

## **“The Old Village”: Yup’ik Precontact Archaeology and Community-Based Research at the Nunalleq Site, Quinhagak, Alaska**

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Volume 43, Number 1-2, 2019

URI: <https://id.erudit.org/iderudit/1071939ar>

DOI: <https://doi.org/10.7202/1071939ar>

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Publisher(s)

Centre interuniversitaire d'études et de recherches autochtones (CIÉRA)

ISSN

0701-1008 (print)

1708-5268 (digital)

[Explore this journal](#)

Cite this article

Knecht, R. & Jones, W. (2019). “The Old Village”: Yup’ik Precontact Archaeology and Community-Based Research at the Nunalleq Site, Quinhagak, Alaska. *Études Inuit Studies*, 43(1-2), 25–52. <https://doi.org/10.7202/1071939ar>

Article abstract

Centred on the underresearched precontact archaeology of southwest coastal Alaska, the Nunalleq project is a decade-long collaboration between the Yup’ik village of Quinhagak and the University of Aberdeen. The Nunalleq archaeological site, like countless others in the Arctic, is being rapidly destroyed by the combined effects of global warming. Newly thawed permafrost soils are extremely vulnerable to rapid marine erosion from rising sea levels and decreases in seasonal ocean ice cover. Organic artifacts at the site have been preserved in remarkably intact condition, revealing an extraordinary record of precontact Yup’ik culture. But with the disappearing permafrost, this archaeological and ecological record is gradually decomposing, and recovery and analysis has become time critical. The Nunalleq project is a community-based response to locally identified needs to both recover threatened archaeological heritage and to find new ways to reconnect young people to Yup’ik culture and tradition. The results of the project have far exceeded our original expectations. Similar collaborative efforts may be the best hope for addressing threatened archaeological heritage in the North and beyond.

# “The Old Village”: Yup’ik Precontact Archaeology and Community-Based Research at the Nunalleq Site, Quinhagak, Alaska

Rick Knecht<sup>i</sup> and Warren Jones<sup>ii</sup>

## ABSTRACT

Centred on the underresearched precontact archaeology of southwest coastal Alaska, the Nunalleq project is a decade-long collaboration between the Yup’ik village of Quinhagak and the University of Aberdeen. The Nunalleq archaeological site, like countless others in the Arctic, is being rapidly destroyed by the combined effects of global warming. Newly thawed permafrost soils are extremely vulnerable to rapid marine erosion from rising sea levels and decreases in seasonal ocean ice cover. Organic artifacts at the site have been preserved in remarkably intact condition, revealing an extraordinary record of precontact Yup’ik culture. But with the disappearing permafrost, this archaeological and ecological record is gradually decomposing, and recovery and analysis has become time critical. The Nunalleq project is a community-based response to locally identified needs to both recover threatened archaeological heritage and to find new ways to reconnect young people to Yup’ik culture and tradition. The results of the project have far exceeded our original expectations. Similar collaborative efforts may be the best hope for addressing threatened archaeological heritage in the North and beyond.

## KEYWORDS

Yup’ik, Alaska; precontact, community-based archaeology, Indigenous archaeology

## RÉSUMÉ

« Le vieux village » : Archéologie yup’ik précontact et recherche communautaire sur le site Nunalleq, Quinhagak, Alaska

Au cœur de l’archéologie précontact de la côte sud-ouest de l’Alaska, encore peu connue, le projet Nunalleq est une décennie de collaboration entre le village yup’ik de Quinhagak et l’Université d’Aberdeen. Le site archéologique Nunalleq, comme d’innombrables autres sites arctique, est en train d’être rapidement détruit à cause des effets combinés du réchauffement climatique. Les sols du pergélisol récemment fondus sont extrêmement vulnérables à l’érosion marine rapide qui résulte de la hausse du niveau des océans et de la baisse de la banquise marine saisonnière. Les

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artefacts végétaux du site ont été préservés intacts grâce à de remarquables conditions, révélant un enregistrement extraordinaire de la culture yup'ik précontact. Mais avec la disparition du pergélisol, cet enregistrement archéologique et écologique se décompose graduellement et leur conservation et leur analyse sont arrivées à un moment critique. Le projet Nunalleq est une réponse communautaire des besoins identifiés pour, à la fois, restituer un patrimoine archéologique menacé et trouver de nouvelles manières de reconnecter les jeunes à la culture et aux traditions des Yupiit. Les résultats de ce projet ont largement dépassé les attentes initiales. Des efforts de collaborations similaires seront peut-être le meilleur espoir de préservation des patrimoines archéologiques menacés dans le Nord et au-delà.

### **MOTS-CLÉS**

Yup'ik, Alaska, précontact, archéologie communautaire, archéologie autochtone

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**T**he Yukon–Kuskokwim (YK) Delta in western Alaska is the homeland of more than 23,000 Yup'ik people, living in 56 villages of between 200 and 1,000 people, spread across an area larger than the island of Britain (Fienup-Riordan and Rearden 2012). Much of the land is flat wet tundra resting on glacial silts and alluvial sediments. Rivers, creeks, lakes, and ponds are abundant, and open water occupies much of the area. The coast is fronted by tidal mud flats that extend outward for miles. The unconsolidated silts and clays on the marine shorelines of this area can erode very rapidly, and even before recent sea-level rises and local subsidence from melting permafrost, severe storms could remove as much as sixty metres of shoreline in a single event (Dupre 1978, 5; Shaw 1983, 10).

In 2007 the residents of the Yup'ik village of Quinhagak noticed increasing numbers of what appeared to be wooden artifacts washed up on the nearby beaches of the Bering Sea. Qanirtuuq Inc., Quinhagak's Alaska Native Claim Settlement Act (ANCSA) Village Corporation, contacted both Alaska State and federal archaeologists for help. However, as elsewhere, state and federal archaeologists in Alaska are chronically underfunded and stretched impossibly thin, charged with managing thousands of archaeological sites on enormous tracts of public land. With the increasing threat of global climate change to archaeological sites in the Arctic in particular, this situation is not unique and likely to be compounded in the future, with few government agencies or public bodies equipped to provide the staff or funding levels required to support long-term sustainable projects (Hollesen et al. 2018, 583). Furthermore, in the United States in particular, there is little or no help available for threatened sites located on Native-owned (i.e., “private”) land unless they are in the path of development projects. The authors, Jones of Qanirtuuq, Inc., and Knecht, who was then working for the University of

Alaska Fairbanks Department of Alaska Native and Rural Development, began discussions shortly after village requests for state and federal help were rebuffed. Knecht moved on to the University of Aberdeen in Scotland as the project was still in the planning phase and the non-local aspects of the project were subsequently managed from there, with the bulk of later funding from the UK.

Acting upon the initiative of the Quinhagak community and with early support from the Alaska Marine Advisory Program, the authors of this paper arrived at a locally based solution, centred on a working partnership between university-based archaeologists, the village residents, and local Native corporation Qanirtuuq Inc. We held meetings with our respective decision makers and in particular Jones held a long series of group and individual discussions with Elders and culture bearers in Quinhagak. Respect for tradition runs deep in Yup'ik communities, and more broadly Elders have generally preferred that archaeological sites remain undisturbed. But in Quinhagak Elders voiced an equally deep concern, one that was also widely shared among other villages in the Yup'ik region: the need to engage younger generations in learning about and preserving their cultural traditions and heritage. After two years of quiet but urgent discussions in village homes, fish houses, and sweat baths, the consensus was that a community-based effort to recover artifacts from eroding archaeological sites would be the best way to honour the past but also an effective means of involving Quinhagak's youth in Yup'ik traditions and cultural heritage.

## **Yup'ik Archaeology and the Nunalleq Site**

Until recent years, the precontact Yup'ik archaeology of this vast area has remained poorly known. Fieldwork in this region is logistically challenging and the costs of fielding a project are very high. There is also a culturally based resistance to archaeology in Yup'ik country, a deeply held but understandable reluctance to allow ancestral sites to be disturbed, the artifacts removed by outsiders and never returned. Before our work at Nunalleq, only three other large research excavations had been undertaken at precontact Yup'ik sites. Wendell Oswalt (1952) installed a 1951 test pit into a midden mound at Hooper Bay. He dug two test pits into permafrost soils as deep as 2.4 m, mostly through historic deposits but reaching older material which he estimated dated to ca. AD 1600. Oswalt's Hooper Bay excavations were completed in a single summer and comprised an area of about 130 m<sup>2</sup> and removed about 204 m<sup>3</sup> of midden deposits, a relatively small portion of which were precontact (Oswalt 1952; Mossolova and Knecht 2019). He reported finding 3,500 artifacts in total, 1,500 of which were pottery fragments (Oswalt 1952).

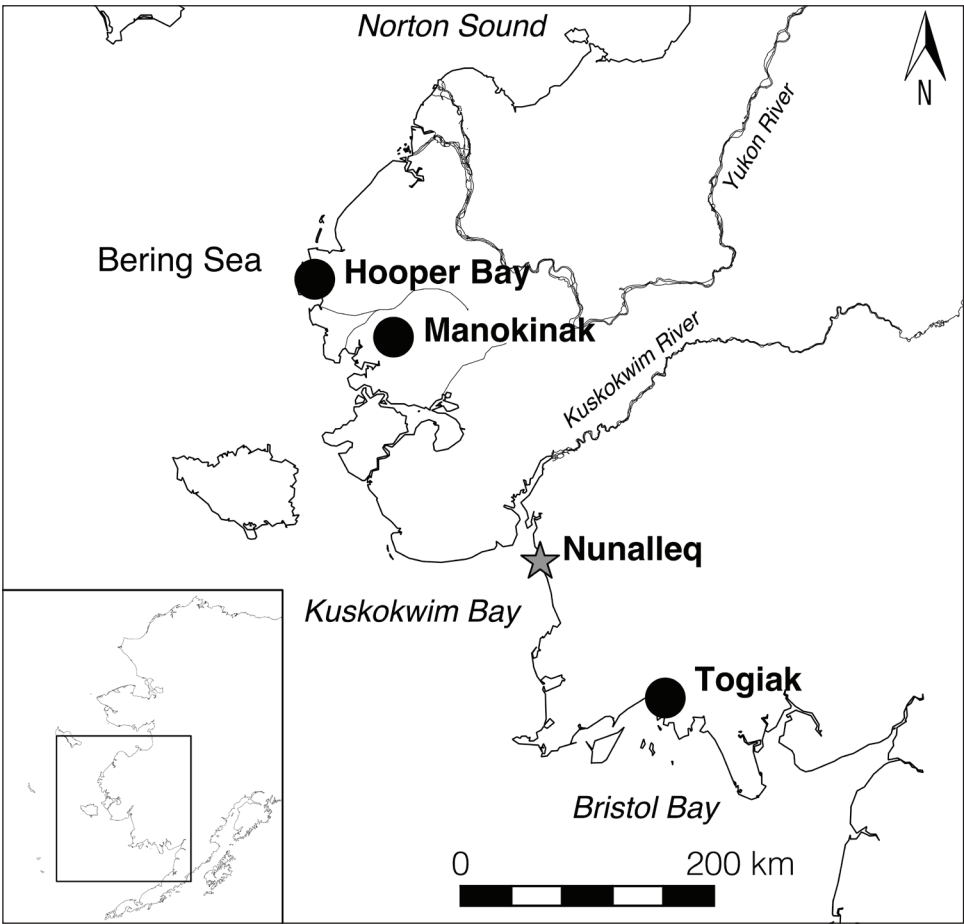
Makoto Kowta, one of Oswalt's graduate students, also excavated a late prehistoric Yup'ik site at Old Togiak in 1960. Working mostly alone and with a shovel, he opened a block of 167 m<sup>2</sup> and removed about 150 m<sup>3</sup> (Kowta 1963; Mossolova and Knecht 2019). Discontinuous permafrost preserved organic artifacts at the site and Kowta recovered 4,070 artifacts, which he air-dried and sent back to California. He estimated that the site dated from AD 1000 to ca. AD 1600–1700 (Kowta 1963, 2).

Robert Shaw's 1983 excavation at the Manokinak site has long been the best-described archaeological sample of precontact Yup'ik material. This collection of about 468 artifacts, came from 14 m<sup>3</sup> of cultural deposit removed from an 8 m<sup>2</sup> trench placed on the edge of a midden mound. Some of this material was generated by earlier Norton occupations with this multi-component site occupied, abandoned, and reoccupied over a period of 1,200 years. The site provided a possible cultural link between early phases of the Norton tradition and subsequent Yup'ik cultures (Shaw 1983, iv–v). Permafrost soils remained frozen at that time and required repeated visits over the course of several field seasons. A variety of organic remains typical of frozen sites were recovered, including fishing gear, bowls, bentwood boxes, vessel bottoms, pegs, toys, and spoons (Shaw 1983).

In addition to these better-published academic research investigations, a substantial number of small-scale excavations and collections have been made in the Yup'ik area through the aegis of US federal agencies. These are reported in a grey literature that is difficult to access, and the collections generated through these projects are similarly scattered. A collation of this literature and consolidation of the collections is needed for their potential to be realized by both archaeological and descendant Yup'ik stakeholders.

By the summer of 2009, in Quinhagak, we were able to field a small crew to begin a preliminary archaeological investigation centred around the beach and locations local people had reported finding artifacts. We found a complete wooden doll on the beach, in fine condition with traces of red ochre surface paint still intact. It was clear that a well-preserved site was actively eroding not far away. We began by following a trail of artifacts—whittled bits of wood, sharpened stakes, and fragments of cut birch bark that were thinly distributed among more modern flotsam along the high tide line. Several miles down the beach we came upon the Nunalleq site. Marked only by a 50 cm band of dark but distinctly organic soil, archaeological deposits were visible on the raw erosion face of the beach berm, some 30 cm below the ground surface. Protruding from the dark soils were shaft fragments, pieces of bentwood bowls, and the trimmed timber supports of collapsed sod houses. Elders told us that the site had once extended as much as 100 m further toward the sea but had steadily eroded with a marked increase in the rate of this loss in recent years.

The Nunalleq site (GDN-248) is located close to the modern village of Quinhagak and is approximately 1.6 km north of Arolik River mouth, and 1 km north of the historically known Arolik village (Figure 1). The site had long been known to local residents, who called it “Nunalleq” or “the Old Village.” An abandoned village, Agaligmiut, was also known to be in the vicinity, with its last known historical location about 1.6 km south of the Nunalleq site. While the Nunalleq site was probably an earlier location for the local group occupying historic Agaligmiut, Quinhagak residents prefer to call the precontact site Nunalleq to distinguish the two, and we chose to honour that preference (Fienup-Riordan, Rearden, and Knecht 2015, 68).



**Figure 1.** Location of the Nunalleq Site and other Yup'ik Sites.

## Excavating Nunalleq: A Race against Time

The Nunalleq project was initiated as an urgent response to increasing erosion. Since we began our work in 2009, the edge of the site has retreated ~10 to 15 m inland. At the request of local partners in Quinhagak, we began excavations at the most endangered portion of the site and in 2009 installed a 12 m<sup>2</sup> excavation square followed by an additional 48 m<sup>2</sup> in 2010. The 2011 summer season focused exclusively on post-excavation and sample processing, and violent series of winter storms in the winter of 2011 led to the loss of several more metres of the site. We redoubled our efforts and in the following six field seasons have excavated a largely contiguous block of just over 500 m<sup>2</sup>, with 68 m<sup>2</sup> of this excavated area now lost to ongoing coastal erosion (Hillerdal, Knecht, and Jones 2019). It may well be the largest hand-excavated block ever installed in an Alaska archaeological site. The volume of the site deposits removed so far exceeds 750 m<sup>3</sup>.

This level of effort was only made possible by a truly remarkable logistical support, with contributions of local and traditional knowledge and generosity of every sort warmly supplied by the Qanirtuuq Inc. and the people of Quinhagak. The first four years of the project were largely supported by the village corporation, coupled with small travel grants supplied through the University of Aberdeen and the Carnegie Trust for the Universities of Scotland. Village-based investment in the project was by far the most substantial contribution, representing a huge commitment in a small and remote community with many other pressing economic demands. However, early results were promising, leading to a large research project grant from UK funders, the Arts and Humanities Research Council (AHRC), committed to supporting the project for a four-year period. Subsequent research grants have followed, again supported by the AHRC. As well as supporting fieldwork activities, travel and analytical costs, this funding supported vital personnel, specifically postdoctoral researchers and other individuals who could commit to working on the project full-time.

Support from the people of Quinhagak and the Qanirtuuq Inc. has been unwavering and invaluable. Qanirtuuq Inc. supplied cars and vans to transport crew members to the site every morning as well as all-terrain vehicles and boats for transporting gear and survey crews. The village provided use of three major structures for crew housing including the large office and community centre. Elders kindly gave up their gathering space for the summer so that our crew could have a place to eat and study. Corporation office space, including the boardroom, was offered up so that students and dig volunteers from afar would have a place to sleep. Even the corporation's CEO's office had a mattress or two on the floor during the field season. Sifting screens, large shelters, outbuilding, and stairways were all designed and constructed on-site by a team of local carpenters and taken down again at the close of every season. Both volunteers and paid staff from Qanirtuuq assisted with the



backbreaking work of backfilling the site post-excavation, as well as in removing the backfill again at the beginning of each field season. Volunteers from the community often came to help with the excavation and field laboratory work. Others would appear with a welcome pot of hot soup or strips of smoked salmon.

The Nunalleq project worked because of an extraordinary level of local engagement. Elders and tradition bearers living in Quinhagak who visit the site regularly (often daily) during excavations and, in the field laboratory, are collaborators rather than informants. Together we have puzzled out the past and shared in the joy of discovery and the spectacular finds that are generated daily during the field season. Local carvers and craftspeople were among the most eager participants in the project and were eager to examine objects as they emerged from the ground. More often than not, a stunning reproduction of an excavated art object would be produced within a day of its discovery. The site was also a popular place for Elders to bring their grandchildren so they could marvel over the objects and discuss the past together. Elders also gathered to participate in more formal meetings where their observations and identifications of the artifacts from the site were recorded and transcribed (Fienup-Riordan, Rearden, and Knecht 2015, 68).

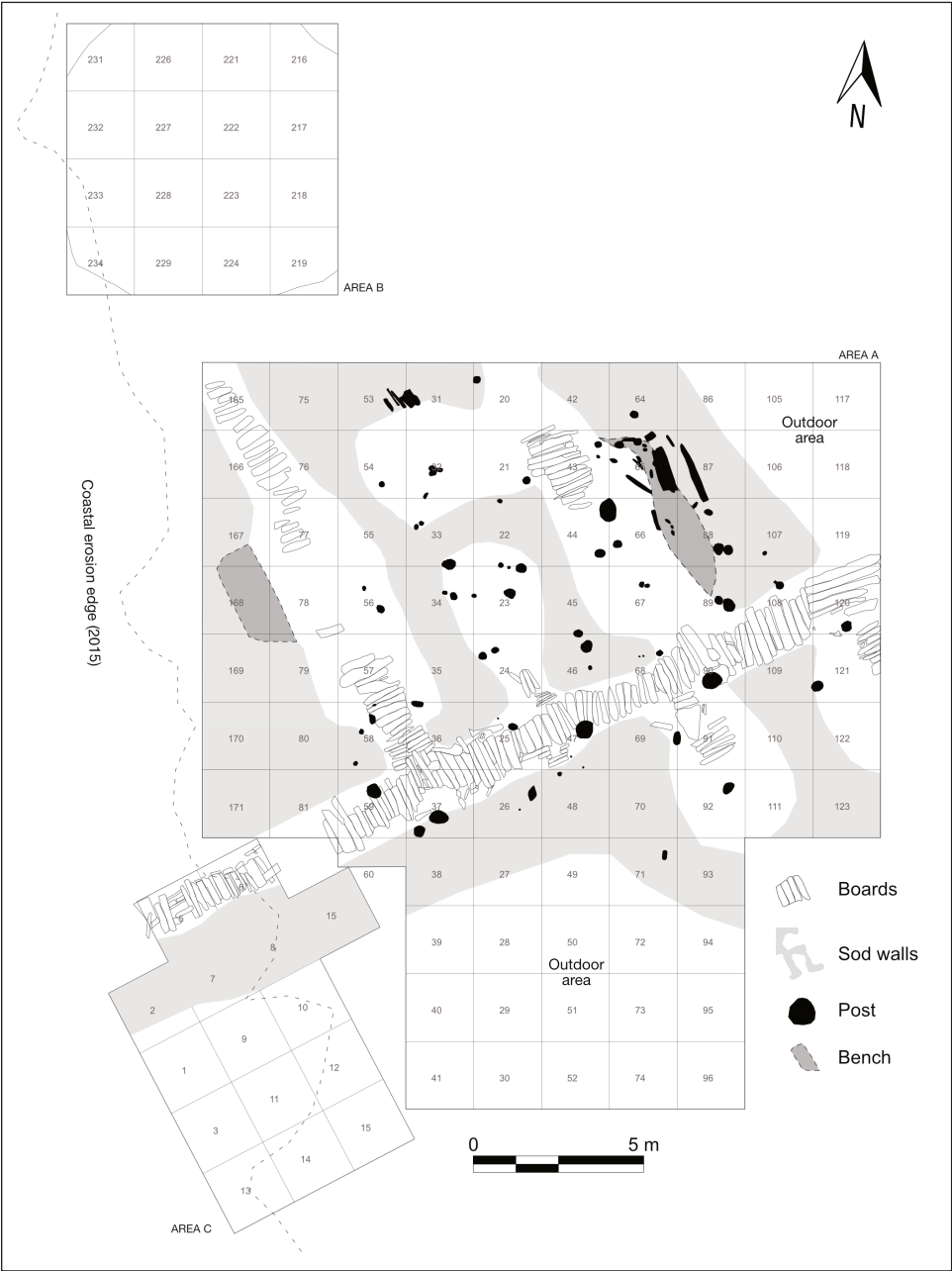
Also crucial to the project have been the cheerfully volunteered labour of nearly two hundred students and volunteers over the years who have worked long hours, six days a week, rain or shine. Such volunteers paid for their own travel to Quinhagak, often from distant countries, as well as their own food and lodging expenses over the summer. Back at the University of Aberdeen, students as well as professionals volunteered thousands of hours in the conservation laboratory, processing artifacts and samples that arrived at the end of every field season.

## **The Archaeology of the Nunalleq Site**

### **Site architecture and phasing**

The large-scale investigations at Nunalleq have revealed the remains of at least two semi-subterranean sod and timber multi-roomed dwellings, occupied one after the other, with phases of hiatus and rebuilding. The largest and most recent house (Figure 2) was likely occupied by a small number of family groups between AD 1570 and 1675, based on Bayesian analysis for 49 radiocarbon dates (Ledger et al. 2016, 2018). Midden deposits north of the house, possibly in the remains of a house pit that was partially dug but never occupied, contained refuse deposits of about the same date (Figure 2). Three occupation phases, defined by varying degrees of remodelling, have been identified in the Area A house (Ledger et al. 2018).





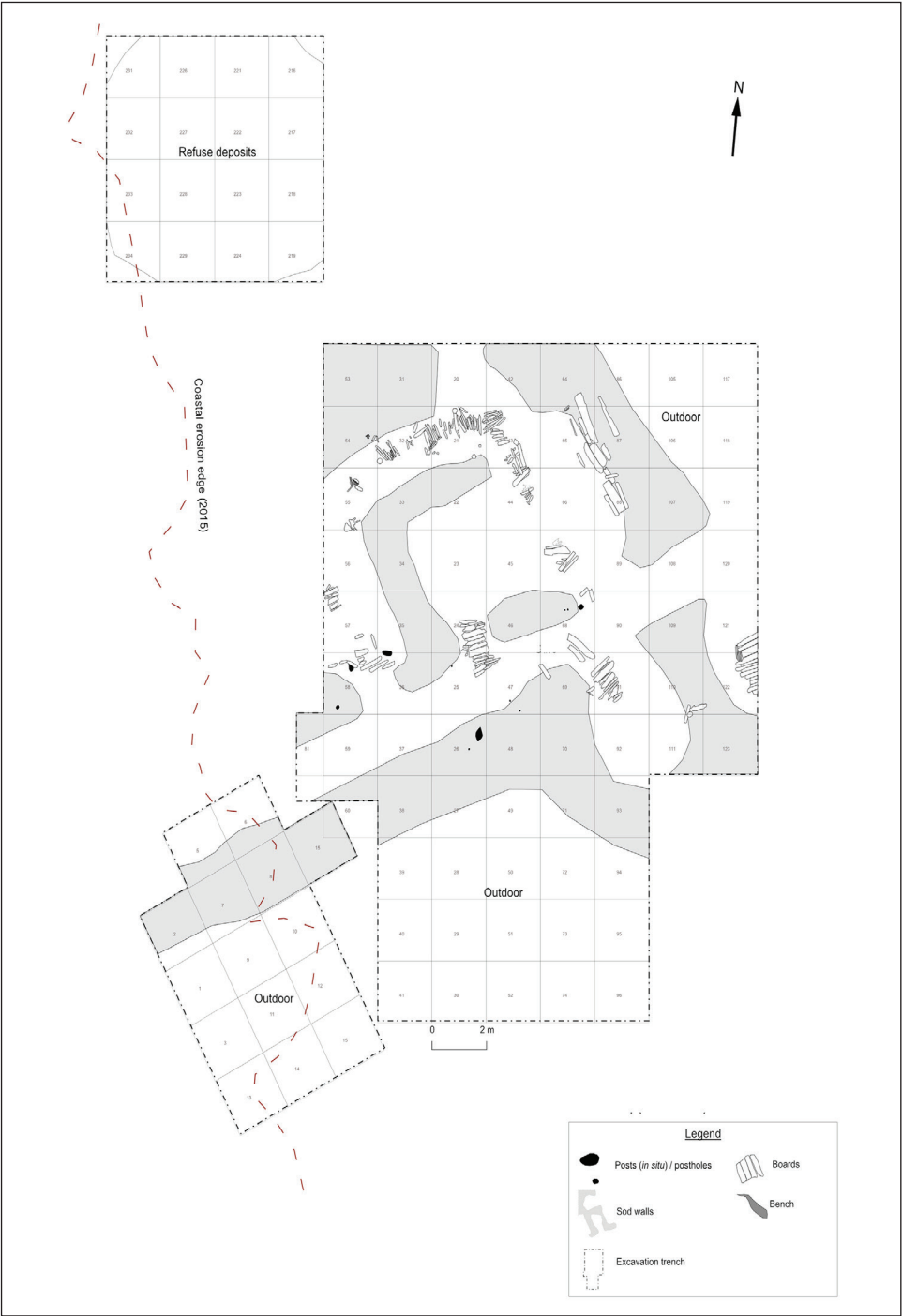
**Figure 2.** The Phase 2 House at the Nunalleq site.

Phase II (named in order of its appearance during excavation) represents the terminal occupation of the site, at the end of which the sod house complex was burned and collapsed, an event that occurred sometime between AD 1645 and 1675. This is contemporaneous to a period of active regional warfare referred to in Yup'ik oral history as the Bow and Arrow Wars, replete with multiple accounts of burning villages, residents trapped in sod houses by enemies, and attempts to be smoke them out by use of fire (Fienup-Riordan and Rearden 2016; Funk 2010). The mid-seventeenth century was also a period when the Little Ice Age, a period of pre-modern global cooling, was thought to have been most severe with impacts on crop production, which in turn destabilized economies and governments in Europe, Asia, and beyond (Parker 2013). Warfare, famine, and violent social and political upheaval occurred at unprecedented levels. We are now exploring the possible connection between climate change, resource stress, and the rise of the Yup'ik Bow and Arrow Wars in this context (see Masson-MacLean et al. 2019).

Local Yup'ik oral histories specifically tell of a village in this location that was attacked and systematically burned and the occupants killed (Charlie Pleasant in Tennant and Bitar 1995; Rearden and Fienup-Riordan 2013; Fienup-Riordan and Rearden 2016). The attack was an act of revenge by another Yup'ik village on the lower Kuskokwim, and our preliminary forensic reconstruction of the event so far mirrors the details recounted in the oral history, including the seasonality, the way in which the house appears to have been fired, and the largely non-combatant status of the victims.

The nature of the attack and its destructive results are starkly defined by thick layers of burnt peat and sod along with support timbers and architectural elements turned to charcoal by intense burning. Timber uprights are partially burned but intact near the base. Burned and shattered pottery vessels are common finds on the charred floors, along with partially burned wooden bowls and other possessions. Burned but well-preserved remains of a small dog were found crushed under a fallen burned timber in one side room. Human remains of more than two dozen individuals were found outside of the house and, following previously agreed to protocols and consultations with Quinhagak authorities, reburied after being recorded and visually assessed by a specialist. A full study of this event is in process but has already provided a chronological framework for the Bow and Arrow Wars as well as a rare record of precontact warfare in Native Alaska.

Phase II, beginning somewhere in the interval AD 1640–1660 (Ledger et al. 2018), also comprised occupation layers prior to the community being attacked and the site abandoned (Figure 3). At least six side rooms were accessed through board lined entry tunnels that lead from two larger hallways floored with split driftwood planks. Side rooms in the house were episodically separated from one another by interior sod walls that were thinner than the



**Figure 3.** The Phase 3 house at the Nunalleq Site.

larger, probably load-bearing sod walls that were in excess of 2 m thick and which defined the boundaries of the sod house complex. The longest hallway was built in a SW-NW direction and is at least 22 m long, although a magnetometer survey indicates that the NW end may extend another 17 m, but some of that length may represent a board walk that led out of the house interior. Excavations in the 2018 season revealed the western edge of the house as well as another major hallway/boardwalk that led through the middle of a side room to another exit. There were at least three entryways into the house; two on the west side of the house, facing the Bering Sea, had short underground cold trap entries. Longer underground entry tunnels, like those in historically documented Yup'ik houses, may have been precluded by the flooding from saturated wet tundra matrix of the Nunalleq site.

Quinhagak Elders such as George Pleasant recall oral histories about the size and complexity of the sod houses at the site, with hidden exits designed to escape in the event of attack. Historic Yup'ik settlements consisted of a large men's house or *qasgi* surrounded by smaller separate sod houses for women and children (Fienup-Riordan, Rearden, and Knecht 2015, 43). The combined sod house architecture at Nunalleq was likely designed for protection during the Bow and Arrow Wars and may have also had advantages in terms of insulation and resource sharing during the Little Ice Age.

Phase III represents an earlier occupation of the house, spanning approximately thirty-five years, beginning in the interval AD 1620–1650 (Ledger et al. 2018), during which the layout of the dwelling was very similar to Phase II, though it appears to cover a greater area and include a bigger central room in lieu of the smaller internal spaces.

Phase IV is an older dwelling which was largely excavated in the 2018 season. It has a much more conventional architecture in that it resembled prehistoric western Thule age houses recorded from areas both south and north of Yup'ik territory. Only a limited number of samples have been submitted for C14 and Bayesian modelling suggests a beginning for this phase somewhere between 1570 and 1630 AD (Ledger et al. 2018). It appears to have been collapsed and the surrounding area filled as the larger house above was constructed sometime after AD 1600. Excavations revealed a cruciform floor plan, featuring a central room with a large planked walkway with smaller side rooms on all four sides. The house was probably used for generations, with the walkway having at least five distinct re-flooring episodes each of which left a layer of large planks behind. A southern side room was abandoned and walled off relatively early in the occupation of this house, probably because of drainage problems. The poor drainage along the southern edge of the excavation trench was evidently a long-term problem at Nunalleq, eventually solved by the construction of the large plank hallway directly above it when the Phase III house was built. There were at least two entries to the

Phase IV house, one a deep but short tunnel on the northwest that opened into a small but deeply excavated side room lined with three large storage pits, probably a food storage and processing area. Analysis of the contents of the house, and its associated ecological archive, is still underway, but it already appears to show that life at Nunalleq may have changed substantially with the onset of the Bow and Arrow Wars and as the Little Ice Age reached its zenith (Mossolova and Knecht 2019).

The stratigraphy at Nunalleq was characterized by layers of packed occupation floors bordered by structural and architectural wood, as well as the remains of collapsed sod walls. Most of the excavation that took place at the site focused on the nested house remains, along with sixteen 2 x 2 m units placed on a contemporaneous trash pit. Wooden structural remains included both in situ supporting posts and lines of split wooden planks representing board walks, entrance-way tunnel flooring, and benches at the edges of living spaces. The western (coastal) perimeter of the site was partially disturbed by a combination of erosion and looting in recent decades; however, by far the greater portion of the site was found to be undisturbed except for the mid-seventeenth-century burning and collapse of the terminal occupation. The earlier floors and sod walls of the Phase IV house in the lower layers of the site were much better defined than those above and easier to follow. The Phase IV house was deeply excavated into natural soils, whereas the newer house lacked a deep house pit and was constructed on top of older deposits by laying down sod walls that were held in place by long pointed wooden stakes, some of them made from recycled kayak gunwales.

## **Material culture and raw materials**

The Nunalleq project has necessarily had a split focus on rescue and recovery, as well as on research questions. The episodic but unrelenting pace of erosion has forced us to concentrate on the western, seaward portions of the site, while at the same time a large excavation was required to make sense of the complicated array of side rooms and passages within the sod house complex. The large-scale excavation coupled with excellent preservation has led to an enormous artifact recovery, particularly of organic artifacts and ecological samples. Because of the limited facilities available in Quinhagak, until the 2017 field season the collection was air freighted after the end of every field season to the University of Aberdeen for cleaning, conservation, and post-excavation processing and analysis. The logistical challenge of keeping up with just the conservation has been considerable, and can hamper other research activity, being necessary prior to cataloguing and artifact analysis. Cataloging is still in process, but we estimate that more than 100,000 artifacts have been recovered so far, not counting small potsherds, unmodified faunal remains, and other ecological samples. Thanks to the extraordinary

preservation conditions afforded by permafrost, the Nunalleq collection includes full-sized wooden masks, human and animal figurines, hafted tools, leather clothing, grass baskets, bowls, kayak parts, weapons, game pieces, and much more, all in nearly pristine condition. Thanks to a combination of better preservation, careful excavation techniques, including screening and single context recording, as well as the focus on house floor contexts, the Nunalleq site has so far produced roughly five times more artifacts per cubic metre than the three previously excavated sites combined.

### *Wood and wooden artifacts*

Wood was by far the most common raw material for used in artifact manufacture at Nunalleq, comprising about 80 per cent of the collection, a pattern typical of regional late prehistoric wet/frozen sites with good preservation (Gleeson 1980; Knecht 1995). Many pieces were found in very good condition, depending on how many years had elapsed since the surrounding permafrost had thawed. In levels where the permafrost had thawed within the last two years or less, wood was often still bright in colour, and thin curls of wood shavings and bright sawdust were still present on occupation floors. Wooden tool and ulu handles were sometimes recovered with hafted lithics and cordage wrappings still intact. Bentwood bowl rims and bases, and complete bentwood bowls and dippers still bore traces of pigment although not the painted designs seen in ethnographic examples (Fitzhugh and Kaplan 1982; Fienup-Riordan 2007).

Wooden artifact manufacturing waste and wood chips and shavings were a significant and sometimes a diagnostic attribute of Nunalleq house floors, and it appears that wood chips were intentionally and routinely spread upon floors perhaps to freshen them, absorb moisture, and add traction. The most common wooden artifacts recovered from Nunalleq are the tens of thousands of cylindrical and ovoid shaft fragments, representing the remains of arrows, sea mammal darts, harpoons, and lances in all stages of manufacture. Weapon shaft fragments were often recycled into wooden pegs of various sizes and in turn used to fasten components of boat and sled frames as well as in the manufacture and repair of smaller objects such as bentwood bowl bases. The remains of bow staves, arrow shafts, point sheaths, and archery tools such as bow wrenches are particularly abundant, reflecting the use of bows in both the maritime and terrestrial economy, the importance of caribou in the diet, and warfare. Tool handles, especially of carving tools, ulus, knives, and adzes are well represented in the Nunalleq collection, as are thousands of bentwood bowl and tub fragments.

Artifacts reflecting Yup'ik ceremonial rounds and belief systems are abundant at the site, including drum parts, masks, mask attachments, maskettes, zoomorphic figurines, and dolls (Mossolova and Knecht 2019;





**Figure 4.** The Nunalleq Site in 2017, View South.

Mossolova et al., this volume). Many elements of ethnographically known Yup'ik belief systems are evident in the Nunalleq collection, such as transformation figures, half-face masks, and paired smiling and frowning faces. Wooden gaming pieces such as spinners, tops, gaming darts, and tally sticks recall ethnographic accounts of gaming (Nelson 1899; Fienup-Riordan 2007, 37). Toy bows and arrows, toy harpoons, and model kayaks as well as toy spoons, dolls, ulus, and bowls in the assemblage were used to socialize and train children for their adult roles. Taken as a whole, a great deal of the Nunalleq assemblage can be recognized in ethnographic collections made three hundred to four hundred years later, reflecting an innovative but generally conservative cultural tradition.

Kayak parts such as ribs, gunwales, deck beams, stern pieces, deck attachments, and paddles are common in the Nunalleq collection. Kayak models indicate the presence of both narrow beam kayaks as well as wide beamed design with a steep deck that more closely resemble historically known kayaks in this region (Golden 2015). Models from Nunalleq as well as several full-sized bow pieces indicate that precontact Yup'ik kayak bows may have lacked the distinctive circular handgrip opening used in historic Yup'ik



kayaks. Models depicting open skin boats as well as canoes are also well represented in the collection.

### *Status-related artifacts*

More than three hundred labrets were recovered at Nunalleq, made from wood, bone, ivory, and stone in a wide variety of styles and sizes. Stylistically, they tend to resemble those from the late Kachemak phase in the Yup'ik-speaking Alutiiq/Suqpiak region on the North Pacific Rim. Some of the ground stone labrets and beads were made from exotic raw materials such as jet (coal), amber, and white calcite, which suggests regular contact with peoples from the Alaska Peninsula or further south (Knecht 1995, 621–54; Steffian and Saltonstall 2001). Labrets are thought to be associated with social signalling and status, and this is supported by the form and distribution of labrets at Nunalleq. Although a full analysis is still underway, it has already become clear that labrets with certain decorative elements, such as stylized faces of a bearded seal, have a very clear pattern of distribution and are concentrated in just one area of the sod house complex. Ownership marks found on the bases of bentwood bowls as well as on certain tools also have patterned distribution. Items possibly associated with higher social status such as amber beads, ivory earrings, and exotic raw materials are also concentrated in certain areas of the sod house complex. Although our analysis is far from complete, what is emerging is a picture of Yup'ik culture that can be counted with better-known complex marine foragers on the Kodiak Archipelago and the Aleutian Islands.

### *Grass and basketry*

When we first began work at Nunalleq we were amazed to find fragments of woven grass mats, twined basketry, and grass cordage. As the excavations went deeper into soils that had been more recently thawed, our recovery of grass artifacts soared from a few dozen each season to many hundreds. Grass was an abundantly used in Yup'ik material culture, but is one of the first materials to decay and vanish following thawing of the permafrost. Conserving and curating the grass has presented a challenge and, although wood and other organics are today conserved in the laboratory in Quinhagak, we have continued to send the basketry to our conservation lab at the University of Aberdeen for treatment. At least three thousand grass artifacts have been recovered so far, including cordage, rope, dog harnesses, mats, socks, along with whole and fragmentary baskets (J. Masson-MacLean, Jorge, and Knecht 2018; E. Masson-MacLean et al., this volume). Leather is also treated at the Aberdeen conservation lab, primarily through freeze-drying. Leather artifacts include neatly cut clothing scraps, boot soles, mittens, and fragments of kayak covers. Patches of marine and terrestrial mammal fur were abundant,

the remains of processed hides and skin clothing, and shedding by domestic dogs. Although the shadow of sinew wrapping was clear on many wooden tool handles and arrow shafts at the site, sinew was not preserved at Nunalleq.

### *Lithics*

The lithic industry at Nunalleq, except for chipped performs, is almost entirely confined to extensive and precise grinding and polishing, with ground stone knife blades and points often exhibiting precise symmetry and hollow-ground edges. The inventory is dominated by triangular end blades used to tip both arrow points and harpoons, along with knives, ulu blades, adze blades, chisels, drill bits, and polished burins, or burin-like tools. The form of these tools all indicate strong links to early Thule culture, with the small knives, drill bits strikingly similar to those from early Eastern Arctic Thule sites (Thomsen and Thomsen 1981). Because it was necessary to prioritize the processing of the organic classes of artifacts, cataloguing and analysis of the Nunalleq lithic assemblage has so far been limited, but we estimate that about twenty thousand ground stone tools and tool fragments were recovered from the site. Work with the many arrow end blades has been important to the forensic reconstruction of the attack episode (Gomez-Coutouly et al., this volume).

### *Pottery and clay lamps*

The Nunalleq site has also yielded a major pottery assemblage with fragments numbering in the tens of thousands, along with some relatively complete pots, some of which have been partially or fully reconstructed. People living at Nunalleq used a range of “bucket-shaped” (Nowak 1982, 82) or “vase-like” pots (Dumond 1969), varying in size and up to 26 cm in diameter in addition to clay lamps. The large majority of sherds are plain, but some are decorated with linear incisions, punctuations, or shell-impressed horizontal lines, sometimes combined with ridges and/or a surface treatment. Some vessels were roughly finished, while others—usually, but not always, thin-walled—were carefully polished. Different clay sources and tempering materials were used to produce the pottery found at the site and thin-section petrographic analysis is underway to better define both clay sources and pottery types (Jorge, Muller, and Knecht 2015). Analysis of the collection is still ongoing but it is already clear that ceramic vessels at Nunalleq were used for a variety of functions, rather than exclusively as cooking pots. An organic residue analysis of thirty-one pottery sherds and five soil samples showed a strong signal from marine mammal fats, which may have been linked to either cooking, processing, or storage use, or possibly were even derived from the manufacture of the pots themselves (Farrell et al. 2014).

## The Bioarchaeological Record at Nunalleq

Bioarchaeological remains recovered from the site include fur, hair, feathers, seeds, and insects that have shed new light on the Yup'ik past.

### *Faunal remains*

An estimated thirty thousand animal bone remains have been recovered at Nunalleq, with about ten thousand from the 2017–2018 field seasons still to be analyzed (McManus-Fry 2015; E. Masson-MacLean 2018; E. Masson-MacLean et al. 2019; and E. Masson-MacLean, this volume). This stands in contrast to an artifact recovery of more than twice those numbers, a much smaller faunal recovery/artifact ratio than in other late prehistoric sites on coastal Alaska. This may be due to Yup'ik belief systems and a strong cultural preference for careful disposal of the bones of prey species—either returning them to the sea or in specially dug pits (Fienup-Riordan and Rearden 2012, 111). The faunal collection is also characterized by a limited fragmentation as well as a number of specimens that have been modified during the tool manufacture.

The animal remains at the site comprise both hard tissues, including tooth and bone, and soft tissues, including fur, claws, and baleen. Fish (27.9% number of individual specimens [NISP]) and marine mammals (27% NISP) dominated the Nunalleq faunal assemblage in terms of numbers of identifiable fragments, followed by caribou (17.2% NISP) and domestic dog (16.9% NISP). Birds (6.6% NISP) and other terrestrial mammals (2.7% NISP) and bivalves (1.3% NISP) comprise the remaining taxa represented at the site (E. Masson-MacLean 2018, E. Masson-MacLean et al. 2019). Stable isotope analysis indicates that salmon were amongst the most important vertebrate resources consumed at Nunalleq, providing up to 50 per cent of the dietary protein (see below and Britton et al. 2013; Britton et al. 2018; Britton, this volume). The results of these analyses, and the large number of salmon remains recovered from the site, are perhaps not surprising given the site's proximity to the Kanektok and Arolik Rivers, which both host major salmon runs. The faunal remains suggest a year-round occupation of the site.

The large sod house complex occupation of the site corresponds with one of the coolest periods of the Little Ice Age, and zooarchaeological analysis (and isotope data) reveal a subsistence strategy centred on the exploitation of three major resources, including salmon, marine mammals, and caribou. This tripartite economy is similar to that observed at other Thule-era sites in Alaska, and elsewhere, and likely permitted a flexibility in resource use in the face of changes in resource availability. Stable isotope data shows that caribou meat was likely consumed at Nunalleq, but that this was not a major component of the diet. Caribou antler, however, provided a major source of raw material used in the production of harpoon points, weapon components, arrow points, wedges, adze holders, fish lures, and many other objects

(E. Masson-MacLean et al. 2019). Worked sections of caribou antler as well as antler preforms are being analyzed in an effort to better understand the process (Houmard et al., this volume). In contrast to most coastal sites in Alaska, there is no evidence that whalebone was used as a building material at Nunalleq; shallow waters and offshore tidal flats perhaps precluded the approach of any cetaceans larger than beluga. Beluga bone is rare but present at the site and used for tool production but little else.

In addition to isotope analysis of human hair (see below, and Britton, this volume), isotope analysis has also been conducted on faunal remains from Nunalleq. This has been undertaken as both a means of providing a faunal “baseline” for the interpretation of human dietary isotope data but also as a way of better exploring faunal ecology and animal–human relationships at the site. For example, intra-tooth strontium and oxygen isotope analysis of caribou teeth from the site have revealed the seasonal migratory behaviours of this species during the Little Ice Age, and highlighted behavioural differences compared to Y–K Delta caribou populations today (Gigleux et al. 2019). These analyses also confirmed that caribou were likely present in the area immediately surrounding the site during their autumn aggregation and migration, illuminating the nature of their exploitation. The isotope analysis of dog remains has also shed light on the role of these animals in human foodways at Nunalleq, and revealed dogs were also fed a diet rich in salmon (McManus-Fry et al. 2018).

The evidence for dog–human relationships at Nunalleq also extends to the crossbeams and runners for sleds, suggesting that dog traction was well established at the site. There is also abundant evidence for the presence of dogs in the form of bones, fur, claws, and coprolites (E. Masson-Maclean et al. 2019). Certain side rooms in all of the sod houses featured dense concentrations of dog fur and coprolites and may have been designated for young dogs or for pupping. The well-preserved remains of a young puppy, including a woven grass collar and leash, were found wrapped in grass mat and buried outside the entry of a side room in the Phase II house. Skeletal and DNA studies of the Nunalleq dogs are ongoing but have already indicated connections with dog populations elsewhere in the north, at precontact Inuit and other Thule-era sites (Ameen et al. 2019).

### *Microfaunal remains*

The Nunalleq house floors sediments indicate large numbers of very well-preserved fly (Diptera), beetle (Coleoptera), caddis fly (Trichoptera), human louse (*Pediculus humanus* L.) and flea (Siphonaptera) remains, now being analyzed (Forbes, Britton, and Knecht 2015; Forbes and Sikes 2018; Forbes et al. 2019). The presence of human lice in floor layers at the site are typical of those not only at other Inuit sites (e.g., Bresciani et al. 1989), but also from

Europe, the Near East and the Americas (e.g., Girling 1984; Fletcher 1994; Bain 2004). The host-specificity of human lice makes them useful indicators for the close proximity of humans. The ongoing analyses at Nunalleq has allowed a better understanding the contemporary conditions at the site during the Little Ice Age as well in forensic reconstruction of the terminal attack event at the site (Forbes et al., this volume).

### *Botanical remains*

Macroscopic and microscopic plant remains have both been recovered from Nunalleq and used to reconstruct life and events there. Test units placed well away from the archaeological deposits were sampled in a high-resolution palynological study that showed that the occupation left a distinct signal in the form of changing plant communities and traces of charcoal (Ledger 2017). The charcoal from this test yielded dates consistent with the main occupation, which was exhaustively tested with a long series of radiocarbon dates (Ledger et al. 2016; Ledger 2017). Berry seeds were present in quantity in concentrations on living floors and our Elder colleagues from Quinhagak instantly recognized them as cloud berries or *Rubus chamaemorus*, which are still a staple in Yup'ik subsistence diets (Barker and Barker 1993). Macroscopic plant remains from Nunalleq house floors were abundant but remain largely unanalyzed in a large collection of well-provenienced bulk samples comprising about 9 m<sup>3</sup>, currently in refrigerated storage. Future research is planned to examine the bulk samples for the remains of insects, plants, bird feathers, and other materials that have been observed in quantity in this collection.

### *Biomolecular studies of human hair*

In addition to micro and macrofaunal remains and plant remains, numerous samples of cut human hair were also found associated with house floors at Nunalleq, likely discarded following haircuts. This has presented an opportunity to study precontact Yup'ik diet through stable isotope (carbon, nitrogen, sulphur) analysis of hair keratin, alongside faunal bone collagen, which provides an isotopic “baseline” for the precontact Yup'ik food web. In combination with the zooarchaeological research, a broad-based diet comprising marine and terrestrial resources, but likely dominated by salmon, has been identified (Britton et al. 2013; Britton et al. 2018). Analysis of sequentially sampled longer strands of hair have provided insights into seasonal and even inter-annual dietary variability, and highlighted dietary differences between individuals (Britton et al. 2018). Ongoing investigations of diet comprising well-phased materials from the more recent research excavations have revealed gradual shifts in resource use and subsistence during the Little Ice Age, and illuminated dietary variability between individuals/across different areas of the site (Britton, this volume).

In addition to isotope analysis, human hair from Nunalleq has also been subjected to mtDNA analysis. This research has placed residents of the Nunalleq site in haplogroups A2a and A2b, typical of modern Inuit/Eskimo groups (Raghavan et al. 2014), and the Eastern Arctic Thule (Saillard et al. 2000; Helgason et al. 2006; Gilbert et al. 2008). Hair samples from Nunalleq contributed to a major study of prehistoric population history in the North American Arctic, reinforcing the genetic discontinuity between Thule-era peoples and earlier groups (Raghavan et al. 2014). Ongoing research will explore possible dietary differences between males and females at the site, as well as possible disparities between social groups (Britton, this volume).

## **Contextualizing Nunalleq: Contributions to Southwestern Alaskan Prehistory**

In addition to enriching our knowledge of precontact Yup'ik life in the Y-K Delta, and providing new and nuanced insights to the environmental and ecological context of the Little Ice Age in this region, the archaeology of Nunalleq is also contributing to our understanding of the wider archaeological framework in Southwest Alaska. Some scholars have suggested that the Thule cultural expansion took the form of a migration that travelled down the coasts of Western Alaska, eventually reaching the Kodiak Archipelago and Gulf of Alaska where ceramics and multiple room houses appeared shortly after AD 1000 (Dumond 1984, 1987). Significant elements of the artifact assemblage from Nunalleq seem to support the idea of Thule cultural expansion onto the Y-K Delta, as does the preliminary DNA analysis of human hair recovered from the site (Raghavan et al. 2014). Other evidence, however, points to significant differences between the Nunalleq assemblage and the contemporaneous (but equally well-preserved) collection from the Karluk One site (KAR-001), occupied by Yup'ik-speaking Suqpiak peoples on the western coast of Kodiak Island (Jordan and Knecht 1988; Knecht 1995; Steffian et al. 2015). The clear cultural relationship between precontact Yup'ik and Alutiiq/Suqpiak peoples is evidenced by similar religious and ceremonial artifacts found at the sites, as well as game pieces and hunting technology. However, the stylistic differences are great enough to suggest that their common ancestral origins and the spread of Thule culture may in fact be separated in time and may well be different issues. Robert Shaw (1983, 356) has pointed out the fact that late prehistoric sites over vast areas of the Bering Sea have been labelled as Thule despite the fact that Western Thule remains essentially an undefined culture archaeologically. The Thule signal at Nunalleq is very clear, but so is a preexisting Norton cultural foundation with deep roots in Southwest Alaska. These debates highlight the problems of equating archaeologically observable cultural shifts with simplistic models of population



migrations and/or replacements, and the challenges of integrating genetic evidence for population histories and origins with cultural evidence for group behaviours and shared identities.

## Concluding Remarks

Excavations at Nunalleq have yielded an unparalleled assemblage, and permitted new and nuanced insights into the Yup'ik past and the prehistory of the wider region. The community-based nature of the project has not only directly facilitated the research—archaeological fieldwork would be neither possible nor desirable without the support of the local community in Quinhagak—but has also greatly enriched it. Similarly, our investigations at Nunalleq have highlighted not only the value of the products of archaeological research but also the inherent value of the archaeological process itself for building the capacities of both community partners and academic stakeholders (Hillerdal, Knecht, and Jones 2019; Britton and Hillerdal, this volume). Western academic and Yup'ik ways of knowing are both shaping the interpretation of material from Nunalleq, resulting in new synthetic perspectives and standards of archaeological practice (Hillerdal, Knecht, and Jones 2019). Archaeological artifacts as tangible remains of the past have a central role in reinforcing cultural identities (Matthews 2007, 288), and with a true collaboration and power sharing, communities can reconnect with the past and regain control of their cultural narrative.

Beyond the professional literature, the Nunalleq project continues to generate outcomes that benefit the Quinhagak and wider Yup'ik community. There have been a wide range of educational and public outreach programs and materials aimed at the local village and culture area as well as national and international audiences. A *National Geographic Magazine* article (Williams 2017) was followed by a public presentation at National Geographic headquarters in Washington, DC, as well as by a National Geographic Society sponsored “Photo Camp” to encourage youth in Quinhagak to tell their own stories through photography.

In 2020 the society produced a film on storytelling through photography in the village, featuring interviews with local participants in the Nunalleq project. A short film about the project, *Children of the Dig* (Branstetter 2018), was widely shown in state and national film festivals. An interactive computer-based learning package called Nunalleq: Stories from the Village of Our Ancestors was narrated by both Quinhagak residents and archaeologists and distributed for use throughout the Lower Kuskokwim school district (Watterson 2019). The Nunalleq Culture and Archaeological Center, built to house the collections, has become a major asset for Quinhagak and the surrounding region. It is used as a venue to teach traditional Yup'ik arts and



skills, often incorporating objects in the collection, as in a Smithsonian Arctic Studies Center–sponsored grass basketry workshop (Crowell 2019). The center is also used for Yup’ik dancing and song, which has been reintroduced in Quinhagak after a hiatus of more than a century by the generation of young people that has grown up with the Nunalleq project. Further afield, a long essay describing the project, “In Quinhagak,” by well-known Scottish writer Kathleen Jamie (2020) was read on BBC Radio 4 to a British and international audience. The Nunalleq project has also figured into a wide range of media projects that have drawn public attention to the impact of climate change on archaeological sites in the North. Through this media attention the voices of the people of Quinhagak are now quite literally heard around the world.



**Figure 5.** Quinhagak youth at the Nunalleq Culture and Archaeology Center, 2019.

In Quinhagak, direct engagement with Yup’ik cultural heritage has provided new opportunities and rekindled traditional ways of sharing and teaching intergenerational knowledge. As changing environmental conditions



**Figure 6.** Wooden artifacts being conserved at the Nunalleq Culture and Archaeology Center.



**Figure 7.** The Nunalleq Culture and Archaeology Center in Quinhagak, Alaska, 2019.

have jeopardized traditional subsistence practices in the Arctic, the deep-rooted connections to the land and tradition are also threatened. While the damage to archaeological sites like Nunalleq are casualties of modern climate change, the research and community engagement there has also provided the tools for mediating of some of its effects (Britton and Hillerdal, this volume). In the summer of 2018, the bulk of the collection of artifacts recovered from the site, initially studied and conserved in Aberdeen, Scotland, was returned to the newly constructed Nunalleq Culture and Archaeology Center in Quinhagak, where a conservation lab has been operational since 2017 (Figure 6 and 7). Collections of grass basketry and leather required further conservation treatment, with return scheduled for 2020. Like the fieldwork, new research in this analytical phase of the project will be undertaken in constant consultation with community Elders and tradition bearers. While advanced scientific analysis of biological and ecological archives will continue to be facilitated by specialist laboratories around the world, it is only fitting that the first detailed analysis of precontact Yup'ik material culture will take place only a few miles from where it was recovered, with and among the descendant community.

## References

- Ameen, C., T. Feuerborn, S. Brown, A. Linderholm, A. Hulme-Beaman, O. Lebrasseur, M. Sinding, et al. 2019. "Specialized Sledge Dogs Accompanied Inuit Dispersal across the North American Arctic." *Proceedings of the Royal Society Biological Sciences* 286, no. 1916. <https://doi.org/10.1098/rspb.2019.1929>.
- Bain, A.L. 2004. "Irritating Intimates: The Archaeoentomology of Lice, Fleas and Bedbugs." *Northeast Historical Archaeology* 33: 81–90.
- Barker, J.H., and R. Barker. 1993. *Always Getting Ready / Upterrlainarluta: Yup'ik Eskimo Subsistence in Southwest Alaska*. Seattle: University of Washington Press.
- Branstetter, Joshua, dir. 2018. *Children of the Dig*. Anchorage, AK: Branstetter Film.
- Bresciani, J., N. Haarløv, P. Nansen, and G. Møller. 1989. "Head Lice in Mummified Greenlanders from A.D. 1475." In *The Mummies from Qilakitsoq: Eskimos in the 15th Century*, edited by J.P.H. Hansen and H.C. Gulløv. Copenhagen: Meddelelser om Grønland, Man & Society.
- Britton, K., R.A. Knecht, O. Nehlich, C. Hillerdal, R.S. Davis, and M.P. Richards. 2013. "Maritime Adaptations and Dietary Variation in Prehistoric Western Alaska: Stable Isotope Analysis of Permafrost-Preserved Human Hair." *American Journal of Physical Anthropology* 151: 448–61.
- Britton, K., E. McManus-Fry, O. Nehlich, M.P. Richards, P.M. Ledger, and R.A. Knecht. 2018. "Stable Carbon, Nitrogen and Sulphur Isotope Analysis of Permafrost Preserved Human Hair from Rescue Excavations (2009, 2010) at the Precontact Site of Nunalleq, Alaska." *Journal of Archaeological Science* 17: 950–63.
- Crowell, A. 2019. "Renewing an Ancestral Art at Quinhagak: A Smithsonian Community Collaboration." *Anchorage Museum Journal*, August 27, 2019.



- Dumond, D.E. 1969. "Prehistoric Pottery of Southwestern Alaska." *Anthropological Papers of the University of Alaska* 14:19–42.
- . 1984. "Prehistory of the Bering Sea Region." In *Arctic*, edited by D. Dama. Washington, DC: Smithsonian Institution Press.
- . 1987. *The Eskimos and Aleuts*. Rev. ed. London: Thames and Hudson.
- Dupre, W. 1978. *Yukon Delta Coastal Processes Study: Annual Report. Environmental Assessment of the Alaska Continental Shelf*, vol. 11, *P.I. Reports for the Year Ending March, 1978*. Boulder, CO: Environmental Research Labs.
- Farrell, T., P. Jordan, K. Taché, A. Lucquin, K. Gibbs, A. Jorge, K. Britton et al. 2014. "Specialized Processing of Aquatic Resources in Prehistoric Alaskan Pottery? A Lipid Residue Analysis of Ceramic Sherds from the Thule-Period Site of Nunalleq Alaska." *Arctic Anthropology* 51, no. 1: 86–100.
- Fienup-Riordan, A. 2007. *Yuungnaqpiallerput / The Way We Genuinely Live: Masterworks of Yup'ik Science and Survival*. Seattle: University of Washington Press.
- Fienup-Riordan, A., and A. Rearden. 2012. *Ellavut / Our Yup'ik World and Weather: Continuity and Change on the Bering Sea Coast*. Seattle: University of Washington Press.
- . 2016. *Anguyiim Nalliini / Time of Warring: The History of the Bow and Arrow Wars in Southwest Alaska*. Anchorage: University of Alaska Press.
- Fienup-Riordan, A., A. Rearden, and M. Knecht. 2015. "Irr'inarqellriit / Amazing Things: Quinhagak Elders Reflect on Their Past." *Alaska Journal of Anthropology* 13, no. 2: 37–71.
- Fitzhugh, W.W., and S.A. Kaplan. 1982. *Inua: Spirit World of the Bering Sea Eskimo*, Washington, DC: Smithsonian Institution Press.
- Fletcher, I. 1994. "A Tale of Hair, Wigs and Lice." *Egyptian Archaeology* 5: 31–33.
- Forbes, V., and D. Sikes. 2018. "A Survey of Beetles (Coleoptera) from the Tundra Surrounding the Nunalleq Archaeological Site, Quinhagak, Southwestern Alaska." *Biodiversity Data Journal* 6: e22788.
- Forbes, V., K. Britton, and R. Knecht. 2015. "Preliminary Archaeoentomological Analyses of Permafrost-Preserved Cultural Layers from the Pre-Contact Yup'ik Eskimo Site of Nunalleq, Alaska: Implications, Potential and Methodological Considerations." *Environmental Archaeology* 20, no. 2: 158–67.
- Forbes, V., P. Ledger, D. Cretu, and S. Elias. 2019. "A Sub-Centennial, Little Ice Age Climate Reconstruction Using Beetle Subfossil Data from Nunalleq, Southwestern Alaska." *Quaternary International*, corrected proof available online July 8, 2019. <https://doi.org/10.1016/j.quaint.2019.07.011>.
- Funk, C. 2010. "The Bow and Arrow War Days on the Yukon-Kuskokwim Delta of Alaska." *Ethnohistory* 57, no. 4: 523–69.
- Gigleux, C., V. Grimes, T. Tütken, R. Knecht, and K. Britton. 2019. "Reconstructing Caribou Seasonal Biogeography in Little Ice Age (late Holocene) Western Alaska Using Intra-Tooth Strontium and Oxygen Isotope Analysis." *Journal of Archaeological Science* 23. <https://doi.org/10.1016/j.jasrep.2017.10.043>.
- Gilbert, M.T.P., T. Kivisild, B. Grønnow, P.K. Andersen, E. Metspalu, M. Reidla, E. Tamm et al. 2008. "Paleo-Eskimo mtDNA Genome Reveals Matrilineal Discontinuity in Greenland." *Science* 320, no. 5884: 1787–89.

- Girling, M. 1984. "Eighteenth Century Records of Human Lice (Phthiraptera, Anoplura) and Fleas (Siphonaptera, Pulicidae) in the City of London." *Entomologist's Monthly Magazine* 120: 207–10.
- Gleeson, P.F. 1980. *Ozette Woodworking Technology*. Pullman, WA: Washington State University.
- Golden, H. 2015. *Kayaks of Alaska*. Portland, OR: White House Grocery Press.
- Helgason, A., G. Pálsson, H.S. Pedersen, E. Angulalik, E.D. Gunnarsdóttir, B. Yngvadóttir, and K. Stefánsson. 2006. "mtDNA Variation in Inuit Populations of Greenland and Canada: Migration History." *American Journal of Physical Anthropology* 130, no. 1: 123–34.
- Hillerdal, C., R. Knecht, and W. Jones. 2019. "Nunalleq: Archaeology, Climate Change and Community Engagement in a Yup'ik Village." *Arctic Anthropology* 56, no. 2: 4–27.
- Hollesen, J., M. Callanan, T. Dawson, R. Fenger-Nielsen, T.M. Friesen, A.M. Jensen, A. Markham, V.V. et al. 2018. "Climate Change and the Deteriorating Archaeological and Environmental Archives of the Arctic." *Antiquity* 92, no. 363: 573–86.
- Jamie, K. 2019. *Surfacing*. New York: Penguin Books.
- Jorge, A., N.S. Muller, and R. Knecht. 2015. "Potting in the Subarctic: Ceramic Technological Strategies Among Hunter-Fisher-Gatherers at Nunalleq, Alaska." Presented at the 13th European Meeting of Ancient Ceramics, September 24–26, 2015, Athens.
- Jordan, R., and R. Knecht. 1988. "Archaeological Research on Western Kodiak Island, Alaska: The Development of Koniag Culture." In *Late Prehistoric Development of Alaska's Native People*, edited by R. Shaw, R. Harrit, and D. Dumond, 225–306. Aurora: Alaska Anthropological Association Monograph series no.3.
- Knecht, R. 1995. "Late Prehistory of the Alutiiq People." PhD diss., Bryn Mawr College.
- Kowta, M. 1963. "Old Togiak in Prehistory." PhD diss., University of California.
- Ledger, P.M. 2017. "Are Circumpolar Hunter-Gatherers Visible in the Paleoenvironmental Record? Pollen-Analytical Evidence from Nunalleq, Southwestern Alaska." *The Holocene* 28, no. 3. <https://doi.org/10.1177/0959683617729447>.
- Ledger, P.M., V. Forbes, E. Masson-MacLean, C. Hillerdal, W.D. Hamilton, E. McManus-Fry, A. Jorge, K. Britton, and R.A. Knecht. 2018. "Three Generations under One Roof? Bayesian Modelling of Radiocarbon Data from Nunalleq, Yukon-Kuskokwim Delta, Alaska." *American Antiquity* 83, no. 3: 505–24. doi: 10.1017/aaq.2018.14.
- Ledger, P., V. Forbes, E. Masson-MacLean, and R. Knecht. 2016. "Dating and Digging Stratified Archaeology in Circumpolar North America: A View from Nunalleq, Southwestern Alaska." *Arctic* 69, no. 4: 378–90.
- Masson-MacLean, E. 2018. "Animals, Subsistence and Society in Yup'ik Prehistory." PhD diss., University of Aberdeen.
- Masson-MacLean, E., C. Houmard, K. Dobney, I. Sidéra, R. Knecht, and K. Britton. 2019. "Pre-Contact Adaptations to the Little Ice Age in Southwest Alaska: New Evidence from the Nunalleq Site." *Quaternary International*, corrected proof available online May 3, 2019. <https://doi.org/10.1016/j.quaint.2019.05.003>.
- Masson-MacLean, E., E. McManus-Fry, and K. Britton. 2020. "The Archaeology of Dogs at the Precontact Yup'ik Site of Nunalleq, Western Alaska." In *Dogs: Archaeology beyond Domestication*, edited by Brandi Bethke and Amanda Burt, 72–101. Gainesville: University of Florida Press.

- Masson-MacLean, Julie, Ana Jorge, and R. Knecht. 2018. "Réponse collaborative à la conservation de poteries préhistoriques arctiques: Défis et premiers résultats." *XXIX<sup>es</sup> Journées des restaurateurs en archeology*. Conservation-restauration des biens culturels. Cahier technique n°23, ARAAFU, Paris.
- Matthews, C.N. 2007. "History to Prehistory: An Archaeology of Being Indian in New Orleans." *Archaeologies: The Journal of the World Archaeological Congress* 3, no. 3: 271–95.
- McManus-Fry, E.T. 2015. "Pre-Contact Ecology, Subsistence and Diet on the Yukon Kuskokwim Delta: An Integrated Ecosystem Approach to Pre-Contact Arctic Lifeways Using Zooarchaeological Analysis and Stable Isotope Techniques." PhD diss., University of Aberdeen.
- McManus-Fry, E., R.A. Knecht, K. Dobney, M.P. Richards, and K. Britton. 2018. "Dog–Human Dietary Relationships in Yup'ik Western Alaska: The Stable Isotope and Zooarchaeological Evidence from Pre-Contact Nunalleq." *Journal of Archaeological Science* 17: 964–72. <https://doi.org/10.1016/j.jasrep.2016.04.007>.
- Mossolova, A., and R. Knecht. 2019. "Bridging Past and Present: A Study of Pre-Contact Yup'ik Masks from the Nunalleq Site, Alaska." *Arctic Anthropology* 56, no. 2: 18–38.
- Nelson, Edward W. 1899. "The Eskimo about Bering Strait." In *Eighteenth Annual Report of the Bureau of American Ethnology 1896–97*. Washington, DC: Government Printing Office.
- Nowak, M. 1982. "The Norton Period of Nunivak Island: Internal Change and External Influence." *Arctic Anthropology* 19, no. 2: 75–91.
- Oswalt, Wendell H. 1952. "Archaeology of Hooper Bay Village, Alaska." *Anthropological Papers of the University of Alaska* 1, no. 1: 47–91.
- Parker, G. 2013. *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century*. New Haven, CT: Yale University Press.
- Raghavan, M., M. DeGiorgio, A. Albrechtsen, I. Moltke, P. Skoglund, T. Korneliussen, B. Gronnøw, et al. 2014. "The Genetic Prehistory of the New World Arctic." *Science* 345, no. 6200. doi: 10.1126/science.1255832.
- Rearden, A., and A. Fienup-Riordan. 2013. *Erinaput Unguvaniartut/So Our Voices Will Live: Quinbagak History and Oral Traditions*. Fairbanks: Calista Elders Council and the Alaska Native Language Center, University of Alaska Fairbanks.
- Saillard, J., P. Forster, N. Lynnerup, H.-J. Bandelt, and S. Nørby. 2000. "mtDNA Variation among Greenland Eskimos: The Edge of the Beringian Expansion." *American Journal of Human Genetics* 67, no. 3: 718–26.
- Shaw, R.D. 1983. "The Archaeology of the Manokinak Site: A Study of the Cultural Transition between Late Norton Tradition and Historic Eskimo." PhD diss., Washington State University.
- Steffian, A., M. Leist, S. Haakanson, and P. Saltonstall, eds. 2015. *Kal'unek—from Karluk. Kodiak Alutiiq History and the Archaeology of the Karluk One Site*. Alutiiq Museum and Archaeological Repository, Kodiak, AK.
- Steffian, A., and P. Saltonstall. 2001. "Markers of Identity: Labrets and Social Organization in the Kodiak Archipelago, Alaska." *Alaska Journal of Anthropology* 1, no. 1: 1–27.
- Tennant, E., and J. Bitar. 1995. *Yupik Lore: Oral Traditions of an Eskimo People*. N.p.: Lower Kuskokwim School District.

- Thomsen, C., and J. Thomsen. 1981. "Archaeological Findings from Saglek Bay, 1981." In *Archaeology in Newfoundland and Labrador 1981*. Annual report no. 2, 5–31. Historic Resource Division, Government of Newfoundland and Labrador.
- Watterson, Alice. 2019. "An Archaeologist in Alaska: How Working with a Yup'ik Community Transformed My View of Heritage." *The Conversation*, July 4, 2019. <http://theconversation.com/an-archaeologist-in-alaska-how-working-with-a-yupik-community-transformed-my-view-of-heritage-118953>.
- Williams, A.R. 2017. "Alaska Thaw Threatens—and Reveals—a Culture's Artifacts." *National Geographic Magazine*, April 2017.