



Full length article

The variable histories of reindeer scapulae on the Iamal Peninsula of Arctic Siberia

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ABSTRACT

Reindeer scapulae are widely incorporated into Indigenous lifeways across the Circumpolar North, especially as hide working tools, fish knives, and divination devices. This article addresses the histories of this particular skeletal element at the Iron Age settlement site of Iarte VI on the Iamal Peninsula, Arctic Siberia. Scapula tools are the most abundant group of implements recovered from the site. These implements, which were only used in Iamal from the 11th to 14th centuries CE, have so far been documented only at Iarte VI and one other site on the peninsula. Their particular forms are not currently known outside the region. We examine how this one element was separated from other parts of the body, which scapulae were chosen for tool production, and how they were transformed into implements. These tools appear to have been used for softening and straightening reindeer skin straps for ropes and lassos, a task now undertaken on the peninsula entirely by men. Drawing upon published accounts and our own ethnographic research with Nenets, we discuss how reindeer scapulae are embedded into perceptions of wild and domestic reindeer, used as hide-working tools, and involved in a variety of social and material practices in this region.

1. Introduction

Reindeer or caribou scapulae are easily recognizable elements of the mammalian skeleton because of their wide, flat, and paddle-shaped form. This element was and still is a rather popular item to be transformed into tools or used as a divination device among Indigenous populations of the Circumpolar North (e.g., Bogoras, 1904–1909; Gusev, 2017; LeMoine, 1997; Moore, 1957; Perevalova and Karacharov, 2006; Vorob'ev, 2014). Indigenous groups of the Iamal Peninsula, Russian Federation (Fig. 1), are no exception to this broad pattern. This region is located just northeast of the Ural Mountains in Arctic Siberia and is the homeland of Nenets and both wild and domestic reindeer (*Rangifer tarandus*). These animals are still the most reliable and abundant resource for people in this region, and they have long shaped the mobility and subsistence patterns of the peninsula's inhabitants (e.g., Fedorova, 2006; Gemuev et al., 2005; Golovnev, 1995; Golovnev et al., 2016; Gusev et al., 2016; Khomich, 1966; Krupnik, 1993; Kushelevskii, 1863; Nomokonova et al., 2017, 2018; Plekhanov, 2014b; Vizgalov et al., 2013; Zhitkov, 1913). Most importantly here, reindeer have a protracted history as sources of materials for tools and clothing,

a material practice that continues in the region to this day.

The archaeological record from the Iamal Peninsula unsurprisingly includes a wide variety of artifacts made from reindeer bodies, including harness pieces, scrapers, arrowheads, clothing items, and ropes (e.g., Fedorova, 2006; Fedorova et al., 1998; Kardash, 2011; Plekhanov, 2014a). Tools made from reindeer scapulae are another abundant group of artifacts found in the region (Fig. 2a), the majority of which were recovered at the Iron Age settlement known as Iarte VI. This site is situated on a small terrace overlooking the floodplain of the Iuribei River in the central part of the Iamal Peninsula (Fig. 1). Iarte VI has produced over 22,000 reindeer remains, making it one of the largest *Rangifer tarandus* assemblages from the entire Siberian Arctic (Nomokonova et al., 2017, 2018). The site provides an excellent opportunity to trace the uses and variable histories of reindeer scapulae. Here we explore how these elements were transformed from parts of the bodies of reindeer to objects of interest and use, and how they ultimately became important links in the chains of people - reindeer relationships that emerged on the peninsula.

To address the variable histories of scapulae at Iarte VI, we incorporate both archaeological and ethnographic data, starting with a

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Fig. 1. Map of the Russian Federation with locations of the Yamal Peninsula and archaeological sites discussed in the text indicated.

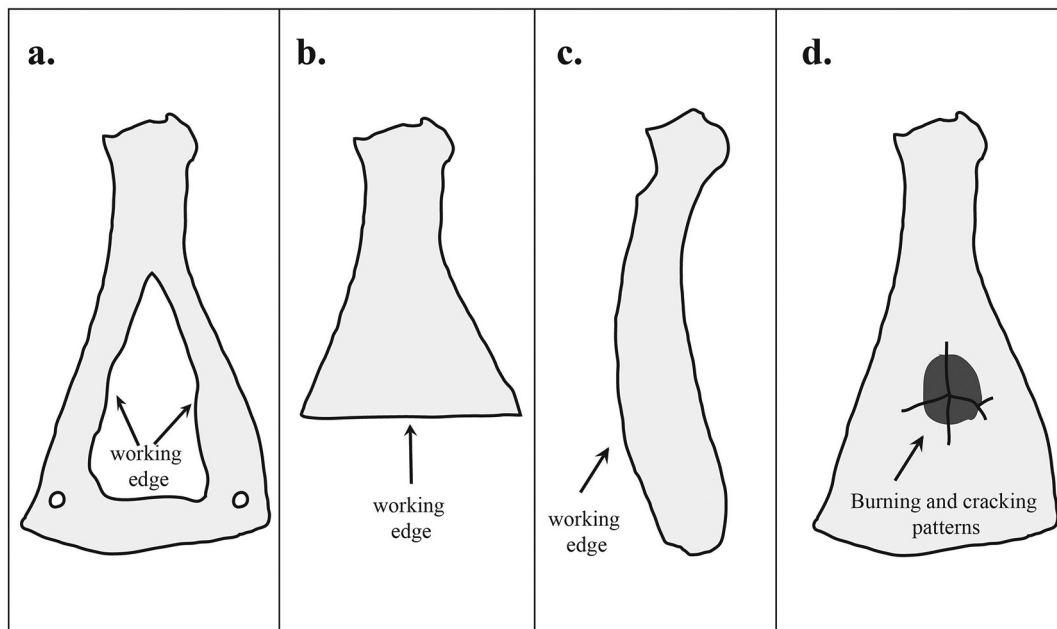


Fig. 2. Schematic examples of *Rangifer tarandus* scapulae uses in the Circumpolar North: a) Iarte VI scapula tool; b) North American hide scraper; c) Northwestern Siberian fish scaler knife; d) Eveny scapula for divination.

brief illustration of how this skeletal element has been known and used among Indigenous groups of the Circumpolar North. This approach is employed to demonstrate ways of engaging with one specific element of an animal body. Further, this helps demonstrate how such practices are incorporated into daily subsistence activities and spiritual relationships with animals, their bodies, and other materials and individuals. Many of these scapula histories are based on previously published observations, but comparative material is also taken from our ethnographic fieldwork with Nenets reindeer herders on the Yamal Peninsula in 2018. Further, we describe and analyze the scapulae found at Iarte VI. We

apply zooarchaeological methods to explore which reindeer scapulae were available at the site, and which of these elements were chosen as suitable for tool manufacture. We also explore how scapulae were transformed into tools, starting with the process of separating them from an animal's body, which was followed by shaping them into tools, using them as tools, and ultimately discarding them. To conclude, we offer comparative analysis of scapula tools found elsewhere on the Yamal Peninsula and discuss how one specific form of scapula tool became meaningful over a period of one or two centuries, and then subsequently disappeared from use on the peninsula.

2. Scapula histories in the circumpolar north

Reindeer or caribou scapulae have been and still are commonly used in making a variety of implements. For example, caribou scapulae were often modified for use as hide scrapers (Fig. 2b), skin softeners, fish scalers, and even fish soup ladles by several Indigenous groups of the North American Arctic over the last few thousand years (Arima, 1984: 449; Birket-Smith, 1929: 145, 242; Boas, 1964: 111; Giddings, 1964: 69–70; LeMoine, 1997: 34–35, 49; Mathiassen, 1927: 89–90; Morrison, 1983: 145–146; Sabo, 1991: 95). In Siberia, Nenets, Khanty, and Mansi (among many others) continue to make knives for cleaning fish (particularly for removing their scales) from reindeer scapulae (Glavatskaya, 2006: 122, 150; Fedorova, 1994: 223; Khariuchi, 2001: 55; Lukina, 2010: 52; Perevalova and Karacharov, 2006: 30). This specific material practice in Northwestern Siberia began at least 2000 years ago based on the large number of scapula knives found in many of this region's Late Holocene archaeological sites (Fig. 2c; Gusev, 2017: 46–47).

Rangifer tarandus scapulae also play an important role as divination items. In these roles, the scapulae are involved in the process of learning about and predicting future hunting trips, travel, and weather, and as a form of protection against the dangers of disease. For example, Chukchi, Eveny (Fig. 2d), Evenki, and Dolgany of Siberia, as well as Cree and Naskapi groups in North America, applied intense heat to scapulae and then read the resulting fracture and burning patterns on the blade as part of divination processes (e.g., Bogoras, 1904–1909: 487–489; D'iachenko, 2005: 191; Speck, 1977: 152–163; Tanner, 1979: 124; Vasilevich, 1969: 242–243; Vorob'ev, 2014: 704–705). For such divination practices, Chukchi used scapulae only from domestic reindeer, and a person of high social standing would conduct readings, usually during the spring migration period (Bogoras, 1904–1909: 487). Other special meanings attributed to this skeletal element also resulted in its incorporation in various beliefs and practices. Khanty, for example, believed that fish scales should only be removed with a bone or wood knife. If this practice were not followed, the person violating this tradition then would be unable to catch fish (Perevalova and Karacharov, 2006: 241). Cree considered scapulae of large animals such as moose and caribou to be potentially dangerous items, and only people such as shamans could use them. They were also considered to have effects on other parts of caribou bodies. The awareness of this power of caribou scapulae resulted in placing such skeletal elements in special locations for display, including in trees next to antlers and skulls, which kept them away from other caribou bones (Tanner, 1979: 123–124).

In 2018, Nomokonova and Losey lived with Nenets reindeer herders at the northern end of the Iamal Peninsula for about 1 month. Our primary goal was to consult with Nenets about their interpretations of various artifacts from the region, including the scapula tools from Iarte VI. Our secondary goal was to better understand how reindeer were incorporated into daily practices and beliefs. Our conversations with and observations of Nenets showed that reindeer skeletal remains, including scapulae, are far more than mere waste from the consumption of these animals. First, as seen among other northern Indigenous groups (e.g., Bogoras, 1904–1909; Tanner, 1979), bones are known to be representations of living animals and their treatment must be conducted in a proper and respectful manner. This is especially the case with sacrificed domestic reindeer whose heads and antlers are often brought to sacred locations devoted to local gods and spirits (Khariuchi, 2012: 94–95; Plekhanov, 2015). During our stay with Nenets families, it was also obvious that reindeer bones were stored and disposed in certain locations within each camp. For example, wild reindeer heads bearing antlers were kept behind the dwelling (a conical tent); such areas were sacred places that were prohibited for women. Some postcranial elements were kept on the roof of the dwelling's doorway extension after the meat from them had been consumed, but other bones were also given directly to families' herding dogs, including scapulae. This was

most often done in the area to the left of the dwelling's entrance, an area also associated with household waste and the women's lavatory.

We had several conversations with Nenets specifically about scapulae, or *latako* in their language. Unsurprisingly, every Nenets we spoke with knew exactly which element this was and where it was located in the body. Everyone also had memories of making, seeing, or using knives made from scapulae for de-scaling fish, as metals knives cannot be used to process fish. Although some gender restrictions exist regarding what parts of reindeer bodies can be eaten by women, no such proscriptions were applied to the flesh associated with the scapula. Questions about the quality of meat on the scapula in comparison to other elements also failed to reveal specific taste or quality concerns about this element, with a general comment being that “everything is good in reindeer”. However, our queries revealed an interesting and clear distinction between scapulae from wild reindeer versus those from domestic reindeer. This distinction involves an understanding that one should never make a hole in a domestic reindeer scapula, as this will cause other domestic deer to leave their people. In other words, integrity of the element is related to the continuity of this particular human-reindeer relationship. Conversely, one must always make holes in scapulae of hunted wild reindeer, an act meant to encourage more wild reindeer to come to the household. Overall, these particular treatments of this element are a way of ensuring useful relationships with reindeer, but those relationships and practices vary between wild and domestic individuals.

Photographs of the Iarte VI scapula tools, described below, were shown to Nenets during our stay, and scapulae from our shared meals were also used in discussing the archaeological implements. Unfortunately, no one we spoke with was able to recognize the scapula tools from the site. While scapulae continue to function within Nenets material practices in various ways, the specific forms seen at Iarte VI have long since dropped from use.

3. Iarte VI and reindeer scapulae

The Iarte VI settlement, which generated the *Rangifer* scapula discussed here, was excavated in the 1990's and again in 2013 and 2015 (Anderson et al., 2019; Brusnitsina and Oshchepkov, 2000; Nomokonova et al., 2017, 2018; Plekhanov, 2014a, 2014b; Vizgalov et al., 2013). The total excavated area is now 338 m². Bayesian analysis of 32 radiocarbon dates, many on reindeer bone from the site, provided a modeled start date for site occupation at ~1016 CE*¹ and a modeled end date at 1122 CE* (Nomokonova et al., 2018). This age range overlaps well with the 46 dendrochronology dates from the site, which range in age from 1066 and 1106 CE (Shiitov and Khantemirov, 2000). The site contains seven house pits with average surface areas of ~7.5 m². The southeastern section of Iarte VI contained a ditch measuring 4 × 15 m, which perhaps was initially built to help to fortify the settlement. Over the course of site occupation, the ditch also was utilized for household waste disposal. This interpretation is supported by the presence of strata in the ditch containing very dense concentrations of bones and other organic remains, particularly along its innermost section. Excavations at the site have produced over 800 artifacts and almost 40,000 faunal remains. Artifacts recovered include pottery fragments, knives, scrapers, arrowheads, rope fragments, wool and leather clothing fragments, pendants and bracelets, toys, and other objects (Plekhanov, 2014a). Faunal remains are overwhelmingly dominated by reindeer, but bones from other mammals including arctic fox, wolf, dog, arctic hare, beaver, and pinniped were also found (Nomokonova et al., 2017, 2018). Additionally, some bones from birds such as swans, geese, ducks, loons, jaeger, gulls, and ptarmigans, along with a few fish specimens from pike and taimen, were also present.

¹ Wherever the asterisk "*" appears following a chronological age (as in "CE*") it refers to a modeled, calibrated, calendar date.

Iarte VI is one of two sites (along with Ust'-Polui) to play major roles in debates about the antiquity and nature of reindeer domestication in Iamal (Anderson et al., 2019). For example, Fedorova (2006) has argued that domestic transport reindeer were required for inhabiting this section of the peninsula. She posited that over 150 such reindeer were needed to transport people to Iarte VI, and that these domestic animals were also the primary source of food and hides. Additionally, Gusev et al. (2016) argued that the abundant scapula scrapers at the site, discussed below, were perhaps employed for working hides to be used in exchanges in the region's trade networks; domestic reindeer were said to be the sources of these hides. Anderson et al. (2019) recently have made the case that the unique landscape of Iarte VI allowed for the keeping of domestic deer at this particular location, although perhaps in fewer numbers than argued by Fedorova (2006). They use a series of geoarchaeological data on soils to argue that reindeer were kept in the open area just southeast of the trench at the site. Much of this soil evidence, however, predates all other dated archaeological materials at the site, including all analyzed faunal remains and artifacts. Finally, analysis of mtDNA of reindeer remains from the main period of site occupation provides little to no indication that the ancestors of today's domestic reindeer were present at Iarte VI (Røed et al., 2020). This may suggest that either no domestic reindeer were present at the site, or that the domestic reindeer that lived there were a distinct population from that now inhabiting the peninsula.

Reindeer scapulae described in this paper derive from the excavations at Iarte VI in 2013 (trench # 1) and 2015, which covered an area of 45 m² (Table 1). These excavations were carried out by the Arctic Scientific Center of the Iamal-Nenets Autonomous District under the supervision of Andrei V. Plekhanov (Plekhanov, 2014a, 2014b). Faunal collections from other excavations at the site were not incorporated for two reasons. First, trench # 2 from 2013 (27 m²) was located at the edge of the settlement and contained only a few poorly preserved animal bone fragments, none of which were scapulae (Nomokonova et al., 2017, 2018). Second, results of the 1990's excavations remain largely unpublished and therefore cannot be integrated with the data in this study. Note, however, that we refer to overall numbers of reindeer scapula tools and other artifacts at the site, which includes those from all previous excavations.

Excavations in 2013 (trench # 1) and 2015 produced 544 reindeer scapula specimens (Table 1). These are from at least 215 elements and a minimum of 123 individuals. A minimum of 42 scapulae were modified into tools. Scapulae were found in almost every stratigraphic layer in the trenches, with the majority being from the bones and organics, and dark-brown sandy loam layers (Table 1). These layers also contained the largest numbers of artifacts and faunal remains in the excavated area of the settlement (Nomokonova et al., 2017, 2018). Spatially, these elements, including those modified into tools, were spread throughout the excavated area and were found mixed with other artifacts and disarticulated faunal remains (Fig. 3).

Table 1
Reindeer scapula remains at Iarte VI settlement from excavations in 2013 (trench # 1) and 2015.

Layers	NISP ^a scapula	MNE ^b scapula	MNI ^c scapula	# Eroded	# Gnawed	# Cut/chop	# Burnt	NISP tools	MNE tools	Side ^d , tools
Dark-grey sandy loam	50	22	12	10	4	1		5	3	3L
Brown sandy loam (ditch fill)	1	1	1			1				
Light-grey sandy loam	29	14	10	3				4	4	1L, 3R
Layer of bones & organics	296	127	68	9	29	18	1	27	15	7L, 8R
Dark-brown sandy loam	145	44	26	1	10	7	1	36	17	9L, 8R
Yellow-grey sandy loam	17	5	4					4	1	?
On bedrock	6	2	2					3	2	2R
Total	544	215	123	23	43	27	2	79	42	20L, 21R

'?' means unknown amount of artefacts or unknown if left or right side, or unknown if fused.

^a NISP is Number of Identified Specimens (total of identified scapulae remains, both complete and fragmented).

^b MNE is Minimum Number of Elements (minimum number of scapulae calculated with consideration of portion, size, side, and age).

^c MNI is Minimum Number of Individuals (minimum number of reindeer based on scapulae counts).

^d L is left scapula; R is right scapula.

4. Scapula abundance at Iarte VI

Reindeer are clearly the key species for Indigenous peoples of the Iamal region. Bodies of these animals were and are integral to almost all aspects of life, functioning as parts of clothing, dwellings, food, and other tools (e.g., Gemuev et al., 2005; Golovnev, 1995; Golovnev et al., 2016; Khomich, 1966; Randymova, 2004). This animal is also the predominant species represented at Iarte VI, clearly indicating that people there relied substantially on reindeer. Specifically, *Rangifer tarandus* comprise well over 90% of all identified fauna remains at the site (Nomokonova et al., 2018). All reindeer skeletal elements are represented, and among the major limb bones (i.e., excluding the feet elements), scapulae are the most abundant when examined by MNE values (Fig. 4). Taking into the consideration the size of the excavated area, an average of 4.8 scapulae per 1 m² were found at Iarte VI. This demonstrates that as a raw material item, scapulae were readily available.

Reindeer scapulae were also the most common material used for tool production among the recovered assemblage from the site. Specifically, the number of tools made from scapulae is higher than those made from wood, antler, metal, clay, and stone (Table 2). Some of these materials are of course far more susceptible to destructive post-depositional processes than bone, and other tool types represented far greater investments of time and energy, meaning they were less likely to have been recurrently discarded on site. Nevertheless, reindeer scapulae seem to have been of particular utility to the people of Iarte VI, even outnumbering other bone items there, including those fashioned from antler.

5. Selecting scapulae

Transformation of reindeer scapulae from unmodified elements of the skeletal system to objects of specific use starts with the process of butchering and separation of these elements from the rest of the body. Evidence of this process can be observed through cut and chop marks on the scapulae themselves. At Iarte VI, such marks were identified on 27 scapulae (~5% of the scapula specimens recovered), the majority of which were on specimens found in the strata with the most abundant faunal remains, including the bones and organics and the dark-brown sandy loam layers (Table 1). In terms of butchering methods, Nenets and northern Khanty techniques (the latter mostly in the southern Iamal region and adjacent regions) approach scapula removal in similar ways. These involve dismemberment of all limb elements at the joints, including the scapulae, according to each element's unique anatomical characteristics (Randymova, 2004: 68; Zen'ko-Nemchinova, 2006: 99–100). These are somewhat similar to butchery practices used with *Rangifer tarandus* in other regions of the North (e.g., Binford, 1981; D'iachenko, 2005: 180–182). With all such practices, dismemberment marks on scapulae are expected to be found encircling the glenoid



Fig. 3. An example of reindeer scapulae depositional context at Iarte VI. The stratum shown is the bones and organics layer in the ditch feature (photo by Andrei V. Plekhanov).

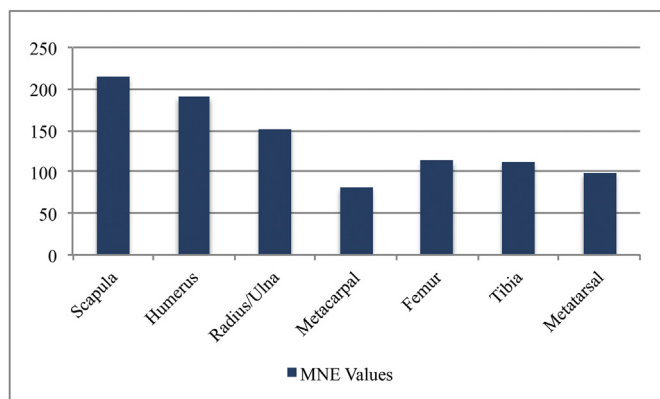


Fig. 4. *Rangifer tarandus* MNE values for limb elements at Iarte VI. Values for carpals, tarsals and phalanges are excluded here because there is no evidence for the use of these elements in tool production at the site.

cavity and neck of the element - areas most proximate to the element's articulation with the humerus (cf., Binford, 1981: 121–122).

The Iarte VI scapulae display at least two kinds of butchering marks, indicating that both metal knives and axes were used to separate this element from the rest of the limb. The majority of such traces are cut marks, which appear to have been produced during separation of the scapula from the rest of the upper limb using a knife. These are mainly located on the lateral but also on the medial and caudal sides of the scapula heads (Fig. 5). Only four scapulae have chop marks, most likely produced with metal axes, three of which were clearly made from chopping the scapulae off from the rest of the limb. Interestingly, none of the scapulae that were later modified into tools show chop marks,

perhaps suggesting a more careful dismemberment of scapulae intended for tool production. No marks clearly associated with the removal of meat from the scapula, like those illustrated in Binford (1981: 98), were identified. Many of the longitudinal cut marks on the scapula blades we observed instead seem to be traces from tool manufacture (described below).

In order to better understand the selection of scapulae for tool use, we provide a preliminary reconstruction of the age and sex of animals from which the scapulae were derived. To do this, we applied two methods developed by Pasda (2009). Note that Pasda's methods were based on a large sample of Greenland reindeer (*Rangifer tarandus groenlandicus*) and their applicability to Iamal reindeer has not been tested (no reindeer skeletal collection of known age and sex is available for Iamal). The first technique is based on observations of the fusion of the scapula head, and the second involves scapula head measurements. According to Pasda (2009: 46), fusion of *tuber scapulae* or *processus coracoideus* on scapulae occurs at 6–9 months of age. Based on Iarte VI scapula fusion data (Table 3), the majority of scapulae at the settlement are from animals older than at least 6 months of age. Overall, assessable scapulae come from a minimum of 93 individuals, and 80 of these scapulae are fused. This leaves 13 unfused scapulae, all coming from animals that are younger than 9 months old (calculated conservatively). Of the 93 assessable scapulae, 39 are from tools, and all but one of the latter are fused. This ageing data indicates that scapulae from animals older than at least 6 months were preferred for tool production. The single modified but unfused scapula was from the dark-brown sandy loam layer (Table 3), and it was in process of being manufactured when abandoned; it bore no traces of being used.

Reindeer are sexually dimorphic, and within a single population these body size differences manifest fairly clearly in some skeletal element dimensions, including those of scapulae. Such size differences

Table 2
Materials used for tool manufacture at Iarte VI.

Materials	1990s excavations	2013 and 2015 excavations	Total
Artifacts from reindeer scapulae	246	42	288
Artifacts from reindeer antlers	87	12	99
Artifacts from reindeer metapodials	1	0	1
Other bone artifacts	39	3	42
Metal artifacts	52	32	84
Stone artifacts	21	68	89
Wood artifacts	161	14	175
Clay artifacts	?	32	32

? means unknown amount of artefacts or unknown if left or right side, or unknown if fused.

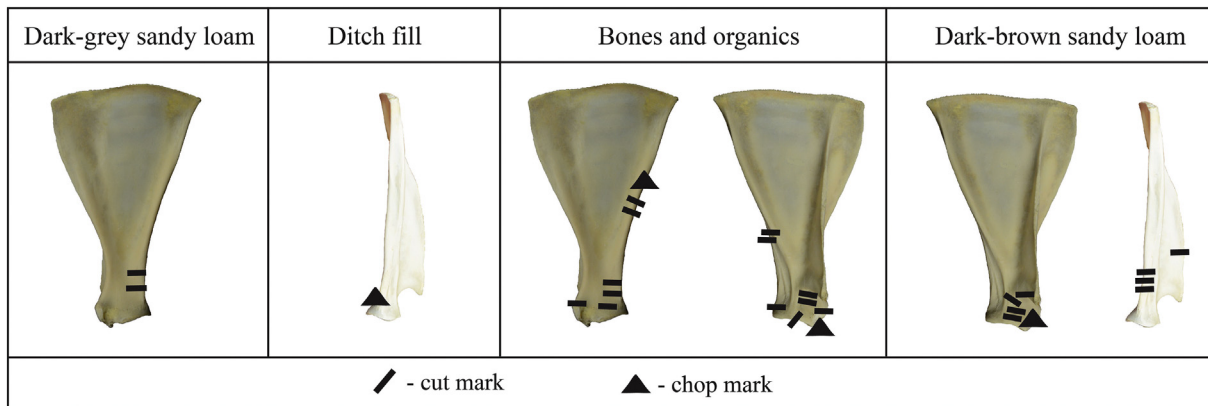


Fig. 5. Location of butchery marks on reindeer scapulae at Iarte VI by stratigraphic layer.

in reindeer start to be noticeable at 12–18 months after birth, but are the most visible among individuals ~3.5 years and older (Pasda, 2009: 70–71). The following measurements were used to assess the sex of Iarte VI scapulae, following Pasda (2009: 13): SLC – smallest length of *collum scapulae*, and GLP – greatest length of the glenoid process. The Iarte VI SLC versus GLP data and comparisons with the Greenland reindeer are presented in Fig. 6. In this plot, some of the Iarte VI scapula tools overlap with the larger end of the range for females, but many fall outside this dataset—their dimensions exceed those of the females (Fig. 6). In comparison to Greenland males, the majority of the Iarte VI tools fall within the range of adult males. Finally, while there is overlap in the size of the Iarte tool and non-tool scapulae, those used for tools tend toward the larger end of the size range (Fig. 6). Overall, these comparisons suggest that the inhabitants of Iarte VI selectively chose larger elements for their scapula tools, many of which were likely from adult males. Note that no selectivity was applied to element side, as both right and left scapulae are represented in nearly equal quantities (Table 1).

6. Making scapula tools

As mentioned above, a minimum of 42 scapulae from the 2013 and 2015 excavations were modified into tools. The process of making these tools appears to be fairly consistent and can be described in the following steps (Fig. 7; Aleksahenko, 1999, 2002, 2004). First, the scapula spine is removed by cutting it from the rest of the element, creating a ‘flat’ triangle of bone. Second, two round holes are drilled in the scapula, one each on the opposite corners of the blade (the proximal ends). A few exceptions, all excavated in the 1990’s, had only a single hole in one corner of their blades (Plekhanov, 2014a: 55, Table 21, # 164). Third, a triangular hole is cut through the center of the scapula blades. Many leftover sections or strips cut out during this part of the process were found at Iarte VI, indicating these objects were made on-site (Table 4). This process was carried out using knives, as there are many traces of long cut lines on the scapulae themselves and on the leftover portions (Fig. 7a–b). The edges of these triangular holes then functioned

as the working edges of the tool. The length of these edges varied from 9 to 16 cm. Further, additional notches were applied to the working edge of many of the scapula tools, perhaps to make them rougher and more resistant to wear (Fig. 7d). One scapula also had notches or incisions on its head that were executed with a knife (Fig. 7c), possibly for a decorative purpose.

The presence of many scapula parts from difference stages of tool production is further evidence that these tools were created on-site for local use (Table 4). These include blanks (scapulae with only the spines removed), leftover blade portions, fully finished tools (often fragmentary), and heavily worn tool fragments. Blanks were found in the layer of light-grey and dark-brown sandy loam. Leftover portions from the middle sections of scapula blades were most numerous in the dark-brown sandy loam layer. A few such fragments were also found in the yellow-grey sandy loam and bones and organics layers.

In addition to this distinct tool-making process, two other scapulae stand out due to having burning patterns on the medial sides of their bodies (Fig. 8). One such scapula had its spine removed but was not otherwise modified (Fig. 8b). The second scapula has a similar burning pattern but its spine was intact (Fig. 8a). It is not clear if the burning in the middle section was an attempt to facilitate cutting out the triangular section of the blade, or if this indicates an alternate use, such as divination, as seen elsewhere in the Circumpolar North (e.g., Bogoras, 1904–1909: 487–489; Speck, 1977: 152–163; Tanner, 1979: 124; Vorob’ev, 2014: 704–705). Notably, reindeer scapula divination is not documented among Nenets or northern Khanty, the two Indigenous populations currently living closest to Iarte VI. These are the only two scapulae at Iarte VI (in the 2013 and 2015 samples) with traces of burning (Table 1). Overall, burning on faunal remains is quite rare at the site, with only 56 specimens (0.3% of the faunal remains by NISP) showing such traces, the majority of which are unidentified mammalian bone fragments.

7. Scapulae and their uses

Aleksahenko (1999, 2002, 2004) examined use-wear on the Iarte VI

Table 3
Reindeer scapulae fusion at Iarte VI.

Layers	MNI Fused	MNI Unfused	MNE Tools	Fusion on Tools
Dark-grey sandy loam	10		3	All fused
Light-grey sandy loam	6	1	4	All fused
Layer of bones & organics	45	7	15	All fused
Dark-brown sandy loam	18	3	17	16 fused, 1 unfused
Yellow-grey sandy loam	1	2	1	?
On the bedrock	?	?	2	?
Total	80	13	42	38 fused, 1 unfused

?’ means unknown amount of artefacts or unknown if left or right side, or unknown if fused.

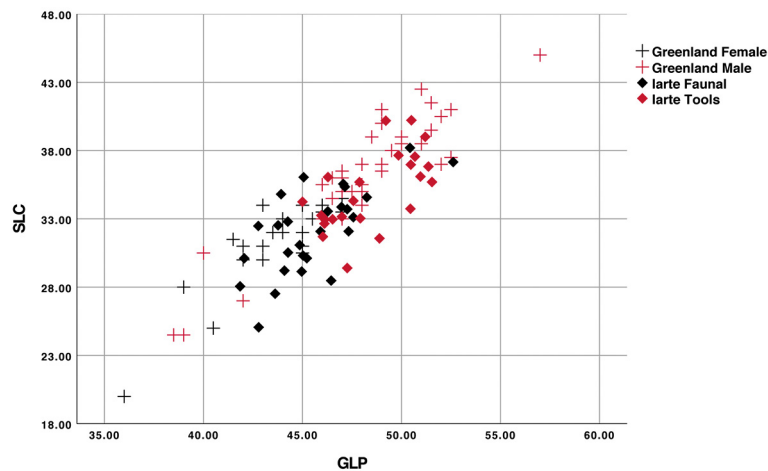


Fig. 6. Comparison of Iarte VI scapula measurements with those of Greenland reindeer. Comparative data from Pasda (2009). SLC is smallest length of collum scapulae, and GLP is greatest length of glenoid process.

scapula tools recovered in the 1990s to assess their uses. Her analyses suggested that these tools' inner margins were used to soften and straighten several sizes of hide straps or belts, especially those used to produce lassos. The widths of the hide straps worked with these tools appears to have fallen in two discrete size ranges, one from 0.4 to 0.6 cm, the other from 5 to 8 cm; most wear traces were from the narrower size range (Aleksahenko, 1999: 132; 2002: 188–189). She also identified traces of ropes or straps inside the drilled holes at the corners of many of the tools, which suggests that the scapulae were tied to something while in use. Some additional support for her interpretations can be found in the minimal ethnographic accounts of reindeer scapula use among the Ural group of northern Khanty. According to Zinaida Randymova (2004: 16), reindeer skin straps for making 1.5 to 2 cm wide lassos are softened and straightened by using a specially made reindeer scapula tool. However, the opening in the middle of the scapula blade for this purpose is significantly smaller than those identified at Iarte VI, with an average diameter of only 1.5 cm (Aleksahenko, 2002: 189).

The fragility of reindeer scapulae for use as such types of tools is evident by the dominance of fragmented specimens in the assemblage. Nearly all scapula tools are fragmented, most of which consist of blade

portions bearing traces of heavy wear. Only one scapula tool in our sample is largely complete out of the minimum of 42 tools found in 2013 and 2015 (Fig. 7a, Table 4). This suggests to us that the tools had high rates of fragmentation and short working lives. Softening hide straps for lasso and rope production surely involved significant force, which could readily fracture thin scapula tools, particularly when subjected to repeated episodes of use. This likely made scapulae in high demand at the site, particularly if lasso and rope production were one of the major foci of hide working at Iarte VI. This interpretation could also be supported by the recovery of a possible lasso-making needle during the 1990s excavations at Iarte VI (Plekhanov, 2014a: 70 (table 32, #248)), which is similar in shape to those used in the early historic period by Nenets and Khanty (Popov, 1955: 69).

After their probable primary use for hide strap working, these tools and unsuitable or unused reindeer scapulae were deposited in the ditch area, along with a suite of other animal remains. Here (and perhaps elsewhere on site) some were subject to gnawing by carnivores and post-depositional attrition. Carnivore tooth marks were found on 7.9% of all *Rangifer* scapulae fragments, but were present on only one tool. This discard and gnawing of the scapula was the final stage in the use-life of these particular skeletal elements.

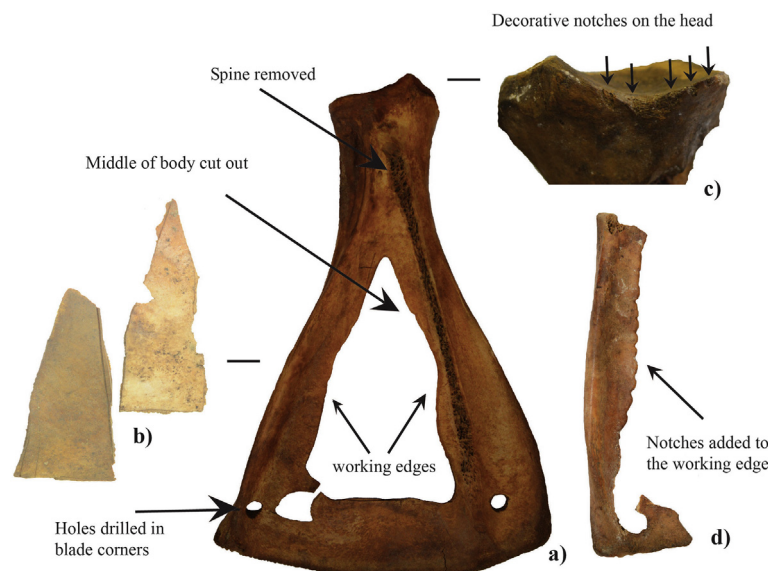


Fig. 7. Evidence of the Iarte VI scapula tool production processes: a) a nearly complete tool; b) left-over pieces cut from the blades of scapulae; c) possible decorative notches on the head of a scapula tool; d) notches applied to the working edge of a scapula tool.

Table 4
Reindeer scapula tools at Iarte VI.

Layer	# Tool blanks	# Tool fragments	# Almost complete tools	# Left-over blade portions	NISP tools	MNE tools
Dark-grey sandy loam		5			5	3
Light-grey sandy loam	1	3			4	4
Layer of bones & organics		25		2	27	15
Dark-brown sandy loam	3	18	1	14	36	17
Yellow-grey sandy loam		1		3	4	1
On the bedrock		3			3	2
Total	4	55	1	19	79	42

8. Discussion

The reindeer scapulae at Iarte VI are clear examples of skeletal elements that were transformed from parts of animal bodies into implements, and these were in turn employed to transform yet other body parts, most likely hides, into critical items of daily use. The histories of these particular elements are directly linked to the broader landscape, human-animal migrations, and seasonal growth and development. The Iamal peninsula provided suitable habitat for the region's reindeer population (whether wild, domestic, or some combination of both), particularly during the warmer portion of the year when the reindeer would amass on the tundra for calving and grazing. Reindeer hides would be best suitable for lasso and rope production in the fall or early winter, when they would have grown thick and carried fewer damaging insects. For thousands of years, reindeer have provided a variety of raw materials that sustained people in numerous ways across much of the Arctic, including in Iamal. At Iarte VI, reindeer scapula tools emerged as particularly important implements that were regularly and repeatedly employed by the site inhabitants. This material practice developed despite the fragility of scapulae in comparison to other materials available at the site, including antler, iron, and stone, suggesting that these elements were readily available and the tools made from them considered rather expedient.

As mentioned earlier, scapulae historically are involved in a range of specific roles and material practices across the Circumpolar North, including in Iamal. Among Nenets in this region, one such set of practices is embedded with the perception of wild and domestic reindeer, and involves distinct post-mortem treatments of the scapulae of these two groups of animals. Another is the particular form of scapula hide-working tool once made on the peninsula, which to our knowledge does not have direct analogies outside of Iamal. At Iarte VI, these tools

were undoubtedly embedded in varying social and material contexts in which decisions were made about their use and discard. This would have involved choosing which elements would be processed into tools and those that would be discarded with other animal waste or given to dogs. It also would have included decisions regarding which tools would be reworked and refashioned during their use-life as hide working implements. In other words, any given scapula at the site could have had various life histories and entanglements with other materials and living beings.

Given that scapula tools were repeatedly used at Iarte VI, they had likely become embedded in the worldviews or ontologies of the people employing them, particularly in regard to gendered practices. Nenets and northern Khanty groups divide their space and many of their daily activities based on an individual's gender (Aksianova et al., 2003; Glavatskaya, 2006; Golovnev, 1995; Khomich, 1966; Serpivo, 2016). For example, only men can work with materials such as wood, bone, and antler, and men's identities are clearly linked to tools such as drills that are used in modifying these materials—they are considered men's things and duties. Conversely, working with hides and the production of clothing, including the tools (e.g., needles, scrapers) involved with these processes, are strictly in the realm of women. One set of exceptions to this is the processes and tools involved in the conversion of hides into lassos and other cords, ropes, and belts. Lasso production is by far the most thoroughly ethnographically documented of these, and all steps of this process are performed only by men (Fig. 9), from initial hide processing to the final weaving of the lasso itself and production of its antler elements (Aleksahenko, 2002: 193; Khomich, 1966: 86; Lukina, 2010: 120; Randymova, 2004: 13, 16; Zen'ko-Nemchinova, 2006: 160–161). Taking these ethnographic observations as analogues for past gendered practices on the peninsula, it can be suggested that the Iarte VI scapula tools were often a part of men's practices. For



Fig. 8. Iarte VI scapulae with burning traces: a) the scapula is unmodified, but its center has post-depositional fractures through the center of the blade; b) a 'blank' for a tool, with the spine removed.



Fig. 9. A Nenets man making a lasso. The metal ring tied to his foot is used to soften the hide strap before it is used in weaving (photo by Aleksandra N. Terekhina and Aleksandr I. Volkovitskii, www.yamalexpedition.ru).

example, men's activities and tools (drilling and drills) are implicated by holes found at the corners of the blades of the scapula tools. In addition, if the scapula tools were used to straighten hide ropes for making lassos or other belts and ropes, this might also be indicative that these tools were within the sphere of men.

Excavations at Iarte VI produced numerous artifacts associated with all stages of hide working, including a variety of stone, antler, and bone scrapers (Aleksahenko, 2002: 195; Plekhanov, 2014a). This settlement also produced the majority of hide processing artifacts found on the entire Iamal Peninsula, and many of these also display heavy use-wear (Aleksahenko, 2002: 186). Iarte VI also has yielded numerous rope and strap fragments, suggesting that these items were once common at the site, perhaps as a result of being locally produced. In this bundle of potentially associated items, scapula tools were pragmatically valuable and met the required qualities at that time to be used and appreciated by the inhabitants of Iarte VI, so much so that they were the most abundant tool type eventually recovered at this location.

Lastly, it is important to mention that the same form of scapula tools are found at only one other site in Iamal, namely Bukhta Nakhodka. This site is situated about 210 km southeast of Iarte VI on the shore of the Gulf of Ob (Fig. 1). Bukhta Nakhodka was a fortified settlement and trading location that dates (by dendrochronology) to the 12th through the beginning of the 14th centuries CE (Fig. 1; Kardash, 2011). Excavation of 256 m² at this site produced 32 scapula tools, all identical in form to those at Iarte VI, except that five were fashioned from moose (*Alces alces*) scapulae, and the majority were not fragmented (Kardash, 2011: 30–31; Vizgalov et al., 2013: 255). Unlike at Iarte VI, Bukhta Nakhodka contained only 2465 *Rangifer tarandus* specimens, which was only 38% of the total number of identified faunal remains recovered, the rest belonging to arctic fox, seals, fish, birds, and a smattering of other species (Vizgalov et al., 2013: 255–257). In other words, reindeer procurement was one of many subsistence activities carried out at this location. Overall, these findings provide a brief history of a particular use of reindeer (and moose) scapula on the Iamal Peninsula over a very short time frame, ranging from the 11 - 12th centuries CE at Iarte VI, and from the 12th to as late as the beginning of the 14th century CE at Bukhta Nakhodka. After this point, such tools are entirely absent within all excavated sites in the broader Iamal region.

9. Conclusion

The reindeer scapulae from Iarte VI provide insights on how a particular element of an animal body became valuable objects of common use in one area of the Siberian Arctic. Present evidence indicates that these artifacts were in use in parts of the Iamal Peninsula for only two centuries or so. Why these tools dropped from use when other scapula tools, such as fish-scalers, have persisted in use for millennia, is unclear. Our understanding of these implements will improve only with continued research, including on the various hide-working traditions that emerged in Iamal, but also on the seasonality of these practices, and human and reindeer population movements and shifts in this unique region.

To conclude, we would like to return to Nenets perceptions, particularly those related to the distinct practices involving scapulae from wild and domestic reindeer. As mentioned in the introduction, there is at present somewhat conflicting evidence regarding the presence or absence of domestic reindeer at Iarte VI. In our previous work, we suggested that the majority of *Rangifer tarandus* remains at this site belong to wild reindeer. This conclusion was based on the site's location in the middle of what was likely the animals' annual migration route, and the fact that the extensive slaughter of domestic transport reindeer seems unlikely for this period, especially given that wild reindeer population levels here at this time were seemingly high (Nomokonova et al., 2018). This proposal has at least some support based on our conversations with Nenets herders in 2018, who said that domestic reindeer scapulae should never be pierced, a practice we found to be repeatedly practiced at Iarte VI for the purposes of tool production. This however cannot be taken to mean that domestic transport reindeer were not present at the site, but merely that such animals were likely not commonly used for daily subsistence needs at this time. They were likely too precious for their roles in transport, a pattern that persisted well into the historic period (Krupnik, 1993; Stépanoff, 2017).

Declarations of competing interest

None.

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