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HUMAN-BEAVER ENGAGEMENTS SEEN THROUGH MULTIPERIOD SETTLEMENT SITES AT RAUTALAMPI HÄMEENNIEMI AND KITEE HIIDENNIEMI, FINLAND

Abstract

The aim of this article is to investigate the relationship between beavers and humans in the prehistoric times. This is studied through animal bone assemblages excavated from two multi-period settlement sites in Northern Savonia and North Karelia, Finland, and is supplemented with ethnographic and folklore material. The theoretical framework uses perspectives from social zooarchaeology, relational ontology and multispecies archaeology and the research questions are answered with zooarchaeological analysis, age estimates and beaver ethology. This study shows that the hunted beavers were adults who could have established their own colonies, modified the landscape to suit their needs and had their first litter. Beavers had different ways of being, engaging and being present in a world that sometimes led to direct and indirect encounters between humans and beavers. The hunters had knowledge that based on the behaviour of beavers, and they used it to find the animals to engage with them.

Keywords: European beaver, hunting, human-beaver encounters, social zooarchaeology, North Karelia, Northern Savonia

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INTRODUCTION

In what is now Northern Savonia and North Karelia, hunting and fishing have been an important part of people's lives from the Stone Age to modern times. At the end of the Stone Age (3200–1900 BCE), animal husbandry began to spread slowly from the western parts of Finland, but never completely replaced hunting and fishing (Bläuer & Kantanen 2013). During the Early Metal Period (1900 BCE–300 CE), hunting continued to be the main livelihood in Northern Savonia and North Karelia, and this was also the case during the Iron Age (300–1300 CE), although settlement sites and bone material from this period are scarce (Lehtosalo-Hilander 1988; Taavitsainen 1994; Lavento 2015; Raninen & Wessman 2015).

What is evident from the archaeological material and historical sources is that there was one certain species that prevailed as one of the most important game species from the Stone Age until its unfortunate extinction in the 19th century due to overhunting: the European beaver (*Castor fiber*) (Paulaharju 1921; 1922; Lehikoinen 2007; Aalto 2017; Ukkonen & Mannermaa 2017). In Finland, the role of beavers and beaver hunting has mainly been discussed together with other game species (see e.g., Lehikoinen 2007; 2009; Aalto 2017; Ukkonen & Mannermaa

2017). The larger mammals, such as brown bear (*Ursus arctos*), Eurasian elk (*Alces alces*) and wild reindeer (*Rangifer tarandus*), have been studied more extensively through artefact studies, Rock Art studies, burial archaeology and zooarchaeology in order to interpret the importance and meanings of these species for subsistence, cosmologies and human-animal relations (Carpelan 1974; Taavitsainen 1976; Halinen 2005; Lahelma 2007; Kivisalo 2008; Salmi et al. 2015; Kirkinen 2019; Salmi 2022).

The aim of this article is to explore the ways beavers were perceived and engaged in interspecies interaction with humans and other non-human animals during the prehistoric times with the help of social zooarchaeology. Social zooarchaeology is an approach in which non-human animals are seen as active participants in the world and as social beings with the capacity to act and influence other non-human animals and humans. Zooarchaeological analysis is used to examine the context and condition of the bones, anatomical distribution and age of the beavers found at two settlement sites from Northern Savonia and North Karelia (Fig. 1).

The results will be compared with the life history and ethology of the beavers as well as folklore and ethnographic material to examine how beavers behaved, how they were perceived by hunters and what embodied engagements they had with humans. The basis of this research is that the settlement sites and the animals

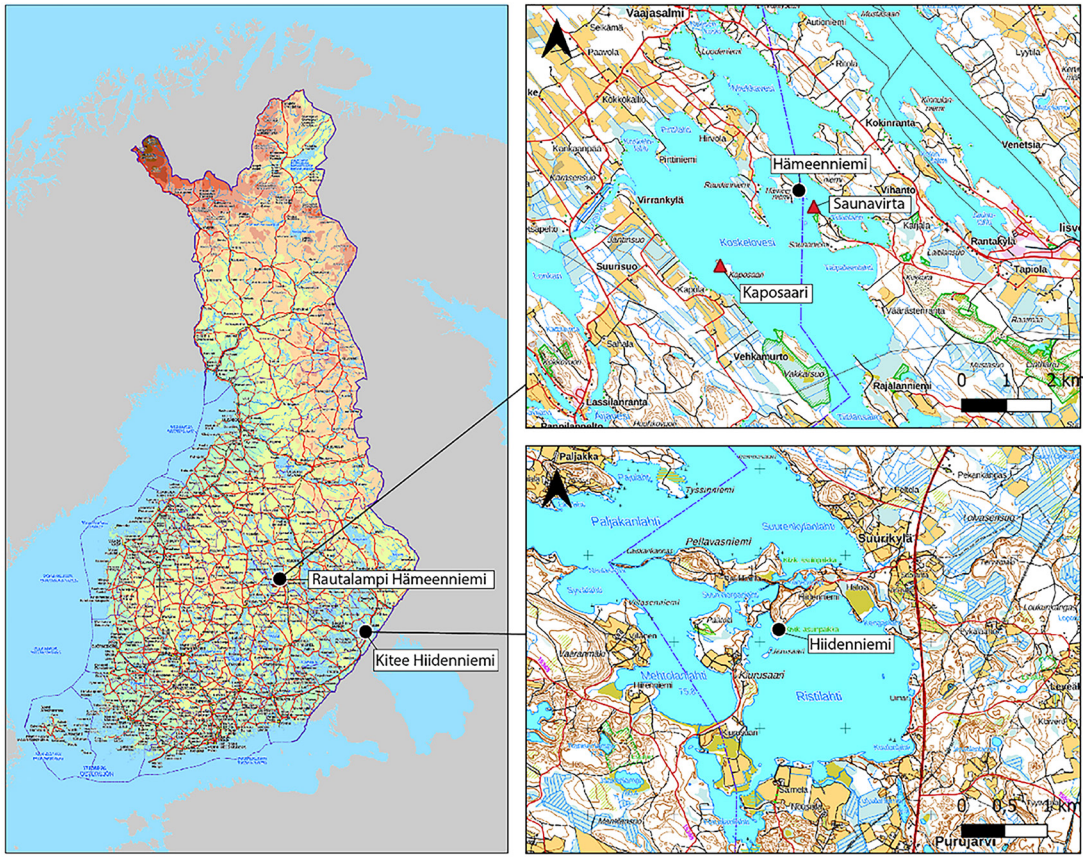

Figure 1. Site locations in Finland and in detail. Top right: Rautalampi Hämeenniemi (686010018) and locations of the nearby stray finds of Kaposaari (KM 5410:2) and Saunavirta (KM 29379) mentioned in the text. Bottom right: Location of Kitee Hiidenniemi (1000003341). Map: E. Jääskeläinen 2023. Data: National Land Survey of Finland 2023, Finnish Heritage Agency 2023.

identified from them can also be used to reflect on the events and engagements outside of the settlement sites as the animals had to be found, encountered, and engaged with before they were hunted and brought to the settlement site.

The settlement sites in the area in question are often defined as multi-period which has been described as difficult to interpret, especially in zooarchaeological research, because they have archaeological material from different time periods and the bone finds rarely have a clear stratigraphic context (Mannermaa 2003; Tourunen 2011a). Here, I use this approach to analyse burnt bone assemblages from two settlement sites at Kitee *Hiidenniemi* and Rautalampi *Hämeenniemi* (Fig. 1), which have been dated to the Stone Age (8850–1900 BCE), the Early Metal Period (1900 BCE–300 CE) and the Late Iron Age (800–1300 CE). As the bones have not been radiocarbon dated, beaver hunting at these multi-period sites is considered within the general framework of prehistory, while recognising that the time frame is broad and that there is likely to have been a lot of variation in human-beaver relationships at different times.

This research will answer the following questions: How old were the hunted beavers based on the age estimates? What do the age estimates tell us about beaver hunting? What do the age estimates tell us about the lives of beavers at the time they were hunted? What do the life history of beavers and their behaviour tell us about hunting, interspecies engagements, and relationships?

European beaver

The focus of this article is the European beaver (*Castor fiber*), an important cohabitant of humans and one of the earliest settlers in Finland, as the oldest radiocarbon-dated beaver from Lieksa, North Karelia, is over 9,000 years old (Ukkonen & Mannermaa 2017: 62). The abundance of beaver bones from the settlement sites and their appearance in historical records, such as tax records and legal disputes concerning hunting rights (Paulaharju 1922; Lehikoinen 2007; Aalto 2017; Ukkonen & Mannermaa 2017), indicate to how important beavers have been throughout the centuries in different parts of Fennoscandia until its extinction during the 19th century. In

Figure 2. Beaver lodge in Hossa national park. The lodge is easy to spot in the landscape once you are familiar with beavers' habits. Picture: E. Jääskeläinen 2022.

Finland, the current beaver population consists of Canadian beavers (*Castor canadensis*) and European beavers. The Canadian beavers were introduced from the United States in the 1930s, as they were thought to be the same species as the local, then extinct, European beaver, which was also reintroduced at that time (Lahti 1972).

Beavers are large rodent-like mammals that live mainly in aquatic environments to which their bodies are adapted (Fandén 2005). Beavers grow to their full body size, reach sexual maturity at 3–5 years of age and usually have their first litter during this time. Adult beaver can grow to a length of 70–105 cm and can weight 12–30 kg. Perhaps the most recognisable features of beavers are their scaly tails and their habit of felling trees and building dams. Although they live mostly on water and are agile swimmers, beavers do not eat fish. Instead, they eat the bark and leaves of deciduous trees, which they gather near the banks of the ponds, rivers, or lakes they

inhabit. For the winter, beavers gather food and store it near their lodges below the water level, so that they do not have to go ashore during the colder months (Lahti 1972; Fandén 2005; Müller-Schwarze 2011).

The lodges that beavers build are sturdy constructions that cannot be easily broken into by predators (Fig. 2), as are the dams they build to control water flow. These activities change the landscape, sometimes drastically, as damming a river, for example, can build up water and can cause flooding in the area. Coles (2006), in their research on the prehistoric beavers of Britain, found that the landscape-altering activities benefited not only humans in many ways, but also other species such as elks and hares. The felling of trees made it easier for hares and elks to find food more easily during the winter months, which could attract people to the area to hunt these species. It has also been suggested that the damming of rivers and the resulting flooding may have increased the size of fish populations and attracted waterfowl (Coles 2006: 48–57).

Theoretical framework

Especially in recent years, the role of animals in societies has been studied from a variety of perspectives and in archaeology, the emergence of social zooarchaeology, relational perspectives, and multispecies archaeology has influenced the way we perceive prehistoric animals (Russell 2012; Lindstrøm 2012; Overton & Hamilakis 2013; Salmi et al. 2015; Overton 2018; Pilaar-Birch 2018; Macāne 2022; Salmi 2022). These interpretations often emphasise the situatedness and relationality of human-non-human relations in pre-modern societies. The categories between humans and non-human animals that relate to each other are porous and change according to the situation. Non-human animals are seen as active participants and social beings in the world and its events, in which they can influence the lives of others. The role of other species and interspecies engagement is an integral part of being a human and being in the world (Hill 2011; Lindstrøm 2012; Overton & Hamilakis 2013; Watts 2013; Overton 2018; Pilaar-Birch 2018).

Thus, the world and everything in it is connected through reciprocal relations. These relationships are situational and are based on internalised knowledge, and hunters know how to use this knowledge in different situations. For example, in modern hunter-gatherer and indigenous ontologies, hunters who moved through the landscape and around of their settlements perceived the landscape as they moved in it (Ingold 2000). They came to know the other species living in the world and knew how to interact with them through knowledge gained from generations of humans and embodied participation in the world (Bird-David 1999; Ingold 2000; Helander-Renvall 2010; Overton & Hamilakis 2013; Bruchac 2014).

This research uses perspectives drawn from the above theoretical viewpoints, focusing on social zooarchaeology. It aims to explore how hunting communities might have perceived the beavers outside of settlement sites based on their known behaviour and recognisable landscape-altering practices, and how they dealt with beavers in the settlement sites after the hunt.

Hiidenniemi and Hämeenniemi settlement sites

The Hiidenniemi settlement site was excavated by Simo Vanhatalo in 2005 and Petro Pesonen in 2006. The excavations revealed several hearths, a waste pit and slag indicating iron smelting. The finds consist of e.g., burned and unburned bones, Sär 2-, Pöljä and Sarsa-Tomitsa Ware, asbestos ware and coarse Iron Age pottery, slag, quartz and metal artefacts, such as knives, a spearhead and a penannular brooch. The dating of Hiidenniemi is based on the radiocarbon dating and typology of ceramics, which indicate a long period of use from the Stone Ages until the Late Iron Age (Pesonen 2006).

All the bones found during the excavations were analysed by Auli Bläuer in 2011 (Tourunen 2011b). The total amount of bones was 825.1 g in 23,189 fragments and 5% of these were identified on the level of species or genus. Identified species were European beaver (*Castor fiber*), mountain hare (*Lepus timidus*), Eurasian elk (*Alces alces*), wood grouse (*Tetrao urogallus*), black grouse (*Lyrurus tetrix*), Eurasian teal (*Anas crecca*), black-throated loon (*Gavia arctica*) or red-throated loon (*Gavia stellata*), northern pike (*Esox Lucius*), European perch (*Perca fluviatilis*) and zander (*Sander*

lucioperca) (Tourunen 2011b; Table 1). Different shares of identified species are presented in Table 1.

The context of the bones from Hiidenniemi varies as some bones were excavated from the fireplaces or from the waste pit, and others were scattered around the area surrounding these. Almost all the bones had been burnt, but 14 of the bones had not been burnt at all or only slightly.

The Hämeenniemi settlement site was excavated in 2001, 2009, 2010 and 2011 (Vanhatalo 2001; 2009; 2010). The report of the 2011 excavation was not available. There were 1,025 burnt bone fragments from the excavation of 2001 (Vanhatalo 2001), 1,380 from 2009 (Vanhatalo 2009) and 87 from 2010 (Vanhatalo 2010) but no osteological analysis has been conducted on them so far . Only a preliminary analysis of bones was carried out by the author on preparing this paper. Other finds from the site included fragments of Comb ceramics, asbestos ware, Pöljä Ware, Luukonsaari Ware and coarse Iron Age pottery, quartz, stone tools, and slag (Vanhatalo 2001; 2009; 2010). The dating of this site is based on the ceramic finds and a radiocarbon-dated charcoal sample, which was taken from the trial trench during the excavations of 2001 and was dated to 1020–1280 calAD (Vanhatalo 2001; 2009; 2010).

It should be noted that there are two stray finds (see Hakamäki 2018: 20–21 for definition) from the Iron Age in the vicinity of Hämeenniemi, which indicate hunting in the area (Fig. 1). The first is a spearhead (KM 29379) from Suonenjoki Saunavirta, which was found on the opposite side of Lake Koskelovesi from Hämeenniemi (Pesonen 2008). The second find is an arrowhead (KuM 6147) from Rautalampi Kaposaari, a small island in the same lake (Nyman 2015).

MATERIAL AND METHODS

In Finland, unburned bones from prehistoric times rarely survive, which leads to an overrepresentation of burnt and highly fragmented bone material (Tourunen 2011a). The burnt bones represent only a fraction of all the bones deposited at a settlement site and only a small percentage of them can be identified. The fragmented nature of the bones also prevents certain analyses, and in this case, it was not

Species	NISP
European beaver (*Castor Fiber*)	90
Mountain hare (*Lepus timidus*)	6
Eurasian elk (*Alces alces*)	1
Wood grouse (*Tetrao urogallus*)	8
Black grouse (*Lyrurus tetrix*)	1
Eurasian teal (*Anas crecca*)	3
Black-throated loon (*Gavia arctica*) / Red-throated loon (*Gavia stellata*)	1
Northern pike (*Esox lucius*)	168
European perch (*Perca fluviatilis*)	12
Zander (*Sander lucioperca*)	1

Table 1. Number of identified species (NISP) in Kitee Hiidenniemi. Table only includes the species that were identified with certainty. Table: E. Jääskeläinen 2023, made after Tourunen 2011b.

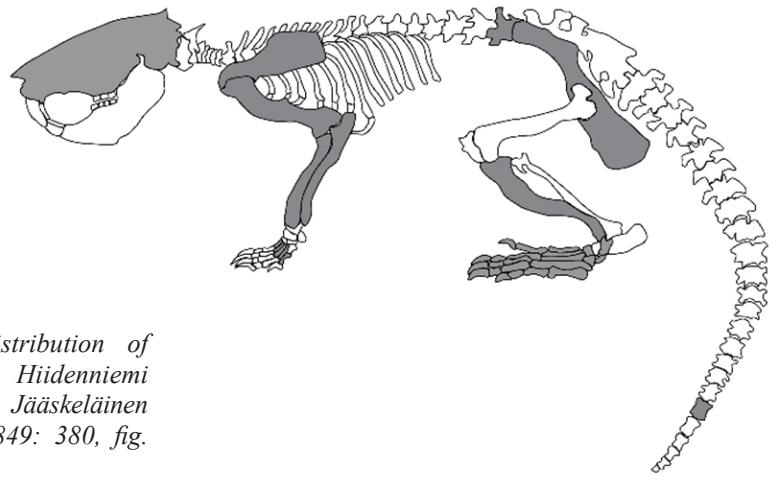

Figure 3. Anatomical distribution of identified bones from the Hiidenniemi assemblage. Drawing: E. Jääskeläinen 2023 (after Jones 1847–1849: 380, fig. 263).

possible to determine the sex of the beavers. This also affects the interpretations that can be made from burnt bone assemblages.

A total of 90 beaver bones were identified from the Hiidenniemi assemblage (Fig. 3). Almost all the bones were from the limbs, especially the pedis. The spatial distribution of the bones in the excavation areas was uneven: 11 bones were found in excavation area 1, 78 bones in excavation area 2 and only on bone in excavation area 3. Thirty-three bones were identified in the soil sample taken from the waste pit.

The minimum number of individuals (MNI) for Hiidenniemi beavers was two, based on ulna's distal open epiphysis (Tourunen 2011b). As all the bones from the Hiidenniemi site had already been analysed by Tourunen in 2011 (2011b), only the identified beaver bones were analysed again to record the epiphyseal fusion for age estimations.

The burnt bones from the Hämeenniemi settlement site were from different excavations. The bones selected for preliminary analysis

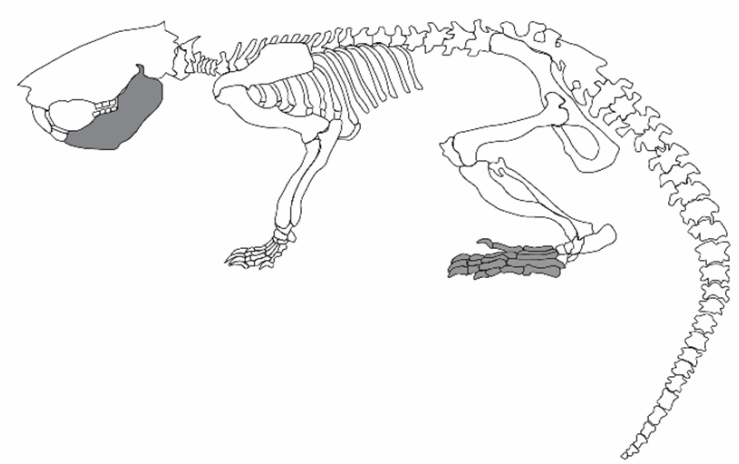

Figure 4. Anatomical distribution of preliminary identified bones from the Hämeenniemi assemblage. Drawing: E. Jääskeläinen 2023 (after Jones 1847–1849: 380, fig. 263).

Element	Hiidenniemi	Hämeenniemi
Clavicula	1	
Cranium	1	
Humerus	6	
Mandibula		1
Metacarpal	1	
Metacarpal 3	1	
Metacarpal 5	1	
Metatarsal	5	
Metatarsal Phalanx 1	9	3
Metatarsal Phalanx 2	9	1
Metatarsal Phalanx 3	3	2
Metatarsal 1	3	
Metatarsal 2	1	1
Metatarsal 3	1	
Metatarsal 4	2	
Metatarsal 5	2	
Naviculare	2	
Os coxae	3	
Os sesamoideum	1	
Pelvis	1	
Phalanx 3	1	
Phalanx 2	1	
Radius	4	
Scapula	5	
Talus	2	
Tarsal 1	1	
Tarsal 3	2	
Tarsal 4	1	
Tibia	3	
Ulna	15	
Vertebra caudalis	1	
Vertebra lumbale	1	
Total	90	8

Table 2. Anatomical element distribution of beaver bones from the Hiidenniemi and Hämeenniemi assemblages. Table: E. Jääskeläinen 2023.

were excavated in 2001 and therefore do not represent the entire settlement site. Burnt bones were found in several test pits and one trial trench (Vanhatalo 2001). The excavation report mentioned that no intact prehistoric fireplaces or structures were found (Vanhatalo 2001: 3), so the burnt bones may have been already scattered around before the archaeologists found the site.

Preliminary identification of the beaver bones from the Hämeenniemi site was carried out using reference images from the ArchéoZoothèque website (2022) and images of beaver skeletons from the Biodiversity Unit of the University of Oulu. All the beaver bones were photographed, and these images were later compared with the beaver skeletons in the Biodiversity Unit's collections in order to be more certain of their identification. Due to the limited time and reference material available, the identifications were only made for those bones that were recognised as mammals and then more specifically as beavers. No other mammals were identified in the preliminary analysis. It was noted that the assemblage also contained fish and bird bones and that the bones from Hämeenniemi would require more in-depth zooarchaeological analysis.

There were eight identified beaver bones, seven being from the pedis and one was a fragment of the processus coronoideus from the mandible (Table 2). One identified phalanx (KM 34058: 271) was a stray find, i.e., a find without a clear find context, but the other identified beaver bones (KM 34058: 107) were from test pit number 4, which had other burnt bone fragments as well. The MNI for the Hämeenniemi beaver's bones was one, based on the proximal end of the first metatarsal (Fig. 4). There were two fragments of it, but on closer analysis it was found that the fragments could have

been from the same individual. It should be noted, however, that Hämeenniemi's sample is very small, so the results in this case are only indicative.

It should also be borne in mind that the MNI at these two sites was very low, even though the number of identified bones at Hiidenniemi was high in relation to other species (Table 1). The fragmented nature of the assemblage and the small number of fragments result in low MNIs which make interpretation of individuals difficult.

Age estimates for the beavers were made using the epiphyseal fusion calendar according to Fandén (2005). He based his estimates on the skeletal development and epiphyseal fusion of the postcranial bones of contemporary European beaver (Castor fiber L) from Southern Sweden and compared them with the life history of the animal (Fandén 2005). The use of epiphyseal fusion is commonly used to estimate the age of domestic and semi-domestic mammals but is less common in wild mammals (Gifford-Gonzalez 2018: 116). In this research, the epiphyseal fusion was recorded as open, fusing or closed as described in Fandén (2005: 202) and then the results were compared to the age estimation table and life history stages (Fandén 2005: Table 10).

RESULTS

The anatomical distribution of the beaver bones found in the settlement sites is concentrated on the limbs, but a few bones from the skull, spine and tail were also found (Figs. 3 & 4; Table 2). In Hiidenniemi the anatomical representation is diverse as almost all the bones from beaver are present. In Hämeenniemi only bones from the lower jaw and hind leg were present, but this may be due to the smaller size of the assemblage.

The total amount of beaver bones that could be aged was 32 from Hiidenniemi and seven from Hämeenniemi, and they were all from the limbs, mainly phalanxes (see Appendix 1). All

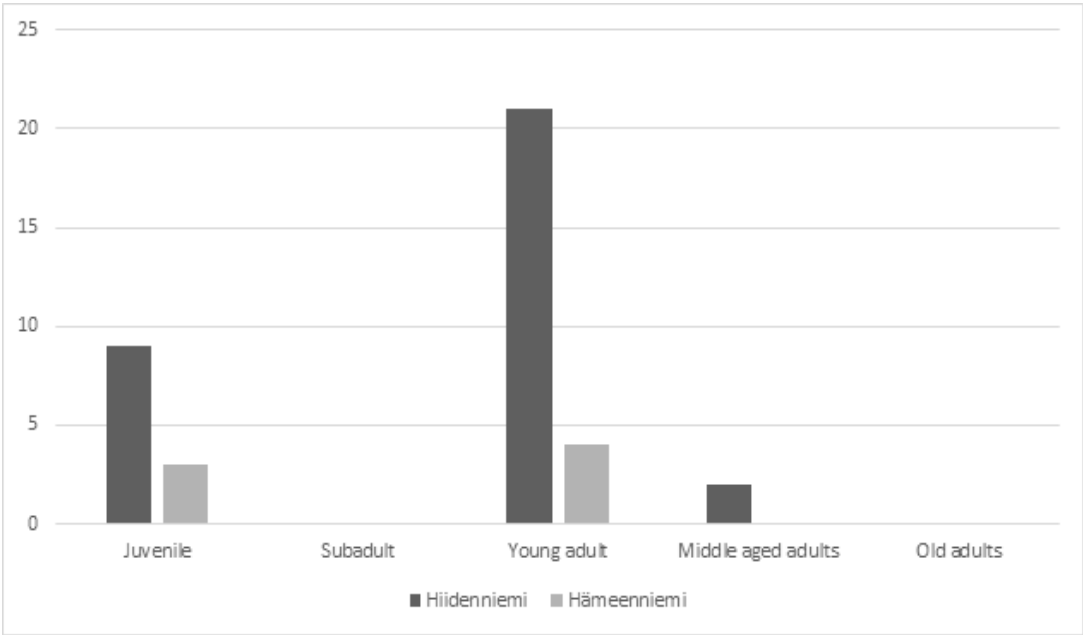

Figure 5. Results sorted into age categories based on Fandén (2005). Juveniles 0–1-year-old, subadults 1-2,5 years old, young adults 3–5 years old, middle-aged adults 6–9 years old and old adults over 10 years old.

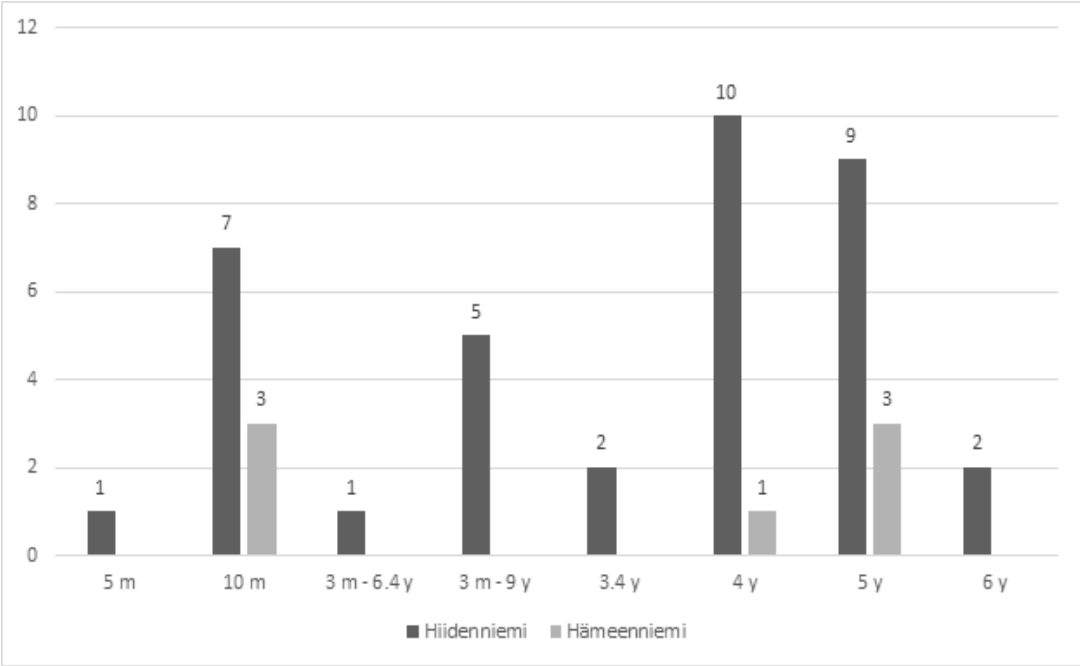

Figure 6. Aged bones from Hämeenniemi and Hiidenniemi presented in graphics. Ages are in months (m) and years (y).

the aged bones are from juveniles, young adults, and middle-aged adults (Fig. 5). Subadults and old adults are missing, but it cannot be completely ruled out that some of the bones are from these age groups. The results are presented in Appendix 1 and in Fig 6.

There are nine bones of juvenile individuals from Hiidenniemi and three from Hämeenniemi (Fig. 5). Juveniles spend their first year in their natal colony even though they can dive and venture into the water very early on in their lives (Fandén 2005: 211; Müller-Schwarze 2011: 90–91). There were no bones aged to the category of subadults. Beavers of this age stay in the natal colony and help their parents to tend the next litter and gather food. At the age of two, beavers usually leave to find mating partners and to establish their own colonies (Lahti 1972: 306–307; Fandén 2005: 211–212).

Beavers reach sexual maturity and have grown to their full body size when they are 3–4 years old, the age category of young adults. Beavers at this age have dispersed from their natal colonies to find their own mating partners and territories. The majority of beavers have their first litter by this age (Lahti 1972: 306–307; Fandén 2005: 212; Müller-Schwarze 2011). From both sites, bones of young adults were common, 21 from Hiidenniemi and four from Hämeenniemi (Figs. 5 & 6).

Middle-aged adults have already made several litters and established a more lasting territory (Fandén 2005: 212), but only two of these were identified in the Hiidenniemi assemblage (Fig. 5). Since old adults are rare in the wild, it is not surprising that they were not found in the assemblages of Hiidenniemi and Hämeenniemi.

DISCUSSION

The results show that the hunted beavers were mostly juveniles and young adults (Fig. 5). The hunting of juveniles could have drastically reduced the beaver population, as European beavers give birth to 2–4 pups once a year and may not reproduce every year (Jormanainen 2005: 170). It is therefore unlikely that juveniles

were targeted, given the importance of beavers to hunters. The age estimates may be misleading because there were no juvenile beaver bones in the reference collections for comparison, and the burning and fragmentation of the material made it impossible to take any measurements for size estimates. Also, the bones that are aged as juveniles, fuse very early in the beaver's life and could be from a much older individual.

The young adults at both sites and the middle-aged adults found at Hiidenniemi suggest that the beavers were hunted when they had reached their full body size. In this way, the catch was optimal as an adult beaver could provide the greatest amount of meat, fat, and fur. The age of beavers also indicates the leaving of the natal colony, and they are fairly easy to spot if you know what to look for as their landscape-altering activities, such as felling trees, and damming rivers, significantly change the environment. These activities can be seen as beneficial or detrimental depending on the point of view. For example, flooding caused by the damming of rivers could be harmful to humans, but it may have had some positive effects on waterfowl and fish (Coles 2006: 48–57; Ukkonen & Mannermaa 2017: 62). Also, felling of trees benefited elk and hare by providing them with food for the winter. In the Hiidenniemi assemblage waterbirds, elk and hare were identified along with beaver (Table 1) which may indicate that these species had benefited from the presence and actions of beavers in the area, which were then exploited by hunters.

The mentioned activities were useful for the beavers themselves, but also for humans, especially hunters, who could find prey more easily in these areas. The knowledge of the beavers' activities would also have led to the beavers being found in different or completely new areas. This may have had been one of the reasons why humans settled in some of these areas, as the beavers would attract other animals. It is possible that the presence of beavers and other game, as well as good fishing waters and opportunities for fowling, was one of the reasons why humans decided to settle in Hiidenniemi and Hämeenniemi over the years.

Another characteristic of beavers is their ability to build sturdy lodges near water using mud, sticks and stones (Fig. 2). Beavers spend most of the day in their lodges and come out onto the land mainly in the evening to gather food and building materials, but also to carry out their construction activities. As beavers are nocturnal animals and mostly active during the darker hours of the day, humans would have noticed their building activities and felled trees during the light of day, and in order to engage with the animal itself, humans may have had to change their habits and movements in relation to beavers (see also Overton 2018).

The nocturnal nature of beavers affected the way they were hunted. Active hunting with handheld weapons, nets or a bow and arrow could have led to night hunting, which can be more demanding than hunting during the day. In summer, the nights in Finland are bright which makes night hunting easier than at other times of the year. It is possible that the hunters hunted beavers during summer nights, but as beavers are at their fattest in late autumn and their fur is at its best in late winter and early in spring (Cole 2006: 54–55; Jormanainen 2005: 170), the beaver hunting season was probably around this time of the year rather than in summer.

Beavers tend to live in the same lodge for several years, and three generations of beavers can live in the same lodge, as young beavers from the previous year's litter take care of the newborn (Jormanainen 2005: 170; Malinen 2014: 201). Beavers give birth in spring, but the juvenile beavers stay in the lodge for several months before they venture to the outside world (Lahti 1972; Jormanainen 2005; Malinen 2014). If in prehistoric times beavers were hunted in the spring to get the best pelt, it is possible to encounter beavers of different ages at this time of the year, as there are several generations of beavers in the colony. Looking at the age estimates, the Hiidenniemi assemblage contained juveniles, young adults, and middle-aged adults. This could suggest that if all the beaver bones were from the same time period, the hunters would have had the opportunity to encounter the whole beaver family, at least in theory. The beavers are at their fattest in the autumn and the juveniles born in the spring would have grown bigger and ventured out of the lodge, so the best time to hunt beavers for food would have been in the autumn.

Active hunting of beavers is a challenging undertaking, as they have good senses of smell

and hearing, although they are almost blind. Beavers are cautious animals and if they sense danger, they will not come ashore. (Jormanainen 2005; Malinen 2014.) The arrowheads and spearheads found in and around the settlement sites could have been used for beaver hunting, but they have their drawbacks. If the pelt of an adult beaver was one of the reasons for hunting these animals, the use of projectiles could damage the skin, making it less usable and valuable (Lehikoinen 2007: 124–125; Overton 2018: 302). Shooting beavers with a bow also requires skill as the lethal point is only the size of a fist (Malinen 2014: 212). Modern hunting practices also suggest that shooting beavers in the water is not advisable as a wounded animal tends to dive and disappear from the hunter (Lahti 1972: 287), or the body of the beaver will sink to the bottom of the lake. Killing the animal directly in the water with projectiles could therefore have been detrimental to the hunters. To catch the beaver on land, the hunters would have had to wait for several hours in a good hiding place for the wary animal to come ashore.

It has been noted that the beavers can be quite dangerous animals when directly approached or agitated (Lahti 1972: 296; Overton 2018: 302), and hunters would have known this. Passive hunting methods such as trapping could be carried out during the day and did not involve direct contact with the animal until the trap was examined making it easier to hunt beavers. In Finland, there is no archaeological material to prove how beavers were hunted in prehistoric times, but in historical times beavers were caught with underwater traps, especially in winter, and with nets at other times of the year (Paulaharju 1921: 69; Nunez 1990; Lehikoinen 2007: 124–125). Trapping as a passive hunting method allowed for more distant engagement during and after the hunt, as there was no direct killing of the animal if it had drowned. The use of underwater traps may explain the presence of juvenile bones in the assemblage, as juveniles can be caught in these traps just like adults.

Beavers are good swimmers and divers, and they use this ability to their advantage. Diving would also have been a way of avoiding or escaping predators and human hunters, which could have been interesting as beavers seemed to disappear into the water when they dived. In northern cosmology and worldview, water has played a significant role with liminal qualities, which have been associated with some of the animals that live mostly or entirely in the water (Kaski 2019; Herva & Lahelma 2020: 110–111). It is known from folklore material from historical times that the beaver's skull and castoreum were used for magical purposes related to water. For example, the skull was used to search the body of a drowned person by looking at the water through the eye sockets, and the castoreum could be used in a spell to calm the sea (Paulaharju 1922: 19; Lehikoinen 2007: 123–127; 2009: 134, 188–191; Pulkkinen & Lindfors 2017: 203). Another example of beavers' liminal qualities can be found in some Sámi drums, where the beavers depicted could be saivo animals, i.e., spirit animals, who helped the shaman on their journey to other worlds (Manker 1950: 22–24).

At both sites, Hiidenniemi and Hämeenniemi, fragments of beaver skulls were found, which of course do not prove the aforementioned beliefs as prehistoric, but they are still intriguing. At other archaeological sites, the mandibles and teeth of beavers have been found to have been used as tools, jewellery, or grave goods. At Yuzhniy Oleniy Ostrov, a Late Mesolithic cemetery in northwestern Russia, pendants made from beaver teeth have been found in several graves (O'Shea & Zvelebil 1984; Mannermaa et al. 2019). A burial with six beaver mandibles was found in the same cemetery, and it was proposed that the grave was a shaman's grave suggesting the importance of beavers in hunter-gatherer cosmology (Gurina 1956; O'Shea & Zvelebil 1984). Mandibula and teeth were also used as tools for different purposes (Zhilin 2020) and for sharpening metal tools such as an axe (Lehikoinen 2009: 190–191). Lehikoinen (2009: 190–191) writes that it was believed that the properties of beaver teeth were transferred to objects sharpened with them.

While there is only limited knowledge on the beliefs of the prehistoric hunter-gatherer communities in Finland, there is evidence that later hunters in the region perceived the animals they hunted as persons with varying powers and abilities. For example, in Finnish-Karelian folklore, the Hunt Master of the Animals would not allow people to hunt if they had not

previously treated the animals with respect and had not performed proper rituals and actions before, during and after the hunt (Tarkka 2005; Siikala 2012). Sámi shared similar beliefs in the Hunt Master of Animals (Pentikäinen 1995: 88–92) and they made offerings at sacred sites to ensure success in subsistence activities such as hunting and fishing (Pentikäinen 1995: 88–92; Äikäs et al. 2009; Salmi et al. 2015). The proper way of acting was crucial for the survival of the people involved, but it was also important for the animals, whose rebirth and new life depended on the hunter's actions. Thus, there were responsibilities that bound both parties, and ignoring these responsibilities could have been dangerous (see Ingold 2000; Hill 2011).

After the hunt, the beavers were brought to the settlement site to be prepared for meals and other purposes, and this is also suggested by the results. At Hiidenniemi and Hämeenniemi, the results and the context, settlement, could indicate hunting for the family unit itself as the total amount of beaver bones is small and the MNI for Hiidenniemi was two and for Hämeenniemi it was one. It is possible that more individuals were brought to the sites than the MNI suggests, as it is difficult to make interpretations from the burnt and highly fragmented material.

At the Hiidenniemi site, there were bones from the whole body, indicating that some of the beavers may have been brought to the settlement as whole carcasses. On the other hand, the Hämeenniemi assemblage may represent a similar situation as beaver mandible, metatarsals and phalanges were found there. The high proportion of limb bones (Figs. 3 & 4; Table 2) could mean that some of the beavers were processed outside of the settlement site and brought back only as skins. Skins were used for clothing because the fur it is waterproof, but they were also valuable for trade, especially for the fur trade during the Late Iron Age. It has been suggested that the objects of foreign origin have arrived here through trading of furs (Talvio 2002; Raninen & Wessman 2015), but this view has been challenged in recent years (e.g., Wuorisalo 2005; Korpela 2008; Kirkinen 2019).

As mentioned above, the proper way of acting was crucial for both parties, so it was important to act accordingly even after the hunt as the animal could retain some of its powers even after death (see e.g., Tarkka 2005; Pentikäinen & Tolley 2007; Hill 2011, Siikala 2012; Kirkinen 2019). When being prepared for consumption, the beaver's body was changed so it would be safe to eat. Overton & Hamilakis (2013: 117) write that humans had an ongoing physical engagement with non-human-animals by eating them and otherwise handling them at the settlement site. Those who did not participate in hunting or handling of the beaver's body would have had shorter physical contact with them than that of the hunters. Engagements with the beaver were regulated through the actions, roles and beliefs of the community, and the hunters had the longest engagement with the beaver itself.

After the beaver had been eaten, the bones from the body were burned, destroyed, and thrown away, as with other species, according to beliefs and habits about how to deal with meal waste. Since unburned bones do not survive in the acidic soils of Finland, there is only partial evidence of how the bones were handled after the animals were eaten. As the hearth enabled the food preparation and survival in a colder climate, the act of burning the bones in it may have had other meanings than getting rid of waste (Westerdahl 2002; Mansrud & Eymundsson 2016; Herva & Lahelma 2020: 166–167). For example, the bones were used as fuel alongside wood (see Vaneeckhout et al. 2010; Ballantyne et al. 2017: 425), which can be seen as a way of feeding the fire (Herva & Lahelma 2020: 166–167).

CONCLUSIONS

The beaver bones in this study came from two multi-period settlement sites. The age estimates suggest that the hunted beavers were mainly adult beavers who had reached their full body size, moved out of their natal colony, and probably had their first litter. The age estimates for juvenile bones could be misleading, and hunting of juveniles could be harmful to both the beaver population and humans, although they may have been caught in underwater traps, if they were used. The anatomical distribution shows that at least some beavers were brought to the site as whole carcasses, especially in Hiidenniemi, but the emphasis on limb bones suggests that some of them were also processed outside of the

settlement. The main species involved in this study were humans and beavers, but it was noted that there were waterfowl, elk, and hare bones from the Hiidenniemi assemblage which may indicate that these species benefited from the presence of beavers. Interspecies relationships between beavers and non-human species would be an interesting topic for future research.

The encounters and engagements outside the settlements were approached by looking at how beavers behaved and acted and what kind of beliefs there were about beavers. In this article, I wanted to illustrate that beavers had different ways of being, engaging and being present in a world, which they shared with humans. The hunters knew how the beavers behaved and where to find them, but the beavers were also active as they could protect themselves or dive away. The hunters would have learned to read the landscape to detect the presence of beavers, and they would have had to adjust their movements and actions in relation to the beavers. The encounters between hunters and beavers would sometimes lead to the act of hunting of adult beavers. Beaver hunting therefore required an intimate knowledge of beaver behaviour and ecology. In many worldviews, such traditional ecological knowledge is associated with beliefs and ideas about animal personhood, agency, and human-animal relationships.

Even in death, the beavers were a part of people's lives and spaces, as the hunted animals were brought to the settlement site to be prepared for meals and then burned on the hearth. This chain of engagement has shaped how the beavers have been perceived and understood in relation to humans and other animals. In the future, the significance of beaver hunting from settlement sites other than multi-period sites should be investigated. It would be very important to study the changing role of hunting and relationships and engagements with wildlife, such as beaver, in the long term as the spread of agriculture may have affected human-animal relationships and interactions.

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Appendix 1. All the aged bones and stages of epiphyseal fusion from Hiidenniemi (Collection number 36423) and Hämeenniemi (Collection number 34058) assemblages with collection numbers.

Collection number	Bone	Epiphysis	Age in years or months
34058: 107	Metatarsal 2	Closed	10 months
34058: 107	Metatarsal Phalanx 1	Closed	5 years
34058: 107	Metatarsal Phalanx 1	Closed	5 years
34058: 107	Metatarsal Phalanx 1	Closed	5 years
34058: 107	Metatarsal Phalanx 3	Closed	10 months
34058: 107	Metatarsal Phalanx 3	Closed	10 months
34058: 271	Metatarsal Phalanx 2	Closed	4 years
36423: 2900	Ulna	Closed	4 years
36423: 2928	Ulna	Open	3 months - 9 years
36423: 2929	Ulna	Open	3 months - 9 years
36423: 4686	Metatarsal Phalanx 2	Closed	4 years
36423: 4786	Metatarsal Phalanx 2	Closed	4 years
36423: 4789	Metatarsal Phalanx 1	Closed	5 years
36423: 4801	Metatarsal Phalanx 1	Closed	5 years
36423: 4809	Metatarsal Phalanx 2	Closed	4 years
36423: 4838	Metatarsal Phalanx 3	Closed	10 months
36423: 4846	Metatarsal Phalanx 2	Closed	4 years
36423: 4848	Metatarsal Phalanx 1	Closed	5 years
36423: 4859	Metatarsal 4	Closed	10 months
36423: 4859	Metatarsal Phalanx 2	Closed	4 years
36423: 4860	Metacarpal 3	Closed	3.4 years
36423: 4860	Metatarsal Phalanx 2	Closed	4 years
36423: 4872	Metatarsal 3	Closed	10 months
36423: 4881	Radius	Closed	3 months - 9 years
36423: 4882	Metatarsal Phalanx 1	Closed	5 years
36423: 4883	Metatarsal Phalanx 3	Closed	10 months
36423: 4919	Metatarsal Phalanx 1	Closed	5 years
36423: 4926	Metatarsal Phalanx 2	Closed	4 years
36423: 4928	Metatarsal Phalanx 1	Closed	5 years
36423: 4945	Tibia	Open	3 months - 6.4 years
36423: 4949	Metatarsal Phalanx 1	Closed	5 years
36423: 4982	Metatarsal Phalanx 2	Closed	4 years
36423: 4986	Metatarsal Phalanx 2	Closed	4 years
36423: 6036	Phalanx 3	Closed	10 months
36423: 6065	Metatarsal 5	Closed	6 years
36423: 6067	Metatarsal 1	Closed	6 years
36423: 6067	Metatarsal 1	Closed	5 months

Collection number	Bone	Epiphysis	Age in years or months
36423: 6082	Metatarsal 2	Closed	10 months
36423: 6086	Ulna	Open	3 months - 9 years
36423: 6090	Ulna	Open	3 months - 9 years
36423: 6099	Metatarsal Phalanx 1	Closed	5 years
36423: 6099	Metatarsal Phalanx 3	Closed	10 months
36423: 6104	Metatarsal Phalanx 1	Closed	5 years
36423: 6128	Metacarpal 5	Closed	3.4 years