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An Early Inuit Workshop

at a *Qassi*, a Men's House, Nuulliit, North West Greenland

by

Asta Mønsted, Martin Appelt, Anne Birgitte Gotfredsen, Claire Houmard, Antoine Zazzo,

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Abstract. Recent excavations in northern Greenland at the early Inuit site, Nuulliit, belonging to the Ruin Island Phase of the Thule culture, included a settlement area in front of House 30, a turf house ruin originally investigated by Holtved, 1947. A discussion of the interpretation of the feature as a *qassi* (a men's house) is presented, and analyses of the spatial distributions of waste, tools, and pre-forms show that the area in front of the *qassi* served mainly as a workshop, where repair, recycling, and discard of hunting gear and tools took place. Walrus ivory tools, soap stone vessels and blades of meteoric iron were produced. Training of apprentices was an integral part of the activities, and small seals and birds were consumed in the workshop area. The workshop mainly dates to the 14th century AD. Norse iron was found, and along with a re-evaluation of radiocarbon dates, this leads to a discussion of the early Inuit expansion into Greenland.

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1. Introduction

Renowned for its many dwelling remains from the Ruin Island Phase of the Thule or early Inuit culture (c. 1250 – 1450 AD), the Nuulliit site is situated at the eastern edge of the resource rich polynya, Pikiarlarsorsuaq, or The North Water (Hastrup et al. 2018, Hastrup et al. [eds.] 2018) in northern Greenland (Fig. 1 - 2). During his 1947-archaeological investigations Erik Holtved identified 62 ruins at the site, i.e. likely the largest early Inuit site in Greenland, at par with the largest sites in Arctic Canada (Whitridge 1999; Desjardins 2020). Based on his excavations Holtved interpreted one of the ruins, House 30, as the remains of a *qassi* (a men's house) (1954:38 – 41). In 2015, the NOW Project (Hastrup et al. [eds.] 2018) had the opportunity to survey and re-investigate the Nuulliit site, and for the first time an activity area in front of a *qassi* was thoroughly investigated, resulting in substantial new information. Based on analyses of spatial organization, technology and subsistence economy this paper elaborates on Holtved's interpretation of House 30 as a *qassi*. Furthermore, based on a new set of radiocarbon dates, the paper puts the *qassi* and the Nuulliit site into a wider chronological and cultural historical perspective by reviewing the early Inuit migrations into Greenland.

1.1 Holtved's investigations at Nuulliit

During a single field season Holtved and his crew of four Inughuit assistants excavated no less than 37 of the 62 visible dwelling ruins at Nuulliit, situated at a spit of land west of the mouth of Iterlassuaq (Granville Fjord) (Fig. 3a-b). The architecture of the house ruins in Ruin Group I and the artefacts from the site formed the basis of Holtved's definition of the Nuulliit-phase of the Thule culture (Holtved 1954: 99 - 100), which he considered a forerunner of his famous Ruin Island phase (Holtved 1944). Later research has concluded that the first mentioned phase is an integral part of the

Ruin Island phase probably representing the initial migration of Inuit into Greenland. These groups spread remarkably fast from Alaska to the North Water area (e.g. McCullough 1989; McGhee 2000).

Almost all features of Group I are stone and turf winter houses of the Ruin Island type: single family houses with a raised sleeping platform, entrance passage and one or two protruding kitchen niches in the front wall. However, a single feature stands out: House 30 (Fig. 4 - 5).

The collection from inside House 30 generally do not deviate significantly from the finds from the "single family houses" nearby (Holtved 1954:50 f.). However, the architecture of House 30 is unique as the floor measures approximately 6 x 6 meters, which makes it considerably larger than the other houses on the site measuring between 2 x 2 meters to about 4.5 x 4.5 meters (ibid.:40). House 30 showed irregular extensions, but no sleeping platforms nor any kitchen niches normally found in the family houses of the Ruin Island phase (McCullough 1989:245). The floor was slightly dug into the ground but the surrounding stone and turf walls "*rose conspicuously above the surface*" (Holtved 1954:39). Two c. 1.5 meters high natural stone pillars, five meters apart, originally supported the roof. Fragments of a floor paving were preserved between the pillars. A c. 3 m long entrance passage roofed by large flagstones went through the front wall in the direction of the family houses at the western shore of the site. Based on the architecture, its considerable size (6 x 6 m) and position some 20 meters behind the row of single family dwellings in Group I, Holtved deduced that this feature represented the *qassi* or "men's house" of the community (1954:38-41).

Holtved and his assistants excavated the floor layers of House 30 using quite coarse methods and, in accordance with the excavation standards of that time, they did not record the specific positions of the objects found. No faunal remains and only a small selection of refuse were collected. However, Holtved listed a small assemblage of artefacts, including well preserved objects of organic materials, from House 30 along with all the other finds from the extensive 1947 excavation (Table 1 in Holtved 1954).

1.2 The many-faceted qassi

Historically, the *qassi* (*qassit* (plural)) served as the meeting place of the local community where in particular the men, headed by an *umialik* (a whale boat captain), planned the hunting of big whales such as bowheads (Mønsted 2016). However, the *qassit* also framed other activities. This feature's diversity across the Arctic is illustrated through various designations in the literature: *Sports house* (Lister 1777), *pleasure house* (Payne 1889), *dancing house* (Boas 1901), *singing house* (Boas 1907), *communal house* (Hawkes 1913), *ceremonial house* (Hawkes 1916), *club house* (Birket-Smith 1924), *feasting house* (Rasmussen 1929), *festival house* (Rasmussen 1931), *social house* (Kroeber 1939), *men's house* (Spencer 1959), *meeting house* (Birket-Smith 1959) and *quasi-ceremonial gathering place* (Spencer 1959).

In the American Arctic, the *qassi* appears to be a predominately northern phenomenon, as they are present among Yup'ik, and Cup'ik in Western Alaska, among the Sugpiaq on the Alaskan Peninsula and on the Kodiak Archipelago, while also among three of the riverine Athabaskan groups, namely the Deg Hit'an, Holikachuk, and Koyukon (Norman and Eldridge 2022: 163). The only Inuit groups of North America who do not seem to have erected *qassit* are the Chugach Sugpiaq and the Siberian Yupik (Oswalt 1967: 187; Lee and Reinhardt 2003: 127).

While these sources provide ethnographical information on the *qassi* phenomenon within the last couple of centuries, excavations of Ruin Island phase sites on Umingmak Nuna (Ellesmere Island) have documented remains of *qassit* dating back to the 13th – 14th century AD (McCullough 1989: 31,37,51,61), parallel to House 30 at Nuullit. Such pre-contact *qassit* have been identified archaeologically across the North American Arctic, from Alaska across the Canadian Arctic and into Greenland (Anderson 1984; Birket-Smith 1924; Dumond 2008; Gulløv 1988; McCullough 1989; McCullough and Schledermann 2005), whereas the *qassit* seemed to be present everywhere but in Greenland during the early historic period (Lee and Reinhardt 2003: 67). Recently, the *qassit* have been re-examined broadly, locating 146 pre-contact *qassit* in total, geographically spanning between southcentral Alaska to western Greenland (Norman and Eldridge 2022: 184).

In Greenland archaeological remains of *qassit* outside the Pikiarlarsorsuaq area are not common. They are found on a few early "pioneer-sites" in West Greenland, on a few later sites in South Greenland (Gulløv 1988; Holtved 1944; Thalbitzer 1941), and probably on Walrus Island in North East Greenland (Jensen et al. 2008:10).

When looking for archaeological indications of a *qassi*, Lutz' suggested the following: a) large percentage of waste flakes suggesting substantial manufacturing activities connected to the structure, b) scarcity or absence of cooking pots indicating cooking was undertaken elsewhere, and c) a high percentage of end blade insets indicating a different use of the possible *qassi* than of the nearby winter houses (Lutz 1973: 117).

1.3 New investigations and new questions

During three weeks of fieldwork under the NOW Project in 2015 the Nuulliit site was surveyed by means of DGPS and a fixed-winged drone (Grønnow et al. 2016). Trial excavations showed that well-preserved cultural layers from the Ruin Island phase outside the house ruins at Nuulliit were sparse. Patches of dry gravel, sand and grass covering a thin turf layer now characterize most of the site surface.

However, a grass and moss covered area of c. 8 m x 8 m in front of the entrance passage of House 30 contained a shallow sediment sequence, 20 – 50 cm deep. The layers consisted of an upper recent turf layer (Layer 1) followed by a darker slightly degraded turf layer (Layer 2) with some large fragments of un-worked whalebone. Layer 3 below was a culture layer - a degraded sand mixed turf layer with lots of artefacts and bone fragments and with a distinct border to the lowermost, dark greyish sterile gravel layer (Layer 4). Close to the opening of the entrance passage and front wall of the house this sequence of layers was covered by turf from the collapsed front wall and probably Holtved's "back-dirt" from the excavation of the house floor and entrance passage. Here, the lowermost layers were frozen.

The team excavated a 6m x 6m area covering most of the activity zone. Artefacts, refuse and faunal materials were collected in 50 cm x 50 cm units and in stratigraphic entities. All excavated soil was put on a plywood plate by unit, thoroughly examined for small artefacts, bones and refuse and subsequently scanned with a metal detector. Soil from selected squares was sampled and brought to the laboratory for wet-screening. This procedure resulted in substantial amounts of finds, including artefacts and refuse of soap stone and organic materials and metal as well as faunal remains. The following analyses of use of space, technology and subsistence economy at the site are based on these abovementioned materials.

Table 1 lists the 1947-finds from the floor layer of Holtved's House 30 as well as the finds from the recent excavation of the activity area in front of the house. Through spatial and technological analyses of the finds it is for the first time possible to gain insight into the activities in front of an early Inuit *qassi* and to add new perspectives to Holtved's interpretation of the feature.

The following questions are posed: How were the outdoor activities in front of the house spatially organized? Who were the artisans/craftsmen? Which raw materials were processed in the activity area? What characterized the manufacturing, repair and up-cycling of the artefacts as well as the consumption of food in connection with the *qassi*? And finally: How did House 30 and the "classic" Nuulliit site relate to the wider Ruin Island Phase community at the North Water polynya and ultimately to the early Inuit peopling of Greenland?

2. Masters and apprentices: The work shop area in front of House 30

The character and distribution of archaeological objects in front of House 30 result from countless individual movements in and out of the activity area of raw materials, waste products from food consumption, the making, repair and –recycling of artefacts as well as waste from clearing the interior of the house. The craft persons' finished products were removed from the area to be used elsewhere on the site and in the land- and seascapes.

A basic question arises: with such complex formation processes determining the spatial pattern in the outdoor activity area, is it possible then to distinguish between the distribution of dumped refuse, including food remains from clearing the house floor, the waste from consumption of food in front of the house, and the waste from “in situ” craft activities? We deal with this issue in three ways: 1) concerning identification of actual workshop areas, we focus on refuse categories from craft activities that for logistic and practical reasons primarily were carried out in open space and in daylight, 2) we have mapped the distribution of small fragments and micro-debris (like soap stone dust), and 3) we add evidence from Holtved’s excavation of the floor of the *qassi*. His excavation method was, as described, “quick and coarse”; however even if he did not collect faunal material or tiny artefact fragments from the floor layer, he was an experienced, professional excavator and a skilled observer of the character and content of archaeological layers.

Obviously, the distribution patterns of the finds were also influenced by taphonomic processes like traffic by humans and dogs and other scavengers, and variable preservation conditions across types of materials and the surface conditions at the activity area. For example, the amount of wooden waste and artefacts is limited, which in likelihood is the combined result of curation of sparse raw material and unfavorable conditions for wood preservation. The preservation-conditions for baleen are generally poor with the exception of a few of the excavated units next to the western wall of the *qassi*. In spite of these biases, we argue in the following that distinct behavioral patterns in the activity area can be identified through spatial analyses.

2.1 Soap stone processing

No less than 5,241 pieces of soapstone (35 kg) varying from large raw material nodules and preforms to flakes less than the size of a finger nail and heaps of micro-debris (dust) were recovered in front of House 30. Two, perhaps three concentrations of soapstone flakes resulting from adze work (mostly very small pieces each weighing a few grams) and “soap stone powder” from cutting and grinding

pre-forms are seen in the workshop area (Fig. 6). Processing soap stone from nodule to finished vessel takes up a lot of space and produce large quantities of small flakes and clouds of powder, that make breathing difficult in a closed space without ventilation (Appelt and Sørensen, personal comm.). Thus the concentrations of debris, including micro-debris, are interpreted as reflecting the actual positions of two-three soap stone lamp- and pot-makers in front of the *qassi*. It must be mentioned, that Holtved only found seven fragments of soap stone containers and no rough-outs or chips of this material inside House 30 (Holtved 1954: 56 – 57). This supports the assumption that the concentrations in the activity area did not result from secondary dumping of soap stone waste from inside the house.

The map showing the average weight relative to the number of pieces (Fig.7) reveals that large raw material blanks and nodules are mainly found in the periphery (the southern and eastern corners of the excavation area) of the heaps of “micro-debris”. These zones, characterized by few, heavy pieces, mark the toss zones (Binford 1978: 348 f.) of the soap stone artisans. A possible toss zone is also separating the work space in the western corner of the excavated area from the other two workspaces.

Two qualities of soapstone are represented: one coarse grained soapstone of a multi-grey and black speckled color and one fine-grained, dense, light grey raw material with a green shade. The last quality typically shows traces of adze work with metal blade as opposed to the coarse-grained soapstone, which was processed with narrow bladed chisels of bone, antler or ivory and with hard hammer stones (percussion/crushing).

Pieces of coarse-grained soap stone are by far the most abundant both by quantity of fragments and by weight. They include large, irregular nodules and thick side- and rim fragments from rough-outs for containers. It is likely that this raw material came from a hitherto unknown outcrop close to Nuulliit. In contrast, the smaller amount of shards of finished or nearly finished pots and lamps of the fine-grained, light grey to greenish quality must have come from containers brought to the site from a distance, probably from Ukussissoq some 90 kilometers south of Nuulliit

on the western side of the Innaanganeq Peninsula. Here, two large, loose boulders of soap stone of this high quality are located beneath a cliff-face. (Appelt et al. 2001:29; Rasmussen 1921).

Several of the thin pot rims are blackened with a crust of charred blubber. Their spatial patterning differs significantly from the debris originating from the primary soap stone processing. The shards of charred containers were mainly dumped in the southern fringe of the refuse concentrations (Fig. 8). Taken together with the fact that these shards are of the same character (from used lamps/pots) as the seven shards from inside the house, mentioned above, this indicates that blubber lamps were used inside and, when broken, tossed from the entrance passage to positions beyond the artisans' close workspaces.

A number of soap stone pieces probably reflect the presence of apprentices. They produced peculiar waste products: Pieces like the ones shown on Figure 9a-c were worked from all angles with different tools. The first mentioned (to the left) is a miniature lamp or pot blank, which someone attempted to hollow out by hammering with a hard stone, whereas the second piece (to the right) was "randomly" worked with a narrow bladed adze or chisel. Neither of these two preforms could ever have become proper soapstone artefacts. We interpret them as apprentices' products, perhaps made by children, experimenting with or being taught soapstone processing in front of the *qassi*. In the floor layer of this feature, Holtved excavated a parallel example of a hollowed out piece of soapstone, all too small and irregular to ever become a proper toy blubber lamp (Holtved 1954:92).

2.2 Metal processing

The finds in front of the *qassi* include 281 pieces of metal, all in all 557,6 grams, which were discovered mainly by scanning the excavated soil with a metal detector (Grønnow et al. 2016). The great majority of metal pieces are small flakes of less than two grams. They are waste flakes from cold hammering of meteoric iron pieces.

Sixty of the larger metal-pieces were XRF-scanned and 29 of these x-rayed. Ten of these metal-pieces are in all likelihood metal of Norse origin, while the remaining 50 pieces are meteoric iron, as we would suggest that the overall majority of the remaining 221 non-tested metal-pieces are. The recognisable pieces include whole or fragmented blades from ulu, scrapers, knives, and harpoons as well as fragments of needles, and a vessel repair staple (Fig. 10a-d). The large amount of iron in the workshop area reflects that Nuullit is situated relatively close – about 100 km as the crow flies – to the iron meteorites at Savissivik in the northern part of Qimusseriarsuaq (Melville Bay) (Appelt et al. 2015).

Cold hammering of meteoric iron demands space and light, and it is likely that primary processing of rough iron flakes brought from the outcrop primarily was an outdoor activity, like soap stone processing. Thus the distribution of iron flakes most likely reflects the actual positions of the crafts-persons producing, and, to some extent, reworking and recycling iron blades. The metal flake concentrations overlap significantly with the soap stone heaps (Fig. 11) indicating that it could have been the same artisans, who processed the two raw materials.

Are there any signs of iron processing inside the qassi? Holtved only found a single knife blade and an unidentified iron piece in the floor layer and no concentrations of iron flakes or nodules. Due to his excavation method and the fact that the use of a metal detector in arctic archaeology was unthinkable at his time, he probably overlooked a lot of iron pieces. However, he was very much aware of the use of native as well as Norse iron in Early Thule context, so if extensive iron processing had taken place inside, he probably would have observed it.

The pieces of Norse metal - the chain-mail ring and fragments of ship-rivets (Fig. 10e) – show the same general spatial distribution, and thus they were treated just like refuse of native iron, at least during this stage of their “life circle”.

2.3 The processing of organic materials

The assemblage from the workshop area includes thousands of chips and shavings from processing organic matter as well as blanks, preforms and 81 identifiable, but mostly fragmented, artefacts of organic materials.

Among the artefacts, hunting tools dominate (Fig. 12): six harpoon heads (a-e), five arrowheads (f-h), three line stoppers, two socket pieces (j-j), two foreshafts (k-l), two socket pieces, two toggles, one lance head, one lance foreshaft, one barbed point, one tension piece, and one possible bola ball. The often forcefully broken tools have mainly been damaged during hunting episodes. Six pieces show traces of repair before being discarded.

Also hand tools of organic raw materials are well represented in the activity area (Fig. 13-14): six adze heads (Fig. 13a-e), three wedges (Fig. 13f), three knife handles (Fig. 14a-c), two mattock heads, one snow knife (Fig. 14d) and one bow drill mouth piece. Like the hunting gear, most of these tools are heavily worn down and share a common damage pattern: the one side of the blade slot broke off during work or due to extraction of the iron blades from the discarded hafts. Four pieces and a crosspiece for a sledge were repaired in the workshop area but discarded anyway.

Blanks and preforms as well as chips and shavings of organic materials show that processing from raw material to finished tool took place in the workshop area. The walrus and narwhal ivory refuse (chips) is concentrated in the center of the work shop area (Fig. 15-16), and taken together with the spectacular heap of narwhal chips in the eastern fringe of the activity zone, there are indications, that the ivory work spaces differed somewhat from the soap stone and metal work spaces.

This interpretation of the spacial pattern of ivory chips must be balanced with the fact that dumping of ivory waste from craft activities inside the qassi might blur the picture. The issue of distinguishing waste from dumping versus waste left "in situ" at the seat of the craftperson is difficult to solve in this case. However, Holtved only identified 13 pieces of "worked bone etc." inside - the modern investigation of the activity area produced over 2000 chips (Table 1). If ivory processing

mainly had taken place indoors, there probably would have been considerably larger amounts of this waste in the floor layer (even if Holtved did not collect all waste products).

Walrus cranial and postcranial elements were evenly distributed over the entire activity area but, in contrast, narwhal was only represented by tusk refuse and no other parts of the skeleton. Worked baleen strips were concentrated in an area within 2 meters from the opening of the entrance passage of House 30. This distribution pattern could, however, as mentioned above, reflect the preservation conditions for this sort of organic material.

Half of the tool assemblage is made of walrus tusk. It seems that tusks from *young and female* animals were selected (64 pieces: 18 juvenile; 14 female adult; 20 juvenile or female). Only three ivory fragments are from adult male tusks (Fig 17a and Table 2). A quarter of the organic raw material is whalebone, and the last quarter is caribou antler, narwhal tusk and sea mammal bone (Fig. 17b – c and Table 3).

While most artefacts were produced by skilled artisans, some harpoon heads show strange and imprecise design elements as well as traces of processing that differ from harpoon heads from the other houses at the site. Lots of manufacturing traces are visible, and they show that iron bladed tools were used for processing. These pieces as well as a couple of awkwardly proportioned and roughly worked polar bear figurines may have been produced by apprentices like many of the soap stone objects (Fig. 18). Further analyses of the ivory, antler and bone chips and shavings including technological experiments are needed to explore these interesting master/apprentice relations in depth (see also Klaric [ed.] 2018).

3. Faunal remains and food consumption in the work shop area

The excavation of the activity area produced more than 11,000 bone fragments, which were identified by using the comparative collection of the Natural History Museum of Denmark, University of Copenhagen.

For the small seals the auditory bulla, mandibula, humerus, radius, ulna and the femur were identified to species. The faunal assemblage of Nuulliit was quantified by NISP (Number of Identified Specimens) and by MNI (Minimum Number of Individuals). Furthermore, for the most frequent taxa the relative distribution of the skeletal elements was given by the use of MNE (Minimum Number of Elements) to calculate the MAU (Minimum Number of Animals) values, understood as the minimum animal units necessary to account for the specimens of a collection (see Binford 1984; Lyman 1996:104-105).

The vast majority of the faunal material consisted of whale bone debris and chips of narwhal and walrus tusk in addition to waste from walrus calvaria resulting from tusk extraction. The remainder of the mammalian and avian bones which were identified to skeletal element and species constituted but a small fraction of the total NISP. However, at least six avian and 11 mammalian species including domestic dog were retrieved from the activity area (Table 4).

Generally, the bones were excellently preserved with weathering stages (WS) *sensu* Behrensmeyer (1978) varying between 0-3, the majority showing WS 0. Only c. 7% (n=94) exhibited carnivore gnawing (Table 5). Only large skeletal elements of e.g. walrus exhibited WS 3 of their upper bone surface having experienced exposure for a prolonged time, whereas downward facing bone surface originally covered by vegetation had WS 0. The majority of bone fragments were likely relatively rapidly covered by sediments and vegetation.

3.1 Birds and mammals

Brünnich's guillemot (comprising c. 51%) predominates among the birds followed by fulmar, eider and little auk. Birds were represented by all skeletal parts although small and fragile parts were underrepresented. Interestingly, fulmars as represented by their robust wing bones (humerus), are more frequent than Brünnich's guillemot according to MNI counts (Table 6). The bird bones were

gnawed and, in many cases, broken, thus clearly representing remains from consumption inside or in front of the *qassi*.

The mammal assemblage was in terms of NISP counts dominated by small seals, mostly ringed seal, by c. 70% followed by walrus with c. 21% in (Table 4). Bowhead whales are represented by a substantial amount of large baleen pieces especially from the area with frozen sediments close to the outer front wall. Henceforth, most of the large cetacean bone fragments likely derive from bowheads. The dietary and economic importance of bowheads as well as other big game is notoriously difficult to estimate from a faunal material (e.g. Darwent & Foin 2010: 325; Desjardins 2013: 47; Gotfredsen 2010: 185, Table 6). The amount of meat, blubber and skin must have been considerable, but a reliable way to estimate how it contributed to the diet is lacking.

Remains of at least four bowheads represented by their dense occipital condyles were found at the Nuulliit promontory. A braincase on the site surface situated adjacent to House 30 and thus the workshop area was AMS dated to be probably contemporary with this feature (see below and Gotfredsen et al. 2018).

3.2 Small seal skeletal and age profiles

In order to assess carcass transport, butchery patterns and disposal of small seals, their skeletal profile was analysed (Fig. 19 and Table 7). To evaluate taphonomic factors acting on the bone assemblage such as density mediated attrition the %MAU was compared with a bone density index (Fig. 20 and Table 8). The assemblage showed no visual or statistically significant ($p > 0.05$) correlation with the bone density, albeit a positive correlation ($r_s = 0.4452$, $p = 0.447$) was observed. The distribution of small seal skeletal parts at Nuulliit showed no correlation with the relative amount of meat and blubber per phocid skeleton as expressed by the FUI index ($r_s = -0.2264$, $p = 0.50$) (Fig. 20), but a significant ($p < 0.05$) positive correlation ($r_s = 0.827273$, $p = 0.738$) with the preference-ranking index developed for Iñupiat, from Barrow, Alaska by Diab (1998) (Fig. 21). Elements of the skull and

of axial skeleton, often being present at sites of primary butchery, are almost completely missing from the *qassi* seal assemblage (Figs 19 - 21). This further underlines, especially for deposits with good preservation conditions and negligible dog gnawing, that human decision-making e.g., preference and food sharing were determining factors for the skeletal element distribution. The small seal skeletal profile of the *qassi* activity area clearly reflects human choice and preference, but probably also to some extent bone density mediated attrition. The age profile of the small seal assemblage showed a preponderance of juvenile, subadult and young adult seals of 57.6%. The contemporaneous midden at Skraelling Island House 15 showed a similar age distribution concerning small seals and a strong correlation with the preference-ranking index (Howse 2013). This indicates that the Nuuliiit *qassi* area not exclusively contains refuse from 'in situ' craft activities, but also served as a midden, where food left overs were dumped.

3.3 Spatial distribution of faunal remains

The majority of bone fragments from small seals (n=956) is quite evenly scattered over the activity area. However, some concentrations in the central area, about three meters from the entrance passage and towards the eastern and northern part, are seen (Fig. 22). The seal bones representing various parts of the skeleton were disarticulated and fragmented. They must be refuse from meat consumption rather than from "in situ" butchering. The spatial distribution of bones from small seals differs considerably from the patterns related to the processing of raw materials, described above. We interpret this fact as reflecting a mixture of traces from food consumption inside, which could account for the almost fan shaped "door dump" area in front or to the right of the mouth of the entrance passage, and "snacking" outside in the workshop area followed by traffic, which caused a more even distribution of fragments.

The avian remains, bird bones, (n=343), showed a similar distribution as that of small seals. Other game was represented by few elements (hare, fox and caribou), that were scattered in the activity area with no evident patterning.

In sum: these distribution patterns presumably reflect a combination of dumping of waste from repeated clearings of the house floor and left-overs from meals consumed outside in the workshop area. Finally, the bone concentrations were smeared by traffic by dogs and humans.

4. Dating the *qassi* workshop area

The dating of the formation of the workshop area at the Nuulliit *qassi* is suggested by five radiocarbon samples on caribou antler (Fig. 23, Table 9). Four of the five radiocarbon dates show that the refuse layer was formed during the 14th century AD according to the calibrated dates (AAR 24766 to AAR 24769). Zooming in on the one standard deviations intervals of the four dates the refuse in the workshop area accumulated either during the latest part of the 13th and early 14th century or during the latter half of the 14th century.

A fifth radiocarbon date (AAR 24770) suggests that the earliest use of the Nuulliit site took place in the second half of the 12th or the first half of the 13th century. However, it must be emphasized that this date was made on a caribou antler with a relatively high content of $\delta^{13}\text{C}$ (-16.47, as opposed to the range of the four other dated antler samples (-20.12 to -17.18)).

A sixth radiocarbon date from Nuulliit was made on a sample of the dense back part of the braincase of a baleen whale situated in close proximity to the *qassi* workshop (AAR 24771). The uncalibrated age of the sample was 1302±28 BP ($\delta^{13}\text{C}$ = -14.49). Using a standard marine reservoir effect of 400 years the radiocarbon laboratory in Aarhus suggests that the calendar-age of the sample is cal. AD 1056-1182 at one sigma. However, according to investigations of whale bones from Alaska, the marine reservoir effect should probably be increased to 600-800 years (Dumond & Griffin

2002). Taken together with the fact that a substantial amount of baleen was excavated close to the walls of the *qassi*, the authors suggest that the whale was caught and butchered on the site during the main period of the site, the 14th century AD (Gotfredsen et al. 2018).

5. Discussion and Conclusion

Holtved's interpretation of House 30 as a *qassi* and a men's house was based on the architecture (size, lack of kitchen niche) and the topographical position of the house in relation to the group of single family houses. The present analysis supports Holtved's interpretation, which is further backed up by the fact that the character of the find material from both inside and outside the house meets the archaeological criteria for a *qassi* (Lutz 1973) .

Even if *qassit* historically have served variable purposes, as described above, we would suggest that the Nuullit *qassi* should be considered a men's house in accordance with Holtved's considerations, i.e. gathering house for one or more whale/walrus-hunting *umiaq*-crews, and probably headed by an *umialik* (e.g. Whitridge 2016: 841 with references). The activities documented in the area outside House 30 conform with the idea that some of the primary activities taking place in, and immediately outside, the house are centred on the production and maintenance of hunting equipment, the consumption of pre-prepared food, and the processing of iron-pieces for a trade that during the 14th and 15th century included Inuit sites across large parts of northern Nunavut, and beyond (e.g. Appelt & Gulløv 2009; Appelt et al. 2015).

Repair, recycling, and discard of hunting gear are reflected in the assemblage: forcefully broken hunting tools of ivory and antler – lance heads, foreshafts, harpoon heads, arrow heads – dominate the assemblage. But also used hand tools like damaged and exhausted adze heads, snow knives, men's knives with end blade slot, and scrapers as well as handles for ulus show that artefacts from both male and the female spheres were repaired and recycled in the workshop. Typically, the blade slots are missing one of their sides due to damage during use or extraction of the iron blade in the activity area.

However, the dominating activities in the workshop area included processing of soap stone and meteoric iron from raw material, through pre-forms, to finalized products and discard of fragmented pieces. The analyses show that “in situ” carving of soap stone and cold hammering of meteoric iron took place around three artisans’ “seats” close to the front wall of the house to the left of the entrance passage (as seen from outside). Some of the heavy chunks of worked soapstone ended up in toss zones in the periphery of the concentrations of dust and small flakes. The distribution of ivory debris – mainly shavings and cut pieces of walrus tusk from female and young animals – indicated that processing of organic materials was spatially organized a little different from the working of soap stone and iron. Importantly, the analyses of soap stone and ivory waste and products have indicated training of apprentices was connected with life at the *qassi*.

There are no indications of primary butchering of game in front of the *qassi*. Rather, the hunters/artisans and their apprentices consumed prepared food in the area, as indicated by the quite even distribution of remains from small seals and birds as well as the state of disarticulation and fragmentation of the bones.

Based on the evaluation of a number of AMS-dates of artifacts of terrestrial materials from the activity area it is concluded that the main activities in the workshop took place during the 14th century AD. However, a single date on a caribou antler indicates that the establishment of the workshop and thus the use of the *qassi* might have begun as early as the 13th century AD.

6. Cultural historical perspectives of the investigations at Nuulliit

The investigation of the workshop area at the *qassi* included, as mentioned above, as series of new radio-carbon dates on terrestrial materials. In concert with other high quality recent dates of the Ruin Island Phase at the edge of Pikiarsorsuaq (the North Water) they provide new opportunities for putting the Nuulliit site and the Ruin Island Phase into a wider cultural historical context.

The architecture and artefact assemblages at Nuulliit fit well into a picture of an intensified 14th century Ruin Island phase occupation of the wider Pikiarlarsorsuaq area (Fig. 24, Table 9). Among the diagnostics are the presence of Ruin Island-style, Cape Kent-style, and Clover-leaf shaped dwelling structures, and in four cases the presence of a *qassi* (i.e. at Skrælling Island, Ruin Ø, Nuulliit, and Uummanaq). Five sites (Skrælling Island, Sverdrup Site, Ruin Ø, Nuulliit, and Uummanaq) also show direct evidence of hunting of baleen whales documented by the presence of true whaling harpoons heads (the very large Thule type 4) and/or large skull-fragments found at the sites (Fig. 25).

With the exception of Cape Kent, all of the dated sites contain one or more objects of Norse origin. Two pieces of woollen cloth were found in House 15 on the Skrælling Island site and in House 6 on Avoortunngiaq's Island (Ruin Ø) respectively (Appelt 2003; Hayeur-Smith et al. 2019; McCullough 1989) (Fig. 26). The recent dates of these place the likely production between 1270-1300 calCE. The use of the two dated structures are likely synchronous. Likewise, one or more rings of an iron chain-mail (probably belonging to the same chain-mail), were found in Houses 2, 6, and 10 on Skrælling Island, in House 4 on Avoortunngiaq's Island, House 18 on Cape Grinnell, and in House 11 on Tugtulissuaq as well as in the workshop area of the *qassi* at Nuulliit. In accordance with Schledermann (1980; 1996), we suggest that the majority of these and other Norse objects, typically parts of iron rivets, found in this part of the High Arctic are the result of a single event: the wreckage of a Norse ship in the polynia area. In parallel to shipwrecks from later European expeditions (e.g. Sutherland 1985) the Norse wreck became a source of exotic raw materials and objects (textiles, iron, copper, oak-wood etc.).

Outside the Pikiarlarsorsuaq area, only one Norse site in all of the North Atlantic have produced chain-mail rings, i.e. the Nipaatsok farm, situated in the inner-most part of the Nuuk-area (Andreasen 1982). At the same farm a Norse arrow-point made of meteoric iron from the Innaanganeq/Cape York meteorite (Appelt et al. 2015; Jensen et al. 2015) was found (Andreasen 1982: fig 13, centre). The use of the Nipaatsok farm span the period from 11th to the late 14th century (*ibid*: 187), while the chain-mail rings, the arrow point, and a small silver coat-of-arms all

were found in the layers deposited in the second half of the 14th century (pers. comm. Claus Andreasen and Jette Arneborg 2016). Given the very particular combination of chain-mail and meteoric iron at Nipaatsiq, the authors suggest that the finds relate to the same historical events that took place during a Norse expedition to the Pikiarlarsorsuaq-area sometime during the 14th century.

As mentioned above, one of the radiocarbon-dates (AAR 24770) from the workshop-area of the *qassi* predates the main 14th century use of the structure by about 80 to 130 years. It could be dismissed as an “anomaly” (see also Friesen 2020; Friesen and Arnold 2008; McGhee 2000), but the authors hesitate to do so, as it corresponds with other “screened” radiocarbon-dates, including those from House 4 at Cape Kent, the Inuit arrow-point from the late Dorset House 4 at Qeqertaaraq, House 16 at Uummanaq, Ruin Ø Houses 4 and 6, as well as Skrælling Island Houses 15, 22 and 25 (Fig. 24). Moreover, two early radiocarbon dates from House 29 at Nuulliit were obtained during a previous project (KIA 16936 and KIA 16941) (Appelt 2003).

These dates indicate that the first Inuit use of the Pikiarlarsorsuaq-area should be dated to the late 12th century or earliest 13th century. The later events in the second part of the 13th century correspond well to the widely accepted understanding of the remarkably fast settling of the eastern Arctic (e.g. McCullough 1989).

Based on the admittedly limited number of early dates, we propose a model consisting of three chronological and demographical phases covering the initial Inuit peopling of the Pikiarlarsorsuaq-area by groups coming from the west: 1) an **explorative phase** that accounts for the sporadic archaeological evidence from the late 12th/earliest 13th century, 2) a **pioneer phase** that account for the 13th century finds, and 3) a 14th century **settling phase**, i.e. the Ruin Island-phase in Pikiarlarsorsuaq, characterized by large cold-season settlements with *qassit*, intensified hunting of baleen-whale and herds of walrus as well as a complex long-distance trade-network in meteoric iron (Appelt et al. 2015). This model is intended to form a guideline for future research in the area

concerning selection of sites and for new typological/chronological analyses of the earliest Thule culture artefact assemblages across the Eastern Arctic.

Dates from the inland of the Sisimiut area (Grønnow et al. 1983; Jensen et al. 2022) indicate that the initial Inuit settlement in West Greenland took place in direct prolongation of the "pioneer phase" at "The Gateway to Greenland" in the Pikiarlarsorsuaq area. The migrating societies moved south remarkably fast already during this mid- or late 13th century phase. A large founder-population could account for the later demographic developments in West Greenland, where European whalers in the 17th century encountered dense populations of Inuit living in communal houses along all the coasts. Likewise, the peopling of the entire North East Greenland by the beginning of the 15th century must have involved large numbers of people coming from or via the Pikiarlarsorsuaq area traveling by sled and umiaq around Peary Land in the north (Sørensen and Gulløv 2012). In contrast to West Greenland, recent research show that this large founder population went through a continuous decline throughout the following centuries, and North East Greenland was completely abandoned by the beginning of the 19th century (*ibid.*).

This rough outline of the Inuit peopling of Greenland needs further research. As seen, only a limited number of acceptable radiocarbon dates are available. Moreover, it is very difficult to locate what can be considered as true pioneering Inuit sites in West, South, and East Greenland based on analyses of artefact assemblages. In order to substantiate the long term demographic models, we must develop far stronger chronologies for most parts of Greenland and combine this with further general studies of small scale society demographics.

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Table 3. Raw material selection. No. of pieces from determinable steps in the work process or with work traces (Unid.).

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¹ designate MNI for all medium-sized alcids, ² designate MNI for all small seals based on ulna, ³ designate MNI based on distal canines, ⁴ designates baleen fragments.

Table 5. Bone modifications. Census of gnawing and cut marks on mammalian bones from the midden of House 30, *qassi* at Nuulliit. ¹ NISP excluding loose teeth, ² NISP excluding loose teeth, maxillary bone, calvaria and baculum, ³ NISP excluding antler.

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Figure captions

Fig. 1

The geographical position of the Nuulliit Site at the outer Wolstenholme Fjord, Avanersuaq, Greenland.

Fig. 2

Drone photo from north-west of the spit with Nuulliit site. The ruins excavated by Holtved in 1947 are clearly seen as pits on the site surface. (Photo by Mikkel Myrup).

Fig. 3a

Holtved packing and recording finds at the end of the excavation in 1947. From Holtved's photo album, on file at The National Museum of Denmark.

Fig. 3b

Holtved's Inughuit collaborators at the Nuulliit site. Uivsâkavsak (Uisaakassak, in modern orthography), Birgitte, and their daughter Kâvsaluk (Kassaaluk) at the excavations sometime during between June 24th and July 24th, 1947. The pipe smoking person to the right is either Maigssânguaq (Maassannguaq) or Miteq. The site was shown to Holtved by "[Uivsâkavsak] *whose land it was on*" (Holtved 1954: 7). Photo by Holtved, 1947.

Fig. 4

The central part of the site, called "New Nuulliit", showing the position of House 30 and the excavation area in front of the feature. (Survey and map by Mikkel Myrup).

Fig. 5

A view from north-east showing the dwelling room with the large flag stone roof support in the foreground and the entrance passage leading out from the front wall. Excavations of the work shop area in front of the dwelling are in the process. (Photo by Bjarne Grønnow).

Fig. 6

Spatial distribution of soap stone pieces by numbers. (Distribution maps by Martin Appelt and Asta Mønsted).

Fig. 7

Spatial distribution of soapstone pieces shown by numbers (color scale) and with the average weight of the pieces (gram) calculated for each $\frac{1}{4}$ m². The contrast between areas with few but very heavy pieces of soap stone debris (light color, large average weight) and areas with high amounts of tiny pieces (dark/black, low average weight) is clearly seen.

Fig. 8

The spatial distribution (by numbers) of charred shards of soap stone containers.

Fig. 9

Soap stone objects probably made by apprentices. A and B: preforms for miniature lamps. C: Piece showing irregular chopping and cutting marks from more or less random directions.

Fig. 10

Examples of iron objects found in the work shop area. A: Norse chainmail ring. B: Head of Norse ship rive. C and D: meteoric iron projectile points, probably harpoon end blades. E: meteoric iron scraper blade with preserved wooden handle.

Fig. 11

Spatial distribution of iron pieces (artefacts and flakes) by numbers.

Fig. 12

Fragmented hunting tools from the work shop area. a-e: harpoon heads; f-h: arrow heads; i-j: socket pieces, k-l: foreshafts. Walrus ivory: a, b, d, e, f, g, j, k. Caribou antler: c, h. Narwhal tusk: i, l. (Illustration by Claire Houmard).

Fig. 13

Hand tools from the workshop area. a-e: adze heads; f: wedge. All made from whale bone. (Analyses and illustrations by Claire Houmard).

Fig. 14

Hand tools from the work shop area. a-c: knife handles, d: snow knife. All made from whale bone.

Fig. 15

The spatial distribution of walrus tusk ivory waste flakes by numbers.

Fig. 16

The spatial distribution of narwhal tusk waste flakes by numbers.

Fig. 17a

Walrus tusk ivory utilization. Age and sex determinations of the pieces are shown by colors. (Data from Table 2).

Fig. 17b

Raw material selections as shown by analyses of the different steps in the production process: waste from manufacturing and repairing tools, blanks, preforms, and end products. (Data from Table 3).

Fig. 17c

Raw material selections. All end products. (Data from Table 3).

Fig. 18

A bear figurine (left) and a base fragment of a harpoon head (right), both of walrus ivory, showing design and work traces (marked with arrows), that probably reflect apprentices' activities.

Fig. 19

Seal %MAU Bone density. Small seal skeletal part frequencies as expressed by %MAU from the midden of House 30, *qassi* at Nuulliit (NUU) compared to the relative bone density of the various skeletal element portions (see Lyman 1994). Data from Table 8.

Fig. 20

Seal %MAU FUI. Small seal skeletal part frequencies as expressed by %MAU from the midden of House 30, *qassi* at Nuulliit (NUU) compared to the relative amount of meat and blubber per phocid skeletal element or Food Utility Index (Lyman et al. 1992). Data from Table 7.

Fig. 21

Seal %MAU and preference ranking. Small seal skeletal part frequencies as expressed by %MAU compared to the Iñupiat preference ranking after (Diab 1998). The dark blue: >75%; medium blue >50%; light blue >25%, white <25%.

Fig. 22

Distribution of all small phocid bones (n=956) from the excavated squares from the midden of House 30, *qassi* at Nuulliit.

Fig. 23

AMS dates from Nuulliit (House 30midden and House 29). Radiocarbon dates are calibrated using The Calib (version 8.1.0) (CALIB; <http://calib.org>, accessed October 24th 2022).

Fig. 24

AMS dates from Early Inuit sites around Pikiarlarsorsuaq (North Water). Radiocarbon dates are calibrated using The Calib (version 8.1.0) (CALIB; <http://calib.org>, accessed October 24th 2022).

Fig. 25

Inuit sites with harpoon heads for hunting large whales, early Thule type. (Map by Martin Appelt).

Fig. 26

Norse artefacts on Pre-Inuit and Inuit (Thule culture) sites around Pikiarlarsorsuaq (North Water). (Map by Martin Appelt).

Table 1. Artefacts excavated by Holtved in 1947 inside House 30, and during the NOW-project's 2015 excavation in front of House 30, Nuulliit.

Object	Excavation 1947	Excavation 2015
Harpoon head, Thule 2 type	1	13
Harpoon head, Thule 3 type	1	-
Harpoon shaft	1	-
Socket piece	1	4
Lance head/lance or harpoon foreshaft	-	10
Arrow head	1	7
Bow, fragment	-	1
Adze head	1	7
Adze handle	1	-
Ice pick	1	-
Hand pick	1	-
Sling handle	1	-
Knife/scrapper	5	7
Snow knife	1	6
Hand drill	1	-
Hammer stone	1	-
Flint flaker	1	-
Drag line handle, wood	1	-
Gull hook	2	-
Sledge runner	1	-
Sledge shoe	2	3
Shackle buckle	-	3
Marline spike, pointed	1	-
Nail	1	4
Lamp, soapstone	1	1
Lamp trimmer	3	1
Cooking pot, soapstone (fragments from used pots)	7	18
Chips from soap stone processing	-	5241
Toy lamp	1	2
Fragment of seal skin thong	1	-

Gambling piece	1	-
Bear figure	1	3
Iron (raw material, artefacts and flakes)	1	281
Chopping block, whale bone	1	2
Unidentifiable artefacts of worked bone	13	4
Unidentifiable artefacts of worked ivory	-	9
Ivory chips	-	2217
Unidentifiable artefacts of worked wood	5	1
Unidentifiable artefacts of worked baleen	2	-
Unidentifiable artefacts of worked antler	-	4
TOTAL	64	391 (excl. soap stone and ivory waste)

Table 2. Walrus tusk utilization. No. of pieces with identifiable age/sex and traces of processing.

	Female	Male	Unid.
Adult	14	3	9
Young		1	17
Young/female			20

Table 3. Raw material selection. No. of pieces from determinable steps in the work process or with work traces (Unid.).

	Walrus		Whale		Caribou	Sea mammal
	IVORY	BONE	TOOTH	BONE	ANTLER	BONE
<u>Manufacturing waste</u>	461	22	126	53	7	93
<u>Repairing waste</u>	17		1	10		
<u>Blanks</u>				1		
<u>Preforms</u>	2					
<u>End products</u>	37		6	24	8	4
<u>Unid.</u>	41		22	39	9	29

Table 4. Taxon

Taxonomic frequencies of taxa from the midden of House 30, *qassi* at Nuulliit. The total identified mammal NISP (Number of Identified SPecimens) are excluding narwhal and walrus tusk debitage, whalebone blanks and debitage, and small dense fragments of large marine mammals likely comprising of walrus cranial and baculum fragments or whalebone (shown in separate column). Further, baleen fragments of presumably bowhead whale were not included in the total identified mammal NISP counts.

¹ designate MNI for all medium-sized alcids, ² designate MNI for all small seals based on ulna, ³ designate MNI based on distal canines, ⁴ designates baleen fragments.

TAXON	NISP	NISP	%NISP	MNI
AVES				
Northern fulmar (<i>Fulmarus glacialis</i>)	47		21.6	13
Eider ducks (<i>Somateria</i> sp.)	31		14.2	4
Gulls (<i>Larus</i> sp.)	3		1.4	1
Little auk (<i>Alle alle</i>)	25		11.5	5
Brünnich's guillemot (<i>Uria lomvia</i>) ¹	56		25.7	10
Guillemot/Razorbill (<i>Uria</i> sp./ <i>Alca torda</i>)	55		25.2	-
Common raven (<i>Corvus corax</i>)	1		0.5	1
Birds specified	218		100	
Birds unsp.	125			
Total birds	343			
MAMMALIA				
Arctic hare (<i>Lepus arcticus</i>)	2		0.1	1
Dog (<i>Canis familiaris</i>)	22		1.6	2
Arctic fox (<i>Alopex lagopus</i>)	25		1.8	2
Polar bear (<i>Ursus maritimus</i>)	34		2.5	3
Ringed seal (<i>Phoca hispida</i>) ²	128		9.3	26
Small seals (<i>Phoca</i> sp.)	828		60.5	-
Bearded seal (<i>Erignathus barbatus</i>)	23		1.7	3
Walrus (<i>Odobenus rosmarus</i>) ³	287		21.0	9
Walrus (<i>Odobenus rosmarus</i>)		2217		
Caribou (<i>Rangifer tarandus</i>)	20		1.5	1
Narwhal (<i>Monodon monoceros</i>)		531		
Bowhead (<i>Balaena mysticetus</i>) ⁴		332		
Large whales (Cetacea)		1219		
Large marine mammal		790		
Mammals specified	1369		100	
Mammals unsp.	4208			
Total mammals	5577			

Table 5. Bone modifications.

Census of gnawing and cut marks on mammalian bones from the midden of House 30, *qassi* at Nuullit. ¹ NISP excluding loose teeth, ² NISP excluding loose teeth, maxillary bone, calvaria and baculum, ³ NISP excluding antler.

	Cut marks	% cut marks	Gnaw marks	% gnaw marks	NISP _{total}
Arctic fox ¹	1	4.3%			23
Dog ¹	1	4.8%	4	19.1%	21
Polar bear ¹	4	16.7%	1	4.2%	24
pocid ¹	17	1.8%	74	7.7%	955
Bearded seal	2	8.7%	3	13.4%	23
Walrus ²	3	4.10%	12	16.40%	73
Walrus ¹	29	12.4%	13	5.6%	233
Carribou ³	1	100			1
Total	29	2.2%	94	7.0%	1340

Table 6. Skeletal elements, Aves.

The skeletal elements as distributed by avian species from the midden of House 30, *qassi* at Nuullit.

Bone element	Fulmar	Eider	Gull	Little auk	Brünnich's Guillemot	Raven	Total
mandibula	1				5		6
calvarium					2		2
maxillare					2		2
vertebra							
sternum	1	1			6		8
costa					2		2
furcula		1		1	8		10
coracoid	2	6		1	16		25
scapula		2		2	4		8
humerus	26	8	3	5	11		53
radius	1	2			7		10
ulna	3	3		6	4	1	17
carpus							
carpometacarpus	1	1		1			3
phalanx ant.	4						4
pelvis							
femur	1	1		3	16		21
tibiotarsus	6	5		6	23		40
fibula	1				1		2
tarsometatarsus		1			3		4
phalanx post.							
diaphysis unsp.					1		1
Total	47	31	3	25	111	1	218

Table 7. Seal skeletal profiles.

Small seal distribution by skeletal element from the midden of House 30, *qassi* at Nuullit. Definitions for MNE (Minimum Number of Elements) and MAU (Minimum Animal Unit) follow Lyman 1994. FUI (Food Utility Index) is after Lyman et al. (1992) and Iñupiat preference ranking is after Diab (1998). Numbers in brackets designates the number of that particular skeletal element in a seal skeleton. The Preference ranking values designate ¹ cranium, ² radius/ulna, ³ front flipper, ⁴ tibia/fibula and ⁵ hind flipper.

Skeletal element	NISP	MNE	MAU	%MAU	FUI	Preference ranking
mandibula (2)	4	4	2	7.8	27.4 ¹	11 ¹
calvarium (1)	10	1	1	3.9		
maxillare (2)	1	1	0.5	2.0		
dens	1					
atlas (1)	3	3	3	11.8	35.8	9
axis (1)	1	1	1	3.9		
v. cervicalis (5)	12	10	2	7.8		
v. thoracica (15)	10	6	0.4	1.6	24.9	
v. lumbalis (5)	6	2	0.4	1.6	32.9	8
v. caudalis (11)	10	9	0,8	3.1		
vertebrae	8					
sternum (8)	15	4	4	15.7	2.7	
sacrum (1)	2	2	2	7.8		
costa (30)	153	77	2.6	10.2	100	7
cartilago costalis	43					
os penis (1)	2	2	2	7.8		
scapula (2)	35	10	5	19.6	19.8	6
humerus (2)	45	25	12.5	49.0	10.7	5
radius (2)	57	39	19.5	76.5	4.8 ²	4 ²
ulna (2)	63	51	25.5	100.0		
carpus (14)	20	20	1.4	5.5		
metacarpal (10)	13	11	1.1	4.3		
phalanx m (28)	30	30	1.1	4.3	2.3 ³	
pelvis (2)	25	10	5	19.6	44.5	3
femur (2)	51	27	13.5	52.9	4.5	2
patella (2)	10	10	5	19.6		

tibia (2)	87	28	14	54.9	16.5 ⁴	1 ⁴
fibula (2)	101	40	20	78.4		
astragalus (2)	11	11	5.5	21.6		
calcaneus (2)	6	6	3	11.8		
tarsus (10)	30	30	3	11.8		
metatarsal (10)	28	24	2.4	9.4		
sesamoides	3					
metapodial	3					
phalanx p (28)	53	48	1.7	6.7	7.7 ⁵	
phalanx usp	5					
Total	957	542				

Table 8. Seal MAU density.

Small seal skeletal part values of MAU (Minimum Animal Unit) for Nuulliit compared to the relative bone density per skeletal element portion or Density Index after Lyman (1994).

Small seal element	Bone density	Nuulliit, House 30 MAU	Nuulliit, House 30 %MAU
mandibula	0.84	2.0	11.11
atlas	0.54	3.0	16.67
axis	0.56	1.0	5.65
v. cervicalis	0.35	2.0	11.11
v. thoracica	0.34	0.4	2.22
v. lumbalis	0.38	0.4	2.22
sacrum	0.43	2.0	11.11
costa	0.4	2.3	12.78
scapula	0.43	5.0	27.78
humerus, prox.	0.43	10.5	58.33
humerus, dist.	0.6	12.0	66.67
radius, prox.	0.63	16.5	91.67
radius, dist.	0.45	15.0	83.33
ulna, prox.	0.44	18.0	100
ulna, dist.	0.79	18.0	100
pelvis	0.47	5.0	27.78
femur, prox.	0.5	10.5	58.33
femur, dist.	0.57	11.5	63.98
tibia, prox.	0.39	10.0	55.56
tibia, dist.	0.48	7.5	41.67
astragalus	0.45	5.5	30.56
calcaneus	0.45	3.0	16.67

Table 9. Radio carbon dates of Early Inuit sites in Pikiarsorsuaq (North Water area), Melville Bay, Washington Land, and Ellesmere Island.

Number	Site name	Feature	Lab #	Material	$\Delta^{13}\text{C}$	^{14}C -age BP	CEcal 1 st. div.	Reference
B1	Kap Kent	4	KIA 16942	Musk-ox horn		892 \pm 36	1051-1217	Appelt 2003
C1	Qeqertaaraq**	4	KIA 17937	Caribou antler		891 \pm 29	1054-1215	Appelt 2003
A2	Nuullit	29	KIA 16936	Musk-ox horn		884 \pm 25	1160-1215	Appelt 2003
A3	Nuullit	30m	AAR 24770	Caribou antler	-16.47	870 \pm 27	1168-1216	Present article
D1	Uummanaq	16	MUSE 19125	Antler		835 \pm 30	1179-1260	Present article
E1	Skrælling Island	22	GSC 3003	Heather	-27.80	830 \pm 60	1168-1268	McCullough 1989; CARD 2019
C2	Qeqertaaraq***	4	AAR 3219	Arctic hare bone	-21.70	770 \pm 40	1228-1278	Appelt & Gulløv 1999
F1	Eskimobyen	25	GSC 3396	Heather	-26.90	760 \pm 70	1212-1377	McCullough 1989; CARD 2019
G1	Ruin Ø	6	MUSE 19124	Wool		735 \pm 30	1265-1291	Present article
H1	Glacier Bay	F30-2	AA88111	Caribou/muskox bone		726 \pm 44	1234-1378	LeMoine & Darwent 2010
A4	Nuullit	29	KIA 16941	Musk-ox horn		724 \pm 20	1273-1287	Appelt 2003
E2	Skrælling Island	15	Beta 464733	Wool	-22.10	720 \pm 30	1271-1296	Hayeur-Smith et al. 2019
G2	Ruin Ø	4	MUSE 19123	Musk-ox horn		715 \pm 30	1271-1298	Present article
J1	Cape Grinnell	20	AA 85150	Caribou bone	-19.80	714 \pm 59	1232-1387	LeMoine & Darwent 2010
E3	Skrælling Island	15	GSC 3038	Wool	-22.00	700 \pm 50	1270-1385	McCullough 1989; CARD 2019
K1	Qaqaitsut	F3-1	AA88107	Caribou/musk-ox bone		694 \pm 43	1286-1388	Lemoine & Darwent 2016
A5	Nuullit	30m	AAR 24769	Caribou antler	-20.12	690 \pm 32	1278-1379	Present article
G3	Ruin Ø	6	K 1489	Wool		680 \pm 100	1265-1398	Appelt 2003
K2	Qaqaitsut	F65-1	AA90329	Caribou bone		678 \pm 52	1275-1383	Lemoine & Darwent 2016
J2	Cape Grinnell	18	AA 85147	Musk-ox bone	-18.90	672 \pm 59	1279-1390	LeMoine & Darwent 2010
L1	Etah	4	BETA233264	Arctic hare		660 \pm 40	1278-1388	Lemoine & Darwent 2016
E4	Skrælling Island	21	GSC 3156	Heather	-26.80	660 \pm 60	1281-1393	McCullough 1989; CARD 2019
J3	Cape Grinnell	20	AA 85149	Caribou bone	-19.50	659 \pm 58	1281-1392	LeMoine & Darwent 2010
M1	Inuarfissuaq	10	MUSE 19119	Caribou bone		655 \pm 30	1291-1388	Present article
J4	Cape Grinnell	18	AA 85148	Caribou bone	-19.80	655 \pm 58	1283-1393	LeMoine & Darwent 2010
N1	Fossil Bugt	?	AAR 7473	Caribou antler	-19.64	652 \pm 36	1290-1389	Andreasen 2014 pers. comm.
M2	Inuarfissuaq	30	MUSE 19121	Caribou bone		650 \pm 30	1295-1388	Present article
A6	Nuullit	30m	AAR 24766	Caribou antler	-17.18	647 \pm 26	1295-1390	Present article
A7	Nuullit	30m	AAR 24767	Caribou antler	-17.36	625 \pm 31	1300-1395	Present article
O1	Sverdrup Site	6	GSC 3561	Heather	-27.00	620 \pm 50	1301-1396	McCullough 1989; CARD 2019
D2	Uummanaq	5m	AAR 24773	Caribou bone	-18.44	618 \pm 26	1303-1395	Present article

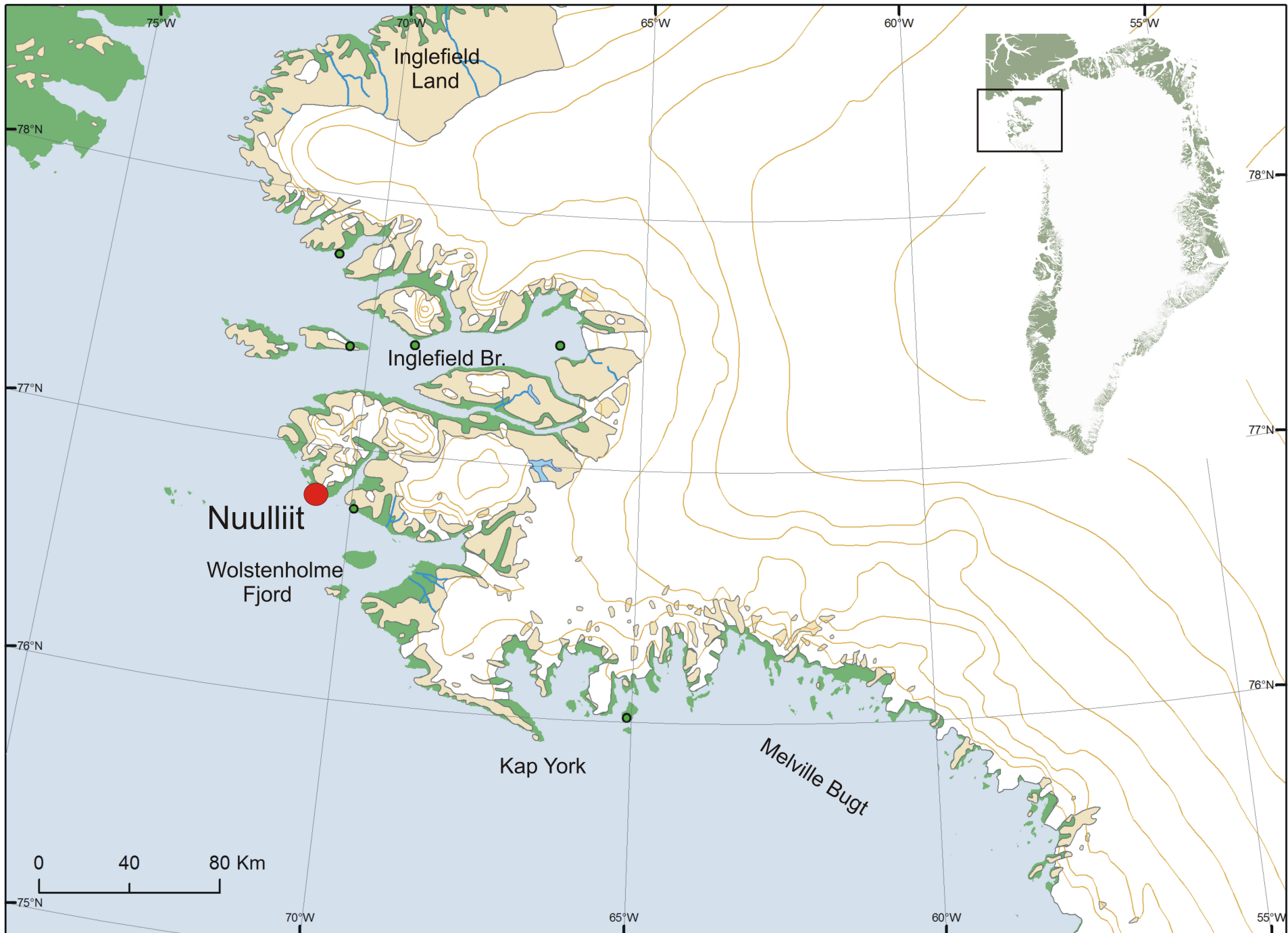
A8	Nuulliit	30m	AAR 24768	Caribou antler	-19.76	617 \pm 28	1303-1395	Present article
J5	Cape Grinnell	16	AA 83638	Caribou bone	-18.90	613 \pm 42	1304-1396	LeMoine & Darwent 2010
J6	Cape Grinnell	18	AA 85146	Caribou bone	-19.20	606 \pm 58	1304-1400	LeMoine & Darwent 2010
J7	Cape Grinnell	20	AA 85151	Caribou bone	-18.90	605 \pm 59	1304-1401	LeMoine & Darwent 2010
J8	Cape Grinnell	16	AA 83637	Caribou bone	-19.60	603 \pm 42	1306-1400	LeMoine & Darwent 2010
E5	Skrælling Island	15	GSC 3059	Heather	-26.80	580 \pm 50	1312-1410	McCullough 1989; CARD 2019
D3	Uummanaq	5m	AAR 24772	Antler	-18.46	572 \pm 26	1325-1407	Present article
C3	Qeqertaaraq	294	AAR 3223	Caribou bone	-19.80	565 \pm 65	1311-1424	Appelt & Gulløv 1999
P1	Tugtulissuaq	11	KIA 16938	Caribou antler		558 \pm 38	1325-1420	Appelt 2003
D4	Uummanaq	Comer's m	MUSE 19022	Antler		520 \pm 25	1406-1430	Present article
D5	Uummanaq	19	MUSE 19126	Antler		510 \pm 30	1409-1435	Present article
M3	Inuarfissuaq	20	MUSE 19122	Caribou antler		490 \pm 30	1417-1442	Present article
M4	Inuarfissuaq	13	MUSE 19120	Caribou bone		470 \pm 30	1424-1448	Present article
M5	Inuarfissuaq	8	AAR 7370	Caribou antler		431 \pm 38	1429-1481	Appelt 2003
D6	Uummanaq	10	KIA 16937	Caribou bone		323 \pm 17	1516-1635	Appelt 2003

¤ Calibrations are made using OxCal 4.4 (Bronk Ramsey 2009a).

* From baleen whale cranium located in the immediate vicinity of Nuulliit House 30 midden. The CEcal age have made use of a standard marine calibration of 400 years.

** The sample derived from an arrow head for caribou hunting carved in undisputable early Thule-style. The arrow head was excavated from a "closed" Dorset house context.

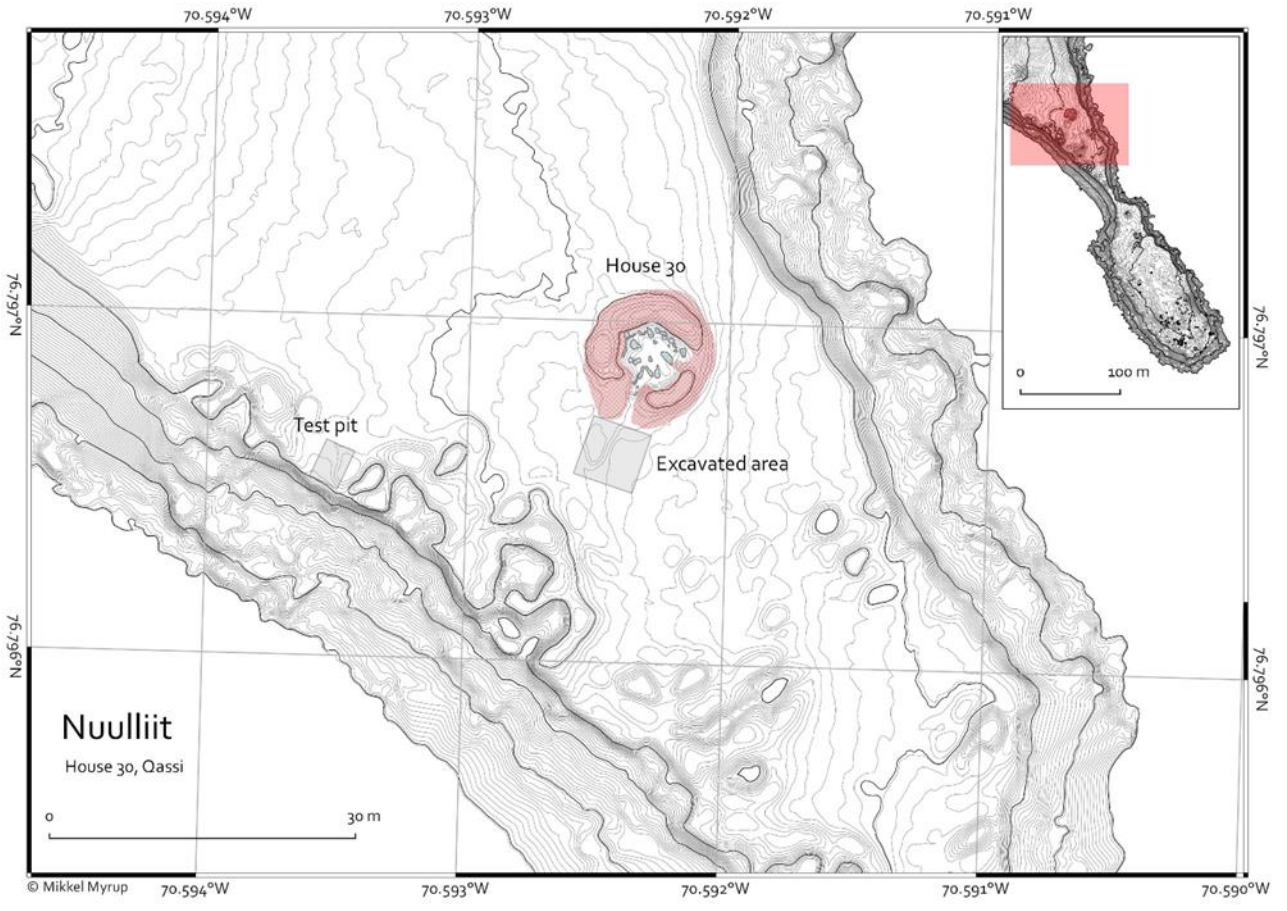
*** The hare bone sample dated is derived from a "closed" Dorset house context in close connection with a Norse bronze pot sherd.







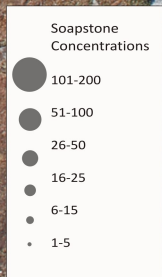
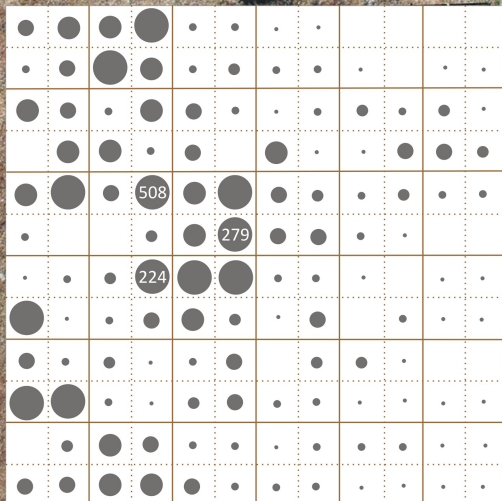






8,0/17,0

8,0/23,0



14,0/17,0

14,0/23,0

8,0/17,0

8,0/23,0

6	3	4	4	129	3	3	69					
6	5	4	1	3	2	7	5	74		7	21	
3	3	6	2	1	3			13	6	7	4	59
	5	5	10	4	2	2	9	6	8	7	5	
13	3	5	3	6	5		20	7	5	6	3	6
				21	6	3	7	3	5	3		
14		15	5	11	2	7	9	15		1	59	
5	108	21	8	3	3	9	5			23	2	5
5	5	8	11	3	7		15	10	88			
2	2	13	6	9	9	14	15	158	4	133	24	
	9	16	13	52	35	9	39	4	33	38	14	
36	6	10	10	15	15	109	17	9	7	34	5	

Soapstone: average weight per 1/4m2, upon scaled numbers

- 1-3
- 4-9
- 10-21
- 22-63
- 64-189
- 190+

14,0/17,0

14,0/23,0

8,0/17,0

8,0/23,0

		3					
					1		
		1	1				
		1				1	
				1		1	
		2	1			1	
		3	1				

14,0/17,0

14,0/23,0



1



2



3

1

2

3



4

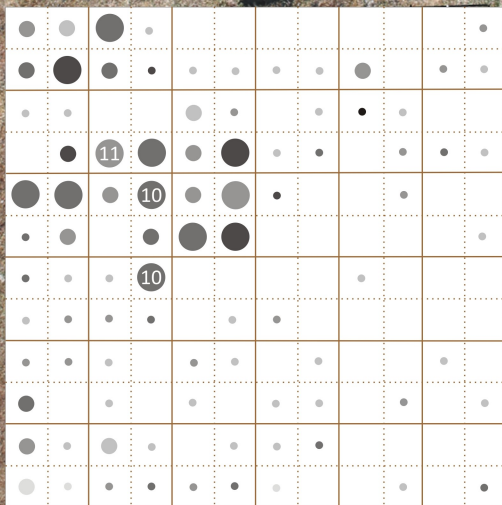


5

N

8,0/17,0

8,0/23,0



14,0/17,0

14,0/23,0



KNK2992-74



KNK2992-25



KNK2992-5



KNK2992-50



KNK2992-75



KNK2992-14



KNK2992-103



5 cm



KNK2992-29



KNK2992-58



KNK2992-66



KNK2992-96



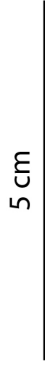
KNK2992-49



KNK2992-20



KNK2992-72



KNK2992-21



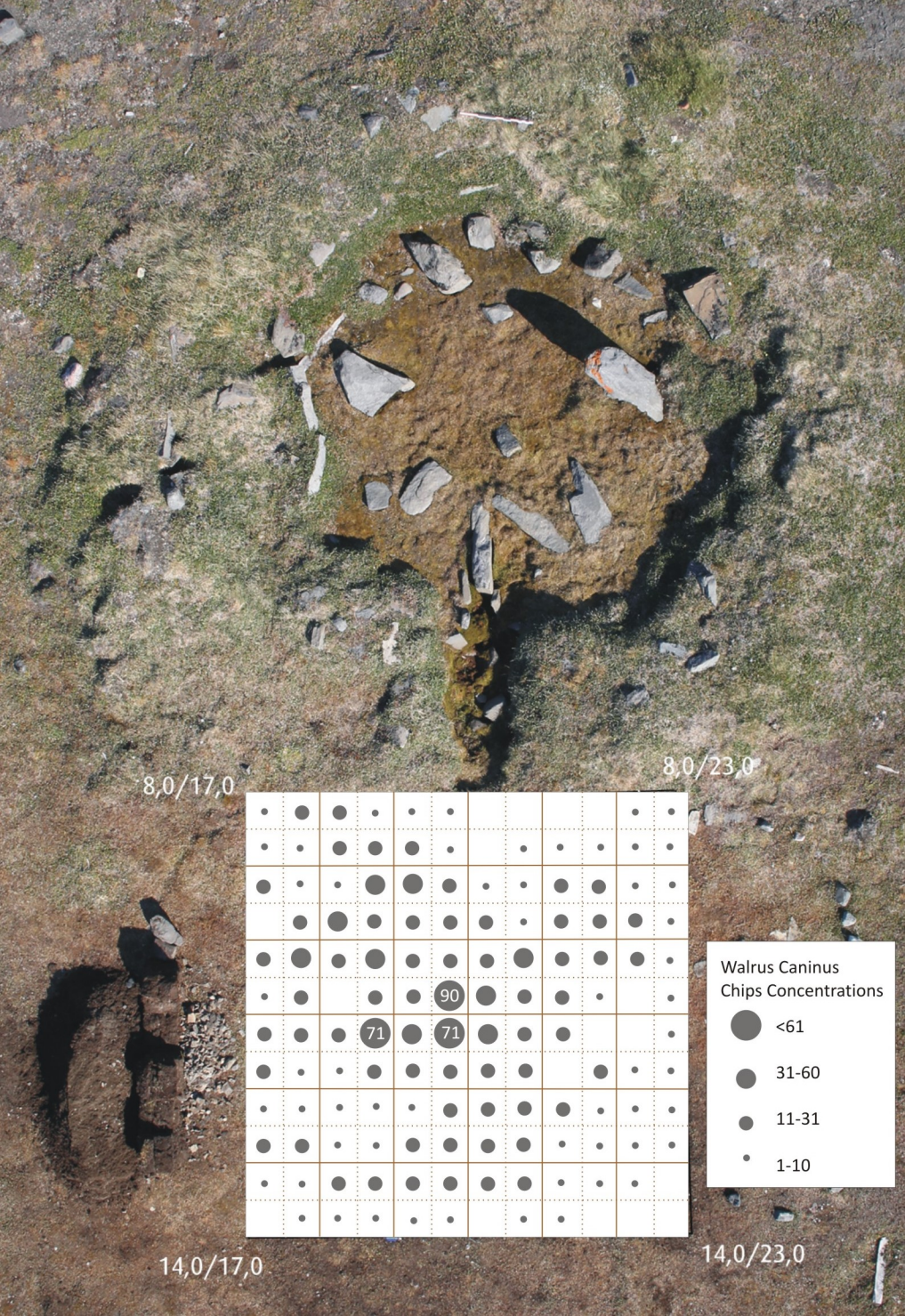
11,0x17,5 #1



KNK2992-36



KNK2992-27

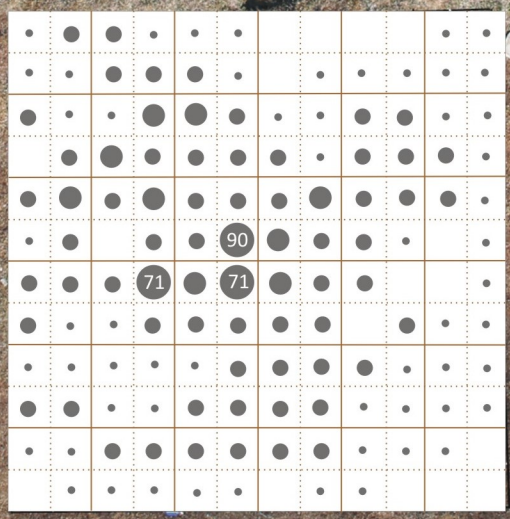


8,0/17,0

8,0/23,0

14,0/17,0

14,0/23,0

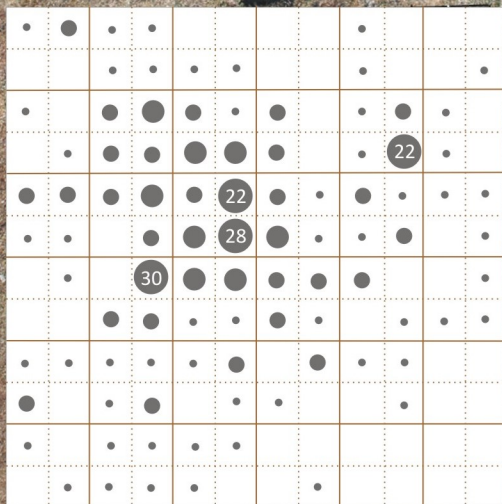


Walrus Caninus Chips Concentrations

- <61
- 31-60
- 11-31
- 1-10

8,0/17,0

8,0/23,0



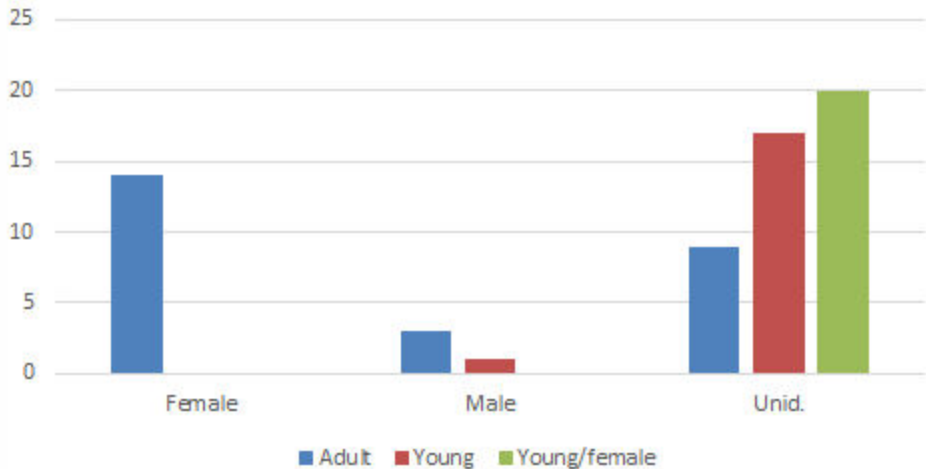
Narwhal Tusk Concentrations

- <19
- 11-18
- 5-10
- 1-4

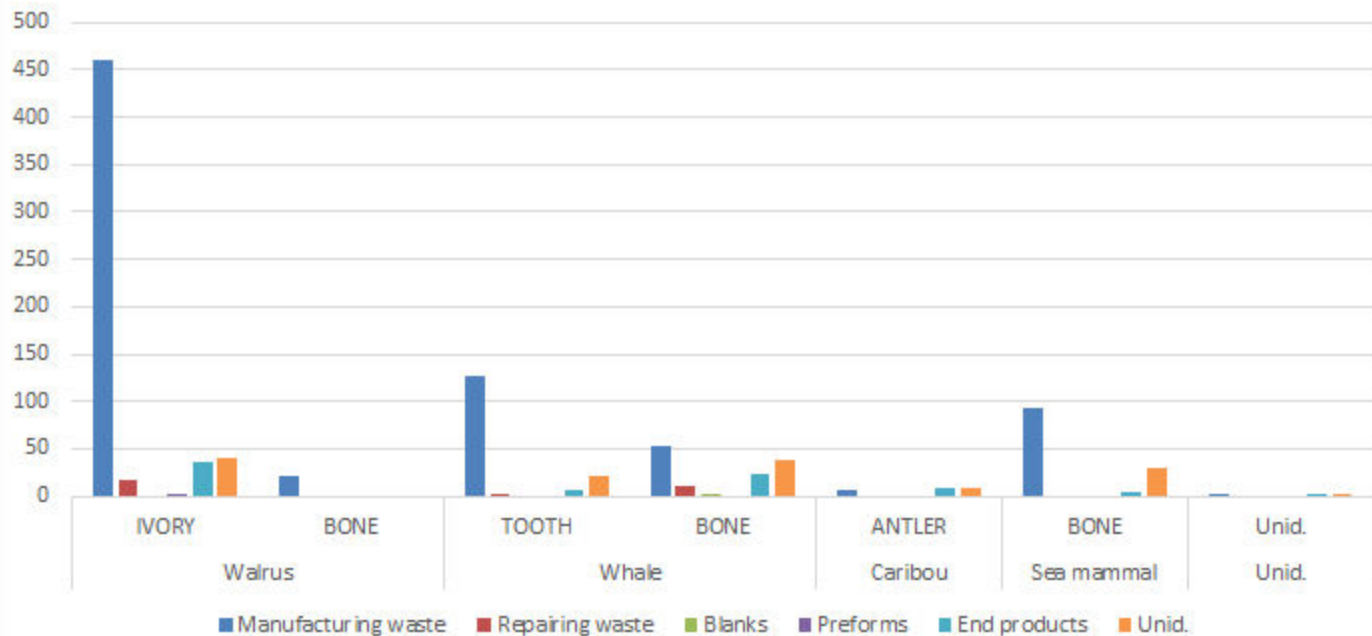
14,0/17,0

14,0/23,0

WALRUS TUSK UTILIZATION



Raw material selection



End products



■ Walrus IVORY

■ Walrus BONE

■ Whale TOOTH

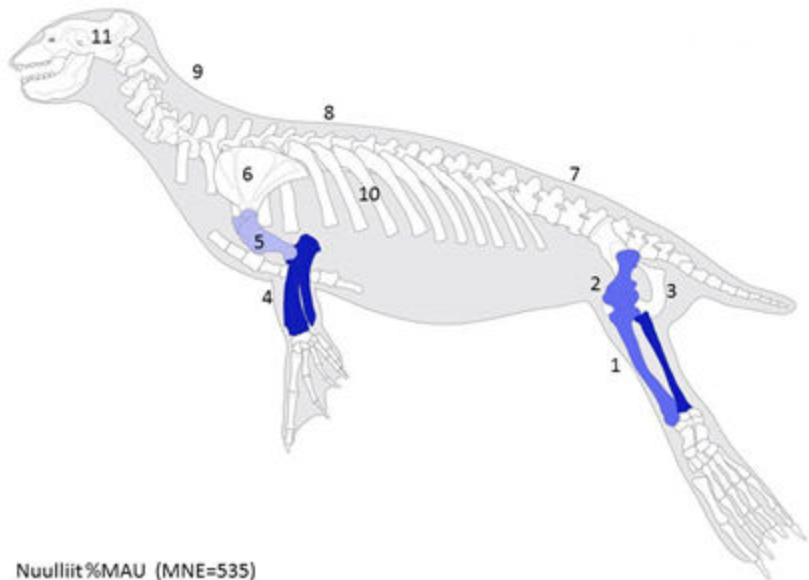
■ Whale BONE

■ Caribou ANTLER

■ Sea mammal BONE

■ Unid. Unid.





Nuullit%MAU (MNE=535)

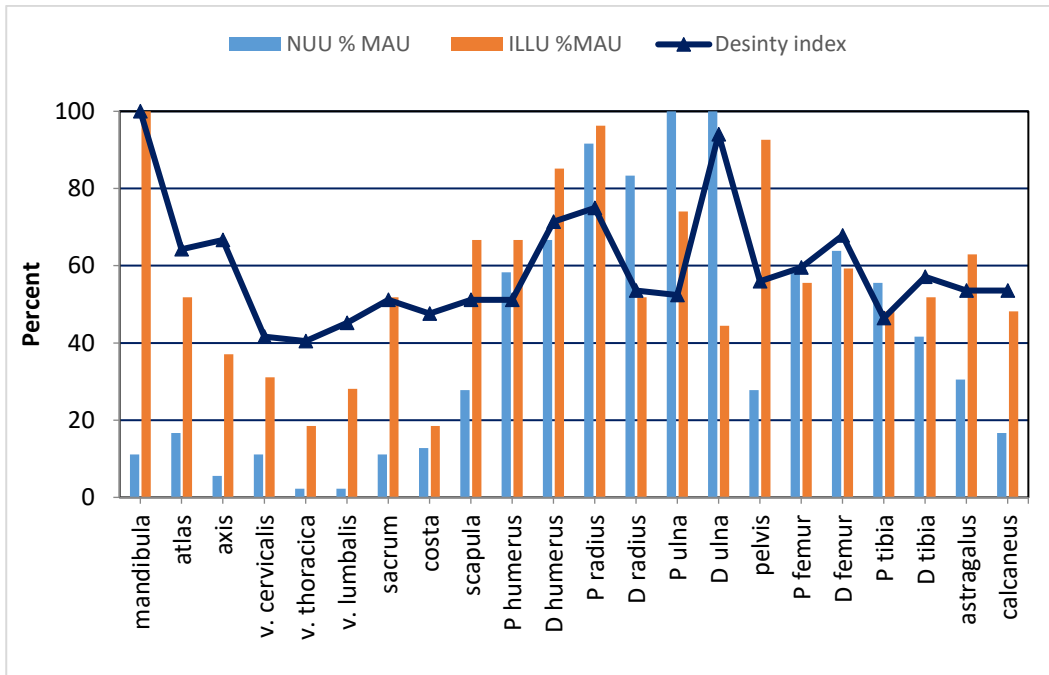


Figure 1 Seal NUU & ILLU %MAU Bone density

Figure 21

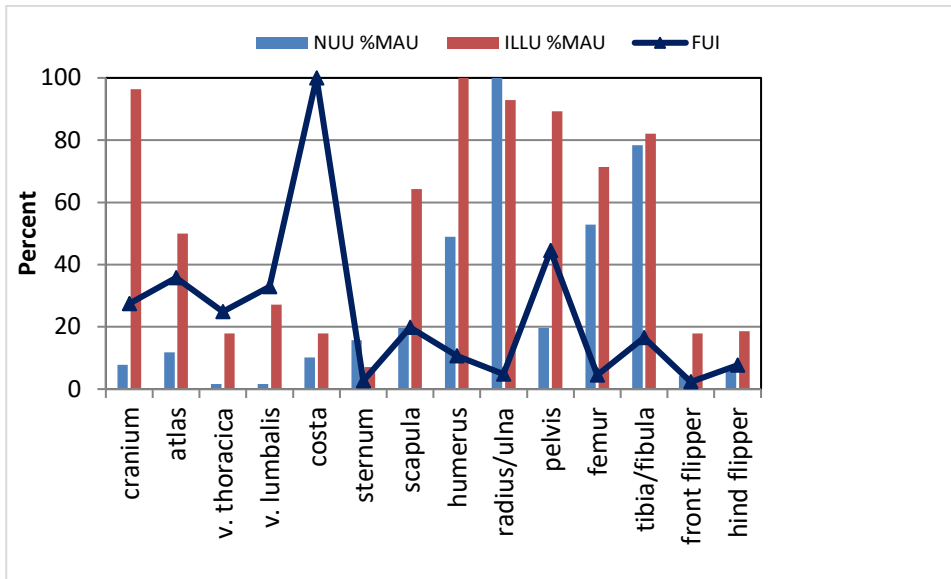
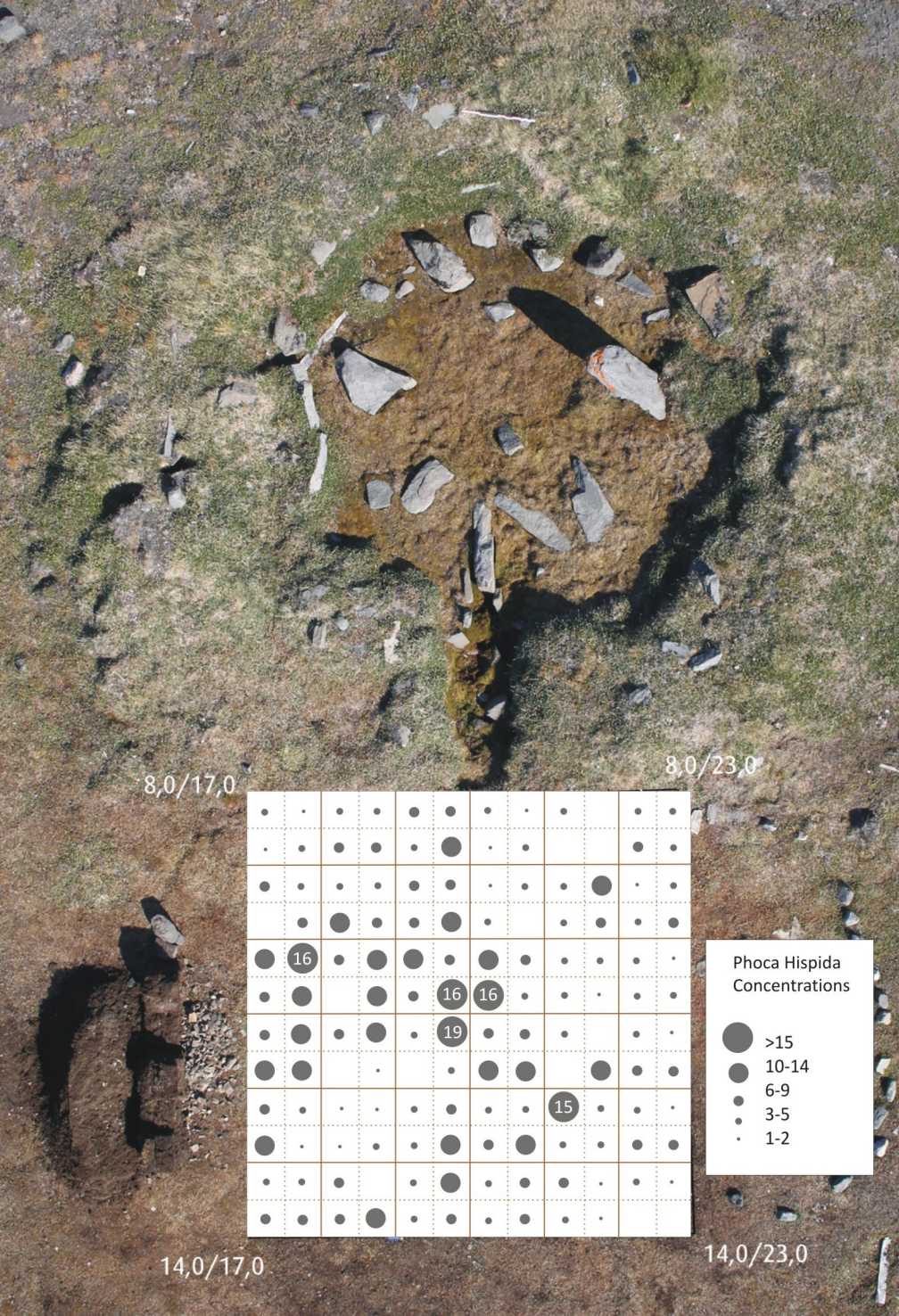


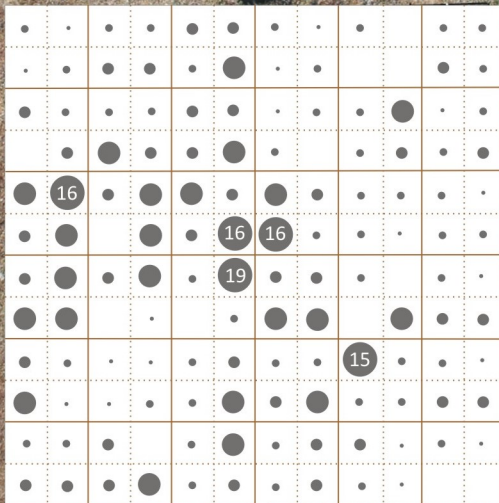
Figure 2 NUU & ILLU %MAU FUI

Fig. 22



8,0/17,0

8,0/23,0



Phoca hispida
Concentrations

- >15
- 10-14
- 6-9
- 3-5
- 1-2

14,0/17,0

14,0/23,0

House 30m - AAR24768

House 30m - AAR24767

House 30m - AAR24766

House 30m - AAR24769

House 30m - AAR24770

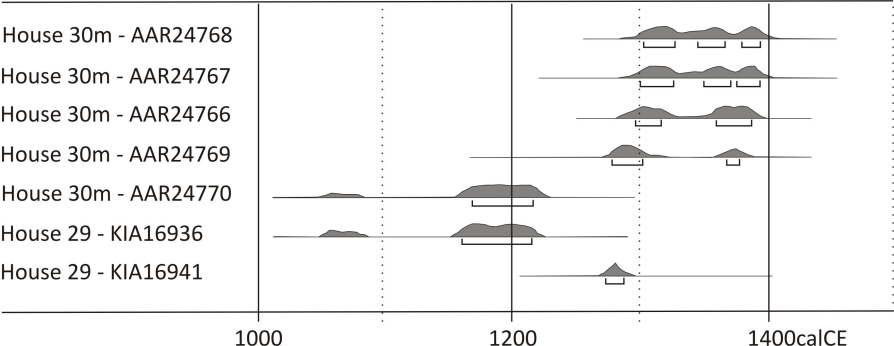
House 29 - KIA16936

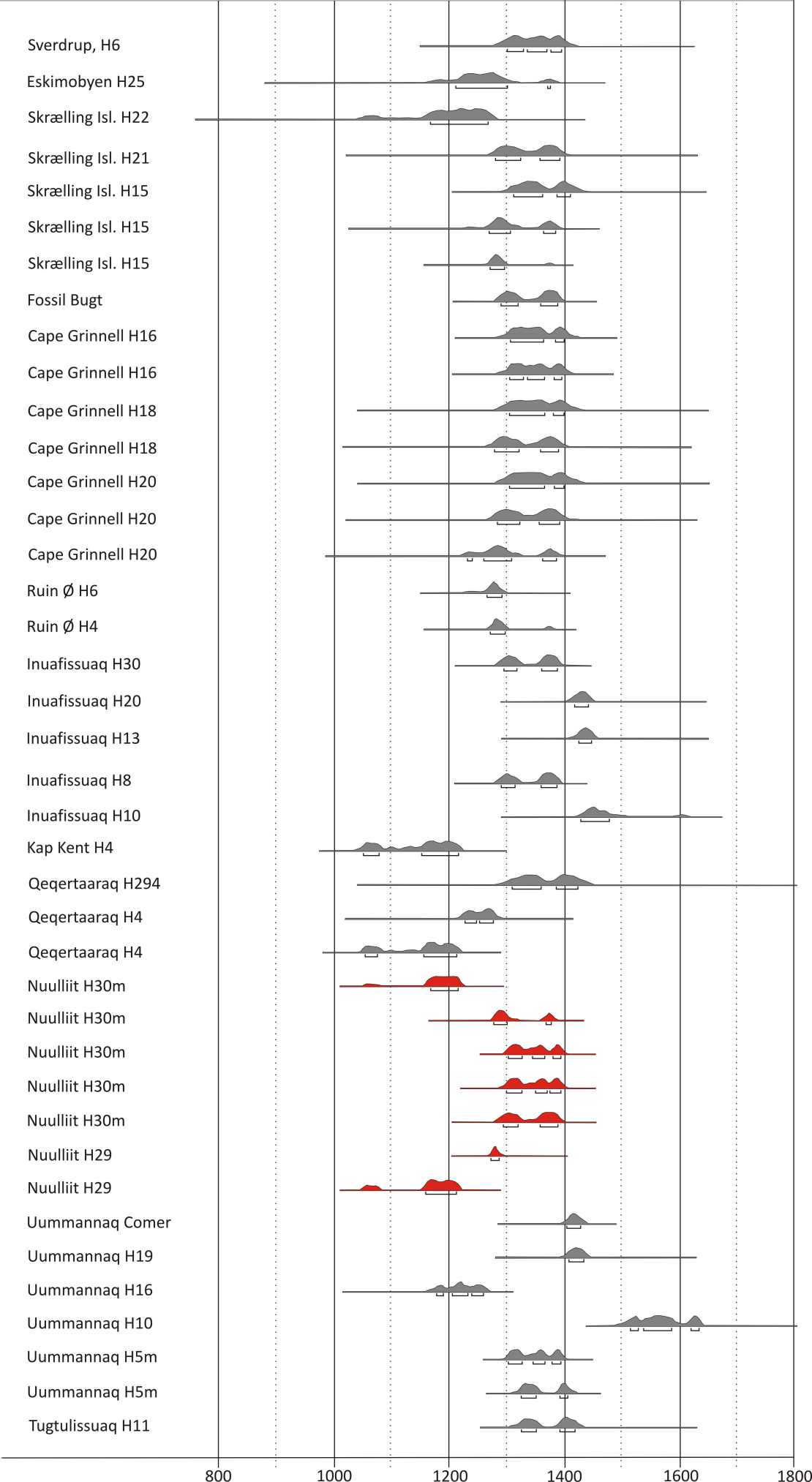
House 29 - KIA16941

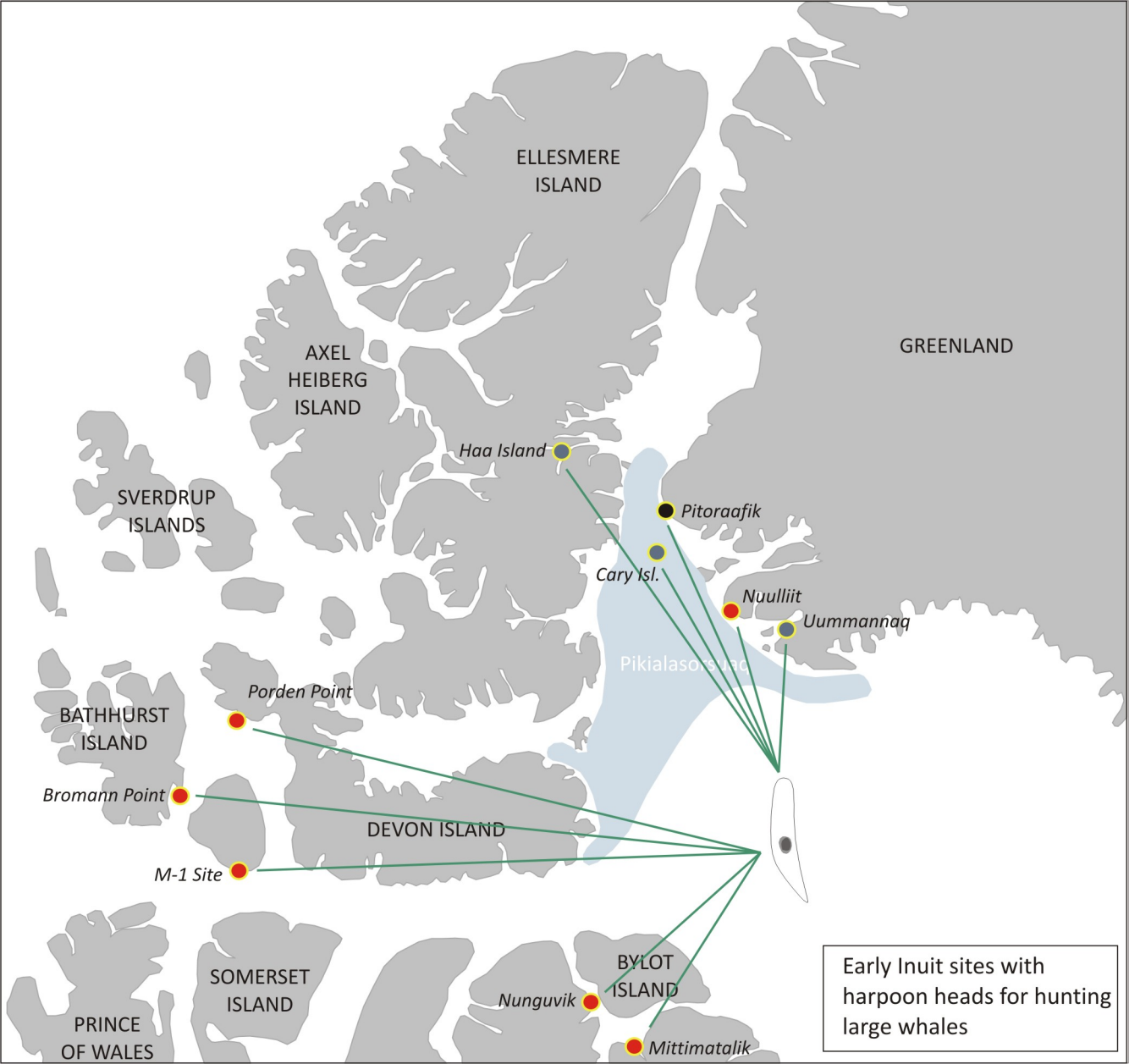
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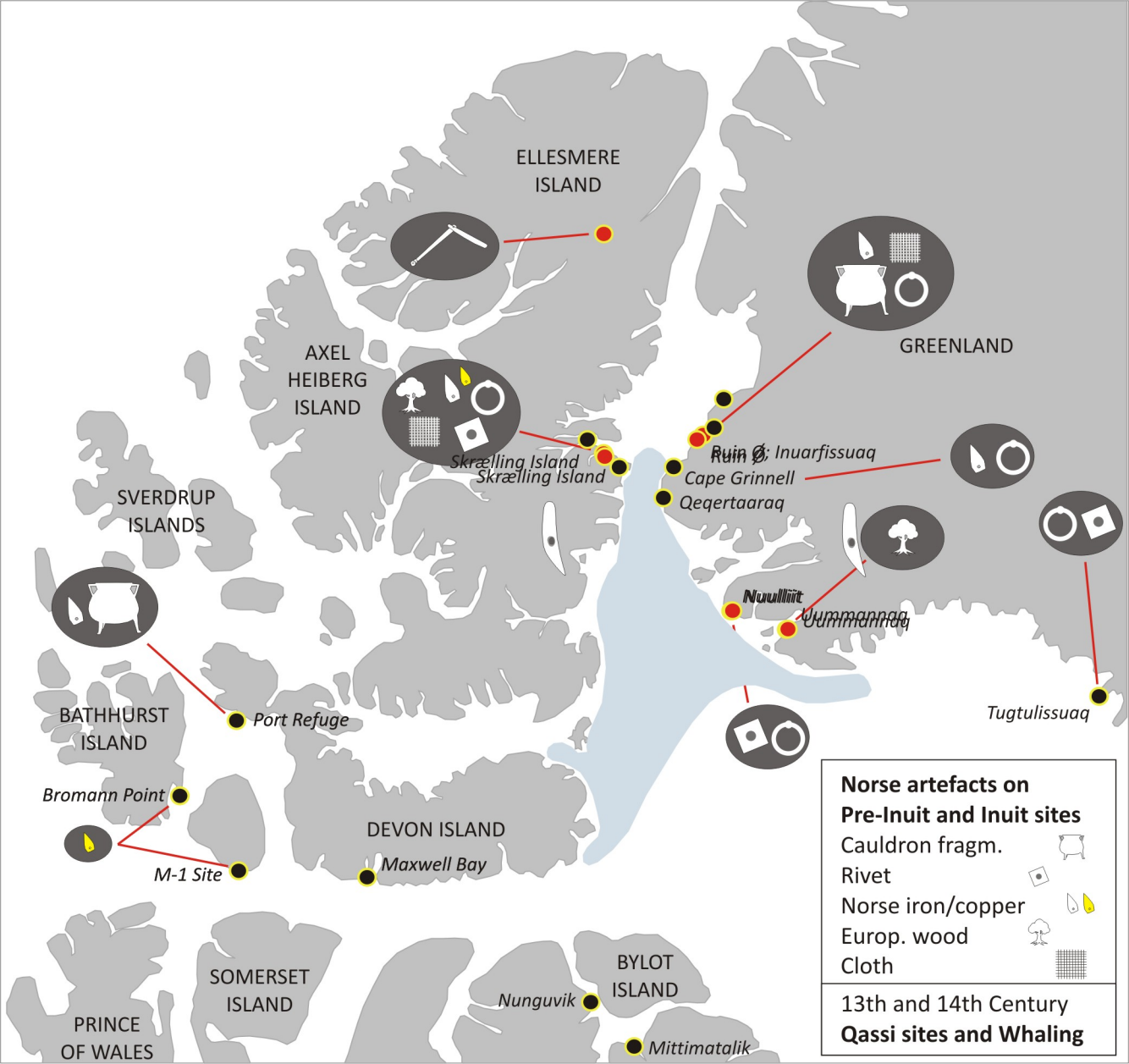
1200

1400calCE









ELLESMERE ISLAND

AXEL HEIBERG ISLAND

GREENLAND

SVERDRUP ISLANDS

Skrælling Island
Skrælling Island

Ruin Ø; Inuarfissuaq
Cape Grinnell
Qeqertaaraq

Tugtullisuaq

BATHURST ISLAND

Port Refuge

Bromann Point

M-1 Site

DEVON ISLAND

Maxwell Bay

Nuullit

Ummannaq

SOMERSET ISLAND

BYLOT ISLAND

PRINCE OF WALES

Nunguvik

Mittimatalik