Études Inuit Studies

The Fabric of Basketry: Initial Archaeological Study of the Grass Artifacts Assemblage from the Nunalleq Site, Southwest Alaska

frLe tissu de la vannerie : Étude archéologique initiale de l'assemblage d'artefacts en herbe du site Nunalleq, sud-ouest de l'Alaska

Julie Masson-MacLean, Edouard Masson-MacLean et Rick Knecht

Volume 43, numéro 1-2, 2019

Le passé dans le présent yup'ik : Archéologies du changement climatique dans l'ouest de l'Alaska
The Past in the Yup'ik Present: Archaeologies of Climate Change in Western Alaska

URI : https://id.erudit.org/iderudit/1072715ar
DOI : https://doi.org/10.7202/1072715ar

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Éditeur(s)

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

ISSN

0701-1008 (imprimé)
1708-5268 (numérique)

Découvrir la revue

Citer cet article

Masson-MacLean, J., Masson-MacLean, E. & Knecht, R. (2019). The Fabric of Basketry: Initial Archaeological Study of the Grass Artifacts Assemblage from the Nunalleq Site, Southwest Alaska. *Études Inuit Studies*, *43*(1-2), 85–105. https://doi.org/10.7202/1072715ar

Résumé de l'article

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The Fabric of Basketry: Initial Archaeological Study of the Grass Artifacts Assemblage from the Nunalleq Site, Southwest Alaska

Julie Masson-MacLean[i], Edouard Masson-MacLean[ii], and Rick Knecht[iii]

ABSTRACT

More than two thousand archaeological grass artifacts dating from the fifteenth to the seventeenth century have been recovered from Nunalleq (GDN-248), an archaeological site located near the village of Quinhagak, southwest Alaska, in eight seasons of fieldwork at the site. This growing collection of basketry and cordage provides unprecedented insights on the use of grass artifacts in precontact Yup'ik households. Permafrost soils have preserved this assemblage astonishingly well, with objects made from grass blades and roots. Here we present the results of a preliminary study of these rarely encountered artifacts, based on the data recorded in the course of conservation work.

KEYWORDS
Alaska, archaeology, basketry, grass, weaves, Yup'ik

RÉSUMÉ

Le tissu de la vannerie : Étude archéologique initiale de l'assemblage d'artefacts en herbe du site Nunalleq, sud-ouest de l'Alaska

Plus de 2000 artefacts archéologiques en herbe datant du XV[e] au XVII[e] siècle ont été retrouvés à Nunalleq (GDN-248), un site archéologique situé à proximité du village de Quinhagak, au sud-ouest de l'Alaska, au cours de huit saisons de fouilles archéologiques. Cette collection grandissante de vanneries et cordage apporte un éclairage inédit sur l'utilisation d'artefacts en herbe en contexte domestique pour la période Yup'ik précontact. Le pergélisol a assuré une excellente et incroyable préservation de cet assemblage, contenant des objets fabriqués à partir de brins d'herbe et de racines. Nous présentons ici les résultats d'une étude préliminaire de ces artefacts rarement rencontrés, effectuée à partir des données acquises au cours du travail de conservation.

MOTS-CLÉS
Alaska, archéologie, vannerie, herbe, mode d'entrecroisements, Yup'ik

i. Department of Archaeology, University of Aberdeen, Aberdeen, Scotland, United-Kingdom. julie.masson-maclean@abdn.ac.uk
ii. Department of Archaeology, University of Aberdeen, Aberdeen, Scotland, United-Kingdom. edouard.masson-maclean@abdn.ac.uk
iii. Department of Archaeology, University of Aberdeen, Aberdeen, Scotland, United-Kingdom. r.knecht@abdn.ac.uk

Until the first half of the twentieth century, grass was an important resource in the Yukon–Kuskowhim (Y–K) Delta, southwest Alaska, and was routinely utilized for many of the necessities of Yup'ik daily life (Griffin 2009). Basketry, along with other objects, are well represented among the collections gathered and recorded by nineteenth- and twentieth-century ethnographers (Nelson 1899; Lantis 1946; Oswalt 1957; VanStone 1967). This record has since been richly supplemented by the contributions of Elders and tradition bearers, in collaboration with anthropologists (e.g., Fienup-Riordan 2005, 147–49; Fienup-Riordan 2007, 217–43).

At the precontact Yup'ik site of Nunalleq (GDN-248)—the remains of a sod house dating to the sixteenth/seventeenth century and located on the Bering Sea coast in the Y–K Delta—the grass assemblage rescued comprises a wide range of functional and decorative objects. Baskets, mats, cordage, and other items were excavated inside and around sod structures at the site, and they form the largest archaeological grass assemblage ever recovered. These artifacts have been astonishingly well preserved due to permafrost soils. They provide valuable insights into precontact Yup'ik household inventories, but also into basketry techniques and styles. Caution, care, and respect for these artifacts, from recovery in the field to conservation and analysis, have been practiced with the aims of both long-term preservation and full realization of their informative potential. This article is based on preliminary analysis of 1,283 grass fragments selected from a total of about 2,000 grass artifacts recovered during excavations from 2012 to 2015. Approximately 1,000 other grass artifacts from the 2017–2018 field seasons are still in earlier stages of the conservation and analytical process.

Background: Grass in Yup'ik Culture

Grass is made up of parallel cellulose fibres that run along the length of the plant and which are in turn composed of coiled microfibrils bound together by a cementing matrix. This fibrous structure provides strength and flexibility, but grass may be easily split along its length by separating the long parallel fibres (Florian, Kronkright, and Norton 1990). Yup'ik weavers distinguish blades of grass as being "male" (*tugglugpiit*) or "female" (*can'get*) and use the flexible female blades over the hard, male blades that carry seeds for twining basketry (Fienup-Riordan 2007, 26, 218, 226). Historically, certain grass species were preferred among a huge range of species available (see Table 1), and, with their long strands, the soft and pliable coarse grasses were the most extensively used (Fienup-Riordan 2007; Crowell and Kay 2014, 39). Yup'ik weavers would have taken advantage of the different properties of the grass species and the constituent parts of these plants for the making process and specific basketry uses. Traditionally, women were responsible for collecting

and curing (drying) the grass. Large quantities of blades were cut at the base and transported in a basket to avoid damage; this was a time-consuming and laborious task that was done every fall when the fully grown grasses were wilted and turned white (Lee 2004; Fienup-Riordan 2007, 218, 226, 242; Fienup-Riordan, Rearden, and Knecht 2015, 55; Eva Malvich, pers. comm. 2018). In the Aleutian Islands, where grass use and basketry may be slightly different, grass was harvested, spread, and aerated for as long as a couple of months until they turned white. The blades were then sorted in three groups: the innermost blades (which are soft and white) were kept for wefts; the third blades for warps; the second blades in either pile depending on their condition; and the remaining coarse outer blades either discarded or woven in small bundles to make mats (Crowell and Kay 2014, 42). Following collection and/or aeration, the piles were tied into neat bundles and hung for further drying. This process allowed for the grass to keep for years in good storage and to be ready for use when required. Women would gather a huge supply to make all the basketry needed for their families, and retain extra supplies to last through periods of less favourable weather and grass growth (Fienup-Riordan 2007, 242; Crowell and Kay 2014, 42). Samples of *taperrnat* (rye grass) and *iitat* (cotton grass) as reference materials in this study were collected near the site during summer 2018 with the help of Eva Malvich, former director of the Yupiit Piciryarait Cultural Center in Bethel, as these were likely to have been used in Nunalleq basketry.

Basketry is a general term that refers to the process of weaving fibrous and pliable material into two- or three-dimensional objects. In Yup'ik, it is called *tupigat* ("things that are twined"). In this article, we have used terms from the following literature to describe the fabrics of Nunalleq basketry: Norton (1990), Wendrich (1994), and Fienup-Riordan (2007). For the Nunalleq assemblage, the woven elements include grass leaves, stems, and roots. These elements can be twisted in an *S* or *Z* direction. Elements are either active or passive, depending on whether they are worked moving around the other elements or not. The wefts (*keluut*) are the active elements that are twined around the passive warps (*tegunret*) that are laid parallel to each other. These parallel elements form a large group with an identical function that is called a set of elements. This set can have an open construction, when interworked elements have space between them, or a closed construction, when they are packed tightly together (see Figure 1).

Table 1. Different types of grasses used by Yup'ik People in the Y-K Delta.

English translation	Yup'ik name	Latin name	Comments
Blades of grass (general term)	*Can'get, evek/ evget*		Generic term for grass; *can'get* (female grasses) and *tugglugpiit* (male grasses) are *aipangqertut* (partners)
Blue grass	*Euget*	*Poa* spp.	Fine grass used for boot lining and nappies
Coarse grass	*Kelugkat*		Threading grass (translates as "those to be used as stitches") that grows along rivers and lakes
Coarse seashore grass (wild rye grass)	*Taperrnat*	*Elymus mollis*	Grass used for baskets and menstrual pads; used as *kelugat* on Nelson Island
Cottongrass	*Melquruaq*	*Eriophorum* spp.	Stems used for boot soles
Tall cottongrass	*Iitat, Anlleq*	*Eriophorum angustifolium*	Reeds and stems used for baskets and mats
Flat seashore grass	*Inaqacit*		Only used mixed with *taperrnarrluut* to string fish, grows with *taperrnat*
Poor quality seashore grass	*Taperrnarrluut*		Mixed with *inaqacit* to string fish
Sedges		*Carex* spp.	Grass used for boot lining and socks
Water weeds	*Nuyaruat*		Long and soft grass (translates as "imitation of hair") used for tissues and towels
Wheat grass	*Qayikvayiit*	*Agropyron* sp.	

Sources: Compiled from Fienup-Riordan 2007, 217–43; Griffins 2009, 90–93.

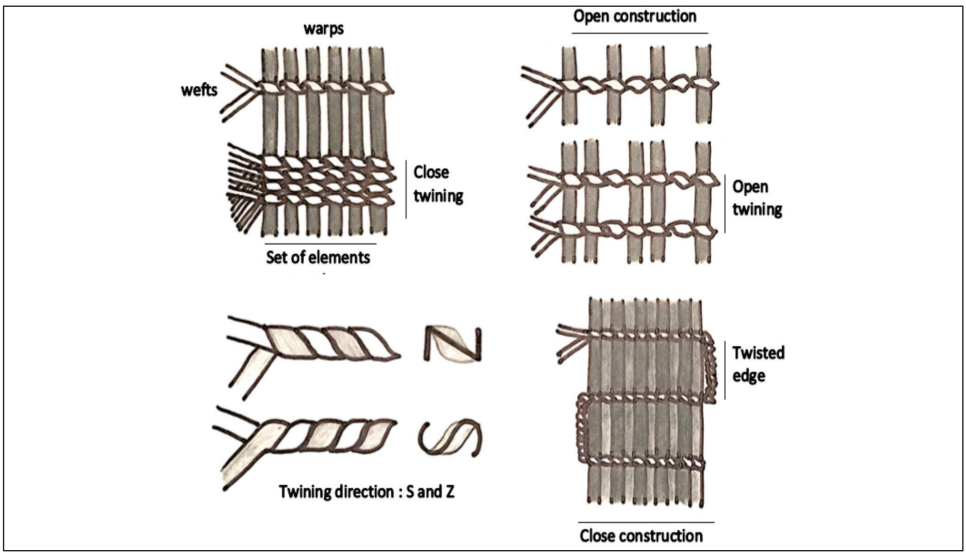

Figure 1. Diagram of the technical terms used in this study, adapted from Norton (1990) and Wendrich (1994) © J. Masson-MacLean.

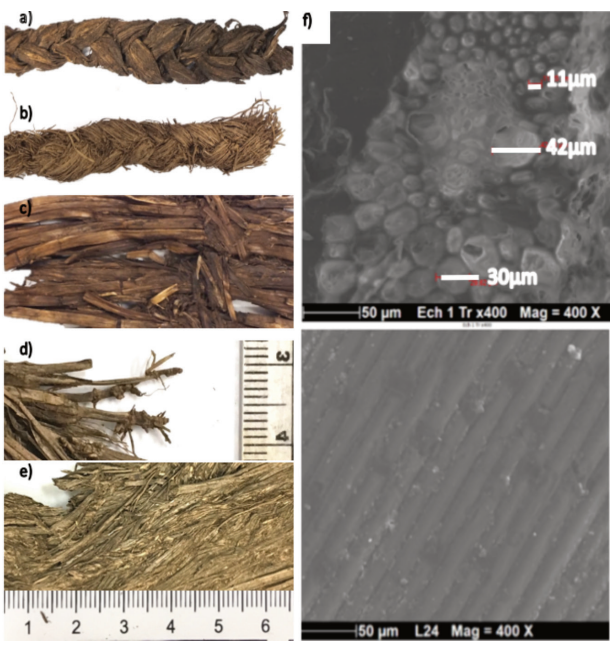

Figure 2. Parts of plants observed from the Nunalleq artifacts: (a) grass leaves, (b) roots, (c) stems, (d) roots attached to the stems, (e) seeds © J. Masson-MacLean, and (f) SEM images of grass leaves: transversal (top) and longitudinal (bottom) sections © C. Pelé-Meziani and Arc'Antique / Institut des Matériaux de Nantes.

Experience in how to gather, dry, and work different kinds of grasses was an essential skill for Yup'ik women, who passed on their knowledge to girls at a young age (Fienup-Riordan 2007, 242; Crowell and Kay 2014, 39). Men would have had some knowledge too (Fienup-Riordan 2007, 226).

The Grass Artifacts at Nunalleq: Manufacturing Techniques Observed

In this section, we present a description of the fabric of the grass artifacts and an overview of the different techniques in use at Nunalleq. Different plant parts have been observed from the artifacts: long blades of grass leaves, roots, stems, stems with roots attached, and seeds (see Figure 2). At Nunalleq, grass was twined in a variety of weaves, but also braided, bundled up, and sometimes coiled.

Twining

The twining technique and its learning

Twining is the main technique in use at Nunalleq as it accounts for 812 fragments (55%) of the grass basketry assemblage. In twining, the set of elements is passive and worked around by a pair of active wefts. As the twining goes on, one weft goes in front of the set of elements and the other goes behind; then they swap position, locking a warp in place. The rows formed by the active pairs are spaced in an open twining, tightly packed in a close twining, and variations occur, as we will see. In a basket or a mat, the set of passive elements is usually vertical and the active elements are horizontal (see Figure 1).

Weavers used to twine mats, baskets, and clothing, among others, with a great variety of weaves. They learned from watching and trying (Fienup-Riordan 2007, 226) and "young girls routinely twined miniature grass mats and bags as practice pieces and used them when playing with their doll families" (Annie Blue in Fienup-Riordan 2007, 228). The direction of twining usually indicates if the weaver was left- or right-handed (Theresa Moses in Fienup-Riordan 2007, 224). Eva Malvich told the story of a girl learning to weave basketry facing her grandmother so the girl was twining in the opposite direction; however, she would ask people to face her when teaching her skill and they would twine in the original direction, like her grandmother (pers. com. 2018).

Weaves observed in the Nunalleq collection

Weaving styles can have practical and/or aesthetic functions. A loose weave enables air circulation and excess oil to drip free, thus helping to prevent spoilage in fish and other foods, while also allowing an opportunity to rinse

foods such as shellfish and berries in fresh water (Osgood 1970, 144; Crowell and Kay 2014, 40). A tight weave would be preferred to keep basket contents secure or reinforce a vulnerable part of the basket.

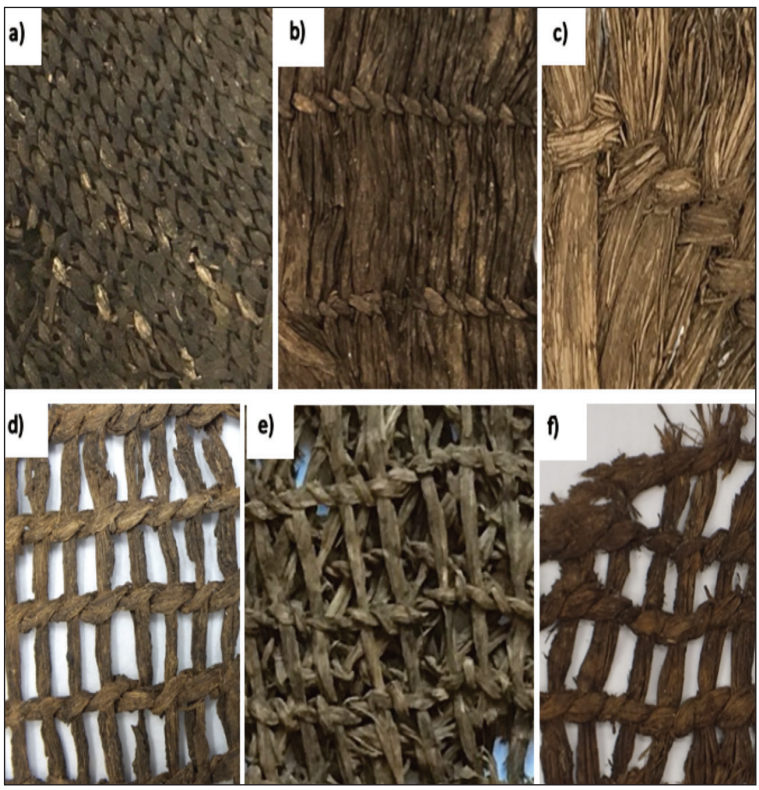

Figure 3. The five weaving types identified at Nunalleq: (a) weave I, (b) weave II, (c) weave III, (d) weave IV, (e) weave V (1/extra/), (f) weave V (2/extra/) © J. Masson-MacLean.

Often weaves are named after their twining, as in the online collections databases from the Anchorage Museum, the Smithsonian Institution, and the Burke Museum, for example: "closely-twined," "compact twining," and "plain twining" describe the same weave, and "open twining" refers to different types of weaving. Similarly, Adavasio (2010) distinguished "closed twining," "open twining," and "open and closed twining." Crowell and Kay (2014) described the "open stitch" of an "open weave" basket as "parallel (I), triangular (Δ), cross shaped (x), or horizontal twining (=)," but only parallel sets of elements have been used at Nunalleq. Corey's (1995) weaves numbering system unified his predecessors' terminologies, but applies to techniques used in Tlingit and Haïda basketry. Given the variety of terminologies, it was decided to use

Wendrich's (1994) efficient approach in describing the elements involved in the fabric of basketry in order to differentiate several weaving types and to name weaves in the Nunalleq collection by using a combination of numbers from I to V, indicating an increasing degree of openness in the construction of various weaves (see Figure 3).

Weave I is a form of close twining created by a process using two grass wefts going around close grass warps (Figure 3a). The twined rows are densely packed together, hiding the warps. The wefts have a stitch length between 0.3 cm to 0.5 cm. This weave is uncommon at Nunalleq and accounts for only 43 fragments (5.3% of the twined fragments). It includes a tiny basket with a diameter of 5 cm (#4391) and a large unidentified piece with a length of around 40 cm (#1225) that both interestingly carry a coloured decoration. Close twining is called *mallegtat* (Fienup-Riordan 2007, 222).

Weave II is a form of open twining with a set of elements of close construction (Figure 3b). The twined rows are spaced with a distance that can vary within the same object, and ranges from 0.3 cm to 5.5 cm. The stitch length of the wefts is usually below 1 cm but it can reach 3 cm. Open twining is very frequent at Nunalleq accounting for 529 grass fragments (of the 812 twined fragments) and includes mats, baskets, and possible clothing.

Weave III is a form of largely spaced open twining with a set of elements of close construction (Figure 3c). It uses large bundles of grass stems for the warps and wefts, of around 3 cm in width, and the space between two weft lines ranges from 3 cm to 18 cm. Among the 78 fragments in weave III, 10 had smaller wefts and warps, of around 1.5 cm. The large weave III was used for wall mats, with one example of a large basket (#5228).

Weave IV is a form of open twining with a set of elements of open construction (Figure 3d). It uses some spacing between the twining rows and the warps, with a distance between two warps of around the width of one warp or slightly smaller. Space between two weft lines is consistently smaller than for the other weaves and ranges from 0.3 cm to 1 cm. Among the 22 artifacts in this weave, only four have been identified to their type: they are all baskets, with one classified as an *issran* by Elders from Quinhagak during consultations in the field.

Weave V is a form of open twining with a set of elements of open, rhythmic construction (Figure 3e, f). It uses additional weft twists to create different rhythms from weave IV. Examples of sequences of rhythms include the following, where "extra" refers to one extra twist inserted after a warp: 1 extra/ (occurs in 33 fragments, 78.6% of the sequences identified); 2/extra/ (4 fragments, 9.5%); 2/extra/2/extra/2/extra/1/extra/ (1 fragment, 2.4%); 2 extra/3/extra/3/extra/ (1 fragment, 2.4%). The space between two weft lines ranges from 0.2 cm to 5 cm. Among the 89 fragments in weave V, 16 belong to 9 baskets, including 3 complete ones.

Discussion on recording the weaving type

Difficulties of identification challenge the observer and this especially occurs with archaeological objects that may have undergone some loss of material integrity. For that purpose, the numbering system can be customized as required, to help minimize misinterpretation or uncertainties in registering degraded artifacts under a weave or another. For example, 39 fragments that were found to be very degraded were recorded as weave II(alt) for "alterations" to avoid possible misidentification.

Yup'ik names were mentioned when references were found, and it is hoped that weave terminology will be adjusted in culturally appropriate ways as community-based and collaborative research continues (Table 2).

Table 2. Types of weaves found at Nunalleq.

Type of weaves	Nb of fragments	Percentage	Yup'ik name	Comments
Weave I	43	5.3	*Mallegtat* (from malleg-, to be close together)	Name of the weave (Fienup-Riordan 2007, 218, 222)
Weave II*	529	65.1		
Weave III	78	9.6		
Weave IV	22	2.7		
Weave V	89	11	*Ukiqlak/ ukilqaaraat* (from *ukineq*, hole)	Name of the weave/basket (Fienup-Riordan 2007, 223)
Undetermined	51	6.3		
Total twined artifacts	812	100.0		

* Weave II includes a sub-category (alt)

Braiding

Braiding is a technique that uses three (or more) threads crossed over one another to create an object. This technique is often used in cordage but also in basket rims at Nunalleq (see Figures 4 and 5). Simple braids were started by folding in two a bundle of grass material that was then braided (Figure 4g). Braids made with grass leaves have often a flat section compared to the braids made with roots, which are often rounded and show a greater strength and better preservation due to the material, along with higher compaction, density, and general thickness.

Figure 4. Techniques in used at Nunalleq: (a–d) twining, (e–g) braiding, (h–j) bundles, (k) coiling, (l) thread for waterproof sewing © J. Masson-MacLean.

Cordage is the second most common find among the grass assemblage at Nunalleq and accounts for 423 artifacts (41.8%) of different sizes ranging from a few centimetres to a metre; 7 starts of braids and 35 fragments bearing a knot to secure the braid or to bind braided rope fragments together were

recorded. Cordage was reused and knotted to form bigger strands, including long ropes of grass roots used as a dog harness (Masson-MacLean, McManus-Fry, and Britton 2020).

Braided basket rims were also found, and it is possible that single braids made of grass leaves are fragments from rims; this could be assessed by further work comparing the lengths of fragmented braids to the one of the braids forming the rims. Also, six basket rims and mats feature a final row that ends with a braid.

Braiding was used with a different, likely decorative, visual effect too for the making of two delicate braids of three three-threaded braids braided together (Figure 4e). Only one of these braids is complete, finished with a knot; it is of comparable dimensions to another simple braid with a similar knot. They were recovered from room entrances (squares 20, 121) and on a house wall (square 69), and it is possible that they represent necklaces, albeit temporary or even toy ones. In the 2018 season, a complete necklace was recovered with very small articulated bivalve shells woven into it.

Coiling

In coiling, an object is worked outwards from its centre as a passive bundle is stitched or bound upon the round before with a single, active stitch so to grow upon itself in spiral rounds. A coil basket usually starts from its inside, the bundle being secured on itself to form its centre. Called *mingqaat* (from *mingqe-*, to sew) in Yup'ik, coiled basketry was probably traded during the precontact period until it appeared likely through the Inupiat Eskimo from the north in the nineteenth century (Lee 2004, 126). It is by far the most common technique in use by today's Yup'ik weavers, especially for basketry sold commercially.

Only two examples of coiled basketry have been recovered so far from Nunalleq. The first object seems to be a tiny basket or ring that combines a row of twining with a row of coiling. The second is made of two identical parts, opened on both their sides, one side being narrower and slightly pinched on its sides, the other being more opened (Figure 4k). They are coiled on four rows and have an oval shape with the wall bending towards the centre of the narrow opening; the outer rows seem to work as edges due to the nature of the coiled technique and, though the fragments are not complete, no remains of any additional rounds are evident. This grass piece resembles the grass frames of an ethnographic pair of snow goggles from Bristol Bay, made with leather dimmers and a beads bridge (Fienup-Riordan 2007, 230); however, no other materials were recovered with the Nunalleq example.

Grass bundles and threads

A bundle is a collection of grass fibres that are held together. At Nunalleq, bundles account for forty-five fragments (3% of the collection) that have been recovered throughout the excavation. They are of all kind of sizes and shapes, and would have been used for different functions. For example, a bundle of fibres, wrapped over itself, could be raw material in storage and a bundle neatly wrapped with some other grass could possibly be a handle (Figure 4h); a bundle packed on itself, associated with leather, was used for boots insulation (Figure 4j); and a bundle shaped in a triangular ring formed the basis of a lamp holder (Figure 4i). Also, there is one example of grass leaves being used as a thread to waterproof the sewing of leather fragments (Figure 4l).

Grass Artifact Types at Nunalleq and Their Possible Uses

A variety of woven grass materials and techniques were employed at Nunalleq (see "Grass Artifacts at Nunalleq" above); the following section outlines the different types and possible uses of the grass artifacts in the collection. Careful examination of the construction of the artifacts is important as the general visual appearance of different objects can be very similar: for example, twined mats and twined baskets, along with other types of objects such as clothing, share a similar organization in terms of the way their sets of elements are organized. It is often necessary to use other clues beyond just the type of weave to differentiate between and identify these objects.

Baskets

A basket (as opposed to the collective term *basketry*) is a composite vessel composed of a rim, a wall, and a bottom, and may include handles, a strap, or a lid. Rims and bottoms are diagnostic features of baskets if recovered in complete enough condition to not be mistaken for another element—like a part of a mat, as would be a fragment from a basket wall of the same weave for example. We have therefore used these features to identify at least fifty-three basket fragments (3.6% of the total grass assemblage), and we have identified four types of rim treatment (see Table 3, Figure 5).

Baskets with a braided loop rim are the most common and account for more than half of the baskets recovered. They are twined with weave II, weave IV, and weave V, and have approximate heights of around 42 cm and widths of around 32 cm, with one basket (#5636) being 10 cm bigger. Their rim is constructed with perpendicular single braids, made from the warps from the final row of the basket wall, that come to feed one horizontal braid for a single braided rim, or two braids if doubled braided: a pattern of openings is created as a result, hence the loops or "eyes." Depending on the

frequency of the perpendicular braids, and their length, these openings can be large or narrow. In the double braided loop rim, the two parallel, horizontal braids are connected at the perpendicular braids. Loop rims would have a practical function as they allow the use of a drawstring. According to Wassilie Berlin, "grass backpacks with evenly spaced holes twined into their upper edges…could be attached to wooden carrying yokes for hauling heavy loads of caribou meat out of the mountains" (Fienup-Riordan 2007, 228).

Baskets with a braided rim are represented by eight fragments. They are twined in weaves II and V. Their rim is directly fed from the warps of the final row of the basket wall. No complete baskets with a braided rim were recovered, but it was possible to approximate some dimensions for two examples (#3016: H=35cm W~18cm; #2504: H>30cm W=37cm).

Very different from the rest of the grass assemblage, artifact #1225 is the only fragment recovered from a basket with a twined rim, one of the very few using weave I and one of only two examples that include decorative elements. Its rim has rows twined to form squared openings (like a loop rim with narrow openings), followed by three full rows of twining that finish the rim. The decoration is made of alternated stitches of a different colour within a same row. A similar basket called a *tassiitaq* (backpack yoke), would have been used to carry heavy objects or pack meat (Annie Blue and Elena Charles in Fienup-Riordan 2007, 163).

Only two plied rim baskets were found at Nunalleq: a fragmented rim and a large basket twined in weave III with a space between two weft lines of 8 cm. A plied rim is made by folding the end of the warps and using them to feed an edge that finishes the basket.

Finally, three fragments of basket bottoms were recovered with four additional bottoms preserved as part of the more complete baskets. Apart for the tiny basket (#4391), which work-in-progress condition ascertains that it was twined bottom up, it was not possible to determine if the bottoms were the starting or the ending point to build the basket as no sure feature was clearly identified. According to Elders, *issratet* (carrying bags) were twined from bottom up and *naparcilluut* (rigid, upright grass storage baskets) from top to bottom, making the wall narrower at each row until the bottom was closed at its centre, and two braids would be sticking out to form its "legs" (Fienup-Riordan 2007, 223, 226, 227).

Weave II and weave V were mainly used to twine the Nunalleq baskets and they jointly account for forty-one fragments that represent three-quarters of the weaves used (Table 3). Historic examples have been searched for comparison with archaeological remains. If no match was found for weave II, two open-weave grass bags in weave V (1/extra/) called *ukilqaaraat* (from *ukineq*, hole), with rims with large openings, are like the baskets recovered from the Nunalleq site: one is a single braided loop rim basket identified as a small *issran* and used as a backpack; the other one, a large Nunivak utility bag, has a double braided loop rim. Another historic example is a braided rim

basket twined with weave V (2/extra/) that was used to store dried herrings (Fienup-Riordan 2007, 223, 224).

Thousands of *issratet* and *naparcilluut* were made each year. The first ones, lined with pieces of a seal-gut garment, were used to store greens and berries and to carry food and clothing while travelling (Fienup-Riordan 2007, 223–24), and the second ones to store frozen fish (Fienup-Riordan 2007, 226). Some of the baskets found at Nunalleq retained remains of their last contents. During conservation, some fish bones and seeds were found imbricated within the baskets. These contents are consistent with traditional use for fish and berries, although baskets were also used to store other things like personal belongings. Basketry remains were recovered in some concentrations near the north and eastern entrances of the later sod house at the site, with no special distribution regarding their weave or rim types. But it appears that the baskets were used to store food supplies in the passageways of the entrances to the sod house complex (Figure 6a).

Figure 5. Baskets at Nunalleq with a (a) double braided loop rim, (b) and (d) single braided loop rim, (c) braided rim, (e) twined rim, (f) and repeated in (c) basket bottom © J. Masson-MacLean.

Table 3. Types of basket rims and bottoms per weaves found at Nunalleq.

Weaves types	Braided loop rims	Braided rims	Twined rims	Plied rims	Basket bottoms	Undetermined rims	Nb of fragments	Percentage	Comments/ Yup'ik name of baskets associated with the weaves
Undetermined	4*	2					6	11.3	
Weave I			3		1		4	7.5	Tassiitaq (backpack yoke) (Fienup-Riordan 2007, 163)
Weave II	6** 13*	2		1			22	41.5	Naparcilluut (rigid, upright storage baskets) (Fienup-Riordan 2007, 218, 226, 227)
Weave III					1		1	1.9	
Weave IV	1**				1		2	3.8	
Weave V	2** 10*	4			1	1 1#	19	34.0	Ukiqlak/ ukilqaaraat (from ukineq, hole) (Fienup-Riordan 2007, 223) Issran /issratet (carrying bag) (Fienup-Riordan 2007, 218, 223, 224) Artifact #2312 has a diameter of 19 cm estimated from a complete row as its rim is missing
Total fragments	36	8	3	1	4	2	53	100.0	

* single braided loop rims ** double braided loop rims # Issran (no rim preserved)

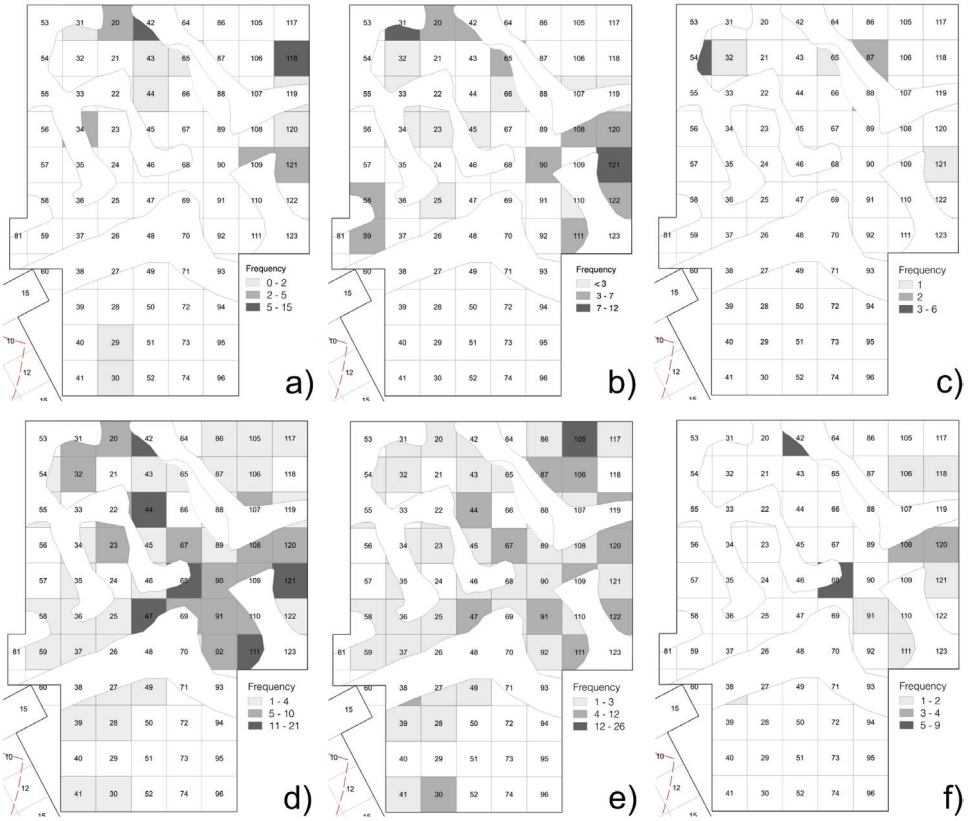

Figure 6. Distribution maps of the (a) baskets, (b) mats twined in weave II, (c) mats twined in weave III, (d) cordage made of grass leaves, (e) cordage made of grass roots, and (f) possible clothing.

Mats

Mats are twined across a chosen length that is defined by four sides: the beginning and ending rows of the mat, and two side-edges. Mat edges can be easily identified in the Nunalleq assemblage from their common diagnostic feature: a twisted edge at the end of a weft line (Figures 1, 4b). Here the wefts are twisted together and brought down the edge of the mat for a variable distance we have called the "space between two weft lines," and then they are worked in the opposite direction across the full width of the mat, all the way to its other edge, where the process is repeated. At the end of the weft row, or just after a twisted edge, the last row of a mat can also end in a braid, with a knot.

There are two occurrences of a frayed edge in the Nunalleq assemblage (Figure 4b). It is a more difficult feature to assess in archaeological objects, though it can come with a reinforcing double row of twining. Some mats were orientated with a frayed outer side and a "side in good condition lain next to

the wall" (Paul John in Fienup-Riordan 2007, 222). The double row of twining can be preserved by itself, but this feature is only diagnostic when used in conjunction with other ones, as above.

Lastly, evidence that a piece of basketry was rolled up is also an indication of the artifact being a mat, though it can be tricky to differentiate collapsed baskets from disturbed rolled up mats. At least one definite example of a rolled mat was found in the assemblage.

These diagnostic features helped to identified 117 mat fragments at Nunalleq, from which 104 were twined using weave II and the rest using weave III.

Grass mats twined in weave II were common in the Nunalleq collection. They have a space between two weft lines ranging from 1 cm to 6 cm. Five artifacts show a double row associated with an ending in a knotted braid, a twisted edge, or a frayed edge. One fragment has an extra twist added to the middle of its twisted edge (SQ111-15167) (Figure 4b), and another one (#2078) carries an extra stitch in the middle of the mat fragment. It is not known yet if these features represent part of a pattern or an owner's mark. Fienup-Riordan (2007, 222) reports that inherited designs were woven by the women into each mat and that the *ikaraliitet* (kayak mats) would carry a mark. These mats were twined with a "smaller mesh…and the ends and sides were twined securely," as they were used to line kayaks, stack fish, and then pull the fish out after fishing (Wassilie Berlin and Theresa Moses in Fienup-Riordan 2007, 222, 239).

Grass mats twined with weave III are much bigger in area and have a space between two weft lines ranging from 6 cm to 15 cm. Mats #3020 and #3021 were found together, creating a combine surface area of about half a square metre. Interestingly, the warps are worked around with two wefts either going around as in twining, or one dividing in two with the other weft coming from below inserted between them to create a braided pattern.

Mat #3015 was identified on site by Quinhagak Elders as an *eviutet*, a grass mat that was used for roof insulation placed between the frame of a sod house and its sod covering. It has its edges twisted and its last row ends with a double row over four warps after which the wefts are braided perpendicularly for the remaining length of the trimmed warps, and knotted. It is almost complete and has a width of 41.5 cm and a length of around 60 cm.

Historically, mats had a variety of other interior and outside uses, including being used as a mattress, bath towel, sled sheet, but also wall lining (*kangciraq*, "loosely twined tarpaulin attached with wooden pegs"), draft barrier for the entrance (*ikirtuqaq*), windbreaks (*asguilitat*, "things that go against a natural force") (Fienup-Riordan 2007, 222–23, 229, 239). The distribution of the mats made using weave III at the Nunalleq site is clearly associated with the wall structure of the later sod house (Figure 6c) while the mats in weave II are scattered everywhere, with a higher concentration near

the north entrance and the east passage way (Figure 6b). During conservation, some small bones from fish and mammals, along with fur remains, were found associated with the mats twined with weave II. Large amounts of soil sediment were especially imbricated within the strands forming the mats of square 87 twined in weave III. This is consistent with the different uses and weaves types associated with the mats, and reflected in the location of the artifacts.

Cordage

Cordage was classified by its material components and mapped. There are 263 cordage fragments made of grass leaves (representing 62.2% of the cordage recovered), 158 fragments of grass root cordage (37.4%), and only 2 fragments of stems (0.5%). Grass cordage in general is common throughout the site; however, cordage made with grass leaves has a higher concentration inside the house and in the passageway, mainly in its eastern section (Figure 6d). On the other hand, cordage made with grass roots predominates in the areas identified as being outside the house (Figure 6e). Further work is required to investigate distribution patterns, but this preliminary data suggests very different uses for cordage made from leaves and roots. Grass root cordage is significantly stronger than that made of leaves and was used in outdoor contexts.

Small and thin grass leave braids were used for a variety of attachments, and a nice example is the lamp holder #2390, a ring made of strands with a diameter of 15 cm that was hung by a braid of grass leaves in the wall of the north entrance of the sod house (square 42, Figure 4i). Large, sturdy ropes had also different kind of uses: "*piirralluk* (braided grass ropes), jump ropes for girls," "dog harness made entirely of grass, including both *kelugkat* and *iitat*…called *sagtet* (gangline and harnesses) for a dog team" (Peter John in Fienup-Riordan 2007, 229). Braided lines were also used to hang tomcod to dry. As John Philip recalled, "Once they were dried, we would remove all the fish heads, leaving the braided grass as is. We never threw away the braided grass but kept it. After freeze-up in fall, when boys wanted to drive dogs, we connected the ends of the grass braids and made them into harnesses" (Fienup-Riordan 2007, 229).

One particularly high concentration of long knotted strands of strong cordage made with roots in the outdoor area (squares 105 and 106, Figure 4f) was associated with human remains, and based on evidence from insect remains, was used in the pre-mortem binding of victims during the attack event on the village (Forbes et al., this volume).

Clothing and insulation

In the cold Arctic, protection and insulation of the body was as important as keeping houses dry and insulated. Being a porous material, grass hosts a lot of air spaces in its structure (Figure 1f; Charlène Pelé-Meziani, pers. comm. 2018) that are responsible for its good insulation properties as air is a poor conductor that slows down heat exchanges. Furthermore, the waxy nature of the grass cuticle is water-repellent so it can prevent water absorption, especially when twined tightly; on the other hand, the open grass capillaries of dry grass can absorb an important quantity of water, especially when kept loose (Norton 1990; Fienup-Riordan 2007, 231–35). People at Nunalleq were aware of and used these properties of the grass material as we saw with the *eviutet* for roof insulation. Grass was also used in clothing but clothing is difficult to distinguish in what is largely a fragmentary assemblage.

Twined parkas, socks, and mittens would have been made using the same twining process as the mats or the baskets in weaves I and II. However, to accommodate the body shape, several extension rows and change of twining direction would have been necessary in, for example, areas around the shoulders, along the sides, or to shape a sock. This would be apparent in the use of multiple extension rows and "embossed" shapes, a change of weave (e.g., from weave I in the bottom part of a sock to weave II in its upper part), and the variations of the space between two weft lines.

For example, find #461 (Figure 4a) had several extension rows and fan-shaped warps distributed on the same side that may be part of a twined parka lining for use under an outer layer of gutskin (Fienup-Riordan 2007, 234–36). Find #5003 is twined with weave II from a plaited edge, and has a 0.3 cm space between two weft lines (Figure 4d). It strongly resembles an ethnographic Kuskokwim mitten liner illustrated by Fienup-Riordan (2007, 232). The fact that it is twined from one edge would exclude it from being a boot liner as these pieces were started from the sole. In winter fish-skin mittens were worn with grass liners as they were waterproof but not warm, and similarly grass liners were used with fish-skin boots for the same reason (Fienup-Riordan 2007, 232). Twined grass liners were called *alliqsiit* and were used with loose grass insoles called *piineq* made with both *iitat* (tall cotton grass) and *kelugkat* (coarse grass). Grass bundles were stuffed into boots to wick perspiration away and keep feet both warm and dry, and to help avoid shrinkage and distortion when drying the boots (Fienup-Riordan 2007, 231–33). One insole of flattened, bundled-up grass leaves was found in situ inside a leather boot (#5619) (Figure 4j).

The insulating and absorbent properties of grass also led to its use for "*iqerrluteng*, a waterproof seam using a running stitch and grass reinforcement" (Fienup-Riordan 2007, 154, 229). Two leather fragments (#2370) in square 53 carry running stitch holes with a "zigzagging" blade of grass that

would have been attached with a sinew thread that didn't preserved (Figure 4l). These remains of a watertight seam used *taperrnat* (coarse seashore grass, Sven Haakanson Jr., pers. comm. 2018). Interestingly, these three grass artifacts and two leather ones possibly relating to clothing were found associated with sod house walls.

Conclusion

The Nunalleq grass assemblage provides us with a first clear look at the variety and ingenuity of utilitarian objects made from grass in precontact Yup'ik households. This collection richly expresses the importance of grass in the deeper past as well as historically in Yup'ik traditional life and culture. This is in accordance with Elder testimonies and stories[1] about the protective and powerful qualities of grass and it is clear that at Nunalleq grass had value and meaning for its practical, reliable, and life-saving properties.

Grass was soft, pliable but strong, warm, protective, even caring. In the song "*Qulitaralrianga*" ("as I sit here and wash my hair") grass is perceived as a woman and the boundaries between them are blurred (Fienup-Riordan 2007, 237); it seems that indeed the fabric of Yup'ik basketry was intrinsically intertwined with women and their lives. Women were responsible for the harvest, processing, and manufacture of basketry for their families, and they learned the necessary skills from a young age. It may well be that the tiny basket recovered was made by a young girl or that a pregnant woman used the mark on the mat for protection against disease or death (Fienup-Riordan 2007, 222). As analysis of the Nunalleq finds continues, grass artifacts will be an important indicator of engendered spaces.

With the large grass assemblage recovered from Nunalleq, we have developed a simple typology rather than trying to shoehorn these weaving techniques into pre-established categories from other culture areas. Continued study will lead to a better understanding of the construction of Yup'ik basketry and diagnostic features useful for interpretation of archaeological grass remains here and elsewhere. As more grass artifacts emerge from thawing sites in the North, continuing improvements in recovery, conservation, and analysis will help make the best use of this little studied but very significant archaeological resource.

1. There are stories, for example, about the young girl who saved herself by holding tight to a single blade of grass (Fienup-Riordan 2007, 236), the giant Uayaran (Fienup-Riordan 2007, 233), and the discontented grass plant (Lee 2004).

Acknowledgements

We thank Eva Malvich for sharing her knowledge and Dr. Aron Crowell and Dawn Biddison for sharing documents and allowing access to his article with Sharon Kay. We thank Charlène Pelé-Meziani and Arc'Antique/Institut des Matériaux de Nantes, who kindly provided the SEM images in Figure 2. Tricia Gillam assisted in the field recovery of some of the larger pieces of woven grass at Nunalleq. We thank Qanirtuuq Inc. and Quinhagak Heritage Inc. for their continued support of the conservation laboratories at the Nunalleq Culture and Heritage Center and in the Nunalleq Project Lab at the University of Aberdeen. Finally, we thank Dr. Kate Britton for proofreading and her useful comments, and our anonymous reviewer for their positive feedback.

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