RESEARCH NOTES

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ARCTIC ALASKA

RESEARCH IN PROGRESS: ASSESSING MARINE RADIOCARBON RESERVOIR EFFECT VARIATION IN GREATER UTQIAĠVIK, ALASKA

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In the summer of 2016, 30 samples of seal and caribou were submitted for radiocarbon dating and stable isotope analysis from archaeological sites in the greater Utqiaġvik, Alaska, area. Specifically, one sample from the Utqiaġvik Site, three from the Nuvuk cemetery, eight from Walakpa, and eighteen from Pingusugruk. The stable isotope analysis and radiocarbon dating was done at the Scottish Universities Environmental Research Centre at the University of Glasgow. This work was funded by a Research Incentive Grant titled 'Estimating ancient Marine Radiocarbon Reservoir Effects to develop better Arctic settlement histories' (PI Anthony Krus and Co-I Derek Hamilton) from the Carnegie Trust for the University of Scotland.

The project goal was to use multiple securely paired radiocarbon samples to assess the variation in marine radiocarbon reservoir effects (MRE) in greater Utqiaġvik, Alaska during the Birnirk and Thule periods. Radiocarbon dates from marine-derived carbon are anomalously old if not corrected for MRE. Modern MRE values from the Alaskan Arctic are highly varied, from several hundred to over a thousand years, due to the extended residence time of 14C in oceanic environments. It is questionable how reflective modern values are of those from the past because changes in upwelling, climate, and ocean currents will inevitably result in changes in local MRE values through time.

The established weighted mean ΔR correction for MRE for Utqiaġvik using known-age historically collected shells is 506 ± 69. The results of this project suggest temporal variation in MRE and a weighted mean ΔR of 411 ± 69 for Birnirk and Thule archaeological materials from the greater Utqiaġvik area.

For the final stages of the project, the ΔR correction values will be further refined with newly developed Bayesian software for calculating DeltaR. A manuscript is currently being drafted that fully presents the methodology and results of the project. Beyond archaeological applications, this new MRE data will be of importance to geo- and marine sciences for calibration radiocarbon dates from shells and foraminifera and for a wider understanding of changes in the ocean carbon cycle. Funding is currently being sought for a largescale multiyear follow-up project that aims to use a Bayesian approach for multi-isotopic modelling and chronology building to refine interpretations for chronology and diet in the Western Arctic further.

WALAKPA ARCHAEOLOGICAL SALVAGE PROJECT (WASP) 2016

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Walakpa, located on Utqiaġvik Iñupiat Corporation (UIC) lands on the Chukchi Sea coast, 20 km south of Barrow, is the only site between Canada and Cape Krusenstern containing confirmed intact vertically stratified Paleoeskimo, Neoeskimo and recent occupations. Walakpa was stable until 2013, when waves undercut it, exposing stratigraphy 2 m deep. A third of the features mapped by Stanford

(1976:Fig. 4) have been destroyed since then. Another severe storm could destroy the remaining deposits.

In 2016, twenty-seven concerned community members and archaeologists began a volunteer salvage effort. We focused on maximizing recovery of primary data, as *in situ* preservation is impossible. We recorded and sampled an intact profile down to the sterile pre-Holocene Gubik formation. We also opened a partially excavated portion of Stanford's area B, revealing a house tunnel (Fig. 1), possibly part of a multi-room structure. We excavated 33.7 m^3, recorded 46 m of profile, recovered 181 artifacts, hundreds of samples (451 faunal, 113 bulk soil, 115 flotation, 10 ceramic, 19 C14, and 11 OSL), and a mummified ring seal (Jensen et al. 2017). The 2016 collections are stabilized for detailed cataloging and analysis. Some are already under analysis, and we are looking for possible collaborators for an analysis project that will include materials from a proposed 2017 salvage project.

REFERENCES

Jensen, Anne M., Aaron Mooris, Andrea Rios Gonzalez, and Raphaela Stimmelmayr
2017 Out of Ice and Time—PATOU, the Mummified Ice Seal. Poster presented at Alaska Marine Science Symposium, Anchorage, AK.

Stanford, Dennis J.
1976 The Walakpa Site, Alaska: Its Place in the Birnirk and Thule Cultures. *Smithsonian Contributions to Anthropology* 20. Washington, D.C.: Smithsonian Institution.

Figure 1: House tunnel in Area BE, possibly associated with Stanford's Birnirk structures. Mummified seal (Patou) in latter meat cellar at upper left.

DRUMS AS WINDOWS INTO ARCTIC CULTURES: A VERY BRIEF CASE EXAMPLE FROM CAPE KRUSENSTERN, ALASKA

Submitted by Christopher B. Wolff, University at Albany, Albany, NY, (cwolff@albany.edu)

In 1959, J. Louis Giddings and a field crew recovered a small drum (Fig. 1) from an ancestral Inuit structure at Cape Krusenstern. In their only published account of the drum, Giddings and Anderson (1986:64) interpreted it as a child's toy based solely on its small circumference and handle; however, other attributes of the drum suggest it was something more. My recent research project investigating circumpolar drum production and use, and how they vary through time, has brought to light other possibilities, and may point towards it being a shamanic instrument. This has broader impacts on the interpretation of houses 25a and 25b at Cape Krusenstern, which Giddings and Anderson referred to as a "late Western Thule" structure, which deserves to a more detailed discussion in a future publication.

My examination of the Krusenstern drum revealed some interesting attributes. When referring to the drum's frame, what Giddings and Anderson (1986:64) described simply as, "…scarfed ends bent around to be lashed to each other" is a common attribute of most Arctic drums. What was different was that one of the ends of the bent drum frame was bilaterally notched (Fig. 1) in a way that is consistent with the ends of an Inuit bow. The repurposing of a bow may be significant as some Siberian groups have historically conceptualized the shaman's drum as a symbolic bow that could potentially shoot "magic arrows" at dangerous supernatural entities, and some even occasionally use the same word for 'bow' and 'drum' (Hultkrantz 2014:16). If ancestral Inuit people had similar ideas about drums, then it is unlikely that they would be allowed to be used as a children's toy.

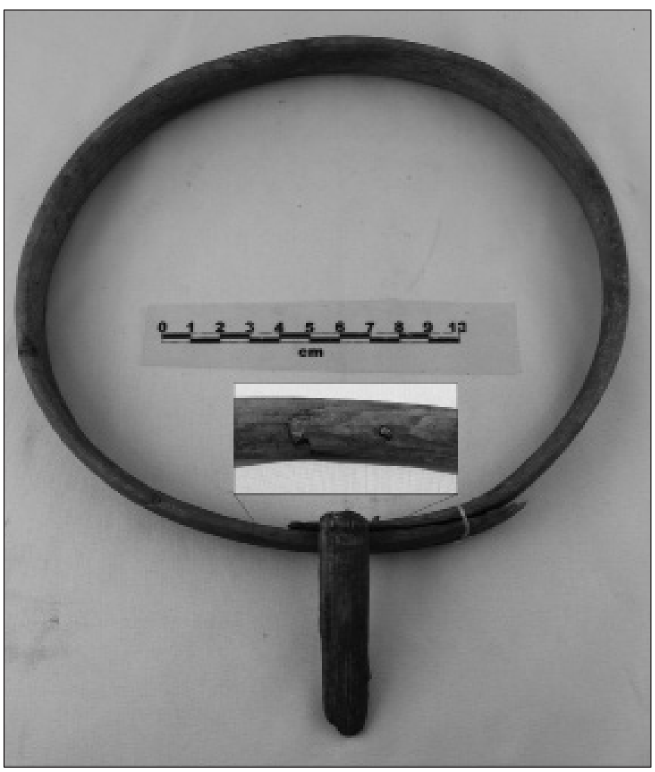

Figure 1: Photo of Krusenstern drum with insert detail of scarf joint.

The small size of the drum also does not necessarily indicate it was a toy, although that is certainly a possibility. In my initial examination of over 200 archaeological and ethnographic drums from Alaska, Nunavut, and Greenland at the National Museum of Natural History, as well as recent collaborative research with Tim Rast at the Canadian Museum of History (Rast and Wolff 2016), I have documented substantial diversity in sizes of Arctic drums, making it currently an inadequate diagnostic attribute for their function. Arctic drum traditions are diverse, and may have been more so before missionization and other effects of cultural contact impacted them. This incipient research is aimed at understanding those changes and utilizing the drum as a window into other cultural traditions and transformations. Putting the Krusenstern drum into this broader historical context, suggests there may have been a more profound process behind its production and use that potentially creates a richer interpretation of the context in which it was found, as well as broader historical relationships throughout the region.

REFERENCES

Giddings, J. Louis, and Douglas D. Anderson
1986 *Beach Ridge Archeology of Cape Krusenstern*. Publications in Archeology 20. National Park Service, U.S. Department of the Interior, Washington, D.C.

Hultkrantz, Ake
2014 The drum in Shamanism: some reflections. *Scripta Instituti Donneriani Aboensis* 14:9–27.

Rast, Tim, and Christopher B. Wolff
2016 Instruments of Change: Late Dorset Palaeoeskimo Drums and Shamanism on Coastal Bylot Island, Nunavut, Canada. *Open Archaeology* 2(1).

KENAI PENINSULA

NEW RADIOCARBON DATES FOR KACHEMAK TRADITION, PHASE II: YUKON ISLAND, KACHEMAK BAY, ALASKA

Submitted by Janet R. Klein, Independent Researcher, Homer, AK; janetklein12@gmail.com

Three new radiocarbon dates, obtained from a two-component Kachemak tradition site on Yukon Island, Kachemak Bay, Southcentral Alaska, were acquired by Peter Zollars, Homer archaeologist, during the 2012, 2015, and 2016 field seasons (Zollars, pers. comm. 2017).

The site, officially known as AHRS SEL 041, the Fox Farm Site, is located in a south-facing meadow on private property. It was first excavated as a trench through a house pit by Drs. Frederica de Laguna, Bryn Mawr College, and Karen Wood Workman, Anchorage archaeologist, in 1978, and expanded the following year by Karen and William Workman and Douglas Reger (De Laguna and K. Workman 1979). For reasons unknown, the trench was never back filled, allowing Zollars and others to dig there, sporadically, since the mid-1990s. Stratigraphically, a thin historic component relating to the fox farmer who lived nearby in the 1920s overlies a deep, multiphased Kachemak tradition shell midden.

The dates obtained by Zollars represent Kachemak II, the middle phase of the three-phase Kachemak tradition (Table 1). Until now, de Laguna and William Workman were the only archaeologists to have excavated and described objects and features associated with the Kachemak II phase. Workman obtained the only KII radiocarbon date for Southcentral Alaska from the main site on Chugachik Island in upper Kachemak Bay, so this little-known phase is relatively poorly described and poorly dated.

Materials for radiocarbon dating the second phase were excavated from fire hearths.

Beta-152920, excavated in 2012, was radiometric analyzed, calibrated using INTCAL98 database; however, it was re-calibrated recently by Beta using INTCAL13 (Ronald Hatfield: personal communication 2017). The two newest dates, Beta-427157, excavated in 2015, and Beta-451882, excavated in 2016, were analyzed using AMS. They were originally calibrated with INTCAL13 (Reimer et al. 2013).

The Kachemak tradition was originally excavated, described, and named in the early 1930s by Frederica de Laguna from her excavations at Cottonwood Creek and Yukon Island. Based primarily on stratigraphy and the development of tool types, she defined three main phases, Kachemak I, the oldest, Kachemak II, the middle phase, and Kachemak III, the youngest, also called the late Kachemak. Although she named it the Kachemak culture, it was renamed the Kachemak tradition when it was identified elsewhere in Southcentral Alaska, especially throughout the Kodiak archipelago.

REFERENCES

De Laguna, Frederica, and Karen W. Workman
1979 Further Testing at the Fox Farm Site (SEL 041). Paper presented at the 6th annual Alaska Anthropological Association, Fairbanks. In possession of Karen Wood Workman and the author.

Reimer, Paula J., Edouard Bard, Alex Bayliss, J. Warren Beck, Paul G. Blackwell, et al.
2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0-50,000 Years cal BP. *Radiocarbon* 55(4). DOI: 10.2458/azu_js_rc.55.16947.

Table 1. Radiocarbon dates from Kachemak II phase.

Specimen	Lab Number	Material	$\delta^{13}C$ (‰)	^{14}C Age (years BP)	2σ Calibration
SEL041. F.F.71-00	Beta-152920	Charred material	–24.1	2430 ± 70	BC 760 to 410; BP 2710 to 2360
SEL041.15-31	Beta-427157	Charred material	–25.3	2510 ± 30	BC 790 to 540; BP 2740 to 2490
SEL041.16-831	Beta-451882	Charred material	–22.6	2410 ± 30	BC 760 to 410; BP 2710 to 2360

ALEUTIANS

NEW ^{14}C DATES FROM THE RAT-00032 SITE, AMCHITKA ISLAND

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The RAT-00032 site on Amchitka Island (western Aleutian chain) was originally excavated in 1971, in advance of planned underground nuclear testing on the island. In compliance with federal antiquities laws, the Atomic Energy Commission decided to initiate action to salvage of one of the few archaeological sites then known on the island: RAT-00032. Because of the site's proximity to ground zero and its position on an eroding bluff, it was suspected that ground motion resulting from the blast would adversely affect the site. The archaeological investigation was carried out by a crew led by John Cook, Charles Holmes, and E. James Dixon.

The original plan called for excavating a 2 m wide trench that would transect the entire site, but this was not accomplished because the site proved to be deeper, larger, and more complex than had been expected. A 22 m long trench was eventually completed, extending about halfway through the site. The main reason that the trench was not expanded all the way to the westernmost extent of the site was the discovery of a complete house structure at the east end, directly on the edge of the eroding bluff. This end of the trench was expanded by eleven 2x2 m excavation units in order to excavate the house fully (Cook et al. 1972). This was the first complete archaeological excavation of a prehistoric Aleutian house structure (Fig. 1).

Cook obtained four radiocarbon dates from RAT-00032; three from the house and one from the lowest level with cultural materials within the trench. Five new AMS determinations have recently been obtained from site materials curated at the University of Alaska Museum of the North. Three dates were run by Mike Etnier (with support from USF&W Service) on charcoal fragments in urchin midden from a location in the trench, and two were run by Jason Rogers and Josh Reuther on charcoal and wood samples from the house structure. The new determinations corroborate Cook's original age assessments for the house and period of site occupation. All radiocarbon determinations from RAT-00032 are presented in Table 1.

Figure 1. Excavating House 1 at RAT-00032.

Table 1. Radiocarbon determinations from RAT-00032.

Lab Number	Material	^{14}C Age (years BP)	2σ Calibration[1]	Provenience
Cook (1972)				
GX-2449	Charred vegetable material	<200	NA	House 1 hearth
GX-2450	Grass and wood chips	335 ± 100	AD 1410-1690 (p=.876); AD 1730-1810 (p=.092); AD 1920-1950 (p=.026)	House 1
GX-2505	Charcoal	495 ± 90	AD 1290-1530 (p=.873); AD 1550-1630 (p=.127)	House 1 hearth
GX-2503	Charcoal	1865 ± 135	190 BC-AD 430 (p=.993)	Level 7
Etnier (2015)				
NOSAMS 128361	Charcoal	250 ± 15	AD 1645-1665 (p=.926); AD 1785-1795 (p=.074)	Top of N48 W68
NOSAMS 128360	Charcoal	715 ± 15	AD 1270-1290	Middle of N48 W68
NOSAMS 128359	Charcoal	2200 ± 15	BC 360-275 (p=.610); BC 260-200 (p=.390)	Bottom of N48 W68
Rogers and Reuther (2017)				
Beta 455422	Charcoal	330 ± 30	AD 1480-1640	House 1 hearth, N48 W54
Beta 455421	Wood	550 ± 30	AD 1310-1360 (p=.420); AD 1390-1430 (p=.580)	House 1 floor, N52 W54

[1] Calibrated with Calib 7.04, using IntCal 13 (Reimer et al. 2013), multiple intercepts listed with corresponding probability.

REFERENCES

Cook, John P., E. James Dixon, and Charles Holmes
1972 Archaeological Report, Site 49 RAT 32, Amchitka Island, Alaska. Report prepared for the U.S. Atomic Energy Commission, Nevada Operations Office. University of Alaska Fairbanks and Holmes and Narver, Las Vegas.

Reimer, Paula J., Edouard Bard, Alex Bayliss, J. Warren Beck, Paul G. Blackwell, et al.
2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0-50,000 Years cal BP. *Radiocarbon* 55(4). DOI: 10.2458/azu_js_rc.55.16947.

INTERIOR

RAMPART DUNE: LATE HOLOCENE SALMON REMAINS IN THE MIDDLE YUKON RIVER CANYON

Submitted by Robert Sattler, Tanana Chiefs Conference (bob.sattler@tananachiefs.org)

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The Rampart Dune site (TAN-0132) is located in central Alaska along the main stem of the Yukon River below the village of Rampart. In this reach, the river meanders through a bedrock and alluvium constricted, underfit channel known as the middle Yukon River canyon. The Rampart Dune archaeological site is spread across the east-facing slopes of at least six dune ridges oriented ENE-WSW. Elevated 20-25m above the mean high water mark of the Yukon River, the topographic setting of the dune complex provides open views of the Yukon River channel and the riparian zone of the floodplain to the south.

Cultural features consist of multiple depressions (c. 30) situated near the brow of the dune ridges and buried organic soil in bluff-top, loess stratigraphy. The depressions are mostly sub-rectangular with varied cross-sections representing different stages of sloughing and proxies of original morphology. The variability in shapes and sizes suggest successive or repeated use over centuries. Soil probes in the center of six depressions demonstrate a uniform veneer of wind-blown loess deposits approximately 15cm thick overlying fine-grained, massive sand deposits. Both of these deposits are fill sediments and record a substantive change in the local depositional environment after abandonment.

A substantive anomaly identified by Ground-Penetrating Radar (GPR) in the largest feature (c. 3x4m inside dimensions, probably a house pit) led to the discovery of a cultural zone approximately one meter below the surface. The cultural zone produced charcoal, well-preserved birch bark, decayed spruce wood, unburned salmon remains (*Oncorhynchus* sp., probably chum [*O. keta*] or silver [*O. kisutch*]) and insect fauna consisting of beetle carapaces and a spider exoskeleton. Charcoal in the cultural zone (CZ2) yielded a radiocarbon age of 990 ± 30 yr BP (Table 1).

At the leading edge of an adjacent dune ridge, testing on a relatively level bench exposed two stratified components in fine-grained loess stratigraphy. Here, the upper cultural zone (CZ3) is defined by a boulder spall found c. 20cm below the boundary between mineral soil and overlying organics, and a lower cultural zone of calcined bone found in a greasy organic soil approximately 50-55cm below the base of surface organics. Charcoal in the lower cultural zone (CZ1) produce a radiocarbon age of 1220 ± 30 yr BP (Table 1).

The three spatially separated cultural components, two non-overlapping radiocarbon ages, and variability in ground cache morphology suggest a substantive village site occupied around a millennium ago. Rampart Dune site features the only known cultural component in the middle Yukon River canyon with well-preserved salmon remains in association with rolls of birch bark. Though the component with salmon was identified with the aid of GPR imagery, multiple radial GPR readings across the smaller depressions were inconclusive. However, GPR anomalies across the level bench at a depth of c. 1.6m suggests buried cultural material in deeply stratified contexts. Further research will progress in consultation of the Rampart Village Council and Rampart Village Corporation.

REFERENCES

Reimer, Paula J., Edouard Bard, Alex Bayliss, J. Warren Beck, Paul G. Blackwell, et al.

2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. *Radiocarbon* 55(4):1869–1887. DOI: 10.2458/azu_js_rc.55.16947

Bronk Ramsey, C.

2009 Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51(1): 337–360.

Table 1. Radiocarbon dating results of two buried components at Rampart Dune site (TAN-0132).

Specimen	Lab Number	Material	$\delta^{13}C$ (‰)	^{14}C Age (years BP)†	2σ Calibration (95.4%)‡
KMayoST14: 2014-2	396165	charcoal	–26.7	1220 ± 30	1258–1203 cal BP (20.9%) 1188–31063 cal BP (74.5%)
Rampart Dune (Pit Q)	445676	charcoal	–27.3	990 ± 30	961–898 cal BP (57.4%) 870–798 cal BP (38%)

† Radiocarbon age using a half-life of 5568 years, corrected for isotope fractionation; error is one standard deviation

‡ Calibrated with OxCal 4.3 (Bronk Ramsey 2009) using IntCal 13 (Reimer, et al. 2013); multiple intercepts listed with corresponding probability

CORE AND BLADE TECHNOLOGY AT THE FORT GREELY ENTRANCE SITE

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Introduction

The Fort Greely Entrance Site (XMH-00253) was located on the surface of a glacial outwash terrace overlooking the Delta River, across the Richardson Highway from the entrance to Fort Greely (Fig. 1). It was found and collected from 1976-1978 by Charles Holmes (Holmes 1979; Rabich and Reger 1978). Holmes discovered wedge-shaped microblade cores, a transverse burin, microblades, burin spalls, and core reduction flakes and assigned the assemblage to the Denali Complex. The outwash gravel made a good construction material source and, at some point in the decade following the discovery of the site, the area was used as a gravel pit (Fig. 2). The site was revisited in 2003 by Fort Wainwright archaeologists and found to have been destroyed.

The accumulated assemblage is housed at the University of Alaska Fairbanks Museum of the North (UA77-57, UA78-484, and UA82-148). It consists of 205 items including 185 flakes related to primary core reduction, microblade core production, and bifacial blank reduction. The Donnelly burin and wedge-shaped microblade cores remain the most interesting parts of the assemblage and were the inspiration for collections research. Although the Fort Greely Entrance Site cannot be dated due to lack of stratified deposits and complete destruction by gravel quarrying, analysis of the lithic assemblage provides insight into prehistoric core and blade production techniques in Interior Alaska.

Methods

In this study we analyzed the lithic technology of the entire tool and debitage assemblage found on the surface of the Fort Greely Entrance Site. The debitage portion of the collection was first divided by raw material type based on observable macroscopic characteristics. It was assumed that the cobble was the basic unit of stone, therefore all flakes and tools made from that cobble should have similar visual qualities such as color, luster, grain size, cortex type, and fracture characteristics (Brantingham et al. 2000; Larson 1994). Using these traits, eight different material types were recorded in the collection. Flakes were assigned to a technological class characterized by a specific technology and lithic production stage. All flake types used in this analysis follow those described and illustrated elsewhere (Andrefsky 1987; Bleed 1996; Deller and Ellis 1992; Esdale 2009; Flenniken 1987; Frison 1968; Le Blanc and Ives 1986; Magne 1985; Magne and Pokotylo 1981; Rasic 2000; Towner and Warburton 1990; Tuohy 1987). General flake categories included: (1) primary production (or initial flake core reduction) flakes (primary decortication flakes, secondary decortication flakes, and interior flakes); (2) bifacial reduction flakes (early and late stage bifacial percussion flakes, bifacial pressure flakes, edge preparation flakes and alternate flakes); (3) unifacial reduction flakes; (4) microblade core production flakes (core tablets, platform preparation flakes, core face rejuvenation flakes, ski spalls, and platform ridge flakes); and (5) nondiagnostic flake fragments. Tools were analyzed for the particular stage in a production sequence, and distinct features were identified that point to methods of production. Tools and flakes were refit when possible. Refitting resulted only in joining broken pieces and not in relating production activities.

Lithic Raw Materials

This assemblage is composed of a small range of raw materials dominated by gray and red cherts (Fig. 3). The majority of the gray chert is heavily patinated, possibly caused by a lengthy surface exposure. The red chert appears to come from a cobble with a grainy exterior; however, the interior flakes from the center of the cobble are a high quality fine-grained cryptocrystalline. Black chert is also an important part of the assemblage, comprising the majority of the tools and 11% of the debitage component. There is some evidence of heat treatment as well. Potlidding was discovered on four gray chert flakes and crazing on two red chert flakes.

Stone Tools

Two microblade cores (a, b), two blunt edge unifacial tools (c, d), one burin (e), and five biface fragments (f) were found in this assemblage (Fig. 4). The microblade cores are small wedge-shaped cores made on bifacial preforms

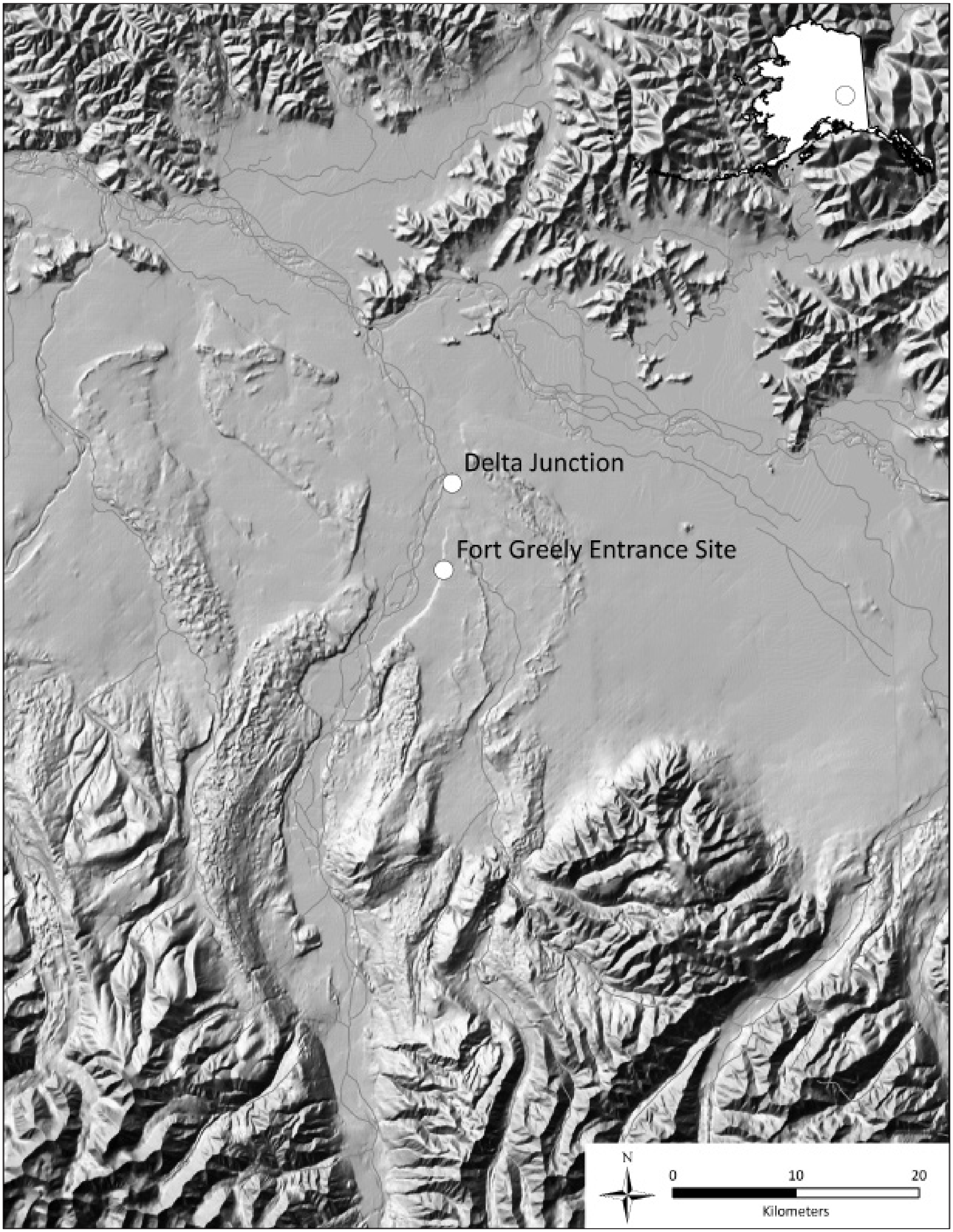

Figure 1. Location of the Fort Greely Entrance Site on army training lands south of Delta Junction, Alaska.

Figure 2. Modern day gravel pit at site location.

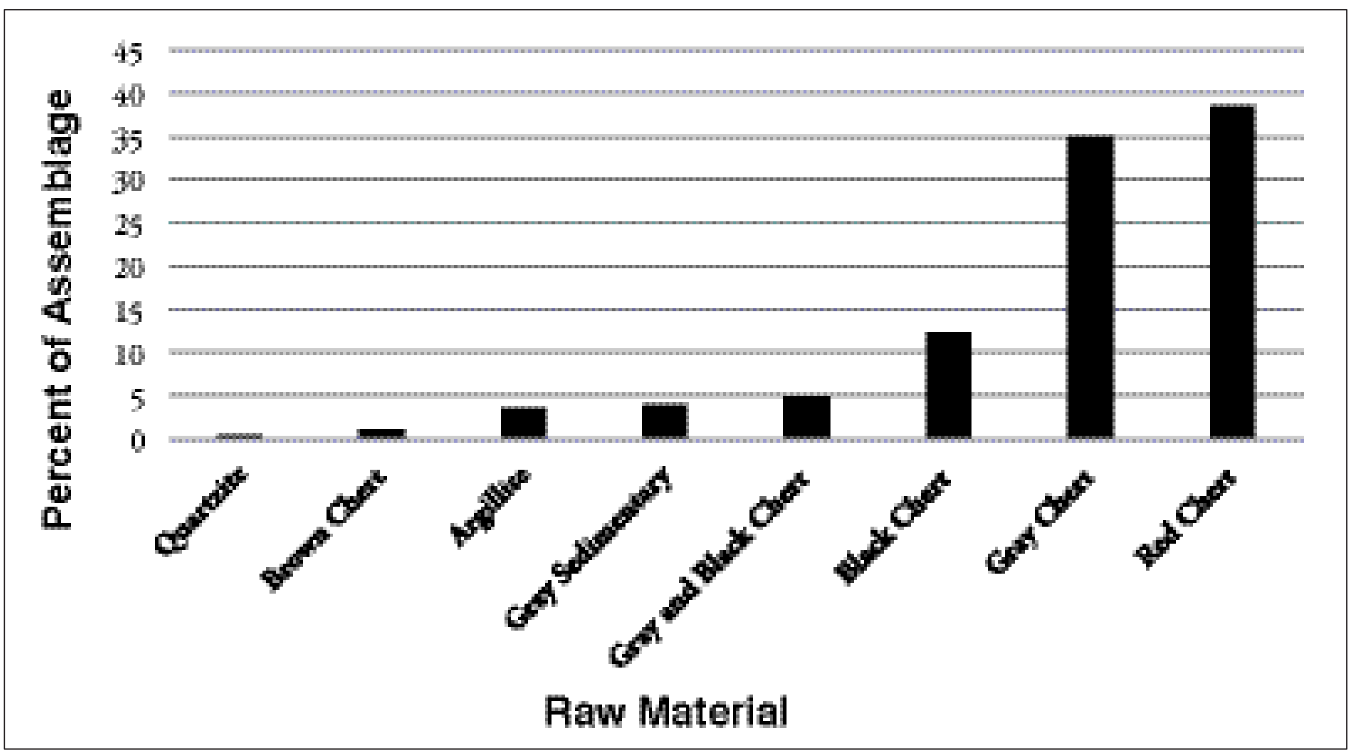

Figure 3. Raw material percentages by type.

Figure 4. Tools in the Fort Greely Entrance Site lithic assemblage.

of black chert and red chert. Also, two blunt edge unifacial tools were made from black chert. One of these tools was made on a flake burinated across the end of a broken biface. The blunt edge formed by the broken edge of the biface was pressure flaked to create a steep right angle. The second similar blunt edge unifacial tool was made on a thick flake with similar retouch creating a right angle. This type of tool has been found in other assemblages and has been shown to be an extremely strong edge used for bone or woodworking (Crabtree 1973). A red chert Donnelly burin (Figure 4e) was also found in the assemblage. It is burinated along both long axes and platform preparation flakes have been removed to create the characteristic "notch" on the Donnelly Burin. Two burin spalls from the same material were also found. The remainder of the tool assemblage is composed of fragmentary bifaces of various raw materials. One of these tools (Figure 4f) is a large black chert biface blank.

Debitage Analysis

The debitage analysis was significant to the interpretation of tool production activities and techniques at the site. The assemblage was discovered entirely on the surface and the large percentage of flake fragments (41% overall) may be partially attributed to post-depositional disturbance such as trampling (Table 1). Primary production flakes (27%) make up the majority of the gray sedimentary and red chert artifacts recovered. These raw materials were likely locally available and tested on site, worked through from cobble to microblade core. Bifacial reduction is minimally represented (19%). Biface blank production activities were noted for gray chert, but no gray chert bifacial tools were recovered. Some bifacial preform and projectile point shaping occurred with a variety of raw materials, but no projectile points were found. Some of the bifacial pressure flaking debitage of red and black chert may have been related to microblade core blank manufacture. Microblade core production debitage is mostly consistent with the raw materials of discarded tools (black chert and red chert), although numbers are low in individual flake categories. Microblade core production and maintenance flakes were found for gray and black chert, but no cores from this material were found on site. The microblades were made of gray and red chert. No black chert microblades were found, although a core of this material was present.

Microblade Core Production Technology

Three main microblade production techniques have been described in Alaskan artifacts, and are recognized by three distinctive core types: Yubetsu/Diuktai cores (Flenniken 1987; Kobayashi 1970), Campus cores (Mobley 1991), and wide-oval platform cores (Esdale 2009; Hall and Gal

Table 1. Flake production sequence categories by raw material.

Raw Material	Flake Fragments	Primary Reduction	Bifacial-Early	Bifacial-Late	Microblade Core Production	Microblades	Burin Spalls	TOTAL %
Argillite	71	0	0	29	0	0	0	100
Black Chert	48	10	0	14	29	0	0	100
Brown Chert	0	50	0	50	0	0	0	100
Coarse Sedimentary	14	57	0	14	14	0	0	100
Gray/Black Chert	10	20	0	0	40	20	10	100
Gray Chert	31	25	19	25	0	0	0	100
Patinated Gray Chert	60	4	4	30	0	2	0	100
Red Chert: Coarse	0	100	0	0	0	0	0	100
Red Chert: Medium	44	54	2	0	0	0	0	100
Red Chert: Fine	7	7	0	27	27	20	13	100
TOTAL %	41	27	3	16	8	3	2	100

1995). Wide-oval platform cores produced from cobbles are not relevant to this discussion.

Yubetsu cores are wedge-shaped microblade cores made on bifacial blanks. In this technique a bifacial blank is shaped and a ridge spall removed the edge of the biface to create a flat right-angled platform (Coutouly 2012; Flenniken 1987; Kobayashi 1970). Several additional flakes might be removed perpendicular to this fresh surface to create a platform for microblade removal. A crested blade is removed from the front of the core to take off the bifacial edge and then pressure microblade removal could proceed. Core tablets removing the entire core platform would refresh the platform as necessary.

In the production of Campus cores, a small, wedge-shaped core was made using a flake blank (Coutouly 2012; Mobley 1991). The keel or face of the flake was often shaped with unifacial or bifacial flaking. A crested blade might be removed from the front of the core face produced by bifacial or unifacial flaking before microblades were removed. Improvements to the core platform were made by removing full core tablets or by small flakes taken from the front and side of the platform removing just partial pieces of the platform. The Campus production technique is simple and raw material efficient (Coutouly 2012). Campus cores have been recognized at Denali and Northern Archaic sites in the interior and Yubetsu/Diuktai cores in the oldest levels at Swan Point (Holmes 2008, 2011).

The two microblade cores at this site were made using a modified Yubetsu technique. Both cores were made on bifaces, but instead of a ridge spall being taken off of the entire edge of the biface, the biface was split in half and the broken edge of the biface was used as the core face for the microblade core. This is evident in the black chert microblade core and associated biface blank fragment (Fig. 5). The second half of this blank was made into

Figure 5. Microblade core made from a broken biface.

a microblade core by removing a core tablet that removed the top ridge spall of the microblade core. Microblades were subsequently detached from the broken biface edge of the core. Further repair work on the platform took place in a Campus style, with small platform rejuvenation flakes. One full core tablet is also found in the assemblage.

Conclusions

Although the Fort Greely Entrance Site is just a small surface lithic scatter its small range of raw materials and short term nature make it an informative snapshot into microblade production techniques and microblade assemblage composition. Prehistoric tool makers used a variety of microblade core production techniques that adjusted to the availability of raw materials, existing blank forms, and even circumstances that arose during mistakes in stone tool manufacturing. It is possible that bifaces were transported as blanks for a variety of tools. In this case, it is not clear if the biface was deliberately snapped in half to produce a microblade core, or if an accident led to this modified Yubetsu/Diuktai technique. Regardless, both Campus and Yubetsu/Diuktai techniques appear to have been used at the site in the production of these cores, and they are not mutually exclusive technologies.

Burins are often associated with microblade cores and are thought to be significant in the manufacture and slotting of bone or antler tools for later insertion of microblades (Barton et al. 1996; Sackett 1989). In this case, burins and the right angle unifacial tools are suggestive of a larger system of tool manufacture that includes bone and antler raw materials.

Although the tools and techniques are reminiscent of Denali Complex and Northern Archaic assemblages in Interior Alaska, we have no way to date the site. There are few sites in the immediate vicinity with microblade cores and radiocarbon dates. The Banjo Lake site and XMH-00915, located approximately 10 km to the east of this site, both have radiocarbon dates placing them in the middle Holocene (6490 CalBP) and microblade cores made on flakes in the Campus technique (Esdale et al. 2015). The artifacts in this assemblage compare well to the microblade cores and burins found at the Donnelly Ridge site 22 km to the south, a Denali complex type site (Hadleigh-West 1967). Comparisons can also be made to mid-to late Holocene components at the Healy Lake, Broken Mammoth (5230 CalBP), and Swan Point sites (Cook 1969; Holmes 1996, 2008). Although the Fort Greely Entrance Site assemblage lacks stratigraphy and radiocarbon dating, our analyses supports the interpretation of a single component occupation that can be tentatively assigned to the Denali complex.

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References

Andrefsky, William, Jr.
1987 Diffusion and Innovation from the Perspective of Wedge Shaped Cores in Alaska and Japan. In *The Organization of Core Technology*, edited by J. K. Johnson and C. A. Morrow, pp. 13–44. Westview Press, Boulder.

Barton, C. Michael, Deborah I. Olszewski, and Nancy R. Coinman
1996 Beyond the Graver: Reconsidering Burin Function. *Journal of Field Archaeology* 23(1):111–125.

Bleed, Peter
1996 Risk and Cost in Japanese Microcore Technology. *Lithic Technology* 21(2):95–107.

Brantingham, P. Jeffrey, John W. Olsen, Jason A. Rech, and Andrei I. Krivoshapkin
2000 Raw Material Quality and Prepared Core Technologies in Northeast Asia. *Journal of Archaeological Science* 27(3):255–271.

Cook, John P.
1969 Early Prehistory of Healy Lake. Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.

Coutouly, Yan A. G.
2012 Pressure Microblade Industries in Pleistocene-Holocene Interior Alaska: Current Data and Discussions. In *The Emergence of Pressure Blade Making: From Origin to Modern Experimentation*, edited by P. M. Desrosiers, pp. 347–374. Springer, Québec.

Crabtree, Don E.
1973 The Obtuse Angle as Functional Edge. *Tebiwa* 16(1):46–53.

Deller, D. Brian, and Christopher J. Ellis
1992 *Thedford II: A Paleo-Indian Site in the Ausable River Watershed of Southwestern Ontario.* Museum of Anthropology, University of Michigan, Ann Arbor.

Esdale, Julie A.
2009 Lithic Production Sequences and Toolkit Variability: Examples from the Middle Holocene, Northwest Alaska. Ph.D. dissertation, Department of Anthropology, Brown University, Providence.

Esdale, Julie A., Robertson, Aaron, and William Johnson
2015 Banjo Lake: A Middle Holocene Site in the Tanana Valley. *Alaska Journal of Anthropology* 13(1):35–56.

Flenniken, J. Jeffrey
1987 The Paleolithic Dyuktai Pressure Blade Technique of Siberia. *Arctic Anthropology* 24(2):117–132.

Frison, George C.
1968 A Functional Analysis of Certain Chipped Stone Tools. *American Antiquity* 33(2):149–155.

Hadleigh-West, Frederick
1967 The Donnelly Ridge Site and the Definition of an Early Core and Blade Complex in Central Alaska. *American Antiquity* 32(3):360–382.

Hall, Edwin S., Jr., and Robert Gal
1995 Cores and Blades at XHP-010, Northwestern Alaska. *Arctic Anthropology* 32(1):131–137.

Holmes, Charles E.
1979 Archaeological Reconnaissance Report for Fort Wainwright, Fort Greely, and Fort Richardson Withdrawal Lands, Alaska. Prepared for the 172d Infantry Brigade, US Army Garrison, Fort Wainwright, Alaska.
1996 Broken Mammoth. In *American Beginnings: the Prehistory and Paleoecology of Beringia*, edited by Frederick H. West, pp. 312-318. The University of Chicago Press, Chicago.
2008 The Taiga Period: Holocene Archaeology of the Northern Boreal Forest, Alaska. *Alaska Journal of Anthropology* 6 (1-2):69–81.
2011 The Beringian and Transitional Periods in Alaska: Technology of the East Beringian Tradition as Viewed from Swan Point. In: *From the Yenisei to the Yukon: Interpreting Lithic Assemblage Variability in Late Pleistocene/Early Holocene Beringia*, edited by Ted Goebel and Ian Buvit, pp. 179–191. Texas A & M University Press, College Station.

Kobayashi, Tatsuo
1970 Microblade Industries in the Japanese Archipelago. *Arctic Anthropology* 7(2):38–56.

Larson, Mary Lou
1994 Toward a Holistic Analysis of Chipped Stone Tools. In *The Organization of Prehistoric Chipped Stone Tool Technologies*, edited by P. J. Carr, pp. 57–69. International Monographs in Prehistory, Ann Arbor.

LeBlanc, Raymond J., and John W. Ives
1986 The Bezya Site: A Wedge-Shaped Core Assemblage from Northeastern Alberta. *Canadian Journal of Archaeology* 10:59–98.

Magne, Martin P.
1985 *Lithics and Livelihood: Stone Tool Technologies of Central and Southern Interior British Columbia*. National Museum of Man Mercury Series, no.133. Archaeological Survey of Canada, Ottawa.

Magne, Martin P., and David Pokotylo
1981 A Pilot Study in Bifacial Lithic Reduction Sequences. *Lithic Technology* 10(2-3):34–47.

Mobley, Charles M.
1991 *The Campus Site: A Prehistoric Camp at Fairbanks, Alaska.* University of Alaska Press, Fairbanks.

Rabich, Joyce C., and Douglas R. Reger
1978 *Archaeological Excavations at the Gerstle River Quarry Site*. Archaeological Survey Projects, 1977. Miscellaneous Publications in History and Archaeology Series, no. 18. Alaska Office of History and Archaeology, Anchorage.

Rasic, Jeffrey T.
2000 Prehistoric Lithic Technology at the Tuluaq Hill Site, Northwest Alaska. M.A. thesis, Department of Anthropology, Washington State University, Pullman.

Sackett, James
1989 Statistics, Attributes and the Dynamics of Burin Typology. *Archaeological Papers of the American Anthropological Association* 1(1):51–82.

Towner, Ronald H., and Miranda Warburton
1990 Projectile Point Rejuvenation: A Technological Analysis. *Journal of Field Archaeology* 17(3):311–321.

Tuohy, Donald R.
1987 A Comparison of Pressure and Percussion Debitage from a Crabtree Obsidian Stoneworking Demonstration. *Tebiwa* 23:23–30.