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Résumé de l'article

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Abstract: An archaeological reconstruction of Saqqaq bows, darts, harpoons, and lances

Permafrost-preserved materials from two Saqqaq sites (ca. 3900-2600 BP) in Disko Bay, West Greenland, have provided unique insight into woodworking in the early Arctic Small Tool tradition. Use of driftwood played a decisive role in the complex material culture of Saqqaq society, and analyses of more than 15,000 artifacts, fragments, and wood shavings enable us to reconstruct the woodworking processes and all categories of toolkits. This article presents an archaeological reconstruction of the remarkably diverse and technologically advanced Saqqaq hunting toolkit, which includes darts, harpoons, lances, and bows and arrows—among the earliest preserved specimens in the New World.

Introduction

Large amounts of tree trunks from Siberian forests wash up on the islands and mainland of Disko Bay. This natural “driftwood trap,” which is created by northward-flowing sea currents, has been a wood mine for the Inuit ever since they settled West Greenland (Fabricius 1807; Grønnow 1996a; Rink 1877). But the exploitation of

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driftwood in Disko Bay goes much further back in time. Excavations at two frozen sites in the area, Qeqertasussuk and Qajaa, where conditions for preservation of organic materials are excellent, have shown that driftwood was extensively used by the people of the Saqqaq culture (ca. 3900-2600 BP), a Greenlandic branch of the early Arctic Small Tool tradition (Figure 1). These two sites have yielded about 1,000 tools and tool fragments of wood and other organic matter, and about 23,000 wooden shavings and split pieces of wood (Grønnow 1994, 1996a; Meldgaard 1983; Meldgaard 2004). The present article uses these unique archaeological finds to reconstruct Saqqaq woodworking techniques as well as an important part of the technology: the hunter’s toolkit.

I argue that this pioneering Palaeo-Eskimo society in West Greenland was processing wood in keeping with remarkably high technological standards, and that driftwood was an indispensable component of a complex Saqqaq material culture. The preserved wooden components enable us to understand the original context of a variety of commonly known Palaeo-Eskimo lithic hunting tool components—bifacial endblades, points, and prongs of stone, bone, and antler—and we gain new insights into a number of artifacts that have hitherto been classified with reference only to morphology and typology and to assumptions about their functional properties. Many open questions remain about the interpretation of the wooden materials, and there is an urgent need to follow up the present theoretical reconstruction with practical archaeological experiments, including tests of the tools’ functional properties. The materials now under study, however, have already shed much light on how the earliest bows, arrows, missiles, and lances of the Eastern Arctic were designed and made.

Saqqaq woodworking techniques

In an earlier paper (Grønnow 1996a), I described how Siberian driftwood ends up in Greenland, its properties, and historic Inuit nomenclature. The Saqqaq “carpenters” had access to much more driftwood than did the later Dorset and Thule cultures. With the onset of the Holocene and a warmer climate in this part of the Arctic (ca. 8500 BP), hundreds of thousands of cubic metres of driftwood, primarily larch, spruce, and pine from Siberian forests, but also spruce logs from Alaska and Western Canada (Dyke et al. 1997), accumulated in varying quantities on the beaches, which were continuously rising with the retreat of the ice cap. When the Saqqaq pioneers first arrived in the “driftwood trap” 4,500 years ago, they had unlimited access to these huge accumulations of wood on the contemporary coastline as well as on raised beaches up to 80-100 metres above sea level. These ample supplies of driftwood explain the extensive use of firewood during the entire Saqqaq period, which would have been unthinkable for the Dorset or Thule societies in West Greenland (Grønnow 1996a: 86; Odgaard 2003: 360f.).

Table 1 lists the Qajaa and Qeqertasussuk artifacts of organic origin by type of hunting activity. By studying the many woodworking tools, preforms, fragmented wooden shafts, and thousands of shavings and split pieces, we can identify the different



Figure 1. Map showing locations of the two frozen Saqqaq sites in Disko Bay (West Greenland), Qajaa and Qeqertasussuk.

stages of driftwood processing. All of the woodworking began by splitting the driftwood trunks into beams or “boards.” This was done by means of quite sturdy wedges of whale bone, antler, or (rarely) ivory. The wedges show traces of heavy hammering on the proximal end. Some have small transverse notches on the broad sides of the distal section to improve the grip on the wood. Subsequently, the boards were chopped into sections to remove damaged or knotty parts (Figure 2a and b). Appropriate sections had to be selected, as many driftwood trunks show remarkably irregular growth rings and twisted grain, thus making them unsuited for further processing into shafts or other tool components. First and foremost, the Saqqaq craftsman selected high-quality wood from *Larix* sp. and *Picea* sp. trunks to make hunting tools (Grønnow 1996a: 82), but in rare cases *Pinus* sp., *Abies* sp., and *Salix* sp. were selected as well (Table 2). *Larix* and *Picea* were used for all sorts of tools, showing that selection was based not on tree species but on the actual physical texture of each driftwood piece.

Table 1. Hunting tools made from organic materials, mainly wood, from Qajaa and Qeqertasussuk.

Components of hunting tools made from organic materials	Qajaa	Qeqertasussuk
<i>Arrows</i>		
proximal shafts, complete	0	2
proximal shafts, notched fragments	1	4
foreshafts, complete	1	9
shaft fragments	27	63
<i>Bows</i>		
bow limb fragments	3	19
bow grip fragments (?) (whale bone)	0	2
toy bow	0	2
<i>Darts</i>		
foreshaft fragments with blade bed	5	18
foreshaft fragments, three-pronged darts	3	17
bird dart prongs (whale bone)	2	27
<i>Harpoons</i>		
harpoon heads, Qt-A (whale bone, antler, ivory)	4	15
harpoon heads, Qt-B, C, and D (whale bone, antler, ivory)	13	36
harpoon heads, undetermined fragments	2	
<i>Atlats</i>		
atlatl fragments (whale bone)	2	
<i>Lances</i>		
foreshafts, light lances with wedge-shaped proximal end	1	20
foreshafts, heavy lances, distal end fragments	1	4
other lance heads (antler, ivory)	1	
<i>Missile shafts</i>		
undetermined fragments of darts, harpoons, and lances	51	83
<i>Skin boats</i>		
frame fragments	7	20
paddle/oar fragments		14
TOTAL	124	355

Analyses of shavings and traces of work on blanks show that adzes were extensively used during the subsequent stages of processing. In fact, adzes with heads made from killiaq (a grey silicified slate) with different edge widths and angles were used throughout the entire process from blank to finished artifact. The surface finish was made with hafted side- and end-scrapers of killiaq or agate, or by means of pumice graters with grooves that matched the size of the slender round dart or lance shaft. A few round shafts were shaped with lithic tools with denticulate edges, thus creating a characteristic longitudinal spiral pattern (Figure 3).

Table 2. Tree species for Qeqertasussuk. Tree species was determined by Nancy Eskildsen (National Museum of Denmark) for about one third of the 355 wooden tool fragments.

Components of hunting tools made from organic materials	Tree species for Qeqertasussuk				
	<i>Larix</i> sp.	<i>Picea</i> sp.	<i>Pinus</i> sp.	Other	Sample size
<i>Arrows</i>					
shaft fragments	14	9	4		27
<i>Bows</i>					
bow limb fragments	7	4	1		12
<i>Darts</i>					
foreshaft fragments with blade bed	11	2			13
foreshaft fragments, three-pronged darts	9	4			13
<i>Lances</i>					
foreshafts, light lances with wedge-shaped proximal end	3	4		1	8
<i>Missile shafts</i>					
undetermined fragments of dart, harpoons, and lances	19	11			30
<i>Skin boats</i>					
frame fragments		5		1	6
paddle/oar fragments		2			2
TOTAL	63	41	5	2	111

To bend an object into a new shape, the wood was softened probably by boiling in water or in a fatty broth and by subsequently bending the object stepwise across a butt edge. This is seen from the transverse bending marks that regularly alternate with compressed portions on the inside of quite sharp curves that we see on the frames of kayak-like vessels (Figure 4). The objects show no bending marks on the outside of the curved portion, thus indicating that the woodworker did not use his teeth to shape the frame, as did historic Greenland Inuit (Petersen 1986: 24-25).

As the usable trunk sections were often quite short, long shafts were made by linking a number of sections together by scarf joints. This technique also provided the wooden shafts, poles, and stakes with flexibility (Alix 2009: 193; Grønnow 1996a: 83). Almost all shaft sections have precisely-cut bevelled ends that show fine transversal scratches made to enhance friction inside the joint and to provide a firm basis for lashing. Thus, a lance or an arrow shaft typically consisted of a short foreshaft, a number of sections forming the main shaft, and a proximal shaft component. Only traces of lashing are preserved on these hunting tool shafts, but intact lashing made from flat threads of baleen are seen on some tools from Qeqertasussuk. Unlike sinew, baleen does not expand when soaked (Grønnow 1994: 209).

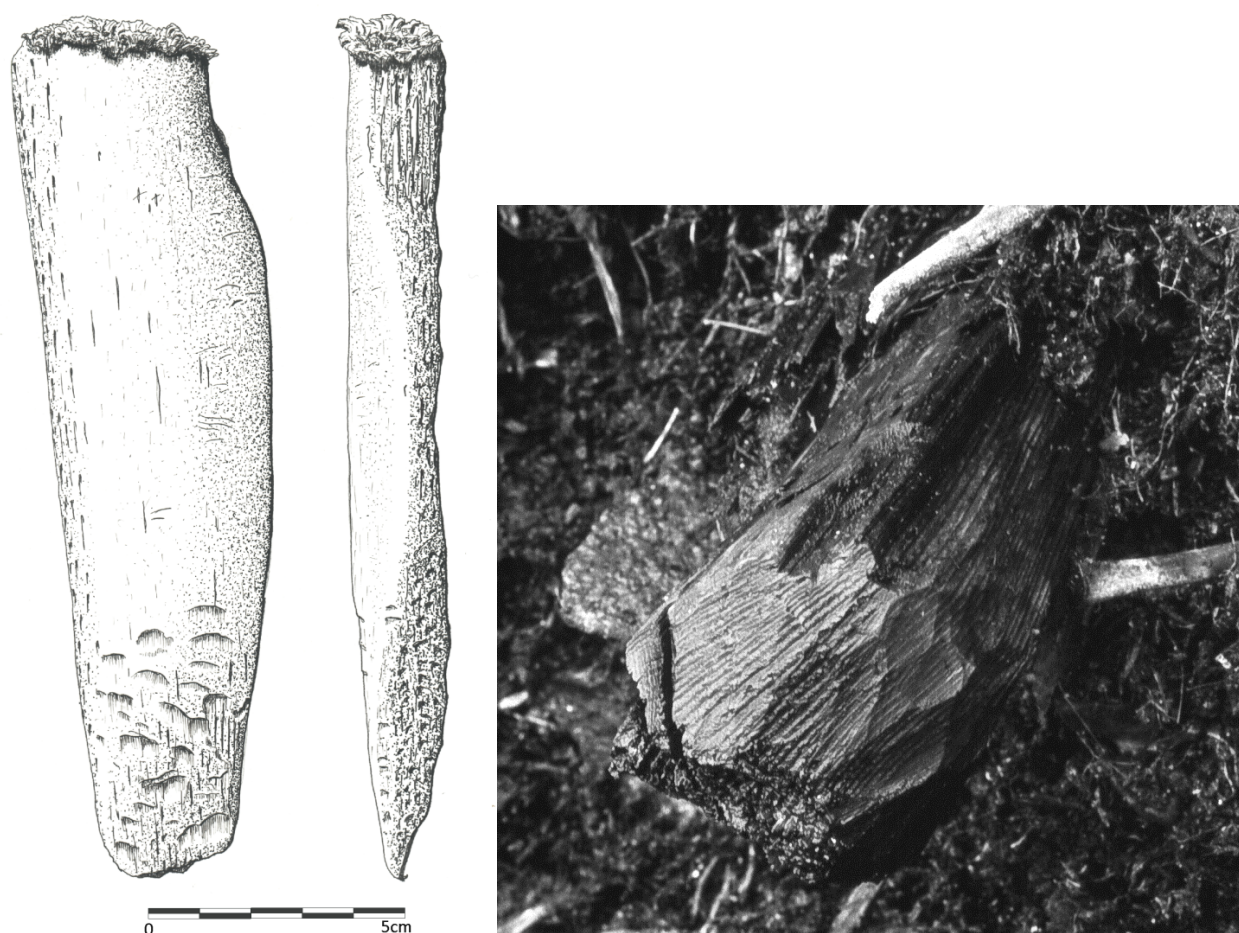


Figure 2. From left to right: a) Heavy wedge of whale bone (length: 170 mm), Qeqertasussuk (drawing: Lars Holten); b) *In situ* photo of a driftwood board split lengthwise and subsequently chopped into sections with an adze. At the end of the piece, adze chopping marks are seen, Qeqertasussuk (photo: Bjarne Grønnow).

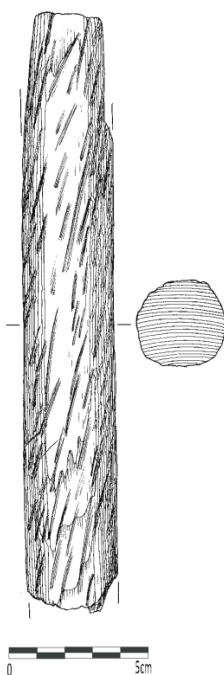


Figure 3. Fragmented shaft (length: 216 mm) decorated (?) with spiral pattern, Qeqertasussuk (drawing: Eva Koch Nielsen). Scale: 5 cm.

In conclusion, qualitative and metric analyses of hundreds of wooden artifacts from Qajaa and Qeqertasussuk document the superior quality of Saqqaq workmanship and a remarkably high level of accuracy. If we look at the shaft in cross section, specifically at the straightness and shape of the bevelled ends, the tolerance threshold is a few tenths of a mm, and such precision is indeed necessary to make a long, straight, and flexible shaft from several components. Recently, full-scale reconstructions of hunting tools have been made from driftwood (larch and spruce) in Greenland, and they confirm that experience and skill are needed to match this level of Saqqaq workmanship (Appelt et al. 2012).

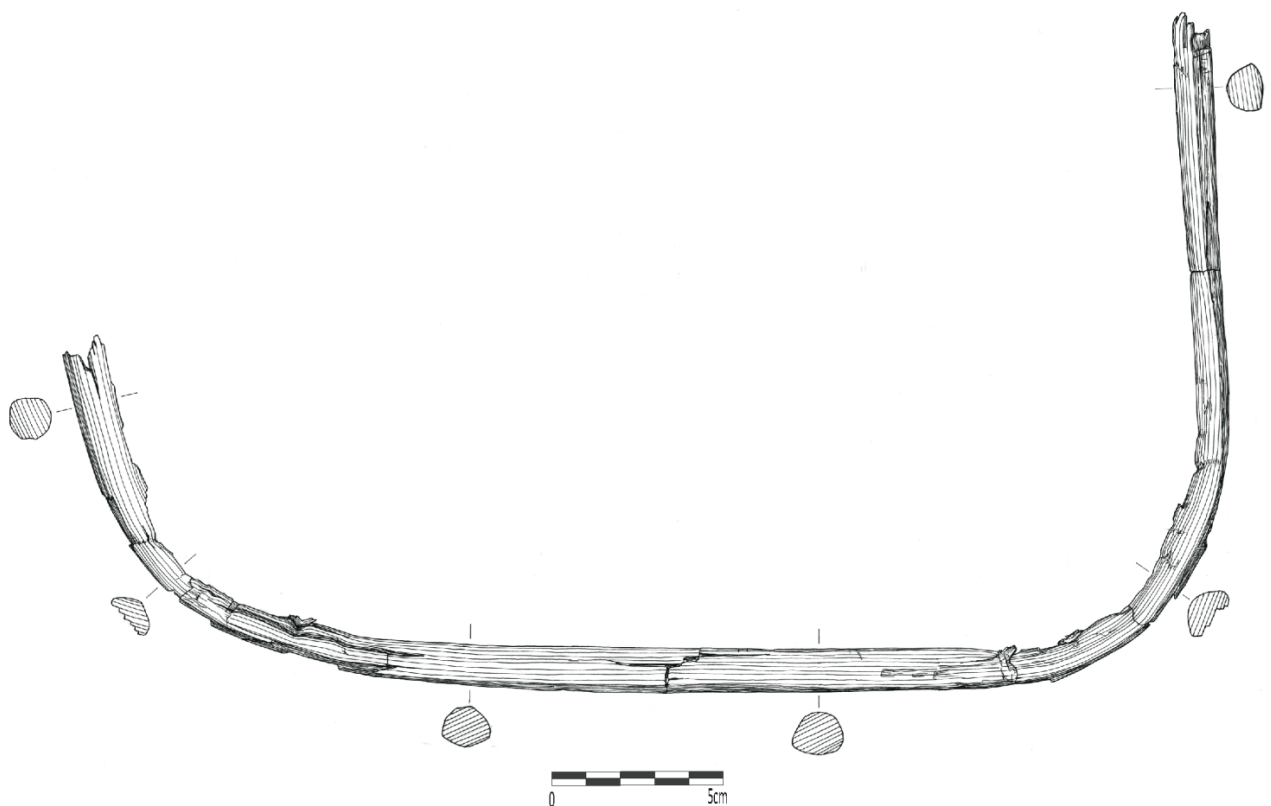


Figure 4. Rib from a kayak-like vessel (total width: 350 mm) with stepwise bending of the wooden strip, Qeqertasussuk (drawing: Eva Koch Nielsen). Scale: 5 cm.

The earliest Arctic bows and arrows

Bifacial projectile points with tapered stems of flint-like raw materials are found at Arctic Small Tool tradition sites all the way from Alaska to East Greenland. Many of them probably served as arrowheads (*cf.* discussion in Riede 2010). Thus, the lithic assemblages indicate that bow and arrow technology first came to the North American Arctic about 5,500 years ago with pioneering Palaeo-Eskimo societies (e.g., the Denbigh Culture) probably originating in Siberia (Harritt 1998; Rasmussen et al. 2010; Slaughter 2005). Because these early bows and arrows were themselves unknown until the excavations at Qajaa and Qeqertasussuk, the fragments from these two sites deserve special attention.

Arrows

This category comprises three components that were originally lashed together: a proximal shaft with a notch; a foreshaft with a distal blade bed; and an arrow endblade made from flint-like material (Grønnøw 1994: 224). An intact but short proximal shaft (295 mm long) with a bevelled distal end shows that sometimes an arrow consisted of several short sections joined by scarf joints, but obviously this may have been a result of repairs to broken shafts.

At Qeqertasussuk, 78 arrow shaft sections have been identified: six proximal shafts notched at the base, some complete with preserved bevelled distal ends; nine foreshafts with blade beds and bevelled proximal ends; 27 shaft fragments with bevelled ends; and 36 shaft fragments broken at both ends. Furthermore, 56 tanged bifacial projectile points, made mainly from killiaq, belong to a group of lithic endblades that fit into the blade beds of the wooden foreshafts.

The longest preserved proximal shafts (Figure 5a) demonstrate the elegant, streamlined design of the Saqqaq arrow. It is 625 mm long and carefully crafted so that in cross section it smoothly varies from one end to the other: round and 10 mm in diameter at the bevelled distal end; 9 mm in diameter at the mid section; and narrow, oval (5 x 7 mm) in cross section at the proximal (notch) end. Traces of lashing for the feathers and for reinforcement of the notch end are preserved as alternating dark and light oblique bands in a 20-30 mm broad zone about 5 mm above the notch end. The traces reveal regrettably neither the number of feathers nor the length of the feathers. The surface of the bevelled end has oblique scratching to stabilise the scarf joint, which originally linked the main shaft to a foreshaft.

The preserved intact foreshafts are 135-145 mm long (Figure 5b). The proximal end is bevelled to fit a scarf joint. Carved into the distal end is a shallow concave blade bed, in which the tapered stem of an arrow endblade made from killiaq had originally been mounted and lashed, as shown by marks on the wood. The wooden arrow shaft sections have an average scarf length of about 64 mm with an average scarf ratio of 6.4:1 (average length of bevelled end divided by average shaft diameter). The 40-60 mm long bifacial “leaf-shaped” arrow endblades are either slender (maximum width: 12.5 mm) or broad (maximum width: 15.5 mm) (Figure 5c), these two types probably reflecting different functions or hunter preferences.

Based on the length of the longest complete proximal arrow shaft (625 mm) and on the average length of the foreshafts and arrow endblades, a complete Saqqaq arrow would have been about 75 cm long from notch to point. In size and design, it differs in every respect from later Arctic arrows—for instance, in the shape and proportions of the notch end. Arrows from the Thule culture and historic Inuit have a flat notch end and most often a relatively deep V-shaped notch (Gulløv 1997: 140; Mason 1894: Plate LIII), while the Saqqaq arrow is oval to round in cross section at this position and shows a very shallow U-shaped notch. The two models seem to have had different release techniques (Alix et al. 2012) and perhaps different bowstrings.

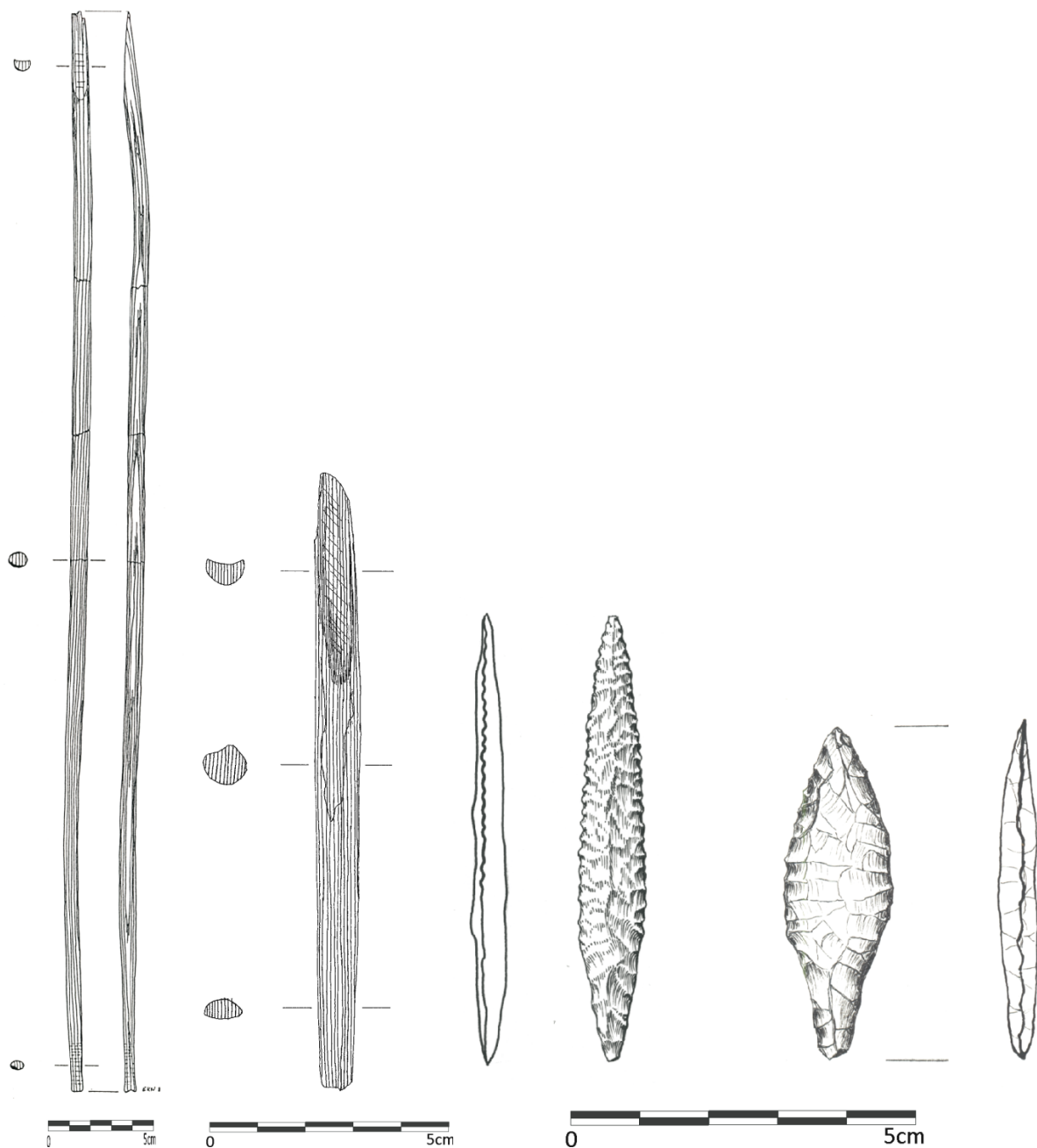


Figure 5. From left to right: a) Proximal arrow shaft component with notch (length: 625 mm) and bevelled distal end, Qeqertasussuk (drawing: Eva Koch Nielsen); b) Arrow foreshaft (length: 128 mm) with blade bed and bevelled proximal end, Qeqertasussuk (drawing: Eva Koch Nielsen); c) Bifacial arrowheads made from killiaq, left: slender type (length: 51 mm), right: broad type (length: 51 mm), Qeqertasussuk (drawings: Lars Holten and Bjarne Grønnow). Scales: 5 cm.

Bows

Evidence on Saqqaq bows is scantier. One reason is fragmentation, as many bow stave fragments are small or reworked or show fractures from forceful breaking. The two sites have nonetheless yielded about 20 pieces that are likely parts of bows. In cross section, the bow limbs have a characteristic flat back and slightly convex inner

side (Figure 6a and b). Only a single piece (from Qajaa) shows probable distal side notches for the loop of the bowstring and/or the anchoring of a backing cord (Figure 6c). Bevelled proximal ends show that the bow limbs had originally been lashed together with either another limb section or the bow grip, but such objects have not yet been identified with certainty. Some characteristic whale-bone objects might be fragments of bow grips (Figure 7). A quite broad, shallow groove runs longitudinally along the flat back of the proposed “grip component” and the sides show pairs of lateral holes, which could have anchored lashings that held a sinew cord in place along the back of the bow. These features indicate that the Saqqaq bow was composite and reinforced. However, neither site has yielded any evidence of either sinew twisters or antler reinforcing plates, which are often found in connection with the later sinew-backed Arctic bows (Birket-Smith 1918: 12; Mason 1894: Plate LXXV).

From the relatively few preserved bow limbs and bow-grip fragments, it is difficult to estimate the original length of a bow. Judging from the size of the only complete bow limb (ca. 45 cm long) and an estimated length of 40-50 cm for the proposed whale-bone bow grip, we suggest that a Saqqaq bow was as big as the historic Inuit bows of West Greenland, about 120-150 cm long (Birket-Smith 1918: 19).

Saqqaq missiles

The wooden foreshafts from the Qeqertasussuk and Qajaa sites hold the key to reconstructing the Saqqaq hunter’s different missiles: darts and harpoons. Many foreshafts reveal their original function through the shape of their distal end or by the presence of a distal blade bed for a projectile point. Through careful analysis of the wooden foreshafts, it is possible to match most of them with the corresponding types of lithic endblades, harpoon heads, and whale-bone end prongs, and to assign more than 200 “unidentified” round shaft fragments to the category of missiles (or lances, see below). Saqqaq missiles were launched by slender atlatls (throwing boards) made from whale bone or walrus penis bone.

Darts

Eighteen foreshafts belong to the category of “darts,” which can be described as long, slender arrows thrown by an atlatl (throwing board). A bifacial point with tapered stem was lashed to a blade bed in the distal end of the foreshaft, and the basal end of the foreshaft was linked by a scarf joint to the main shaft (diameter of 12-17 mm) (Figure 8). Analyses of the lithic bifacial endblades reveal two calibers of darts. The light darts had points 18-19 mm wide, whereas the heavy darts had points about 22 mm wide. These darts were probably mainly for caribou hunting, i.e., as were the arrows shot by bows. Eleven out of 13 specimens were made from *Larix* sp. and 2 from *Picea* sp. The foreshafts were made from perfect knot-free pieces of wood with dense growth rings.

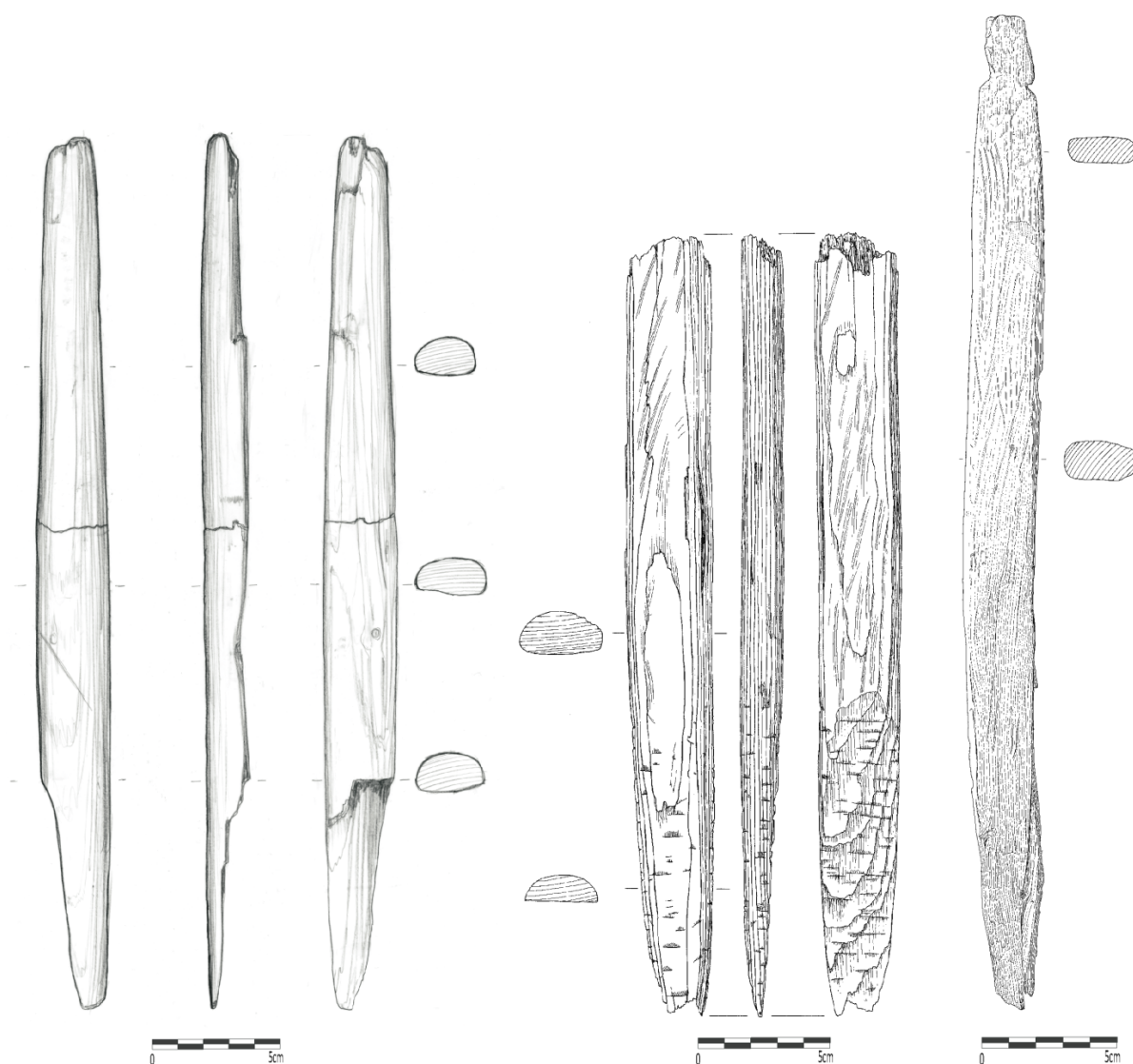


Figure 6. From left to right: a) Fragmented distal end of bow limb (length: 357 mm), Qeqertasussuk (drawing: Bjarne Grønnow); b) Bow limb fragment with bevelled end for scarf joint (length: 306 mm), Qeqertasussuk (drawing: Eva Koch Nielsen); c) Bow limb with distal notches (length: 374 mm), Qajaa (drawing: Pia Breinholt). Scales: 5 cm.

Another 17 wooden foreshafts about 14 mm in diameter had three longitudinal furrows in the distal end. These furrows perfectly fit the proximal end of several long, slender, barbed prongs made from whale bone. Scratches and marks on the distal ends of the foreshafts show that tight lashings held the end prongs in position. The proximal ends of the foreshafts are bevelled and were originally lashed to a main shaft via a scarf joint. Thus, the bird dart was a missile with three long barbed end prongs made from whale bone (Figure 9a and b). Recent reconstructions of Saqqaq bird darts show that the barbs of the end prongs probably were turned outwards (Martin Appelt, pers. comm. 2011). Peculiar as it might seem, this way of mounting the end prongs is known from a few bird spears that come from Alaska and date to the historic period (Nelson 1899: 151-152). One would expect some reinforcement of the rear end of the dart shafts to prevent wear by the antler or ivory “tooth” or “pin” of the atlatl. But so far the two sites have not yielded any end knobs of hard material for darts.

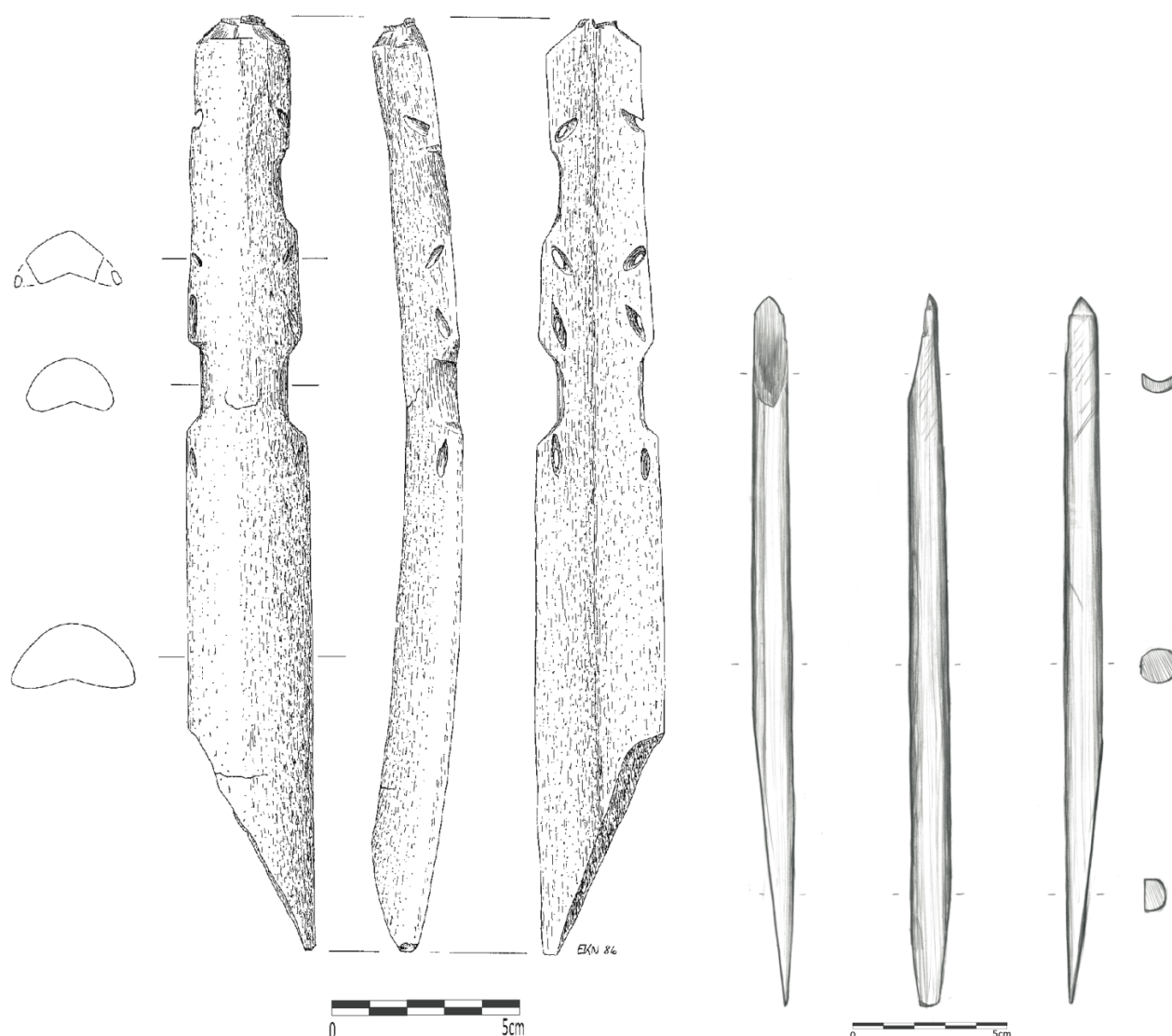


Figure 7. (left) Fragmented and reworked bow grip (?) made from whale bone (length: 258 mm), Qeqertasussuk (drawing: Eva Koch Nielsen). Scale: 5 cm.

Figure 8. (right) Dart foreshaft with blade bed and bevelled proximal end (length: 232 mm), Qeqertasussuk (drawing: Bjarne Grønnow). Scale: 5 cm.

Harpoons and atlatls

Parts of harpoon shafts must account for a number of the unidentified round wooden shaft fragments with diameters of about 12-22 mm. Regrettably, only a small number of whale-bone and wood harpoon foreshafts can be identified as made for toggling harpoon heads, and no foreshafts at all for tanged harpoon heads. Identifiable foreshaft fragments may thus be lacking, but the harpoon heads themselves provide information on Saqqaq harpoons, which were used for hunting on the ice and in open water. Well over 50 harpoon heads made from antler and ivory have been recovered at the two Disko Bay sites (Grønnow 1997). From the heads we infer that the Saqqaq harpoons were much lighter than those of later cultures. A toggling harpoon head (type

Qt-A) would be mounted on a slender wooden or whale-bone foreshaft, which fitted into a small socket in the harpoon head. A scarf joint then linked the foreshaft to the main shaft (Figure 10a and b).

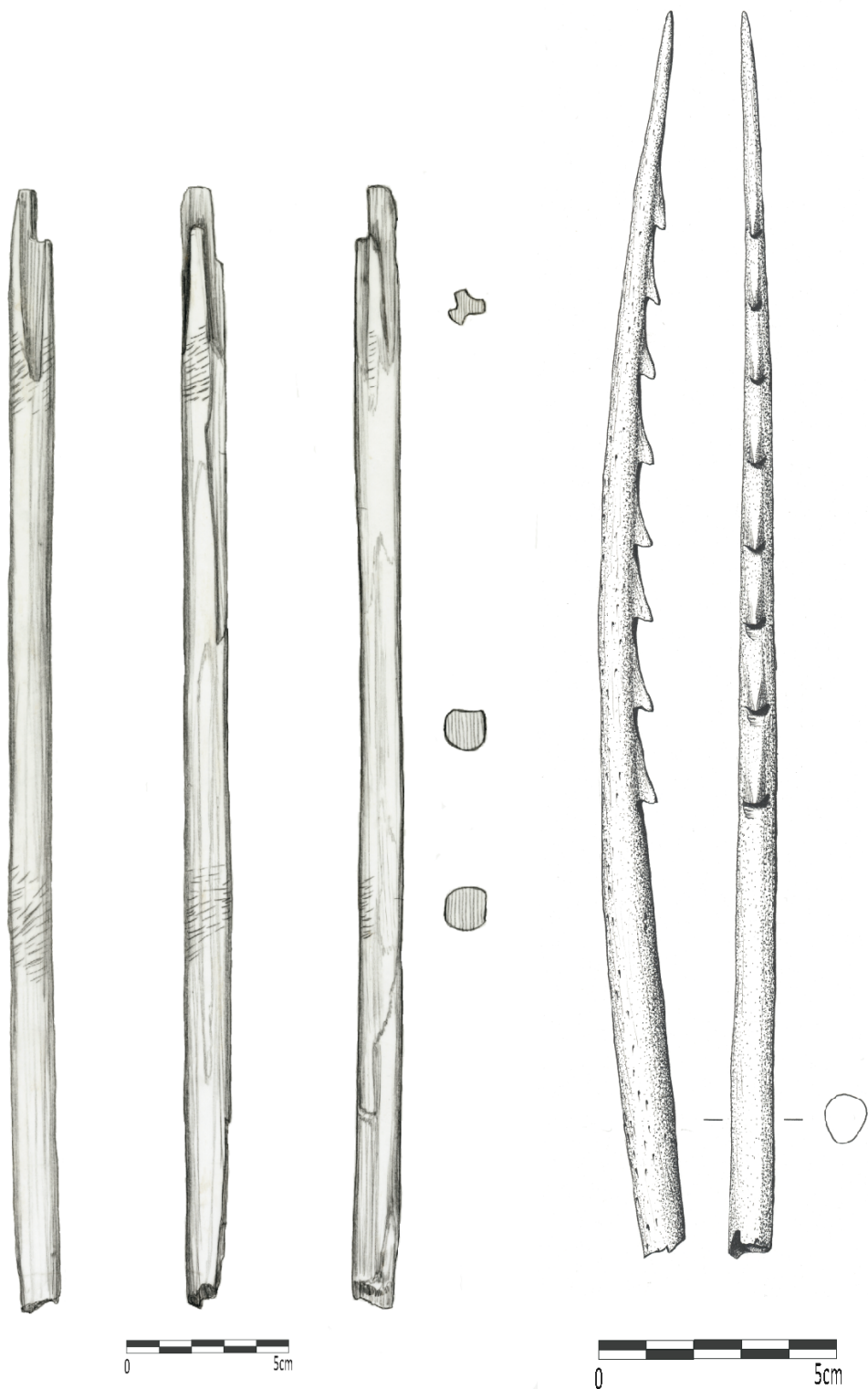


Figure 9. From left to right: a) Distal end fragment of shaft for three-pronged bird dart (length: 356 mm), Qeqertasussuk (drawing: Bjarne Grønnow); b) End prong made from whale bone for bird dart (length: 270 mm), Qeqertasussuk (drawing: Lars Holten). Scales: 5 cm.

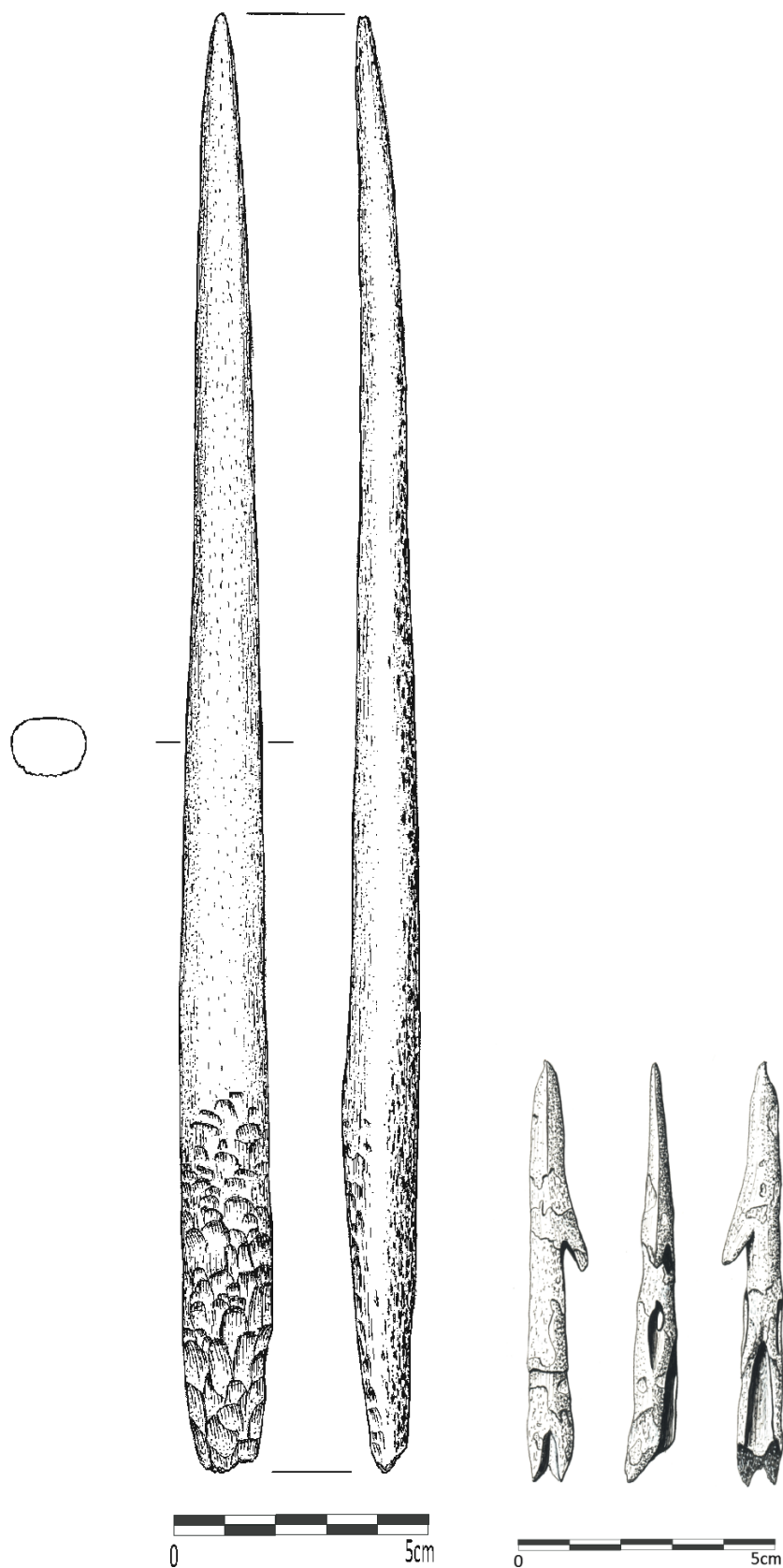


Figure 10. From left to right: a) Foreshaft made from whale bone for toggling harpoon head (length: 295 mm), Qeqertasussuk (drawing: Eva Koch Nielsen); b) Toggling harpoon head made from antler, type Qt-A (length: 79 mm), Qeqertasussuk (drawing: Lars Holten). Scales: 5 cm.

The most common Saqqaq harpoon head was a tanged type with barbs and spurs and most often with a replaceable narrow triangular endblade made from killiaq, which was squeezed into a distal slit. Three main types of tanged heads have been identified: Qt-B, Qt-C, and Qt-D (Figure 11: 1-3). The vast majority of these types from Qeqertasussuk are made from antler (49 out of 56), a few from ivory, and three from driftwood (*Larix* sp.). One of the wooden heads is quite large (Figure 11: 4) and might have been functional, but the others are so fragile that they probably served more as model or toy harpoon heads. As mentioned, no foreshafts for tanged harpoon heads have been found yet, but ethnographic analogies from the Bering Strait region suggest that these small heads were most likely used to hunt small seals in open water (Nelson 1899).

A few finds from Qajaa in Disko Bay and Nipisat in the Sisimiut area (Gottfredsen and Møbjerg 2004: 77) show that Saqqaq atlats were quite slender, and—according to the width of the shaft grooves—designed to launch light darts and harpoons with shaft diameters of 11-15 mm. They were carefully carved from whale bone or walrus penis bone, and a pin of hard material (ivory or antler) was countersunk into the distal end of the groove (Figure 12).

Saqqaq lances

Harpooned marine mammals were killed with lances, which were thrust or thrown at short distances. About 25 foreshaft fragments with wedge-shaped proximal ends have been recovered at Qajaa and Qeqertasussuk (Figure 13). This proximal-end shape would fit perfectly into a “swallow-tail” slit at the distal end of a main shaft. One or two holes through the broad sides of the proximal end show that originally bone or wooden pegs locked the foreshaft into a fixed position at the end of the main shaft. The broad sides of the wedge-shaped end were obliquely scratched to ensure high friction and thus secure the stability of the joint. Moreover, traces of lashing on the narrow sides of the foreshaft’s proximal end show that the joint was reinforced. The cross sections of these foreshafts are oval, and in some cases a shallow probably ornamental longitudinal groove is seen on each broad side of the shafts.

In contrast to the scarf joints of the missile shafts, the wedge/swallow-tail joints are resistant not only to longitudinal pushing forces, but also to pulling forces. This property is of course essential for a lance, which the hunter may thrust and pull several times to kill the game animal.

Most of the lance foreshaft fragments are from light weapons. They were armed with tapered-stem, bifacial lance points made from killiaq, which were set into a blade bed. Metric analyses of the foreshafts and lance points show that several calibers of lances were used. Among the few heavy wooden lance foreshafts, one was uncovered with the base of the endblade still in its original position in the blade bed. This type of lance with a point 30 mm wide was suited for killing big marine animals (Grønnow 1994: 219; Meldgaard 2004: 125f.).

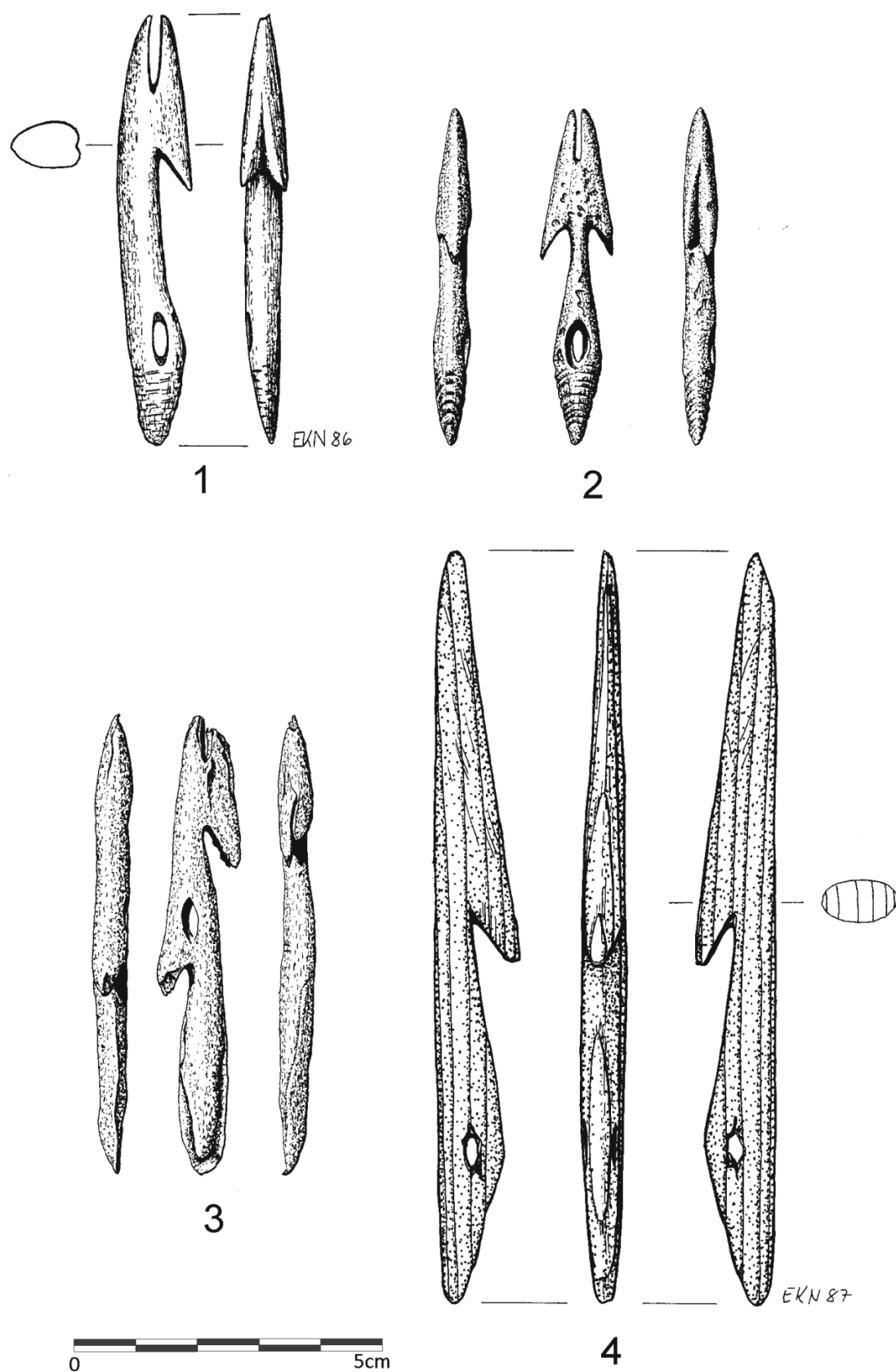


Figure 11. Tanged harpoon heads from Qeqertasussuk: 1) Type Qt-B (length: 68 mm); 2) Type Qt-C (length: 53 mm); 3) Type Qt-D (length: 78 mm); 4) Type Qt-B harpoon head made from driftwood (length: 124 mm) (drawings: Lars Holten and Eva Koch Nielsen).



Figure 12. Distal fragment of an atlatl made from whale bone or walrus penis bone with a countersunk antler pin (length: 224 mm), Qajaa. The furrow into which the proximal end of a dart or harpoon shaft would fit measures about 12 mm across (photo: John Lee, National Museum of Denmark). Scale: 10 cm.

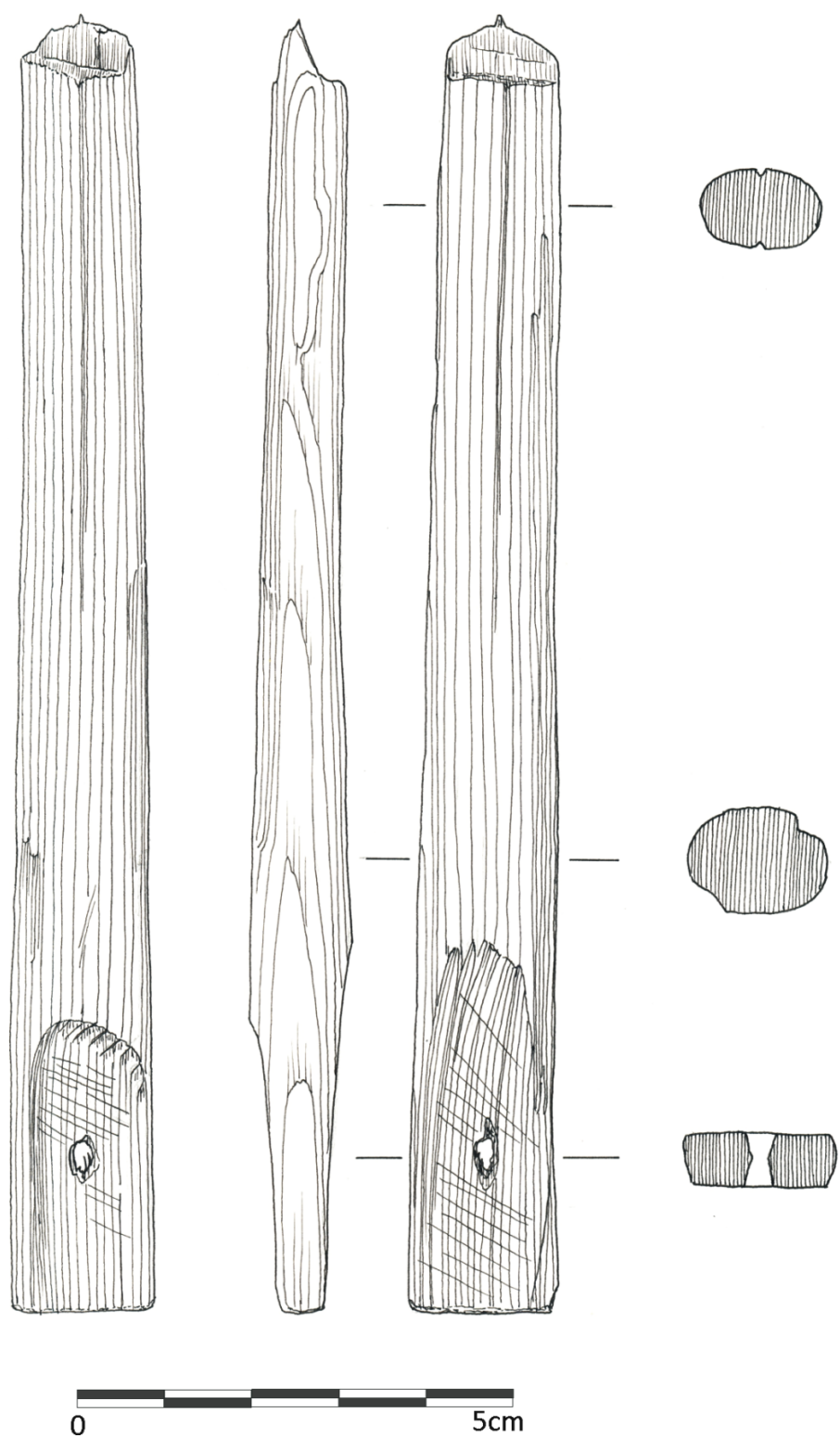


Figure 13. Lance foreshaft with a characteristic wedge-shaped proximal end and an oval cross section. Note the hole through the broad sides of the proximal end and the ornamental (?) shallow longitudinal groove on both sides of the foreshaft (length: 149 mm), Qeqertasussuk (drawing: Eva Koch Nielsen).

Other hunting tools

A few probable missile or lance heads, made from ivory or antler, come from Qajaa and the Nipisat site in the Sisimiut area. The ivory ones are quite heavy and have a distal blade bed for a (lithic?) point and a broad barb, which points forward (Figure 14). Their function is unknown. The same goes for a few possible antler lance heads from Nipisat, which have a rounded, but sharp-edged distal end and a line hole in the tapered proximal end (Gotfredsen and Møbjerg 2004: 73f.). Baleen strings with running nooses may be snares for small game hunting (Grønnow 1996b: 28), while other knotted strings could be fragments of nets used for catching seals (Meldgaard 2004: 165).

Seagoing boats but no sledges

Among the thousands of fragments of wooden artifacts, a few indicate that Saqqaq hunters, as one would expect from the faunal assemblages and hunting weapons, used seagoing boats to hunt marine mammals. Among about 20 fragments, particularly informative is an almost complete rib of a watercraft found at Qeqertasussuk (Grønnow 1994: 221). A single long strip of wood, 35 cm wide and about 22 cm high, is bent into a U-shape and has a flat bottom—a characteristic of a slender skin-covered vessel. With this narrow, low profile the Saqqaq boat was probably kayak-like, i.e., with a skin-covered deck and likely not open on top like a canoe (Golden 2006: 25).

Excavations at Qeqertasussuk have produced several paddle fragments. The largest one shows the outline of the distal end of a blade 83 mm wide that tapers towards its distal end (Grønnow 1994: 222). These fragments and shavings show that paddles, like many other larger wooden objects, were reworked and probably used for other tools or just for firewood. It is not possible to tell from the fragments whether the Saqqaq kayaker used double- or single-bladed paddles.

Even though the faunal assemblages provide evidence of dogs as big as modern Greenland sledge dogs, there are no indications of sledge use. They were probably hunting dogs and pack animals (Meldgaard 2004: 87f.).

The hunter's toolkit and his prey

The faunal assemblages from the Saqqaq sites in Disko Bay consist of more than 100,000 bones that attest to a broad-scale subsistence economy (Meldgaard 2004). The different components of the hunting toolkit can be matched with certain hunting activities. There is ample evidence that caribou hunting was an important subsistence activity (*ibid.*: 145f.). The long, slender arrows and composite bows of the Saqqaq culture fit into this picture, as do the light darts. Darts launched by atlatl were used alongside bows and arrows.



Figure 14. Proximal end fragment of a heavy ivory lance (?) foreshaft, Qajaa (length: 126 mm). The distal end is broken off just above the forward-pointing barb. A complete specimen of this type, found at Nipisat, is shown in Gotfredsen and Møbjerg (2004: 79). The tapered proximal end would fit into a socket on the distal end of a wooden shaft (photo: John Lee, National Museum of Denmark). Scale: 10 cm.

Tens of thousands of bird bones, mainly from species like Brännich's guillemot, little auk, fulmar, and a variety of gulls, have been recovered from the midden deposits (*ibid.*: 144f.). There are many methods of fowling but most of the birds were probably hunted with three-pronged bird darts. These Saqqaq darts are comparable to Alaskan specimens in ethnographic collections. Nelson (1899: 152-153) vividly describes the different techniques for throwing them from a sitting position in a kayak, and this description might apply to the Saqqaq hunter as well.

Seal meat was the staple food of Saqqaq society (Meldgaard 2004: 110ff.). The faunal assemblages clearly reflect diverse strategies. In winter, ringed seals were caught mainly by means of small toggling harpoons thrust through breathing holes in the sea ice. During the warm season, harp seals were hunted in Disko Bay. By analogy with historic Inuit, this kind of open-water sealing would have lent itself to the light Saqqaq harpoon head with tapered tang. Even from a sitting position in a seagoing boat, the hunter could hit the target from quite long distances by launching these light harpoons by means of an atlatl (Nelson 1899: 135f.). Bladder technology—the hallmark of the Thule culture and historic Inuit period—has left no material remains in a Saqqaq context. We thus infer that the Saqqaq used a method where the shaft itself acted as a brake on the harpooned seal as it dived and dragged the propelling shaft through the water (Fitzhugh and Kaplan 1982: 67f.). The Qeqertasussuk faunal assemblages show that a large number of migrating harp seals were mass-hunted, probably by means of nets or communal drive hunting (Meldgaard 2004: 118 f.).

There seem to be no large harpoons for hunting big marine animals like whales and walruses, but these animals do appear in the faunal assemblages. Bones from at least six whale species have been identified at Qeqertasussuk (*ibid.*: 125 ff.). Even though larger species like minke whale and bowhead were probably only scavenged as carcasses that drifted ashore, the hunting toolkit shows that the Saqqaq were perfectly capable of hunting such species as narwhal and beluga whale.

This picture is consistent with evidence from Saqqaq lances. Most of the lances are very light and suited to killing animals the size of ringed, harp, and harbour seals. A few were heavy, however, with broad endblades mounted in wooden foreshafts. Such lances could have been used to kill larger game animals, like walruses when they hauled themselves out on to beaches in Disko Bay.

Fishing is represented by the bones of several species in the faunal assemblages (Meldgaard 2004: 150f.), but evidence is only sporadic in the artifact material. For example, no fish-hook components have been identified. A few probable leister prongs made from caribou antler and baleen may be evidence that Arctic char were caught in rivers. Both the toggling harpoon and the tanged harpoon are so small that they could have been used to harpoon large fish like salmon and large cod, which are represented in the faunal assemblages (Meldgaard 2004: 154).

Specific tools cannot be linked to hunting of small game species like Arctic hare and Arctic fox, which are well represented in the faunal assemblages. These animals were undoubtedly caught by means of snares and traps.

Conclusion

Based on detailed investigations of wooden artifacts from the frozen Disko Bay sites, we can present a detailed picture of the advanced and comprehensive hunting toolkit used by the Saqqaq people (Figure 15). The kit, in which driftwood played a central role as a raw material, consisted of:

- Composite, reinforced bows and arrows armed with either broad or slender bifacial endblades
- Light atlatl darts with either broad or slender bifacial endblades
- Light atlatl-launched bird spears with three slender barbed end prongs made from whale bone
- Light harpoons with toggling or tanged heads
- Light and heavy lances armed with bifacial endblades of a wide range of calibers
- Light and heavy lances or spears with specialised foreshafts and heads made from ivory or antler
- Snares and nets made from baleen strings
- Seagoing kayak-like boats

This very light and portable toolkit made use of functional and quite elegant solutions. For instance, long wooden shafts for missiles of all kinds had several sections that were made from carefully selected driftwood of coniferous origin, in particular larch and spruce. The use of scarf joints is quite simple, but it provides the shaft with high resistance to longitudinal *pushing* forces—a property needed for missiles. Saqqaq designs may be minimal but, as the woodworking and artifact descriptions show, the craftsman needed great accuracy and skill to produce the tools.

With this technology, in which driftwood was an indispensable raw material, the Saqqaq hunters could select from a wide range of hunting tools the proper missile for a specific hunting situation determined by the game species, the hunting strategies, and the chosen method. During the entire Saqqaq period this hunting toolkit made possible a broad-scale subsistence economy. Throughout two millennia there was almost no deviation from the choice of raw materials or the standard designs of hunting tools showing a complex but very consistent material expression of Saqqaq identity (Grønnow 2012).

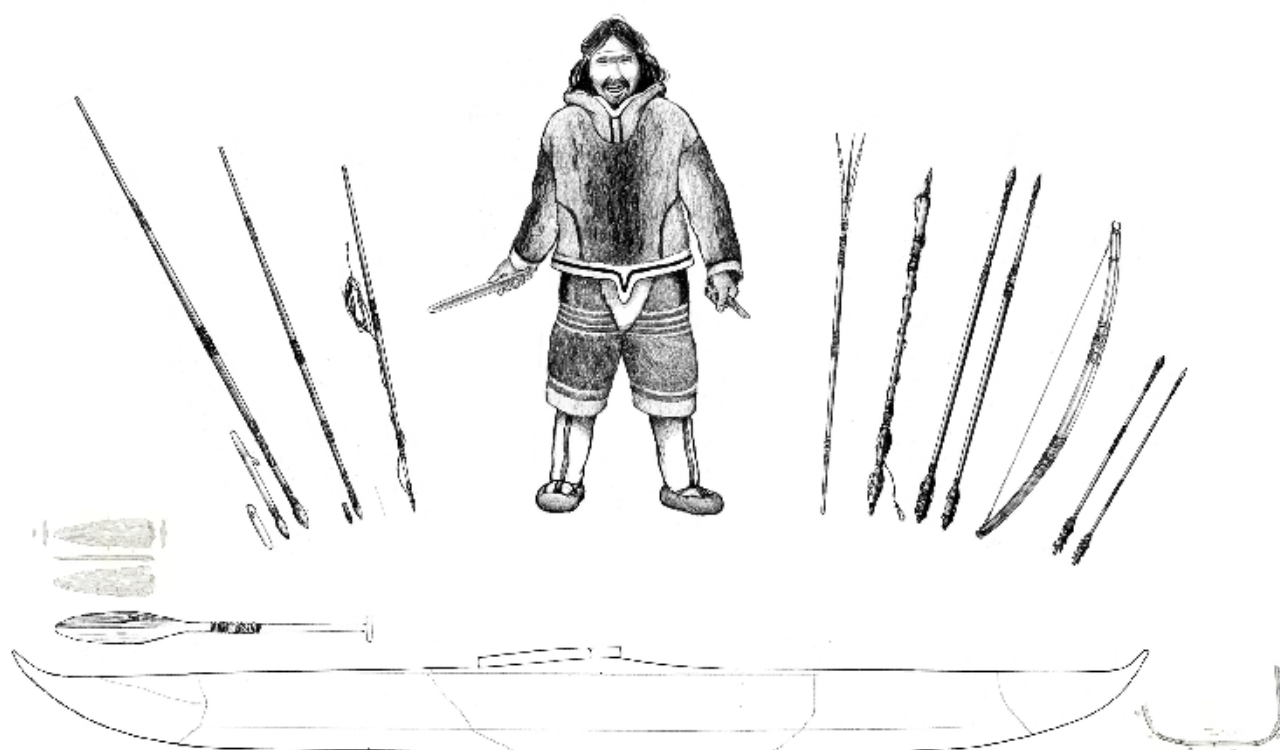


Figure 15. A Saqqaq hunter with his hunting toolkit. This schematic reconstruction is based on the archaeological analyses in the present article. To the left of the hunter, a heavy lance and a light lance with different kinds of heads are shown as well as a toggling harpoon for seal hunting through breathing holes. In his hands the hunter holds an atlatl and a knife. To the right, one sees a three-pronged bird spear, a harpoon for open-water sealing, two kinds of light darts, a reinforced bow, and two calibers of arrows. Below, finds from Qeqertasussuk—a fragment of a paddle and a frame—suggest that the Saqqaq hunter possessed kayak-like vessels (drawing: Nuka K. Godtfredsen, National Museum of Denmark).

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