological debates is the relational aspect between diverse agents, such as persons, beings and things, and how these relations are constructed and performed (see Pilaar Birch 2018; Crellin et al. 2021). Perceptions of animals and other non-humans and interactions with them were fundamental aspects of peoples' awareness of themselves and the surrounding environment. Traditionally, the most commonly articulated ontologies include animals, natural phenomena, souls and spirits as the main actants framing hunter-gatherer ontologies, which have been labelled as animism, totemism, shamanism and perspectivism, and are briefly presented in the following.

2.2.1. Animism

Animism is one of the most commonly used notions in anthropology when discussing indigenous peoples' perceptions of the surrounding environment. The origins of the classical term can be traced back to Edward Burnett Tylor's (1903: 476–478) work on primitive culture, where he discussed *primitive* people who ascribed personality and life not only to men and beasts, but also to natural objects and things, indicating that they, too, can have personhood and can be animated. The central aspect in animism is the attribution of human-like characteristics to non-humans, such as animals, spirits and even artefacts. Animism obscures the relationship between nature and culture, and it highlights the social character of relations between humans and non-humans (Willerslev 2007; Viveiros de Castro 2015: 230–232).

Lately, the concept of animism has been revisited by Ingrid Fuglestvedt (2010, 2018; see also Descola 2013). The *new animism* extends the possession of a spirit not only to every living entity, but also to non-living entities. It also envisages active engagement in social relations with animated animals having souls, will and intention (Fuglestvedt 2010: 25). Fundamental elements of this concept include the active role of animals and objects in these relationships, involvement with animals on a personal level as well as the possibility to transcend identities, reflecting particular shamanistic beliefs (Fuglestvedt 2018: 99). The concept of *new animism* has become important in providing relational interpretative models for archaeologists (Alberti 2016: 170–171) and has recently also been employed in studies on prehistoric hunter-gatherer communities (Overton 2014, 2016, 2018; Pasarić & Warren 2018; Herva & Lahelma 2020; Mansrud & Berg-Hansen 2021).

2.2.2. Totemism

Totemism, according to the definition of Claude Lévi-Strauss (1963), is a belief system where an animal or plant is taken to represent a certain group of humans or represent their affiliation to a kin group. Although this does not necessarily mean that the human group is descended from its totem, that this species is worshipped or that its consumption is governed by certain food taboos (Russell 2012: 25). Recently, the status of this conception has been revised, considering totemism as a form of classification, not an ontology, and asserting that it can be used only in combination with animistic systems (Viveiros de Castro 2015).

Totemism has been a much-used framework, sometimes together with animism, when discussing hunter-gatherer rock art in Northern Europe (Huurre 1998; Lahelma 2008; Fuglestvedt 2018, 2020). It has also been commonly used as an interpretative tool when discussing burial assemblages in Russian archaeological material (see Косарев 2003; Костылёва & Уткин 2010; Kaverzneva & Kashina 2015).

2.2.3. Shamanism

Even though no clear definition has been provided, shamanism is primarily linked to belief systems and often concentrates around a particular person, a spiritual leader, who obtains abilities to communicate with spirits and other non-human beings, or

serves as a medium in this communication (Hutton 2001). The origins of this conception have been linked to Siberia, where an especially rich ethnographic culture provides numerous historically documented examples of such practice (e.g. Hutton 2001; Narby & Huxley 2001).

Particular bodily appearances, transformations and an ability to transcend different worlds and engage in spiritual communication with the invisible side of things encompass some of the major aspects in shamanism (Hutton 2001). Shamans' costumes, often made from animal skins or other animal remains, are considered as instruments allowing them to obtain particular abilities or take on certain forms or characteristics of animals (see Holmberg 1922; Prokofyeva 1963; Furst 1991; Taksami 2001). Music, dance, alcohol, trances etc. are the means to achieve altered states of consciousness that facilitate a change of state, crossing species boundaries (human–animal) and incarnation in other forms, these often being considered the main expression of shamans' powers to communicate with other spirits (Siikala 1992; Russell 2012: 24; Herva & Lahelma 2020).

Shamans, classically associated with animism, are present in many indigenous (foraging) societies (Russell 2012), where shamans are considered the most powerful people, since they can shift from one reality to another (Viveiros de Castro 2015: 289–291). However, in his observations of Siberian Yukaghirs, Willerslev (2007: 27) argues that this concept should be understood as a broadly-based activity practiced to varying degrees by ordinary hunters, rather than being seen as "mysticism" under the control of a particular religious elite.

The application of shamanism in interpreting archaeological materials has long roots. Various animal-derived artefacts from hunter-gatherer burials and other contexts have been interpreted as shamanic attributes (Гурина 1956; Clark 1967; Larsson 1988a;

Figure 2.2. The Astuvansalmi panel contains numerous motifs, including human and non-human representations, and is one of the largest rock art sites in Finland. Photo: A. Macāne.

Schmidt 2000; Strassburg 2000; Little et al. 2016; Mykhailova 2019; Mantere & Kashina 2020). In addition, shamanistic practices and transformations have recently been strongly related to the interpretation of Northern European rock art (Fig. 2.2) (see Lahelma 2007, 2008, 2012; Gjerde 2010; Herva & Lahelma 2020).

2.2.4. Perspectivism

During the last decades, *perspectivism* has become one of the main and most pronounced theoretical approaches (Viveiros de Castro 1998, 2015), discussing ontologies and challenging the basic Western intellectual assumptions and anthropological concepts (Latour 2009; Alberti 2016: 172). An emphasis on different perspectives in seeing and perceiving things, no matter from which and whose point of view, characterizes Viveiros de Castro's approach. Even through it is grounded in studies of indigenous people in Amazonia, this ontology is fundamental for human–non-human studies and includes several aspects which I find important also when discussing Northern European hunter-gatherer communities.

Humanity and not animality is considered the common condition for both humans and animals. The animal's appearance and visible body hide the anthropomorphic essence inside of the animal, and can be put on and taken off like a dress or garment (Viveiros de Castro 2015: 229). Perspectivism also applies to other non-human beings (the dead, spirits, plants, artefacts etc.), not only to humans and animals, although it does not apply to all animal species, or at least not to the same extent (Viveiros de Castro 2015: 200–203). This personification of all living and non-living beings from the same environment and their humanity separates this approach from other ontologies. These are important aspects to keep in mind also when discussing northern hunter-gatherer burials and animal remains in them (see also Živaljević 2015).

2.3. Posthumanism, and the multispecies and relational approach to investigating human–animal relations in the past

During the last decades, anthropocentrism on the one hand and human impact on the environment on the other have become central themes in the social sciences and beyond. It has even been suggested that a new geological era called the *Anthropocene* should be introduced (Crutzen & Stoermer 2000; Solli et al. 2011). An overemphasis on the importance of humans and interpretation of data from the human-centric perspective have been acknowledged also in archaeological research (e.g. Conneller 2011; Nilsson Stutz 2016; Boyd 2017; Herva & Lahelma 2020). Various theoretical and methodological tools under different titles and conceptions have been developed to approach this issue (see Crellin et al. 2021 for wider discussion). The previously discussed hunter-gatherer ontologies illustrate some of these attempts, while the following discussion points out some more, which are central for this study.

Posthumanism represents another ontological perspective, which questions the position of humans and their exceptional role in the past (see Fowler 2013; Crellin et al. 2021). It does not mean a lack of interest in humans but simply changes the focus (Olsen 2012). Rachel Crellin (2021: 120–122) notes that the posthumanist position is

relational, embedded and embodied. Humans are just one among many other entities entangled in an assemblage with non-humans. Relationality characterizes the way in which all entities come into being through constant interaction (Deleuze & Guattari 2004; Harris 2016, 2018, 2021). Chris Fowler (2013) has labelled it the relational realist approach, which considers the archaeological evidence not in terms of separate objects or artefacts, but instead looks at it as an assemblage of all involved parties or entities. Entanglement with the object of study is inevitable; the past emerges while these assemblages are studied (Fowler 2013: 63).

The multispecies approach shares similar standpoints; it provides another instrument for broadening the investigation and interpretation of human and non-human interactions in the past (see Harris & Crellin 2018; Pilaar Birch 2018 and articles therein for more detailed discussion). It also considers human exceptionalism as problematic and seeks to emphasize the role of other species in these relationships and interactions, eliminating the boundaries between species (Viveiros de Castro 2015; Boyd 2017; Bird-David 2018; Pilaar Birch 2018). Even in terms of burial archaeology, the need to move away from the human-centric perspective towards a broader, ecological and material relation-based view of burial assemblages has been suggested (Nilsson Stutz 2016: 20).

Relations are a critical dimension of reality (see Fowler & Harris 2015) and comprise the key concepts in these ontological approaches, which Oliver Harris (2021)

Figure 2.3. The perch has just been taken from nets under the ice of Lake Lubāns and is resting on the motorcycle. Multiple levels of relations can be distinguished here: embodying the connection with the waters it was living in, the fishermen who got it out of the lake, the fishing nets in which it was caught and the motorcycle ИЖ Планета 2 from 1966, which has for years been used for fishing on the first ice, and has been sunk a couple of times, but has always been successfully retrieved from the bottom of the lake. Photo: A. Macāne.

has meticulously discussed. He emphasizes the diversity of relations, as well as their intensity as important factors which shape the relational approach. It is not only about how relations between people and other non-humans and things form them, but also about how the relations are themselves existing in parallel to what we study (Harris 2021: 32). I also consider them as pivotal for approaching hunter-gatherer burial assemblages in north-eastern Europe and discussing relationships between animals and humans. Hunter-gatherer ontologies and the relational approach provide tools to explore these relationships and the ways they were shaped. In the following, I illustrate how they can be operationalized when discussing animal remains from hunter-gatherer burial contexts in north-eastern Europe.

2.4. Setting the interpretative framework

The environment was constituted by a variety of living beings and natural phenomena reflecting complex relationships. These relationships developed through continued interactions, which were inevitable in the close co-existence within the shared naturescapes. The archaeological material reveals diverse treatment and the occurrence of animal remains in burials and other deposits at cemeteries, which are the results of various kinds of human behaviour. The relational approach argues for the active engagement of all parties involved in these relationships, including animals and other objects (Fig. 2.3). Previously, however, animals and their remains were perceived as passive objects and were analyzed as zooarchaeological material, focusing on obtaining data about taxonomic, morphological and economic properties. They were primary used to provide information about the world of living humans.

This study aims, instead, to investigate the animal remains in burials as part of a larger assemblage. The relational approach urges engagement with the research material, keeping in mind all levels and processes involved in the transformation of a living animal into parts, which are further modified into various shapes and objects until they are finally deposited in a burial (see also Conneller 2011). Drawing on Russell's (2012) work on the complexity of human and animal relations and Conneller's work on animal materials (2011), I argue that multiple levels of involvement and encounters can be distinguished in the relationships between hunter-gatherers and animals. The focus in this work is on the relations between animals and humans, and artefacts made from animal remains which accompanied the burial. It is equally important to reflect on why some species or certain animal individuals were chosen for making ornaments or accompanying the burial while others were not. This reflects the complexity of relationships between various inhabitants of the Stone Age landscape and helps to constitute the context for the species which were chosen for making various tools and ornaments. There are many more species with which humans were in a daily contact, but for some reasons they were not chosen to be included in the burial arrangements of hunter-gatherers (for further discussion see Chapter 11).

The previously given examples from the ethnographic record on hunter-gatherer relations with animals and hunter-gatherer ontologies, along with the posthumanist, multispecies and relational approach, set the interpretative framework for the thesis.

The combination of these approaches informs this study at a general level and permits a consideration of animals and animal remains in burials from a new perspective and at a different depth. By focusing on the individual characteristics of animals and their life histories, it is possible to reveal relationships between animals and humans, as expressed in hunter-gatherer burial contexts, on a more personalized level. This can further our understanding of Stone Age animals not only as resources or in terms of the symbolic meanings they may represent. It also allows us to go beyond the human-centric perspective when interpreting the archaeological record of animal remains, pointing out that not all materials and artefacts should be explained through the human prism, emphasizing the importance and value of other inhabitants of the environment.

Even though the above-mentioned perspectives intend to move away from anthropocentrism, it is not possible in full, first of all, because the research is being undertaken by us humans, and is affected by our biases (such as knowledge, background, experiences, agendas, aims etc.), as well as the fact that we, as archaeologists, study humans in the past. Nevertheless, an attempt to move towards a relational, multispecies approach focusing on animal biological characteristics and other properties, their personality, transformations of animals and their body parts, and the shared environment of animal species and humans is important in order to expand the discourse in burial archaeology. This is possible only through careful investigation of archaeological material and excavation documentation, as well as other available data, in order to form a solid basis for the ontological approach. The relational approach also encourages us to go beyond generalized interpretations and underlines the need to go back to sources and approach them with an open mind, in order to also reveal individual cases which may be of importance in discussing the complex social relations between the Holocene hunter-gatherers and animals. This thesis provides a novel perspective that stresses a more holistic view by focusing on animals and considering animals and their remains as active agents in shaping these relationships. I believe that the above-presented interpretative framework can complement the previous research on Stone Age animals, and will result in a more vivid illustration of hunter-gatherer relationships with animals and the surrounding environment.

Chapter 3.
Methods, material and central concepts

This chapter first describes the selection of the primary material and discusses its limitations. Second, the methods employed in this study are presented, and third, some central concepts are discussed in more detail.

3.1. Selection of the research material and its limitations

3.1.1. Selection of the research material

The primary data of this dissertation comes from animal remains recovered at Zvejnieki, Skateholm I and II, and Sakhtysh II and IIa cemeteries and from contexts identified as graves by the excavators of these sites (for a discussion on what is grave, see Chapter 3.3.1). All the studied burials are inhumations containing either complete or partial interments, sometimes with additional artefacts (grave inventory – for discussion, see Chapter 3.3.2).

All available faunal remains from these sites were analyzed and documented in the course of this study. Thereafter, the selection and delimitation of material suitable for further detailed analysis was challenging. Some of the burials have been disturbed or destroyed by the digging of later burials or other human (or animal) activities at the cemetery during the Stone Age or later periods. This means that not all items present in the museum collections come from a definite burial context or can be directly attributed to the deceased. All animal-derived materials are reported in the database (Appendix 2), but finds coming from grave fills and mixed contexts are excluded from the final analysis presented in Chapters 5–10. Here, only the animal remains that can be directly associated with the deceased or were documented at the level of the skeleton are discussed. Therefore, special attention in this study was given to clarification of the find contexts of the animal remains: in most previous publications (Zagorska & Lõugas 2000; Eriksson et al. 2003; Lõugas 2006; Костылёва & Уткин 2010; Zagorska 2016; Костылёва 2018), apart from those dealing with the Skateholm material (Jonsson 1986, 1988; Larsson 1988a, 2000, 2016, 2021), the relationship of

individual animal finds to the buried person have not been in focus, and all animal materials have instead been presented together.

The first step in the investigation of the material was compilation of a database with all necessary information characterizing the graves at each site. This information was collected from the primary sources, such as the excavation documentation, reports, photos, drawings, as well as the publications from all the studied sites. Basic parameters, such as sex, age, position and grave integrity, details of grave constructions and the main categories of grave inventory have been collected in the database and are presented in Appendix 1. The structure of the data and the database, including the classification of burials, artefacts and find locations, are given in the introduction to Appendix 1. This data forms the basis for this study, and is presented in the material chapters (Chapters 5–10). It also served as a source for the distribution maps and statistics on animal species. Biological anthropological data is derived from excavation documentation and publications, and no human osteological material has been analyzed for this study.

3.1.2. The limitations of the primary material

The selected material comes from different geographical areas, reflecting various ecological settings. The timespan of the Zvejnieki material covers nearly five millennia, providing a long-term perspective and the possibility of tracing changes in attitudes and relations with animals. Skateholm and Sakhtysh, on the other hand, provide an insight into relationships with animals during shorter periods of time and in particular cultural contexts.

Because of the different areas, times and traditions involved, the preservation and associated documentation of the studied material (as described in detail in Chapter 4) varied greatly between the sites. Consequently, many challenges were encountered while working with this material. The major concerns affecting the representativity of the primary material are outlined in the following.

The major issues which influenced the collection and re-analysis of the material have to do with the documentation (Fig. 3.1) and excavation methods of different times and places. One of the major problems is the recovery, treatment and analysis of animal bone material. The lack of specialists, particularly zooarchaeologists, in the Soviet Union, as well as the level of knowledge at that time about what information animal remains can provide, affected the amount of material collected and analyszd. Therefore, unworked animal remains were often not collected and included in the collection. At Sakhtysh, most animal remains from cultural layers were discarded after the excavation, including bones from buried dogs. At most, some of the material was studied by a zoologist in field (see Цалкин 1963, 1964), but no proper reports or publications of these analyses exist. Therefore, the only available information comes from the excavation reports and field diaries. The situation is slightly better in the case of Zvejnieki, where mostly worked animal remains from burials and grave fills have been preserved, while unmodified animal remains have been discarded. This has affected the composition of the present collection and influences the possibilities

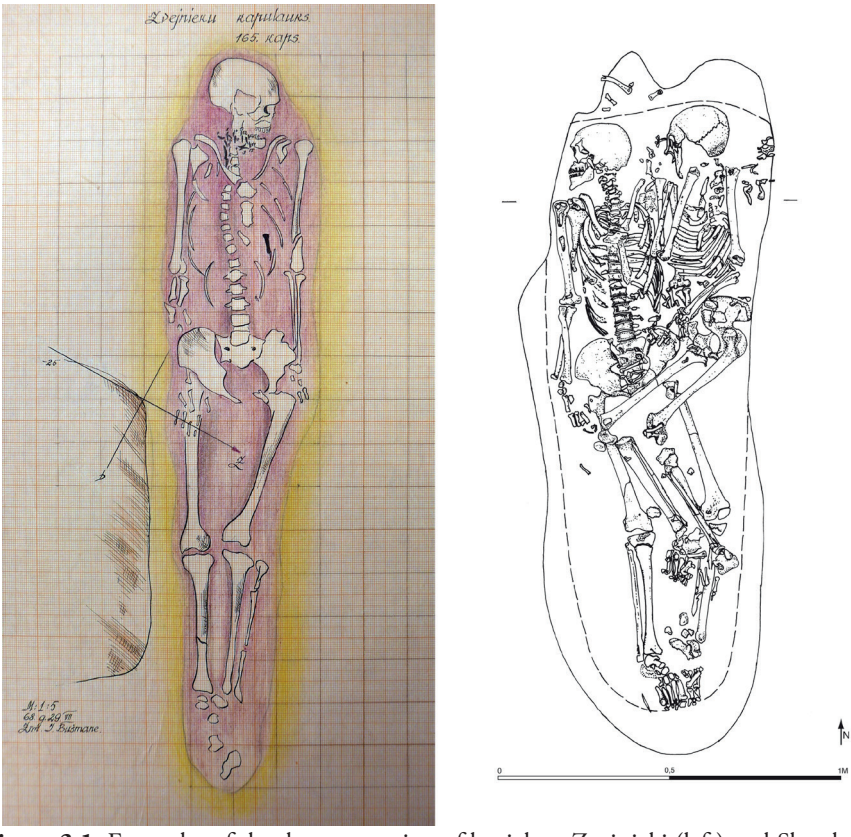


Figure 3.1. Examples of the documentation of burials at Zvejnieki (left) and Skateholm (right). At Skateholm a professional osteologist was employed on the excavation, while at Zvejnieki there was an illustrator – as was often customary in the Soviet Union during that time. Drawing: Burial 165 at Zvejnieki by I. Bušmane (Institute of Latvian History, University of Latvia), Skateholm Burial 14 by A. Nilsson (personal archive of L.Larsson).

of analyzing the animal materials. This contrasts strongly with Skateholm, where a professional osteologist was present throughout the excavations, and therefore the level of documentation and analysis of bone materials is on a much higher level. The result is a much more detailed assemblage of animal remains, also giving information about species such as fish, birds and reptiles, which are small and often difficult to recover if sieving is not used (as was the case both in Zvejnieki and Sakhtysh) (Fig. 3.2). This affects the interpretations and results in a biased view of, for example, fish remains from hunter-gatherer burials.

The second major challenge is the discrepancy between the excavation documentation and the actual material currently present in the museum collections. Difficulties of locating animal remains from burials were particularly challenging in the case of the Skateholm material, as well as the Sakhtysh finds. The Skateholm material is poorly preserved, and many of the finds which have been marked in field drawings and analyzed by Leif Jonsson (n.d.) or published and discussed by Larsson (n.d., 1988a) can

Figure 3.2. Dmitriy Kraynov (on the right) in the white hat overlooking the works and carrying out the documentation at Sakhtysh II in 1963. Local laypeople and school kids were often employed to work at excavations at Sakhtysh and other sites in the Soviet Union. Photo: unknown (Archive of the Archaeology Museum at Ivanovo State University).

no longer be found. At Sakhtysh, unworked bones were not usually even included in the museum collections and cannot be examined. The Zvejnieki collection is the most complete, although even here not all the material previously been taken for various analyses has been returned to the collections.

The varying preservation of the material brought additional challenges. The very poor preservation of the Skateholm material made it impossible to collect the same information from the specimens as at the other sites. At Sakhtysh, too, poor preservation occasionally hindered the possibility of determining the species or certain characteristics of tooth pendants. The preservation level of the Zvejnieki material is generally excellent, but numerous tooth pendants are broken, and some have been restored with wax, which prevents the identification of various characteristics.

Occasionally there are inconsistencies between the primary sources and published material. These were clarified, relying on the primary documentation and archaeological material available in museum collections. These problems were especially common in the case of Sakhtysh, where diverse publications present different information about find contexts, and numbers and determinations of tooth pendants. In the absence of proper osteological analysis, these reflect the changing interpretations of the excavators (see e.g. Костылёва & Уткин 2010; Костылёва 2018). Furthermore, the excavation reports did not include the exact locations of artefacts in relation to the deceased, preventing the possibility of discussing the possible ways of their use in more detail.

The field documentation for Zvejnieki and Skateholm allowed nearly all animal finds to be located.

A site-specific problem at Zvejnieki is the variation in the procedure for numbering burials and individuals. In some cases, every individual in a burial has been given a number, while in others a lowercase letter is used to separate the individuals within the same burial. This complicates the correct attribution of the grave inventory to a certain individual, especially in double and multiple burials.

3.2. Methods

3.2.1. Osteological analysis

The principal method employed in this project is osteological analysis. Taxonomic identification of animal teeth and bones is the basis of zooarchaeological studies (Hillson 1992, 2005). In the course of analysis, all specimens were identified to taxon and anatomical element. In cases where it was not possible to determine the animal species, the specimen was identified to family or group level (e.g. carnivores or ungulates), but in some cases no detailed identification was possible, and the specimen was marked as indeterminate (indet.). Some animal remains, especially seals, are difficult to identify to a particular species. Therefore, only teeth from grey seals (*Halichoerus grypus*) were separated, while other seals are reported together as Phocidae (see also Lõugas 2006). The bones were determined to bone element, and the teeth to the primary anatomical category: incisor, canine, premolar or molar, from the skull or mandible. Further, the side (left or right) from which the bone or tooth originates was assessed.

Identification was based upon the principle of comparative anatomy, i.e. structural and morphological similarity between the archaeological specimen and a homologous one in a modern skeletal collection (Hillson 1992). Tooth and bone identifications were carried out using a comparative reference collection which was created in the course of this work and was used while studying research material in museums and storage facilities, also using identification manuals (e.g. Schmid 1972). The rest of the bones and teeth were identified based on photos, consulting with colleagues and using comparative reference collections at Arkeologerna in Lund, Gothenburg Natural History Museum and Leif Jonsson's personal reference collection. Some unclear specimens were studied under the microscope, as was the material chosen for radiocarbon dating and ZooMS analysis.

In the course of the analysis, when possible, data on the animals' age, sex, tooth wear or other specific properties were documented. The assessment of age was made by determining development, whether a tooth is deciduous or permanent, and whether root formation is complete, for instance whether the root apex is open or closed, based on the following references: elk (Skuncke 1949; Peterson 1955); dog, fox, aurochs/cattle, horse, red deer and roe deer (Habermehl 1961); pine marten (Habermehl & Röttcher 1967); wild boar (Козло & Никитенко 1967; Ahnlund 1976; Briedermann 1986; Boitani & Mattei 1991); otter (Zeiler 1988); brown bear (Guskov 2015). Teeth with a closed apex (at least from ungulates) come from adult animals older than 2

years in the case of wild boar and over 4 years in the case of canine teeth in aurochs/cattle (Brown et al. 1960; Magnell, unpublished data). Sex estimation of the animal is not possible or difficult for most taxa, but in the case of wild boar and red deer, with distinct sexual dimorphism in size and morphology of the canines, the sex has been assessed (Mayer & Brisbin 1988; d'Ericco & Vanharen 2002).

Quantification of the animal remains was based on three methods: the number of burials in which a taxon occurs; count of the total number of identified specimens (NISP) of each taxon; and the minimum number of individuals (MNI) (Grayson 1984; Lyman 1994). Different quantification methods were used, since they each have different advantages and problems. By quantification of occurrence in the graves it is possible to establish how widespread a particular species was in a burial site or a certain part of the cemetery. Since in some graves certain species are represented only by a single or a few specimens, while other species are represented by numerous pendants, quantification based on NISP has also been used. NISP shows in a different way which species are common and whether they occur frequently in a grave, suggesting preferences for certain species. Since multiple teeth (NISP) can come from one animal individual, it is important to also calculate the MNI in order to establish how many animals the tooth pendants represent. The estimation of MNI was based on counting the tooth/bone elements from the left and right side, and the upper and lower jaw (for teeth), but other properties, such as age, morphology, size and tooth wear were also taken into account. This was particularly important when identifying the use of complete sets of ungulate front teeth. Problems arose in cases when the whole burial was on display en bloc, which meant that it was not possible to see all items present in the burial or carry out detailed determination of taxa and other properties. Quantification based on MNI was not always possible due to poor preservation or major restoration of animal remains. Numerous teeth at Zvejnieki have been restored using wax. In cases where bone or tooth fragments could be refitted, they were counted as a single element. For example, in Burial 92 at Zvejnieki, pond tortoise carapace fragments have been refitted by gluing, and these represent a single specimen.

The presence or absence of surface modification or working traces on animal remains or artefacts made from them was also considered (Lyman 1994; Fisher 1995; David 2006, 2007, 2016). This was done without using any magnification, since this was not a focus of this investigation and will be pursued in future research. Recording of the type of modification to the bone was needed for categorizing various artefact types in order to identify differences between the studied burials. When relevant, the methods employed for tooth pendant modification and perforation were also reported, following the terminology used by Éva David (2006) and Larsson (2006a). The categories used for recording tooth suspension included drilling, carving, notches and grinding. Other properties, such as surface decoration, was also recorded.

3.2.2. Other analyses

In the course of this study, new radiocarbon datings, including bulk stable isotope (^{13}C, ^{15}N) measurements, were obtained, and ZooMS analysis was performed. Radi-

ocarbon samples were analyzed at the ^{14}Chrono Center, Queen's University, Belfast. Radiocarbon ages were measured by AMS (accelerator mass spectrometry), and bulk stable isotopes (δ^{13}C, δ^{15}N, %C, %N, C:N ratio) were analyzed in duplicate on a Thermo Delta V elemental analysis-isotope ratio mass spectrometer (EA-IRMS). All ^{14}C ages have been calibrated using OxCal v4.4.4 (Bronk Ramsey 2009) with the IntCal20 atmospheric curve (Reimer et al. 2020).

The aim with radiocarbon datings was to obtain a better chronological overview of the sites and animal remains from the burial contexts. Most of the new analysis was performed on the Sakhtysh material, since previously only a few animal remains from burial contexts have been dated from these sites (see Piezonka et al. 2013). Altogether, 10 out of 13 samples of animal tooth pendants from burial contexts and animal bones from the ritual activity areas at the Sakhtysh sites were successfully dated (Appendix 3). These results are discussed in more detail in Chapter 4 and have been published previously (Macāne et al. 2019). New radiocarbon datings of animal remains from the Skateholm burials were also attempted (eight samples), but in all cases, except one, the level of collagen turned out to be insufficient. No radiocarbon datings were carried out on the Zvejnieki animal remains due to the museum's restrictions on sampling.

While analyzing the material from Zvejnieki and Sakhtysh, certain tubular beads drew attention. Tubular beads are often interpreted as coming from bird bones (e.g. Zagorskis 1961, 1987; Костылёва & Уткин 2010; Larsson et al. 2017), but the morphological structure of some of the tubular beads under study was not similar to that of bird bones. Osteological examination, also under the microscope, and consultations with several other osteologists did not result in a positive outcome. Therefore, mass spectrometry and collagen peptide mass fingerprinting (commonly referred to as ZooMS) analysis was attempted for two bone beads from Sakhtysh II (Burials 1 and 12) and one from Zvejnieki (Burial 317) (Appendix 4). They were carried out with the help of Theis Jensen at the University of York. ZooMS is used to taxonomically identify species which cannot be determined by other methods (e.g. Buckley et al. 2009; Jensen et al. 2020). Unfortunately, not enough collagen was preserved in these tubular beads, and ZooMS analysis did not succeed.

3.3. Central concepts

The thesis deals with burials and animal materials found in grave features. Therefore, it is necessary to understand the use of some central concepts. The terms *burial* and *grave* are commonly used when dealing with the disposal of the dead in archaeology (see e.g. Tarlow & Stutz 2013). The complexity of the terms *grave good*, *grave gift* and *grave inventory* is also discussed by taking up different examples.

3.3.1. What is a grave?

Death and issues connected with the dead can be studied from various angles in archaeology (Binford 1971; Parker Pearson 1999; Tarlow & Stutz 2013). Death and attitudes to it, as well as treatment of the deceased depend on a set of factors, such as geographical region, and the beliefs and conceptual worlds regulating the handling

Figure 3.3. Inhumation is still the most common tradition of disposal of the dead in the region of eastern Latvia. Various grave markers designate the locations of burials at the Īdeņa cemetery. Photo: A. Macāne.

of the corpse (Fig. 3.3). First of all, the concept of a grave needs a clarification. Is it just a place where the remains of the deceased are left or buried? How to trace it in the archaeological record, and what are the characteristics that designate a grave? These are some of the questions crucial to archaeological research; nevertheless, the definition of what is a grave often remains unclear in archaeological discussion (see Fahlander & Oestigaard 2008; Nilsson Stutz 2016).

The term *grave* often stipulates disposal of the dead in some particular place and manner. As shown by the archaeological as well as the ethnographical record, a burial can be much more than an inhumation or cremation (e.g. Parker Pearson 1999: 5; Tarlow & Stutz 2013; Tõrv 2018), which often come to mind as the first ideas when thinking about disposal of the dead. In this work the research material comes from inhumations, but it is important to also keep in mind other ways of treating human remains, which reflect different attitudes to death and dead bodies (see Oestigaard 2000, 2013; Gray Jones 2011; Bugajska 2021 and below).

Burial is in many cases the final moment in dealing with the dead. Many different actions are performed before the actual disposal of the body (Kroeber 1927; Ucko 1969; Binford 1971; Huntington & Metcalf 1979; Bloch & Parry 1982; Nilsson Stutz & Larsson 2016). The moment of death is just the beginning. It starts a process including various activities, which can be time and resource demanding. Rather than involving just disposal of the corpse, burial is a social process, where the community performs various procedures in connection with the death. The preparation for burial may involve the actual construction of the grave, preparation of the corpse for disposal, as well as preparation of the items which will be placed in the grave and the performance of various ritual practices (Chapman 1987; Parker Pearson 1999; Nilsson

Stutz 2003; Bell 2009). The deceased can go through various treatments before the final disposal of the corpse, and these do not always involve maintaining the integrity of the body (Nilsson Stutz 2003, 2013, 2016; Gray Jones 2011).

Environmental conditions and taphonomic processes further affect what can be found archaeologically. Sometimes there are no remains left to bury or treat, although this does not mean that the deceased is not mourned or remembered in some special way. The lack of physical human remains does not prevent construction of a grave or performance of some other burial practices, as shown, for example, by cenotaphs. Such interpretations, for instance, have been proposed for some features with animal remains at the Skateholm cemetery (Larsson 1988a). As the ethnographic record shows, there are many different ways of treating the dead which may not leave any traces in the archaeological record (Kroeber 1927; Hertz 1960; Chapman & Randsborg 1981; Schiffer 1987; Huntington & Metcalf 1979; Weiss-Krejci 2013). There may not necessarily be any special, designated area for placement of the dead. The dead body may be buried in a settlement, may be left in nature (in a tree, in water, on a platform) or exposed to the animals or maybe even to other humans, as in the case of cannibalism. Burials may be individual as well as collective.

These examples illustrate the multiplicity of aspects involved in creating the archaeological feature which we investigate as a burial. However, in this work I specifically discuss burials as features for final disposal of the dead body in a pit (grave) dug into the ground. The dead body may or may not be accompanied by objects or other structures. These grave features may be located in a settlement area, or placed in a certain area further away from the living community and form a cemetery or burial ground.

3.3.2. Gift, grave good or grave inventory?

Items and artefacts connected with the burial are often the key elements when interpreting funerary practices in the past (Fig. 3.4). Even if the human remains are not present, artefacts found in the burial may serve as the material for reconstructing burial practices and gaining knowledge about the past societies (see the case of Finland; Halinen 1999; Ahola 2019). However, defining what is a grave good or gift and what is not has triggered extensive discussion among archaeologists (e.g. Chapman 1987; Larsson 2021). The challenges in providing a clear definition for what is a grave good relate to the complexity of the term. According to Mike Parker Pearson (1999: 7) "Grave goods may include items which were possessions of the deceased, or they might be mourners' gifts to the dead. They may serve to equip the dead for the world of the afterlife, or to prevent the dead coming back to haunt the living. Grave goods may be selected to serve as reminders of a person's deeds or character. The commonest grave goods are clothing and related equipment, containers and remains of food and drink." In the following I will discuss some of these aspects.

One of the challenges has been and still is how to distinguish between different categories of items and how to name them. Items found with the deceased can be interpreted as personal belongings, reflecting the characteristics of the dead, or items that have been important or worn during the lifetime (e.g. Vanhaeren & d'Errico

Figure 3.4. Bone pendants and beads, nowadays stained by red ochre, may have been part of the leg garment worn by the man interred in Burial 317 at the Zvejnieki cemetery. Photo: A. Macāne.

2005). On the other hand, they can be items specially made for placement in the grave (Larsson 2006a). Other objects may be connected with rituals performed during the funeral or may have accidentally gotten into the grave (e.g. Kjällquist 2001). Items found in the grave can also have been given to the deceased to aid their passage from one world into another (Ahlström & Larsson 2015; Tõrv et al. 2017; Larsson 2021). A funeral is carried out by the people who remain behind, and may sometimes constitute a performance, a scene for the living (e.g. Parker Person 1982). Therefore, some items may also represent the results of these activities.

Grave goods help to delimit the body (Parker Pearson 1999: 9; Joyce 2005: 151; Sofaer 2006: 51 and references therein). The character and placement of most of the grave inventory in the studied hunter-gatherer burials indicates that it was part of the funerary costume or other burial arrangement (including wrappings), rather than being actual grave goods. There is an extreme example from Zvejnieki cemetery in Latvia, where an arrowhead in a burial should not be considered as a grave good, but it was the cause of death for the buried person, since it was discovered stuck in one of the vertebrae (Zagorskis 1987; Meadows et al. 2016). However, items which can be directly connected with human remains have often been perceived as belonging to the category of grave goods (Larsson 2021). Nevertheless, even in such cases I think one should be very careful when categorizing particular items as grave goods.

Grave constructions or remains of structures connected with a burial have occasionally been considered as grave gifts. For example, antler finds at Skateholm and Bøgebakken in Denmark have been interpreted as remains of the grave structure and as grave goods, but also as constituting a supply of raw material (Larsson 1988a, 2021; Nilsson Stutz 2003; Brinch Petersen 2015). From Skateholm there is also evidence of other constructions made of organic materials, which can be associated with burial structures, such as dugout canoe (Burial IV at Skateholm II; Larsson 2016) or a construction over the grave which has burnt down during the filling of the grave (Burial 26, Skateholm I; Larsson 1988a, 2021). In Burial 33 at Skateholm I, the grave pit was nearly a metre longer than the deceased, suggesting the presence of organic substances which were used in the grave construction or funerary rituals (Larsson 2021). However, the fact that such organic materials have most commonly disintegrated only results in a partial image, which also complicates the interpretation of other finds in the grave (see Nilsson Stutz 2003 for a discussion of organic wrapping materials and items in grave arrangements).

Discussion of grave goods often includes a certain valuing of items. The exclusivity or fineness of artefacts has been one of the aspects for categorizing grave goods and ranking buried persons (e.g. Vanhaeren & d'Errico 2005; Larsson 2021). On this basis, worked animal teeth and bones are usually accepted without question as grave goods, while other finds of animal remains from burials have often been interpreted in connection with feasts and burial rituals (Russell 2012: 64). Similarly, waste materials (debris) from flint or other lithic production are in many cases not considered as grave goods, while ready-made objects tend to be directly interpreted as such. This is also seen in the status of similar small finds in the grave fill (see Kjällquist 2001; Larsson 2016, 2021). Larsson (2016) has argued that the grave fill can also be regarded as a grave good in itself, especially in cases when the grave is filled with material taken from other places, such as earth from a settlement cultural layer. A particular choice of the kind of earth used in the grave arrangement has been noted for Zvejnieki burials, where dark soil from the cultural layer has been used to line the grave pit before the deceased was placed on it, often covered with contrasting red ochre (Zagorskis 1987; Zagorska 2008). It may also be questioned whether the red ochre which has been intensively used in hunter-gatherer burials can be regarded as part of the burial ritual or should also be interpreted as a grave good and an important part of the burial arrangement. Similarly, the status of the clay used in several burials at Zvejnieki together with red ochre, covering the face of the deceased and resembling a death mask, remains unclear (Zagorskis 1987; Denisova 1996; Nilsson Stutz et al. 2013).

A similar notion concerns other seemingly natural elements which could be put in graves and carry particular meanings. At Zvejnieki, ordinary stones might have had special meaning in the burial ritual, similarly to stones placed in the eye sockets and mouth at the Nivågård cemetery in Denmark (Zagorskis 2004; Jensen 2009; Nilsson Stutz et al. 2013). There are also a wide range of other finds and structures around the deceased and in the vicinity of the grave. Fireplaces in and above graves or special depositions with deliberately destroyed artefacts right next to the grave are

some examples of these (Grünberg 2000, 2013; Zagorskis 2004; Костылёва & Уткин 2010; Oshibkina 2016; Brinker et al. 2020; Macāne & Nordqvist 2021).

These examples illustrate the complexity of the meanings and interpretations connected with items and structures found in a burial. Indeed, it is difficult to reach a clear definition. Therefore, in this work I use the term *grave inventory* to designate all items found at the level of the skeleton, since it is often very difficult to draw the line and decide whether an object is part of the funerary dress of the deceased, a gift from the mourners or the remains of a feast or ritual activities performed in connection with the burials.

Chapter 4.

The study sites: Zvejnieki, Skateholm and Sakhtysh

This chapter presents the sites studied in the thesis. Each complex of sites is introduced, examining their geographical location, research history and chronological frame. This is followed by a brief overview of cemeteries and graves, noting any special features and grave inventory, in order to provide a framework for further analysis and interpretation. First, to contextualize the study sites, a brief overview is presented of previous studies on animal remains from hunter-gatherer burials in north-eastern Europe. However, the history of research on hunter-gatherer burials in north-eastern Europe is not a main focus of this study, and more extensive reviews can be found elsewhere (see Tõrv 2018; Ahola 2019; Macāne & Nordqvist 2021).

Hunter-gatherer burials in north-eastern Europe have attracted considerable research attention and have been studied extensively. Some studies have presented more general overviews of these burials (Гурина 1956; Zagorskis 1961, 1987; Janzon 1974; Albrehtsen & Brinch Petersen 1977; Лозе 1979; Larsson 1988b; Burenhult 1997; Зимина 1999, 2000; Kjällquist 2001; Суворов 2001; Костылёва & Уткин 2010; Butrimas 2012; Gumiński 2014; Brinch Petersen 2015; Иванищева 2018; Ahola 2019). Others have concentrated on particular aspects of the burials, such as grave inventory (Larsson 2006a; Lõugas 2006; Lehmkuhl 2007; Jonuks 2009; Gumiński & Bugajska 2016; Zagorska 2016; Kashina et al. 2021), specific burial practices (Knutsson 1995; Blank Bäcklund & Fahlander 2006; Bugajska 2015, 2021; Oshibkina 2016; Gummesson et al. 2018; Ahola et al. 2020; Molin et al. 2021) or particular methodological or theoretical approaches (O'Shea & Zvelebil 1984; Strassburg 2000; Nilsson Stutz 2003, 2006, 2008; Fahlander 2008; Andersson 2015; Tõrv 2018).

Animal remains from hunter-gatherer burials in north-eastern Europe have been discussed in previous studies from various economic (Jonsson 1986, 1988; Rowley-Conwy 1998; Eriksson et al. 2003; Eriksson 2006; Lõugas 2006) or technological aspects (Larsson 2006a; Mannermaa et al. 2021; Rainio & Mannermaa 2014; Rainio et al. 2021), or with reference to particular burial practices (Zagorska & Lõugas 2000; Zagorska 2016). Lately, greater attention has been given to the social importance of

animal remains from hunter-gatherer burials, with a focus on human–animal relations (see Larsson 2006a; Mannermaa 2008a, 2013; Jonuks & Rannamäe 2018). New osteological and other studies have been undertaken on animal materials from several hunter-gatherer burial grounds in north-western Russia (Mannermaa 2013; Mannermaa et al. 2019, 2021; Kashina et al. 2021; Rainio et al. 2021).

Animal remains constitute the most numerous find category in hunter-gatherer burials of north-eastern Europe (Гурина 1956; Zagorskis 1987; Larsson 1988b; Grünberg 2000, 2013; Butrimas 2012). A few major cemeteries, such as Zvejnieki in the Eastern Baltic, Yuzhniy Oleniy Ostrov and Sakhtysh sites in Russia and Skateholm and Vedbæk in southern Scandinavia, have dominated in the discussion; more common, however, are hunter-gatherer burials in small burial grounds and burials on settlement sites (Källquist 2001; Butrimas 2012; Brinch Petersen 2015; Gummesson et al. 2018; Tõrv 2018; Ahola 2019; Macāne & Nordqvist 2021). All in all, considering the length of the period, the number of human burials is quite small. Most of the hunter-gatherer burials so far documented are inhumations, and therefore it is probable that other ways of disposing of human remains were also in use (e.g. Tõrv 2018; Macāne & Nordqvist 2021). The data is also biased in other ways, since in some areas, such as Finland, some areas of the Eastern Baltic or north-western Russia, soil conditions do not favour the preservation of organic materials (e.g. Иванищева 2018; Tõrv 2018; Ahola 2019).

The recovery of animal remains from burials and the attention given to them have largely depended on the research tradition, on the presence of an osteologist in the field and on the possibilities of carrying out osteological analysis after the excavation (Jonsson 1988). As already discussed above, this is a problem especially in the Eastern Baltic and western Russia, where many faunal collections have not been studied or even preserved after excavation. Consequently, even if the faunal materials have been preserved or studied, little attention has been given to social aspects of animal remains in hunter-gatherer burials and relationships between the buried humans and animals, whose remains were deposited in the graves.

4.1. Zvejnieki (Latvia)

The Zvejnieki cemetery (Fig. 4.1) is one of the largest hunter-gatherer cemeteries in Northern Europe, with 330 graves excavated so far, containing 350 individuals (Larsson et al. 2017). The Zvejnieki complex (Fig. 4.2) is situated on a drumlin that was formerly an island in Lake Burtnieks, northern Latvia, and consists of hunter-gatherer settlements (classified as Mesolithic and Neolithic) and a cemetery. The site was excavated mainly during the 1960s–1970s by Francis Zagorskis (Institute of History of the Latvian SSR Academy of Sciences). New excavations were undertaken during the 2000s under the leadership of Ilga Zagorska and Valdis Bērziņš (Institute of Latvian History) and Lars Larsson (University of Lund). According to the available radiocarbon dates, the cemetery was in use for five millennia, between 7500 and 2600 cal BC, making Zvejnieki the cemetery with the longest period of use in Northern Europe (Zagorska 2006a; Macāne 2020).

4.1.1. Location

The Zvejnieki complex is situated at the northern shore of Lake Burtnieks, where the River Rūja discharges into the lake (Fig. 4.1). Lake Burtnieks is Latvia's fourth largest lake, located in a depression within the extensive Burtnieks drumlin field (Zelčs 1994: 173–174). The drumlins were formed by the retreating ice, and their upper parts in the Lake Burtnieks area became ice-free around 13,500–13,300 years ago (Rinterknecht et al. 2003).

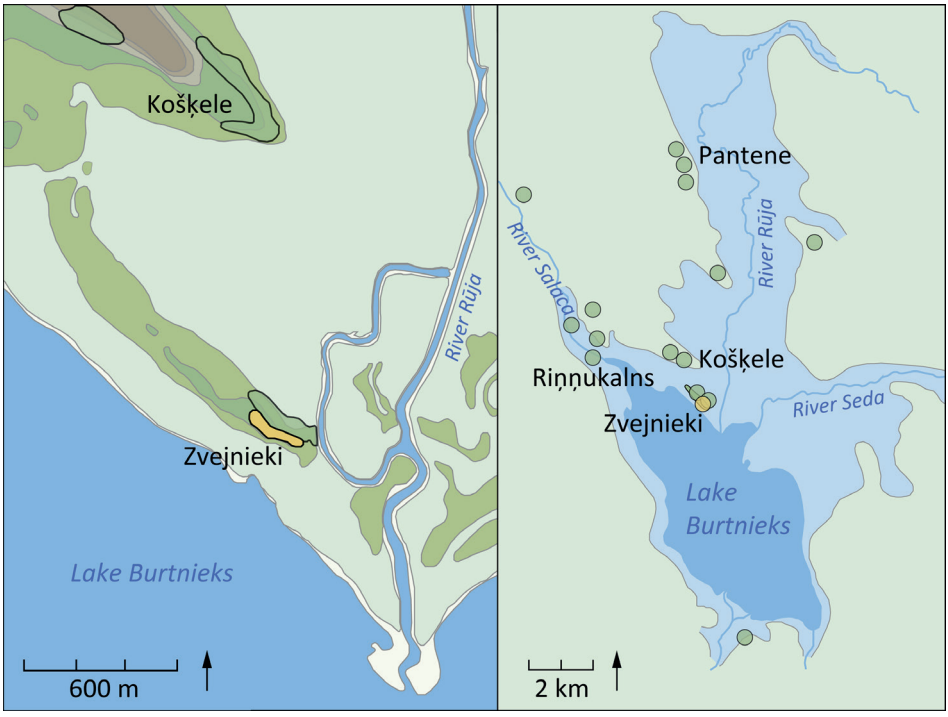


Figure 4.1. Left: Location of the Zvejnieki cemetery (yellow area with black outline) and settlement sites on the Zvejnieki and Košķele drumlins (green areas with black outline). Right: Settlement sites marked with green dots, Zvejnieki cemetery marked with yellow dot. Extent of palaeolake Burtnieks in light blue and current lake in dark blue. Redrawn after Larsson et al. 2017: Fig. 2 and Eberhards 2006: Fig. 5. by K. Nordqvist.

Reconstruction of the palaeoenvironment and palaeobotanical studies were carried out during the early 2000s in order to obtain a better understanding of natural processes and human activities in the environs of Lake Burtnieks (Zagorska 2002, 2006b, 2006c; Eberhards et al. 2003; Eberhards 2006; Kalniņa 2006). The shoreline of the ancient lake was reconstructed by Guntis Eberhards and colleagues (2003), showing that the Zvejnieki complex was located on an elongated, gently-sloping island in Lake Burtnieks, which became a peninsula towards the end of the Stone Age. The Zvejnieki–Bērzi drumlinoid stretched approximately 1600 m in a northwest-southeast direction and together with the River Seda delta formed a natural barrier between the

deeper Southern Lake (the present-day Burtnieks) and the shallower Northern Lake, which is nowadays terrestrialized and consists mainly of mires (Eberhards 2006: 44). The drumlinoid consists of stony clay and till, covered by various grades of sand, gravel with pebbles, and occasional larger boulders (Eberhards et al. 2003; Eberhards 2006).

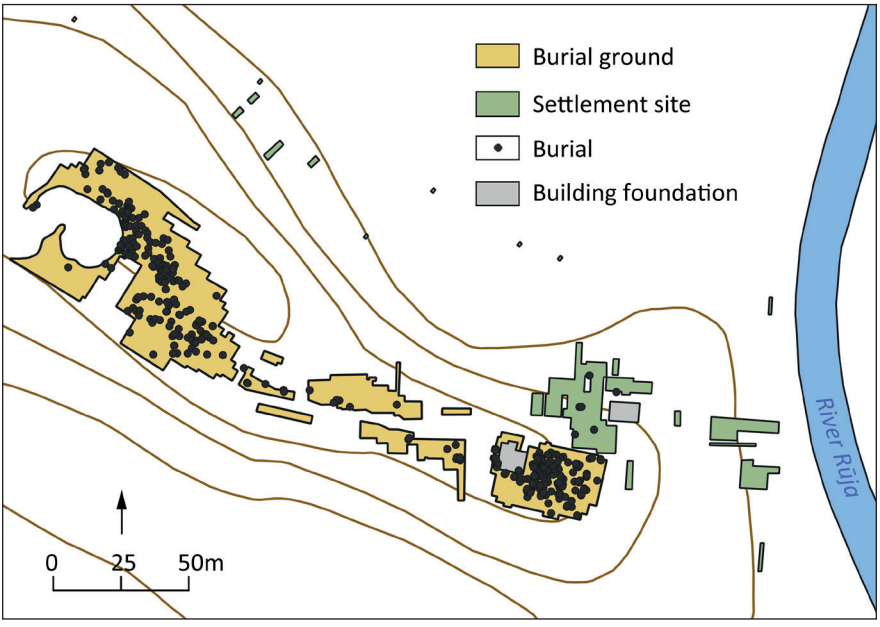


Figure 4.2. General map of the Zvejnieki archaeological complex. Contours every 1 meter. Redrawn after Larsson et al. 2017: Fig. 3 by K. Nordqvist.

The Zvejnieki cemetery is located on the highest part of the south-eastern end of the former island. The Zvejnieki II (Mesolithic) site covers the northern part of the south-eastern end of this gravel ridge. The water-level fluctuations have affected the formation of the stratigraphy of the sites. Zvejnieki I (Neolithic) settlement is located at the south-eastern end of the gravel ridge, just by the right bank of the River Rūja, at a small bend in the river. Both settlements were placed at locations protected from strong wave action and winds (Eberhards 2006: 46).

4.1.2. Research history

The surroundings of Lake Burtnieks drew archaeologists' attention already in the second part of the 19th century. Tartu University professor Constantin Grewingk mentions stone tools from Lake Burtnieks already in his first work on Stone Age finds from the Eastern Baltic (Grewingk 1865). The first sites known on the lakeshore were the Riņņukalns shell midden and Kaulēnkalns settlement, at the outlet of the River Salaca, and Zvejnieki. During the 1870s–1880s the first burials were discovered at Zvejnieki by local antiquarian Count Carl Georg Sievers and Carl von Löwis of Menar but they were considered to belong to later periods (Grewingk 1875; Sievers 1874; Löwis of Menar 1896).

After this, no research was carried out at Zvejnieki over several decades, except for short visits by archaeologists. However, the finds from Zvejnieki were described in all the major archaeological publications on the Latvian Stone Age (Ebert 1913; Šturms 1927), mentioning a large flint-knapping workshop at the site, while the human bones were still considered to be of later origin. One of the leading Stone Age archaeologists during the first period of the Republic of Latvia, Eduards Šturms, carried out a small excavation at Zvejnieki in 1943 (no report is preserved from the excavation). He considered this site as mainly relating to the Neolithic, although he did not exclude the possibility that Mesolithic remains might be found here (Šturms 1970).

The site attracted attention again in 1964, when human burials were discovered during gravel extraction. Local historian Laimonis Liepnieks visited the area in spring 1964 and noted red-coloured human bones and skulls in the quarrying area. Archaeologists were informed about this discovery, and shortly afterwards Jānis Apals and Francis Zagorskis from the Institute of History of the Latvian SSR Academy of Sciences went to inspect the site. Half of the gravel ridge had already been destroyed, and several human burials, some with red ochre, were visible in the section of the gravel pit (Zagorskis 1987: 10; Zagorska 2006b: 11).

Figure 4.3. Information plaque about archaeological excavations at the Zvejnieki Neolithic cemetery in 1965, as it was considered at that time. Photo: F. Zagorskis (personal archive of I. Zagorska).

Gravel extraction was stopped, and that summer excavation began at the cemetery and at the Zvejnieki I settlement, where the work continuing the two following years (Fig. 4.3 and 4.4). The occupation layer had been disturbed by the foundations of a sauna and other later activities (Zagorskis 1964, 1965, 1966; Zagorska 2006b: 16–17; Larsson et al. 2017: 61). Altogether, investigation of the Zvejnieki complex continued for more than a decade. Zvejnieki cemetery was excavated during the field seasons of 1964, 1965, 1966, 1968, 1970 and 1971 (Zagorskis 1974). In the course of the excavation, a Mesolithic occupation was also discovered, and part of this site

was excavated during excavation campaigns in 1971–1975 and 1977–1978 (Zagorska 1971, 2006b, 2019). Four burials were discovered within the area of the settlement site (Zagorska 2006b: 13). More than 300 burials were unearthed in the cemetery, and by the end of the 1970s, 4200 m^2 of the Zvejnieki cemetery had been excavated (Zagorska 2006b: 12).

Figure 4.4. The first excavation season (1964) at the Zvejnieki I settlement and view of the Zvejnieki cemetery, surrounding the farmhouse in the background (cf. Fig. 4.5). Photo: F. Zagorskis (Repository of Archaeological Material, Institute of Latvian History, University of Latvia).

Fieldwork and survey at Zvejnieki and in the environs of Lake Burtnieks resumed in 2001 and continued in the following years. The survey along the ancient shorelines of Lake Burtnieks revealed at least six new Stone Age find spots (Zagorska 2002). Small-scale excavation was carried out at the Zvejnieki II settlement to gain a better understanding of habitation phases and reconstruct the development of the palaeolake (Zagorska 2002, 2006c). The main objective was to collect samples for palaeoenvironmental reconstruction and palaeobotanical studies (Eberhards 2006; Kalniņa 2006).

Between 2005 and 2009, excavation at Zvejnieki cemetery was carried out as part of a cooperation project between Lund University (Sweden) and the Institute of Latvian History. During four field campaigns, 22 burials were excavated, containing 26 individuals (Nilsson Stutz 2009; Larsson 2010; Nilsson Stutz et al. 2013; Nilsson Stutz & Larsson 2016; Larsson et al. 2017) (Fig. 4.5). During the new excavations at Zvejnieki, detailed field documentation techniques were applied, including archaeothanatology (Nilsson Stutz et al. 2013; Larsson et al. 2017). Excavation was also undertaken on both settlement sites in an attempt to clarify issues concerning the use of the cemetery and the habitation phases at the Zvejnieki complex (Bērziņš & Zagorska 2010; Larsson et al. 2017).

Figure 4.5. View in 2019 of the ruins of the Zvejnieki farmhouse, located in the eastern part of the cemetery, where excavation was undertaken in 2005–2009. Photo: A. Macāne.

In 2006, a test-pit survey was carried out in the vicinity of Košķele drumlin, which is located about 1.4 km from Zvejnieki (Fig. 4.1). In the Stone Age the two drumlins would have been separated by a shallow bay. A large settlement (Mesolithic) was discovered at the southern tip of the Košķele drumlin, resembling the situation at Zvejnieki (Bērziņš 2008a). In connection with work to develop the electricity network, small-scale excavation was carried out at Zvejnieki I settlement in autumn 2014 (Kalniņš & Zagorska 2016). In an attempt to better understand the Stone Age habitation on the shores of the ancient Lake Burtnieks, a survey was carried out in autumn 2020. Several new find spots were discovered that indicate the presence of possible settlements on the southern and northern shores of the ancient Lake Burtnieks (Kalniņš et al. in press).

4.1.3. Previous research on the Zvejnieki material

The first publications on the Zvejnieki burials were authored by Francis Zagorskis (Fig. 4.6), summarizing the data from Zvejnieki cemetery in several articles (Zagorskis 1973, 1974, 1986). His monograph on the cemetery as a whole was published posthumously (Zagorskis 1987). The book gives a detailed description of each grave and grave inventory, along with an overview of the period of use of the cemetery and a typological breakdown of the burials and burial practices. Zagorskis also proposed a division of the cemetery into two phases. The northern part – on the summit of the gravel ridge – was seen to consist mainly of Mesolithic graves. In the southern part, around the Zvejnieki farmstead, mainly Neolithic burials are located. Anthropological material from the cemetery was studied by Raisa Denisova (Денисова 1975), odontology by Rita Grāvere (Гравере 1977) and palaeopathology by Vilis Derums (1978).

After the collapse of the Soviet Union, the Zvejnieki material became more widely known abroad (Zagorska 1992). Due to the excellent preservation conditions and the quality of the field documentation, which was outstanding for its time, it is possible to trace the specific position of every find. The field reports are also of a very high

Figure 4.6. Francis Zagorskis by Burial 100, that of a child, richly sprinkled with red ochre and adorned with 75 pendants from animal teeth and bone. Photo: I. Zagorska (personal archive of I. Zagorska), drawing of Burial 100: B. Vaska (Institute of Latvian History, University of Latvia).

standard and contain detailed descriptions of all graves and features connected with burials. Cooperation with Professor Lars Larsson from Lund University (Sweden) led in the following decades to a larger interdisciplinary research project involving a wide range of specialists: anthropologists (Gerhards 2006; Zariņa 2006), osteologists (Lõugas 2006; Mannermaa 2006, 2008a), geologists (Eberhards 2006), palynologists (Kalniņa 2006), odontologists and palaeopathologists (Jankauskas & Palubeckaite 2006) and conservators (Gaismiņa 2006). The Zvejnieki material was also investigated using a variety of new methodological and theoretical approaches (Eriksson 2003, 2006; Eriksson et al. 2003; David 2006; Iršėnas 2006; Nilsson Stutz 2006). The first results of this collaboration were presented in a conference in Riga in February 2004, and brought together in a book entitled *Back to the Origin*, edited by Lars Larsson and Ilga Zagorska (2006).

To make available data from this unique site, Zagorskis monograph was translated into English by Valdis Bērziņš and published in the BAR series in 2004 (Zagorskis 2004). The material from the 2005–2009 excavation seasons at Zvejnieki has also been studied with a variety of methodological approaches, and these results have been summarized in numerous publications (Larsson 2006b, 2009, 2010, 2012, 2017; Nilsson Stutz et al. 2008, 2013; Nilsson Stutz 2009, 2016; Nilsson Stutz & Larsson 2016; Zagorska 2016, Larsson et al. 2017, Zagorska et al. 2018; Macāne 2020). The first aDNA data have recently also been published for individuals from Zvejnieki (Jones et al. 2017; Mathieson et al. 2018; Krūmiņa et al. 2018; Mittnik et al. 2018). The

Zvejnieki material is the subject of ongoing studies and has been included in several new projects using new analytical tools (e.g. Schulting et al. 2020).

4.1.4. Chronology

The chronology of Zvejnieki cemetery was established already by Zagorskis (1974, 1986, 1987) based on the typology of artefacts, for instance animal tooth pendants, as well as stratigraphy, changing burial practices and the spatial distribution of the burials. Zagorskis suggested that the Zvejnieki burials covered several millennia, between the Late Mesolithic and the Late Neolithic according to Latvian Stone Age chronology (Zagorskis 1974: 20, see Fig. 1.2). In the following, the traditional periodization of the Zvejnieki complex will be briefly presented, based mainly on the excavators' chronological scheme and available radiocarbon dates (Zagorska 2006a, 2016; Meadows et al. 2016, 2018; Zagorska et al. 2018).

The habitation around Lake Burtnieks began already at the end of the Preboreal or the very beginning of the Boreal period (Zagorska 1992, 2019). The composition of pollen and plant macro-remains confirms this suggestion, with weak traces of possible human presence already from the very end of the Younger Dryas. The area was most intensively inhabited during the Boreal period, when pine forest spread in the area, due to the mild and dry climate (Kalniņa 2006: 73; Ozola et al. 2010). A Kunda-type fishing spear found in the Pantene peat-bog, in the northern part of the ancient Lake Burtnieks, constitutes one of the earliest traces of human activity on the shores of Lake Burtnieks. The available radiocarbon datings also indicate that the earliest habitation at Zvejnieki II settlement occurred in the 9th millennium cal BC (Загорска 1983, Zagorska 1992, 2019). Two occupation layers have been recognized, the lower layer representing ca. 9000–7000 cal BC (the Early Mesolithic habitation), which Zagorska (2019) identifies as the oldest stage of the Kunda Culture (Pulli stage or Culture – Zagorska chooses to use the latter, cf. Kriiska 2020a). The Kunda Culture represents the earliest phase of the Mesolithic in the Eastern Baltic (ca. 8500–7000 cal BC).

A large proportion of the burials at the cemetery have been assigned to the 6th and 5th millennium cal BC (Late Mesolithic–Early Neolithic). Habitation traces of this period on the settlements are very weak (Zagorska 2006a). The first pottery vessels at Zvejnieki belong to the Narva Culture (mid 6th – mid 5th millennium cal BC). Burial practices from this period show a continuation of previous practices, as well as demonstrating a wider variety of animal species, especially carnivore teeth used for making pendants (Zagorska 2016). The Comb Ware Culture (starting in the beginning of the 4th millennium cal BC) represents the following stage in the chronology of Zvejnieki. Zvejnieki I settlement mainly corresponds to this phase. At the Zvejnieki cemetery this phase is illustrated by various burial customs, including multiple burials, votive deposits by the graves and the appearance of amber ornaments (Zagorska 2006a: 100).

The last phase of Stone Age burials at Zvejnieki is linked to the Corded Ware Culture (the 3rd millennium cal BC). Due to the flexed leg position, 11 burials were assigned to this phase (Zagorskis 1987; Loze 2006; Zagorska 2006a). However, the datings and examples from other cemeteries suggest that leg position alone cannot

be taken as indicative of a Corded Ware burial (Larsson 2000; Zagorska 2006a; Tõrv 2018; Ahola & Heyd 2020; Macāne & Nordqvist 2021). Only three of the burials at Zvejnieki had a typical grave inventory for a Corded Ware Culture burial, namely a clay vessel, a bone adze and an awl, and decorated antler plaques (Burials 88, 137 and 186). One adze was made from a bone of a domesticated animal – a goat or sheep. Together with one more bone, these are the only domesticated animal remains identified in the Zvejnieki graves (Lõugas 2006: Fig 7; Zagorska 2006a: 103). A group of twelve graves located on the southern side of the drumlin belong to the Bronze and Iron Age, and some others are from the medieval period (Zagorska 2006a: 105).

The absence of grave goods makes it difficult to assign burials with certainty to a particular phase of the cemetery. Therefore, one of the first questions after the collapse of the Soviet Union was clarification of its chronology. The first radiocarbon datings were carried out in the early 1990s (Zagorska 1994; Zagorska & Larsson 1994). Ever since, the dating of Zvejnieki has been an ongoing activity (Zagorska 1997, 2003; Eriksson et al. 2003; Mannermaa et al. 2007; Larsson 2010). By now, nearly 80 burials have been (AMS) dated. In fact, the chronology of the Zvejnieki burials, as well as reservoir effect corrections, have been the main focus of studies during the last decade (Meadows et al. 2016, 2018; Zagorska et al. 2018; Schulting et al. 2020). These have clarified some of the temporal questions and show that the presence of freshwater reservoir effect (FRE) is significant. An offset of 300–400 years should be taken into consideration when discussing the Zvejnieki datings. In light of the new radiocarbon datings that place most burials between the late 8th and early 3rd millennium cal BC, the spatio-temporal distribution proposed earlier is no longer valid.

4.1.5. Burials at Zvejnieki

At the Zvejnieki cemetery, at least 350 individuals were buried in 274 burial features. The majority – 227 individuals – are single burials; in addition, there are 33 double (66 individuals) and 14 multiple burials (57 individuals). The hunter-gatherer burials include 264 burial features with 339 individuals. The graves mostly contained single burials, laid in supine position in oval or rounded grave pits. Some individuals have been buried in prone or crouched position with legs flexed. Grave orientation is quite random, and no consistent pattern can be traced (Zagorskis 1987). The grave pits vary in depth from 0.20 to 1.1 m, with an average depth of 0.4–0.6 m. The size of the pits depends on number of buried individuals and can be less than 1 m in length for children and up to 3.6 m long for the multiple burials. Similarly, the width varies from 0.25 m to 5.00 m. Most of the graves had a fill of dark soil, which had evidently been taken from occupation layers, since it contained a large number of artefacts, animal remains and other human bones from disturbed burials (Zagorskis 1987; Larsson et al. 2017).

Stones have been used in the grave constructions, sometimes covering the whole burial, or else stones were placed by certain parts of the body or as markings of the grave boundary. Red ochre has been used in burials, usually covering certain parts of the body, which often correspond to the position of the richest grave goods (see

Zagorska 2008). The ochre used in graves was not a natural product but rather a special mixture prepared for the burial practices, which included clay and was burned to obtain the right consistency (Upīte 2004). By some burials, special deposits with intentionally destroyed artefacts were discovered (Zagorskis 1987; Zagorska 2006a). The use of wrappings and other manipulations of the bodies has also been suggested for some individuals at Zvejnieki (Zagorskis 1987; Nilsson Stutz 2006, 2009, 2016). The long continuation of the cemetery's use and the large proportion of disturbed burials indicate that no grave markers were used, or else they disappeared over time (Larsson 2017).

Figure 4.7. Lūcija Vankina, head of the Archaeology Department at the History Museum of the Latvian SSR (right) organizing the transportation of Burial 45 *en bloc* in 1965. The burial of a young adult included six bone spearheads and seven animal tooth pendants. The burial is now on display in the permanent exhibition at the National History Museum of Latvia. Photo: F. Zagorskis (personal archive of I. Zagorska).

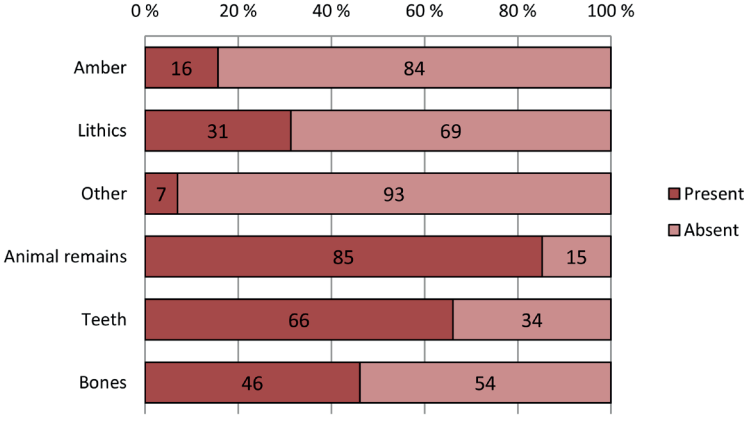


Figure 4.8. The grave inventory of hunter-gatherer burials with secure contexts shows the prevalence of animal remains (number of burials: 115).

Some graves are distinguished by a rich grave inventory (Fig. 4.7), while others have none. Around one third of all burials at Zvejnieki had a grave inventory. Among the hunter-gatherer burials with secure contexts, the grave inventory was documented in 115 burial features (Fig. 4.8). Animal remains were found in more than 80% of these burials, mainly consisting of animal tooth pendants (see Chapter 4.1.6 and Fig. 4.8–4.10). Bone artefacts were also placed in graves, and less commonly unworked animal bones. Lithic items occur in around 30%, while amber ornaments appear in around 15% of burials with grave inventory. Pottery fragments are rarely found with burials and the same is true of items made from other materials, such as copper or fossils (Fig. 4.9).

4.1.6. Animal remains at Zvejnieki

A diverse range of unworked and modified animal remains, such as bones, teeth (mainly incisors and canines), antlers, jaws, phalanges, astragali, claws and other body parts, have been recorded together with the Zvejnieki burials (Fig. 4.10 and 4.11). Animal remains and tooth pendants from graves were analyzed in the early 2000s by Estonian osteologist Lembi Lõugas (Zagorska & Lõugas 2000; Lõugas 2001, 2006; Eriksson et al. 2003). She has also carried out analysis of animal remains excavated at the settlement sites during the fieldwork in the early 2000s (Lõugas 2003). The taxonomic identification of animal remains from burials using comparative anatomy was the main focus in previous studies (Lõugas 2006: 76), while stable isotope analysis has been carried out on some of the animal remains from the burials (Eriksson 2003, 2006). In the course of this study, more detailed osteological investigation was undertaken, focusing on, for instance, the number of identified individuals, sex, age and other aspects of the animals, providing new information about animals in the Zvejnieki burials.

Animal remains were identified in 105 hunter-gatherer burials at Zvejnieki, but only in 98 cases do they come from secure burial contexts (Fig. 4.10). The majority of animal remains consist of pendants made from animal teeth. Altogether, 2443 animal teeth were identified in hunter-gatherer burials at Zvejnieki, of which 2263 teeth are associated with secure contexts, including pendants made from human tooth (Fig. 4.11). Elk teeth comprise the largest number among the identified animal species, followed by wild boar and red deer. Animal bones, worked into various tools or ornaments and unworked bones have been found in much smaller numbers, comprising 450 pieces (Fig. 4.10 and Fig. 4.12). The majority of these are tubular beads, pendants made from bird bones, phalanges, and bones from other animals. Various bone artefacts as well as figurines and antlers were identified among them. Unmodified bones from birds, beaver and pond tortoise were also identified.

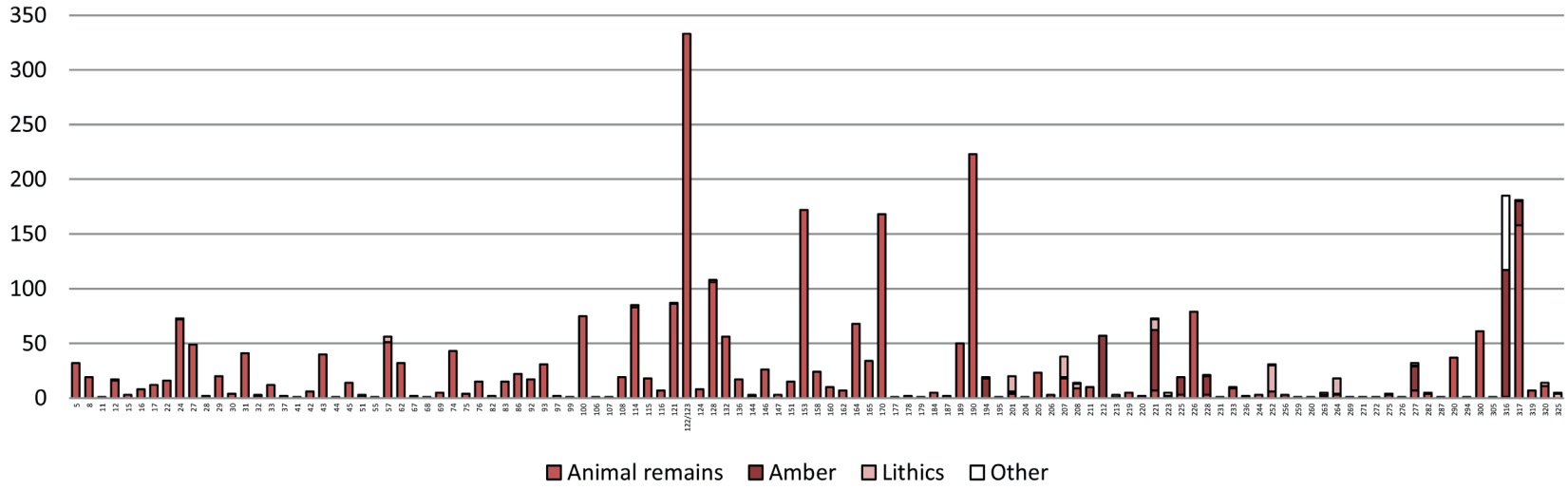


Figure 4.9. All finds from hunter-gatherer burials with secure contexts (number of burials: 115, *y*-axis: number of items).

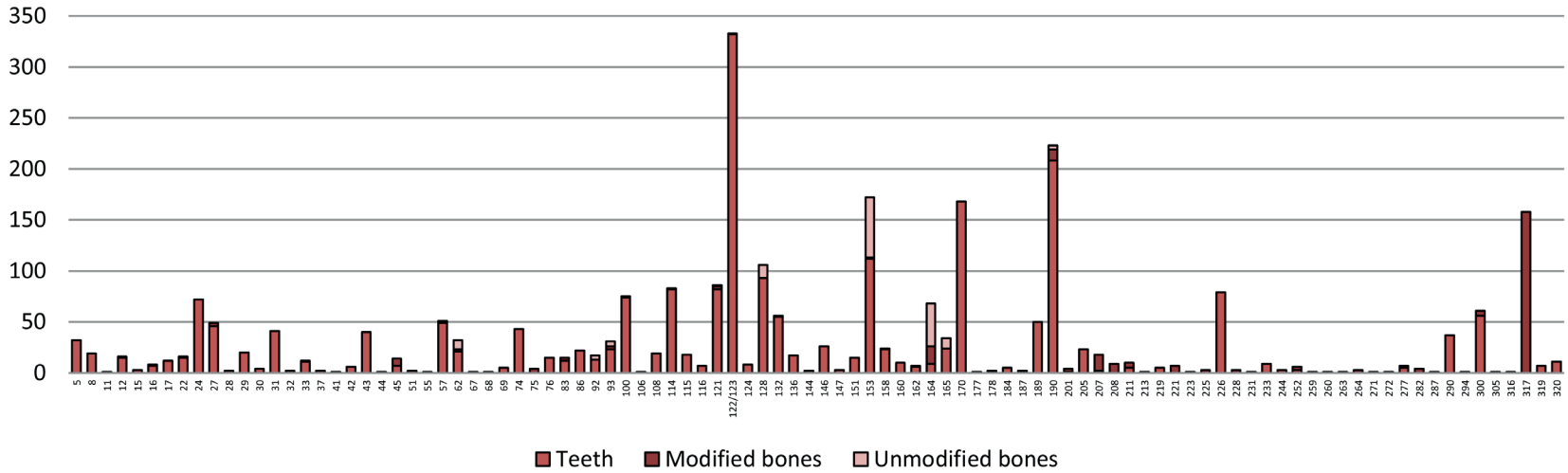


Figure 4.10. Animal remains in the hunter-gatherer burials with secure contexts at Zvejnieki (number of burials: 98, y-axis: number of items).

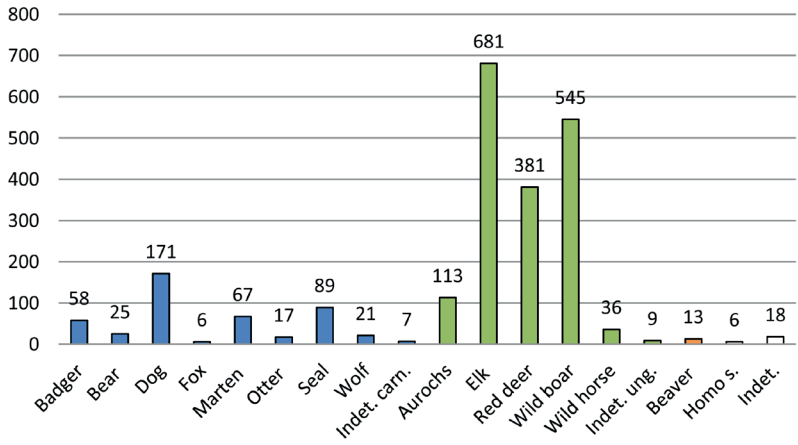


Figure 4.11. Animal teeth by species in hunter-gatherer burials with secure contexts at Zvejnieki (number of teeth: 2263, y-axis: number of items).

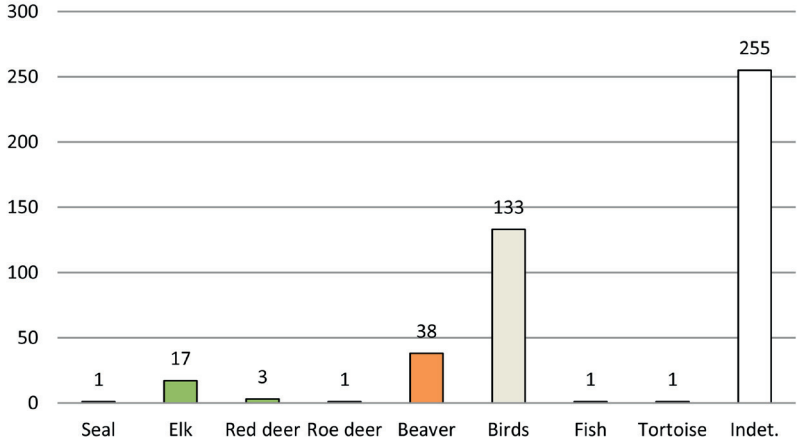


Figure 4.12. Animal bones by species in hunter-gatherer burials with secure contexts at Zvejnieki (number of bones: 450, y-axis: number of items).

4.2. Skateholm (Sweden)

One of the largest hunter-gatherer burial sites so far known in southern Scandinavia has been excavated at Skateholm. Altogether, 87 graves are known from the cemeteries at Skateholm I and II (Larsson 1988a, 1988b, 2016; Nilsson Stutz 2003). The Skateholm complex is located at the coast of the southernmost part of present-day Sweden (Fig. 4.13) and was investigated during the early 1980s under the direction of Lars Larsson (University of Lund), resulting in the discovery of 22 Stone Age settlements. In addition to Skateholm I, where 65 burials were found, and the 22 burials documented at the Skateholm II cemetery, human burials have also been discovered at Skateholm III and IX. Furthermore, at least 15 dog skeletons were unearthed, buried

individually or together with humans. The burials from the Skateholm sites date from the 6th and 5th millennium cal BC.

4.2.1. Location

An ancient lagoon consisting of several islands and shallow bays (Fig. 4.13) was chosen for habitation and burial of the dead by hunter-fisher-gatherers of the Ertebølle Culture. The lagoon was formed and reshaped in the course of the Littorina Sea transgressions during the Late Atlantic and Early Subboreal. The environment in the area during the 6th millennium cal BC is characterized by a lagoon landscape consisting of alder carr, sedge fen, reed swamp and open brackish waters with aquatic plants (Gaillard et al. 1988: 52). This corresponds to the Atlantic climatic optimum, with a warmer climate than today (Gaillard et al. 1988: 53). In the second part of the Late Atlantic, the lagoon opened towards the sea, and salinity in the lagoon increased (Gaillard et al. 1988; Lemdahl & Göransson 1988). Marine sediments and gravels from Late Glacial times formed an ancient island, with overlying clay-intermixed sand and gravel (Lemdahl & Göransson 1988).

The environmental reconstructions indicate that Skateholm II was inhabited at some time during the Early Atlantic period and is the oldest site in the lagoon. Skateholm II was situated on a little island in a shallow, sheltered lagoon. When the area was completely submerged in the course of the changing level of the Littorina Sea, people moved about 150 m away to Skateholm I, which was located on the southern coast of a rectangular island. This period was characterized by a more open lagoon environment with greater marine influence (Gaillard et al. 1988: 54). However, because of continued sea-level rise, Skateholm I also had to be abandoned. The people probably moved west to Skateholm III, which is situated on the ancient shoreline around 300 m from Skateholm I (Gaillard et al. 1988; Larsson 2016: 176). Skateholm IX, situated in the eastern part of lagoon, is thought to be contemporaneous with Skateholm I (Larsson 1988a: 55).

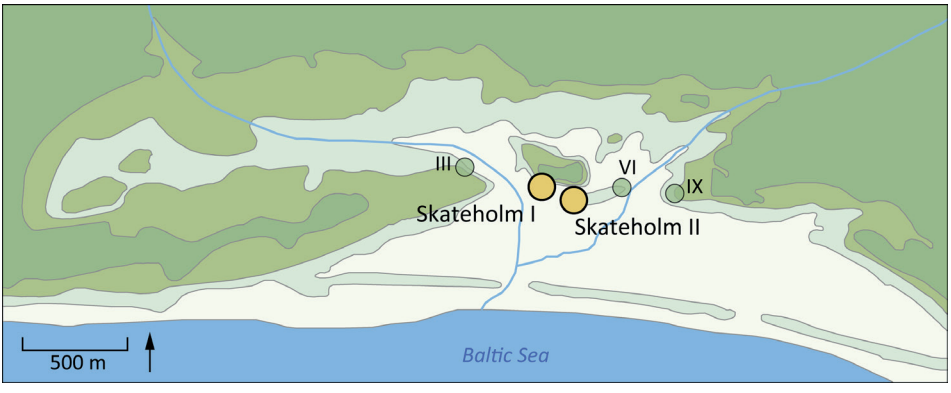


Figure 4.13. Map with the location of the Skateholm cemeteries (yellow) and other Skateholm sites (green) mentioned in the text. Redrawn after Larsson 2016: Fig. 1 by K. Nordqvist.

4.2.2. Research history

Evidence of human habitation and even burials had been known from the Skateholm area since the 1930s, when several graves were discovered during gravel extraction at Skateholm III, only one of which was excavated (Larsson 2016: 176). The discovery of 18 hunter-gatherer graves (containing 22 individuals) in Vedbæk on the east coast of Sjælland (Denmark) (Albrethsen & Brinch Petersen 1977) served as a point of departure to begin archaeological survey of the southern coast of Sweden. The Skateholm project was initiated with the research aim of discovering Stone Age burials on the Swedish side of the Öresund strait. The research strategy was carefully designed, focusing on the relationship between settlement and cemetery, and encompassing the wider social and environmental setting (Larsson 1988b: 13).

The first systematic research at Skateholm started in March 1980 (Larsson 1988b: 12). Excavation at Skateholm I revealed traces of an occupation layer and a human burial, providing the basis for a larger excavation. In 1981, Skateholm II was discovered, although later activities had disturbed the primary layers, and no burials were found at first. Only later, thanks to mole activity, archaeologists also found human bone fragments at Skateholm II. In the following years, excavation was carried out simultaneously at both sites, as well as in nearby areas, revealing 22 Stone Age settlements (Larsson 1988b: 14) (Fig. 4.14).

The project involved a wide range of specialists from various fields, such as anthropology, geology, biology and osteology, and employed research methods that were new and innovative for the time. One of these was georadar, which facilitated the discovery of several burials in the course of the excavation (Bjelm & Larsson 1984). All finds, starting with those in the grave fill, were carefully documented in three dimensions. The preservation level of organic material at Skateholm is poor. Generally, all that survived

Figure 4.14. Lars Larsson (on the ladder) documenting burials at Skateholm, accompanied by Håkan Nilsson, Per Karsten and Ewa Ryberg. Photo: unknown (personal archive of L. Larsson).

of the human remains was a very thin layer of the largest and hardest long bones, and after exposure most of the human remains began to disintegrate, so that many analyses and measurements had to be carried out *in situ* (Alexandersen 1988; Persson & Persson 1988). Most commonly, the skeletons had completely disintegrated, and only the contours of body positions remained in the soil as darker stains. The presence of an osteologist in the field also contributed to the recovery of animal remains and their proper documentation (Larsson 1988b: 16). Animal bone analysis by osteologists (Jonsson 1986, 1988), along with geological studies (Lemdahl & Göransson 1988) and various analyses, such as pollen (Göransson 1988), plant-macrofossil (Gaillard & Lemdahl 1988), diatom (Håkansson 1988) and insect faunal analysis (Lemdahl 1988), helped reconstruct the environmental conditions at Skateholm during the Stone Age. The grave numbering was separated between Skateholm I and Skateholm II, assigning Arabic numerals to graves on the former site and Roman numerals to those of the latter. Eight graves were lifted *en bloc*, and some of these are exhibited at Lund University Historical Museum, Trelleborg Museum and the Swedish History Museum in Stockholm.

The excavations at Skateholm I and II were completed in 1984 (Fig. 4.15). Altogether, an area of about 4000 m^2 was opened up at Skateholm I, and around 1200 m^2 at Skateholm II. In 1985 excavation continued at Skateholm III, VI and IX. Habitation traces were found at all of these sites, with human remains at Skateholm IX (Larsson 2016: 175). Later, a new excavation at Skateholm I was undertaken in 1999 by Ingrid Bergenstråle (1999a, 1999b) in the frame of a field course for archaeology students from Lund University. No new burials were revealed during this campaign.

4.2.3. Previous research on the Skateholm material

The results and primary data of the Skateholm project have been extensively published by the director of the excavation, Lars Larsson (1980, 1981a, 1981b, 1982, 1983a, 1983b, 1984a, 1984b, 1984c, 1985, 1988a, 1988b, 1988c, 1988d, 1988e, 1988f). He has brought together and discussed various aspects of burials at Skateholm, including grave goods (Larsson 1989, 1993, 2000, 2016) and dog burials (Larsson 1990; see also Blank Bäcklund & Fahlander 2006; Perri 2013). Larsson has also examined topics such as the distribution of burials within the cemetery, various kinds of burial rituals and other activities linked to burials, such as grave filling and intentional manipulation of the body (Larsson 2000, 2002, 2003, 2017, 2021). Despite the poor state of preservation of the human remains, during the last decades various analyses and investigations have been undertaken on the Skateholm material and are still continuing.

Radiocarbon dating and stable isotopic analysis have been carried out on the Skateholm material (Larsson 1989, 1993). Diet and mobility patterns have been studied on the basis of stable carbon and nitrogen isotopes (Price 1987; Lidén & Nelson 1994; Eriksson 2003, 2007; Eriksson & Lidén 2002). Strontium isotope studies have been carried out on human and animal remains from Skateholm I and II. The results indicate that these sites were inhabited by a very homogenous community with a highly sedentary lifestyle, with only a few individuals possibly coming from somewhere else

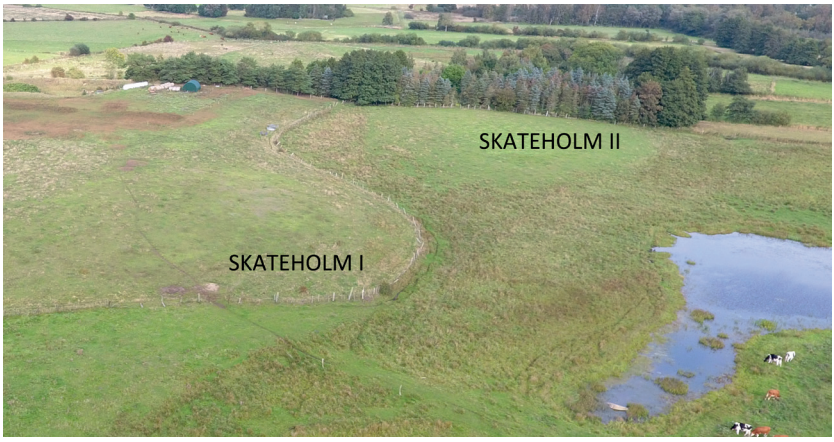


Figure 4.15. Aerial view of the Skateholm I and II sites. Photo: P. Larsson (personal archive of L. Larsson).

(Price et al. 2021; Larsson & Price 2022). The osteological investigations of human remains have included, for example, odontological characteristics, suggesting the special placement of certain groups of people (families or related members of a group) in particular areas of the cemetery (Alexandersen 1988; Persson & Persson 1988).

Animal remains from the Skateholm sites have also been subject to repeated investigation, concentrating especially on the seasonality and occupation period of the sites. The seasonal indicators for the occupation of sites during the autumn–spring are most numerous (Price et al. 2021), even though year-round habitation has also been suggested (Jonsson 1988; Carter 2004). Peter Rowley-Conwy (1993, 1998) has suggested that Skateholm I was occupied in the winter, although some species could also have been hunted during the summer. A new research project has recently been initiated applying laser ablation on animal teeth in order to study strontium values and mobility (Larsson et al. 2021).

Various theoretical approaches have been employed in studying the Skateholm material. The ritual theory and archaeothanatology approach (also known as *anthropologie de terrain*) has successfully been applied, demonstrating various burial practices and manipulation of the bodies (Nilsson Stutz 1998, 2003). This is also demonstrated by traces of scalping, which have been identified at Skateholm I (Ahlström 2008; Ahlström & Larsson 2015). Hunter-gatherer ontologies and shamanism, in particular, have been used as an interpretative framework by Jimmy Strassburg (2000), while micro-archaeological studies by Fredrik Fahlander (2008, 2010) have suggested various patterns of cemetery organization.

4.2.4. Chronology

The internal chronology of the Skateholm sites has been compiled on the basis of topographical location, environmental reconstructions, artefact types and radiocarbon datings, suggesting that Skateholm II was the oldest site, followed by Skateholm I and III (Larsson 1989: 368, 2016). However, radiocarbon dating at the Skateholm

complex has been challenging in many ways. First of all, due to the poor preservation of bone collagen, many radiocarbon dates have failed (Larsson 1989; Lidén & Nelson 1994; Eriksson & Lidén 2002; Eriksson 2003, 2007). Therefore, charcoal and hazelnut shells were also dated. Large measurement errors have been the result of the applied methodology, since the conventional ^{14}C method was used initially, while later dates were obtained by the AMS method. The dietary preferences can also have biased the results. The intake of aquatic resources can result in reservoir effect, which affects the radiocarbon age (see Eriksson 2003).

The available dates from Skateholm I and II show a very wide chronological range. The dated burials from Skateholm II fall in a period of nearly 2000 years, even though most burials relate to the period 5500–4500 cal BC. Similarly, data from Skateholm I shows that most burials relate to the period 5500–4500 cal BC, with the majority falling in the late 6th millennium cal BC and around the turn of the 5th millennium cal BC. At both sites, the large measurement errors can be seen in the dated charcoal and hazelnut fragments, while human and animal bones may be biased by the dietary reservoir effect. The oldest date from Skateholm I is a metacarpal bone of a dog from burial 46 dated during this study. It was dated to 5555–5365 cal BC (probability: 95.4%; UBA-35604: 6500±47 BP), while isotope measurements gave a $\delta^{13}C$ value of -19.8, a $\delta^{15}N$ value of 12.5, a C:N ratio of 3.21 and a collagen yield of 5.40. The stable isotope values for the dog suggest a marine diet (for comparative data on dog diet see Eriksson & Lidén 2002; Eriksson 2003, 2006; Eriksson et al. 2003). Therefore, this dating of a dog bone could be affected by marine reservoir effect, resulting in a much older age. Seven other samples from dogs were sent for radiocarbon dating in the course of this study (Burials VIII, X, XIX and XXI from Skateholm II and Burials 15 and 17 from Skateholm I) but did not provide results due to poor preservation of the collagen.

The general period of use of both cemeteries at Skateholm relates to the Ertebølle Culture, which constitutes an approximately 1500-year long time interval (ca. 5600–4000 cal BC) (Larsson 1989, 2016; Andersson et al. 2004). It corresponds to the Late Mesolithic period according to the southern Scandinavian periodization (see Fig. 1.2). The Ertebølle Culture represents the last hunter-gatherers in these areas, who were also the first makers of pottery in the region. Despite the challenges of dating quality, the available radiocarbon dates place both Skateholm cemeteries in the early stage of the Ertebølle Culture (ca. 5600–4800 cal BC) (see also Andersson et al. 2004).

4.2.5. Burials at Skateholm I cemetery

At Skateholm I (Fig. 4.16), 65 burials have been excavated, including remains from at least 61 human inhumations and 10 dogs (Larsson n.d., 1988a, 1988b; Nilsson Stutz 2003; see Appendix 1). Most were primary, individual inhumation graves, although two cremations have also been investigated. The majority are single burials (48), while five double burials of humans and two with humans and dogs have also been documented. The majority of burials were in supine position, although almost two-fifths were crouched (Larsson 2000: 92). Some individuals had been placed on

the side or in a sitting position and one in prone position (Larsson 1981a, 1982). The dead had been placed in oval or rectangular (sometimes irregular) grave pits of varying size without any distinct orientation. In some cases, the limit of the pit corresponds to the size of the buried person, while in some cases grave pits were much larger (even up to 2.4 x 1.6 m). The burials are generally shallow, a depth of 0.1–0.4 m being the most common, even though some are deeper, reaching 0.6–0.75 m.

Various burial practices and manipulation of the bodies have been identified at Skateholm I. A partly disarticulated body was found in Burial 13, suggesting mutilation, and some bones were missing (Larsson 1988a, 1993; Nilsson Stutz 2003). The use of fire has been observed with some burials in the form of overlying hearths. Red ochre has been documented in the majority of graves, having been applied to 46 burials (Larsson 1993). In general, at Skateholm I, only one grave has been destroyed by the digging of a later burial, but in several cases the grave pit has been disturbed without touching the human body – suggesting that grave markers were used (Larsson 2016: 178). The distribution of dog burials is spatially delimited: six dog burials were found in one particular area, corresponding to the settlement cultural layers (Fig. 4.16) (Larsson 2000: 91; see also Blank Bäcklund & Fahlander 2006).

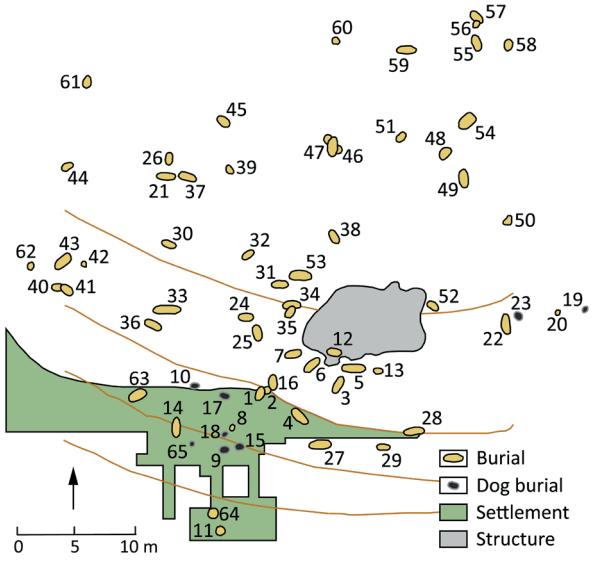


Figure 4.16. General map of the Skateholm I cemetery. Contours every 0.5 meter. Redrawn after Larsson 1988a and Strassburg 2000: Fig. 44 by K. Nordqvist.

More than half of the burials at Skateholm I had a grave inventory (Appendix 1). Various animal remains comprised the largest part of the grave inventory (see Chapter 4.2.7. for more detailed information) as well as the lithic items (documented in 25 burials). Pendants made from animal teeth, red deer in particular, were the most numerous. Amber was recorded only in three cases, while other inventory comprised sea urchin and red coloured ferrous material (Larsson 1988a, 1993).

4.2.6. Burials at Skateholm II cemetery

Twenty-two burials (Fig. 4.17) have been discovered at Skateholm II, containing 23 humans and five dogs (Larsson n.d., 1988a, 1988b; see Appendix 1). The majority of burials at Skateholm II were considered to be primary interments. All burials were in supine position, except for five, which were in a sitting position. All burials were single, with the exception of two double burials. In four cases dogs were buried together with humans, and one dog was buried individually (Larsson 1988b, 1993). There is also one cremation documented at the cemetery. One pit considered to be a grave was also excavated, but no human remains were found.

The deceased were always placed in oval grave pits oriented N–S or NE–SW. The size of the pits varies greatly, from 0.5 to 3.6 m in length and 0.3 to 1.6 m in width. The burials are shallow, having a depth of 0.1–0.6 m. Two special constructions discovered at Skateholm II have been interpreted in connection with funerary rituals (Larsson 1988b, 2000). These pits with post-holes were filled intentionally with a mix of various soils and ochre together with artefacts. Red ochre is present on nearly all burials, usually covering particular parts of the body.

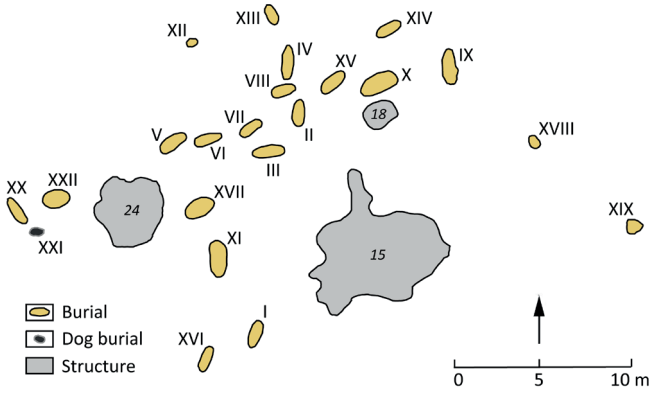


Figure 4.17. General map of the Skateholm II cemetery. Redrawn after Larsson 1984b: 40 by K. Nordqvist.

All burials, except two, had a grave inventory. Lithic artefacts were documented in 17 burials, while animal remains were identified in 14 graves, mainly consisting of pendants made from various animal teeth. Red deer antlers were discovered in three burials, in addition to structure 18, where only antlers were found without any human remains. In one burial a fossil sea urchin was also documented. Even dogs had a grave inventory at Skateholm II, comprising an antler axe, a red deer antler and a flint knife (Larsson 1988a, 1993).

4.2.7. Animal remains at Skateholm

The burials at Skateholm offer a rich record of various animal remains. Besides a large number of animal tooth pendants, the finds include antlers, worked and unworked bones, and fish remains. The find recovery of animal remains was very accurate at Skateholm in comparison to the other studied sites. Osteologist Leif Jonsson has

carried out the primary osteological studies of animal remains from the Skateholm sites. This work is summarized in an extensive report and several publications (Jonsson n.d., 1986, 1988). Identification to species was a primary task in the previous studies, including skeletal element, body side (for paired bones and skull fragments) and sex, if possible. Thereafter, fragmentation and other taphonomic parameters, pathologies, gnawing, cut marks and burning traces were documented (Jonsson 1988: 57).

The main focus in this study was on the contextualization of animal remains from Skateholm burials. The difficulties of locating animal remains in the museum collections forced the author to rely on the primary excavation documentation and publications on the animal remains from the Skateholm burials (Jonsson n.d., 1986, 1988). No further studies on artefacts made from animal remains was possible due to the poor state of preservation. However, some dog bones were selected for radiocarbon analysis (Fig. 4.18), but no collagen was preserved in most of these bones (see Chapter 4.2.4).

Figure 4.18. The preservation of animal remains from Skateholm is generally poor. This is one of the better-preserved dog individuals from Burial XXI, stored at Lund University Historical Museum. Nonetheless, radiocarbon dating was not successful. Photo: A. Macāne.

The Skateholm burials contain an abundance of various animal remains, but the contextualization of these remains was quite challenging. Despite the very careful documentation, the attribution of certain animal remains to the buried individuals was not straightforward. The soil from the grave fills was rich in various finds, including animal remains. Therefore, in cases when unworked animal body parts were found at the level of the skeleton, difficulties were encountered in determining whether they can be regarded as intentionally placed or come from the grave fill.

Animal remains are documented in 37 burials at Skateholm I, although only in 26 cases (Fig. 4.19) can these finds be considered as coming from a secure context associated with the buried individual or the level of the skeleton. Animal teeth and

pendants made from them constitute the largest section of animal finds (Appendix 2). They were documented in 10 burials, counting 217 teeth (Fig. 4.20). The majority of these are red deer incisors, followed by wild boar incisors and canines. Other species are not so numerous and are represented only by a few teeth. Modified animal remains include various bone tools, such as an axe, harpoons and bone points, as well as red deer antler tines. Unmodified animal bones include various parts of wild boar, roe deer, dog, wild cat and seal. In the case of 13 burials, fish remains can be regarded as coming from the skeleton level or are directly association with the buried individual.

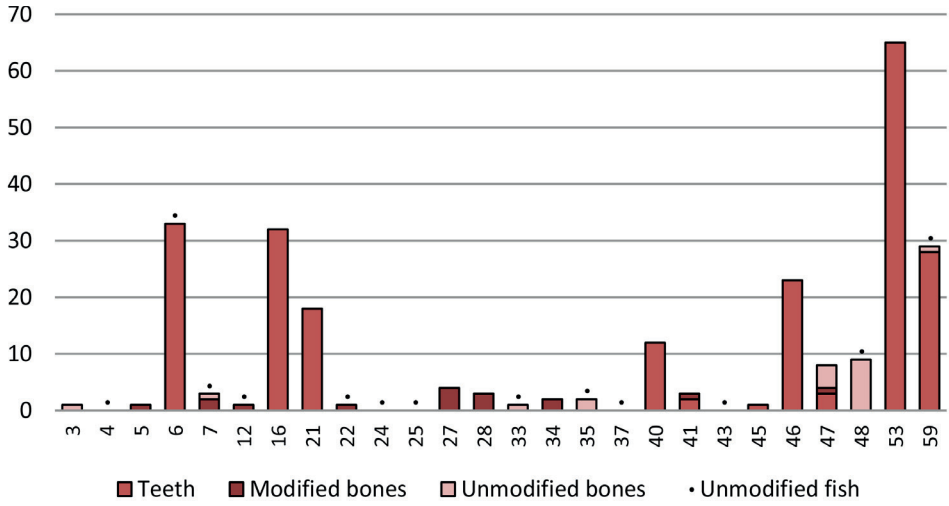


Figure 4.19. Animal remains from burials with secure contexts at Skateholm I (number of burials: 26, y-axis: number of items excluding unmodified fish bones).

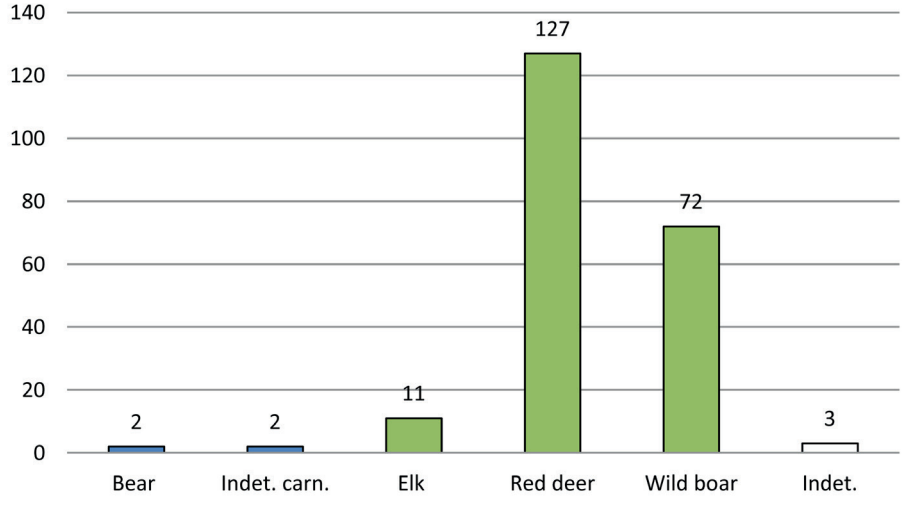


Figure 4.20. Animal teeth by species from burials with secure contexts at Skateholm I (number of teeth: 217, y-axis: number of items).

At Skateholm II, animal remains were identified in 13 human burials (Fig. 4.21) and with one buried dog. Animal teeth are the most numerous animal parts in burials, counting 438, and come from eight burials (Fig. 4.22). The vast majority are red deer incisors (389 items), while wild boar teeth number only 39, with a couple of teeth from other species (Appendix 2). Modified animal remains include various bone tools, perforated mandibles from marten and phalanges of roe deer. Unmodified bones include various body parts from wild boar, cervids as well as marten, porpoise, seals and other species. Complete crowns of red deer antlers, single antlers or tines, as well as artefacts made from antlers were identified in five burials, including one dog burial. Fish remains were documented in six burials, with a particular deposition of sticklebacks in Burial IX (Jonsson 1986).

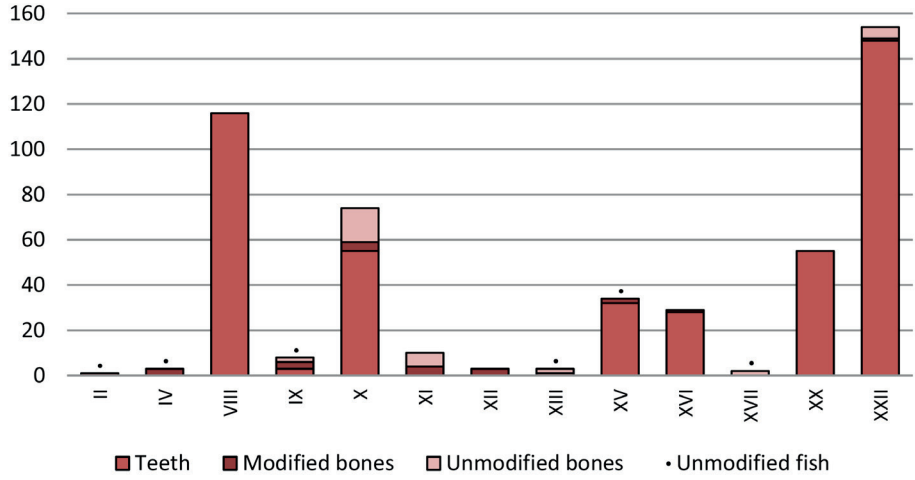


Figure 4.21. Animal remains from burials with secure contexts at Skateholm II (number of burials: 13, y-axis: number of items excluding unmodified fish bones).

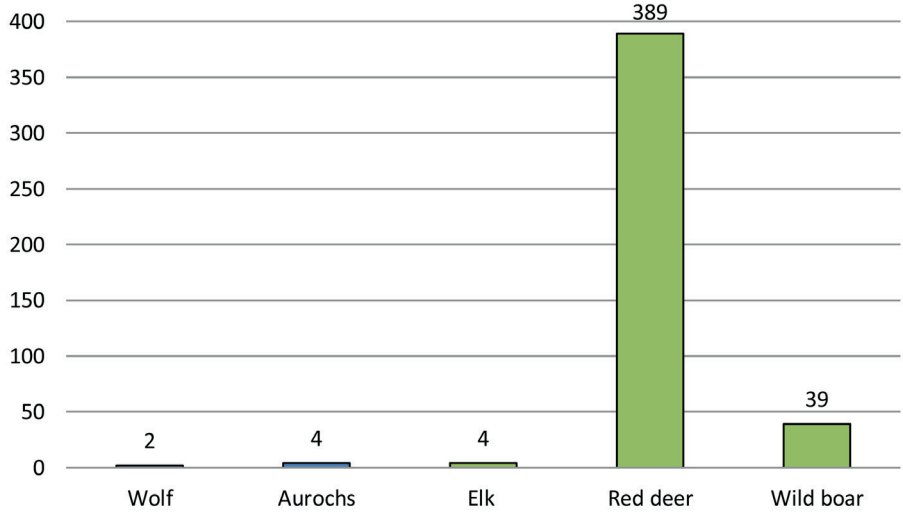


Figure 4.22. Animal teeth by species from burials with secure contexts at Skateholm II (number of teeth: 438, y-axis: number of items).

4.3. Sakhtysh (Russia)

The Sakhtysh peat bog in the Upper Volga area is one of the key micro-regions for studying hunter-gatherer archaeology of the boreal central European Russia. The investigations in this area have revealed stratified settlement sites with dwellings, spatially overlapping with "ritual activity areas" and substantial hunter-gatherer cemeteries (Fig. 4.23). Altogether, 149 burials have been excavated at five of the Sakhtysh sites (I–II, IIa, VII and VIII; Крайнов & Уткин 1991; Костылёва & Уткин 2010: 9–10). In this study, animal remains from 67 burials at Sakhtysh IIa and 23 human burials and three dog graves at Sakhtysh II are in focus. The settlement and cemetery complex is situated in Sakhtysh peat bog in the middle of the Volga–Oka interfluve. It was systematically investigated by a team from the USSR/Russian Academy of Sciences from the 1960s up to the 2000s under the leadership of Dmitriy Kraynov, Olga Gadzyatskaya, Elena Kostyleva, Aleksandr Utkin, Mikhail Zhilin and others. The hunter-gatherer burials date mainly from the 5th–4rd millennium cal BC and represent the Lyalovo (Pit-Comb) and Volosovo Culture phases (Middle and Late Neolithic according to the local Stone Age periodization, see also Fig. 1.2) (Костылёва & Уткин 2010; Piezonka et al. 2013; Macāne et al. 2019).

4.3.1. Location

The Sakhtysh peat bog formed in the area of an ancient palaeolake, which nowadays comprises an area of about 50 km². The sites of the Sakhtysh complex (Fig. 4.23) are located along a 3 km stretch of the ancient course of the Koyka River, which took its source from the Sakhtysh palaeolake (Жилин 2002a: 99; Костылёва & Уткин 2010: 9). The archaeological complex consists of five long-term settlements (Sakhtysh I, II, IIa, VII and VII), six seasonal sites (Sakhtysh III, IV, IX–XI and XIV) and some stray finds (Sakhtysh V–VI, XII–XIII; Костылёва et al. 2016; Костылёва & Уткин 2016).

Figure 4.23. Plan of the Sakhtysh complex showing the cemeteries analysed in this work (yellow) and other Sakhtysh sites (green). Redrawn after Костылёва & Уткин 2010: Fig. 2. by K. Nordqvist.

Figure 4.24. Sakhtysh II is situated on the left bank of the River Koyka, while Sakhtysh IIa is located directly facing Sakhtysh II, on the opposite bank of a small creek, in a waterlogged valley which during the Boreal period was a lake-like widening of the river with a very slow current. Photo: E. Kostyleva (Archive of the Archaeology Museum at Ivanovo State University).

Palynological reconstruction suggests that during the Stone Age the area nowadays occupied by the Sakhtysh peat bog was a lake, and its shores were covered with forest (Жилин 2002a). Lakeshores were the most preferred places for settlement location during the Boreal period, and in spite several transgressions the same sites were repeatedly inhabited. Occupation traces going back to the Boreal period have been excavated at Sakhtysh IIa, IX, XIII and XIV (Крайнов et al. 1990a; Жилин 2002a: 101). At ca. 6000 cal BC (transition between the Mesolithic and Neolithic according to the local periodization) the lake started to overgrow, also leading to the relocation of settlement. From now on, all the settlements were located on the banks of the former riverbed of the River Koyka, especially at places where other small rivers or creeks entered this river (Fig. 4.23 and 4.24).

4.3.2. Research history

Peat extraction in Sakhtysh peat bog began in 1881 and continued intensively until the 1980s, when it was abandoned along with the collapse of the Soviet Union (Аверин et al. 2009: 130). The first archaeological survey in Sakhtysh peat bog was conducted in 1930 by Vasiliy Smirnov, and two test pits resulted in the discovery of Sakhtysh I (Дубынин 1965). More systematic study of the complex began in 1962, undertaken by a team from the USSR Academy of Sciences under the direction of Dmitriy Kraynov (Fig. 4.25) (Крайнов 1971, 1973a, 1973b, 1974, 1975, 1976, 1977, 1981, 1984a, 1985; Крайнов & Уткин 1991), Elena Erofeeva (Ерофеева & Крайнов 1971, 1974) and Olga Gadzyatskaya (Гадзяцкая & Крайнов 1965; Гадзяцкая 1966, 1986). In later years, Evgeniya Molodtsova, Elena Kostyleva and Aleksandr Utkin (Костылёва & Крайнов 1987; Уткин 1992; Костылёва & Уткин 1996; Костылёва 1997) were also in charge of the excavations at various Sakhtysh sites. Between 1996 and 2006, research was continued by Mikhail Zhilin (Жилин 2002a) and during 2000s by Vadim Averin (Аверин et al. 2009; Аверин 2011), concentrating on the

earliest habitation phase at Sakhtysh. In 2021, a small excavation was carried out at Sakhtysh VIII by Elena Piskunova and Vyacheslav Baryshnikov, discovering one burial from the Volosovo phase (Kostyleva pers. comm.).

The largest-scale excavations have been carried out at Sakhtysh I, II, IIa, VIII and XIV (Костылёва 2018). Sakhtysh II was excavated between 1963 and 2001. Fourteen field campaigns have been undertaken at this site (1963–1964, 1966, 1978–1982, 1984–1987 and 2001). Sakhtysh II is the most extensively studied site of the complex, with an excavated area of 1490 m^2 (Костылёва & Уткин 2010: 11). Sakhtysh IIa was discovered in 1986 by Kraynov and Kostyleva, and the higher-lying dryland part of the monument was investigated between 1986 and 1994 (Костылёва & Крайнов 1987; Крайнов & Костылёва 1989, 1990, 1991, 1992; Крайнов et al. 1994a). In order to obtain more data for palynological reconstruction of the ancient landscape, in 1999 drilling was undertaken in the peaty part of Sakhtysh IIa, and a survey was carried out along the banks of the River Koyka, resulting in the discovery of two new sites (Sakhtysh XIII and XIV) (Жилин 2002a: 99). In 2004, small-scale excavation was initiated in the peaty part of the site as a consequence of peat bog fires in the area (in 2001 and 2002), which had endangered the site (Костылёва 2005). The last excavations at Sakhtysh IIa were carried out in 2015. Altogether, 824 m^2 have been opened at Sakhtysh IIa (Kostyleva pers. comm.). The burial grounds at Sakhtysh II and IIa are considered completely excavated (Костылёва & Уткин 2010: 11).

Figure 4.25. Excavation at Sakhtysh II in 1987 under the direction of Dmitriy Kraynov (sitting on the right in the white hat). Photo: E. Kostyleva (Archive of the Archaeology Museum at Ivanovo State University).

Figure 4.26. The Ministry of Culture informs that the archaeological monument from the Neolithic at Sakhtysh is protected by the state. Photo: unknown (Archive of the Archaeology Museum at Ivanovo State University).

4.3.3. Previous research on the Sakhtysh sites

There is a rich publication record on the Sakhtysh complex, mostly in Russian, with a few works in English (Fig. 4.26). The first results and overviews of the sites were presented already in the 1970s–1990s by the principal investigators (Крайнов 1973a, 1973b, 1974, 1984b, 1987a, 1988, 1992; Крайнов et al. 1990a, 1994a, Уткин 1992). In the following decades, the Sakhtysh material has been analysed from various aspects. Along with archaeological excavation, palynological, geomorphological and anthropological investigations have also been carried out at the Sakhtysh complex (Костылёва & Уткин 2010: 10). Numerous studies have been devoted to particular topics or artefact types, such as art objects and ornaments (Utkin 1989; Уткин & Костылёва 1996a, 1998, 2000a, 2000b; Костылёва & Уткин 2007, 2008a), bone tools (Жилин 2001, 2002b) and Russian Karelian type metatuff tools (Тарасов & Костылёва 2015). The chronology of the Sakhtysh sites has been the subject of several studies (Крайнов et al. 1991; Костылёва & Уткин 2009; Выборнов & Костылёва 2009) as have the environmental setting (Жилин 2002a, Жилин et al. 2014) and finds from settlement sites (Аверин et al. 2009; Уткин & Костылёва 2018; Уткин et al. 2018).

The burial finds have been widely discussed in several publications (see Уткин & Костылёва 1991, 1996b, 2000c, 2001; Костылёва & Уткин 2000, 2008b, 2008c, 2010). Anthropological material from the Sakhtysh cemeteries was studied, sometimes also at the site, by Galina Lebedinskaya, Tatyana Alekseeva, Maria Kozlovskaya, Valeria Fedosova and Maria Dobrovolskaya, including various analyses on human remains (see Алексеева et al. 1997; Энговатова et al. 2015). Recently, new studies have been

undertaken on human remains from the Sakhtysh sites, including new biomolecular and palaeogenetic analysis (Piezonka et al. 2019; Khramtsova et al. 2019).

During the last decade the finds from Sakhtysh have been the subject for several international collaboration projects, mainly focusing on early pottery and burials (Hartz et al. 2012; Piezonka et al. 2013, 2016; Костылёва et al. 2015, 2018; Dolbunova et al. 2017). Several new publications in Russian and English have also appeared in the frame of this study, presenting new radiocarbon dates (Костылёва & Мацане 2018a, 2018b; Macāne et al. 2019) and discussing certain aspects of the animal remains and non-local materials in the Sakhtysh burials (Костылёва et al. 2018; Костылёва & Мацане 2019; Macāne et al. in press).

4.3.4. Chronology

The Sakhtysh area has evidence of human habitation from the Early Mesolithic to the Iron Age. The first inhabitants in the Sakhtysh area settled here during the Preboreal. The finds suggest short-term, seasonal habitation, representing the Butovo Culture, with rich stone, bone and antler artefact assemblages (Жилин 2002a: 101). The first habitation phase is also documented at Sakhtysh IIa, but no human burials have been identified from this period (Жилин 2002a: 101).

The earliest pottery from the Sakhtysh complex (around 6000 cal BC) belongs to the Upper Volga Culture (Dolbunova et al. 2017), and marks the transition to the Neolithic in this region. It is recorded at the majority of the Sakhtysh sites. The increasing role of fishing during this time is indicated by various kinds of fishing gear found at the settlements (see Жилин 2001, 2002a). The next phase is marked by the Lyalovo (or Pit-Comb) Culture, which flourished in the area in the 5th and early 4th millennium cal BC (Зарецкая & Костылёва 2011); the later parts of it are linked with the Comb Ware distributed in the Eastern Baltic and western Russia (Крайнов & Гурина 1996). Occupation layers from this period have been investigated nearly at all sites at Sakhtysh and Lyalovo burials have been excavated at Sakhtysh II, IIa and VIII (Костылёва & Уткин 2010).

The habitation traces of the subsequent Volosovo Culture, starting in the first part of the 4th millennium cal BC, are also known at most Sakhtysh sites (Жилин 2002a: 103). The Volosovo Culture phase comprises the main occupation periods at both Sakhtysh II and IIa, in addition to which Volosovo burials have been investigated at Sakhtysh I, VII and VIII (Костылёва & Уткин 2010). Indications of later human activities (the Bronze and Early Iron Ages) have been documented at many sites, including Sakhtysh II, IIa (Жилин 2002a: 103; Костылёва & Уткин 2010: 10).

The chronology of the Sakhtysh sites and burials has been established by artefact typology, the spatial distribution of burials as well as conventional datings of charcoal and human bone, often with poor contextual data (Зарецкая & Костылёва 2008; Костылёва & Уткин 2009; Выборнов & Костылёва 2009; Костылёва & Уткин 2010). In order to clarify the chronology of these sites, radiocarbon dating of animal remains from burials was undertaken during this study. Eighteen samples, consisting of 13 samples of bone and tooth and five samples of charred organic residue, were analysed

at the ^{14}Chrono Centre, Queen's University, Belfast (for a more detailed description of the dated samples and their contexts, see Appendix 3 and Macāne et al. 2019).

Relatively few burials can be associated with the 5th millennium cal BC and the Lyalovo Culture and the majority belong to the Volosovo phase. Even if this is broadly in line with typological observations, the new AMS datings question the previously established internal chronologies and some typological sequences (see Костылёва & Зарецкая 2000; Костылёва & Уткин 2010). Most importantly, the Volosovo use periods of both burial grounds (II and IIa) are shortened markedly. The AMS dates suggest that both cemeteries were only used for a few centuries around the mid 4th millennium cal BC (Macāne et al. 2019). There is little evidence of Volosovo burials during the 3rd millennium cal BC, even considering that freshwater reservoir effect can be up to 500 years (see Piezonka et al. 2013, 2016; Macāne et al. 2019 for a discussion of FRE). Nevertheless, the amount of dates is small and observations must be confirmed with additional data in the future.

4.3.5. Burials at Sakhtysh II cemetery

At Sakhtysh II (Fig. 4.27), 23 burials with 46 individuals were excavated. Four single burials belonged to the Lyalovo phase (Крайнов et al. 1990b). Out of 19 Volosovo burials, 16 were single burials and three multiple graves. In addition to human graves, three dog burials were discovered at the site (Костылёва & Уткин 2010: 22). The cemetery also included areas interpreted as places of ritual activities, consisting of fourteen ritual deposits, a "sanctuary" and two "ritual platforms". The settlement also included pit houses (Крайнов 1982. 1987b: 15).

The burials at Sakhtysh II did not show any pattern of organization but were randomly distributed over the whole site. In general, bone was poorly preserved. All of the Lyalovo burials were in

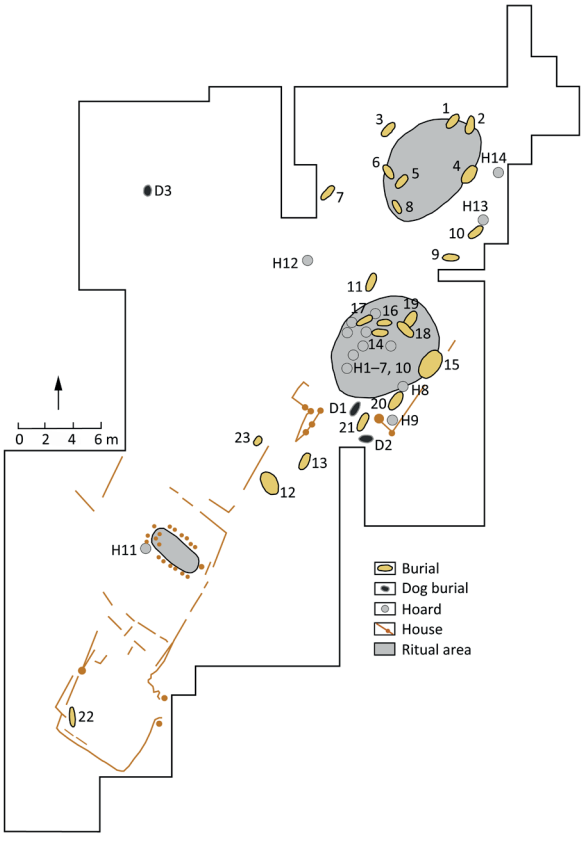


Figure 4.27. General map of the Sakhtysh II settlement site and cemetery. Redrawn after Костылёва & Уткин 2010: Fig. 2 by K. Nordqvist.

Figure 4.28. Dmitriy Kraynov documenting the excavation of multiple Burial 4 at Sakhtysh II in 1963, while Olga Gadzyatskaya (to the right) is working on the recovery of human remains. Photo: unknown (Archive of the Archaeology Museum at Ivanovo State University).

supine position. The deceased had been placed in rectangular pits with rounded ends having no specific orientation. The size of pits varied between 1.0 to 2.05 m in length and 0.65 to 0.9 m in width. The graves were 0.55–0.60 m deep, as measured from the present-day surface. Most of the Volosovo burials were in supine position, while some were crouched or on side, and five individuals were buried in prone position. The graves were oriented mainly towards the NE, NW and SW. Oval grave pits were documented only for three individuals.

Several burials had been manipulated and lacked skulls, or else body parts had been cut off (Fig. 4.28) (Костылёва & Уткин 2010: 16–17). In one case, the grave contained only the skull, which has been considered a primary deposition based on the anatomical position of the mandibula (Крайнов 1982: 81). Two hearths, which were made directly above the grave pit after refilling, have also been documented for one burial (Костылёва & Уткин 2010: 16–17). Red ochre was documented only in two Lyalovo and two Volosovo burials at Sakhtysh II (Костылёва & Уткин 2010: 15).

The grave inventory was documented in 10 burials and mainly consisted of animal remains Appendix 1. Tubular bone beads comprise the largest part of the grave inventory, while tooth pendants and bone tools were also identified. Amber ornaments were found with seven individuals in two multiple burials. Stone items were excavated from eight burials, consisting of flint tools and pendants made from slate and serpentine. In two burials, pottery fragments were identified by the head, but these may originate from the cultural layer. Small fragments of some kind of copper artefact were found in one burial (Костылёва & Уткин 2010: 18).

4.3.6. Burials at Sakhtysh IIa cemetery

The multi-layer settlement site Sakhtysh IIa (Fig. 4.29), with post-holes, pits and hearths, is accompanied by a cemetery of 67 graves with 75 individuals (see Appendix 1) and two "sanctuaries" (Крайнов et al. 1993; Крайнов et al. 1994a). Fifteen burials have been attributed to the Lyalovo phase and 52 to the Volosovo phase. In

a recent publication, however, the number of buried Volosovo individuals is given as 59 (Костылёва 2018: 294).

Grave pits were visible in the case of nine burials of the Lyalovo phase, mainly oriented NW–SE. The burials were generally placed in supine position (Fig. 4.30), with a few exceptions, namely with legs flexed or prone. The 58 skeletons from the Volosovo phase were placed mainly in a SW–NE direction. The grave pits were shallow and not always traceable. In all cases where the body position could be established, the Volosovo burials are in supine position. In a few cases the burials were disturbed, and it was not possible to establish the body position.

Many of the Volosovo burials exhibit manipulation of the body: skulls are sometimes missing, or some bones have cut marks, suggesting that complex ritual activities took place at the so-called "sanctuaries" or ritual areas. Both "sanctuaries" were above-ground constructions with poles and an underground pit, in many cases containing remains of animal bones and some special items, such as a mask made from an elk antler (Fig. 11.11) (Крайнов et al. 1994b; Уткин & Костылёва 2001; Костылёва & Уткин 2010: 37, 41, 48–49; 2011; Piezonka et al. 2013). Hearths are often directly associated with the burial, located above the body or at the bottom of the grave pit (Уткин & Костылёва 2002: 342). Ochre was documented only in four Lyalovo burials. Some burials were bound or wrapped in birch bark or animal skins. The organization of the Volosovo cemetery suggests that grave markers of some kind were probably used, since few of the burials have been destroyed (Костылёва & Уткин 2010).

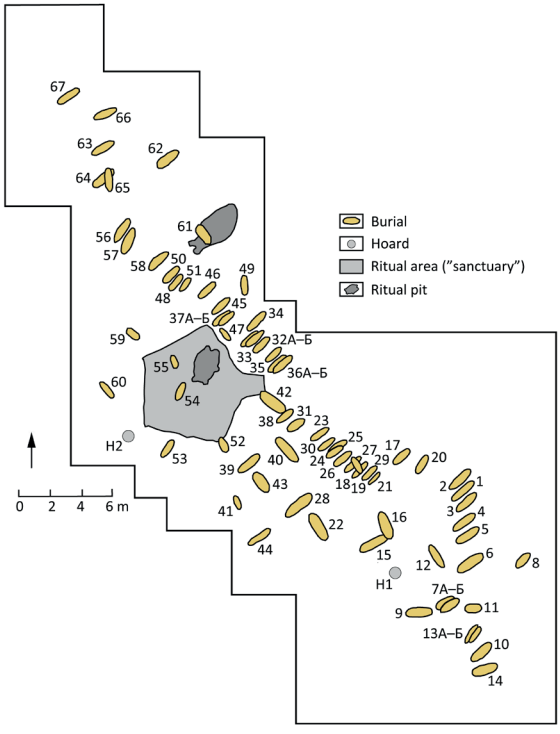


Figure 4.29. General map of the Sakhtysh IIa cemetery. Redrawn after Костылёва & Уткин 2010: Fig. 44 by K. Nordqvist.

Grave inventory is associated with 42 burials. A grave inventory from the Lyalovo phase was documented only in three cases, including artefacts made of bone and pendants from animal teeth (Костылёва & Уткин 2010). Stone and flint artefacts, along with ornaments made from bone and teeth, are common in the Volosovo burials. Animal remains can be securely associated with 25 burials, the majority of which are animal teeth. Amber ornaments were found in 13 Volosovo burials and form the largest part of the grave inventory (383 items). A clay figurine was documented in one burial.

Figure 4.30. Aleksandr Utkin (left) and Yuri Zhuravlev (right) working on Burial 40 at Sakhtysh IIa in 1990. Photo: E. Kostyleva (Archive of the Archaeology Museum at Ivanovo State University).

4.3.7. Animal remains from Sakhtysh

Animal remains from the Sakhtysh complex have not been subject to consistent investigation. Faunal materials from settlement contexts have been studied by Benyamin Tsalkin, Evgeniy Tsepkin, Valentina Danlichenko, Nina Ermolova and Irina Kirillova (Костылёва & Уткин 2010: 10), but no comprehensive record of these investigations exists. Neither are there any publications or actual bones remaining for further study. On some occasions, when a zoologist had time to visit the excavation, animal remains were studied on site and thereafter were reburied in the old excavation trenches (Kostyleva pers. comm.). Only occasional information about the taxonomic identification of animal remains can be found in some excavation reports. A brief table with species determinations from various depths exists for Sakhtysh I and II (excavations in 1963 and 1964), compiled by Tsalkin. However, in view of the poor contextual information and lack of other data, these data are of limited use, providing only tentative information about the range of animal species present at the sites.

Detailed osteological examination of animal tooth pendants and other animal remains from burials at the Sakhtysh II and IIa cemeteries was undertaken for the first time in the course of this study (Fig. 4.31–4.34). Previously, identification of animal species had been carried out tentatively, including rough estimations of species

registered in the excavation reports by the excavation directors and published without osteological analysis (Костылёва & Уткин 2010; Костылёва 2018). Sakhtysh II and IIa were chosen for this study, since they had the largest numbers of preserved animal-derived materials from burials, taking into account that most of the unmodified animal remains from burials have been discarded after excavation. All animal tooth pendants and other animal-derived materials were investigated, focussing on taxonomic identification, the number of identified individuals and other properties. However, material from some burials was missing and was discovered later, identification being performed from photos sent by Elena Kostyleva.

At Sakhtysh II, animal remains were identified in 14 burials (Fig. 4.31). In nine burials animal remains came from secure contexts, while tooth pendants were identified in five burials. Tubular bone beads comprise the largest section of animal remains, including 450 fragments. Animal teeth number 70 (Fig. 4.32), badger being the most common species, followed by bear and other carnivore species. Artefacts made from animal bones include pendants, tools and a bone figurine. Unmodified animal remains – bear mandibles – have been mentioned in the excavation documentation but have not been preserved.

Animal remains were identified in 25 burials at Sakhtysh IIa (Fig. 4.33). Animal teeth are the most commonly found animal part in burials, comprising 112 specimens (Fig. 4.34). Marmot teeth without visible modification traces are the most numerous, while pendants have been made mainly from bear, badger and elk teeth. Modified bones mainly encompass pendants made from animal bones and bone tools. Beaver mandibles represent unmodified bones.

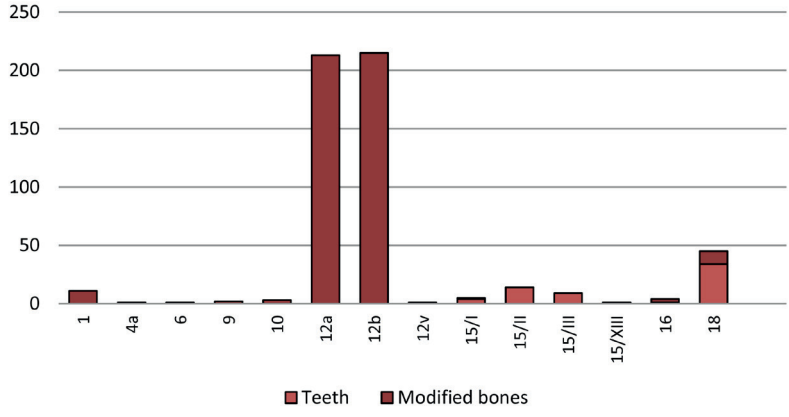


Figure 4.31. Animal remains from Volosovo burials with secure contexts at Sakhtysh II (number of burials: 14, y-axis: number of items).

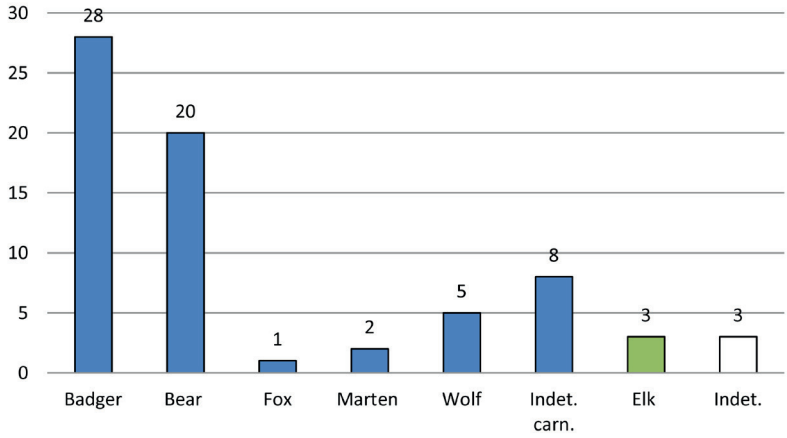


Figure 4.32. Animal teeth by species in Volosovo burials with secure contexts at Sakhtysh II (number of teeth: 70, y-axis: number of items).

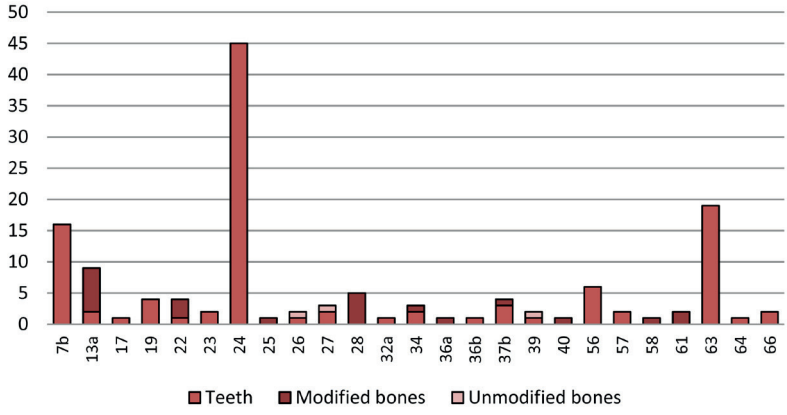


Figure 4.33. Animal remains from burials with secure contexts at Sakhtysh IIa (number of burials: 25, y-axis: number of items).

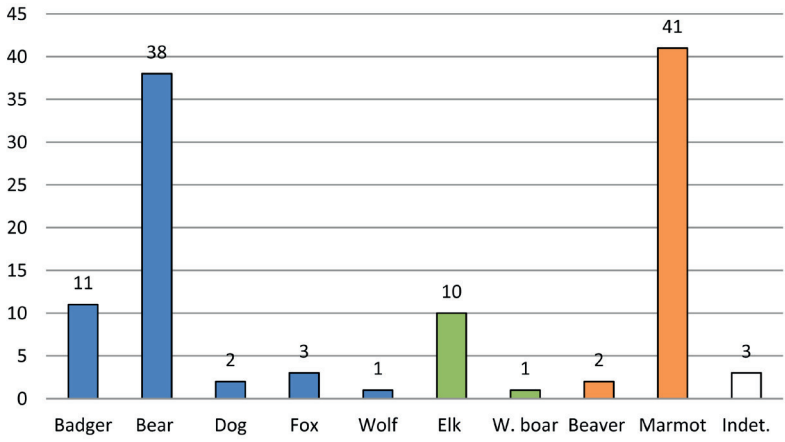


Figure 4.34. Animal teeth in burials with secure contexts at Sakhtysh IIa (number of teeth: 112, y-axis: number of items).

PART 2

Chapter 5.
Carnivores

Members of the Carnivore family comprise the largest number of animal species identified in the burials. This group includes one of the most important animals in northern cosmology, namely the bear, as well as the only domesticated animal that the Holocene hunter-gatherers had – the dog (Vang Petersen 2013; Mannermaa et al. 2014; Bergström et al. 2020). Most carnivores have very good pelts, which made them among the most desired quarries, while their behaviour made them the most dangerous predators inhabiting the Stone Age environment.

The word *carnivore* derives from the Latin and literally means "meat eater". Even though carnivores feed on other animals, they may also include plants, berries and nuts in their diet (e.g. Berkovitz & Shellis 2018). In the following, the carnivore species encountered in the studied assemblages are presented in more detail. The Canidae family includes dog *(Canis familiaris)*, wolf *(Canis lupus)* and fox *(Vulpes vulpes)*. The brown bear *(Ursus arctos)* belongs to the Ursidae family. The Mustelidae family includes badger *(Meles meles),* European pine marten *(Martes martes)* and otter *(Lutra lutra).* Earless seals belong to the Phocidae family. Wildcat *(Felis silvestris)* represents the only catlike animal from the Felidae family. This chapter also include the harbour porpoise *(Phocoena phocoena)*, from the Phocoenidae family, as well as the European hedgehog *(Erinaceus europaeus)*, from the Erinaceidae family. These two animals are not according to taxonomy carnivores, but they both have mainly a carnivorous diet.

5.1. Dog

The wolf *(Canis lupus)* is the only ancestor of the domestic dog *(Canis familiaris)*. Even though the geographical location for the separation between the species is still not clear, genetic diversification of dogs is known to have begun during the Late Pleistocene, around 20,000 years ago. In the archaeological record, clear signs of dog domestication occur about 15,000 years ago (Larson et al. 2012). Five different genetic clines of dogs have been distinguished already in prehistoric times, also showing differences in the diet of dogs between hunter-gatherer and farming communities (Bergström et al. 2020). Today various breeds of dogs (more than 350) can be found in all ecosystems of the world (FCI 2021).

5.1.1. Biological characteristics and other properties

Figure 5.1. A dog I met in streets of Vilnius during my first EAA conference in 2016 similar to Stone Age dogs in size and morphology. Photo: A. Macāne.

Appearance and morphology

The body proportions of Stone Age dogs were more or less wolf-like (Fig. 5.1), but shoulder height has decreased with time from 70 cm to around 44–58 cm (Benecke 1993; Zhilin 2014; Ukkonen & Mannermaa 2017). In terms of size and appearance, the Stone Age dogs in western Russia have been compared to the Russian-European laika (Ошибкина 1997, 2000). Dogs in Central Europe and southern Scandinavia show a wider size range (see Aaris-Sørensen 1988; Benecke 1994; Mannermaa et al. 2014).

Habitats and diet

Dogs can easily adapt to any circumstances and environments, and accompany humans in various ecosystems. Dogs are carnivores, but their diet is variable. Co-habitation with humans has influenced the diet of dogs, for example, suggesting adaptation to starch rich food as shown by the genetic data (Bergström et al. 2020) They may consume the same or similar food as humans, such as fish, shellfish and sea mammals, as shown by stable isotope studies from Zvejnieki and other sites in the Baltic region (Eriksson 2003, 2006; Eriksson et al. 2003; see also Piličiauskas et al. 2019: 91; Bergström et al. 2020).

Social relations and reproduction

Dogs reach sexual maturity at the age of 6–12 months, for both males and females, but this may vary greatly between and even within breeds. Average litter size is 5–6 puppies, but this also depends on the breed (Borge et al. 2011). The natural behaviour of wolves and their complex social structure make dogs suited for a life close to humans (Feddersen-Petersen 2007). As social animals, canids communicate with one another in a variety of ways, for example, exposure of the teeth can be used to communicate a threat or a greeting (Berkovitz & Shellis 2018: 278). Human–dog relations can involve various roles, such as hunting companions and guards, but also raw material and food (Bartosiewicz 1990; Storå 2002; Pionnier-Capitan et al. 2011; Mannermaa et al. 2014). In addition, dogs can be objects of emotional attachment and even bed warmers (Manwell & Baker 1984; Russell 2012; Vang Petersen 2013), and the relationship between humans and dogs, similarly as with cats, has been in-

terpreted as one of mutual benefit and even of joy (Lindström 2001: 174; Haraway 2008; Russell 2012).

5.1.2. Dog remains in hunter-gatherer contexts in north-eastern Europe

Dog remains are commonly found at hunter-gatherer sites in north-eastern Europe, even though not in large quantities (Жилин 2004; Lõugas 2006; Girininkas & Daugnora 2013: 589, Table 3; Mannermaa et al. 2014: 31). Based on material combined from several Latvian Stone Age sites, dog remains are most common during periods defined locally as Middle Mesolithic and Middle Neolithic (Zagorska 1992). At sites of the Volga–Oka area, dog remains are present starting from the Boreal period and throughout the entire Stone Age (Zhilin 2014). An increase in dog tooth pendants occurs during the Neolithic period (variably the 6th–3rd millennium cal BC) in the Baltic Sea region and western Russia, as demonstrated by finds from settlement and burial contexts (Ошибкина 1997; Жилин 2001: 140–141; Lõugas 2006; Macāne 2017; Jonuks & Rannamäe 2018).

In addition to unburnt and burnt dog bones from the habitation layers, dogs have also been buried in individual graves or together with humans. Dog burials (for a discussion of the problematic issues and complexity of this term see Perri 2017) are a widespread phenomenon around the world (e.g. Диков 1979; Morey 2006, 2010; Losey et al. 2013; Perri 2013; Vang Petersen 2013; Živaljević 2015; Lazăr et al. 2016). In Northern Europe such examples are few (Larsson 1988a, 1990; Perri 2013). One of the earliest dog burials in Sweden has been discovered at the Almeö site by Lake Hornborgasjö in western Sweden, dated to the late Preboreal (Arnesson-Westerdahl 1995), while another dog burial has been documented at the Ytterberg site by the same lake, dating from the Boreal–early Atlantic transition (Arnesson-Westerdahl 1984). A dog burial within a hunter-gatherer settlement was recently found at Ljungaviken (ca. 8700–8200 cal BC) in south-eastern Sweden (Henriksson et al. 2021). A possible dog burial was documented at the Gøngehusvej 7 site in Denmark (Brinch Petersen 2015: 82). Two complete dog skeletons in anatomical order have been reported near a burial of a child in the Popovo cemetery, north-west Russia, dated to about 9000–6000 cal BC (Oshibkina 2008: 58). Several dog burials have also been discovered at Volosovo period sites, such as Volodary (Цветкова 1990) and Chornaya Gora (Костылёва & Уткин 2010: 227, 239, Fig. 115) in central European Russia.

The presence of prehistoric dogs is also attested in other ways. In fact, the earliest indication of dogs in Sweden are gnawing marks on reindeer bones from Late Palaeolithic site Hässleberga in Scania (Magnell et al. 1999). Another rare example comes from the Henriksholm-Bøgebakken, in north-eastern Zealand, where a human radius with canid gnawing marks is documented (Brinch Petersen 2015: 108).

Traces of human modification are rarely observed on dog bones. In north-western Russia, traces of butchering and burning on dog bones were recorded at Veretye and other sites of the Butovo Culture, suggesting that dogs were eaten (Ошибкина 1997: 121) or used for pelts (Жилин 2001: 140–141). Cut marks on dog skulls and bones at the Ertebølle Culture sites of Agernæs in Denmark and Bökeberg in Scania

(Karsten 2001; Richter & Noe-Nygaard 2003) similarly indicate that dog skins were valued material. Dog bones with cut marks from butchering at the sites Præstelyngen in Denmark and Strandvägen in Sweden suggest consumption of the dog meat (Noe-Nygaard 1995; Gummesson et al. 2019a). Dog bones have rarely been used for making artefacts. One such example from central European Russia represents an artefact interpreted as a needle case made from a long bone (Жилин 2001: 106). The importance of the dog for prehistoric people is also indicated by hunting scenes with dogs depicted on Stone and Bronze Age rock art panels in Scandinavia and north-western Russia (Савватеев 1970; Lindström 2001; Lahelma 2008; Gjerde 2010; Лобанова 2015; Fuglestvedt 2018).

5.1.3. Dog at Zvejnieki

Dog remains at the Zvejnieki cemetery consist only of teeth, which have been documented from 16 hunter-gatherer burials. However, only in 14 graves can dog teeth be securely related to the deceased (Fig. 5.2, Table 5.1). In Burial 132 dog teeth originated from the grave fill, while Burial 167 was heavily disturbed, and all human remains and animal tooth pendants were mixed. Dog teeth comprise 171 specimens (out of 190 in total). The majority are canines, while incisors and molars have also been used for making pendants (Fig. 5.3: 1). Nearly all of the dog teeth (168) are perforated, and only three teeth had no modification traces. Carving of the root end has commonly been applied to dog teeth.

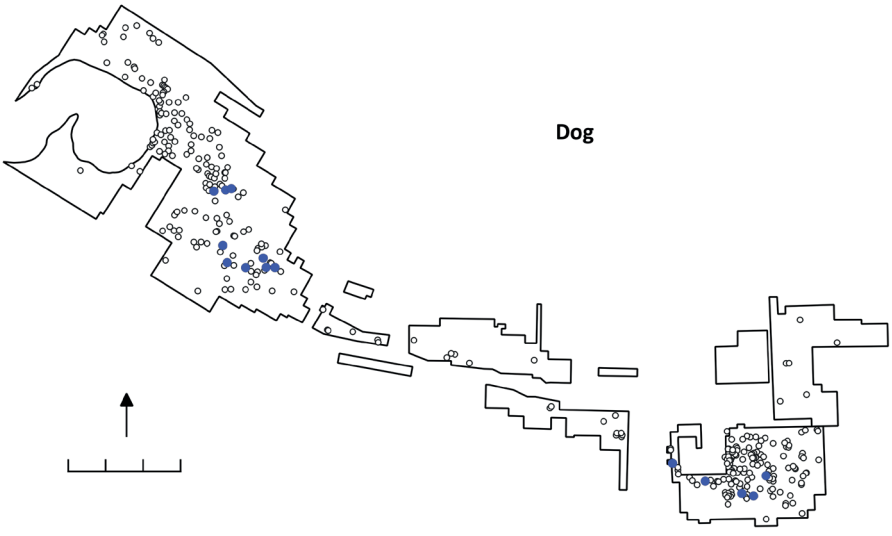


Figure 5.2. Burials with dog teeth at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

Most of the dog teeth have been found in richly furnished graves, accompanied by pendants from many other animal species (see Appendix 2, and Fig. 5.3, 5.11, 5.32). In many cases they were arranged in combination with other carnivore teeth; however, they occur also together with ungulate teeth (Fig. 5.38). Burial 233 is the

only example where pendants have been made exclusively from dog teeth, found along with a slate adze in the partly disturbed grave of a woman. In the case of partly disturbed Burial 205, all dog incisors, most likely originating from the same animal, were arranged in a fan-shaped decoration together with marten canines by the feet of an adult individual.

The largest number of dog teeth were found with child in Burial 226 (Fig. 5.3), where 69 teeth from at least 12 individuals were identified. The majority are canines (39), followed by molars and premolars (19) and incisors (11), which were arranged in a chain-like decoration over the child's chest. All of the dog teeth show a similar pattern of modification: carved perforations were made in the root ends, including both roots of molars. In Burial 205 similar manufacturing traces were observed on all tooth pendants.

Most dog teeth come from single burials of adult individuals, occurring slightly more commonly in men's graves (6) than in women's graves (4). In three cases, children (Burial 226) or juveniles (Burials 153 and 290) were buried with dog teeth, and dog teeth were also found in the double burial of an adult male and a child (Burial 122/123). In five cases dog teeth have been found around the head, where they occurred in combination with teeth from other species. Some have been found in the middle part of the body, on the chest and by the arms and elbows. Another area where dog teeth were found is the lower legs and feet.

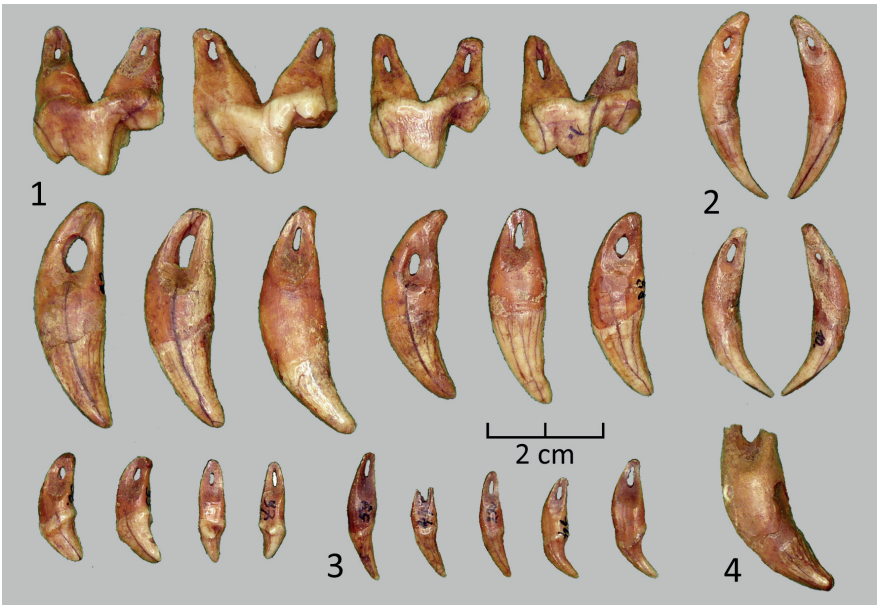


Figure 5.3. Burial 226 of a child at Zvejnieki included dog tooth (1) pendants from molars, canines and incisors, as well as canines from fox (2), marten (3) and seal (4). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Table 5.1. Dog teeth at Zvejnieki. (Table includes: grave number; sex and age of the buried individual: M – man, F – woman, indet. – sex undetermined; age: A – adult, C – child (also including juveniles up to 18 years); NISP I: number of identified specimens of incisors, NISP C: canines, NISP PM/M: premolars or molars; MNI: minimum number of individuals; location: where the tooth pendants were found in relation to the body; modification: traces of working observed on teeth or other animal remains, including types of perforations: carving, drilling, notches, grinding; comments: includes additional information on tooth or burial context).

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
114	M	A		1		1	head	carving	large individual, hole broken
121	F	A		5		3	left hand, chest, between femur	carving	holes very tiny and in the middle of root
122/ 123	M+ indet.	A + C		9		4	outside left femur	carving	location unknown for some dog teeth
136	F	A		1		1	by the feet?	carving	exact location unclear
146	F	A	6	9	2	3	head	carving	molar perforated in one root; some incisors and canines may be from same animal
153	M	C	13	17		6	head, left shoulder, left femur	carving, grinding	some canines from same animal
158	M	A	1			1	under the right humerus	carving	
164	M	A	1			1	by right elbow	?	
165	M	A	1	14		5	neck	carving	most teeth with little or no tooth wear
205	indet.	A	4			1	feet	carving	all incisors from same? animal; arranged in fan-shaped decoration

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
226	indet.	C	11	39	19	12	chest, pelvis, above the knees	carving, grinding	all teeth made in similar manner; little tooth wear and open root apex on some teeth
233	F	A	1		8		pelvis, by hands, and beside legs	carving	
290	indet.	C	1	1	3	1	across knees	carving	open root apex, broken
300	M	A	3	1		2	head	carving	little tooth wear

The few dated burials (121, 122 and 226) with dog tooth pendants fall in the range from the 6th to the 4th millennium cal BC. Stable isotope studies were carried out on 23 dog tooth pendants from 15 burials. Generally, all dog teeth from the same burial showed a similar dietary pattern, but it could differ from that of the buried human (Eriksson 2006: 196–197). The dietary studies on some dogs show that they spent some time at the coast (Eriksson et al. 2003: 19). The teeth of these dogs were also used for making tooth pendants, and are in many cases combined with seal teeth, for example in Burials 158, 165 and 226 (see Fig. 5.3: 1, 4). Gunilla Eriksson (2003, 2006) has suggested that seal and marine dog tooth pendants could have been exchanged with coastal communities, since at settlement sites seal remains comprised individual fragments (Lõugas 2006). Dog bones were identified from settlement layers at Zvejnieki II (Mesolithic), where they were third most common after elk and beaver (Lõugas 2006: 77, Fig. 1).

5.1.4. Dog at Skateholm

At Skateholm I, eight dogs are considered to represent individual dog burials, and two have been buried together with humans (Fig. 5.4, Table 5.2). The preservation of dogs varied from very good and fairly complete skeletons to a few that were partly disturbed or badly preserved. A few items were found with dog burials, such as flint flakes and a concentration of fish bones in the stomach region. Some of the dogs were covered with red ochre (Jonsson 1988; Larsson 1988a).

One complete and one partly disturbed dog were excavated in two human burials. A complete dog was found on the pit floor in Burial 62 together with a poorly preserved human skeleton. Several body parts (a complete radius, a pelvis fragment and other bone fragments) of dog were documented in Burial 46. Although the burial was disturbed, possibly a young dog was buried together with an adult and a child

(Larsson n.d.). A left metacarpal of this dog was dated to the mid 6th millennium cal BC (see Chapters 3.3.2 and 4.2.4 for datings).

A deposit near the knees of Burial 48 was recorded as containing a large number of animal bones and flint artefacts. Among these were also two rib fragments of a dog without any traces of modification. Unmodified dog bones have been documented at both the Skateholm I and II settlement sites. Whether or not these finds originate from disturbed dog burials or represent some other kind of activity is not clear (Jonsson 1988: 67), but scattered dog bones occur regularly on hunter-gatherer settlements in South Scandinavia. A roe deer calcaneus with dog gnawing marks was identified with Burial 46 (Jonsson n.d.). Burials of six individual dogs are located side by side in the southern part of the cemetery, while two others are situated in the eastern part and are on the periphery of most human burials. Burials, including humans and dogs, are located further away from individual dog burials (Fig. 5.4).

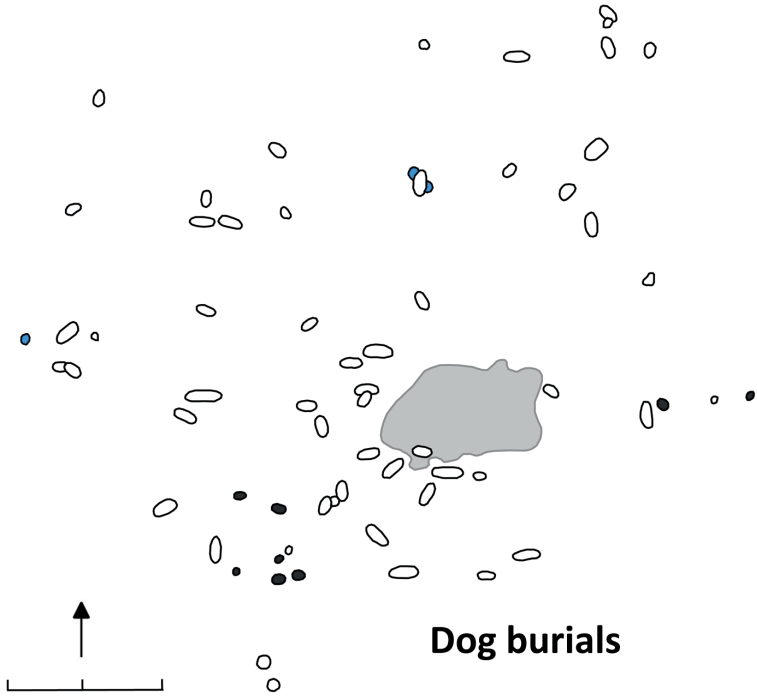


Figure 5.4. Dogs at Skateholm I. Individual dog burials marked in black, dogs buried with humans marked in blue. Scale bar is 10 m. Map: K. Nordqvist.

Table 5.2. Dogs at Skateholm I (grave numbers marked with Arabic numbers) and II (grave numbers marked with Roman numbers). For legend see Table 5.1.

Grave no.	Burial type	Comments
9	individual dog	fully grown dog; cranium and forelegs well preserved; pelvis and hind legs poorly preserved; red ochre behind neck, spine and hips; flint flake by rib cage
10	individual dog	adult dog bones scattered in W part of pit, destroyed by ploughing; red ochre in W part of pit; flint artefacts in fill
15	individual dog	fully grown dog; poor preservation; tibia missing; on right side
17	individual dog	fully grown dog cranium; scapula and vertebrae destroyed
18	individual dog	fully grown dog; severely disturbed dog burial; vertebrae, ribs in situ, cranium further away
19	individual dog	disturbed; pit contained bones of dog
23	individual dog	fully grown dog; well preserved dog burial; ochre by spine and scapula
46	indet. + C + dog?	disturbed; vertebrae, coxae, radius, metacarpal in disturbed part of grave; possibly a young dog or part of a dog has been placed with the burial
48	deposit	dog ribs in the deposit with other bones from other species; near the knees of the buried person
62	indet. + dog	poorly preserved human bones; destroyed by digging secondary pit; skull and knees missing; dog placed in 0.2 x 0.1 m area on pit floor below left femur
65	individual dog	pit distinctive, with red colouring; contained fragmentary remains of cranium, rib and extremities of a puppy
VIII	F + dog	dog by feet of a female; partially infilled before dog placed in grave; dog not in complete anatomical order
X	M + M + dog	dog in grave fill
XV	M + dog	dog bones discovered 50 cm from the skeleton, at the level of the left femur, near wall of the grave pit
XIX	indet. + dog	heavily disturbed burial
XXI	individual dog	dog burial with decorated red deer antler tool (hammer?) placed parallel to front legs; red deer antler beam behind the back; 2 flint knives

Five dogs have been excavated at Skateholm II (Fig. 5.5, Table 5.2). Four of them were found together with humans (three next to each other in the northern part of the cemetery), and only one dog had an individual grave (Fig. 5.6). This burial (XXI) is also one of the richest in the whole cemetery in terms of the grave inventory (Larsson 1990). The dog was accompanied by a decorated red deer antler tool (hammer?), a red deer antler beam and two flint knives. The other four buried dogs were found together with human burials. The humans in all of these graves had a rich grave inventory consisting mainly of animal tooth pendants and red deer antlers. No items which could be considered as grave goods were associated with dogs. It has been suggested

that two dogs had their necks intentionally broken, perhaps so that they would follow their owner to the grave (Larsson 1988a: 150). In Burial X, a wild boar humerus with dog gnawing marks was identified.

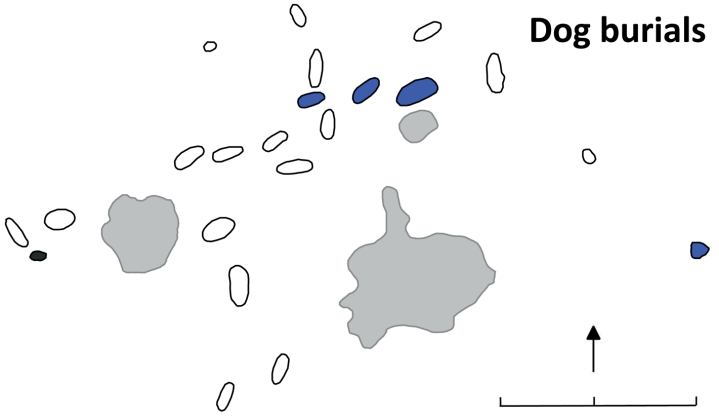


Figure 5.5. The individual dog burial marked in black and dogs buried with humans marked in blue at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

Figure 5.6. Burial XXI: a dog inhumed at Skateholm II with rich grave inventory consisting of a decorated red deer antler tool, a red deer antler and flint knives. Photo: L. Larsson (personal archive of L. Larsson).

5.1.5. Dog at Sakhtysh

Sakhtysh II is the only site in the Sakhtysh complex where dogs have been buried (Крайнов & Костылёва 1985: Fig. 32–35; Костылёва & Уткин 2010: 22) (Fig. 5.7, Table 5.3). It has been reported that preservation of dogs was good. Two were complete dogs and one was partial, accompanied with various artefacts. It is unclear whether these could be regarded as intentionally deposited grave goods for the dog or whether this feature has some other character. The dating of the dogs is not entirely clear, but the stratigraphy of the layers where the dogs were found seems to be connected with the Stone Age use of the site (Крайнов & Костылёва 1985: 24). Unfortunately, none of these dogs have been preserved. Similarly, information about a few dog bones identified in cultural layers at Sakhtysh I and a few at Sakhtysh II comes from an osteological report for the initial excavation seasons, but no bones have been preserved (Цалкин 1963, 1964).

Table 5.3. Dogs at Sakhtysh II. For legend see Table 5.1.

Grave no.	Burial type	Comments
D1	individual dog	nearly complete skeleton in correct anatomical position; lying on the right side with crouched limbs, the head facing N
D2	individual dog	nearly complete skeleton in correct anatomical position; lying on its left side with the head oriented ENE; an accumulation of Pit-Comb ceramics by the head of the dog
D3	disturbed dog	dog bones discovered away from the main area of the Volosovo cemetery at a depth of 60–70 cm, disturbed by an overlaying hearth; only a quarter of the dog bones in correct anatomical position; found together with Volosovo pottery fragments, pendants made from animal teeth and bones, ochre pieces and an accumulation of fish scales; above the dog bones were a "hoard" consisting of large flint flakes and tools

Dog teeth are documented from two Volosovo burials at Sakhtysh IIa (Fig. 5.8, Table 5.4). One pendant from a dog incisor was found with a richly adorned adolescent in Burial 63 (Fig. 5.15: 4), and a canine of a dog was found on the pelvis of the woman buried in Burial 24. Although the tooth is in very poor condition, a drilled perforation is visible. Also, the dog incisor has a drilled perforation, which is broken, but the sides of hole are very smooth, perhaps from heavy wear. In addition, a dog tooth pendant with two notches cut into the end of the root was found in the fill of Lyalovo Burial 40.

Table 5.4. Dog teeth at Sakhtysh IIa. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP C	MNI	Location	Modification	Comments
24	F	A		1	1	pelvis	drilling	poor preservation, broken hole
63	indet.	C	1		1	pelvis/ upper thighs	drilling	broken hole

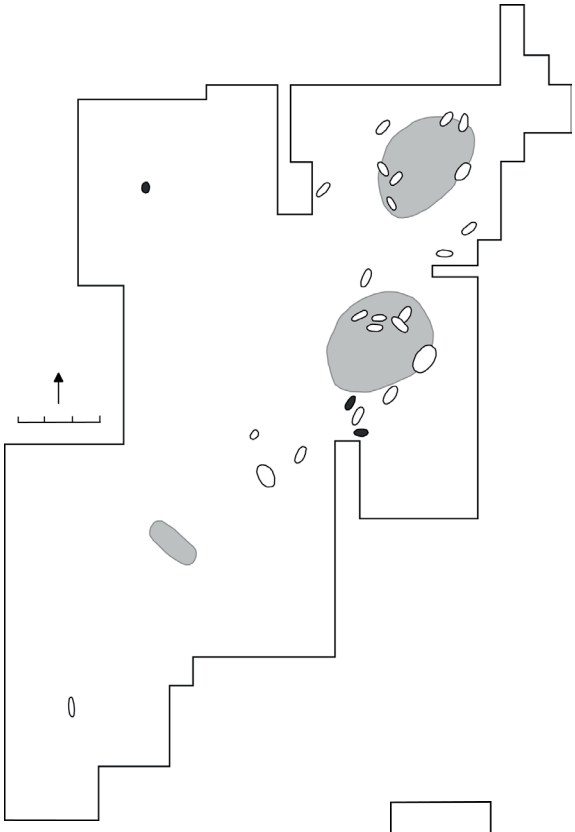


Figure 5.7. Buried dogs at Sakhtysh II marked with black. Scale bar is 6 m. Map: K. Nordqvist.

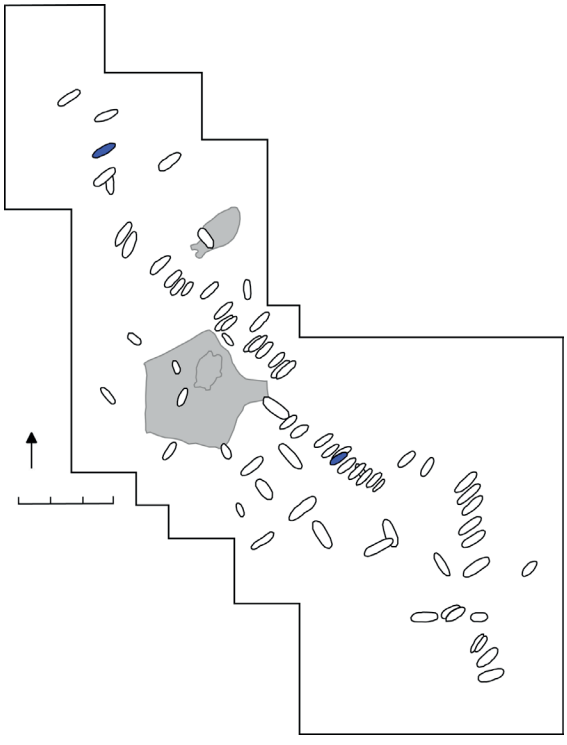


Figure 5.8. Burials with dog tooth pendants at Sakhtysh IIa. Scale bar is 6 m. Map: K. Nordqvist.

5.1.6. Discussion

Dog remains at the studied cemeteries comprise complete dog bodies, parts of them as well as specially selected dog teeth which have been turned into pendants. At Zvejnieki and at Sakhtysh IIa, dog remains are represented only by teeth, while at Skateholm I and II, and Sakhtysh II complete dogs have been buried individually or together with humans.

At Zvejnieki, pendants made from dog teeth are the most numerous among the carnivore species identified in burials (see Fig 4.11). At Sakhtysh IIa, only two dog teeth were identified, and none from Skateholm. Carving is the main perforation technique for dog teeth at Zvejnieki, while at Sakhtysh IIa drilling has been used. Both at Zvejnieki and Sakhtysh IIa, pendants from dog teeth were documented from burials with a rich inventory of other items. At Zvejnieki, mainly pendants from other animal teeth were found, although numerous bird wing bones and 17 bone spears were documented in Burial 164, while a slate adze was found in Burial 233. Both burials with dog teeth at Sakhtysh IIa had tooth pendants from several other species, and Burial 24 also contained numerous marmot incisors and stone pendants. In this burial a particular placement of certain animal species and teeth in relation to each other was observed. A dog canine was found in the pelvic region of a young woman, taking a central position among marmot teeth and serpentine pendants found in this area. Perhaps this dog embodied specific meanings for the buried woman, and the pendant made from the dog canine could have served as an amulet or was imbued with particular attributes. A special animal tooth placed at the centre of the garment has likewise been noted in Burial 8A, that of a young female, at Henriksholm-Bøgebakken, in this case interpreted as a girdle belt (Brinch Petersen 2015: 147–148).

Since the Palaeolithic, the dog has been with humans and has played an important role in everyday life. Dogs were helpers in hunting, guarding and transportation, but also probably a valued commodity for their pelts as clothing and teeth as ornaments or as a food source (Noe-Nygaard 1995: 223; Ошибкина 2000; Ewersen & Ramminger 2010; Vang Petersen 2013: 154; Mannermaa et al. 2014; Brinch Petersen 2015: 129). Most importantly, dogs were companions, playmates for children and deflectors for human frustrations, and participated in various human activities of daily life, including rituals (Vang Petersen 2013: 157). According to Peter Vang Petersen (2013: 158), the cosmological importance of dogs decreased at the end of the Mesolithic, when the appearance of other domestic animals changed the role of dogs and their relationship with humans. This may be valid for southern Scandinavian material, while in areas east of the Baltic Sea, the dog's importance increases particularly during the 5th and 4th millennium cal BC, as evidenced by the material discussed in this study, as well as by the buried dogs in other Volosovo contexts (Цветкова 1990; Костылёва & Уткин 2010: 227, 239, Fig. 115). The presence of dogs both in settlement cultural layers and burials reflects not only the many sides of the human–dog relationship, but also the potentially different roles, identities and personalities that different dogs may have embodied.

The main role of dog is often reduced to the helper-protector. For example, most dog teeth in Zvejnieki come from burials of adult men, which could easily be interpreted to reflect their importance as invaluable helpers to the "man the hunter". However, the largest number of dog teeth were discovered with the child in Burial 226. This cannot be linked to the dog's role as helper in hunting, but rather to the companionship and protective function of the dog. Dog teeth in this burial could have been given special meanings, perhaps credited with protective or apotropaic properties. Similar powerful characteristics have been attributed to ornaments made from the body parts of dogs found in burials in Popovo (Ошибкина 2017: 60).

The aid of dogs in mobility and transport is well documented both in archaeology and ethnography (see Itkonen 1948; Morey 2010; Russell 2012). Dietary isotope studies on dog tooth pendants from lacustrine Zvejnieki have shown that some of the dogs had a marine diet (Eriksson et al. 2003; Eriksson 2006). This may indicate seasonal movements of people and dogs between inland areas and the coast, for example related to the exploitation of marine resources (see Storå 2002), but could also represent the exchange of dogs or tooth pendants between different areas and populations. A recent study on dog genetic ancestry suggests that dog movements between communities and larger territories were not only the result of following humans: rather, dogs may also have had a role as cultural and/or economic commodities (Bergström et al. 2020).

The practice of burying dogs in burial grounds in a similar manner to humans suggests that some dogs had a particular role in the community: not all dogs and not all humans received such treatment (see Chapter 11.2.2 for further discussion). Dogs could have been considered as equal family or group members among hunter-gatherers and therefore given a specific burial (Evans & Welinder 1997; Morey 2006; Fahlander 2008). Both in the ethnographic past and in our contemporary world, companionship remains the central element of the relationship between humans and dogs (Manwell & Baker 1984; Haraway 2008; Lupo 2011; Perri 2013, 2017).

Dogs were buried in individual graves at Skateholm and Sakhtysh, while some dogs were buried together with humans at Skateholm. The individually buried dogs are mostly concentrated in particular areas near human burials but outside the central area of the cemetery (Fig. 5.4, 5.5, 5.7 and 5.8). In previous studies at Skateholm (Blank Bäcklund & Fahlander 2006: 270), the particular location of dog and child burials has been linked to their status within the community, suggesting that they were not considered full members of society and therefore had a lower social status and were buried on the outskirts of the cemetery. In another study (Strassburg 2000: 161, 213) it has been suggested that the buried dogs may represent shamans or other liminal individuals, which could be the reason for placing their remains in a particular part of the cemetery. Furthermore, Kristina Jennbert (2003: 148) has suggested that dogs buried separately represent even more specific individuals than those buried with humans, although in all cases the emotional bond was strong.

Intentional killing in connection to the burial ritual has been proposed in the case of two dogs at Skateholm (Larsson 1988a: 150). Also in Popovo, dogs may have been killed specially to accompany the deceased in the afterlife (Ошибкина 1983, 1994,

2017: 60). The link between dog remains and ritual activities has also been recognized at Sakhtysh II, where dog burials are associated with numerous hoards and ritual activity areas. Likewise, finds from Popovo cemetery – two complete dog skeletons buried above a pit with various animal bones – are considered to be a sacrifice and part of the funerary ritual of the child in Burial VII (Ошибкина 2006: 100–105).

In a few cases individual dogs have been given grave goods: Burial XXI of a dog at Skateholm II was one of the richest burials in the whole cemetery (Larsson 1990) and also dog Burial 3 at Sakhtysh II had some artefacts associated with it (Костылёва & Уткин 2010). In the case of Skateholm, Larsson (1994: 568; 2021: 653) has suggested that the grave inventory is "too much" for a dog and therefore possibly represents a human, who for some reason was not buried in the pit. Still, this is an anthropocentric view, as it is possible that some dog individuals were given gifts in ways similar to humans. For example, in hunter-gatherer cemeteries near Lake Baikal, some dogs were given an inventory including pendants made from red deer canines, various animal bones, antlers and lithic and bone implements (Losey et al. 2013).

The attribution and interpretation of the grave inventory in burials including dogs is challenging. This arises from the difficulties of determining who was buried with whom and what status and role the human and the dog had in the burials (Losey et al. 2013: 12, Fig. 8). One should be cautious in presuming that the dog was given as a companion to the human; perhaps the human was following the dog to the grave? The relationship between the dog and the human is built at an individual level, created through interaction, training or other common engagement (Haraway 2008; Russell 2012; Perri 2013). Therefore, giving particular care and attention to a specific dog is likely linked with the personhood and identity of those specific animal and human individuals (Russell 2012: 4; see Chapter 11.2.2. for further discussion). At Zvejnieki dog teeth are always associated with the human body and not found in the grave pit or beside the skeleton, as has been noted for other animal species (see Chapters 6 and 7) – this is a strong indication of a deeply personal human–dog relationship, built on individual bonds and companionship.

5.2. Wolf

The wolf *(Canis lupus)*, also known as the grey wolf (Fig. 5.9), is the largest canid of Eurasia and North America. Worldwide, more than 36 wild *Canis lupus* subspecies have been distinguished (Wozencraft 2005).

5.2.1. Biological characteristics and other properties

Appearance and morphology

Wolves have a strong body, shorter torso and longer tail than other canids. The front of the body is well-built and robust, with a relatively large head and a somewhat pointed muzzle and ears. Wolves have a developed sense of smell and hearing, but their eyesight is rather poor (Latvijas Daba 2021). Wolves can reach up to 100–160

Figure 5.9. The grey wolf at Nagļi, eastern Latvia. Photo: A. Jesko.

cm in length, with a shoulder height of up to 80–90 cm. The body weight is usually larger for males (30–65 kg) than for females (25–50 kg) (Latvijas Daba 2021).

Depending on their habitat, the banded fur colour may vary from light grey or yellow brown to black or white (in arctic regions) (Lindström 2001: 103). In the forested zone of Europe, the wolf pelt is more commonly a greyish brown colour of varied intensity (Andersone 2002). Twice a year (approximately in May and September) wolves change their pelt. Wolves live around 15–16 years, but in the wild may even reach the age of 20 (Siliņš 1984: 36). Wolves may be infected by various pathogens and parasites, notably rabies, and thus become dangerous to humans.

Habitats and diet

Wolves circulate in large territories, varying from 30 to 4350 km^2, moving through different habitats but preferring easy terrain, such as open woodlands, forest or river edges (Aaves et al. 1998: 146; Mech & Boitani 2003: 19, 30). Wolf habitats depend on the availability of food, suitable and protected places for dens, and the proximity of water. The dens are usually in dry, well-protected places, often in naturally formed hollows or burrows made by other animals (Siliņš 1984: 34). During the mating period and while the cubs are small, wolf families stay in one place. In autumn, when the young start to participate in the hunt, territories become larger, and in winter they hunt in much larger areas. Depending on hunting success, wolves can move 20–40 km a day, while in starvation periods they may roam over distances of 60–80 km or even larger distances when young adult leave the wolf pack to search for new territories.

The wolf is a generalist and can easily adapt to environmental conditions. However, wolves are typical carnivores and preferably eat meat. Vegetable food is consumed only in times of starvation. They mainly feed on hoofed mammals, such as young or old elk, roe deer and other mid-size ungulates (Lindström 2001: 121, 144). In times of decline in ungulate populations, beaver and other smaller mammals can also constitute a significant food supply for wolves (Andersone 2002). Livestock and dogs can suffer from wolf attacks and they also feed on carrion. A wolf can consume about 2–4 kg of meat in a day but can also survive several days without food (Latvijas Daba 2021).

Social relations and reproduction

The wolf is a monogamous animal and lives its whole life with the same partner. Males reach maturity at the age of three, and females at two. The mating period lasts from the end of January to the beginning of March. The cubs are born in the den, usually at the end of April or in early May. Litter size varies, depending on the local conditions and population structure, with an average of six cubs. Usually, mated pairs and their offspring from the last two years form a nuclear family.

Wolves are particularly specialized in cooperative hunting, as demonstrated by their social nature and behaviour. More successful, however, is individual hunting or hunting in pairs. Wolves are territorial animals, and this may cause conflict between wolves and lead to increased mortality. Generally, the size of the wolf pack depends on available prey with an average of 7–8 individuals per pack. Groups may be larger when they hunt larger prey. For example, when the elk stock decreases, this is also directly reflected in the number of wolves (Lindström 2001: 163; Mech & Boitani 2003: 7).

Wolves are cautious animals. In contact with humans, they become scared, as humans are the only danger for wolves (Mech & Boitani 2003). When wolves move in packs, they use the same tracks, and it is difficult to estimate the exact number of wolves (Siliņš 1984). Wolves engage in hunting particularly at night and sleep during the day in any suitable, protected spot.

5.2.2. Wolf remains in hunter-gatherer contexts in north-eastern Europe

Wolf bones occur regularly at hunter-gatherer sites in northern and north-eastern Europe, but comprising usually only a few bone fragments at most (Aaris-Sørensen 1977; Zagorska 1992; Жилин 2004; Lõugas 2006; Brinch Petersen 2015: 82; Ukkonen & Mannermaa 2017). Problems also arise from the morphological similarities between dogs and wolves, and identification is often based on the size of the bone (Aaris-Sørensen 1977). At the Maglemose settlement Sværdborg I in Denmark a complete skeleton of wolf has been found, which have been interpreted to represent the carcass of a skinned animal rather than a burial (Aaris-Sørensen 1976: 141; for a practically contemporaneous wolf burial in Siberia, see Bazaliiskiy & Savelyev 2003: 27–28).

5.2.3. Wolf at Zvejnieki

Wolf teeth have been documented in six graves at Zvejnieki (Fig. 5.10, Table 5.5). Altogether, 19 incisors and two molars were recorded, all of them worked by the carving method. All burials with wolf teeth also had large numbers of tooth pendants

from other species (Fig 5.11: 5). In some burials (290, 300) they were specifically combined with teeth of other carnivores (see Fig. 5.38). In the double Burial 122/123 (Fig. 5.32: 5), four second incisors from the upper and lower jaw were recorded, most likely coming from the same individual. Because of the small number of burials with wolf teeth, it is impossible to characterize the humans more commonly buried with wolf tooth pendants. The available data show that adult males were more often adorned with wolf tooth pendants, but they have also been provided to two children and one woman. Burials with wolf teeth have been dated to the 6th and 5th millennium cal BC. There are no clearly assigned finds of wolf from the Zvejnieki settlements, but a few bones of wolf have been mentioned in tables summarizing faunal data from Latvian Stone Age sites (Zagorska 1992; Lõugas 2006).

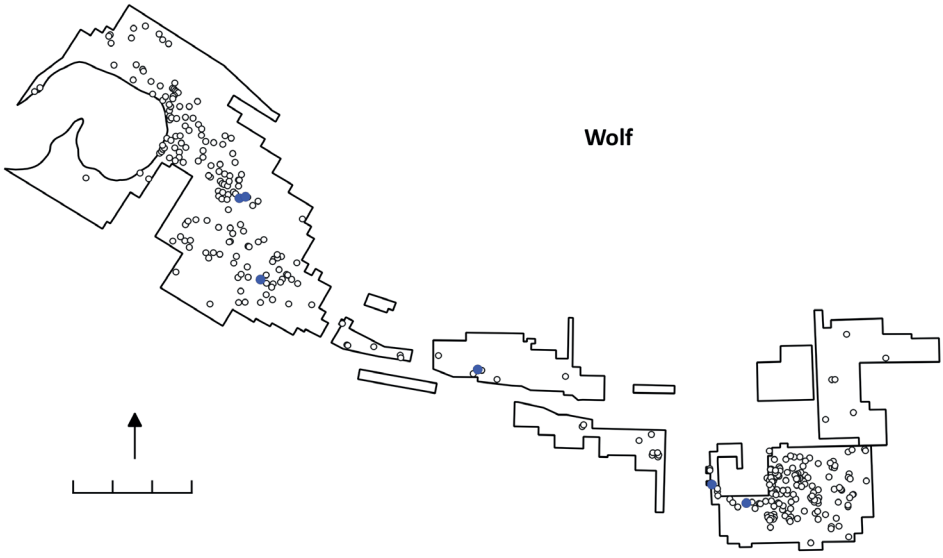


Figure 5.10. Burials with wolf teeth at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

Table 5.5. Wolf teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP M	MNI	Location	Modification	Comments
121	F	A	1		1	outside left shoulder	carving	open root apex
122/ 123	M+ in-det.	A + C	5		1	between femur, right hand, pelvis, feet	carving	some incisors from same animal; root apex open
153	M	C	3		2	?	carving	exact location unclear
190	in-det.	C	2		1	?	carving	heavy tooth wear; exact location unclear
290	in-det.	C	1		1	across knees	carving	very smooth hole; open root apex; broken
300	M	A	7	2	1	head	carving	heavy tooth wear; parts of molar broken

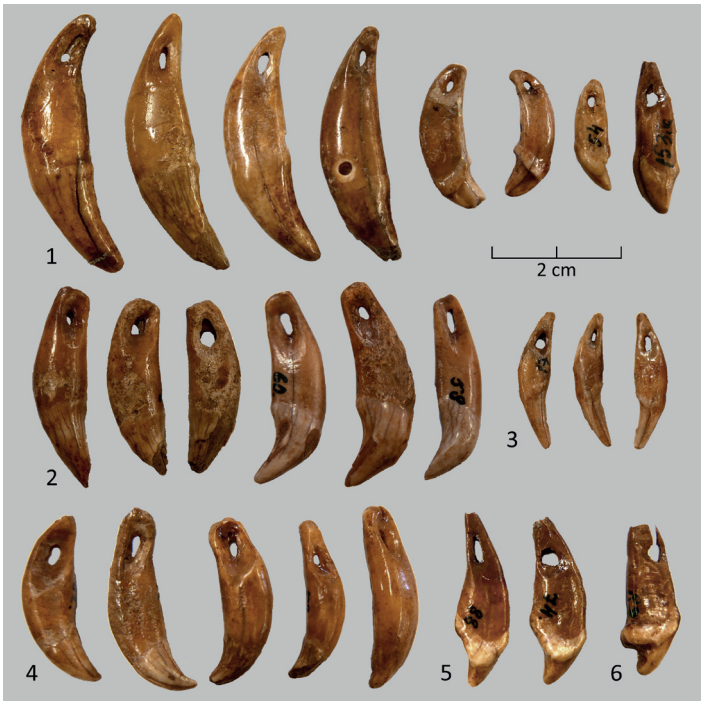


Figure 5.11. Burial 153 at Zvejnieki had pendants made from various carnivore teeth: dog (1), badger (2), marten (3), seal (4) wolf (5) and bear (6). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

5.2.4. Wolf at Skateholm

The finds of wolf come from two burials at Skateholm II (Table 5.6). A left mandibula fragment with the first molar was found near the burial of a woman (IX). The identification of wolf was based on measurements of the tooth, which fall in the size range for wolves (Jonsson n.d.; cf. Aaris-Sørensen 1977). In the grave fill of the same burial one more wolf tooth was identified. A perforated wolf tooth was identified from Burial X, with two men and a dog. Several wolf bone fragments have been identified at the Skateholm I settlement (Jonsson 1988: 67).

Table 5.6. Wolf remains at Skateholm II. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP M	MNI	Location	Modification	Comments
IX	F	A		mandibula + M	1	?	no	first molar with mandibula fragment; one more wolf tooth in fill
X	M + M + dog	A + A	1?		1	?	drilling	location of tooth unclear

5.2.5. Wolf at Sakhtysh

At Sakhtysh II, five wolf teeth are recorded from Burial 18 (Table 5.7). The wolf teeth are part of an assemblage consisting of other carnivore tooth pendants, mainly bear and badger, associated with the dismembered body of a young woman. The pendant manufacturing techniques are similar for all the teeth, and the drilled holes for wolf teeth are similarly placed in the mid part of the root (Fig. 5.12: 2). No wolf teeth have been dated, but elk and bear tooth pendants from this burial have been dated to the mid 4th millennium cal BC (see Macāne et al. 2019). At Sakhtysh IIa, a wolf incisor (Fig. 5.15: 3) was included among the personal ornaments of a rich adolescent in Burial 63 (Table 5.7). The drilled perforation was broken, but the sides of the hole were very smooth, possibly from heavy use.

Table 5.7. Wolf remains at Sakhtysh II and IIa. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
18	F	A	5	1	pelvis and by dismembered arm	drilling	all teeth have the same manner of perforation in the mid root
63	indet.	C	1	1	pelvis	drilling	perforation broken

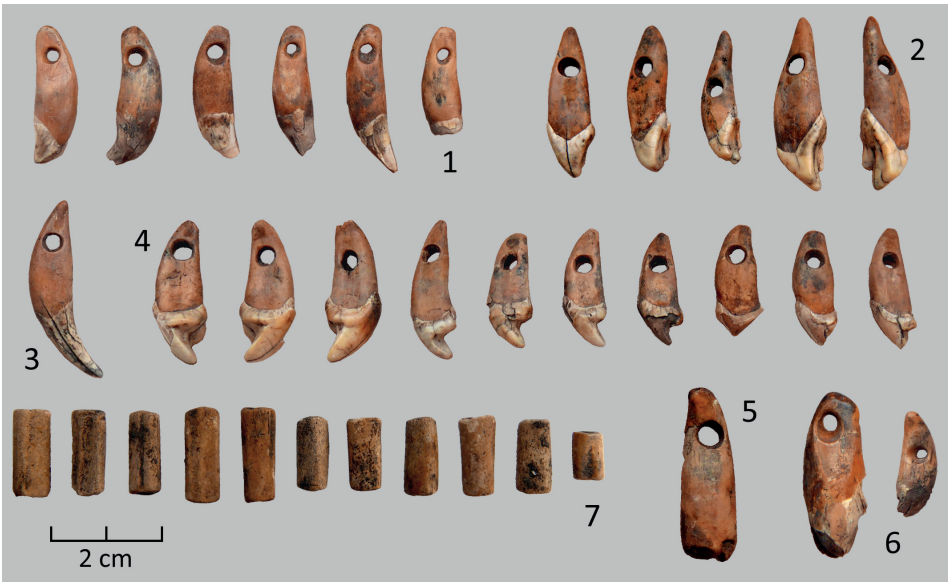


Figure 5.12. Inventory of Burial 18 at Sakhtysh II included numerous pendants, mainly from carnivore teeth: badger (1), wolf (2), fox (3), bear (4), but also elk (5) and undetermined (6) species, as well as tubular bone beads (7). By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

5.2.6. Discussion

Wolf remains are rare in the studied material. Most of the wolf teeth come from Zvejnieki, consisting mainly of incisors, along with a couple of molars. At Sakhtysh, a few wolf incisor pendants were identified in the burial contexts, while some identifications have been difficult to make due to the morphological similarities between dog and wolf teeth and the fact that Stone Age dogs might have been quite large (wolf-sized). Wolf tooth pendants from Zvejnieki and Sakhtysh can be directly associated with the deceased, while at Skateholm wolf remains were found in the grave pit or in the fill, and only one tooth had a perforation. The modification techniques used on wolf teeth differ. Drilling has been used for making perforations in wolf teeth at Sakhtysh and Skateholm, while at Zvejnieki all wolf teeth had carved perforations.

Both at Zvejnieki and Sakhtysh, the identified wolf teeth come from rich burials and are accompanied by other carnivore pendants. The largest number of identified animal species and tooth pendants in the whole of the Zvejnieki cemetery come from double Burial 122/123, which also included a whole set of wolf canines. All the other burials with wolf teeth at Zvejnieki as well as both burials at Sakhtysh demonstrate a similar situation. This means that wolf teeth were available or possibly curated within the community for use on some special occasions or arrangements of personal ornaments. Burials with wolf tooth pendants date to the period between the 6th and 4th millennium cal BC.

The settlement finds, even though scarce, confirm the presence of wolves at all studied locations. The vast forested areas east of the Baltic Sea would have been suitable

environments for wolf populations, providing abundant food sources, as demonstrated by ungulate remains on settlement sites in these areas (see Жилин 2004; Lõugas 2006). The small number of wolf remains in burials can be possibly explained by their solitary nature. Wolves avoid humans, unless they are starving, and human interaction with wolves would most likely have been rare. However, the presence of a few wolf tooth pendants in burials indicates that wolves were hunted, probably with the help of dogs and traps. Hunting from an ambush could have been practiced, for example using entrails and parts of the carcass of other animals as bait (Жилин 2004: 67). The low number of wolf remains may reflect the fact that the wolf is one of the most dangerous species and a threat to humans in the Northern Hemisphere. It certainly played a role in hunter-gatherers' lives, but it was clearly not among primary species chosen for making ornaments.

5.3. Fox

The red fox *(Vulpes vulpes)* is the largest subspecies among foxes. At least forty subspecies are distinguished under the genus *Vulpes* (Wozencraft 2005). The species is well adapted to various habitats and geographical locations, and is one of the most widespread animals within the order Carnivora (Lindström 2001: 90).

5.3.1. Biological characteristics and other properties

Appearance and morphology

The fox is a small to middle-sized carnivore, with a slender body and a long tail. Body length varies between 60 and 85 cm, while the tail has a length of 35–60 cm. The fox has a slender muzzle and upright ears. Body weight is around 4–8 kg, but the size of foxes shows great geographical variation. Males are usually larger than females (Siliņš 1984: 37).

The colour of the fur varies, especially on the back, presenting various tones of red, while the front is white or light grey (Fig. 5.13), the ears are black on the back, and the tip of the tail is always white. Foxes have a well-developed sense of smell and hearing, but their eyesight is not so good (Siliņš 1984: 38). On average, foxes live up to 10 years, but can occasionally even reach 20 years (Lindström 2001: 77). Foxes are also more dangerous than other carnivores, since they carry many diseases, such as scabies, rabies, etc. Foxes spread tapeworm, which humans can also carry (Lindström 2001: 182).

Habitats and diet

Because they adapt so well and so quickly, foxes may be encountered in various environments. Their habitats vary from open terrain to forest (Jonsson 1988: 67). Foxes live in territorial groups, and will mark good hunting areas with urine and excrement, especially during the mating period. During the winter foxes live a solitary life, and then their territories can be much larger, but during the breeding period the hunting territory of a fox family is around 25 km^2. Foxes live in dens, but are not typical den diggers and therefore prefer to take over abandoned badger setts than dig new ones.

Figure 5.13. A young red fox in the Lake Lubāns wetlands. Photo: A. Jesko.

If nobody disturbs them, foxes may stay in the same den for several years and will accordingly clean the den once a year, usually in spring. Sometimes foxes, badgers and racoon dogs may share the same system of burrows or place their dens close together (Siliņš 1984: 39).

The red fox is a generalist, and the diet depends on the season and available food resources in the inhabited territory. The vole is the main component of the fox's diet, but foxes like to eat the intestines of their prey and may carry away parts of their prey, such as the head, and hide them (Lindström 2001: 144, 146). In the winter, the diet is dominated by small mammals and is complemented with birds, lizards and fish during spring and early summer, while various insects and beetles become important during the summer. During late summer and autumn, they prefer various fruits and sweet berries, such as blueberries, which help to store fat before winter. A fox may lose as much as 1 kg of weight during winter (Lindström 2001: 83).

Social relations and reproduction

Foxes are quite solitary animals for most of the year, except when the females have their young. In areas with a suitable and rich biotope, red foxes live in family groups, but often they live as an adult pair. Foxes are monogamous animals. The mating period is usually in February or March, and males will fight during the mating season. Foxes reach sexual maturity at 10 months, but some females may reach it only in the second year. On average, 4–6 kits are born, in May or June. Foxes bring hunted voles to their kits in the den (Lindström 2001: 124), but after three months the kits start to live and hunt on their own, and the family breaks up (Siliņš 1984: 40).

Foxes can be active all day, but they hunt more actively at dusk and during the night. Foxes like to lie on a stone in the sun or in a place with a good view during the daytime, but when the temperature goes down or the weather is very bad, the fox will go into its underground den and may stay there until it gets better (Lindström 2001: 72). Foxes are very cautious animals. They may become prey for the golden eagle, lynx and wolf, and therefore foxes avoid the territory of these animals (Lindström 2001: 98, 100). Foxes reproduce fast, so hunting them is not as destructive as it is for other animal populations (Lindström 2001: 187).

5.3.2. Fox remains in hunter-gatherer contexts in north-eastern Europe

Remains of fox are rare but do occur at hunter-gatherer settlement sites in north-eastern Europe (Ошибкина 1983, 1997; Лозе 1988; Zagorska 1992; Eriksson & Magnell 2001; Lõugas 2006; Ukkonen & Mannermaa 2017; Gummesson et al. 2019a). In faunal assemblages fox remains often comprise <1% of the identified species (e.g. Жилин 2001, 2004; Карху 2002; Кириллова 2002). Fox bones with signs of skinning have been identified at the Agernæs site, Denmark (Richter & Noe-Nygaard 2003). Fox remains in burial contexts are scarce. For example, a perforated canine was identified in one hunter-gatherer burial at Abora I cemetery in south-eastern Latvia (Macāne 2019). Bones of fox, among several other animal species, were encountered together in pits considered to be deposits at the Peschanitsa burial site in north-western Russia (Oshibkina 2008: 58).

5.3.3. Fox at Zvejnieki

Only canines of fox have been identified in burials at Zvejnieki. In three burials, six fox teeth have been recorded, all perforated by the carving technique (Fig. 5.14, Table 5.8). Fox teeth were found in the burials of one man, one woman and one child. One more fox canine pendant was identified from Burial 168, but the context is completely disturbed, and therefore it is excluded from the analysis. A whole set of fox canines were identified in child Burial 226 (Fig. 5.3: 2), but whether all these teeth come from the same individual is difficult to assess. Fox teeth are found in combination with other animal teeth, mostly carnivores. Dated burials (121, 153) with fox teeth fall in the 5th millennium cal BC. No fox remains can be clearly associated with the Zvejnieki settlements, but data about a few fox bones identified at Latvian Stone Age sites is included in a summarized table (Zagorska 1992; Lõugas 2006).

Table 5.8. Fox remains at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
121	F	A	1	1	chest	carving	part of crown broken
153	M	C	1	1	head	carving	
226	in-det.	C	4	1	chest	carving	little tooth wear; perforation hole very smooth

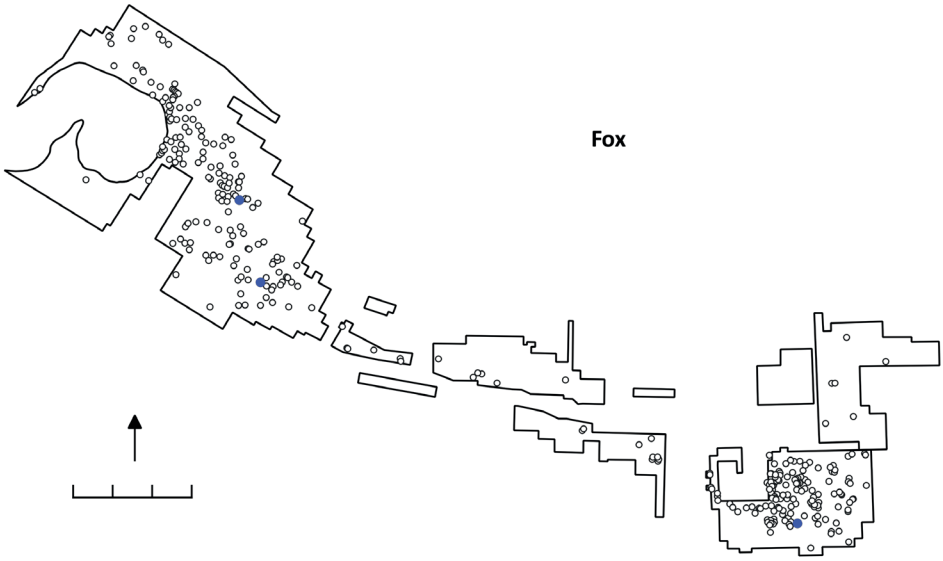


Figure 5.14. Burials with fox tooth pendants at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

5.3.4. Fox at Skateholm

In Burial XIII at Skateholm II, a tibia of a juvenile fox was identified (Jonsson n.d.). The exact find location is unknown, and therefore it is difficult to relate the find to the buried child. No other fox bones or teeth have been associated with burials at Skateholm. Several fox bone fragments have been documented in settlement contexts at both Skateholm I and II (Jonsson 1988: 67).

5.3.5. Fox at Sakhtysh

Only one canine of a fox has been documented in Burial 18 at Sakhtysh II (Fig. 5.12: 3, Table 5.9). The tooth had a drilled perforation made in a similar manner to other tooth pendants from bear, elk, badger and wolf. Tubular bone beads were also recorded in this burial. The only other information about fox remains at Sakhtysh comes from an osteological report for the initial excavation seasons, where several fox bones were identified in cultural layers at Sakhtysh I and a few at Sakhtysh II (Цалкин 1963, 1964). Three fox canines have been documented from Burial 63 at Sakhtysh IIa (Fig. 5.15: 2, Table 5.9) together with other animal tooth and bone pendants. All fox teeth had drilled holes; one was broken.

Table 5.9. Fox remains at Sakhtysh II and IIa. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
18	F	?	1	1	by pelvis and dismembered arm	drilling	dismembered body
63	indet.	C	3	1	pelvis	drilling	perforation hole broken on one canine

Figure 5.15. The adolescent in Burial 63 at Sakhtysh IIa had an inventory including pendants of bone (1) and tooth pendants of several animal species: fox (2), wolf (3), dog (4), badger (5), bear (6) and unidentified species (7). By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

5.3.6. Discussion

Fox remains are scarce on the studied sites. Only a few fox canines were documented from hunter-gatherer burials at Zvejnieki and Sakhtysh, while a few bone fragments have been identified in a grave fill at Skateholm (Jonsson n.d.). At Zvejnieki, most fox canine pendants come from one particular child burial, where they were combined in a decoration over the child's chest together with pendants from other carnivores. Drilling has been used for making perforations in fox teeth at Sakhtysh, while at Zvejnieki all fox teeth had carved perforations. Both at Zvejnieki and at Sakhtysh, fox canine pendants are present in those burials which had the richest grave inventory and the largest numbers of different animal species used for making tooth pendants. Burials with fox tooth pendants date to the period from the 6th to the 4th millennium cal BC.

The fox is a very widespread and adaptive animal, and it seems unlikely that foxes would not have been hunted in the vicinity of the studied sites. Nevertheless, only a few fox bones have been reported from the faunal assemblages of the settlement contexts (Цалкин 1963, 1964; Jonsson 1988; Lõugas 2006). Due to their highly valued pelts,

foxes have always been desired fur animals, but perhaps the hunted animals were not taken to the settlement and were skinned already at the kill site. However, consumption of fox meat has also been documented in historical sources, and in periods of crisis people have eaten fox meat even up to the 20th century (Lindström 2001: 182). The low number of fox remains from burials may also be linked to the social behaviour of foxes – for instance, scavenging on refuse from human settlements. It may also reflect the minor role of the fox in the conceptual world of hunter-gatherers and a preference for other animal species in making personal ornaments.

5.4. Bear

Bears belong to the "doglike" carnivores in order Carnivora. There are eight bear species belonging to three subfamilies. Bears are the largest terrestrial members of the order Carnivora, polar bear *(Ursus maritimus)* being the very largest among them. The brown bear *(Ursus arctos)* is commonly found in Eurasia and North America. This species has the most variable size among modern bears (Servheen et al. 1998).

5.4.1. Biological characteristics and other properties

Appearance and morphology

The brown bear is a strong and robust animal with a short tail and short limbs. The body length varies between 1.4–2.8 m, with an average weight of 180 kg for males and 135 kg for females. The weight varies seasonally, being greatest in autumn and least in spring. The body of the bear is adapted to hibernation, which may last for half a year, but this also depends on the biotope, and in southern Europe some males may not hibernate at all (Lindström 2001: 79). They may lower their body temperature to 3–4 degrees °C during hibernation, which allows bears to lower their pulse from 40 to 10 heartbeats per minute to save energy. Bears may lose half their weight during hibernation, but usually lose around 20–40% (Lindström 2001: 79–80).

The bear's body is adapted for standing on the hind limbs and sitting upright, as the main weight is on the hindlimbs. The forelimbs are strong enough to be able to catch prey, excavate dens, dig out burrowing animals and turn over rocks or logs to locate prey (Latvijas Daba 2021). Despite their heavily built body, they are adapted runners, climbers and swimmers.

Brown bears have long, thick fur (even thicker in winter), which is not always brown but varies from yellowish brown to dark brown or black (Fig. 5.16), depending on the region. Bears have a massive skull in relation to the rest of the body. Brown bears have the largest brains among carnivores and show relatively advanced cognitive abilities (Deecke 2012). Brown bears have very strong teeth, although the large canine teeth are used mostly for display, while the carnassial teeth are more adapted to omnivorous food.

Bears have colour vision and are able to distinguish ripe fruit and nuts. They have an excellent sense of smell, better than other carnivores. They can also remember

by smell places where they have been or re-locate food supplies. Bears can reach an average age of 25 years (Lindström 2001: 77).

Figure 5.16. A bear family at Skånes Djurpark in southern Sweden. Photo: A. Macāne.

Habitats and diet

Brown bear occupies the broadest range of habitats among bear species, ranging from steppe areas to arctic regions. Preferred habitats include semi-open terrain with scattered vegetation, but in Northern and Eastern Europe brown bears are well adapted for forest-dwelling. Bears are not highly territorial, and several individuals may share the same area, except at times when females are fertile or food resources are available. The bear den is usually located in a protected spot and may be dug into the ground, or an old, overgrown anthill may be used for this purpose. It may also be located in a fallen tree or a cavity in rocky or mountainous areas. Bears use moss and dry grass to line their sleeping chambers (Lindström 2001: 78–79).

The brown bear is a seasonal, opportunistic omnivore and consumes the greatest variety of different foods among bears. Easily accessible and abundant food is preferred, and therefore vegetable food may form up to 90% of its diet. Brown bears feed on various plants, roots and insects. Berries become an important part of the bear's diet during late summer and autumn and help accumulate fat before the winter. In territories where this is possible, bear preys on salmon during the spawn, or eats crabs and clams (Berkovitz & Shellis 2018: 292). Especially after hibernation, bears prefer to eat ants to obtain protein and restore their body and energy (Lindström 2001: 123). Bears may also eat birds and their eggs, and small rodents like marmots, mice and voles. However, bears are capable of killing much larger prey, such as young elk calves and adult ungulates, especially after emerging from hibernation (Lindström 2001: 123; Berkovitz & Shellis 2018: 292). They may also feed on carrion or plunder wolf kills. Bears may cache part of the prey under branches or moss (Lindström 2001: 144).

Social relations and reproduction

Bears are solitary animals except when mothers have cubs. Females reach sexual maturity between the ages of four and eight years, and males around the age of six, when they have reached a body size enabling them to fight other males (Latvijas Daba

2021). Mating usually takes place from May to early July, and cubs are born while the mother is in the winter den, around January–February. The size of the litter is one to three cubs, but older and larger females may have larger litters, also depending on the geographical location and food supplies. Bear cubs may have difficulty surviving the first winter and often stay with their mother for at least one or two winters before they move out of the den (Lindström 2001: 80).

Despite their solitary behaviour, bears may form social hierarchies based on age and size. Adult males, in particular, may be aggressive, especially towards cubs, adolescents and young adults. Particularly if a female mates with several males, the father may kill its own cubs (Lindström 2001: 171). Females with cubs can also be very aggressive. Bears are unpredictable in temperament but seldom attack humans, except if they feel threatened or are surprised. Bears are diurnal or nocturnal animals (Latvijas Daba 2021).

5.4.2. Bear remains in hunter-gatherer contexts in north-eastern Europe

Bear bones occur in faunal assemblages at most hunter-gatherer sites in north-eastern Europe (Zagorska 1992; Жилин 2014: 94; Lõugas 2017; Ukkonen & Mannermaa 2017; Magnell, accepted). Usually, bear remains do not exceed 2–3% (Жилин 2004: 39), but rarely appear in larger numbers among faunal assemblages (see Разлуцкая 2001: 86–88; Girininkas & Daugnora 2013: 589, Table 3; Lõugas 2017, Table 1).

The Kanaljorden site at Motala in Middle Sweden (6th millennium cal BC) is exceptional, since bear remains comprise 13% of the faunal assemblage from the site. Bear remains take second place after wild boar, and deliberate deposition of bear body parts, including mandibles, in particular areas of the site has been observed, suggesting the ritual handling of bear remains (Gummesson 2014; Gummesson et al. 2018: 81–88, 2019a: 86–88; Hallgren et. al. 2021). Bear bones have also been found in ritual areas together with carnivore and other animal and human remains at Bökeberg III, indicating their importance in ritual activities (Eriksson & Magnell 2001).

A higher number of bear remains in faunal assemblages is recorded in the 4th and 3rd millennium cal BC and associated with the Pitted Ware Culture sites in Sweden and Denmark (Hallgren 2008; Larsson Å. 2009; Klassen et al. 2020; Magnell, accepted) and the Volosovo communities in central European Russia (Костылёва & Уткин 2010). Bear finds on sites from this period suggest ritual handling of bear bones (see Lepiksaar 1974: 150; Sjöling 2000: 24; Костылёва & Уткин 2010) as well as transportation of bear bones between distant areas (Klassen et al. 2020; Makarewicz & Pleuger 2020). For instance, bear bones have been found at sites of this period on Gotland, where a bear population has never lived, suggesting that bears were transported to the island by humans (Magnell, accepted). The paws and claws are the most numerous body parts from Pitted Ware sites, indicating the importance of bear skins and perforated canine teeth (Sjöling 2000: 24). Butchering marks are often recorded on bear bones, indicating skinning and filleting for removal of meat, and there are marrow extraction marks as well as signs of dog gnawing (Gummesson 2018; Gummesson et al. 2019a: 88).

Bear bones have quite rarely been used for making tools (Ванкина 1970; Жилин 2004: 52 Bērziņš 2008b: 365; Jensen 2013: 62). Bear canine teeth have been used as flint-knapping tools (Жилин 2004: 52), while a bear ulna was used to make a representation of an elk head (Fig. 11.10) found at Riņņukalns shell midden (Jaanits 1961). Bear teeth have commonly been used for making adornments. All kinds of teeth have been utilized for this purpose, although pendants made from canine teeth are more common (Sjöling 2000: 24; Жилин 2004: 52; Костылёва & Уткин 2010: 221; Butrimas 2012: 177, Fig. 95; Ошибкина 2017: 36; Gummesson 2018; Gummesson et al. 2019a: 88; Macāne & Nordqvist 2021).

Bear teeth, skulls and mandibles, paws and figurative representations in various materials are commonly found in hunter-gatherer burials. A bear mandibula and a canine have been documented from Burial 7 at Donkalnis cemetery in Lithuania (Butrimas 2012: 177, Fig. 95). Especially numerous are bear remains in hunter-gatherer burial contexts from the forested zone of western Russia. Numerous bear canine pendants were discovered with burials at Yuzhniy Oleniy Ostrov cemetery in Karelia (Гурина 1956: 137). Bear bones have also been documented in ritual pits associated with hunter-gatherer burials at the Popovo cemetery together with fish and bird bones (Ошибкина 1983: 203, Table 10). Similarly, at Berendeevo burial ground in central European Russia, a small pit by Burial 2 contained several bear mandibles and a skull, which have been interpreted as a sacrifice (Никитин 1976: 202; Костылёва & Уткин 2010: 189). A multiple burial at the Volodary site in Volga–Oka interfluve had numerous bear bones from paws and metapodials distributed all over it (Костылёва & Уткин 2010: 194). At the Volosovo period burials of Maslovo Bolota V, two bear skulls without teeth were encountered near Burial 1 (Костылёва & Уткин 2010: 217). At the Chornaya Gora site, a bear mandibula was found in multiple Burial 50, where 14 adult individuals were buried, while bear tooth pendants were documented with several other burials (Костылёва & Уткин 2010: 224–225). A baculum of a brown bear with a possible perforation was identified in the neck area of Burial 3 at the Kubenino site in north-western Russia (Kashina et al. 2021: 81).

Bear representations in various materials, such as amber, bone, stone and clay, show the symbolic importance of the bear for hunter-gatherer populations in north-eastern Europe (Ванкина 1970; Carpelan 1977; Loze 1983; Wyszomirska 1984: 106; Vang Petersen 1998: 87–90; Bērziņš 2008b: 365; Костылёва & Уткин 2010; Björck 2019; Magnell, accepted). Bear representations are especially widespread in the Volosovo Culture area (see Никитин 1978: 61, Fig. 17.5, 1996: 158), and numerous bear representations in stone and a few in wood have been documented in the territory of present-day Finland and north-western Russia (Carpelan 1977; Immonen 2002).

5.4.3. Bear at Zvejnieki

Twenty-five bear teeth are documented from six burials at the Zvejnieki cemetery (Fig. 5.17, Table 5.10). The majority are incisors (21), two are canines, one is a premolar and one is a molar. No other body parts of bear have been documented. Bear teeth were documented in three burials of adult man, two children and one juvenile

individual. All bear teeth come from very richly furnished burials, including tooth pendants from other animal species (Fig. 5.32: 1, 5.38).

Bear tooth pendants were mostly documented on the upper part of the body, near the head or over the chest. Both carving and drilling methods have been used to perforate bear teeth, but a pair of third maxillary incisors had a deep groove around the root (Fig. 5.32: 1). Perforations on bear teeth were often very smooth and shiny, indicating their heavy use and possible curation. Most of burials with bear teeth are located in the western part of the cemetery (Fig. 5.17). The dated burials with bear teeth (122, 153 and 300) fall into the period between the mid 6th and mid 5th millennium cal BC (Zagorska 2006a; Zagorska et. al. 2018). A few bear bone fragments have been identified in the faunal assemblage from the Zvejnieki II settlement site (Lõugas 2006: 77).

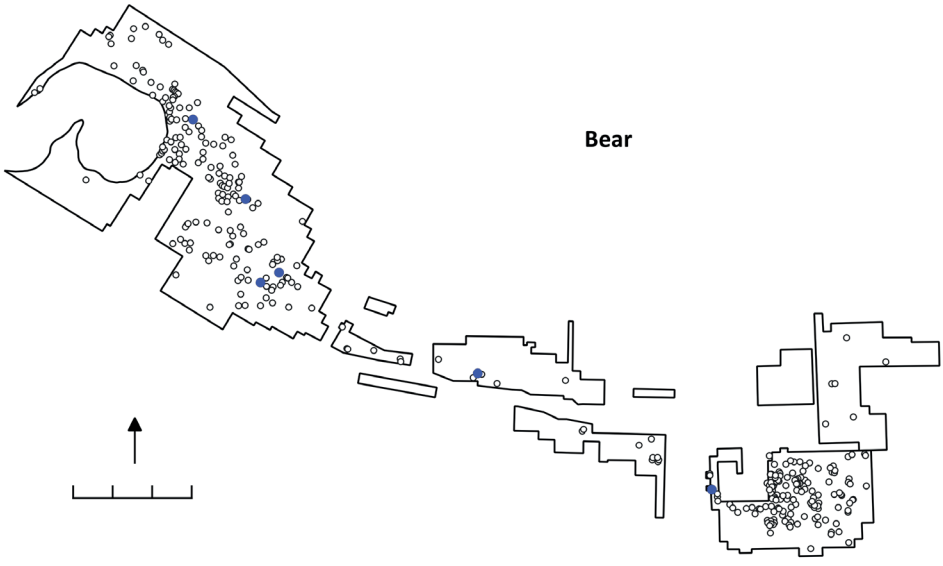


Figure 5.17. Burials at Zvejnieki with bear teeth. Scale bar is 30 m. Map: K. Nordqvist.

Table 5.10. Bear teeth from Zvejnieki burials. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
62	indet.	C			1	1	outside left elbow	drilling?	heavily restored root
122/ 123	M+ indet.	A + C	12	1		3	legs, between child's knees	carving, drilling, notch	some teeth from same individual; heavy tooth wear
153	M	C	4			1	head	carving	
158	M	A	1			1	left shoulder	carving	
190	indet.	C	2	1	1	1	chest	drilling, carving, grinding	canine of a young animal
300	M	A	2			1	head	carving	heavy tooth wear; smooth perforation hole

5.4.4. Bear at Skateholm

The only burial where bear remains can be securely linked to the deceased is Burial 41 at Skateholm I, where an adult and a child were buried together. Two perforated bear canines were found on the chest of a child together with amber pendants (Larsson 1988a). A few more bear bones were recorded in the grave fill of Burial 33 at Skateholm I and Burial X at Skateholm II and cannot be directly associated with human remains. Only two more fragments of bear bones were documented from the settlement layers at Skateholm I (Jonsson 1988: 68).

5.4.5. Bear at Sakhtysh

Bear remains are among the most numerous faunal remains in the Sakhtysh complex. Bear bones have been documented in burials at Sakhtysh I, II, IIa and VIII, the ritual activity areas and the cultural layers of the settlement. At the Sakhtysh I cemetery two bear mandibles were deposited by the right upper arm of Burial 7. Remains from paws and canines were documented in Burials 2 and 5. A considerable number of bear bones were scattered around bear mandibles, which were lying to the southeast of Burial 2 (Костылёва & Уткин 2010: 13, Fig. 5). A bear skull and burnt bird bones were documented from a ritual pit, the so-called "sanctuary" at Sakhtysh VIII (Костылёва & Уткин 2010: 62). However, none of these remains were available for my investigation. Several flint figurines have been found at Sakhtysh, representing a bear or a bear-human in a standing position (Fig. 5.18) (Крайнов 1988; Ошибкина et al. 1992; Костылёва & Уткин 1994; Уткин & Костылёва 1996a). Several baculum bones of a bear (some with a perforation, see Fig. 5.19: 1) have been excavated at the

Sakhtysh sites and, as suggested by experiments, this bone was used for decorating pottery (Костылёва & Калинина 2002). The osteological analysis of faunal material from the settlement layers at Sakhtysh I and II from the 1963 and 1964 excavation seasons shows that bear constitutes the fourth and fifth most common species, respectively, in the faunal assemblages (Цалкин 1963, 1964).

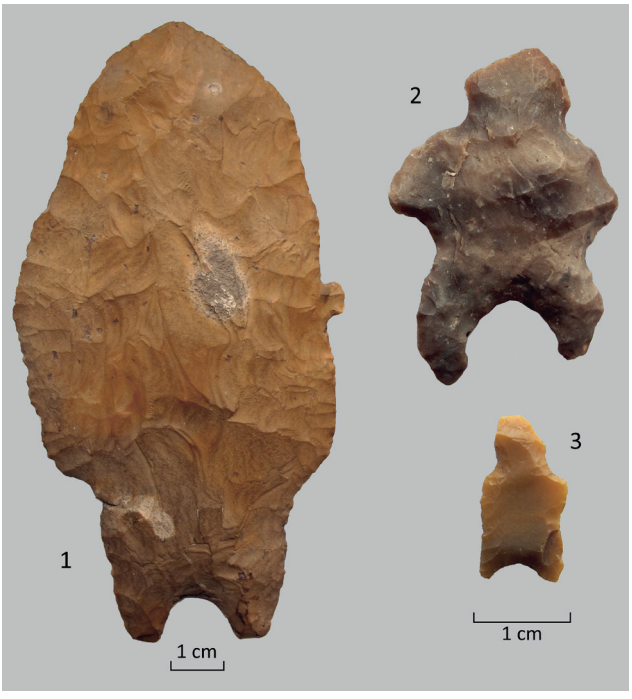


Figure 5.18. Figurines in flint from the Sakhtysh sites depicting a bear or bear-human from the Sakhtysh IIa (1, 2) and Sakhtysh II (3) settlements. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

Figure 5.19. Baculum bone of a bear with perforation (1, Sakhtysh II settlement) used for pottery decoration (2, Sakhtysh I settlement). By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

Bear remains at the Sakhtysh II cemetery were documented in three Volosovo burials (Table 5.11, Fig. 5.20). All teeth registered at Sakhtysh II are incisors (20), mainly upper incisors. Bear teeth were found in association with three individuals in multiple Burial 15, and one of these (15/VII) also had a fragment of a bear mandibula deposited by the skull. Four women had been adorned with bear teeth, as well as one child, and in one case the sex has not been determined.

Bear teeth are mainly associated with the lower legs of the buried individuals and with the knee area in particular. All bear tooth pendants have been perforated by the drilling technique, even though most of the teeth from Burial 15 are in poor condition or broken. The bear tooth pendants from Burial 18 have been made in the same manner, the drilled hole located more towards the middle of the root (Fig. 5.12: 4). Tooth pendants from other animal species were recorded from multiple Burial 15 and single Burial 18. A pendant made of a maxillary incisor of bear from Burial 18 has been dated to the mid 4th millennium cal BC (Macāne et al. 2019).

Bear remains were also encountered in several hoards and areas of ritual activities. Hoard 9 was a charcoal-rich feature containing a few sherds of Volosovo pottery, several lithic artefacts and a poorly preserved mandibular canine of a bear. The canine was dated to the mid 4th millennium cal BC (Macāne et al. 2019). Bear paws were documented in Hoards 1 and 10, lying in anatomically correct order in the upper part of the pit, possibly covering the pit (Костылёва & Уткин 2010: 30). In Hoard 10 several bear bones and a bear canine with notches were found together with flint artefacts. All of the items showed traces of fire (Крайнов & Костылёва 1985*)*. Two bear bones from Hoard 10 were taken for radiocarbon dating but did not provide a sufficient amount of collagen.

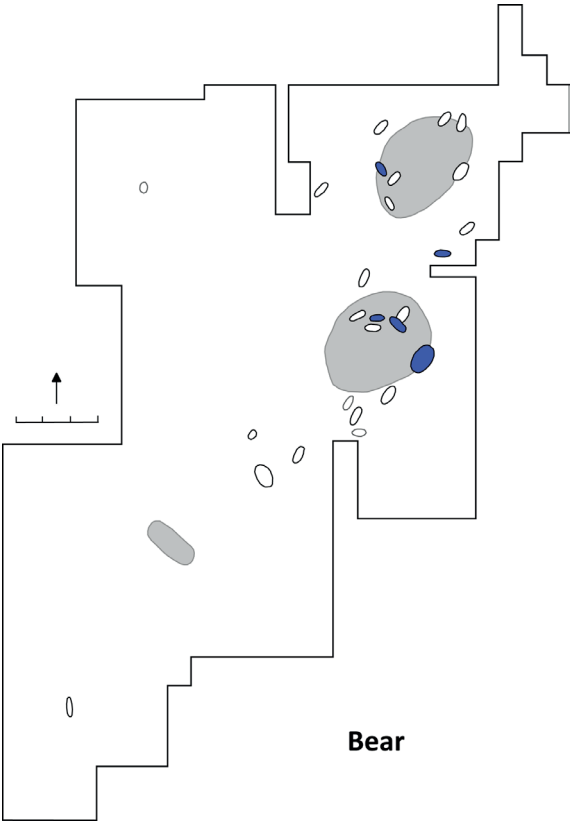


Figure. 5.20. Burials including bear remains at Sakhtysh II. Scale bar is 6 m. Map: K. Nordqvist.

Several bear bones were found in the so-called "sanctuary". In a pit measuring about a metre across, filled with charcoal-rich soil, the split skull of a bear, and mandibulae and pelvic bones of an old and a young bear were discovered at a depth of 45 cm. Next to the skull lay an unfinished artefact made from an elk antler (Костылёва & Уткин 2010: 27). In addition, bear tooth pendants were documented from the settlement layers, including eight third maxillary incisors, two canines and one molar (Macāne 2017).

Table 5.11. Bear remains at Sakhtysh II and IIa. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP C	NISP M	MNI	Location	Modification	Comments
6	indet.	A	1			1	pelvis	drilling	only 1 bear tooth was available for my study
15/ I	F	A	1			1	by right knee or chest	broken	location of tooth not completely clear, in report pendants from carnivores marked as found by right knee and chest
15/ II	indet.	C	6			2	upper thighs, pelvis	drilling	
15/ III	F	A	1			1	upper thighs	drilling	
15/ VII	F	A				1	head	no	half of adult bear mandibula by skull
18	F	A	11			5	by knees, dismembered arm	drilling	same manner of perforation, the drilled hole located more towards the middle of the root; prone position, dismembered body; 2 hearths above burial, disturbed
7b	M	A	15		1	4	by right femur & left tibia	drilling	very smooth perforation hole
19	F	?	3			1	under chest	drilling	disturbed burial; all bear teeth from the same(?) animal
23	F	A	2			2	head	drilling	
24	F?	A	2			1	head	drilling	
27	F	A	1			1	chest	drilling	disturbed burial

Grave no.	Sex	Age	NISP I	NISP C	NISP M	MNI	Location	Modi-fication	Comments
32	M	?		1		1	chest	broken root end	double burial; unclear to which individual the tooth pendants belong
34	M	M	1		1	1	by left elbow	drilling	
37	F	A	3			1	head, pelvis	drilling	double burial, disturbed; unclear with which individual tooth pendants associated; in report bone and tooth pendants associated with lower individual B
39	M	A		1		1	?	no	unmodified bear canine
56	M	A	1			1	legs	drilling	
57	F	A	1			1	pelvis	drilling	2 drilled holes
63	indet.	C	5			2	pelvis	drilling	very smooth perforation holes

At the Sakhtysh IIa cemetery, bear teeth have been documented from one Lyalovo burial and 15 Volosovo burials (Fig. 5.21, Table 5.11). Only in the case of 12 burials could bear teeth be securely associated with the deceased. In the Volosovo graves bear teeth number 43, although only 38 come from secure contexts. Some burials (2, 21 and 38) were too heavily disturbed to permit a precise assessment of the position of the teeth, and some of the bear teeth came from the fill. One maxillary incisor of a bear together with a badger tooth fragment were identified in the fill of Lyalovo Burial 43, that of a child aged 5–6 years. Both of these teeth had notches at the root end. Bear incisors are mentioned by the excavators as having been found on the forehead of the man buried in Burial 28 (Костылёва & Уткин 2010), but these were not available for analysis.

The majority of teeth from secure contexts are incisors from the upper and lower jaw (Fig. 5.22). There are also a few molars and unmodified canines. The data from Sakhtysh IIa show that mainly young adults of both sexes were adorned with bear tooth pendants. Five men and six women were given bear teeth, and in one case the sex was indeterminate. The locations of bear teeth include all parts of the body – the head, torso, pelvis and legs.

Most pendants have drilled perforations. In a few cases, notches have also been cut at the end of the root, but these teeth come from insecure contexts. In Burial 7b most of the perforations have been manufactured in a similar way, suggesting that they might have been made at the same time and worn during the person's lifetime.

The perforations are very smooth, and one side of the root is much thinner, possibly indicating the place where the thread would have been attached, as illustrated in Figure 5.23. The bear teeth from Burial 2 (Fig 5.22: 4), showed different modification techniques. One of incisors had a drilled hole, which has broken, and a new drilled hole has been initiated but not finished. Another pendant was made from a bear molar with notches at root end. In Burial 39 an unmodified canine of a bear was found.

In the course of this study, three burials with bear tooth pendants have been dated (burials 7b, 19 and 63), providing nearly coeval dates falling in the mid 4th millennium cal BC (see Macāne et al. 2019). Bear bones were also identified at the so-called "sanctuary" at Sakhtysh IIa together with bones of elk, beaver and pine marten, a Volosovo type vessel *in situ* and a mask made from an elk antler (Fig. 11.11) (Костылёва & Уткин 2010: 49). Furthermore, 55 bear tooth pendants were studied from the settlement cultural layers at Sakhtysh IIa (Macāne 2017). Most had a drilled perforation. Mainly incisors, particularly third maxillary incisors, were used for pendants, although a few perforated canines and third mandibular molars were also documented. In several areas of the settlement bear paws have also been documented (Костылёва & Уткин 2010).

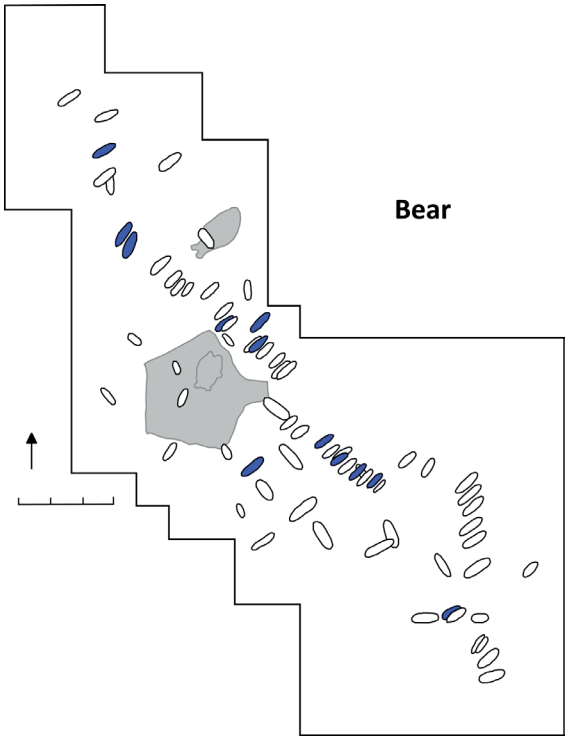


Figure 5.21. Distribution of burials with bear teeth at Sakhtysh IIa. Scale bar is 6 m. Map: K. Nordqvist.

5.4.6. Discussion

The investigated sites differ markedly in the number of bear remains. Pendants made from bear teeth are the most numerous from the Sakhtysh burials, including 58 items. At Zvejnieki, six burials had bear tooth pendants, with 25 specimens in total, but at Skateholm only two bear canines were documented, deriving from one burial. Mainly

Figure 5.22. Drilling is the most common perforation technique, as evidenced by bear tooth pendants from burials at Sakhtysh IIa: Burial 19 (3), Burial 34 (2) and Burial 37 (1). In Burial 2 (4), one tooth had notches, one had a drilled perforation and one had an unfinished drilling, all from a mixed context. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

Figure 5.23. Bear tooth pendants from Burial 7b at Sakhtysh IIa were made not only from incisors but also from a molar. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

incisors have been turned into pendants, although in a few cases canines and molars were also used. Drilling is the most common perforation technique at Sakhtysh, while at Zvejnieki both drilling and carving have been used to make holes. At Sakhtysh, bear teeth mainly occur in adult burials. At Zvejnieki, pendants made from bear teeth were found in several child burials and double burials of an adult and a child, similarly as at Skateholm. The position of the bear teeth, when mentioned, suggests that bear teeth were mainly found in the region of the pelvis and upper thighs at Sakhtysh, while at Zvejnieki they are mostly documented on the upper body, near the head or over the chest. The largest number of bear teeth, documented for Burial 7b at Sakhtysh IIa, were found on both sides of the legs of the deceased and have been interpreted as being sewn onto the clothing (Костылёва & Уткин 2010: 46). Unmodified bear canines can be considered as a particular category of finds at Sakhtysh IIa, placed with the deceased as a special deposit (possibly in the role of amulets). All burials with bear teeth at Zvejnieki had a rich grave inventory containing numerous other pendants from other animal species, while at Sakhtysh bear teeth were in few cases the only items placed with the deceased.

The reasons for regional differences may be sought in the different ecological settings, chronology and cultural background of the studied sites. The available radiocarbon datings indicate that burials with bear remains at Zvejnieki relate to the late 6th and early 5th millennium cal BC, which partly corresponds to the dates of the Skateholm burials. The bear remains in burials at Sakhtysh have been dated to the mid 4th millennium cal BC. The forested areas around Sakhtysh and in northern Latvia were more suitable for bears than the Scanian seacoast. The occurrence of bear tooth pendants with just one burial at Skateholm can be possibly linked to the hunting pressure this species suffered towards the later part of the Ertebølle period (Aaris-Sørensen 1980, 1988), since very few bear remains have likewise been identified from the settlement cultural layers (Jonsson 1988). The bear tooth pendants and a few bone fragments at the settlement site demonstrate that bear was present in the vicinity of Zvejnieki (Lõugas 2006), while bear bones and teeth have been found in abundance at the Sakhtysh sites (Цалкин 1963, 1964; Macāne 2017).

In addition to burials, the bear remains are prominent also at settlements and ritual activity areas. Finds of bear paws at Sakhtysh II are particularly distinctive, since in several ritual hoards they were placed above accumulations of flint artefacts so as to have covered them and some of them show traces of fire. Bear paws, canines and mandibles were also deposited above the skeletons at Sakhtysh I (Костылёва & Уткин 2010: 13). The placement of bear mandibles or other body parts in burials is a common trait in the distribution area of the Volosovo Culture in general (Костылёва & Уткин 2010; see also Ошибкина 2017: 36 for earlier examples). Bear bones found in a pit at Sakhtysh II have even been suggested as representing a possible bear burial and bear cult (Крайнов 1988; Костылёва & Уткин 2010: 27). In addition, numerous representations of bear in various materials suggest that bear had a particular role in the ritual practices and cosmology of Volosovo hunter-gatherers. The symbolic significance of bear claws as amulets has also been suggested for bear paws documented at

the Pitted Ware sites in Sweden (Magnell 2019: 171, accepted; Klassen et al. 2020). All this indicates that the importance of bears increased in Northern Europe during the 4th millennium cal BC.

The bear, with its human-like characteristics, has held an important place in the conceptual world of many northern hunter-gatherer communities. Various rituals, rules and practices regulating the relationship with the bear are illustrated by the archaeological and historical record throughout the circumpolar region (Hallowell 1926; Zachrisson & Iregren 1974; Jordan 2003; Pentikäinen 2007; Willerslev 2007; Piludu 2019; Herva & Lahelma 2020; see also Chapter 11 for further discussion). For example, for the Saami, bears were sacred animals, and bear body parts had to be handled with care and following well-established routines and rules, showing similarities between human and bear burial arrangements (Zachrisson & Iregren 1974; Schanche 2000; Jennbert 2003). Likewise, until recently, the Mansi of western Siberia brought certain bear bones, including skulls and mandibles, to certain sacred places in the landscape (Косинцев 2000, 2016). Since bear cult and the practice of burying bears are widespread phenomena among circumpolar communities, it cannot be ruled out that some of the bear bone deposits documented at hunter-gatherer burial sites in central European Russia (Крайнов 1988; Костылёва & Уткин 2010; Костылёва 2018) actually represent bear burials.

The bear's high place in the cosmology and mythology of circumpolar hunter-gatherers can be explained in part by its appearance and character. One of the largest and most powerful animals in the northern forests – often referred to as the "king of the forest" – the bear has practically no natural enemies other than human. Furthermore, the similarities between human and bear have provided the basis for developing a special relationship with these animals. Based on the studies assemblages, there are changes in the frequency of bear remains. Whether this is the result of the prevalence of the bear at different times and in different areas cannot be fully resolved, but it is clear that the bear was symbolically significant and closely connected to the lives of hunter-gatherers of the 4th millennium cal BC.

5.5. Badger

The European badger *(Meles meles)* belongs to the Mustelidae family, which is the largest and most diverse family in the order Carnivora. There are 59 species belonging to 22 genera, which include polecats, stoats, weasels, martens, otters, badgers and, the largest of all, wolverines (Berkovitz & Shellis 2018: 283). The 11 species of badger are subdivided into four subfamilies. The European badger and four other species belong to the Melinae (Berkovitz & Shellis 2018: 286). The distribution area of the European badger covers nearly all of Europe. In the east, the Volga River and the northern Caucasus has been suggested as the boundary zone between the European and Asian badger species (Baryshnikov et al. 2002; IUCN 2021).

5.5.1. Biological characteristics and other properties

Appearance and morphology

The badger is one of the largest members of the Mustelidae. It has a massive body, with a narrow front and wider rear part. The head is elongated, with a narrow muzzle and small ears. The fingers are long and adapted for digging, while the legs are short, with wide feet. The length of the body may reach 60–90 cm, the tail length reaching 15–25 cm. In summer, their body weight is 7–13 kg, while in winter they can exceed 20 kg. Males are usually larger than females (Siliņš 1984: 54), but food availability directly affects variation in badger size (Virgós et al. 2011).

Badgers have well-developed hearing and sense of smell, which is used to find food. The fur is bristly and rough. Badgers, and likewise ferrets, have black and white fur on the head, the dark lines continuing over the whole body (Fig. 5.24). The rest of the body is covered with thick fur, grey-brown in colour. In the wild, badgers can live up to 15 years, but the average lifespan is between 5 and 8 years. The footprint of the badger resembles that of a bear, only in miniature (Siliņš 1984: 54). The badger may also spread diseases, such as livestock tuberculosis (Lindström 2001: 183).

Habitats and diet

Badgers are sedentary animals, and their preferred habitats are located near the edge of mixed or deciduous woodland. They also like coniferous forest, especially glades and forest margins, where they make seasonal trips especially during late summer and autumn to eat berries (Lindström 2001: 88). When moving around, badgers make paths which they use regularly. Badgers move within areas about 400–1000 m from their dens, known as setts, which are dug into well-drained, sandy slopes. Sometimes burrow systems with several storeys may be constructed, suitable for several families (Siliņš 1984: 56).

Badgers are not typical hibernators, but during the winter they mostly stay in the den. If the weather is very cold, they may sleep for up to 5–6 months (Lindström 2001: 80). Before the winter, badgers collect moss and dry grass, which they put in the sleeping chambers, and when it starts to decay the microorganisms also serve to provide heat (Lindström 2001: 79). Badgers are very clean animals and take care of their setts, which are cleaned twice a year – in spring, before mating, and in autumn, before hibernation.

Badgers are generalists and easily adapt to various biotopes. European badgers eat mostly plant foods, such as berries, grasses and fruits, as well as invertebrates such as snails, frogs and insects, but they will also prey on young rabbits, rodents, birds and hedgehogs (Berkovitz & Shellis 2018: 286). Especially after their winter sleep, badgers prefer to eat earthworms to obtain proteins and restore their body and energy (Lindström 2001: 147). Badgers turn up vegetation in the search for food and dig funnel-shaped pits. By their digging activities, badgers regulate soil moisture and improve aeration, as well as exterminating bugs and other insects that could endanger vegetation (Lindström 2001: 183).

Figure 5.24. Badger has black and white fur on the head, the central white line continuing along the whole of the back. Photo: A. Jesko.

Social relations and reproduction

Badgers are monogamous animals and form pairs that stay together for several years. In areas with a suitable and rich biotope, badgers can form groups of mixed age and sex, consisting of two to 25 individuals (Jonsson 1988: 66; Da Silva et al. 1993: 558; Lindström 2001: 94). Badger males reach sexual maturity at the age of three, and females during their second year. The mating period is in spring (end of March–May, sometimes even later), and 2–3 cubs are born while the mother is in the winter den, around February–March. Badger cubs stay in the sett for the first six weeks and start to follow their mothers at the age of three months. The cubs may stay with their mother for at least one more winter before they move out of the den (Jonsson 1988: 66; Lindström 2001: 79).

The badger is mainly a nocturnal animal, active in the evenings. In undisturbed areas they may engage also in daylight activities (Neal 1977: 48, 72, 127). Badgers may become prey to wolf, lynx and also dogs). Badgers may bluff and pretend to be dead in case of attack, or puff up their coat to scare the attacker (Lindström 2001: 100, 104).

5.5.2. Badger remains in hunter-gatherer contexts in north-eastern Europe

Badger remains show low numbers in faunal assemblages from hunter-gatherer sites in north-eastern Europe (Zagorska 1992; Magnell 2006; Girininkas & Daugnora 2013; Lõugas 2017; Ukkonen & Mannermaa 2017). Usually, they do not exceed 1–2% (e.g. Лозе 1979: 114, Table 22), but in some cases larger numbers of bones have been identified (Жилин 2004; Lõugas 2017). A find of a badger skull with articulated mandible from the site Kanaljorden in Sweden indicate ritual activities with badger remains during the Mesolithic (Gummensson et al. 2018; Hallgren et al. 2021).

5.5.3. Badger at Zvejnieki

In total 62 badger canines were identified at Zvejnieki. Fifty-eight of them are from secure contexts and were found in ten graves (Fig. 5.25, Table 5.12). In four cases

they come from mixed contexts or from grave fills (Burials 132, 167, 254/255 and 299). Most burials with badger tooth pendants are single graves, except for the double Burial 122/123 and multiple Burial 242–245. More often, it was men who were adorned with badger teeth. Badger teeth were documented only from two women's and two children's burials.

In nearly all cases (except Burial 244), badger teeth come from burials with an abundant inventory of other animal tooth pendants, particularly other carnivore teeth. The largest number of badger teeth comes from the richly adorned juvenile Burial 153 (Fig. 5.11), where 26 badger canines were identified, deriving from at least seven individuals. In Burial 146, a whole set of badger canines, most likely from one individual, was documented behind the head. The location of badger teeth in relation to the body shows that the majority of teeth come from the head area. All badger teeth have carved perforations.

The few datings obtained from burials with badger remains (122, 153 and 300) indicate the mid 6th to mid 5th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). No other badger remains have been identified at Zvejnieki cemetery. Few badger bones have been reported in a summarized table of badger bones identified at Latvian Stone Age sites belonging to the 6th and 5th millennium cal BC, the Late Mesolithic–Early Neolithic according to local periodization (Zagorska 1992; Lõugas 2006).

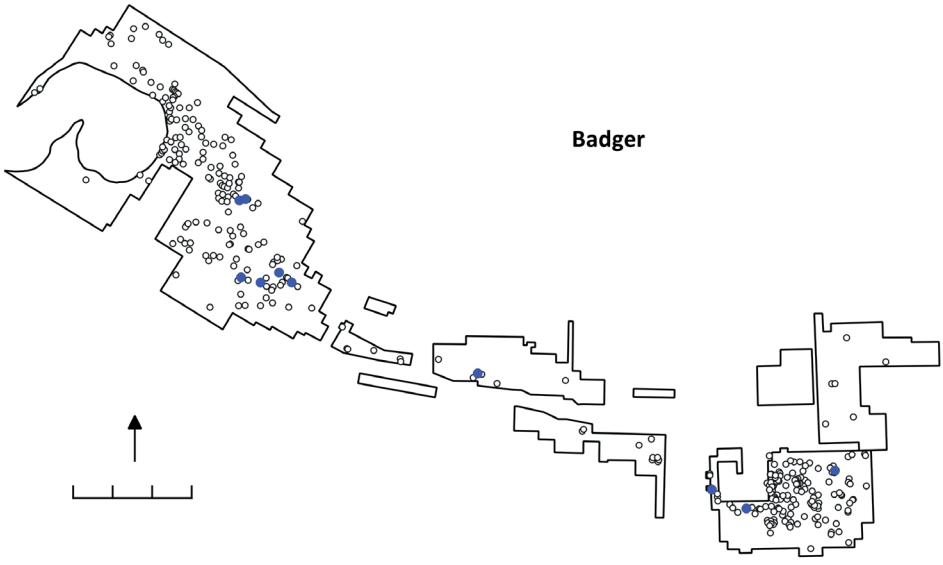


Figure 5.25. Burials with badger teeth at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

Table 5.12. Badger teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
121	F	A	1	1	chest	carving	
122/ 123	M+ indet.	A + C	11	4	feet, above adult's pelvis	carving, polishing	some teeth come from the same animal individuals
146	F	A	5	2	around head	carving	whole set of badger upper and lower canines from the same animal
153	M	C	26	7	around head	carving	some canines from the same animal
158	M	A	3	1	chest	carving	
165	M	A	1	1	chest	carving	
190	indet.	C	2	2	outside right & left femur	carving, polishing	
244	M	A	1	1	between the legs	carving	
290	indet.	C	1	1	by knees	carving	
300	M	A	7	3	head	carving	perforation holes very smooth

5.5.4. Badger at Sakhtysh

Twenty-eight badger canines have been identified with two burials at Sakhtysh II (Table 5.13). In the case of multiple Burial 15, badger tooth pendants were recorded in connection with three individuals, and two teeth could not be associated with any particular individual. Only canines, mostly upper canines, were documented, but more detailed data could not be obtained, since identification was performed from photos.

Based on the available data, badger tooth pendants were more often provided as adornments for women (in three cases). In one case the burial was that of a child, and in another the sex was indeterminate. Tooth pendants from other species were documented in the same burials, as well as amber ornaments and bone beads and figurines. According to the available excavation documentation, badger teeth were associated with the lower body – between the pelvis and the feet. All of the badger tooth pendants have been perforated by the drilling technique. Even if the preservation of the teeth in the case of Burial 15 is very poor, and most of the perforations are broken, it seems that the holes were made by drilling. In Burial 18 all of the tooth pendants have been made in a similar manner (see Fig. 5.12: 1).

Table 5.13. Badger remains at Sakhtysh II and IIa. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
15/ I	F	A	3		right knee or chest	drilling	determination from photos; very poor preservation
15/ II	indet.	C	5		upper thighs, pelvis	drilling	2 tooth pendants missing; determination from photos; very poor preservation
15/ III	F	A	4		upper thighs	drilling	determination from photos; very poor preservation
15/ I–III?	?	?	2		feet	drilling	tooth pendants not clearly associated with any of individuals I–III; very poor preservation
18	F	A	14	2	by dismembered arm, pelvis	drilling	finds in small accumulations, one by dismembered arm, another by pelvis
19	F	A?	1	1	chest	drilling	
24	F?	A	1	1	head	drilling	
27	F	A	1	1	chest	drilling	
56	M	A	1	1	legs	notches	
63	indet.	C	7	4	pelvis	drilling	smooth perforation holes

Badger bones were also identified in ritual Hoard 11 (a pit containing various bone and lithic artefacts and bones of beaver, bear and marten), which was located further away from the central part of Sakhtysh II cemetery and is associated with the so-called "ritual platform" (Костылёва & Уткин 2010: 24). Numerous badger bones were found in this pit, coming from at least four animals. Many bones were complete, while some were fragmentary, including limb bones, nearly the whole of the spinal column and other body parts. A thoracic vertebra from a badger in the hoard has been dated to the late 4th millennium cal BC (Macāne et al. 2019). This deposit was the only one (among all 14 Hoards at Sakhtysh II) covered with red ochre and without traces of fire. There exists no good osteological overview of the Sakhtysh sites, and in the early excavations few badger bones were identified (Цалкин 1963, 1964).

There are 13 badger canine pendants from six Volosovo burials at the Sakhtysh IIa cemetery (Table 5.13, Fig. 5.26). However, only 11 teeth from five burials can be associated with the skeleton level. In Lyalovo Burial 43, a badger canine with notches comes from the fill. In addition, badger teeth were found in the grave fill of Burial 62 (one tooth had no visible modification traces, and another had notches); they are therefore not included in the statistics. Based on available information, three women, one man and a juvenile were given badger tooth ornaments.

Tooth pendants from other animal species, most commonly bear teeth, as well as stone and bone (Fig 5.15: 1) pendants have been documented in the same burials as

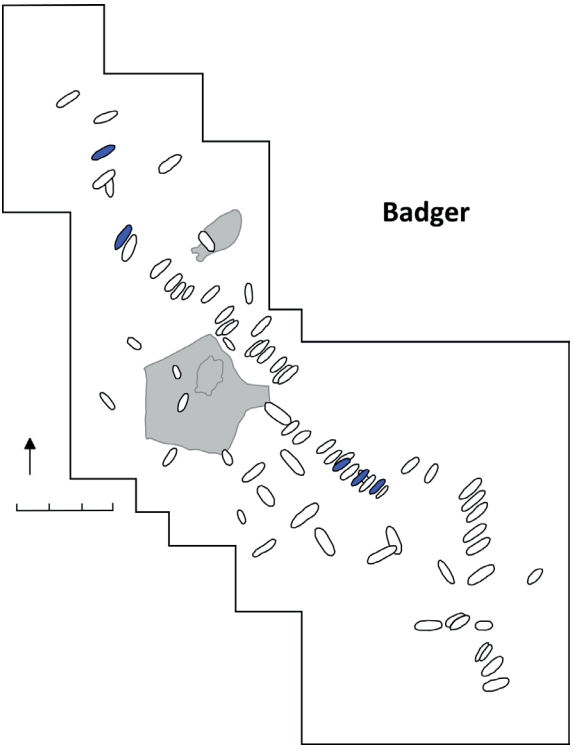


Figure 5.26. Burials with badger tooth pendants at Sakhtysh IIa. Scale bar is 6 m. Map: K. Nordqvist.

badger teeth. The largest number of badger canines comes from the adolescent Burial 63 (Fig 5.15: 5), which was one of the richest in terms of animal tooth pendants in the whole cemetery. Drilling is the most common type of perforation, although notches were observed in the case of Burial 56.

5.5.5. Discussion

Badger remains from the studied sites show diversity in the encountered body parts as well as their find contexts. At Zvejnieki, only badger canines were found in burials, while the faunal assemblages at Sakhtysh show a much wider variety of badger remains encountered in settlement, ritual and funerary contexts. Badger remains have not been documented in graves at Skateholm, but occur among the animal bones from the settlements Skateholm I and II (Jonsson 1988).

All badger teeth had carved perforations at Zvejnieki, while drilling and notches were observed on badger canines at Sakhtysh. At Zvejnieki, men have more often been adorned with badger teeth, while at Sakhtysh they were found in burials of women. The location of badger teeth in the head area at Zvejnieki indicates their use in some kind of head decoration. At Sakhtysh, the location data is partially inaccurate but indicates that badger tooth pendants were found near the upper thighs or by the feet at Sakhtysh II and possibly formed some kind of decoration for the lower part of the body. At Sakhtysh IIa, some badger teeth were also found on the chest and by head. Very often, badger canines have been found in association with other carnivore tooth pendants at Zvejnieki, and all of the badger teeth come from richly furnished burials (Fig. 5.32). Also at Sakhtysh, pendants from badger teeth are found together with other ornaments from animal teeth, stone or bone.

In the previous publications (Костылёва & Уткин 2010; Костылёва 2018), practically no badger teeth are mentioned in graves at Sakhtysh IIa and have been included under the category "teeth of a carnivore". During this study, numerous badger teeth and bones were identified from burials and ritual activity areas, especially at Sakhtysh II. In fact, the number of badger tooth pendants exceeds that of all other animal species

at the Sakhtysh II cemetery, and they are second most common after bear teeth at Sakhtysh IIa. The special role of badger for the Volosovo groups is further illustrated by Hoard 11 at Sakhtysh II. A deposit covered with red ochre contained numerous badger body parts along with other bone and stone implements. This particular deposition of badger remains, perhaps even a burial of a badger, resembles the treatment of bear bones found in hoards and areas of ritual activities near burials at Sakhtysh II. Ritual depositions of a skull of a badger along with mandibles and other bones of bear from the site Kanaljorden may also indicate a connection between badger and bear (Gummesson et al. 2019; Hallgren et al. 2021).

Badger remains are common in the early phase (8th–7th millennium cal BC) burials at Zvejnieki, and osteological analysis of the Zvejnieki II settlement indicated no badger bones at all (Lõugas 2006: 77). A few bone finds in settlement layers at Skateholm indicate that humans were hunting this species (Jonsson 1988: 65) but the absence of badger remains in graves perhaps reflects a low interest and a preference for other animal species when making ornaments and tools. In the Zvejnieki burials, badger remains increase starting from the mid 6th millennium cal BC and are extremely abundant in the Sakhtysh burials and ritual hoards of the mid–late 4th millennium cal BC.

The studied badger remains reflect the general trend of increasing importance of carnivores over time. Badgers would have been important animals for their distinctive pelts, rather large quantity of meat, as well as their ability to accumulate fat that could be used for a variety of purposes. Furthermore, their appearance and habits, in many respects reminiscent of bears, may at least partially explain their numerous presence in Sakhtysh and Zvejnieki and the importance of this companion species.

5.6. Pine marten

European pine marten *(Martes martes)* belongs to the genus *Martes* in the subfamily of Guloninae of the Mustelidae family. This species is native and widespread in the northern parts of Europe and also in Central and Northern Asia (Ruiz-Gonzalez et al. 2013). In north-eastern Europe, the distribution range of European pine marten during the Stone Age could have been sympatric with that of the sable *(Martes zibellina)* (Гасилин & Саблин 2013). The distribution range of the beech (stone) marten *(Martes foina)* can also include Baltic States and Denmark, but it is more common in central and southern parts of Europe, and Central Asia (IUCN 2021).

5.6.1. Biological characteristics and other properties

Appearance and morphology

The European pine marten is a small animal with a long, fluffy tail, which may reach half of the body length. Its body is slender and strong, with short legs. The length reaches 40–55 cm, while the weight is up to 2 kg. The male is larger than the female and may take larger prey (Latvijas Daba 2021).

Marten fur is thick and long in winter, the colour varying from reddish brown to chestnut brown, the belly and back usually a darker shade, while the collar area

Figure 5.27. Pine marten is a highly efficient predator and has one of the best quality pelts in the boreal forests. Photo: A. Jesko.

is usually lighter (Fig. 5.27). The summer coat is thinner and lighter in colour, and is changed in May (June) and October. The maximum life expectancy is eight years (Siliņš 1984: 63, 67).

Habitats and diet

Old coniferous forest is the preferred habitat for martens, where they choose extremely covered arboreal resting sites (Ruiz-Gonzalez et al. 2013). They try to avoid clearings and open areas, since these do not offer possibilities to hide or escape (Lindström 2001: 78). Martens spend most of their life in the forest canopy but also hunt on the ground. Among all the mustelids, martens are the best adapted to arboreal life. The pine marten may have its nest in a hollow tree or under a boulder (Jonsson 1988: 66), but old squirrel nests may also be re-used (Lindström 2001: 101). When the temperature falls, the marten goes into an underground den. If the temperature falls to -5 degrees °C, the marten stays in the den also during the daytime (Lindström 2001: 72).

The European pine marten is a rather specialized hunter, squirrels and voles comprise the most preferred prey. Its diet depends on the season, the inhabited territory and available food resources. During the winter, the diet is dominated by small mammals, and is complemented with birds, lizards and fish during spring and early summer, while various insects and beetles become important during the summer. During late summer and autumn, various berries and fruits became a more crucial part of the diet. The marten, as well as other small carnivores, such as the weasel and ermine, have no possibility to store fat and extra energy, so instead they make caches consisting of eggs and small rodents, reserving food for the winter (Siliņš 1984: 66).

Social relations and reproduction

Martens are quite solitary animals for most of the year, except when females have their young. The female reaches maturity in the second year of its life and gives birth in the third year. The reproductivity is quite low, and hunting pressure may affect this species badly. Mating takes place in summer, and between 2–5 kits (maximum: 7) are born in the nest, during March–April. The marten keeps its babies in the den for at least two months to protect them from predators (Lindström 2001: 101). They spend the day sleeping in the nest and become active in the evenings (Pereboom et al.

2008: 986). Martens do not have many natural enemies, but occasionally foxes may attack martens (Siliņš 1984: 66).

5.6.2. Marten remains in hunter-gatherer contexts in north-eastern Europe

Marten bones are commonly found at most sites in the forest zone of north-eastern Europe (Жилин 2004; Trolle 2013; Vang Petersen 2013; Lõugas 2017; Ukkonen & Mannermaa 2017). In many cases, marten is the most common animal species among the carnivores at Stone Age sites in the Eastern Baltic and the forest zone of western Russia. For example, at the Stanovoye 4 site (the Mesolithic habitation phase) marten is the third most common species in the faunal assemblage, after elk and beaver, and comprises 6.3% (Жилин 2004: 40), while at Ivanovskoye 7 in the Volga–Oka interfluve, pine marten bones are more numerous than those of all other fur-bearing animal species together (Жилин 2014: 54, Table 2). Numerous marten remains were identified also at the Kääpa site in south-eastern Estonia and Zvidze in eastern Latvia well as the sites Ringkloster, Agernæs and Tybrind Vig in Denmark (Лозе 1979: 114, Table 22; Richter 2005; Lõugas 2006: 78, 2017: Table 1; Trolle 2013), demonstrating increasing occurrence of marten remains in the 6th–5th millennium cal BC (Late Mesolithic and Early Neolithic). Signs of skinning have commonly been documented on marten bones, indicating that they were hunted for fur. In the faunal material from the Agernæs site, cut marks were observed on many bones, also showing a preference for selective hunting of older male individuals (Richter & Noe-Nygaard 2003: 26). There is also a rich assemblage of perforated and unmodified marten mandibles from the settlement layers at the Volosovo period sites of central European Russia (Macāne 2017). Pendants made from marten long bones are known from Stanovoye 4 (Жилин 2019).

Marten mandibles and skulls, as well as canines, are commonly found in hunter-gatherer burial contexts in north-eastern Europe. Most numerous are marten mandibles, often with perforation holes, recorded, for instance, at Vedbæk, Tågerup, Kreiči, Dudka, Tamula and Kubenino cemeteries (Фосс 1938; Kjällquist 2001: 50; Richter 2005; Kriiska et al. 2007, Fig. 10; Gumiński 2014; Ahola et al. 2020; Macāne & Nordqvist 2021). Pendants made from marten teeth are scarce. For example, in Burial 20 at the Minino site in north-western Russia dozens of perforated marten canines were found in the head area of the buried woman (Суворов 2001: 10). Pendants made from marten teeth were also documented at Tamula and the settlement Ageröd I:HC in Sweden (Larsson 1978; Kriiska et al. 2007). Marten bones were also identified in pits located by burials at the Peschanitsa cemetery (Oshibkina 2008: 58).

5.6.3. Marten at Zvejnieki

Out of a total of 73 marten canines, 67 finds are recorded from 18 burials at the Zvejnieki cemetery that can be securely associated with the skeleton (Table 5.14, Fig. 5.28). Six teeth found with four burials (60, 62, 167 and 319) come from the grave fill or mixed context. Pine marten canines have mainly been recorded in single graves, primarily those of adult males. Only one woman and three children had marten tooth pendants. Two double burials with an adult male and a child also had

ornaments from marten teeth. Marten tooth pendants are found mainly in area of head, chest and lower legs.

In most cases, marten teeth have been combined with other animal tooth pendants (Fig. 5.3: 3). Burial 277 is exceptional in this regard. Here, four marten canines were documented together with a rich grave inventory consisting of an elk head figurine in antler, copper rings and numerous amber ornaments (Zagorskis 1987). This grave is part of multiple Burial 274–278. The largest number of marten teeth (19) were documented for Burial 205, where teeth from at least six martens had been used for making pendants. Together with four dog teeth, they were arranged in a fan-shaped decoration by the feet of the buried person. All perforations were made by carving, which was the most common perforation method for marten teeth at Zvejnieki, and in one grave notches were also recorded.

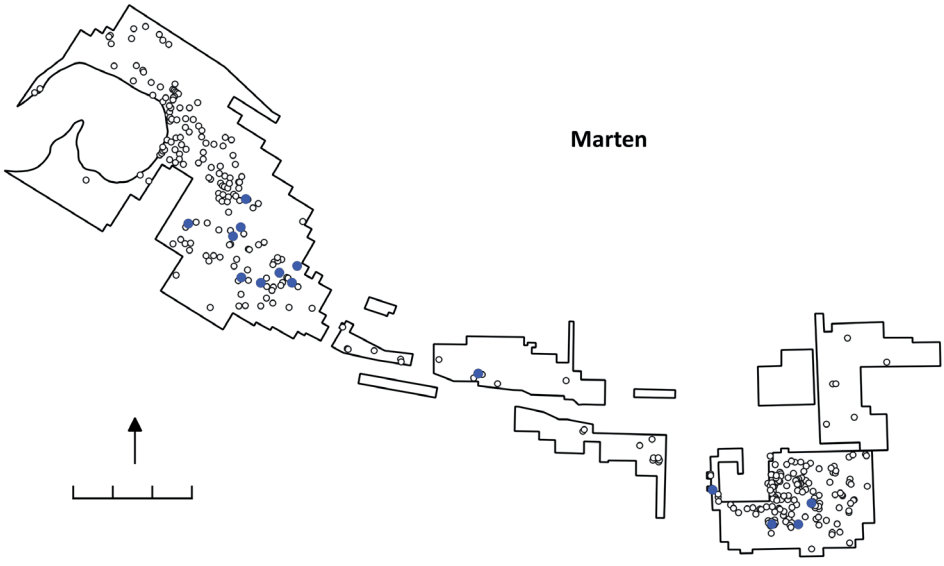


Figure 5.28. Distribution of burials with marten tooth pendants at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

Table 5.14. Marten teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
92	M	A	1	1	?	carving	perforation broken
122/ 123	M + indet.	A + C	2	1	lower legs, feet	carving	
124	M	A	1	1	head	carving	

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
128	indet.	C	3	1	outside left shoulder, between femur & knees	carving	
146	F	A	1	1	head	carving	
153	M	C	10	5	head	carving	
158	M	A	3	2	chest	carving	
160	M	A	8	2	head	carving	
165	M	A	1	1	under left arm	carving	
190	indet.	C	8	4	legs, and to left of legs	carving	
205	indet.	A	19	6	by feet	carving	many with open root apex
226	indet.	C	5	2	chest	carving	small, elongated carved hole, similar for all teeth
277	M + indet.	A + C	4		above sacrum	notches	perforation hole broken for three canines
300	M	A	1	1	head	carving	

The field documentation includes several other mentions of marten at the Zvejnieki cemetery. A complete marten skeleton is mentioned by Burial 199. However, the context is not completely clear. Zagorskis (1970) did not consider it a special deposit of this animal but rather a later disturbance, which had destroyed the right side of the pelvis of the buried woman. However, the possibility of a marten burial cannot be excluded. A pine marten jaw is also mentioned in a field diary from the 1965 excavation. It was found after the removal of the skull of Burial 32. Zagorskis (1965) does not mention whether it was perforated or not, but as it has not been collected along with the grave goods, it most likely had no traces of working.

The few datings obtained from burials with marten canines (122, 153, 277 and 300) indicate the mid 6th to mid 4th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). Only one marten bone fragment has been identified at Zvejnieki II settlement (Lõugas 2006: 77, Fig. 1). Marten remains become more numerous starting from the 6th millennium cal BC also at other Latvian sites (Lõugas 2006: 77, Fig. 2).

5.6.4. Marten at Skateholm

Numerous marten bone fragments, representing nearly all body parts, have been recorded at Skateholm I and II settlement sites (Jonsson 1988: 66). At Skateholm I no marten remains from the burials can be securely associated with the grave inventory. Part of a marten cranium was found in Burial 14, recorded as under the culture layer, and its relationship to the burial is, thus, unclear. However, several other animal cranium fragments have been documented from the same burial, some centimetres

above the body, indicating that perhaps they illustrate the intentional deposition of these body parts in the grave fill (Larsson 2021). In Burial 35, several animal bone fragments were encountered in the area of the skeleton (Jonsson n.d.), among them a marten pelvis bone, but in this case too it cannot be securely related to the deceased.

Marten remains were identified with four burials at Skateholm II, but only in two cases can they be associated with the deceased (Table 5.15). In Burial XVII (Fig. 5.35) part of a marten cranium was documented inside the right elbow (Larsson 1988a). The sitting female in Burial XXII was adorned with four marten mandibles (Fig. 5.29). One was perforated, while the others were too fragmentary for assessment of modification traces. A rich grave inventory, including more than 100 tooth pendants of red deer, wild boar and elk, a slate plate pendant and two shed antlers, accompanied the buried woman. In Burials XVI and XV several marten bone fragments were found in the sieved earth, in the fill and at the level of the skeleton, but cannot be directly associated with the buried person (Jonsson n.d.).

Table 5.15. Marten remains from the Skateholm II burials. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	MNI	Location	Modification	Comments
XVII	M	A	cranium	1	inside right elbow	unmodified	upper part of marten skull, 3 flint flakes on right side of elbow; porpoise vertebrae inside left elbow
XXII	F	A	mandibula	3	pelvis	drilling?	4 mandibles, one perforated, others fragmentary, from at least 3 martens

Figure 5.29. Burial XXII at Skateholm II had four marten mandibles by the pelvis of the buried woman. Photo: L. Larsson (personal archive of L. Larsson).

5.6.5. Marten at Sakhtysh

Numerous marten body parts have been documented in the Sakhtysh settlement layers (Цалкин 1963, 1964), including perforated marten mandibles (Fig. 5.30), cranium fragments and canine pendants. However, the distribution range of sable *(Martes zibellina)* during the Subboreal period also included the area of Sakhtysh (Гасилин & Саблин 2013); therefore, it cannot be excluded that some of these remains may belong also to this species. Only two canines have been documented from two burials at Sakhtysh II (Table 5.16). In both burials marten teeth were found on the upper body of an adult. Both canines had a notch at the root end.

Table 5.16. Marten teeth at Sakhtysh II. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
9	indet.	A	1	1	by left elbow	notch	
16	F	A	1	1	by right shoulder	notch	deep cut notch on the root

Figure 5.30. Perforated mandibles from pine marten/sable *(Martes martes/Martes zibellina)* from settlement layers at Sakhtysh I (1–3). By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

5.6.6. Discussion

Finds of marten mandibles and canine pendants are recorded at all of the studied sites, although showing some geographical differences. Only marten canine pendants were identified in burials at Zvejnieki and Sakhtysh II, while marten mandibles and a skull fragment were excavated at Skateholm. A fragment of a marten mandibula is mentioned as having been found under the skull of Burial 32 at Zvejnieki, but it cannot with certainty be considered as part of the grave inventory. Carving is the most common

perforation technique for marten canines at Zvejnieki, even though notches were also identified, similarly as at Sakhtysh. Marten remains are mostly found in adult burials, but at Zvejnieki several children also had pendants from marten canines. They were identified by various parts of the body, mainly associated with the upper body – the head and chest area – but also at the pelvis and feet. At Zvejnieki and in Burial XXII at Skateholm II, marten remains were found in rich burial assemblages accompanied with pendants from other animal species, as well as stone, bone and copper items. By contrast, at Sakhtysh II, marten canines are the only grave inventory.

Marten remains have been documented in quite large numbers in cultural layers both at Skateholm and Sakhtysh (Цалкин 1963, 1964; Jonsson 1988), and some also at Zvejnieki (Lõugas 2006). The absence of marten mandibles from the Zvejnieki and Sakhtysh burials is noteworthy, but several perforated marten mandibles were excavated from the Sakhtysh settlement layers and also from several other Volosovo period sites in the forest zone of central European Russia (Macāne 2017). Considering the numerous mandibles know from other hunter-gatherer burials in north-eastern Europe (e.g. Richter 2005; Gumiński 2014; Macāne & Nordqvist 2021), a special significance was attached to this particular bone of the animal. The small size of marten teeth could have been the reason why whole mandibles were used instead (see Chapter 11.2.1 for a discussion), although numerous canine pendants from burials at Zvejnieki show that local or temporal preferences also affected the selection.

Marten has been intensively hunted in all times due to its highly valued fur (Vang Petersen 2013: 153) and the occurrence of marten remains in hunter-gatherer contexts is surely linked with its importance as one of the main fur-bearing animals in the forest zone. The number of marten remains, similarly to those of other carnivores, increases in burial contexts starting from the 6th millennium cal BC. However, their relatively low numbers, even almost complete absence in the burials as Sakhtysh, indicates that the significance of this species was associated with the daily subsistence rather than the symbolic and cosmological world.

5.7. Otter

European or Eurasian otter *(Lutra lutra)* is a member of the otter subfamily *(Lutrinae)*, belonging to the weasel family (Mustelidae). Thirteen subspecies have been distinguished belonging to seven genera (Berkovitz & Shellis 2018: 287). The European otter is native to Eurasia and is the most widespread species among otters. It is common in most parts of Europe, northern Asia and northern Africa.

5.7.1. Biological characteristics and other properties

Appearance and morphology

The European otter is a mid-sized semi-aquatic mammal. Its body is slim and very flexible, and the head is small and round. The length is between 70–90 cm, while body weight varies from 5 to 10 kg, males being somewhat larger. The tail is 35–50

cm long and becomes thinner towards the tip. The canine teeth are well developed and very sharp (Siliņš 1984: 57).

Otters are clumsy on land, but their feet and tail are adapted for swimming (the tail serves as a rudder), and they have the ability to close their ears and nose while diving. The fur is short and thick, usually dark brown in colour, while the belly may be lighter brown or yellowish. The wool layer is compact and dense, but the top coat keeps it dry, and otters come out dry even after swimming (Latvijas Daba 2021). On average, otters live around five years, but can reach up to 10 years.

Habitats and diet

Otters can live near freshwater, brackish and marine environments. They are strongly territorial animals and prefer small and medium-size rivers (up to 20 m wide) or streams with clean water and forested riverbanks. Running water is the most important aspect, and otters choose a habitat where the water tends not to freeze in wintertime. Otter families inhabit 5–15 km long stretches of the riverbank and never go very far from the river. Otters make their burrows on a higher slope, protected from water. The entrance to the burrow is below the water level (Siliņš 1984: 59; Jonsson 1988: 65).

Otters are opportunistic eaters, surviving on what they find in nearby waters. The otter diet consists of fish, although during the winter they also catch other prey (Berkovitz & Shellis 2018: 287). The otter may eat up to 1 kg of fish a day. It prefers fatty fish, such as eels and salmon, but may also eat other fish species and small ducklings, water voles, frogs and molluscs (Richter & Noe-Nygaard 2003: 26).

Social relationships and reproduction

Otters usually live in families, but males can have a solitary lifestyle. They are monogamous, and both parents take care of their pups. Female otters reach reproductive age in the third year of life. Otters have a low reproduction rate and relatively sparse populations. Mating takes place more often in the winter season and during the mating period males may whistle (Siliņš 1984: 60. Between two and five cubs are born during late spring and early summer. The youngsters stay with their mothers for the first year.

Otters are active year-round and mostly at dusk and during the night. They are very cautious animals. Otter babies are easy to tame and easily bond with the human. They can also be taught to catch fish and bring them out of the water.

5.7.2. Otter remains in hunter-gatherer contexts in north-eastern Europe

Otter is a common find on Boreal and Atlantic period sites in Denmark (Richter & Noe-Nygaard 2003: 27), but in general otter remains are scarce, and the quantity of their remains usually does not exceed 1% within faunal assemblages in north-eastern Europe (Лозе 1979: 114, Table 21, 22; Lõugas 2017; Ukkonen & Mannermaa 2017). For instance, at Ivanovskoye 7, otter bones comprised only 0.2% of all animal remains (Жилин 2004: 37). Cut marks on otter bones from Mesolithic sites in Denmark show that besides skinning and usage of their furs also otter meat was used as food (Noe-Nygaard 1995: 223–226).

5.7.3. Otter at Zvejnieki

Five burials at Zvejnieki contained otter teeth, comprising 17 canines altogether (Table 5.17, Fig. 5.31). Otter teeth have been found with two men, one woman, one child and one double burial consisting of an adult male and a child (Fig. 5.32: 6). They were located on different parts of the body, including the head, chest, pelvis and lower legs. All graves with otter teeth contain a rich grave inventory, mainly tooth pendants from other species. In Burial 164, a whole set of otter canines has been used for making the adornments. Little tooth wear, open root apexes as well as a similar way of manufacturing the perforations indicate that they come from the same animal. This burial also included 17 bone spearheads (see Fig. 1.4 and Fig. 6.12: 7), 42 bird bones, along with five other animal tooth pendants. Different suspension methods have been applied to otter teeth, including drilling and notching, but carving has been the most common method for making perforations. An animal head figurine in antler found with Burial 271 has been interpreted as representing an otter (Zagorska et al. 2018).

Figure 5.31. Burials with otter teeth at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

All burials with otter teeth are located in the western part of the cemetery. The few datings from burials with otter teeth correspond to the period between the late 6th and the late 5th millennium cal BC (Burials 121, 122 and 164). No otter remains have been found in the Zvejnieki settlements, but a few fragments of otter bones have been reported in a summarized table of various animal species identified at Latvian Stone Age sites of the 6th and 5th millennium cal BC (Zagorska 1992; Lõugas 2006).

Table 5.17. Otter teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	MNI	Location	Modification	Comments
121	F	A	2	1	chest	carving	
122/ 123	M + indet.	A + C	4	3	feet	carving	
158	M	A	1	1	left shoul-der	carving	
164	M	A	4	1	head	drilling	may be from the same animal; little tooth wear
190	indet.	C	6	4	pelvis, head, lower legs, feet	notches, carv-ing, grinding	heavily ground root

Figure 5.32. The largest number of animal tooth pendants in the whole of Zvejnieki cemetery were identified in the double Burial 122/123, also including otter tooth pendants (6). Other species comprise: bear (1), dog (2), badger (3), seal (4), wolf (5), marten (7), aurochs (8), red deer (9), elk (10), wild horse (11), wild boar (12). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

5.7.4. Otter at Skateholm

The only otter remains in burials at Skateholm come from grave fills (Burials 14 and 33). An otter skull was documented in the fill of Burial 14 at Skateholm I. Whether it belongs to the funerary ritual or to the rich cultural layer that was used to fill the grave is not altogether clear (Larsson n.d.). However, the fact that several mandibula fragments from roe deer, red deer, wild boar and marten were recorded just above the skeleton would seem to suggest they were intentionally deposited in the grave fill. A few otter bones, mainly represented by extremities and cranium fragments, have been identified at the Skateholm settlement sites, possibly indicating that just the skins were taken to the sites, while the carcasses were left at kill sites or somewhere else (Jonsson 1988: 65).

5.7.5. Discussion

Otter remains securely assignable to the grave inventory come only from Zvejnieki. The faunal assemblages from Skateholm (Jonsson 1988) and Sakhtysh (Цалкин 1963, 1964) indicate that otters were present in the surroundings of the sites, but no otter remains were included in burials. Otter canine pendants were identified with five burials of men, a woman as well as children. All burials including otter teeth had a rich inventory of tooth pendants from various animal species, bone tools and unworked bones. Various suspension techniques were observed on otter teeth, but carving was the most common. Burials with otter teeth correspond to the late 6th and late 5th millennium cal BC.

Out of 17 otter teeth at Zvejnieki, in Burial 164 a whole set of the upper and lower canines were identified, suggesting the intentional choice of teeth coming from the same individual. This means that only a few otters were used for making pendants at Zvejnieki. Perhaps otters were a rare species in the surroundings, or perhaps the relationship with them was focused on other areas of life than their inclusion in burial assemblages.

5.8. Wildcat

The European wildcat *(Felis silvestris silvestris)* belongs to the Felidae family. Besides the European wildcat, which inhabits forests in Europe, several other subspecies have been distinguished. The Caucasian wildcat *(Felis silvestris caucasica)* is distributed in the Caucasus and coastal areas of the Anatolian peninsula, while several species of steppe and bush wildcats have been documented in Africa and southern Eurasia (Kitchener et al. 2017).

5.8.1. Biological characteristics and other properties

Appearance and morphology

The European wildcat is larger than its domestic relatives. It has a longer body and limbs and weigh around 5 kg. Males are slightly larger than females. The pelt has dis-

tinct transverse stripes on the sides and a bushy tail with black stripes and a rounded black tip (Kitchener et al. 2017).

Habitats and diet

European wildcat preferred habitats were broadleaf and mixed birch–pine forests, but nowadays they inhabit more montane forests which are less disturbed by man. They are highly mobile in their home range, which covers a large territory (Klar et al. 2008: 310; Monterosso et al. 2009: 27). The den may be placed on the ground or in arboreal cavities, such as a hollow tree (Jonsson 1988: 65). Wildcats may also re-use badger and fox dens. Rodents constitute the main diet, but other invertebrates, reptiles, birds and carrion may also be consumed (Jonsson 1988: 65).

Social relations and reproduction

The wildcat is a solitary animal except when females have their young. Mating takes place in March, and the kittens are born in May. Kittens leave their mothers when they are five months old (Kitchener et al. 2017). Wildcats are nocturnal animals and competition with the lynx has prevented this species from establishing itself in wider areas (Jonsson 1988: 65).

5.8.2. Wildcat remains in hunter-gatherer contexts in north-eastern Europe

Wildcat remains have been documented at a several sites in southern Scandinavia and the Eastern Baltic, but occur in small numbers (Hatting et al. 1973; Richter & Noe-Nygaard 2003; Lõugas 2017; Gummesson et al. 2019a). A considerable number of wildcat bones have been documented on several Danish sites, indicating that they were hunted for their fur or were also consumed (Lindström 2001: 182; Richter & Noe-Nygaard 2003: 23). Calcined bones of wildcat have also been documented at the Boreal period site of Utreh 3 in western Russia (Жилин 2004: 41). Wildcat remains are rare in burial contexts. For example, wildcat mandibulae have been recorded at the Dudka cemetery in northern Poland (Gumiński 2014: 163). Tooth pendants of wild cat canines are known from the sites Rönneholms mosse and Ageröd I:HC in Scania (Larsson 1978; Magnell 2010).

5.8.3. Wildcat at Zvejnieki

A wildcat astragalus was documented with Burial 132 at Zvejnieki (see Fig. 7.6). It was found in unmodified condition in the soil above the skeletons along with beaver astragali and nearly twenty tooth pendants from various animal species. In addition, a rich assemblage of tooth pendants (nearly fifty) and beaver astragali was directly associated with a deceased man and a child. A few wildcat remains have been identified in the faunal assemblage from the upper layer of the Zvejnieki II settlement site (Lõugas 2017).

5.8.4. Wildcat at Skateholm

Wildcat remains have been encountered with three burials at Skateholm I, although only in two cases can they be securely associated with the level of the skeleton (Table

5.18). A wildcat humerus fragment was identified in Burial 62, but it cannot be securely linked to the grave inventory, as it was found in the grave fill (L. Larsson pers. comm.). In Burial 12, a bone point made from a wildcat bone was found beside the right tibia along with an amber piece (Larsson n.d.). In Burial 48, a deposit near the knees of the interred was recorded as containing a large quantity of animal bones and flint artefacts. Among these were two phalanges from a wildcat, without any traces of modification (Jonsson n.d.).

The only burial with wildcat remains at Skateholm II is Burial XIII. A second phalanx of a wildcat was found together with an adder/viper vertebra fragment on the left side of the cranium, while two more wildcat limb bones were identified that were not in direct association with the deceased (Jonsson n.d.). No wildcat remains have been documented from other burials, but several wildcat bones have been recorded from settlement layers at Skateholm I and II, indicating that the animal was present in the vicinity of the settlement (Jonsson 1988: 65).

Table 5.18. Wildcat remains at Skateholm I and II. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	MNI	Location	Modification	Comments
12	F	A	ossa longa	1	beside right tibia	yes	bone point
48	M	M	phalanx	1	in deposit near knees	no	in a deposit with other animal remains
XIII	indet.	C	phalanx	1	left side of head	no	limb bones of wildcat in same burial

5.8.5. Discussion

Wildcat bones have been documented only at Skateholm and Zvejnieki. The majority of these finds are bone fragments from limbs and come from the grave fills or settlement contexts. The only worked wildcat bone is a long bone, which was shaped into a bone point at Skateholm I. The wildcat astragalus discovered in Burial 132 in Zvejnieki, despite the fact that it was found in the fill, may indicate a selection of this particular bone. Moreover, it was found together with several beaver astragali and tooth pendants from different animal species, strongly suggesting an intentional choice of this assemblage. Considering the relatively large number of beaver astragali found with the Zvejnieki burials (see Chapter 7.1.3), this particular bone seems to have embodied a particular importance and could have served as an amulet, for example (see Chapter 11.2.4 for discussion). Nevertheless, based on the studied assemblages, the wildcat does not appear to have been among the primary companion species and certainly was not associated with burial practices.

5.9. Seals

The eared seals and sea lions (Otariidae) and true (or earless) seals (Phocidae) are marine mammals. They are often referred to as pinnipeds, but this is no longer a formal taxonomic term. The lack of hind limbs distinguishes the Phocidae from the eared seals, making them much less mobile on land (Berkovitz & Shellis 2018: 295–296). The true or earless seals inhabit mainly the polar and subpolar regions, representing 19 species in 13 genera (Berkovitz & Shellis 2018: 300). During the Stone Age, the Baltic Sea was inhabited by ringed seal *(Pusa hispida),* grey seal *(Halichoerus grypus)* and harp seal *(Pagophilus groenlandicus)* (Fig. 5.33). Two ringed seal populations *(P. hispida saimensis* and *P. hispida ladogensis)* became separated from the ancestral Ancylus Lake population and were trapped in the emerging Lakes Saimaa and Ladoga, respectively. They differ today from their maternal population not only genetically but also in coloration, morphology and even behaviour (Schmölcke 2008: 236). Also the harp sea has now practically disappeared from the Baltic Sea due to environmental changes and human impact (Lepiksaar 1986; Storå & Ericson 2004; Glykou et al. 2021).

Figure 5.33. Seal resting on a stone by Møns Klint (Denmark) facing the Baltic Sea. Photo: A. Macāne.

5.9.1. Biological characteristics and other properties

Appearance and morphology

The grey seal is the largest among the seals in the Baltic Sea. Bulls can reach a length of 240 cm and more than 300 kg, while cows reach about 200 cm in length, and their weight does not exceed 200 kg. The harp seal is smaller, reaching about 175 cm in length and not exceeding 140 kg. The ringed seal reaches a maximum body length of about 140 cm and its weight on average is under 100 kg (Storå 2001: 3). There may be considerable sexual dimorphism in size between males and females (Berkovitz & Shellis 2018: 295).

Seals are highly adapted to swimming and can dive for extended periods, but must return to land for mating, breeding, and moulting. Seal pups have yellow-white fur when they are born, which turns into a white coat during the first weeks, which changes afterwards to a greyish spotted coat. With age, the pelage changes again, becoming darker as well as reflecting sexual dimorphism (Storå 2001: 47–48), allowing individual animals to be distinguished. Life expectancy, depending on the species of seal, varies between 18 and 30 years, while grey seal females can reach up to 35 years (HELCOM 2021).

Habitats and diet

The grey seals in the Baltic are pelagic, and their distribution depends on the ice cover (Storå 2001: 3). The harp seal is an Arctic deep-sea animal, and is nowadays present throughout the Atlantic part of the Arctic Ocean (Schmölcke 2008: 233). Harp seals migrate over long distances due to their necessity of staying at the ice-edge throughout the year (Sergeant 1991). This may be a reason why nowadays harp seals cannot survive in the Baltic Sea the whole year round (Lõugas 1998) and only sporadically reach Danish waters and the Baltic Sea (Bennike et al. 2008). The ringed seal is a circumpolar Arctic species with a very special adaptation to life in the polar region, being able to maintain breathing holes in the ice. In contrast to grey and harp seals, this species is not pelagic but spends the whole time near the coast and in shallow bays, and may even swim up the rivers. Ringed seals live in the eastern part of the Baltic Sea, and persist north of the line between the cities of Stockholm and Riga (Schmölcke 2008: 233).

Most seals are opportunistic carnivores that prey mainly on fish and marine invertebrates, such as squid, molluscs and crustaceans. The diet mainly consists of fish, especially those of the Gadidae and Clupeidae families. Many seals, both phocids and otariids, use suction either as their main mode of feeding or as a way to catch smaller prey or prey hidden in crevices (Berkovitz & Shellis 2018: 295–300).

Social relations and reproduction

Grey and harp seals are gregarious animals and live in groups, mainly consisting of adults. The ringed seal, on contrary, is a solitary and rather static animal species. Harp seal youngsters are solitary during the first year, and their migration is separate from the rest of the herd. However, they can swim long distances due to their need to stay in the vicinity of the ice belt. During the autumn, harp seals migrate southwards, feeding heavily before the whelping period.

Grey seals in the Baltic Sea breed on ice during February–March, and a single pup is born on drifting ice or on rocks and beaches. Females reach sexual maturity between 3–5 years and males at the age of six years (HELCOM 2021). The harp seal breeding season is in the spring and takes place mainly on pack ice – drifting pieces of ice that are not attached to land. A single pup is born in February. Male harp seals reach maturity at the age of 6–8 years, and females at 5–8 years, with a peak at six years (Lõugas 1998). The ringed seal breeding season is in March–April and takes place on solid ice attached to the land, mostly near the coastline, where the seals make snow

caves in which one pup is born (Ukkonen 2002: 190; Schmölcke 2008: 233). Males reach sexual maturity at the age of seven years and females at four years.

5.9.2. Seal remains in hunter-gatherer contexts in north-eastern Europe

Grey and ringed seals were present in the Baltic Sea starting from the Yoldia Sea stage, while during the Holocene thermal maximum, harp seals are the most common species in faunal assemblages (Glykou et al. 2021). Four different seal species (also harbour seal *Phoca vitulina*) have been documented at sites from the Subboreal period in Estonia and Lithuania, (Lõugas 1997a, 1997b; Girininkas & Daugnora 2013).

In the Baltic Sea region, seal bones are common in faunal assemblages from the coastal sites and, for example, in southern Sweden, seals are often the most hunted animals after ungulates (Jonsson 1988; Eriksson & Magnell 2001). Specialized sites for seal hunting have been recognized in several places in the Baltic Sea basin, such as the Gotland and Åland Islands as well as islands by the Estonian coast (Lõugas et al. 1996; Kriiska & Lõugas 1999, 2009; Storå 2001). For example, at the oldest sites on the Estonian islands (dated to the transition of the 8th–7th millennium cal BC) seal bones comprise 70–100% of mammal bones (Kriiska & Lõugas 1999: 166, 2009: Fig. 26.8). Generally, an increase in seal bone assemblages occurs during the 5th–4th millennium cal BC in the Baltic Sea area (Lepiksaar 1986; Storå 2001; Ukkonen 2002: 195–196; Glykou et al. 2021). Seal bones are commonly identified at coastal sites, such as Šventoji, Siliņupe or Sārnate in Lithuania and Latvia (Lõugas 1997a; Bērziņš 2008b; Glykou et al. 2021). At inland sites such as Kunda-Lammasmägi and Narva-Joaorg in Estonia (Паавер 1965; Яниц 1991) or Ageröd I:HC and Strandvägen in Sweden (Magnell 2006; Gummesson et al. 2019a), seal bones may account for only a few percent of faunal remains, but still indicate for contact with the coastal area. Seals were also present and hunted in the large lakes of north-eastern Europe (particularly Lakes Ladoga and Saimaa, likely also Onega and Päijänne; see Seitsonen et al. 2017; Ukkonen & Mannermaa 2017; Nordqvist & German 2018).

Seals were a rich resource, providing skins and meat, but also fat, which was used to fuel lamps, for example (Heron et al. 2013). Seal bones were used for making tools (Osipowicz et al. 2019) while the teeth served for making ornaments, which have been deposited with burials, for instance at Kõnnu on Saaremaa (Lõugas 1997a) and Tågerup in Scania (Kjällquist 2001) or in ritual deposits (Osipowicz et al. 2020). Special handling of seal remains, particularly skulls, has been observed at the Jettböle sites and Ajvide, where they were deposited in particular parts of the sites (Storå 2001: 49). Seal representations in various materials, such as amber, clay and bark, are known from several sites in Baltic Sea region (Janzon 1983; Färjare 1996; Burenhult 1997; Zagorska 2000). For example, on the Åland islands seal figurines in clay were even recovered together with seal cranium deposits, emphasizing the seal's importance in the conceptual world of the Pitted Ware Culture groups (Storå 2001: 36, 51). In several cases, the representations of seal are not easily distinguishable, and such images have also been interpreted as fish, as exemplified images on pottery sherds (Rimantienė 2016: Fig. 155), petroglyphs (Лобанова 2015) or clay figurines (Pesonen 2000).

5.9.3. Seal at Zvejnieki

Seal remains are documented from 16 burials at Zvejnieki (Table 5.19, Fig. 5.34). In Burial 167 seal teeth come from mixed context and therefore were excluded from analysis. All of the burials with seal remains are single burials, except for one double Burial (122/123). All seal teeth, except for one incisor, are canines (88). A pendant made from a seal phalanx was found with Burial 121. Due to morphological similarities, species-specific identification of seals is not always possible. Grey seal teeth are more readily distinguishable because of their size, and such specimens were documented from seven burials at Zvejnieki.

Seal teeth have most often been found in combination with a rich grave inventory of tooth pendants from other species. In cases where fewer species are documented in the same burial, they mainly originate from carnivores. Only in the case of Burial 184 were pendants made exclusively from seal teeth. The position of the seal teeth in relation to the body varies. In five cases they were found in the head region. Seal teeth were also found by the upper part of the body, outside the skeleton, near the elbows and extremities. The majority of seal remains come from burials of adult men (seven cases). Seal teeth are also documented in three burials of women and four burials of children or juvenile individuals. Most seal teeth have been carved to make the perforation, although in Burial 184 all canines were perforated by the drilling technique. A few teeth from Burials 74 and 122/123 (Fig. 5.32: 4) had notches for suspension.

Burial 74, dated to around the turn of the 6th millennium cal BC, is the earliest dated burial with seal remains, containing a grey seal canine pendant. This is the only carnivore specimen among ungulate teeth (elk, red deer and wild boar), suggesting contacts with coastal areas. All of the teeth from this burial have been worked in a

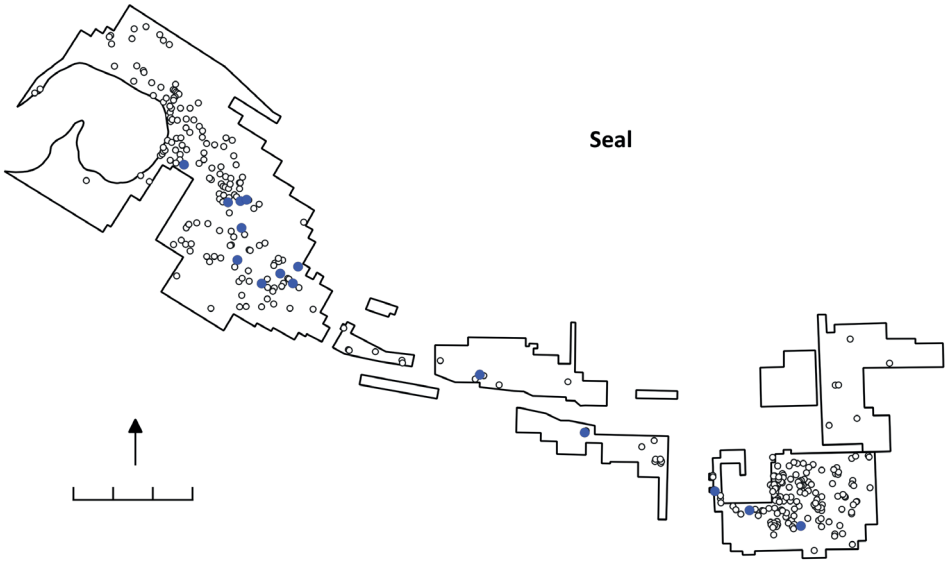


Figure 5.34. Burials with seal remains at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

similar manner and have notches for suspension. Perhaps the deceased woman came from the seacoast, or else this seal tooth or the whole decoration could have come to Zvejnieki via exchange. The few other datings obtained from burials with seal remains (121, 122, 153 and 300) indicate the mid 6th to mid 4th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). Burials with seal teeth are distributed over the whole of Zvejnieki cemetery (Fig. 5.34). Only one ringed seal bone fragment has been documented at Zvejnieki II settlement (Lõugas 2006: 77, Fig. 1).

Table 5.19. Seal remains at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP C	NISP I	MNI	Location	Modification	Comments
74	F	A	1		1	right arm	notches	grey seal canine
114	M	A	1		1	above right shoulder	restored	tooth heavily restored, so no information on body side or modification; grey seal canine
121	F	A			1	right elbow	carving	seal phalanx pendant; carved hole in distal end
122/ 123	M+ indet.	A + C	1		1	neck of adult	notches	modification differs from that of all other teeth in grave; grey seal?
128	indet.	C	3		2	outside left tibia, chest	carving	two grey seal canines
136	F	A	1		1	under right elbow	carving	heavily worn; grey seal
153	M	C	5			head	carving	little variation in size; Phocidae
158	M	A	2			neck, head	carving	Phocidae; part of crown missing
160	M	A	1			head	drilling?	Phocidae
165	M	A	6			neck, chest	carving	Phocidae
184	M	M	4			head	drilling	most crowns broken or in poor condition; all heavily worn, as perforations very smooth.
190	indet.	C	2		2	left knee, by right foot	carving, grinding	grey seal (1) and Phocidae (1)
226	indet.	C	1		1	chest	carving	heavily worn; perforation broken; grey seal
290	indet.	C	29	1		across knees	carving	3 grey seal canines
300	M	A	31			head	carving	2 grey seal canines

5.9.4. Seal at Skateholm

Seal remains were documented in seven burials at Skateholm I (Table 5.20). Only in three cases could they be considered as grave inventory. All of the seal remains from burials are without modification traces, and their relationship to the skeleton is not always clear. In Burials 8, 28, 35 and 46, seal remains originate from the grave fill or mixed contexts and therefore cannot be securely associated with the human remains. Seal remains from secure contexts come from two single burials and one double burial of a child and juvenile individual. The woman in Burial 3 had red ochre but no other grave goods, while the double Burial 47 also contained stone and flint tools. Twenty-eight animal tooth pendants were documented with poorly preserved human remains in Burial 59. All seal remains at Skateholm are unworked. A grey seal mandibula fragment was recorded from Burial 3, where it was found lying on the left side of the rib cage, richly sprinkled with red ochre (Larsson n.d.). The location of the burnt seal bone fragment in Burial 47, together with several other animal bones located at the level of the skeleton in a row beside the child's feet, may also indicate intentional deposition (Jonsson n.d.; Larsson n.d.). In Burial 59 seal and other animal remains had been placed together in a pit near the deceased.

Table 5.20. Seal remains at Skateholm I. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	MNI	Location	Modification	Comments
3	F	A	mandibula	1	chest	no	grey seal, intensive ochre on rib cage and waist
47	indet.+ indet.	J + C	diaphysis	1	beside feet	no	burnt seal diaphysis fragment
59	indet.	?	metatarsal		in deposit	no	in a deposit at W end of grave pit with fish bones and 2 wild boar incisors

At Skateholm II seal bones have been identified from two burials (IX and X). Their exact location in relation to the skeleton is not known, but the bones have been given find numbers, indicating that they were found near the skeleton (Jonsson n.d.). Quite large numbers of seal bones have been found on the Skateholm settlement sites, coming from grey seal, ringed seal and unidentified seal species. Seal remains are fourth most common in the faunal assemblages after wild boar, red deer and roe deer (Jonsson 1988). At both Skateholm I and II, the largest numbers of identified fragments of grey seal come from the cranium, including loose teeth and mandibles, followed by ribs and upper extremities (Jonsson 1988: 64–65). Traces of fire on seal bones may be evidence that they were heated to extract or melt the fat. Five humeri of very young grey seal pups have been found at Skateholm. The measurements by Jonsson (1988: 63–64) confirm that they were killed during the first weeks of life, most likely for their white fur.

5.9.5. Discussion

Seal remains have been documented at Zvejnieki and Skateholm. Pendants made from seal teeth are the second most common after dog teeth among the carnivore species represented in burials at Zvejnieki. At Skateholm only unmodified seal bones were documented in burials. The majority of finds at Zvejnieki are pendants made from seal canines, but an incisor and a pendant from a seal phalanx have also been identified (see also Lõugas 2006). A few grey seal canine pendants have been identified, while the others are mainly canines from smaller seal species, such as ringed or harp seal. Carving is the most common perforation technique for seal teeth. In two cases, notches have been made for suspension, and only in one burial did all the teeth have a drilled perforation. The location of seal teeth concentrates around the head and lower legs, indicating that they belong to some kind of a decoration. At Skateholm, seal bones were found in direct association with the deceased or in a deposit beside the burial.

While the absence of seal remains at Sakhtysh is understandable given its geographical location, contrasting patterns between Zvejnieki and Skateholm reflect changing attitudes and relationships towards seals. The occurrence of seal teeth in such large numbers at Zvejnieki indicates an importance attached to the seals and potentially close contacts with the coastal areas. However, apart from seal remains in burials and the marine isotopes detected in some dog teeth, there is little evidence of coastal presence at Zvejnieki: the investigated refuse fauna includes just one seal bone fragment (Lõugas 2006: 77, Fig. 1) and human isotope studies have so far only been able to recognize few signs of marine component in the diet of the analyzed individuals (Eriksson 2006: 199; see also Schulting et al. 2020). Thus, seals appear to represent a non-local import to the area; they had no immediate livelihood related value and were signified for other reasons.

The occurrence of numerous seal remains in the Skateholm settlement layers is not unexpected considering the seacoast location and the importance of seals in the coastal subsistence (Jonsson 1988). At the same time, few unmodified seal bones can be directly linked to the grave inventory, and may even originate from the grave fill – no seal teeth or bones modified into tools or ornaments were found in the Skateholm burials. Although symbolic relationships to seal seem to have been enhanced later in the Stone Age (Storå 2001: 49; Osipowicz et al. 2020), the present evidence suggests that seals were considered in more "economic" terms by the Ertebølle hunter-gatherers.

5.10. Porpoise

The harbour porpoise *(Phocoena phocoena)*, is the only whale species inhabiting the Baltic Sea. Five other species of porpoise inhabit the Northern Hemisphere and the North Sea. Porpoises, along with whales and dolphins, are descendants of land-living ungulates (hoofed animals) that first entered the oceans around 50 million years ago. Porpoises are small animals with a rounded head and a triangular dorsal fin. The back is usually dark, while the belly is light grey or white. The adult individuals weigh from 45 to 70 kg and do not exceed 1.8 m in length. The harbour porpoise usually prefers

shallow coastal waters, bays and estuaries. They are rather solitary animals and rarely live in groups. Reproduction takes place during the spring. Schooling fish form the main part of their diet, along with marine invertebrates. Porpoises rely on hearing to detect prey and also for orientation and communication (ASCOBANS 2018).

5.10.1. Porpoise in hunter-gatherer contexts in north-eastern Europe

Porpoise appears to have been present in the Baltic Basin since the early stage of Littorina Sea (ca. 7000 cal BC; Sommer et al. 2008). Its remains have been found at several coastal sites, but in general, porpoise bones in faunal assemblages from sites in Estonia, the Åland Islands and Sweden are quite scarce, usually numbering a few fragments (Jonsson 1988: Table 1; Lõugas 2017: Table 1; Ukkonen & Mannermaa 2017: 128). Only a few coastal sites, such as Siliņupe in Latvia, Naakamäe on Saaremaa Island and Vabaduse väljak on the Estonian mainland have yielded larger numbers of identified bone fragments (Паавер 1965; Lõugas 1997a: 40; Lõugas & Tomek 2013). A figurine in clay representing a porpoise has been identified at the Jägala Jõesuu V site in northern Estonia (Khrustaleva & Kriiska 2020). Porpoise teeth have been used for decorating pottery, as shown by finds from the Latvian coastal sites, as well as inland sites located by Lake Lubāns (Bērziņš & Dumpe 2016: 18–20).

5.10.2. Porpoise at Skateholm

Porpoise bones (vertebrae) were identified with two burials at Skateholm II. In the case of Burial XI the find context is not entirely clear, while the placement of a lumbar vertebra inside the left elbow in Burial XVII (Fig. 5.35) seems more intentional, especially considering that a marten cranium fragment was identified inside the right elbow (Jonsson n.d.; Larsson n.d.). Only three other porpoise fragments were identified in settlement layers at Skateholm I and II (Jonsson 1988: 63).

Figure 5.35. Burial XVII at Skateholm II with a porpoise vertebra beside the left elbow and a marten cranium fragment beside the right elbow. Photo: L. Larsson (personal archive of L. Larsson).

5.10.3. Discussion

The porpoise, like the seals, clearly reflects the local availability of animal species. It is therefore not surprising that porpoise remains were observed only in burials at Skateholm. Still, given their rare occurrence in burials, marine species were not favoured to accompany humans in the burial during this time (see also Chapter 5.9 on seals). Representation of porpoise in clay (Khrustaleva & Kriiska 2020) and the use of porpoise teeth in pottery decoration (Bērziņš & Dumpe 2016) suggest that attitudes towards the porpoise changed later in the Stone Age, but the present data does not permit further discussion.

5.11. Hedgehog

The European hedgehog *(Erinaceus europaeus)* is a spiny mammal of the family Erinaceidae of the order Insectivora. There are three other species distinguished in genus *Erinaceus,* which inhabit mainly Europe, parts of Russia, the Middle East and northern China (Hutterer 2005). The European hedgehog has a short, round body covered with 5000–6000 shiny spikes, which are made of keratin and are usually up to two to three cm long. They are used as protection in case of danger, when the hedgehog curls into a ball. It is a solitary animal and hibernates during the winter. Hedgehogs are usually active during the night. They have a well-developed sense of smell and hearing, whereas their sight is not so good. They are omnivorous but mainly feed on various insects, snails and worms. Females have one litter per year, and usually 4–5 hoglets are born. Hedgehogs can also swim. Predators include owls, badger, wild boar and dog. They are carriers of various parasites and diseases, such as ticks. Hedgehogs live around 5–6 years (Latvijas Daba 2021).

5.11.1. Hedgehog in hunter-gatherer contexts in north-eastern Europe

Hedgehog remains have been documented at the Kõpu I site on Hiiumaa island, suggesting that humans were taking this animal or parts of it with them (Kriiska & Lõugas 1999; see also Ekman 1973 for Gotland). Finds of hedgehog bones have also been identified at Kääpa and Riigiküla III on the Estonian mainland (Lõugas 2017: Table 1). Hedgehog remains appear in a few hunter-gatherer burials, where mandibles have been used in perforated or unmodified form, as at Dudka and Kreiči (Gumiński 2014: 164–167; Macāne 2019). A hedgehog scapula fragment with a possible perforation was found at Bad Dürrenberg in Germany (Grünberg et al. 2016). Hedgehog bones were also found at the Västerbjers and Ire cemeteries on Gotland dating from the Pitted Ware period (Janzon 1974, 1983).

5.11.2. Hedgehog at Skateholm

Thirteen hedgehog bone fragments, comprising mainly mandibulae and bones from the extremities, have been identified from the settlement Skateholm II and only four from Skateholm I (Jonsson 1988: 69). A right tibia of a juvenile hedgehog was identified in Burial IX at Skateholm II (Jonsson n.d.). Although the exact location of the

hedgehog tibia within the grave is not known, it was most likely found at the level of the skeleton, as it has been given a find number.

5.11.3. Discussion

Human interest in the hedgehog is reflected in the possible transportation of these animals, as well as their occasional inclusion in hunter-gatherer burial assemblages, including Skateholm. The preference for mandibles can perhaps be linked to the size of the hedgehog and its very tiny teeth (cf. marten mandibles above, see Chapter 11.2.1 for discussion). Nevertheless, the overall small amount of material shows that the hedgehog was not one of the most important companion species during the Stone Age.

5.12. Contextualizing carnivore remains at Zvejnieki, Skateholm and Sakhtysh

5.12.1. Zvejnieki

Nine carnivore species have been identified in 24 burials at Zvejnieki with secure contexts. Dog and seal teeth are the most numerous in Zvejnieki burials, followed by marten and badger (Fig. 5.36). Canines are the most common body part of carnivores identified in the burials, although a few incisors and molars have also been noted, as well as a phalanx (seal) and an astragalus (wildcat). In seven more burials carnivore remains come from the grave fill or from mixed burial contexts and cannot be directly associated with the deceased, and therefore were not included in the statistics.

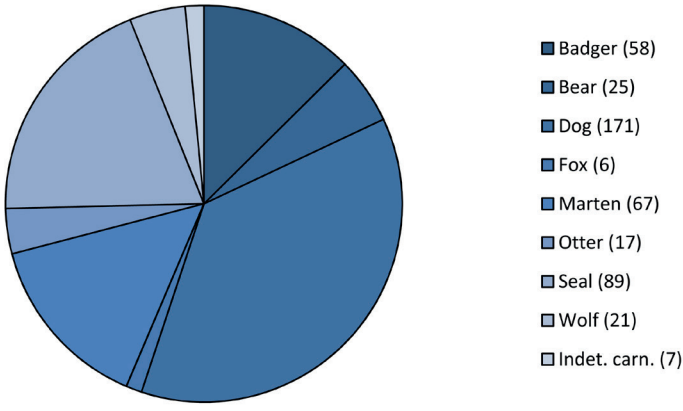


Figure 5.36. The number of carnivore teeth by species in hunter-gatherer burials with secure contexts at Zvejnieki; in addition, wildcat is present in one mixed context (number of teeth: 461).

The spatial distribution of burials with carnivore remains at Zvejnieki does not show concentrations, and instead they are spread across the whole area of the cemetery (Fig. 5.37). However, some carnivore species, such as bear and otter, are mainly found in western part of the cemetery. These species, similarly to marten, are usually found

in burials with rich inventory, including tooth pendants from numerous carnivore and ungulate species. Up to seven different carnivore species can be combined in the same burial assemblage. Eight burials include only one, and eight burials include more than four carnivore species. The largest number of carnivore species are found in double Burial 122/123 and Burial 153. Carnivore teeth occur usually together with other carnivore teeth and only in one case (Burial 233) are dog teeth found alone (Fig. 5.38). They are also commonly associated with ungulate teeth, partially reflecting the general predominance of ungulates at Zvejnieki, while combinations with other species are much rarer. In a few cases bone artefacts, unmodified bones, stone items, and ornaments from amber and copper were documented in the same burials with carnivore teeth.

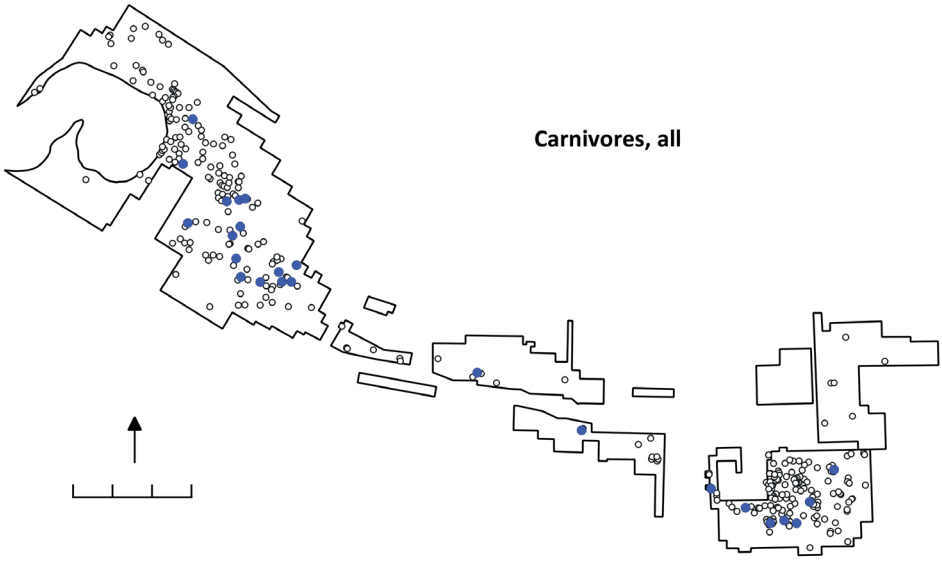


Figure 5.37. Distribution of all burials with carnivore remains at Zvejnieki. Scale bar 30 m. Map: K. Nordqvist.

The most common modification on tooth pendants is carving that have been used for all species of carnivores. Drilling have only been used on tooth pendants from bear and otter, while notches only on tooth pendants from pine martens and seals. Tooth pendants of carnivores have been found in different parts of buried humans, but they are most commonly found by the head and chest. Carnivore remains were most commonly found in burials of men (10 cases) and children or juvenile individuals (6 cases), as well as in two double burials of an adult man and child. Five women were adorned with carnivore pendants, as well as one adult of unidentified sex.

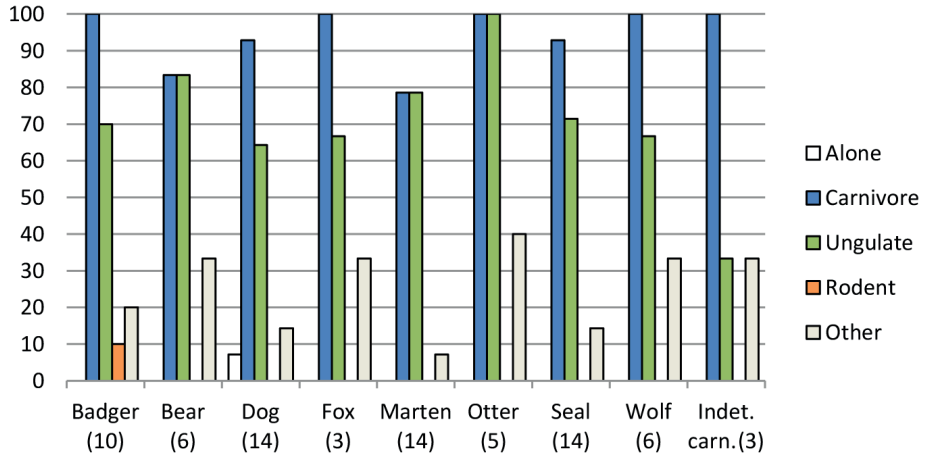


Figure 5.38. The graph shows what percentage (y-axis) of the teeth of each carnivore species (x-axis, number of burials given in parentheses) are found together with the teeth of other animal groups at Zvejnieki (number of burials: 24).

One of the earliest dated burials with carnivore remains, containing a grey seal canine pendant, is Burial 74, is from around the turn of the 6th millennium cal BC. Burials 122/123 and 121 with very rich assemblages belong to the late 6th millennium cal BC. An increase in carnivore tooth pendants can be seen starting from the mid 5th millennium cal BC, when especially badger, dog and seal teeth become more common in Zvejnieki burials.

5.12.2. Skateholm

Carnivores are represented at Skateholm mainly by buried dogs, while five other carnivore species occur very sparsely in burials (Fig. 5.39–5.42). Carnivore remains from secure contexts were documented in seven burials at Skateholm I and five burials at Skateholm II. Carnivore remains were found both with men and women. Similarly, spatial arrangements remain elusive. The carnivores are mostly represented by fragments of various unworked body parts. A bone point made of wildcat bone at Skateholm I is the only example where a carnivore bone has been turned into a tool. The bear canines from Burial 41 are the only pendants made from carnivore teeth. Other inventory in burials with carnivore remains consist mainly of teeth and bones of other animal species, but also a few bone tools, stone artefacts and amber items were also documented.

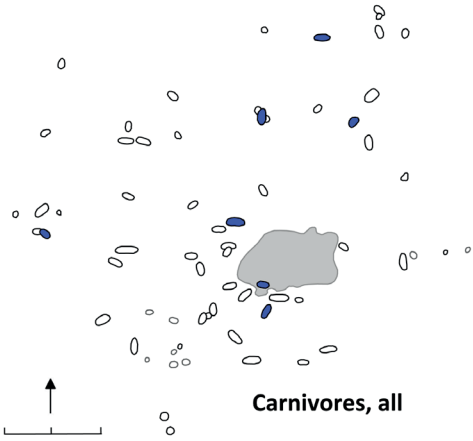


Figure 5.39. Distribution of all burials with carnivore remains at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

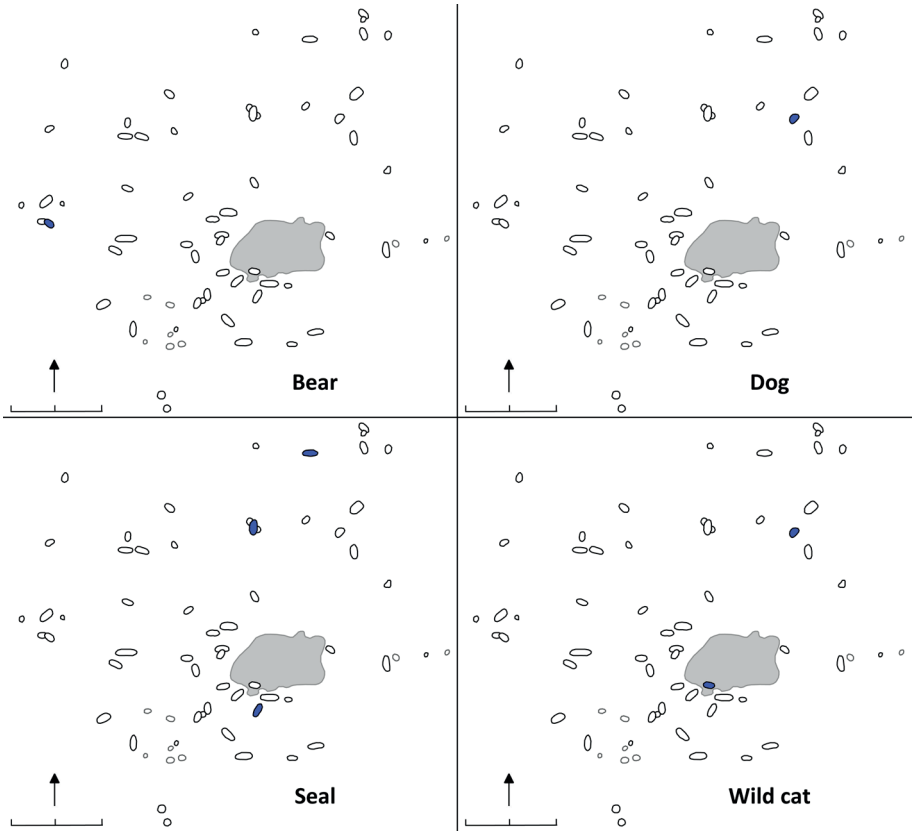


Figure 5.40. Distribution of burials with bear, dog, seal and wildcat remains at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

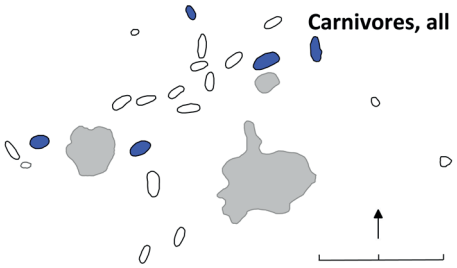


Figure 5.41. Distribution of burials with carnivores at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

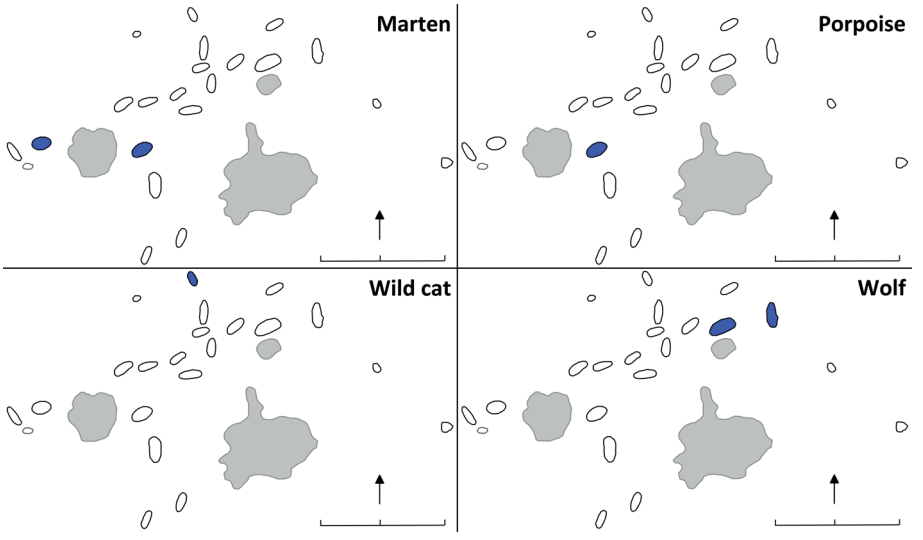


Fig. 5.42. Burials with marten, porpoise, wildcat and wolf remains at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

5.12.3. Sakhtysh

Generally, carnivores form the largest group of animal remains identified from burials at Sakhtysh. At Sakhtysh II, carnivore remains from five species were present in five burials, in addition to which three dogs burials were found (Fig. 5.43). Out of 70 identified animal tooth pendants, 64 were from carnivore species. Badger canines and bear incisors are the most commonly encountered teeth (Fig. 5.44). Up to four different carnivore species were combined in Burial 18, which also had the largest number of animal tooth pendants (see Fig. 5.12). Carnivore teeth occur usually together with other carnivore teeth, as there are only few ungulate (elk) tooth pendants at Sakhtysh II. In isolated cases, marten and bear teeth occur alone. Besides other animal tooth pendants, bone and stone tools and amber ornaments were found in some burials.

Burials with carnivore remains are situated in the main part of the cemetery and near the ritual activity areas that include numerous other depositions of animal remains

(mainly bear and badger). Only one dog burial is located further away. Drilling is the most common perforation technique at Sakhtysh II, while on a marten canine a notch was also observed. Tooth pendants of carnivores are located in different parts of the body, but most have been found by the pelvis and the legs. Carnivore teeth, when possible to determine, occur mainly in female burials, and once associated with a child. Only one burial with carnivore teeth (Burial 18, with a bear incisor) is dated to the mid 4th millennium cal BC, while two hoards with badger and bear remains date to the mid-late 4th millennium cal BC.

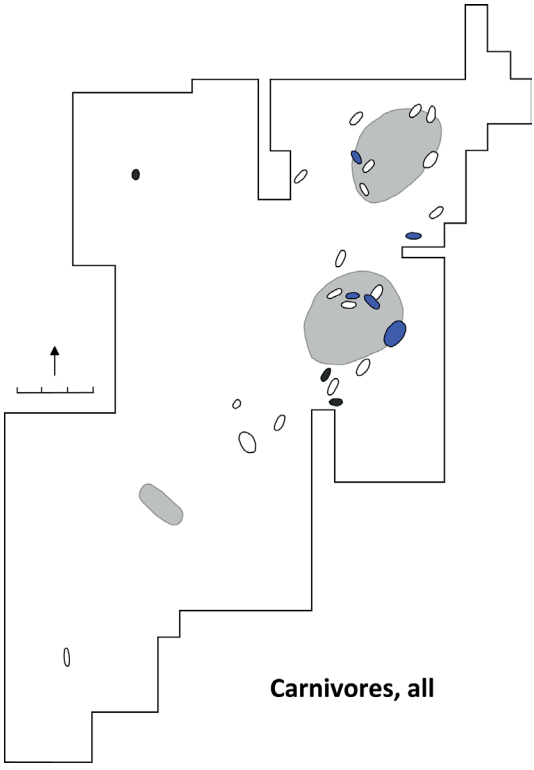


Figure 5.43. The distribution of all burials with carnivore remains and the individually buried dogs at Sakhtysh II. Scale bar is 6 m. Map: K. Nordqvist.

At Sakhtysh IIa, carnivore remains were identified in nearly half of the burials with animal remains. Altogether, 55 carnivore tooth pendants from five different species were identified in 12 burials at Sakhtysh IIa, distributed all over the burial ground (Fig. 5.45). Carnivore remains were identified in four more burials, but these came from the grave fill or mixed context. Bear teeth clearly prevail among carnivore tooth pendants and were identified in all burials with secure contexts (Fig 5.46). They can be found alone or together with other species (carnivores, ungulates or rodents). The largest number of species was found in Burial 63, where all five carnivore species occur. Burials with carnivore remains contained stone and bone ornaments in addition to animal tooth pendants. Bear tooth pendants from Burials 7b, 19, 63 all date to the mid 4th millennium cal BC.

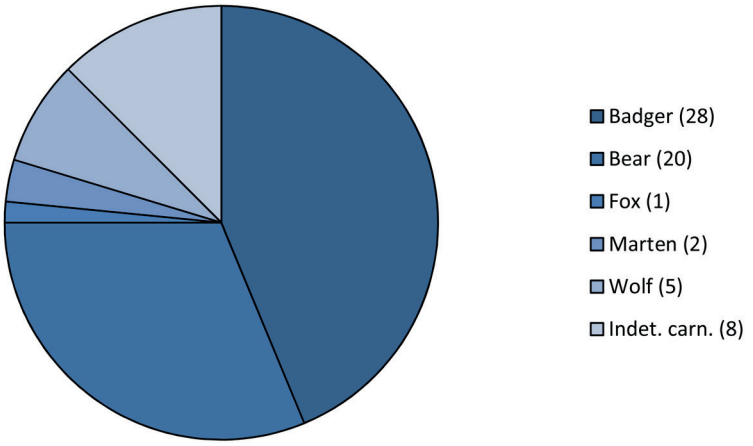


Figure 5.44. The number of carnivore teeth by species in hunter-gatherer burials with secure contexts at Sakhtysh II (number of teeth: 64).

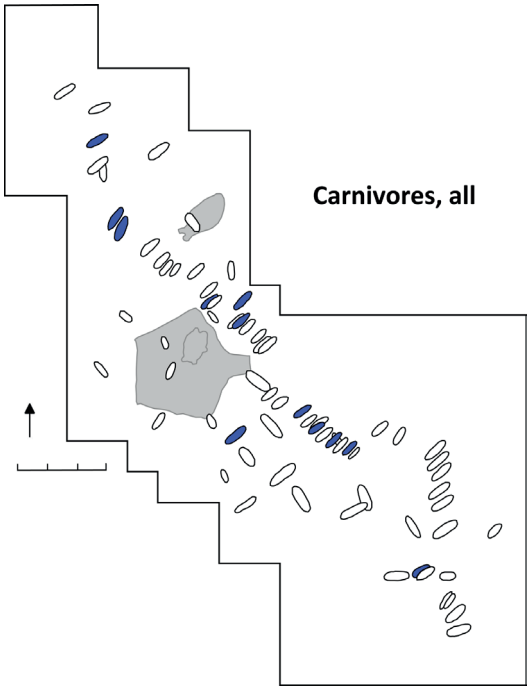


Figure 5.45. Distribution of all burials with carnivore remains at Sakhtysh IIa. Scale bar is 6 m. Map: K. Nordqvist.

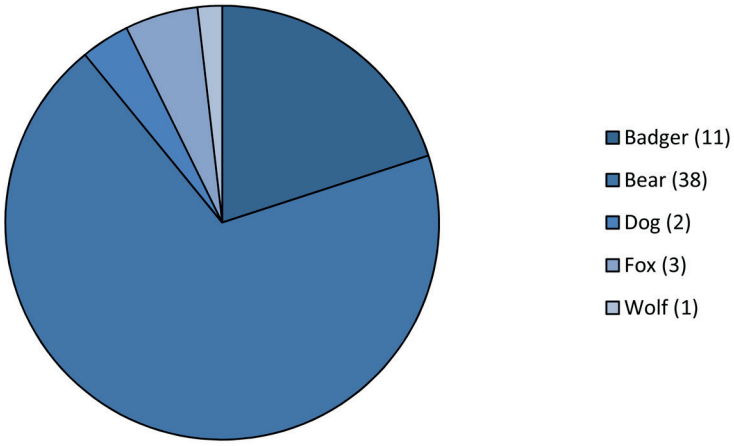


Figure 5.46. The number of carnivore teeth by species in hunter-gatherer burials with secure contexts at Sakhtysh IIa (number of teeth: 55).

5.12.4. Carnivores and northern hunter-gatherers

The carnivore group includes some of the most dangerous and impressive inhabitants of the Stone Age landscape, as well as the only domestic companion species – the dog. Carnivores are predators, which attack others in order to survive, but this group includes a wide range of species with different biological and social qualities and inhabiting various ecological niches. Likewise, the connections and relationships between humans and various carnivore species were manifold and diverse. Seals are often the only carnivore directly given a big nutritional value, but species such as bears, badger, otter and porpoise could also have been eaten regularly, and other like dog, wolf, marten and wildcat at the least at the time of starvation (Ошибкина 1997; Richter & Noe-Nygaard 2003; Жилин 2004: 35; Mannermaa et al. 2014). Most carnivores have good-quality pelts, some even waterproof, and these would have been important for the Stone Age hunter-gatherers. The colour and patterns of the fur differs not only between species, but also between young and old individuals even depending on the season, and this may also have been an important factor in their selection and use (see Jonsson 1988; Жилин 2004). Finally, some carnivores, most notably bears; have also played an important role in the hunter-gatherer worldview and cosmology (Hallowell 1926; Jordan 2003; Willerslev 2007; Piludu 2019).

Finds from the studied cemeteries indicate that the selection and preference for certain carnivore species can be linked to ideological or aesthetic needs rather than economic importance. For example, seals were available at the seacoast by Skateholm, but this species has not been given any particular attention in burial assemblages. At Zvejnieki, on the other hand, despite the distance from the coast, seal teeth are commonly found in burials. Differences can also be seen in the attitudes towards the dogs, since at Skateholm and Sakhtysh II dogs were buried in individual graves or

together with humans, while at Zvejnieki, despite the presence of numerous pendants made from dog teeth in burials, no dog burials have been documented.

Part of the observed differences between the cemeteries is also due to geographical and chronological distance. Despite the uneven coverage of radiocarbon datings and individual fluctuations of certain species, both relative and absolute amounts of carnivores seem to increase as the Stone Age progressed. These changes can be explained not only by the environmental changes or particular geographical locations, but also by changing attitudes towards carnivore species as companion animals. Each of the studied locations and the hunter-gatherer groups using those sites appear to have had their own "preferred" species, such as the bear and badger at Sakhtysh, which also followed them in burials.

Chapter 6.
Ungulates or hoofed animals

The largest and most frequently hunted animals during the Stone Age were ungulates, which include aurochs, elk, red deer, roe deer, wild boar and wild horse. The abundance of ungulate remains at hunter-gatherer settlement and burial sites in north-eastern Europe emphasizes the importance of these companion species, valued for social, conceptual and economic reasons.

The ungulates, or hoofed animals, include two orders: Arctiodactyla (even-toed) and Perissodactyla (odd-toed). The first comprises the suborders Suina and Ruminantia. The Suidae family includes wild boar *(Sus scrofa)*, while the latter includes aurochs *(Bos primigenius)*, belonging to the Bovidae family, and elk *(Alces alces)*, red deer *(Cervus elaphus)* and roe deer *(Capreolus capreolus)* from the Cervidae family. The wild horse *(Equus ferus)* represents the Equidae family, belonging to the Perissodactyla. The main differences between these groups are seen in the way these animals bear their weight and in their digestion system. The even-toed ungulates bear their weight on two toes (third and fourth), while the odd-toed ungulates have developed the third digit of each limb into a single hoof, on which they bear the most weight. The ruminants have a special digestive system, where cellulose is digested in several chambers of the stomach, which differs from pigs and the odd-toed ungulates, which digest their food in the intestines. This chapter presents animal species from the Bovidae, Cervidae, Suidae and Equidae families documented in burials at Zvejnieki, Skateholm and Sakhtysh.

6.1. Aurochs

The aurochs *(Bos primigenius)*, ancestor of domesticated cattle, is nowadays extinct. During the Pleistocene, the aurochs spread to Europe, becoming common and widespread across the whole of Eurasia during the Early Holocene. The aurochs was the largest terrestrial animal inhabiting postglacial Europe. Most likely, the ecological conditions of a wet and mild climate were favourable for the aurochs and promoted its spread. Overhunting and ousting from the preferred habitats were most likely the reasons for the aurochs's extinction, and the last aurochs is documented in Poland in the 17th century (Chaix 1994; Clutton-Brock 1999; van Vuure 2005). The domestication

of the aurochs took place in the Near East and in India 10,000–8000 years ago and resulted in two modern cattle species *Bos taurus* and *Bos indicus* (Edwards et al. 2010).

6.1.1. Biological characteristics and other properties

Appearance and morphology

Aurochs were large cattle with long, slender legs. The skull and front part of the body was massive and elongated to be able to support the large horns. Sexual dimorphism is strongly expressed in the size and weight of the bulls and cows, as well as the horns and fur colour. All aurochs have long, narrow horns, although the cows' horns are much smaller. They were curved in three directions, but facing forwards (van Vuure 2005). At birth, the coat of the aurochs was reddish brown, but during the first months of life the bull's coat turned more black-brown. The bulls also had a light-coloured stripe crossing the back and lighter hair on the forehead (van Vuure 2005).

Domestic cattle are much smaller in comparison with aurochs. The size of the aurochs in Europe varied depending on the region, in general becoming larger towards the north. In southern Scandinavia, the aurochs's shoulder height could have been 155–180 cm for bulls and 135–155 cm for cows. The weight varied, but could have reached around 700 kg, while in Pleistocene populations it may have been as much as 1500 kg (van Vuure 2005). The variation in aurochs body size correlates with the habitat and environmental conditions. The temperature and climate, as well as resource availability and territoriality probably affected aurochs size and morphology (Wright 2013: 22–23).

Habitats and diet

The preferred habitats of aurochs were open forest, riverbank meadow, marshy forest and fen. In a mild and humid climate, with little snow cover, the northern limit of the distribution of aurochs would have been at the present boundary between the boreal forest and more southerly mixed coniferous or deciduous forest (Degerbøl & Fredskild 1970; van Vuure 2002: 3).

The aurochs were grazers, and their diet during the Early Holocene consisted of grasses but later changed towards a more mixed diet from more densely wooded areas (Noe-Nygaard et al. 2005). Along with grasses, aurochs could also have fed on acorns, while in winter foliage and branches of bushes could also form part of the diet (Lepiksaar 1986; van Vuure 2002).

Social relationships and reproduction

The aurochs were social animals and spent at least part of the year in the group. The groups of cows and their offspring could consist of up to several dozen of animals. Sometimes they would engage in fights, especially during the mating season, which was in the late summer or early autumn. The calves were born in spring and stayed with the mother until they were strong enough to follow the group to the feeding grounds (van Vuure 2005; Wright 2013).

6.1.2. Aurochs remains in hunter-gatherer contexts in north-eastern Europe

Even though aurochs bones are not as common on sites around the Baltic Sea as elk and red deer, it was in certain periods one of the main hunted animals. In general, aurochs remains are found in small numbers, but at some sites from the Preboreal and Boreal periods they are more numerous, for example Ageröd in southern Sweden (Ekström 1993) and several Danish sites (see Degerbøl & Fredskild 1970; Richter 1982). However, already during the Atlantic period aurochs disappeared from these areas due to isolation of populations, change of habitats and overhunting (Aaris-Sørensen 1988: 190–193, 1999; Ekström 1993; Noe-Nygaard et al. 2005), although radiocarbon dating of aurochs remains from the Arlöv I settlement (Late Mesolithic according to the local periodization) indicates that a small population was possibly present in Sweden as late as 4500 cal BC (Magnell 2017: 127). The northernmost extent of the distribution of aurochs is observed in Middle Sweden and at the Hornborgasjön (Ekström 1993: 16–22).

The importance of aurochs as a food source and raw material is shown by the fact that the whole animal was brought to site. On Latvian sites, aurochs bones, including meat-poor parts, such as mandibulae and limb bones, have been identified at the Sārnate dwellings (5th–3rd millennium cal BC) (Bērziņš 2008b: 364). Numerous aurochs remains have been identified from the Riigiküla III site in north-eastern Estonia (Lõugas 2017: Table 1). Aurochs bones provided one of the most suitable materials for making various bone tools. Long bones and ribs were the preferred parts for bone tool manufacture. In southern Scandinavia, at the transition between the Boreal and Atlantic periods bovid ribs were commonly used for making large barbed bone points (Jensen et al. 2020).

Aurochs teeth provided suitable material for making pendants. Such items have been documented at settlement contexts, for instance at Sārnate (Bērziņš 2008b: 364), as well as in burial contexts in Denmark, Estonia and Lithuania (Albrehtsen & Brinch Petersen 1977; Butrimas 2012; Lõugas 2017). A pendant from an aurochs tooth found on the chest of a woman in Burial 19C at Vedbæk has been considered an exotic item, possibly originating from Scania (Brinch Petersen 2015: 143, 146). Aurochs tooth pendants have also been found at the Kõnnu site on Saaremaa island, where there was probably no aurochs population. These objects are likely to have arrived with humans from the mainland (Lõugas 2017). In areas further east, information about aurochs remains is very scarce, since coniferous forest is not the preferred habitat for this species (Жилин 2004: 45–46, Table 1).

6.1.3. Aurochs at Zvejnieki

Aurochs teeth have been identified with 26 burials at Zvejnieki, comprising 113 teeth from secure contexts (Fig. 6.1, Table 6.1). In addition, seven aurochs incisors were identified in six more burials (3, 106, 125, 126, 167, 257) but they come from mixed contexts. All of the aurochs teeth are incisors. Most of the aurochs teeth have been found with modification traces, meaning that they either have perforations or have been polished and ground (Fig. 5.32: 8). Drilling and carving are most common

perforation techniques, although in several cases teeth had no visible modification traces. A particular mode of root modification was observed in several burials (e.g. 86, 100, 114, 121), where the root was heavily ground from two or four sides.

Aurochs teeth are generally found in burials with a rich inventory of tooth pendants from other animal species, except for Burial 44. Generally, aurochs teeth are encountered with burials where the majority of tooth pendants come from other ungulate species (see Fig. 6.32). Several burials had aurochs teeth together with elk teeth (e.g. Burials 5, 125 and 162). In one case, aurochs teeth had been combined with wild horse teeth (Burial 42). However, in numerous cases – e.g. Burial 122/123 (Fig. 5.32) – aurochs teeth are combined also with carnivore teeth or rodent and bird remains.

Generally, aurochs teeth are not the most numerous items in the grave inventory. Only Burial 86 had a larger number of aurochs incisors than those of horse and wild boar tooth pendants. In most cases, few aurochs incisors are found with burials (see Appendix 2). The largest number of aurochs teeth comes from Burial 114, where an adult male was buried with 20 aurochs teeth and 59 teeth from red deer, elk, wild boar, dog, seal and horse. However, some of the teeth are poorly preserved, and 10 of the aurochs incisors were missing the roots and have been heavily restored, so no traces of modification could be observed. The remaining teeth had carved holes or had been heavily ground before perforation. In Burial 132, a particular arrangement of mainly unmodified elk and aurochs teeth could be observed by the head, especially on the right side. A whole set of unmodified aurochs incisors, most likely coming from the same animal, was identified above the right shoulder of the buried man.

The majority of aurochs teeth occur with child burials (ca. 45%), in addition to which they are documented from seven burials of men and four of women (Fig.

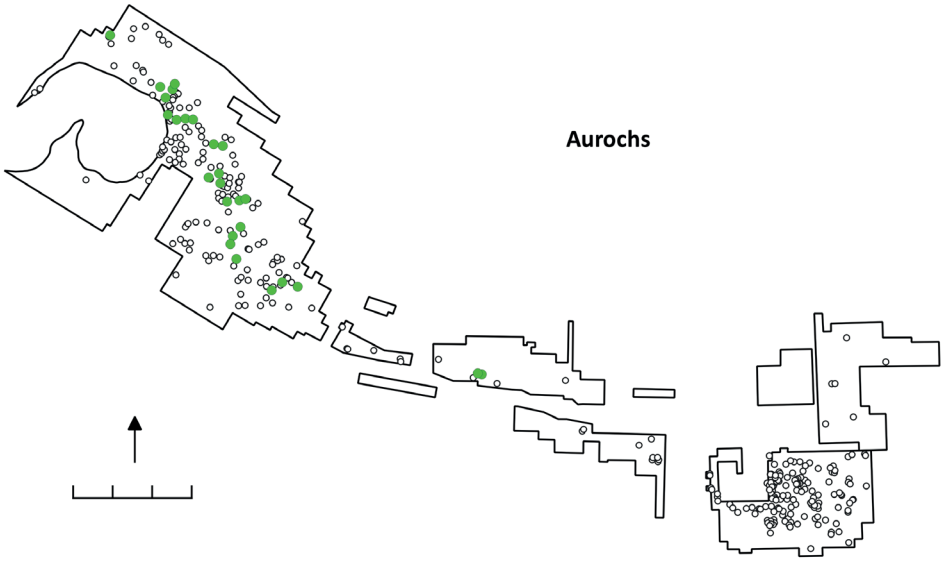


Figure 6.1. Distribution of burials with aurochs teeth at the Zvejnieki cemetery. Scale bar is 30 m. Map: K. Nordqvist.

6.33). Aurochs teeth are also recorded in three double burials of an adult male and child. Most of the burials with aurochs teeth are concentrated in the western part of the cemetery (Fig. 6.1).

The earliest date with aurochs teeth comes from Burial 170, falling in the mid–late 8th millennium or the transition to the 7th millennium cal BC. Burials 57, 93, 100 and 122 are from the 6th millennium, while Burial 121 has been dated to around the turn of the 5th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). The date from Burial 164 falls in the late 5th or early 4th millennium cal BC, this being the youngest date for a burial with aurochs teeth. A few aurochs bone fragments were identified at Zvejnieki II settlement (Lõugas 2006: 77, Fig. 1).

Table 6.1. Aurochs teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	MNI	Location	Modification	Comments
5	indet.	C	1	1	head	notches	deep cut notch on one side of root
8	indet.	C	5	1	chest, pelvis, fill	drilling, carving	teeth on and under the body, some roots broken
17	M	A	1	1	head	-	no information on perforation, root poorly preserved, crown partly broken, heavy tooth wear
24	indet.	C	1	1	chest, pelvis	drilling	
27	indet.	C	1	1	neck	drilling	
42	M + indet.	A + C	1	1	knee area	drilling	
44	indet.	C	1		chest	drilling	heavy tooth wear
57	F	A	3	1	on pelvis, by left arm	drilling, carving	most in poor condition, one from very large individual but only crown left, root broken
62	indet.	C	2 (4)	1	pelvis, outside right femur, mixed soil from disturbed part, in fill	carving, notches	at least two heavily worn teeth from same animal, two incisors from the feet area that had been dug away and found 35 cm higher up
76	F	A	1	1	pelvis	drilling	restored tooth
83	indet.	C	3	1	right arm	drilling	only part of crown, heavily restored
86	indet.	C	13	4	head, neck	drilling, carving, grinding	some teeth from the same animal, some without perforation but roots ground
93	M	A	1	1	head	drilling?	

Grave no.	Sex	Age	NISP I	MNI	Location	Modification	Comments
100	indet.	C	6	2	pelvis, upper legs	drilling, carving, grinding	many teeth heavily restored, perforations broken, roots heavily ground from two or four sides, some teeth from same animal
114	M	A	20	3?	neck, shoulder, outside left femur	carving, grinding	most root ends broken or heavily restored, but in some cases carved perforation, heavy grinding on roots
121	F	A	2	1	outside right femur, mixed soil outside left knee	carving, grinding	heavily ground root end for carving the hole
122/ 123	M + indet.	A + C	16	5	feet, pelvis, right hand, outside lower legs of adult, behind head, between femur of adult	carving, drilling, grinding	some of roots ground, some teeth with very heavy tooth wear, several teeth from same animal
124	M	A	1	1	dark soil above burial	carving, grinding	heavy tooth wear
128	indet.	C	14	4	head, lower arm, chest, outside left femur	carving, grinding	root ends ground before perforation; heavily restored, heavy tooth wear
132	M + indet.	A + C	9 (10)	2	chest, right shoulder, in mixed soil above grave	carving, grinding	whole set of unmodified incisors from same animal, one incisor in mixed area
136	F	A	4	2	outside left tibia, by feet	carving, grinding	
162	M	A	1	1	outside left knee	drilling	
164	M	A	1	1	by head	grinding, notch?	
170	M	A	2	1	chest, right side, neck	drilling, broken, restored	can be from same animal
189	indet.	C	1	1	neck, chest, right side of the body	restored	all root restored
190	indet.	C	2	2	outside left leg	carving	can be from same animal

6.1.4. Aurochs at Skateholm

Aurochs teeth have been found with three burials at the Skateholm I and II cemeteries. Two perforated incisors of an aurochs were recorded in the disturbed part of Burial 46 at Skateholm I. Possibly, these belonged to the grave inventory, but because the middle part of the body had been destroyed by a later burial, they cannot with certainty be related to this burial. Both aurochs incisors were perforated, and teeth from red deer, wild boar and grey seal were identified, together with amber pieces. Also, dog bones were found in the destroyed part of the burial, indicating that a young dog could also have been buried there (see Chapter 5.1.4).

Aurochs teeth were identified from two burials at Skateholm II. However, only in one case can they be associated with the buried person. Four incisors of aurochs were documented with Burial XX, most likely coming from two animal individuals (Jonsson 1988: 60). These items were found behind the pelvis together with red deer tooth pendants. The exact location of a left permanent incisor from Burial X is not known, but it has a perforation and therefore was most likely part of the rich grave inventory associated with this burial of two men and a dog. Aurochs remains have not been identified in settlement layers at Skateholm I or II (Jonsson 1988: Table 1).

6.1.5. Discussion

Aurochs was one of the most widely hunted animals in European prehistory (Aaris-Sørensen 1988; van Vuure 2002; Wright 2013). Most aurochs tooth pendants were found at Zvejnieki, while a few incisors were also present at Skateholm, but no aurochs remains were identified from burials at Sakhtysh. All aurochs teeth are incisors, and most of them had perforations. However, a proportion of the incisors at Zvejnieki did not show any visible traces of modification, while others had heavily ground roots without a perforation. Drilling is commonly used for making perforations, even though carving and in few cases also notches have been cut into the root end.

As shown by the material from Zvejnieki, aurochs teeth mainly occur in combination with other ungulate species, in particular elk and red deer. However, aurochs tooth pendants are present in burials with a rich inventory including tooth pendants from several other animal species, bird and rodent bones. At Zvejnieki, aurochs teeth come mainly from child burials (Fig. 6.33), suggesting that the teeth would not have been acquired by children. Rather they demonstrate care in arranging child burials. Among adult burials, men more often than women were buried with aurochs tooth pendants. Aurochs incisors at Zvejnieki are found not only on various parts of the body but also beside the body. Most of the burials with aurochs teeth concentrate in the western part of the cemetery (see Fig. 6.1).

The aurochs teeth from Zvejnieki are distributed nearly over four millennia, which indicates that this species was never intensively present. On the other hand, aurochs tooth pendants often come from burials with rich inventories including remains from several other animal species, and are mainly associated with child burials (Fig. 6.33). The scarcity of aurochs remains in settlement contexts (Lõugas 2006) suggests that aurochs was not a widely hunted species in the Lake Burtnieks area. Therefore, it is

possible that aurochs tooth pendants may even originate from more distant areas with more suitable ecological conditions for this species. Similarly, the absence of aurochs remains from the settlement contexts at Skateholm (Jonsson 1988) suggests that tooth pendants found in burials there represent a rare and special animal. They may even represent heirlooms or import from other areas, as by the late Ertebølle time aurochs were about to become extinct due to high hunting pressure in the coastal areas of southern Scandinavia (Aaris-Sørensen 1988; Jonsson 1988; Noe-Nygaard et al. 2005; Magnell 2017; see also Larsson & Price 2022). The Sakhtysh sites were already on the northern fringe of the range of aurochs and only individual aurochs or *Taurus* sp. bones are mentioned from this area (Цалкин 1964; see also Жилин 2004: 25).

The aurochs was one of the largest animals with which the Holocene hunter-gatherers shared their environment. Their size would have made them valued in terms of food and raw material supplies, and the presence of aurochs teeth in burials and even their potential curation and import suggests some symbolic importance attached to this species. However, the generally low number of aurochs remains in all contexts indicates that the connection with this species was weaker than with the other large ungulates – most importantly the elk and red deer – which dominated the landscapes of the studied territories.

6.2. Elk

The European elk *(Alces alces)* is the largest animal in the ungulate (Artiodactyla) order in Europe today. During the Holocene this species was more widespread and covered a large part of Europe, including the Pyrenees in the south and Great Britain in the west. Due to hunting and other activities the distribution of this species declined in more southerly areas, remaining mostly in northern parts of Europe. Nowadays they inhabit Central–Northern Europe and northern Russia, while several elk subspecies can be found in North America (Nygrén 1986; Geist 1998; Schmölcke & Zachos 2005).

6.2.1. Biological characteristics and other properties

Appearance and morphology

Elks are large animals with an elongated body, very long legs and a short tail. The neck is short and muscular. The head is large in comparison to the rest of the body. The muzzle is rounded, and the upper lip is large and covers the lower one. This results in a beard-like appearance. The ears are large, up to 25 cm (Siliņš 1984: 6–7).

There is distinct sexual dimorphism, the females being smaller. Males weigh up to 600 kg, and females up to 400 kg. Females never have antlers. In their first autumn the young male elks develop small bumps on the forehead, where the first antlers will grow the following spring, without any tines (Fig 6.2). In the third year of life the antlers grow longer and may have a few tines. A wider palmation of antlers forms only on individuals older than five years and reaches its maximum between the ages of 7.5 and 12.5 years. However, the antlers can show great variety, depending on each individual's congenital characteristics and living conditions. Elks shed their antlers in

December–January, but older individuals may begin this process at the end of October. Elk fur is short and rough. The skin colour varies over the body: the back is usually dark brown, the belly more greyish and the hind legs white. The skin is fragile and easily breaks (Siliņš 1984: 7–8).

Figure 6.2. Young elk male in the Lake Lubāns wetlands showing the early stage of antler development. Photo: A. Jesko.

Habitats and diet

Elk is adapted to a cold climate, and its distribution is closely tied to the boreal forest zone. Elk is a typical forest inhabitant, populating a variety of forest, scrub, young stands, bog edges, overgrown clearings and meadows. During the winter season elks prefer large pine and aspen forests, while during the summer they also make use of shrubs and young forest. They prefer new shoots from various shrubs and various plants growing in water or wet areas. During the autumn and winter, they eat more bark and new shoots of willow, rowan, aspen and birch. Only if none of these are available, will elk eat pine or even spruce (Siliņš 1984: 8–9).

Social relationships and reproduction

Elk are solitary animals and do not usually gather in herds. They are active in the mornings and evenings, and also in the daytime in places where they are not disturbed. Depending on the elk population in particular areas, elk can be monogamous or polygamous. The mating period begins at the end of August or in September, depending on the population, and lasts for about one month. Females reach sexual maturity in the second, and males in the third year of life (Siliņš 1984: 10). Elk males bellow during the rut, become very aggressive and may attack anything that moves in the forest. Depending on the age of the mother, one or two calves are born in late May or early June. The calves live with their mother until the rut, and when it is over they rejoin their mothers (Siliņš 1984: 11). Elk numbers depend on predators and disease. The main predators of elk are wolves, bears and humans.

6.2.2. Elk remains in hunter-gatherer contexts in north-eastern Europe

Elk and beaver were the most important animal species during most of the Stone Age in north-eastern Europe. In particular, in the faunal assemblages from the Boreal period sites east of the Baltic Sea elk remains are the most numerous (Паавер 1965; Лозе 1988; Zagorska 1992; Жилин 2004; Lõugas 2006, 2017; Girininkas & Daugnora 2013: 589, Table 3; Ukkonen & Mannermaa 2017). In southern Scandinavia, elk remains decrease, especially during the Atlantic period, when this species is nearly absent from the Danish islands. The number of elk remains also decreases on the coastal sites of southern Sweden, while inland sites do not indicate such change (Jonsson 1988; Magnell 2006: 57, 2017: 127–128).

Elk has been important not only for food: elk bone and antler were the most common raw materials used for making various tools and ornaments. Elk metapodials and ulnae have been most frequently used for making tools and hunting gear, such as harpoons and spears, in the Eastern Baltic (David & Zagorska 2004; David 2006). Such tools require straight, thick and compact bone parts, which other large animals, such as red deer or brown bear, cannot provide. Also, tools made from elk ribs and scapulae have been found at numerous sites (e.g. Sārnate, Bērziņš 2008b: 363) and in some cases even have incised decoration (Veretye, Ошибкина 2017). Similarly, in southern Scandinavia elk bones and antlers were commonly used for making hammers, daggers, knives, bone points and other tools (Brinch Petersen 2015: 146; Jensen et al. 2020). Artefacts made from elk bones or unworked remains have also been documented at several hunter-gatherer burial grounds in north-western Russia. For example, at Peschanitsa burial ground, a knife made from an elk shoulder blade was found in the fill of one burial, while accumulations of bones from elk and other animals were documented in other burials (Oshibkina 2008: 53).

Pendants made from elk teeth are the most common finds from burials in north-eastern Europe, especially from the Boreal period (see e.g. Ошибкина 1983, 1994; Butrimas 2012). More than 4000 elk teeth have been documented from 84 burials at the Yuzhniy Oleniy Ostrov cemetery (Гурина 1956; Mannermaa et al. 2021). In South Scandinavia tooth pendants from elk are more rare, but have been found in burials and on settlements (Larsson 1978; Eriksson & Magnell 2001; Kjällquist 2001). The elk hyoid bone has also been used for making pendants and have been documented from several hunter-gatherer burials and settlement contexts in north-western Russia (Гурина 1956: 312, 294, 306; Ошибкина 2017: 36). For example, in Burial VIII at the Popovo burial ground, 58 pendants made of hyoid bone were found in a burial of young man (Oshibkina 2008: 58).

Elk had a very important place in the worldview of northern hunter-gatherers and is the most commonly depicted animal in mobiliary art as well as rock art panels (see Fig. 2.2) (Кашина 2005; Lahelma 2007, 2008; Gjerde 2010; Sjöstrand 2011; Helskog 2012; Fuglestvedt 2018). Elk head staffs form a special category of finds. Around thirty staffs with an elk head decoration are known from hunter-gatherer burial grounds and settlements across north-eastern Europe (Rimantienė 1979; Костылёва & Уткин 2010: 211, Fig. 111; Zhulnikov & Kashina 2010; Mantere & Kashina 2020) as well as in vast

Figure 6.3. Elk head figurine made from wood found at Ivanovskoye 3 settlement in the Volga–Oka interfluve in 1981. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

territories of northern Eurasia (e.g. Losey et al. 2021). Such elk head staffs, often in a complete state, have been found with burials at Yuzhniy Oleniy Ostrov (Гурина 1956) and Donkalnis (Butrimas 2012). In settlement contexts such finds may have been intentionally destroyed (Mantere & Kashina 2020), although an elk head staff carved from antler at the Šventoji 3B site was found in intact condition (Rimantienė 1979; Loze 1983). Elk antlers also provided suitable material for making masks: at the Veretye 1 site, two masks were found, one zoomorphic and the other anthropomorphic (Ошибкина 2017: 52). In addition, eight plates made from antler were found in settlement contexts, while at the Popovo cemetery two such antler plaques were found in ritual pits near Burial VI, richly sprinkled with ochre and accompanied by other artefacts (Ошибкина 2017: 51, 132).

Elk representations in amber have been found at Egemarke in Denmark (Vang Petersen 2021) and Sārnate (Ванкина 1970). Several artefacts representing elk have been found in the osseous stray find collection from Lake Lubāns and several sites located by the lake (Loze 1983; Vankina 1999). Elk representations are also found on stone axes in northern Sweden, Finland and Karelia (Carpelan 1977; Björck 2003: 38, Fig. 8). Clay figurines representing elk are known from Åloppe in Sweden (Björck 2003: 38, Fig. 8) and Pörrinmökki and Pykinkoski in Finland (Wallenius 1986; Pesonen 2000). An elk head representation carved in wood (Fig. 6.3) was found at the Ivanovskoye 3 settlement in the Volga-Oka interfluve (Костылёва & Уткин 2007; see also Immonen 2002 for Finland).

6.2.3. Elk at Zvejnieki

Elk remains from secure contexts have been identified with 57 burials at Zvejnieki (Fig. 6.4, Table 6.2), comprising teeth and various items made from elk body parts. Elk teeth constitute the most numerous animal body part documented in the grave inventories at Zvejnieki and have primarily been used for making pendants. Altogether, 681 elk teeth from secure contexts (736 in total) have been documented from

50 burials at Zvejnieki. In 12 more burials, elk remains originate from the grave fill or mixed contexts and are excluded from the analysis. In total, 610 modified elk teeth have been identified, and are present with 64% of all burials with animal tooth pendants at Zvejnieki.

The most numerous finds are elk incisors. Their number varies from one to as many as 83 teeth in one grave. The largest number of elk incisors is documented from double Burial 122/123, that of an adult male and a child. Here at least 15 animals were used for making ornaments. Deciduous teeth from elks were identified from 10 burials, although usually only one or two items were documented per grave. Three deciduous teeth were identified only from the richly furnished Burials 122/123 and 190. Split or complete elk premolars and molars (Fig. 6.5: 4) are documented from 13 burials, comprising 208 pendants. The largest number of split molar pendants are registered in Burial 24, counting 63 specimens.

Figure 6.4. Distribution of burials with elk remains at Zvejnieki cemetery. Scale bar is 30 m. Map: K. Nordqvist.

Various modification techniques have been observed on elk teeth (Fig. 6.5). The largest number of elk teeth have notches (grooves) in the end of the root, or else perforations have been carved. Drilling has been identified only in few cases. All of the elk premolars and molars have similar modification traces for suspension and have notches on the root end. In some cases, the root end is broken, but these most likely had a similar type of modification. Various types of notches have been cut into the root end or just above the crown. In a few cases a deep cut groove over the whole root end was used for attaching these items. In several burials, elk teeth have no perforation but have instead been modified by grinding. Grinding with rough parallel striations on two or four sides of the root was observed, for example in Burials 43, 100 (Fig.

6.5: 2). Especially heavy grinding was observed also on specimens with drilled perforations, such as teeth from Burials 43 and 320 (Fig. 6.5: 3). Elk teeth without visible modification traces were identified from several burials (e.g. 57, 132 and 164), mainly comprising poorly preserved specimens. In some cases, the root ends are broken or restored, whereby no manufacturing traces could be observed. However, some are complete, and these demonstrate that elk teeth without any modification could also have been deposited with burials.

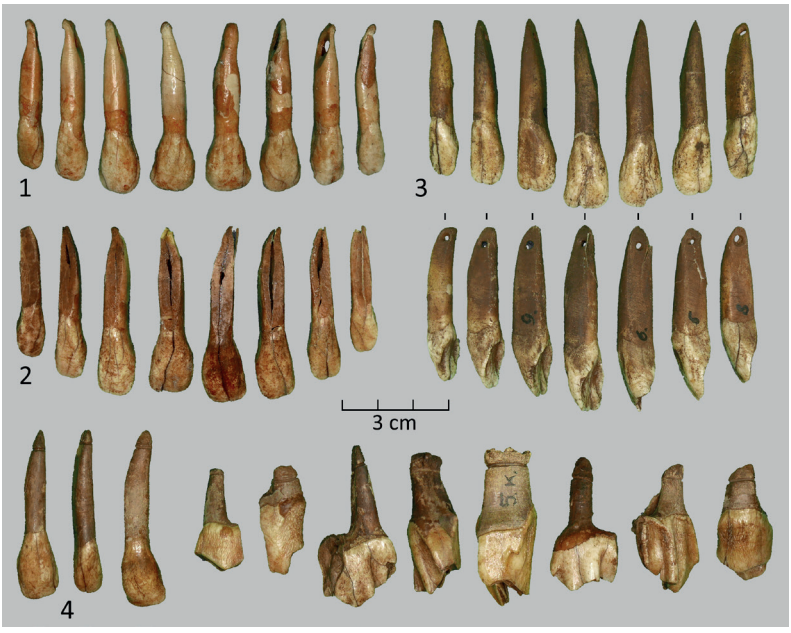


Figure 6.5. Elk teeth from Burials 5 (4), 100 (2), 153 (1) and 320 (3), including incisors and pendants made from split premolars and molars. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Elk teeth are documented in all areas associated with the body and next to it. An intentional grouping of teeth in pairs is observed with double Burial 11/12, where, elk, wild boar and horse teeth were arranged in pairs on the right side of Burial 12. In Burial 100 several complete sets of elk incisors were identified on various parts of the body, although mainly associated with the torso. The elk incisors were arranged in several clusters placed on the chest of the man and child in the double Burial 122/123, as well as on both sides of legs of the adult individual and the child, which had been placed above the legs of the adult.

A complete set of elk incisors (most likely from the same animal) with carved perforations was found on the middle of the frontal part of the head of a juvenile in Burial 153 (Fig. 6.5: 1, 6.6). In addition to this set of elk teeth, more than 80 different carnivore teeth were found around the whole head (with two more elk incisors on the left side). In Burial 170, a particular organization of tooth pendants could be

identified. Elk teeth with a drilled perforation had mainly been placed by the feet and head, and were especially numerous around the neck. Some were also found on the left side of the chest. In Burial 24, split elk molar pendants were distributed all over the poorly preserved child burial, but the largest concentration was in the pelvis area, around and under it.

Figure 6.6. A complete set of elk incisors found on the forehead of a juvenile in Burial 153. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Elk are represented not only by teeth but also by other bones with or without working traces. In the case of Burial 208, four metapodial bones of elk with holes (Fig. 6.7: 2), were found under the right leg of the buried man, together with other bone tools and worked bone fragments. Various tools made from elk bone have also been found with burials. The most common are awls or daggers made from metacarpal or metatarsal bones (Fig. 6.12: 1–3), found with six burials. Most of these were located in the region of the upper body, especially by the arms. For example, in the case of Burial 317, an awl was found adjacent to the right humerus. Three objects resembling maces, made from elk antler, were identified from Burial 221 (Fig. 6.7: 1). They were found together with a rich array of amber ornaments. In a deposit by Burial 211, a knife fashioned from an elk scapula and three awls made from elk metacarpals were documented among other bone and antler artefacts.

A pendant with incised decoration made from an elk (or cervid) hyoid bone (Fig. 6.12: 5) was identified in Burial 100 (previously interpreted as a bird mandibula, see Zagorskis 1987: 33). Artefacts depicting elk have been identified from two burials. In the case of Burial 277, an antler object in the shape of an elk head was found near the left leg of the buried man (Fig 6.12: 6). This burial also had rich amber decorations

and even two copper rings (the only such find in the whole of Zvejnieki cemetery). Also, a bone dagger with a handle resembling an elk head has been found with Burial 57 (Fig. 11.7).

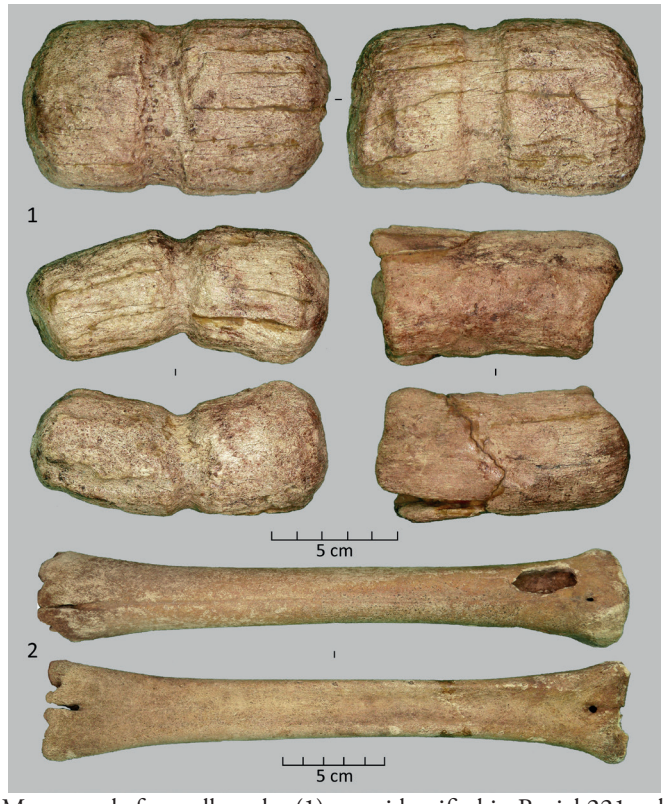


Figure 6.7. Maces made from elk antler (1) were identified in Burial 221, while in Burial 208 elk metapodial bones with holes were documented (2). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Burials with elk remains are distributed over the whole of Zvejnieki cemetery (Fig. 6.4). Elk remains, particularly teeth, are especially numerous in the western part of the cemetery. For instance, burials with split premolars and molars were found only in this part of the cemetery. Burials with tools made from elk bones are more common in the eastern part. The largest section of burials with elk remains are burials of adults. The majority of these are burials of men (21), while elk remains were identified only with nine burials of women and three burials of indeterminate individuals (Fig. 6.33). Burials of children number 25. Elk teeth were also documented with two double burials of an adult male and a child (122/123 and 132a). Elk teeth could be the only part of the grave inventory, but more often they were combined with pendants from other animal teeth and artefacts from various materials, such as amber, copper and stone. Ornaments from elk premolars and molars were mainly documented in burials with other ungulate remains and could also occur alone.

Dated burials with elk teeth comprise 14 graves with 16 radiocarbon datings (see Appendix 1). Since elk teeth are the most common at Zvejnieki cemetery, the time span of these burials is also wide, stretching over four millennia. The earliest dated burial with elk remains is Burial 170, falling in the mid–late 8th millennium or the transition to the 7th millennium cal BC. A double burial of children, 319/320, is the second oldest, falling in the mid 7th millennium cal BC. Burials 57, 93, 100 and 122 are from the 6th millennium cal BC, while Burial 121 gave a date from the turn of the 5th millennium cal BC. Burials 153, 163 and 165 have given dates in the mid–late 5th millennium cal BC, while Burial 164 and double Burial 316/317 are from the late 5th or first part of the 4th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018).

Table 6.2. Elk remains at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	NISP I	NISP PM, M	MNI	Location	Modification	Comments
5	indet.	C	dentes	4	26	1	neck, head, chest, mixed	notches	elk incisors possibly from same individual
11	indet.	C	metacarpal			1	pelvis	decorative cut lines	awl from elk metacarpal
12	indet.	C	dentes, metacarpal	9		2	chest, beside the body	notch, carving, grinding	awl from elk metacarpal
15	M	A	dentes		3	1	right knee	notches	
16	F?	A	dentes		6	1	head, pelvis	notches	
17	M	A	dentes	1		1	left of head	carving	poorly preserved roots
22	indet.	C	dentes, metacarpal	1		1	chest	broken	broken root, awl from elk metacarpal
24	indet.	C	dentes		63	1	chest, pelvis, left of head	notches	2 possible elk incisor pendants, but all crown broken
27	indet.	C	dentes		19	1	neck, chest, pelvis, legs	notches	
28	indet.	A	dentes	2		1	above skeleton, on chest	notches	both teeth extremely modified, nearly whole crown missing
29	indet.	A	dentes	2	17	1	by left arm, inside right femur, by right tibia, inside left tibia	notches	some premolars/molars do not have notches, since root end broken
30	indet.	C	dentes		3	1	pelvis	notches	
31	indet.	C	dentes		37	1	chest, pelvis, legs	notches	
33	F	A	dentes	2	8	1	between femur, under head	notches	
37	M	A	dentes	1		1	right from head	grinding	

Grave no.	Sex	Age	Anatomical part	NISP I	NISP PM, M	MNI	Location	Modification	Comments
43	indet.	C	dentes	38		9	pelvis, by right & left hand	drilling, carving, grinding	several sets of teeth from same individuals
45	indet.	C	dentes	2		1	outside right pelvis, femur	notches?	exhibited at NHML, studied through the showcase
55	indet.	C	dentes	1		1	by right lower arm	poorly preserved	very poor condition
57	F	A	dentes	24		5	pelvis, chest, left of head, above right shoulder	carving, drilling, no modification	many incisors from same animals, elk head depiction on bone dagger
62	indet.	C	dentes	5 (10)	4	3	pelvis, behind head, in disturbed part, mixed earth, in fill	carving, notches	14 elk teeth, 9 with skeleton, 5 teeth by foot that had been dug up and found 35 cm above the rest of skeleton, some in fill, deciduous incisors
69	indet.	C	dentes	2		1	by feet	not preserved	crown fragment only
74	F	A	dentes	8	20	1	by right lower arm, in grave fill	notches	premolar and molar very fragmented
83	indet.	C	dentes	1		1	on right arm	restored	heavily restored crown fragment
92	M	A	dentes	3		2	under left elbow	carving, broken	perforations broken and heavy restored
93	M	A	dentes	4	1	1	by left lower arm, left tibia, above left shoulder, feet	notches, carving, broken	deciduous incisors
100	indet.	C	dentes, hyoid	35		6	chest, pelvis, above knees	grinding, carving? drilling?	roots heavily polished from 4 or 2 sides, no perforation, some have drilled or carved perforation, 4 decorative sets of teeth from same animals?; elk? hyoid pendant with carved hole & decorative incisions
108	indet.	C	dentes	6		2	right side of head, above tibia	notches	all with notches
114	M	A	dentes	14		3	chest, neck, left foot, inside & outside right femur	carving, drilling, grinding broken	many root ends broken or restored

Grave no.	Sex	Age	Anatomical part	NISP I	NISP PM, M	MNI	Location	Modification	Comments
115	M	A	dentes	7	1	2	chest, pelvis, femur	carving, grinding	deciduous incisors
116	indet.	C	dentes	6 (9)		1	by feet, mixed earth above burial	carving, broken	some root ends broken & restored; some from mixed area
121	F	A	dentes	24		5	chest, between femora, outside left upper legs	carving, drilling, grinding cut marks, broken	some roots polished before making hole, some from same individual, deciduous incisors
122/ 123	M + indet.	A + C	dentes	83		15	chest (adult & child), by feet, outside right & left legs, knees of adult, by right pelvis, left shoulder	carving, polishing	some may be from same individuals, deciduous incisors
128	indet.	C	dentes	9		1	chest, left & right arms, feet, femur	carving, broken	some teeth without tooth wear, some heavily worn
132	M + indet.	A + C	dentes	18 (24)		5	above right shoulder, femur, in mixed earth above grave	carving, grinding, no modification	whole set of unmodified elk incisors, some root ends polished, some teeth from same animals
136	F	A	dentes	2		1	on chest, mixed earth above burial	carving	one crown nearly all missing
146	F	A	dentes	1		1	on head	carving	most of crown broken
147	M	A	dentes	2		1	by right elbow, under skeleton	drilling, polishing	part of one crown broken, heavy polishing on same tooth
153	M	A	dentes	18		2	head, outside left shoulder, knees	carving, grinding	1 complete set of incisors from same animal, no tooth wear; other set with heavy tooth wear (from same animal)
158	M	A	dentes	4		2	chest	carving, polishing	
160	M	A	dentes	1		1	outside left tibia	?	no information on perforation
162	M	A	dentes	5		1	outside right & left knee	drilling	some teeth from same animal
164	M	A	dentes	1		1	on left side by dislocated mandibula		tooth broken
165	M	A	dentes	1		1	under head	carving	

Grave no.	Sex	Age	Anatomical part	NISP I	NISP PM, M	MNI	Location	Modification	Comments
170	M	A	dentes	53		9	by feet, chest, head, neck	drilling, cutting	some from same individuals, all drilled, some have straight cut root end, in similar manner as for wild boar teeth
178	F	A	dentes	1		1	above skull		
189	indet.	C	dentes	5		1	neck, chest, right side of the body	carving	deciduous incisor
190	indet.	C	dentes	47		7	head, chest, pelvis, outside upper legs	carving, grinding	carved roots, some heavily ground, some just crowns, deciduous incisors
208	M	A	metapodium			1	under right leg	holes	four metapodial bones from elk with hole in proximal end
211 (deposit)	F	C	metacarpal, scapula			1	in deposit by grave		three awls of elk metacarpals
219	indet.	C	dentes	1		1	behind head	drilling	burial should also have premolar and molar, but they are missing from museum collection
221	M	A	antler				legs		elk antler maces
259	indet.	A	metacarpal			1	inside left tibia		elk metacarpal awl
260	indet.	C	metacarpal			1	forehead, left side		elk metacarpal awl, broken tip
316	F	A	dentes	1		1	by feet	notch	broken crown
317	M	A	metacarpal			1	by right upper arm		elk metacarpal awl
319	indet.	C	dentes	7		2	by feet	drilling	seems nearly all from same animal
320	indet.	C	dentes	11		3	by feet	drilling	one whole set of elk incisors

In the territory of the Zvejnieki cemetery, a deposit of elk antlers is mentioned in the vicinity of Burial 271 in a field report from 1971 (Zagorskis 1971: 64). The description of this find is brief, but according to the photo (Fig. 6.8), the antlers had been deposited in a pit filled with black earth, which contrasted well with the surrounding gravel. Elk remains are the most numerous at the Zvejnieki II settlement, by far exceeding the numbers of other animal species (Lõugas 2006).

Figure 6.8. Elk antler deposit in the eastern part of the Zvejnieki cemetery. Photo: F. Zagorskis (Repository of Archaeological Material, Institute of Latvian History, University of Latvia).

6.2.4. Elk at Skateholm

At Skateholm I, elk incisor pendants have been documented in three burials, but only in the case of two burials of women can they be securely associated with the deceased (Table 6.3). In addition, in Burial 21, a complete set of elk incisors (eight teeth), with only crowns preserved, have been identified as originating from the grave fill (Jonsson n.d.).

Table 6.3. Elk teeth at Skateholm I and II. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	MNI	Location	Modification	Comments
6	F + indet.	A + C	1	1	pelvis	no	
53	F	A	10	2	behind hips	drilling	
VIII	F + dog	A	2	1	pelvis	drilling?	
X	A + A + dog	A + A	1	1	by skull?	drilling	two drilled holes: one failed and a second drilled higher up in the root
XXII	F	A	1	1	pelvis?	drilling?	

At Skateholm II, four elk incisors with perforations have been documented from three burials (Fig. 6.9). All of these graves had a rich inventory of other animal remains and stone tools. Burial VIII had over 100 red deer tooth pendants in the pelvic area, while Burial X had 55 other animal teeth, along with more than 20 unmodified and

modified bones. In Burial XXII an elk tooth was found together with a rich assemblage of other animal tooth pendants, marten mandibles and a slate pendant. Elk remains have been found on the settlements at Skateholm I and II, but in low frequencies, constituting less than 1% of all bones of ungulates (Jonsson 1988).

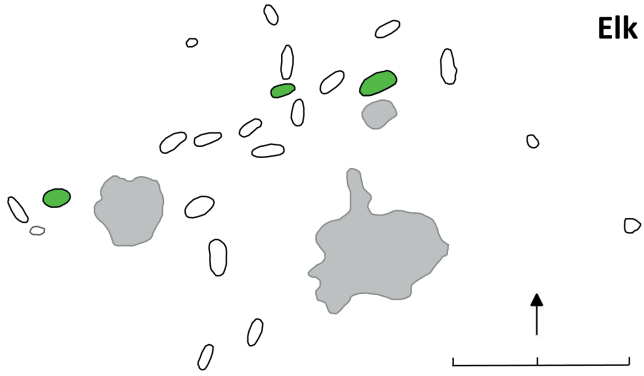


Figure 6.9. Burials with elk remains at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

6.2.5. Elk at Sakhtysh

Single elk incisors have been documented with Burials 9, 15/XIII and 18 at the Sakhtysh II cemetery (Fig. 6.10, Table 6.4). Notches have been cut on the incisor in Burial 9, while the pendants from Burials 15 and 18 have drilled holes. From Burial 9 a marten canine pendant was also recorded, while Burial 18 had numerous pendants from carnivore teeth. A split antler of elk and small fragments of sharp bone tools were found under the skeletons of Burials 9 and 15 (Костылёва & Уткин 2010: 42), but these were not available for me to study.

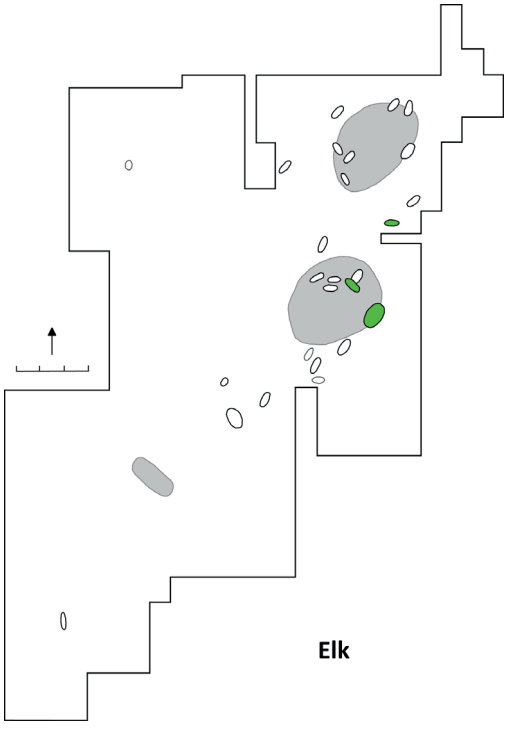
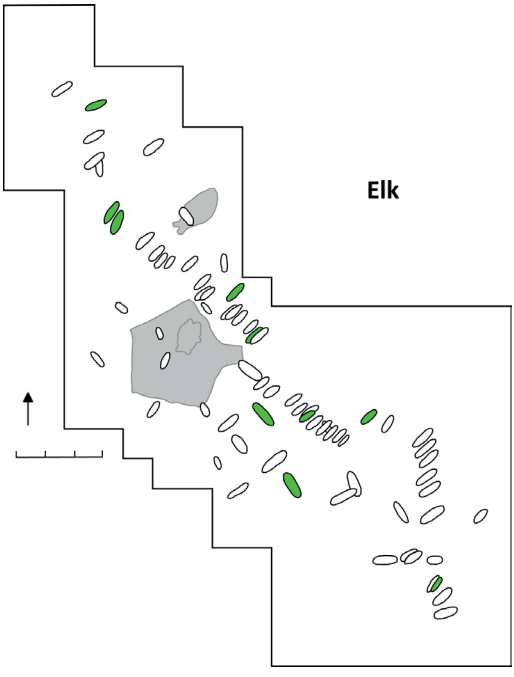


Figure 6.10. Burials with elk teeth at Sakhtysh II. Scale bar is 6 m. Map: K. Nordqvist.

Table 6.4. Elk teeth at Sakhtysh II and IIa. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	MNI	Location	Modification	Comments
9	indet.	A	1	1	by tibia	notch	all crown broken, poor preservation
15/ XIII	indet.	C	1	1	?	drilling	
18	F	A	1	1	by knees	drilling	
13a	F	A	1	1	head	notch	crown broken, root poorly preserved
17	indet.	C	1	1	on chest	drilling, grinding	heavily disturbed child burial
22	F	A	1	1	under feet	notches	2 bone daggers and harpoon
24	F	A	1	1	pelvis	drilling	
36b	M	A	1	1	head	root end cut	no perforation, just straight cut root end
40	M	A		1	shoulder		elk metacarpal awl
56	M	A	2	1	upper thighs, tibia	notches	
57	F	A	1	1	pelvis	drilling, grinding	crown broken, poor preservation, hole broken
66	F	A	2	1	shoulder area	notches, drilling	originally three elk incisors mentioned, dating failed



Ten elk incisors were identified from nine burials at Sakhtysh IIa (Fig. 6.11, Table 6.4). Mainly single incisors were documented, except in the case of Burials 56 and 66. Most of them come from burials of adult women. In contrast to other animal tooth pendants, and especially the carnivore tooth pendants, elk teeth are in many cases the only grave inventory and are not encountered in

Figure 6.11. Distribution of elk remains at Sakhtysh IIa. Scale bar is 6 m. Map: K. Nordqvist.

larger numbers. Some teeth had notches, while others had drilled perforations for suspension.

Elk tooth pendants occurred with burials distributed over the whole cemetery, and were also encountered with two Lyalovo burials (22 and 40), while a dagger or an awl made from an elk metacarpal bone was found by the left shoulder of an adult male, Burial 40. The excavation documentation also mentions an artefact made from elk antler by the left elbow of Burial 34, where two bear tooth pendants and a slate pendant were also found, outside the left arm (Крайнов & Костылёва 1990). Under two Burials – 6 and 15 – lengthwise split elk antlers and sharpened bone tools were found (Костылёва & Уткин 2010: 42).

Also, a unique mask (see Fig. 11.11) made from an elk antler was found in the so-called sanctuary (Kostyleva et al. 2001; Костылёва & Уткин 2010: 49). The mask is that of a human face. The nose has open nostrils for breathing, a high forehead with pronounced eyebrows and four drilled perforations on each side, most likely for suspension. A ceramic vessel of the Volosovo type also lay *in situ* in this pit, as well as bones from bear, beaver, elk and marten. Numerous elk incisor pendants have been documented in the settlement cultural layers at Sakhtysh II and IIa, where elk teeth comprise nearly half of all studied tooth pendants (Macāne 2017).

6.2.6. Discussion

Elk teeth are the most common raw material for making pendants at Zvejnieki, comprising 681 specimens, while only 12 elk tooth pendants have been documented at Sakhtysh burials and 15 at Skateholm. Other elk body parts, such as metapodials, hyoid bones and antlers have also been turned into various tools and personal ornaments at Zvejnieki and Sakhtysh (Fig. 6.7, 6.8, 6.12). Elk incisors prevail, but occasionally also split premolars and molars have been used for making pendants at Zvejnieki. Carving at the root end is the most common practice for perforating elk teeth at Zvejnieki, while at Skateholm drilling and at Sakhtysh notches and drilling were rather used for suspension. This supports the earlier observations at Zvejnieki, where drilling is linked to the earlier use phases of the cemetery, gradually changing to other modification practices over the millennia (see Larsson 2006a). Only notches have been made for suspension of elk premolars and molars, while in some burials the roots of incisors were heavily ground from two or four sides.

Occasionally, complete sets of incisors coming from the same animal have been used in Zvejnieki. These teeth are sometimes not perforated, but otherwise exhibit similar way of working and use. The incisor sets have been often found following the anatomical order of the teeth in the jaw. This suggests that the sets come from particularly important animal individuals. Perhaps preserving the anatomical integrity when transforming them into burial ornaments was a way of maintaining the personal link to this animal individual. In some cases, complete sets of front teeth of other species have also been found, including the aurochs and red deer at Zvejnieki and the red deer at Skateholm.

Figure 6.12. Various elk bone and antler artefacts documented in Zvejnieki burials. Awls or daggers made from elk metapodial bones were documented in Burials 12 (1), 22 (3), 264 (2). Pendant made from a hyoid bone of a cervid was found in Burial 100 (5), elk representation in antler in Burial 277 (6). Bone spears, arrowheads and harpoons were found in Burials 164 (7) and 300 (4). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

At Zvejnieki, elk premolars and molars would have been the most commonly available material for making pendants throughout the Stone Age. Still, they have only been found with 13 burials. All elk premolars and molars have been split and suspended using notches. All burials with this type of tooth pendant are located in the western part of the cemetery, and the only available date (Burial 74) places them at the turn of the 6th millennium cal BC. Pendants from molars and premolars are rarely encountered in the same graves as pendants from incisors, possibly suggesting that they were used to manifest affiliation to a particular social group or aesthetic preferences. Be this as it may, the rarity of molars and premolars shows that their selection meant a different interaction with the elk than the common use of incisors.

Since ungulate teeth are the most numerous at Zvejnieki, it is not surprising that elk teeth have most commonly been found together with teeth of other ungulates (see Fig. 6.32). Combinations with carnivores are not uncommon, and sometimes elk teeth also occur alone. The richest burials include numerous animal species and hundreds of teeth. For example, Burial 122/123 had more than 80 elk teeth together with more than 100 wild boar teeth and over 100 teeth from 10 other animal species (Fig. 5.32 and 6.13). The abundance of elk teeth provides a possibility to make comparisons with the age and sex of the buried individuals (see Fig. 6.33). Most elk teeth come

Figure 6.13. The double Burial 122/123 of an adult male and a child had 332 animal teeth, 83 of which were elk tooth pendants. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne.

from children's burials, followed by burials of men, while relatively few women had elk tooth pendants. This shows that both the selection of species and with whom they were buried were conscious decisions. Furthermore, presence of such a great number of animal teeth in one burial indicates controlled resource procurement within the community. For example, the ornaments in Burial 122/123 consisted of teeth coming from at least 15 elks. These teeth would have been gradually accumulated or curated for a longer period of time, or collected from the family community in the event of the death and burial. Long-term use and curation of tooth pendants has previously been suggested for the Zvejnieki material (Larsson 2006a: 281), Skateholm (Larsson & Price 2022: 60), as well as Yuzhniy Oleniy Ostrov (Mannermaa et al. 2021). While at Zvejnieki elks (as well as all other main ungulate species) were most commonly associated with children, at Yuzhniy Oleniy Ostrov only a few elk tooth pendants have been documented from children's graves (Mannermaa et al. 2021). Such differences tell of different social traditions and different relationships with particular animal species.

Besides teeth, other parts of the elk body were also modified into artefacts and chosen to accompany the deceased in the grave. Elk metapodials are one of the most commonly used part of the elk (see David 2006). With spears and harpoons in particular, intensive working has removed all recognizable traces of the actual animal. On the other hand, daggers or awls manufactured from the lateral metacarpal bones (metacarpale II and V) of elk represent artefacts where the animal bone in its natural form has been chosen to serve particular purposes. Some indication of their use and wear is provided by a few cases both in Zvejnieki (Burial 300 and 317) and Sakhtysh IIa (Burial 40), where such metacarpal awls were found very close to the right upper arm of the buried men. Another male (Burial 208) at Zvejnieki had four elk metapodial bones with holes placed under his legs (Fig. 6.6: 2). Although the function of these bones remains unclear, their placement is intentional. Deposits of metapodial

bones are often interpreted as raw material for making bone tools (see Larsson 1983c, 2015; Gummesson et al. 2019b; Jensen 2020 for Scania). In Zvejnieki, there are also a few elk phalanges with possible marrow extraction traces, but these come from the grave fill and their connection with the deceased is not clear.

Elk antler artefacts are very few, but include some of the most unique objects in the studied assemblages. Burial 277 at Zvejnieki had a small elk representation (a fragmented staff?) of antler (Fig. 6.12: 6). The three maces made from elk antler in Burial 221 (Fig. 6.7: 1) do not find parallels in the study area. A resembling artefact type, also called a mace, but made of rounded crystalline rocks with a similar groove in the centre, have been found in present-day Finland (Meinander 1954; Nordqvist pers. comm.). These objects are associated with Comb Ware pottery starting from the 4th millennium cal BC, consistent with the dating of Burial 221. Slate rings, documented in the same burial and themselves likely also a northern import, further strengthen the link in that direction. Another intriguing object is the mask made from an elk antler found at Sakhtysh IIa (see Chapter 11.2.4 for a further discussion of the mask; also Ошибкина 2017 for another mask found at Veretye I). Otherwise, antler finds from the cemeteries are rare: split elk antlers have been mentioned in connection with some burials at Sakhtysh II and IIa (Костылёва & Уткин 2010: 42), and an elk antler deposit at Zvejnieki (Fig. 6.8).

The abundance of elk bones at the settlement sites of boreal hunter-gatherers underscores the enormous economic value of this animal. Still, the relationship to this species was not built solely on economic grounds. Finds from hunter-gatherer burials and the numerous elk representations and depictions stress the social and symbolic relationship with this animal and its importance in the cosmology and worldview of northern hunter-gatherers. However, the present data shows that the importance attached to the elk varied both geographically and with time. The small number of elk teeth at Skateholm may indicate its lesser symbolic meaning or simply show that this species was not abundant in the surroundings of the site (Jonsson 1988). At the same time, the relative paucity of elk finds from the Sakhtysh burials cannot be linked to the environmental conditions, since elk tooth pendants are quite numerous in the settlement layers (Macāne 2017). By the 4th millennium cal BC the relative importance of carnivores had increased, and perhaps different meanings were attached to the elk during daily life and in death. The dominance of elk teeth at Zvejnieki not only shows the availability of this animal but rather emphasizes a particular social or symbolic attachment to this species. The elk was, after the aurochs, the largest inhabitant of the Holocene environment. The shared environment, regular encounters and observations, combined with the physical characteristics and economic importance of elk made this animal one of the most important companion species for these hunter-gatherers.

6.3. Red deer

Red deer *(Cervus elaphus)* belongs to the Cervidae family. Around 15 regional subspecies have been distinguished under the species *Cervus elaphus*, inhabiting most of Europe, western Asia and north-western Africa (Gyllensten et al. 1983; Höglund et al. 2013).

6.3.1. Biological characteristics and other properties

Appearance and morphology

Red deer has a slender head, a long neck, slender and muscular legs, and a very short, rounded tail. The height varies between 1.2 and 1.4 m for males, while the length reaches up to 1.9–2.4 m. The weight is between 180 and 340 kg. The females are around 20–40% smaller. The coat varies depending on the season, and the sex and age of the animal, but consists of guard hairs and a short undercoat. The males are reddish brown in summer, while in winter their coats are greyer or yellowish brown. In the first three months the calves' pelage is red brown with round yellowish-white spots, helping them to hide from danger (Siliņš 1984: 14).

The first antlers, without a rosette and covered with velvet-like skin, appear on the male deer at the age of 7–8 months. Thereafter, the antlers have a rosette, and the number of tines increases with age, but the number of tines is not equivalent to the age. The maximum size of the antlers is reached at the age of 7–13 years, after which they diminish in size. Adult deer shed their antlers in March–April (Mitchell et al. 1977; Siliņš 1984: 15). Red deer have a well-developed sense of hearing and smell, whereas their eyesight is weaker. They are good swimmers and may escape from predators in water. The life expectancy is around 15 years, but may sometimes reach up to 20 years (Siliņš 1984: 15).

Habitats and diet

Red deer favour broadleaved and mixed forest. The leaves and shoots of birch, aspen and willow form the main part of the diet, in addition to herbaceous plants. During the summer season they prefer grassy areas of forest with broadleaved trees and may graze in meadows by the forest. In the autumn season they prefer drier areas rich in lichens and lingonberry bushes, which may be supplemented with acorns and rowanberries, while in the winter season forest areas rich in young junipers, pines, aspens and willows are preferred (Siliņš 1984: 17–18).

Social relationships and reproduction

Red deer live in sedentary herds. The female and her offspring of two years form the basic unit of the herd. Several such units form a herd, comprising between six and 12 animals. In favourable conditions herds may reach up to 50–100 individuals (Siliņš 1984: 15, 253). The herd has a strictly regulated order, and is usually led by an older female. The choice of herd leader takes place without any fights or competition. It is decided by natural characteristics, since only a fertile female which can take care of its calves can also lead the herd. Each herd has its own territory (Siliņš 1984: 17).

Usually, the males are solitary, and starting from the third year they leave the herd. Males also form a herd, but their organization is completely different. There is no leader in a male herd, and the strongest ones terrorize the smaller and weaker individuals. Some males choose to live solitary lives throughout the year, except for the mating period. The peak of the rut is in mid-September and it lasts for 5–6 weeks. The sounds males use during the rut signal their size, and the presence or absence of

females. Older and stronger bulls do not need sounds to signal their power. Females reach sexual maturity in the second or third year of life, while males are sexually mature already in their second year, but take part in the rut starting from the third year. The gestation period lasts 34–35 weeks, and the calf is born in late May or early June. Natural enemies of red deer include boreal predators such as bears, lynx and wolves (Siliņš 1984: 21).

6.3.2. Red deer remains in hunter-gatherer contexts in north-eastern Europe

Red deer was the main quarry for the hunter-gatherer communities in coastal areas of southern Scandinavia and the Eastern Baltic (Noe-Nygaard & Richter 1990; Eriksson & Magnell 2001; Richter & Noe-Nygaard 2003; Girininkas & Daugnora 2013; Lõugas 2017; Magnell 2017). However, a generally lower frequency of red deer at the coastal sites in comparison with the inland sites, noted for areas in southern Sweden, has been interpreted as reflecting higher hunting pressure in the coastal regions due to denser and more sedentary human populations by the coast (Magnell 2017: 132). On the eastern shore of the Baltic Sea, red deer remains are more common in the western parts of Latvia and Lithuania, while in eastern Latvia and Estonia elk remains dominate in faunal assemblages (Girininkas & Daugnora 2013; Lõugas 2017).

Red deer bones and antlers were commonly used for making bone tools, as shown by the studies of Scandinavian and western Latvian materials (Gummesson 2018; Zagorska et al. 2021). Both shed and unshed antlers have been used for making tools (Gummesson et al. 2019a), and it has been suggested that dogs could have been used to help find this important raw material (Vang Petersen 2013: 153). The largest osseous assemblage from western Latvia, collected from the washed-out site of Sise (6th millennium cal BC), consists mainly of tools and debitage from red deer antler (Zagorska et al. 2021).

Red deer remains are commonly encountered in hunter-gatherer burial assemblages. Pendants made from red deer teeth are the most numerous, even though in southern Scandinavia, red deer antlers have also been used in burial arrangements (Larsson 1988a; Brinch Petersen 2015). Ornaments made from red deer teeth have been found with numerous burials in the southern parts of the Baltic Sea region and also further south, on German and Polish sites (e.g. Brinch Petersen 2015: 146; Grünberg 2016). For the most part, red deer mandibular incisors and canines have been used, but maxillary canines have occasionally been identified as well (see Brinch Petersen 2015). For instance, deer tooth was one of the main materials for making tooth pendants at Donkalnis and Spiginas burial grounds: deer teeth comprise 18% of all animal tooth pendants found at these sites (Butrimas 2012: 129, Fig. 75). Similarly, numerous red deer teeth have been documented from the burials at Vedbæk and Tågerup, where complete sets of front teeth were placed in several positions on or beside the body (Albrehtsen & Brinch Petersen 1977; Kjällquist 2001; Brinch Petersen 2015). Several such sets were identified, for example with Burial 8, where the buried woman had 164 red deer incisors and canines, coming from at least 40 deer. Most of the teeth at

Vedbæk have been perforated, but some of the teeth have even been cut out of the deer mandibulae (Brinch Petersen 2015: 150).

Depictions of red deer are not that common in north-eastern Europe, but a resemblance to the red deer fawn skin pattern has been suggested for amber pendants found at the Holme and Fælleseje tørvemose sites in Denmark (Vang Petersen 2021: Fig. 9). A preference for skins of young fawns is also indicated by the large number of red deer fawn bones, as well as bones of roe deer fawns, excavated at the Agernæs site (Richter & Noe-Nygaard 2003).

6.3.3. Red deer at Zvejnieki

Red deer incisors, canines, premolars, phalanges and tools made from red deer antler have been identified from 24 burials at Zvejnieki (Fig. 6.14, Table 6.5). Altogether, 381 red deer teeth from secure contexts (403 teeth in total) have been identified at the Zvejnieki cemetery. In Burials 126 and 177, and partly also Burials 62 and 132, red deer remains came from mixed contexts or grave fills. Nearly all of the red deer teeth are incisors and mandibular canines, with the exception of Burials 114, 121, 124, 189 and 190, where 14 maxillary canines have been identified. Two premolars or molars were identified with Burials 100 and 132.

Various perforation techniques were observed on red deer teeth, including carving, drilling as well as notches. However, compared to the teeth of other ungulates, red deer teeth present a larger number of teeth without a perforation and teeth in completely unmodified condition (69 teeth). Heavy grinding has been observed on teeth from Burials 108, 114, 122/123 and 189. All of the maxillary red deer canines from Burial 190 had a drilled perforation, except one tooth, which had a carved perforation (Fig. 6.15: 3).

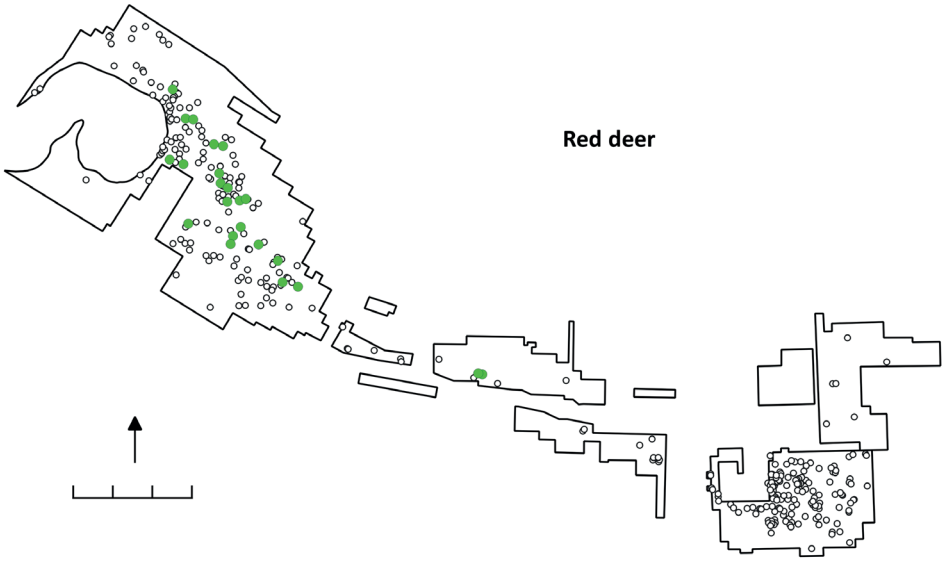


Figure 6.14. Red deer remains at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

Only three burials had more than 50 red deer teeth (Burials 122/123, 128 and 190). The use of complete sets of red deer front teeth has been identified in the case of several burials (e.g. 57, 76 and 93) and teeth are often without any perforation. For example, nearly all of the red deer teeth from Burial 57 (see Fig. 11.7) were unperforated, but many red deer teeth showed traces of grinding. One whole set of incisors had grinding marks on the lingual side of crown (see Fig. 11.8), while another set had ground roots but without perforation. Another set was found under a green slate axe beside the head of the buried woman. The teeth were in such poor condition that no modification traces could be observed, although small perforation holes are visible in the grave drawing (Zagorskis 1965).

Red deer teeth are not only found on various parts on the body, but also beside the body. In graves at Zvejnieki, red deer teeth more often than other species show groupings or clustering, frequently following the correct anatomical order of the front teeth. Furthermore, many of these clusters were placed beside the body, rather than on it. Under the pelvis of the buried female in Burial 76 (Fig. 11.13), a nearly complete set of red deer front teeth had been placed in a cluster together with wild boar teeth. In Burial 93 (Fig. 7.7), a nearly complete set of incisors had been placed outside the left elbow in a small accumulation with wild boar teeth and beaver astragali. In this case, too, no perforation was observed, only grinding on the sides.

Other red deer parts at Zvejnieki include phalanges, which have been turned into pendants in the case of Burials 62 and 67 (Fig. 6.16), being placed on the left side of the body, in a similar manner to beaver astragali. Tools made from red deer antler

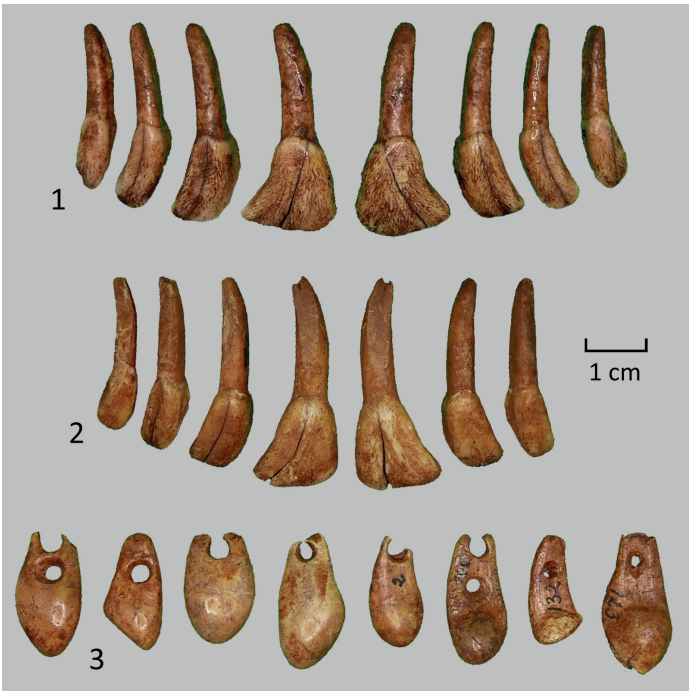


Figure 6.15. Red deer incisors from Burials 57 (1) and 76 (2) and upper canines from Burial 190 (3). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

were identified in a deposit beside Burial 207, together with other tools made from animal remains and stone.

Nearly all burials with red deer teeth are accompanied by a rich inventory, mainly consisting of tooth pendants from other animal species. Red deer teeth are mainly combined with other ungulate teeth, while in a few cases carnivore teeth and bones from beaver, birds and fish have also been identified. Burials with red deer teeth occur only in the western part of the cemetery. Here the largest number of ungulate teeth have been identified. A nearly equal number of red deer remains have been encountered with adult and child burials at Zvejnieki (Fig. 6.33). Seven adult males and four women have been given red deer teeth, as have 10 children.

Figure 6.16. Red deer phalanges with notches were documented in Burials 62 (1) and 67 (2) at Zvejnieki. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

The available datings from burials with red deer remains fall into the period between the mid 8th and the early 4th millennium cal BC. A few red deer teeth were identified from Burial 170, which is the oldest burial so far dated at Zvejnieki (mid–late 8th millennium and transition to the 7th millennium cal BC). Several burials with red deer teeth (57, 76, 93, 100 and 122) have been dated to the 6th millennium, while Burial 121 has been dated to around the turn of the 5th millennium cal BC. Burials 124 and 164 are from the late 5th or early 4th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). Red deer remains are not very numerous at Zvejnieki II settlement (Lõugas 2006: 77, Fig. 1).

Table 6.5. Red deer remains at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	NISP I	NISP C	MNI	Location	Modification	Comments
27	indet.	C	dentes	7		2	?	notches	at least 3 incisors possibly from same animal
57	F	A	dentes	18	4	4	by left leg, pelvis, by left arm, to right of head	no modification, grinding, drilling	at least 2 whole sets of red deer incisors, many teeth polished but without perforation, 6 incisors under green slate axe by head
62	indet.	C	dentes, phalanx	3 (6)	0 (2)	1	pelvis, upper thighs, mixed earth in disturbed area	notches, carving, grinding	part of incisors come from same animal; some teeth come from mixed area, pendant made from distal phalanx with notches
67	indet.	C	phalanx			1	by left femur	notches	pendant made from distal phalanx with notches
74	F	A	dentes	7		2	by right lower arm	notches	
76	F	A	dentes	5	2	1	under pelvis	no modification, grinding	whole set of incisors from the same animal
86	indet.	C	dentes		1	1	neck	drilling?	
92	M	A	dentes	4		2	left upper arm, under left elbow, head	carving, grinding	root ends ground, no perforation, restored
93	M	A	dentes	4	2	1	outside left elbow	polishing, notches	possibly some teeth from same individual, no perforation but cut on root end
100	indet.	C	dentes	2	1	1	right lower arm, outside right femur		no perforation
108	indet.	C	dentes	1		1	head	carving, grinding	very heavily polished root end
114	M	A	dentes	28	3	9	pelvis, upper thighs, outside left shin, feet	carving, grinding	especially numerous first incisors, many from same animal
121	F	A	dentes	24	4	5	chest, pelvis, upper thighs, mixed earth	carving	equal number of nearly all incisors

Grave no.	Sex	Age	Anatomical part	NISP I	NISP C	MNI	Location	Modification	Comments
122/ 123	M + indet.	A + C	dentes	68	4	17	by adult's head, chest, pelvis, around legs, and feet	carving, grinding	some teeth have heavy tooth wear, deciduous incisors
124	M	A	dentes	3	1	1	chest, dark earth above burial	carving, drilling	
128	indet.	C	dentes	49	4	12	head, chest, elbow, lower arm, pelvis, upper thighs	carving, grinding	root ends ground before making perforation, some restored with wax
132	M + indet.	A + C	dentes	1 (12)		6	outside right femur, in mixed earth above skeleton	carving, grinding	root ends ground, little or no tooth wear, part of teeth from mixed area, premolar
147	M	A	dentes	1		1	?	notches	no tooth wear
151	indet.	C	dentes	2		1	chest, head	carving,	
164	M	A	dentes	1		1	head	?	
170	M	A	dentes	13		4?	feet		many incisors have only crowns, nearly all roots broken, some restored
189	indet.	C	dentes	35	6	9	neck, chest	carving, grinding	heavily restored
190	indet.	C	dentes	59	14	14	head, chest, pelvis, legs, left of legs, feet	carving, drilling, grinding	all upper canines have drilled perforation holes except one, heavily ground roots, many come from the same animals
207	indet.	C	antler				in deposit		red deer antler tools in deposit beside burial

6.3.4. Red deer at Skateholm

Red deer remains were documented from 10 burials at Skateholm I (Fig. 6.17, Table 6.6). Tooth pendants were found in seven graves, the majority being incisors. In general, the preservation of bone is very poor at Skateholm, and therefore in several cases (Burials 16 and 59) only the tooth enamel has been preserved, and no information could be obtained about modification or manufacturing traces. In cases when teeth are better preserved, drilling has commonly been used for making perforations. The number of red deer teeth in burials varies from single items up to a few dozen.

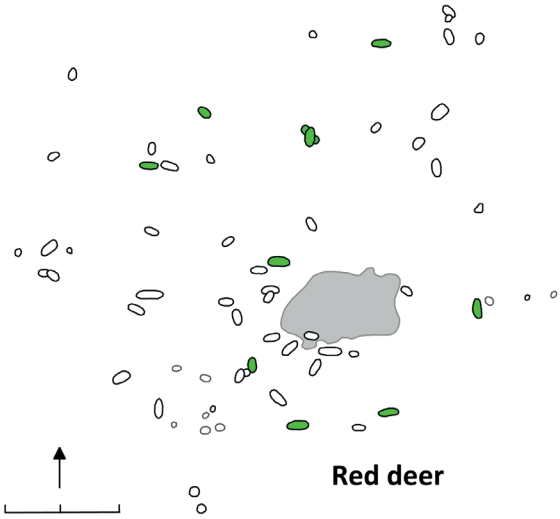


Figure 6.17. Burials with red deer remains at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

In several burials, the use of complete sets of red deer teeth has been identified. In the case of Burial 46, 22 red deer teeth are mentioned, comprising three complete sets of red deer front teeth, one of them still in the mandibula. In addition to these red deer teeth which could be directly associated with the buried adults, in crouched position, six more tooth fragments and numerous pieces of tooth enamel were found in the disturbed part of the grave and may originate from the burials (Jonsson n.d.).

The positions of the tooth pendants are quite diverse, encompassing the skull (Burial 21), the middle of the body (Burial 59), the arms and wrists as well as the pelvis (Burial 53) and the feet (Burials 16 and 53). Special selection and organization of red deer teeth has been observed in some of the graves (Jonsson n.d.). Thus, in Burial 16, a fan-shaped arrangement of red deer teeth was observed under the feet of the deceased, consisting of at least three tiers of teeth. The tooth root was preserved only in the case of three pendants, all of which had drilled perforations (Larsson n.d.).

Red deer antlers have been documented from three burials. A deposit of three antler tines was documented in Burials 27 and 28, the position, behind the skull, being nearly identical. An antler axe with a shaft hole was found over the left forearm of Burial 22. Red deer bones were also documented in the grave fills of two burials. Mandibula fragments were found in the grave fill of Burial 14, just above the skeleton level, together with other animal skull and mandibula fragments. A dagger made from a red deer ulna has been mentioned in the grave fill of Burial 33, together with 11 more fragments of red deer bones and other animal remains (Larsson n.d.). However, these objects cannot be attributed with certainty to the burial and the body, as they may belong to the fill, which was taken from the settlement cultural layer to cover the body.

Burials with red deer remains are spread all over the cemetery (Fig. 6.17), and no clear concentrations could be observed. Despite the poor preservation of skeletons

at Skateholm, it seems that adult individuals, particularly men, were more often accompanied by a grave inventory consisting of red deer teeth and other body parts.

Table 6.6. Red deer remains at Skateholm I and II. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
16	M	A	dentes	32				feet	drilling	feet laid over tooth pendants placed in fan-shaped ornament; perforation visible on three teeth
21	F	A	dentes	11				head		just crowns left, roots not preserved
22	M	A	antler					left fore-arm		shaft hole axe from red deer antler over left forearm
27	M	A	antler					behind the head		three antler tines
28	M	A	antler					behind the head		three antler tines
45	indet.	?	dentes			1+		thighs	no?	red deer molar by thighs, but not clear if this is a grave good?
46	M (+ indet. + dog?)	A (+ C + dog?)	dentes, mandibula	22			3	head, neck, mixed	no?	three whole sets of red deer teeth, one still in the mandibula, others not, but in correct anatomical position; some teeth from mixed context
47	indet. + indet.	C + C	dentes, epiphysis	3				left hand, pelvis, by right knee	?	red deer tibia distal epiphysis with red ochre, perforated?
53	F	A	dentes	42				right and left wrists, left elbow, pelvis, feet	?	all perforated?
59	indet.	?	dentes	16		1		torso		poor preservation, no information about modification

Grave no.	Sex	Age	Anatomical part	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
VIII	F + dog	A?	dentes	114				head, pelvis	drilling?	tooth pendants in anatomical order around pelvis forming 2–3 parallel rows
IX	F	A	dentes			1		at level of skeleton		1 mandibula fragment with M1, M2 also mentioned with find number, but position uncertain – in fill?, and 1 PM/M fragment at level of skeleton
X	M + M + dog	A + A	dentes, vertebra, ossa longa, antler	28	7	3		neck, chest, head	drilling, unperforated	one lumbar vertebra fragm., 1 coxa fragm., 2 ossa longa fragm.; antler tool with perforation
XI	M	?	antler, MT3+4, temporale-petrosum					antlers across the legs	no	4 red deer antler beams and complete antler crown, still attached to cranium, over legs of buried man
XV	M + dog	A	dentes, antler	16				under right wrist, behind head	drilling	16 tooth beads, antler point and 3 unworked antlers in deposit behind head
XVI	F	?	dentes, metatarsal	28			13	by feet, at skeleton level, fill	drilling?	incisors by feet, worked metatarsal in fill
XX	F	?	dentes	51				by head and pelvis	drilling?	arranged in several tooth groups
XXI	dog	?	antler					behind back, between paws	decorative incisions	decorated antler hammer in paws of dog and antler beam behind back
XXII	F	?	dentes, antler	124	16	1	28	pelvis	drilling?	tooth beads of red deer, wild boar, elk at pelvis, 2 shed antler beams beneath feet

Red deer teeth, antlers and other bones have been documented in burials at Skateholm II (Table 6.6). The most numerous finds from the burials at Skateholm II are red deer teeth (389 specimens) found in seven burials (Fig. 6.18). Incisors are most commonly used for making pendants, which have been perforated by the drilling technique, although some teeth did not have perforations. The majority of tooth beads have been found in the region of the pelvis or by the head or feet.

In three cases, large numbers of teeth were encountered within single burial. For the most part, it seems the teeth were arranged in a certain manner, often following the anatomical order and placing the first incisor in the middle of the decoration (Burial VIII). The largest number of red deer tooth pendants are documented from Burial XXII, coming from at least 28 animals, and were placed in the pelvic region (Jonsson n.d.; Magnell 2014). Taking into account the equal number of first and second incisors from the left and right side, complete sets of front teeth were most likely being used, following a particular arrangement. In the same grave, to the south of the skeleton, a group of teeth was documented containing a whole set of red deer front teeth (one canine is missing) and two more incisors (Larsson n.d.).

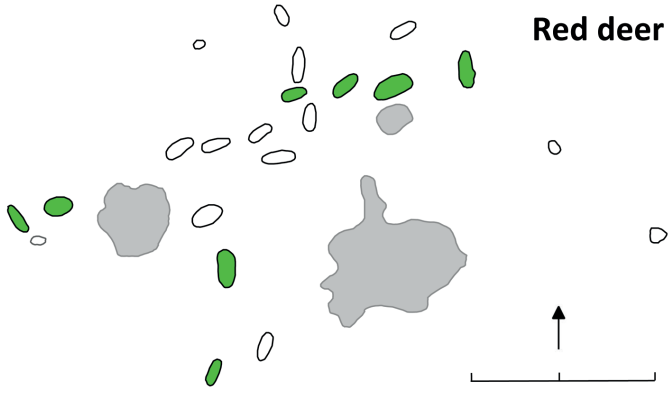


Figure 6.18. Red deer remains at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

Burial X, where two adult men and a dog were buried together, had 38 red deer teeth. Perforations were observed on 17 specimens. Most were found in the pelvic region of a man in a sitting position. In the same burial, a perforated antler object (from red deer?) had been placed over the head (Larsson n.d.). Antlers have been found with four more burials at Skateholm II. They were located beside or under the body, or as deposits in the grave or part of the grave construction. The last is the case for Burial XXII, where a female in sitting position had been placed on two red deer antlers. Four red deer antler beams and a complete antler crown, still attached to the cranium, was found over the legs of the man buried in Burial XI. A decorated red deer antler hammer was found with a buried dog in Burial XXI. In the case of Burial XV, an antler tool and three antler beams (two shed) are interpreted as grave inventory.

An antler tool was discovered by the right elbow, while two antler beams were found behind the head of the buried man. Another antler beam was found near the feet.

Two deposits (Structures 8 and 18) containing only red deer antlers were found at Skateholm II. Structure 8 contained three antlers without any human remains. The absence of red ochre has been one of the arguments for considering this feature a cenotaph (Larsson 1988a, 2004).

Unmodified red deer bones have been identified with several burials (IX, X, XI, XV and XVI), most of them originating from the grave fill. These comprise various parts of the body, including cranium fragments, long bone fragments and mandibles with teeth (Jonsson n.d.). Thus, for example in Burial XI (Fig. 6.19), metatarsal and cranium fragments were found at the level of the skeleton, but because of the lack of modification, they cannot directly be considered as intentionally placed grave goods, in contrast to the red deer antlers, which had been placed across the legs.

Figure 6.19. In Burial XI at Skateholm II, red deer antlers were placed over the legs of the buried man. Photo: L. Larsson (personal archive of L. Larsson).

Burials with red deer remains are spread all over the cemetery, and no clear concentrations could be observed (Fig. 6.18). Red deer remains were documented with adult burials, although slightly more women than men had been provided with red deer remains. Red deer remains were also found with one dog Burial (XXI). Red deer remains are third most common in the Skateholm II settlement layers (Jonsson 1988).

6.3.5. Discussion

Red deer teeth and antlers are the main body parts encountered with the studied burials at Zvejnieki and Skateholm. Teeth constitute the most common material used for making personal ornaments at Skateholm and the third most numerous at Zvejnieki. Even though the majority of red deer teeth have perforations, they are also commonly found without perforation or any modification traces. Drilling has been

used for piercing the roots at Skateholm, while at Zvejnieki carving has commonly been applied to make the perforations. In some cases, notches have been cut in the roots for suspension. On the teeth found with several burials at Zvejnieki only traces of grinding or polishing were noted.

The majority of red deer teeth are incisors, but occasionally upper canines have been found at Zvejnieki. At Skateholm II, many red deer teeth are found around the pelvis of women, particularly individuals placed in sitting position, and similar finds from Vedbæk have been interpreted as decorations of belts or garments (Brinch Petersen 2015). The practice of using complete sets of red deer front teeth was documented in several burials at Skateholm I and II and at Zvejnieki. In many cases, the teeth were found close together often following anatomical order. At Zvejnieki, these sets were often found by the body, indicating that they may have decorated some items placed in the grave (e.g. Burials 57 and 93; see Fig. 7.7 and 11.7). Other body parts of red deer include pendants made from hooves. These were identified in nearly identical position from two burials of children (62 and 67) at Zvejnieki, and can be associated with some special deposit next to the body (cf. beaver astragali).

Red deer antlers in modified or natural form have been documented from several burials at Skateholm. Complete antlers have been placed under or over the deceased and in two cases only antler tines have been placed in similar way behind the head of the buried man (Burials 27 and 28). A decorated antler axe was found with a dog (Burial XXI) and another axe with a man in Burial 22. Red deer antlers have been also given particular attention at other southern Scandinavian sites (e.g. Albrehtsen & Brinch Petersen 1977), and for example, deposits of antlers are known from settlement contexts at Ageröd V and Bökeberg III in Scania (Larsson 1983c; Karsten 2001; Bjørnevad-Ahlqvist 2020).

The red deer was one of the most important animals for the coastal communities of southern Scandinavia and further south in Europe (see d'Ericco & Vanhaeren 2002; Rigaud 2011; Borić & Cristiani 2019). This is in contrast to the boreal Eastern Baltic area. Although red deer teeth are the third most numerous in the Zvejnieki graves, red deer remains comprise quite a small number at the Zvejnieki II settlement (Lõugas 2006), and maybe the teeth themselves are imported from the Baltic coast. Sakhtysh is already well outside the preferred habitat for red deer. Therefore, many of the roles the elk had at Zvejnieki may have been assigned to the red deer at Skateholm, where it was the most numerous animal species encountered in burials. With its considerable size, distinctive body parts and economic importance, the red deer was one of the main companion species for hunter-gatherer communities in southern Scandinavia.

6.4. Roe deer

The roe deer *(Capreolus capreolus)* is the smallest animal species in the Cervidae family. They are ruminants belonging to the Artiodactyla order of the ungulates. Roe deer have a wide distribution across all of Europe, limited by climate conditions in the north – the depth of snow cannot be more than 40 cm (Siliņš 1984: 22).

6.4.1. Biological characteristics and other properties

Appearance and morphology

The roe deer has a slim body, long legs, a small head, long ears and a short tail (Fig. 6.20). The weight varies between 25 and 30 kg, rarely reaching 40 kg. The coat is reddish-brown in summer and grey in winter, with a white patch in the tail region, and the newborn roe deer has very soft, white-spotted skin (Richter & Noe-Nygaard 2003: 30). The males have short antlers with three tines each, although the number of tines may differ depending on the winter conditions. The bucks shed their antlers in November–December. Females do not have antlers (Siliņš 1984: 23).

Figure 6.20. Buck in the Lake Lubāns area. Photo: A. Jesko.

Habitats and diet

Roe deer prefer mixed and deciduous forest alternating with open vegetation. They often live in scrub and low forest but prefer forested areas or undergrowth where they can hide. The main mode of feeding is browsing. Preferred foods include brambles, raspberries, rose twigs and shoots. Calves are born during the summer, so enough food can be gathered for the mother and young. Herbs and grasses are the main food during the warm season. Acorns constitute an important part of the diet during the autumn. In winter they may feed on felled coniferous trees as well as heather, ivy, grasses, herbs and fungi. Usually, roe deer feed in the mornings and evenings, but in winter and early spring may spend the whole day in search of food (Siliņš 1984: 23).

Social relationships and reproduction

Roe deer do not form herds, except in autumn, when animals may gather in small herds of 5–7 individuals, usually led by a male. Bucks do not hold large harems, but control the females which stay within the feeding range. Males show territorial behaviour during the spring, when the mating period begins, rubbing the antlers, scraping the earth, scent marking and showing aggression against other males. The mating season is in July–August. Fawns are born at the end of May or in early June.

Usually, two calves are born at the same time, rarely more or less. During the period when the calves are small, the mothers also show territorial behaviour.

Roe deer communicate by barking when they are worried or in danger and squealing during the mating process. The white spot by the tail is used as a signal to warn others in case of danger, and helps the calves follow their mother. Bucks secrete scent to mark their territory, with scent glands located in the front toes and forehead (Siliņš 1984: 24) The natural enemies of the roe reed include wolves and other forest predators (Aaves et al. 1998: 146).

6.4.2. Roe deer remains in hunter-gatherer contexts in north-eastern Europe

Roe deer was one of the most-hunted game species alongside red deer and wild boar at the Mesolithic settlements in southern Scandinavia (Lepiksaar 1982; Jonsson 1988; Jensen 1991; Noe-Nygaard 1995; Gotfredsen 1998; Eriksson & Magnell 2001; Richter & Noe-Nygaard 2003). Remains of very young animals have been identified at the Agernæs site, suggesting that they were most likely killed for their white-spotted skin and were not even eaten (Richter & Noe-Nygaard 2003: 46). Dogs were most probably used to help hunt newborn roe deer (Vang Petersen 2013: 152). On the eastern shore of the Baltic Sea, roe deer remains are few (see Zagorska 1992; Жилин 2004; Ukkonen & Mannermaa 2017), and a larger number of roe deer bones have been identified only in some cases (e.g. Zvidze, see Lõugas 2017). Bones of roe deer have rarely been used for making tools east of the Baltic Sea (Жилин 2004: 50), but one example comes from the Zamostye 2 site in western Russia (Lozovski 1996). In south Scandinavia worked roe deer bones occur regularly, but in lower frequencies than red deer (Gummesson 2018).

Roe deer remains are rare in hunter-gatherer graves. The few examples include tooth pendants known from the Dudka cemetery (Gumiński 2014). In Burial 19 at Vedbæk a metacarpal or metatarsal fragment and a phalanx from the same roe deer were found near the lower jaw (Albrehtsen & Brinch Petersen 1977: 14). At Gøngehusvej 7 (6th millennium cal BC), the intact body of a roe deer fawn was buried in the same grave as a human (Brinch Petersen & Meiklejohn 2003).

6.4.3. Roe deer at Zvejnieki

At the Zvejnieki cemetery an antler fragment of roe deer has been identified only from Burial 201. The rich grave inventory consisted of flint tools, a beaver incisor, bone awls and amber ornaments, all with traces of red ochre and therefore considered as grave goods. These were found in the area of the pelvis and legs, while more bone artefact fragments were found in the black earth, but these were not counted as grave goods (Zagorskis 1970). This burial has been dated to the early 4th millennium cal BC (Eriksson et al. 2003; Zagorska 2006a). Also, roe deer bones constitute a very small number in the analyzed Zvejnieki settlement material (Zagorska 1992; Lõugas 2006).

6.4.4. Roe deer at Skateholm

Roe deer remains which can be related to the secure contexts have been documented from three burials at Skateholm I (Fig. 6.21, Table 6.7) and four burials at Skateholm II (Fig. 6.22). Mainly bones from the cranium and limbs were documented. Finds of skull, radius or metatarsus fragments have been discovered with burials at Skateholm I. In Burial 7, a metatarsal, possibly with working traces, was found overlying a deposit of fish bones documented near the feet (Larsson n.d.). In Burials 35 and 48, bones of roe deer were found beside the skeleton, but cannot be directly associated with the body. Roe deer bones have also been identified in Burials 14, 33, and 41, but these originate from the grave fill (Jonsson n.d.).

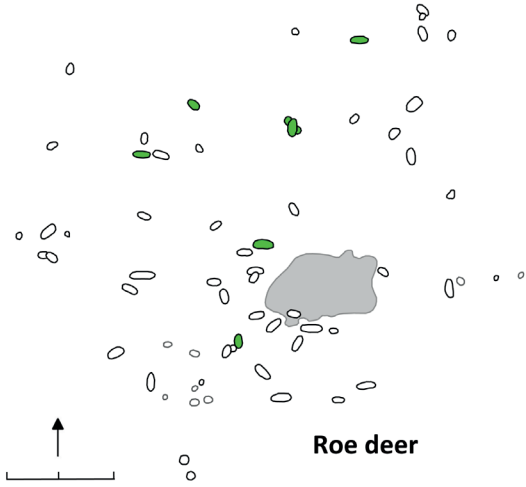


Figure 6.21. Roe deer remains at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

Table 6.7. Roe deer remains at Skateholm I and II. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	Location	Comments
7	M	A	metatarsal	in dark spot behind feet	large number of fish bones in area of dark earth behind feet
35	F	A	radius	right side of body	radius fragment, at same level as body but not clear whether grave good
48	indet.	?	radius	deposit near knees	radius fragment in deposit with other animal bones and flint
IX	F	?	os coxa-acetabulum, tibia	in grave	one tibia modified

Grave no.	Sex	Age	Anatomical part	Location	Comments
X	M + M + dog	A + A	phalanges, metapodials	near left hand (6 PH), on hip bone (MT), below mandible (MC)	6 phalanges, 3 metacarpals, 1 metatarsal, 3 more fragments of roe deer bones from sieving
XII	indet. + indet.	C + C	phalanges	between children	a couple of perforated roe deer phalanges
XV	M + dog	?	maxilla with dentes, metapodials, scapula	at skeleton level, in fill	tool fragment from metapodial at skeleton level; in fill or at skeleton level: maxilla with P3, P4, M1; M+, metapodials, scapula

At Skateholm II, roe deer remains were encountered in eight graves altogether, but only in four cases can they be securely associated with the buried person (Fig. 6.22, Table 6.7). Modification traces were identified on roe deer remains from four burials (IX, XX, XII and XV). Burials X and XII are double burials, and Burial X even had a dog buried in the same pit. The anatomical parts identified from the Skateholm II burials mainly comprise limb bones, particularly metapodials and phalanges. In Burials IX, X and XV, tools made from roe deer tibia and metatarsal bones were found. Further, six phalanges were found in Burial X, but only three phalanges had a perforation, with additional fractures near the holes. Phalanges formed part of some kind of decoration by the left hand. Three metacarpals had only the proximal parts present, other parts having been broken off. The similar breakage pattern on all three bones and their position, near the lower jaw together with tooth pendants, could be taken as signs of intentional deposition, possibly as part of some kind of decoration (Larsson 1988a, n.d.). A couple of perforated roe deer hooves were found between children buried in a half-sitting position in Burial XII (Jonsson n.d.). In the northern part of the cemetery, roe deer remains are documented from three burials situated close together and one more burial somewhat further away. Roe deer remains were encountered with burials of adults as well as children. Roe deer bones are the third most numerous in the cultural layer at the Skateholm I settlement and the most numerous at Skateholm II (Jonsson 1988: 60–61, Table 1).

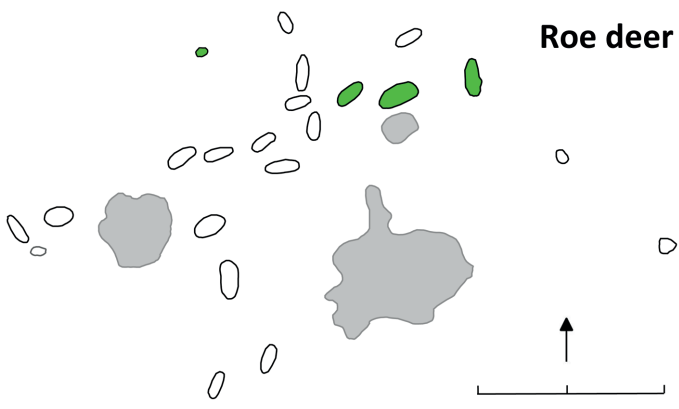


Figure 6.22. Roe deer remains at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

6.4.5. Discussion

The most numerous roe deer finds come from the Skateholm cemeteries. Limb bones and skull fragments are the most common body parts there, while at Zvejnieki only an antler fragment was found. At Skateholm II roe deer bones show modification traces, such as perforated hooves, or were worked into tools, whereas at Skateholm I several unmodified roe deer bones were identified from the fills or from deposits beside the body. Roe deer is the smallest of the ungulates, and perhaps their small size also impacted their use. Teeth are the most common body part of other animal species found in burials, but roe deer have very small teeth that were not so suitable for making pendants or other decorations (but see Gumiński 2014).

The paucity of roe deer remains at Zvejnieki cemetery suggests that even is this animal was present in the surroundings, it was not given a big role in the ritual context. Similarly at Sakhtysh, roe deer may have been present in nature (see Жилин 2004), but no roe deer remains were identified in the burials and it is also very sparsely present in the settlement assemblages (Sakhtysh I, see Цалкин 1964). The numerous roe deer remains documented at southern Scandinavian sites can instead be seen as indicating their economic value (Jonsson 1988; Richter & Noe-Nygaard 2003). This is also partially reflected in Skateholm burials, which show that the roe deer had their place in the cosmological world of hunter-gatherers, yet playing a smaller role than the most prominent companion species, like the red deer.

6.5. Wild boar

The wild boar *(Sus scrofa)* is the most widespread subspecies of the Suidae family (Oliver et al. 1993). It belongs to the western group of wild boars distinguished among 16 subspecies recognized in various geographical areas, which also include eastern, Indian and Indonesian groups (Wozencraft 2005). It adapts easily to various environments and is common in large parts of Europe, southern Eurasia and northern Africa.

6.5.1. Biological characteristics and other properties

Appearance and morphology

Wild boar is a mid-sized animal with short, stocky legs, a well-built forepart of the body and a large head (Fig. 6.23). The size of the body depends on the sex and feeding conditions. Male boars may reach up to 300 kg, while females may reach 200 kg, but the average is 70–90 kg. The coat is sparsely covered with black, dark brown or red bristles. During the winter season, wild boar have thick undercoats. The young piglets have a light brown or yellow coat with long darker stripes on the back, which gradually changes to a grey-brown coat at the age of 3–4 months. Wild boar are good swimmers and have a good sense of hearing and smell, but their eyesight is very poor. Wild boar may live up to 15 years, but usually do not reach such an age in the wild (Siliņš 1984: 29).

Figure 6.23. Wild boar in the environs of Lake Lubāns. Photo: A. Jesko.

Habitats and diet

Wild boar occupies a wide range of habitats. It is associated with forest, preferring the vicinity of lakes and wetlands. Mixed and deciduous forests are favoured, since this species is very dependent on the autumn crop of acorns and nuts. However, it can also be found in plains and mountainous regions. Wild boar are stationary animals, as long as food supplies are sufficient and they are not disturbed.

Wild boars make shelters in dense forest, in a little clearing or under the branches of a large spruce. The mother makes a shelter for herself and the young piglets, while the yearlings make a shelter for themselves, near that of the mother. Male boars sleep separately in their own shelters. In the summer, wild boars have to wallow in mud or clay to protect themselves from insect bites, after which they scratch against tree trunks (Siliņš 1984: 28).

Wild boars do not have a ruminant digestive system. They are herbivorous or partly omnivorous, occasionally also eating small rodents, eggs, the young of other animals and carcasses. Acorns and chestnuts constitute the main part of the diet, but ferns, rosebay, goutweed, hogweed and grass, as well as all berries are also eaten in large quantities. Herbaceous plants are the preferred food during late spring and early June. Wild boars are selective in their food preferences and eat tastier food first. In harsh winters, when the soil is deeply frozen and wild boars cannot dig, they search for food under the moss and vegetation (Паавер 1965: 206).

Social relationships and reproduction

Male boars are solitary for most of the year, while females stay in groups with first- and second-year youngsters, which can reach 6–10 animals. In harsher winters, groups may be larger, having a clear hierarchy. The group is led by an older and more observant female.

During the rut, males join the female groups. The rut takes place during the winter, between November and January, and fights may occur between males. Birth takes place between March and mid-May, and usually around 5–6 piglets are born.

In good years, up to two litters may be born. Males and females reach reproductive age at 8–10 months. The males may form harems of 2–3 females, but the strongest ones may have as many as eight females.

Wild boars are very cautious animals and usually hide, but when threatened may attack using their sharp canines and can even be deadly to humans. Wild boars are active in the evening or in the early morning and only in very harsh winters do they also search for food during the daytime. Wild boars have a good memory and remember where to find food or places where they have been in danger. Their main natural enemies are wolves (Siliņš 1984: 28).

6.5.2. Wild boar remains in hunter-gatherer contexts in north-eastern Europe

During the Holocene, wild boar was among the most common wild game in north-eastern parts of Europe, and the transition from the Boreal to the Atlantic period and subsequent environmental changes seem to have had positive effect on their populations (Magnell 2006: 58). Wild boar remains are found at most hunter-gatherer sites in southern Scandinavia (Rowley-Conwy 1998; Richter & Noe-Nygaard 2003; Magnell 2006), as well as in the Eastern Baltic (Паавер 1965; Lõugas 2006, 2017; Girininkas & Daugnora 2013: 570). Wild boars are a rich source of nutrition and raw materials, and based on the presence of all body parts at sites in Sweden and Latvia, whole wild boars were even transported to settlements (Magnell 2006: 48; Bērziņš 2008b: 362). Wild boars are among the animals whose teeth (particularly canines) have been used more than bones to make various tools and ornaments, probably due to their morphology and aesthetic properties (Жилин 2001; Richter & Noe-Nygaard 2003: 29; Magnell 2006: 31; Gummesson 2018: 58; Kashina & Macāne 2020).

Wild boar remains have been documented from numerous hunter-gatherer burials in north-eastern Europe. Pendants and ornaments made from wild boar incisors and tusks have been found at Vedbæk (Albrethsen & Brinch Petersen 1977) and at Tågerup (Kjällquist 2001). Numerous teeth and bones from domestic pigs or wild boar have been documented at Västerbjers and other cemeteries belonging to the Pitted Ware Culture on Gotland (Janzon 1974; Burenhult 1997; Andersson 2015). Wild boar tusks have also been recovered from Volosovo related burials, such as the Iberdus I site in central European Russia (Kashina & Macāne 2020). Furthermore, various body parts such as mandibulae and tusks have been found in deposits and ritual contexts both in central European Russia (e.g. Shagara II and Vladychino; Kashina & Macāne 2020) and southern Scandinavia (e.g. Sludegårds Sømose; Noe-Nygaard & Richter 1990).

Representations of wild boars are known in various materials, but such finds are not common. For example, one wild boar figurine in amber is known from Resen Mose (Andersen 1981; Noe-Nygaard & Richter 1990; Taffinder 1998), another example in bone with a perforation from Tamula and representations in clay from the Zvejsalas and Lagaža sites (Loze 1983).

6.5.3. Wild boar at Zvejnieki

Wild boar teeth have been documented from 47 burials at Zvejnieki (Fig. 6.24, Table 6.8), comprising 545 items from secure contexts (593 in total). In nine burials, wild boar remains come from the grave fill or mixed contexts. Mandibular incisors comprise the largest part of the assemblage. Canines, premolars and molars were also identified within the studied material, although in much smaller numbers. Canines were found with nine burials, while premolars with eight. The number of wild boar teeth varies from single items up to 112, the largest number being identified from double Burial 122/123. This burial also had the largest number of canines – 13 were recorded. Most were female canines (two maxillary and eight mandibular), and three were lower canines of a young boar (Fig. 5.32: 12). Female wild boar tusks were also identified from Burials 89, 151 and 153. A split boar tusk was found in a deposit beside Burial 207, also containing a large number of other bone artefacts. Most of the teeth were modified, although some were poorly preserved and their roots were broken or did not show any traces of perforation or working. Carved perforation holes were the most common type for suspension, although a considerable number of wild boar incisors had notches in the root end and also drilled holes were observed on wild boar teeth. The teeth from several burials had the roots ground before making the holes.

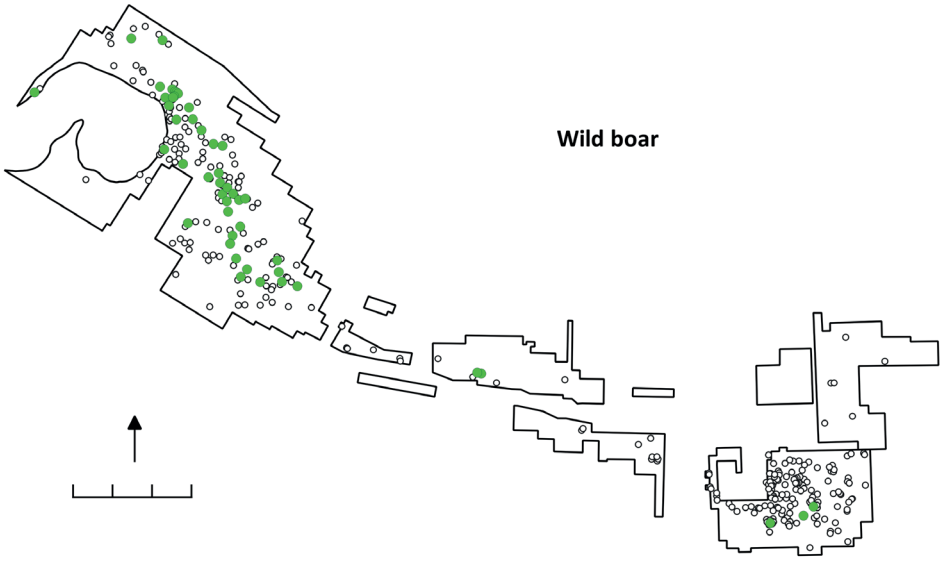


Figure 6.24. Burials with wild boar teeth at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

Nearly all of the wild boar teeth come from richly furnished graves, mainly including tooth pendants from other animal species, especially other ungulates (see below, Fig. 6.32). However, in Burials 122/123 and 170, with the most numerous wild boar tooth pendants, teeth of several carnivore species were also identified. In many cases wild boar

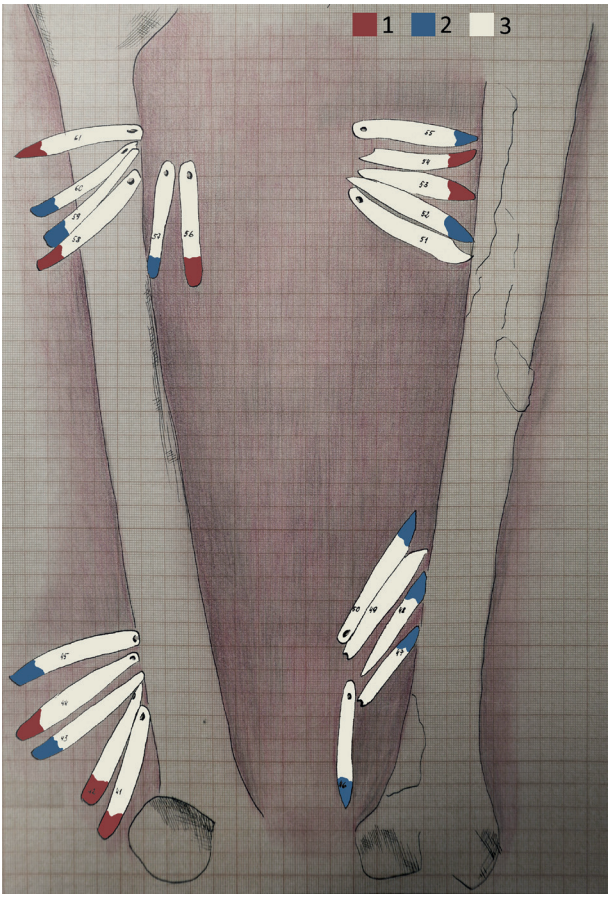


Figure 6.25. In Burial 170 at Zvejnieki, mandibular wild boar incisors were arranged in groups of five, over the legs of the buried man. Teeth from both, left (1) and right sides (2) were used to make adornments and in few cases, it was not possible to determine the side (3). Drawing: I. Bušmane (Institute of Latvian History, University of Latvia), illustration: K. Nordqvist.

teeth were found in combination with elk teeth. Thus, wild boar and elk incisors formed a decoration on the right and left side of the legs of double Burial 122/123. Except for this concentration, wild boar teeth were found all over the body, including the head and feet areas. In Burial 151 an equal number and composition of wild boar incisors was identified by the right and left hands (five by each hand, with four left and one right mandibular incisor). A few more teeth were found by the legs and left arm, and a female wild boar canine pendant was documented by the shoulder.

A very particular way of arranging tooth pendants could be observed in the case of Burial 170. On the legs, between the pelvis and toes, small clusters consisting of five mandibular incisors of wild boar were identified (Fig. 6.25). An attempt was made to investigate whether the incisors have been organized in some special pattern. However, this did not reveal a more specific way of arranging the teeth, except that first and second mandibular incisors, and those of the left as well as the right side, have been used in each of these clusters. Six incisors had been placed on the right femur. On the chest such clusters were not so clear, but here, too, a certain order had been followed. Thus, elk and wild boar teeth had been placed on the left side of the chest, while on the right side only wild boar teeth were present (see Kjällquist 2001: 51–52 for a similar pattern in the double burials at Tågerup), and on the area of the waist a group of aurochs teeth were identified. A few wild boar teeth were identified at the back of the head, although in this area most of the teeth came from elk. Teeth in this grave also show a particular mode of modification. The root ends were cut straight

and a drilled hole made in the end of the root. Some of the holes were very smooth and the root ends worn down, most likely due to heavy use.

Wild boar teeth have more commonly been placed on the body – mainly on the chest, pelvis and leg areas. They mainly occur with single burials, but are also present with three double burials. Twelve burials of men and six burials of women had wild boar teeth, while 26 were burials of undetermined sex, most of them children (23 burials). The distribution of burials with wild boar teeth clusters in the western part of the cemetery, while three burials in the eastern part also had wild boar remains. One of these is linked to a wild boar tusk tool in a deposit associated with the multiple Burial 206–209, where several bone tools were documented.

Dated burials with wild boar remains cover a period of nearly four millennia. The earliest dated burial with wild boar teeth is Burial 170, falling in the mid to late 8th millennium or at the transition to the 7th millennium cal BC. Several burials with wild boar remains (57, 76, 89, 93, 100 and 122) have been dated to the 6th millennium cal BC. Burial 121 gave a date at around the turn of the 5th millennium cal BC, while Burial 153 gave a date in the mid to late 5th millennium cal BC. The dates from Burials 124, 164 and 206–209 fall in the late 5th or early 4th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). Few wild boar bones have been identified in faunal assemblages at Zvejnieki II, although in the summarized tables from Latvian Stone Age sites their remains are more numerous, taking third place (Zagorska 1992; Lõugas 2006).

Table 6.8. Wild boar teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
8	indet.	C	13			2	chest, pelvis	carving, grinding	exhibited in Valmiera Museum, examined through showcase
12	indet.	C	4			1	right side beside body	carving, notch	perforation broken, deep groove on one tooth
17	M	A	6			3	left of head	grinding, carving?	roots in very poor condition
22	indet.	C	14			5	chest	drilling, broken	root end cut, some broken, teeth from at least 5 wild boars
24	indet.	C	6			2	chest, pelvis	drilling notches	
27	indet.	C	18			4	neck, chest, pelvis, legs	notches, no perforation	some incisors unperforated, some have deep notches on one side or around the whole root, some deciduous teeth
29	indet.	A	1			1	upper thighs	no modification	root end broken
30	indet.	C	1			1	neck	notch	
31	indet.	C	4			2	head, chest	notches	

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
32	indet.	C	2			2	head, pelvis	notches	heavy tooth wear
33	F	A	1			1	Under head	notches	
37	M	A	1			1	by right elbow	notches	heavy tooth wear
43	indet.	C	2			2	pelvis	notches	deciduous incisors from at least 2 animals
45	indet.	C	2			1	upper thighs	carving?	exhibited at NHML, examined through showcase
51	indet.	C	2			1	by legs	notches	both pendants may be from same animal
62	indet.	C	4 (5)		1?	3	on right pelvis, mixed earth, fill	notches, carving	
69	indet.	C	3			2	by feet		heavily restored, only crown left
74	F	A	6		1	2	by right lower arm	notches	
76	F	A	7			5	under left pelvis	carving, drilling	very heavy tooth wear on several teeth
83	indet.	C	6		1	3	on right arm, head area	drilling	mostly crown left and heavily restored, 2 drilled
86	indet.	C	4			3	head, neck, chest	carving?	some teeth heavily restored
92	M	A	5			2	left upper arm, head	carving?	perforation broken, tooth heavily restored
93	M	A	5	2		2	outside left elbow, by right shoulder, feet	notches	
100	indet.	C	22	1	1	9	chest, right elbow, pelvis, upper thighs	carving, notches	some broken root ends, some teeth from same animal, some teeth heavily restored
106	indet.	A	1				neck area	carving?	perforation broken
108	indet.	C	12			3	neck, outside right arm, pelvis, upper thighs	carving, notches	notches, heavy tooth wear, some carved holes broken
114	M	A	8	3		3	pelvis, femur, under left hand, by left shoulder, feet	carving broken	many root ends broken or restored
115	M	A	5	1			chest, pelvis	carving	very tiny carved holes, mostly broken, one extra incisor with same number (from other grave or wrong marking?)
116	indet.	C	0 (3)	1			by feet, mixed earth above	drilling? carving	one mandibular canine, incisors from mixed area

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
121	F	A	16		1	7	right & left lower arm, upper thighs	carving	
122/ 123	M + indet.	A + C	97	13	2	24	pelvis, around legs, head, feet, chest (adult)	carving grinding	some teeth from young animals, often from same animal, especially deciduous incisors, some have very heavy tooth wear
124	M	A	1			1	dark earth above burial	broken, carving?	heavy tooth wear
128	indet.	I	9			2	to right of head, by right elbow, above left shoulder, upper thighs, feet	carving, broken	poor condition, some root ends broken
132	M	A	25 (27)			8	chest, neck, upper thighs, in mixed earth above skeleton	drilling, carving, broken	most teeth carved, holes broken and teeth in poor condition, some with very heavy tooth wear; two teeth from fill
136	F	A	9			3	upper thighs, feet	drilling,	open root apex, some from same animal
144	indet.	A	2			1	upper thighs	drilling	little tooth wear, open root
146	F	A	2			1	head	carving	heavy tooth wear on both teeth
151	indet.	C	12 (13)	1		5	by right & left hand, upper thighs, in mixed earth above skeleton, outside left elbow, chest	carving, grinding	most carved, broken root end, mandibular canine from female, some from same animal; one tooth from fill
153	M	A	5	7	1	2	upper thighs, chest	carving, broken	two canines from same female, large split tusk of boar with two perforations
158	M	A	6			2	chest, under right humerus	carving	
164	M	A	1			1	head	broken	
170	M	A	99			28	head, chest, upper thighs, outside left tibia, feet	drilling, grinding, cut	many incisors with same modification technique, root ends cut, drilled perforation, heavy polish on sides, many come from same animals
189	indet.	C	3			1	neck, chest	carving	

Grave no.	Sex	Age	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
190	indet.	C	52			13	chest, outside left legs, right lower arm, on right tibia	carving, notches, grinding broken	most carved, but also notches, one tooth has both, polish on some roots, broken root end, some cut straight, some from same animal
207	indet. + indet.	C + C		1		1	in deposit		no modification traces, in deposit beside 206–209, in addition many other antler and bone artefacts: harpoons, knives, adzes, also amber and flint,
219	indet.	C	3				behind the head	drilling	
277	M + indet.	A + C			1	1	?		no modification traces

6.5.4. Wild boar at Skateholm

Wild boar remains have been identified from eight burials at Skateholm I (Fig 6.26, Table 6.9). Most common are incisors, which have been documented from five burials, although canines were also found in three graves, and one burial had unmodified premolars and molars. Drilling is the most common perforation method. The largest number of wild boar teeth has been identified from Burial 6, where 28 incisors and four canines were documented (Jonsson n.d.). All of the teeth have been perforated using the drilling technique. In Burial 40, canines from a female wild boar were found, although all very poorly preserved. The teeth have most probably been perforated, but the poor preservation of osteological remains in some cases (Burials 21 and 59) does not permit more definite identification of bone modifications.

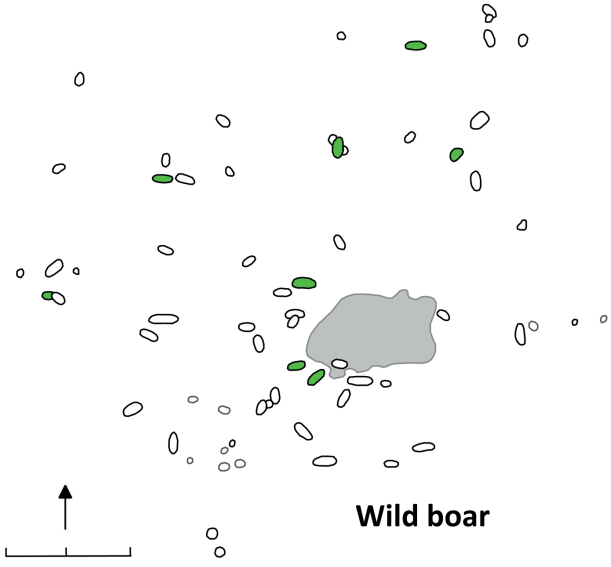


Figure 6.26. Burials with wild boar remains at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

In Burial 47, two phalanges of wild boar were found next to the left foot of a child. One of these was a lengthwise-cleaved first phalanx, while the other was a second phalanx. The same group also included a cervical vertebra of red-throated diver and a burnt seal bone, although their status as grave goods is not certain. Similarly, in the case of Burial 48, a dark colouring was registered in the grave pit, containing animal bones, including three phalanges, two fibula fragments and a vertebra from wild boar.

The distribution of burials with wild boar remains does not show any clear pattern. In accordance with the sex estimations, it seems that mainly women have been adorned with wild boar teeth. Wild boar bones were also identified in the fills of several burials, such as 14 and 33 (Jonsson n.d.), but have not been included in the analysis, since they may originate from the finds-rich settlement cultural layer that was used to fill the graves. A healed injury in the leg of the man buried in Burial 13 has been interpreted as having been sustained in a wild boar attack (Larsson 1988a: 67).

Table 6.9. Wild boar remains at Skateholm I and II. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
6	F + indet.	A + C	dentes	28	4		1	pelvis, by left elbow	drilling?	two/three rows of pendants, incisors in upper 2 tiers, canines under incisors, near hip
7	M	A	phalanx				1	by left shoulder	no	wild boar first phalanx from juvenile individual, unclear if intentionally deposited
21	F	A	dentes	7			1	pelvis	roots not preserved	poor preservation
40	F	?	dentes	7	5		3	chest	drilling?	in front of face, chest with tooth beads, two tiers of wild boar teeth, poorly preserved, 5 canines of female wild boars
47	indet. + indet.	C + C	phalanx				1	by child's legs	longitudinally split	phalanges found near child's legs, uncertain if grave goods,
48	indet.	?	phalanx, vertebra, fibula				1	in dark coloured area by knees	no	3 phalanges found in deposit, 2 fibula fragments, cervical vertebra
53	F	A	dentes	8	1	2	1	right and left wrists, left elbow, pelvis, feet	drilling?	
59	indet.	?	dentes	10				torso	no roots preserved	poor preservation, no roots preserved

Grave no.	Sex	Age	Anatomical part	NISP I	NISP C	NISP PM/M	MNI	Location	Modification	Comments
IX	F	?	fibula, dentes			1		at skeleton level	no	in burial also centrotarsale, os nasale, ulna, but their location unclear
X	M + M + dog	A + A + dog	dentes, radius, tibia, scapula, humerus	12	3		3	in front of face	drilling, no modification	3 tusk pendants (1 from large male and 2 from females), tusk is split with hole in proximal end
XI	M	?	ulna, femur, costa, metatarsale 3 and 4				1	at skeleton level	no	
XIII	indet.	C	humerus, astragalus, scapula, dentes			1	1	at skeleton level	no	wild boar molar by legs and pelvis
XV	M + dog	?	dentes, phalanges, tibia, tarsale, astragalus, centrotarsale	16	2		2	under right wrist, pelvis, in fill	drilling?	dog buried in same pit, 3 phalanges, centrotarsale, tarsale IV, astragalus, modified lower canine from female and male boar, tibia
XXII	F	?	dentes	6				pelvis	drilling?	

At Skateholm II, wild boar teeth were found with six burials (Fig. 6.27, Table 6.9). They mainly consisted of incisors, although canines have also been identified. Drilling has been used for perforation, although in some cases the poor preservation of teeth did not allow assessment of modification traces. In those cases where the teeth are perforated and can be considered as ornaments, they have been placed at the pelvis along with tooth pendants from red deer and elk. In Burial X, twelve wild boar incisors were identified, 11 of which had a drilled perforation. In the same burial three canines were also found: two perforated canines were from female individuals, while one was from a very large male (Jonsson n.d.). A wild boar radius, tibia, scapula and humerus were also identified in this grave, located in the fill or at the level of the skeleton. None of these bones were worked. Similarly, in the case of Burial XV, seven unmodified wild boar bones and two possibly worked canine teeth were found in the fill or at the level of the skeleton. Sixteen (perforated?) incisors were identified in direct association with the deceased. Burial XXII contained six wild boar teeth with a drilled perforation, which were found in the pelvic region. Additional wild boar bones without traces of modification were found with several other burials (Burials

V and XVII), but their context is not clear. A wild boar humerus with dog gnawing marks has been identified from Burial X (Jonsson n.d.).

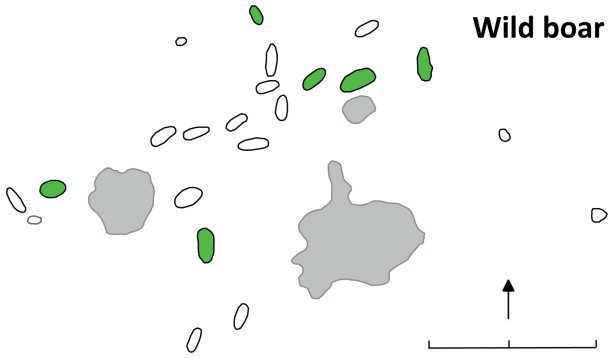


Figure 6.27. Wild boar remains at Skateholm II. Scale bar is 10m.
Map: K. Nordqvist.

6.5.5. Wild boar at Sakhtysh

Wild boar remains are very scarce at the Sakhtysh cemeteries. Only Burial 56 at Sakhtysh IIa had a pendant made from a deciduous wild boar incisor with heavy tooth wear. There was one deep notch on the root end along with smaller cut lines. In the same burial elk, bear and badger tooth pendants were also found in the region of legs. In the cultural layer of Sakhtysh IIa, only a few tooth pendants from wild boar were registered (Macāne 2017). At Sakhtysh II, a pendant from a wild boar tusk is mentioned in Burial 18, which was not available for my study (Костылёва & Уткин 2010). Numerous wild boar tusk tools and ornaments have been documented from the cultural layers at the Sakhtysh sites, as well as sites from the same chronological period in the Volga–Oka interfluve (see Жилин 2001; Kashina & Macāne 2020). A flint figurine representing an animal resembling a wild boar has been found at Sakhtysh I (Костылёва & Уткин 2007).

6.5.6. Discussion

Wild boar tooth pendants are the second most common both at Zvejnieki and Skateholm after elk and red deer, respectively; only one pendant was found at Sakhtysh. The most common body part found with burials is the mandibular incisors and relatively few wild boar tusks have been found. At Zvejnieki, maxillary incisors and premolars were also used for making pendants. Carving and notching are the most common suspension techniques at Zvejnieki, while drilling has been used for perforating wild boar teeth are Skateholm. A few teeth at Zvejnieki show traces of grinding on the root or cutting of the end of the root. While at Zvejnieki only wild boar teeth have been identified from burials, at Skateholm also numerous (unmodified) wild boar bones were documented at the skeleton level or in grave fills.

The wild boar tooth pendants are usually directly associated with the dead body, suggesting their use as personal ornaments or decorations on clothing or wrappings. At Zvejnieki, most wild boar teeth are associated with the burials of children followed

by men, but with burials of women at Skateholm. Wild boar teeth are commonly combined with other ungulate species, but especially with the most common ungulates, the elk at Zvejnieki (Fig. 6.32), and the red deer at Skateholm. In rich burial assemblages carnivore species have also been combined with wild boar teeth. In some rich burials at Zvejnieki, the amount of wild boar teeth may be very big and even exceed the number of elk. For example, Burial 170 contained teeth from at least 28 wild boars, again suggesting that the teeth would have been accumulated over a longer time period or were curated in the community for a particular occasion. As many as ten female canines were identified from Burial 122/123, in addition to three tusks of a young individual. Tusks from male boars have often been perceived as a desired body part, but the burial assemblages from Zvejnieki and also Skateholm indicate that female canines were more often chosen for making pendants – perhaps due to their morphology, which would have made them more suitable for perforating and arrangement in decorations. The prevalence of female canines may also indicate selective hunting of wild boars, where certain individuals would have been targeted, similarly to very young piglets, perhaps coveted for their very particular skin patterns. A hunting of wild boar with a focus on females as well as piglets have been noticed at some Mesolithic settlements in South Scandinavia (Magnell 2006).

Wild boar is the most common species in the faunal assemblage from Skateholm I and the second most common animal at Skateholm II and the Zvejnieki II settlement site (Jonsson 1988; Lõugas 2006). The paucity of wild boar teeth and other remains at Sakhtysh may relate to the distribution area of this species, and could also be biased by the lack of zooarchaeological analysis in the area (see Цалкин 1963, 1964; Жилин 2004). This may also be due to the preferences for other species in the 4th millennium cal BC, even though wild boars are known from other Volosovo burial contexts (Kashina & Macāne 2020). In the Baltic region, wild boar was definitely one of the animals most hunted by the Holocene hunter-gatherers. This has obviously had an impact on the worldview of hunter-gatherers and is materialized in burials where wild boar takes the role as one of the main companion species.

6.6. Wild horse

The wild horse *(Equus ferus)* was one of the main species during the Late Pleistocene in Eurasia and is the ancestor of the modern domestic horse *(Equus ferus caballus)* and Przewalski's horse *(Equus ferus przewalskii)*. Ancient DNA studies have distinguished two pre-domestic wild horse populations in western Eurasia during the Holocene: one on the Iberian Peninsula and the other in the Eurasian steppe (Cieslak et al. 2010). The occurrence of this species in north-eastern Europe has been suggested as representing small, sporadic populations of wild horses surviving in forested areas. The domestic horse spread in Europe at the beginning of the 3rd millennium cal BC (Benecke 2002) from the eastern part of the Pontic-Caspian steppes (Kazakhstan and Ukraine), which is believed to have been a locus of horse domestication at around 3500 cal BC (Outram et al. 2009).

6.6.1. Biological characteristics and other properties

Appearance and morphology

Wild horses were quite small in comparison with many modern domestic horse breeds. However, during the Holocene, wild horses were among the largest wild game, along with aurochs and elk, and had a short and sturdy body, a short mane and a large head. The withers height did not exceed 1.5 m and weight varied between ca. 120 and 350 kg (Жилин 2004). The life span of a horse can be considerable, reaching more than 30 years, at least for the Prezewalski horse (Nationalzoo 2021). Coat colour varied between greyish, brown and yellowish brown and light with darker spots, the legs being darker (Ludwig et al. 2009).

Habitats and diet

Wild horse is a grazing animal adapted to a high-silicate diet consisting of various grasses and sedges. The wild horse's preferred habitat is an open landscape such as steppe and forest-steppe. In the forest, horses can survive only if they have enough open areas with grass undergrowth and places to escape from predators (Sommer et al. 2011).

Social relationships and reproduction

Wild horses are social animals forming herds and living together. This also relates to the fact that they are prey animals and their survival has depended on their ability to defend against or escape from predators. Therefore, open landscapes have been their preferred habitat. The herds have a hierarchical structure and consist mainly of mares and their offspring, as well as the leading stallion; sometimes there can be several stallions. The group is a harem based around and led by the main (dominant) mare, whose role is to lead the herd to water and feeding areas, while the stallion shows protective behaviour against the threat of predators or other stallions. Horses have developed communication systems, using various sounds, smells as well as body language (McGreevy 2004).

6.6.2. Wild horse remains in hunter-gatherer contexts in north-eastern Europe

Wild horse remains are not common in faunal assemblages at hunter-gatherer sites in north-eastern Europe (Паавер 1965; Lepiksaar 1986; Sommer et al. 2011; Lõugas 2017). Several finds of wild horse remains come from Preboreal period sites in Denmark, Germany and Poland (Benecke 2002; Sommer et al. 2011). In southern Sweden, a horse bone has been identified at Ageröd, but most likely represents a later mixed bone from a domestic horse (Larsson 1978; Lepiksaar 1978; Magnell, pers. comm.); however, in the western Baltic Sea region and continental Europe the spread of wild horse populations has been related to the shift from a hunter-gatherer to a farming lifestyle (Hartz & Schmölcke 2013: 27). Wild horse remains occur in faunal assemblages on Eastern Baltic sites starting from the 8th millennium cal BC and last approximately up to the 5th millennium cal BC. This can be linked to the adaptation by this species to forested environments in the Eastern Baltic (Lõugas 2017), but in

general the wild horse has not been native to the forested areas further north and east. Only a few artefacts made from wild horse bones are known, including a tool from the Sārnate site (Bērziņš 2008b: 364).

6.6.3. Wild horse at Zvejnieki

Thirty-six wild horse teeth have been identified from 13 burials at Zvejnieki (Fig. 6.28, Table 6.10). All of the wild horse finds come from secure contexts and can be directly associated with the buried person. All except one had clear modification traces, mainly in the form of carved perforations. Teeth from Burials 86 and 114 also had a drilled perforation. The teeth of wild horse are mainly found on the body but in few cases also beside the body, forming particular arrangements. In Burial 12 (Fig. 6.29: 1), various ungulate incisors had been placed in pairs beside the body. A pair of wild horse incisors, possibly both from the same animal, had been placed on the right side at the level of the pelvis. Also, in the case of Burial 17 (Fig. 6.29: 3), horse incisors had been placed on the left side beside the head. The largest number of wild horse teeth were identified from Burial 100, where six incisors were found. Four of these had been placed on the chest: two on the right and two on the left side. In the case of child Burial 86 (Fig. 6.29: 2), four wild horse teeth were found under the head, most likely part of some kind of decoration, since other ungulate teeth were found around the head and neck. In the case of Burial 122/123, only two horse teeth were found on the adult's chest, above the child's head.

Horse teeth occur mainly in burials of children (seven cases) and adult males (five cases), as well as in one double burial of a child and adult man (Fig. 5.32: 11, Table 6.10). Burials with wild horse remains are located in the western part of cemetery. They

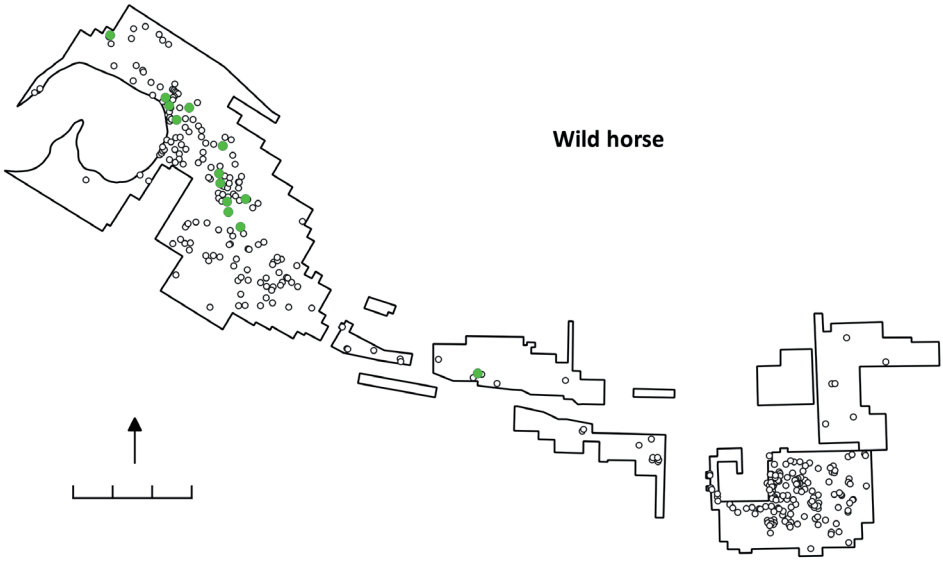


Figure 6.28. Burials with wild horse teeth at Zvejnieki. Scale bar is 30 m. Map: K. Nordqvist.

were found in burials with a rich grave inventory. An awl made from a horse bone is mentioned with Burial 252 (Zagorskis 1987: 66), although more detailed analysis, for instance with ZooMS, would be needed to verify the identification.

The available dates of burials (93, 100, 122) with horse teeth all fall in the 6th millennium cal BC. A paired dating of a human bone and a horse tooth pendant from Burial 100 illustrates the freshwater reservoir effect on the human bone date (see Meadows et al. 2016; Zagorska et al. 2018 for a discussion on FRE). At Zvejnieki II settlement site several wild horse remains have been identified (Lõugas 2006, 2017).

Table 6.10. Wild horse teeth at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	MNI	Location	Modification	Comments
8	indet.	C	1	1	chest, pelvis, in fill	carving	exhibited in Valmiera Museum, examined through showcase
12	indet.	C	2	1	beside the body on the right side	carving	placed in pairs, same animal?
17	M	A	4	2	left of head	carving	carved perforation, may come from same animals
42	M	A	5	1	pelvis, upper thighs	carving	most teeth from same animal, some root ends broken
45	indet.	C	3	1	by right femur, beside right foot	carving	exhibited at NHML
86	indet.	C	4	1	head	drilling, carving	
93	M	A	3	1	by left knee & foot	carving?	heavily worn teeth, holes very smooth
100	indet.	C	6	1	chest, pelvis, under knees	carving, drilling?, grinding	heavily restored teeth, heavily ground root before perforation
114	M	A	1	1	chest	drilling	part of crown broken
115	M	A	2	1	chest, inside left femur	carving, grinding	root ground before perforation
122/ 123	M + indet.	A + C	2	1	on adult's chest	carving	
128	indet.	C	1	1	outside left femur	carving	
190	indet.	C	2	2	on right lower arm, outside left femur	carving	

Figure 6.29. Wild horse incisors at Zvejnieki, Burials 12 (1), 17 (3) and 86 (2). By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

6.6.4. Discussion

Pendants made from wild horse teeth are known only from the Zvejnieki cemetery, where they have been discovered with 13 burials, varying from one to six specimens. Mainly carving has been used to make perforations on horse teeth. In many cases the perforations show heavy wear, suggesting intensive use and possible curation (see Larsson 2006a: 269). As with other large ungulates, it was mainly children who were adorned with wild horse teeth. Burials with wild horse teeth date from a relatively short period of time when wild horses were possibly present in the Lake Burtnieks area, although the possibility cannot be excluded that the wild horse teeth came from some other areas further away. The lack of wild horse remains at Skateholm and Sakhtysh is likely the result of their absence in the surrounding environment. This species was never a common animal in north-eastern Europe, and thus its importance to local populations appears to have been minor and chronologically limited.

6.7. Contextualizing ungulate remains at Zvejnieki, Skateholm and Sakhtysh

6.7.1. Zvejnieki

Out of a total of 2263 identified animal teeth at Zvejnieki, ungulate species are clearly dominant, comprising 1764 specimens in 72 burials (Fig. 6.30). Six ungulate species were documented, elk remains being the most numerous, followed by wild boar and red deer (Fig. 6.31). Incisors are the most common body part identified in the Zvejnieki burial assemblages, although all other teeth – canines, premolars and molars – have also been turned into pendants, albeit in much smaller numbers. Beside ungulate teeth, other body parts have also been identified in burials. Most of them have been worked and shaped into various tools and ornaments. These are mainly metapodial bones (of elk), phalanges, a hyoid bone, and antlers of elk, red deer and roe deer. Additional ungulate remains came from insecure contexts in 14 more burials.

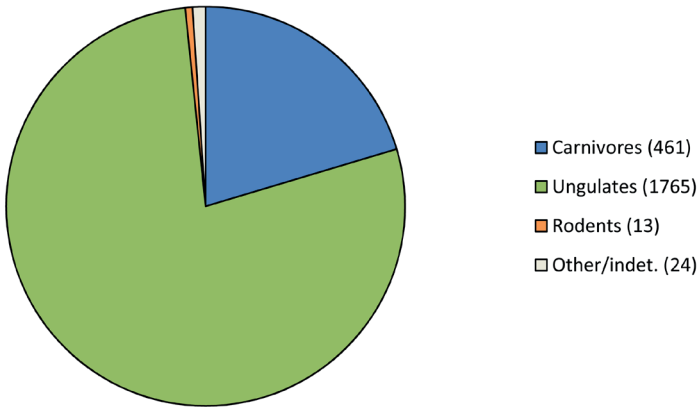


Figure 6.30. Ungulate teeth comprise the largest proportion of animal teeth from burials at Zvejnieki (number of teeth: 2263).

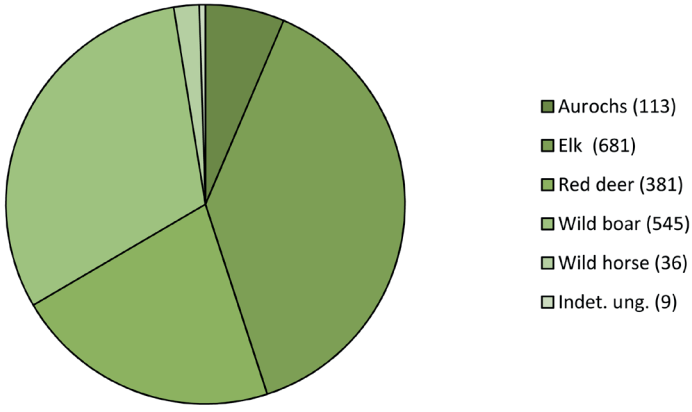


Figure 6.31. The number of ungulate teeth by species in hunter-gatherer burials with secure contexts at Zvejnieki (number of teeth: 1764).

The majority of burials with ungulate teeth are located in the western part of the cemetery (Fig. 6.34). Only elk and wild boar remains, which are the most frequently occurring ungulate species, have been documented in the eastern part. Even though it has previously been suggested (Zagorskis 1987) that the earlier burials are located in the western part, in the light of recent radiocarbon datings this is not entirely valid (see Larsson et al. 2017). Most of the burials had one to three ungulate species in the same burial, but in some cases up to five different ungulate species were found together. Due to their large numbers, ungulates are most commonly found in combination with other ungulate species, followed by carnivores (Figure 6.32). Ungulate teeth and other body parts also occur together with various other artefacts made mainly from stone and amber, in individual cases from copper and pottery.

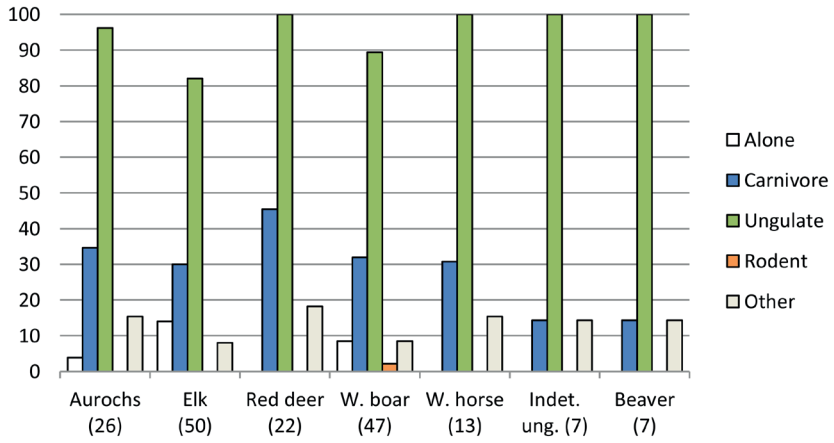


Figure 6.32. The graph shows what percentage (y-axis) of the teeth of each ungulate and rodent species (x-axis, number of burials given in parentheses) are found together with the teeth of other animal groups at Zvejnieki (number of burials: 72).

Carving is the most common method for perforation in tooth pendants, although drilling and notches are also used. Numerous incisors do not show any perforations or notches, and instead grinding marks are observed on roots. Working traces on other bones vary from minimal to very extensive modifications. Tooth pendants of ungulates are found on different body regions, but mostly by the legs and chest of the deceased, suggesting a direct association with clothing or personal ornaments. In some cases, tooth pendants by the body may also have adorned some other objects placed in the burial. Ungulate remains most commonly occur in children's and juvenile burials, even though, when counting females and males together there is a slight prevalence of adult burials; males are more often buried with ungulate remains than females (Fig. 6.33).

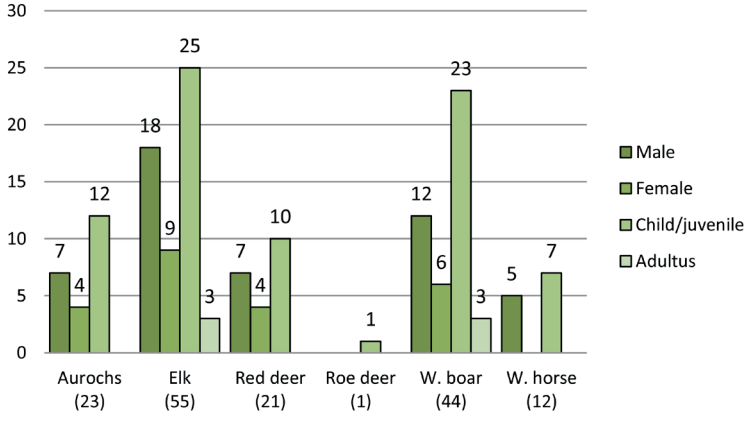


Figure 6.33. Numbers of burials of men, women, children/juveniles (0–18 years) and adults (>18 years) with tooth pendants or other bones of ungulates at Zvejnieki. Only single burials where the sex and age of the buried humans have been assessed and with finds in secure burial context are included.

Ungulate remains seem to be more numerous in the earlier burials, but based on the available radiocarbon datings, they can be found with burials from the whole period of the cemetery's use (8th–4th millennium cal BC). Wild horse teeth are only present in burials from the 6th millennium cal BC.

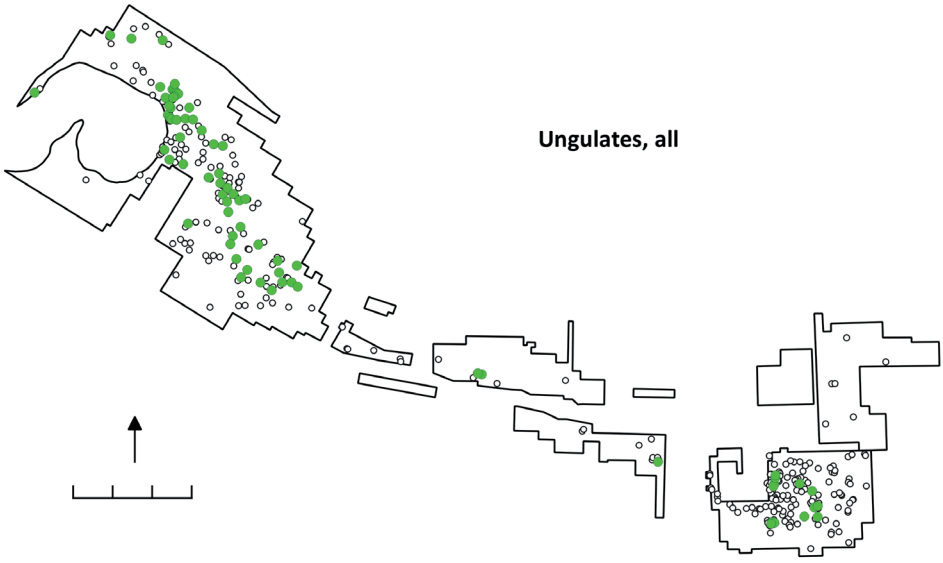


Figure 6.34. The distribution of ungulate remains at Zvejnieki is concentrated in the western part of the cemetery, although they occur all over the area. Scale bar is 30 m. Map: K. Nordqvist.

6.7.2. Skateholm

Ungulates are the most numerous animal group at both Skateholm sites. Altogether 210 teeth (out of 217 teeth in total) were found with 13 burials at Skateholm I and 436 teeth (out of 448) with 10 burials at Skateholm II. Red deer dominates the assemblages and wild boar is the second most common species documented with burials at Skateholm (Fig. 6.35, see also Fig. 4.20, 4.22). Almost all teeth are incisors, with the exception of some wild boar canines. Red deer antlers and bones from all ungulate species occur in graves (both worked and unworked), although in several cases it has been difficult to assess their association with the deceased.

Burials with ungulate remains were distributed across the whole cemetery at Skateholm I and II, with no clearly identifiable distribution patterns (Fig. 6.36 and 6.37). Ungulate remains are often found together in the same burials at both Skateholm I and II. As many as four ungulate species can be combined in one grave (Skateholm II), although red deer and wild boar are also found alone. The burials with ungulate remains included also artefacts of stone, and at Skateholm I amber was found.

Drilling is the main perforation technique used at Skateholm for ungulate teeth. Antler (and other bone) are found either unworked or transformed into objects.

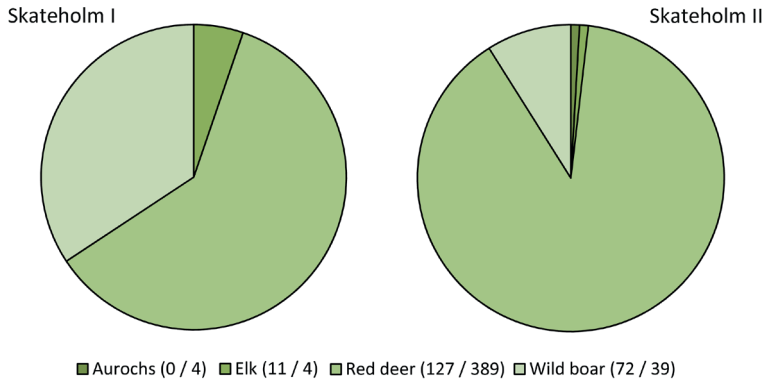


Figure 6.35. The number of ungulate teeth by species in hunter-gatherer burials with secure contexts at Skateholm I (left, number of teeth: 210) and Skateholm II (right, number of teeth: 436).

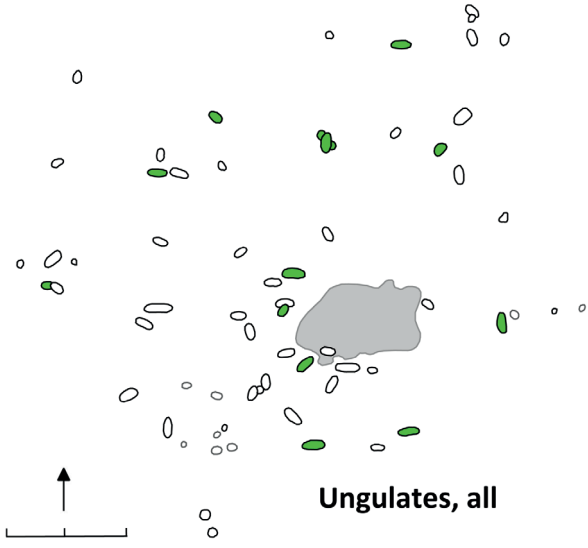


Figure 6.36. Burials with ungulate remains at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

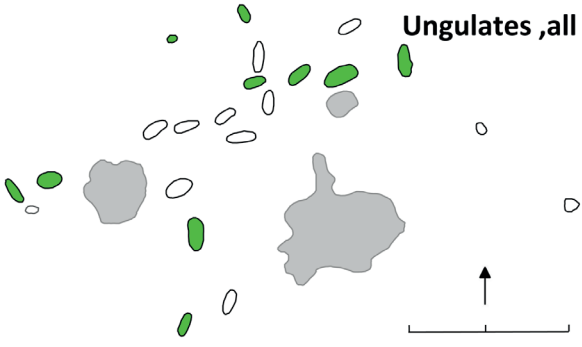


Figure 6.37. Burials with ungulate remains at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

Tooth pedants occur in different body regions, but mainly by the pelvis and the head. Ungulate remains are mainly present in burials of adults, but were given also to children buried together with adults. At Skateholm II, ungulate remains are slightly more prevalent in burials of women.

6.7.3. Sakhtysh

Ungulate remains are rare in graves at Sakhtysh. Elk remains were documented only in three burials at Sakhtysh II and nine at Sakhtysh IIa, along with one wild boar tooth from the latter site. Most of the remains are incisors, but also awls made from elk metacarpal bone have been reported from Sakhtysh IIa (Lyalovo burials) and worked antlers from both sites. In contrast to the cemetery material, pendants made from elk teeth are numerous in the settlement layers at Sakhtysh IIa (Macāne 2017). No particular distribution patterns can be noted for burials with elk teeth (see Fig. 6.11). Single elk teeth occur in most of the burials, and only in two cases two or three teeth were found in same grave. Elk incisors are rarely found in the same burial as carnivore teeth. Both notches and drilling are used for suspension and some teeth have traces of grinding. Elk teeth occur on all parts of the body and are mainly associated with burials of adults, and particularly women.

6.7.4. Ungulates and northern hunter-gatherers

Ungulates were the largest animals surrounding humans in the Stone Age landscape. They were very important animals to the survival of hunter-gatherer communities. The elk, for example, not only provided food, but also essential raw materials (hides, antlers and bones, sinews, etc.) for the manufacture of garments and other daily utensils. Ungulate remains form the largest part of the faunal assemblages from hunter-gatherer sites in southern Scandinavia, the Eastern Baltic and central European Russia (see Лозе 1988; Zagorska 1992; Жилин 2004; Lõugas 2006, 2017; Magnell 2006, 2017; Girininkas & Daugnora 2013), directly emphasizing their economic importance. Their utilitarian value influenced the way ungulates were positioned in the hunter-gatherer cosmologies. Cervids in particular played an important role in the northern worldview, as can be seen in rock art and numerous portable representations of these animals (Loze 1983; Кашина 2005; Gjerde 2010; Fuglestvedt 2018; Herva & Lahelma 2020).

The availability of ungulates in the surrounding environment was not the main determining factor for their inclusion in burial assemblages. In coastal areas of southern Scandinavia, certain species were intensively hunted, such as red deer, elk, aurochs, which led to the decrease of these species or their extinction. Despite these aspects, red deer and wild boar clearly predominate in burial assemblages at Skateholm. At Zvejnieki, the communities appear to have used every species available in their environment and possibly even imported red deer and wild horse teeth. At the same time, there were certainly numerous ungulates around the Sakhtysh sites, but the hunter-gatherers simply decided not to include them in the burial assemblages.

Attention was paid not only to the selection of particular animal species, but also to certain body parts and even animal individuals. While cervid molars would have

been by far the most readily available raw material for making tooth pendants, they are documented only in individual cases at Zvejnieki, all of which probably date to a relatively short period of time. The selection of particular individuals is illustrated by the use of complete sets of ungulate mandibular incisors at Zvejnieki and Skateholm, often even found in correct anatomical order. Pendants made from wild boar female canines further emphasize the particular choice of certain animal individuals.

The number of animals used for making ornaments in some burials, especially at Zvejnieki, but also at Skateholm, is impressive. Hundreds of tooth pendants are present in some burials, meaning it took dozens of animal individuals to form these assemblages: for instance, Burials 122/123 and 170 at Zvejnieki included teeth from at least 24 and 28 wild boars, respectively, and Burial XXII at Skateholm II teeth from at least 28 red deer and six wild boars. This gives an indication of the resource management, prolonged sourcing and procurement of certain animal teeth. The curated items may also be related to the objects' biographies, including the origins of the raw material, perhaps coming from important animal individuals or connected with the previous owners or use contexts of these teeth. Procurement and object biographies are also relevant questions related to rich children's burials at Zvejnieki, as these assemblages cannot be seen as personal belongings or as reflecting personal achievement.

A decrease in ungulate species with a concomitant increase in carnivore species occurs in hunter-gatherer graves in the 5th and 4th millennium cal BC. These changes in attitudes towards various animal species probably explain the small number of ungulate remains in the Sakhtysh burials. The previous dominance of ungulates is challenged also at Zvejnieki, even if they continue to exist. However, the earlier burials at Zvejnieki as well as the burials at Skateholm leave no doubt as to the importance of certain ungulate species in the mythology or conceptual world of the hunter-gatherers. Characteristics (real or perceived) associated with the species or a relationship with particular animal individuals were highly valued. The large cervids, particularly red deer (southern Scandinavia) and elk (the Eastern Baltic), and wild boar were among the undisputed main companion species.

Chapter 7.
Rodents

Rodents constitute the largest order of mammals. They differ from all other animal species in having a particular ability to gnaw and include species like rats, mice and squirrels. Rodents are distinguished by strong, continuously growing incisors and by the absence of canine teeth. They inhabit various natural and human-made habitats and are native to most of areas in the world except for Antarctica and New Zealand. The Eurasian beaver *(Castor fiber)* (Fig. 7.1) is the largest rodent in Eurasia and the second largest in the world after the South American capybara *(Hydrochoerus hydrochaeris)* (Nowak 1999). Many rodents have good quality pelts, and some could have been an important food source. Rodents, being among the most common species and living close to humans, also had a significant role in spreading diseases, such as plague (e.g. Kryštufek & Vohralík 2013; Kehrmann et al. 2020; Susat et al. 2021).

7.1. Beaver

Beavers belong to the Castoridae family in the suborder Sciuromorpha of the order Rodentia. Beavers share more similarities with squirrels and marmots than with the mouse-like rodents or Muridae (Müller-Schwarze 2011: 2). Two different clades of Eurasian beavers have been identified, in Western and Eastern Europe, based on a recent study of mitochondrial aDNA. The boundary of these clades during the Early Holocene corresponds to the current one, lying in present-day Poland (Horn et al. 2014: 1727). Beavers have been a desirable hunting prey through time, and by the 19th century the beaver became extinct in most European countries, including the Baltic region. Reintroduction campaigns during the 20th century have restored beaver populations but also introduced new problems: for example, in Finland, the North American beaver *(Castor canadensis),* which is an alien species to the environment, has now taken over a large areas in the country (Nolet & Rosell 1998; Balodis et al. 1999: 26; Halley & Rosell 2002; Belova et al. 2017).

7.1.1. Biological characteristics and other properties

Appearance and morphology

Beavers are mid-sized mammals with a droplet-shaped body. A beaver weights 10–30 kg and can reach up to 1.2 m in length, although the average is 65–100 cm. Among pairs of Eurasian beavers, females are usually larger than males (Milishnikov 2004). Beaver incisors grow continuously, and the mandibular incisors are particularly long, taking up most of the length of the mandible. The outer surface is a bright orange colour, and the enamel is very dense and sharp. Accordingly, the skull, too, is massive to be able to support the muscles for the chisel-like teeth, which are used for wood-cutting. The front paws are adapted for holding food, dam-building and digging, while the webbed hind feet are adapted for swimming (Müller-Schwarze 2011: 13).

Beavers have valuable fur, meat and scent glands (producing castoreum, widely used in folk medicine, e.g. Paulaharju 1922; Itkonen 1948) which distinguish them from other animals and have made them a desirable quarry. Beavers have a flat, scaly tail, which serves various purposes, including balance, as a rudder when underwater, for storing fat reserves and for regulating body heat loss (Müller-Schwarze 2011: 11). Beaver fur is extremely dense and usually dark brown. Beavers moult during the summer, and the fur is in best condition in winter, between December and March (Müller-Schwarze 2011: 15). The average lifespan of beavers is 10–15 years, but in good conditions they can reach up to 20 years (Latvijas Daba 2021).

Figure 7.1. A Eurasian beaver swimming in Lake Lubāns. Photo: A. Macāne.

Habitats and diet

The Eurasian beaver is a semi-aquatic mammal which lives in freshwater systems (Fig. 7.1). Even though shallow waters are the main habitat for beavers, they are also adapted for life on land and can walk, run, dig and forage (Müller-Schwarze 2011: 19). Beavers construct dens, also called lodges (Fig. 7.2), which can be up to 2 m high and usually

have two chambers, their entrances being underwater. A beaver family usually lives year-round at one particular site for several years. The lodge is surrounded by a core area consisting of pond or water-body systems (Müller-Schwarze 2011: 31). Beavers build dams in small water-bodies in order to create their habitat (Müller & Watling 2016). They make dams to protect their dens and the entrances to them, and also to facilitate tree-cutting and lodge construction. During winter, only one lodge is used, while during the summer several lodges may be inhabited (Müller-Schwarze 2011: 32).

Figure 7.2. Beaver lodge in south-eastern Latvia. Photo: A. Macāne.

Beavers have a crucial role in modelling their environment, since they cut trees and build dams, which can cause large areas to be flooded (Fig. 7.3 and 7.4). They are even called "ecosystem engineers", since they not only modify the landscape, affecting water flow and water-system morphology, but also influence the distribution and abundance of other animals and plants (Jones et al. 1994; Balodis et al. 1999: 29; Wright et al. 2002).

Figure 7.3. Beavers can locally cause major changes to vegetation. Photo: A. Macāne.

Figure 7.4. A beaver has started to cut a tree. Bark constitutes the main part of beavers' diet. Photo: A. Macāne.

Beavers have a purely herbivorous diet, of which soft deciduous trees form the major part (Latvijas Daba 2021). Beavers mainly consume the bark (Fig. 7.4); however, part of the diet can also consist of herbaceous and aquatic vegetation (Müller-Schwarze 2011: 24). Beavers also make caches of twigs and branches in the water during the autumn for winter consumption. Beavers forage for about four hours a day and will venture 50–60 m from the pond, up to a maximum of 250 m (Müller-Schwarze 2011: 26–27).

Social relations and reproduction

Beavers are monogamous animals, and the family is their main social unit. A beaver family usually consists of a pair of adult parents and one or two generations of offspring. On average, there are six family members. Young beavers do not breed, even if they are able to; only the dominant pair mates, producing one litter per year (Müller-Schwarze 2011: 30–33). The litter size of the Eurasian beaver is 2–3 kits, which are born in May. The kits stay in the lodge for about one month and then start to explore the surroundings. They begin foraging when they reach 2–3 months (Müller-Schwarze 2011: 34). In the late spring, two-year-old juveniles leave the family and start breeding during the next year, with a three-year rotation cycle. The labour roles of beavers are gender divided. The female tends to lead and concentrates on maintenance of the dam and the lodge, and on organizing food caches, while the male inspects the dam (Müller-Schwarze 2011: 36).

Beavers do not have many natural enemies, their main predators being wolves, in addition to which they are affected by various infectious diseases (Latvijas Daba 2021). Beavers use various sounds and their body to communicate and warn others in case of

danger, for instance slapping the water with the tail (Kitchener 2001). When beavers fight, they will bite each other in the tail (Latvijas Daba 2021).

7.1.2. Beaver remains in hunter-gatherer contexts in north-eastern Europe

Alongside elk, beaver has been the most important hunting quarry during a large part of prehistory. Beaver is one of the main animal species identified in the faunal assemblages from Stone Age sites on the eastern shore of the Baltic Sea (Жилин 2004; Lõugas 2006, 2017; Ошибкина 2017: 37; Ukkonen & Mannermaa 2017). In southern Scandinavia, beaver bones are generally not found in large quantities at hunter-gatherer sites, although beaver is the most commonly occurring game after cervids and wild boar (Gummesson et al. 2019a). Beavers were also actively hunted on the southern coast of the Baltic Sea, as evidenced by the Dąbki 9 site in northern Poland (Schmölcke & Nikulina 2015: 79).

Beaver bones, and particularly teeth and jaws, were attractive raw materials for making tools. Such artefacts have been documented at hunter-gatherer sites from the Eastern Baltic to the Trans-Urals (Lozovskaya et al. 2017; Zhilin 2020). Traces of intensive use for woodworking, as well as repair and re-use of the broken tools, have been observed on numerous beaver mandibles and incisors. The largest collection of beaver mandible tools has been documented at the Zamostye 2 settlement site, comprising more than a thousand mandibles (Lozovskaya et al. 2017: 426). About a hundred beaver mandibles with use-wear traces have also been documented in the cultural layers of the Veretye 1 site, and traces of birch bark have been found on one of them, most likely used to provide the handle of the tool (Ошибкина 2017: 37). A few finds of beaver mandible tools are known from Denmark (Hatting 1970), while some worked beaver bones also occur on other south Scandinavian sites (Gummesson 2018).

The maxillary incisors (removed from the bone) have been used as knives or side scrapers (Zhilin 2020: 11). Mandibular incisors no longer suitable as tools were turned into pendants, often with transversally sawn notches at one end. At Zamostye, more than 500 incisor pendants have been collected (Lozovskaya et al. 2017: 430). Incisors with transverse cuts on the enamel, possibly traces from making pendants, are known from the Tågerup site (Eriksson & Magnell 2001: 185). Three pendants made from a beaver sternum (chest bone) were found at the Veretye 1 site, and these finds have no parallels in the neighbouring territories (Ошибкина 2017: 38).

In hunter-gatherer burial contexts, mainly pendants made from beaver incisors have been documented, but in some cases mandibles and unworked bones have also been used. At the Yuzhniy Oleniy Ostrov cemetery more than 1000 beaver tooth pendants have been found, as well as mandibles and several beaver vertebrae (Гурина 1956). Beaver remains are mainly associated with female burials (O'Shea & Zvelebil 1984; Schmölcke et al. 2017: 5). In Burial 115, small plates made out of beaver incisors were found by the head, which have been considered as forming part of some kind of headgear (Гурина 1956: 237). Beaver incisor pendants were also documented at the Kubenino site in north-western Russia (Kashina et al. 2021: 81) and the Jurkova site in south-eastern Latvia (Macāne & Nordqvist 2021).

Beaver astragali are rare finds from Stone Age burials. One such find comes from the Kreiči cemetery (Macāne & Nordqvist 2021), and one from the Riņņukalns shell midden (Brinker et al. 2020). A beaver astragalus is also known from a Mesolithic burial in Germany (Grünberg et al. 2016: 318). A complete beaver skeleton, the bones of which appear to be intentionally crushed, has been found with Burial 1 at the Maslovo Bolota V site, belonging to the Volosovo period (Костылёва & Уткин 2010: 217).

Beaver representations in various materials are rare. Two beaver figurines (in bone and amber) were found with a double burial at the Valma cemetery in Estonia (Jaanits 1965; Ots 2010). Beaver figurines in flint are known from sites in Mordovia and from the Kama River (Никитин 1977: 80, Fig. 12, 16, 1996: 160), and in clay from the Pohtiolampi site in Finland (Koskimies 1967).

7.1.3. Beaver at Zvejnieki

Beaver remains were identified in 16 burials at the Zvejnieki cemetery. They mainly consist of beaver ankle bones (astragali), unmodified incisors and one molar. In the case of Burials 198, 257 and 328, beaver teeth come from a mixed context. Altogether, 42 beaver astragali were documented from nine burials (Fig. 7.5, Table 7.1). One more beaver astragalus was found in the artefact collection from the cemetery, but it does not belong to any of the graves. Beaver incisors were identified with six burials, comprising 13 incisors from secure contexts. Nearly all incisors are complete and without visible traces of modification. The only split beaver incisor with working traces comes from Burial 328. In contrast to the beaver astragali, which all come from secure, well-documented burial contexts and can be related to the deceased or to grave inventory,

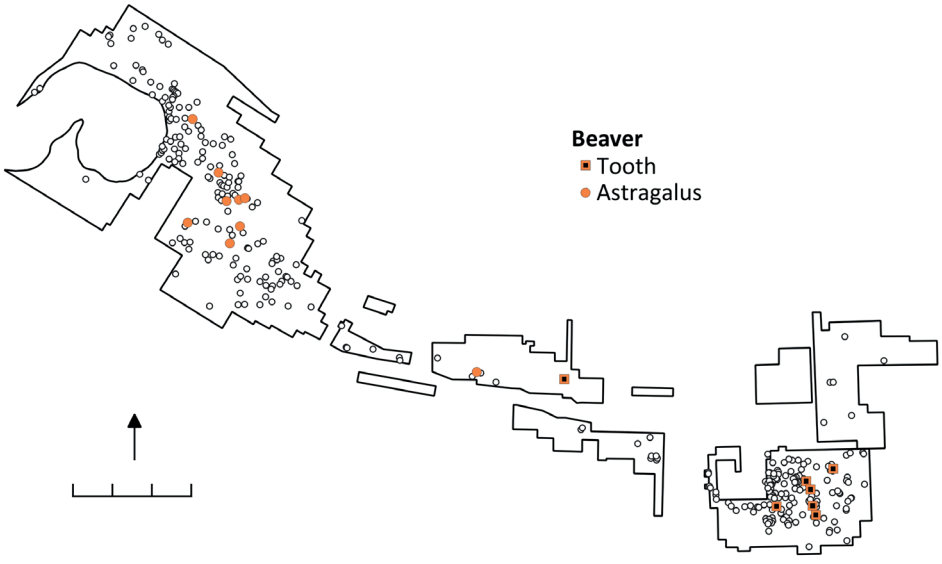


Figure 7.5. A clear distinction can be seen between the distribution of beaver astragali and that of beaver incisors at the Zvejnieki cemetery. Astragali (circles) are more common in the western part, while incisors (squares) appear in the eastern part of the cemetery. Scale bar is 30 m. Map: K. Nordqvist.

most of the beaver incisors come from deposits associated with burials (Burials 207, 211 and 252) and cannot be directly linked to personal ornaments. Burial 252 had at least one complete beaver incisor under the skeleton, in the dark occupation soil which had been put under and over the body. At least two more beaver incisors and two small fragments have been found in an ochre spot or deposit on the left side of the legs. An unmodified molar fragment of beaver was found with Burial 213, by the right elbow of the buried man (Zagorskis 1971: 3). All of these finds are associated with burials of children or adult males. Other artefacts from bone and flint were also found in these deposits, often with red ochre.

Twenty-seven incisors and one molar of beaver from Burial 121 have been mentioned in previous publications (Larsson 2006a: 262, Table 1; Lõugas 2006: Fig. 7). However, no beaver incisors were identified in the original excavation documentation (Zagorskis 1966) or during my analysis of the grave goods in the collection of the National History Museum of Latvia. There is a similar situation with the beaver incisors reported from Burials 244 (two pieces) and 299 (one piece) (Lõugas 2006: Fig. 7); during my analysis no such items were identified, and the primary field documentation does not mention such finds (Zagorskis 1971). One more beaver incisor is mentioned in the excavation report (Zagorskis 1970) from the fill of Burial 200, but this was missing from the museum collection.

Figure 7.6. Beaver astragali from Burial 128 and a wildcat astragalus (lower right) from Burial 132 at Zvejnieki. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

The largest number of astragali in one burial are documented from Burial 128 (Fig. 7.6), where 13 astragali from at least nine beavers were located mainly on the

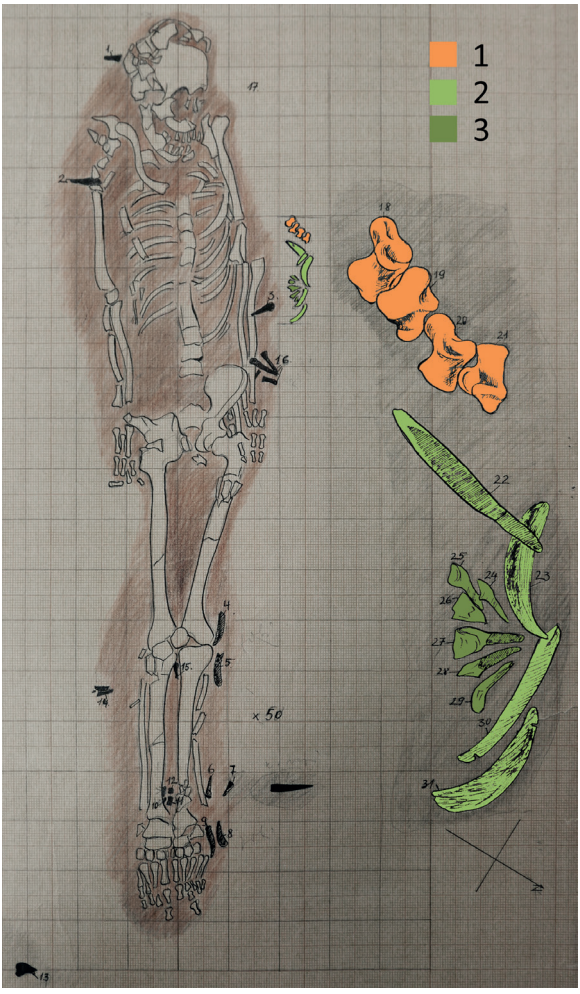


Figure 7.7. In Burial 93 at Zvejnieki four beaver astragali (1) and pendants from wild boar (2) and red deer (3) were found beside the left elbow of the buried man. Drawing: L. Linmeijere (Institute of Latvian History, University of Latvia), illustration: K. Nordqvist.

upper part of the body, behind the head and left shoulder, with some also on the chest. This child burial also had 92 tooth pendants and a flint knife. From Burial 132, together with four beaver astragali and 75 tooth pendants from different animal species, a wildcat astragalus has also been documented (Fig. 7.6). In the case of Burial 92, a small deposit of three beaver astragali was found on the left side by the head. Burial 93, an adult male, was adorned with tooth pendants, and a deposit of beaver astragali was documented by the left elbow (Fig. 7.7), coming from at least three beavers.

All of the burials with beaver astragali are richly furnished, with a large number of animal tooth pendants and other grave inventory. Intensive use of red ochre is also typical of all these burials. Beaver astragali are more often documented with burials of children or juveniles, as well as adult males. Only one burial of a young woman (Burial 121) had two astragali. The beaver astragali are often located in small deposits beside the body (by the head or extremities) and more often on the left side of the body (see Fig. 7.7, also Fig. 11.12).

The location of burials with beaver astragali and incisors shows a clear division between the western and eastern parts of the cemetery (Fig. 7.5). Perhaps the use of beaver teeth in burials can be linked to different burial customs, especially considering the context in which they were found. For instance, incisors were mostly found in deposits beside the burial together with other tools, and these burials are located in eastern part of the cemetery. Burials with astragali (93, 121 and 122/123) are dated

to the 6th millennium cal BC, while the only dated burial (201) with a beaver incisor is from the early 4th millennium cal BC (Zagorska 2006a). In the faunal assemblages excavated from the Zvejnieki II settlement beavers are the second most common species (Lõugas 2003, 2006, 2017), similarly to the faunal assemblages excavated from Latvian Mesolithic sites in general (Zagorska 1992: Table 1).

Table 7.1. Beaver remains from burials at the Zvejnieki cemetery. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP M	NISP As-tra-galus	MNI	Location	Comments
62	indet.	C			9	5	by left humerus, chest, left knee	
92	M	A			3	2	by left elbow	
93	M	A			5	4	by left elbow, feet	
114	M	A			1	1	feet	fragment
121	F	A			2	1	left upper arm, by right knee	
122/ 123	A + indet.	A + C			1	1	chest	
128	indet.	C			13	9	head, left arm, chest, right el-bow, above legs	upper part of body partly disturbed
132	M + indet.	A + C			1 (4)	3	chest, grave fill	1 astragalus at skeleton level; 3 beaver and 1 wildcat astragali in filing
187	M	A	1			1	by left shoulder	
190	indet.	C			4	4	left of head and by left pelvis	
201	indet.	C	1			1	in pelvic area	rich grave inventory with flint tools and beaver incisor, all with traces of red ochre
207 (de-posit)	indet.	C	1			1	in deposit	beaver incisor in deposit, part of multiple Burial 206–209
211 (de-posit)	M	A	4 + 1			2	by skeleton, in deposit	disturbed burial, inten-sive ochre on deposit, not in grave
213	M	A		1		1	by right elbow	
244	M	A	1			1	by left side of pelvis	
252	M	A	3			3	in black soil under skeleton, by left foot	one beaver incisor in black soil under skeleton, two by left foot in ochre spot (deposit/ hearth?)

7.1.4. Beaver at Skateholm

In the burials at Skateholm, beaver remains originate only from the grave fills. One beaver bone fragment is mentioned from Burial 33 at Skateholm I, while a fragment of burnt beaver mandibula has been identified with Burial X at Skateholm II (Jonsson n.d.). Only 15 fragments of beaver have been identified at Skateholm I and II settlements, comprising less than 1% of all identified species (NISP) of mammals (Jonsson 1988: 68).

7.1.5. Beaver at Sakhtysh

Beaver incisors and mandibulae have been documented only for five burials at Sakhtysh IIa. Single beaver incisor pendants were found with Burials 13a and 56. Both incisors had notches for suspension and were found in the area of the upper thighs. In the field documentation an intentionally deposited beaver mandibula is mentioned by the right knee of the adult men in Burials 26 and 39. In the case of Burial 27 a mandibula was lying on the right side of the rib cage of a young woman (Костылёва & Уткин 2010: 42). However, none of these were available for my analysis. Most likely, they had no traces of modification and have therefore been discarded, but there is no information about this. All of the burials with beaver remains have been attributed to the Volosovo Culture (Костылёва & Уткин 2010), but none of them are dated.

Beaver is the second most common animal identified in the animal bone assemblages from the early excavation seasons at Sakhtysh I and II (Цалкин 1963, 1964). A large number of tools made from beaver jaws and bones, as well as whole skulls, one of which had an embedded bone arrowhead, have been documented in the settlement layers (see Жилин 2004; Zhilin 2020). Several beaver incisor pendants are documented from the settlement contexts. All of them are incisor fragments with notches at one end. One had decorative lines cut on the sides (Macāne 2017).

Table 7.2. Beaver remains from burials at the Sakhtysh IIa cemetery. For legend see Table 5.1.

Grave no.	Sex	Age	Anatomical part	NISP I	MNI	Modification	Location	Comments
13a	F	A	I	1	1	notches	outside left femur	double burial – beaver tooth with upper skeleton
26	indet.	C	man-di-ble		1	?	outside right knee	
27	F	A	man-di-ble		1	?	outside right side of rib cage	
39	M	A	man-di-ble		1	?	outside right knee	
56	M	A	I	1	1	notch	upper thighs	deep notch on one side

7.1.6. Discussion

Beaver remains were identified in burials at Zvejnieki and Sakhtysh IIa, while at Skateholm they were documented only in the grave fills. Teeth, mandibles and astragali are the most common body parts documented in burials. At Zvejnieki, beaver remains do not show traces of working, while at Sakhtysh IIa, incisors had notches for suspension, suggesting their use as ornaments. The unmodified incisors from Zvejnieki originate mainly from deposits beside the deceased. They often occur together with other tools of bone or flint, which suggests that they are tools rather than personal ornaments. Similarly, beaver mandibles in burials at Sakhtysh IIa were deposited beside the body and can be linked with their function as tools or being part of the funerary dress.

Astragali are the most common beaver body parts in burials at Zvejnieki. Beaver incisors and astragali differ both in their location is the cemetery and their context in burials. Burials with beaver astragali are located in the western part of the cemetery, while beaver teeth cluster in the east (Fig. 7.5). Beaver astragali are always found in rich burials, along with numerous animal tooth pendants and other rare osseous artefacts, such as human tooth pendants, seal and red deer phalanx pendants, and intensive use of red ochre (Fig. 7.7). These differences may reflect chronological preferences in the use of beaver body parts, as the astragali seem to date already to the 6th millennium cal BC.

The beaver astragali finds are mainly associated with the burials of children or juvenile and adult males (8 out of 9). These bones are often found beside the body on the left side, near the arms or knees. The lack of perforation or other traces of working suggests that they may have been placed in some kind of pouch or other container. Perhaps they were charms or amulets given as special gifts and possessed protective or apotropaic characteristics (see also Birtalan 2003; Russell 2012 and Chapter 11.2.4). The fact that no other foot bones have been recorded argues for the selection of this particular bone. Also, the one astragalus of wildcat – but no other bones of this animal – at Zvejnieki would suggest that particular meaning was given to this bone (Fig. 7.6). Beaver astragali are commonly also found in burials of the Iron Age and historical times in the Eastern Baltic and western Russia. Besides beaver, marten and hare astragali have also been documented as well as astragalus copies made from bone or bronze (see Luik 2010).

The nearest hunter-gatherer parallels for Zvejnieki come from two hunter-gatherer burials in Latvia, Riņņukalns and Kreiči, where two astragali were found in relatively similar contexts. The absence of beaver ankle bones from other burial sites in north-eastern Europe suggests that astragali may have been assigned particular meanings specifically in this area. However, astragali may be underrepresented in the archaeological assemblages as they are usually found without any traces of modification and may therefore have been discarded earlier as unworked animal bones.

The beaver's ability to engineer and alter the environment and master both land and water would not have escaped the notice of Stone Age hunter-gatherers. Their economical importance is clearly shown by the abundance of beaver remains from settlement layers in the Eastern Baltic and central Russia (Жилин 2004; Lõugas 2006,

2017; Ошибкина 2017: 37; Ukkonen & Mannermaa 2017). The beaver was desired for its valuable fur, meat, bones and teeth, but probably also for its scent glands (castoreum), which have been used for various medicinal purposes and have been even considered an aphrodisiac (Luik 2010: 52). The absence of beaver remains from the Skateholm burials is in accord with the very low number of beaver bones on the settlement sites (Jonsson 1988). However, the scarcity of beaver remains from the studied burials in the areas east of the Baltic Sea suggests different attitudes towards this species. Again, the scarcity of beavers in Sakhtysh burials is likely explained by temporal preferences and the general decline or change of non-carnivorous species in burial context during the Stone Age. This may also be seen in Zvejnieki, where the numerous astragali simultaneously point towards regional preferences – Zvejnieki itself, for example, stands in stark contrast to Yuzhniy Oleniy Ostrov with the abundance of beaver incisors and other bones in burials (Гурина 1956). In the economical sense, the beaver was certainly one of the key companion species, but in burial contexts its status appears to have varied regionally and been ambivalent.

7.2. Marmot

Marmots are large rodents belonging to the squirrel (Sciuridae) family and are the largest squirrels on earth. There are 15 subspecies of marmots living in Europe, Asia and North America, inhabiting mainly mountainous, forest steppe and steppe areas (Kryštufek & Vohralík 2013: 50). Marmots are divided into the Palaearctic (Marmota) and Nearctic *(M. monax* and *M. broweri*) groups. The subgenus Marmota includes four species groups of which the Bobak group is relevant for this study. Bobaks are native to the steppes of Eastern Europe (Ukraine and Russia) and central Asia; the westernmost subspecies is *Marmota bobak bobak* (Kryštufek & Vohralík 2013: 61, 68). In the past, the range of bobaks was likely much larger than today (Ognev 1963; Nowak 1999). Like other marmots, bobaks are susceptible to infection by bubonic plague (Kryštufek & Vohralík 2013; Kehrmann et al. 2020).

7.2.1. Biological characteristics and other properties

Appearance and morphology

Bobak marmots (Baibaks) have a rounded body, short legs and a moderately long tail. The adult animal weighs around 10 kg, with a length of approximately 50–60 cm. Males are usually larger than females. The fur colour varies from golden yellowish to copper reddish brown. In winter the fur is thicker and short (double fur), while during the summer the fur is lighter and thinner (Kryštufek & Vohralík 2013: 51). In the wild, bobak marmots can live up to 15 years. The incisor enamel surface varies from whitish to pale-yellow, rarely being light orange (Kryštufek & Vohralík 2013: 63).

Habitats and diet

Bobak marmots inhabit open habitats in forest steppe and steppe grassland, including cultivated field borders. Bobaks are a marmot species that prefers living at low altitudes, avoiding the Ural Mountains and instead inhabit the undulating landscape

west of the Urals and the steppe areas further to the south. Formerly the species was common and abundant in the whole of the steppe zone from western Ukraine to the Irtysh River (Kryštufek & Vohralík 2013: 66).

Marmots live in burrows and hibernate for more than half the year (up to eight months), from early September to early April, depending on the weather conditions. There are separate burrows for summer and for winter habitation. The winter burrows can be up to 100 m long and up to 4 m deep. The burrows are re-used for several decades, and over the years small hills (over 1 m high and 20 m in diameter) develop, indicating the presence of marmot burrows. The winter burrows are closed with a little pile of earth during hibernation. Marmots mainly survive on various grasses and herbs, especially before hibernating (Kryštufek & Vohralík 2013: 68).

Social relations and reproduction

Bobaks are socially active animals that live in extended family groups consisting of 2–5 adults and their offspring (Kryštufek & Vohralík 2013: 51). In suitable habitats, colonies of up to 15 families can be found in one square kilometre. It takes three years for young marmots to reach sexual maturity and about 60% of mature females give birth in the first year, and usually 4–6 young are born. Male offspring leave the home colony after their second winter.

Bobaks are active in the mornings and evenings. The colony has 1–2 guards (mainly females), which survey the surroundings while the rest of the family is feeding. Bobaks are preyed upon by foxes, wild dogs and steppe wolves, as well as eagles. Their strong front legs, teeth and aggressive character help them defend against predators, which they may attack when possible.

7.2.2. Marmot remains in hunter-gatherer contexts in north-eastern Europe

Marmot remains are not a common find from sites of the forest zone in central European Russia, and the Baltic Sea region is outside its natural habitat. Marmots are more common in steppe areas where marmot remains are more often found at archaeological sites. For example, at several Stone Age cemeteries in the present-day Republic of Tatarstan (west of the Urals), marmot teeth have been found in hunter-gatherer burial assemblages. At the V Mellyatamakskiy cemetery, marmot teeth were found in three burials, while at the Russko-Shuganskiy cemetery, more than 50 marmot teeth were documented with human remains (Казаков 2011: 28–29, 40). Marmot teeth have also been found with several cave burials in the southern Urals, where the burial assemblages usually also include shell beads: for example, more than two dozen marmot teeth were found with a child burial in the II Ust-Katavskoy cave (Казаков 2011: 46). Further south, the number of marmots in settlement and burial contexts increases. As an example, at the Early Eneolithic cemetery of Ekaterinovskiy Cape, located in the forest steppe area in the Middle Volga region, unworked marmot incisors were found with four burials along with beaver incisor and wild boar tusk ornaments and several stone and bone items (Королев et al. 2015: 516; 2018: 294).

Over 350 marmot incisors were found in one burial at the Maksimovka cemetery, located in the Middle Volga region (Шалапинин & Королев 2020).

7.2.3. Marmots at Sakhtysh IIa

In the studied materials, marmot remains were identified only at the Sakhtysh IIa cemetery, where they comprise the largest group of all animal teeth found at Sakhtysh cemeteries. Marmot incisors were identified from three burials, but most of them were discovered in the pelvic region of the adult female in Burial 24 (Fig. 7.8 and 7.11). Two maxillary incisors were also found with Burial 21 (Fig. 7.10: 2), and a single tooth with Burial 26 (Fig. 7.10: 1). No perforation or other modification traces were observed on the marmot teeth.

Forty better-preserved incisors belonging to the lower and upper jaw were identified in Burial 24, as well as more than 20 smaller fragments. There were more teeth from the lower than the upper jaw, although in quite even numbers from the left (14 mandibular and 5 maxillary incisors) and right (15 mandibular and 6 maxillary incisors) sides (Fig. 7.8 and 7.9). At least 15 animals were needed to make this decoration. The actual number may have been higher, but the overall preservation condition of the marmot teeth was quite poor and did not allow more precise estimation. However, on several teeth a dark organic substance was noticed, which could possibly be the remains of some substance that facilitated their suspension.

All of the burials with marmot teeth are located in the same area of the cemetery and are partly disturbed. Therefore, it is possible that all these teeth may originate from Burial 24, since no other burials with marmot teeth have been found. A marmot incisor from Burial 24 was dated to the mid 4th millennium cal BC (Macāne et al.

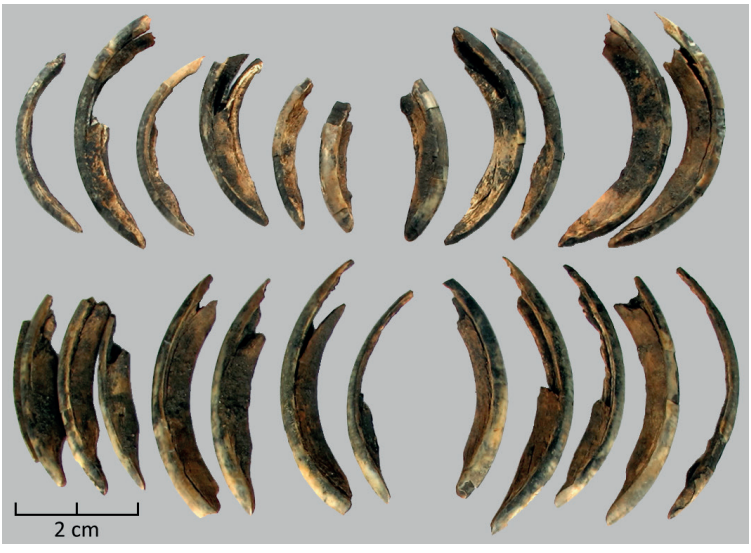


Figure 7.8. Marmot incisors from Burial 24 at Sakhtysh IIa. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

2019). Since no detailed osteological analysis of faunal assemblages from Sakhtysh has been carried out, the occurrence of other marmot remains in the settlement cultural layers is unclear.

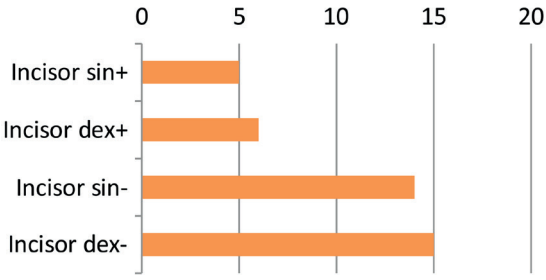


Figure 7.9. Mandibular (-) and maxillary (+) incisors show a nearly equal number of marmot teeth from the right (dex) and left (sin) sides in Burial 24 at Sakhtysh IIa.

Figure 7.10. The inventory of Burials 21 (2) and 26 (1) at Sakhtysh IIa, including marmot incisors, pendants made from bear teeth and an amber button. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

7.2.4. Discussion

The numerous marmot teeth in Burial 24 at Sakhtysh IIa are a unique find in this context. The absence of modification traces on marmot incisors, as well as their position in the pelvic region of the deceased, suggests that they were part of a garment. Given the even number of teeth coming from the lower and upper jaws, it is possible that the teeth were used in pairs, sewn onto clothing, or attached using some adhesive made from organic materials. Besides marmot teeth, Burial 24 included pendants made from serpentine (Fig. 7.11: 6). This semi-precious stone can be found in the Ural

Mountains, and a total of 90 serpentine pendants have been documented from other burials and cultural layer at settlements at Sakhtysh (Macāne et al. in press). Thus, most of the grave inventory of Burial 24, with the probable exception of the animal tooth pendants of canid, bear, elk and badger (Fig. 7.11: 1–5), is not of local origin.

Marmot teeth could originate not only from the steppe areas further south but also from areas west of the Urals, where serpentine outcrops are also known. Either the person who wore these items was non-local, or the objects were imported or exchanged from territories further away. The marmot teeth from other Stone Age burials in the region west and south of the Ural Mountains are either personal ornaments or found in deposits, but some also come from destroyed burials. Serpentine pendants are also known from all of these sites, often correlating with the presence of marmot teeth (Казаков 2011). Further south in the marmot distribution areas, marmot incisors are found in several burials, where they had a decorative function (Королев et al. 2015, 2018; Korolev et al. 2019; Шалапинин & Королев 2020).

Figure 7.11. Burial 24 at Sakhtysh IIa. Left: marmot incisors were found in the pelvic region of the buried woman; right: grave inventory. In addition to marmot teeth (see Fig. 7.8), five tooth pendants mainly belonging to carnivores were also found: one canine from a canid (wolf or a large dog, 5), one canine of a badger (4), one incisor of an elk (3) and two bear incisors (1–2). Eleven pendants made from non-local rocks, such as serpentine and in one case slate (6), were also found in the same grave. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: E. Kostyleva (Burial 24), A. Macāne (grave inventory), illustration: K. Nordqvist.

Marmot teeth, like the serpentine pendants, may have arrived in Sakhtysh through hunter-gatherer exchange and communication networks, or as a result of migration from territories further south or east. The former option does not seem implausible since numerous other non-local artefacts, originating between the Baltic Sea and the Urals, are known from the Sakhtysh complex, such as amber, rock crystal and Russian-Karelian metatuff artefacts (Тарасов & Костылёва 2015; Костылёва et al. 2018; Tarasov & Nordqvist 2022; Macāne et al. in press). Native to steppe areas and undulating regions west and south of the Urals, the marmot represents a curiosity at Sakhtysh. Therefore, it cannot be regarded as an actual companion species to the communities studied in this work.

7.3. Contextualizing rodent remains at Zvejnieki and Sakhtysh IIa: rodents and northern hunter-gatherers

Rodent remains are represented in the studied material by two species, the beaver and the marmot. Despite the importance of the beaver for hunter-gatherer communities on the eastern shore of the Baltic Sea during the Stone Age, very few beaver remains have been identified from burials at Zvejnieki and Sakhtysh IIa (and none at Skateholm). Marmots are native to more eastern and southern areas and were only identified at Sakhtysh IIa. Teeth – and incisors in particular – were the preferred parts of these rodents. At Sakhtysh IIa, mandibles, and at Zvejnieki astragali of beaver were encountered in several burials.

In terms of their appearance, especially the very specific morphology and colour of the teeth, as well as their habitats and behaviour, rodents are very different from all other animals inhabiting the Stone Age landscapes. Even though other, smaller rodents were probably quite numerous in the Stone Age landscape, their remains may not preserve so well archaeologically or are biased by recovery strategies. Therefore, the finds of beaver remains offer the only insight into human–rodent relationships in the Stone Age milieu. Beaver has in all times been a very important animal, not only because of its capacity for altering the environment, but also for its fur, meat, fat, and scent glands (producing castoreum), while the mandibles and teeth have been desired raw material. The apotropaic properties of beaver scent glands are well known throughout history. The ethnographic record from present-day Finland provides many examples of the beaver's importance during historical times and the symbolic, economic and remedial properties assigned to this animal (see Paulaharju 1922; Itkonen 1948). Perhaps this, too, was seen as significant and affected, for example, the choice of the beaver astragali, as few other animals inhabiting the Stone Age environment have been assigned such strong healing and health-promoting abilities as beaver.

These properties, in addition to the economic importance of this animal, make the beaver among the most important wild animal species to inhabit the landscape together with the Holocene foragers of north-eastern Europe during the Stone Age. In contrast to several hunter-gatherer burials in north-eastern Europe, where large numbers of beaver incisors have been modified into ornaments (Гурина 1956; Cimermane 1958), beaver remains in studied burials are relatively rare and used in different

ways, also suggesting local meanings assigned to this companion species. Marmots with similar morphological characteristics, although inhabiting solely the terrestrial and subterranean realm, may have held a similarly important position for the Stone Age hunter-gatherers in territories further east and south of Sakhtysh.

Chapter 8.
Birds

With a great variety of species, birds constituted one of the most abundant groups of animals in the Stone Age environment. Feathers, wings, beaks as well as bird songs are some of the very distinctive features that characterize birds. While many other species can swim, dive and inhabit waters and land, the ability to fly is something only birds possess and set them apart from other animals that inhabited the Stone Age landscape.

8.1. Biological characteristics and other properties

Birds can be divided into several groups, including waterbirds (seabirds and waterfowl), land and forest birds, and birds of prey. Waterbirds are bird species strictly reliant on aquatic environments, at least in some stage of their life cycle. Land or forest birds include mainly terrestrial species; forest birds are often divided further into generalists and coniferous forest birds. Birds of prey are carnivorous and feed on other birds, fish and terrestrial animals (HELCOM 2021).

Seabirds or marine birds are adapted to life on the sea or along coastlines. Among the most common seabird species in the Baltic Sea region are various birds belonging to the Charadriidae family, such as skuas, gulls, terns, auks and skimmers. Waders or shorebirds are adapted to aquatic environments, but differ from aquatic birds in having the ability to walk in water (wade) with their long legs. (HELCOM 2021). Waterfowl typically comprise birds belonging to the orders Anseriformes, Gaviiformes and Podicipediformes, such as ducks, loons, grebes, swans, geese and the coot (del Hoyo et al. 1994). Numerous species belonging to the Anatidae family, such as several ducks, swan and geese, are typical of freshwater bodies. Waterfowl are adapted to life in water, but they are also associated with the vegetation surrounding waterbodies, where they obtain food and nest.

The whooper swan *(Cygnus cygnus)* is a large bird inhabiting the Northern Hemisphere (Fig. 8.1). It can reach up to 150 cm and on average weighs ca. 10 kg. This is a migratory species, wintering in southern Europe or eastern Asia and breeding in the north. Swans are monogamous and pair up for life. Breeding takes place in wetlands,

and both the male and the female build the nest. The offspring stay with the parents for the first year. Swans feed mainly on aquatic plants (Carboneras & Kirwan 2020).

Figure 8.1. The whooper swan *(Cygnus cygnus)* has been assigned a significant symbolic and ideological role in the world as conceived by northern hunter-gatherers. Photo: A. Jesko.

The mallard or wild duck *(Anas platyrhynchos)* is a medium-sized waterfowl species inhabiting northern, temperate and subtropical climate zones (Fig. 8.2). Mallards are ca. 50–65 cm long and weight ca. 1–1.5 kg. They are social birds whose diet consists mainly of aquatic plants and small animals and insects (IUCN 2021). Diving ducks of the genus *Aythya*, such as tufted duck *(Aythya fuligula)*, greater scaup *(Aythya marila)* and common pochard *(Aythya farina)*, are medium sized waterfowl found in lakes and marshes and in the Baltic Sea coast mainly during migration. Their diet consists of aquatic plants, molluscs, insects and fish. Mergansers are fish-eating ducks of the family Anatidae. The goosander *(Mergus merganser)* and red-breasted merganser *(Mergus serrator)* are medium to large birds found on rivers and lakes in forested areas of north-eastern Europe and the Baltic Sea (HELCOM 2021). The Gaviidae family includes divers, such as red-throated loon *(Gavia stellata)* and black-throated loon *(Gavia arctica)*. These are migratory waterfowls inhabiting the Northern Hemisphere. Loons are monogamous species and pair up for life. The diet consists mainly of fish and other aquatic invertebrates. They are very skilled divers but not very adept at moving on land (IUCN 2021).

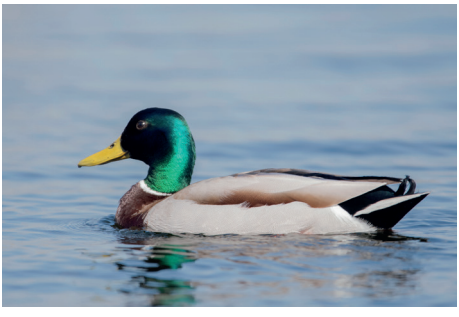


Figure 8.2. Mallard *(Anas platyrhynchos)* is one of the most common waterfowl species in Northern Europe. The male birds can be recognized by the glossy green head with a white collar, while the females have mainly brown plumage. Both males and females have very distinctive blue speculum feathers with white edges. Photo: A. Jesko.

Birds of prey are diurnal and belong to the Accipitridae family (eagles, hawks, buzzards), the Pandionidae family (osprey), the Falconidae family (falcons) and the Strigiformes family (owls). Eagles are the largest birds of prey. The white-tailed eagle *(Haliaeetus albicilla)* is widespread across temperate Eurasia (Fig. 8.3). It can reach up to 1 m in length, and the weight can vary between 4 and 7 kg for females, males being slightly smaller. White-tailed eagles are territorial and prefer wooded areas in the vicinity of the sea or fresh water. Nests are constructed in old trees or on cliffs. Their diet consists mainly of aquatic species, fish or birds, but they also scavenge (del Hoyo et al. 1994). Hawks of the order Accipiter are small to medium sized birds of prey common in the forested areas of north-eastern Europe. The northern goshawk *(Accipiter gentilis)* is an opportunistic predator that hunt mammals such as squirrels and hare, but also birds from thrushes to grouses.

Figure 8.3. A white-tailed eagle *(Haliaeetus albicilla)* leaving with a fish after a successful catch. Photo: A. Jesko.

Most of forest and land birds feed on insects and worms, while some species can also eat buds, shoots, leaves, grasses and berries. Distinctive sexual dimorphism is observed for this group of birds with males usually being larger and having brighter coloured feathers. Typical coniferous forest birds include black grouse *(Tetrao tetrix)* and western capercaillie *(Tetrao urogallus)* (Fig. 8.4) from the Tetraonidae family, pheasants (Phasianidae family) and woodpeckers (Picidae family) (Latvijas Daba 2021). These species are distributed across wide areas of Northern Europe and the Palearctic regions. The other land or forest bird species, for example the birds of the sparrow family (Passeriformes), including crows (Corvidae), thrushes (Turdidae), sparrows and songbirds are generalists adapted to more varied habitats. Eurasian jay *(Garrulus glandarius)* is a sedentary species, that prefers woodlands (NatureGate 2021).

Figure 8.4. The capercaillie *(Tetrao urogallus)* is a typical forest bird. Males have a distinctive red line above the eyes, and the chest is covered with shiny dark green feathers. Photo: A. Jesko.

8.2. Birds in hunter-gatherer contexts in north-eastern Europe

A variety of bird species have been identified in osteological material from hunter-gatherer sites in north-eastern Europe (Паавер 1965; Jonsson 1988; Лозе 1988; Ошибкина 1997; Карху 2002; Жилин 2004). With a few exceptions (e.g. Møhl 1978), however, bird remains are quite scanty in these faunal assemblages (see Gumiński 2005; Mannermaa 2008a; Bērziņš et al. 2014). This may be linked to taphonomic processes as well as find recovery methods, and also to a lack of specialists who could have studied them (but see Mannermaa 2003, 2006, 2008a).

Waterfowl, and in particular various ducks and divers, are the most common bird species from hunter-gatherer sites in the Eastern Baltic and western Russia (Лозе 1988: 116–117; Жилин et al. 2002; Карху 2002; Mannermaa 2003, 2008a: 51, 53, 63; Жилин 2004: 20, 68–69; Daugnora & Girininkas 2004: 89–90; Mannermaa & Lõugas 2005; Kashina & Emelyanov 2020: 407). Larger and better studied faunal assemblages from Stone Age sites in South Scandinavia usually have a more diverse selection of birds, including waterfowl, waders, birds of prey and different kinds of forest birds (Jonsson 1988; Eriksson & Magnell 2001; Boethius 2018). Regional specialization and preferences have been identified in a few cases. Gulls, geese and cormorants are among the most common species identified at sites on Åland, Gotland and Saaremaa (Mannermaa 2008a: 54). Swan was commonly hunted in the south-western part of the Baltic Sea where, for example, swan bones comprised 70% of the faunal remains at the Aggersund site (Møhl 1978; Overton & Hamilakis 2013). At the same time, swan bones are found in very low numbers in the eastern part of the Baltic Sea and the Baltic islands, with the exception of the Stora Förvar site on Gotland (Mannermaa 2008a: 54).

Due to their morphology, with a naturally hollow diaphysis, bird bones are suitable for making various tools and ornaments. However, taphonomic factors contribute to the poor preservation of these artefacts, and only rarely have they been identified in archaeological material (Mannermaa 2008a: 59; Gummesson 2018: 59, Table 5). Various artefacts have been manufactured from wing and foot bones of waterfowl, common crane and whooper swan (Жилин 2001; Girininkas & Daugnora 2013: 573; Kashina & Emelyanov 2020: 408).

Even though extremely common, numerous hunter-gatherer burial sites in north-eastern Europe contain either modified or unmodified bird bones or figurines depicting birds (Grünberg 2013). Furthermore, recent studies have revealed the use of feathers, identified in burials at Donkalnis and Riņņukalns (Mannermaa & Kirkinen 2020). Unmodified bird bones have been found in several burials or depositions by burials in north-western Russia, such as Peschanitsa and Popovo, where duck, wild grouse and crane have been identified (Oshibkina 2008: 53–54, 58,60). A few bird bones found in a burial at the Vaateranta cemetery in Finland could possibly be interpreted as grave goods (Mannermaa 2003: 15). In southern Scandinavia, bird bones (e.g. grebe) have been identified in inhumation burials and in one cremation burial at Vedbæk (Brinch Petersen et al. 1993: 66–67; Brinch Petersen & Meiklejohn 2003). Vedbæk also includes the famous child burial on a swan wing (Albrehtsen & Brinch Petersen 1977), and wing bones have also been reported from many other sites, including Tamula (crane; Jaanits et al. 1982: 82, 99) and Dudka (capercaillie; Gumiński 2005: 124). Remains of birds of prey are relatively rare in hunter-gatherer burials, but bones from osprey and white-tailed eagle have been identified at Yuzhniy Oleniy Ostrov and Kubenino (Mannermaa 2008b, 2016; Kashina et al. 2021: 84).

Tools made from bird bones are rare in burials. An awl made from the humerus of a diver was found in Burial 3 at the Kubenino site (Kashina et al. 2021: 84). Unmodified bird bones as well as artefacts made from tarsometatarsal bones of crane, cormorant and other unidentified species were also present in several burials at the Pitted Ware sites of Ajvide, Ire and Västerbjers on Gotland (Janzon 1974; Burenhult 2002; Mannermaa 2008b). Much more commonly encountered are various ornaments and pendants made from bird bones (see Grünberg 2013). Tubular beads are probably the most numerous bird bone artefact type in hunter-gatherer burials in north-eastern Europe. They have been documented, for instance, at Ajvide, Dudka, Kreiči, Tamula and several hunter-gatherer burial sites in Russia (Jaanits 1957; Burenhult 2002; Gumiński 2005; Kriiska et al. 2007; Костылёва & Уткин 2010; Macāne & Nordqvist 2021).

Bird representations have been found in several hunter-gatherer burials in the Eastern Baltic and western Russia. Bone figurines of birds have been found, for example at Tamula and the Riņņukalns shell midden (Meadows et al. 2016; Tõrv et al. 2017; Tõrv 2018). However, representations of birds mostly originate from settlement contexts (Кашина 2005; Kaverzneva & Kashina 2015: 242; Kashina & Emelyanov 2020). A particularly rich assemblage of bird (bone) figurines has been found at sites dated to the Volosovo Culture, such as Chornaya Gora and Strelka I (Loze 1983; Костылёва & Уткин 2010). Amber figurines depicting birds are known from the Lake Lubāns

amber workshops, such as the Zvejsalas site, where a clay figurine was also found (Loze 1983: 108; 2008). Clay figurines in the shape of a waterfowl are known, for instance, the Pörrinmökki, Vihi 1, Lintutorni (Pesonen 2000) and Lommi III (Khrustaleva & Kriiska 2020) sites. Representations of birds, mostly waterfowl (ducks, crane and swan), were often carved on bone or wood tool (bowl, ladle and knife) handles. Stylistically relatively similar artefacts have been recovered from a wide area between the Baltic Sea and the Urals (Loze 1983; Vankina 1999; Immonen 2002; Rimantienė 2005; Ошибкина 2017; Tõrv et al. 2017; Жилин & Костылёва 2021).

Bird images are encountered on hunter-gatherer pottery. They are usually found on Comb Ware and related pottery and are particularly common in Finland and north-western Russia, but known also in the Eastern Baltic area ad even beyond the Urals (Loze 1983; Utkin 1989; Pesonen 1996; Schulz 2006; Zhulnikov & Kashina 2010). Birds are a common motif represented also on rock art sites. Nearly half of the images in the Onega Lake petroglyphs are bird representations, most often swan-like waterfowl (Zhulnikov & Kashina 2010; Lahelma 2012; Лобанова 2015; see also Kivikäs 2005; Lahelma 2008 for Finland).

8.3. Birds at Zvejnieki

Out of sixteen burials with identified bird remains (see Mannermaa 2006), only in eight burials can they be counted as grave goods or as belonging to the burial (Table 8.1, Fig. 8.5 and 8.10). In the rest of the burials bird bones were found in the grave fill, or else the find context was not clear, or they come from disturbed burials.

Figure 8.5. At Zvejnieki unmodified bones from wings of Eurasian jay were identified in Burial 164 (1), while bird bones in Burials 83 (4), 93 (2) and 190 (3) had traces of working. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Most of the bird remains come from waterfowl and mainly represent various ducks (mallard, goosander and red-breasted merganser) belonging to the Anatidae family. In some burials bird bones have been found in an unmodified state (Burials 153, 164 and 165), while in others (Burials 83, 93, 121 and 190) there are cut marks on the diaphysis, and/or carved perforation holes have been made for suspension. In Burial 93, a duck humerus has been shaped into a pointed artefact (Fig. 8.5: 2). Two nearly complete ducks had been placed outside the left and right elbow of the young man in Burial 153 (Mannermaa 2006). Wing bones from Eurasian jay were identified with several parts of the body in Burials 164 and 165. In Burial 165, jay bones were found under the upper part of the body and spine, while in Burial 164 (Fig. 8.5: 1) they were placed by the elbows and came from at least 17 jays (Mannermaa 2006). Two jay bones have also been identified from Burial 167, but the context is mixed, and the finds come from a destroyed burial.

A bird bone is also mentioned in the field report and marked in the drawing to the left of the skull of an adult man in Burial 300 (Zagorskis 1971). It was found together with a decoration consisting of 56 animal tooth pendants, which apparently formed some kind of headdress (Zagorska & Lõugas 2000). Considering that this bone was found among other modified items (tooth pendants), it possibly belongs to the burial and was part of the head decoration. At the same time, it was found in the upper layer of the decoration and could possibly also come from the soil used to fill the grave.

Most of the bird bones have been found in burials with rich assemblages of other animal remains, mainly tooth pendants. Bird bones are more commonly found in burials of adult men, but the largest number of modified bird bones has been documented in child Burial 190. At least six duck bones had cut marks on the diaphysis and holes on one side, most likely for suspension (Fig. 8.5: 3).

Figure 8.6. Tubular beads, originally interpreted as made from bird bones, were documented in three burials at Zvejnieki: Burials 225 (3), 282 (4) and 317 (2). Only in the case of Burial 282 do they resemble bird bones. In Burial 317, in addition to tubular beads, ornaments from amber, bone and antler (1) were also found. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Tubular beads discovered in Burials 225, 282 and 317 (Fig. 8.6) were previously identified as bird bones (Zagorskis 1987). Morphologically, only the beads from Burial 282 can be identified as bird bones, while the raw material of those from Burials 225 and 317 cannot be determined with certainty. To tackle this problem, one bead from Burial 317 was sent for ZooMS analysis, but did not yield results (see Appendix 4).

Table 8.1. Bird remains at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	Taxa	Anatomical part	NISP	MNI	Location	Modification	Comments
83	Indet.	C	*Anas platyrhynchos,* Anatidae sp.	humerus	3	1	on chest, pelvis	cut marks, uneven holes in proximal end	holes in proximal end for suspension?; several additional small fragments of bird bones
93	M	A	Anatidae sp.	humerus	2	1	outside right tibia, by feet in filling	hole in proximal end	shaped into pointed tool; report for 1966 mentions four bird bones
121	F	A	*Anas platyrhynchos,* Anatidae sp.	humerus, bones	2	1	outside left femur, lower legs	cut marks, perforation	bones missing from NHML collection
153	M	C	*Anas platyrhynchos,* Aythya sp.	bones from legs, wings, shoulder, vertebral column	59	2	outside left & right arm	no	bones missing from NHML collection
164	M	A	*Garrulus glandarius,* Gavia sp.	carpo-metacarpi, PH1 (dig. II), PH tarsi	42	17	by head, right elbow, above chest, by knees, by feet	no	bird bones at ILH
165	M	A	*Garrulus glandarius, Anas platyrhynchos,* Anatidae sp., Aythya sp./ *Bucephala clangula*	carpo-metacarpi, tarso-metatarsus, femora	10	?	under head, pelvis, under spine	no	some bones present at ILH
190	Indet.	C	*Anas platyrhynchos, Mergus serrator, Mergus merganser,* Aythya sp./ *Bucephala clangula*	humerus, bones	11	?	chest, left side by femur, pelvis, knees, by right knee & tibia	cut marks & perforation on one side of diaphysis	eight humeri of various ducks, fragments of bird bones
282	F	A	Aves sp.	ossa longum	2	?	over pelvis	cut marks on diaphysis	

Six figurines representing birds have been identified in five burials at Zvejnieki (Zagorska et al. 2018). Most bird figurines are made from bone or antler, but in two burials wild boar tusk and sturgeon scuta were used as the raw material for making figurines. A two-headed bird figurine in antler was found outside the legs of the woman in Burial 221. Two bird figurines, one made from a bony plate of a sturgeon and the other from bone, were found in Burial 228 (see Fig. 11.9). However, the figurine made from sturgeon bone is missing from the museum collection, and more detailed study was not possible. It has been suggested that it represents flying birds, black grouse and waterfowl (Zagorskis 1987; Mannermaa 2006). Artefacts interpreted as bird representations have also been found with Burials 74, 100 and 162. A very stylized figurine representing a bird, found behind the head of an adult woman in Burial 74, was made from a wild boar tusk. A figurine in the shape of a duck head was found under the pelvis of an adult man in Burial 162. A pendant with incised decorative lines made from a cervid hyoid bone in Burial 100 (see Fig. 6.12: 5) has also been interpreted as representing the head of a bird (Zagorska et al. 2018: 105). The dated burials with bird remains or bird depictions cover the period from the 6^{ths} to the 4th millennium cal BC (Zagorska 2006a; Zagorska et al. 2018). Very few bird bones have been found and identified from the settlement context at Zvejnieki II. Avian bones are represented by a few fragments of grebe, which were not identified in burials, and some modified bird bones (Lõugas 2006: 77; Mannermaa 2006: 297).

8.4. Birds at Skateholm

Very few bird remains have been identified in burials. Only in Burials 35 and 47 at Skateholm I were bird remains found on the skeleton or in direct association with the deceased (Table 8.2). On the rib cage of a woman in Burial 35 there was a foot bone from a bird of prey, possibly a hawk (Jonsson n.d.). A cervical vertebra of a red-throated diver was found by the feet of the child in Burial 47 (Jonsson n.d.). In the destroyed part of Burial 46 several bird bones were encountered, such as a sacral vertebra of a duck, a radius fragment from a great black-backed gull and a complete femur from a female white-tailed eagle (Jonsson n.d.). Since this part of the burial has been destroyed, it is not entirely clear if these bones can be considered as intentional deposits, as they were found among numerous remains of other animal species. Two fragments of carpometacarpus bones, one from the Anatidae family and another from an unidentified bird species, were found in the fill of Burial IX at Skateholm II (Jonsson n.d.) but cannot be linked to the deceased.

Numerous bird species have been encountered at the Skateholm settlement sites. However, their numbers are small, usually not exceeding one or a few bone fragments. The identified species comprise migratory birds, waterfowl, various seabirds and birds of prey (Jonsson 1988).

Table 8.2. Bird remains at Skateholm. For legend see Table 5.1.

Grave no.	Sex	Age	Taxa	Anatomical part	Location	Modi-fication	Comments
35	F	A	Accipiter?	phalanx	on rib cage	no	bird belonging to the genus Accipiter?; several animal and fish bones at the level of the skeleton
47	in-det.	C	*Gavia stellata*	vertebra	by feet	no	

8.5. Birds at Sakhtysh

Tubular beads considered to originate from bird bones as well as figurines representing birds are the only bird-related finds at the Sakhtysh sites. No other bird bones have been preserved from the Sakhtysh excavations. However, the field reports and publications mention bird bones from a pit associated with the "sanctuary" at Sakhtysh VIII. In this ritual activity area, a pit filled with burnt bones of various species and a bear skull have been documented (Костылёва & Уткин 2010: 62).

The tubular beads are documented in Burial 1 and in multiple Burial 12 at Sakhtysh II (Fig. 8.7). However, only 11 tubular beads from Burial 1 have typical morphological characteristics of bird bones. More than 400 beads associated with two individuals were found in multiple Burial 12, but osteological analysis could not identify them as originating from bird bones. To verify this, two beads, one from Burial 12 and one from Burial 1, were sent for ZooMS analysis, but did not yield any results. Most likely, the insufficient collagen level or the possible treatment during the conservation of the beads prevented successful ZooMS analysis. However, two tubular beads from Burial 12 were successfully radiocarbon dated, although the collagen level was just above the minimum necessary. The datings indicate early 4th millennium cal BC, while the isotope values overlap with those of fish and can therefore also be affected by freshwater reservoir effect (see Macāne et al. 2019 for data and discussion).

At the Sakhtysh sites, depictions of birds have been found on several pottery fragments, in addition to which several figurines representing birds come from the settlements' cultural layers, some are associated with ritual activity areas and only one comes from a burial (Utkin 1989; Костылёва & Уткин 2008a; Костылёва et al. in press). Most of them are interpreted as representing water birds (Fig. 8.8). Bone and wood are the most common raw materials used for making figurines, but a few were also made from clay and flint. At Sakhtysh II, several bird figurines, all with traces of fire, were found in the ritual Hoards 8 and 10 and in the ritual activity area near Burial 14 (Костылёва et al. in press). Bird figurines in clay and flint come from the cultural layer at Sakhtysh IIa, while a bird head pendant with a broken perforation was found in the ritual pit ("sanctuary"). Five bird head figurines were found in the cultural layer at Sakhtysh I, and one was associated with Burial 10 (Костылёва et al. in press).

Figure 8.7. Tubular beads from Burial 1 (2) and multiple Burial 12 (1) at Sakhtysh II. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

Figure 8.8. Bird figurines, mainly representing waterfowl, have been found at the Ivanovskoye 7 (1) site and several of the Sakhtysh sites (2, 5: Sakhtysh II, 3: Sakhtysh IIa, 4, 6: Sakhtysh I). By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

8.6. Discussion

In general, there are very scarce bird remains from the investigated hunter-gatherer burials. Although this may depend partially on taphonomic factors and find recovery strategies, their presence (or absence) also reflects intentionality in their selection. At Zvejnieki, bird remains were securely associated with the buried person only in eight cases, while unmodified bird bones were only found in two burials at Skateholm. At Sakhtysh, the presence of birds is evidenced by tubular beads in burials and figurines depicting birds from other contexts.

There are differences between Zvejnieki and Skateholm in terms of the bird parts placed in burials. While at Skateholm bones of the feet and vertebrae were identified, at Zvejnieki the majority of identified bones are from wings. The humerus in particular was common for making pendants and tools. The identification of Eurasian jay wing bones in three burials at Zvejnieki suggests a particular significance of this body part or a special symbolic or ideological meaning associated with this bird. Perhaps the jay was a totem for a particular group of people, or else the aesthetic properties of the blue colour of jay wing feathers affected their selection (Fig. 8.9). The number of identified jays in Burial 164 at Zvejnieki is considerable, and it is possible that the wings decorated the funerary garment (Mannermaa 2006: 296). Similarly, the location of duck humerus pendants near the body in Burials 93, 121 and 190 would suggest that they were attached to the clothing or intentionally placed beside the body. Perhaps the sound these bones created when hanging and touching each other was important (Mannermaa 2006, 2008a: 61).

Figure 8.9. The Eurasian jay has a very particular blue colour on the wings, which might have been the reason for the selection of their wings in Burial 164 at Zvejnieki. Photo: A. Jesko.

Besides pendants made from duck humerus and figurines representing birds, the only other worked bird bones from the studied burials are tubular beads. A few such beads have been documented in Burial 282 at Zvejnieki and Burial 1 at Sakhtysh II. Tubular beads are a common find in hunter-gatherer burials in north-eastern Europe (Jaanits 1957; Burenhult 2002; Gumiński 2005: 125; Костылёва & Уткин 2010; Macāne & Nordqvist 2021), and usually all such small beads have been automatically counted as bird bone beads (see Костылёва & Уткин 2010; Nilsson Stutz et al. 2013; Larsson et al. 2017). Thus, several hundreds of small beads documented in double Burial 316/317 at Zvejnieki and in multiple Burial 12 at Sakhtysh II have also been

previously interpreted as made from bird bones, but re-analysis shows that their morphology is not similar to that of bird bones (see Chapter 9.1.6. for discussion). In addition, some of the beads from double Burial 316/317 were actually made from fossilized sea lilies (Macāne 2020).

In addition to the selection of particular parts of birds for placement in burials, their location in the burials also reflects different patterns. At Zvejnieki, bird remains were mostly placed beside the body, while at Skateholm they were also placed on the chest. In Burial 153 at Zvejnieki, complete birds were placed by the elbows of the deceased. Similar finds are known from other hunter-gatherer burials in north-western Russia (Oshibkina 2008), showing that the deposition of complete birds in or beside human burials is a more widespread tradition. They may represent a special offering or food given to the dead, or may be connected with the notion of birds as messengers between different worlds. The find contexts of bird figurines at Sakhtysh also indicate their importance in ritual activities, while figurines at Zvejnieki are more directly connected to the body of the deceased.

At Zvejnieki, most of the burials with bird remains are concentrated in the western part of the cemetery, except for Burial 282, with tubular beads of bird bone (Fig. 8.10). Bird remains are mainly documented in burials of adults, but in few cases also in burials of children. The available datings of burials with bird bones or bird representations at Zvejnieki cover the period from the 6th to the 4th millennium cal BC. Material from Sakhtysh and other sites in areas east of the Baltic further shows that bird symbolism becomes particularly visible during the 4th millennium cal BC (Kaverzneva & Kashina 2015; Костылёва & Уткин 2010; Kashina & Emelyanov 2020).

Figure 8.10. Distribution of burials with bird remains at the Zvejnieki cemetery. Scale bar is 30 m. Map: K. Nordqvist.

8.7. Contextualizing bird remains at Zvejnieki, Skateholm and Sakhtysh: birds and northern hunter-gatherers

In archaeological discourse, fowling and the significance of bird meat in the diet have rarely been emphasized, instead being treated as having a supplementary role (see Matiskainen 1990; Zagorska 1992; Kriiska 2001; Eriksson 2004; Жилин 2004; Magnell 2006; Mannermaa 2008a). However, the birds and their eggs may have had a large economical meaning, and humans probably engaged with them seasonally, during the migrating and nesting periods. In addition to meat and eggs, birds provided also raw materials, including bones and feathers. The bird species identified from Zvejnieki and Skateholm mainly represent waterfowl, including various species of duck, as well as other species that were available in the vicinity.

Relationships with particular bird species could have been affected by ideological reasons that regulated their hunting and consumption. In particular, taboos have been suggested with respect to the scarcity of swan remains in the Eastern Baltic (Gumiński 2005: 125–126; Mannermaa 2008a: 67). The swan was an important bird for the circumboreal hunter-gatherers, and these birds may have been interpreted as totems, symbols and soul messengers between the human and spirit world (see Napolskikh 1992; Lahelma 2008; Herva & Lahelma 2020). More broadly, the cosmological role of waterfowl in the boreal zone is well attested. Their numerous representations in portable art, pottery and rock art (Utkin 1989; Pesonen 1996; Schulz 2006; Lahelma 2008; Zhulnikov & Kashina 2010; Herva & Lahelma 2020) later find historically documented analogies in the creation myths of several Finno-Ugric peoples, in which the role of the waterfowl is central (see Napolskikh 1989, 1992; Lahelma 2012).

The wings and feathers are main characteristics that separate birds from mammals and fish. The wing symbolism must have been essential as these particular body parts were found in several burials at Zvejnieki as well as other hunter-gatherer cemeteries in north-eastern Europe (e.g. Jaanits 1957, 1961; Albrehtsen & Brinch Petersen 1977; Jaanits et al. 1982; Gumiński 2005). Bird wings (depending on sexual dimorphism) are often very colourful, and such aesthetic qualities may have been the reason for the selection of certain bird species or individuals. At the same time, the plumage could also have been used in everyday activities, such as an admixture in pottery-making or making arrows. Feathers must also have been used in adorning (ceremonial) dresses and headgear. Possibly, by wearing feathers or other body parts of birds, people believed they were embodying physical characteristics of birds, and in this sense, feathers and other bird parts mediated interspecies communication and transformation. The use of feathers is well documented in the ethnographic record, especially in connection with shamans' costume (Holmberg 1922; Siikala 1992; Furst 1991; Mannermaa & Kirkkinen 2020). Perhaps some birds served as spirit helpers (of shamans) in transformation rites for prehistoric hunter-gatherers.

Birds are a large and diverse group of animals that would have been present in all hunter-gatherer environments. Although not always highly visible, their songs and communication would have filled the Stone Age landscape at certain times of the day, and in particular seasons the flocks of migratory birds would have been prominent.

Birds were a source of food and raw materials, but also carried symbolic and cosmological meanings, and may have been an important medium in transformations. In other words, the relationships between Holocene hunter-gatherers and birds were manifold. Some of the birds, and particularly certain waterfowl species, were important companion species. Nevertheless, their significance at the studied sites if often revealed in contexts other than the burials.

Chapter 9.
Fish and reptiles

Even though terrestrial mammals comprise the majority of animal remains found at Stone Age sites in north-eastern Europe, various fish, reptile and amphibian species were part of the shared environment. These species often stand apart from other animal groups in their appearance (scales or carapace instead of fur and feathers), biological properties (ectotherm), living environment (aquatic) and mode of locomotion (swimming or crawling). Of these, fish were encountered daily, while the role of the other species may have been more limited. This chapter discusses the fish species from the studied sites, as well as snake and tortoise remains.

9.1. Fish

Fish are aquatic craniates with gills (main respiratory organ) but lacking limbs and digits. Their skeleton is made up of bones comprising the skull, axis and fin rays, and the body is covered with scales. Fish have the largest variety of species among the vertebrates (Froese & Pauly 2022). Ninety-nine percent of living fish are ray-finned fish belonging to the *Actinopterygii* clade of the bony fishes, the *Osteichthyes* (Latvijas Daba 2021). Fish are spread all over the world and are found in marine, river and lake water systems.

9.1.1. Biological characteristics and other properties

Various bony fish species inhabit the Baltic Sea and freshwater basins in north-eastern Europe. They may be divided into predatory and prey fish. For example, pike *(Esox lucius)*, perch *(Perca perca),* zander or pike-perch *(Stizostedion lucioperca)*, salmon *(Salmo salar)* and cod *(Gadus morhua)* belong to the former group, while various species in the Cyprinidae and Culpeidae families belong to the latter.

Sturgeons belongs to an ancient group of bony fish, the Acipenseriformes. The Atlantic sturgeon *(Acipenser oxyrinchus)* is the species that today as well in the past did inhabit the Baltic Sea region and not the European sturgeon *(Acipenser sturio)* (Ludwig et al. 2002, 2008). Its skeleton is composed mainly of cartilage, and bone typically covers only the skull; the body is covered with bony scutes. Sturgeons are anadromous fish mainly living in the sea, but they spawn in rivers and feed on ben-

thic organisms and fish. A sturgeon usually lives alone, but larger concentrations are formed before spawning and wintering. The spawn occurs between April and August. Sturgeons can reach a considerable size (several hundred kilograms) and an age of up to 50–100 years (Latvijas Daba 2021).

Herring *(Clupea harengus)* is a small marine fish, generally up to 35 cm long, with a slender, flattened or round, shiny, silvery body. They live in shoals, mostly in open waters but spawn by the coast. The Baltic Sea is inhabited by a smaller subspecies, the Baltic herring *(Clupea harengus membras)*. Depending on biological and morphological characteristics, two types of Baltic herring are distinguished, one usually spawning in spring (May or June) and the other in autumn (August–October) (Latvijas Daba 2021).

European eel *(Anguilla anguilla)* has a slender, snake-like body. Eels live mainly in the shallow coastal waters of the seas and freshwater basins connected to the sea. They make very long spawning migrations to the Atlantic Ocean and Sargasso Sea. Eels reach up to 1.5 m in length and weighs up to 6 kg (Latvijas Daba 2021).

Pike (Fig. 9.1), belonging to the Esocidae family, is one of the most common predatory fish in the Northern Hemisphere. Pikes are 0.5–1.5 m long and weigh usually a few kilos, rarely reaching more than 10 kg. Pike typically occurs in freshwater and in brackish estuaries and similar places with reduced salinity. A highly predatory fish, it feeds mainly on various small fish. Spawning takes place between February and June (Latvijas Daba 2021).

Figure 9.1. Pike, zander, perch, bream and roach were in the catch from the last ice fishing with my father on Lake Lubāns. Photo: A. Macāne.

Whitefish *(Coregonus lavaretus)* and other species of the Coregoninae subfamily belong to the salmon family (Salmoniformes). They are slender, medium to large (30–120 cm, up to 12 kg) predatory freshwater or migratory fish usually found in areas with a cool or cold climate. Spawning takes place in rivers between September and December (Latvijas Daba 2021).

The carp (Cyprinidae) family includes medium-sized or small fish, usually 20–70 cm long, occurring almost exclusively in freshwater. The carp family is the largest family of fish in the world and also one of the dominant families in the Northern

Hemisphere. Cyprinids feed mainly on invertebrates and plants. Some of the most common fish species of the carp family include carp *(Cyprinus carpio)*, bream *(Abramis brama)*, white bream *(Blicca bjoerkna)*, roach *(Rutilus rutilus)*, common rudd *(Scardinius erythrophthalmus)* and tench *(Tinca tinca)*. Small fish, such as roach, live in shoals, while larger fish, like ide *(Leuciscus idus)*, live a more solitary life. Spawning depends on water temperature and takes place between April and August (Latvijas Daba 2021).

Catfish or wels *(Silurus glanis)* is a large freshwater fish with a slender, cylindrical body and a large, flattened head. It can reach up to 2.5 m in length and up to 100 kg in weight. Catfish are predators who eat mollusks, amphibians, fish and even small aquatic birds and mammals. Spawning depends on water temperature and takes place between April and August (Latvijas Daba 2021).

Cod belongs to the family Gadidae. In the Baltic Sea, the subspecies Baltic cod *(Gadus morhua callarias)* is distinguished. It is a marine fish living in shoals and can reach up to 130 cm in length and weigh up to 25 kg. Cod feeds mainly on fish and mollusks and spawns mainly in April–May (Latvijas Daba 2021).

Three-spined stickleback *(Gasterosteus aculeatus)* belongs to the family Gasterosteiformes. It is a small, slender fish, usually 3–18 cm long. It occurs in the seas and freshwaters of the Northern Hemisphere and feeds on plankton. Spawning takes place between March and August (Latvijas Daba 2021).

Perch (Fig. 9.1) is a mid-size predatory fish. It is a freshwater species but also occurs in brackish coastal areas. It averages around 15–40 cm in length and weighs less than 1 kg. Perch are predatory and eat mainly invertebrates, crustaceans and fish. Spawning time, depending on water temperature, is between February and July (Latvijas Daba 2021).

The Atlantic mackerel *(Scomber scombrus)* is a pelagic predator fish. It lives in shoals in the Atlantic and North Sea, but during the Littorina Sea it was found more commonly in southern parts of the Baltic Sea. Is is usually 30–40 cm long, weighs up to 0.5 kg and spawns in May–July (Pethon & Svedberg 1995).

Flounders (Pleuronectidae) is a family that include marine flatfishes. The flounders lives on the sea bottom and feeds on crustaceans and fish. They range in size between 30–60 cm in length depending on taxa, but may reach up to 1 m. The most common flounders in the Baltic Sea are European flounder *(Platichthys flesus)*, European plaice *(Pleuronectes platessa)* and turbot *(Scopthalmus scombrus)* (Pethon & Svedberg 1995).

9.1.2. Fish remains in hunter-gatherer contexts in north-eastern Europe

Fish have been one of the main food sources, but well-preserved, well-excavated and well-analyzed fish bone assemblages from hunter-gatherer sites in north-east Europe are quite rare (Lõugas 1997a; Ritchie 2010; Robson et al. 2013; Boethius 2018; Piličiauskas et al. 2019; Nurminen 2020). Many of the old assemblages in the Eastern Baltic and western Russia, excavated during the 1960s–1990s, were often dominated by large pike bones that could be collected without sieving (see Sloka 1984, 1985, 1986; Stančikaitė et al. 2009). Several new excavations employing accurate recovery and dry- or wet-sieving have changed the situation significantly (Bērziņš et al. 2014;

Lozovski & Lozovskaya 2016; Piličiauskas et al. 2019; Bērziņš 2020; Brinker et al. 2020). In South Scandinavia the situation is better and usage of sieving at excavation since the 1970s have resulted in several large fish bone assemblages from Denmark and South Sweden (Jonsson 1986; Enghoff 1987, 1994; Eriksson & Magnell 2001; Boethius 2018).

The composition of fish species depends on location and dating of the site, but fish commonly present in the Eastern Baltic area include pike and zander, as well as different cyprinid species (Lepiksaar 1984; Sloka 1984, 1986; Lõugas 1997a; see also Nurminen 2020). In South Scandinavia, marine, seasonal or migratory fish take a larger role, as can be seen, for instance, at the Havnø and other Ertebølle sites (Ritchie 2010; Robson et al. 2013). Processing, preservation and storage of fish was important part of the economy, as shown by the evidence from the Norje Sunnansund site (Boethius 2016) and Šventoji 2/4 (Piličiauskas et al. 2019: 136) (Fig. 9.2).

Figure 9.2. Drying was one of the preservation methods available for the Stone Age fishing communities. Fish drying at my home in Īdeņa, a fishing village located by Lake Lubāns. Photo: A. Macāne.

Fish remains are rarely found with hunter-gatherer burials. In Vedbæk area, fish bones have been found in a small pit by the head of a buried person and in the stomach area of another deceased (Brinch Petersen 2015: 106). In Riņņukalns shell midden, more than 10,000 fish bones, mainly from ruffe *(Gymnocephalus cernua)* and perch, were found in a fish deposit by the head of the buried (Brinker et al. 2020). Thick accumulations of fish bones and scales were identified in association with several burials at the Abora I site (Loze 1971). Complete fish skeletons (burbot, *Lota lota*, and tench), fish bones and scales were documented in deposits, stomach region and grave fills at the Peschanitsa and Popovo burial grounds (Oshibkina 2008: 53–54, 58). Pendants made of fish bones have been found at the Minino I burial ground (Oshibkina 2008: 62; Wood et al. 2013: 165), while figurines resembling fish have been documented in burials at Peschanitsa and Popovo (Oshibkina 2008: 54).

Outside burials, fish representations in different raw materials include the possible drawn images of fish on bone and antler tools from at Norje Sunnansund (Boethius 2018: 77) and Sjöholmen (Larsson 2017). Fish representations in bone are known from the Riigiküla I, Abora I and Malmuta sites in the Eastern Baltic (Loze 1983: 92, 94) and from several Volosovo sites in the Volga–Oka interfluve (Костылёва & 92010). Fish, particularly pike, depictions are known from rock paintings in Finland and Sweden (Lahelma 2008; Goldhahn et al. 2010) and fishing scenes and images of fish (even a sturgeon) can be also found in the rock carvings of north-western Russia (Савватеев 1970; Лобанова 2015).

9.1.3. Fish at Zvejnieki

Fish remains have been mentioned in several graves at Zvejnieki (Lõugas 2006), including, for example, remains of whitefish (Burial 2), sturgeon (Burial 22), pike (Burial 89) and perch (Burial 168). None of these fish bones were present in the museum collection. Instead, there was a bag of fish bones comprising mainly pike and perch and associated with the destroyed Burial 167. In the field report from 1968, a fish vertebrae accumulation is also mentioned by the feet of the buried man in Burial 170 (Zagorskis 1968), but no fish bones have been preserved in the museum collection.

The only secure context of fish remains at the Zvejnieki cemetery is from Burial 228 (see Fig. 11.9). Sturgeon scutes have been used to make two figurines, one representing a bird and the other a human face (Zagorskis 1987; Zagorska et al. 2018: 114, Fig. 17). Currently, the figurine of a bird is missing from the museum collection. They were found in the neck area together with two more figurines made from bone. The burial is dated to the mid 4th millennium cal BC (Zagorska et al. 2018). In Burial 252, a haemal or neural spine fragment of a large fish was identified, which has previously been interpreted as a bone needle (Zagorskis 1987) but cannot be securely associated with the buried person. A pike vertebra was found in association with Burial 300, but since this burial is located within the Zvejnieki II settlement area it could also come from the grave fill. Although fish remains are not commonly found in burials at Zvejnieki, a larger number of fish and other animal remains were documented in pits – remains of hearths – between or near some burials, e.g. Burial 211 (Zagorskis 1970: 31).

At the Zvejnieki II settlement, pike comprise more than half of the identified fragments, followed by perch and bream. A relatively large number of tench bones have been identified, followed by wels, asp *(Aspius aspius),* pike perch, roach and silver bream *(Blicca bjoerkna).* Only individual bones of burbot, whiting *(Merlangius merlangus)* and anadromous and migratory species, such as eel and salmon (*Salmo salar*), were identified (Sloka 1985; Zagorska 1992: 115).

9.1.4. Fish at Skateholm

Fish bones have been identified from 33 out of 83 burials at Skateholm I and II. Only in 13 burials at Skateholm I (Fig. 9.3, Table 9.1) and six burials at Skateholm II (Fig. 9.4, Table 9.1) have fish remains been found in direct association with the dead and

can be regarded as intentional depositions. The rest originate from the fills of graves that have been dug through the cultural layer (Jonsson 1986: 62; n.d.).

Most of the fish associated with the buried person have been found in the area of the mouth, throat or stomach and have been interpreted as remains from ceremonial activities connected with the burial ritual or remains of the "last meal" (Jonsson 1986: 62). Large numbers of fish bones were also encountered in the area of the feet or beside the head, or in deposits beside the deceased. In Burial IX at Skateholm II, a large number of three-spined sticklebacks were found by the left shoulder of the buried woman. According to Leif Jonsson's estimate (pers. comm.), at least 295 whole fish have been deposited here. Shark teeth have been identified from three burials, and in two cases it has been considered that these are not fossil shark teeth, while a tooth from Burial XVI is mentioned as fossil shark (Jonsson n.d.).

Fish remains are associated with eight burials of women at Skateholm I and three burials of men, while in two more burials the sex is undetermined. At Skateholm II, fish remains mainly occur in burials of adult men, but also with one child and one burial of a woman. The distribution pattern of burials with fish remains does not show particular concentrations.

Numerous fish remains have also been identified from the settlement layers at Skateholm I and II, pike and perch being the most common. Even though freshwater species dominate, the Baltic herring and other marine and migratory fish were also identified in the faunal assemblage from both settlements (Jonsson 1988).

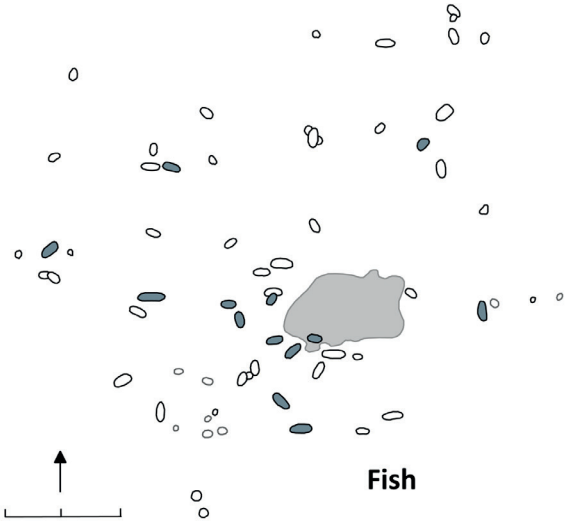


Figure 9.3. Fish remains from secure burial contexts at Skateholm I. Scale bar is 10 m. Map: K. Nordqvist.

Table 9.1. Fish remains at Skateholm I and II. For legend see Table 5.1.

Grave no.	Sex	Age	Taxa	Location	Comments
4	F	A	*Anguilla*, Cyprinidae, *Gasterosteus*, *Rutilus*	by left rib cage & by pelvis	fish bones in dark discolourations by left rib cage and pelvis
6	F + indet.	A + C	*Abramis*, Cyprinidae, (*Rutilus*/*Scardinus*)	pelvis area	dark-coloured area with fish bones (0.15 x 0.1m)
7	M	A	*Anguilla*, *Clupea*, Cyprinidae, *Esox*, *Perca*, Pisces	deposit by feet	small dark discolouration (0.1 m in diameter) containing fish bones by feet, more fish bones in fill
12	F	J/A	Pisces	pelvis, left tibia	fish vertebrae
22	M	M	*Perca*, *Scardinus*	by head, left shoulder, under feet	one pharyngeal bone of rudd by left shoulder, one perch vertebra by head, fish bones also found beneath feet
24	F	M	*Blicca*, Cyprinidae, *Esox*, *Rutilus*, *Perca*	stomach area	vertebrae and pharyngeal bones in stomach area
25	F	A	Cyprinidae, *Rutilus*	stomach area	two fish vertebrae from stomach area that may be from fill or cultural layer
33	M?	M	*Clupea*, Cyprinidae, *Esox*, *Perca*, *Platichthys*, *Pleuronectes*, *Rutilus*,*Scardinus*	in stomach area and in mouth, under body, in dark area	fish bones in stomach area and in mouth
35	F	A	*Anguilla*, *Blicca*, *Clupea*, Cyprinidae, *Esox*, *Rutilus*, *Scardinus*, *Perca*	in region of feet	many fish bones in region of feet and in fill
37	F	A	*Anguilla*, *Blicca*, *Clupea*, Cyprinidae, *Esox*, *Perca*, *Rutilus*, *Scardinus*, *Selachia*	to left of cranium	fish bones in dark discolouration (0.3 x 0.15m) left of head
43	F	A	*Anguilla*, *Esox*, *Perca*	in pelvic region	a few perch vertebrae in pelvic region, and more fish bones identified from fill or cultural layer
48	indet.	?	*Esox*, Pisces	deposit near knees	in dark spot with other animal bones
59	indet.	?	*Clupea*, Cyprinidae, *Rutilus*	in dark discolouration beside human remains	metapodial of seal, vertebrae from herring, roach and cyprinid
II	M	A	*Perca*	Pelvis	
IV	M	A	Pisces	in dark discolouration on left side of cranium?	
IX	F	A	*Abramis*, *Anguilla*, *Blicca*, *Clupea*, Cyprinidae, *Esox*, *Gadus*, *Gasterosteus*, *Leuciscus idus*, *Rutilus*, *Scardinus*	next to right shoulder, on left shoulder, between legs, from skeletal level, in fill	at least 295 complete sticklebacks placed by left shoulder, some fish bones also in fill

Grave no.	Sex	Age	Taxa	Location	Comments
XIII	indet.	C	*Abramis*, *Esox*, Pleuronectidae, *Salmo* sp.	by legs & pelvis	
XV	M + dog		*Abramis*, *Anguilla*, Cyprinidae, *Gasterosteus*, *Gadus morhua*, *Lamna nasus*, *Perca*, *Rutilus*, *Scomber scombrus*, *Scophtalmus maximus*	by feet, on pelvis, between knees, at skeleton level	
XVII	M		*Anguilla, Gadus*, *Lamna nasus*, Pleuronectidae	fine sieving of earth from pelvis region	fossil shark tooth, vertebrae and premaxillae fragments

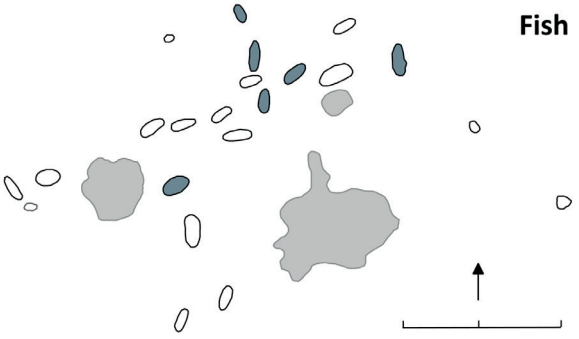


Figure 9.4. Fish remains from secure contexts at Skateholm II. Scale bar is 10 m. Map: K. Nordqvist.

9.1.5. Fish at Sakhtysh

No fish bones have been documented from the Sakhtysh burials, while a large number of fish and bird bones have been mentioned in the ritual pits at Sakhtysh II (Костылёва & Уткин 2010: 26). None of these bones are present in the museum collections, and information comes only from the excavation documentation. The available osteological reports from the early excavations at Sakhtysh I and II mention a small number of fish bones (<50 bone fragments) (Цалкин 1963, 1964). The identified fish species found at the Sakhtysh I site included pike, ide, catfish, perch, roach and sturgeon. All of these fish species, except sturgeon, also occur in the Oka basin at the present day. However, considering small number of fish remains and the find recovery strategies, the representativity of this data should be taken with caution.

9.1.6. Discussion

The differences in identified fish remains at the studied sites are noteworthy. Considering the importance of fish in the diet of northern foragers, this understood to reflect primarily taphonomy and research-related issues. The presence of an osteologist

during the excavations and sieving have resulted in a much higher number of identified fish remains in the settlement layers and many burials at Skateholm (Jonsson 1986, 1988; Larsson 1988a). Despite the ambiguity of some burial contexts at Skateholm, the intentional deposition of fish can be traced in several cases. The presence of fish remains in pits or hearths found in the cemetery areas at Zvejnieki and Sakhtysh suggests that fish was associated with burial activities at these sites as well.

There are several examples from the Skateholm burials where fish remains were encountered in small deposits by the body or were found in the region of the mouth, rib cage or stomach area. These finds could be the result of fish consumption as a normal part of the diet but could also be connected with activities carried out in connection with the funeral (Jonsson 1986; Larsson 2002). The particularly numerous remains of sticklebacks by the shoulder of the buried woman in Burial IX at Skateholm II has a resemblance to the example from the Riņņukalns shell midden. Here, a thick layer of fish bone (consisting of thousands of small ruffe bones) covered the head area of the buried man, while small fish bones were also discovered in the mouth and stomach area (Brinker et al. 2020). The location of the fish bones, as well as the amount and size of the fish, rather suggest the presence of some container with fish, prepared for the funerary ritual. Possibly, a similar practice has also been seen in connection with burials at Abora I (Loze 1971), but the available excavation documentation does not permit further interpretation. The finds of fish bones at both Zvejnieki and Sakhtysh also indicate that fish were part of some activities performed in relation to burials.

The practice of placing fish in graves, either raw or processed is further documented in other hunter-gatherer burial grounds in north-eastern Europe (Oshibkina 2008: 53–54, 58). In two cases from the Popovo cemetery, complete fish placed by the hands of the deceased were recoded (Oshibkina 2008) and can be interpreted to reflect the transformative or mediating function of fish (see Chapter 11.2.3 for further discussion). The transformative properties of are linked to their very particular appearance and biological properties, namely living in the water and having the ability to swim. Fish, and especially pike, have had a considerable role in northern cosmology: pike was an important fish species for shamans, serving as a medium for disappearing in the waters and travelling between different realms. Transformation into a fish allowed the shaman to swim and approach areas and beings that could not be reached in other ways (Herva & Lahelma 2020).

The studied materials include only a few examples of fish bones that have been worked and turned into ornaments. The first one is the use of sturgeon bones for making pendants documented in Burial 228 at Zvejnieki. Perhaps the morphology and appearance of the sturgeon scute was the reason for its selection as a raw material for making ornaments (see Fig. 11.9 and Chapter 11.2.3 for further discussion). The second example are the tubular beads found in several burials at Sakhtysh and Zvejnieki. They are often interpreted as being made from bird bones (see Костылёва & Уткин 2010; Larsson et al. 2017; see also Chapter 8.3 and 8.5), but this assumption is a generalization, and some of these beads have already shown to be made out of fossils (Macāne 2020). The possibility that fish bone was used for making these items

cannot be excluded due to several arguments. First of all, the morphology of these tubular beads does not resemble that of bird bones. Since the number of such beads in most cases exceeds a hundred or even two hundred specimens (Sakhtysh II, Burial 12), readily available material should have been used for making these beads. An attempt to analyze beads from three burials with ZooMS was not successful (Burials 1 and 12 from Sakhtysh II and 317 from Zvejnieki; see Chapter 3.2.2, Appendix 4). However, one of the tubular beads from Burial 12 at Sakhtysh II was dated, and the bulk stable isotope values (^{13}C, ^{15}N) resemble the values of freshwater fish (for details, see Macāne et al. 2019; also Appendix 3).

Considering their abundance, large fish, in particular, could have been important as raw material for making tools, ornaments, clothing or other items. Several examples of using fish teeth as raw material for making ornaments are known from hunter-gatherer burials in southern Europe (e.g. Rigaud et al. 2014; Mărgărit et al. 2017). For example, at the Vlasac cemetery in the Danube Gorges region, up to several hundred cyprinid pharyngeal teeth ornaments were found in burials (Cristiani & Borić 2012; Cristiani et al. 2014). The ethnographic sources contain a rich record of the use of fish skin or other body parts for various purposes. The use of fish skins (Fig. 9.5) for making belts, clothing, footwear, straps, purses is well known, as is the use of fish glue and fish oil. Fish remains also could possess strong medical, spiritual and cultural properties or serve as economic commodities (see Зуев 1947; Berg 1984; Hurcombe & Williams 2002; Sirelius 2009; Глебова 2012; Косинцев 2013; Vávra 2020).

Figure 9.5. Eel and burbot skins are well known as an excellent raw material for manufacturing various objects, but pike skin was also used to make bags and pouches, as seen in this example exhibited at the *Torum Maa* ethnographic open-air museum in Khanty-Mansiysk, Russia. Photo: A. Macāne.

The archaeological material underlines the central role of fish in hunter-gatherer economies in north-eastern Europe. In addition to faunal assemblages (Lõugas 1997a; Boethius 2018; Nurminen 2020), various stationary fishing structures and a great

number of fishing equipment have been excavated in north-eastern Europe (Rimantienė 2005; Bērziņš 2008b; Ritchie 2010; Lozovski & Lozovskaya 2016; Koivisto 2017). The importance of fish in the diet of hunter-gatherers is nowadays also well documented with help of isotope and biomarker studies (Eriksson 2003; Piezonka et al. 2013, Meadows et al. 2018; Mökkönen & Nordqvist 2019; Papakosta et al. 2019). Fish were among those animals with which humans had daily interaction, and therefore fish can generally be termed as an essential companion. Humans were well acquainted with the seasonal movements and behaviour of fish, which also regulated their own movements and activities. Certain fish were given cosmological and transformative meanings, and while the present material is small, there is enough evidence linking them with mortuary practices. Nonetheless, the ways in which fish are used and signified appear to differ from the other animals used in these contexts, possibly reflecting the different appearance and properties of this companion species.

9.2. Reptiles

Reptiles are vertebrates belonging to the class Reptilia, which includes turtles, tuatara, crocodiles, snakes and lizards. The squamates (lizards and snakes) are the second largest order of vertebrates after fish. Reptiles are widespread all over the world except for Antarctica (Gans & Bell 2001). The present material includes the European pond tortoise *(Emys orbicularis)* and some snakes *(*Serpentes*)* which are discussed in the following.

9.2.1. Biological characteristics and other properties

The European pond tortoise is a medium-sized freshwater turtle nowadays mostly found in Southern and Central Europe. During the Stone Age, when the climate was warmer, this species occurred further north, its distribution range also extended into southern Sweden and the Baltic States. It is a semi-aquatic species, whose body is hidden in a hard shell consisting of fused scutes. The diet varies from fish and various invertebrates to aquatic plants (Ficetola & De Bernardi 2006). The European pond tortoise winters between October and April, and mating takes place in spring. The main predators are foxes, badgers and raccoon dogs (Latvijas Daba 2021).

Figure 9.6. The females of the common European adder are typically brown in colour, while males are grey with a black zigzag stripe along the middle of the back. It is the only venomous snake in north-eastern Europe. Photo: A. Jesko.

Snakes are carnivorous reptiles belonging to the suborder Serpentes. In Northern Europe four snake species are documented: the common European adder or viper *(Vipera berus berus)* (Fig. 9.6), the grass snake *(Natrix natrix),* the slow or blind worm *(Anguis fragilis)* and the smooth snake *(Coronella austriaca).* They have round, elongated body, which is covered in scales. Snakes live in various habitats and their diet consists of small mammals, amphibians and invertebrates. All snakes hibernate in the winter and lay eggs after mating (Latvijas Daba 2021).

9.2.2. Reptile remains in hunter-gatherer contexts in north-eastern Europe

The rare occurrence of reptile remains at Stone Age sites can be linked to find recovery strategies, since the bones are very small and fragile, but partially represent their actual occurrence. Only tortoise carapace fragments are slightly more common in north-eastern Europe (see Zagorska 1992). In western Russia, pond tortoise remains are reported from the Utreh 3 site (Жилин 2004: 41). In Southern Scandinavia worked and decorated tortoise shells are found at Agernæs (Jæger 1998; Strassburg 2000: 332; Petersen 2021: Fig. 10) and Segerbro (Larsson 1986; Jonsson 1988; Gramsch & Larsson 2001), and some fragments with working and fire trances are also known at Bad Dürrenberg (Grünberg et al. 2016: Fig. 37).

Snake depictions in various materials (amber, bone, wood, antler, flint and clay) are actually more common than snake and other reptile remains in faunal assemblages. Snake figurines in amber and bone are found at Abora I (Loze 1983: 93), and a snake carved from an elk antler at Tõrvala (Moora 1957; Jaanits 1961: 22). Wooden snake figurines are known from several wetland sites in the Baltic States, Belarus and western Russia (Ванкина 1970; Кашина 2005; Rimantienė 2005; Lozovskaya 2020), and most recently discovered at Järvensuo 1 in Finland (Koivisto & Lahelma 2021). In burials, snake figurines are recorded once at Tamula (Jaanits 1957; Loze 1983) and twice at Yuzhniy Oleniy Ostrov (Гурина 1956). Possible snake representations on pottery are known from Zvidze and the Šventoji 3B site (Loze 1983: 131; Rimantienė 2005) and snakes and lizards are depicted also on rock art panels in north-western Russia, and red ochre rock paintings in Finland and Sweden (Савватеев 1970; Kivikäs 2005; Lahelma 2008; Gjerde 2010; Sjöstrand 2011; Лобанова 2015).

9.2.3. Reptiles at Zvejnieki

The only reptile find at Zvejnieki is a pond tortoise found in Burial 92 (Fig. 9.7, see also Fig. 1.4). Behind the head, on the right side of the buried man, 18 carapace fragments could be reassembled to form a nearly complete shell. No visible traces of modification could be observed on the carapace fragments. The grave inventory also included several beaver astragali and numerous animal tooth pendants, located on the left side of the body. This burial was partly disturbed, and only the upper part of the body was preserved.

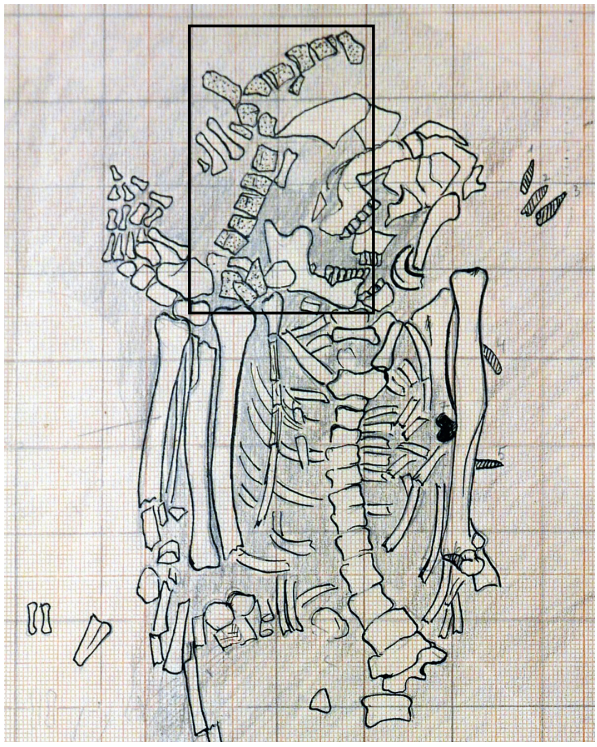


Figure 9.7. The nearly complete carapace of a pond tortoise was found on the right side, behind the head of adult male Burial 92 at the Zvejnieki cemetery. Drawing: L. Linmeijere (Institute of Latvian History, University of Latvia), illustration: K. Nordqvist.

9.2.4. Reptiles at Skateholm

Several reptile and amphibian species have been identified from the Skateholm burials (Jonsson n.d.). Snake remains were found in two graves. A fragment of a snake vertebra covered with red ochre was found on the left side of the head of Burial XII at Skateholm II. In Burial 33 at Skateholm I, a snake bone was discovered in the stomach area, another under the body, and two more in the fill (Jonsson n.d., 1988). Besides reptiles also remains of amphibians, a common toad *(Bufo bufo)*, were identified from Burials 3 and 33 at Skateholm I, but these finds originate from the grave fills and are not associated with the burial (Jonsson n.d.). A pond tortoise shell fragment was found in the fill of Burial IX at Skateholm II, while two more carapace fragments were found in the settlement layers at Skateholm I (Jonsson n.d., 1988).

9.2.5. Reptiles at Sakhtysh

No reptile bones have been identified from the Sakhtysh burials. The only evidence of pond tortoise comes from Sakhtysh I settlement, where skull fragments were found in the cultural layer (Костылёва & Уткин 2010: 10). At Sakhtysh II, a broken bone figurine interpreted as representing a snake head was found by the skull of Individual I in the multiple Burial 15 (Ошибкина et al. 1992: Fig. 126; Костылёва & Уткин 2010: 20, Fig. 19:2).

9.2.6. Discussion

Small and fragile bones of snakes and other reptiles and amphibians are challenging to find and recover, but their rare occurrence at hunter-gatherer sites is rather related to preferences for other animal species. The few pond tortoise finds at the studied sites suggests that this species may have been rare in these areas, while serpents, though present, are of little practical value.

The morphology of the pond tortoise carapace is unusual and makes it suitable for various purposes. The shell could have been used as a head decoration or a helmet with a protective function, but its use as a mask or bowl has also been proposed (Larsson 1986; Strassburg 2000: 332). The location of the turtle carapace by the head of the buried man at Zvejnieki could possibly indicate its use as a head decoration or head gear. At the same time, it did not have any modification traces and could just as well have served as a vessel deposited by the head of the deceased, possibly containing some organic material or food. Perhaps this very distinctive inhabitant of the surrounding environment also possessed some symbolic meanings as has been documented for the snakes: the depictions of snakes suggest a particular role for these reptiles in northern cosmology. Still, the reptiles were not that important for purely practical or economic reasons – rather, their appearance and behavioural properties made them stand apart among other companion species in the Stone Age environment.

9.3. Contextualizing fish and reptile remains at Zvejnieki, Skateholm and Sakhtysh: fish, reptiles and northern hunter-gatherers

Fish and fishing were important to the economy and daily life of the Holocene hunter-gatherer communities in north-eastern Europe. However, unlike most of the central companion species that shared the terrestrial environment with humans, fish have a different presence. They only become visible when they are taken out from their watery realm, which means that it was not possible to establish such a close individual relationship with them as, for example, with large mammals, which could have been be followed and observed even for years. Perhaps the bond was more directed towards certain fish species, although their properties may also have been embodied in occasionally caught (or mythical) large and old individuals of, for example, pike and sturgeon.

Fish provided a widely available raw material in the form of bones and skins, albeit little attention is usually paid to this part of fish use. Fish probably also carried symbolic meanings, as exemplified by the pendants of sturgeon scute bones found at Zvejnieki. Fish's ability to swim and live in water has given them a special role in northern cosmology, and they could have served as mediums for shamans to transform and perform various rituals and actions, or travel between the worlds (see Herva & Lahelma 2020). Fish deposits or remains in burials at Skateholm, but also in some burials in the Eastern Baltic, provide yet another perspective on human–fish relationships. Finds of fish bones in the mouth and stomach area of the buried persons

suggest that fish may have been ritually consumed during burial rituals or meals in organic vessels were placed to accompany the deceased.

Reptiles (and amphibians), on their behalf, have very little economic meaning, and their presence is also significantly lower. However, they do share certain physical and behavioural traits with fish that distinguish them from all other creatures in the Stone Age landscape: a non-human-like (non-mammal-like) appearance, the ability to move and swim even without legs and the mastery of both land and water. These qualities may have generated some associations between the fish and reptiles, and may explain the occasional occurrence of snake and tortoise finds in burials. In addition, due to its particular shape and materiality, the tortoise carapace could have embodied practical, decorative and protective properties (Strassburg 2000; Gramsch & Larsson 2001). Still, the reptiles must be viewed as more peripheral companions than fish – but even fish, although a vital group of species, can be evaluated as liminal due to their absence from the terrestrial world. Their role in daily life was irreplaceable, and it seems that, at least occasionally, fish was also consumed in death.

Chapter 10.
Modified human remains

Humans *(Homo sapiens)* were one of the species inhabiting the Holocene environment together with numerous other beings. Humans were adapted for living in various habitats and consuming various kinds of foods, of animal or vegetable origin. At the same time, humans themselves could become prey, a source of food and raw material. Loose human remains have been found at numerous settlements as well as burial sites in Europe, suggesting that human bodies went through various types of bodily manipulations (e.g. Larsson et al. 1981; Meiklejohn et al. 2005; Gray Jones 2011; Bugajska 2015). Inhumation at particular places in the landscape (cemeteries) was not the only way of disposing and using the human body. Even though inhumation has been considered the principal form of disposal of the dead, mortuary practices and the handling of dead bodies were much more diverse than this (e.g. Parker Pearson 1999: 5; Gray Jones 2011; Tarlow & Stutz 2013; Tõrv 2018). This means that human bones must have been available and were circulating within the community of the living. Manipulation of the dead is well known from, for example, farming communities that used monumental, collective grave structures (megaliths) for burying their dead (e.g. Ahlström 2009; Blank 2021). Such constructions secured repeated access to the remains of the dead ancestors and facilitated engagement in various manipulations of them. Loose human bones are known from numerous hunter-gatherer sites in Northern Europe (Larsson et al. 1981; Brinch Petersen 2015; 2016; Gummesson & Molin 2016; Kjällquist & Price 2019; Tõrv 2018; Macāne & Nordqvist 2021). Material from all of the studied cemeteries also includes human remains that cannot be related to any particular closed burial context. This chapter presents human remains with working traces found in hunter-gatherer burials, as well as discussing evidence of various manipulations of human bodies and the presence of loose human bone at all of the studied sites.

10.1. Modified human remains in hunter-gatherer contexts in north-eastern Europe

Even though manipulation and modification of human remains is documented elsewhere in Europe (see Albrehtsen & Brinch Petersen 1977; David 1999; Woodman

2015), human remains turned into artefacts or tools have rarely been identified in hunter-gatherer burials in north-eastern Europe. Recent studies on osseous materials from hunter-gatherer sites using ZooMS show that the use of human bones for making barbed points, arrowheads and pendants was most likely more common than previously thought (see Dekker et al. 2021). For example, at least 12 artefacts from burials at the Yuzhniy Oleniy Ostrov cemetery were made from human bone (Mannermaa pers. comm.). Human teeth, similarly to animal teeth, have been worked and used as ornaments. For instance, three perforated human teeth were found in multiple Burial 19 along with ca. 50 animal tooth pendants at Henriksholm-Bøgebakken. Since all of the skeletons at the site had their teeth, the human tooth pendants cannot originate from the buried individuals (Brinch Petersen 2015: 107).

10.2. Modified human remains at Zvejnieki

Eight human teeth in four burials at Zvejnieki have been considered as grave inventory (Table 10.1). Only one tooth found in the neck area of Burial 114 had no perforation (Fig. 10.1: 3). The other seven teeth were modified into pendants and had small perforations at the root end made by carving. The largest number of modified human teeth were found in Burial 62, which had three pendants (Fig. 10.1: 1). The only modified human bone is documented in child Burial 190, where a perforated first phalanx from the hand was found on the left side on the chest. In the same burial a perforated maxillary incisor was documented outside the left knee (Fig. 10.1: 4).

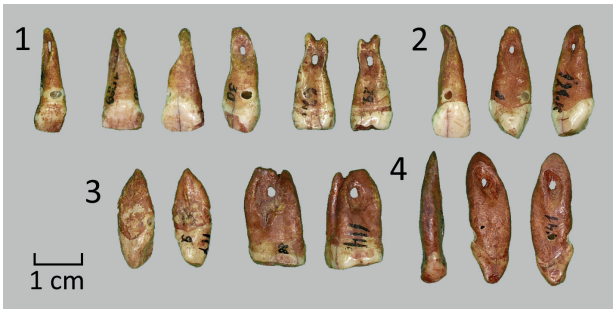


Figure 10.1. In four burials at Zvejnieki, human remains have been used as material for making personal ornaments. Human teeth with perforations were found in Burials 62 (1), 121 (2) and 190 (4), while a tooth in Burial 114 (3) did not show any modification traces. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne, illustration: K. Nordqvist.

Mainly incisors, but also a single canine, a premolar and a molar have been perforated and turned into pendants. An adult man, a woman and two children had human tooth pendants in their burials, placed on or by the body. All burials with modified human remains have a rich inventory, mainly consisting of animal tooth pendants. In other burials, the number of animal tooth pendants comprised several dozen, but in Burial 190, over 200 items. All burials with modified human teeth also contained

other unusual finds: beaver astragali were present in all of them, a pendant made from a seal phalanx was found in Burial 121, and bird bone pendants in Burials 121 and 190.

Stable isotope studies were carried out on all perforated human teeth, suggesting a non-local origin for a pendant in Burial 190 (Eriksson 2003, 2006; Eriksson et al. 2003: 13, 15). The only dated burial with modified human remains is Burial 121, indicating the transitional period between the 6th and 5th millennium cal BC. Loose human bones were commonly encountered in the territory of the cemetery and settlement areas; although they most likely come from disturbed burials, they may also represent various manipulations and re-depositions of human remains (Zagorskis 1987; Nilsson Stutz et al. 2013; Nilsson Stutz & Larsson 2016; Larsson et al. 2017).

Table 10.1. Modified human remains at Zvejnieki. For legend see Table 5.1.

Grave no.	Sex	Age	NISP I	NISP C	NISP PM	NISP M	Location	Modification	Comments
62	In-det.	C	2		1		by feet; in mixed soil of disturbed part of burial	carving	three human teeth, perforated; one in fill
114	M	A	1			1	outside left femur, neck	carving, no modif.	molar with perforation
121	F	A		1			left side above chest, near shoulder	carving	
190	In-det.	C	1				outside left knee	carving	perforated human phalanx missing from museum collection

10.3. Modified human remains at Skateholm

Intentional manipulation of dead bodies has been attested in several cases at Skateholm (Larsson 1988a, 1989; Nilsson Stutz 2003). Only in one burial was an additional human bone documented, while in other cases dead bodies were missing some parts. A human rib coloured with red ochre was found in a deposit outside the knees of the interred in a sitting position in Burial 48 at Skateholm I. This rib cannot be connected with the buried person, since the distance from the torso to the knees is at least 60 cm, and no traces of bioturbation have been observed (Larsson n.d.). Furthermore, the find context, in a small deposit together with animal bones, and the fact that this bone is covered with red ochre suggest intentional handling of these remains. The composition of the animal bones also shows a particular selection: a phalanx and tibia of a wild cat, a wild boar phalanx and leg bones, dog ribs, roe deer leg fragments and numerous skull bones of a pike (Jonsson n.d.).

In Burial 28 at Skateholm I, several bones (left radius, ulna, left iliac blade and left femur) seem to have been removed after the soft tissues had decomposed. This suggests intentional manipulation of the dead body at a time when these particular body parts could be removed without disturbing other bones. This example argues for

a good knowledge of body decomposition and taphonomic processes and illustrates premeditated actions for retrieving the desired bones (Nilsson Stutz 2003: 310–313). Similar scenarios can possibly also be observed in the case of Burials 7 and 35, where the left femur was missing, while dismemberment of the body prior to deposition in the grave has been suggested for Burial 13 (Larsson 1984a: 20–22, 1988a; Nilsson Stutz 2003: 312–313). The grave fills and the cultural layer at the Skateholm sites contained several loose human bones, which, as at Zvejnieki, derive from disturbed burials or suggest alternative ways of handling human remains.

10.4. Modified human remains at Sakhtysh

Mutilation, dismemberment or particular handling of human bodies have been documented in several cases at Sakhtysh. Particularly at Sakhtysh II, parts of the bodies were missing in the case of several burials, and in one pit only the skull was found. Dismemberment of bodies was documented in single Burials 3 and 18 as well as multiple Burials 4, 12 and 15. Skulls were missing from the man in Burial 3, Individual XI in Burial 15 as well as three men in Burial 4. Additional traces of violence and cut marks on various long bones were documented for all the individuals in Burial 4. The skull of the woman had a pierced hole, possibly from an arrowhead, while several cut marks were also documented on the left femur (Лебединская 1963). In Burial 12, the skull of Individual A had been cut off and placed in the area of the pelvis. The body of a young woman in Burial 18 had been dismembered and placed in prone position. Two hearths have been documented above the skeleton, and traces of fire were observed on some bones, particularly the skull and left arm (Костылёва & Уткин 2010: 17–18). Also, a human skull fragment and a phalanx were documented in the sanctuary at Sakhtysh II (Крайнов 1982: 83). In addition, numerous fragments of loose human bones were documented in the Volosovo cultural layers at several Sakhtysh sites (IIa, VII and VIII).

10.5. Contextualizing modified human remains at Zvejnieki, Skateholm and Sakhtysh

In addition to inhumations, the studied cemeteries demonstrate various ways of handling human bodies, including their mutilation, re-deposition and working. Intentional modifications were observed at Zvejnieki and possibly Skateholm, while traces of violence and dismemberment were documented in several burials at Sakhtysh II. Articulated or loose human remains were found in grave fills and settlement cultural layers at all sites. This indicates that loose human bones were present and part of the daily living environment of the hunter-gatherers, and likely incorporated into various rituals and other activities (Larsson 1990; Nilsson Stutz et al. 2013; Nilsson Stutz & Larsson 2016; Larsson et al. 2017).

Perforated human teeth were found in four burials at Zvejnieki, and a perforated phalanx in Burial 190 shows that other body parts were also used for making ornaments. The presence of an unmodified human incisor among the grave inventory

in Burial 121 further demonstrates that human remains did not need to be altered in order to be placed with the dead. All burials with modified human remains have rich inventories, including other rarely encountered animal bones (beaver astragali, red deer and seal phalanx and bird bone pendants). This suggests intentionality in the selection and combination of these bones and species. Similarly, the human rib strewn with red ochre from Burial 48 at Skateholm I represents intentional handling and deposition of modified human remains together with other selected animal body parts. It is of course possible that some of the heavily worked osseous tools found in the burials are also of human bone, but this cannot be clarified without further ZooMS analyses (see Dekker et al. 2021).

The use of human remains to make artefacts may be associated with ancestral relations or represent trophies taken from other groups. Human bones of particular individuals could have been turned into artefacts and worn as amulets, even curated within the community (Meiklejohn et al. 2005; Brinch Petersen 2016; Gray Jones 2011). The choice of human bones to create certain artefacts would have involved symbolic or ideological meanings and would have been connected with the personal identity of the individual selected (Fowler 2004; Cobb & Gray Jones 2018). Humans and their bodies have been subjected to a variety of manipulations during lifetime as well as at and after death, which changed the status and materiality of their remains. Treatment of human bodies could also have parallels with handling of animal bodies (Nolan 1986; Conneller 2006; Gray Jones 2011). Both could bear similar traces of butchering and dismembering with cut marks or other manipulations of the bones and can be discarded in the refuse layers. Such practices may also explain many of the loose human remains found at the settlements (Brinch Petersen 2016; Gummesson & Molin 2016; Kjällquist & Price 2019).

Traces of violence and heavy mutilation of bodies were documented in several cases at Sakhtysh: some of the deceased had their skulls missing, in one case the skull had been cut off and placed in another part of the burial, while others displayed fresh and healed wounds. Of course, this could be explained by some kind of ritual practices, but in this case the injuries likely represent inter-group violence.

Despite the dominant anthropocentric views, humans were one part of the ecosystem and their remains can to some extent be equated with those of the animals, which provided raw material for the manufacture of various tools. The ethnographic record gives evidence of the use of modified or unmodified human bones for various purposes, including both utilitarian and ritual contexts (Kerner 2018). Loose and modified human remains were part of the Holocene landscape, and the deceased may have continued to be present in other forms and in other contexts (Conneller 2006; Gray Jones 2011). Similarly to animals, the diverse find circumstances of human bones, the degree of their transformation and modification, and the integrity of the body reflect the multiple roles and relationships between the living and the dead.

PART 3

Chapter 11.
Stone Age companions

This chapter links together the previously presented material from Zvejnieki, Skateholm and Sakhtysh (Chapters 5–10) with the relational approach and hunter-gatherer ontologies (see Chapter 2) in order to explore the multiplicity of human and animal interactions during the Stone Age. The first part of the chapter discusses regional and temporal patterns of animal remains from the studied sites. It demonstrates how relationships with animals changed over time and varied between different geographical areas. The second part examines the multiplicity of relationships between humans and animals reflected in the hunter-gatherer burials. The discussion is structured around several central themes. One of these discusses fragmentation of animal bodies and the parts chosen to be deposited in burials. Another reviews expressions of animal personality and personhood, while others examine animal-derived materials as means for social identification and various transformations. The third and final part of the chapter discusses relationships between humans and animals in the Stone Age and how they were expressed in hunter-gatherer burial practices in north-eastern Europe – and proposes a reading of the Stone Age world from a companionship perspective.

The Stone Age environment was co-shaped through relationships between all human and non-human beings inhabiting it. These consisted of companion species (see Haraway 2003, 2008), which co-shaped the environment around them by being in it and living their own lives in particular habitats, with a particular rhythm of life, appearance and personal characteristics. Dogs have often been mentioned as the main companion species to humans (Haraway 2003, 2008; Armstrong Oma 2007, 2010; Perri 2013; Vang Petersen 2013), but following the definition of companions by Haraway (2008: 134, see also Chapter 2), this term comprises much more. The perspectives of post-humanism and relational ontologies (see Chapter 2; also Haraway 2008; Fowler 2013; Fredengren 2013; Overton 2014; Fowler & Harris 2015; Boyd 2017) provide an opportunity to look at animals and non-human beings in the Stone Age environment as active agents which influenced each other's behaviour and created mutual relationships. The social relationships between humans and non-human beings were forged through this ongoing interplay, where all the participants, possessing their

own personal characteristics, will and intentions, took part in shaping interspecies relations (Hill 2013: 127).

Co-existence in the same environment made the relationship between all beings relational and situational. The presence of animals could be observed in the landscape through physical encounters, sounds and various animal tracks (see Overton 2014, 2016, 2018). Seasonal migration and aggregation of wild game, birds and fish, along with their distribution in the landscape, affected humans and is evident in the yearly mobility patterns of hunter-gatherers (Binford 1980; Larsson 1990; Rowley-Conwy 1999; Magnell 2006). A good knowledge of animal behaviour was essential for the creation of social and symbolic bonds between humans and animals, as well as for human survival in the shared environment and successful hunting. At the same time, in this mutual relationship, animals would likewise have noted and reacted to the presence of humans and other species in their territory. Moreover, not only animals and their biological and personal characteristics but also the landscapes and habitats they represented were important in shaping the relationships between humans and animals in a shared environment. From this perspective, I argue that relationships between humans and animals in the Stone Age took several different forms.

11.1. Regional and temporal tendencies

The occurrence of certain species in hunter-gatherer burials provides indications about variation in relationships between humans and these animal species. The presence or absence of certain animals or their body parts suggest that species were perceived differently: while some species were more important for food, others held a more prominent role ideologically or symbolically and were valued for their companionship or other reasons. The studied sites represent different time periods, cultural contexts and geographical regions, reflecting diverse ecological conditions. The Zvejnieki material stands out from other sites in that it provides a long-term perspective for the discussion of burials with animal remains. The use of the cemetery during five millennia makes it possible to explore the changing attitudes towards various animal species over time. In contrast, Skateholm and Sakhtysh represent much shorter periods but still cover several hundreds of years during the 6th–5th and 4th millennium cal BC, respectively.

11.1.1. Zvejnieki

Less than one third (98) of the burials at Zvejnieki contained animal remains which can be securely associated with the buried individual or the grave inventory. Only 26 of these burials can be considered as reliably dated through reservoir correction of radiocarbon datings (see Meadows et al. 2016, 2018; Zagorska et al. 2018) (Fig. 11.1, see also Appendix 1). Attempts to summarize all animal tooth pendants have been made previously, based on both spatial and typo-chronological features of burials (Zagorskis 1987; Zagorska 2016), but are not fully supported by the available radiocarbon data. Even if discussion of highly detailed temporal patterns must await the future, my analysis reveals several interesting tendencies in the use of animal materials in burials.

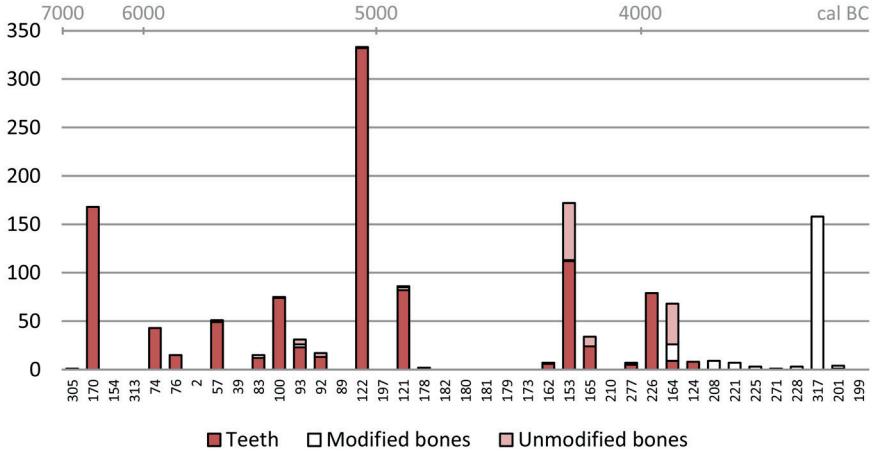


Figure 11.1. The reliably dated burials at Zvejnieki illustrate the change from the prevalence of animal teeth during the 7th–5th millennium cal BC to an increasing number of modified bone artefacts and unmodified animal remains during the 5th–4th millennium cal BC. The dated burials included in the graphs are the ones corrected for freshwater reservoir effect by Meadows et al. 2016; Zagorska et al. 2018 (number of burials: 39, 26 of which have animal remains, y-axis: number of identified animal remains, x-axis: burial).

The studied material shows a prevalence of ungulate remains, particularly teeth, in the burial assemblages in the early phase of the cemetery's use (8th–6th millennium cal BC) and an increase in carnivore species from the mid and late 5th millennium cal BC onwards (Fig. 11.2). The reasons for these temporal differences may be sought in the environmental conditions as well as in the cultural context. Hunter-gatherer burials at Zvejnieki are broadly associated with the local Mesolithic, Narva and Comb Ware Cultures (with local variants); in addition there are some burials associated with the Corded Ware Culture and later periods (see Zagorskis 1987; Zagorska 2006a).

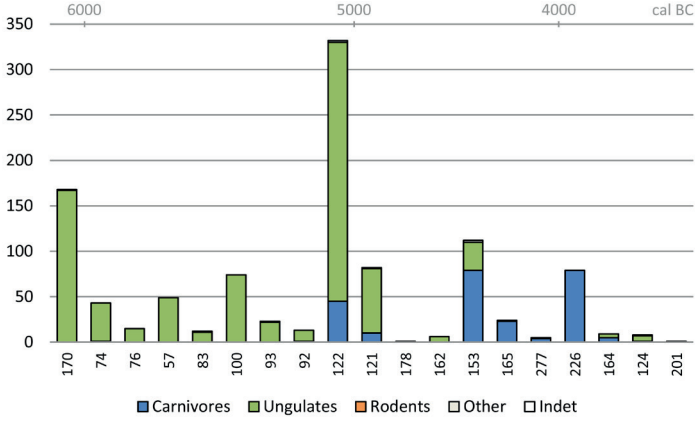


Figure 11.2. Ungulate species dominate animal tooth assemblages in reliably dated burials during the early use phases of the cemetery, but in the 5th and 4th millennium cal BC an increase in carnivore species and synchronous decrease in ungulate species can be observed (number of burials with animal teeth: 19, y-axis: number of identified teeth, x-axis: burial).

The earliest burials at Zvejnieki date from the mid 8th and 7th millennium cal BC, corresponding to Boreal period environmental conditions, with a fauna dominated by large herbivores (Lõugas 2017). During this period the burials contain mainly ungulate tooth pendants and bone artefacts. Elk and wild boar are the most common species, followed by red deer and aurochs (Fig. 11.3). These large and mid-size ungulates were present in the surroundings of Zvejnieki, as evidenced by settlement faunal assemblages (Zagorska 1992; Lõugas 2006). Despite the abundance of beaver in the faunal assemblages at the Zvejnieki II settlement site, beaver teeth have not been used for making personal ornaments at Zvejnieki. Instead, unmodified beaver astragali (ankle bones) have been identified in nine burials. The dated burials with beaver astragali belong to the 6th millennium cal BC, and all astragali correlate with very rich grave inventories. In a few burials (e.g. Burials 122/123 and 170) more than 100 teeth have been found, and in these the largest numbers of pendants are from wild boar (Fig. 11.3). Incisors prevail in the studied tooth pendant assemblage from this period, but premolars and molars of elk have also been turned into pendants (see Fig. 6.5). Canines of red deer and wild boar have also been used, but more rarely (see Chapter 6, Fig. 5.32 and 6.15).

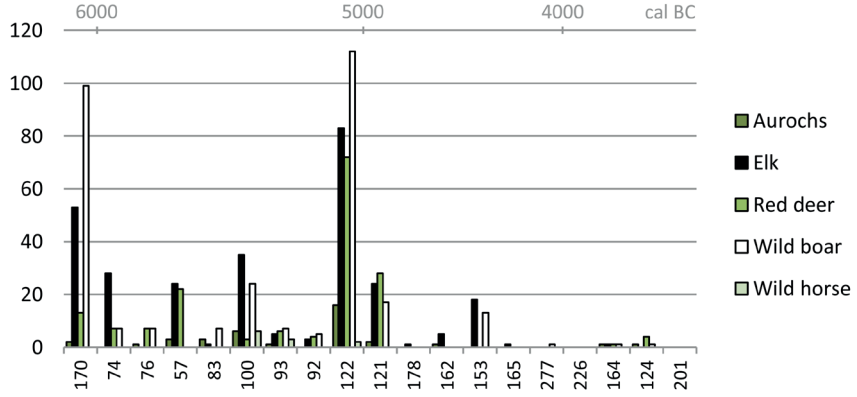


Figure 11.3. Presence of ungulate teeth in reliably dated burials at Zvejnieki. Even though elk teeth in total are the most numerous in burials at Zvejnieki, wild boar teeth predominate in the graves with the largest number of tooth pendants (number of burials with animal teeth: 19, y-axis: number of identified teeth, x-axis: burial).

The Atlantic chronozone, in the 7th and 6th millennium cal BC, brought changes to the environment through the spread of broadleaved forest and increased faunal diversity. While ungulate remains still dominate the burial inventories, the number of animal species increases, and up to 15 different animal species (Fig. 11.4) can be found in a single burial (e.g. Burials 121, 122/123, 153 and 190). During the 6th millennium cal BC wild horse appears in the Eastern Baltic (Lõugas 2017), and the dated burials with wild horse teeth fall in this period. In other words, changes in the natural environment are translated to the cultural context. Carnivore species start to occur more commonly in the burial assemblages from the 5th millennium cal BC onwards. At Zvejnieki, dog teeth comprise the largest part of the carnivore remains,

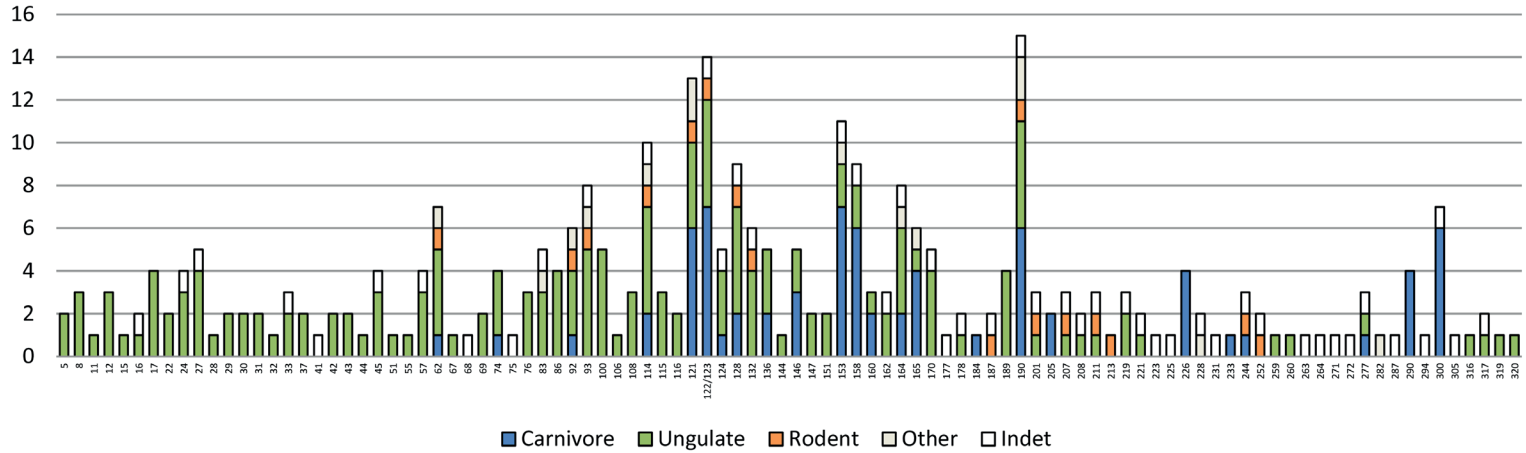


Figure 11.4. Up to 15 different animal species may be combined in one burial at Zvejnieki; generally, only one or two species occur in a single burial (number of burials with animal remains: 98, y-axis: number of identified species, x-axis: burial).

followed by seal as well as badger and marten teeth. Mainly carnivore canines have been used for making tooth pendants, but incisors and molars have also been identified in the material (e.g. Burial 226; see Fig. 5.3).

The transition between the 5th and the 4th millennium cal BC marks transformations in the hunter-gatherer communities in the forest zone east of the Baltic Sea (Herva et al. 2014; Mökkönen et al. 2017; Нордквист & Крийска 2018). The environment is affected by changes from the Atlantic to the Subboreal period (Seppä et al. 2009; Rosentau et al. 2017), while archaeologically we see a transition to the Comb Ware Culture. The changes in the material culture are also reflected in hunter-gatherer burial practices (Zagorskis 1987; Zagorska 2006a; Tõrv 2018; Ahola 2019) as well as in the attitudes towards animals. Pendants made from animal teeth are quite rare in burials from this period. It is noticeable that when tooth pendants are present, they are exclusively from carnivore teeth, especially dog, seal, badger and marten. Instead, animal remains occur in new forms and present new artefact types, such as elk antler maces (Burial 221), and tubular bone beads and pendants (Burial 317), not previously known at Zvejnieki. In addition, artefacts made from other materials than animal remains, such as amber, slate, copper and fossil sea lilies as well as pottery, appear in the Zvejnieki burial assemblages in the 4th millennium cal BC (Fig. 11.5). The changing relationship towards animal remains accompanying the deceased reflects wider cultural changes and finds parallels at the other studied sites (see 11.1.3).

The last reliably dated hunter-gatherer burials currently fall in the later 4th millennium cal BC. The Corded Ware Culture spread in the area in the early 3rd millennium BC, and so it is not possible to say how it would have influenced the hunter-gatherer mortuary traditions – or whether those traditions actually ceased already earlier at Zvejnieki (see similar situation at Sakhtysh, Macāne et al. 2019).

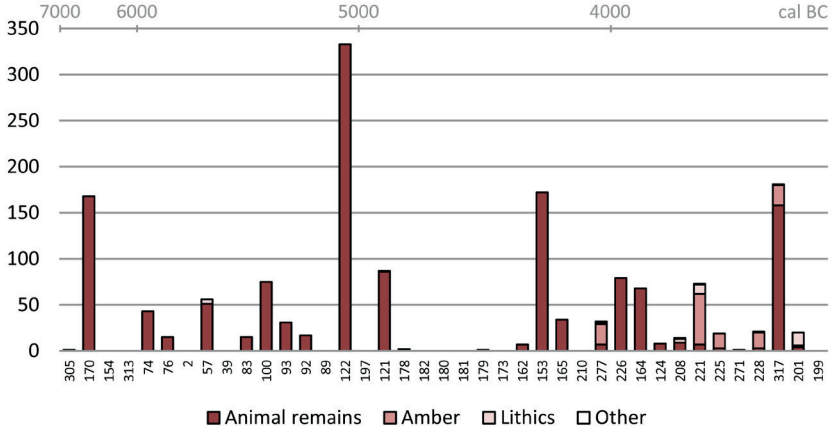


Figure 11.5. Finds in dated burials at Zvejnieki: non-osseus materials, most prominently amber, become more common in the 4th millennium cal BC (number of burials: 39, 26 of which have animal remains, y-axis: number of identified items, x-axis: burial).

11.1.2. Skateholm

Animal remains have been identified in half of the burials at Skateholm I, although they can be securely associated with the deceased in 26 cases (see Fig. 4.19). At Skateholm II, animal remains are documented in more than half of the human burials, as well as with one buried dog (Fig. 4.21). The Skateholm material represents the 6th and early 5th millennium cal BC and the Ertebølle Culture (Andersson et al. 2004; Hallgren 2008; Larsson 2016, 2021). In total there are 25 dated burials from Skateholm. The coastal broadleaved forest environment was inhabited mainly by ungulate species as well as various carnivores, fish and birds (Jonsson 1988). Roe deer, wild boar and red deer are the most common species identified in the faunal assemblages from the settlement sites at Skateholm (see Chapter 6; Jonsson 1988).

Red deer remains outnumbered all other animal species in burials (see Fig. 4.20 and 4.22). The abundance of red deer remains not only illustrates the availability of these animals in the surrounding environment; their selection to be introduced into the burials also emphasizes their significant role in the conceptual world of hunter-gatherers of the Ertebølle Culture. The use of complete sets of red deer front teeth as well as antlers may even indicate that certain animal individuals were chosen for this purpose. The second most common species in the burial assemblages is wild boar. The meagre frequency of elk and aurochs remains in burials and settlement layers at Skateholm may be a result of overhunting of these animals in the coastal areas (Jonsson 1988; Eriksson & Magnell 2001; Magnell 2006).

Skateholm stands out in terms of the number of dogs buried with humans or in separate burials at the cemetery (see Chapter 5.1 and 11.2.2.). Other carnivore remains comprise single teeth of bear and wolf, marten mandibles and vertebrae of seal and porpoise in the Skateholm burials. Despite the abundance of seal remains in the faunal assemblages (Jonsson 1988), this species is poorly represented in the burial record, with only a few bones and no tooth pendants at all. Artefacts made from other animal bones in the Skateholm burials include axes made from red deer antler, a bone point from a wildcat, perforated phalanges from roe deer and unmodified bones of several mammal species and fish (see also Jonsson 1986, 1988), accompanied by lithic and amber items. Despite the availability of a number of animal species in the surroundings of Skateholm, the emphasis in burials is on ungulate species. This confirms the pattern observed for the Zvejnieki burials from the same time period.

11.1.3. Sakhtysh

Animal remains were documented with one third of buried individuals at both, Sakhtysh II and IIa. However, at Sakhtysh II only in nine burials (14 individuals) can these remains be securely associated with the deceased, and tooth pendants are found only in five burials. At Sakhtysh IIa, animal remains were identified in 25 burials. The environmental conditions comprise boreal forest with freshwater aquatic resources. The cultural context belongs to the 5th and 4th millennium cal BC Lyalovo and Volosovo Cultures: animal remains were documented only in three Lyalovo burials, the majority being associated with the Volosovo period.

In the Lyalovo burials, only a few ungulate remains are documented, while tooth pendants from carnivores are most common in the Volosovo burials. The composition of animal species from Sakhtysh II and IIa shows that carnivores were selected for making tooth pendants, bear and badger being the most common species (see Fig. 4.32 and 4.34). Not only are bear and badger teeth commonly used for making tooth pendants, but other parts of bear and badger bodies have also been found in ritual hoards with traces of burning (e.g. bear paws), while bear mandibles have been deposited in burials and on settlement sites (Костылёва & Уткин 2010). Even though numerous marten mandibles have been documented in the Sakhtysh settlement layers (Macāne 2017), very few marten canines have been identified in the burials.

Rodent remains occur in several Sakhtysh IIa burials, including beaver mandibles and non-local marmot incisors. Modified animal remains at Sakhtysh include awls made from elk metacarpal bones as well as pendants and tubular beads made from unidentified animal bones that resemble those found in Burial 317 at Zvejnieki. Generally, the dominance of carnivores and the scarcity of ungulate remains in burials corresponds to the situation observed for the Zvejnieki burials from the 4th millennium cal BC. Moreover, grave inventories from the Volosovo burials at Sakhtysh often include artefacts made from various non-local materials, namely amber and imported stones, such as serpentine and rock crystal. This, too, finds parallels in grave inventories of Zvejnieki burials from the 4th millennium cal BC and provides additional evidence of the movement of people and artefacts over vast territories in the Boreal zone as well as of the changing burial practices and material preferences of the forager populations.

11.1.4. Companion species

The shared environment is an essential aspect in creating potential relationships between species (Overton 2016, 2018; Pilaar Birch 2018; O'Connor 2018; Armstrong Oma & Goldhahn 2020). Animals present in the immediate surroundings were most likely also the ones that played an important role in the worldview of the Holocene hunter-gatherers. The fluctuations in the relationship with animals were affected by the ecological changes as well as by geographical and temporal differences in the cultural contexts and in the varying ways of using and perceiving the surrounding environment. The most common animals in hunter-gatherer burials are the terrestrial mammals from the surrounding environment. They share similar traits with humans, such as life on land (mastering the land), have a similar body structure, including four limbs and teeth, and have the ability to swim or climb trees and consume a variety of foods. Perhaps these characteristics created an aspect of recognition or intimacy that formed a basis for a favoured relationship with these species. However, not all terrestrial species were chosen to accompany the dead.

As the study shows, ungulates were the more widespread species in burials, especially during the 8th–6th millennium cal BC in north-eastern Europe. Large ungulates dominate in the burial assemblages at Zvejnieki and Skateholm, elk and red deer being the most common species, respectively, followed by wild boar. They were all commonly encountered, most likely even dwelling in the immediate surroundings of

settlements, and were important hunting game, as demonstrated by faunal assemblages at these sites (Jonsson 1988; Magnell 2006; Lõugas 2017). These ungulates are all large animals and could contribute significantly both to the individuals' food intake (meat, blood and internal organs) as well as provide raw material for tools and utensils in the form of antler and bone, skin and sinew (David 2003, 2006; Jensen et al. 2020). Differences in their regional occurrence can be linked to their general geographical distribution. Red deer is usually associated with more southerly areas with deciduous forest and has been the main animal sourced for making tooth pendants in southern and western parts of Europe (Choyke 2001; Rigaud 2011; Grünberg 2013). Elk is a typical dweller of the boreal forest. The important role of elk for northern hunter-gatherer communities is well attested not only by faunal data from settlement sites (Жилин 2004; Lõugas 2017; Ukkonen & Mannermaa 2017) but also by its central role in rock art and other figurative representations in various materials (Кашина 2005; Lahelma 2007; Gjerde 2010; Sjöstrand 2011; Fuglestvedt 2018; Mantere & Kashina 2020). Wild boar prefer mixed and deciduous forests and were probably plentiful in the surroundings of both Skateholm and Zvejnieki. Other ungulate species take a less prominent role in the burials studied.

While carnivore remains are present in the faunal assemblages at all sites also during the earlier phases, their numbers are small in comparison to ungulates (Цалкин 1964; Jonsson 1988; Жилин 2002a, 2004; Lõugas 2006). The increase in diversity of species in burials, especially in carnivore species, occurs at least from the 5th millennium cal BC at Zvejnieki, and later also at Sakhtysh. The environmental changes brought about by the Holocene Thermal Maximum affected the climate, vegetation and faunal composition in the studied regions. However, environmental change alone cannot explain the increased diversity in species represented, as this was also dictated by cultural preferences and special relations with particular species.

The increase in carnivore species in the faunal assemblages is linked to a period of broader changes in hunter-gatherer societies which is characterized by new kinds of networks moving people, materials, ideas and influences. Unlike many ungulates, carnivores usually do not have major nutritional value. Instead, many carnivore species have good-quality pelts (fur animals), which could be used for clothing or could have economic value and serve as important items in exchange networks. The changing relationship towards animals may also be affected by the social behaviour of carnivore species, which, being predators, differ starkly from plant-eating ungulates. That carnivore canines have mainly been chosen for making tooth pendants indicates not only that the aesthetics of ornament composition have changed, but also that the animal behaviour embodied by these particular teeth could have played a significant role in this choice.

The dog, being the only domesticated animal, was perceived differently from other animals and had a very particular role in hunter-gatherer communities. Sharing the same living space and food (Eriksson et al. 2003; Eriksson 2006), pursuing the same lifestyle and activities, including hunting (Vang Petersen 2013), and forming close relationships with humans, the dog was one of the main companion species throughout

the Stone Age. The special relationship between humans and dogs is illustrated by dog burials at Skateholm and Sakhtysh. However, not all dogs were given an individual burial, suggesting that the individuality of certain animals most likely played a significant role in their particular treatment (see Chapter 5 and 11.2.2.). At the site level, the main difference is in the integrity of the body: at Skateholm and Sakhtysh it was important to maintain the complete body of certain individuals, while at Zvejnieki only the teeth of dogs were selected.

Despite the coastal location, very few seal bones have been identified in the burials at Skateholm. At Zvejnieki, on the other hand, seal teeth are the second most common carnivore teeth in burials, after dog. The occurrence of seal canines indicates contacts or visits to the coastal areas (see Eriksson et al. 2003; Eriksson 2006), either representing movements within the yearly cycle or exchange networks. The movement between the coast and the inland area is also indicated by marine isotope values in dog tooth pendants from some of the Zvejnieki burials (Eriksson 2006). At Zvejnieki, seal teeth are often combined with badger canines. Perhaps the morphological similarity of the canines of these species was the reason for their selection, or maybe this has to do with the combination of two realms: terrestrial (subterranean) and subaquatic. Furthermore, both species share several other properties, including their distinctive appearance, the relative abundance of meat and their ability to accumulate fat (also used for medical purposes in the case of badger). The abundance of seal remains in settlement layers at Skateholm indicates that the relationship with this species was probably of a more mundane character, where they were perhaps being targeted for meat and fat (blubber), which could have been used as fuel for lamps (Heron et al. 2013; Papakosta et al. 2019).

Bear and badger remains are the most common in the Sakhtysh burials, and the presence of various body parts in ritual and settlement contexts suggests a particular role of these animals in the conceptual world of the Sakhtysh hunter-gatherers. Both species, bears and badgers, share similarities in appearance and behaviour, such as being omnivorous and hibernating, perhaps indicating a mythological relationship between these species. In many cultures, the bear is considered as human-like, and in northern Eurasia it has held a central role in cosmology and mythology (see Chapter 2, also Hallowell 1926; Jordan 2003; Zvelebil 2003; Pentikäinen 2007; Schmölcke et al. 2017; Herva & Lahelma 2020). The character of bear remains at Sakhtysh indicates that the bear embodied strong symbolic meanings and possessed a specific place in the cosmology of the groups using these sites. Even though a few bear teeth are known also from the Skateholm and Zvejnieki burials, their low numbers suggest that the bear had a different role – or even that bears were a rarely encountered and hunted species. Perhaps the increasing importance of bear is also linked to the temporal aspect, its position during the 4th millennium cal BC at Sakhtysh illustrating changes in the conceptual world of northern hunter-gatherers (see Carpelan 1977: 41).

Other carnivore species are present in much smaller numbers. The importance of marten has previously been emphasized at Sakhtysh (see Крайнов 1973a), since numerous marten remains and especially perforated mandibles were documented

from the settlement areas (Macāne 2017; see Fig. 5.30). However, only a few marten canines have been identified in the burials. At Skateholm, whole mandibles were also deposited in burials, even if canine teeth are the most commonly represented part of them. The relationship with marten may have been linked less to death than to daily life, in which their highly valuable pelts would have been used for clothing or as exchange goods (Hatting et al. 1973; Richter & Noe-Nygaard 2003).

While beaver is one of the most common species in faunal assemblages in the Boreal zone (Жилин 2004; Lõugas 2006; Ошибкина 2017; Ukkonen & Mannermaa 2017; Kriiska 2020a), only in rare cases did it follow humans in burials, with the exception of Zvejnieki. Beaver ankle bones, in particular, constitute a special case and an indication of local cultural preferences. They were found in several burials at Zvejnieki and in two other hunter-gatherer burials in the territory of eastern Latvia, suggesting that this bone of the beaver was imbued with particular meanings (Zagorskis 1961; Brinker et al. 2020; Macāne & Nordqvist 2021). The multiple roles of beaver are well illustrated by rich ethnographic records, which emphasize the diversity in how this animal and its body parts were valued and used by historical communities living in north-eastern Europe (Paulaharju 1922; Itkonen 1948; see also Chapter 11.2.4). With its distinctive appearance and ability to cross the boundary between land and water, and to modify the landscape like no other animal, the beaver was a very special member of the Stone Age environment. The importance of this species seems to be more associated with daily life at the studied sites, in contrast to many other hunter-gatherer burials in north-eastern Europe, where beaver incisors have been used for making personal ornaments (Гурина 1956; Mannermaa et al. 2021; Kashina et al. 2021; Macāne & Nordqvist 2021). Finds from Zvejnieki indicate the use of the incisors as tools, similar to beaver mandibles found in Sakhtysh burials and on numerous north-western Russian settlements (Lozovskaya et al. 2017; Zhilin 2020).

The remains of fish and birds in the studied burials also suggest that the importance of these species related primarily to daily life. Fish were the main food source for these communities and therefore strongly connected with everyday subsistence practices (see Lõugas 19967a; Eriksson et al. 2003; Ritchie 2010; Lozovski & Lozovskaya 2016; Meadows et al. 2016, 2018; Boethius 2018; Nurminen 2020), while birds would have been observed and heard every day and at predictable times of the year in the case of migratory birds (Mannermaa 2008a). Still, the large number of fish bones in burials at Skateholm can be linked to their consumption as part of the funerary ritual (Jonsson 1986, 1988; see also Brinker et al. 2020 for a similar example from Riņņukalns shell midden), but it also illustrates how taphonomic and recovery-related issues may affect the visibility of fish remains in the material. Bird wings and intentional deposits of complete birds at Zvejnieki demonstrate the attention given to certain bird species and body parts. Birds and fish are liminal species, and with their very particular appearance, differing from that of mammals, they may have carried different meanings. Many of them inhabited water bodies, which were a fundamental element in the hunter-gatherer world and its economic and cosmological spheres (Larsson 2003; Lahelma 2008). Furthermore, in the ethnographic record such liminal specwies have

been assigned roles as spirit helpers of shamans (Herva & Lahelma 2020). The small number of fish and bird finds in the studied burials might therefore also be connected with this notion, since shamans were community members with particular functions within the society.

11.1.5. Changing relationships

The studied material, covering a period of five millennia, shows the changing relationship between humans and animal species. The shift from ungulates to carnivores and from pendants made from animal teeth to more heavily modified forms of artefacts made from animal remains can be seen in the studied burial assemblages. Also, the nearby, common companion species from the surrounding environment were gradually replaced by non-local materials, and objects, which could also include non-local animal species. The relationships with animal species at each site were shaped by environmental conditions as well as by the chronological and cultural context. Certain species, such as elk, wild boar and bear, occur at all of the studied sites, while other species or body parts appear to have been favoured at a particular site or at particular times.

It has been suggested that the later 5th and the 4th millennium cal BC was a time of major transformation that changed not only the hunter-gatherer societies but also their awareness of the surrounding environment and the materials which can be extracted and used from it (Herva et al. 2014; Нордквист & Крийска 2018). These changes also affected the relations with the animals, their roles and the importance attributed to different species. Many changes are associated with the Comb Ware Cultures in the Eastern Baltic as well as the Volosovo phase in central European Russia (both in the 4th millennium cal BC). Both of these witness the dominance of carnivore species, although simultaneously the overall number of animal remains in the burials decreases. This decrease is paralleled by the introduction of new artefacts and materials into the burial assemblages. These include amber, slate and Karelian metatuff, as well as serpentine and copper, which were circulating in vast areas between the Baltic Sea and the Urals (Loze 2008; Zhulnikov 2008; Kriiska et al. 2013; Tarasov & Nordqvist 2022; Macāne et al. in press; Macāne & Nordqvist in press).

From Zvejnieki there are numerous examples of non-local materials. For example, in Burial 277 (ca. 4400–3800 cal BC, Zagorska et al. 2018), two rings of native copper, possibly originating from Karelia (Nordqvist & Herva 2013), were found together with an amber ring and animal tooth pendants. Burial 221 (3900–3350 cal BC) contained unique elk antler maces, which find parallels in morphologically similar stone objects in the territory of Finland (Meinander 1954; Nordqvist pers. comm.), found alongside amber, stone rings, a flint arrowhead and a bone fish hook (Fig. 11.6). The identification of non-local fossil sea lily beads in Burial 316 (a bone dagger in the same double Burial 317 has been dated to ca. 3800–3500 cal BC; Larsson et al. 2017: 88), also richly furnished with amber (Macāne 2020), further emphasizes the importance given to non-local materials, and may also hint at the new social realities and roles these materials were used to communicate (Macāne & Nordqvist in press; see also Tarasov & Nordqvist 2022). Non-local materials at Sakhtysh include amber,

in particular, which is found in numerous burials (altogether nearly 750 pieces) and originates from the eastern shores of the Baltic Sea. Burial 24 at Sakhtysh IIa (ca. 3600–3400 cal BC) presents another interesting case, as it included marmot teeth and 11 serpentine pendants, all potentially originating hundreds of kilometres to the east (Костылёва et al. 2018; Macāne et al. in press).

The decrease in local animal species and pendants made from their teeth in burials takes place at the same time when new raw materials and artefact forms start to play a more significant role. It has been suggested in connection with Zvejnieki (Larsson 2006; Zagorska 2016) that amber artefacts actually replaced animal tooth pendants. The resemblance of amber pendants to pendants made of bone from Zvejnieki, Sakhtysh and other hunter-gatherer burials in central European Russia does give some support to this statement and demonstrates the need to imitate certain artefact forms in other materials. Amber is documented only in 5% of the burials (19 individuals) at Zvejnieki (Macāne & Nordqvist in press); tooth pendants are recorded in four of them, and the rest also contain artefacts made from animal bones. Thus, animals continued to be present but were transformed into various types of artefacts, which were so heavily modified that the animal species could no longer be identified.

Figure 11.6. Burial 221 at Zvejnieki is dated to the early 4th millennium cal BC and includes several non-local materials and artefact forms. Amber pendants were found together with maces made from elk antler, which have no parallels in the nearest territories: the closest similarities are with stone maces found in Finland. Drawing: B. Vaska (Institute of Latvian History, University of Latvia).

The intensification of contacts between hunter-gatherer groups over large territories in north-eastern Europe meant the movement of people, ideas, artefacts and materials, including parts of dead and even living animals (e.g. dogs; Bergström et al. 2020). At the same time, disease could also spread. The role of animals in these processes has only recently started to be explored, but it cannot be excluded that rodents (marmot and beaver) and other animals (e.g. fox, wild boar and badger) may have carried and transmitted various bacteria causing illnesses and even death

(Lindström 2001: 183; Костылёва et al. 2018; Susat et al. 2021). This would have had an impact on social relationships between communities, as well as with their nearest companions, the animals, assuming that people recognized the cause–effect relationship between animals and disease.

11.2. Multi-layered relationships between humans and animals

Hunter-gatherer ontologies (see Chapter 2) illustrate different realities and different conceptual views of how relationships between humans and non-humans could have been created and expressed in the Stone Age. Animism, totemism and shamanism have for a long time been a traditional source for interpreting archaeological material, animals and other non-humans constituting important media in shaping reality in these ontologies. Therefore, even if animal remains from hunter-gatherer burials were presented in Chapters 5–9 following a well-established western animal taxonomy, this is probably not the way Stone Age hunter-gatherers classified animals. Instead, their relationship with animals has been often discussed in the frame of a three-level system, where the world is divided into land, water and sky (Jordan 2003; Zvelebil 2003; see also Chapter 2). In this cosmology, land is connected with the human world, while the other two spheres are perceived as liminal spaces, linked to other species which could inhabit the underworld or master the air (Herva & Lahelma 2020).

However, attributing the species discussed in this work to the three-tier system is not without problems. While flying (the sky) is often assigned only to birds, several animals, such as the squirrel, marten and other mustelids can live in trees and jump or climb. In addition, many bird species manoeuvre between all three spheres. Beaver and otter inhabit mainly water but also land, and most terrestrial animals can also swim, while others live in underground burrows (e.g. badger, fox and marmot). Therefore, such a division was not employed in presenting the main data. In order to balance the Western approach, numerous aspects potentially involved in perceiving and engaging with the animals during the Stone Age are discussed below, including fragmentation and selection, individuality and personhood, transformation, interspecies fluidity and shapeshifting, as well as symbolic and social communication through animal remains.

11.2.1. Fragmentation and selection

Like human bodies, animal bodies change at death (Nilsson Stutz 2003; Conneller 2011; Gray Jones 2011). Since most of the animals in hunter-gatherer burials studied in this work are present as isolated teeth and bones, keeping the integrity of the animal body was not as important as for humans (see Nilsson Stutz 2003, 2013, 2016). Nevertheless, fragmentation of animals most likely followed some rules and general practices, and the particular treatment of animal bodies is also well attested in the ethnographic record (e.g. on bear or elk, see Cox 1988; Jordan 2003; Zvelebil 2003; also Moubarak-Nahra et al. 2014). Some animal parts were used as they were, with skin, fur or feathers still attached to the bones (e.g. bird wing bones at Zvejnieki and roe deer phalanges at Skateholm; see Chapter 6.4 and 8), whereas teeth would have needed to be extracted from the jaws, and other bones cleaned of soft tissue. In

addition to fragmentation, selection is another keyword. Despite the abundance of animals in nature, only certain species and particular parts of their bodies were chosen to be deposited in burials with humans. Furthermore, a selection was made on the scale of transformation. Some parts were used in their natural form, while others were completely modified, losing any traceable properties of the animal from which they were made (Conneller 2011).

Most animal body parts in the studied burials consist of parts of the head and limbs. The former include antlers, skulls, mandibles and teeth, while metapodials, astragali and phalanges, as well as wing bones of birds, illustrate the latter. These are principal body parts that allow one to recognize the animal species or even differentiate between animal individuals, but also signal their social behaviour and association with a particular group, i.e. predators, herbivores, rodents and so forth. Particularly the head and parts of it (teeth or antlers) are used in expressing different kinds of behaviour, ranging from aggressive to sexual. Limbs, on the other hand, are used to move, hold things, push or dig. Extremities are also used to facilitate the mastery of certain spheres of the environment, such as air, water, land or the underground sphere.

The relational approach provides an opportunity to see the choice of certain animal species and body parts as complex and conscious actions based on an assemblage of different prerequisites, including the animals' habitat, appearance, sex, size and social behaviour. In addition, the selection may be influenced by the situationality of the circumstances of the encounter, hunt or discovery of the animal, as well as by the meanings it embodied for the buried individual or the whole community (Overton 2014: 304). An animal body part or object made from it may represent not only biological traits or particular animal characteristics but also the places where these animals live, how they live and what their relations are with other species (Conneller 2011). The selection of particular animal parts therefore signals good knowledge of their appearance, habitats, behaviour and way of life (also Overton 2014, 2016, 2018).

Among the teeth selected for the burials, ungulate incisors and carnivore canines predominate. Both of these are a highly visible part of these animals' appearance and also representative of their social behaviour. Thus, carnivore teeth, especially the canines, are well developed and visible, since they are used to attack and tear the prey as well as to scare competitors or attackers. The only ungulates whose canines were also chosen for making adornments are red deer and wild boar: wild boar canines, in particular, are also well-visible, provide information about the sex and age of the animal, and can also cause fatal injuries. On the other hand, at Sakhtysh, a preference for bear incisors rather than canines was observed in grave inventories. Perhaps the canines were too large or were assigned different meanings and used in different contexts. Only rodent incisors were used, these also constituting the main characteristic feature of these animals. Premolars and molars were used for making pendants only in very few cases, but include, for example, split elk, dog and wolf teeth from Zvejnieki.

The size of the animals and their teeth was also clearly a factor affecting their selection. For example, teeth from the smallest of the ungulate species – roe deer – do not occur in the studied material. Pine marten teeth, especially incisors, are very small,

and canines are the only teeth suitable for making pendants (also Jonuks & Rannamäe 2018: 172). The small size may have prompted the use of complete mandibles instead of single teeth, similar to hedgehog and other small carnivore species identified in hunter-gatherer burials in north-eastern Europe (Grünberg 2013; Gumiński 2014; Macāne 2019). In fact, perforated marten mandibles seem to have had a special role – maybe reflecting the marten's importance as a fur animal – and have been found at numerous locations, including Skateholm II, Kubenino, Tamula and Vedbæk (Albrethtsen & Brinch Petersen 1977; Kriiska et al. 2007; Kashina et al. 2021).

Similarly to mandibles, special meanings have been assigned to whole skulls, which have been found in deposits and cultural layers and linked to various ritual activities (Noe-Nygaard & Richter 1990; Burenhult 1997; Storå 2001; Andersson 2015; Osipowicz et al. 2020). In my material, the numerous bear body parts (including mandibles and skull parts) in the Sakhtysh burials, ritual hoards and cultural layers suggest the importance of this animal for the Volosovo foragers and reflect the need for ritually proper handling of bear remains (see Jordan 2003: 133; Zvelebil 2003: 12; Hill 2011: 420; also Chapter 2). Other examples are few; the beaver mandibles and incisors from both Sakhtysh and Zvejnieki contexts rather indicate their use as tools, probably for working wood (see Zhilin 2020).

Limbs or limb bones rarely occur in hunter-gatherer burials and are usually represented by individual bones, such as beaver astragali or phalanges of seal, red deer and roe deer, as well as bird wings. No complete paws are known in burials, but bear paws have been documented in ritual hoards at Sakhtysh II (see Chapter 5.4.5; Костылёва & Уткин 2010). As mentioned above, these body parts also reflect the mastery of different habitats. Thus, for example, the numerous body parts of badger at Sakhtysh may be related to its capability to dig, engage with the soil and disappear into the subterranean underworld, which was given special meanings and linked especially with shamans in northern cosmologies (see Mökkönen et al. 2017; Herva & Lahelma 2020). Similar connotations may have also been associated with marmot, fox and other animals that live in underground burrows, while bird wings are directly connected to sky and the upper world.

Selection of the animal body parts put into the burials may also have been dictated by factors no longer visible to us, such as perishable fur and feathers (see Kirkinen 2019; Mannermaa & Kirkinen 2020). These, however, must have been commonly used for making clothing, grave furnishing and wrappings. The selection of particular animals or individuals may also have been dependent on the time of the year: some animals change their coats, while young animals often have a differently coloured pelt, which may have made them a lucrative target (see Jonsson 1988; Storå 2001).

However, obtaining animal materials need not always involve killing the animal. Apart from the cadavers of dead animals, shed antlers can be obtained this way. Antlers are very distinctive markers of certain cervid species, and even allow the identification of particular individuals. Antlers are actively used to demonstrate superiority during the rut, and change their appearance over the year and the individual's lifetime. Prehistoric hunters would have known about the period when antlers were shed and the

places where they could be found. This may have shaped the relationship between humans and antler-bearing individuals and resulted in more sustainable acquisition of raw materials – or perhaps antlers were perceived as a gift from animals.

The fragmentation and selection of certain animal species and their body parts suggest that a particular shape or function of the body part were important aspects. Also, the actual animal species played a central role. Similarly to animals, the modified human remains found in a few of the studied burials are teeth and a phalanx (see Chapter 10), confirming that special meanings were ascribed to these parts of both the human and the animal body.

11.2.2. Animal individuality and personhood

Despite the criticism that personhood rather reflects an anthropocentric approach (Cobb & Grey Jones 2018), relational ontologies also emphasize the possibility that animals and other non-human beings can have personhood (Viveiros de Castro 1998; Fausto 2007: 497; Hill 2013: 120; Živaljevic 2015; Pilaar Birch 2018; Crellin et al. 2021). In my material I could see several examples which might be linked to expressions of animal individuality.

A good example illustrating the attention given to particular animal individuals is the use of complete sets of animal front teeth. Often placed in anatomically correct order, such cases were identified in several burials at Zvejnieki and Skateholm. They show that special attention was given to making the decoration from one particular animal, maintaining the integrity of a certain animal individual and keeping and using all the teeth together. This practice is common especially for ungulate species, such as elk, aurochs and red deer (Fig. 11.7 and 11.8). The morphology of ungulate incisors and their aesthetic properties facilitated their use in complete sets. Carnivore incisors are often small, and canines of these animals were usually selected instead. Nevertheless, in several Zvejnieki burials canines from dog, fox or otter most likely come from the same animal individual. In other words, here a degree of integrity was likewise maintained by presenting teeth from the same animal together.

The personality of certain animal individuals is also reflected in the buried dogs at Skateholm and Sakhtysh. Only some dogs were given a burial of their own, and a few were placed in the same burial together with humans, while most were not buried at all (or were buried elsewhere). Individuality or personal achievement most likely lay behind the differences in their treatment. Keeping in mind the particular place of dogs in the hunter-gatherer communities as hunters, protectors and companions (Haraway 2003, 2008), a dog's death was perhaps equated with the loss of a community member and therefore deserved a human-like burial (Larsson 1990; Evans & Welinder 1997; Magnell 2006; Morey 2006; Perri 2013; Vang Petersen 2013). The lack of other similar animal burials in hunter-gatherer contexts further emphasizes the particular role of dogs in these communities (Bazaliiskiy & Savelyev 2003; Losey et al. 2016). At Zvejnieki, no dogs were buried, even though their teeth were used to make pendants. This demonstrates the diverse relationships to dogs in different hunter-gatherer communities and indicates that maintenance of the complete body

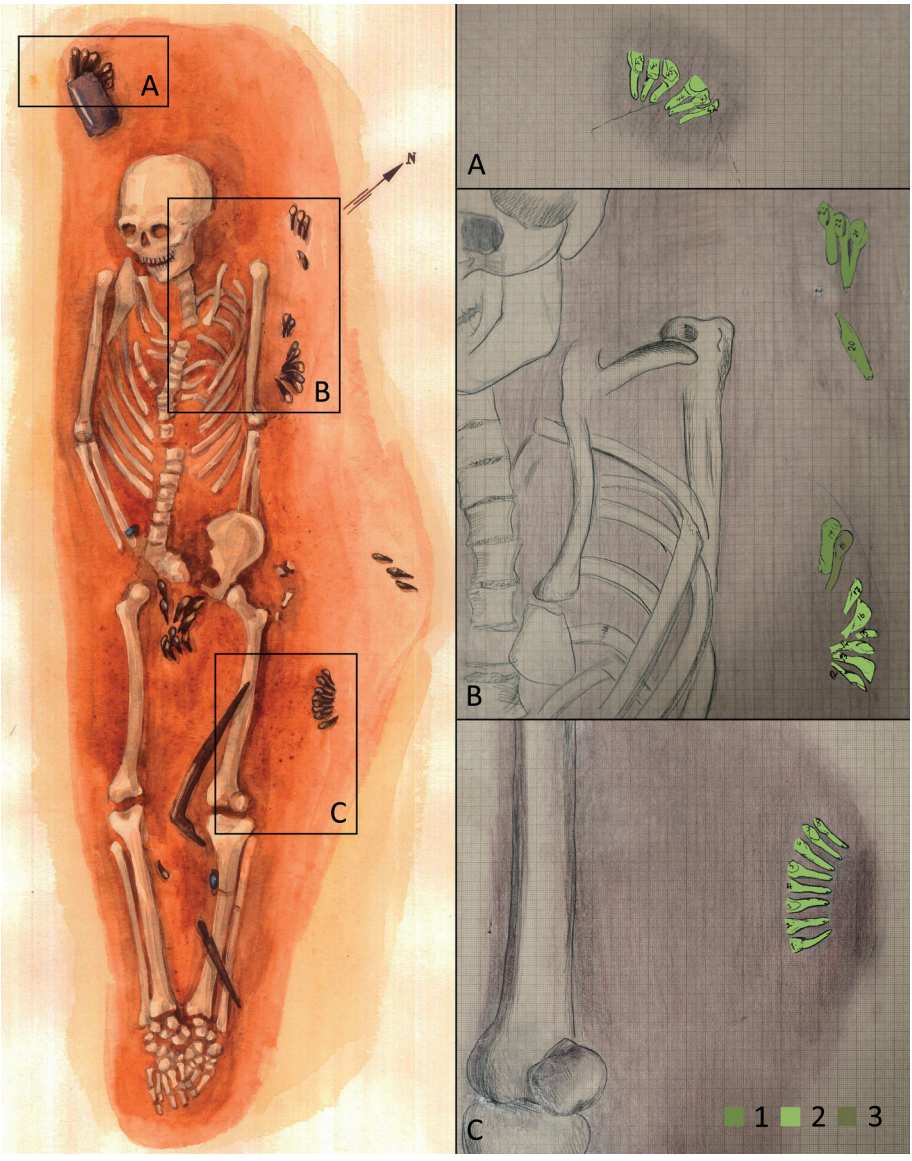


Figure 11.7. Burial 57 at Zvejnieki contained several complete sets of red deer front teeth without perforations. One of these was associated with a stone axe (A). A second set was located by the left arm (B), and a third outside the left femur (C). The way these teeth were arranged illustrates the attention paid to maintaining integrity and correct anatomical order. 1 – elk, 2 – red deer, 3 – aurochs. Drawings: I. Ārmane and B. Vaska (Institute of Latvian History, University of Latvia), illustration: K. Nordqvist.

was not always needed. Perhaps only a body part, such as a tooth, could represent a certain dog individual (see also Conneller 2011; Mansrud 2017b).

Personality and individuality play a crucial role in developing mutual relationships between humans and animals (Haraway 2003, 2008). Active engagement from both

Figure 11.8. Similar working or wear traces observed on the lingual side of all teeth in one of the red deer incisor sets from Burial 57 at Zvejnieki (C in Fig. 11.7) indicate that the teeth were used together in anatomical order. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Photo: A. Macāne.

sides is needed to create and develop relations through which animal personhood emerges, resulting in different attitudes and treatment of certain animal individuals (Willerslev 2007; Fredengren 2013; Viveiros de Castro 2015). Similarly to humans, animals possess different characteristics based on their appearance, size and sexual dimorphism. These parameters are often quite distinctive and are important in group organization or interspecies relations (Descola 2013).

Humans were well-acquainted with animal appearance, behaviour and social organization. Specific body parts, such as antlers or wild boar tusks, or the colour and patterns of animal fur, helped humans to follow the life histories of certain animal individuals and recognize them repeatedly in the landscape – for instance, during the hunt particular individuals may have been spared intentionally. At the same time, the majority of wild boar tusks from the Zvejnieki burials, for example, are from females, strongly indicating the selection of certain individuals. Perhaps such a choice was linked to the personhood of adult female wild boars, whose presence in the landscape as herd leaders was more visible when they moved around with their young. On the other hand, this selection could have been guided by the morphology of the canine teeth of female wild boars, rendering them more suitable for making adornments.

Animal individuality and personality were essential in creating relationships with other members of the group, with other animal species and in the wider interspecies community. Certain individuals with necessarily qualifications became leaders of the group. Similarly, these traits can be also related to human communities, where the social organization of the group depended on the personal characteristics and skills of each of its members. Personhood as a projection of the individual characteristics of certain animals also led to their differential treatment by humans.

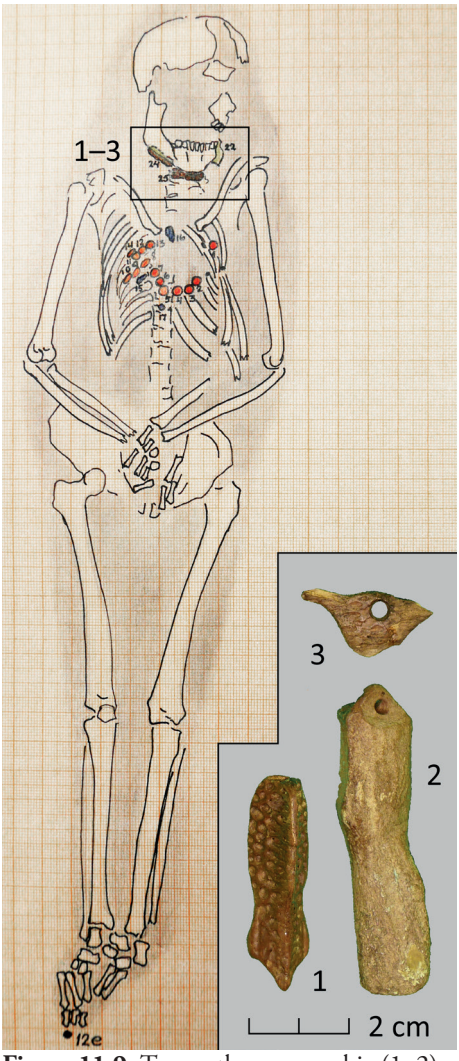


Figure 11.9. Two anthropomorphic (1, 2) and two zoomorphic figurines (of which only one is illustrated here as 3) were discovered by the neck of the deceased in Burial 228 at Zvejnieki. Two of these (no. 1 and the specimen not shown here) were made out of sturgeon bones. By kind permission of the Department of Archaeology, National History Museum of Latvia (LNVM VI: 93). Drawing: B. Vaska (Institute of Latvian History, University of Latvia), photo: A. Macāne, illustration: K. Nordqvist.

11.2.3. Transformations: interspecies fluidity and shapeshifting

The need to disguise or shift identities is well attested in the Holocene hunter-gatherer communities in Europe and in ethnographic records, which link this practice particularly to shamanism (Conneller 2004, 2011; Willerslev 2007; Butrimas 2012; Little et al. 2016; Wild 2019; Herva & Lahelma 2020). The variety of animal body parts, such as antlers, fur or wings, as well as artefacts made from animal remains, could be used as a medium for transformations or disguises (Herva & Lahelma 2020; Mannermaa & Kirkinen 2020). The transformation process or metamorphosis using clothes, masks and other spiritual forms is documented among Siberian and Amazonian hunter-gatherers (Viveiros de Castro 1998, 2015; Willerslev 2004, 2007). The material from hunter-gatherer burials examined in my work also provides several examples in which animal body parts may have served as a medium for transformations, interspecies fluidity or shapeshifting between species.

Animal-derived materials, bone and antler, were commonly used in the manufacture of animal and human figurines found in several hunter-gatherer contexts in north-eastern Europe (Гурина 1956; Jaanits 1957; Zagorskis 1987; Iršėnas 2006; Tõrv et al. 2017). In Burial 228 at the Zvejnieki cemetery, two figurines representing birds were found together with two anthropomorphic figurines (Fig. 11.9). All of them had perforations, suggesting their use as pendants. One of the bird figurines (a black grouse or capercaillie; Zagorskis 1987; Mannermaa 2008a; Zagorska et al. 2018) and one of the anthropomorphic figurines (a face in profile; see Fig. 11.9: 1) was made from bone plates of sturgeon.

Perhaps the raw material was chosen due to its particular morphology, where the small pits of the scutum added a decorative element to the figurines, or maybe the sturgeon scutum itself was decisive and added particular meanings to these artefacts. Or perhaps we have here an example of interspecies relations and fluidity between the species embedded in materiality. In the northern cosmologies birds and fish take on important roles and often facilitate the journey between worlds (Tõrv et al. 2017; Herva & Lahelma 2020). Maybe this bird representation made from a fish bone embodied both and therefore could be regarded as an even more powerful symbol, uniting water and air.

Figure 11.10. A representation of an elk's head made from a bear ulna was found in the excavation of Riņņukalns shell midden in the late 19th century. It provides a concrete example of interspecies fluidity and transformation between carnivore and ungulate, hunter and prey. By kind permission of the University of Tartu / Institute of History, Tallinn (AI 1392: 383). Photo: A. Macāne, illustration: K. Nordqvist.

Another example comes from Riņņukalns, where a figurine representing an elk head made from a bear ulna (Fig. 11.10) has been discovered (Jaanits 1961). These examples illustrate the transformation of one animal (the bone raw material) into another (the completed animal representation) through human modifications (see also Conneller 2011). The morphology of a particular bone or antler could have been used to facilitate the representation of characteristic features of another living animal: the surface of the sturgeon scutum imitates the bird's feather pattern, and the bear ulna the shape of the elk's head.

Masks are objects in which animal body parts have been used as a medium to transform or disguise the identity of the wearer. The transformative function of masks has particularly been linked to the need for a shaman to turn into an animal, but masks can imitate humans as well as non-human beings (Pernet 1992; Conneller 2004; Pedersen 2011; Wild 2019; Elliot & Conneller 2021). An illustration is provided by the anthropomorphic mask made of an elk antler found in the ritual pit, "sanctuary", at Sakhtysh IIa (Kostyleva et al. 2001) (Fig. 11.11). The mask is carefully made, and perforations as well as nostril holes suggest its use on the face during activities where shapeshifting would have been a crucial element. Another important aspect may be related to the intentional choice of the particular elk used for making this mask. Perhaps it represents the embodiment of an animal ancestor and through its materiality conveyed particular meanings of this animal to the Sakhtysh inhabitants. Also, the

Figure 11.11. An anthropomorphic mask made from an elk antler found at Sakhtysh IIa can be associated with the need to assume a disguise and transform from one state of being to another. By kind permission of the Archaeology Museum at Ivanovo State University. Photo: A. Macāne, illustration: K. Nordqvist.

mask could serve as medium for *becoming* an elk, as also suggested in the case of red deer frontlets from Star Carr (Conneller 2004).

Shapeshifting and transformation can also be linked to the animal tooth pendants found in the head area, often accompanied by a clay-ochre mixture covering on the face and amber ornaments, in several burials at the Zvejnieki cemetery (Zagorskis 1987; Denisova 1996; Zagorska 1997, 2001). These can be interpreted as elements of a disguise, where animal-derived materials have also been used to effect human transformations in the funerary ceremony, although the location of the tooth pendants has also been seen as representing decorations used during the lifetime or included in the funerary garment (Zagorska & Lõugas 2000). A similar practice is known also at other hunter-gatherer cemeteries in north-eastern Europe, with the interpretation that these are death masks given only to specific members of the society (Гурина 1956; Halinen 1999; Katiskoski 2003; Edgren 2006; Butrimas 2012; Ahola 2019).

Antlers, particularly red deer antlers, have long been perceived as a transformative medium in the Mesolithic world (Bevan 2003; Conneller 2004; 2011; Wild 2019). The presence of antlers in several hunter-gatherer burials in Europe argues for the importance of this animal body part, which also conveys the notion of regeneration and regrowth, a capability which humans do not possess (Albrehtsen & Brinch Petersen 1977; Schulting 1996; Grünberg 2013; Živaljevic 2015; Grünberg et al. 2016). This may also be the case with the red deer antlers deposited in burials at Skateholm (Larsson 2013; Macāne 2021). Perhaps, through employing the antlers people believed to be transforming themselves or becoming one of the animals (an elk or deer), indicating transcorporeality (Conneller 2004; 2011; Fredengren 2013; Little et al. 2016). Since they are relatively rarely encountered in the archaeological material, this supports

the notion that only certain people in the society had the role of ritual specialists or shamans with the ability to transform (Herva & Lahelma 2020).

Bird remains, and particularly wings, provide a further perspective on the transformations. The wing bones of at least 17 Eurasian jays (Mannermaa 2006) by the elbows of male burial 164 at Zvejnieki can be seen as medium for transportation and shifting between the spheres of the world. The symbolic embodiment of wings, representing the ability to fly, seems to have been essential, since wing fragments occur at hunter-gatherer cemeteries in Northern Europe (Jaanits 1957, 1961; Albrehtsen & Brinch Petersen 1977; Gumiński 2005: 124). Bird remains in burials can also be connected with ideas about the journey to the afterlife and the world of the dead, and bird figurines from burial contexts are interpreted as soul carriers, symbolic escorts of the dead or messengers between different worlds (Jaanits 1961: 65; Zvelebil 2003: 7; Loze 2015: 199–200; Tõrv et al. 2017: 58). Mastering the three tiers of the world, birds were also a medium for shapeshifting and transformation and served as helper spirits to shamans (Napolskikh 1989; Lahelma 2005; Jonuks 2009; Herva & Lahelma 2020). Not unexpectedly, feathers and wings are known also from Siberian shaman costumes (Holmberg 1922; Mannermaa & Kirkinen 2020). The rarity of bird remains in the present material further suggests that these buried individuals held a particular position.

The question of transformation can also be approached from the material aspect: working natural raw materials and transforming them into something else. For instance, by working and transforming animal remains, their original properties would change, obtaining new forms and probably also new meanings (see also Conneller 2011). This would also parallel with the increased interest in transforming mineral materials into particular shapes and formats (e.g. amber, lithics and clay), as seen in burials especially from the 4th millennium cal BC (Herva et al. 2014; Mökkönen et al. 2017).

The above examples show that animal-derived materials had a central role in mediating transformation and shapeshifting. Their materiality and embedded origins were employed in crossing borders and moving between different spheres of the world. Based on burial materials, such transformation and shapeshifting seem to have been closely connected to particular members of the societies, for instance shamans. Their intimate connection to particular animal helper spirits indicates that human–animal relationships also took place on a very personal level.

11.2.4. Animals as amulets

Particular bones deposited beside the body offer yet another dimension to the relationships between humans and animals. These bones often come from the extremities of certain animal species, and their special placement not on but by the body and in a particular place in relation to the body indicate the special meaning of these items as something more than just personal ornaments. Such finds include beaver astragali at Zvejnieki, pendants made from animal hooves or phalanges at Zvejnieki and Skateholm, and possibly also bear canines and paws at Sakhtysh.

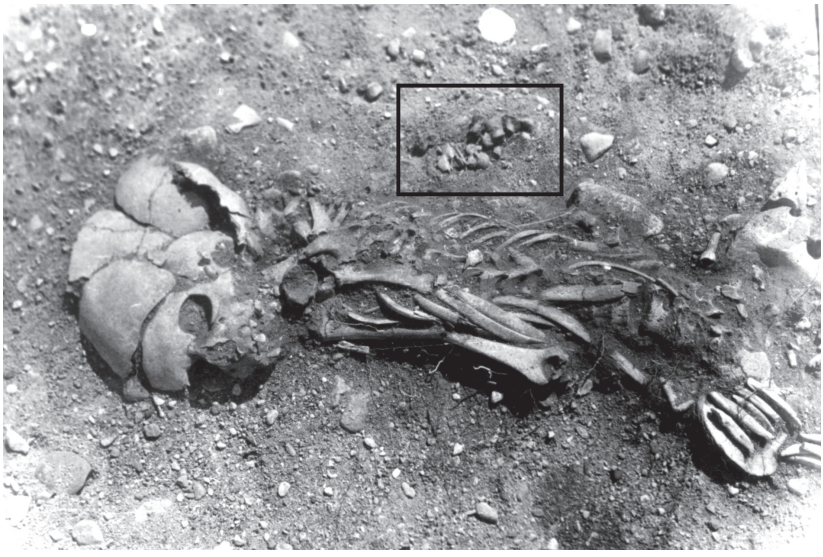


Figure 11.12. A deposit of beaver astragali was found on the left side of the upper body of the child in Burial 62 at Zvejnieki. A red deer phalanx with notches is also visible by the left side of the pelvis. Photo: F. Zagorskis (personal archive of I. Zagorska), illustration: K. Nordqvist.

The beaver astragali are often found in burials of children (Fig. 11.12) and adult men at Zvejnieki. They are regularly found on the left side next to the body and are in some cases associated with animal tooth pendants. They have no modification traces, but the natural shape of the bone would have facilitated their attachment. Red deer hooves were identified by the left part of pelvis in two burials of children (62 and 67) at Zvejnieki. Similar notches on the distal ends of the hooves in both burials may suggest their attachment to clothing, or else they are linked with a special deposit beside the body, as with the beaver astragali. Similarly, at Skateholm, perforated phalanges of roe deer were found by the hands or between the bodies of two children.

The scarcity of astragali and phalanges indicates that only particular community members were given these items. They may have been identity or group markers or perhaps were amulets embodying protective and healing properties. The find contexts of beaver astragali at Zvejnieki suggest that they may have been worn hidden, placed in some container or pouch that was decorated with animal tooth pendants. Supporting data come from ethnography, where the protective function of certain animals and their body parts has been documented. These amulets may have been carried in small bags against physical and spiritual dangers (see Douglas 1966; Morris 1998). Astragali in particular are associated with protective and healing properties (on dog and wolf in Mongolia, see Kabzinska-Stawarz 1991; also Birtalan 2003; Luik 2010), but also ritualistic and shamanistic activities (on sheep in Mongolia, see Bemmann & Nomguunsüren 2012; Törbat et al. 2012; Vávra 2020: 338) and hunting luck (on walrus among the Sirenki of Chukotka, see Hill 2011: 415). The importance of beaver is recorded in the northern areas, among the Finno-Ugric peoples inhabiting

territories between the Eastern Baltic and the Urals (Paulaharju 1922; Itkonen 1948), as well as in North America (Cox 1988: 68). Archaeologically beaver astragali bones are also known from later periods in Northern Europe (Luik 2010). Interestingly, in addition to beaver, only one ankle bone of wild cat appears in the analyzed material from Zvejnieki.

Protective properties have also been assigned to figurines depicting birds or other animals, and animal tooth pendants have occasionally been interpreted as amulets protecting their bearers or bringing good luck (Jaanits 1961; Loze 1983, 2015). Therefore, even if direct evidence of specific osseous amulets is relatively sparse, figurines and some teeth may have embodied similar protective and healing functions – or indicated group affiliation.

11.2.5. Social communication through animal tooth pendants

Animal tooth pendants are the most numerous animal body parts documented at the studied sites: more than 3000 animal and a few human teeth can be associated with secure burial contexts. The majority of these (ca. 2300) come from the Zvejnieki cemetery. The appearance of people and their clothing constituted a way of communicating and conveyed certain information about the bearer. The need to signal one's identity and affiliation to a group or community using animal body parts or objects made from them is well known from prehistoric as well as contemporary hunter-gatherer communities (Viveiros de Castro 1998; Vanhaeren & d'Errico 2005; Conneller 2011; Rigaud 2011; Ошибкина 2017). Similarly, pendants made from animal teeth have traditionally been interpreted as personal ornaments and have been linked to the social organization of hunter-gatherer communities (Larsson 1988a, 2013; Zagorska & Lõugas 2000; Mannermaa 2006; Zagorska 2006a, 2016; Butrimas 2012; Grünberg 2013; Schulting et al. 2020; see also Borič & Cristiani 2019; Laporte & Dupont 2019). Furthermore, the selection of particular animals and particular teeth for use can be seen as a representation of relationships between humans and certain animals, where animal teeth and other body parts worn by humans may also have served as a medium to confer certain animal characteristics or skills on their wearer (see Fausto 2007: 507; Conneller 2011).

In addition to the conscious selection of the species and parts used (e.g. carnivore canines and ungulate incisors), the location of osseous items on the body or in direct association with the skeleton indicates the importance of the arrangement of these objects in the burials and the aesthetic values attached to them. At Zvejnieki, tooth pendants were found mainly by the head and on the torso, but also beside the body, suggesting that they were also associated with other items placed in the burial (Fig. 11.13 and also Fig. 11.7: A, where a set of red deer teeth are associated with a stone axe). At Skateholm and also at Sakhtysh animal teeth were mainly found in the pelvic region and at Sakhtysh also by the legs.

Burial 100 at Zvejnieki illustrates a very particular way of wearing tooth pendants or preparing the funerary garment or wrapping (Fig. 11.14). The roots of elk incisors were heavily ground from all four sides of the root, and several complete incisor sets

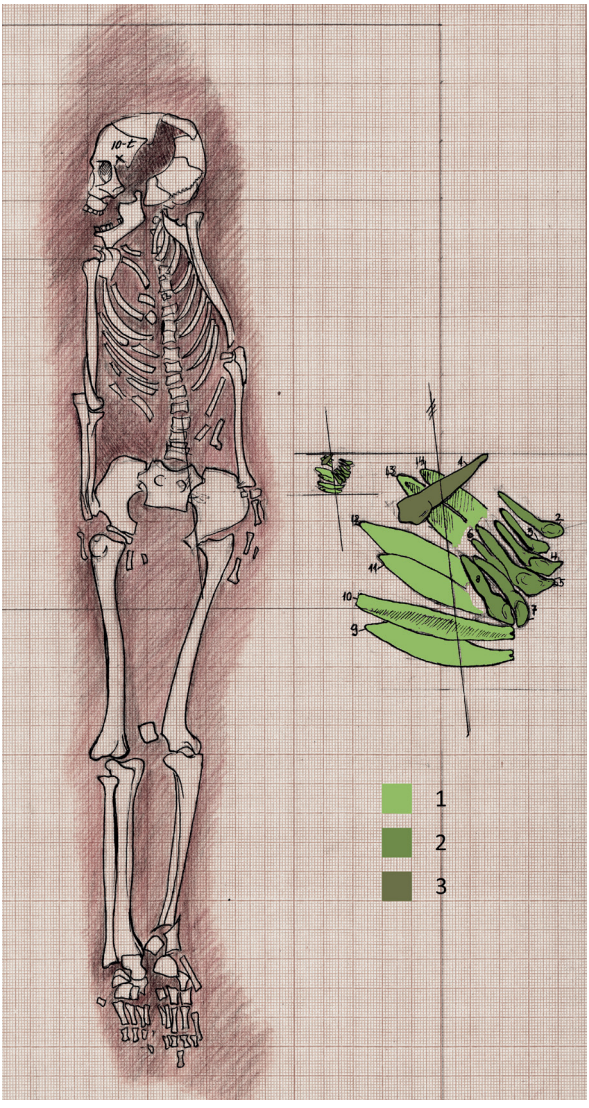


Figure 11.13. Burial 76 at Zvejnieki shows that animal teeth were not only found on the deceased but could also be placed under the body, in this case under the lower back and pelvis. Perhaps they were part of the funerary garments or decorated some other items which were placed at the bottom of the grave before the deceased. This burial also illustrates the care placed in combining particular animal species or perhaps even retaining certain animal individuals: only ungulate species were selected to accompany the deceased in the grave, including wild boar (1), red deer (2, a full set of incisors without perforations) and aurochs (3). Drawing by L. Linmeijere (Institute of Latvian History, University of Latvia), illustration: K. Nordqvist.

were placed in anatomically correct position on the chest of the buried child. Perhaps these teeth were sewn on or attached in some other way to the garments. Burial 170 at Zvejnieki provides another example of a specific way of arranging tooth pendants. Wild boar incisors were found in groups of five (or six), located between the pelvis and the feet, while tooth pendants of other ungulate species were mainly located by the head or the feet (see Fig. 6.25). Perhaps wild boar incisors were combined in groups of five to decorate the clothes or wrappings of the dead for purely aesthetic reasons, but at the same time they may also have demonstrated identity or social affiliation to a certain group.

Only a small proportion of the buried individuals had tooth pendants with them. At Zvejnieki, these constitute around one third of the buried individuals, while at Sakhtysh II this number is less than 20%, but at Sakhtysh IIa a bit less than 30%. Only at Skateholm II more than half of buried individuals had pendants from animal teeth, while at Skateholm I only 16%. Many burials had no grave inventory at all. Considering the number of animals documented in faunal assemblages at Zvejnieki (Lõugas 2006) and Skateholm (Jonsson 1988), the availability of teeth of species such as elk, red deer or wild boar would not

have been a problem. Rather, it seems that the selection of animals for making tooth pendants and of persons to be adorned with them was guided by some other considerations.

Animal tooth pendants seem to represent a certain social position or role in society, but as several rich burials at Zvejnieki are those of children (e.g. Burials 128, 190 and 226), they strongly indicate that the presence of tooth pendants cannot be linked to the personal achievements of the buried person (see also Schulting 1996). At the same time, at Sakhtysh and Skateholm very few children have been adorned with any grave inventory, and mainly adult men and women were given tooth pendants. Generally, the number of teeth shows large variation among the burials, even if usually only one or a few tooth pendants are found in burials at all of the studied cemeteries. Just a few burials at Zvejnieki (Burials 122/123, 153 and 190) and Skateholm (Burials 53, VIII, X, XX and XXII) contained several dozens or even hundreds of tooth pendants. Burial 24 at Sakhtysh IIa is the only case with numerous teeth, while ornaments from other materials, for example amber, could exceed several dozen at the Sakhtysh sites (Костылёва & Уткин 2000, 2010; Macāne & Nordqvist in press). This suggests a preference for other materials in making the personal ornaments of the Volosovo period burials at Sakhtysh, showing a similarity to the later Zvejnieki burials, where an increasing number of ornaments from amber and other materials are documented from the 4th millennium cal BC.

Figure 11.14. Only teeth from ungulate species were found in Burial 100 at Zvejnieki. Several complete sets of elk incisors (2) with roots heavily ground from all four sides were found on the chest of the buried child. Aurochs (3) incisors were also prepared in a similar manner, whereas wild boar (1) and wild horse (4) incisors had perforations. Drawing by L. Linmeijere (Institute of Latvian History, University of Latvia), illustration: K. Nordqvist.

The number of teeth present in a burial can also be considered from the perspective of the accumulation of the desired body parts. In the case of the wealthiest burials, with hundreds of pendants, accumulating these could have taken a rather long time (after all, one elk individual, for example, has just eight incisors). Furthermore, some

tooth pendants at Zvejnieki did not exhibit wear traces, which indicates that they were produced shortly before the burial (Larsson 2006a, 2020). All of this suggests that certain animal materials could have been accumulated over a longer time period and possibly curated within the community to be used on a certain occasion (e.g. a burial) or kept as raw materials or capital for exchange purposes.

Curation and inheritance may also explain the co-occurrence of various kinds of modifications on animal teeth documented in one burial. Teeth could have been accumulated over a longer period and could perhaps have originated from different sources, for example coming from different sections of the kin group, representing inheritance or gifts. At the same time, this may also reflect an individual's life story and relationship with various animal individuals, whose teeth were shaped into ornaments. Similarly, differences in tooth pendant modification techniques were observed between the studied sites, most likely reflecting both cultural and temporal trends. While at Zvejnieki, carving is the most common way to perforate the teeth during the whole use period of the cemetery (drilling is more documented in burials during the early part of the cemetery's use; see also Larsson 2006a), at Skateholm and Sakhtysh drilling was more common. For example, of the 14 red deer upper canines buried with a child in Burial 190 at Zvejnieki, all but one had a drilled perforation (Fig. 6.15: 3). This sets them apart from the manufacture of the other teeth in the burial, which have carved holes. Inheritance of personal ornaments or tooth pendants has also previously been suggested for some animal tooth pendants at Zvejnieki and Skateholm, and similar cases are known elsewhere in Europe (Larsson 2006a; Cristiani & Borič 2012; Larsson & Price 2022). The selection and combination of up to 14 different animal species in some of the burials at Zvejnieki also indicates that the tooth pendants were either readily available (the personal possessions of the deceased) or were produced by, or obtained or inherited from, the surviving members of the social group.

Besides animal teeth, four burials at Zvejnieki (62, 114, 121 and 190) also contain human teeth turned into pendants. Found together with teeth from various animal species, they suggest that a distinction was not necessarily always made between humans and animals, and that both human and animal teeth could fulfil particular functions attributed to tooth pendants (see also Dekker et al. 2021). This introduces an additional perspective on hunter-gatherer human–animal relationships, while at the same time it may be noted that human teeth constitute something of a curiosity within the main body of animal teeth.

That terrestrial mammals were the most common animals represented in the studied burial assemblages of these hunter-gatherers, who were generally heavily reliant on aquatic resources, tells something about the important status of these animals. Perhaps elk and wild boar at Zvejnieki, red deer at Skateholm and bear and badger at Sakhtysh were species with which humans identified personally or as a group. The selection of particular animal teeth may even illustrate a totemic worldview, where these species or particular individuals representing them were used to identify oneself as belonging to a certain group or community (Lévi-Strauss 1963). Be this as it may, the use of the

body parts or depictions of totem animals in clothing is a common practice among contemporary hunter-gatherer societies (Viveiros de Castro 1998; also Siikala 1992).

Similarly, the representations of animals made from other raw materials may convey information about their bearer's social identity or kin group. The elk, bear and birds are among the most commonly depicted animals from the studied hunter-gatherer contexts and other sites in north-eastern Europe (e.g. Loze 1983; Кашина 2005; Kashina & Emelyanov 2020), thus partially overlapping with the animals represented in the form of tooth pendants. Perhaps these depictions likewise tell of special (personal) relationships with particular species, maybe embodying certain characteristics of these animals or reflecting a mythological or ancestral relationship with them.

The studied materials illustrate that particular animals and their body parts were important objects in social communication. Some could be worn visibly, while others were perhaps not intended to be seen and were worn hidden or in some kind of pouches and used as amulets embodying special meanings and powers. Even though the location of most of the teeth in burials would appear to indicate that they served as adornments for funerary garments or wrappings, or were parts of necklaces or other personal ornaments, tooth pendants also accompanied other items placed in the graves.

11.3. The Stone Age world from a companionship perspective

The Stone Age world was shaped through an ongoing interaction between various actors: human and non-human, living and non-living, all interwoven in mutual relationships. Human–animal companionship in the Stone Age environment was relational and situational, and was expressed in daily life as well as at death. On the one hand it was a relationship with living animal individuals, while companionship in other forms continued also after the death of animals and humans. Some animal bodies could be fragmented and used for multiple purposes, such as food, clothing and raw materials, while others retained the integrity of the body and were buried after death.

With their diverse appearance and personal characteristics, animals and humans were forging interrelations between species by co-existing in the same space. Animal physiology is generally well adapted to species-specific survival strategies, and animals know how to master certain landscapes and environments at different times of the year (Magnell 2006: 86). These observations were used by people in their own life organization, adapting their movements and settlement organization patterns according to the life rhythm of animal companions (Binford 1980; Larsson 1990; Rowley-Conwy 1999; Magnell 2006). The lifespan of some animals, such as elk or bear (also some bird species), may reach a considerable age. In such conditions both parties would recognize the presence of the others in the shared environment, and this would contribute to shaping the mutual, long-term relationship between humans and these animal individuals.

The relationships and companionship could also have been initiated by the actions of some wild animals. For example, some carnivore or rodent species could have been drawn to the human-modified landscape and environments, taking advantage of human

refuse or food stores (Larson & Fuller 2014). In some cases, landscape management by hunter-gatherers could affect ecosystems and biodiversity and create particular environments suitable for certain species, most notably grazers such as aurochs, elk or wild horse (Smith 2011; Grøn 2012; see also Russell 2012). This would have resulted in a closer relationship to these species and better recognition of particular animal individuals; this is also how domestication could have started. Perhaps some animals even perceived humans as their companion species. At the same time, species as fleas, lice and mosquitoes, which are attracted to humans and take them and other animals as their main companions, would rather have constituted disturbance and annoyance to humans and animals.

The inclusion of particular animal body parts in particular burials reflects personal choices and individual relationships with these animals, while on the other hand also shows the living communities' conceptions. Only a part of the society were actually inhumated in the studied cemeteries, and only some of them had animal remains. Several roles can be proposed for these items, often referred to as "personal ornaments". Among other things, they may have been a medium for self-identification and expression of group or family affiliation, embodied protective or apotropaic properties, or used in transformations and shapeshifting. The studied material illustrates that interspecies relationships were dynamic and changing over time. As discussed in the first part of this chapter (11.1), ungulate teeth dominated in burial assemblages of the 8th–6th millennium cal BC, while carnivore species become more common starting from the 5th millennium cal BC. Not only did the animal species in use change; so did the teeth and other body parts that were used, as well as the shapes into which animals were transformed. Especially in the case of the Zvejnieki burials dated to the 4th millennium cal BC, animal body parts could be so extensively modified that it was no longer possible to identify the species. These changes in animals' characteristics and apparently also in their meanings are associated with wider transformations in hunter-gatherer communities in north-eastern Europe.

The communities studied in this work retained a hunter-fisher-gatherer lifestyle throughout the uselife of the cemeteries (excluding later burials at these locations by different populations). Even though subsistence was based on foraging, the material culture and burial practices testify to substantial changes taking place in the socio-cultural and cosmological settings over time (see Zagorskis 1987; Zagorska 2006a; Herva et al. 2014; Nordqvist 2018; Tõrv 2018; Ahola 2019; Kriiska 2020b). Intensified contacts between distant areas are reflected in burial assemblages, and artefacts made from non-local materials started to play a more important role in burial assemblages in the 4th millennium cal BC. This indicates shifts in attitudes towards raw materials and towards animal species: ornaments and objects placed in burials could originate far away (Macāne 2020; Macāne et al. in press), replacing the previous (animal) companions, those which were often encountered in the vicinity. Despite these changes, animals retained their place as the nearest companions in the lives of northern hunter-gatherers.

By employing the relational approach, my goal was to illustrate the diversity of relationships between animals and humans: the occurrence of animal remains in burials should not be regarded only as a rigid system of patterns and rules, as described in various hunter-gatherer ontologies, but rather as a system that was constantly negotiated and relational. The Stone Age landscape was formed through various levels of interactions and relations between living and non-living beings: it was filled and shaped by the coexistence of numerous companion species. Interaction with this surrounding environment formed the reality that hunter-gatherers shared with the other species. Environmental and ecological aspects largely determined the species available, while the cultural context determined the preferences and restrictions in selecting them. Reading this from a companionship perspective implies that these relationships were absolutely fundamental but at the same time fluid and situational. Burials constituted just one part of interaction: they manifested some of the links but were also used to rework them. All these aspects together shaped people's identity and their way of life.

Companionship in north-eastern hunter-gatherers was forged at an individual level, both human and animal. The active engagement of humans and various non-humans, as well as the personality of these agents, were essential in creating interspecies relationships in the Stone Age milieu. Interactions in the shared space and time involved physical actions, the material remains of which formed the archaeological record we can study today. This material undeniably shows that despite the spatial, temporal and cultural variations, animal companions were never far away from the Stone Age hunter-gatherers.

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Summary

Svensk sammanfattning

Modifierade såväl som obearbetade lämningar efter olika djurarter är vanligt förekommande arkeologiska fynd i gravar kopplade till jägar-samlarsamhällen i nordöstra Europa. I föreliggande avhandling undersöks relationer mellan människor och djur som nyttjade samma levnadsmiljö, samt hur dessa relationer uttrycktes och gavs materiell form i de nordliga jägar- och samlarsamhällenas begravningsseder. Det empiriska materialet i studien består av lämningar av djur, i synnerhet smycken tillverkade av djurtänder, vilka har deponerats i gravar inom fem större begravningsplatser tillhörande jägar-samlare. Dessa lokaler är Zvejnieki (Lettland), Skateholm I och II (Sverige) och Sakhtysh II och IIa (Ryssland). Gravfältet i Zvejnieki (daterad från det 8:e till det 3:e årtusendet f.Kr.) har det största antalet djurben och tänder och intar därför en central plats i studien. Material från Skateholm (ca 5600-4800 f.Kr.) och Sakhtysh (5:e - början av 3:e årtusendet f.Kr.) ger ytterligare exempel på interaktioner mellan människa och djur från mer snävt avgränsade tidsperioder och från olika geografiska områden.

Den tvärvetenskapliga verktygslåda som använts i detta arbete inkluderar en omtolkning av tidigare osteologiska analyser, en komplettering med nya analyser, en omfattande arkiv- och litteraturstudie av dokumentation som är relevant för de studerade platserna. Dessutom har rumsliga och kontextuella analyser både av de studerade gravfälten och av varje undersökt grav utförts. Vidare har analyser av djurlämningar med varierande resultat av ^{14}C-datering, stabila isotoper i bulk och ZooMS utförts. Relationellt förhållningssätt och jägare-samlare ontologier utgör grund för den teoretiska ramverk för avhandlingen som undersöker relationer mellan människor och djur utifrån kompanjonskap (*companionship*). I denna avhandling betraktas djuren inte bara som en källa till mat och råvaror, utan som följeslagare (*companions*), som bebodde och nyttjade det gemensamma landskapet.

Avhandlingen består av 11 kapitel. Kapitel 1–3 introducerar studien och den metodologi och ramverk för tolkning som använts i analysen. I kapitel 4 presenteras de fem arkeologiska begravningsplatser som ingår i studien, samt tidigare forskning kopplad till dessa. I kapitel 5–10 beskrivs och presenteras resultat från analyserna av gravarna och de djurgrupper som ingår i studien (rovdjur, hovdjur, fåglar, fisk och reptiler samt modifierade människoben och tänder). I kapitel 11 syntetiseras resultaten från

de olika gravar och begravningsplatser och diskuteras från ett relationellt perspektiv förhållandet mellan människor och djur hos jägar-samlarsamhällen i nordöstra Europa.

Det analyserade fyndmaterialet, vilket spänner över fem årtusenden, visar på förändrliga relationer mellan människor och olika djurarter i nordöstra Europa under den studerade perioden. Hovdjur främst älg, vildsvin och kronhjort, var de vanligast förekommande djuren i gravar, speciellt under 8:e–6:e årtusendet f.Kr. Under det 5:e årtusendet f.Kr. går det att urskilja en större mångfald av djurarter i begravningarna, särskilt avseende på rovdjur. Ett ökat antal rovdjur i förhållande till hovdjur, samt ett skifte från tandpärlor till mer kraftigt modifierade artefakter tillverkade av andra delar av djuren, som ben och horn, kan tydligt ses i det studerade begravningarna. Det går också se att de vanligt förekommande djurarterna med tiden gradvis ersattes av importerade material och föremål, tillverkade av även icke lokala djurarter (t.ex. sälar och murmeldjur).

Förhållandena mellan människor och djurarter på de arkeologiska lokaler som ingår i studien, formades av flera faktorer. Bland dessa kan nämnas miljömässiga och ekologiska förhållanden (förekomst av vissa arter) och sociokulturella kontexter (preferenser och restriktioner kopplade till traditioner och kosmologiska föreställningar). Vissa arter som älg, vildsvin och björn förekommer på alla studerade platser, medan andra arter som kronhjort, grävling och säl verkar ha varit mer gynnade på en viss lokal eller vid en viss tidpunkt. Hovdjurens framtänder och rovdjurens hörntänder användes oftast för att tillverka hängsmycken, men lokala preferenser för användning av andra ben, t.ex. bäverns språngben *(astragali)*, modifierade och icke-modifierade fågelvingar och kronhjorts horn kan också observeras. Studien visar att fragmentering av djuren och urval av specifika kroppsdelar hade stor betydelse. Djurens individualitet och personlighet verkar varit viktiga för att skapa relationer mellan dem och människor.

Material härrörande från djur hade en central roll i förmedlingen av social kommunikation och kosmologiska föreställningar. Vissa djur, eller delar av deras kroppar, kan ha varit viktiga ”följeslagare” för människan i uttrycket av egen identitet eller grupptillhörighet. Andra djur kan ha besuttit skyddande eller apotropeiska egenskaper. Vissa delar av djur kan ha använts i shamanistiska syften (i vid bemärkelse) genom att symbolisera transformationer och formskiftning. Den varierande placeringen av djurlämningar i gravarna visar på mångfalden i relationerna mellan människa och djur samt på de många användningsområdena för djurlämningar. De var inte bara prydnader eller svepningar för de döda, utan kunde också utgöra utsmyckning på andra föremål, eller vara en del av depositioner och strukturer i gravarrangemangen.

Att studera allt detta ur ett följeslagarperspektiv, visar att relationerna mellan människa och djur var djupt grundläggande för stenålderns jägare-samlare, samtidigt som de inte nödvändigtvis styrdes av strikta regler. Snarare var relationerna flytande och situationsbundna. Människors och djurs aktiva engagemang, liksom dessa aktörers personligheter, var avgörande för att skapa de relationer och levnadsmiljöer mellan arter som utgjorde jägar- och samlargruppernas omgivande miljö. Denna avhandling bidrar med nya perspektiv på hur man kan studera osteologiska lämningar av djur inom arkeologin i nordöstra Europa och vidare. Studien utgör ett viktigt bidrag till att

utvidga vår förståelse av relationerna mellan stenålderns människor och djur, och hur mångfacetterade de verkligen var. Trots de rumsliga, tidsmässiga och kulturella variationerna var djurens följeslagare aldrig långt borta från stenålderns jägar-samlargrupper.

Nyckelord: relationer människa-djur, relationella ontologier, följeslagarperspektiv, gravarkeologi, begravningspraktiker, zooarkeologi, jägare-samlare, stenålder, mesolitikum, neolitikum, nordöstra Europa, södra Sverige, Lettland, centraleuropeiska Ryssland.

Summary

Kopsavilkums

Eiropas ziemeļaustrumu daļā pētītajos mednieku-vācēju kapos līdz ar cilvēku apbedījumiem bieži mēdz atrast arī neapstrādātas vai apstrādātas dzīvnieku paliekas. Disertācijā tiek aplūkotas cilvēku un dzīvnieku attiecības to kopīgajā vidē un tiek izvērtēts, kā šīs attiecības pauda ziemeļu mednieki-vācēji, piešķirot tām materiālu formu. Materiāls empīriskajiem pētījumiem sastāv no dzīvnieku paliekām, it sevišķi dzīvnieku zobu piekariņiem, kas ievietoti kapos piecās nozīmīgās apbedījumu vietās: Zvejnieku kapulaukā (Latvijā), Skateholmas I un II kapulaukā (Zviedrijā) un Sahtišas II un IIa kapulaukā (Krievijā). Zvejnieku kapulaukā (8.–3. g. t. pr. Kr.) iegūts lielākais dzīvnieku palieku kopums, un tam ir centrālā vieta šajā pētījumā. Materiāli no Skateholmas (ap 5600.–4800. g. pr. Kr.) un Sahtišas (5. g. t.–3. g. t. sākums pr. Kr.) piedāvā papildu piemērus cilvēku un dzīvnieku mijiedarbībai īsākos laikposmos un citās teritorijās. Šajā darbā izmantots starpdisciplināro metožu kopums, kas aptver iepriekš veikto zooosteoloģisko analīžu pārinterpretāciju, papildinot tās ar jaunām analīzēm, plašu arhīvos un literatūrā iegūstamās dokumentācijas apkopojumu par pētāmajām senvietām, kā arī pētīto kapulauku un atsevišķo apbedījumu telpisko un kontekstuālo analīzi. Papildus veiktas dzīvnieku palieku radioaktīvā oglekļa, stabilo izotopu un ZooMS analīzes, ar dažādām sekmēm. Materiāla interpretācijā izmantotā pieeja balstās uz savstarpējo attiecību izvērtējumu un uz mednieku-zvejnieku ontoloģiju, attiecības starp cilvēkiem un dzīvniekiem akmens laikmetā aplūkojot caur līdzgaitniecības (angl. *companionship*) prizmu. Dzīvnieki disertācijā tiek uztverti ne tikai kā pārtikas un izejmateriālu avots, bet arī kā līdzās dzīvojošas sugas, kuras dalīja dzīves telpu ar cilvēku.

Disertācija sastāv no 11 nodaļām. 1.–3. nodaļā izklāstīta metodika un interpretīvais satvars. 4. nodaļā aplūkotas pētījumā iekļautās senvietas un iepriekš veiktie pētījumi. 5.–10. nodaļā aprakstīta un sīkāk iztirzāta katra no galvenajām dzīvnieku grupām (plēsēji, pārnadži, grauzēji, putni, zivis un rāpuļi) un cilvēks. 11. nodaļa veltīta diskusijai un secinājumiem attiecībā uz daudzslāņainajām cilvēku–dzīvnieku attiecībām.

Pētāmais materiāls, kas aptver piecus gadu tūkstošus, atspoguļo izmaiņas cilvēku un dzīvnieku sugu attiecībās Eiropas ziemeļaustrumos. Pārnadži, it sevišķi alnis, meža cūka un staltbriedis, ir apbedījumos visplašāk pārstāvētie dzīvnieki, it sevišķi 8.–5. g. t. pr. Kr. Sākot no 5. g. t. pr. Kr., apbedījumu inventārā novērojams pārstāvēto dzīvnie-

ku sugu daudzveidības pieaugums, it sevišķi attiecībā uz plēsējiem, kā arī pāreja no pārnadžiem uz plēsējiem un no dzīvnieku zobu piekariņiem uz izteiktāk pārveidotām artefaktu formām, kas izgatavotas no cita veida dzīvnieku paliekām (kaula un raga). Turklāt apkārtējā vidē visbiežāk sastopamās līdzgaitnieku sugas pakāpeniski aizvieto importēti materiāli un priekšmeti, tostarp dzīvnieku sugas, kas nebija vietēji sastopamas (piemēram, roņi, murkšķi). Attiecības ar dzīvniekiem katrā konkrētajā vietā ietekmēja dažādi faktori: vides un ekoloģiskie apstākļi (konkrētu sugu pieejamība), kā arī sociālais un kultūras konteksts (ar tradīcijām un kosmoloģiskajiem priekšstatiem saistītas izvēles un ierobežojumi). Dažas sugas, kā alnis, meža cūka un lācis, pārstāvētas visās senvietās, turpretī citas sugas, kā staltbriedis, āpsis un roņi, šķietami tika augstāk vērtēti konkrētās vietās vai laikposmos. Piekariņu izgatavošanai visbiežāk izmantoti pārnadžu priekšzobi un plēsēju acu zobi, bet ir novērojamas arī lokāla mēroga tendences izmantot citus kaulus, kā, piemēram, bebra veltņa kaulu, putnu spārnu kaulus dabīgā vai pārveidotā formā un staltbriežu ragus. Pētījums parāda, ka nozīmīga bija konkrētu ķermeņa daļu sadalīšana un atlase, bet dažkārt tika pievērsta uzmanība tam, lai saglabātu konkrēto dzīvnieka indivīdu kā vienotu veselumu. Attiecību veidošanā starp dzīvniekiem un cilvēkiem būtiska loma bija dzīvniekam kā indivīdam un tā personībai.

Dzīvnieku materiāliem bija centrālā loma kā starpniekiem sociālajā komunikācijā un kosmoloģiskajos uzskatos. To materialitāte un specifiskā izcelsme tika izmantota, lai šķērsotu robežas un pārvietotos starp pasaules dažādajām sfērām. Daži dzīvnieki vai to ķermeņa daļas varēja būt nozīmīgi līdzgaitnieki pašidentifikācijai un lai izteiktu piederību pie grupas vai dzimtas, turpretī citi iemiesoja sargājošas vai ļaunumu novērsošas īpašības. Dažas dzīvnieku daļas varēja izmantot šamanistiskās (plašākā nozīmē) darbībās, t. i., lai pārveidotos vai mainītu izskatu. Daudzveidīgais dzīvnieku palieku izvietojums kapos sniedz papildu norādes uz šo attiecību daudzveidīgumu un uz dzīvnieku palieku dažādo izmantojumu. Tās rotāja gan mirušā ķermeni un aptinumu, gan arī citus priekšmetus, kā arī tika iekļautas ar apbedījumiem saistītos depozītos un konstrukcijās.

Izvērtējot iegūtās liecības no līdzgaitniecības skatupunkta, noskaidrots, ka cilvēku–dzīvnieku attiecībām bija fundamentāla nozīme akmens laikmeta mednieku-vācēju dzīvē. Nebūtu tomēr jāuzskata, ka šīs attiecības noteica stingri likumi; drīzāk tās bija mainīgas, atkarīgas no konkrētajiem apstākļiem. Līdzgaitniecība Eiropas ziemeļaustrumu daļā akmens laikmetā veidojās individuālā līmenī, piedaloties gan cilvēkiem, gan dzīvniekiem. Cilvēku un dažādu citu būtņu aktīvai iesaistei un šo aģentu personībām bija būtiska loma starpsugu attiecību un vides apstākļu radīšanā, kas veidoja mednieku-vācēju dzīves telpu. Šis pētījums tādējādi piedāvā jaunu pieeju dzīvnieku palieku izvērtēšanai Eiropas ziemeļaustrumos un citās teritorijās. Tas ir nozīmīgs papildinājums izpratnes paplašināšanai par attiecībām starp akmens laikmeta iedzīvotājiem un dzīvniekiem, ļaujot novērtēt to ontoloģiski fundamentālo nozīmi. Neskatoties uz telpiskajām, hronoloģiskajām un kultūras atšķirībām, dzīvnieki arvien palikuši akmens laikmeta mednieku-vācēju tuvi līdzgaitnieki.

Atslēgas vārdi: cilvēku–dzīvnieku attiecības, uz savstarpējām attiecībām balstītas ontoloģijas, līdzgaitniecības pieeja, apbedījumu arheoloģija, apbedīšanas tradīcijas, zooarheoloģija, mednieki-vācēji, akmens laikmets, mezolīts, neolīts, Eiropas ziemeļaustrumi, Dienvidzviedrija, Latvija, Krievijas Eiropas daļas vidiene.

Summary

Kūpsavylkums

Eiropys zīmeļaustrumu daļā pieteitajūs medinīku-vuocieju kopūs leidz ar cylvāku apbedejumim bīži mādz atrast ari naapstruoduotys voi apstruoduotys dzeivinīku palīkys. Disertacejā teik apsavārtys cylvāku i dzeivinīku attīceibys tūs kūpeigajā vidē i teik izvārtāts, kai ituos attīceibys paude zīmeļu medinīki-vuocieji, pīškirūt tom materialu formu. Materials empiriskajim pietejumim sastuov nu dzeivinīku palīku, it seviški dzeivinīku zūbu pīkareņu, kas īlykti kopūs pīcuos nūzeimeiguos apbedejumu vītuos: Zvejnīku kopulaukā (Latvejā), Skateholmys I i II kopulaukā (Zvīdrejā) i Sahtišys II i IIa kopulaukā (Krīvejā). Zvejnīku kopulaukā (8.–3. g. t. pr. Kr.) dabuots leluokais dzeivinīku palīku kūpums, i tam ir centraluo vīta itymā pietejumā. Materiali nu Skateholmys (ap 5600.–4800. g. pr. Kr.) i Sahtišys (5. g. t.–3. g. t. suokums pr. Kr.) pīduovoj papyldu pīmārus cylvāku i dzeivinīku mejīdarbeibai eisuokūs laika pūsmūs i cytuos teritorejuos. Itymā dorbā izmontuots storpdisciplinarūs metožu kūpums, kas aptver īprīšk veiktūs zooosteologiskūs analižu puorinterpretaceju, papildynojūt tuos ar jaunom analizem, plotu arhivūs i literaturā dabojamuos dokumentacejis apkūpuojumu par pietejamom senvītom, kai ari pieteitūs kopulauku i atseviškūs apbedejumu telpiskū i kontekstualū analizi. Kluotyn vēļ veiktys dzeivinīku palīku radioaktivuo ūglekļa, stabilūs izotopu i ZooMS analizis, ar vysaidom sekmem. Materiala interpretacejā izmontuotuo pīeja bolstuos iz sovstarpejūs attīceibu izviertiejumu i medinīku-zvejnīku ontologeju, attīceibys storp cylvākim i dzeivinīkim akmiņa laikmatā apsaverūt car leidzgaitnīceibys (angl. *companionship*) prizmu. Dzeivinīki disertacejā teik uztvarti na tik kai puortykys i izejmaterialu olūts, tok ari kai sūpluok dzeivojūšys sugys, kurys daleja dzeivis telpu ar cylvāku.

Disertaceja sastuov nu 11 nūdaļu. 1.–3. nūdaļā pastuosteita metodika i interpretivais satvors. 4. nūdaļā apsavārtys pietejumā īkļautuos senvītys i īprīšk veiktī pietejumi. 5.–10. nūdaļā apraksteita i seikuok iztierzuota kotra nu golvonūs dzeivinīku grupu (pliesieji, puornadži, grauzieji, putyni, zivs i ruopuli) i cylvāks. 11. nūdaļa veļteita diskusejai i secynuojumim attīceibā iz daudzsluoņainajom cylvāku–dzeivinīku attīceibom.

Izviertejūt dabuotuos līceibys nu leidzgaitnīceibys skotpunkta, nūskaidruots, ka cylvāku–dzeivinīku attīceibom beja fundamentala nūzeime akmiņa laikmata medinīku-vuocieju dzeivē. Tok nabyutu juoskaita, ka ituos attīceibys nūsaceja styngri lykumi;

dreižuok tuos beja maineigys, atkareigys nu konkretūs apstuokļu. Leidzgaitnīceiba Eiropys zīmeļaustrumu daļā akmiņa laikmatā veiduojuos individualā leiminī, pīsadolūt kai cylvākim, tai dzeivinīkim. Cylvāku i vysaidu cytu byutņu aktivai īsaistei i itūs agentu personeibom beja nūzeimeiga lūma storpsugu attīceibu i vidis apstuokļu radeišonā, kas veiduoja medinīku-vuocieju dzeivis telpu. Tai itys pietejums pīduovoj jaunu pīeju dzeivinīku palīku izviertiešonai Eiropys zīmeļaustrumūs i cytuos teritorejuos. Tys ir nūzeimeigs papyldynuojums izpratnis paplašynuošonai par attīceibom storp akmiņa laikmata dzeivuotuojim i dzeivinīkim, ļaunūt nūviertēt tūs ontologiski fundamentalū nūzeimi. Nasaverūt iz telpiskūs, hronologiskūs i kulturys atškireibu, dzeivinīki vys vēļ palykuši akmiņa laikmata medinīku-vuocieju tyvi leidzgaitnīki.

Atslāga vuordi: cylvāku–dzeivinīku attīceibys, iz sovstarpejūs attīceibu baļsteitys ontologejis, leidzgaitnīceibys pīeja, apbedejumu arheologeja, apbedeišonys tradicejis, zooarheologeja, medinīki-vuocieji, akmiņa laikmats, mezolits, neolits, Eiropys zīmeļaustrumi, Dīnvydzvīdreja, Latveja, Krīvejis Eiropys dalis vidīne.

Appendix 1.

Cemeteries

Structure of the data

In the database, the burials are divided into the following categories according to their integrity:

– complete (intact graves and votive deposits in connection to burials);

– partly disturbed (burials destroyed by digging later graves or pits);

– heavily disturbed (burials with disarticulated bones or no bones, or mixed contexts);

– partly excavated.

The presence (1) or absence (0) of red ochre, stone settings and other features in the grave construction, and the various kinds of grave inventory are also summarized in the database. Deposits including various animal materials in burials or in direct connection with a burial are included in the database together with the respective grave. The contents of the grave inventory and location of finds in the burial are classified as follows:

F – fill;

B – on the body;

G – beside the body in the grave pit, at the skeleton level;

D – deposition in the burial, at the skeleton level;

M – mixed, the context is uncertain, or the burial has been disturbed by later graves or other activities.

Animal remains are divided into four groups:

– modified teeth (perforated or exhibiting other traces of modification, such as grinding or polishing);

– unmodified teeth;

– modified bones;

– unmodified bones.

The total number of teeth or bones is specified for each burial, including the animal species present. Where it was not possible to identify the species or animal group, e.g., carnivore or ungulate, the finds are given as indeterminate (indet.).

The locations of animal remains in the burial are divided into:

a – head area;

b – upper part of body: neck, shoulders and chest;

c – upper legs (from waist and pelvis to knees);

d – lower legs (from knees to feet);

e – left of head;

f – left of upper body;

g – left of upper legs;

h – left of lower legs;

i – right of lower legs;

j – right of upper legs;

k – right of upper body;

l – right of head;

m – mixed;

n – in the fill;

o – in the deposit.

The presence or absence, as well as method of modification or working traces on animal remains or artefacts made from them are recorded. Traces were analyzed by naked eye only, without using any magnification. The modification traces are classified as:

1 – drilling;

2 – carving;

3 – notches;

4 – grinding.

At Zvejnieki, chronology is marked with SA for Stone Age, BA – Bronze Age, IA – Iron Age. At Sakhtysh: L – Lyalovo, V – Volosovo.

Table 1. Zvejnieki. Data compiled after Zagorskis 1987, 2004; Zagorska & Larsson 1994; Zagorska 1997, 2006a; Mannermaa et al. 2007; Meadows et al. 2016, 2018; Larsson et al. 2017.

Table 2. Skateholm I, Table 3. Skateholm II - Data compiled after Eriksson 2007; Jonsson n.d., 1986, 1988; Larsson n.d.; 1980, 1981a, 1983a, 1984b, 1988c, 1989.

Table 4. Sakhtysh II, Table 5. Sakhtysh IIa - Data compiled after Костылёва & Уткин 2010; Piezonka et al. 2013; Macāne et al. 2019.

Table 1: Zvejnieki

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
1	indet	adultus	single	partly disturbed	NW	supine	1	0	0
2	M	adultus	single	complete	NW	supine	1	0	0
3	indet	adultus	single	heavily disturbed	S	supine	0	0	1
4	indet	adultus	single	heavily disturbed	?	unknown	0	0	0
5	indet	infans	single	partly disturbed	SW	supine	1	0	1
6	M?	adultus	single	partly disturbed	SW	supine	1	0	0
7	M	adultus	single	partly disturbed	N	supine	1	0	0
8	indet	infans	single	partly disturbed	SW	supine	1	0	1
9	F	matura, 40–60	single	complete	W	on right side	1	0	0
10	F?	adulta	single	partly disturbed	SE	supine	0	0	0
11	indet	infans	double	partly disturbed	NE	supine	1	1	1
12	indet	infans	double	partly disturbed	SW	supine	1	1	1
13	indet	infans	single	partly disturbed	NE	supine	1	0	0
14	M	adultus	multiple	partly disturbedd	SW	supine	0	0	0
15	M	adultus	multiple	partly disturbedd	SW	supine	0	0	1
16	F?	adulta	multiple	partly disturbedd	NE	supine	1	0	1
17	M	adultus	single	heavily disturbed	N	supine	1	0	1
18	indet	infans I, 0–7	single	partly disturbed	WSW	supine	0	0	0
19	indet	adultus	single	heavily disturbed	E	supine	1	0	0
20	indet	adultus	single	heavily disturbed	SSW	supine	1	0	0
21	indet	infans	single	heavily disturbed	SSW	supine	0	0	0
22	indet	infans	single	heavily disturbed	N	supine	1	0	1
23	indet	adultus	single	partly disturbed	NE	supine	1	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	0						SA, 6900±65 (Ua-3638)
0	0	0	0	1 M, F	3 m				1, 4	SA
0	0	0	0	0						?
0	0	0	0	1 B, M	32 a, b				3	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1 B, U	18 b, c, n	1			2, 4	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B			1 b			SA
0	1B	0	0	1B, G	15 f, g, h		1 b		2, 3, 4	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1 B	3 c				3	SA
0	0	0	0	1 B	5 a, 2 c		1 c		3	SA
0	0	0	0	1 G	6 l	6 l			2	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1 B	12 b	3 b	1 c		1, 4	SA
0	0	0	0	0						SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
24	indet	infans	single	heavily disturbed	SE	supine	1	0	1
25	indet	infans	double	heavily disturbed	SW	supine	0	0	0
26	indet	infans	double	heavily disturbed	SW	supine	1	0	0
27	indet	infans	multiple	partly disturbed	SW	on right side	1	0	1
28	indet	adultus	multiple	partly disturbed	SW	supine	0	0	1
29	indet	adultus	multiple	partly disturbed	NE	supine	1	0	1
30	indet	infans	multiple	partly disturbed	NE	on right side	1	0	1
31	indet	infans	multiple	partly disturbed	NE	supine	1	0	1
32	indet	infans I, 0–7	multiple	partly disturbed	E	supine	1	0	1
33	F	adulta	multiple	partly disturbed	E	supine	1	0	1
34	indet	infans	multiple	partly disturbed	E	on right side	1	0	0
35	M	adultus	single	complete	SW	supine	0	1	0
36	M	adultus	single	complete	SE	on right side	1	1	0
37	M	adultus	single	complete	SSE	prone	1	1	1
38	M	adultus	single	partly disturbed	N	supine	0	1	0
39	M	maturus, 40–60	single	complete	N	prone	1	1	0
40	F?	matura, 40–60	single	partly disturbed	NW	supine	1	0	0
41	indet	infans	single	partly disturbed	NE	supine	1	0	1
42	M	adultus	double	complete	NE	supine	1	0	1
42a	indet	infans I, 0–7	double	?	NE	supine	1	0	0
43	indet	infans I, 0–7	single	partly disturbed	NWN	prone	1	0	1
44	indet	infans	single	heavily disturbed	NE	supine	1	0	1
45	indet	juvenis, 14–19	single	complete	NWN	supine	1	1	1
46	indet	adultus	single	heavily disturbed	W	supine	0	1	0
47	M?	adultus	single	complete	SW	supine	0	0	0
48	M?	juvenis, 14–19	multiple	partly disturbed	NE	supine	1	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1B	0	0	1 B, G, U	50 b, c,d, f, l	21 b, c,d, f, l			1, 3	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1F	0	0	1B, U	39 a, b,c	7 a, b, c	3 c, d		1, 3	SA
0	0	0	0	1B, F	2 b, n				3	SA
0	0	0	0	1 B	12 b, c, d	8 b, c, d			3	SA
0	0	0	0	1 B	1 a, 3 c				3	SA
0	0	0	0	1 B, G, U	4 a, b, 34 b, c, d	3 b, c, d			3	SA
0	1B	0	0	1B	2 a, c				3	SA
0	0	0	0	1B, U	8 a, c	3 a, c	1 b		3	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1 G	1 e, 1 f				2, 3	SA
0	0	0	0	0						SA
0	0	0	0	0						SA, 6775±55 (Ua-3635)
0	0	0	0	0						SA
0	1F	0	0	1B			1 d			SA
0	0	0	0	1B	6 c, d				2, 4	SA
0	0	0	0	0						SA
0	0	0	0	1B, U	36 b, c	4 b, c			1, 2, 3, 4	SA
0	0	0	0	1B	1 b				1	SA
0	0	0	0	1B, G, F	5 c, g, 1 h	1 c	6 c, 1 h, 1 n		2, 3	SA
0	0	0	0	0						SA
0	0	0	0	0						BA or IA?
0	0	0	0	0						SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
49	indet	infans I, 0–7	multiple	heavily disturbed	SW	supine?	1	0	0
50	F	adulta	multiple	heavily disturbed	SW	supine	1	0	0
51	indet	infans	multiple	heavily disturbed	NE	supine?	1	0	1
52	indet	infans I, 0–7	single	partly disturbed	SW	supine	1	1	0
53	indet	adultus	single	partly disturbed	S	supine	1	0	0
54	indet	infans I, 0–7	single	partly disturbed	NW	supine	0	0	0
55	indet	infans	single	heavily disturbed	N	supine	1	0	1
56	M	adultus	single	partly disturbed	SE	supine	0	0	1
57	F	adulta	single	complete	NW	supine	1	1	1
58	M	juvenis, 14–19	single	complete	W	supine	0	0	0
59	indet	infans	single	heavily disturbed	? (N-S)	?	0	1	0
60	M?	adult	single	complete	W	supine	0	0	1
61	indet	infans II, 7–14	single	heavily disturbed	E	on right side extended	0	0	0
62	indet	infans II, 7–14	single	partly disturbed	N	supine	1	0	1
63	M	adult/ maturus	single	complete	ENE	prone	1	0	0
64	M	adultus	single	partly disturbed	W	supine	0	1	0
65	M	adultus	single	partly disturbed	SW	supine	1	0	0
66	indet	adult	single	heavily disturbed	NE	supine	1	0	0
67	indet	infans I, 0–7	single	complete	W	supine	1	1	1
68	indet	infans	single	heavily disturbed	S	supine	1	1	1
69	indet	infans I, 0–7	single	heavily disturbed	SWS	supine	1	1	1
70	M	adultus/ maturus	single	partly disturbed	NE	prone	0	1	0
71	F	adulta	single	heavily disturbed	E	supine?	1	0	0
72	M	maturus, 40–60	single	partly disturbed	NE	crouched on right side	0	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1G	0	0	1G	2 d				3	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1F	0	0	1B		1 b				SA
0	1U (F)	0	0	1U (F)		1 n				SA
0	1B, G	0	0	1B, G	24 a, b, c, j, k, l	25c, e, k, l	2 c, d		1, 2, 4	SA, 6825±60 (Ua-3636)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1F	1 b		1 n	2n	3	SA
0	0	0		0						SA
0	0	0	0	1 B, G, F	36 c, d, l,	3 c	2 c, d	9 i, k	1, 2, 3	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1B	0	0	1G			1j		3	SA
0	0	0	0	1G	1 d				2	SA
0	0	0	0	1B		5d				SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
73	indet	infans I, 0–7	single	partly disturbed	S	supine	1	1	0
74	F	adulta	single	partly disturbed	SW	supine	1	0	1
75	indet	adultus	single	heavily disturbed?	S	?	1	0	1
76	F	adulta	single	complete	SE	supine	1	1	1
77	M	adultus	single	heavily disturbed	NE	supine	0	0	0
78	indet	infans	single	heavily disturbed	SW	supine	1	0	0
79	indet	infans?	single	heavily disturbed	E-W	?	1	0	0
80	indet	infans?	single	heavily disturbed	E-W	?	1	0	0
81	indet	adultus	single	heavily disturbed	E	?	0	0	0
82	indet	adultus	single	heavily disturbed	S	supine	0	0	1
83	indet	infans I, 0–7	single	partly disturbed	SW	supine	1	0	1
84	indet	adultus	single	heavily disturbed	S	supine	0	0	0
85	F	adulta	double	partly disturbed	S	supine	1	0	1
85a	indet	infans I, 0–7	double	partly destroyed	S	supine	1	0	0
86	indet	infans I, 0–7	single	complete	S	supine	1	1	1
87	indet	infans ?	single	heavily disturbed	SE-NW	?	1	0	0
88	indet	infans	single	heavily disturbed	S	supine	0	1	1
89	indet	adultus	single	heavily disturbed	E-W	?	0	0	1
90	indet	adultus	multiple	heavily disturbed	E	prone	0	0	1
91	indet	adultus	multiple	heavily disturbed	S	supine	1	0	0
92	M	adultus	multiple	partly disturbed	N	supine	1	0	1
93	M	adultus	single	complete	SW	supine	1	0	1
94	indet	adultus?	single?	heavily disturbed	N - S	?	1	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	1B, G	33 a, b, n	11 b, n			1, 3	SA, 7165±30 (KIA-51362)
0	0	0	0	1B, U			5 b, c			SA
0	0	0	0	1U	10 c	5 c			1, 2, 4	SA, 6900±75 (Ua-4688)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1B	0	0	0						SA
0	0	0	0	1B	4 a, b	8 b, c	2 b, c	x c	1	SA, 6785±50 (Hela-1210)
0	0	0	0	0						SA
0	1B	0	0	0						SA, 6460±60 (Ua-3637)
0	0	0	0	0						SA
0	0	0	0	1B, G	20 a, b, e	2 a, b			1, 2, 4	SA
0	0	0	0	0						SA
0	0	1G	0	0						BA?
0	0	0	0	1G	1 m	1 m			1	SA, 10200±115 (Ua-19800), 6415±100 (Ua-19803)
0	1B	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1G, U	11 a, b, l	2 b		21 a, b, e, l	2, 4	SA
0	0	0	0	1B, G, F	22 a, b, c, d, k	1l	4 b, d, h, n	5d, k	1, 2, 3, 4	SA, 6840±55 (Hela-1212)
0	0	0	0	0						?

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
95	M	maturus, 40–60	single	partly disturbed	S	supine	1	1	1
96	M	adultus	single	complete	W	supine	1	0	0
97	F	matura, 40–60	single	partly disturbed	NE	supine	1	1	0
98	indet	infans I, 0–7	single	heavily disturbed	SE	supine	1	1	0
99	indet	infans I, 0–7	single	partly disturbed	S	supine	1	1	1
100	indet	infans II, 7–14	single	complete	NE	supine	1	1	1
101	indet	adultus	double	partly disturbed	S	supine	1	1	0
102	M	adultus	double	partly disturbed	S	supine	1	1	0
103	indet	infans	single?	heavily disturbed	N-S	?	1	0	0
104	indet	adultus	single	heavily disturbed	SW	supine	1	1	0
105	F?	infans II, 7–14	single	complete	S	half-seated	0	0	1
106	indet	adultus	single	heavily disturbed	S	supine	0	0	1
107	indet	infans	single?	no skeletal remains	NE-SW	?	1	1	1
108	indet	infans I, 0–7	single	partly disturbed	WSW	supine	1	1	1
109	M	adultus?	single	heavily disturbed	?	?	1	0	0
110	indet	infans	single	partly disturbed	N	supine	1	1	0
111	indet	adultus	single	heavily disturbed	N	supine	1	1	0
112	M	maturus, 40–60	single	complete	E	supine	0	1	0
113	M	maturus, 40–60	single	heavily disturbed	S	supine?	0	0	0
114	M	adultus	single	complete	S	supine	1	1	1
115	M	adultus	single	partly disturbed	S	supine	0	0	1
116	indet	infans	single	heavily disturbed	S	supine	1	0	1
117	indet	infans I, 0–7	single	heavily disturbed	S	supine	1	0	0
118	indet	infans?	single?	heavily disturbed	? (SSW-NNE)	?	1	1	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1G	0	0	1F		1n				SA
0	0	0	0	0						SA
0	1B, G	0	0	0						SA
0	0	0	0	0						SA
0	1G	0	0	0						SA
0	1F	0	0	1B	66 b, c	8 b,c	1b		1, 2, 3, 4	SA, 6492±41 (KIA-51364), 6797±40 (KIA-51363)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	1B, F	0						17th century?
0	1F	0	0	1B,F	1b, 1 m	1 m			1	SA
0	1F	0	0	0						?
0	0	0	0	1B	19 a,b, c, d				1, 2, 3	SA
0	1B	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1G, U	0	0	1B, G	57a, b, c, d, e	25a, b, c, d, e		1d	1, 2, 4	SA
0	0	0	0	1B	17 b, c				2	SA
0	0	0	0	1G, F	10 d, j, m	3 m			1, 2	SA
0	0	0	0	0						SA
0	1F, G	0	0	0						SA?

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
119	indet	infans I (0–7), infans II (7–14)	double?	complete	S	supine	1	1	1
120	M	adultus	single	heavily disturbed	S	supine	0	0	0
121	F	adulta	single	partly disturbed	S	supine	1	0	1
122	M	adultus	double	complete	S	supine	1	1	1
123	indet	infans I, 0–7	double	complete	S	supine	1	1	1
124	M	adultus	single	partly disturbed	SW	supine	1	0	1
125	indet	adultus	single	heavily disturbed	?	?	0	0	1
126	indet	infans I, 0–7	single?	heavily disturbed	NE-SW	?	1	1	1
127	F	adulta	single	complete	SW	supine	1	0	0
128	indet	infans	single	partly disturbed	S	supine	1	0	1
129	indet	adult	single	heavily disturbed	W	?	0	1	0
130	M	adultus	single?	heavily disturbed	E-W	?	1	0	1
131	indet	adultus	single?	heavily disturbed	W?	?	0	1	0
132	M	adultus	double	partly disturbed	SW	supine	1	1	1
132a	indet	infans I	double	partly disturbed	SW	?	1	1	1
133	indet	infans	single	heavily disturbed	E	supine?	0	0	0
134	M	adultus	single	complete	E	supine	0	0	0
135	M	adultus	single	heavily disturbed	W	supine	0	1	0
136	F	adulta	single	heavily disturbed	N	supine	1	0	1
137	M	maturus	double?	heavily disturbed	E	on left side	1	0	1
137a	F	adulta	double?	heavily disturbed	?	?	1	0	1
138	indet	juvenis (14–19), infans II (7–14)	double?	partly disturbed	W	supine	0	0	0
139	indet	adultus	single	heavily disturbed	E	supine	0	1	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1F	0	0	0						SA
0	0	0	0	0						SA?
0	1B, F	0	0	1B, G	77 b, c, d, g, j	5 b, c	3b, d, j	2k, j		SA, 6145±80 (Ua-19883)
0	0	0	0	1B, G	306 a, b, c, d, e, i	26 c, d		1b	1, 2, 3, 4	SA, 6395±75 (OxA-5967)
0	0	0	0	1B, G						SA
0	0	0	0	1B, G	7 a,b, n	1 n			1, 2	SA, 5280±55 (Ua-3639)
0	1M	0	1M	1M	4 n		2		2	SA
0	0	0	0	1M	32 m	22 m				SA
0	0	0	0	0						SA
0	1B, G	0	0	1B, G	76 a, b,c, d, e, f, g, h j, k	17 c, d		14 e, b, l, c,	2, 4	SA
0	0	0	0	0						SA
0	0	0	0	1M	20 m				1	SA
0	0	0	0	0						SA
0	0	0	0	1B, G, F	50 a, b, c, l, g, j, m	27 a, b, c, m		1b, 4m	1, 2	SA
0	0	0	0	0						SA
0	0	0	0	0						BA–IA?
0	0	0	0	0						BA–IA?
0	0	0	0	0						SA?
0	0	0	0	1B	15 b, c, d, m	2 d, m			1, 2	SA
0	0	1M	0	1G, M	2m		2e		2	SA, 4280±60 (Ua-19811)
0	0	0	0	0						?
0	0	0	0	0						SA
0	0	0	0	0						SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
140	F	matura, 40–60	single	complete	S	supine	0	1	0
141	M	maturus, 40–60	single	complete	E	supine	0	1	0
142	M	adultus	single	partly disturbed	E	supine	0	1	1
143	indet	infans	single	heavily disturbed	SW-NE	?	1	1	0
144	indet	adultus	single	heavily disturbed	W	supine	0	0	1
145	indet	adultus	single	heavily disturbed	E	supine?	0	1	0
146	F	adulta	single	complete	E	supine	1	1	1
147	M	adultus	single	partly disturbed	W	supine	1	1	1
148	indet	adultus	single	complete	E	supine	0	1	0
149	F	adulta	double	partly disturbed	S	supine	0	0	0
149a	indet	infans I	double	partly disturbed	S	supine?	0	0	0
150	indet	adultus	single	heavily disturbed	S-N	?	0	1	0
151	indet	infans I, 0–7	single	partly disturbed	S	supine	1	1	1
152	F	adulta	single	heavily disturbed	E	supine	0	0	0
153	M	juvenis, 14–19	single	partly disturbed	W	supine	1	1	1
154	M	maturus, 40–60	single	complete	W	supine	1	1	1
155	M	maturus, 40–60	single	heavily disturbed	N	supine	0	1	0
156	M	maturus, 40–60	double	partly disturbed	E	supine	0	1	0
157	F	matura, 40–60	double	partly disturbed	E	supine	1	1	0
158	M	adultus	single	partly disturbed	E	supine	0	1	1
159	indet	infans II, 7–14	single	partly disturbed	E	supine	0	1	0
160	M	adultus, 30–35	single	complete	E	supine	1	1	1
161	M	adultus	single	partly disturbed	E	supine	0	0	0
162	M	adultus	single	partly disturbed	E	supine	1	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA?
0	0	0	0	0						BA, 2770±65 (Ua-19804)
0	0	0	0	1F, G		4 c, n, k		1k		BA, 2370±65 (Ua-3640)
0	0	0	0	0						SA
0	1B	0	0	1B	2c(m)				1	SA
0	0	0	0	0						SA?
0	0	0	0	1B	26a				2	SA
0	0	0	0	1G, U	2 f, m				2, 3, 4	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B, F	17 a, b, c, d, m				2, 4	SA
0	0	0	0	0						SA?
0	1B	0	0	1B	108 a, b, c, d	4 d	1b		2	SA, 5745±65 (OxA-5968)
0	0	0	0	1B				1c		SA, 10610±75 (Hela-1372), 7730±70 (Ua-3644)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B	23 b, m		1b		1, 2	SA
0	0	0	0	0						SA
0	0	0	0	1B	10 a, d				1, 2	SA
0	0	0	0	0						SA
0	0	0	0	1B, U	6 d		1c		2	SA, 5635±65 (Ua-19805)

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
163	M	maturus, 40–60	single	partly disturbed	E	supine	0	1	0
164	M	adultus	single	partly disturbed	E	supine	1	0	1
165	M	adultus	single	complete	SW	supine	1	0	1
166	indet	infans II, 7–14	single	partly disturbed	E	supine	0	1	0
167	M	adultus	double?	heavily disturbed	?	?	0	1	1
167a	F	adulta	double?	heavily disturbed	?	?	0	1	1
168	M	maturus, 40–60	single?	heavily disturbed	?	?	1	0	1
169	indet	juvenis, 14–19	single	heavily disturbed	W?	supine?	0	1	0
170	M	adultus	single	complete	N	supine	1	0	1
171	indet	infans	single	heavily disturbed	NE?	supine?	1	0	0
172	indet	infans	single	heavily disturbed	SW-NE	?	1	0	1
173	M	maturus, 40–60	double	partly disturbed	W	supine with flexed legs to right side	1	0	0
174	indet	infans	double	partly disturbed	W	supine	1	0	0
175	indet	adultus	single	heavily disturbed	W	supine	0	0	0
176	M	adultus/ maturus	double?	partly disturbed	W	supine	0	0	0
176a	M	adultus/ maturus	double?	partly disturbed	W	supine?	0	0	0
177	M	maturus, 40–60	single	complete	SE	prone	0	0	1
178	M	adultus	multiple	complete	E	prone	1	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	1B, G	7 a, b	2 a, b	17 b, c	42 e, f, h		SA, 5770±55 (Hela-1215), 5230±95 (Ua-15544)
0	0	0	0	1B, U	24 a, b			9 a, c,	2	SA, 10690±80 (Hela-1217), 5250±55 (Hela-1216), 5480±100 (Ua-19812)
0	0	0	0	0						SA
0	0	0	0	1F	27 m	3 m	2m	30 m	1, 2, 3	SA
0	0	0	0	0						SA
0	0	0	0	1M	5 m		1 m		2, 4	SA
0	0	0	0	0						SA
0	0	0	0	1B, G	125 a, b, c, d	40 a, b, c, d			1, 4	SA, 10435±75 (Hela-1373), 8150±80 (Ua-19812)
0	0	0	0	0						SA
0	0	0	0	1M			1m			SA
0	0	0	0	0						SA, 5895±65 (Ua-19816)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B, F			1c	1n		SA
0	0	0	0	1B, F	1 a (n)		1 d		1	SA, 6144±45 (UBA-26027), 6185±80 (Ua-19806)

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
179	M	adultus	multiple	complete	E	prone	1	0	1
180	M	maturus, 40–60	multiple	partly disturbed	W	prone	1	0	0
181	M	adultus	multiple	complete	W	prone	1	0	0
182	M	maturus, 40–60	multiple	complete	W	prone	1	0	0
183	M	maturus, 40–60	single	partly disturbed	S	crouched on right side	0	0	0
184	M	maturus, 40–60	double	partly disturbed	ESE	supine	1	0	1
185	M	adultus	double	complete	ESE	supine	1	0	0
186	indet	infans I, 0–7	single	partly disturbed	WSW	supine with flexed legs to right side	0	0	1
187	M	adultus	single	complete	E	supine	1	1	1
188	indet	infans	single	heavily disturbed	SW	?	1	0	0
189	indet	infans	single	heavily disturbed	NNE	supine	1	1	1
190	indet	infans	single	heavily disturbed	NNE	supine?	1	0	1
191	M	maturus, 40–60	single	partly disturbed	W	supine	0	0	1
192	M	maturus, 40–60	single	partly disturbed	SE	supine	0	1	1
193	F	adulta	single	heavily disturbed	W	supine	0	0	0
194	indet	infans	single	heavily disturbed	E	supine	0	0	1
195	M	adultus	single	partly disturbed	W	supine	0	0	1
196	indet	infans I, 0–7	single	partly disturbed	E	supine	0	0	0
197	M	maturus, 40–60	single	partly disturbed	NE	supine with flexed legs to right side	0	0	0
198	F	matura, 40–60	single	heavily disturbed	?	?	0	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1B	0	0	0						SA, 5838±44 (UBA-26028), 5895±50 (Ua-19807)
0	0	0	0	0						SA, 5968±44 (UBA-26029)
0	0	0	0	0						SA, 5937±46 (UBA-26030)
0	0	0	0	0						SA, 6107±47 (UBA-26031), 6005±75 (OxA-5970)
0	0	0	0	0						SA
0	0	0	0	1B	5a				1, 2	SA
0	0	0	0	0						SA, 5230±65 (Ua-3641)
0	1F	0	0	1B, G			3 b, k			SA, 4190±90 (Ua-15545)
0	1F	0	0	1B, F		1a	1a(n)			SA
0	0	0	0	0						SA
0	0	0	0	1B	50 b, c, d				2	SA
0	0	0	0	1B, G	190 a, b, c, d, g, h, i, j, k	18 b, c, d, j, i	11 i, j, h,	3l, 1c	1, 2, 3	SA
0	1F	0	0	0						SA
0	1G	0	0	0						SA
0	0	0	0	0						SA
1B	1B	0	0	0						SA
1M	0	1M	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA, 6410±95 (Ua-19808)
0	0	0	0	1M	1 m	1 m				SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
199	F	matura, 40–60	single	partly disturbed	ENE	prone	0	0	1
200	M	adultus	single	partly disturbed	ENE	supine	0	0	1
201	indet	infans II, 7–14	single	heavily disturbed	W-E	supine?	1	0	1
202	M?	adultus	single	partly disturbed	N	crouched on left side	0	0	0
203	M	adultus	single	partly disturbed	SSW	crouched on right side	0	0	0
204	M	maturus, 40–60	single	partly disturbed	SW	supine	0	0	1
205	indet	adultus	single	heavily disturbed	S	supine	0	0	1
206	indet	infans II, 7–14	multiple	partly disturbed	W	supine	0	0	1
207	indet	infans II, 7–14	multiple	partly disturbed	E	prone	1	0	1
208	M	adultus	multiple	partly disturbed	W	on right side extended	1	0	1
209	M	adultus	multiple	partly disturbed	W	on left side	1	0	1
210	M	maturus, 40–60	single	heavily disturbed	W	?	0	0	0
211	F	juvenis, 14–19	single	heavily disturbed	?	?	0	0	1
212	M	adultus	single	complete	NE	supine	0	0	1
213	M	adultus	single	partly disturbed	SW	supine	0	0	1
214	F	adulta	single	heavily disturbed	NE	?	0	0	0
215	indet	adultus	single	heavily disturbed	NE	supine?	0	0	0
216	indet	adultus	single	heavily disturbed	W	supine	0	0	0
217	M	adultus	single	partly disturbed	NE	supine	0	0	1
218	indet	infans I, 0–7	single	partly disturbed	E	supine	0	0	0
219	indet	infans	single	heavily destroyed	N	supine	1	0	1
220	M	adultus	multiple	complete	SE	supine	0	0	1
221	F	adult	multiple	partly disturbed	SE	supine	1	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1F	1U	0	1F		1n				SA, 4825±85 (Ua-15546)
0	1F	0	0	0						SA
1B	1B	0	0	1B, F		1b	7d, n	1d		SA, 4865±75 (Ua-19884)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1B	0	0	0						SA
0	0	0	0	1B	23 d				2	SA
1B	0	0	0	0						SA, 5285±50 (Ua-3643)
1B, D	1B, D, U	0	0	1B, U, D		2 o	2 b, f, 14 o			SA
0	1B	1B	0	1B, G, U			9 c, d, g			SA, 4850±60, 5345±60 (Ua-19815)
0	0	0	0	0						SA
0	0	0	0	0						SA, 5660±45 (OxA-5985)
0	1F	0	0	1M, D		4 m, 1 o	4 o			SA
1B	0	0	0	0						SA
0	1B	0	0	1G		1f				SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1F				1n		SA
0	0	0	0	0						SA
0	0	0	0	1B, G	4a	1a			1	SA
1B	0	0	0	0						SA
1B	1B	1B	0	1B			7 c, d, h			SA, 5180±65(Ua-19813)

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
222	F	matura, 40–60	multiple	complete	SE	supine	1	0	0
223	indet	adultus	multiple	heavily disturbed	SE	supine	1	0	1
224	indet	infans I, 0–7	multiple	heavily disturbed	NW	?	1	0	0
225	indet	maturus	multiple	partly disturbed	NW	on right side extended	1	0	1
226	indet	infans I, 0–7	single	partly disturbed	SE	supine	1	0	1
227	M	maturus, 40–60	single	heavily disturbed	?	?	0	0	1
228	M	maturus, 40–60	single	complete	E	supine	0	0	1
229	F	adulta	single	partly disturbed	NE	supine	0	0	0
230	F	adulta	single	partly disturbed	S	supine	0	0	0
231	M	adult/ maturus	single	partly disturbed	NE	supine	1	0	1
232	M	adultus	single	partly disturbed	SSE	supine	0	0	0
233	F	adulta	single	partly disturbed	SE	supine	0	0	1
234	M	adultus	single	complete	SE	supine	0	0	0
235	M	adultus	single	partly disturbed	NE	supine	0	0	0
236	indet	adult	double	partly disturbed	E	supine	1	0	1
237	indet	infans I, 0–7	double	heavily disturbed	ENE	supine?	0	0	0
238	indet	adultus	single	heavily disturbed	E	supine	0	0	0
239	M	adultus	single	partly disturbed	SE	supine	0	0	0
240	M?	adultus	single	partly disturbed	W	supine	0	0	0
241	M	maturus, 40–60	single	partly disturbed	NNW	supine	0	0	0
242	M	maturus, 40–60	multiple	partly disturbed	SSE	supine	0	0	1
242a	indet	infans	multiple	heavily disturbed	?	?	0	0	0
243	F	adulta	multiple	complete	SSE	?	1	0	1
244	M	adultus	multiple	heavily disturbed	SSE	supine	1	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
1B	1B, U	0	0	1B			1i			SA
0	0	0	0	0						SA
1B	0	0	0	1B			3b, c			SA, 5110±45 (OxA-5986)
0	0	0	0	1B	78 b, c	1 b			2	SA, 5345±60 (Ua-19814)
0	1M	1M	0	1M			1m			SA
1B	1B	0	0	1B			3a			SA, 5090±55 (Ua-19809)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1U			1		3	SA
0	0	0	0	0						SA
0	1G	0	0	1B, U	9 c, d			1		SA
0	0	0	0	0						SA
0	0	0	0	0						SA
1B	1B	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1B	0	0	0						SA
0	0	0	0	0						SA
0	1B	0	0	0						SA
0	1B	0	0	1B	1 d	2a, c				SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
245	indet	infans	multiple	heavily disturbed	NNW	?	1	0	0
246	F	adulta	single	heavily disturbed	SW	supine	0	1	0
247	indet	adultus	single	partly disturbed	NW	supine	0	0	0
248	F	adulta	single	partly disturbed	WNW	supine	0	0	0
249	indet	adultus	single	partly disturbed	W	supine	0	0	0
250	M	maturus, 40–60	single	partly disturbed	NW	supine	0	0	0
251	M	adultus	single	partly disturbed	S	supine	0	0	0
252	M	maturus, 40–60	double?	complete	E	supine	0	0	1
252a	M	maturus	double?	?	E	supine	0	0	0
253	indet	infans I, 0–7	single	partly disturbed	ENE	supine	0	0	0
254	M	adultus	double	partly disturbed	E	supine	1	0	1
255	F	matura, 40–60	double	complete	E	supine	1	0	0
256	F	adulta	single	partly disturbed	E	supine	1	1	1
257	indet	infans	single	heavily disturbed	?	?	0	0	1
258	M	adultus	multiple	complete	W	supine	0	0	0
259	indet	adultus	multiple	partly disturbed	W	supine	0	0	1
260	indet	infans II, 7–14	multiple	complete	W	supine	0	0	1
261	indet	infans I, 0–7	multiple	heavily disturbed	E	on left side	0	0	0
262	M	adultus	single	partly disturbed	NNE	supine	1	0	0
263	M	maturus, 40–60	multiple	complete	NE	prone	1	0	1
264	M	maturus, 40–60	multiple	partly disturbed	SW	supine	1	0	1
264a	indet	infans I, 0–7	multiple	heavily disturbed	NW	on left side	1	0	0
265	indet	adultus	single	partly disturbed	SE	supine	0	0	0
266	M	maturus, 40–60	single	partly disturbed	E	supine	0	0	0
267	F?	adulta	single	partly disturbed	SE	supine	0	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA, 6195±60 (OxA-5987)
0	1D, U	1U	0	1D, U		1 n, 2 o	2 n, 1 o			SA, 5410±90 (OxA-5988)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1F	2 n				1	SA
0	0	0	0	0						SA
1U	0	0	0	0						SA, 4480±45, 5320±45
0	1M	0	0	1M	2 m	5m	3m		1	SA
0	0	0	0	0						SA
0	0	0	0	1B			1d			SA
0	0	0	0	1B			1a			SA
0	0	0	0	0						SA
0	0	0	0	0						SA
1U	1G	0	0	1U			1b			SA
1B	1B, G	0	0	1B, G, U			1c, 1j, 1b, 1l			SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1F	2 n		1n			SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
268	M?	adultus	single	heavily disturbed	E	prone	0	0	0
269	M	adultus	double	partly disturbed	E	supine	0	0	1
269a	indet	adultus	double	heavily disturbed	?	?	0	0	0
270	indet	infans	single	heavily disturbed	N	?	0	0	0
271	M	adultus	double	partly disturbed	SSE	supine	1	0	1
271a	indet	infans	double	partly disturbed	SE	?	0	0	0
272	indet	infans	single	heavily disturbed	NE	supine	1	0	1
273	F	adulta	single	partly disturbed	SE	supine	0	1	0
274	F	juvenis, 14–19	multiple	heavily disturbed	W	supine	1	0	0
275	M	adultus	multiple	partly disturbed	E	supine	1	0	1
276	M	maturus, 40–60	multiple	partly disturbed	E	supine	1	0	1
277	M+ infant	adult+infans	multiple	partly disturbed	W	supine	1	0	1
278	indet	infans II, 7–14	multiple	heavily disturbed	W	?	1	0	0
279	M	adultus	double	partly disturbed	NE	supine	0	0	0
280	indet	infans I, 0–7	double	heavily disturbed	NE	supine	0	0	0
281	M	adultus	double	partly disturbed	SSE	supine	1	0	0
281a	indet	infans	double	partly disturbed	?	?	1	0	0
282	F	adulta	multiple	partly disturbed	E	supine	0	0	1
283	indet	infans I, 0–7	multiple	heavily disturbed	W	?	0	0	0
284	F	adulta	multiple	heavily disturbed	W	supine	0	0	1
285	M?	adultus	double	heavily disturbed	NE	supine	0	0	0
286	F	juvenis/ adulta	double	partly disturbed	NE	supine	0	0	0
287	F	matura, 40–60	double	partly disturbed	NW	prone	0	0	1
287a	indet	infans	double	partly disturbed	SE	supine	0	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	1B, F	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B			1c			SA, 5225±36 (KIA-51365)
0	0	0	0	0						SA
0	0	0	0	1B			1d			SA
0	0	0	0	0						SA
0	0	0	0	0						SA
1B	1B	0	0	0						SA
0	1B	0	0	0						SA
1B	1B	0	1B	1B, G	5 c		2 d			SA, 5545±65 (Ua-19810)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1B	0	0	1B			2c			SA, 5100±65 (Ua-3645)
0	0	0	0	0						SA
0	0	0	0	1F			2n			SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B			1b			SA
0	0	0	0	0						SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
288	M	maturus, 40–60	single	partly disturbed	W	supine	0	0	0
289	M	maturus, 40–60	double	partly disturbed	ENE	supine	0	0	0
290	indet	juvenis, 14–19	double	heavily disturbed	SE	supine	1	0	1
291	indet	infans II, 7–14	single	heavily disturbed	?	?	0	0	0
292	M	adultus	double	partly disturbed	SE	supine	0	0	0
293	indet	juvenis, 14–19	double	partly disturbed	SE	supine	0	0	0
294	F	matura, 40–60	single	heavily disturbed	WNW	supine	0	0	1
295	indet	infans	single	heavily disturbed	SW?	?	1	0	0
296	F?	juvenis/ adulta	single	heavily disturbed	W	supine	0	0	0
297	M	maturus, 40–60	single	partly excavated	W	supine	0	0	0
298	M	adultus	single	partly excavated	NW	prone	1	0	0
299	indet	adultus	single	partly excavated	SSE	supine	0	0	1
300	M	adultus	single	complete	W	supine	1	0	1
301	F	adulta	double	heavily disturbed	SE	supine?	0	0	0
302	indet	infans II, 7–14	double	heavily disturbed	NW	supine?	0	0	0
303	F?	matura, 40–60	double	complete	SW	crouched prone	0	0	0
304	F	adulta	double	partly disturbed	S	supine	0	0	0
305	M	adultus	single	partly disturbed	NE	supine	1	0	1
306	indet	senilis	single	partly disturbed	NW	supine	0	0	0
307	indet	juvenis, 14–19	single	partly disturbed	NE	crouched dorsal with legs to right	0	0	0
308	F	adulta	single	complete	N	crouched on left side	0	0	0
309	indet	adultus	single	heavily disturbed	N	?	0	0	0
310	indet	adultus	single	heavily disturbed	E	supine?	0	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B	37 h, d, i				2	SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B			1b			SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1G	1 n		1 i		2	SA
0	0	0	0	1B	56 a		3a, 1b		2	SA, 5690±45 (Ua-3642)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1B			1 c	1 c		SA, 8240±70 (Ua-3634)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA, 5150±60 (LuS-6437)

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
311	indet	adultus	single	heavily disturbed	W	supine	0	0	0
312a	indet	adultus	multiple	partly disturbed	SSW	supine	0	0	0
312b	indet	adultus	multiple	partly disturbed	SSW	supine	0	0	0
312c	indet	adultus	multiple	partly disturbed	SSW	supine	0	0	0
312d	indet	infans	multiple	partly disturbed	?	?	0	0	0
313	F	adulta, 33–37	single	complete	S	supine	0	0	0
314	F	adulta, 35+	single	heavily disturbed	N	supine	0	0	0
315	indet	indet	single	heavily disturbed	W	supine	0	0	0
316	F	adulta, 36–40	double	complete	E	supine	1	1	1
317	M	adultus, 25-30	double	complete	E	supine	1	1	1
318	indet	indet	single	heavily disturbed	?	?	0	0	0
319	indet	infans I, 5±18	double	complete	W	on left side	1	0	1
320	indet	infans I, 2–3	double	complete	W	supine	1	0	1
321	indet	juvenis, 16–17	single	heavily disturbed	W	prone?	0	0	0
322	F	adulta, 25–40	single	partly disturbed	S-N	supine	0	0	0
323	indet	infans I, 4±12	double	complete	SE	on left side	0	0	0
324a	indet	infans I, neonatus	double?	heavily disturbed	?	?	0	0	0
324b	indet	infans I, 2–3	double?	heavily disturbed	?	indet	0	0	0
325	M	adultus, 30–35	double	partly disturbed	SE	supine	0	0	1
326	indet	indet	single	heavily disturbed	W	supine?	0	0	0
327	indet	indet	single	heavily disturbed	W	?	0	0	0
328	M	adultus, 20–25	single	heavily disturbed	W	on right side?	0	0	0
329	indet	adultus	single	heavily disturbed	W	supine?	0	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA
0	0	0	0	0						SA, 6160±50 (Lu-6834)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA, 7525±60 (LuS-8220)
0	0	0	0	0						SA
0	0	0	0	0						SA
1B	0	0	1B	1B	1d				3	SA, 5285±55 (LuS-8217)
1B	1B	0	0	1B			158 a, b, d			SA, 5105±50 (LuS-8216), 4865±60 (LuS-7852)
0	0	0	0	0						SA
0	0	0	0	1B	8 a, d, n				1, 2, 3	SA, 7635±65 (Ua-36994)
0	1B	0	0	1B	11 d				1, 2	SA, 7620±65 (Ua-36995)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	0						SA
0	1B	1B	0	0						SA, 5230±50 (LuS-8833)
0	0	0	0	0						SA
0	0	0	0	0						SA
0	0	0	0	1F	1n					SA
0	0	0	0	0						SA

Grave no	Sex	Age	Burial type	Intergrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
330	indet	adultus	single	partly excavated	SW	supine?	0	0	0

Table 2: Skateholm I

Grave no	Sex	Age	Burial type	Integrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
1	M	maturus	single	partly disturbed	SSW-NNE	crouched on left side	1	0	1
2	M	maturus, ca. 60	single	partly disturbed	ESE-WNW	half-sitting	1	0	0
3	F	juvenis/ adultus, 19–20	single	complete?	NE-SW	sitting	1	0	1
4	F	adultus, 40–50	single	complete?		half-crouched on left side	0	0	1
5	M	adultus, 19–29	single	complete?	E-W	half-sitting	1	0	1
6	F+indet	adulta (35–40), neonatus	double	complete?	ENE-SSW	sitting	1	0	1
7	M	adultus, 30–40	single	complete	W	supine with crouched legs to right	0	0	1
8		infans, 4–5	?	?	?	?	0	0	1
9	dog	fully grown	single	complete	S	left side	1	0	1
10	dog	adult	single	heavily disturbed	WNW-ESE	?	1	0	0
11	indet	adultus, 40–50	cremation	heavily disturbed	?	?	0	0	1
12	F	juvenis/ adultus, 19–21	single	partly disturbed	NNW	supine	1	0	1
13	M	adultus, 30–40	single	heavily disturbed	E-W	supine	1	0	1
14	M+F	adultus (45–55), juvenis (17–19)	double	partly disturbed	N-S	supine and right side	0	0	0
15	dog	fully grown	single	partly disturbed	ESE-WNW	on right side	0	0	0
16	M	adultus	single	heavily disturbed	N-S	sitting?	1	0	1
17	dog	fully grown	single	partly disturbed	NW-SE	on left side	0	0	0
18	dog	fully grown	single	heavily disturbed	SSW-NNE	on right side	1	0	0
19	dog	?	single	heavily disturbed	SW-NE	?	0	0	0
20	indet	?	cremation	heavily disturbed	E-W	?	0	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	0						SA

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1B	0	0	0						
0	0	0	0	0						
0	0	0	0	1B				1b		
0	1B	0	0	1B				Xb		6240±55 (Lu-1834)
0	0	0	0	1B			1d			6400±55 (LuS-15153)
0	0	0	0	1B	32 b, c	1c		Xc	1	5980±40 (LuS-15157)
0	1G	0	0	1G			1b, 1d	1b, Xd		6200±70 (Ua-19882)
0	0	0	0	1B				1a?		
0	1B	0	0	0						6220±100 (Lu-1888)
0	0	0	0	0						
0	0	0	0	1G			1			
1B	0	0	0	1B			1d	Xc,d		
	1B	0	0	0						6225±50 (LuS-15149)
0	0	0	1B	0						
0	0	0	0							
0	1B	0	0	1B	3 d	29 d			1	6205±50 (LuS-15151)
0	0	0	0	0						
0	0	0	0	1B				X		
0	0	0	0	0						
0	0	0	0	0						

Grave no	Sex	Age	Burial type	Integrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
21	F	adulta	single	heavily disturbed	E-W	supine	1	0	1
22	M	maturus, >60	single	heavily disturbed	NNW-SSE	supine	1	0	1
23	dog	fully grown	single	complete	NNW	on left side	1	0	0
24	F	maturus, >50	single	complete?	E-W	crouched on left side	1	0	0
25	F	adulta, 30–40	single	partly disturbed	NNW-SSE	sitting	1	0	0
26	F	adulta, 35–45	single	partly disturbed	N-S	crouched on left side	1	0	0
27	M	adultus, 35–45	single	heavily disturbed	E	supine	1	0	1
28	M	maturus, >50	single	partly disturbed	E-W	supine	1	0	1
29	indet	?	single	heavily disturbed	E-W	crouched on left side	0	0	0
30	indet	?	single	heavily disturbed	W	supine	1	0	0
31	indet	juvenis?	single	heavily disturbed	E-W	supine	0	0	1
32	M?	adultus	single	heavily disturbed	NE-SW	sitting	1	0	1
33	M?	maturus, 55–60	single	complete	E-W	prone	1	0	0
34	indet	adultus, 35–45	single	heavily disturbed	WNW-ESE	supine	0	0	1
35	F	adultus, 30–40	single	partly disturbed	NE-SW	crouched on right side	0	0	0
36	indet	adultus, 30–40	single	heavily disturbed	WNW-ESE	supine	1	0	0
37	F	adulta, 40–50	single	partly disturbed	WNW-ESE	supine	1	0	1
38	M	adultus, >20	single	partly disturbed	NNW-SSE	supine	1	0	1
39	indet	indet, 45–55	single	heavily disturbed	NW-SE	sitting?	1	0	0
40	F	indet, 40–45	single	partly disturbed		crouched on right side	1	0	1
41	M+indet	adultus (55–65), infans (4–5)	double	complete		crouched on right side	1	0	1
42	indet	infans, 2–3	single	heavily disturbed	NW-SE	?	1	0	0
43	F	adulta, 45–55	single	partly disturbed	NE-SW	supine	1	1	0
44	indet	adultus, 60+	single	heavily disturbed	NE-SW	crouched on left side	0	0	1

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	0	0	0	1B, U		11a, 7c				
0	1G	0	0	1B, G			1b	1a, Xa, b		
0	0	0	0	0						
0	0	0	0	1B, G				Xb		6255±40 (Ua-36424)
0	0	0	0	1B				Xb		
0	0	0	0	0						5930±125 (Lu-1886), 5990±70 (Lu-2116)
0	1B	0	0	1B			3a	Xd		
0	0	0	0	1G			3l	1n		
0	0	0	0	0						
0	0	0	0	0						
0	1B	0	0	0		0		0		
0	1B	0	0	0						
0	1B	0	0	1B, G, F				2b, Xb, n		
0	1B	0	0	1B			2a,b			
0	0	0	0	1B, G				Xd, n		
0	0	0	0	0						6095±50 (LuS-15152)
0	1B	0	0	1G				Xl		6270±70 (Lu-2109)
0	0	0	0	0						6025±40 (LuS-15156)
0	0	0	0	0						
0	0	0	0	1B		12b				
1B	1B	0	0	1B	2b		1c	Xn	1	
0	0	0	0	0						
0	0	0	0	1G				Xc		6180±70 (Lu-2347)
0	1B	0	1G	0						

Grave no	Sex	Age	Burial type	Integrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
45	indet	adultus, 25-30	single	heavily disturbed		crouched on right side	1	0	0
46	M (+iyn-det+dog?)	A 50+ (+infans+young dog?)	double	heavily disturbed	NNW-SSE	crouched on left side	1	0	1
47	in-det+in-det	juvenis +infans <1	double	partly disturbed	N-S	supine+supine?	1	0	1
48	indet	indet, >20	single	heavily disturbed	NE-SW	sitting	1	0	1
49	indet	indet, 50–60	single	heavily disturbed	N-S	supine	1	0	1
50	indet	indet, >20	single	heavily disturbed	NE-SW	crouched on right side?	0	0	0
51	M	adultus, 40–50	single	complete	SW-NE	crouched on left side	1	0	0
52	F?	adulta, 45–50	single	partly disturbed	ESE-WNW	?	0	0	0
53	F	adulta, 18-20	single	complete	E-W	supine	1	0	1
54	indet	indet, >20	single	heavily disturbed	NE-SW	sitting	1	0	0
55	indet	indet, >20	single	heavily disturbed	N-S	supine	1	0	1
56	indet	indet, >20	single	heavily disturbed	NE-SW	?	1	0	1
57	indet	indet, 16–20	single	complete	NW-SE	supine	1	0	1
58	F	adulta, 60+	single	complete	SSW-NNE	crouched on right side	0	0	0
59	indet	indet, 16–20	single?	heavily disturbed	E-W	?	1	0	1
60	indet	indet, >60	single?	heavily disturbed	NW-SE	crouched?	1	0	1
61	indet	indet, 35-45	single?	heavily disturbed	NNE-SSW	supine?	1	0	1
62	in-det+dog	F (>60), dog	double?	heavily disturbed	NNE-SSW	half-sitting?	1	0	1
63	M+M	adultus (35–45), adultus (35–45)	double	heavily disturbed	E-W	crouched+-supine	0	0	0
64	indet	infans	?	?	?	?	0	0	0
65	dog	puppy	single?	heavily disturbed	N-S	crouched on right side?	1	0	0

Amber	Lithics	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bones	Tooth modification	Chronology/ C14
0	1B	0	0	1B		1c				6095±55 (LuS-15155)
1B	0	0	0	1B	2 m	25 a, b, m		Xm, n		6500±47 (UBA-35604)
0	1B, G	0	0	1B	3b, c			5 c, i, Xn		6075±50 (Ua-36423)
0	1B	0	0	1D				13, X		
0	1B	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	1B, G, U	65 b, c, d, k					6250±60 (Ua-17098)
0	0	0	0	0						
0	1B	0	0	0						
0	1G	0	0	0						
0	1B	0	0	0						
0	0	0	0	0						
0	1G	0	0	1G, D		28		1o, Xo		
0	1B	0	0	0						
0	1G	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						

Table 3: Skateholm II

Grave no	Sex	Age	Burial type	Integrity	Orientation (head in)	Body position	Ochre	Stones in grave construction	Grave inventory
I	indet	infans II, ca10	single	partly disturbed	NNE	supine	1	0	1
II	M	adultus, 25–30	single	complete	NNE-SSW	sitting	1	0	1
III	F	adultus, 25–30	single	partly disturbed	E-W	supine	1	0	0
IV	M	adultus, 35–45	single	partly disturbed	NNE-SSW	supine	1	0	1
V	F?	adulta?	single	complete	ENE-WSW	supine	0	1	1
VI	F	adulta?	single	partly disturbed	WNW-ESE	supine	1	0	1
VII	M	indet	single	heavily disturbed	NE-SW	supine	1	0	0
VIII	F+dog	adulta?	single?	partly disturbed	WNW-ESE	sitting+on right side	1	0	1
IX	F	adulta	single	complete	N-S	supine	1	0	1
X	M+M+dog	adultuts (30–35), adultus (25–30)	double	complete	ENE-WSW	supine+sitting	1	0	1
XI	M	indet	single	partly disturbed	N-S	supine	1	0	1
XII	indet+indet	infans+infans	double	complete	?	half-sitting	1	0	1
XIII	indet	infans	single	heavily disturbed	NW-SE	supine	1	0	1
XIV	F	adulta, 50–60	single	heavily disturbed	?	supine with flexed legs	1	0	1
XV	M+dog	adultus, 19–20	single	heavily disturbed	NE-SW	sitting	1	0	1
XVI	F	adultus, 45–55	single	partly disturbed	NNE-SSW	supine	0	1	1
XVII	M	adultus, 30–35	single	partly disturbed	WNW-ESE	supine	1	0	1
XVIII	M	adultus, 60+	single?	cremation	NNE-SSW	cremation	0	1	1
XIX	indet+dog	indet	double?	heavily disturbed	N-S	indet+on right side	0	0	1
XX	F	indet, 18–20	single	partly disturbed	NNW-SSE	supine	1	0	1
XXI	dog		single	partly disturbed	E-W	on left side	1	0	1
XXII	F	indet, 30–40	single	partly disturbed	NW-SE	sitting	1	1	1

Amber	Lithics	Other	Bone	Mod-ified tooth	Unmod-ified tooth	Modified bone	Unmodified bones	Tooth mod-ification	Chronology/ C14
0	1B	0	0						
0	1B	0	1B			1a	Xb		6300±100 (Lu-2478)
0	0	0	0						
0	1B, D	0	1B, D			3 b, o, n	Xo		
0	1B	0	0		0		0		
0	0	1B	0						
0	0	0							
0	0	0	1B, D	116c				1	
0	1B, G	0	1B, G		5	1d, 2	11, Xb, k, n?		5460±110 (Lu-2443), 6290±140 (Ua-156), 6285±45 (CAMS-85214)
0	1B	1B	1B	30 a, b, c, d	25	4 (1a, 2 k, 1 c)	23, X	1	5660±100 (Lu-2445), 6430±140 (Ua-155)
0	1B	0	1B				15c, d, ns		
0	1B	0	1B			3			
0	1B, G	0	1B		1		8, X		
0	1B	0	0						
0	1B		1B, G, U	16a, 16b		1b, 1i,	1 i, 2l,	1	5900±140 (Lu-2444), 6090±180 (Ua-80)
0	1B	0	1B?	28d		1		1	
0	1B	0	1B				2b		
0	1G	0	0						6822±112 (Ua-39762)
0	1B, G	0	0						
0	0	0	1B, G	8a,e, l 47c				1	6200±50 (LuS-15150)
0	1B	0	1B, G			1	1		6050±50(LuS-15154)
0	1B	0	1B, G	141	7	1c	3c, 2h, i,	1	

Table 4: Sakhtysh II

Grave no	Sex	Age	Burial type	Integrity	Orientation (head in)	Body position	Ochre	Stones	Inventory
1	indet	infans, 9–12	Single	partly disturbed	SW	supine	0	0	1
2	indet	infans, 9–12	Single	heavily disturbed	N	disturbed	0	0	0
3	indet	adultus	Single	heavily disturbed	SW	supine	1	0	0
4a	F	juvenis, 16–18	Multiple	complete	NE	prone	0	0	1
4b	M	adultus, 18–20	Multiple	partly disturbed	NE	supine	0	0	0
4v	M	adultus, 30–40	Multiple	partly disturbed	SW	supine	0	0	0
4g	M	adultus, 20–30	Multiple	partly disturbed	NE	prone	0	0	1
5	F	adultua, 25–30	Single	partly disturbed	SW	supine	0	0	0
6	indet	adultus	Single	partly disturbed	SE	supine	0	0	1
7	indet	?	Single	heavily disturbed	?	disturbed	0	0	1
8	indet	?	Single	heavily disturbed	?	disturbed	0	0	0
9	indet	adultus	Single	heavily disturbed	ESE	crouched on left side	0	1	1
10	indet	adultus	Single	partly disturbed	NE	prone	0	0	1
11	F(?)	adulta	Single	partly disturbed	NE	supine	0	0	0
12a	M	adultus, 30–35	Multiple	partly disturbed	SSE	crouched on right side	1	0	1
12b	F	adulta, 25–30	Multiple	complete	NNW	crouched on right side	1	0	1
12v	indet	infans, 5–7	Multiple	heavily disturbed	NNW	supine? disturbed	1	0	1
12g	indet	juvenis	Multiple	heavily disturbed	NNW	supine? disturbed	1	0	1
13	indet	juvenis	Single		SSW	supine	0	0	0
14	indet	?	Single	heavily disturbed	?	disturbed	0	0	0
15 I	F	adulta	Multiple	partly disturbed	SW	supine	0	0	1
15 II	?	infans, 7–10	Multiple	partly disturbed	SW	supine	0	0	1
15 III	F	adulta	Multiple	partly disturbed	SW	supine	0	0	1
15 IV	M	adultus	Multiple	partly disturbed	NE	supine	0	0	1
15 V	F	adulta	Multiple	partly disturbed	NE	supine	0	0	1
15 VI	F	adulta	Multiple	partly disturbed	NE	supine	0	0	0
15 VII	F	adulta, 20–25	Multiple	complete	SW	supine	0	0	0
15 VIII	?	infans, 7–10	Multiple		SW	supine	0	0	0

Amber	Stone	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bone	Tooth modification	Chronology/C14
0	1B	1B	0	1B			12b			V
0	0	0	0	0						V
0	0	0	0	0						V
0	1B	0	0	1B			1b			V
0	0	0	0	0						V
0	0	0	0	0						V
0	1B	0	0	0						V
0	0	0	0	1B			1b			V
0	0	0	0	1B	1c				1	V
0	0	0	1	1G						V
0	0	0	0	0						V
0	1B	1B	0	1B	2 b, d				3	V
0	1B	0	0	1B			3a, b, d			V
0	0	0	0	0						L
0	0	0	0	1B			213u			V, 5170±40 (UBA-34097), 5164±38 (UBA-40193)
0	0	0	0	1			215c			V
1	0	0	0	1B			1			V
1	0	0	0	0						V
0	0	0	0	0						V
0	0	0	0	0						V
1B	1B	0	0	1B	4b, d		1a		1	V, 2000±150 (GIN-5237)
1B	1B	0	0	1B	14				1	V
1B	0	0	0	1B	9				1	V
1B	0	0	0	0						V
1B	1B	0	0	0						V
0	0	0	0	0						V
0	0	0	0	1G				1e		V
0	0	0	0	0						V

Grave no	Sex	Age	Burial type	Integrity	Orientation (head in)	Body position	Ochre	Stones	Inventory
15 IX	F	adulta	Multiple		NE	supine	0	0	0
15 X	M	adultus	Multiple		SE	supine	0	0	0
15 XI	M	adultus	Multiple	partly disturbed	NNE	on left side	0	0	0
15 XII	F	adulta	Multiple		SW	supine	0	0	0
15 XIII	indet	infans, 5–7	Multiple		SW	supine	0	0	1
15 XIV	indet	?	Multiple	heavily disturbed	NE(?)	disturbed	0	0	0
15 XV	indet	?	Multiple	heavily disturbed	NE(?)	disturbed	0	0	0
15 XVI	indet	infans, 5–7	Multiple	heavily disturbed	?	disturbed	0	0	0
15 XVII	indet	adultus	Multiple	heavily disturbed	SW(?)	disturbed	0	0	0
15 XVIII	indet	adultus	Multiple	heavily disturbed	?	disturbed	0	0	0
16	F	adulta	Single	partly disturbed	E(?)	supine	0	0	1
17	M	adultus	Single	partly disturbed	WS	prone	0	0	0
18	F(?)	adulta	Single	heavily disturbed	NW	prone	0	0	1
19	M	adultus, 20–25	Single	partly disturbed	SW	supine	0	0	0
20	F	adultus, 20–25	Single	complete	SE	supine	1	0	0
21	indet	infans, 1–3	Single	partly disturbed	NE	supine	1	0	0
22	indet	adultus	Single		NE	supine	0	0	0
23	indet	adultus	Single	complete	?	just scull	0	0	0

Table 5: Sakhtysh IIa

Grave no	Sex	Age	Burial type	Intergity	Orientation	Body position	Ochre	Stones	Inventory
1	M	adultus, ca 35	Single	heavily disturbed	SW	supine	0	0	0
2	M	adultus, 30–35	Single	heavily disturbed	SW	supine	0	1	1
3	M	adultus, 35–40	Single	heavily disturbed	SW	supine	0	0	1
4	M	adultus, 50–55	Single	partly disturbed	SW	supine	0	0	1
5	M	adultus, 40–45	Single	heavily disturbed	SW	supine	0	0	0
6	M	adultus, 30–35	Single	complete	SW	supine	0	0	1

Amber	Stone	Pottery	Other	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bone	Tooth modification	Chronology/C14
0	0	0	0	0						V
0	0	0	0	0						V
0	0	0	0	0						V
0	0	0	0	0						V
0	1B	0	0	1B	1				1	V
0	0	0	0	0						V
0	0	0	0	0						V
0	0	0	0	0						V
0	0	0	0	0						V, 4540±150 (GIN-7276)
0	0	0	0	0						V
0	1B	0	0	1B	1b		3		3	V
0	0	0	0	0						V
0	1B	0	0	1B	34, c, d		12?c		1	V, 4865±35 (UBA-40191), 4737±31 (UBA-40192)
0	0	0	0	0						L
0	0	0	0	0						L
0	0	0	0	0						L
0	0	0	0	0						V
0	0	0	0	0						V

Amber	Stone	Pottery	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bone	Tooth modification	Chronology/C14
0	0	0	0						V
1	0	0	1F	3n					V
1	0	0	1						V
1	0	0	1						V
0	0	0	0						V, 4800±200 (GIN-6237)
0	0	0	0						V

Grave no	Sex	Age	Burial type	Intergity	Orientation	Body position	Ochre	Stones	Inventory
7a	F	adulta, 20–25	Double	partly disturbed	SW	supine	0	0	1
7b	M	adultus, ca 40	Double	partly disturbed	SW	supine	0	0	1
8	F	adulta, 30–40	Single	heavily disturbed	SW?	disturbed	0	0	0
9	M	adultus, 50–55	Single	heavily disturbed	WSW	supine	0	0	1
10	F	adulta, 20–25	Single	complete	SW	supine	0	1	0
11	F	adulta, 20–25	Single	complete	ENE	chrouched on left side	0	0	0
12	M	adultus, 30–40	Single		NW	prone?	0	0	0
13a	F	adulta, 35–40	Double	partly disturbed	SW	supine	0	1	1
13b	M	adultus, 50–60	Double	heavily disturbed	SW	disturbed	0	0	1
14	M	adultus, ca 40	Single	partly disturbed	WSW	supine	0	0	0
15	M	adulta, 20–25	Single	complete	SW	supine	0	0	1
16	F	adulta, 20–25	Single		SSE	supine	0	0	0
17	indet	infans	Single	heavily disturbed	SSW	supine	0	0	1
18	M	adultus, 30–35	Single	heavily disturbed	?	disturbed	0	0	1
19	F	?	Single		SW	supine	0	0	1
20	F(?)	?	Single		SW	supine	0	0	0
21	indet	adultus, ca 25	Single	heavily disturbed	?	disturbed	0	0	1
22	F	adulta, 20–25	Single	complete	SSE	prone?	0	0	1
23	F	adulta, 20–25	Single		SSE	supine	0	0	1
24	F(?)	adulta, ca 20	Single	partly disturbed	SW	supine	0	0	1
25	F	adulta, 30–35	Single	heavily disturbed	?	disturbed	0	0	1
26	indet	juvenis, 13–15	Single	partly disturbed	SW	supine	0	0	1
27	F	adulta, 30–35	Single	heavily disturbed	SW	supine	0	0	1
28	M	adultus, 35–40	Single		SW	supine	0	0	1

Amber	Stone	Pottery	Bone	Modified tooth	Unmodified tooth	Modified bone	Unmodified bone	Tooth modification	Chronology/C14
0	1	0	0						V
0	0	0	1B	16c, d				1	V, 4719±45 (UBA-34099)
0	0	0	0						V
1	0	0	1G				1a		V
0	0	0	0						V, 4540±160 (GIN-6234)
0	0	0	0						L
0	0	0	0						L
0	1	0	1B	2a, c		7a, c		3	V, 4200±240 (GIN-7189)
0	1	0	0			1			V
0	0	0	0						V, 5380±140 (GIN-7187)
1	0	0	0						V
0	0	0	0						L
1	0	0	1B	1b				1, 4	V
1	0	0	0						V
0	1	0	1B	4b				1	V, 4881±42 (UBA-34990)
0	0	0	0						V
1	1	0	1B	2	2				V
0	0	0	1B	1d		3		3	L
0	0	0	1B	2a		1a		1	V
0	1	0	1B	5a, c	40+c			1	V, 4769±38 (UBA-34098)
0	1	0	1			1			V
1	0	0	1B		1		1d		V
0	1	0	1B	2b		1b		1	V
1	0	0	1B			5c			V, 4740±110 (GIN-7190)

Grave no	Sex	Age	Burial type	Intergity	Orientation	Body position	Ochre	Stones	Inventory
29	F	adulta, 40–45	Single	complete	SE	supine	1	0	0
30	indet	juvenis	Single		SW	supine	0	0	0
31	F	?	Single	heavily disturbed	?	disturbed	0	0	0
32a	M	?	Double		SW	supine	0	0	1
32b	M	adultus, 40–45	Double		SW	supine	0	0	0
33	M	adultus, 50–60	Single		SW	supine	0	0	1
34	M	adultus, 50–60	Single		SW	supine	0	0	1
35	M	adultus, 35–40	Single	heavily disturbed	SW	supine	0	0	0
36a	M	adultus, 40–45	Double		SW	supine	0	0	1
36b	M	adultus, 20–25	Double		SW	supine	0	0	1
37a	F	adulta, 40–45	Double	heavily disturbed	SW	supine	0	0	1
37b	F	adulta, 25–30	Double	heavily disturbed	SW?	disturbed	0	0	0
38	M	adultus, 40–45	Single	heavily disturbed	?	disturbed	0	0	1
39	M	adultus, 30–35	Single	partly disturbed	SW	supine	0	0	1
40	M	adultus, 50–60	Single	complete	NW	supine	0	0	1
41	indet	infans, 1–2	Single		SSE	supine	0	0	0
42	M	adultus, 20–25	Single	complete	SE	supine	0	0	0
43	indet	infans, 5–6	Single	complete	SE	supine	1	0	1
44	M(?)	adultus, 35–40	Single	heavily disturbed	SW	supine	0	0	1
45	indet	adultus, 30–35	Single		SW	supine	0	0	0
46	F	adulta, 20–25	Single		SW	supine	0	0	1
47	F	adulta, 50–55	Single		NW	supine	0	0	0
48	F	adulta, 30–35	Single		SW	supine	0	0	0
49	F(?)	adulta, 40–45	Single		N	supine	0	0	0
50a	F(?)	adulta, 40–45	Double		SW	supine	0	0	0

Amber	Stone	Pottery	Bone	Mod-ified tooth	Unmod-ified tooth	Modified bone	Unmodi-fied bone	Tooth modi-fication	Chronology/C14
0	0	0	0						L
0	0	0	0						V
0	0	0	0						V, 5440±150 (GIN-7275)
0	0	0	1B		1b				V, 7730±70 (GIN-7274)
0	0	0	0						V, 3040±200 (GIN-7271)
0	0	0	0						V, 3550±200 (GIN-7277)
0	1	0	1B	2b		1b		1	V, 4540±150 (GIN-7276)
0	0	0	0						V, 4080±180 (GIN-7273)
0	0	0	1B			1b			V, 2030±260 (GIN-7272)
0	0	0	1	1a					V, 5090±90 (GIN-7270)
0	0	0	1						V
0	0	0	1	3a, c,		1a		1	V
0	0	0	1	1					V
1	0	0	1B		1b	1c			V
0	0	0	1B			1b			L, 6406±24 (AAR-15050)
0	0	0	0						L
0	0	0	0						L
0	0	0	1	2n					L
1	1	0	0						V
0	0	0	0						V
0	1	0	0						V
0	0	0	0						V
0	0	0	0						V
0	0	0	0						V
0	0	0	0						V

Grave no	Sex	Age	Burial type	Intergity	Orienta-tion	Body position	Ochre	Stones	Inven-tory
50b	indet	infans, 1.5–2	Double		?	disturbed	0	0	0
51	indet	infans, 8–10	Single		SSW	supine	0	0	0
52	indet	infans, 1–2	Single	completely disturbed	SSE	supine	0	0	0
53	indet	infans, 4–7	Single		SW	supine	0	0	1
54	F	adulta, 45–50	Single	completely disturbed	SSW	supine	0	0	1
55	indet	infans, ca 3	Single	completely disturbed	?	disturbed	0	0	0
56	M	adultus, 25–30	Single	partly dis-turbed	SSW	supine	0	1	1
57	F	adulats, ca 45	Single	heavily dis-turbed	SSW	supine	0	1	1
58	F	adultus, 40–45	Single	partly dis-turbed	SW	supine	0	0	1
59a	indet	infans, 3–4	Double		ESE	supine	1	0	0
59b	indet	infans, 1.5–2	Double		ESE	supine		0	0
60	indet	adultus, ca 20	Single		?	disturbed	0	0	1
61a	F	adulta, 20–25	Double		NW	supine	1	0	1
61b	indet	infans, ca 2	Double	completely disturbed	?	disturbed	0	0	0
62	M	adultus, 40–45	Single		SW	supine	0	1	1
63	indet	infans II, 10–15	Single	partly dis-turbed	SW	supine	0	0	1
64	F	adulta, 40–45	Single		SW	supine	0	0	1
65	F	adulta, 35–40	Single		SE	supine	0	0	1
66	F	adulta, 20–25	Single	partly dis-turbed	SW	supine	0	0	1
67	M	juvenis, 17–19	Single		SW	supine	0	0	0

Amber	Stone	Pottery	Bone	Mod-ified tooth	Unmod-ified tooth	Modified bone	Unmodi-fied bone	Tooth modi-fication	Chronology/C14
0	0	0	0						V
0	0	0	0						V
0	0	0	0						L
1	0	0	0						V
0	1	0	0						V, 4964±23 (AAR-15051)
0	0	0	0						L
0	1	0	1	6c, d, n				1, 3	V
0	0	0	1	2c		1c		1, 4	V
0	0	0	1B			1b			V
0	0	0	0						L
0	0	0	0						L
0	0	0	1						L
0	0	0	1B			3b, e, l			L, 6356±23 (AAR-15052)
0	0	0	0						L
0	0	0	1F	1n	1n	1			V
0	1	0	1B	19c		7b, c		1	V, 4766±51 (UBA-34989)
0	0	0	1B	1c					V, 4550±350 (GIN-7490)
0	0	1	1						L
0	0	0	1B	2b				1, 3	V, 5252±29 (AAR-21042), 5033±24 (AAR-15053)
0	0	0	0						V

Appendix 2.

Animal remains in the studied burials

All animal remains presented in the tables come from secure contexts in the studied burials. All animal teeth (both modified and unmodified) are mentioned under relevant species. Unmodified bones are mentioned separately according to the taxa (when several species present), but all modified bone artefacts are summarized under the worked (modified) bones. At Zvejnieki, in parenthesis number of teeth in total, before () number of teeth from secure context.

Table 1. Zvejnieki

Grave no	Aurochs	Badger	Bear	Beaver	Dog	Elk	Fox	Marten	Otter	Red deer	Seals	Wild boar
	animal teeth											
5	1					30						
8	5											13
11												
12						9						4
15						3						
16						6						
17	1					1						6
22						1						14
24	1					63						6
27	1					19				7		18
28						2						
29						19						1
30						3						1
31						37						4
32												2
33						10						1
37						1						1

Wild horse	Wolf	Carnivore, indet	Ungulate, indet	Homo s.	Indet	no of pendnats	Beaver	Tortoise	Wild cat	Birds	no of unmodi-fied bones	worked bones
							unmodified bones					
			1			32						
1						19						
												1
2						15						1
						3						
			1			7						1
4						12						
						15						1
			1		1	72						
			1			46						3
						2						
						20						
						4						
						41						
						2						
						11						1
						2						

Grave no	Aurochs	Badger	Bear	Beaver	Dog	Elk	Fox	Marten	Otter	Red deer	Seals	Wild boar
	animal teeth											
41												
42	1											
43						38						2
44	1											
45						2						2
51												2
55						1						
57	3					24				22		
62	2 (4)		1			9 (14)		0(2)		3 (8)		4 (6)
67												
68												
69						2						3
74						28				7	1	7
75												
76	1									7		7
83	3					1						7
86	13									1		4
92						3		1		4		5
93	1					5				6		7
100	6					35				3		24
106	0(1)					0(1)						1
108						6				1		12
114	20				1	14				31	1	11
115						8						6
116						6(9)						1(4)
121	2	1			5	24	1		2	28		17
122/ 123	16	11	13		9	83		2	4	72	1	112
124	1							1		4		1
128	14					9		3		53	3	9
132	9(10)	0(2)			0(1)	18(24)				1(12)		25(27)
136	4				1	2					1	9

Wild horse	Wolf	Carnivore, indet	Ungulate, indet	Homo s.	Indet	no of pendnats	Beaver	Tortoise	Wild cat	Birds	no of unmodi-fied bones	worked bones
							unmodified bones					
												1
5						6						
						40						
						1						
3						7						7
						2						
						1						
						49						2
				2 (3)		21 (38)	9				9	2
												1
					1	1						
						5						
						43						
												4
						15						
					1	12						3
4						22						
						13	3	1			4	
3					1	23	5				5	3
6						74						1
						1(3)						
						19						
1				2	1	82	1				1	
2			2			18						
						7(13)						
	1			1		82	2				2	3
2	5				2	332	1				1	
					1	8						
1					1	93	13				13	
			1		1	55(77)	1(4)		0(1)		1(5)	
						17						

Grave no	Aurochs	Badger	Bear	Beaver	Dog	Elk	Fox	Marten	Otter	Red deer	Seals	Wild boar
	animal teeth											
144												2
146		5			17	1		1				2
147						2				1		
151						0(1)				2		13(14)
153		26	4		30	18	1	10			5	13
158		3	1		1	4		3	1		2	6
160						1		8			1	
162	1					5						
164	1				1	1			4	1		1
165		1			15	1		1			6	
170	2					53				13		99
177												
178						1						
184											4	
187				1								
189	1					5				41		3
190	2	2	4			47		8	6	73	2	52
201				1								
205					4			19				
207				1								1
208												
211				5								
213				1								
219						1						3
221												
223												
225												
226					69		4	5			1	
228												
231												
233					9							

Wild horse	Wolf	Carnivore, indet	Ungulate, indet	Homo s.	Indet	no of pendnats	Beaver	Tortoise	Wild cat	Birds	no of unmodi-fied bones	worked bones
							unmodified bones					
						2						
						26						
						3						
						15(17)						
	3				2	112				59	59	1
					2	23						1
						10						
						6						1
						9				42	42	17
						24				10	10	
					1	168						
												1
						1						1
		1				5						
						1						1
						50						
2	2	4	2	1	1	208	4				4	11
						1						3
						23						
						2						16
												9
						5						5
						1						
					1	5						
												7
												1
												3
						79						
												3
												1
						9						

Grave no	Aurochs	Badger	Bear	Beaver	Dog	Elk	Fox	Marten	Otter	Red deer	Seals	Wild boar
	animal teeth											
244		1		1								
252				3								
259												
260												
263												
264												
271												
272												
277								4				1
282												
287												
290		1			5						30	
294												
300		7	2		4			1			31	
305												
316						1						
317												
319						7		0(1)				
320						11						
Total	**113**	**58**	**25**	**13**	**171**	**681**	**6**	**67**	**17**	**381**	**89**	**545**

Wild horse	Wolf	Carnivore, indet	Ungulate, indet	Homo s.	Indet	no of pendnats	Beaver	Tortoise	Wild cat	Birds	no of unmodi-fied bones	worked bones
							unmodified bones					
					1	3						
						3						3
												1
												1
												1
												3
												1
												1
						5						2
												4
												1
	1					37						
												1
	9	2				56						5
												1
						1						
												158
						7(8)						
						11						
36	21	7	9	6	18	2263	39	1	0 (1)	111	151	300

Table 2. Skateholm I

Grave no	Bear	Elk	Red deer	Seals	Wild boar	Carnivore, indet	Ungulate, indet	Indet	no of pend-nats
	animal teeth								
3									
4									
5									
6		1			32				33
7									
11									
12									
16			32						32
21			11		7				18
22									
24									
25									
27									
28									
33									
34									
35									
37									
40					12				12
41	2								2
43									
45			1						1
46			22					1	23
47			3						3
48									
53		10	42		11	2			65
59			16		10			2	28
Total	**2**	**11**	**127**		**72**	**2**		**3**	**217**

Dog	Fish	Wild cat	Seal	Snake	Red deer	Roe deer	Birds	Wild boar	no of un-modified bones	worked bones
				unmodified bones						
			1						1	
	x									
										1
	x									
	x							1	1	2
										1
	x									1
	x									1
	x									
	x									
										4
										3
	x			1					1	
										2
						1	1		2	
	x									
										1
	x									
			1		1		1	1	4	1
1		1				1		6	8	
	x		1						1	
1	x	1	3	1	1	2	2	8	18	17

Table 3. Skateholm II

Grave no	Auroochs	Elk	Red deer	Wild boar	Wolf	no of pendnats
	animal teeth					
II						
IV						
VIII		2	114			116
IX			1	1	1	3
X		1	38	15	1	55
XI						
XII						
XIII				1		1
XV			16	18		34
XVI			28			28
XVII						
XX	4		51			55
XXI						
XXII		1	141	6		148
Total	4	4	389	41	2	438

Table 4. Sakhtysh II

Grave no	Badger	Bear	Elk	Fox	Marten	Wolf	Carnivore, indet	Indet	no of pendnats	no of unmodified bones	worked bones
	animal teeth										
1											11
4a											1
6		1							1		
9			1		1				2		
10											3
12a											213
12b											215
12v											1
15/I	3	1							4		1

Fish	Marten	Porpoise	Snake	Red deer	Roe deer	Wild boar	Wild cat	no of unmodi-fied bones	worked bones
unmodified bones									
x									1
x									3
x						1		1	3
				4	7	4		15	4
		1		1		5		7	4
									3
x			1				1	2	
x									2
									1
x	1	1						2	
									2
	3			1				4	1
	4	2	1	6	7	10	1	31	24

Grave no	Badger	Bear	Elk	Fox	Marten	Wolf	Carnivore, indet	Indet	no of pendnats	no of unmodified bones	worked bones
	animal teeth										
15/II	5	6					3		14		
15/III	4	1					3	1			
15/VII										1	
15/XIII			1								
15/I-III?	2						2		4		
16					1				1		3
18	14	11	1	1		5		2	34		11
Total	**28**	**20**	**3**	**1**	**2**	**5**	**8**	**3**	**70**	**1**	**459**

Table 5. Sakhtysh IIa

Grave no	Badger	Bear	Beaver	Dog	Elk	Fox	Marmot	Wild boar	Wolf	indet	no of pendnats	no of unmodified bones, beaver	worked bones
	animal teeth												
7b		16									16		
13a			1		1						2		7
17					1						1		
19	1	3									4		
22					1								3
23		2									2		
24	1	2		1	1		40				45		
25													1
26							1				1	1	
27	1	1									2	1	
28													5
32a		1									1		
34		2									2		
36a													1
36b					1						1		
37b		3									3		1
39		1									1	1	

Grave no	Badger	Bear	Beaver	Dog	Elk	Fox	Marmot	Wild boar	Wolf	indet	no of pendnats	no of unmodified bones, beaver	worked bones
	animal teeth												
40													1
56	1	1	1		2			1			6		
57		1			1						2		
58													1
62													2
63	7	5		1		3			1	2	19		
64										1	1		
66					2						2		
Total	**11**	**38**	**2**	**2**	**9**	**3**	**41**	**1**	**1**	**3**	**111**	**3**	**22**

Appendix 3.

Radiocarbon datings of animal remains from the studied burials

Radiocarbon datings of animal remains carried out during this study, including unsuccessful datings.

Table 1. Sakhtysh II, IIa, Skateholm I, II

Site	Context	Lab-index	BP	±	cal BC, 95.4%	δ13C
Sakhtysh II	Burial 12	UBA-34097	5170	40	4050-3811	-23.80
Sakhtysh II	Burial 12	UBA-40193	5164	38	4046-3811	-21.80
Sakhtysh II	Burial 18	UBA-40191	4865	35	3711-3536	-21.70
Sakhtysh II	Burial 18	UBA-40192	4737	31	3635-3378	-20.40
Sakhtysh II	Hoard 9	UBA-34992	4730	41	3635-3376	-20.40
Sakhtysh II	Hoard 11	UBA-34096	4445	37	3335-2931	-19.60
Sakhtysh II	Hoard 10	UBA-34094	-	-	-	-
Sakhtysh II	Hoard 10	UBA-34095	-	-	-	-
Sakhtysh IIa	Burial 19	UBA-34990	4881	42	3766-3539	-20.40
Sakhtysh IIa	Burial 24	UBA-34098	4769	38	3643-3382	-20.60
Sakhtysh IIa	Burial 63	UBA-34989	4766	51	3649-3377	-20.00
Sakhtysh IIa	Burial 7b	UBA-34099	4719	45	3635-3373	-20.20
Sakhtysh IIa	Burial 66	UBA-34991	-	-	-	-
Skateholm I	Burial 46	UBA-35604	6500	47	5553-5364	-19.8
Skateholm I	Burial 15	UBA-35609	-	-	-	-
Skateholm I	Burial 17	UBA-35606	-	-	-	-
Skateholm II	Burial X	UBA-35605	-	-	-	-
Skateholm II	Burial XXI	UBA-35607	-	-	-	-
Skateholm II	Burial XIX	UBA-35608	-	-	-	-
Skateholm II	Burial VIII	UBA-35610	-	-	-	-

δ15N	C:N	Coll.yield	Sample	Reference
7.50	3.28	1.9	tubular bone bead	Macāne et al. 2019
7.60	3.22	1.0	tubular bone bead	Macāne et al. 2019
5.20	3.19	3.4	dentes (I+sin), Alces alces;	Macāne et al. 2019
9.10	3.19	6.0	dentes (I3+sin), Ursus arctos	Macāne et al. 2019
8.00	3.56	3.0	dentes (C-), Ursus arctos	Macāne et al. 2019
11.40	3.26	4.7	vertebra, Carnivora (Meles meles?)	Macāne et al. 2019
-	-	-	bone, mammal	Macāne et al. 2019
-	-	-	bone, mammal	Macāne et al. 2019
7.50	3.51	10.3	dentes (I3+), Ursus arctos	Macāne et al. 2019
5.90	3.20	3.1	dentes (I), Marmota bobak	Macāne et al. 2019
7.20	3.53	7.4	dentes (I2+dex), Ursus arctos	Macāne et al. 2019
9.90	3.24	5.30	dentes (I3+sin), Ursus arctos	Macāne et al. 2019
-	-	-	incisor, Alces alces (pendant);	Macāne et al. 2019
12.5	3.21	5.4	metacarpal IV, sin, Canis familiaris	This study
-	-	-	humerus, proximal fragm., Canis familiaris	This study
-	-	-	radius, proximal fragm., Canis familiaris	This study
-	-	-	tibia fragm., Canis familiaris	This study
-	-	-	radius, diaphys fragm., Canis familiaris	This study
-	-	-	ossa longum fragm., Canis familiaris	This study
-	-	-	tibia proximal frgam., Canis familiaris	This study

Appendix 4.

ZooMS samples

Table 1. Bone samples for ZooMS analysis

Site	Context	Context 2	Sample
Zvejnieki	Burial 317	#1045	Tubular bone bead
Sakhtysh II	Burial 1	#1352	Tubular bone bead
Sakhtysh II	Burial 12	1978	Tubular bone bead