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A life history of a female hunter from Yuzhniy Oleniy Ostrov (Karelia, Russia)

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Abstract

Here we study the life history of a 25–35-year-old woman buried at the Late Mesolithic cemetery of Yuzhniy Oleniy Ostrov in Karelia. Our study involves osteological analysis of the human skeletal materials, sequential isotopic analysis and macroscopic investigation of bone projectile points found in the grave. We suggest that she could have been a hunter. Her diet was based on freshwater fish, hunted animals, and gathered plants. However, it was likely to have been seasonally variable. She was in good health, based on morphological evidence, but a DNA-analysis revealed that she carried the hepatitis B virus.

Keywords: individual life histories, Yuzhniy Oleniy Ostrov, Mesolithic in Karelia, stable isotopes, paleopathology, traceology, bone projectile points

17.1 Introduction

Life history studies can provide important evidence of past people's life ways. Biological life histories in archaeology are based on physical anthropology and in recent years, multi-isotope analyses (e.g. Krogman 1935; Fernández-Crespo et al. 2020; Henderson et al. 2022). Mortuary archaeological data (including grave goods, body positions and burial practices) as well as environmental and chronological data, offer lines of evidence that may provide details of the lives of buried individuals (Zvelebil & Weber 2013). In a ideal situation, this multi-methodological and multi-perspective data can be used to reconstruct parts of a past person´s life history. (e.g. Zvelebil & Pettitt 2008). In this paper, we investigate the life history of a female buried at the Late Mesolithic cemetery Yuzhniy Oleniy Ostrov (YOO) in Karelia, northwestern Russia. Our preliminary study involves osteological analysis of human skeletal materials, sequential isotopic analysis and macroscopic investigations of the artefacts found in the grave.

17.2 Materials, Methods and Results

17.2.1 The Yuzhniy Oleniy Ostrov (YOO) burial site

The YOO cemetery is situated on Lake Onega in the Karelian Republic, northwest Russia. Grave 90 is one of 177 registered graves at the cemetery, excavated in 1936–1938 by Russian archaeologist V. I. Ravdonikas (Gurina 1956). (Fig. 1). Most of the YOO graves contain human skeletal remains and a rich inventory of bone and stone artefacts. The most common osseous artefacts are pendants made of teeth from Eurasian elk (*Alces alces*), Eurasian beaver (*Castor fiber*) and brown bear (*Ursus arctos*) (Gurina 1956). Animal tooth pendants, especially grooved elk teeth, are considered to be the most important cultural identifiers for Mesolithic groups in Karelia (Mannermaa

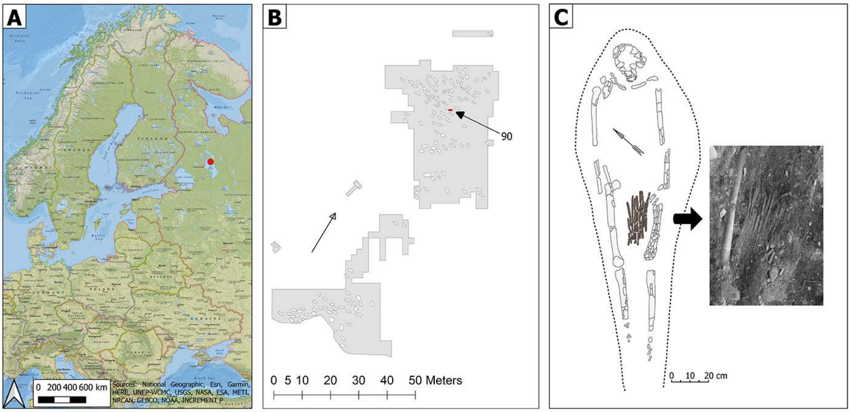

Figure 1. A – location of the Yuzhniy Oleniy Ostrov; B – plan of the excavated areas and graves and the location of the Grave 90 (based on Gurina 1956); C – Grave 90 of a 25–35-year-old woman at Yuzhniy Oleniy Ostrov and a photo of the projectile points *in situ*. Drawing based on Gurina (1956: Fig. 46), photo Peter the Great Museum of Anthropology and Ethnography (Kunstkamera), MAE 1886-60.

et al. 2021). All human skeletal remains belong to the collection 5773 and all animal bone artefact finds to the collections 5716 of the Peter the Great Museum of Anthropology and Ethnography (Kunstkamera) in St. Petersburg.

Systematic descriptions of graves were provided by Nina N. Gurina in a monograph 'Оленеостровский могильник' (En. The Oleneostrovskiy cemetery), published in 1956. More recently, the materials from the graves and their human remains have been discussed in several publications (e.g. Mannermaa et al. 2021; 2022; Rainio et al. 2021; Schulting et al. 2022). The human remains in Grave 90 have not been directly dated with AMS but radiocarbon dates of c 6000–6200 calBC for other burials at YOO (Schulting et al. 2022) suggest a maximum period of 250–300 years for use of the site and provide a rough date also for this grave.

The deceased was lying on her back in an extended, supine position (Fig. 1c). Her face was directed upwards, and the upper limbs were extended along the body. The preservation of human bones is poor. The skeleton is represented by cranial and some postcranial bones, most of them located in anatomical position. A layer of brownish red coloured ochre covered the skeletal remains. Between the legs of the deceased were several pointed weapons (Fig. 1c) but no other grave goods were found.

17.2.2 Physical anthropology and DNA

Only the fragmented cranium, the teeth and a diaphysis of one femur were complete enough to be included in the osteoarchaeological and paleopathological examination, conducted using the protocols recommended by the British Association of Bioanthropology and Osteoarchaeology (Mitchell & Brickley 2017). The sex estimation was complicated by the absence of diagnostic bones and erosion of the bone tissue. Based on cranial traits, previous researchers (e.g. Yakimov 1960) had estimated that the individual was a male. Furthermore, V. Yakimov (1960: 264) mentions that several features observed in this particular individual, for example the prominence of the glabellar area is exceptional within the YOO population. The robustness of the skull was the reason for earlier anthropologists to suggest a male sex, however, a recent DNA-analysis revealed that the individual was a female (Kocher et al. 2021). Age characteristics obtained using dental attrition indicates that the woman was between 25 and 35 years old at the time of death.

Our paleopathological investigation revealed several features regarding her health. Signs of healing porotic hyperostosis were observed on the frontal bone, mostly in the glabellar and supraorbital areas. Porotic hyperostosis itself can be evidence of the variety of diseases but most researchers (e.g. Walker et al. 2009) consider it the result of megaloblastic anaemia acquired by nursing infants as consequence of deficiencies in maternal vitamin B12 reserves and poor sanitary living conditions that can cause additional nutrient loss. An examination of her oral health revealed carious lesions (mandibular right M1, M2, M3, and maxillary right M3). Maxillary and mandibular molars show signs of moderate dental calculus on the buccal surface.

The DNA-analysis has revealed that the woman in Grave 90 is one of four individuals at YOO carrying the hepatitis B virus (HBV) (Kocher et al. 2021). In modern paleopathological discourse, there is no documented evidence of HBV manifestations diagnosed with morphological methods. That also means that we cannot estimate whether the individual suffered from acute or chronic type HBV.

17.2.3 Stable isotopes

Analysing the stable isotope composition of body tissue, derived from dietary intake, allows insights into diet, mobility and environmental factors on an individual level. As a part of a larger study on isotopic markers at YOO, the individual was subjected to multi-proxy analysis that included the investigation of the isotopic compositions and contents of C, N and O according to well established methodologies (Czermak et al. 2020; Sahlstedt & Arppe 2021).

To reconstruct the main constituents of diet and variations in it over time, $\delta^{13}C$ and $\delta^{15}N$ values in sequentially sampled tooth dentine were analysed. To this purpose, the maxillary left M1 was prepared and sequentially sampled according to the method developed by Czermak et al. (2020). Seventeen samples were taken following the growth axis of the tooth from crown to root, covering the complete time span of dentine formation. This permits the investigation of the individual's childhood dietary input from around birth to c 9 years of age (e.g. Lee-Thorp 2008; AlQahtani et al. 2010). The quality of results was assessed according to standard criteria (DeNiro 1985; Fernández-Crespo et al. 2020). The remaining data points fall on a scale between 13.5 to 19.9‰, averaging at 15.9‰, for $\delta^{15}N$ and -20.6 to -19.5, averaging at -20.0‰, for $\delta^{13}C$, with an initial steep decline in $\delta^{15}N$ values, associated with infant weaning, as well as multiple smaller scale changes in isotopic composition during early childhood (Fig. 2).

$\delta^{18}O$ values of enamel phosphate were determined on an incisor, reflecting the early years of the individual's life (c from 0 to 3–4 years) to explore her origins and climatic setting of the period. The use period of the cemetery coincides with the 8.2 ka cooling event (Schulting et al. 2022), and thus the usefulness of the human $\delta^{18}O$ values as provenancing tools are likely compromised due to expected shifts in geospatial patterns of precipitation $\delta^{18}O$ values. The obtained $\delta^{18}O$ value for Individual 90, 10.8‰ (VSMOW), is on the lower end of the spectrum of values obtained for the YOO humans. Translating this value to approximate $\delta^{18}O$ values of ingested drinking water (Daux et al. 2008), c -17‰, suggests significantly lowered $\delta^{18}O$ values of precipitation in the region and are generally suggestive of harsh, cold conditions as the climatic backdrop for this individual and indeed all the humans at YOO.

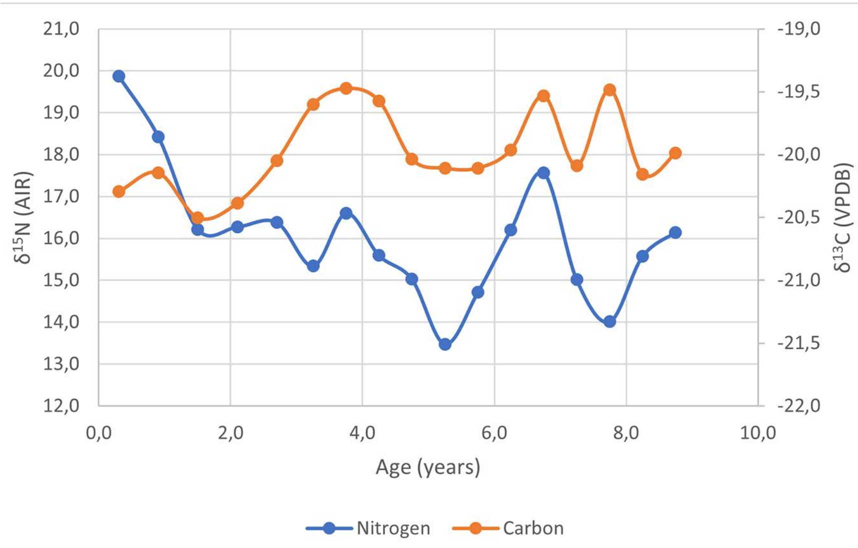

Figure 2. Graph showing $\delta^{13}C$ and $\delta^{15}N$ values sampled sequentially from a first molar. Illustration R. Eckelmann.

17.2.4 Grave goods

Grave 90 contained at least twelve poorly preserved, broken bone projectile points (arrow or spear heads), originally located between the femora of the deceased. Their distal parts were oriented towards the feet. They had been glued together and taken as a monolith in the field and moved to the Peter the Great Museum of Anthropology and Ethnography (Kunstkamera) in St. Petersburg. We studied the items with the naked eye and a magnifying glass in 2018. Breakages, multiple cracks and flaking were observed on the surfaces and only very few technological traces are visible. The texture of the fracture margins is jagged and irregular – typical of fragmentation of a dry bone (Fisher 1995). Dry breakages indicate that projectiles were broken during or after the excavation, but they were complete when put in the grave.

Most of the projectiles are long and straight, but there are also at least three barbed projectile points (three or four unilateral barbs), and one unilateral slotted point with two flint inserts in the assemblage. One of the points is possibly paddle-shaped. Points were made of long bones from large mammals, but the species cannot be identified. Due to intensive surface erosion and the glue holding items together, it is impossible to estimate the manufacture or hafting technology. Some long and fine striations on the surfaces of the shafts and the barbs of the barbed points demonstrate that a fine scraping technology was used.

17.3 Discussion and conclusions

17.3.1 Diet, physical features and health

While the woman's stable nitrogen values are very high compared to what is known from most populations of the European Mesolithic (e.g. Schulting 2018; Henderson et al. 2022), they are still below the average for YOO

(Schulting et al. 2022; Eckelmann et al. in prep). In contrast, her $\delta^{13}C$ values fall within the population average, and can be considered normal for the area and expected climatic conditions (e.g. DeNiro & Epstein 1978; Schulting et al. 2022; Eckelmann et al. in prep.). The combination of both proxies is indicative of a large contribution of high trophic food to protein intake, most likely coming from piscivorous aquatic sources, which is in concert with previous studies (e.g. Schulting et al. 2022). This specific individual, though, appears to have a higher contribution of terrestrial input than the majority of the YOO individuals investigated.

Regarding the temporal aspects of dietary change, the $\delta^{15}N$ values are the highest at the beginning of the individual's life, which is caused by the suckling effect: during the breastfeeding period the infant is de facto one level above her mother in the trophic chain, leading to elevated $\delta^{15}N$ values (Fogel et al. 1989). The initial drop visible in the nitrogen and to a degree carbon values is then understood to be related to the cessation of exclusive breastfeeding and the subsequent weaning period leading to a gradual trophic level stepdown. This decline, and with it the weaning period, appears to be completed at c 1.5 years of age. This is remarkably early within the YOO dataset (Eckelmann et al. in prep), as well as compared with other groups. Most traditional societies complete weaning between 2–3 years with a trend to even longer periods of sustained breastfeeding recorded for foragers compared to agricultural or pastoralist societies (Sellen & Smay 2001). The few existing datasets for weaning in the Mesolithic show similar tendencies, with weaning completed at c 3 years at Zvejnieki, Latvia (Henderson et al. 2021), after 2 years at the Danubian Gorges (Becdelièvre 2022) and at around 2 years in the Meuse Basin (Bocherens et al. 2007). Reported factors leading to a shortening of the breastfeeding period of individual children include the birth of a new child, maternal physiological stress or illness, increased maternal workload and plenty of available secondary caretakers, reducing the mother-child time (e.g. Quinlan & Quinlan 2008; McKerracher et al. 2017).

For the post-weaning period up to 9 years, the individual retains overall high $\delta^{15}N$ values, showing temporal dips, likely indicating an increase in the contribution of terrestrial protein sources and decrease of aquatic ones. Diverging $\delta^{13}C$ and $\delta^{15}N$ values during this time may potentially be associated with intense body growth during periods of nutritional stress (cp. Feuillâtre et al. 2022); however, there are no osteological indicators for physiological stress (Batanina et al. in prep.). Considering the timing of the visible fluctuations, as well as the apparent repeatability of the up and downs, another possible explanation is that these changes are related to seasonal mobility and/or changes in prey choices.

While there are no dietary stress markers in her teeth, the presence of moderate caries, which is unusual for hunter-gatherer communities (e.g. Lanfranco & Eggers 2012), could be a potential indicator for higher amounts of carbohydrates in the diet. Preliminary analysis of dental calculus from the woman in Grave 90 by Tuija Kirkinen has revealed probable tuber starch particles (Kirkinen et al. in prep.). Based on this, it can be assumed that at least some of these carbohydrates came from root vegetables.

The absence of rickets, scurvy and other markers of nutrient deficiences might be interpreted as satisfactory conditions in early and late childhood. The only sign of probable physiological stress are porous lesions on cranial bones. Porotic hyperostosis covering the bones of the cranial vault can be interpreted as evidence of insufficient vitamin B12 intake, which consequently can cause anaemia (e.g. Walker et al. 2009). As isotopic data indicates dietary preferences consisting of fish and terrestrial animal proteins, the porotic lesions of the cranium have several explanations. One possible reason is poor sanitary conditions including parasite invasion and/or problems with the gastrointestinal tract (e.g. Sullivan 2005). The aetiology of anaemia in this context is immune reaction of erythropoiesis suppression leading to inflammatory anaemia (Razhev 2016). The 'parasite' assumption is supported by the prevalence of aquatic resources, which might cause parasite invasion. Another possible reason for porotic hyperostosis lesions and anaemia might be the manifestations of HBV. In medical research, anaemias are considered as rare complications of HBV (e.g. Hafeez et al. 2016). The question regarding the impact of HBV is rather complicated as both chronic and acute forms might occur asymptomatically (Hollinger & Liang 2001). However, medical records can include symptoms such as easy fatigability, anxiety, anorexia, nausea, vomiting and malaise (Hollinger & Liang 2001).

The woman had robust facial features, she seems to be overall healthy. Nevertheless, a low number of pathological manifestations on poorly preserved skeletal remains is not necessarily evidence of 'good health'. Lack of evidence of diet-related physiological stress in her skeletal remains corresponds with the data from the whole YOO group: the frequencies of, scurvy and rickets are considerably low (Batanina et al. in prep.). This corresponds with previous research including the study of Harris lines and the compactisation index (Mednikova 2009), showing adaptation of human groups to local living conditions.

17.3.2 What can the grave goods say about her lifetime activities?

All observed arrowhead types are quite common in western Russia (Zhilin 2020; 2021). The scraping technique observed is also common for the manufacture of projectile points in the Late Mesolithic of this area (see for example Treuillot 2013; 2016). Points were found in a tight cluster, which indicates that they were probably held together with string or fibres or kept in a container such as a quiver to hold the arrows during hunting and storage. Similar potential sets of projectile points (potential quivers), deposited on various parts of the bodies were found in ten other graves at YOO (Gurina 1956).

Did the woman use these weapons and was she a hunter? Graves are always made by someone other than the deceased, and it is often not possible to determine whether the artefacts found in the grave were given to the deceased by other people or, whether the artefacts belonged to or were owned and used by the buried person. The grave itself can also be seen as representing the material remains of a ritualised response to death (Ahola 2019: 14). This could mean that the setting of the grave and artefacts would represent a

Figure 3. An artistic interpretation of the woman in Grave 90 and her life as seen through archaeological research. Drawing T. Björklund.

practice formulated by the state of the community following the death of a (significant?) member.

Sometimes muscular marks in certain skeletal parts indicate use of bow and arrow (Sládek et al. 2022) but in our case the postcranial bones are so poorly preserved that muscular marks cannot be studied. Keeping this in mind, we admit that we cannot unambiguously say whether the weapons belonged to the deceased woman or whether they were given to her for the grave. However, Rainio et al. (2021) have studied use wear on the Eurasian elk tooth pendants from YOO and concluded that the pendants were intensively worn and that they most likely were used by the deceased during their lives. Using this study as an example, we may assume that the points in Grave 90 belonged to the woman during life, and that she indeed was a hunter. In ethnographically recorded hunter-gatherer communities, women had active roles (e.g. Haas et al. 2020). We can assume that prehistoric hunter-gatherer women would also have been skilled hunters. For example, in eastern Finland a female hunter holding a bone and arrow has been depicted in the rock painting at Astuvansalmi (Seitsonen 2005: Fig. 4). The painting probably dates to c 4600–2000 calBC.

It is possible that the woman also prepared the points herself. Sometimes the nature of abrasions and wear on the front teeth suggests their use as a third hand (Radini et al. 2017). In our case, the woman has moderate attrition on her teeth, however, we cannot unequivocally link this attrition to using teeth as a third hand (Fig. 3).

The analysis of points with complete surfaces from other graves at YOO shows that at least some of them were used before deposition. The setting of the points in Grave 90 finds parallels with the Grave 164 (c 4000 calBC) at the Zvejnieki cemetery, Latvia (Mannermaa 2008; Macāne 2022). Traces of impact and repair on five of the specimens in Grave 164 confirm that the points were used (Osipowizc et al. 2022).

Unlike most other individuals from YOO cemetery (Mannermaa et al. 2021), the woman in Grave 90 did not have any tooth pendants or other macroscopically visible ornaments or grave goods. Rainio et al. (2021) have shown that elk tooth pendants in some graves at YOO were used as rattles, probably in ceremonial dances. The woman in Grave 90 woman did not carry rattles in her clothes like many other individuals in the cemetery, probably indicating a social status not associated with such activities. It seems that despite the fact that the woman was probably hunting and eating terrestrial animals such as elk, she perhaps did not receive or own their incisors. When the life histories of more individuals from YOO have been reconstructed, we may apply this information in the study of social structures and gendered roles in the society. using this site.

17.3.3 Conclusions

To summarize the results, we propose the following information about the life of the individual in Grave 90. She was a 25–35-year-old woman with strong facial features. As a child, she was weaned at the age of 1.5 years, which is early within the YOO dataset and Mesolithic groups elsewhere. In her late childhood, she consumed high amounts of aquatic protein (from freshwater fish) but also a higher input of terrestrial protein (from land mammals) than her compatriots. The percentual contribution of food sources likely varied over time but there are no indicators for dietary stress during her life. We suggest that the observed porotic hyperostosis – a sign of anaemia – might be caused by parasite invasion and problems with gastrointestinal tract (due to aquatic food and perhaps raw fish). Another cause for anaemia could be the hepatitis B virus. The observed dental caries – unusual for hunter-gatherer communities – could indicate higher amounts of carbohydrates in her diet.

She is one of the rare women at YOO who was buried with hunting gear (straight bone projectiles, few barbed points and a slotted point). As such, she might have been a hunter (of land mammals). The weapons represent technology types that are common in this area. A lack of elk teeth in her grave suggests that she did not carry rattles on her clothes like many other individuals in the cemetery.

Acknowledgements

The material studied for this article belongs to the collections 5773 (human skeletal remains) and 5716 (artefacts) of the Peter the Great Museum of Anthropology and Ethnography (Kunstkamera) in St. Petersburg. We thank the Kunstkamera museum for permission to study the materials from YOO and publishing the photo of the projectile points in this article. Dr. Dmitriy Gerasimov, Dr. Alisa Zubova and Dr. Vyacheslav Moiseyev are especially thanked for their collaboration, help and advice in studying the materials. Tom Björklund is thanked for drawing the picture in Figure 3. Professor Volker Heyd has participated in the study of the mobility of the YOO ancestors by using strontium stable isotopes. Although this article will not cover strontium analysis, which is still in progress, this paper is a way to show our gratitude to him. The research is part of the project 'Animals Make Identities. The Social Bioarchaeology of Late Mesolithic and Early Neolithic Cemeteries in North-East Europe' (AMI), which has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 864358).

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