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REVIEWS

TALES OF THE NORTH: THE LIFE AND TIMES OF WILLIAM BATES WORKMAN

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When the term "scholar" was coined, someone had Bill Workman in mind. "Uncle" Bill to many of us who were lucky enough to be his students or to have had his presence on our graduate committees, Dr. Workman is the embodiment of a quintessential scholar—a person with an encyclopedic knowledge of world prehistory and ethnography, a keen intellect, and a deft way of going directly to the heart of any matter with aplomb, wit, and humor. We first met Bill in 1971 on our first field experience in Alaska, to excavate with our professors, William Laughlin and Jean Aigner, in the Aleutian Islands. Since then, Bill has been a mentor, a colleague, a supporter, and most of all, a friend. From a personal viewpoint (DRY), my own field experiences with Bill—at the Ringling Site near Gulkana, Alaska in the 1970s, at the Yukon Island Fox Farm site in Kachemak Bay in the 1980s, and at nearby Port Graham in the 1990s—were among my most pleasurable field experiences. I was honored to have studied the archaeofaunal

William (Bill) Workman excavating at the Early Contact Village site, Kenai Fjords National Park, in August 2003 (see Crowell et al., this volume). Photo by Aron Crowell.

remains from his excavations on Chugachik (Indian) Island as well as from the Fox Farm site and Port Graham (the last of which is still unpublished). It was as a result of Bill's connections with Hiroaki and Atsuko Okada that I (DRY) was able to excavate with them at the Hot Springs Site at Port Moller on the Alaska Peninsula, another life-changing field experience. I have also learned from Bill the pleasures to be found in alternating work on the rainy coast, where things preserve well, and the dry interior, where one has real summer.

The intellectual exchanges that we have had with Bill—in the hallways at the University of Alaska Anchorage (UAA), in the field, and at meetings—were, and are, incredibly stimulating experiences. Perhaps we enjoyed these discussions so much because we almost always found ourselves in agreement with Bill's positions on various issues. Also, it has always been wonderful to be regaled by Bill's previous field experiences and tales of the "Wisconsin mafia"—the group of Arctic archaeologists that were originally students at the University of Wisconsin under Chester Chard, Bill Laughlin, and Hansjürgen Müller-Beck—a group whose diaspora brought circumpolar studies to a number of U.S., Canadian, and Japanese universities and other institutions. Bill has often said that those who lust for leadership are probably the least desirable candidates, and so it was that though he sometimes took over the role with reluctance, his three stints of service as chair of the Department of Anthropology at UAA were always exemplary. Although he retired from the department in 2005, it is fortunate for us that he is willing to continue to spend time as professor emeritus at UAA, participating on graduate committees and sharing his expertise that extends into so many areas.

As befits a true scholar, William Bates Workman has led an academic life, but one that has often enabled him to spend summers in a tent, in either a rainy and windy or a mosquito-choked environment. Growing up in Madison, Wisconsin, he attended the university there, where he obtained his B.A., M.A., and Ph.D. degrees. He was a "faculty brat" whose father was a professor of German there. Bill also had a facility for languages, learning not only German but Russian, which was to prove valuable in later circumpolar research. Before he graduated from UW, he not only met and married Karen Wood, but, through the connections of his professors, was able to participate in expeditions to Kodiak Island (with fellow student and Kodiak native Donald Clark), and to undertake his MA research on Chirikof Island and his PhD research in the southern Yukon. Each of these resulted in a published *magnum opus* that made a major contribution to the northern archaeological literature. Other connections with former fellow graduate students from Japan resulted in multiple visits there to participate in conferences and to work on joint publications with these colleagues.

After leaving UW, Bill obtained two academic positions in Anchorage, Alaska, first at Alaska Methodist University (now Alaska Pacific University), and second (after the near-bankruptcy of AMU) at the University of Alaska Anchorage. While at UAA, Bill served as department chair as well as on various promotion and tenure committees, obtained (with his colleague Jack Lobdell) NSF grants to support his research in Kachemak Bay, and mentored numerous undergraduate and graduate students. While in Anchorage, he contributed in many ways to the Alaska Anthropological Association, serving as president, board member, and contributor to numerous committees. Bill has been constantly supportive of the work of others, reviewing innumerable works of students and colleagues alike. His gift for placing the works of others into incisive, synthetic treatments is part of what has always made, and continues to make, Bill's professional writings so noteworthy and his talks such a pleasure to listen to. In addition, for 30 years Bill and Karen have opened their house to visiting scholars from all of the continents of the world, especially from Canada, Russia, and Japan. Bill and Karen have also traveled several times to Japan, to interact with colleagues there; to Europe, to participate in professional symposia in Scandinavia and more recently to review European circumpolar research at meetings in France; and to Canada, particularly to work at the National Museum of Civilization in Ottawa, home to several colleagues and friends.

During the course of his long career, Bill's professional interests have fallen into a number of areas. His early work on Kodiak and Chirikof islands, and later work in Kachemak Bay, gave him a deep, abiding interest in the topic of maritime adaptations, which has extended throughout the circumpolar region and to most of the rest of the world. His fieldwork in the Stikine Valley of northwest British Columbia gave him some perspective on the Pacific Northwest Coast in addition to his previous expertise on southern Alaska. His PhD work in the southern Yukon at the Aishihik and Canyon Creek sites, and later work with Japanese colleagues at the Gerstle River site in east-central Alaska, gave him an interest in late Pleistocene and early Holocene archaeology of Beringia, an inter-

est that was reflected in his paper in the 1980 "Ice-free Corridor"-theme conference of the American Quaternary Association in Edmonton, Alberta (published in the now-defunct *Canadian Journal of Anthropology* in 1982), and in an excellent recent review of the "coastal migration" hypothesis prepared for *American Antiquity*.

This same work in the Yukon, as well as later work at the Ringling Site near Gakona village, gave Bill an interest in the ethnography and ethnohistory of arctic and especially Athabascan people, which was one of his favorite subjects in the classroom. His interest in, and connections with, Athabascan people were reflected in the potlatch at Aishihik to which he and Karen were invited in the summer of 2007, 40 years after their initial fieldwork there. In the paper immediately following this introduction, Karen reflects on many of these themes in her discussion of her work with Bill and their "Early Days in Anchorage."

All of these interests are reflected in the bibliography of Bill's major works that we have compiled here (Veltre and Yesner, this volume). Unfortunately, we have not been able to obtain a list of the numerous presentations that Bill has made to professional organizations, such as the Alaska Anthropological Association and the Society for American Archaeology. However, this exhaustive listing of his published works does reflect the great breadth and diversity of his professional contributions.

Bill's wide-ranging interests are also reflected in the papers that are presented here in his honor. These have been divided into three sections, each roughly organized by time and space. Part I of the volume deals with papers concerning the prehistory and paleoecology of interior Alaska, the Yukon, and the Northwest Coast. Charles Schweger, one of Bill's early colleagues from the University of Alberta, leads off this section with a discussion of U.S. and Canadian perspectives on the paleoecology of Beringia. His deconstruction of the ideological (as well as political) border between the U.S. and Canada demonstrates the difference in perspectives that has led to conflicting interpretations of Beringian paleoenvironments. This paper represents the first of four contributions by Canadian colleagues who have been important to Bill in his career. It also helps to set the background for the next several papers that deal with more ancient human settlement in northwest North America. The following paper, by Kathryn Krasinski and David R. Yesner, deals with site structure at the Broken Mammoth site, arguably one of the more important of the early sites in interior Alaska, largely because of its well-preserved evidence of faunal remains, organic tools, and features such as hearths containing large amounts of artifactual debris as well as animal bones. We use similar spatial analytical techniques as those that have been commonly used on Upper Paleolithic European sites to analyze the former activities on this site by some of the earliest colonists in Eastern Beringia, and conclude from the distribution of hearths, fauna, and debitage that they initially occupied the area more sporadically but later (by 10,500 radiocarbon years ago) established a semipermanent base camp there.

Assuming that these early eastern Beringians represent the earliest colonists of the New World, how did they move south from this region? This is the theme addressed by Roy Carlson, professor emeritus from Simon Fraser University, in his discussion of the Northwest Coast as a "high road or hindrance" for human adaptations and potential southward migration. Carlson presents, in a manner very typical of his professional contributions, a highly balanced synthesis of the role of the Northwest Coast as a human habitat during the Pleistocene–Holocene transition. In doing so, he effectively relates the earliest archaeological cultures of the Northwest Coast to those of Beringia to the north. His paper offers convincing evidence that hypotheses of both coastal and interior migration south from Alaska should continue to be pursued. Following this, in a paper that covers the same geographical area as the previous two contributions, physical anthropologists Richard Scott and Christy Turner (a former classmate of Bill's at the University of Wisconsin) consider the relationship between Na-Dené and "Greater Northwest Coast" peoples as seen from the perspective of both ancient human skeletal remains (especially teeth) and modern nuclear genes. The Na-Dené construct, of course, includes the linguistically related Athabascan and Tlingit groups; the relationship of Haida peoples to these groups has been suggested but is hotly debated, but other contemporary Northwest Coast groups belong to the "Amerind" construct which is not linguistically affiliated. Scott and Turner conclude that the demonstration of intermediate values in both dental and genetic features between Na-Dené and Greater Northwest Coast Indians is a byproduct of common descent and gene flow (hybridization).

The other papers in this section deal with the same region, but focus on later time periods. Charles Holmes, in his synthetic paper on the "Taiga Period," deals with the Holocene period that postdates the earliest colonists, and is associated with the reforestation of interior Alaska and the adjacent Yukon by spruce, birch, and alder. Holmes

deals with the thorny problem of the mid-Holocene assemblages of the interior forest, often loosely placed under the rubric of the "Northern Archaic," with the type-diagnostic artifact being the side-notched projectile point. The association of the Northern Archaic with microblade industries that predate notched points and are associated with them in roughly 50% of Northern Archaic sites, invites a range of interpretations involving ethnicity and functionality to explain these associations. By subdividing the Holocene "Taiga Period" into three sub-periods, Holmes is able to demonstrate (1) the temporal gap between early and mid-Holocene industries, suggesting abandonment of the interior (during a period in which the southern Alaskan coast is first colonized); (2) the gradual establishment of the Northern Archaic tradition, congruent with the establishment of the boreal forest itself; (3) the amalgamation of industries, suggesting the absorption of pre-existing microblade-using peoples by northward-moving notched point-using (Archaic) peoples; (4) the probable influence of external Eskimo-related cultures on these processes; (5) the re-emergence of microblade industries in the Late Taiga period; and (6) the disappearance of the Taiga Period with the establishment of the late prehistoric "Athabascan Tradition" clearly related to contemporary peoples. Although correlates in the way of volcanic eruptions and vegetational changes are sought to explain many of these transitions, there is clearly much work to be done, as Holmes points out.

Robert Ackerman, professor emeritus at Washington State University and another early colleague of Bill, expands consideration of the late Holocene period for the region of interior southwestern Alaska north of the Alaska Range, particularly the Lone and Farewell Mountain region. Ackerman touches on many of the same themes treated by Holmes, including the amalgamation of microblade and notched point industries and the relationship of that process to contemporaneous Eskimo cultures on the coast. He notes, however, that microblade industries are absent in that region after 3,000 years ago, suggesting both the regional nature of these technological trends, and their possible linkage to differences in subsistence that we are now just beginning to understand.

Some additional light is shed on the technological variability associated with late prehistoric artifact assemblages of interior Alaska and the Yukon in the following paper by Jacques Cinq-Mars and Raymond Le Blanc. Exhausted ground stone adzes or axes are occasionally found in such assemblages, and while they are usually considered to have been tree-felling tools, Cinq-Mars and Le Blanc suggest on the basis of experimental evidence that they may have been used primarily for smaller-scale woodworking (e.g., delimbing trees or producing snowshoe frames) or animal butchery. Instead, their experiments show that antler wedges may have performed the function of tree-felling, producing the "culturally-modified trees" that are prevalent in the late prehistoric period.

The following paper by Diane Hanson of the University of Alaska Anchorage presents the results of her excavations that, 20 years later, picked up where Bill had left off in his 1970s work at the Ringling Site. Her detailed faunal analyses supplement earlier work by Jack Lobdell, and demonstrate that hare could be (at least numerically) important in regional Athabascan subsistence, a trend which I (DRY) have also found on the Kenai Peninsula. Along with recent work by Kory Cooper, she expands on some of Bill's earlier work on copper artifacts in the late prehistoric period, suggesting both local manufacture and the possibility of trade networks. Finally, Phyllis Fast of UAA also contributes to our understanding of the late prehistoric period in the interior of Alaska and the Yukon through the use of oral narratives to supplement the archaeological record. In doing so, she is able to use effectively a range of Athabascan oral traditions, on both direct and metaphorical levels, to support Bill's hypothesis linking the so-called "White River Ash" produced by a cataclysmic volcanic eruption 1400 years ago to the equally massive emigration of peoples from the region. In doing so, Fast places emphasis on the coincidence in timing of this event with the onset of the late prehistoric Athabascan Tradition (as discussed by Holmes), as well as the subsequent appearance of possible Athabascan-related assemblages in the southern boreal forest and northwest Plains as recorded recently by Jack Ives and others.

Part II of the volume treats Bill's interests in the prehistory of southcentral and southwestern Alaska. I (DWV) begin this section by presenting new data about the work of one of the famous (or is it infamous?) early workers in this region, Aleš Hrdlička of the Smithsonian Institution, as seen through the eyes of Alan May, one of his early assistants. Before his recent death, May donated his diaries to the archives of the University of Alaska Anchorage. These documents have provided new perspectives on Hrdlička's Aleutian work. Laughlin, of course, was a student of Hrdlička's, as well as professor to several of the individuals contributing to this volume (Clark, Turner, Yesner, and Veltre).

In "Tales of the North Pacific," Don Dumond presents what he terms a series of "just-so" stories that attempt to tell the tales of past cultural traditions in southwestern Alaska, and to link them both to other, various contemporary ethnicities, and to major forces of paleoclimatic change. The latter includes eustatic and tectonically-related sea level changes, sea ice conditions and related climatic change, volcanic eruptions, earthquakes, and tsunamis, as well as changes in oceanic productivity. With increased knowledge of both the regional archaeological record and its paleoenvironmental backdrop, such "just-so" stories are, in fact, moving from conjecture to testable hypotheses.

The latter is demonstrated in the following two papers. Janet Klein and Peter Zollars add additional elements to the chronology of Kachemak Bay, laying a foundation for better tests of hypotheses of migration and ethnic change, cultural interaction, and abandonment in relation to paleoclimatic change. Herbert Maschner does the same for the western Gulf of Alaska region, presenting in the process important new data on archaeological assemblages from that area. Here he presents not only new chronologies for the lower Alaska Peninsula and adjoining Sanak Island, but also diagnostic artifactual markers for the period around 5000 to 2500 BC in the larger region. These markers, consisting of fishtail endblades and bilaterally-barbed, cross-shaped base harpoons, are found throughout much of the region during this time period, and in fact extend as far north as the Choris Peninsula. Their widespread distribution implies cultural, and probably linguistic, unity throughout this zone. In the case of the cross-shaped base harpoons, I (DRY) have also shown that they are present on the coast of Primorie in the Russian Far East during the same period, implying that the North Pacific world at this time had even more extensive linkages, either through migration or diffusion.

In his following contribution, Don Clark focuses on one tradition within the larger set of southern Alaskan archaeological traditions: that of the Late Kachemak period. This is an important tradition at the end of the Neoglacial period in which intensive salmon fishing seems to have arisen on Kodiak Island, and is followed by site abandonment in Kachemak Bay and by major population transitions on Kodiak Island and the Alaska Peninsula. Clark emphasizes that one way to achieve increased understanding of this important transitional period is through household archaeology, which allows more precise definition of this process by focusing on both intrasite and intersite variability in artifact assemblages, subsistence practices, and settlement patterns. Here he considers the possible invasion of Norton peoples as an element in this process, one that could certainly be linked to paleoclimate change in the period preceding the Medieval Climatic Optimum.

This section concludes with two papers that reflect Bill's (and Karen's) interests in the Dena'ina Athabascan, as well as the Alutiiq/Pacific Eskimo, inhabitants of the Kenai Peninsula area. Douglas Reger and Charles Mobley synthesize a wide range of both published and unpublished data on Dena'ina subsistence practices, based on both artifact and faunal assemblages, to help us understand the use of marine resources by the only known saltwater-adapted Athabascan population. They conclude that Dena'ina people made opportunistic use of a wide range of marine as well as terrestrial resources, using a wide range of distinctive technologies that differ significantly from traditional Eskimo ones. Of particular interest was the Dena'ina use of shellfish for tool-making (including fabrication of ornaments), perhaps more important than their use in subsistence.

Finally, in their paper Alan Boraas and Donita Peter provide an enormous service to archaeologists—not only those working with Dena'ina culture, but on a more universal basis. By demonstrating that the processes of primary and secondary discard of food remains, hearth materials, exhausted tools, tool production waste, and other household refuse is governed by considerations of spirituality connected with proper behavior in relation to important animal and ancestor spirits, Boraas and Peter allow us to breathe life into our study of what is present (or absent) in houses and other village spaces, by connecting these practices with the lives of real people. In doing so, they not only link the present with the past, but show us new axes of archaeological interpretation that were not heretofore possible.

The paper by Boraas and Peter serves as a bridge to the final two papers, placed in a final section on historical archaeology. While the other papers in the volume treat (or attempt to reconstruct elements of) precontact lifeways, these papers address more squarely questions of postcontact cultural change. In the paper by Aron Crowell et al., the emerging record of sites and artifacts from the outer Kenai Peninsula region, particularly when combined with earlier work on Kodiak Island, helps to shed light on the period of early Alutiiq contact with Russian occupants on the southcentral Alaskan coast. Documentary evidence suggests that (for both Dena'ina and Alutiiq people) the Russian contact period was one of relatively light

acculturation compared to the wholesale economic and political transformations of later American occupation. Furthermore, in the vein of "core" v. "periphery" analyses, Crowell et al. argue that the level of acculturation was significantly lighter in the Kenai Peninsula area than on Kodiak Island, and was characterized by "free trade" rather than "forced labor." An important item in this trade was the manufacture of large numbers of fur and feather parkas, which the Russian colonists had in limited supply, probably by women, which undoubtedly increased their labor substantially. In the final paper in the volume, from farther afield, Richard Scott and Ruth Jolie demonstrate that such large-scale production of clothing in the areas of raw product availability took a toll on the physical well-being of women as well, as can be documented in the human skeletal record.

Taken together, the papers in this volume represent the wide range of interests of both Bill and his colleagues. We present them for Bill in a spirit of thanks for all of the kindnesses and intellectual stimulation that he has visited upon us during what will shortly be five decades of his professional career.

—Anchorage, Alaska, September 1, 2008

THE EARLY YEARS, ANCHORAGE AND BEFORE

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KEYWORDS: William Workman, Alaska, anthropology

William Bates Workman was born and raised in Madison, Wisconsin, and all of his degrees are from the University of Wisconsin at Madison, in anthropology. He was Phi Beta Kappa, held two graduate National Science Foundation Fellowships and, upon completion of his doctoral dissertation, was elected to Sigma Xi. After leaving Madison he taught at two universities in Anchorage that were so close together that, living in the same house since 1970, he could walk to either one in about 15 minutes. From the beginning of his teaching career he felt he could live in Anchorage for the rest of his life, and he frequently stated that he had the best job in the world.

Bill's area of specialization is the Subarctic, with fieldwork primarily in southern Alaska and the neighboring parts of Canada. His advisor at the University of Wisconsin referred to him and other student archaeologists as "northern campers," and he has, in fact, spent altogether more than two years tent camping in sometimes abysmal weather, especially in May and September. Not only do workers in the Subarctic claim deeper soils in their sites, they also claim worse weather than their more northern colleagues, in part, of course, because of longer field seasons. Camping is one of the many firsts that he experienced in Alaska. Fieldwork on Kodiak and Afognak islands, in Kachemak Bay, on the Kenai Peninsula, along the Copper River, in the southern interior of Alaska, and in the adjacent Yukon Territory over the past 45 years has for him involved tent camping almost exclusively.

Large National Science Foundation grants to William S. Laughlin, and the multidisciplinary field work that resulted, included Bill for the first time in 1962 while a student in Madison. While many others went to the major excavation in Nikolski in the Aleutian Islands, Bill went on to Kodiak Island where he met Donald W. Clark. In 1963, he went with Clark for a week to survey Chirikof Island off the southeast coast of the Alaska Peninsula where they surface-collected 28 deflated sites whose stone artifacts alone remained after winds removed the sands of this arctic desert. Laboratory analysis back at Madison greatly exceeded field time. A preliminary report came out three years later, but his MA thesis based on these surface collections was not completed until 1969 and contained over 1,000 pages of text and photographs. His major professor, Chester S. Chard, had connections with Japan and the USSR, and these influenced Bill's life-long friendships with Japanese archaeologists and created a familiarity with written Russian, leading to translations for the journal *Arctic Anthropology*. One of his first publications described the Port Moller collections that came from Chard's participation in the joint University of Wisconsin-Meiji University fieldwork on the Alaska Peninsula in 1960.

Bill's formative years on Kodiak with Don Clark yielded not only a life-long friendship but an unparalleled deep mutual admiration. An idea of the fieldwork they shared in the early 1960s can be gleaned from Clark's many early publications. In 1964, their summer survey checked known sites for earthquake damage, and in 1971 they returned to the mouth of the Afognak River to excavate two early, eroding sites with a joint crew from the National Museums of Canada (NMC), under Don's direction, and Alaska Methodist University (AMU), under Bill's direction. The Canadians were Knut Fladmark, Will Peacock, and John Nobleman. The Alaskans were Greg Dixon, Chris Rabich (Campbell), Willy Johnson, and Jim Houston, three of whom were reunited in 2006 when the Alaska Anthropological Association met in Kodiak, in part to honor the two old men of the island and in part to reminisce about the horrors of the weather during that very cold spring of 1971.

In 1966, Bill journeyed to another part of the North with John Cook. They surveyed in the southwestern Yukon Territory of Canada with Anne Shinkwin and Peter Ramsden under the auspices of the NMC, and they spent time with Catharine McClellan in her ethnographic

research area. In 1967, Bill went again with John Cook, this time to an excavation at Healy Lake in the interior of Alaska. However, this season was cut short by a life-threatening car accident that involved Bill's parents, so he returned to a bedside watch in Madison. In December he married me—Karen Wood—a fellow graduate student who shared a strong dislike of morning and who for a year had met him daily before 8 a.m. over the departmental coffee pot. Early summer saw us headed to the Yukon Territory with visiting Japanese scholar, Kensaku Hayashi. The other crew members, George Wenzel and Jeff Mauger, flew to Whitehorse. This excavation of the Chimi site near Aishihik formed the basis for Bill's 1974 Ph.D. dissertation, published in 1978 in the Mercury Series of the NMC, the sponsor of the work.

In the spring of 1969, Bill took preliminary exams and I took comprehensive exams. We purchased an International Scout, loaded it with personal effects, and drove the Alcan Highway in the late summer so that Bill could take a job at Alaska Methodist University (AMU) in Anchorage. There he joined Frederick Hadleigh West in the Archaeology Department. At that time, they and John Cook at the University of Alaska (hereafter, UAF to distinguish it from Anchorage institutions) were the only archaeologists employed in the entire state. Our fears that Anchorage was too far away from the center of the continent were needless because Anchorage was the hub for subarctic research. Our former professor, Bill Laughlin, had moved to the newly formed Anthropology Department at the University of Connecticut with his NSF research teams and visited with us often as he continued work in the Aleutians with students from there. Other early visitors to our campus home included Jack Campbell and crews from the University of New Mexico, and Joan Townsend from the University of Manitoba.

Anchorage had few tourist attractions other than the Chugach Mountains in the 1960s. The main building on AMU campus, designed by Edward Durrell Stone, was a stop on all city tours. We lived in it, in an apartment next to the Student Union, and we dealt with tourists at all hours of the day and night as they wandered happily over the rolling lawns, admired the magnificent flowers in hanging planters, and explored the shining white central attraction which was our home. After one summer in the spotlight, we looked for a house within walking distance and found one just as the fall semester began.

The next six years were bittersweet. The more we grew to like AMU, the weaker it became in the face of dwindling support from the Methodist Church and oil monies pouring into the educational coffers of the state. We witnessed the deforestation and then construction of adjacent Anchorage Community College (ACC). For forty years we have been neighbors to continuous construction at Providence Hospital and the University of Alaska Anchorage, and most of Anchorage south of the old city limits has been constructed since 1970. We have had an interesting life here with massive change occurring around us.

In the mid-1970s construction began on the Trans Alaska Pipeline. Fred West and John Cook had divided the pipeline archaeology between themselves, with the University of Alaska handling the northernmost three-quarters and AMU that portion from Hogan's Hill near Paxson south to the terminal at Valdez. Because of delays to the pipeline, Bill was in place to help with survey of the line when Fred departed for a job on the U.S. East Coast. The Arctic Institute of North America provided experts to oversee the archaeology conducted along the Alyeska Pipeline Corridor and this group included Jack Campbell, Elmer Harp, Robert McKennan, William Taylor, and James VanStone. Bill's excavations focused on an area of the Gulkana River where ancestral Ahtna camped, manufactured copper implements, and stored their fish about six hundred years ago.

Overlapping with this work in the Copper River country, we followed up on a survey that Douglas Reger conducted and began excavations in Kachemak Bay in the early 1970s. Both the pipeline and the Kachemak Bay work involved not only students from Alaska Methodist University but also students and faculty (Jack Lobdell) from Anchorage Community College. Lists of field crews from those years are a who's who of early archaeology students in Anchorage.

Alaska Methodist University closed its doors in the spring of 1976, and Keith Brady spent the summer with us, packing collections and mailing them to UAF and to the Museum of Man, then part of the NMC. We spent that autumn travelling the northern world and staying with Bill's parents in Madison, Wisconsin, between trips. Kerry Feldman and students at the newly activated University of Alaska Anchorage (UAA) prevailed upon Chancellor Lindauer to hire Bill in the Anthropology Department beginning in January of 1977, much to the relief of Bill's wife and parents. Feldman also convinced the university that an archaeologist could not exist without a laboratory, and when the new Science Building was completed, the

Archaeology Laboratory was located there. Before the spruce trees were planted, the lab had an exquisite view of both the Chugach Range and the Talkeetna Mountains.

Excavations in Kachemak Bay over five seasons filled the Archaeology Laboratory to capacity, in large part because of the wonderful bone preservation in the shell middens there. Working jointly with Jack Lobdell at ACC, Bill held field schools at Cottonwood Creek in 1974, at the Chugachik Island sites in 1977 and 1981, and at two sites on Yukon Island in 1978 and 1979. Gretchen Bersch, a colleague at ACC, was building a house on Yukon Island and thought perhaps an archaeologist should be involved. Jack and Bill jumped at the chance and began bringing large crews to the island. Gretchen's hospitality and cooking greatly enhanced field schools over the next few years. The 1981 field school was supported by a National Science Foundation grant that allowed student laboratory time immediately following the field work, so that summer the lab buzzed with projects that were reported to the archaeological community in Anchorage, which had become quite large.

With high hopes for writing up this massive amount of material, our sabbatical year in 1982-83 was spent at the Museum of Man. Canadian hospitality was at an all-time high for visiting scholars. We did get a lot of work accomplished, but we could not approach the productivity of these museum-based archaeologists, who turned out book after book on research spanning all of Canada.

An earlier museum experience was in the fall of 1979 when we spent four months in Japan, living on the Osaka University campus, but working at the National Museum of Ethnology in Senri. For two months we helped Yoshinobu Kotani edit a book, the results of one of the early Senri Seminars organized in 1978 by Kotani and Bill. The third month we travelled north while waiting for the publisher to furnish the proofs.

In the lab when we arrived home from Ottawa in 1983 were new Osborne computers which Feldman had provided the department. This was a critical point in Bill's career. In his forties now, Bill had to take on a new technology and give up the typists and secretaries of old. In retrospect, of course, it was a good move and life did become much less dependent upon other people.

The 1970s witnessed massive growth of the Alaskan anthropological community. The university and the community college were adding human resources as were state and federal governmental agencies. By the mid-1970s there were about fifty archaeologists in Anchorage alone. Douglas W. Veltre came from the University of Connecticut to begin teaching in the Anthropology Department at ACC in 1974, replacing Linda Ellanna, who followed Laughlin back to Connecticut to finish her Ph.D. degree there. David R. Yesner, from Connecticut as well, also appeared at ACC during the 1970s, disappeared, then reappeared in the mid-1980s. Veltre and Yesner joined Robert Mack, who had been at ACC since the early 1970s and had done a year's post-graduate work at Connecticut, on the anthropology faculty, so that at one time nearly the entire Anthropology Department at ACC hailed from the University of Connecticut.

It was also the Anchorage Community College Anthropology Department that hosted in 1974 the first meeting of what was to become the Alaska Anthropological Association (AAA). Bill and I were surprised that so many people showed up to listen to all of the papers in plenary session. I remember eating from vending machines and sitting on the floor because there was not enough seating in the lobby of Building K prior to William Laughlin's evening presentation. Richard Scott of UAF was elected interim president and bore the brunt of organizational formation. The AAA met every year from then on, generally alternating meetings between Fairbanks and Anchorage.

Bill served as president of the AAA for several years and was on the board of directors intermittently until 1995. He found ultimate satisfaction in this organization and took pride in the high quality of presentations. It was an opportunity to get together with researchers past and present, old and young from all corners of the state and beyond. In the early years we designated honorary, lifetime memberships that went primarily to people whose careers in the north began in the 1920s and 1930s, and many were still actively involved in fieldwork. They were invited to speak to the association over the next few years. It may be that we learned as much from these, our intellectual forefathers and mothers, in person as we did from their numerous publications, and among the things we learned was to enjoy life and the research we were doing.

Our guests convinced us (as if we needed it) that we were in the most interesting field, with people who were leading the most adventurous lives and whose fieldwork took them all over Alaska. One of these was Don Dumond, whom we had met while still students at UW, Madison in the rebellious 1960s. He stopped by after the Milwaukee meetings of the Society of American Archaeology to look at collections and was, or was nearly, tear-gassed in an anti-war riot. Don departed for his supposedly more

peaceful campus at the University of Oregon only to be greeted by rioting there. Twenty years later, we spent a peaceful sabbatical year in Eugene enjoying the company of Don and Carol Dumond.

Our early fear of Anchorage as the end of the world affected our use of local libraries to our detriment. We bought lots of books, subscribed to a large number of journals, and belonged to a number of professional organizations. The floors at home were always littered with newsletters and thick volumes of the most recent research on the North. From this came an impressive northern bibliography indexed to provide topical bibliographies based on his needs of the moment. Bill's wide ranging interests allowed him to write topical overviews such as Holocene peopling of the New World, the effects of volcanism on human and animal populations, Norton culture, sea mammal hunting and even cultural resources management. Legally required repatriation of human remains spurred him on to studies of northern practices with the dead, particularly relative to the Kachemak culture.

The move from AMU (now Alaska Pacific University) to UAA brought security, both financially and professionally, and a much heavier workload. Bill has estimated that he taught over 3,500 students just in his years as a full professor, and for each one there were three essay exams, each of which he read. In 2005, UAA began claiming 50 years of existence but the institution known as the University of Alaska Anchorage only took on that name in late 1976 or 1977 after a difficult identity struggle. The curious may look at the photo gallery of institutional leadership on the third floor of the Consortium Library. In my view, UAA began in 1977, and in January of that year Bill came to work at this remarkable institution. We have watched it grow from its inception, as have many of the other anthropology faculty who remain in Anchorage. It is time to craft the history of the Anthropology Department at UAA, but that is another job.

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The works listed in this bibliography include William Workman's formal book and journal publications. Entries are listed alphabetically by author. In addition to those items listed here, Bill has written numerous book reviews and reports to agencies and other entities, and he has presented well over forty papers at conferences and symposia. Many of these through 1984 are listed in *Bibliography and Index of Alaskan Archeology*, by C. Eugene West and Richard O. Stern, published by the Alaska Anthropological Association in 1987 as volume 3 of its Aurora series.

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THE LATE PLEISTOCENE PALAEOECOLOGY OF BERINGIA: DECONSTRUCTING AND CONSTRUCTING BORDERS

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ABSTRACT

The sometimes controversial Late Pleistocene paleoecology of Beringia affords an excellent opportunity to examine how research and reconstructions of full-glacial vegetation may have been influenced by the Alaska-Yukon border. A review of published conclusions, based mostly on pollen data, demonstrates that national origins have had little influence on this controversial topic while revealing other areas where borders do have apparent effects, such as the study of macro- versus microfossils, the profession of botanist versus geologist, a focus on lacustrine versus alluvial sediment, the significance of mammal fossils, small- versus large-scale palaeoecological reconstruction, Canadian versus American funding and infrastructure, and National Park Service versus Parks Canada policies. However, quantitative indicators—authors and citations—indicate minimal Canadian participation and content in recent archaeological syntheses. This may be attributed to differences in American and Canadian attitudes. While Alaska-Yukon border influences are not apparent, it must not be assumed that this will be the case in the future. Succeeding generations must have the opportunity to benefit from cross-border educational and research experiences.

KEYWORDS: Beringia, paleoecology, Late Pleistocene, Alaska-Yukon border

INTRODUCTION

At a time of rampant globalization, including of science, it is of interest to examine the effects that an international border might have on the style and results of scientific activity. Here attention is directed to the border between Alaska and the Yukon that divides two nations and, for our interests, the paleogeographic entity of Late Pleistocene Beringia. A variety of opinions and conclusions, even controversies, exist concerning the paleoecology of full-glacial Beringia, so it becomes a good focus for an examination of the role of the international border on research design and outcome. The border and the paleoecology of Beringia will be "deconstructed." But what should one look for? That is, how does one determine qualitatively or quantitatively if the border has had an influence? Aside from comparing researchers and their results—i.e., the science itself—comparisons will be made of participation in conferences, publications, joint research activities, funding, infrastructure, and administration of science in the Yukon and Alaska. In the process I will call attention to several different types of borders, not just those of a geographic/political nature, as these probably had more effects on the outcome of research than the sign marked "Entering Canada, Handguns Not Allowed." To begin, a quick comparison indicates that the subject itself is spelled *palaeoecology* in Canada and *paleoecology* in Alaska.

At the height of late Wisconsin glaciation, the whole of Canada was mostly ice-covered, except for a relatively small portion of the central and northern Yukon (Duk-Rodkin

1999). Canada is proud of this region, as here one can see the most deeply weathered soils of the country, complete with polygenetic characteristics and sand wedges, as well as pediments, deposits of miners' "muck" and tephra, and, perhaps most importantly, abundant fossils of megafauna such as mammoth, saiga, short-faced bear, horse, and bison, all of which draw attention to the extraordinary changes that have occurred here over the past thirty thousand years. The Yukon refugium (not the best word to describe the region) is a special place—for the tourist, the romance of the Klondike Gold Rush is mixed with Ice Age deposits, while for the scientist it is Canada's unique window on the Pleistocene. These interests have come together in the establishment of the Yukon Beringia Interpretive Centre in Whitehorse. Westward, crossing two international boundaries involving three countries (Canada, the United States, and Russia), the Yukon's limited refugium expanded to become the easternmost province of Ice Age Beringia. During the late Wisconsin period, lowered sea levels exposed the Bering and Chukchi marine shelves, welding northwest North America to northeast Asia. With the rest of Canada under glacial ice, the Yukon underwent a dramatic turn of geography and ecology, becoming part of Alaska and the Asian landmass.

PALEOECOLOGY OF BERINGIA

The paleoecology of Beringia has been treated in various summaries and syntheses (Barnosky et al 1987; Colinvaux 1997; Guthrie 1990; Hopkins et al. 1982; Lamb and Edwards 1988; Ritchie 1984; Schweger 1997) punctuated with numerous journal articles and chapters. At some level each summary, and most of the papers, discusses the range of opinions concerning the nature of the vegetation of Beringia. It is appropriate that discussion, speculation, and debate be centered on the primary producer trophic level. After all, tons of vertebrate fossils have been recovered through the course of placer mining and river erosion, and there is great interest in the Bering Land Bridge as a route for the migration of Asian human populations to settle North America. The debate focuses on whether the vegetation of Beringia was an arctic grassland or steppe sufficiently productive to support herds of grazing mammals through the Late Pleistocene full-glacial period or whether climatic conditions at this time were so severe that unproductive tundra vegetation dominated. This juncture seems to be an ideal place to begin an examination of the significance of the international border. Supporters of one side or the other of the vegetation debate may be confined behind their side of that border.

The paleoecology of Beringia has attracted a spectrum of international researchers starting with Swedish botanist Erik Hultén, who defined Beringia through his work on circumpolar biogeography, drawing attention to the flora of the Ice Ages (Hultén 1937). Dan Livingstone, who initiated Quaternary pollen analyses in northern Alaska in the 1950s, was a Canadian at birth and educated at Dahlhousie University before acquiring his PhD at Yale. He first documented the herb and birch pollen zones and postglacial arrival of major forest elements in lake sediment cores from south of the Brooks Range, Alaska (Livingstone 1955). Englishman Paul Colinvaux, whose pollen analysis of Imuruk Lake, western Alaska (Colinvaux 1964), brought focus to the paleoecology of the Bering Land Bridge, studied with Livingstone at Duke University. Pioneering pollen analysis in the Yukon was carried out in the mid-1960s by Jan Terasmae, a geologist of Estonian birth with the Geological Survey of Canada (Terasmae and Hughes 1966). James Ritchie, University of Toronto, of Scottish heritage, has devoted most of his career to the paleoecology of Northwest Canada, arguing strongly against the arctic-steppe hypothesis (Ritchie and Cwynar 1982). Mary Edwards, whose work on Alaskan lakes (Edwards 1985) has contributed much to documenting patterns of full- and late-glacial climate and vegetational change, is of English background and was a staff member at the Universities of Alaska and Trondheim, and now Southampton. John V. Matthews Jr. and myself became Canadian citizens after graduating from the University of Alberta and starting to work in Canada. Americans Paul Matheus and Scott Elias live in the Yukon and England, respectively, yet work on both sides of the border. These few biographies of paleoecologists make the point: Pedigree does not necessarily determine upon which side of the border one works. This fact is strengthened when we look at research collaborations. Russian paleoentomologist Svetlana Kuzmina, for example, lives in Canada and works in the Yukon and Alaska (Zazula et al. 2007), while Patricia Anderson of the University of Washington works in Siberia with Russian Anatoli Lozhkin of the University of Magadan (Anderson et al. 2002). But does national affiliation influence one's conclusions?

Both sides of the border have contributed significantly to our understanding of the paleoecology of Beringia and there does not appear to be an easy breakdown of the issues and controversies (Table 1). In other words, those

Table 1. Full-glacial vegetation of Beringia quoted from selected sources and employing a variety of approaches

Author	Location	Method	Vegetation Description
Livingstone 1955	Brooks Range, AK	pollen	herbaceous tundra
Colinvaux 1964	Seward Peninsula, AK	pollen	sparse grassland, arctic tundra, "vegetation reduced to the most frigid form of arctic tundra, a tussockless, grassy expanse, spotted with frost scars and loess deposits and devoid of all trees except willow" (p. 323)
Colinvaux 1967	Seward Peninsula, AK	pollen	tundra, much like that of the modern Alaska arctic coast at Barrow, "*Artemisia* pollen maxima in Alaska represents an abundance of dry sites" (p. 227)
Guthrie 1968	interior Alaska	vertebrates	grassland
Rampton 1971	southwest Yukon	pollen	fellfield or sedge-moss tundra
Matthews 1974a	interior Alaska	pollen & beetles	steppe-tundra
Mathews 1974b	Seward Peninsula, AK	pollen & beetles	steppe-tundra
Matthews 1976	Beringia	pollen, vertebrates & miscellaneous	arctic-steppe
Cwynar and Ritchie 1980	eastern Beringia	pollen influx	"sparse, discontinuous vegetation of herbaceous tundra on uplands and local sedge-grass meadows on lowlands" (p. 1377)
Colinvaux 1980	Bering Land Bridge	pollen	"tundra; different in subtle ways from all modern tundras and with rather more *Artemisia*—but definitely tundra" (p. 15)
Ager 1982	western Alaska	pollen	herb-dominated tundra (or tundra-like)
Cwynar 1982	northern Yukon	pollen influx	"discontinuous herbaceous communities . . . sparser than that of modern fellfields . . . upland vegetation was sparse and discontinuous, similar but not identical to modern fellfields" (p. 15)
Ritchie 1982	northern Yukon	pollen influx	"sparse, unproductive herb tundra on lower mountain slopes and a sedge-grass marsh complex in poorly drained sites" (p. 563)
Anderson 1985	northwest Alaska	pollen influx	meadow-like tundra [in lowlands]
Anderson et al. 1989	Alaska—western Canada	pollen & cord distance analysis	analog to modern arctic and mid-arctic sites
Guthrie 1990	Beringia	vertebrates	steppe, fine-grained mosaic, mammoth-steppe
Anderson and Brubaker 1994	Alaska	mapped pollen data	herb-dominated tundra, with mesic graminoid tundra in lower elevations of western area and more xeric, sparse tundra comminities in the east and at higher elevations
Elias et al. 1996	Bering Land Bridge	pollen, insects & plant macrofossils	mesic shrub tundra
Schweger 1997	eastern Beringia	miscellaneous	mosaic of vegetation types [due to elevation and moisture] in an arid-climate environment
Eisner 1999	northern Alaska	pollen influx	steppe-tundra
Ager 2003	St. Michael Is., AK	pollen	grassy herbaceous tundra
Bigelow et al. 2003	circumpolar, above 55°N	"biomization" of modern and fossil pollen	a mosaic of erect dwarf-shrub tundra, prostrate shrub-tundra, and graminoid and forb tundra
Zazula et al. 2006	northern Yukon	plant macrofossils & pollen	xeric steppe in mosaic that included fens, mesic meadows, steppe-tundra and herb-tundra depending upon elevation
Zazula et al. 2007	west central Yukon	plant macrofossils, insects & pollen	steppe-tundra

who work in Alaska are not wedded to the arctic-steppe reconstruction, any more than those who work in the Yukon are confined to discontinuous herbaceous tundra. Over-the-border qualitative comparisons are revealing but do not point to any significant differences in conclusions. Nevertheless, they do document something of the historical dimensions of the controversy.

Following the biogeographical work of Hultén, fossil pollen recovered from lake sediments became the major paleoecological research method and led to discovery of herb-rich pollen spectra dominated by grass, sedge, and sage (*Artemisia*) dated to the full-glacial period, ~21,000 to 15,000 ^{14}C yrs BP. Livingstone (1955) interpreted these spectra as representing herbaceous tundra vegetation, while Colinvaux (1964, 1967) was more certain from the pollen record of Imuruk Lake that the vegetation was "the most frigid form of Arctic tundra." He went on to say, however, having used the term *tundra-steppe* in the 1967 volume *The Bering Land Bridge* (Hopkins 1967), that "following Cwynar and Ritchie, the term [tundra-steppe] will no longer be used in my laboratory" (Colinvaux 1980). Documenting the dominance of grazers in the Late Pleistocene vertebrate communities of interior Alaska, Guthrie (1968) concluded that a grassland vegetation prevailed. This paper gave focus to early discussions on the grass-*Artemisia*-dominated pollen assemblages. Fossil pollen and beetles led Matthews (1968, 1970, 1974a, 1974b) to conclude that the vegetation of interior and western Alaska was a "steppe-tundra." He later renamed this vegetation "arctic-steppe" in papers that attracted much critical attention (Matthews 1976, 1982). Cwynar and Ritchie (1980) attacked the arctic-steppe interpretation, using a deductive research design and employing pollen-influx values to conclude that a sparse, discontinuous herb tundra (fellfield) vegetation dominated. This paper tended to polarize the issue, with steppe people and fellfield tundra people lining up across rather than along the Alaska-Yukon border.

If any border were to exist, it would be over the extent to which nonbotanical information, particularly the record of fossil mammals, should be used in reconstructions of Beringian paleoecology. Colinvaux (1980) clarified his position, arguing that this vegetation was a tundra with rather more *Artemisia* but still definitely a tundra. What to do with the large amounts of *Artemisia* pollen in full-glacial spectra became a key issue in the interpretations. Ager (1982) concluded that herb-dominated tundra vegetation dominated western Alaska. Cwynar (1982) produced what must be one of the most detailed pollen records in Beringia, concluding that discontinuous herbaceous tundra, similar to but not exactly like modern fellfields, dominated the northern Yukon. Ritchie (1982) reconstructed a sparse, unproductive tundra on lower mountain slopes, with sedge-grass marsh vegetation in poorly drained areas. Introducing alluvial palynology, Schweger (1982) concluded that vegetational mosaics were controlled by multiple ecological factors with emphasis on elevation and drainage, a reconstruction that seems to have influenced subsequent researchers. Anderson (1985) concluded that pollen records from northwestern Alaska indicate mesic, meadowlike tundra existed during the last glacial maximum (LGM) and postulated a west-to-east, moist-to-dry gradient across Beringia. Large modern pollen data sets assembled by Anderson and Brubaker (1986) have facilitated multivariate comparisons with fossil pollen spectra to identify modern analogs. Results indicate that the herb-dominated modern tundra of northern Alaska and Banks Island may serve as an analog to the full-glacial vegetation, although *Artemisia* in modern pollen spectra is consistently lower than in the fossil records (Anderson et al. 1989, 1991). Going further, Bigelow et al. (2003) employed a "biomization" method based on groupings of plant taxa known from modern and fossil pollen records into functional types with identifiable sets of traits and distinctive climatic requirements. Best fits between the two data sets, for the LGM, identified "prostrate dwarf-shrub, erect dwarf-shrub, and graminoid and forb tundra forming a mosaic in Beringia. Graminoid and forb tundra . . . was far more extensive . . . while low- and high-shrub tundra were greatly reduced." This project united the skills, insights, and data of twenty-seven multinational specialists.

The 1979 discovery in Alaska of a frozen bison, Blue Babe, led to the publication of Guthrie's (1990) award-winning *Frozen Fauna of the Mammoth Steppe*. This book carefully builds a strong case for the existence of a Late Pleistocene mammoth-steppe, a fine-grained mosaic that provided many more mammalian habitats than at present, extending through unglaciated terrain from southern England to the Yukon. Its publication may have softened polarized positions but raised serious questions on how any paleoecological reconstruction can be done without including the influence of a grazing fauna. Schweger (1992, 1997) argued for using ecosystem models to generate hypotheses that could be tested with paleoecological data. A model of full-glacial soil development (Schweger 1997) was tested with modern soils and primary production measurements by Laxton et al. (1996). The notion of

testing specific hypotheses about biological production in the glacial marginal environment was advanced by the work of Turner et al. (1999), who traced nitrogen pathways from glacial ice to loess deposits. Coming full circle, Eisner (1999) reexamined her extensive north Alaskan pollen research to reconsider the tundra-steppe vegetation hypothesis. Of interest, Eisner had been a postdoctoral researcher in Colinvaux's laboratory at Ohio State University, where the words *tundra-steppe* were never to be used!

New methodologies are currently being developed and employed in reconstructing LGM Beringian paleoenvironments. While pollen microfossils are still important and widely employed, data from macroremains, specifically insects and plants, are much needed as they represent the paleoenvironment in very different ways, offer significant taxonomic detail, and can verify or challenge existing reconstructions. Elias et al. (1996), relying on macrofossils recovered from marine sediment cores, provided the first record of mesic shrub tundra from the Land Bridge itself. Zazula et al. (2006) recovered 6,240 macrofossils from dated alluvium in the northern Yukon that represent fens, graminoid meadows, steppe-tundra, and herb-tundra congruent with pollen and Bluefish Cave vertebrate remains. The frozen middens of dated Arctic ground squirrels have yielded very well-preserved plant remains indicating their adaptation "to the open, steppe-tundra vegetation, loessal soils and glacial climates of the mammoth-steppe biome" (Zazula et al. 2007). Abundant *Artemisia* flowers, particularly *A. frigida* (prairie sage), have now been recovered from several Yukon sites, including stomach contents of a frozen horse. This supports conclusions reached by some researchers on the basis of high *Artemisia* pollen frequencies. *Artemisia* or sage was in fact widespread in the Yukon and Alaska, more so than in any modern tundra of northwestern North America (Zazula et al. 2003). Western Alaska may be the exception, as *Artemisia* pollen frequencies in lake cores are generally lower (Anderson 1985, 1988; Anderson et al. 1994), and no *Artemisia* macrofossils have yet been identified (Elias et al. 1996, 1997; Goetcheus and Birks 2001).

Höfle et al. (2000) reported on a full-glacial paleosol from the Seward Peninsula. While modern analogues cannot be identified, the paleosol does have attributes of the ecosystem described by Guthrie (1990); however, to call it steppe would be misleading, and Höfle et al. (2000) conclude that a cold, seasonally dry tundra, with more consumable plant material than modern tundra, existed during the LGM. The plant remains indicate "a closed, dry, herb-rich tundra grassland with a continuous moss layer, growing on calcareous loess that was continuously supplied with loess" (Goetcheus and Birks 2001:135).

Finally, research methods used to document the full-glacial paleoecology of Beringia have continued to diversify. Elias (2000) developed and employed the Mutual Climatic Range method, the first application to Beringia of a transfer function method, yielding maximum and minimum temperature estimates for the region. Seismic reflection profiles and core transects were employed by Abbott et al. (2000) to reconstruct paleohydrology and lake levels in interior Alaska. A series of papers at the Third International Mammoth Conference (2003) in Dawson City, Yukon, demonstrated new methodologies being applied to understanding the importance to the Beringian ecosystem of the woolly mammoth (*Mammuthus primigenius*) and other megafauna that knew no borders. Of particular importance was the demonstration by Matheus et al. (2003) that stable isotope composition of fossil mammal bones provides evidence of habitat and niche partitioning.

OTHER BORDERS

The above discussion reveals boundaries of method and theory in paleoecological reconstruction that have nothing to do with the political boundary between the United States and Canada. For example, pollen recovered from lakes versus alluvial sediments differ in how they record pollen sources, long-distance and extra-local versus extra-local and local, respectively. Other boundaries include a focus on microbotanical remains such as pollen versus macrobotanical remains such as seeds; the role of animals, whether they are fossil insects or mammals, versus exclusive use of plant remains in reconstructions; the work of those who come from a geological background versus those with a botanical or zoological background. It would be wrong to assume that either side of any boundary has the correct answer. The paleoecology of Beringia can best be accomplished by integrating data from as many methods as possible within a framework of herbivore ecology. At this point one would be remiss for not citing the excellent collaborative research between Americans, Canadians, and Russians conducted on the unique yedoma landscape of the East Lena Delta, Siberia. Using a multiproxy approach, Sher et al. (2005) concluded that, during the Weichselian, "the changing subtypes of the tundra-steppe environment were persistently favorable for mammalian grazers."

In contrast to the above, Ritchie (1984) recognized a difference between the paleoecological research done in Alaska and the Yukon in a developmental and temporal sense. He undertook research in the Yukon a decade or two after the pioneering work of Livingstone, Guthrie, Colinvaux, Péwé, Hopkins, and others who worked in the decades of the 1950s and 1960s.

> It so happens that developments in Quaternary plant ecology in Alaska and in northwest Canada are out of phase. . . . Now we are ready, at least in plant palaeoecology, for a first summary, while our colleagues in Alaska have moved on to a second phase of research, using the new approaches and techniques [research design and pollen influx] that we have found so effective in addressing the problems raised by Hopkins (1972). (Ritchie 1984)

His conclusion established yet another border, that between research as a narrative construction versus problem solving (hypothesis testing) through application of the methods of Quaternary plant ecology (Birks 1985). Cwynar and Ritchie (1980) initiated this approach in attempting to test the narrative models of others, including Hultén and Matthews. This approach is advocated with hypotheses generated through GCM climate simulations (Anderson and Brubaker 1993; Barnosky et al. 1989), ecosystem models (Schweger 1992, 1997), and soil models (Laxton et al. 1996). Such developments mean that one can no longer do research in Beringian paleoecology from a strictly descriptive narrative perspective.

Scale is important to a discussion of other borders. Our understanding of the paleoclimate of Beringia is reconstructed by dozens of temporally and spatially constrained observations and studies, some no larger than a sand wedge and host sediments or the catchment area of a small lake. For example, Zazula et al. (2006) limited their detailed full-glacial paleoecological reconstruction to the Bluefish River watershed of the northern Yukon. On the other hand, Bigelow et al. (2003) have synthesized the vegetation of the entire circumpolar region north of 55° N. Computer-based GCM simulations barely resolve the paleoclimate of this vast area. Finally, Guthrie's (1990) mammoth-steppe biome is of a truly intercontinental scale, hypothesized as extending from southern England eastward across Europe and Eurasia, through Siberia, over the Bering Land Bridge into Alaska and the Yukon.

Of course, historical and infrastructural differences between Alaska and the Yukon constitute another series of borders. Alaska has had a university system since 1915 which has served to foster research through its resident staff, libraries, laboratories, and museum. Yukon College maintains both academic and vocational programs, with support for Yukon research coming from the affiliated Northern Research Institute. The Yukon Beringian Interpretive Centre effectively serves both local and tourist interests. John Storer, Paul Matheus, and now Grant Zazula have staffed the Yukon Paleontology Program; archaeologists Ruth Gotthardt and Greg Hare are employed by the Heritage Branch, Yukon Government. The notable infrastructure differences between Alaska and the Yukon clearly create another and very significant border. Alaskan researchers can access National Science Foundation (NSF) grants that carry overhead costs; Canadian researchers may be funded through grants from the Natural Science and Engineering Research Council (NSERC) or the Social Sciences and Humanities Research Council (SSHRC), but this funding carries limited overhead costs and is only a fraction in dollar value of what is made available through NSF. Both Canadian research councils have abandoned policies that promote or provide supplemental support for northern research. Even the Polar Continental Shelf project, which is the flagship organization supporting northern research in Canada, only nominally serves the western Arctic. Since so much of Alaska and Yukon lands are controlled by the U.S. National Park Service and Parks Canada, respectively, their differences in policy towards research forms another border. In contrast to Parks Canada, the National Park Service appears to have an enlightened attitude about research on lands under their control. Parks Canada shows little interest towards research and has actually created impediments to research on lands under their control. As more land is "locked" up by Parks Canada, research opportunities continue to decline. Ironically, this is the case in the Old Crow Basin where the very research that identified the significance of the area has virtually disappeared following much of the region being designated as Vuntut National Park. Similar comparisons can be made with Native land claims. Differences exist between Alaskan and Yukon Native lands in terms of provisions for and acceptance of research.

QUANTITATIVE MEASURES

In light of the above, there does appear to be a strong theoretical and methodological border effect, one that can be measured quantitatively. For example, textbook maps labeled "Archaeological Sites of North America," or some-

thing equivalent, should in fact read "Archaeological Sites of the United States," as the Great White North above the U.S.-Canadian border is often left blank. Maps of key pre-Clovis sites rarely show the Bluefish Caves or position them well away from their actual locations. Another case in point is the book *American Beginnings: The Prehistory and Palaeoecology of Beringia*, a spectacular compendium conceived and edited by Fred Hadleigh West (1996). Its 576 pages are indeed "a very full representation of the basic scientific data relating to Beringia" (West 1996:ix), but while the preface mentions Siberia, not one mention is made of Canada. In fact, of the fifty-six contributors, forty-two have affiliations in the United States, with the remainder from Russia. There are no Canadian or even Canadian-affiliated contributors. A check of the many bibliographies yields fifty-eight references involving Canadians (broadly defined and as senior authors), cited seventy-five times. Altogether there are 1,091 literature citations in the book, of which only 7 percent are Canadian. Even the title, *American Beginnings*, conveys latent American nationalism so ingratiating to other New World nations. The area from Chile to Canada is subsumed beneath America's umbrella. Of course, one can always argue, as pressed Americans usually do, that the term *American* refers to the countries of the Americas. Mandryk (1992) examined the same phenomenon in regards to the so-called "ice-free corridor" which, it is hypothesized, channeled migrants through Canada to the bountiful cornucopia of America south of the ice sheets. It is the immigrant tale retold, with Canada passively participating by supporting the lifeless glacier ice. Why would any immigrant take root in Canada when the good life lies just over the next hill in the United States?

The compilation *Terrestrial Paleoenvironmental Studies in Beringia* (Edwards et al. 1997) includes nineteen authors and coauthors, of which three are Canadian. The well-organized, timely, and informative Beringian Paleoenvironments Workshop, held in Florissant, Colorado, and published as a special issue of *Quaternary Science Reviews* (Elias and Brigham-Grette 2001), listed ninety-two participants of which fourteen, or 15 percent, were Canadian. Russian colleagues fared much better, making up 25 percent of the authors in *American Beginnings*, 42 percent in *Terrestrial Paleoenvironmental Studies in Beringia*, and 13 percent at the Beringian Paleoenvironments Workshop. The most recent synthesis, *Human Ecology of Beringia* (Hoffecker and Elias 2007) builds on earlier sources, particularly West (1996), but fares much better. The Bluefish Caves' archaeological and paleontological record is well reviewed, even though its significance is largely dismissed when discussing the abandonment of eastern Beringia during the full-glacial period. Of the nearly five hundred citations in the book, only 11 percent involve Canadian or Canadian-affiliated authors. Russian sources do considerably better.

Until recently, scientists of the former Soviet Union working in Beringia were not encouraged to contact Western colleagues and certainly were discouraged from traveling in the West. The last-minute cancellations of Soviet colleagues was a great disappointment to the organizers and participants of the 1979 Wenner-Gren Foundation–sponsored Paleoecology of Beringia conference. We have all welcomed the wonderful new opportunities that have become available for Russian exchanges—contributions from Russian colleagues have added significantly to our knowledge of Beringia, and it is important that conference organizers and editors have seen to it that their voices are now included. The issue here, however, is the lack of Canadian participation in conferences, workshops, and comprehensive publications, and even in international research projects such as PALE (Paleoecology of Arctic Lakes and Estuaries). But whose fault is it? Canadians love America since America allows us to forget or neglect responsibilities for our own problems and stupidities; we have a neighbor to blame. America becomes a target for what are really Canadian issues. Likely Canadians find it more convenient to blame Americans than to account for their own lack of visibility in Beringian science.

BERINGIAN PALEOECOLOGICAL RESEARCH: PRESENT AND FUTURE

Given my experiences in recent years, I believe our research is being done in increasing isolation. The Alaska-Canada border may be solidifying. From 1975 to the late 1980s, dozens of Canadian researchers focused on the stratigraphy, paleoecology, and archaeology of the Yukon refugium, largely driven by the promise of "early man" archaeology. That work greatly advanced our understanding of the Quaternary of the Yukon, and for a while Canadian researchers were challenging their American counterparts. It became apparent, however, that real progress required a cooperative effort between those working in Alaska and the Yukon. Joint workshops were held (Carter et al. 1989; Matthews et al. 1990) and a joint U.S. Geological Survey–Geological Survey of Canada field project was conceived.

This project saw researchers share field experiences and undertake joint research on both sides of the border. Admittedly, this work really focused on the stratigraphy and environments of the Late Tertiary/Early Pleistocene, but its coming together was an outgrowth of the earlier interest in early man research in the northern Yukon. The search for evidence of early human occupation and technology could only progress when the ages of all deposits were known. Joint fieldwork, undertaken in 1990 and 1991, involved nearly two dozen researchers with a wide range of specializations and held great promise. But before significant benefits could be realized, government cutbacks on both sides of the border, as well as firings, retirements, and deaths, eroded these partnerships.

However, it is important not to be too pessimistic. In the Yukon a new generation of Quaternary scientists have developed strong collaborative ties and trans-boundary research. Canadian Duane Froese and his University of Alberta graduate students work between Alaska and the Yukon. John Westgate of the University of Toronto, now retired, works on both sides of the border, and collaboratively with Duane Froese, Grant Zazula, Scott Elias, myself, and others. A new project on early archaeology of the Alaska-Yukon Borderlands, focusing on the joint excavation of the Late Pleistocene Little John site near the U.S.-Canadian border, is a collaborative effort of Norman Easton of Yukon College in Whitehorse and David Yesner of the University of Alaska Anchorage, and a host of paleoecological studies on faunal and floral assemblages at the site are planned on both sides of the border (Yesner et al. 2008). This mix of "old-timers" and new scholars has revitalized our picture of Quaternary paleoecology in Beringia, and holds promise for the future.

Finally, while the border between Alaska and the Yukon has not been a significant factor up to this point in our understanding of the Late Pleistocene paleoecology of Beringia, there is evidence that Canadian research and researchers have not been cited or featured in international publications or workshops. This is not necessarily anyone's fault, but it does raise significant issues about the xenophobia and centrism of Americans, as well as the reticence of Canadians and their willingness to take the role of the victim. I see no reason why any of these liabilities need to persist, but we must continue the dialogue and attempt to discover ways to pursue and benefit our mutual interests. Some years ago I participated, along with a mixed group of Nordic graduate students and researchers, in soils and plant macrofossil workshops in Norway and Sweden. Specialized, weeklong, joint-learning experiences such as these are frequent offerings at Scandinavian universities. A similar arrangement between Alaska and Canada might tear down some barriers and initiate research contacts for new generations of Quaternary paleoecologists.

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LATE PLEISTOCENE/EARLY HOLOCENE SITE STRUCTURE IN BERINGIA: A CASE STUDY FROM THE BROKEN MAMMOTH SITE, INTERIOR ALASKA

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ABSTRACT

Intrasite spatial analysis and the characterization of site structure at archaeological sites consider the relationship between archaeological material to derive connections between economic and social behavior through the prehistoric use of space. This paper examines the spatial distribution of hearth features, débitage, and faunal remains in the late Pleistocene and early Holocene cultural components of the Broken Mammoth site, near Big Delta in interior Alaska. *K*-means analysis was used to reconstruct activity areas including lithic workshops, meal preparation areas, and refuse zones. Site organization suggests Broken Mammoth was a semipermanent base camp for early colonists of eastern Beringia.

KEYWORDS: spatial analysis in archaeology, prehistoric activity areas, K-means cluster analysis, Beringia, Paleoindian archaeology, Broken Mammoth Site

INTRODUCTION

Most research on late Pleistocene and early Holocene sites in eastern Beringia has focused efforts on technological connections to Siberia and Northeast Asia (Goebel et al. 1991; Hoffecker et al. 1993; West 1996; Yi and Clark 1985). Studies of intrasite artifact distributions and site structure have seen much less research emphasis, but a few notable exceptions exist (Higgs 1992; Hoffecker 1983a, 1983b; Potter 2005; Reanier 1992; Thorson 2006). Intrasite structure has bearing on the nature of land use, mobility, and settlement patterns for the earliest Alaskan colonists. Combining technological studies with detailed information from site organization produces enhanced descriptions of adaptive behavior by better separating individual activities from otherwise palimpsest assemblages.

The Broken Mammoth site, located near Big Delta in the central Tanana Valley of interior Alaska, provides an excellent case study for the analysis of site organization of early Alaskan inhabitants because of the presence of numerous hearth features in well-stratified contexts, relative lack of postdepositional taphonomic disturbance, and faunal preservation (Yesner et al. 1992). This paper addresses the spatial structure of lithic and faunal patterns in the two oldest components of the Broken Mammoth site, cultural zones 3 and 4, dated between 12,000 and 9,300 ^{14}C yrs BP. In doing so the following questions are addressed:

1. Are activities spatially segregated in each cultural zone?
2. How intensely was the site used during each period of occupation?
3. Can individual activities help to discern occupation type?
4. Did the function and structure of the site change over time?

Archaeological remains are patterned because of patterned human behavior, and therefore site organization reflects the underlying use of space and can relate to larger

issues of settlement and economy (Binford 1978a; 1978b; Clarke 1977; Schiffer 1972). Detailed spatial analyses, when employed in conjunction with behavioral frameworks developed through ethnoarchaeological research, have the ability to augment interpretations of site structure, site function, human behavior, chronology, and taphonomy. Further, spatial analysis can establish the limits of activity areas and identify tool kit associations (Carr 1984). Data this specific can be employed to identify behavioral change through time. For example, *k*-means clustering analyses of European Middle and Upper Paleolithic sites demonstrate social change between these periods, partly through a change in archaeological site structure and organization. Middle Paleolithic sites such as Mauran contain only simple hearths that did not serve as the central point for activity. Variation in cluster density and content was also lacking (Simek 1987). In contrast, Upper Paleolithic sites such as Abri Pataud and Le Flageolet each contained multiple hearths that served as focal points for artifact deposition with associated material scattered in fan-shaped patterns away from the hearths. Further, cluster content, density, shape, and size were highly variable (Gamble 1999; Simek 1987). Hearth-centered activities in the Upper Paleolithic are indicative of a shift in the cognitive use of space with an ability to compartmentalize separate activity areas at a level not present in the Middle Paleolithic.

In eastern Beringia, spatial analyses have been applied to late Pleistocene and early Holocene sites in various regions of interior and northern Alaska. Artifact concentrations in Components I and II at the Dry Creek site, Nenana Valley, have been demonstrated to overlap, suggesting the possibility of postdepositional sediment and artifact mixing (Hoffecker 1983b; Thorson 2006). Also in the Nenana Valley, three discrete artifact concentrations

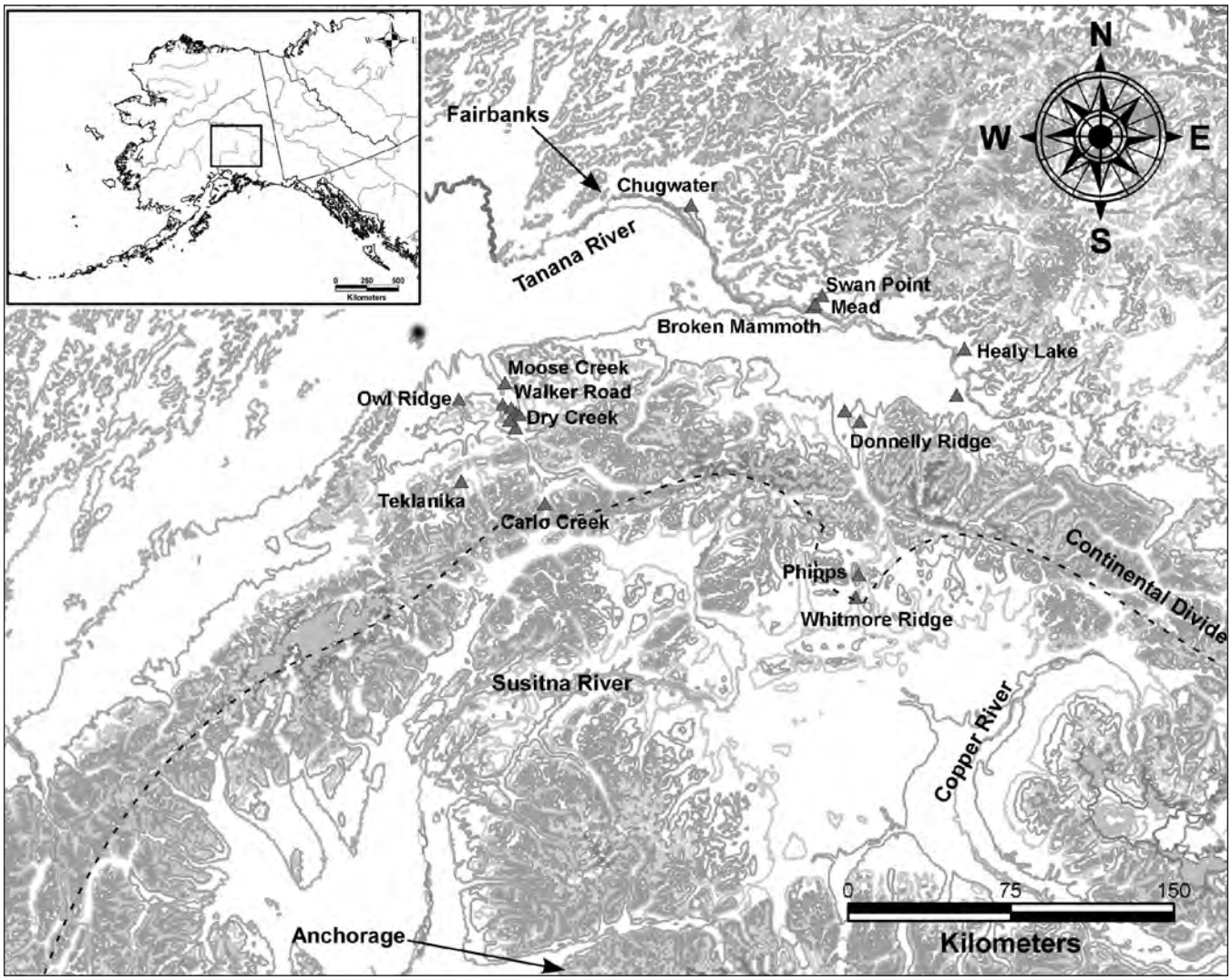


Figure 1. Early Sites in Interior Alaska. Modified from Wygal 2003:19.

were identified at the Walker Road site. Refitting studies demonstrated that these clusters were meaningful units, because materials found in clusters were only found to refit with other material from the same concentration (Higgs 1992). Spatial analysis from the Mesa site in northern Alaska demonstrated that a microblade assemblage there represented a separate occupation from the Paleoindian Mesa Complex occupation (Bever 2006; Kunz et al. 2003). While the primary Mesa Complex artifact concentration was spatially segregated from the microblades, Mesa Complex artifacts also occurred within the microblade scatter. They are interpreted as two separate occupations, because postdepositional downslope movement was demonstrated by refit studies. Further, raw materials used to produce the microblades were absent in the Paleoindian assemblage (Bever 2006; Kunz et al. 2003). Most recently, closer to the Broken Mammoth site in the Tanana Valley, detailed spatial analyses at the Gerstle River Quarry site demonstrated that contemporaneous, spatially separate faunal clusters were related to different stages of carcass processing (Potter 2005, 2007). These sites and other late Pleistocene/early Holocene archaeological sites from interior Alaska are depicted in Fig. 1. The present study uses a similar approach to identify differences in site structure and function at the two earliest components of the Broken Mammoth site.

THE BROKEN MAMMOTH SITE

Holmes and McAllister discovered the Broken Mammoth site in 1989 when highway construction exposed paleosols, hearths, animal bones, and cultural material, including fragments of mammoth ivory. The site (Fig. 1) sits on top of a 30 m bluff overlooking the confluence of Shaw Creek and the Tanana River (Holmes 1996; Yesner 1996; Yesner and Stone 2001). Like other late Pleistocene and early Holocene sites in interior Alaska, Broken Mammoth has a view of a broad river valley and the Alaska Range from the south face of a bluff. Fittingly, the Tanana Athabascan name for the site means "place where one can see far" (Yesner 1996).

Four cultural zones (hereafter abbreviated "CZs") occur within approximately 2 m of stratified aeolian silt (loess) overlying late Pleistocene sands (Fig. 2). Excellent organic preservation at the site is attributed to the rapid accumulation of well-drained calcareous soils. Since its discovery, Broken Mammoth has been well documented as one of the three earliest dated sites in Alaska (Holmes 1996, 2001; Yesner 1996; Yesner et al. 1992; Yesner and Stone 2001).

The Middle Paleosol Complex contains CZ 3, an assemblage dated between 9,300 and 10,300 ^{14}C yrs BP. The CZ 3 assemblage includes microblades, bifacial knives, flake cores, choppers, hammerstones, anvilstones, and a cache of mammoth ivory tools. Multiple hearth features as well as abundant and diverse faunal material have also been recovered. One hearth, dated to 10,300 ^{14}C yrs BP, was associated with an eyed bone needle (Holmes 1996; Yesner 1996).

The oldest cultural material occurs in CZ 4 within the Lower Paleosol Complex dated between 11,040 and 11,770 ^{14}C yrs BP. The assemblage contains evidence for bifacial and unifacial lithic reduction strategies as well as plano-convex scrapers, large quartz choppers, hammerstones,

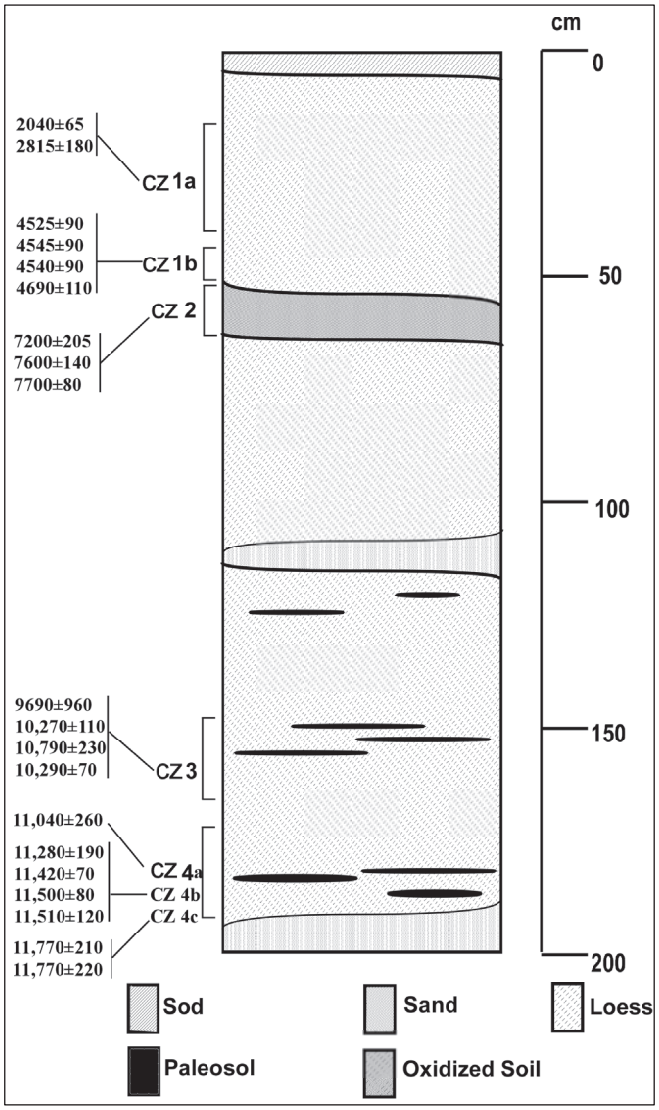


Figure 2. Broken Mammoth site stratigraphic profile.

and anvilstones. Numerous avian and mammalian remains and numerous hearths and hearth smears were also present (Holmes 1996; Yesner 1994, 1996, 2001; Yesner et al. 1992, 2000; Yesner and Stone 2001).

THE USE OF SPACE: IMPLICATIONS FOR SITE STRUCTURE

Hunter-gatherers conduct activities and use space in predictable ways. Behavioral models based on ethnographic and ethnoarchaeological studies have demonstrated that material discard, abandonment, and natural taphonomic processes affect where materials are distributed around a camp (Murray 1980; Schiffer 1972). Attempts to understand these processes and decipher meaning from the archaeological record based on ethnographic analogy have been extensive (Binford 1978a, 1980, 1983, 1987, 1991; Carr 1991; Enloe et al. 1994; Jochim 1976; Kent 1984, 1987; Simek 1989; Stevenson 1985, 1991; Whitelaw 1991; Yellen 1977). In particular, Binford's (1983) ethnoarchaeological study of mobile hunter-gatherer and pastoralist cultures led to a universal description for individuals working around hearths. According to his model, individuals sit obliquely from hearths as they perform activities including meal preparation and tool manufacture. During these activities, they drop small objects such as bone fragments and other debris into the "drop zone" beside the hearth, while larger objects are tossed forward or backward into "toss areas" (Binford 1983). Few items fall into the hearths themselves and a doughnut-shaped distribution of waste material forms around the feature (Fig. 3).

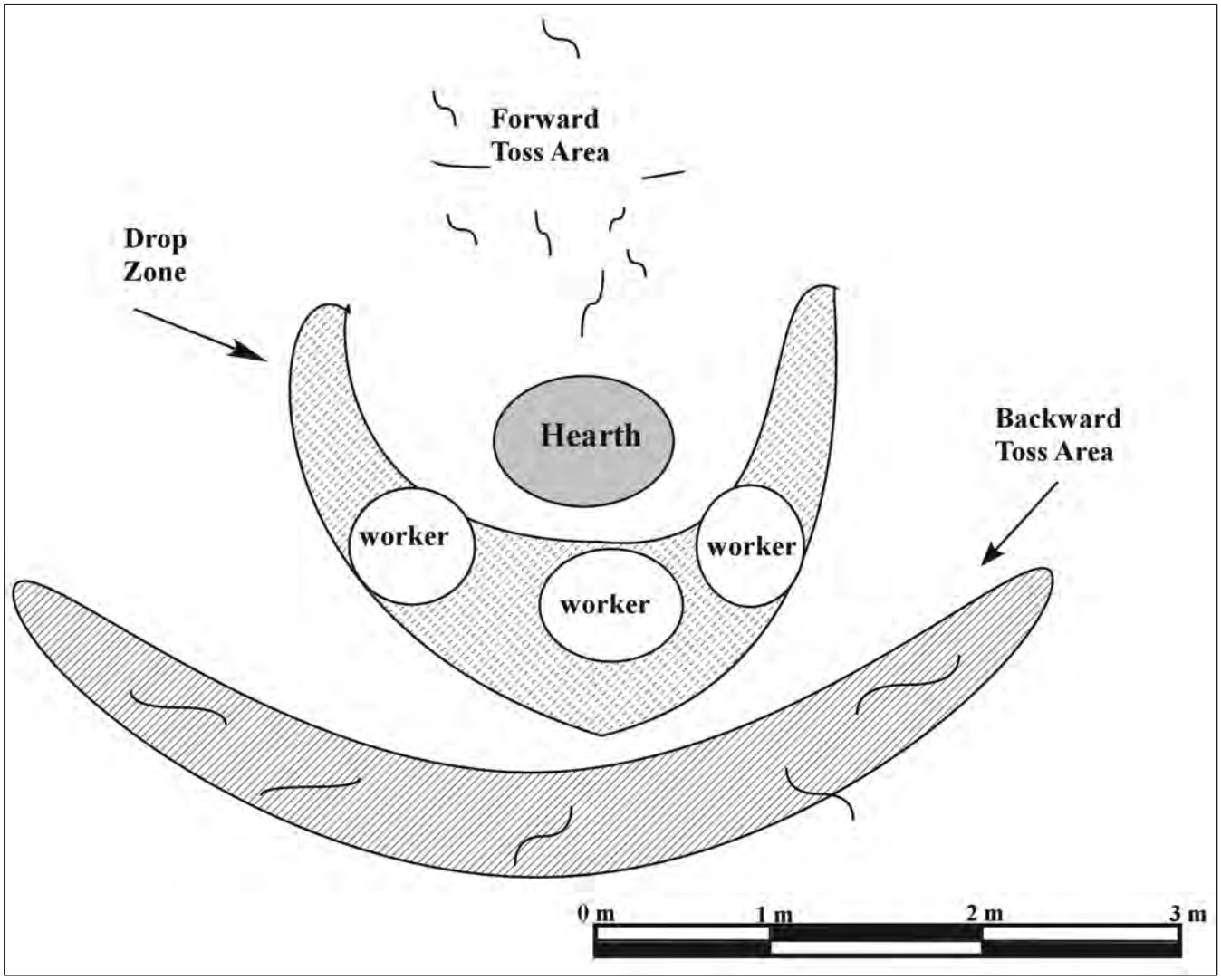


Figure 3. Binford's "Working Around a Hearth" model. Modified from Binford 1983:153.

This phenomenon has been observed in numerous ethnographic cases among the !Kung Bushmen, Nunamiut Eskimos, and Navajo (Binford 1983), and documented archaeologically in Upper Paleolithic sites (Cahen et al. 1979; Carr 1991; Simek 1987; Simek and Larick 1983; Whallon 1973). Applying this model to a prehistoric site in northwest Alaska, Anderson (1988) demonstrated that activity-specific debris was concentrated within distinct areas 2 m in diameter at Onion Portage. He argued that as more individuals sat around a single hearth, this diameter would gradually increase, and thus give a relative indication of group size.

Further archaeological distinctions can be made between *inside hearths* and *outside hearths* in that the former tend to be better contained and discrete as a function of increased maintenance inside the structure (Binford 1983; O'Connell et al. 1991). As hearths are cleaned, detritus is scattered or pitched away from hearths. Linear distributions or diffuse cultural material may be an indication of hearth clearing. Material discarded around *inside hearths* may even form rings or arcs of material as it tends to migrate to the edges of tents over time. Outside hearths do not usually receive as much attention. As a result of hearth maintenance, refuse areas or dump zones are produced through an accumulation of objects, circular and dispersed in nature. Foot traffic or shuffling creates further horizontal spreading of the material, which may become size-sorted over time (Binford 1983; Stevenson 1991).

Intensive activities like tool manufacture typically occur while seated near a hearth and conform to Binford's (1983) drop and toss zones model, with distributions that do not usually exceed Anderson's (1988) 2 m diameter observations. During extensive activities (e.g., butchering) material distributions deviate from those produced by intensive activities (e.g., tool manufacture). In the former, not only does the worker constantly shift positions around the work area but these activities also do not typically occur around hearths. Thus, discarded material spans larger areas and is less densely clustered than material deposited during intensive activities. Binford's (1978a, 1978b) ethnographic accounts noted that numerous factors influence human behavior around hearths—including wind direction, which plays a significant role in deciding where one sits.

Hearth features commonly serve as the center of group activity (Gamble 1999), but concentrated activity is not restricted to these features. Material deposited at these locations need not be contemporaneous, and discerning how many visits were made to a specific activity area during an occupation is not always possible. This complex variation in human behavior was demonstrated by O'Connell's (1987) research with the Alyawara, where he pointed out that different activities occur in the same location, and refuse produced by a specific activity is not always deposited at the point of production. Thus, intrasite spatial analysis should focus attention on material deposited around hearths, but it should not be limited to these features, especially if dump zones occurring away from central activity areas are suspected.

ANALYTICAL TECHNIQUES

Spatial organization must be recognized through the mathematical identification of artifact concentrations and examination of cluster maps, not solely on archaeological intuition. Through systematic correlation between clusters, site function can be inferred by assessing cluster heterogeneity and distribution across the site. The *k*-means clustering technique has been widely used to perform this analysis (Kintigh 1990; Kintigh and Ammerman 1982; Reanier 1992; Simek 1984; Simek and Larick 1983) and is appropriate here because it uses point provenience data to define clusters without reducing data to the quadrat level. It also allows the investigator to assign meaning to cluster results through the application of behavioral frameworks developed from ethnoarchaeological studies (Reanier 1992). First developed by Kintigh and Ammerman (1982), the *k*-means algorithm is a nonhierarchical divisive technique used to define clusters based on provenience data. It is nonhierarchical in that at each stage of the clustering process, one data point may be assigned to a separate cluster instead of remaining in the cluster to which it was originally assigned (Reanier 1992). The clustering criterion for *k*-means analysis, the Sum Squared Error (SSE) is defined as "the sum over all objects in the analysis of the Squared Euclidean distance from each object to the centroid of the cluster to which it was defined" (Kintigh and Ammerman 1982:39):

$$\mathbf{SSE} = \sum_{i=1}^{N} [(x_i - x_{ci})^2 + (y_i - y_{ci})^2]$$

The centroid of a cluster containing point i is (x_{ci}, y_{ci}), and (x_i, y_i) represents the ith point of an N point data set (Kintigh and Ammerman 1982). K-means analysis begins with a single cluster from which subdivision into more clusters occurs at the point furthest from its assigned cluster center. Data points are then reassigned, some remaining in

the original cluster, and others in the newly formed cluster. This process continues until the specified number of clusters has been created (Kintigh and Ammerman 1982; Reanier 1992). Designed to minimize intracluster variances, it also maximizes intercluster distances (Kintigh 1990; Kintigh and Ammerman 1982).

K-means analysis is particularly flexible and diverse because it can tolerate large data sets, process any assigned number of clusters, and detect small- and large-scale degrees of patterning. When the clustering process is complete, a list of each cluster's constituents, percent of the analyzed assemblage, centroid, and radius is generated. All maps presented in this paper with *k*-means clusters depict the size and shape of these defined clusters and incorporate all assigned data points. Because the method is not intuitive, the researcher must specify how many clusters to produce. While the researcher usually has an *a priori* reason (e.g., frame of reference) to select a specific number or range of clusters, other methods can be used to determine how many clusters are appropriate. Graphical representation of the reduction of the clustering criterion known as the Sum Squared Error (SSE) can be visually inspected to identify a cluster solution by the presence of a break or shoulder (Reanier 1992). While SSE reduction plots provide a quantitative explanation for clustering decisions, this method is not without problems. The plots do not have the ability to define single cluster solutions and are dependent on grid orientation (Reanier 1992). Used in conjunction with visual expectations, Reanier (1992) developed a statistical method to assess whether clusters formed during *k*-means analysis are significantly more clustered than expected from random data using Monte Carlo methods applied to the SSE criterion. While this expectation is generally reasonable, it would prevent the formation of clusters produced from the random dispersion of material through cultural and natural taphonomic processes including trampling, shuffling, hearth cleaning, and wind movement. Since such patterns might mirror random distributions produced through Monte Carlo methods, cluster solutions with behavioral meaning are more effectively identified when sets of clusters are generated that are separated by areas devoid of lithic or faunal material. Because of the complex nature of the spatial distribution of artifacts at the Broken Mammoth site, clusters were also defined when they did not include heavy overlap and single clusters encompassing only distant outliers begin to form (Reanier 1992). When these criteria are met, clusters are then evaluated for homogeneity, location, and size of cluster. Chi-square (χ^2) analyses were used to assess the homogeneity within and between clusters. Significant differences in cluster composition (e.g., significantly more faunal remains than débitage) may indicate the primary function of an activity area was faunal processing or meal preparation. Clusters were considered dispersed if they extended over 4 m^2, and diffuse if fewer than twenty data points occurred on average in a 4 m^2 area. Intensive and extensive work areas can be identified partly through incorporating Anderson's (1988) and Binford's (1983) expected measurements of these areas.

THE BROKEN MAMMOTH ARCHAEOLOGICAL SAMPLE

For both cultural zones 3 and 4 at the Broken Mammoth site, faunal material and débitage were subjected to *k*-means analysis to address questions about lithic manufacture, lithic maintenance, food preparation, and maintenance of hearths and other features reflecting discrete intrasite activity sets. A total of 8,675 archaeological materials were included in this analysis, deriving from excavations in cultural zones 3 and 4 at the Broken Mammoth site undertaken during the 1990–2002 field seasons (encompassing the 1990, 1991, 1992, 1998, 2000, and 2002 field seasons; only partial data were available from the 1993 field season, and material had not yet been processed from the 2005 field season at the time of this analysis). However, not all of these materials were included in the *k*-means analysis. First, formal tools, microblades, charcoal fragments, and mammoth ivory fragments were not included in this analysis because of their low frequencies in the assemblages. Instead, débitage and faunal elements, which comprised the majority of artifacts at the site (Table 1), were selected for the spatial analysis because of their high frequencies in the assemblages. These included 8,555 faunal elements and 5,264 débitage fragments (Table 1).

Furthermore, because of differential recovery of these materials, a problem with all archaeological sites, not all of

Table 1: Broken Mammoth cultural zone 3 artifact frequencies

Type	Frequencies	Number included in *k*-means analysis	% included in *k*-means analysis
Fauna	5,325	3,246	61
Flakes	3,980	1,794	45
Microblades	44	0	0
Formal Artifacts	41	0	0

the débitage or faunal elements could be included in the analysis. At the Broken Mammoth site, faunal remains in both cultural zones were overwhelmingly represented by bone fragments less than 1 cm in maximum dimension, and débitage consisted primarily of tiny pressure flakes. Many of these bone and stone fragments were recovered in ⅛ in. screens, rather than *in situ*. However, only materials recovered *in situ* were given three point proveniences. Therefore, spatial analysis was limited only to archaeological material recovered *in situ*, eliminating sieved or screened materials. The final total did include nearly five thousand faunal elements and over three thousand débitage fragments, representing ~55–60 percent of the former and just under 50 percent of the latter (Table 1). The smaller sample size, however, raised the possibility that it might provide a skewed representation of spatial patterns. To control for these discrepancies, all artifacts were initially mapped in the center of the 50 cm^2 area from which they were recovered, and contour maps were generated using Surfer 7 Goldenware software. In every case, clusters formed by the contour maps directly overlapped clusters of material found *in situ*. Further, no new activity areas were recognized with these added precautions. This allowed the occupational intensity of each area to be assessed more accurately.

ANALYSIS OF ARCHAEOLOGICAL MATERIAL FROM CULTURAL ZONE 3

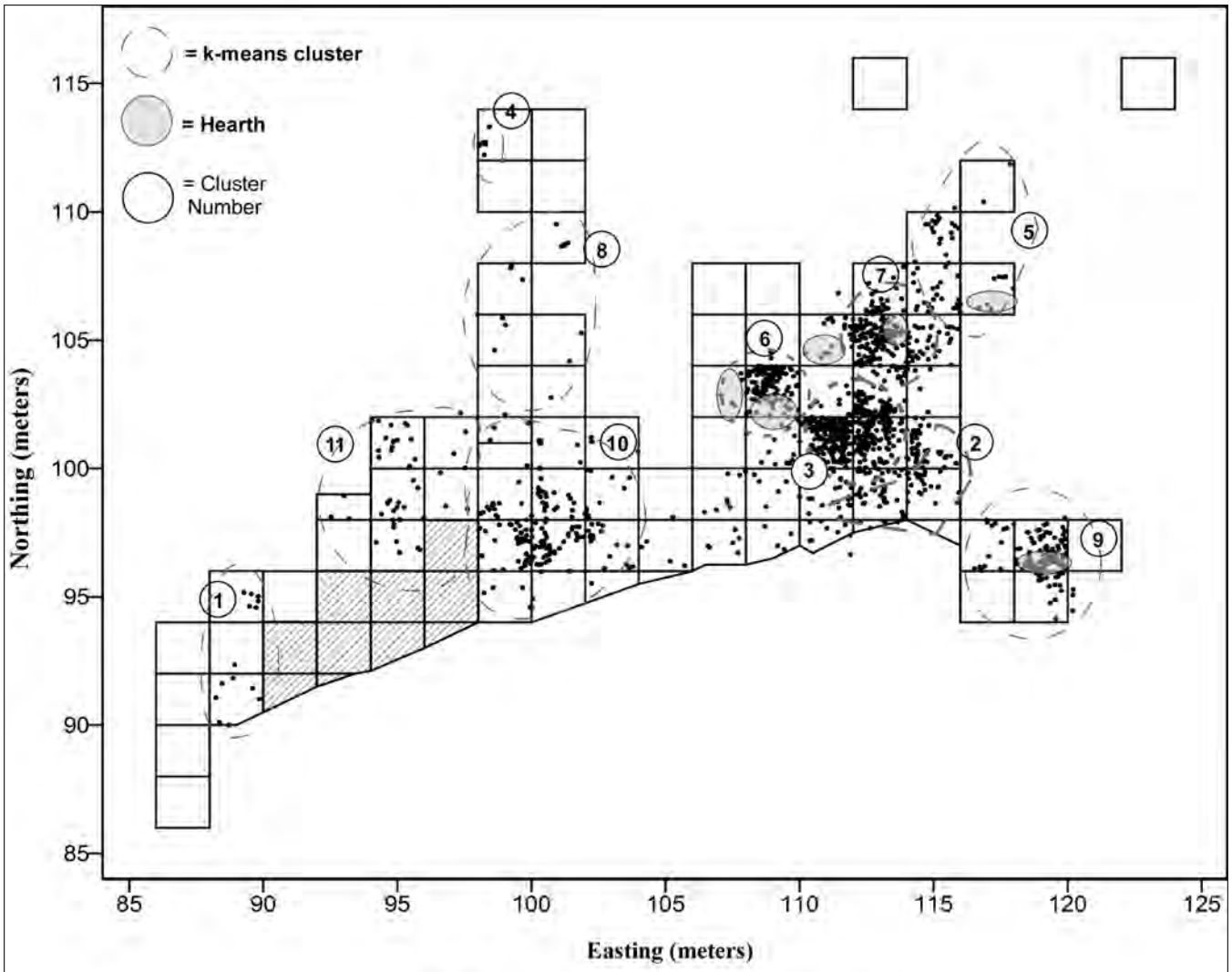
Relationships were sought between *k*-means clusters and six substantial hearths and hearth smears from the CZ 3 assemblage. Each of the hearths was discretely defined and ranged in shape from elliptical to circular, and in size from 40 cm to over 1 m in diameter. The hearths are predominantly located in the eastern portion of the site and all but one were placed over 5 m from the bluff edge.

A *k*-means analysis of the CZ 3 faunal remains shows several types of cluster associations within the optimal eleven-cluster solution (Fig. 4). Clusters 5, 6, 7, and 9 are associated with hearths, and although large, each is particularly concentrated and likely represents drop and toss zones with the exception of cluster 5. In contrast, clusters not associated with hearths (especially 1, 4, 8, 10, and 11) are widely dispersed across the western portion of the site. Each of these clusters spans at least 6 m and likely represents secondary refuse zones.

Débitage frequencies are fewer than faunal remains in CZ 3, but nonetheless eight clusters were considered optimal in this analysis (Fig. 5). At least one flake cluster corresponds with each hearth feature and these occur in dense concentrations, mirroring the distribution pattern of fauna. Cluster 1 represents a single isolated flake while cluster 2 is a particularly dense and well-defined concentration of flakes that occurs within a 1 m radius and is not associated with a hearth. Located 15 m from the nearest hearth, clusters 1, 5, and 6 appear to be associated with the specialized work cluster 2 and were possibly deposited through a combination of shuffling of the cluster 2 material and hearth cleaning from the eastern portion of the site. Cluster 8 encompasses three of the six hearths from this cultural zone. Surprisingly, débitage is only located directly in the space between these three hearths. This spatially restricted distribution of débitage suggests perhaps wind direction played a role in seating locations and that few people sat at the hearths simultaneously.

K-means analysis cannot take the presence or absence of hearth features into account during cluster formation, but it is not surprising that each hearth feature overlapped with at least one artifact cluster for both fauna and débitage. This supports Gamble's (1999) and Binford's (1978a, 1978b) proposal that many activities are in fact hearth-centered despite disturbances from foot shuffling. While *k*-means cluster analysis independently identified flake and faunal clusters as overlapping, their content and relative frequencies varied from cluster to cluster. For instance, fauna from cluster 3 significantly outnumbered the overlapping débitage from cluster 8 ($p=0.000$), an indication this area was used predominantly for bone processing. A similar pattern is portrayed in fauna cluster 9 and flake cluster 3 ($p=0.000$). The opposite is true for lithic cluster 2 and the overlapping fauna cluster 11 because, in this case, flakes statistically dominate fauna ($p=0.000$). Each cluster is circular, with some being more discrete than others, and the small degree of overlap supports the notion the site was frequently reoccupied (Yesner 1996, 2001). The site contains evidence for the co-occurrence at Broken Mammoth of a variety of specialized tasks that would normally be found as single events on the landscape.

The evidence from Broken Mammoth could represent either of two possible scenarios: (1) a palimpsest (conflations) of a repeated series of small-scale, task-specific activities blurred through time; or (2) a more extensive semipermanent base camp. These are not considered palimpsests, however, because radiocarbon-dated hearth samples and dispersed charcoal ranging from 10,270±110 ^{14}C yrs BP to 10,790±230 ^{14}C yrs BP are all contemporary



K Means Cluster Statistics for Fauna

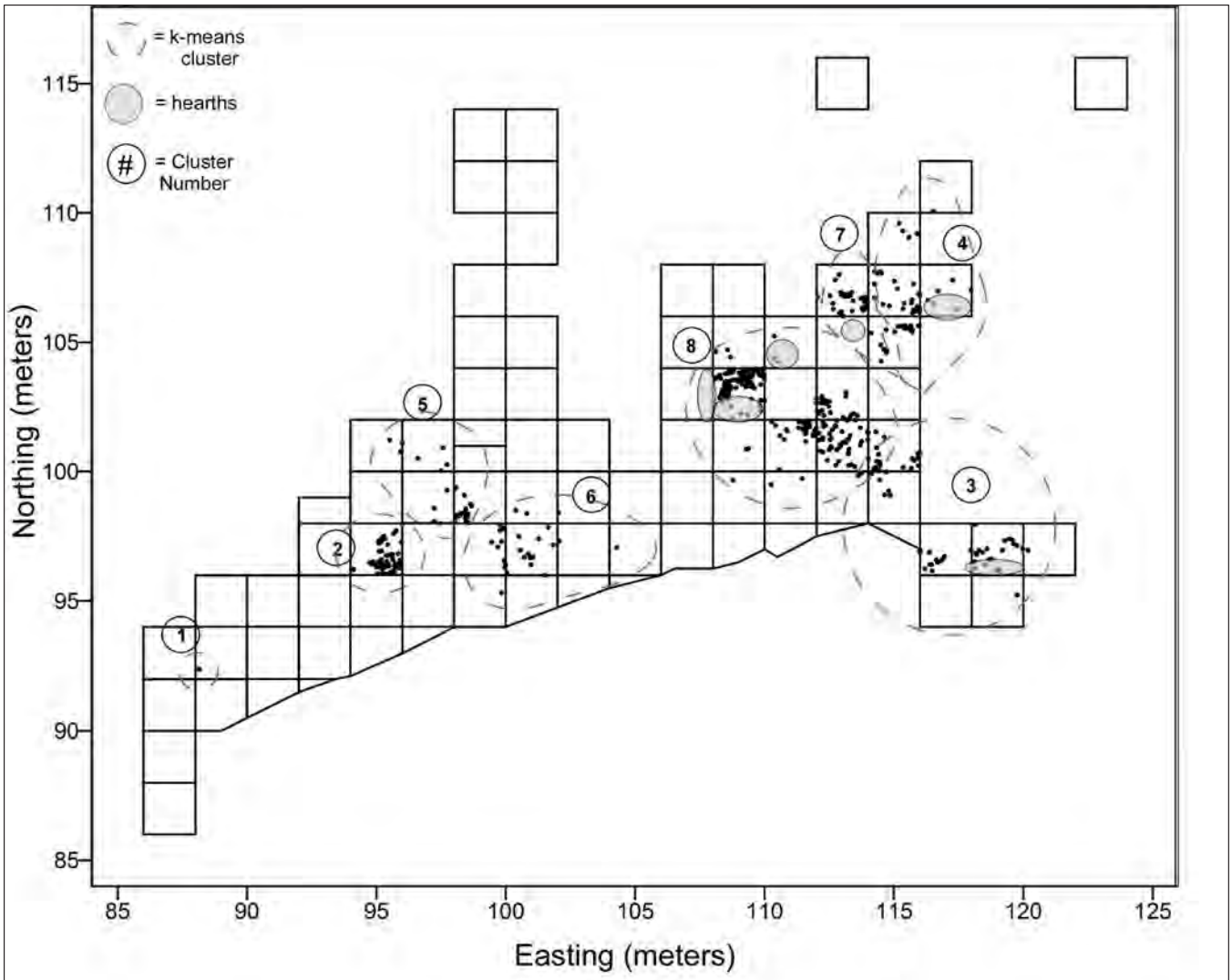
Cluster	1	2	3	4	5	6	7	8	9	10	11	Sums
Counts	55	178	554	6	370	449	964	34	367	195	53	3225
%	1.7	5.5	17.2	0.2	11.5	13.9	30.0	1.0	11.4	6.0	1.6	100

Figure 4. Broken Mammoth Site cultural zone 3 k-means clusters for fauna.

at 2 σ (Hamilton and Goebel 1999; Yesner et al. 1992). Following Potter (2005, 2007), because loess accumulation occurred rapidly after the cultural zone 3 material was deposited, and because the cultural remains are clearly associated with contemporaneous hearth features, the CZ 3 material can be considered a single assemblage. Thus, although the ratio between primary and secondary reduction débitage has not yet been assessed for the Broken Mammoth site, because both faunal processing and lithic manufacture were common, the site does not appear to have been the result of an accumulation of highly specialized or task-specific operations.

ANALYSIS OF ARCHAEOLOGICAL MATERIAL FROM CULTURAL ZONE 4

Most cultural features from cultural zone 4 occur along the eastern bluff edge and are characterized by eight hearths and hearth smears. Three of these hearths are approximately 50 cm in diameter, circular in nature, and are at least



***K* Means Cluster Statistics for Flakes**

Cluster	1	2	3	4	5	6	7	8	Sums
Counts	1	289	149	113	37	33	186	507	1315
%	0.1	22	11.3	8.6	2.8	2.5	14.1	38.6	100

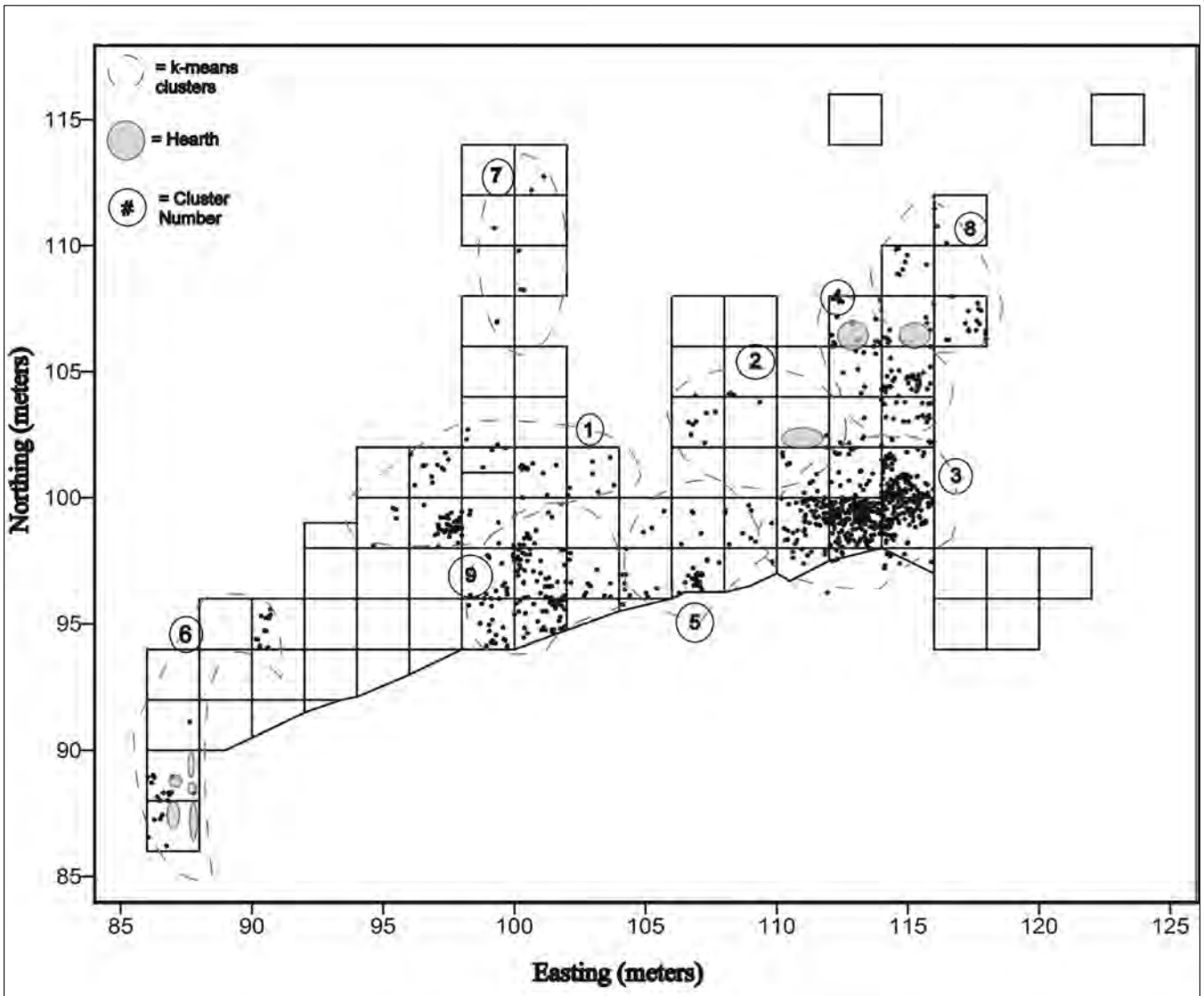
Figure 5. Broken Mammoth Site cultural zone 3 k-means clusters for débitage.

5 m from the bluff edge. The remains of five hearths were identified within a 4 m^2 area in the western-most portion of the site. These features range in shape from circular to elliptical and are 20–50 cm in diameter.

Visual inspection of the distribution of cultural material across the site clearly demonstrates the diffuse nature of the cultural zone 4 occupation. The majority of the CZ 4 finds were faunal remains, which outnumbered débitage by more than half. In applying the *k*-means analysis, nine clusters were considered for the fauna data set. Faunal cluster 3 represented the densest cluster, but was not in association with a hearth. This location likely was an intensive activity area, not a refuse zone, because of its concentrated nature. Faunal distributions *not* analogous to Binford's (1978a, 1978b, 1983) "working around a hearth" model were unexpected. The dispersion of material across the site would indicate that some hearths were cleaned, the site was used

Table 2: Broken Mammoth cultural zone 4 artifact frequencies

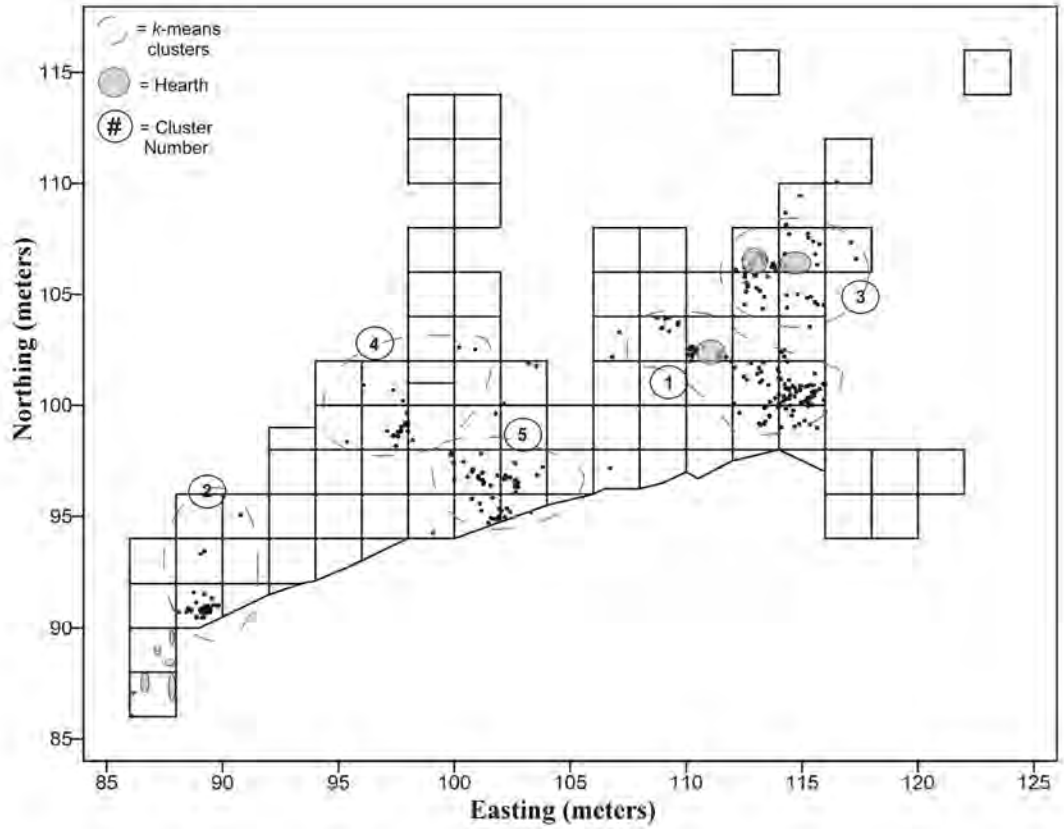
Artifact Type	Frequencies	Number included in *k*-means analysis	% included in *k*-means analysis
Fauna	3,230	1,740	54
Flakes	1,284	602	47
Formal Artifacts	35	0	0



***K* Means Cluster Statistics for Fauna**

Cluster	1	2	3	4	5	6	7	8	9	Totals
Count	94	408	506	271	62	124	8	117	150	1740
Percent	5.4	23.4	29.1	15.6	3.6	7.1	0.5	6.7	8.6	100

Figure 6. Broken Mammoth Site cultural zone 4 k-means clusters for fauna.



K Means Cluster Statistics for Flakes

Cluster	1	2	3	4	5	Totals
Count	259	143	104	28	68	602
Percent	43.0	23.8	17.3	4.6	11.3	100

Figure 7. Broken Mammoth Site cultural zone 4 k-means clusters for débitage.

infrequently, or intensive activities were not restricted to hearth areas.

Five clusters were considered optimal in the *k*-means cluster analysis for débitage from cultural zone 4. In general, débitage is not as heavily dispersed as fauna and is concentrated more heavily around hearth features (Fig. 7). There is a strong correlation between débitage, faunal remains, and features within CZ 4 with multiple activities occurring around hearths. Chi-square (χ^2) analyses were used to test whether faunal and débitage frequencies were statistically different. For instance, flake cluster 5 and faunal clusters 5 and 9 have overlapping lithic and faunal remains with frequencies that are not statistically different ($p=0.933$). However, one specialized lithic workshop was identified in cluster 2 where the concentration is discrete and faunal remains are absent.

DISCUSSION

Activity increased in CZ 3 over CZ 4 perhaps as the result of an increase in the number of people occupying the site as evident in the relatively high number of artifacts recovered as well as the density of activity areas defined by the *k*-means technique. Moreover, faunal processing was the dominant activity during the CZ 4 occupation, while the CZ 3 occupants substantially increased lithic manufacture over earlier times, although faunal processing remained an important site function for both occupation episodes.

CZ 4 occupants used the bluff edge more intensively than in CZ 3, especially in the area of cluster 6 where a collection of small hearths occur in the western portion of the site. This area is unique because these features do not appear to be the center of identifiable activity and may be the result of low-intensity inside hearths. Moreover, their brief use may be an indication of lower population levels in the CZ 4 occupation.

Space maintenance and clearing seems to be demonstrated in at least some of the hearth features for both CZs. The restricted location of cultural material around some hearths suggests use by single individuals, and there is no indication for large, permanent, or stone-lined hearth features in either occupation. Small refuse zones are primarily located in the center of the site and are highly dispersed, suggesting this area received heavy foot traffic. Moreover, within both cultural components, intensive activities including lithic manufacture and maintenance, bone processing, and meal preparation took place around hearths but were not limited to these features. The eastern and southern sides of the site displayed the most intensive activity for both CZs 3 and 4. But hearths from CZs 3 and 4 were not superimposed, an indication of the absence of postdepositional disturbance but also for distinct occupational events.

Hunter-gatherer discard practices are partially dependent on site function and degree of mobility. Thus, one can identify site type based on discard expectations. Residential base camps would have been supported by spike or peripheral camps in areas where resources were obtained (e.g., kill sites and lithic quarries; cf. Binford 1978b; Guthrie 1983). Guthrie (1983) defines base camps as containing storage features such as caches, drying racks, tent rings, or semisubterranean features as signs of more permanent occupations. Base camps must also be located near a water source and accessible firewood. He defines spike camps as temporary seasonal hunting or processing stands where animals were processed for transport elsewhere (Guthrie 1983). Thus, one would expect groups characterized by residential mobility to discard certain materials in areas peripheral to living spaces at residential camps as they are frequently revisited, while highly mobile populations discard most material at their use locations (Murray 1980).

To date, no base camps have been found in interior Alaska as defined by Guthrie (1983), but sites possessing high feature diversity in which a wide range of generalized tasks were performed (e.g., tool and animal processing) have been documented (Potter 2005). Perhaps this is because base camps were located along river corridors and destroyed by subsequent fluvial activity (Yesner 1996). Although there is no evidence of drying racks, tent structures, or semisubterranean features at Broken Mammoth, mammoth ivory recovered from CZ 3 may represent a cache (Yesner 1996). Furthermore, the site meets other criteria for base camps, including access to substantial water sources (Shaw Creek and the Tanana River), firewood, and good protection from the elements. Perhaps more substantial facilities mentioned by Guthrie (1983) were originally positioned elsewhere at the base of the bluff along the riverbank and thus are not reflected in the excavated portion of the site. Broken Mammoth likely served as a semipermanent camp in which excavated cultural material represents a series of diverse activities.

CONCLUSIONS

This study provides the preliminary work to address the distribution of archaeological material at the Broken Mammoth site. Site activities are by no means limited solely to butchering, with a wide variety of activities including marrow processing, disposal, transport of animal remains, hearth maintenance, and tool preparation. Site function, structure, and activities did not vary much among these periods. Many of these activities were spatially segregated and restricted to small and discrete areas analogous to workshops. Faunal and lithic analyses, along with future refit studies will further illuminate details of these activities. Although settlement patterns likely did not change significantly between the late Pleistocene and early Holocene occupations, the site likely represents a semipermanent base camp and was used more intensely perhaps because of increased population densities during the later cultural zone 3 occupation. Future comparisons to other late Pleistocene and early Holocene sites in interior Alaska will better explain the nature of prehistoric hunter-gatherers during this dramatic period of climate change and faunal turnover.

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THE NORTHWEST COAST DURING THE PLEISTOCENE/HOLOCENE TRANSITION: HIGH ROAD OR HINDRANCE?

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ABSTRACT

This paper examines the results of recent paleogeographical and archaeological investigations bearing on the question of whether the Northwest Coast was a route by which late Pleistocene peoples moving from Beringia could have reached points south of the glacial margins. There is as yet no radiocarbon-dated archaeological evidence on the Northwest Coast earlier than about 11,000 ^{14}C yrs BP, even though it can be inferred from paleoenvironmental indicators that transit down the coast was possible between 14,000 and 12,000 ^{14}C yrs BP. Interior migration routes, however, were also feasible during the latter part of this time interval.

KEYWORDS: migration routes, Beringia, British Columbia

INTRODUCTION

In spite of speculative claims to the contrary, Beringia is still the most logical late Pleistocene homeland for New World aborigines. Given this assumption, the question then arises as to the route or routes Beringians took when the glaciers that barred them from North American regions to the south began to melt during the terminal Pleistocene, and what enticed these arctic-adapted people to spread into unfamiliar regions. It is known from archaeological evidence that microblade-using people were present north of the glaciers at the Swan Point site in central Alaska by at least 12,250 ^{14}C yrs BP (Holmes 2007), that human coprolites dating to 12,300 ^{14}C yrs BP were deposited in Paisley Cave in eastern Oregon south of the glaciated regions (Gilbert et al. 2008), and that Clovis people were spread throughout most of the United States south of the glaciers by 11,050–10,800 ^{14}C yrs BP (Waters and Stafford 2007) and in parts of western Canada (Driver 1998), if not earlier. Many scholars favor an interior corridor either east or west of the Rocky Mountains as the primary route of entry, although a coastal route has come to be preferred by some investigators. There has been speculation about migration by nunatak hopping and ice floe cruising during periods of peak glaciation, but the less controversial migration models depend on at least partial deglaciation of the respective routes during the late Pleistocene. Considerable glaciological research has been undertaken in the last decade, and needs to be considered in assessing the relative likelihood of alternative migration scenarios from Beringia south. Fig. 1 shows locations of proposed corridors and relevant sites or localities.

THE COASTAL ROUTE

A model of migration south along the Northwest Coast was brought into prominence by Fladmark (1979, 1983), who suggested travel via unglaciated coastal refugia during peak glaciation. At that time there was some suggestion of mid-Pleistocene human occupation south of the glacial margins that has since been debunked (Dincauze 1984, Owen 1984). More recently, the Monte Verde site in southern Chile, with its pre-Clovis radiocarbon dates, has sometimes been cited (Ames and Maschner 1999,

Dixon 1999, Gruhn 1994) as evidence of an early Pacific coastal migration, although the confusions in the published reports on this site (cf. Fiedel 1999b) now make this evidence equivocal. We will never know whether Monte Verde is pre-Clovis or not without confirmation from other excavations at sites in the area. In a recent analysis of colonization routes, Anderson and Gillam (2000) rule out the Northwest Coast as the "least-cost" route for Clovis ancestors because of the indented nature of the coastline, but do not seem to take into account the ease of movement on a treeless coastal plain such as existed during the terminal Pleistocene when the outer continental shelf was exposed during a short interval.

Glaciologists consider the outer fringes of the north Pacific coast to have been deglaciated earlier than elsewhere. Mann and Peteet (1994:136) date the last glacial maximum in that region at 23,000 to 14,700 ^{14}C yrs BP and note that coastal ice masses terminated offshore during this period and extended onto the outer continental shelf approximated by the 200 m bathymetric contour. They further infer that the Alaska Peninsula Glacier Complex "would have precluded coastal migration by humans during its maximum extent" even though some places such as Cook Inlet were glacier free by 16,000 ^{14}C yrs BP. In the Queen Charlotte Islands ice had also retreated by 16,000–15,000 ^{14}C yrs BP and bears had reached the outer coast of the Queen Charlotte Islands by 14,500 ^{14}C yrs BP (Fedje 2003:30). Further south on the coast in southwest British Columbia and Washington State, the last glacial maximum was a thousand or more years later and ice covered a 400 km stretch of the continental shelf west of Vancouver Island until 14,500–14,000 BP (Blaise et al. 1990). In the interval following deglaciation of the outer coast and before melting of the continental glacial mass caused sea level rise, a strip of shrub-tundra along the outer coast could have permitted passage by 14,000 ^{14}C yrs BP of peoples with a culture already adapted to survival in the Arctic, including use of skin-covered watercraft for crossing rivers, inlets, and estuaries, although such a passage would not have been easy. Today this coastal strip lies far beneath the sea. A full maritime adaptation such as is known by almost ten thousand years ago on the northern Northwest Coast (Carlson 1998) would not have been necessary for such a passage. The extant Beringian hunting, fishing, and hide-working technology would have worked well in this newly deglaciated shrub-tundra coastal environment, providing that resources were available.

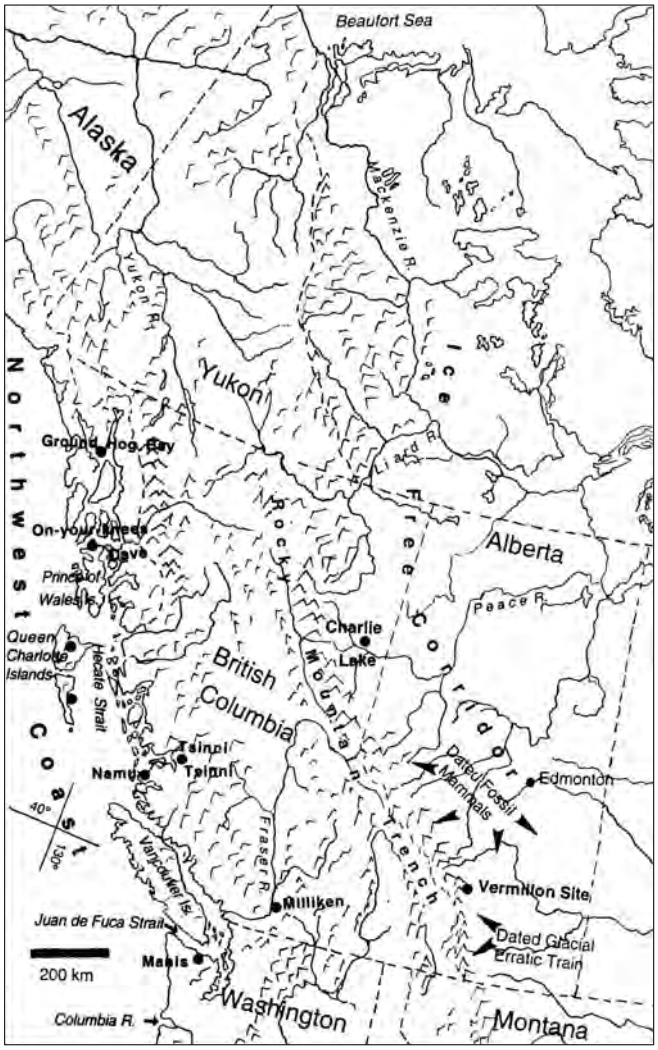

Fig. 1. Map showing Northwest Coast and Interior corridors with selected sites and localities mentioned in the text.

The inner coast, the inside passage that today permits travel by small boat in protected waters from Skagway in Alaska to Olympia in Washington State with few exposures to the open ocean, with the possible exception of an already ice-free refugium underlying what is now Hecate Strait (Byun 1999), appears to have become ice free later than the outer coast. Heaton et al. (1996) obtained twenty dates on land mammal bones from Prince of Wales Island that yielded four dates between 44,500 and 35,365 ^{14}C yrs BP, followed by an interval with no land mammal dates, and then ten dates between 12,295 and 9,995 ^{14}C yrs BP, and six dates younger than 6,415 ^{14}C yrs BP. There was also one date of 17,565 ^{14}C yrs BP on bones of ringed seal, a sea mammal adapted to pack ice, and some dates on fish bones. These dates suggest that the inner coast was uninhabitable by land mammals between 35,365 and

12,295 ^{14}C yrs BP because of glacial cover, but that by the younger date the region was occupied by bears and could have been occupied by other land mammals. Further south on northern Vancouver Island the earliest bears have been dated at 9,830±140 ^{14}C yrs BP; mountain goats are known even earlier at 12,200±190 ^{14}C yrs BP (Nagorsen et al. 1995, Nagorsen and Keddie 2000). Unlike bears, people don't hibernate during the winter, and unlike both bears and mountain goats, people do not have thick fur. However, Beringians did have both clothing and fire, and should have been able to survive as well on the Northwest Coast twelve thousand years ago as they did in Beringia. So far the archaeological record provides no solid evidence for humans that early on the coast itself, although there is solid evidence dating a little over ^{14}C yrs BP both to the north at the Swan Point site in central Alaska (Holmes 2007) and to the south at Paisley Caves in eastern Oregon (Gilbert et al. 2008).

Although it has long been known that there were sea level changes, it is only recently that the magnitude of these changes along the Northwest Coast at the close of the Pleistocene has become apparent. It is necessary to look for former shorelines both underwater and at higher elevations far back in the forest. Whereas south of the glaciated regions sea level rise is the most significant factor in hiding the coastal archaeological record, within the glaciated region not only sea level rise but postglacial isostatic change—the rebound of areas depressed by the load of glacial ice as well as forebulge, tilting, and nonsynchronous changes in ice loading and unloading—significantly complicate discovery of early sites. At present, early coastal sites are known to range in elevation from 55 m below sea level for a flake from an ancient shoreline in the Queen Charlotte Islands (Fedje and Josenhans 2000), to sites at and below sea level exposed in the intertidal zone, to sites 300 m above sea level such as Tsini Tsini, now far inland above the Bella Coola valley (Hobler 1995). The evidence for sea level change and related archaeology is summarized in the following paragraphs from north to south on the coast.

There is evidence for sea level change on the northern Northwest Coast in Alaska, the Queen Charlotte Islands (Haida Gwaii), and the northern mainland coast of British Columbia (B.C.). The earliest component at Ground Hog Bay in southeast Alaska dating 10,000–9,000 ^{14}C yrs BP is some 10–15 m above present sea level (Ackerman, Hamilton, and Stuckenrath 1979). In the southern Queen Charlotte Islands, Hobler (1978) found intertidal lithic scatters like those found earlier on the central B.C. coast, and more recent work at the Richardson Island intertidal site (Fedje and Christiansen 1999, Fedje and Josenhans 2000) has resulted in the discovery of an underlying bifacial component without microblades dating to 9,300 ^{14}C yrs BP succeeded by one with microblades at 8,900 ^{14}C yrs BP. In addition, sonar was used to map the bottom of Hecate Strait and develop predictive models of where sites would be when this was dry land. Testing the model by dredging resulted in the discovery of two artifacts: a flake at 53 m depth on a 10,000 ^{14}C yrs BP shoreline, and a crude undiagnostic notched stone anchor at 110 m depth. Evidence that a drowned pine forest, dating to 12,200 ^{14}C yrs BP at a depth of 143 m, had replaced the earlier herb-shrub tundra present since about 14,000 ^{14}C yrs BP (Mathewes 1989) was also discovered. Cave sites in the Queen Charlotte Islands have yielded fragments of spear points directly associated with bear bones dated between 10,950 and 10,400 ^{14}C yrs BP (Fedje 2003, Fedje et al. 2008). Working in the Queen Charlotte Islands, Fladmark discovered pebble tools and microblade industries in various sites at high elevations (Fladmark 1970, 1990). The first site excavated, Skoglund's Landing, is an ancient raised beach containing some badly rolled pebble tools high above Massett Inlet. Microblade industries at other sites were found to date back to 7,000 ^{14}C yrs BP, and have since been found to date back to 9,000–8,500 ^{14}C yrs BP (Fedje 2003, Magne and Fedje 2007). On the northern B.C. mainland Archer (1998) recently examined large exposures of a raised beach 50 m above modern sea level at Port Simpson that contained a variety of clamshells but no evidence of human occupation. The shells provided two close radiocarbon dates which gave a marine reservoir corrected average of 12,400 ^{14}C yrs BP.

On the central British Columbia coast, the 1969–70 excavations at Namu (Hester and Nelson 1978) revealed a microblade component dating to 9,000 ^{14}C yrs BP. Later excavations (Carlson 1979, 1996) in a different part of the site uncovered an earlier premicroblade component in the bottom 30 cm of nonshell deposits with a beginning date of 9,700 ^{14}C yrs BP. This occupation was probably at a time of lower sea levels, when the site was a considerable distance from the intertidal shellfish beds. Cannon (2000) has since undertaken an augering program at Namu and other central coast sites and has postulated a gradual decline in relative sea level on the central coast for the last ten thousand years, although my reading of his figures suggests a short-term sea level rise about 5,000 ^{14}C yrs BP. At

the Bear Cove site on northern Vancouver Island the oldest component is in a nonshell deposit like that at Namu, 7 to 10 m above present sea level (C. Carlson 1979). In 1970 when doing surveys on the central B.C. coast we started finding the opposite of higher elevation sites. These were beach assemblages of flaked stone tools interpreted as lag deposits from sites eroded by early Holocene rising sea levels (Apland 1982, Carlson 1972).

In 1994 Hobler (1995) began excavations at Tsini Tsini at an elevation of 300 m above the Talchako River in the upper Bella Coola drainage. This site is undated by radiocarbon, but on the upper, older terrace the assemblage, which lacks microblades, is like that at Namu I with its oldest date of 9,720±140 ^{14}C yrs BP (Carlson 1996). There are marine diatoms in the deposit. Further down the valley, but still some 50 km from saltwater, shells from an elevated layer of marine clay gave a radiocarbon date of 10,570±85 ^{14}C yrs BP (Hobler 1995). A marine reservoir correction of six hundred years (Josenhans et al. 1995) on shell makes this date about 10,000 ^{14}C yrs BP. The younger terrace at Tsini Tsini contained a microblade assemblage that at dated sites on the central coast appears just before 8,500 ^{14}C yrs BP and persists to about 5,000 ^{14}C yrs BP. The Sallompt site, also on a raised terrace above the Bella Coola River, produced an assemblage with microblades similar to that from the lower terrace at Tsini Tsini further upriver (Hobler 2004). The artifact assemblages at both Tsini Tsini and Sallompt contain Chindadn points and resemble Nenana assemblages in Alaska and the Yukon (Carlson 2008:68–70). The Bella Coola valley with its tributaries was apparently an estuary filled with saltwater when Tsini Tsini was occupied, with uplift taking place more recently than 10,000 ^{14}C yrs BP (Hall 2003).

Borden's (1960) work in the Fraser Canyon at the Milliken and South Yale sites resulted in the discovery of early sites at higher elevations in the southern B.C. coastal zone. The earliest occupation level at Milliken, dated about 8,000–9,000 ^{14}C yrs BP, is in sands deposited by the Fraser River when it was running some 20 m above its present high water level (Mitchell and Pokotylo 1996). At South Yale thousands of pebble tools found in terraces above the Fraser River led Borden (1969) to hypothesize a pre-Wisconsin or late Pleistocene occupation that we now know is only four thousand to six thousand years old at this site (Haley 1996). Such pebble tools do occur in early sites dating back nearly ten thousand years, and are found in undated surface assemblages on high terraces above the major rivers in British Columbia, but they are only part of the lithic assemblages of that period. The South Yale assemblages, consisting mostly of pebble tools, are found on a series of kame terraces well above the Fraser River. Borden originally thought they were early, but later work (Haley 1996) has shown that these particular assemblages date to the Hypsithermal period and occur in eolian sand covering the terraces, rather than in the terraces themselves. Recent work in reservoirs on tributaries of the lower Fraser River during draw-down periods has exposed many early lithic assemblages at elevations well above the present shoreline (McLaren and Steffen 2008, Wright 1996), whereas at the Fraser delta itself and offshore islands, early sites are probably below current sea level as a result of rapid sea level rise between 5,800 and 4,500 ^{14}C yrs BP (Williams and Roberts 1988).

Enticements for movements from Beringia into newly deglaciated territory on the northern Northwest Coast by hunter-gatherers would be the presence of resources, whether they be the clams, sea mammals, fish, bears, or mountain goats for which there is direct evidence cited above. These resources predate the earliest evidence for the presence of humans. With the earliest humans there is evidence for additional faunal resources. The earliest dated archaeological evidence on the coast is at the Manis Mastodon site (Gustafson et al. 1979) on the south side of the Strait of Juan de Fuca in Washington State. The dates range 11,000–12,000 ^{14}C yrs BP with the earliest date of 12,000±310 ^{14}C yrs BP on willow from the bottom of the bog in which the remains were found (Petersen, Mehringer, and Gustafson 1983). No culturally diagnostic artifacts were recovered. A piece of pointed bone embedded in a rib of the mastodon and several pieces of grooved and polished ivory were associated with the faunal remains. Of more interest than the artifacts are the faunal remains themselves, which in addition to the mastodon include both bison and caribou (Peterson et al. 1983). While both bison and mastodon could have spread from the south, the presence of caribou raises the question of how this species reached this previously glaciated coastal region. Caribou are known both prehistorically and historically from the Queen Charlotte Islands off the northern B.C. coast and are very common in the paleontological record north of the glaciated regions in Beringia, where caribou bones have been directly dated at 13,130 and 15,190 ^{14}C yrs BP (Ackerman 1996:473), in the Yukon at Bluefish Cave at 12,830±60 and 12,210±210 ^{14}C yrs BP (Cinq-Mars 1979), and at the Little John site at 9530±40 ^{14}C yrs BP (Easton and MacKay 2008:338). They appear on the coast in the

Alexander Archipelago by 12,000 ^{14}C yrs BP (Heaton and Grady 2003). Bones from the Queen Charlottes dating 6,000–4,000 ^{14}C yrs BP are more similar to those of the large barren-ground caribou rather than to those of the historic Dawson caribou (Byun et al. 2002, Severs 1974), and DNA studies suggest they are a late-glacial or postglacial import rather than a relic from a preglacial population. If caribou followed a shrub-tundra environment out of the Yukon on to the northern coast and down the exposed coastal plain during glacial retreat, this would have been a major enticement for human predators to follow (Carlson 2007).

THE INTERIOR ROUTES

Routes south from Beringia both east and west of the Rocky Mountains have been proposed by various researchers. The western route through the Rocky Mountain Trench in British Columbia was favored by Borden (1969), whereas most other researchers have considered the eastern route between the margins of the retreating ice sheets—usually referred to as the "Ice-Free Corridor"—as more feasible. Glacial retreat in the Interior was later than on the Northwest Coast. Some researchers consider the Ice-Free Corridor as opening too late to permit access by Clovis or proto-Clovis migrants from the north.

The Yukon was the gateway to the Rocky Mountain Trench. Catto (1996) indicates that overland migration was feasible through the Richardson Mountains–Peel Plateau along the Yukon–Northwest Territories border and then south along the foothills west of the glacier-filled Mackenzie Mountains. This area was deglaciated no later than 13,000–12,000 ^{14}C yrs BP with a minimum date for deglaciation at 12,400±120 ^{14}C yrs BP on a sample of herbaceous vegetation. Further south numerous isolated areas along the western foothills of the northern Rockies were never glaciated (Catto et al. 1996).

The Rocky Mountain Trench is a 1,400-km-long valley that stretches from the Liard Plain near the Yukon–British Columbia border south to Flathead Lake in Montana. The trench varies from 3 to 16 km in width and is flanked by the Rocky Mountains on the east and the Cassiar-Columbia Mountains on the west. Several reservoirs now occupy much of this feature. Montane glaciers from the west covered much of the trench during the late Pleistocene (Rutter 1977, Ryder and Maynard 1991). The dating of glacial events seems to be limited to deposits in the Finlay, Parsnip, and Peace River valleys, where the last glacial advance was apparently gone by 13,970±170 ^{14}C yrs BP, which is the earliest postglacial date in the western Peace River–Grand Prairie region of Alberta and British Columbia (Catto et al. 1996). Additional dates are 11,600±1,000 ^{14}C yrs BP on a mammoth tusk from an end moraine in the Peace River Valley, and dates of 10,400±170 to 9,280±200 ^{14}C yrs BP for the same event on shells and a bighorn sheep skull (Rutter 1977). Further to the west on the Fraser Plateau mammoth is dated at 20,190±190 ^{14}C yrs BP (Carlson and Carlson 1998), but this occurrence predates the last glacial maximum. With the opening of the Richardson Mountain–Peel Plateau pass in the Yukon to the north by 12,400 ^{14}C yrs BP (Catto 1996), the data at hand tend to indicate that the Rocky Mountain Trench was a passable route at this time. So far the few archaeological surveys in this region have failed to discover remains earlier than the type of fluted point found at Charlie Lake Cave dated at 10,500 ^{14}C yrs BP (Howe and Brolly 2008).

The Ice-Free Corridor, the proposed corridor area east of the Rocky Mountains, has been subjected to a considerable amount of glaciological research in continuing attempts to determine whether this route was blocked during glaciation, and if so, when it opened after the last glacial maximum. Dyke and Prest (1987) published a map and date estimates indicating that glacial retreat began between 14,000 and 12,000 ^{14}C yrs BP. More recent research has focused on the radiocarbon dating of faunal remains found in and near the central and southern parts of the corridor (Burns 1996). Burns obtained twenty-nine dates on fossil mammal bones (mammoth, horse, caribou, prairie dog, and unidentified) from sites in the Edmonton area of Alberta. The absence of any dates in the interval between 21,330 and 11,620 ^{14}C yrs BP tends to indicate both that the region was covered with glacial ice during this period and that it was open and repopulated by fauna by 11,620 ^{14}C yrs BP (based on dates on bison, mammoth, and horse after 11,620 ^{14}C yrs BP). Palynological work by MacDonald and McLeod (1996) indicates that during the period between 12,000 and 10,000 ^{14}C yrs BP, the area between the waning ice sheets supported an herb and shrub vegetation, creating a biogeographic corridor with warm and dry summers.

The most recent dating in the proposed corridor is that of Jackson et al. (1997) using the cosmogenic Chlorine 36 method on eight glacial erratics in the foothills erratic train in Alberta. This method measures elapsed time since the erratics were reexposed to cosmic rays when the glacier

carrying them melted. Seven of the eight dates ranged in age from 17,600 to 12,000 BP and average 14,900 ^{14}C yrs BP representing the last time the erratics were exposed to sunlight.

Lemmon et al. (1994) present a series of maps showing positions of Laurentide ice in the northern part of the corridor area between 25–30,000 and 8,550 ^{14}C yrs BP that indicate more recent ice retreat there than to the south. These maps tend to indicate a maze of glaciers and meltwater lakes that would have been a significant obstacle to passage until at least 10,500 ^{14}C yrs BP. Part of this difference from the above-referenced estimates of Dyke and Prest (1987) is based on a more conservative evaluation of the radiocarbon dates for deglaciation. In addition, Mandryk (1996:84) points out that, because of the nature of the process of deglaciation, the "ice-free" corridor did not actually have to be ice free in order to support human populations, and that the corridor environment was capable of such support by 12,000 ^{14}C yrs BP. Detailed calibration of particular radiocarbon dates (cf. Fiedel 1999a) may eventually help resolve some of these dating problems. Classic Clovis fluted points are found at the East Wenatchee site (Mehringer and Foit 1991) on the upper Columbia River, but it is not in the corridor, and probably represents a northward extension of classic Clovis from a point of origin to the south.

The earliest dated archaeological remains so far discovered in either interior corridor area are at Charlie Lake Cave at 10,500 ^{14}C yrs BP (Fladmark 1996) and at Vermilion Lakes dated at 10,770 ^{14}C yrs BP (Fedje et al. 1996) east of the Rockies. The indications at Charlie Lake are that the inhabitants were bison hunters moving northward, although strains of both genetically distinct northern and southern bison are found there at this time (Shapiro 2004), which does indicate contact between the northern and southern ends of the corridor at 10,500 ^{14}C yrs BP.

Direct evidence of enticements into either of the interior corridors is difficult to come by, probably because of the obstacles to both habitation and discovery (Mandryk 1996). Fiedel (2000) suggests observation of the flights of migrating birds could have been a factor, and some plants and small animals are found throughout the ice-free corridor between 12,000 and 10,000 ^{14}C yrs BP (MacDonald and McLeod 1996). Larger game animals are so far unknown from the corridor until 11,620 ^{14}C yrs BP. Catto et al. (1996) conclude that the corridor was a laterally fluctuating zone adequate for some plants and small animals, but unfavorable for humans. The overall impression is that the corridor would have been an unpleasant and difficult place in which to survive. However, it should be kept in mind that aboriginal peoples do cross glaciers while moving into unknown territory judging from eighteenth-century accounts of Athabascan movements (Cruikshank 2005:33–40), indicating that a corridor need not be ice free.

DISCUSSION

The major problem with current discussions of the routes for the peopling of the Americas is the absence of hard archaeological evidence in the most promising places at the right period of time. First, the paleogeographical evidence suggests that glacial ice had receded from the far outer coast by 14,000 ^{14}C yrs BP and from the Yukon gateway to the interior routes by 12,400 ^{14}C yrs BP. Second, there is no hard archaeological evidence from either of these potential corridors that is either that early or falls within the time period of the oldest known cultures in the Arctic—the microblade industry at Swan Point I at 12,250 ^{14}C yrs BP (Holmes 2007)—and the earliest fully accepted Paleoindian culture—Clovis beginning at either 11,500 or 11,050 ^{14}C yrs BP, depending on which dates are selected for America to the south. An additional problem is whether to make use of averages of radiocarbon dates or the range of radiocarbon dates on particular cultures. In view of these problems and others, the alternative to hard evidence and an inconclusive range of dates is to make comparisons between the earliest archaeological remains found and the remains from adjacent regions in order to assess similarities and differences and infer relationships. Because of the specific nature of fluted points this comparison is relatively easy for the two interior corridors.

The earliest known archaeological remains from the Rocky Mountain Trench is one undated projectile point, similar to the Peace River fluted type, found by Arcas Associates in recent surveys (Howe and Brolly 2008). From the potential corridor east of the Rockies, the "Ice-Free Corridor," the earliest known remains include the Peace River fluted type, a late derivative dated at only one site, Charlie Lake Cave at 10,500 ^{14}C yrs BP, where the type and dates suggest that the points belong to belated cultures of the Fluted Point Tradition moving northward following the retreating glacial environment. Arctic fluted points closely resemble the Peace River fluted points and probably represent the culmination of this northward movement. The direct ancestry of the bison hunters using

these late types of fluted points is traceable to earlier fluted point makers such as classic Clovis to the south (Carlson 1991, Carlson and Magne 2008). If the ancestors of classic Clovis came through either of the interior corridors moving south, their remains are yet to be found. The recent discovery of human coprolites, but no diagnostic artifacts, dating 12,300 BP at Paisley Caves in eastern Oregon (Gilbert et al. 2008) indicate the presence of humans well before classic Clovis, but do not help with determining a route of entry.

The earliest materials from the Northwest Coast corridor indicate a somewhat more complicated scenario than that found in the interior. Four lithic technologies are present in Northwest Coast sites that date between 11,000 and 8,000 ^{14}C yrs BP (Carlson 1990, 1996). To the south of the Strait of Juan de Fuca in the coastal environmental zone there is a scattering of Clovis fluted points (Croes et al. 2008), which although not directly dated mark the presence of the earliest identifiable inhabitants at about eleven thousand years ago. In part of this coastal area, at least in the lower Columbia River region, fluted points are succeeded first by points belonging to the Intermontane Stemmed Point Tradition—a possible Clovis derivative spreading down the Columbia River from the interior (Carlson 1988, 1996; Carlson and Magne 2008), and later by foliate biface and pebble tool assemblages found along the coast into southern Oregon (Moss and Erlandson 1995; Pettigrew 1990) that are found earlier to the north. Microblade technologies are the last early lithic tradition to appear and are also earlier in the north and appear later as far south as the lower Columbia River (Carlson 1996, Magne and Fedje 2007). The earliest known microblade industry in North America is in the Swan Point I component in central Alaska dating 12,250 ^{14}C yrs BP where the Ubetsu and Diuktai techniques were used to produce microblades (Holmes 2007). The Northwest Coast microblade technique is different, but is probably derived from those found further north.

A single fluted point of local graywacke is known from Whidbey Island in Puget Sound, which is not far from the Manis Mastodon site, so it is likely that hunters using fluted points were in the area at the same time as the mastodon, although this occurrence has little bearing on whether the Northwest Coast was a route of entry into subglaciated North America. No fluted points have been found on the coast north of Whidbey Island, and the occurrence there probably represents a northward extension of the fluted point tradition that originated from blade and biface prototypes elsewhere in the United States (Carlson 1991). A site similar to Manis, the Woodburn Bog in the Willamette Valley, Oregon, dating between 12,760 and 9800 ^{14}C yrs BP and containing bones of extinct mammals and birds and reported flakes, is under investigation by Hibbs (2000) and Stenger (2000). Foliate bifaces and pebble spalls are found in younger post-mastodon components at Manis (Gustafson et al. 1979).

On the Northwest Coast north of Whidbey Island the earliest known assemblages contain neither fluted points nor microblades. These components constitute a pre-microblade horizon and are found in the earliest components at the Milliken (Mitchell and Pokotylo 1996), Bear Cove (C. Carlson 1979), Namu (R. Carlson 1996), Tsini Tsini (Hobler 1995), and Queen Charlotte Island sites (Fedje et al. 2008), and probably at Skoglund's Landing (Fladmark 1979), Ground Hog Bay (Ackerman 1979), and On-your-knees Cave (Dixon 2008), although the assemblage size of the last three components is very small and difficult to separate from succeeding components that do contain both bifaces and microblades. At On-your-knees Cave the only artifact from what could be a pre-microblade component is a bone point dated at 10,300 ^{14}C yrs BP. At Skoglund's Landing the depositional environment—an ancient raised beach—could preclude the discovery of microblades. One flake from Milliken has been classified as a microblade (Mitchell and Pokotylo 1996) but since there is no other evidence of microblade technology in this fairly large assemblage it is probably a fortuitous occurrence. This pre-microblade horizon consists of assemblages (Fig. 2) containing foliate bifaces in particular, and smaller numbers of scraper-planes, blades, side-scrapers, bifacial knives, tear-drop bifaces ("Chindadn points"), and perforators in components that range in age from 10,000 to 8,000 ^{14}C yrs BP and overlap with the earliest microblades at 9,000–8,500 ^{14}C yrs BP. These assemblages are more similar to the Nenana Complex of central Alaska (Goebel et al. 1991, Pearson 1999, West 1996), which predates them, than to other North American assemblages, and were probably derived from that source via a migration route to the coast through the Yukon (Carlson 2007, 2008) where Nenana Complex–related remains have also been found (Easton and MacKay 2008). The incentive for this move could well have been the caribou that are found at this time in the steppe-tundra regions of both the Yukon and the northern Northwest Coast coastal plain.

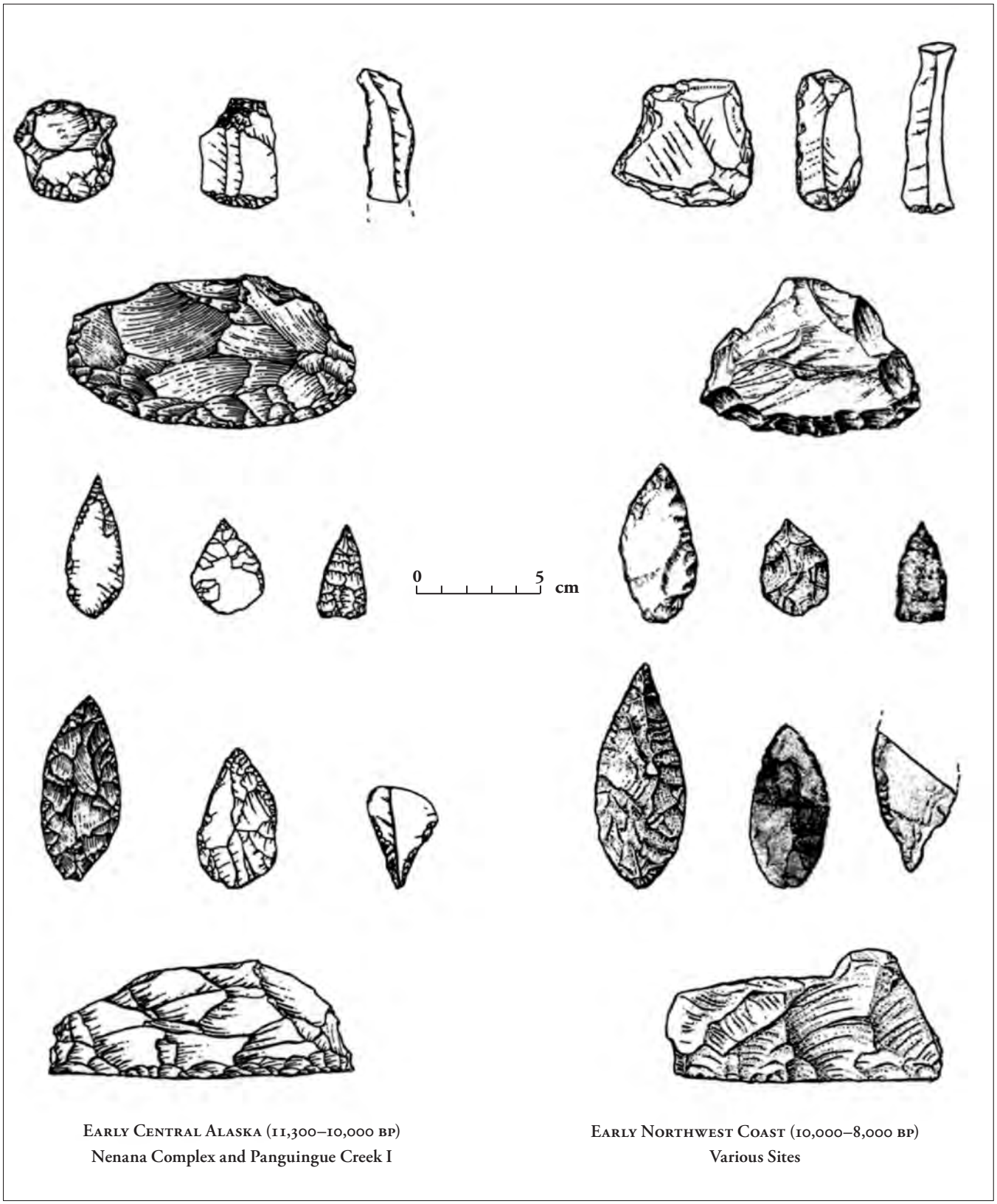

Fig. 2. Types of lithics found in both Nenana Complex sites in central Alaska and in early sites on the Northwest Coast of British Columbia. Top two rows: scrapers. Third row: triangular and Chindadn bifaces. Fourth row: foliate and Chindadn bifaces and drills. Bottom row: scraper planes. Artifacts re-drawn from Carlson (1996), Fedje (2003), Pearson (1999), West (1996).

CONCLUSIONS

There is no hard archaeological data from projected migration routes either on the coast or in the interior that is early enough to indicate passage of the ancestors of Clovis or proto-Clovis peoples to regions south of the glacial margins, even though most paleogeography indicates that both the outer coast and interior deglaciation corridors became potentially passable by Arctic-adapted peoples sometime between 14,000 and 12,000 ^{14}C yrs BP, with the coastal route opening about two thousand years earlier than the interior routes. In view of the changing environments of that period such evidence may never be found. In the proposed interior corridors the earliest known culture is a derivative of the Fluted Point Tradition probably spreading from the south, where fluted points may have originated from a proto-Clovis blade and biface industry such as that found at the Cactus Hill site in Virginia (McAvoy and McAvoy 1997) and the Meadowcroft Rockshelter in Pennsylvania (Adavasio 1993). In contrast, on the Northwest Coast the earliest known culture north of the Strait of Juan de Fuca is probably derived at least in part via the Yukon from the Nenana Complex of central Alaska to the north.

We don't know if either or both the projected coastal and interior corridors were high roads for early migrants, but such migrants did somehow get to subglaciated regions of the Americas by 12,300 ^{14}C yrs BP in spite of hindrances to travel. The evidence for more abundant faunal resources and the earlier retreat of glaciers on the coast than in the interior favor the coast as the initial route, but the archaeological record in both regions is still silent. Both routes remain more plausible than trans-Atlantic crossings proposed on the basis of similarities in European and American lithics (Stanford 1999) that can be explained more economically as the results of parallel evolution from a common Old World Upper Paleolithic technological base than by migrants floating the Atlantic on icebergs (Greenman 1963) or on any other type of primitive watercraft.

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THE PHYSICAL ANTHROPOLOGICAL INTERMEDIACY PROBLEM OF NA-DENÉ/GREATER NORTHWEST COAST INDIANS

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ABSTRACT

For more than thirty years, it has been recognized that the dentition of the Indians of the Alaskan Interior and Pacific Northwest has crown and root trait frequencies that are often intermediate between those of Eskimo-Aleuts and all North and South American Indians. When many dental morphological variables are assessed simultaneously, tooth-based distance values show that Na-Dené/Greater Northwest Coast (ND-GNWC) samples fall between Eskimo-Aleuts and American Indians. The largest analysis of nuclear genetic markers to date reveals a similar pattern (Cavalli-Sforza et al. 1994). The divergence of Eskimo-Aleuts, American Indians, and ND-GNWC populations from a common ancestor in Northeast Asia was initially driven by chance forces (founder effect/genetic drift), but ND-GNWC intermediacy found in recent populations is likely due to gene flow in the New World between American Indian (cf. Algonkian) and ND-GNWC groups.

KEYWORDS: colonization of New World, dental morphology, genetics

INTRODUCTION

In evaluating population relationships, an important concept is that of a common ancestral population. Assuming monophyletic origins of anatomically modern humans, all populations, whether they come from Africa, Europe, Asia, the Pacific, or the Americas can trace their ancestry back to a common ancestor. Our problem does not go that deep in time (>100,000 years) but instead centers on the relatively recent divergence of Native American populations (i.e., within the past twenty-five thousand years). The majority of researchers concur that Native American populations are most similar to and were ultimately derived from Northeast Asian groups. Additionally, numerous genetic and dental studies show that Native Americans are more closely related to one another than they are to Northeast Asians. These observations raise two interrelated questions: (1) What was the pattern of branching that led to divisions within the New World, and (2) How did evolutionary processes lead to the patterns of relationships indicated by different biological systems?

First, of the four major evolutionary mechanisms that lead to population differentiation (natural selection, genetic drift, gene flow, mutation), mutation has not been a major contributor to Native American population history because mutation rates are very low for any given genetic locus. Despite this caveat, there are some interesting and unique alleles that may have arisen through mutation once populations reached the New World. These rare variants, while not particularly useful in genetic distance analyses, nonetheless provide insights into the broader issue of branching patterns among Native American groups (Lampl and Blumberg 1979). Another issue is whether or not the biological traits (alleles, phenotypes) under con-

sideration are subject to natural selection. For the most part, the alleles, haplogroups, and dental traits studied in Native Americans are assumed to be selectively neutral. Researchers have expended much energy trying to elucidate the selective significance of various genes and traits, but among the few successes are alleles that confer some protection from malaria (e.g., HbS, HbC, HbE, α and β thalassemia) or body form characteristics associated with latitude and extremes in ambient temperature (i.e., Bergmann and Allen rules). Malaria is not an issue in the New World. Given the high degree of latitudinal variation in the Americas, however, some body dimensions might be subject to natural selection and thus reflect ecogeographical rules (Newman 1953). Because some anthropometric variables may be subject to selection, we limit most of our attention to genetic markers and tooth crown and root traits, the majority of which have no demonstrated correlation with fitness (i.e., are selectively neutral).

Given the rarity of mutations and ubiquity of selectively neutral traits, genetic drift and gene flow are the primary forces that influence population differentiation. The effects of these two processes are opposite. Genetic drift and its spatial component, founder effect, are stochastic processes that lead to population divergence when groups split from a common ancestral population. The subsequent rate of change brought about by drift is determined by effective population size (with smaller populations diverging more rapidly than large ones), and time (with greater time depth, separation from a common ancestor results in greater divergence) (Falconer 1981). After a splitting event and concomitant geographic isolation, genetic drift invariably results in population differentiation. By contrast, gene flow always produces convergence—when members of two divergent populations exchange genes, the result is a hybrid population that falls somewhere between the two ancestral populations, with placement determined by the proportionate genetic contribution of each ancestral group.

Biological or genetic distance statistics, which estimate the degree of similarity or dissimilarity among three or more groups, provide values that measure relative population relationships (Buikstra et al. 1990; Constandse-Westermann 1972; Weiner and Huizinga 1972). Assuming that many (e.g., twenty or more) genes or traits are used to calculate population distances, and that chance processes (genetic drift and founder effect) are the primary differentiating mechanisms, the pairwise distance values between three or more diverging groups are dictated by their pattern of splitting from a common ancestral population. For example, consider groups A, B, and C. If the conditions above hold (selectively neutral traits and geographic isolation of A, B, and C) and these three hypothetical groups bud off from a common ancestor at about the same point in time, the distance values between A-B, A-C, and B-C should be equal (Fig. 1). If A splits off from the common ancestor first, with B-C remaining a single lineage, when B and C ultimately do diverge, the relative distance values are A-B equals A-C, with both distance values greater than B-C. With these principles in mind, the basic question we pose is how Na-Dené/Greater Northwest Coast populations (ND-GNWC) came to assume an intermediate position relative to Eskimo-Aleuts on the one hand and North and South American Indians on the other.

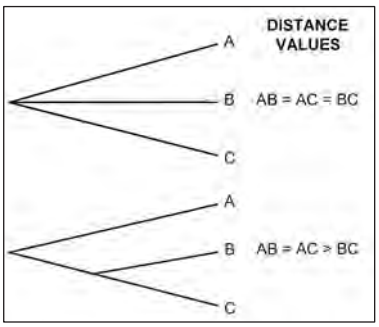

Figure 1. Hypothetical branching patterns and associated distance values, given the assumption that founder effect and genetic drift are the primary mechanisms underlying differentiation.

DENTAL VARIATION

Empirically, native Northwest Coast–Alaska interior populations (ND-GNWC) exhibit dental trait frequencies that suggest intermediacy between the populations of Eskimo-Aleuts and a territorially large group consisting of all North and South American Indian populations whose dental trait frequencies are remarkably similar throughout the Americas (Turner 1984, 1985a, 1986). Dental trait intermediacy associated with the Na-Dené language family was first noticed in a study of lower first molar root number in New World populations. Lower first molars exhibit either two or three roots. Turner (1971) found that the less common three-rooted phenotype, or 3RM1, was in low frequency (5–6 percent) in North and South American Indian populations but was exceptionally frequent in Eskimos and Aleuts (30–40 percent). A small Athapaskan sample (Navajo) had an intermediate

frequency of 27 percent. With the accumulation of additional data from all parts of the Americas, this pattern of 3RM1 variation was confirmed (cf. Turner 1983, 1984). Moreover, a high frequency of 3RM1 was also found in Northeast Asians, adding further support to the position that this region was the source for populations ultimately ancestral to New World peoples (Scott and Turner 1997, 2006; Turner and Scott 2007).

In a series of articles, Turner (1983, 1984, 1985a, 1985b, 1986) presented data on more than two dozen crown and root variables in Native American dental samples stretching from Point Barrow, Alaska, to the southern reaches of South America. Here we reduce that data set based on dozens of populations and thousands of individuals to three groupings that make up the essence of our problem: American Arctic (Eskimos and Aleuts), Northwest North America (Athapaskans, Greater Northwest Coast), and North-South Amerind (all groups from North and South America not included in the above two groupings).

In Table 1, which shows dental trait frequencies for the three Native American groupings, Northwest North America shows intermediate frequencies for thirteen of twenty-three traits. By contrast, the American Arctic falls between the other two groupings for six dental traits, while American Indians show intermediacy in only one case. For Cusp 5 (UM1) and Cusp 7 (LM1), American Arctic and American Indians have the same mean trait frequency. Four-cusped lower first molars are absent in all three groupings, so there is no intermediacy for this variable. While intermediate dental trait frequencies are not invariant for Northwest North America, they are by far the most common for this group.

Another way to evaluate intermediacy is to tabulate the number of pairwise comparisons where two of the three samples show the most similarity. In this regard, American Arctic and Northwest North America are closest for ten dental traits while Northwest North America and American Indians are most similar for eight traits. By contrast, there are only four instances in which American Arctic and American Indian samples are the most similar. Mean differences in dental trait frequencies show the same

Table 1. Crown and root trait frequencies in composite samples from the American Arctic, Northwest North America, and North and South American Indians.

Trait (tooth)	American Arctic	Northwest North America	North & South Amerind	Most similar groups
Winging (UI1)	0.232	**0.358**	0.500	AA-NNA
Shoveling (UI1)	0.692	**0.831**	0.919	NNA-NSA
Double-shoveling (UI1)	0.349	**0.567**	0.705	NNA-NSA
Interruption grooves (UI2)	**0.596**	0.650	0.510	AA-NNA
Bushman canine (UC)	0.000	**0.004**	0.016	AA-NNA
Odontomes (UP and LP)	**0.062**	0.065	0.044	AA-NNA
3-cusped upper molar (UM2)	0.306	**0.142**	0.115	NNA-NSA
Carabelli's cusp (UM1)	0.019	**0.055**	0.056	NNA-NSA
Cusp 5 (UM1)	0.167	0.214	0.167	AA-NSA
Enamel extensions (UM1)	**0.459**	0.509	0.437	AA-NSA
4-cusped lower molar (LM1)	0.000	0.000	0.000	AA-NNA-NSA
4-cusped lower molar (LM2)	**0.052**	0.044	0.086	AA-NNA
Y pattern (L)M2	0.200	**0.118**	0.098	NNA-NSA
Cusp 6 (LM1)	**0.504**	0.503	0.551	AA-NNA
Cusp 7 (LM1)	0.085	0.068	0.085	AA-NSA
Deflecting wrinkle (LM1)	0.300	**0.365**	0.381	NNA-NSA
2-rooted upper premolar (UP1)	0.049	**0.067**	0.143	AA-NNA
3-rooted upper molar (UM2)	0.374	**0.415**	0.559	AA-NNA
2-rooted lower canine	**0.003**	0.000	0.007	AA-NNA
Tomes' root (LP1)	0.034	**0.093**	0.199	AA-NNA
3-rooted lower molar (LM1)	0.311	**0.165**	0.065	NNA-NSA
1-rooted lower molar (LM2)	0.312	0.387	**0.328**	AA-NSA
Distal trigonid crest (LM1)	0.187	**0.078**	0.042	NNA-NSA

Note: bold-faced reflects intermediate frequency of the three groups.

pattern. The mean pairwise frequency differences among the three groupings are: American Arctic–Northwest North America (6.67 percent), Northwest North America–American Indian (6.18 percent), and American Arctic–American Indian (10.65 percent). Again, there is a distinct separation between American Arctic and American Indian while Northwest North America is about equally similar to the other two groupings.

For qualitative variables such as nonmetric dental traits, a frequently used biological distance statistic is the Mean Measure of Divergence, or MMD (Berry and Berry 1967; Green and Suchey 1976). If dental trait frequencies exhibit a tendency for Northwest North American samples to be intermediate between Eskimo-Aleuts on the one hand and American Indians on the other, what do biological distance values show? The MMD values in Table 2, based on average pairwise distance among the groups (with North American and South American Indians treated individually), show that Northwest North American populations are most similar to North American Indians (0.058), with a slightly larger mean distance to Eskimo-Aleuts (0.078). However, the mean distance between North American Indians and Eskimo-Aleuts (0.169) is more than twice as great as either of these groups is from Northwest North America, providing additional support for intermediacy. In addition, both Northwest North America and Eskimo-Aleut show larger differences from South American Indians (0.123 and 0.260) than from North American Indians. Despite this, the pairwise distance between North American and South American Indians is quite small (0.072), supporting the position held by Turner (1984, 1985a) that American Indians from both continents show dental homogeneity.

GENETIC VARIATION

Native Americans have been intensively studied for genetic markers of the blood for more than fifty years. Initial focus was on the ABO, Rh, and MNSs systems but this short list of loci was ultimately augmented by dozens of additional loci and alleles (see summaries in Mourant 1954; Mourant et al. 1976; Roychoudhury and Nei 1988). Early workers, dealing with a limited number of genetic systems, reached widely disparate conclusions on the meaning of genetic variation. The quantity and quality of genetic data are now sufficient to yield relatively consistent results.

Szathmary (1979, 1981, 1993) focused on Native populations from the Subarctic and Arctic regions of the New World and Siberia. Her position, exemplified by the title of her article "Are the Biological Differences Between North American Indians and Eskimos Truly Profound?" (Szathmary and Ossenberg 1978), runs counter to the long-held view of Laughlin (1963, 1966) that the major dichotomy in the New World was between Eskimo-Aleuts, on the one hand, and American Indians on the other. However, a closer examination of Szathmary's analyses and conclusions shows that the groups she refers to broadly as North American Indians are primarily Algonkians of the Eastern Subarctic and Athapaskans of the Western Subarctic. North American Indians from the United States Southeast, United States Southwest, and Mexico are not included in her analyses.

While Szathmary did not actually analyze a complete representative sample of North American Indians, her findings are instructive. Prior to her work, most researchers assumed a fairly large "genetic gulf" between Eskimos and Indians, but she has rightly pointed out that this gulf is not invariably large, especially when comparisons are made to Indian populations of the Western (Athapaskan) and Eastern (Algonkian) Subarctic.

Because Szathmary focused on northern groups, we wanted to evaluate the issue of ND-GNWC intermediacy with a larger set of Native American populations using distance values from *The History and Geography of Human Genes* (Cavalli-Sforza et al. 1994). After extracting data from hundreds of sources, Cavalli-Sforza et al. (1994) provided a meta-analysis of human genetic variation based on 120 nuclear alleles. For New World groups, this involved the calculation of mean gene frequencies across many groups to characterize broader geographic or language-based groupings. The groups most pertinent to our question include: Na-Dené (Alaskan), Na-Dené (Canada), Na-Dené (Southern), Eskimo (Siberia), Eskimo (Alaskan Inupik), Eskimo (Yupik), Eskimo (Canada), and Eskimo (Greenland). These were analyzed along with data from

Table 2. Average distance values (MMDs) between Northwest North Americans, Eskimo-Aleuts, and North and South American Indians based on twenty-nine crown and root traits

	NNA	EA	NAI	SAI
Northwest North America	0			
Eskmo-Aleut	0.076	0		
North American Indian	0.058	0.169	0	
South American Indian	0.123	0.260	0.072	0

four North American Indian (Penutian, North Central Amerind, Keresiouan, Almosan), three Siberian (Chukchi, Reindeer Chukchi, Koryak), and six South American groups (Andean, Equatorial, Macro-Carib, Macro-Ge, Macro-Panoan, Macro-Tucanoan).

Cavalli-Sforza and his colleagues calculated genetic distance values among the twenty-three groups of Native Americans and Siberians. Rather than reproducing this large distance matrix with twenty-three rows and columns, we analyzed those elements of the matrix most relevant to the issue of ND-GNWC intermediacy. Specifically, we calculated the mean distance of all members of one meta-grouping (i.e., a combination of several linguistic or geographic groups, including Na Dené North, Na Dené South, Eskimo, Siberia, North American Indian, South American Indian) with all the distances of another such grouping. For example, there are two northern Na-Dené groups and five Eskimo groups, so the total number of pairwise distances between these two groupings is ten.

The mean distance values between the six meta-groupings are shown in Table 3, along with the number of values used to derive each mean distance. The key points evident in this table are: (1) the similar values between Alaskan Na-Dené and both Eskimo (0.72) and North American Indian (0.79) groups, with a larger distance between the latter two groups (0.95); (2) the generally small mean distance values for Na-Dené South, especially when compared to Alaskan Na-Dené (0.42) but even smaller for North American Indians (0.29), indicating that gene flow has significantly influenced the genetic make-up of southern Athapaskans; (3) the very small distance value between North and South American Indians (0.39), supporting Turner's dental analysis that shows that these two groups are homogeneous; and (4) the consistently large distances between Siberian and all Native American groups, a finding that suggests that all Native Americans branched off a Siberian ancestor at about the same time.

The efficacy of gene flow as it impacts southern Athapaskans is shown in Fig. 2. Illustrating the distances of Cavalli-Sforza et al. (1994) using an unweighted pair groups clustering algorithm, the major subdivision in the

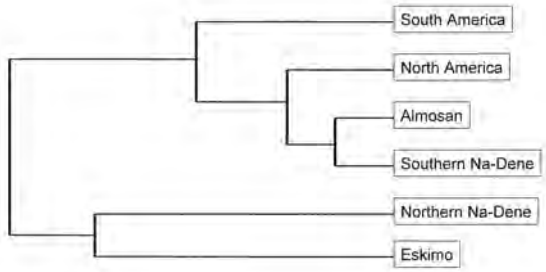

Figure 2. Dendrogram of Native American relationships based on analysis of genetic distance values using an unweighted pair groups clustering algorithm.

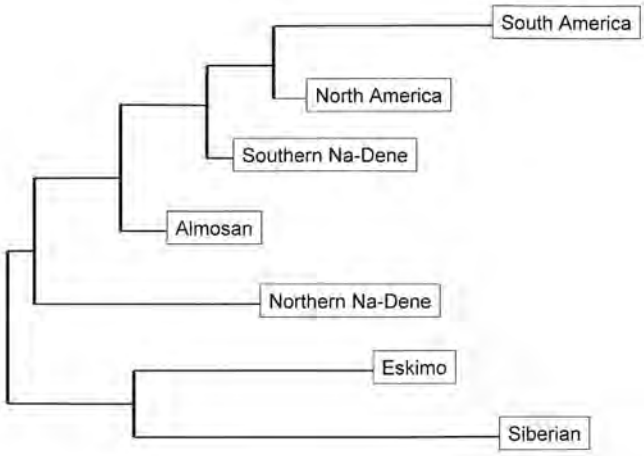

Figure 3. Dendrogram of Native American relationships based on analysis of genetic distance values using Nei's neighbor-joining method clustering algorithm.

Table 3. Mean genetic distance values among major New World groupings, with focus on Na Dene, Eskimo, and American Indian (calculated from distance values in Cavalli-Sforza et al., 1994)

	ND-N	ND-S	ESK	SIB	NAI	SAI
Na Dené—north	0					
Na Dené—south	0.42 (2)	0				
Eskimo	0.72 (10)	0.92 (5)	0			
Siberian	1.32 (10)	0.89 (5)	0.97 (15)	0		
North American Indian	0.79 (8)	0.29 (4)	0.95 (20)	1.07 (12)	0	
South American Indian	1.24 (12)	0.59 (6)	1.39 (30)	1.52 (18)	0.39 (24)	0

Numbers in parentheses refer to number of distance values used to calculate mean.

New World is between northern Na-Dené and Eskimo on the one hand, and American Indians on the other. Interestingly, southern Na-Dené clusters more closely with Almosan (Algonkian and Mosan speaking groups) than with their linguistic relatives in Canada and Alaska. Using Nei's neighbor-joining method (Fig. 3), a slightly different pattern emerges. In this instance, northern Na-Dené is in the uppermost cluster with American Indian groups, while Eskimo clusters with Siberian. Southern Na-Dené is once again pulled more tightly into the North American Indian sphere, a result that has no other ready explanation beyond gene flow bringing about convergence.

Genetic analysis follows much the same pattern as that revealed by dental morphology—Athapaskans and Greater Northwest Coast populations assume an intermediate position relative to Eskimo-Aleuts and American Indians. In fact, the parallel goes even further. In the Cavalli-Sforza et al. (1994) volume, one dendrogram of world variation has Northwest North Americans clustering with North and South American Indians, while Eskimos cluster with Siberians (Fig. 2.3.2.A; p. 78). In another dendrogram focusing on New World variation (Fig. 6.9.1; p. 323), Eskimos cluster with northern Athapaskans, with all other North and South American Indians on another cluster (which includes southern Athapaskans). For dental morphology, Powell (1993) arrived at a similar result in his analyses of Turner's (1985a, 1986) data set on Native American dental variation. Using an unweighted pair groups method, Powell derived a tree that linked North American Indians with South American Indians, while Northwest Coast Indians clustered with Aleuts, Eskimos, and Siberians. Evaluating the same data set using a maximum parsimony tree, he found that Northwest Coast Indians clustered with North and South American Indians, while Northeast Siberians, Aleuts, and Eskimos were on a separate cluster. In other words, two large data sets on different biological systems reveal similar and inconsistent conclusions regarding Na-Dené affinities. Similarities are shown to both Eskimo-Aleuts and to American Indians, with method of analysis and sample array impacting the final Na-Dené linkage with other Native American populations.

INSIGHTS FROM A RARE VARIANT: ALBUMIN NASKAPI

Although mutations do not often contribute to population affinity assessment, one rare variant in the albumin system is an exception. This allele, Albumin Naskapi, is essentially a New World mutation that has attained polymorphic frequencies in populations from only two North American language groups: Athapaskan and Algonkian. It is completely absent in the overwhelming majority of other Native American groups, including Eskimo-Aleuts. The rarity of this selectively neutral trait and its curious geographic/linguistic distribution may contribute significantly to unraveling the question of ND-GNWC intermediacy.

Table 4 shows the distribution of Albumin Naskapi in more than twenty thousand native North Americans

Table 4. Distribution of the Albumin Naskapi allele in Eskimo-Aleut, Na-Dene, and American Indian populations.

Language family	*n*	Naskapi phenotype	AL Naskapi allele frequency
Eskimo (1)	1,529	3	0.001
Eskimo (2)	184	0	0.000
Aleut (1)	99	0	0.000
Na-Dené			
Tlingit-Haida (1)	456	0	0.000
Haida (2)	69	0	0.000
Athapaskan (1)	2,222	161 (5)*	0.039
Athapaskan (2)	881	39	0.022
Salishan (2)	111	11	0.050
Wakashan (2)	257	1	0.002
Algonkian (1)	2,596	162 (6)*	0.034
Algonkian (2)	382	9	0.012
Siouan (1)	887	3	0.002
Siouan (2)	105	3	0.014
Zunian (1)	655	0	0.000
Zunian (2)	202	0	0.000
Uto-Aztecan (1)	2,587	1	0.000
Uto-Aztecan (2)	414	0	0.000
Yuman (1)	310	2	0.003
Yuman (2)	796	0	0.000
Muskogean (1)	413	0	0.000
Muskogean (2)	119	0	0.000
Macro-Nahua (1)	880	0	0.000
Macro-Maya (1)	1,123	0	0.000
Macro-Mixteco (1)	468	0	0.000
Tarasco (1)	167	0	0.000
Mestizo (1)	2,306	0	0.000
Total	20,218	395 (11)*	0.010

(1) Schell and Blumberg, 1988; (2) Smith et al. 2000; *homozygotes in parentheses

(Schell and Blumberg 1988, Smith et al. 2000). Some key points in this table are:

Of 395 Native Americans that have the Albumin Naskapi phenotype, 371 (94 percent) come from Athapaskan or Algonkian speaking groups. If you add two more Northwest Coast groups to this total (Salishan, Wakashan), the number goes up to 383 (97 percent).

Only eleven individuals are homozygous for Albumin Naskapi, and in every instance they come from Athapaskan or Algonkian groups.

Although this albumin variant is named Albumin Naskapi, after a northeastern Algonkian group, it is in very similar frequencies in Athapaskans (3.4 percent) and Algonkians (3.1 percent) so the point of origin of the variant is unclear.

The few exceptions to the general Athapaskan-Algonkian rule come from groups that abut Athapaskan (Uto-Aztecan, Yuman) or Algonkian groups (Eskimo, Siouan), making gene flow the likely source of the allele.

With the exception of three Ungava Eskimos (who are adjacent to Algonkian groups), no other Eskimo or Aleut has tested positive for this allele.

More than five hundred Tlingit-Haida have been tested for this variant but none has the marker.

In samples that include more than five thousand Southeastern United States and Mesoamerican Indians, not a single case of Albumin Naskapi was found

Albumin Naskapi occurs in only two Old World groups—Eti Turks and North Indians (Franklin et al. 1980, Kaur et al. 1982); based on geography, history, and many other genetic variables, it seems likely that Albumin Naskapi arose as independent mutations in these populations.

The ramifications of these observations are presented in the next section.

BRANCHING PATTERNS AND THE QUESTION OF INTERMEDIACY

Fig. 4 shows five branching scenarios and three points of divergence for Native American populations, the assumption being that Eskimo-Aleut, ND-GNWC, and American Indian groups all shared a common ancestor at some point. For scenario A, all three groups diverged from a common ancestor at the same point in time. Scenario B has American Indians diverging first, with a subsequent splitting event for Eskimo-Aleut and ND-GNWC. With scenario C, Eskimo-Aleuts diverge first, with ND-GNWC and American Indians diverging from a later common ancestor. The final two scenarios (D and E) are B and C with the added element of gene flow, between either ND-GNWC and American Indians or between ND-GNWC and Eskimo-Aleuts. The vertical lines extending from 1, 2, and 3 refer generally to where divergence occurred. For 1, in all instances, only one proto-Native American population entered the New World, with differentiation occurring after arrival. For 2, some (B, C, D, E) or all (A) of the divergence between the three groups took place in the Old World. Finally, with 3, all three groups diverged before entering the Americas. These models do not specifically suggest when the three groups last shared a common ancestor; it could be associated with an earlier (e.g., 20–30,000 BP) or later (12–20,000 BP) date.

Given dental variation and distances, genetic variation and distances, plus the distribution of Albumin Naskapi, what pattern of divergence shown in Fig. 4 is the most parsimonious? Taking each scenario in turn:

A. The possibility that the three groups diverged from a common ancestor at about the same point in time is not consistent with dental or genetic evidence. With this scenario, the three pairwise distances should all be about the same, but this is never the case. ND-GNWC

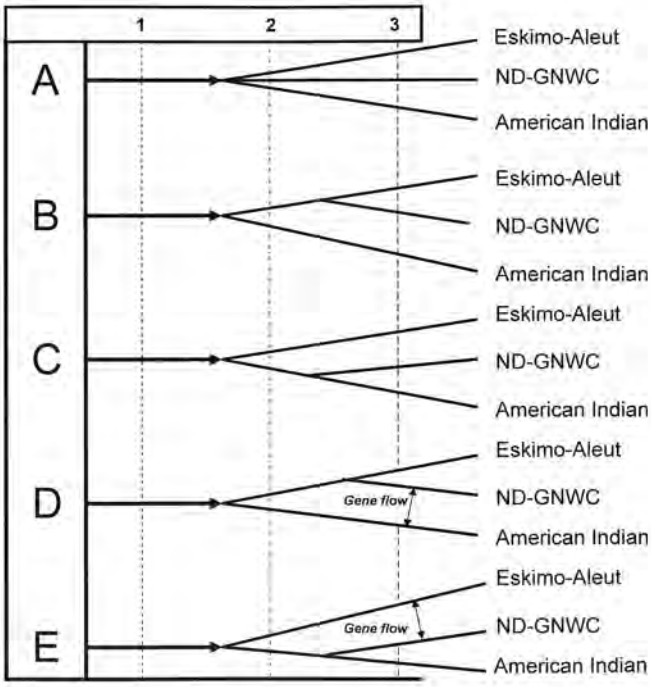

Figure 4. Five hypothetical branching scenarios for Eskimo-Aleut, Na-Dene/Greater Northwest Coast, and American Indian populations; scenarios D and E involve gene flow and convergence.

is usually about equidistant from Eskimo-Aleut and American Indian, while the latter two groups always show the largest pairwise distance.

B. Here the notion is that Eskimo-Aleuts and ND-GNWC groups shared a common ancestry following an earlier split from groups ultimately ancestral to American Indians. This interpretation has been suggested by many workers, with Szathmary the leading proponent. The problem in this case is that Eskimo-Aleuts and ND-GNWC should always show the smallest pairwise distances, with both equidistant from American Indians. This holds for neither dental nor genetic distance analyses.

C. In this instance, ND-GNWC and American Indians are thought to be more closely related, with Eskimo-Aleuts as the outlier. For anthropologists, this scenario was close to dogma, as many workers (cf. Laughlin 1963) never distinguished between the two groups, referring to them together as American Indians. It was this position that Szathmary and Ossenberg (1978) challenged when they posed the question of whether or not there was a major difference between Eskimos and (northern) North American Indians.

D and E. These scenarios involve gene flow as an important contributor to ND-GNWC intermediacy and the direction of the gene flow is important. In D, Eskimo-Aleut and ND-GNWC share a more recent common ancestry (see B), but their distance values are pulled toward American Indians because of gene flow. For E, ND-GNWC and American Indians are thought to share a more recent common ancestor (see C) but admixture with Eskimo-Aleuts has pulled them toward those groups. The distance values based on tooth morphology and nuclear genetic markers cannot distinguish between either of these models. To help resolve this conundrum, another look at Albumin Naskapi is necessary.

There are several aspects to the distribution of Albumin Naskapi that favor scenario D. First, this allele is absent in Eskimos and Aleuts (given the likely assumption that the three Ungava Bay Eskimos who express this gene received it via gene flow from neighboring Algonkian groups). To argue scenario B, one would have to explain how the gene was maintained in a relatively high frequency in Athapaskans but somehow disappeared from the Eskimo-Aleut gene pool. Second, linguists see no ties whatsoever between Athapaskan and Algonkian, so simply attributing the allele's presence to a common ancestor does not seem plausible. It is more likely that the allele is shared in common because of gene flow between Athapaskans and Algonkians, perhaps at a very early date (cf. Smith et al., 2000). If so, this would lend support to scenario D. As to timing, the absence of the Naskapi allele in Tlingit-Haida is also instructive. These groups are thought to have diverged from Athapaskans about forty-five hundred years ago (Michael Krauss, personal communication), with Tlingit-Haida adapting to the coast and Athapaskans settling the interior regions of Canada and Alaska, where they would have eventually come in direct contact with Algonkian groups. Although it is difficult to tie the spread of an archaeological tradition with specific ethnic/linguistic groups, the spread of the Northern Archaic tradition into Alaska may be a candidate that would explain how a broad range of contact developed between Athapaskans and Algonkians in the western Subarctic.

OTHER LINES OF EVIDENCE

MITOCHONDRIAL DNA

In one of the earliest studies of mtDNA variation in arctic populations, Shields et al. (1993) found a close similarity between Alaskan and Greenlandic Eskimos and Na-Dené groups (Athapaskans, Haida)—so close, in fact, that using a mutation rate of 1 percent sequence divergence per 8,950 years, the authors calculated an average divergence date between 5,100 and 7,100 years ago for these circumarctic populations. Three Northwest Coast groups, although more distantly related, also shared close genetic ties to Eskimos and Na-Dené speakers. The authors note "these Circumarctic populations originated from an Asiatic population whose own ancestors had previously contributed to a substantial fraction of the lineage ancestry of contemporary Pacific Northwest Amerind populations" (Shields et al. 1993:560). This observation adds credence to our methodological decision to include Greater Northwest Coast groups with Na-Dené.

Native Americans have four main mtDNA haplogroups referred to as A, B, C, and D, along with a relatively rare haplogroup X. Jobling et al. (2004) provide a figure on the distribution of these haplogroups, which supports many of the points made in this paper. First, Eskimos and Na-Dené speakers both have very high frequencies of haplogroup A with haplogroup B low or absent. Eskimos and Aleuts do differ from Na-Dené in having a much higher frequency of D. By contrast, North

Amerinds, Central Amerinds, and South Amerinds have moderate and variable frequencies of A (20–55 percent), uniform frequencies of B (30–40 percent), low to moderate frequencies of C (10–25 percent), and very low frequencies of D (0–10 percent). These data support the general notion of American Indian homogeneity and the greater similarity between Eskimo and Na-Dené than between other American Indians.

Brown et al. (1998) evaluated the rare haplogroup X to determine if there was some linkage between Native Americans and Europeans. They found that the geographic distribution of X in the New World was restricted largely to northern North American Indians, including Algonkians, Siouans, Northwest Coast groups, and Apacheans (Na-Dené). Although this observation lacks specificity, it does add another line of evidence suggesting affinity and/or gene flow among Native Americans of the Subarctic, Plains, and Northwest Coast.

Although mtDNA researchers working on variation among Native American populations have weighed in on issues regarding the timing of dispersal and the number and sequence of migrations, there is as yet no consensus. As Eschleman et al. (2003:15) conclude, "It is not surprising that mitochondrial DNA has largely confirmed the findings of classical genetic markers regarding genetic relationships among Native American tribal groups and yet has not conclusively resolved raging debates regarding number of migrations, source populations, and the timing of these migrations." With more research in this area, especially on ancient DNA, perhaps these data will contribute in a more decisive way to evaluating the scenarios shown in Fig. 4.

ANTHROPOMETRY

Jantz et al. (1992) analyzed anthropometric data on fifteen thousand Native Americans collected under the direction of Franz Boas during the Jesup North Pacific Expedition (1897–1903). Two of their major conclusions relate directly to the subject of this paper. First, they did not find that either Eskimo-Aleuts or Na-Dené speakers were as strongly differentiated from other Native American groups as indicated by blood group markers and dental morphology. Second, they concur with Szathmary that Na-Dené groups show greater similarity to Eskimo-Aleut than to Algonkians, supporting "the position that Na-Dené and Eskimo-Aleut share a more recent common ancestry than either does with Algonkians" (Jantz et al. 1992:458). Ousley (1995) focused on another subset of Boas' anthropometric data, which involved six body and six face measurements. Using canonical discrimination analysis, he found that Eskimos of southwest Alaska were generally similar to Aleuts and some Northwest Coast Indian tribes. Although measurement data may be tied in part to climate, the observation that Na-Dené and Eskimo-Aleut are relatively similar is in agreement with divergence scenario C. These data cannot show, however, the gene flow indicated by Albumin Naskapi that supports scenario D.

CONCLUSIONS

All Native Americans share the same general Sinodont dental pattern that occurs in Northeast Asia. However, this pattern differs in some respects within the New World, and the most prominent characteristic of this difference is that it corresponds roughly with language families. Hence, these dental trait frequencies were used by Greenberg et al. (1986), along with linguistic, genetic, and archaeological evidence, to define three matching New World linguistic, dental, and genetic divisions. These corresponded approximately to the distribution of the Eskimo-Aleut, Na-Dené, and Amerind language families, a position also supported by genetic data (Cavalli-Sforza et al. 1994). Since 1983, Turner has added more data from the Northwest Coast region, and as a result it is likely that some other language family or families could be involved, not just Na-Dené (Turner 1985a, 1986), a suggestion first made by Paleoindian and Northwest Coast archaeologist Roy A. Carlson (1990) and supported by subsequent genetic analyses (cf. Shields et al. 1993).

Turner (1983) envisioned four possible migration scenarios to account for the pattern of dental variation in the New World:

1. Three migrations (Paleoindian, Na-Dené, Eskimo-Aleut, with Aleut and Eskimo diverging after arrival in New World);
2. Four migrations (Paleoindian, Na-Dené, Eskimo, Aleut, with the latter two groups diverging prior to arrival in New World);
3. Two migrations (Paleoindian, Eskimo-Aleut, with Na-Dené forming in America through admixture between Paleoindians and Aleuts); and
4. Three migrations (Paleoindian, Eskimo, Aleut, with Na-Dené forming through admixture between PaleoindianPaleo-Indians and Aleuts).

In later papers, Turner (1985a, 1985b, 1986) proposed that the scenario of three separate migrations (scenario 1) was the most parsimonious model, since it integrated the largest amount of information from linguistics, physical anthropology, genetics, archaeology, and natural history. These three divisions were interpreted as the result of three separate, previously divergent migrations from Siberia. The first late Pleistocene colonists of Alaska and the New World are thought to have been ancestral Paleoindians or Epi-Clovis. They probably were proto-Amerind (Macro-Indian) speakers. Most likely next to arrive were Na-Dené speakers, who were equated with Alaskan Paleoarctic and Siberian Diuktai cultures. Last, or arriving at the same time as Na-Dené but by a Beringian coastal route rather than through the interior Beringian plain, were maritime Aleut-Eskimo folk with the Aleutian Anangula culture derived from the lower Amur-Hokkaido region. Given the considerable late Pleistocene environmental and archaeological variation in eastern Siberia (Derevyanko et al. 1998; Lbova et al. 2003; Ovodov and Martynovich 2000; Tseitlin 1974; West 1996), late Pleistocene pre-Beringian human diversity in Siberia was likely greater than that which was carried to Alaska.

Additional analysis supports the three migration scenario and adds new insights into the sequence of divergence events given ND-GNWC biological intermediacy. The three migration model of Turner is not couched in terms of most recent common ancestor—rather, he has three separate migrations coming out of Siberia in the sequence of American Indian, Na-Dené, and Eskimo-Aleut. When this is considered in light of the divergence patterns in Fig. 4, scenario D can be reconciled with Turner's model by adding that Paleoindians diverged first out of a Northeast Asian population base, while Eskimo-Aleuts and Na-Dené did not diverge until some later time (but in Siberia). Ultimately, the three groups did migrate separately into the New World but at that time, Eskimo-Aleut and Na-Dené were more closely related to one another than either was to American Indians. Subsequent gene flow between American Indians (notably Algonkians) and Na-Dené groups resulted in convergence between these groups, producing the pattern of intermediacy for ND-GNWC that would not have been generated if all three groups had been derived from a common ancestor at about the same time.

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THE TAIGA PERIOD: HOLOCENE ARCHAEOLOGY OF THE NORTHERN BOREAL FOREST, ALASKA

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Abstract

It is difficult to place archaeological material from mid-to-late Holocene sites in interior Alaska and adjacent Yukon into coherent chronological classification schemes that have broad acceptance and utility. Workman's (1978) synthesis of Southwest Yukon archaeology is an exception, and is still a touchstone after thirty years. A "vague and variable" Northern Archaic tradition is often evoked for Alaskan notched point assemblages with and without microblades. "Northern Archaic" has become a catchall term for numerous artifact collections found between Anderson's Northwest Alaska and Workman's Southwest Yukon sequences. An overarching framework, neutral to current terminology, is proposed to accommodate local and regional classifications. Data from Lake Minchumina, Swan Point, and other interior sites form the basis for the Taiga period that is divided into early, middle, and late cultural periods.

KEYWORDS: Northern Archaic tradition, microblade, notched point

INTRODUCTION

Holocene archaeology of the northern boreal forest is not well studied, documented, or understood. A clear and detailed chronological framework has eluded researchers because of the lack of stratified sites with cultural components that represent a continuous record from late Pleistocene through Holocene times. Many interior archaeological collections are quite small and often lack adequate radiocarbon dates. As a result, archaeologists have tended to rely on specific artifact traits to help with dating and cultural classification. The term "Taiga period" was proposed more than a decade ago (see Holmes 1995) to refer to the Holocene archaeological materials of the northern boreal forest region. This terminology was an outgrowth of earlier work where it was suggested that the Northern Archaic in the greater Tanana Valley could be viewed in terms of early and late developments (Holmes 1979). The Taiga period is divided into early, middle, and late cultural periods that begin about 7500 BC.[1] The time prior to the Taiga period is a "Transitional Period" that is in turn preceded by the "Beringian Period" (Holmes 2001). The central Alaska prehistoric divisions are a device to divide time into neutral units as background to the diverse cultural units found in Alaskan archaeology (Fig. 1).

BERINGIAN PERIOD

Briefly, the Beringian period includes the earliest discovered archaeological remains in Alaska. The landscape was open, treeless shrub tundra dominated by dwarf birch and willow, but with significant amounts of grasses,

1 All dates contained in this paper are given in calendar years based on calibrated radiocarbon dates (Bronk Ramsey 1995, 2001; Reimer et al. 2004).

sedges, and forbs that supported now extinct fauna, e.g., horse and mammoth. During this time, Alaska was still connected to Siberia via the Bering Land Bridge, thus it is not surprising to find in Alaska archaeological evidence of microblade technology that resembles that of the Dyuktai culture found in Siberia (Mochanov and Fedoseeva 1996). Early microblade technology, based primarily on the Yubetsu/Dyuktai technique (Chen 2007; Kobayashi 1970), was widespread throughout Beringia at this time. Thus far, Swan Point is the only site in Alaska that meets the criteria of age (12,000 BC), artifact inventory, and microblade production technique (Fig. 2) to be included in Phase I of the East Beringian tradition. The East Beringian tradition only includes sites that are older than ca. 9,500 BC (11,500 BP) and does not include the American Paleoarctic tradition or Denali complex, both of which I consider to be completely "Alaskan prodigy," i.e., descendants of earlier north Asian/Siberian traditions but with distinct tool manufacturing techniques (Holmes 2001:156). I see the abandonment of the Yubetsu/Dyuktai technique in favor of the Campus technique (cf. Anderson 1970; Mobley 1991; West 1967, 1984) in microblade technology as significant in defining the early Holocene prehistory in Alaska.

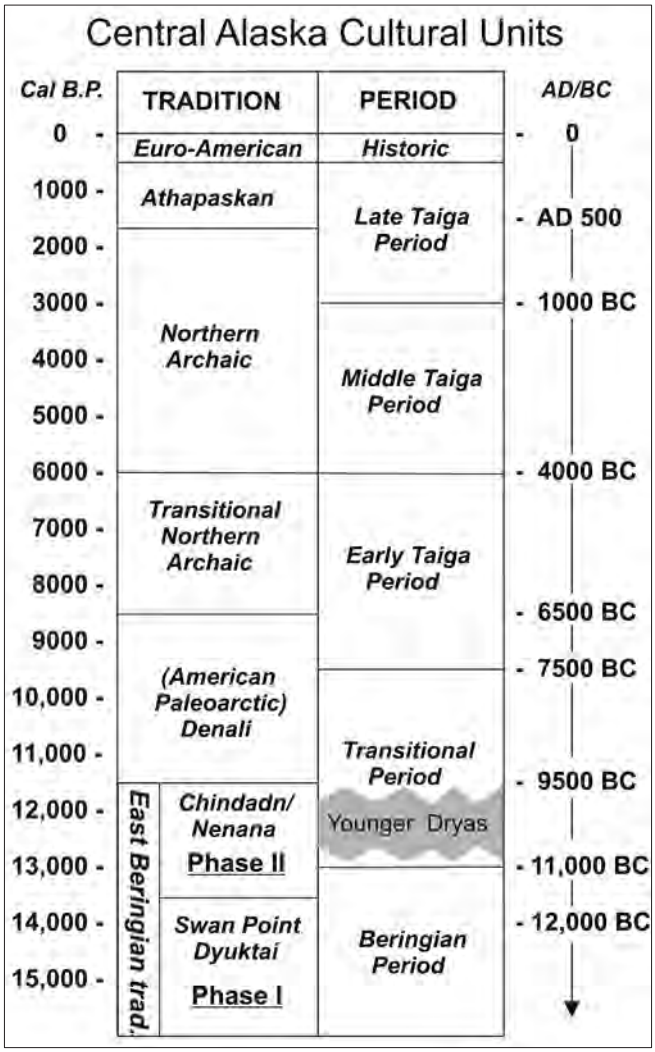

Figure 1. Outline of Cultural Units for Central Alaska.

TRANSITIONAL PERIOD

The transitional period begins at the start of the Younger Dryas climatic interval, ca. 11,000 BC, and was marked by significant changes in climate and animal extinctions (e.g., mammoth and horse), as well as changes in technology. The American Paleoarctic tradition and Denali complex, although clearly grounded in ancestral Siberian technology, took another trajectory. Communication between Alaska and the rest of North America became possible along an interior ice-free corridor (Catto 1996; Clague et al. 2004) after ca. 11,000 BC. This may have resulted in phenomena such as the Nenana complex in the

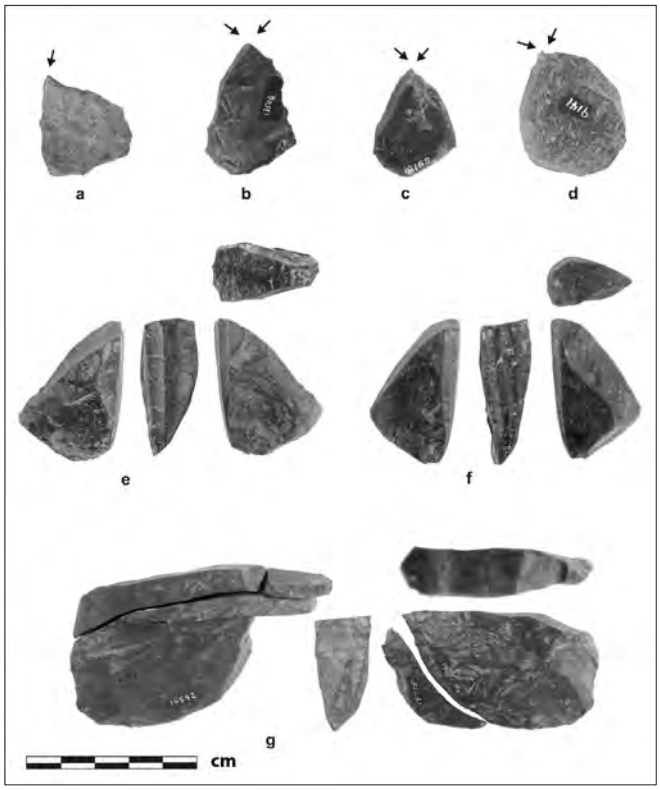

Figure 2. East Beringian tradition artifacts from Swan Point Cultural Zone 4 (c. 12,500-12,000 BC), > Level 15: a, transverse burin; b-d, dihedral burins; e-f, exhausted microblade cores; g, microblade core with refit "ski" spalls and frontal spall.

interior and the later Mesa complex in northern Alaska, which appeared with no apparent Siberian antecedent. In Cultural Zone 3 at Swan Point, ca. 10,000 BC (Table 1), there was a notable decrease in microblade production and emphasis on small biface points (Fig. 3). Swan Point Cultural Zone 3 and other sites or components with Chindadn biface points are delegated to Phase II of the East Beringian tradition. Dwarf birch shrub tundra continued to dominate the landscape; however, willow increased by 10,000 BC and *Populus* was significant by 9000 BC. Spruce and alder were important elements of the vegetation mosaic by 8000 BC.

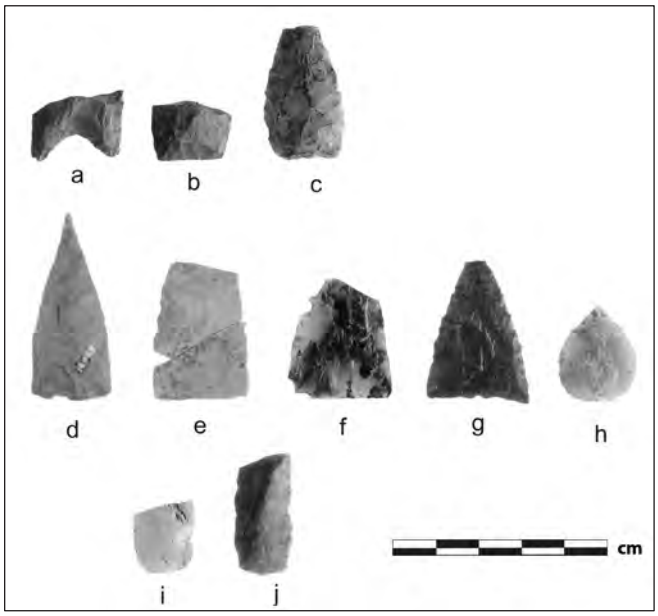

Figure 3. Transitional Period artifacts from Swan Point Cultural Zone 3: Level 9 bifaces, a, concave base; b, straight base; c, trianguloid form; levels 10-11 bifaces, d-g, trianguloid forms (f, with graver spurs); h, "tear drop" round base; Level 12 i, small lanceolate base; Level 14 j, small lanceolate form.

TAIGA PERIOD

The Taiga period, as the name attests, began with a landscape draped in birch-spruce woodland. In central Alaska five environments were all exploited by humans during the Taiga period: (1) periglacial shrub tundra; (2) scrub forest/scrub tundra; (3) gallery forest and/or parkland; (4) birch forest; and (5) black spruce taiga. At 7500 BC the Denali complex or American Paleoarctic tradition was still present, but there were signs that perhaps a nonmicroblade technology may have been present as well, an example being the distinctive biface technology of the Eroadaway site (Holmes 1988).

By about 6000 BC the archaeological record for the Alaskan interior boreal forest fades; there are no sites securely dated and described for the period ca. 6000 to 4000 BC. One possibility for this low visibility is that there may have been a population decrease. The earliest archaeological evidence for the Yukon, outside of Bluefish Caves, is found at sites like the Canyon and Annie Lake, leading some archaeologists to term this evidence the "Northern

Table 1. Radiocarbon dates from Swan Point for the Transitional and Taiga Periods. Calibrated by OxCal 4.0 (Bronk Ramsey 1995, 2001; Reimer et al. 2004).

Laboratory No.	^{14}C Age BP	Calibrated Age 2 σ	Comments	Cultural Zone
Beta 223302	860 ± 40	AD 1040–1270 (910–680 CalBP)	hearth charcoal	CZ 1a
WSU-4523	1220 ± 70	AD 660–970 (1290–980 CalBP)	charcoal	CZ 1a
WSU-4524	1570 ± 70	AD 340–640 (1610–1310 CalBP)	charcoal assoc. w/burnt bone	CZ 1a
WSU-4522	1670 ± 60	AD 240–540 (1710–1410 CalBP)	charcoal	CZ 1a
WSU-4521	1750 ± 80	AD 70–440 (1880–1420 CalBP)	charcoal assoc. w/ burnt bone	CZ 1a
Beta-190580	4260 ± 40	3010–2690 BC (4960–4640 CalBP)	hearth charcoal	CZ 1b
Beta-209886	6610 ± 40	5620–5480 BC (7570–7430 CalBP)	charcoal	CZ 2
WSU-4426	7400 ± 80	6430–6080 BC (8380–8030 CalBP)	charcoal	CZ 2
Beta-190578	10,010 ± 90	10,050–9250 BC (12,000–11,200 CalBP)	hearth charcoal	CZ 3
Beta-170458	10,050 ± 60	10,050–9300 BC (12,000–11,250 CalBP)	hearth charcoal	CZ 3
Beta-56666	10,230 ± 80	10,450–9650 BC (12,400–11,600 CalBP)	hearth charcoal	CZ 3
Beta-209885	10,570 ± 40	10,850–10,440 BC (12,780–12,390 CalBP)	hearth charcoal	CZ 3

Cordilleran Tradition," implying ties to the northwestern Paleoindian tradition (cf. Clark 1983; Hare 1995:131). It can be noted that the 5900 BC Annie Lake microblade component (Greer 1993; Hare 1995:31) is contemporary with the Canyon site, thereby giving support to Workman's (1978) inclusion of the Canyon Creek site, despite the lack of microblades, in his Little Arm Phase. Nevertheless, in interior Alaska we do not have a firm understanding of what the archaeology was like during the period 6000 to 4000 BC. Artifacts from Swan Point Cultural Zone 2, ca. 7500 to 4000 BC (Table 1) are sparse but include lanceolate points, large side scrapers, and subconical microblade cores (Fig. 4).

Conventional wisdom suggests that, during the later part of the Early Taiga period, either (1) the Denali complex was changing into the Northern Archaic, with some Denali traits continuing forward, or (2) there was an abrupt change in technology. It has been suggested that Denali traits were lost when a rather large-scale population movement, traceable to the Archaic Tradition of the Plains, followed the northward and westward expansion of the boreal forest (Anderson 1968a, 1968b; Workman 1978). This would account for so-called "pure" Northern Archaic assemblages, i.e., those without microblades. This large-scale migration theory has been challenged by Clark (1992) and others (cf. Morrison 1987), on grounds that there is considerable regional diversity in the Northern Archaic with numerous examples of assemblages that "amalgamate" microblade technology. However, evidence is lacking that would also show a clear continuity of Denali traits across almost two thousand years, although this hypothesis continues to be tested.

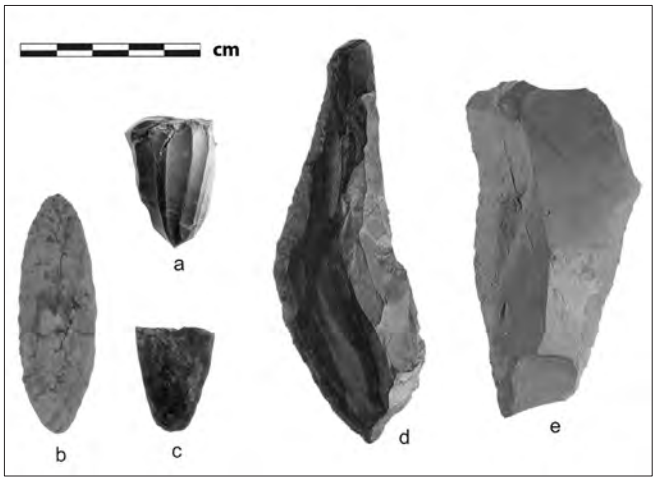

Figure 4. Early Taiga Period artifacts from Swan Point Cultural Zone 2, levels 7-8: a, sub-conical microblade core; b, lanceolate biface; c, lanceolate base; d-e, large unifacial side scrapers.

The modern vegetation exhibits fingers of boreal forest extending northward into the Brooks Range and the Kobuk and Noatak drainages, and southward toward Bristol Bay and down toward the Alaska Peninsula. According to Edwards et al. (2000), there is almost no change in the northern position of the tundra/taiga biome distribution in Alaska from around 4800 BC to the present. The boreal forest was well established by the start of the Middle Taiga period, having attained its full extent in Alaska by 4000 BC. Coincidentally, this marks the beginning of the Northern Archaic tradition.

NORTHERN ARCHAIC AND THE MIDDLE TAIGA PERIOD

The Northern Archaic satisfies the definition of a cultural tradition, defined as any distinctive tool kit or technology that exists relatively unchanged for an extended period of time and usually over an extended area. Anderson defined the Northern Archaic tradition on the basis of a sharp distinction between "Arctic-oriented" and "Interior-oriented" cultural systems. While he has now deemphasized any "strictly ecological connection between the Northern Archaic and a particular habitat" (Anderson 1988:88), there remains a strong correlation between the Northern Archaic and the boreal forest. I would note here that Anderson defined six phases of Northern Archaic at Onion Portage. Notched points occurred only in Phases 1–3 and were the only "point" forms present, whereas Phases 4–6 had a variety of stemmed and "oblanceolate" point forms. It is important to remember that the Northern Archaic tradition is more than just notched points.

It is striking to find the early appearance of notched point sites over such a wide geographic range. Between 4000 and 3000 BC notched point forms are found not only at Onion Portage, but also in the Noatak drainage (Anderson 1972), at Ugashik Lake and Bristol Bay (Dumond 1981; Henn 1978), in the Upper Susitna basin (Betts 1987; Dixon et al. 1985), and in the Tangle Lakes area (McGhee 1971; West 1972). The distribution is probably even greater than depicted in Fig. 5, which plots notched point sites that have acceptable associated radiocarbon dates. A number of sites have bracketing dates or reported dates only relative to the notched point component. Clearly there was a sudden but widespread occurrence of notched points throughout the region.

A clear majority of sites have associated microblades (e.g., at Ugashik Knoll, Butte Lake, and Nimiuktuk-51–3), while other contemporary and regionally close sites lack associated microblades (e.g., at Graveyard and Onion Portage). The point to remember is as follows: just because microblades and notched points are sometimes found associated and sometimes not, we need not divide the Northern Archaic into "pure" and "tainted" or mixed sites. Not all sites will display every tool in the tool kit. Furthermore, it is important to recognize how small, and therefore biased and perhaps misleading, some artifact inventories are. The significance of sample size is often overlooked when archaeologists evaluate site cultural affiliations. Also, depositional environment affects the potential for mixing assemblages from separated time intervals, especially in shallow sites, and must be evaluated. Evidence

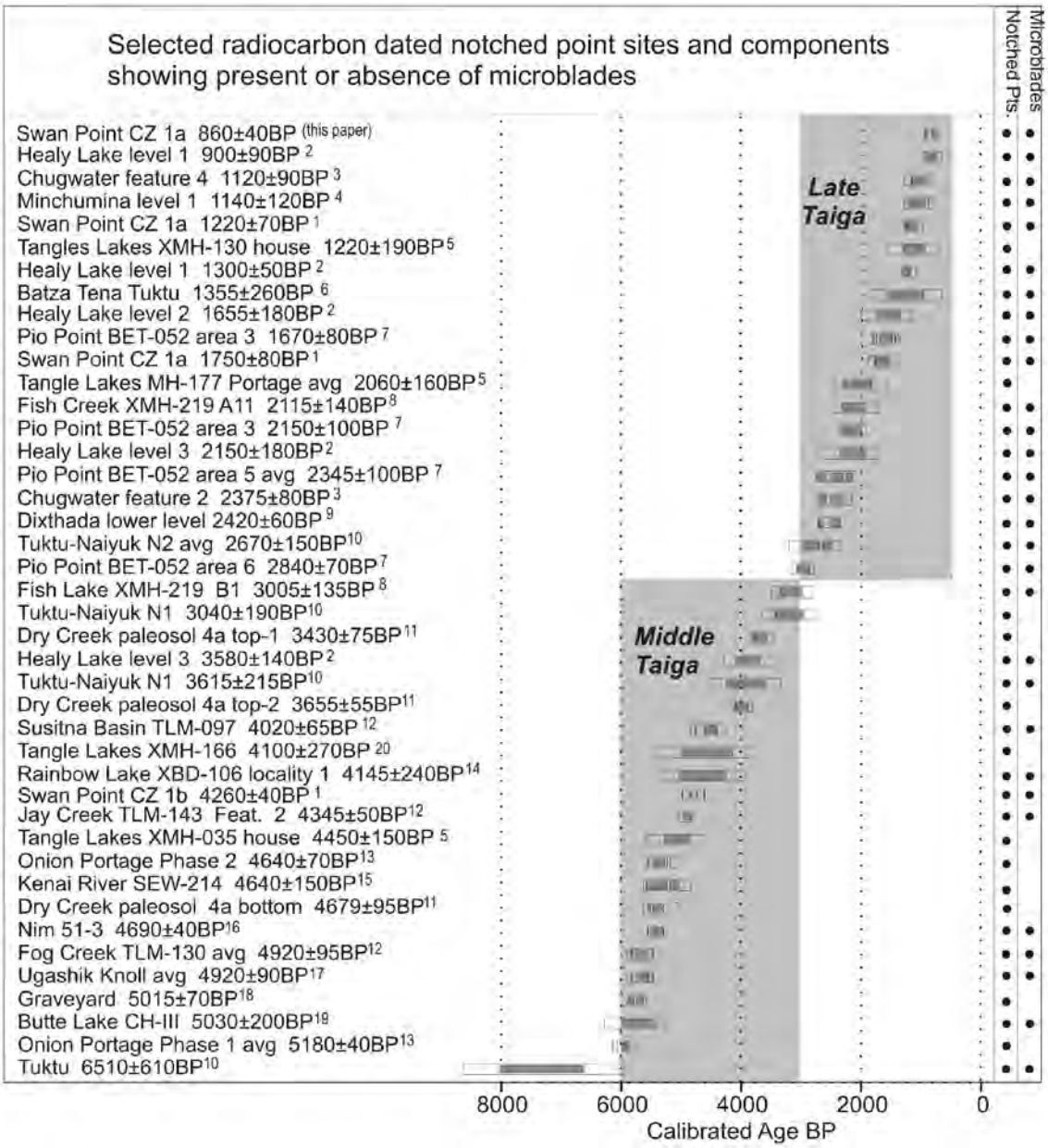

Figure 5. Plot of uncalibrated radiocarbon dates for Alaska sites with notched points, and their association with microblades. Sources: 1-Holmes 1996; 2-Cook 1996; 3-Lively 1988; 4-Holmes 1986; 5-McGhee 1971; 6-Clark and McFadyen Clark 1993; 7-Dillingham 1994; 8-Cook et al. 1977; 9-Shinkwin 1979; 10-Gal 1982; 11-Powers et al. 1989; 12-Dixon et al. 1985; 13-Anderson 1988; 14-Bacon and Holmes 1980; 15- Holmes 1984; 16-Esdale 2004; 17-Henn 1978; Dumond 1981; 19-Betts 1987; 20-Brandau and Noakes 1978.

from dated context suggests that we are more likely to find sites with the two traits associated than without. The data demonstrate that microblade technology was integral to the Northern Archaic tradition. There are even hints that microblade technology may have been present in the inventory of artifacts found in the Onion Portage Northern Archaic phases. Anderson lists five microblades and one microblade core in the overall Northern Archaic artifact inventory (Anderson 1988:Fig. 67). Although it is unclear in which phase or band/layer they were found, Anderson clearly does not consider them as part of the Northern Archaic. In the case of the Tangle Lakes Northern Archaic sites, e.g., Mt. Hayes 35 and XMH-166, it is not clear whether or not microblades were part of the inventory.

It is interesting to attempt to follow the temporal history of notched points in different regions of Alaska. They appear in diverse locations at about the same time, between 4000 and 3000 BC. But in some regions (Northwestern Alaska, Bristol Bay, and the Susitna Basin) they seem to disappear altogether, while in other regions (Tangle Lakes) they reappear around 500 BC. Elsewhere in the Tanana Valley (at Healy Lake, Minchumina, Chugwater, Dixthada, and Swan Point) and the south flank of the Brooks Range, notched points are present at ca. AD 1000.

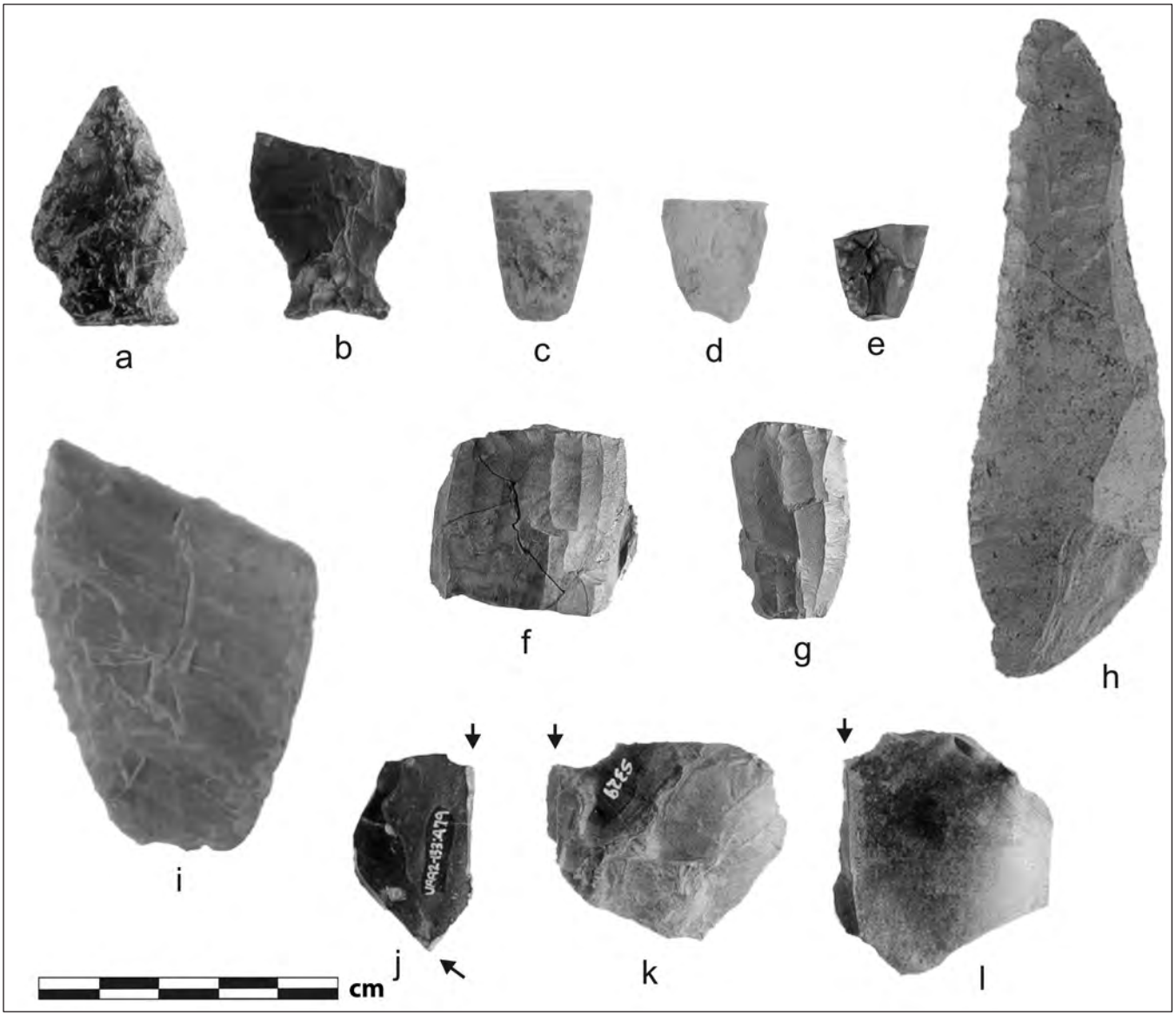

Figure 6. Middle Taiga Period artifacts from Swan Point Cultural Zone 1b levels 5–6: a–b, notched point forms; c–e, lanceolate biface bases; f–g, multiplatform tabular microblade cores; h, large unifacial side scraper; i, large, thin biface; j–l, "Donnelly" transverse flake burins.

The Middle Taiga period begins with the establishment of the Northern Archaic tradition, which occupied a large geographical unit on the order of a "culture area." The culture area concept requires that there be continuity of shared cultural traits that were derived from a common base. But we encounter some difficulty here, because the common base for Northern Archaic would seem to be Denali complex/American Paleoarctic microblade technology. As has been noted, there is a two-thousand-year data gap separating the traditions. Rapid diffusion of traits from outside Alaska is another possible explanation, but is it any better? How do we evaluate its merit? My thought is that while there must have been a base of common traits among these widely spaced Northern Archaic groups (putting the issue of common origin aside), it seems clear that in a rather short interval of time these groups were becoming regionally distinct. Even so, it is unlikely the Northern Archaic developed in isolation during the Middle Taiga period, as there were non–Northern Archaic groups all around the boreal forest borders that likely affected this process, e.g., Arctic Small Tool tradition.

Although the focus here has been on notched points and microblades, the picture is much more complex. Other aspects of the tool kit, e.g., burins and scrapers, are significant as well, as is the overall way of life. Cultural Zone 1b (ca. 4000 to 1000 BC) at Swan Point includes large scrapers, lanceolate points and knives, Donnelly burins, notched points, and tabular microblade cores (Fig. 6). The hunting technology of the Northern Archaic tradition may have more to do with various lanceolate projectile systems than with notched points. There is some ambiguity concerning notched points; a notched point may have begun as a projectile and later been broken and adapted for use as a knife. It is clear that the atlatl was the means for launching both notched and lanceolate projectile points throughout the Middle Taiga period and into the beginning of the Late Taiga period, given recent evidence emerging from ice patch archaeology in Yukon and Alaska (cf. Hare et al. 2004; Dixon 2005). Examples of both notched points and lanceolate points have been found hafted to foreshafts in association with atlatl dart shafts. Fig. 7 shows the silhouette of an 800 BC hafted lanceolate point from the Wrangell/St. Elias Mountains (Dixon et al. 2005:Fig.6) compared to a similar point found in an Alaska Range ice patch in 2003 (VanderHoek et al. 2007:191). The radiocarbon dates that Hare et al. (2004) used to document atlatl and bow-and-arrow use during the Holocene in the southwest Yukon have been plotted to show the relationship between the Middle and Late Taiga periods (Fig. 8). The introduction of the bow-and-arrow at ca. 1000 BC occurs at the juncture of Middle and Late Taiga periods.

LATE TAIGA PERIOD AND THE ATHAPASKANS

The Late Taiga period began around 1000 BC and lasted until the Historic period. Northern Archaic tradition assemblages became more diversified during this time, yet exhibit continuity with the preceding Middle Taiga period, i.e., the presence of notched points and microblades along with numerous lanceolate point forms, scrapers, and burins. The Onion Portage Itkillik complex, which Anderson (1988:150) interpreted as a "late phase

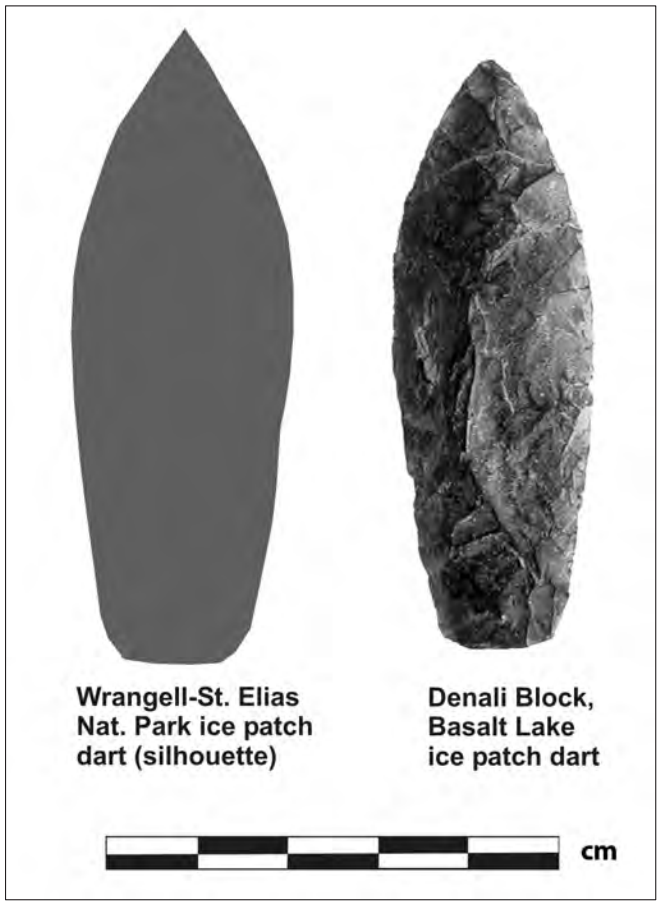

Figure 7. Comparison of two Middle/Late Taiga Period lanceolate points found on melting ice patches. Left side; silhouette of lanceolate dart point found hafted in a wooden foreshaft (dated to c.800 BC, wood shaft and c. 1000 BC, sinew binding) from Wrangell Mountains. (Dixon et al. 2005). Right side; lanceolate point found in Alaska Range near Tangle Lakes (VanderHoek et al. 2007).

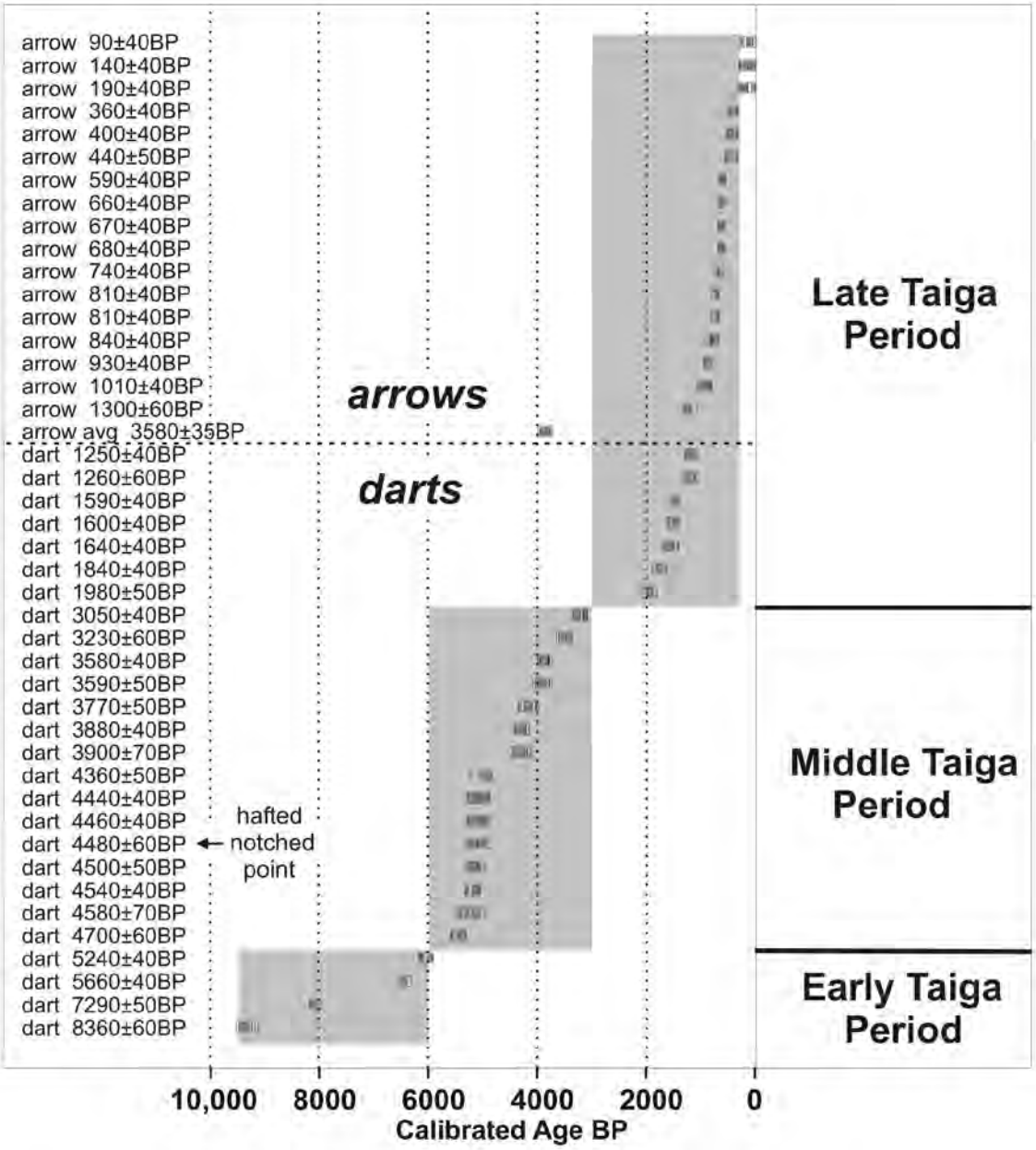

Figure 8. Plot of uncalibrated radiocarbon dates on artifacts from Southwest Yukon alpine ice patches alongside Taiga Periods. Note: occurrence of notched point dart c. 3100 BC, change from atlatl dart to bow and arrow between c. AD 800-700, and the 1000 gap in the radiocarbon record. Source for radiocarbon data (Hare et al. 2004).

of the Northern Archaic," lacks notched points but is nearly identical in artifact types to the earlier Northern Archaic Palisades and Portage complexes. Anderson (1988) suggested that the Itkillik complex represents Athapaskans and may have been intrusive into an otherwise Eskimo continuum. The "Minchumina tradition" (Holmes 1986), a local variant of the Northern Archaic tradition with three phases within the Late Taiga period, also provides an example of diversification at the end of the Northern Archaic. A Norton tradition influence (Dogwood phase), evident at Minchumina, may represent an Eskimo intrusion into what had become a local Athapaskan continuum. While the Minchumina Cranberry and Raspberry phases lie comfortably within the Late Taiga period, the dating for the earlier Blueberry phase needs better resolution. Artifacts from Swan Point Cultural Zone 1a (ca. 1000 BC to AD 1000) include tabular and boulder spall scrapers, ground and pecked adzes, various end scrapers and side scrapers, notched points, and lanceolate bifaces (Fig. 9).

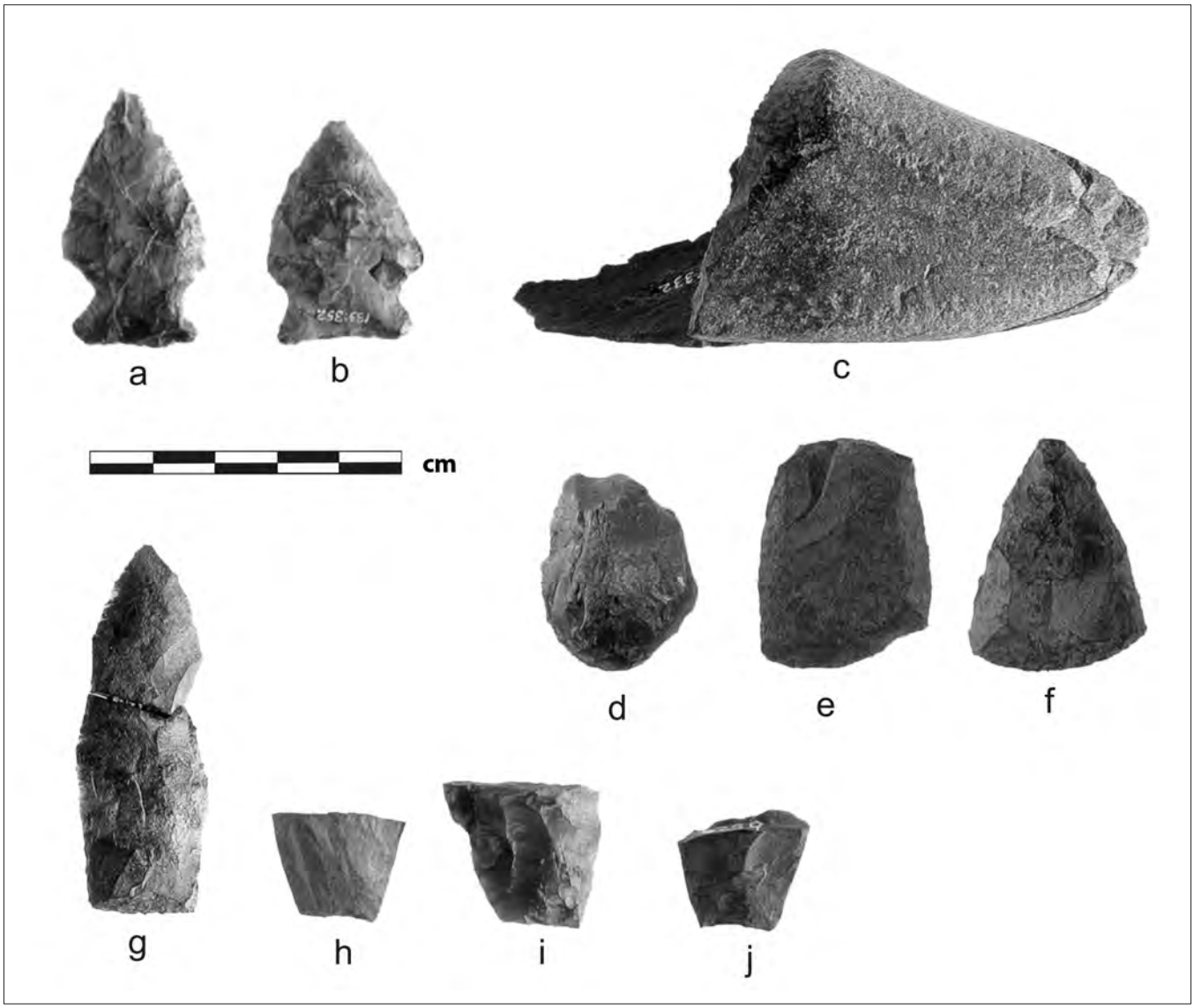

Figure 9. Late Taiga Period artifacts from Swan Point Cultural Zone 1a levels 1-5: a-b, notched points; c, ground/pecked adze fragment; d-f, unifacial end scrapers; g, lanceolate biface; h-j, lanceolate biface bases.

The term "Late Denali phase or complex" (cf. Dixon 1985) is often used to refer to interior sites of the Late Taiga period because they have microblades and Donnelly-style burins. It is one thing to recognize the presence of "Denali-like" traits in a late context, and quite another to argue for a cultural connection to the earlier Denali complex. I recognize and emphasize differences between the Denali complex (or American Paleoarctic tradition) and the later Northern Archaic tradition. I am not alone in suggesting that archaeologists refer to the post-1000 BC assemblages as something other than "Denali" to avoid the impression of cultural continuity over four or five thousand years.

Sometime around AD 800 there was a marked change in the archaeological record across much of the interior boreal forest. Workman (1974, 1979) has suggested that the White River ashfall at this time may have triggered human population displacements in Yukon that led to Athapaskan migrations eastward into the Mackenzie Valley and southward into northern British Columbia. There was an earlier (ca. AD 500) White River ashfall that affected eastern Alaska as far north as the Yukon River (Lerbekmo and Campbell 1969; Lerbekmo et al. 1975). Whether either of these events had any lasting effect on Alaskan populations is unknown and awaits further research. Nevertheless, technological change is well documented, e.g., at Gulkana (Workman 1977) and Dixthada (Shinkwin 1979). There is less emphasis on lithic technology (microblade and burin technologies disappear) and more on bone, antler, and

copper technology. The bow-and-arrow is now the hunting method, as reflected in various small arrow point types and barbed antler points (cf. Hare et al. 2004; Dixon et al. 2005; VanderHoek et al. 2007). This marks the end of the Northern Archaic tradition and the beginning of the Athapaskan tradition, which leads to ethnically recognizable Athapaskan groups.

DISCUSSION

Researchers are encouraged to consider the Taiga period as an overarching framework to accommodate local and regional cultural classification. For much of the Holocene period in central Alaska the Northern Archaic tradition is the predominant cultural construct. The concept "Archaic" is not new in American archaeology. It is interesting to recall how it has been used to distinguish "Indian" from "Eskimo" ancestry. From its original use in eastern North America, application of the term has spread, although its use in Alaska and Yukon came relatively late. Since Anderson (1968a) introduced the term, the Northern Archaic tradition has gained in popularity (cf. Dumond 1977; Ackerman 2004; Clark 1992; Workman 1978).

The Archaic has been defined as "the stage of migratory hunting and gathering cultures continuing into environmental conditions approximating those of the present" (Willey and Phillips 1958:107). Some of the characteristics that distinguish Archaic cultures from earlier cultures can be seen to apply to the Northern Archaic tradition, e.g., a greater variety of biface points, especially corner-notched and side-notched forms. Other characteristics include hammerstones, polishing stones, whetstones, abraders, and notched pebbles. Masses of fire-broken rocks, presumably used in stone boiling and pit roasting, are typical traits. Examination of the archaeological record shows that all of the defining characteristics for an ideal archeological construct are seldom found at any particular site, nor should we expect them to be.

It seems clear that the Northern Archaic tradition is long and complex. As such it should be conceived of in terms of local and regional variation. Regional variants or geographic distinctions are already recognized, and will help our understanding of cultural differences and similarities. As we have seen, there is reason to consider the Northern Archaic in terms of early and late developments. We know that an early notched point horizon was widespread. The question of whether or not notched point assemblages belong to distinct cultural episodes may not be quite as nagging as once thought. The evidence shows that variants of notched points provide an unbroken thread that lasted for five thousand years (Fig. 5). Furthermore, although the correlation is not perfect, the archaeological record shows a pattern of nearly continuous association of notched points and microblades in central Alaska for this same period. Therefore, the relationship of notched point and microblade technology is valid.

One of the least understood periods in Alaskan prehistory is the Early Taiga period. It has not yet been demonstrated that *in situ* microblade and burin technology along with various lanceolate biface styles of the transitional period led directly to what is recognized as Northern Archaic. Once the archaeological knowledge base is expanded in specific geographic regions through detailed chronological sequences, we will get better answers. We should look closely to the consequences of both people and cultural influences coming from outside Alaska into a sparsely populated landscape that had become taiga.

Effort is needed to better understand the end of the Late Taiga period and the associated changes in technology. Is cultural continuity traceable from pre-AD 500 to the Athapaskan tradition?[2] The beginning of the Late Taiga period is best characterized as pre-Athapaskan, in that the material culture is a variant of Northern Archaic. Linguistic studies suggest that central Alaska has been occupied by Athapaskan-speaking groups for at least the past two to three thousand years (Krauss 1972:953). The eventual loss of microblades along with notched points is significant in recognition of an Athapaskan tradition. The timing of this change in technology awaits finer resolution.

When it comes to cultural influences on material traits, the Northern Archaic may be viewed, not so much as open ended, but as open sided as well. In general, cultural development and change during the Taiga period is conceived of as both parallel (cultural variability happens within isolated cultural groups) and lateral (cultural traits and influences diffuse throughout neighboring groups).

2 Although Cook and McKennan (1970) defined the Athapaskan tradition as beginning as early as c. 2500 BC, others (Dixon 1985; Holmes 1979) have restricted it to the past fifteen hundred years before the historic period. See Bacon (1987) for a critical discussion of cultural chronology for central Alaska.

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THE LATE HOLOCENE OCCUPATION OF INTERIOR SOUTHWESTERN ALASKA

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ABSTRACT

A small party of hunters occupied a narrow cave near Farewell Mountain in southwestern Alaska around three thousand years ago. Bones of small to large animals were found around their campfire, some with cut marks. Radiocarbon dates on charcoal from their campfire within the cave indicated an occupation between 2931±23 ^{14}C years BP and 3165±40 ^{14}C years BP. An earlier use of the cave area was suggested by charcoal from a layer in front of the cave that dated to 3760±180 ^{14}C years BP. The artifacts lying about the cave campfire were nondiagnostic, but a nearby site contained a side-notched projectile point similar to those recovered from Northern Archaic sites in the region, suggesting that the cave may have been occupied during a late phase of the Northern Archaic tradition.

KEYWORDS: Farewell Cave, Northern Archaic tradition, southwest Alaska

NORTHERN ARCHAIC TRADITION SITES IN SOUTHWESTERN ALASKA

During an archaeological survey in 1982 six archaeological sites were found in the vicinity of Lone and Farewell mountains north of the Alaska Range (Figs. 1, 2). Here the low-lying piedmont is covered with moraines of the Farewell and Selatna glaciations, outwash slopes, flood plains and alluvial fans (Bundtzen 1980; Bundtzen and Gilbert 1983; Fernald 1960; Kline 1983; Kline and Bundtzen 1986). Three braided streams—Big River, Windy Fork, and the South Fork of the Kuskokwim River—flow northward across the piedmont, carrying boulders, gravel, sand, silt, and organic materials from sources within the Alaska Range (Fig. 2). With peak elevations of 807 and 802 m, Lone and Farewell mountains are characterized by a series of rubble-covered limestone ridges. On the crest of the ridges are discontinuous mats of alpine tundra vegetation with isolated alder thickets that encircle or extend on to the ridge tops. Lower in elevation are stands of poplar, aspen, white birch, and white spruce on better-drained slopes and black spruce on the lower slopes and valley bottoms.

Five of the sites consisted of surface lithic scatters, two on a ridgeline on Lone Mountain (MCG-036 and 037) and three on small hilltops (MCG-034, 038, 039) near Farewell Mountain. The sixth site (MCG-035) is in a cave that had been used as a temporary shelter by prehistoric hunting parties.

Site MCG-036 on Lone Mountain contained a weathered flake core and nine flakes of chert and argillite. MCG-037, also on Lone Mountain, contained two flake cores, a biface fragment, an end scraper, and 111 decortication and primary biface thinning flakes of chert and argillite. The position of the two sites on a high ridge overlooking the Kuskokwim River lowland and the limited amount of cultural debris suggests lookout stations used by hunters during the fall caribou migration. There was no organic material at either site for dating and the generalized nature of the assemblages did not provide an age estimate.

Site MCG-038 near Farewell Mountain contained a unifacial tool made on a large flake of argillite and a chert biface fragment. There was retouch along one curved

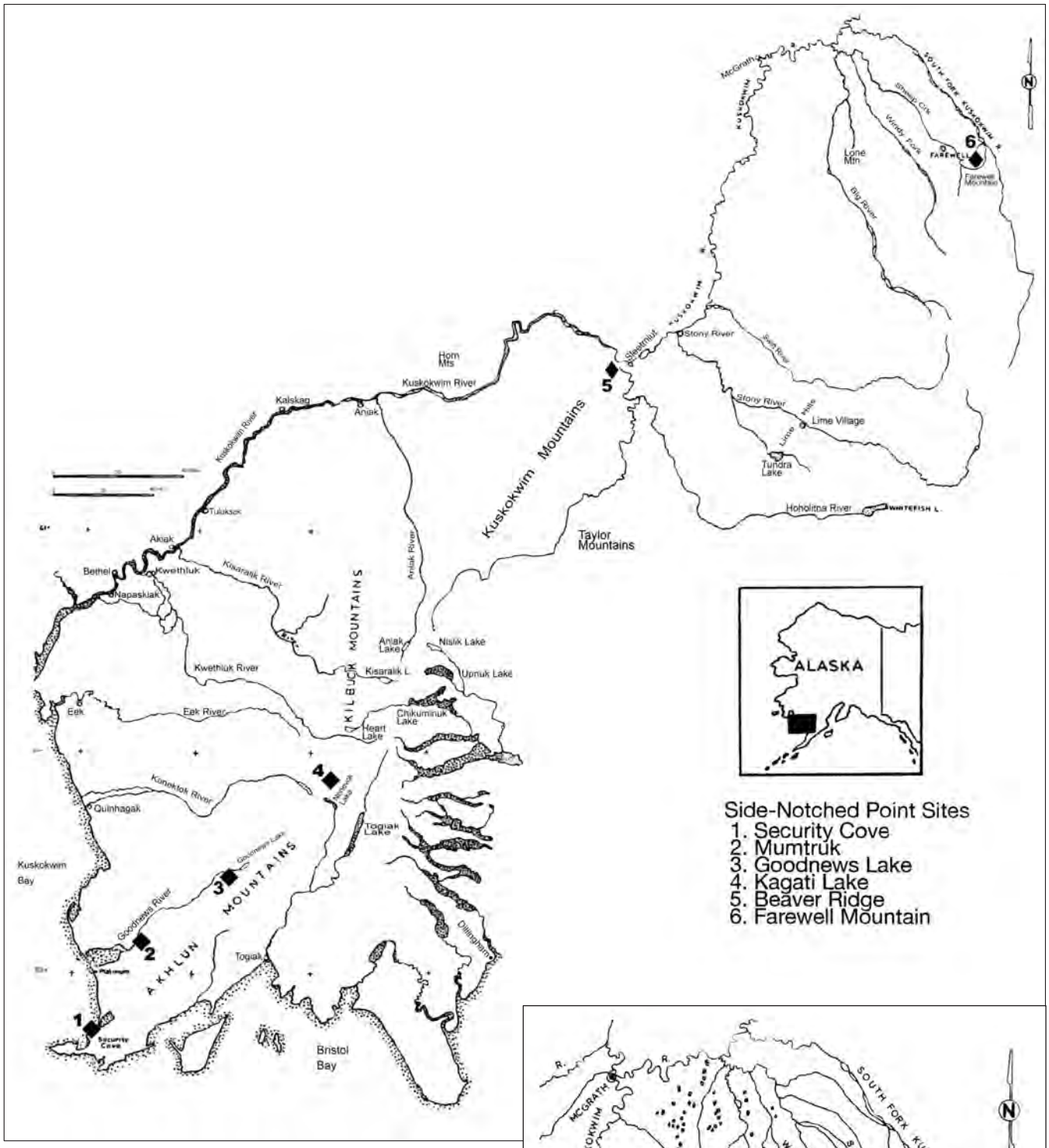

Figure 1 (above). Archaeological sites in southwest

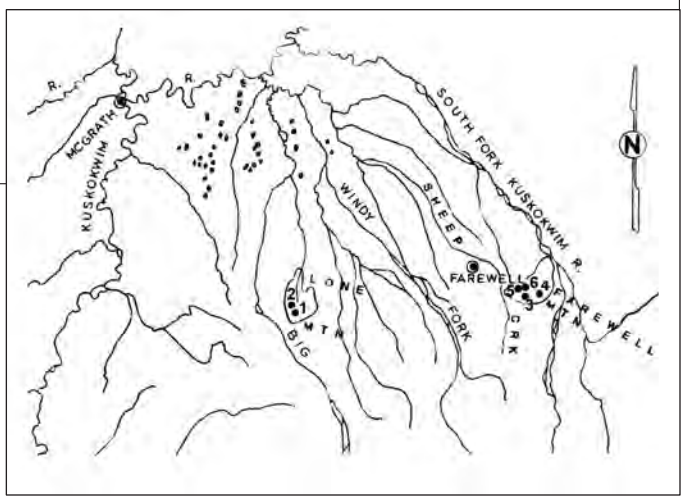

Figure 2 (right). Lone and Farewell mountains sites

side of the flake, suggesting that it was used as a large side scraper. At MCG-039 a bifacial side blade of chert was discovered with one margin strongly curved and the other fairly straight. The straight side or back was lightly retouched while the curved side had been repeatedly retouched as the result of multiple resharpening. The large biface could have been hafted transversely like an Eskimo ulu or longitudinally hafted and used as a large side blade. A battered piece of obsidian with many cleavage planes was found with the side blade at MCG-039. Site MCG-034, on an exposure along a spur-like ridge of limestone, yielded a chert flake and a side-notched projectile point with the tip missing. The side-notched point (Fig. 3) was made on a thick flake; the reverse face retained much of the ventral flake surface. The rather broad side notches were formed by retouch directed from either face and had been lightly ground along the edges. The base was convex and thinned by the flaking on both faces. Flaking on the face of the point was collateral and reached only partway across the face, leaving a central knob, often the mark of an inexperienced or careless knapper. The point had been hastily made with little care for form. Based on the form of notching and the shape of the base, the point could fit within the early phases of the Northern Archaic tradition found at the Onion Portage site (Anderson 1988). Given the variability of side-notched projectile point forms, however, the point could fit almost anywhere within the span of the Northern Archaic tradition. No datable organic material was recovered to date the site chronologically.

Figure 3. Side-notched projectile point, site MCG-034.

In terms of comparable site assemblages, component IV at the Dry Creek site has weakly side notched to stemmed projectile points that are similar to those of phase 5 at Onion Portage (Powers et al. 1983). Component IV has upper dates of 3430±75 ^{14}C years BP and 3655±60 ^{14}C years BP and a lower date of 4670±95 ^{14}C years BP (Powers et al. 1983). No microblades were recovered in component IV of the Dry Creek site. Side-notched projectile points were also present in the upper levels of site MMK-4 at Lake Minchumina together with other projectile point types and microblades in a seemingly late cultural context ca. AD 800–1000 (Holmes 1986).

Further to the west, side-notched points have been found at the Beaver Ridge site (SLT-072) at the mouth of the Holitna River, around the shores of Kagati Lake (GDN-082, 094, 100, 158), along the upper and lower courses of the Goodnews River (GDN-069, 018), and at Security Cove (XHI-009) (Fig. 1). The Beaver Ridge site, previously unreported, contained scrapers; cobble cores; biface fragments; hammerstones; quartz pebbles broken perhaps by bipolar procedures; bifacial thinning flakes of chert, argillite, and obsidian; and a side-notched projectile point that is almost stemmed (Fig. 4). This is the first recovery of obsidian and the side-notched projectile point form on the Holitna River. Calcined bones from the site have been identified as fragments of metapodials and metacarpals from an artiodactyl, probably caribou. The Holitna

Figure 4. Artifacts from the Beaver Ridge site (SLT-072). Upper row—side-notched projectile point, three biface fragments; lower row— three utilized flakes.

River, Kagati Lake, Goodnews River, and Security Cove side-notched point assemblages (Ackerman 2005) can be assigned to a local variant of the Northern Archaic tradition, which at Onion Portage dates to roughly between 6000 and 4000 ^{14}C years BP (Anderson 1988). Towards the end of this sequence (phase 6, 4300–4200 ^{14}C years BP), side-notched points were replaced or evolved into an oblanceolate biface form (Anderson 1988). Most of the side-notched points found in sites in southwestern Alaska (Fig. 1) are undated due to the lack of any recovered datable material. The one exception is the Pond site (GDN-094, Fig. 1 site 4) where a Portage-type point (Anderson 1988) was recovered. Charcoal from the cultural level dated to 4120±40 ^{14}C years BP (Ackerman 2005).

Within central Alaska there are additional sites where side-notched points co-occur with other tool forms. The late dates for many of these sites suggest that there may have been a projectile point tradition(s) derived from the Northern Archaic tradition or may indicate that there was a blending of the Arctic Small Tool tradition with as-yet-unknown point complexes.

FAREWELL MOUNTAIN CAVE

Below the limestone ridge where we found the side-notched point (MCG-034), there were a series of openings in the cliff face (Fig. 5). Most were natural fissures in the limestone that had been enlarged by freeze-thaw cycles, but did not appear to be large enough for human use. Lower down in the cliff face there was a somewhat larger opening 12.8 m above a small stream (Fig. 6). It had provided shelter to a family of porcupines for their scat was everywhere. The main gallery of the cave (Fig. 7) was an irregular passageway that was 87 cm wide and 51 cm high at its entrance before excavation (1.2 m wide and 1.25 m high after excavation) and extended 3.25 m into the cliff face. Two narrow side passages led off to the east and west. The eastern passage was 50 cm wide and 2.25 m deep while the western passage was only 25 cm wide at its juncture with the main corridor, but did extend as a narrow fissure 2.25 m westward where it broke through the cliff face to the left of the cave entrance.

The cave deposit was composed of silt- to sand-sized sediments and rockfall (Fig. 8). The surface of the cave floor consisted of porcupine dung and a scattering of porcupine needles. Just below the surface, we recovered well-preserved bones of porcupine, snowshoe hare, voles, and lemmings that bore marks of gnawing. A similar assortment was found throughout the upper levels of the cave deposit. At the base of the deposit (Fig. 8) there was

Figure 5. View of limestone ridge, Farewell Mountain Cave. Upper cave opening visible.

Figure 6. Farewell Mountain Cave site (MCG-035) with Lance Rennie and Jim Gallison beginning excavation near entrance.

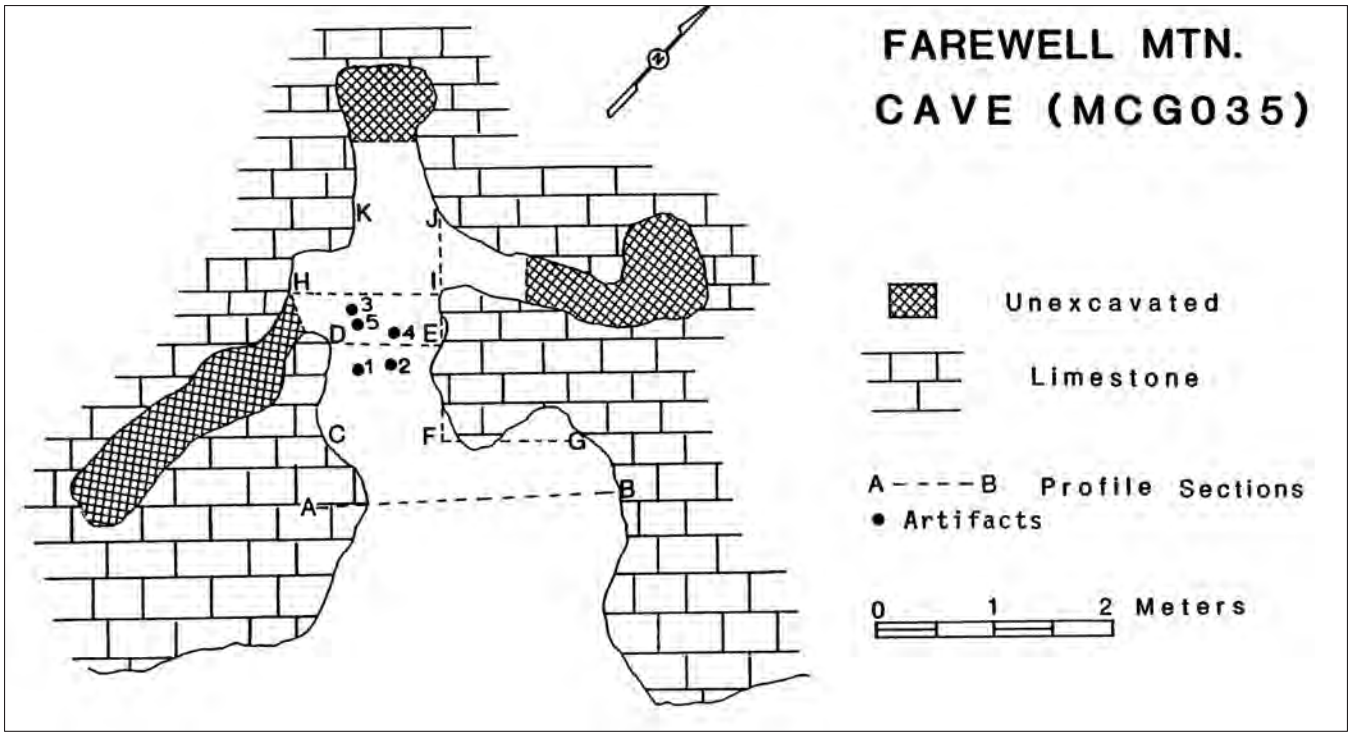

Figure 7. Plan view of Farewell Mountain Cave site (MCG-035). Artifacts: (1) biface fragment, (2) flake that fits onto the biface, (3, 5) two pieces of a chert flake, (4) argillite flake

Figure 8. Photograph of stratigraphic profile at DE (Figure 7) at the front of the Farewell Mountain Cave (MCG-035)

a well-defined layer of charcoal, carbonized fat, charred to calcined bones, and a few artifacts on the cave floor extending from cross section line AB to somewhat beyond cross section line HI (Fig. 7).

Neil Endacott, a doctoral candidate in anthropology at Washington State University, analyzed the faunal remains from the cave. Bones from the highly carbonized cultural layer on the floor of the cave (Table 1) were identified as those of ground squirrel, ptarmigan, and snowshoe hare. No particular pattern in prey species selection was evident in the small sample (ten) of identified bones. A larger sample of bone fragments that could not be identified to species but could be grouped by size to large, medium, and small mammals was recovered (Table 2). For larger-sized animals such as sheep- or caribou-size animals, long bones and ribs (including the costal cartilage that is also part of the rib cage) were the most strongly represented remains. Ribs were again the most numerous part of the animal in the class 3–5 category where the fragmentary nature of the faunal remains did not permit more specific assignment. In the smaller animals, such as fox, hare, marmot, or porcupine (class 3), ribs and the vertebrae of the tail were dominant (Table 2). Our sample of the smallest class size (class 2) was limited to four bones with long bones and ribs following the general pattern. Overall, fragments of ribs and long bones are the most dominant elements in the faunal assemblage, but it should be noted that 100 bones (Table 2) were so fragmented and burned that they were unidentifiable to body part. The charred to calcined nature of the fragmented bones indicates that they had been broken/pulverized to extract fat before being placed in a fire. There appears to be some selection for the larger animals in terms of the bones recovered, but bones of the smaller mammals were also present.

Table 1. Identified fauna from Farewell Mountain Cave (MCG-035)

Species	Body Part						Total
	radius	metapodial	incisors	maxilla	femur	rib	
Showshow hare (*Lepus americanus*)	1	1	2				4
Ptarmigan (*Lagopus lagopus*)	2			2	1		5
Ground squirrel (*Spemophilus parryii*)						1	1
Total	3	1	2	2	1	1	10

Table 2. Class size fauna from Farewell Cave (MCG-035)

Class size	Body Part								Total
	long bones	ribs	costal cartilage	caudal vertebra	cut bone	cranial	maxilla	fragments	
Class 5: sheep/caribou	10	19	19		1			7	56
Class 3–5		30			2				32
Class 3: fox, hare, marmot, porcupine	4	18		9	1	1			33
Class 2: squirrel	2	1					1		4
Unknown size class								93	93
Total	16	68	19	9	4	1	1	100	218

Human involvement in the accumulation of faunal remains is further corroborated by cut marks across a rib fragment of class 3 animal (Table 2), by cuts along the edge of a cranial fragment of a small-to-medium-sized mammal (class 3–5), and by cuts along the edge of two flat bone fragments from class 3–5 and class 5 size animal. Unfortunately, none of the cut pieces of bone could be identified to species.

Only a few artifacts were recovered from the cave excavation. A broken biface of argillite (Fig. 9) lay on the cave floor about 1 m back from the narrow entrance (Fig. 7:1). The biface fragment had been flaked from the right margin with additional retouch along the edge. The piece had broken medially, probably prior to the attempt to create a biface. A flake that could be refitted onto the biface lay approximately 30 cm to the east (Fig. 7:2). Two pieces of a chert flake (Fig. 7:3, 5) were found just north of the biface. A remaining flake of argillite (Fig. 7:4) was found 50 cm to the north and east of the biface. These five artifacts clustered just within the passageway, adjacent to the fissure on the west where a fire had been built. The artifacts were of such a generalized nature that they did not provide any hints as to the cultural phase represented at this temporary camp.

Figure 9. Biface fragment (No. 1 in Figure 7) from Farewell Mountain Cave site (MCG-035).

It appeared from the fragments of charred birch bark obtained from the hearth area that birch was the wood of choice for the hunter's campfire. The charcoal of the hearth zone consisted of twigs, small branches, and fragments of larger pieces of wood.

The area in front of the cave entrance contained two charcoal layers separated by a 15 cm zone of silt and rock fall. The charcoal sample from the lower layer dated to 3760±180 ^{14}C years BP (WSI 2762) (4620–3639 BP at 2 sigma). Within the cave, the hearth feature consisted of a single layer of charred bone, burnt fat/grease, and charcoal from which we recovered artifacts and cut bone. Charcoal from this layer yielded dates of 3165±40 ^{14}C years BP (WSU

2760) (3467–3329 BP at 2 sigma) and 2921±23 ^{14}C years BP (WSU 2761) (3161–2971 Cal BP at 2 sigma). Since bone fragments were recovered from the deposits in front of the cave entrance we assumed that this area was also part of the cave occupation, but no artifacts or cut bones were encountered in this area. The date of 3760±180 ^{14}C years BP is also almost six hundred years older than the oldest hearth date of 3165±40 ^{14}C years BP and likely represents an occupation prior to the cave occupation. The two dates from the hearth feature in the cave, while separated by a bit more than two hundred years, probably represent a single occupation given the vagaries of radiocarbon dating and the fact that the samples were taken from the same hearth feature. If there were multiple occupations they were closely spaced occurrences.

We are thus left with this brief glimpse into the past. Between three thousand and thirty-one hundred years ago one or two hunters (not enough room for more) crouched beside a fire in a small gallery-type cave on the north slope of the Alaska Range. Heat from the small fire would have quickly warmed the cave. The matrix of burnt and cut bone and the charred residue of grease and wood on the cave floor indicates that the hunters enjoyed a meal or two during their brief occupancy. The fragmentary argillite biface and the two argillite flakes may have been expedient tools used around the fire or a halfhearted attempt to fashion a tool from rather inferior raw material. The two fragments of a chert flake indicate that tools made of other lithic materials were brought into the cave by the hunters, but not left behind.

We wondered about the positioning of the small cooking fire in the cave and why it had not been placed further into the passageway. After our excavations were complete, we built a small fire in the exact location of our ca. three-thousand-year-old hearth next to the west fissure. After a bit of uncertainly as the cold air was forced out of the narrow fissure to the west, the opening began to draw like a chimney, venting all of the smoke out of the cave. We sat around our small fire, enjoying the warmth, not unlike the ancient hunters who had temporarily found refuge in the cave some three thousand years ago.

The cultural identity of the hunters remains unknown, but ethnographic studies of the seasonal pattern of the interior Kolchan (Hosley 1981) who occupied this region in historic times indicate that during the summer hunters moved up Big River to the front of the Alaska Range in search of caribou (Fig. 1). By late fall, they moved across the foothills and lowlands over to the South Fork of the Kuskokwim River. In early fall, when late runs of salmon came up the Kuskokwim River, they built rafts and floated with their stores of hides and meat down the South Fork to their winter villages, where they would net salmon for their winter stores. This historic pattern of small groups of hunters wandering over the foothills and lowlands in search of scattered caribou was likely a pattern that was also used some three thousand years ago.

THE KUSKOKWIM LOWLANDS DURING THE LATE HOLOCENE

The environmental setting for hunters who traversed the Kuskokwim River lowlands and the foothills on the North Slope of the Alaska Range three thousand years ago was not too unlike that of today. White spruce (*Picea glauca*) was present in the Farewell Lake area by 8000 ^{14}C years BP with an increase in white spruce pollen noted between 8000–6000 ^{14}C years BP (Brubaker et al. 2001). Stands of birch trees (*Betula papyrifera*) expanded into the Farewell Lake area by six thousand years ago (Brubaker et al. 2001). Towards the late Holocene (ca. 4000 ^{14}C years BP) the climate became cooler and wetter, with black spruce (*Picea mariana*) replacing white spruce (Hu 1994; Hu et al. 1995). Minor expansion of mountain glaciers in many parts of Alaska also occurred about this time (Hu et al. 1995), marking the onset of Neoglacial conditions. South and west of Farewell Mountain, black spruce needles recovered from the Lime Hills Cave site (LIM-002) (Ackerman 1996) dated to 2940±50 ^{14}C years BP (BETA 119055) indicate that black spruce had become well established throughout the region by the time of the occupation of the Farewell Mountain cave site. Yesner (2001) noted that after ca. 7500 ^{14}C years BP, and certainly by 4000 ^{14}C years BP, boreal and wetland taxa such as red squirrel, red fox, beaver, and muskrat were present at the Broken Mammoth site. Bigelow and Edwards (2001) reported that in central Alaska between 5800 and 3000 ^{14}C years BP there were fluctuating abundances of spruce, birch, and alder. The mid- to late Holocene was marked by climatic transitions with a warm and wet period that favored the spread of white spruce, a cool wet regime that would have encouraged the replacement of white spruce by black spruce, and in some areas a colder, drier period that was characterized by return to shrub vegetation (Edwards et al. 2001). A decrease in forest cover has been noted in Siberia around 3500 ^{14}C years BP when forests gave way to a shrub tundra dominated by birch and alder (Pisaric et al.

2001). It appears that between ca. 4000 to 3000 ^{14}C years BP there was a climatic cooling that would likely have resulted in a mix of conifer and hardwood forests together with patches of alder shrub and in the wetter areas willow and sedge meadows, not too unlike the present landscape. This latter shift, if present in the Farewell Mountain region, would have favored herd animals such as caribou, moose, and perhaps bison.

LATE HOLOCENE SITES

Sites of the Northern Archaic tradition in southwestern Alaska, with a single exception (Ackerman 2005), have not been dated nor have the sites in the uplands of the Kuskokwim Mountains with artifacts that have been tentatively assigned to the Late Tundra tradition (Ackerman 1987, 2001). Rough prismatic microblade cores and microblades were recovered with side-notched points at the Ugashik Knoll site on the Alaska Peninsula (Henn 1978). The Ugashik Knoll phase dates between 5055 ±70 and 4810±85 ^{14}C years BP, and it has been suggested that the appearance of side-notched points marks the transition from the Paleoarctic to the Northern Archaic traditions or the contact between the peoples of these two traditions (Henn 1978:40–41).

Dating of later Holocene-age sites has proven to be difficult. The Dixthada site in central Alaska has a date of 2420±60 ^{14}C years BP for the lower level of occupation (Shinkwin 1979). The Campus site, also in central Alaska, has been dated between 3500 and 2750 ^{14}C years BP (Mobley 1991). Both sites contain side-notched to stemmed projectile points associated with wedge-shaped microblade cores and microblades quite unlike the side-notched projectile point assemblage at Dry Creek (Powers et al. 1983), Onion Portage (Anderson 1988), or the Northern Archaic tradition sites in southwestern Alaska (Ackerman 2005) where microblades are absent. Further work at the Campus site (Pearson and Powers 2002) has helped to clarify the dating difficulties, but obviously additional investigations of the late Holocene in central Alaska are needed.

Further surveys conducted in the immediate vicinity of Farewell Mountain in 1982 were disappointing. Helicopter transects of the area around the South Fork of the Kuskokwim failed to locate other potentially suitable site areas. Ground surveys south of Farewell Mountain on the west side of the South Fork of the Kuskokwim River were equally unproductive. Additional surveys were conducted in the upper reaches of Windy Fork, Big River, and the area south of Lone Mountain (Fig. 2). No additional sites were noted in these areas.

COMMENTARY

In terms of Alaskan prehistory, the period around three thousand years ago is well defined along the coast by industries of the Arctic Small Tool and Norton traditions (Ackerman 1982, 1988; Dumond 1981, 1987; Giddings 1960, 1961, 1964; Giddings and Anderson 1986; Henn 1978). Within interior Alaska and the southern Yukon, the cultural sequence is less well understood. Side-notched points together with microblades may be attributes of the Northwest Microblade tradition of the Yukon between 4000 and 3000 ^{14}C years BP (Gotthardt 1990). In central Alaska, the association of side-notched, stemmed, and lanceolate points with microblades and burins has also been noted (Late Denali complex, 3500–1500 ^{14}C years BP) (Dixon 1985). Henn (1978), as noted earlier, recovered microblades with side-notched points at the Ugashik Knoll site on the Alaska Peninsula with dates between 5055 and 4810 ^{14}C years BP. At the Beverley Lake site (Wood-Tikchik lakes district) microblades were part of an Arctic Small Tool tradition dating between 3700 and 3100 ^{14}C years BP (Greg Biddle 2008, personal communication). In all of our traipsing about on the north flank of the Alaska Range (South Fork of the Kuskokwim River to Big River) and wherever we found side-notched points, we did not find even a glimmer of evidence for microblades. It would appear that in this region microblades had been phased out by 3500–3000 ^{14}C years BP or earlier, and only a bifacial industry remained. The last three to four thousand years of Alaskan prehistory are, as yet, poorly understood, and remain an area of research for future generations of Alaskan archaeologists.

ACKNOWLEDGEMENTS

James Gallison and Lance Rennie served as field assistants during the 1982 survey and earlier surveys (1978–1981). It through their untiring efforts that much of what is now known about the early to mid-Holocene occupation of southwestern Alaska has been achieved.

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STONE ADZES OR ANTLER WEDGES? AN EXPERIMENTAL STUDY ON PREHISTORIC TREE-FELLING IN THE NORTHWESTERN BOREAL REGION

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ABSTRACT

"Adze-cut stumps" is the name commonly used by both local residents and passing ethnographers and archaeologists to designate culturally modified tree stumps that are known to occur in many areas of the Northwestern boreal forest. As the name implies, they have been viewed as indicative of ancient logging or tree-felling activities, presumably carried out with stone adzes, and whose resulting particular morphological attributes have long been interpreted as indicative of a relatively great antiquity, i.e., generally dating back to (or prior to) the period of European contact when traded steel axes quickly replaced the stone adzes. However, a close examination of available ethnographic data, personal field observations, and, particularly, the first results of an experimental tree-felling study indicate quite convincingly that such features should best be interpreted as having been created by an entirely different technique making use of "antler wedges." Furthermore, field observations from the Old Crow/Porcupine area can be used to suggest that quite a number of these "stumps," especially when found in clusters, may well be associated with the construction and maintenance of caribou fences, semisubterranean housepits, and various types of caches. Finally, recently obtained preliminary dendrochronological results and radiocarbon dates indicate that these "stumps" are indeed precontact in age, and that some of them date back to at least the beginning of the second millennium AD.

Keywords: experimental archaeology, ethnoecology, lithic technology

INTRODUCTION

Throughout the Yukon Territory, researchers have recorded discoveries of well-preserved old tree stumps that are thought to be the result of precontact tree-felling activities. Such features, which are often called adze-cut stumps, have attributes that distinguish them from stumps that result from using steel axes, and, as we show in this paper, possibly stone axes or adzes as well. Typically, adze-cut stumps taper gradually from the intact portion of the trunk near ground level to the severed portion near the top. The stump sides exhibit tapered flat facets that result from the prying away of thin, narrow slabs of the tree trunk. Unlike steel axe–cut stumps, there are no transverse, or any other, chopping marks, nor do they show evidence of single or multibeveled cut faces resulting from the use of axes to create a notch or overlapping notches in the trunk.

Douglas Leechman provided the first description of these distinctive "culturally modified trees" (using current terminology), based on observations in the southern Yukon along the Alaska Highway. He provided a plate (Leechman 1950:Pl. XI) and a schematic illustration of attributes of these artifacts (Leechman 1950:Fig. 3). He also discussed how they were created based on information he collected from "four people in four different places" (Leechman 1950:46). He noted the use of two methods:

> Two different types of tools ... One was a wedge of caribou antler, shaped like a cold chisel, which was driven into the wood with a maul or stone hammer. The other was a celt, made of greenstone or some other dense, hard rock, and hafted to a spruce root handle. When the wedge was used, it was held horizontally and driven into the tree trunk at a convenient height above the ground, usually about 2 ½ or 3 feet. It was so held as to enable the workman to pry off a vertical slab of the tree trunk about 1 ½ inches wide, ¼ inch thick, and 8 or 9 inches long. When the first slab or sliver had been removed, the edge of the wedge was placed near one side of the scar thus produced and a second slab was pried off. This procedure was repeated till the tree trunk had been completely encircled. If necessary, a second or even a third round was cut, but this was done only when larger trees had to be felled. (Leechman 1950:46)

He added that most of the stumps observed were less than "6 inches [~15 cm] thick at the point where they had been cut, but trees of almost any size could have been felled if it was found necessary or desirable" (Leechman 1950:46). Interestingly, Honigmann reported the use of caribou horn or antler for tree cutting among the Kaska Athapaskans of the southeastern Yukon, noting that "[t]he efficiency of an ax [i.e., stone axe] remained so limited that horn adzes were regarded as eminently more satisfactory for cutting down growing timber" (Honigmann 1954:27). Following the Leechman and Honigmann work, Johnson and Raup (1964:Fig. 50, pp. 193–194) reported other instances of adze-cut stumps from southern Yukon, which were also found along the Alaska Highway. Their excellent illustration of several samples is reproduced here (Fig. 1).

Although the evidence for use of antler wedges in tree-felling activities was documented for the Yukon in the 1950s, anthropologists and other researchers working in the northwestern boreal forest almost invariably continue to refer to faceted, tapered stumps as having resulted from chopping activities using stone adzes (e.g., Flucke 1953; Hadleigh-West 1963:105; Johnson and Raup 1964:Fig. 50; McClellan 1975:193; McKennan 1959:65, 1965:37; Nelson 1973:35). Since there have been archaeological specimens of antler wedges found in the northern Yukon at a number of sites, we decided to conduct experimental work to determine if antler wedges could indeed have been used for felling trees. Here we report on the results of ex-

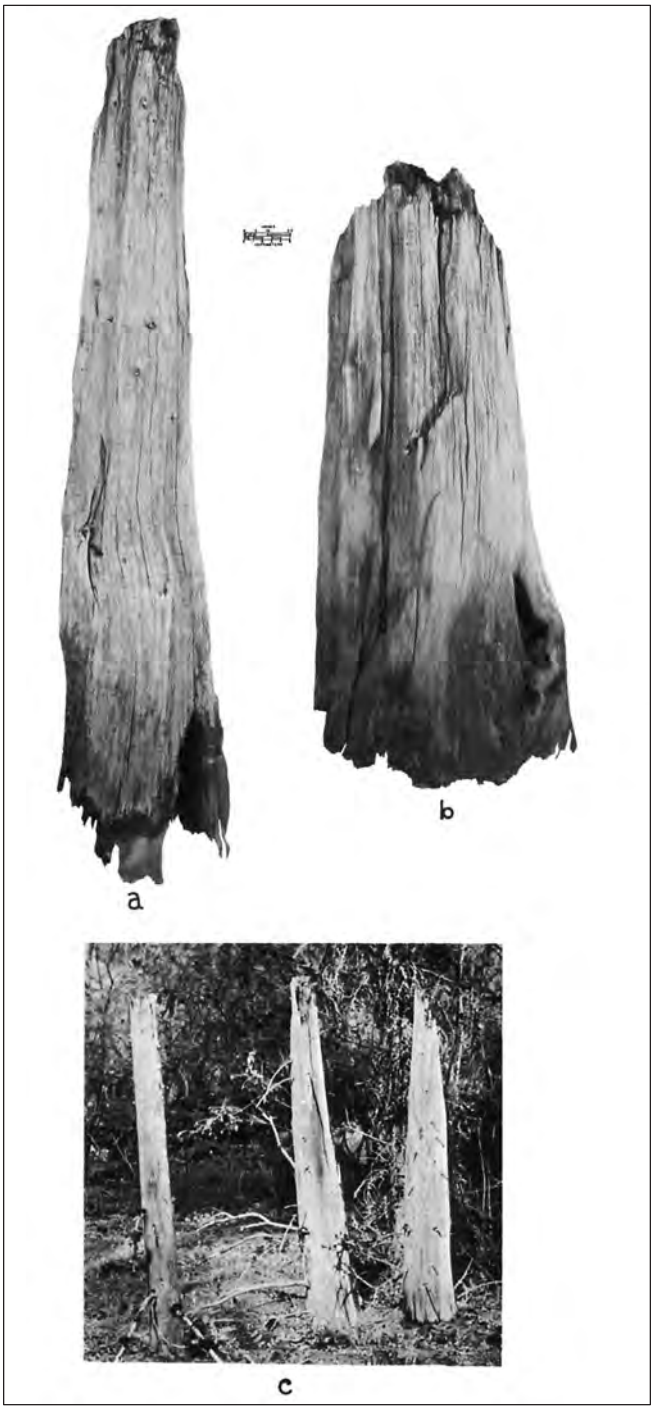

Figure 1. White spruce "adze-cut stumps" from Southern Yukon (from Johnson and Raup 1964:Fig. 50, p. 179)

periments that demonstrate the effectiveness of the use of antler wedges for tree-felling. As well, we document the presence of these stumps in the northern Yukon and, in one instance, examples of the logs that were produced by this precontact technology.

ARCHAEOLOGICAL EVIDENCE FROM THE NORTHERN YUKON: WEDGES AND STUMPS

Fig. 2 shows the distribution of locations with more than one adze-cut stump that have been recorded in the northern Yukon since the 1960s. Clusters of these stumps are often found around caribou fence complexes (Fig. 2:a–e). These log-based structures typically consist of elongated U-shaped corrals or traps, diversion fences with associated cache features, and villages or camps with additional caches (elevated or ground), drying racks, and habitations (e.g., Greer and Le Blanc 1992; McFee 1981; Roseneau 1974; Warbelow et al. 1975). Based on ethnographic data and a preliminary dendrochronological study (Alldritt 1987), most of the wooden components from these fences date to the late nineteenth century, when steel axes were available. However, nearly all of the fence complexes have at least some evidence of stumps and structural parts that were cut with some type of precontact tool. One fence in particular (Black Fox #3), which was in very poor condition when studied in 1981 (Alldritt field notes 1981), had almost no evidence of the use of steel axes; adze-cut stumps (Figs. 3, 4) were common, and virtually all fence components were cut without the aid of steel tools. An estimated tree-ring date suggests a maximum age of AD 1740 (Alldritt 1987), which in this region is considered proto- or precontact.

Other stump clusters are associated with housepit features such as at Rat Ridge Spit (site NbVo-4) (Fig. 2f), located on the northwestern fringe of the Old Crow Flats (Greer and Le Blanc 1992). Dozens of adze-cut stumps were observed at this site, ranging from 10 cm to more than 30 cm in diameter. Finally, what appears to be a collapsed cache made of adze-cut logs was discovered at the mouth of a small cave, in the upper Porcupine River drainage (Figs. 5, 6). The cut ends of the logs have characteristic faceting caused by the detachment of slabs of the tree trunk during felling, and are the complement to the stumps. Preliminary dendrochronological estimates suggest that the logs could well date to the middle of the nineteenth century (Greg Hare 2001, personal communication).

Antler wedges have been reported from a few sites in the northern Yukon. Three surface finds come from localities along the Porcupine River, up- and downstream from the village of Old Crow (Bonnichsen 1979:129–131, Pl. VIII-19, VIII-20; Morlan 1980:336–338) (Fig 7 a–c). Bonnichsen referred to them as beveled antlers, but Morlan preferred the more common "wedge" term. Initially considered to be possible candidates for a late Pleistocene presence in the region, in the mid-1980s two of these wedges were subsequently dated and found to be somewhat less than two millennia old (Nelson et al. 1986:Table 1), likely relating to the Old Chief Phase of the late Prehistoric period (Le Blanc 1984). Two other specimens from the Old Crow River, not reported by Morlan and Bonnichsen, are included in this study (Fig. 7d–e) Finally, one example has been found in excavated context at the Rat Indian Creek site (Fig. 7f). It is from a layer that is also part of the Old Chief Phase, and is likely to be about fifteen hundred years old (Le Blanc 1984:Pl. 77, p. 491). Table 1 presents summary data on sizes of these specimens.

THE EXPERIMENTS

WEDGE MANUFACTURE

Suitable caribou antler was obtained from an Old Crow resident. The condition of the beams was judged to be

Table 1: Attributes of experimental and archaeological wedges

Wedge	Length (cm)	Thickness	Edge Angle**	Illustration
A*	24.4	2.9	18°	Fig. 9
B*	23.5	3.9	26°	Fig. 8
C*	22.5	3.2	22°	Fig. 8
MiVl-1:1	20.3	2.8	25°	Bonnichsen 1979:Pl. VIII-19, 109-1; Fig. 7A
MjVj-6:1	24.8	2.9	25°	Bonnichsen 1979:Pl. VIII-19, 114-1; Fig. 7B
MjVl-1:26c	19.0	3.2	30°	Bonnichsen 1979:Pl. VIII-20, 115-26; Fig. 7C
MjVg-1:4045	20.0	3.8	–	Fig. 7F

*Denotes experimental

**The edge angle was taken dorso-ventrally at the bit end.

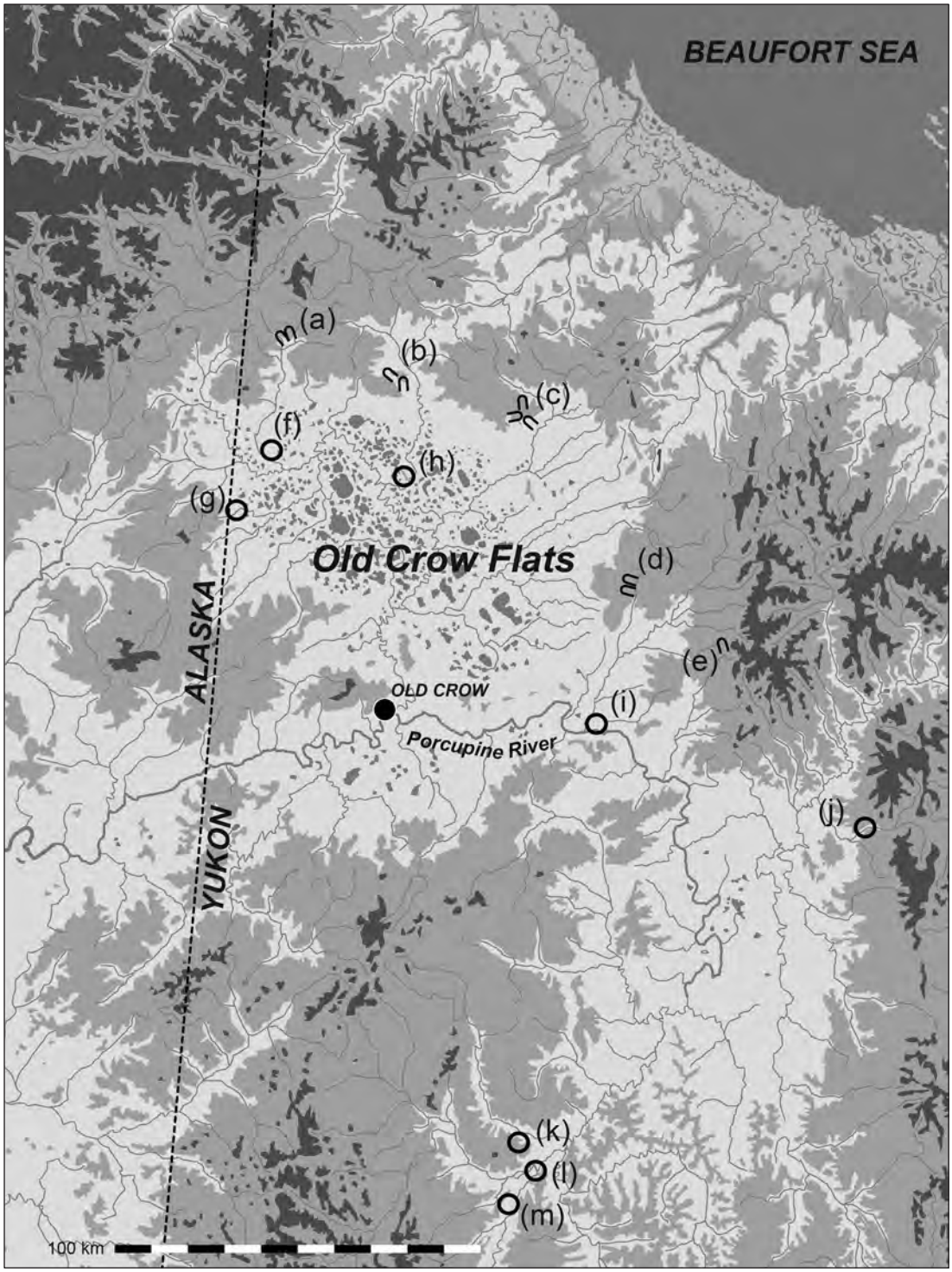

Figure 2. Locations of "Adze-cut stumps and Logs": (a) Thomas Creek—caribou fences; (b) Timber Creek—caribou fences; (c) Black Fox Creek—caribou fences; (d) Driftwood Hills—caribou fences; (e) Berry Creek—caribou fences; (f) Rat Ridge—all associated with prehistoric housepits; (g) Potato Hill—prehistoric housepits; (h) Timber Hill—stump clusters; (i) Rat Indian Creek site; (j) Trail River—stump clusters; (k) Tsi-tché-Han cave—log cache; (l) Bear Cave—cut logs; (m) Fishing Branch cave—log cache.

excellent, as there was no sign of bleaching or desiccation cracking that would suggest long-term exposure; the material was also dense and hard. The antler was probably obtained from 1997 or 1998 kills.

The work sequence for producing three experimental wedges was as follows:

1. Sections were cut from the main beams of two male caribou antlers using a standard carpenter's saw and a Swede or bow saw.
2. Beveling of the working ends was initially shaped with a sharp steel axe.
3. After roughing out, the bevels were further shaped using a steel axe, and completed with a rotary sander equipped with a relatively fine sanding disk.

The whole manufacturing process required an afternoon to make three wedges. Basic attributes are presented in Table 1 along with measurements on comparable archaeological specimens.

Obviously, our fabrication of these items using modern technology does not represent a true replicative experiment in all steps. However, the purpose of the work was to demonstrate the feasibility of the logging action. Inspection of archaeological specimens from the middle Porcupine River region indicates that the wedges were likely made using longitudinal and transverse grooving techniques to extract blanks, then additional working using whittling and scraping to configure and sharpen the working end (Le Blanc 1984). Both felling experiments were conducted at the Rat Indian Creek site (MjVg-1), which is located on the right bank of the Porcupine River about 90 km by boat upstream from the village of Old Crow.

EXPERIMENT 1

A white spruce (*Picea glauca*) about 12 cm in diameter was selected for the first felling exercise. Using a wedge, the bark was peeled off from a section of the tree trunk at a convenient location for the cutting operation, approximately 80 cm above the ground surface. Cutting was initiated by orienting the wedge transversely to the vertical axis of the trunk, placing the tip of the wedge a few centimeters in from the maximum diameter of the tree. The wedge was then hit on the thick or butt end using a 2 lb (~1 kg) sledgehammer. The initial splitting process lifted a small section of the trunk, and further hammering to about halfway through the length of the wedge produced a long, narrow (~5–8 cm wide) segment of wood from the surrounding trunk (Fig. 10 a–c). The segment could then be split away from the trunk by grasping the butt end of the wedge tool and using it as a lever, causing the isolated segment to split up and down the trunk and eventually to snap at the point where the wedge was inserted. It was then a fairly easy task to peel the trunk segments or slabs upward and downward from the wedge entry point, so that they could be pulled away from the tree trunk. This process created a flat area or facet on one side of the tree that then served as a "platform" for removing the next slab. To do so, the wedge was again positioned on the flat area 1–2 cm from the exterior edge of the trunk, and hammered through the next segment. The process was continued around the circumference of the trunk, much like a beaver attacks a tree, until only a few centimeters was supporting the tree; then it was simply pushed over (Fig. 10d). Hadleigh-West (1963:105) used the term "beavered" to refer to the distinctive features of similar stumps from the Chandalar region near Arctic Village in northeastern Alaska.

During the experiment, the first wedge (Fig. 8, wedge B) was replaced after a few minutes because the beveled edge angle (between the dorsal and ventral faces of the wedge) appeared to be too abrupt or steep; a tool with a more acute angle (Fig. 8, wedge A) was then substituted, and the process improved considerably. In all, the felling exercise took ten minutes, but this included pauses for photographs and to change wedge tools. Aside from slight polish, the cutting tip of the wedge did not exhibit any damage at the end of Experiment 1. The butt end showed a moderate amount of compression damage to the rind or antler cortex from the hammer blows. Fig. 11 shows the resulting stump.

EXPERIMENT 2

A second tree, in this case a black spruce (*Picea mariana*) with a diameter of 10 cm, was cut down using the narrow angle wedge (A) using the same technique and at about the same height above the ground surface. The process took five minutes (Fig. 12). A slight nick was left in the cutting edge from contact with a hard knot (Fig. 9). The accumulated impact damage on the butt end from the two experiments was moderate.

General Observations

1. Neither tree sustained any evidence of cutting or abrasion marks on the facets left by the cutting action of

Figure 3. Sample of "Adze-cut stumps": (A–C) Rat Ridge Spit; (D–E) Driftwood Hills Caribou Fence Complex 2; (F) Frances Lake, Northwest Territories.

the wedge. This accords with observed archaeological stumps with similar morphology. In contrast, if a stone axe or copper adze had been used to cut the archaeological examples, one would anticipate that there would have been cut marks left on the stumps.

2. The process goes very fast, but could have been improved with more experience and a slightly longer wedge tool that would improve leverage for prying slabs away from the tree trunk.
3. Although a modern hammer was used as an impactor, similar results could have been achieved easily with a handheld cobble or a wooden maul.
4. The majority of wear/damage occurs on the hammered end of the wedge. This could be minimized by wrapping this end with hide to cushion the blows, or

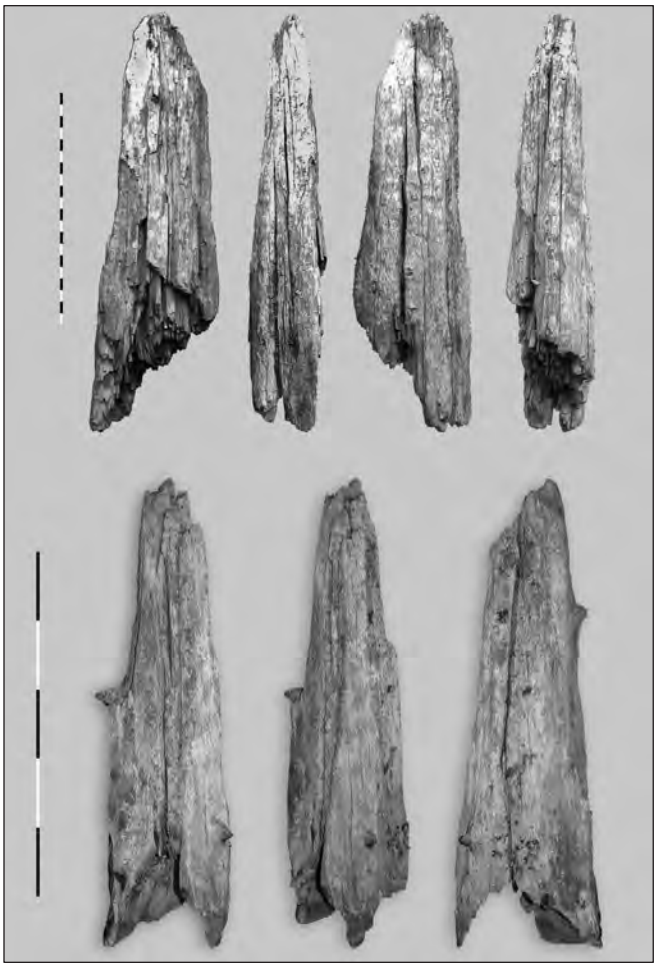

Figure 4. "Adze-cut stumps" from the Rat Ridge site (NbVo-4).

Figure 5. Fishing Branch log cache: (A) collapsed cache in front of the cave; (B) detailed view of some of the logs.

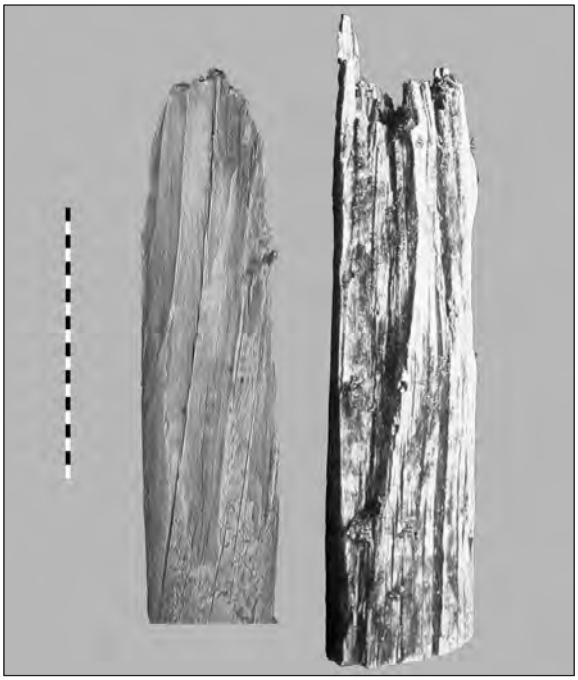

Figure 6. Examples of the culturally modified ends of two of the Fishing Branch cave logs.

perhaps by using a wooden maul in combination with the hide covering. Flake scars on the impact end on the Rat Indian Creek archaeological specimen (Fig. 7f) indicate the use of direct percussion, probably with a stone hammer. In reference to archaeological wedges, Morlan (1980:337) suggested that the cancellous tissue on the hammered end could have been hollowed out and a wooden plug inserted to "preclude serious damage to the butt."

5. The sap in spruce trees (especially white spruce) is slippery and provides an excellent lubricant for the wedge. This likely minimizes wear.
6. Unlike swinging a hafted adze or even an axe, the use of the wedge provides excellent control over the cutting process. This is analogous to the indirect percussion method in used stone flaking.

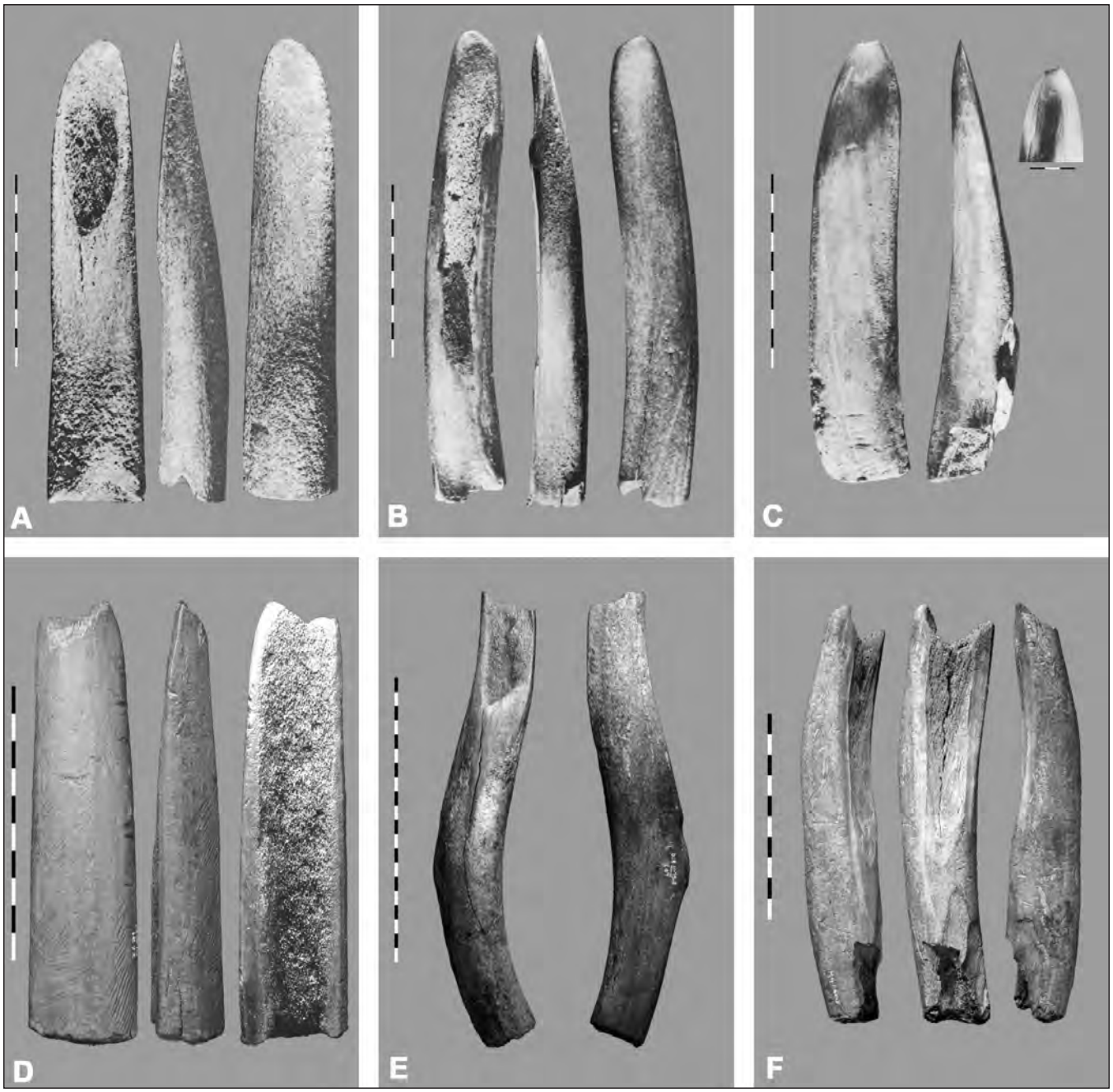

Figure 7. Prehistoric antler wedges from deposits located along the banks of the Porcupine and Old Crow rivers. (A–C) Porcupine River (note slightly damaged tip on C and compare to that illustrated in Fig. 9; (D–E) Old Crow River (note heavy distal wear and damage); (F) Rat Indian Creek site, Porcupine River (note heavy distal and proximal wear and damage; note also that this is the only antler wedge ever found in situ). Scale in centimeters.

Figure 8. Two of the three experimental antler wedges that were made for the tree-felling experiment. Both (B, on the left, and C, on the right) were found to be inefficient due to the obtuseness/thickness and short lengths of the wedges. Scale in centimeters.

DISCUSSION

Using antler wedges to fell trees is comparable in many ways to splitting logs to quarter them for making smaller pieces as blanks for a variety of items, or to producing planks, a procedure that is widely known in western North America (e.g., Jenness 1972:37). What was impressive in our experiments was the speed and ease with which softwood tree species such as spruce could be felled using the replicated wedges. Equally important is the success of the experiment in duplicating the attributes of archaeological stumps and logs in all details, particularly in the faceting and the absence of any chopping marks. Although the experimental exercises were on trees with moderate diameters, observations of stumps at caribou fence complexes and at Rat Ridge Spit indicate that diameters 30+ cm were likely feasible with the use of antler wedges, a fact that Leechman observed, though not specifically in reference to using a wedge. It would appear, therefore, that our data agree quite well with oral history data collected in the 1950s in the southern Yukon.

We believe that the lack of chopping marks, combined with elongate faceting, are hallmarks of the use of antler wedges, rather than stone axes or adzes. Unfortunately, as far as we are aware, there are no other comparative experimental data involving tree-felling with antler wedges. However, there is a significant body of information on experiments with stone, bronze, and iron or steel tools. These usually involve comparing efficiencies measured by timing felling exercises with the axes or adzes made of different (i.e., stone or metal) materials on various species of wood (e.g., Coles 1979:101–102, Fig. 29; Flucke 1953; Mathieu and Meyer 1997; Renfrew and Bahn 2004:336; Saraydar and Shimada 1971). There is also an informative ethnographic

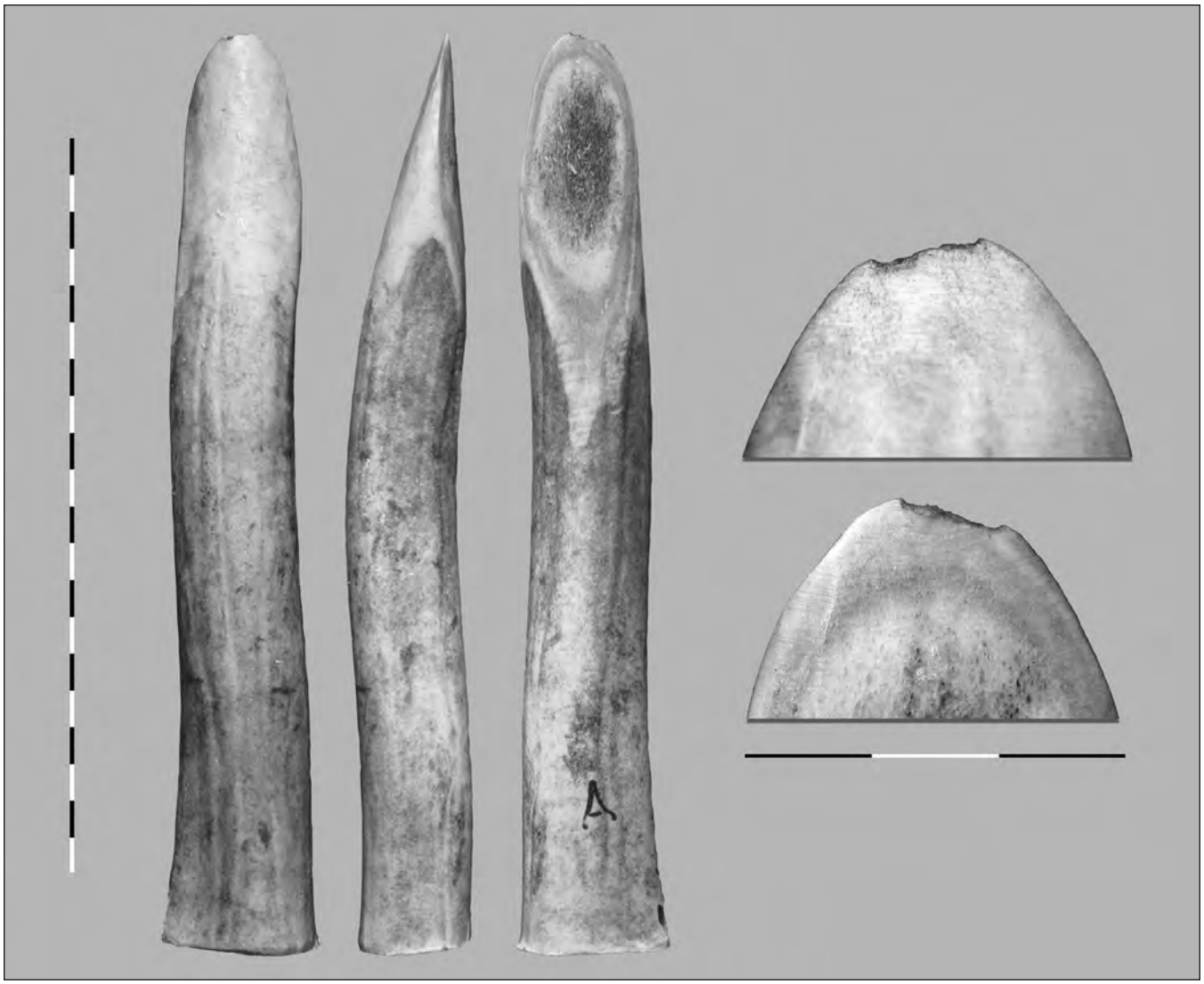

Figure 9. Experimental antler wedge A, which was used for the tree-felling experiment (note the slightly damaged tip).

report from Indonesia (Pétrequin and Pétrequin 2000). Where figures are provided, the stumps resulting from these experiments all exhibit varying degrees of chopping marks, some quite intensive. Coles (1979:Fig. 29), for example, illustrates the results of two experiments on spruce with stone and bronze axes, respectively. The stone-cut stump (~13 cm in diameter) is described as splintered, with chopping facets clearly visible on the log portion. The effect on the visible portion of the stump is actually highly splintered if not shredded in appearance. The bronze axe-cut stump (~20 cm in diameter) has clear, short chopping marks that closely resemble what would be achieved with the use of a modern steel axe. Both cutting experiments took three minutes.

Recent ethnographic work in Indonesia deals with a comprehensive study of stone axes. Stumps cut with a hafted, long-handled stone axe show a process of felling by chopping a notch into a trunk, much like using a steel axe (Pétrequin and Pétrequin 2000:Fig. 15), i.e., by swinging the axe in an inclined horizontal plane. The short horizontal base of the notch is splintered, but the long inclined upper portion is covered with short, overlapping chopping facets. In contrast, the adze was swung in a vertical plane in line with the vertical axis of the tree (Pétrequin and Pétrequin 2000:Fig. 18). The resulting chopped section has long, and once again, overlapping, fairly thin chopping facets that result in a cluster of attached wood shavings at the base of the chopping area.

In short, the cutting attributes on stumps and logs using stone, bronze, and steel axes differ clearly from the experimental examples reported in this paper. The major differences are that facets on wedge-cut stumps are split

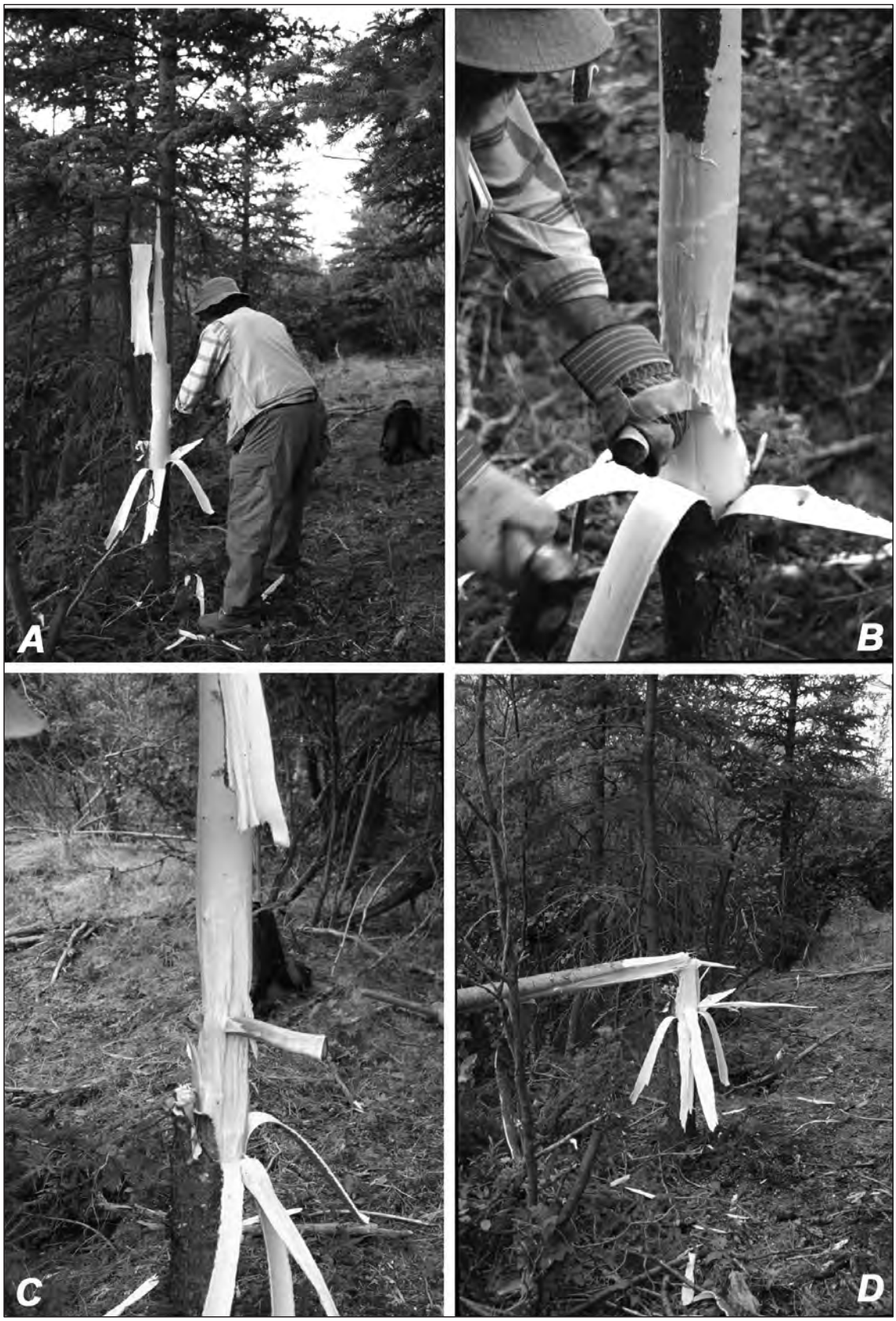

Figure 10: Experiment 1: (A) end of the bark stripping and beginning of the wedge work; (B) view of the first go-around; (C) second go-around with the wedge in place, ready to be used in order to pull another slab off the tree; (D) end of the tree-felling sequence.

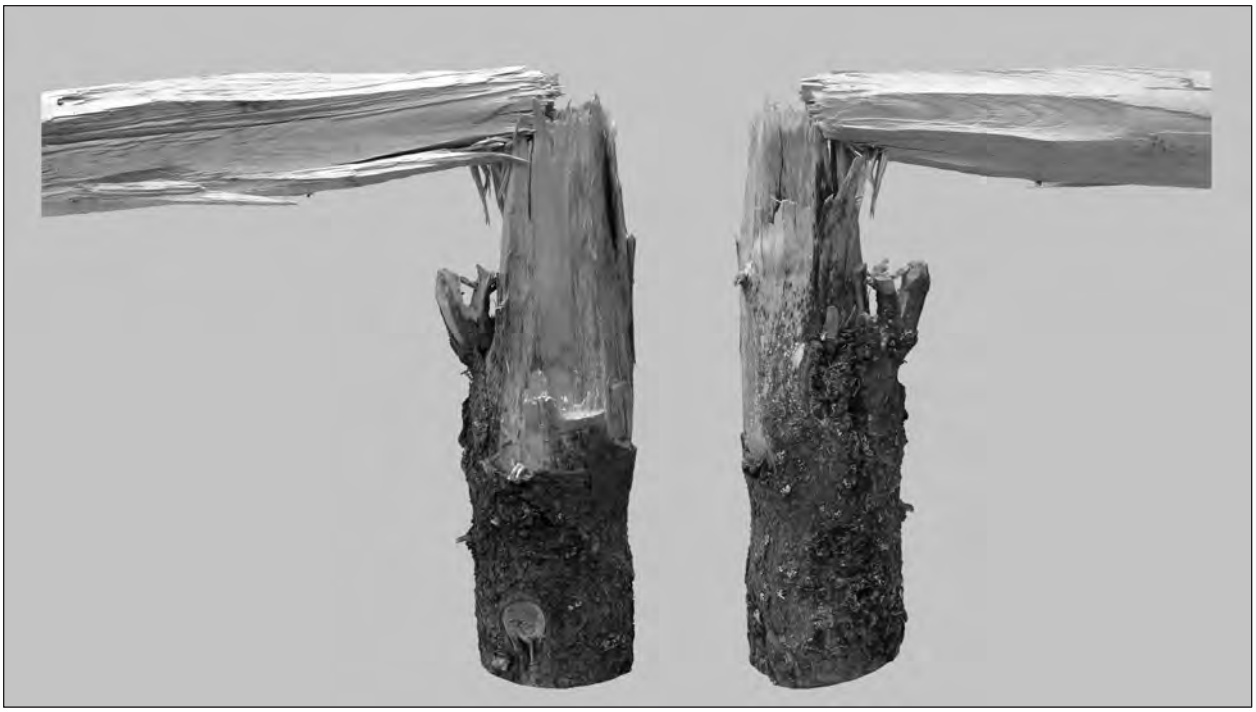

Figure 11: Detailed view of Experiment 1 stump and log. The height of the stump is 53 cm.

from the trunk rather than chopped from the trunk. The wedge-induced facets also tend to be much longer than those resulting from chopping actions.

CONCLUSIONS

Pecked and ground stone adzes or axes (i.e., celts) have been reported for late Prehistoric sites in the northern Yukon (Le Blanc 1984:Pl. 41; Morlan 1973:Pl. 9). They are comparatively rare, and frequently consist of "exhausted" specimens that, through prolonged use, are rather stubby and no longer have cutting edges on the tool ends. Instead, the bits that were once bevel-ground to shape now exhibit deep flake scars and evidence of pounding or battering, possibly through recycling for use as hammering tools at the end of their effective use-lives as cutting implements. Based on our experiments, and the archaeological evidence from surviving stumps and logs, it seems reasonable to conclude that these stone implements may not have played a direct role in tree-felling. This conclusion is supported by the absence of any tool-cutting marks on the archaeological examples, not to mention on the stumps and logs resulting from our experiments. Nonetheless, the presence of these heavy-duty tools in the northern Yukon suggests that they were once used for some type of cutting activity. One possible function is for delimbing tree trunks after felling. The logs used in construction of the Fishing Branch cache (Fig. 5) were obviously stripped, but unfortunately no observations were made on the branch remnants, so we cannot comment on how the logs were cleaned. Another possible function for the stone celts was as woodworking tools for production of snowshoe frames, or any other one of the numerous wood items that were necessary to successful survival in the western Subarctic (cf. Osgood 1940). Celts may have also played a role in butchering activities, possibly in processing frozen carcasses.

Whatever the case, it seems evident from our limited investigation that antler wedges could have been effective logging tools. Future experiments paralleling ours would be useful on different softwood species as well as on hardwoods. It would also be instructive to conduct experiments at different times of year, particularly during cold-weather periods. Lastly, it is possible that antler wedges were used for tree-felling in other areas of the world and at different time periods, though the presence of a supply of caribou or reindeer antler may have been a precondition, because of its superior strength as compared with other types of antler (Albrecht 1977; Guthrie 1983; MacGregor 1985). In this respect, large quantities of wedges have been reported from various Upper Paleolithic contexts, especially from southwestern France. The few of these that have been examined exhibit the same morphological attributes as

Figure 12: Experiment 2: (A) bark stripping followed by the first go-around with the wedge in place for pulling the first slab from the tree; (B and C) positioning of the wedge in the first go-around; (D) the stump and the felled log.

those found on the northern Yukon ones, although they are mostly made of red deer (*Cervus elaphis*) antlers and they tend to be much smaller.

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REPORT

ARCHAEOLOGICAL INVESTIGATIONS IN THE 1990S AT THE RINGLING SITE, GUL-077, NEAR GULKANA, ALASKA

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ABSTRACT

The Alaska Office of History and Archaeology (OHA) tested the Ringling site (GUL-077) in the mid-1990s and relied heavily on William Workman's previous (1975–1977) research to interpret the data. This Athabascan tradition site was occupied between AD 925 and 1485 (Workman 1976:143) with sporadic occupations afterward. This nearly kilometer-long site has produced one of the largest copper artifact assemblages in Alaska. Presumably, the abundant copper was traded and the residents of GUL-077 appear well integrated into the central Alaska trade network. The OHA excavations support an assumption that the copper was annealed, based on an association of copper tools and copper fragments with hearths. Subsequent analyses by H. Kory Cooper (2007) confirmed that the metal was annealed during tool manufacture. Faunal remains, lithic debitage, and post holes were also associated with the hearths. The abundant hearth material was a stark contrast to the large cultural depressions that yielded structural remains but little else.

Keywords: Ahtna, Athabascan, Copper River

INTRODUCTION

The Ringling site (GUL-077) is 19 km north-northeast of Glennallen, Alaska, on the west side of the Gulkana River (Fig. 1). William Workman directed salvage excavations there in the mid-1970s because the site overlies an important gravel source used during the construction of the Trans-Alaska Pipeline. The area is nearly a kilometer long, and contained the remains of forty-nine large cultural depressions, numerous caches, and hearths on an alluvial gravel hill along the west side of the Gulkana River. Workman (1976) described a large Athabascan site with one of the greatest concentrations of copper artifacts recovered in interior Alaska. The site provided the primary data for "Ahtna Archaeology: A Preliminary Statement" (Workman 1977), and Katherine Arndt's (1977) M.A. thesis used the data from the site to reconstruct Ahtna cache pits. Subsequent testing at GUL-077 by the Alaska Office of History and Archaeology (OHA) in 1995 and 1996 resulted in an interim report (Hanson 1999) that is summarized here. Workman's extensive work at GUL-077 stimulated research that continues through a new generation of scholars working in the region (e.g., Cooper 2007; Cooper et al. 2008: Slobodina and Speakman 2008).

HISTORY OF SITE USE AND EXCAVATIONS

The Ringling site is within historic Ahtna territory, which extended from the headwater tributaries of the Susitna and Matanuska rivers, along the Copper River, and nearly to

the Gulf of Alaska (De Laguna and McClellan 1981:641–642). Workman (1976:12) speculated that the ridge underlying GUL-077 consisted of "esker deposits buried by lacustrine deposits in a proglacial lake and partially exhumed by subsequent (Holocene?) erosion." The surface is covered with late Pleistocene and Holocene aeolian sands and silt sediments between 75 cm and 2.6 m thick over the gravel core of the site (Workman 1976:12; Holmes and McMahan 1986:12). The vegetation cover is typical of boreal forests found in southcentral Alaska. The valley of the Gulkana River is composed primarily of bottomland spruce overstory and the flats of the Copper River basin support lowland spruce hardwood forests (Selkregg 1974:129). The Gulkana site is covered primarily by poplar trees at the apex of the hill and spruce trees leading downhill to the Gulkana River and Bear Creek.

Cuuyi (or Kuuwi) was one of the historically better known individuals who lived near the site. He was called the "midget chief," and sixty people lived in his village at the confluence of Bear Creek and the Gulkana River (Gibson and Mischler 1984:23). Bear Creek is at the south edge of GUL-077. Oral histories describe him as a wealthy man who lived in a wooden house held together with copper nails (Gibson and Mischler 1984).

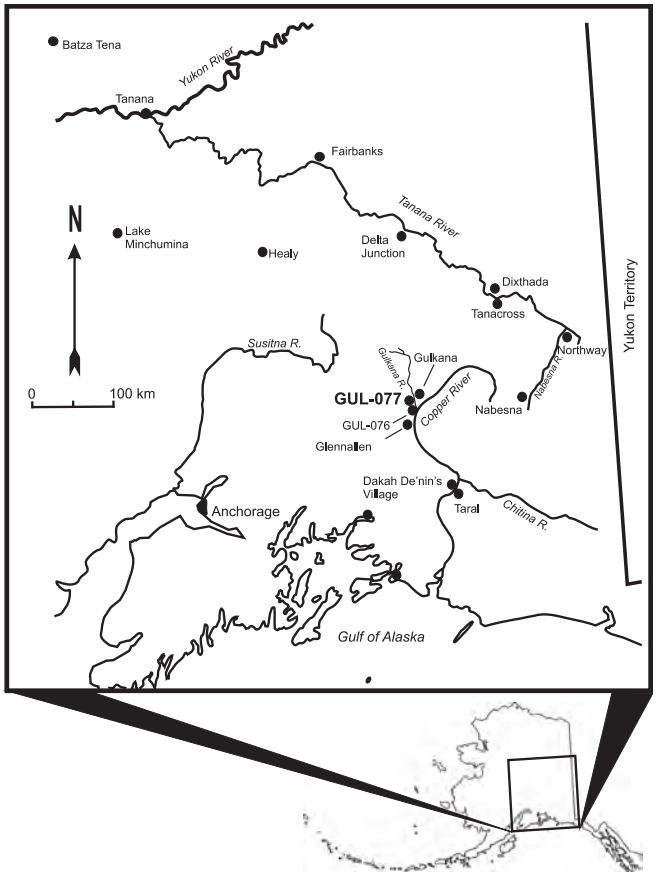

Figure 1. Interior Alaska and GUL-077

By the early 1900s, people from several different villages settled along the south side of the river in the town of Gulkana, opposite a telegraph station and roadhouse and beside the Valdez-Eagle trail, soon to become the Richardson Highway (Buzzell 2001; Reckord 1983a). A modern cemetery was established on the northeast corner of GUL-077. During World War II, the Alaska Road Commission built a replacement bridge across the river and bulldozed a road that cut through the bluff that included the cemetery (Buzzell 2001:21) and probably also sliced through a portion of the precontact site of GUL-077. The residents of Gulkana moved to higher land on the north side of the river by the 1950s because the road realignment cut the village in half. The new bridge design caused ice jams, which led to flooding at the original village site (Buzzell 2001:22; cf. Gibson and Mishler 1984; Buzzell 2001 for excellent summaries of the recent history of Gulkana).

The residents of Gulkana continued to use the hill on the south side of the river for hunting moose, picking berries, and trapping (Reckord 1983a). Clayton Ringling and his family were the last people to build their houses on GUL-077 when they established a homestead after World War II. The homestead was purchased in the 1970s by Alyeska Pipeline Service Company (Gibson and Mischler 1984:32). No structures remain from the homestead.

Froelich Rainey was the first archaeologist to test the large Ahtna site near Gulkana in 1936 (Rainey 1939a, 1939b), but extensive excavations did not take place until 1974 through 1976 (Workman 1972, 1976, 1977). William Workman, then with Alaska Methodist University, undertook further excavations at the site under contract to Alyeska Pipeline Service Company, which was removing large portions to reach the gravels underneath. Workman's (1976:13) project concentrated in the areas being removed for gravel toward the center of the site, although his crew conducted shovel tests throughout the site. The site was split into northern and southern portions by the resulting gravel pit (Fig. 2).

The land was purchased by the State of Alaska in 1980–1981 as a gravel source for road maintenance by the Alaska Department of Transportation and Public Facilities (ADOT&PF). Stern (1983) completed a reconnaissance survey of portions of GUL-077 that were being considered for gravel and found that they were outside of the archaeological site and could be mined for materiel. Gibson

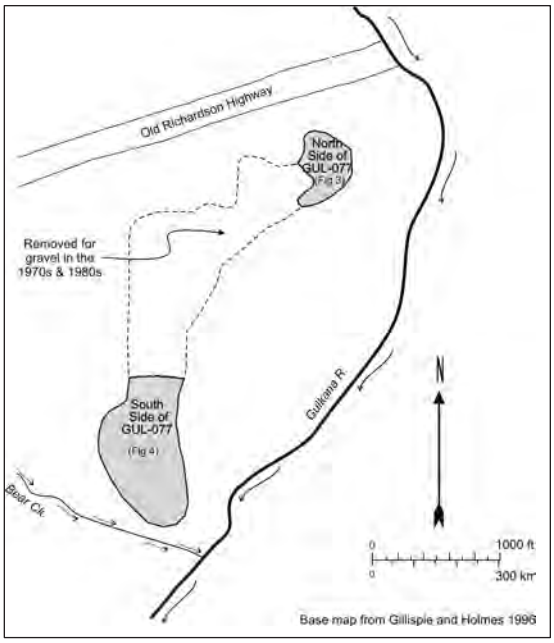

Figure 2. North and south portions remaining of GUL-077

and Mishler (1984) conducted a similar survey the following year in the northwest portion of the site and also found the area that was needed for gravel by ADOT&PF was not within the site boundaries. Later, Holmes and McMahan (1986) conducted additional surveys and shovel tests in the northeast part of GUL-077 and documented more than twenty cultural features that included clusters of house depressions and cache pits. They tested two depressions identified initially as cache pits and excavated one feature that they interpreted to be a small campsite. In the mid-1990s, significant amounts of gravel were required by ADOT&PF and they became interested in removing the remaining ridge. As a result, a more extensive description and evaluation of GUL-077 was undertaken by the Office of History and Archaeology to gather information for a determination of eligibility for the National Register of Historic Places to assist with ADOT&PF's compliance with Section 106 of the National Historic Preservation Act. The research design for this project was developed in 1995 by Thomas Gillispie, and testing began that year. The work continued the following year under the direction of Diane Hanson (1999). After archaeological testing and evaluation, a portion of the site that had been disturbed during the post–World War II homestead component was removed for gravel in 1996 by ADOT&PF.

Radiocarbon dates and the artifact assemblage from GUL-077 place it within the Athabascan tradition (1500–100 years BP), the most recent precontact cultural unit (Table 1). Based on evidence from interior Alaska sites, Dixon (1985) suggested that the Athabascan tradition replaced the late Denali complex (ca. 3500–1500 BP) over a five-hundred-year period. Clark (1981:113) interpreted the Athabascan tradition as including the Tuktu and late Denali complexes followed by late prehistoric occupations. One of the characteristics of the late Athabascan tradition in the Copper River Valley was the introduction of copper working and the replacement of stone and bone tools by copper tools (Clark 1981:124). "Other diagnostic material cultural traits include increased reliance on organic materials for tool manufacture, intensive use of birch bark, high frequencies of fire-cracked rock, and the manufacture of stemmed projectile points and barbed antler and bone arrowheads" (Dixon 1985:61). The Euro-American tradition follows the Athabascan tradition, identified by the appearance of Euro-American items by the early nineteenth century (Dixon 1985).

Table 1: Radiocarbon dates from GUL-077

	rcybp	lab number	Cal years	Feature
Workman 1976: 142-143	195 ± 130	GX-4297	AD 1755	hearth in N6-8/E6-8
	765 ± 125	GX-4298	AD 1185	charcoal w/ fish bone, fire cracked rock, barbed bone point, N0-2/E4-6
	695 ± 115	GX-4300	AD 1255	timbers in storage pit N4.46-4.53/E4.10-4.30
	modern	GX-4390	AD 0	Pit 47
	460 ± 100	GX-4391	AD 1490	charcoal from small pit, S0-1/E0-2
	modern	GX-4392	AD 0	charcoal under small hearth N0-2/W2-3.8
	760 ± 125	GX-4299	AD 1190	Pit 50, partly burned timber, N0-2/E2-4
	215 ± 105	GX-4389	AD 1735	Pit 32 partly burned wood on floor of multi-celled cache I, N4-6/E4-6
Hanson 1999: Appendix 4	720 ± 60	WSU-4922	AD 1186–1397	timber in 95-36 (AMU 21)
	780 ± 70	WSU-4923	AD 1045–1387	hearth in N4908/E4948

METHODS

The 1995 field season began with an archaeological pedestrian survey on the north side of GUL-077 (Fig. 3). Some flagging from Workman's 1974–1977 investigations remained; this helped link the observed features to his maps. On the north side of the bifurcated site, 292 50 x 50 cm shovel tests were excavated in 8 m intervals down to frozen ground, sterile sediments, or the limits of the ability to dig in the hole (about 70 cm below the ground surface). The sediments were sieved through ⅛ in. screens. Forty-two shovel test pits had artifacts, charcoal, fire-cracked rock, or disturbed sediments or unusual soil colors or compositions that indicated cultural deposits. Larger 1 x 1 m pits were placed near shovel tests that were positive for cultural indicators.

In 1996, attention shifted to the southeast bluff edge of the north side of GUL-077 because there were plans to remove gravel from this area later that summer (Fig. 3). A portion of the bluff edge had already been taken for gravel in the 1970s. Workman (1976:23) suggested this might be part of an extensive prehistoric camp (AMU feature 77-3-2). A 3 x 2.5 m unit (N190/E641.5) was excavated on the edge of the bluff. Additional features and

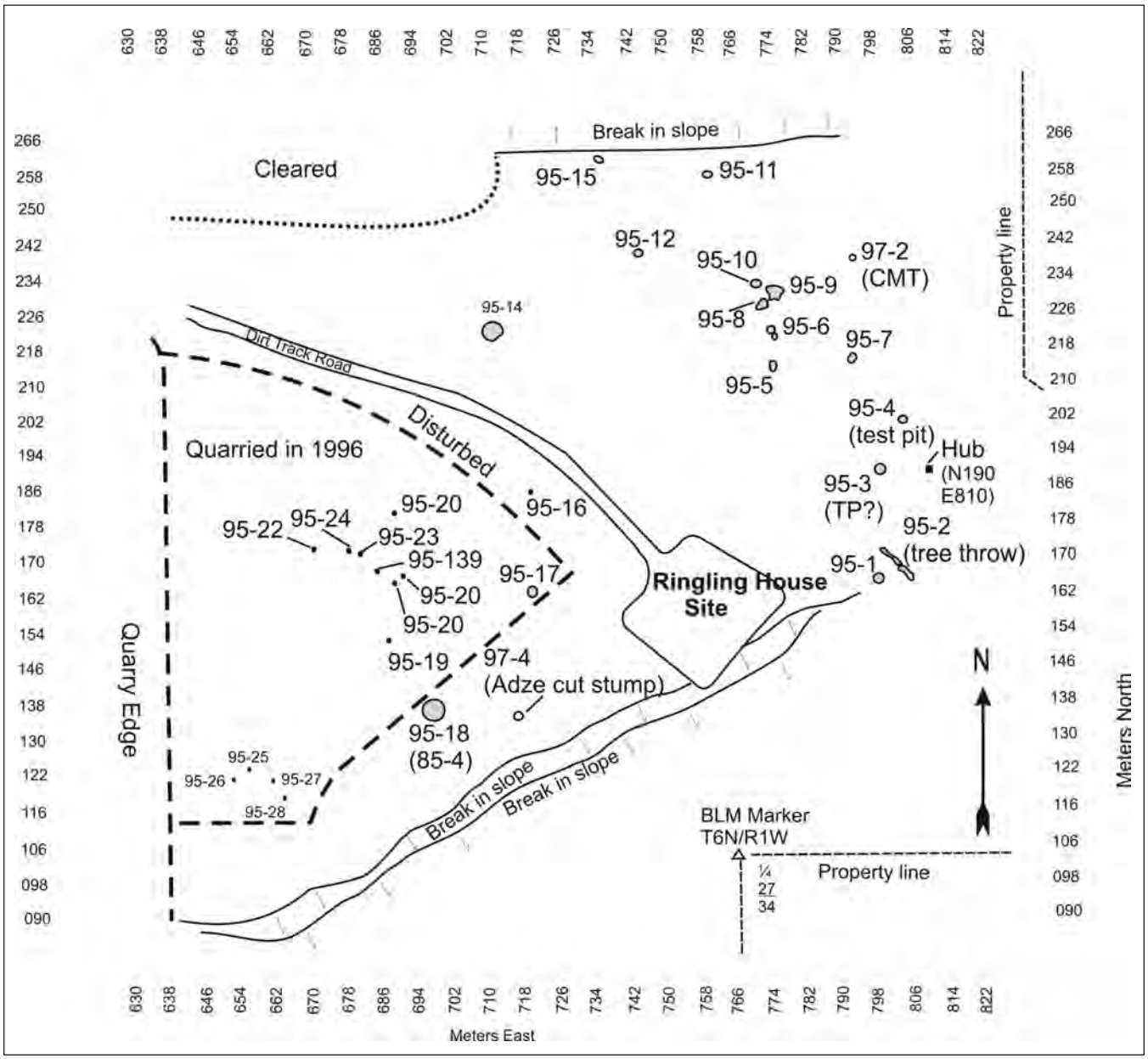

Figure 3. Features on the north side of GUL-077

items were recorded on the north side of GUL-077 after metal detector hobbyists conducted a survey in July 1996. Among other recent historical items was a possible lead musket ball. Four additional 2 x 2 m pits were opened to investigate areas in which prehistoric copper artifacts were found. One unit produced a copper projectile point, hearth, and stone tool workshop area.

The same sampling procedures were used on the south side of GUL-077 in 1996, and 630 shovel tests were excavated in 8 m intervals (Fig. 4). Seventy grid points were not tested because they were in boggy terrain, the ground was steep, the shovel test would have been placed in an obvious cultural feature such as a cultural depression, or the shovel test would have interfered with a mapping hub. Seventy-one of the test pits yielded evidence of cultural deposits. Two larger 2 x 2 m test excavations were placed between positive test pits. Because features were more obvious on the south side of the site, the other units, including a 1 x 8 m trench in feature 95-36, were excavated in or near a concentration of features near the center of the south side of the site. All units were excavated with trowels and the sediments screened through ⅛ in. mesh screen.

In 1997, three Office of History and Archaeology archaeologists visited GUL-077 to measure and photograph some of the features on the north and south sides of GUL-077. No shovel tests or other excavation were conducted during that visit. No additional archaeological investigations have taken place at the site and ADOT&PF has used stockpiled gravel at this materiel site.

RESULTS

FEATURES

Most surface features were depressions (Figs. 3 and 4). Small rectangular depressions were believed to be test pits from the 1985 and 1975–76 investigations. These small depressions cluster to the lower left of a graph of the depression sizes recorded in 1995 and 1996 (Fig. 5). Some larger depressions appeared to have been natural features caused by tree falls and were identified by the associated tree nearby, or by a small mound left from the remains of tree roots. Most single cultural depressions ranged from 1.5 to 4 m long and 1 to 2.5 m wide. Multiple connected depressions were larger, and were 3.6 to 6 m long and 1.5 to 3.5 m wide. Large pits between 4.5 and 14 m long and 4 to 8 m wide were believed to be large cache pits or other cultural depressions. Five depressions were tested in 1995 and 1996.

Depressions were neither common nor so clearly defined on the north side of the site (Fig. 3). There were some small shallow depressions on the northeastern part of the north side ranging from a double-celled cache pit 3.2 x 2.2 m (feature 95-6) to smaller depressions of 1.7 x 1.2 m (feature 95-7). Larger depressions (95-14 and 95-17) were associated with the construction of the Ringling homestead and are probably not part of the Athabascan occupation of the hill.

The west and northwest portions of the site were disturbed and appear to have been bulldozed based on an examination of aerial photographs, surface vegetation, and the results of test units. The parallel furrows noted in three units (N223/E684, N223/E694, and N226/E678) and mixed sediments in Unit N226/E678 supported this interpretation (Forshaw 1996:6; Petruzelli 1996:22; Roth 1996:17). Based on the size of the poplar trees, it was probably bulldozed during the Ringlings' occupation after World War II. These portions of the site were removed in 1996 and 1997 for gravel.

Cultural materials lay just under the litter-mat or root-mat in undisturbed portions of the north half of the site. Workman (1976) identified a camping area near the bluff edge on the east-southeast edge of this portion of the site. The OHA excavations revealed extensive ash deposits, obsidian, other lithic materials, bone, and copper artifacts. The north side of a dirt track access road also had hearths and ash deposits, copper tools, barbed bone points, and lithic flakes just below the ground surface.

On the south side of GUL-077, the largest depressions were on the west side of the dirt track road at the top of the hill. They are assumed to have been the remains of semisubterranean housepits or cache pits (Fig. 4). Cache pit–sized single and multiple-celled depressions were concentrated along the east face of the hill, east of the dirt track road, although some were also on top of the hill nearer the road. Shovel tests east of the road, at the base and alongside the hill produced no cultural materials, even near cache pits. In contrast, ash, fire-cracked rock, stone flakes, and a copper awl were found in shovel tests along the crest of the hill on the west side of the road. Probably the most unusual item recovered during shovel testing south of the site was a coconut in a low swampy area. Initially, the coconut was dismissed as a recent object thrown into the woods but it may have an older history. Many coconut shells and husks brought from Hawaii were recovered from Russian-period deposits in Sitka (McMahan 2002:66). Dale Slaughter (1999, oral communication) stated that coconuts were

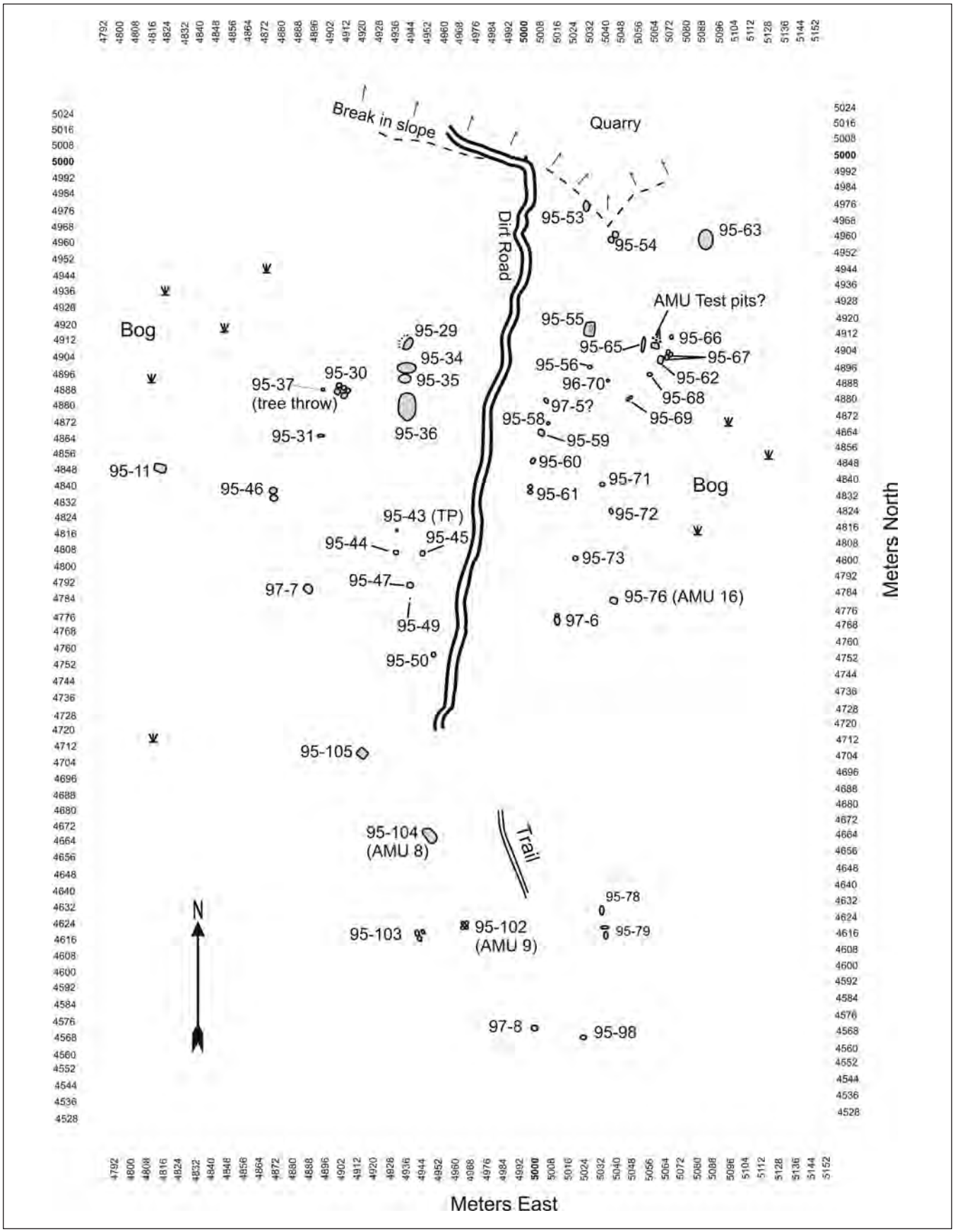

Figure 4. Features on the south side of GUL-077

traded to Alaska Native people, who used them for bowls and other items. It would be difficult to determine if this is a coconut traded from the coast; however, the distance from any features or other cultural deposits, in a low swampy area, would support a more recent origin.

There was no systematic survey using metal detectors across the southern part of the site as there had been on the north. Daniel Thompson used a metal detector and had positive results in the camp area near feature 95-29 (Fig. 4). It would be worth conducting a similar survey on the southern part of the site.

A 1 x 8 m trench was excavated into the north edge of feature 95-36 (AMU-21; Fig. 4). This feature is a large rectangular depression 13.1 x 7.3 m long and approximately 1 m deep (Workman 1976:47). The constricted southern end may have been a small entrance, a side room, or a room for sweat bathing. Keith Brady tested the depression in 1976 with a 2 x 2 m test pit in the center, and several test pits around the outside. He recovered a possible boulder spall in a gravel layer and a thin bark floor (Brady 1976:5; J. Lobdell 1976:9). Excavators working in the 1996 trench uncovered two flakes but no other artifacts. They exposed parallel wood timbers and vertical posts, and some of the wood was charred (Figs. 6 and 7). The radiocarbon date for one of the timbers was AD 1186–1397 (720±60 ^{14}C yrs BP; WSU 4992; calibrated using OxCal 4.0).

Feature 95-34 (AMU 23; Fig. 4) was a 9 x 4 m oval depression, 0.8 m deep with steep walls. A 1 x 2 m trench was excavated into the north wall. A stone or sediment fragment with surface impressions of small ferns, minute shells, and cross hatching (possibly from grasses) came from the base of the depression. Other materials found in this unit included basalt and obsidian flakes, unburned and calcined bone, fire-cracked rock, charcoal, and ash patches. One patch of sediment smelled "fishy" when it was first uncovered and may have contained residual fish oils (Hanson 1996:30).

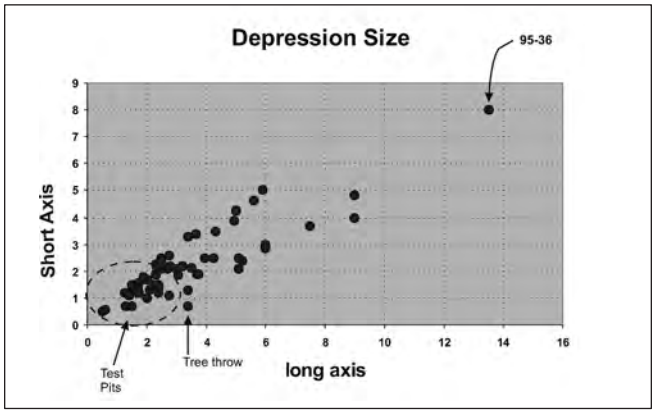

Figure 5. Cultural Depression dimensions. Depression measurements are in meters.

Unit N4908/E4948 contained one of the most well-defined hearth features (Fig. 8). This was a 2 x 2 m test unit east of feature 95-29 (AMU-24; Fig. 4). Immediately below the litter-mat/duff layer was a hearth containing ash, abundant fire-cracked rock, and numerous small mammal bone fragments, primarily from hare (*Lepus* sp.; Fig. 8). A portion of a second hearth was imbedded in the south end of the west wall. Charcoal from the central hearth dated to AD 1045–1387 (780±70 ^{14}C yrs BP; WSU 4923; calibrated using OxCal 4.0). A copper awl (UA96-62-024), copper fragment (UA96–62–336), numerous chert and obsidian flakes, spall scrapers (UA96-62-022, 023, 264), bone points (UA96-62-290), and round, smooth stones (possibly boiling stones; UA 96-62-031, 073, 248) were associated with the two hearths. A small disturbed area on the west side of the test unit containing aluminum foil 41 cm below the unit datum is probably from a 1976 shovel test (G. Lobdell et al. 1976; J. Lobdell 1976:25–26).

There were post molds under the hearths. One post-mold angled toward the north and contained fire-cracked rock and charcoal flecks and fragments; salmon bones were at the base of the post mold. The salmon bones included head elements, ribs, spines, and vertebrae. Some of the fin bones appeared articulated. These are among the few fish bones recovered at the site. Another unusual pit or postmold beneath the hearth contained a complete beaver mandible, an obsidian flake, fire-cracked rock, and calcined bone. Fire-cracked rock also lay at the base of the hole. One other postmold on the northwest side of the unit had an antler drill handle (UA96-69-291). The drill handle was T-shaped and the widest end was placed into the hole first and the narrow or haft end was facing upward. There was also fire-cracked rock found within the feature. It is interesting that two of the holes contained remains of beaver and fish. Beaver jaws were saved to use as scrapers, and fish bones were cached to use as broth (Reckord 1983b:33). Remains of both animals were normally returned to the water according to oral historic accounts (cf. De Laguna and McClellan 1981:648; McFadyen Clark 1996:191). The contents of these post holes may have served as more than simple fill.

The OHA excavations confirm Workman's (1976) conclusion that this is a large camp area. There are probably multiple hearths and campsites including copper and lithic working activity areas, and evidence of

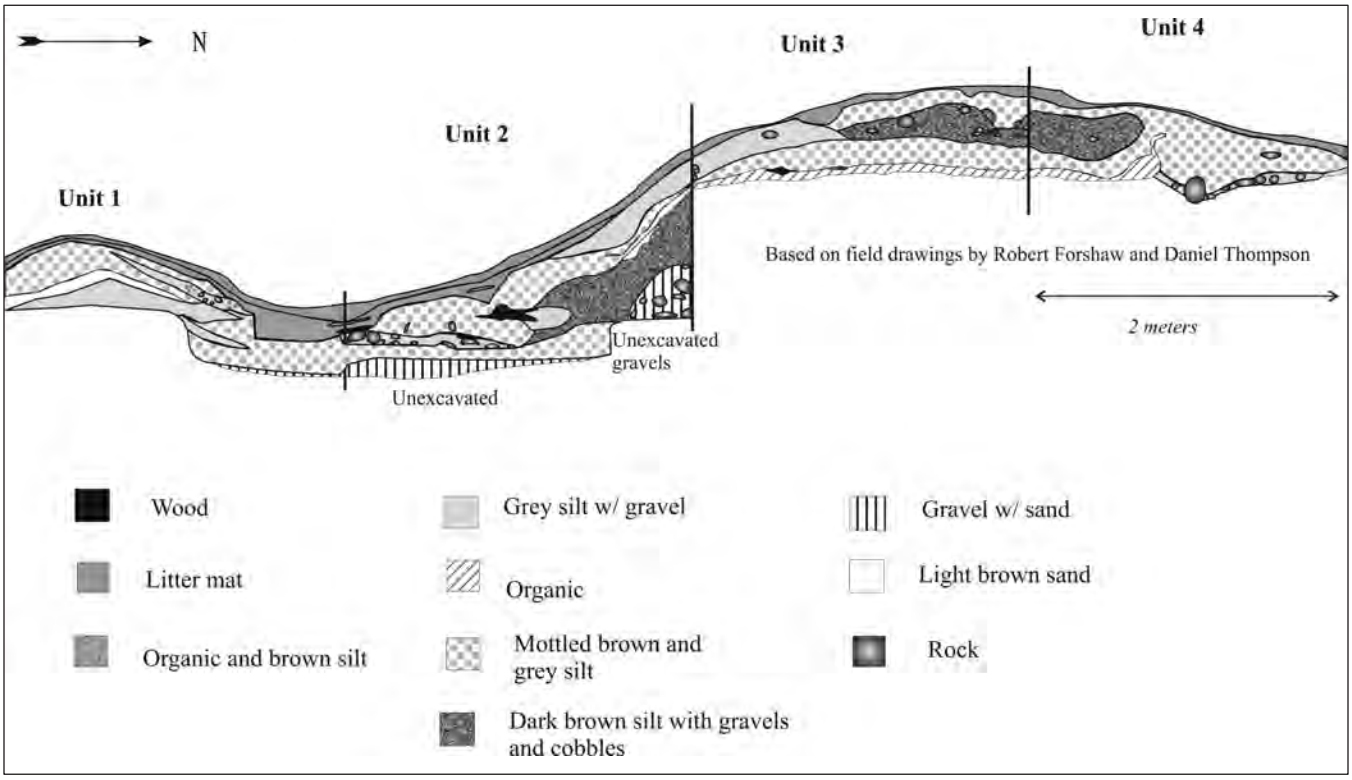

Figure 6. Profile of trench in north wall of feature 95-36 (AMU-21)

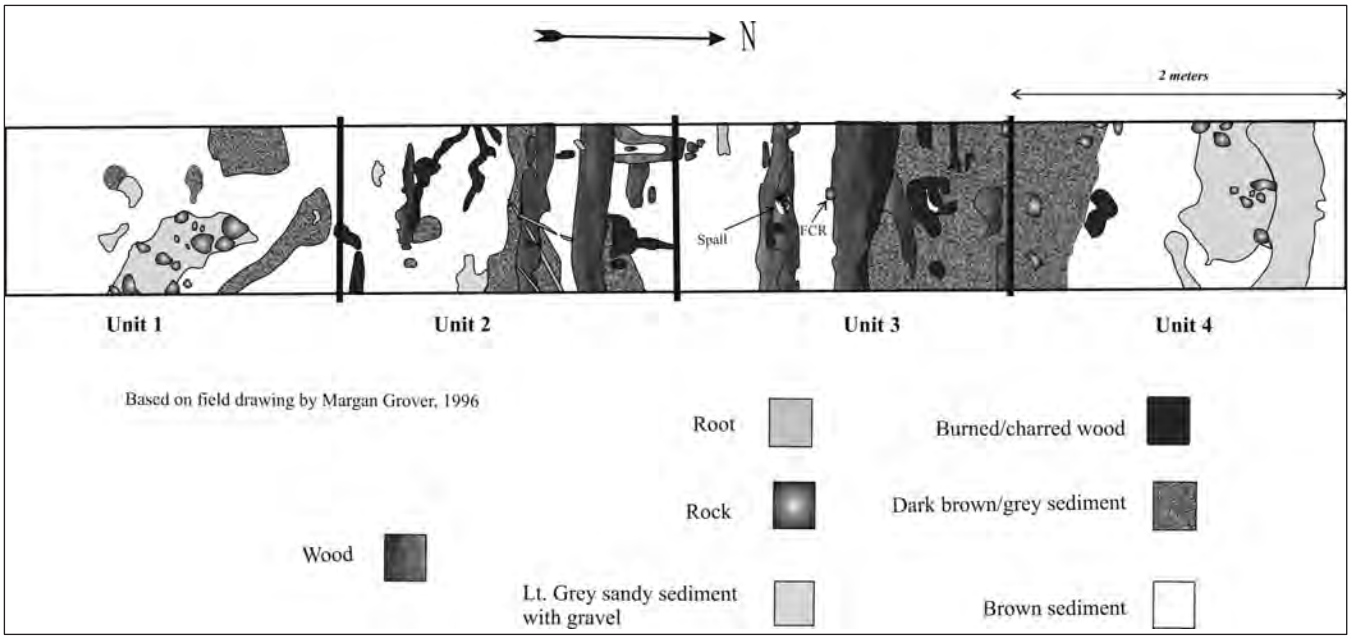

Figure 7. Plan view of trench in north wall of feature 95-36 (AMU-21) showing structural remains

temporary structures or other functional structures. The bulk of the information about activities at Gulkana will probably come from these features and not from the large cultural depressions.

There is another activity area to the south between N4830-N4770 and E4980-E4920 with several small shallow depressions ranging from 2.1 x 2.7 m (feature 95-44) to 6 x 2.85 m (feature 95-46; AMU 20). Shovel tests in the area produced a copper awl, fire-cracked rock, bone, ash, and a lithic flake. No test excavations were conducted here but this too may have been a camping area at the top of the hill.

Culturally Modified Trees. Culturally modified trees reflect twentieth-century use of the hill. The culturally modified trees on the south side of the site were generally arborglyphs or words and pictures cut into the bark of the tree (Stryd 1997). Most were near a dirt track road leading from the gravel pit toward Bear Creek. Gulkana residents reported that some trees were carved in the 1920s. Other carvings were more recent and one had a hatch design and a series of lines cut into the bark. In many cases, scars grew over the carvings, making the message illegible. Culturally modified trees on the north side were likely associated with the Ringling house and included adze-cut trees and a rectangular scar into a spruce tree.

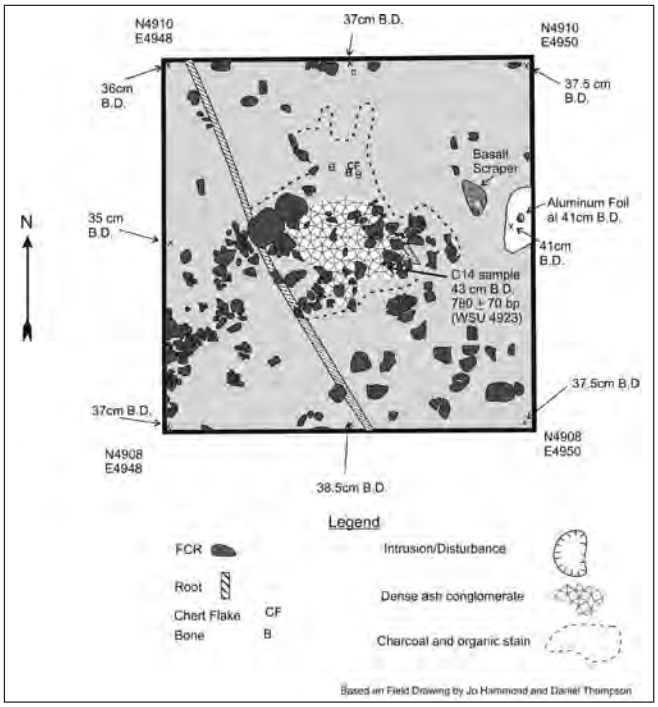

Figure 8. Hearth feature in Unit N4908/E4948

ARTIFACTS

Copper Artifacts: Copper tools have probably made the greatest impression on archaeologists working in the Far North because metal working is not normally considered to be part of the repertoire of mobile hunting and foraging groups. Copper is, however, available in the Central Arctic/Subarctic among the Copper Inuit, the Yellowknife, and the Ahtna on the Copper River near the Wrangell Mountains (cf. Cooper et al. 2008). Besides replacing lithic versions of many tools (Workman 1976:83), copper was used for decorative items and was an important component of the trade network in the region, and the Ahtna were the hub of that network (Cooper 2006, 2007; Pratt 1998).

Copper tools from the 1995 and 1996 investigations at the Gulkana site were analyzed by Kelley Hankins (1997) using Workman's (1976:54–69) categories. There were not as many copper artifact categories represented in the 1985, 1995, and 1996 assemblages as there were in the 1975 and 1976 assemblages, which is probably a consequence of the smaller assemblage size. Workman (1976) recovered 142 copper items, and only 27 copper artifacts were found in 1995 and 1996.

The only copper projectile point (UA96-62-229) recovered in 1996 was distinctive (Fig. 9). The point has a triangular blade and a long narrow stem and is unlike the points described by Workman that have a more lanceolate or leaf-shaped blade (Fig. 9: all points with AMU or GUL accession numbers). The other points are smaller, with more rounded blades and stems that are flatter and wider relative to the blade. UA96-62-229 is more similar to a point found by Shinkwin (1979:52, Fig. 10a) in level 2 at Dakah De'nin's village, an early mid-nineteenth century occupation based on the presence of trade items (Shinkwin 1979:85). Rainey (1939a:367, Fig. 3-12) also recovered similar points from Dixthada in the Upper Tanana River Valley. A point from the Rat Indian Creek Site in northern Yukon Territory is similarly shaped, but the blade is rounded and the stem is broader relative to the blade and the shoulders (Le Blanc 1984:396, Fig. 96a). The blade shape of the 1996 point is most similar to the brass points from Great Bear Lake illustrated by Clark (1991:66, Pl. 24), except that the stems are considerably longer than that of the Gulkana point. The points from Great Bear Lake were European trade goods, and Dakah De'nin's village site was also a historic period occupation. The similarity of the points from these sites to the point

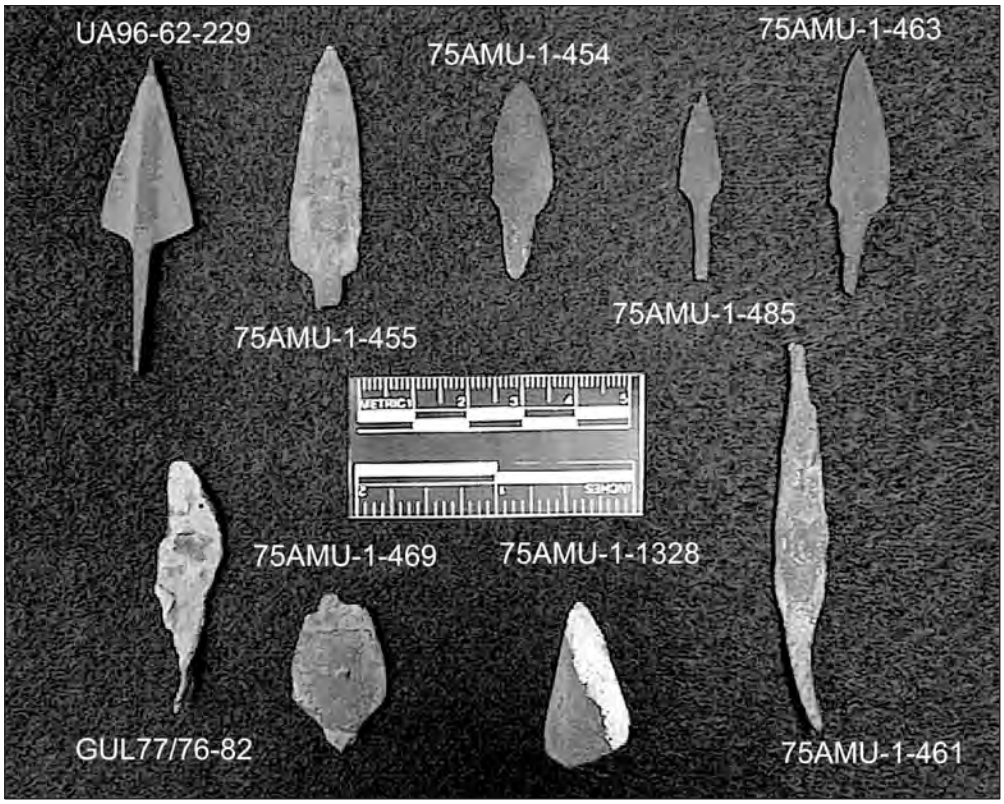

Figure 9. Copper points (UA and GUL artifact accession numbers are followed by the excavation year. AMU accession numbers are preceded by the year of excavation)

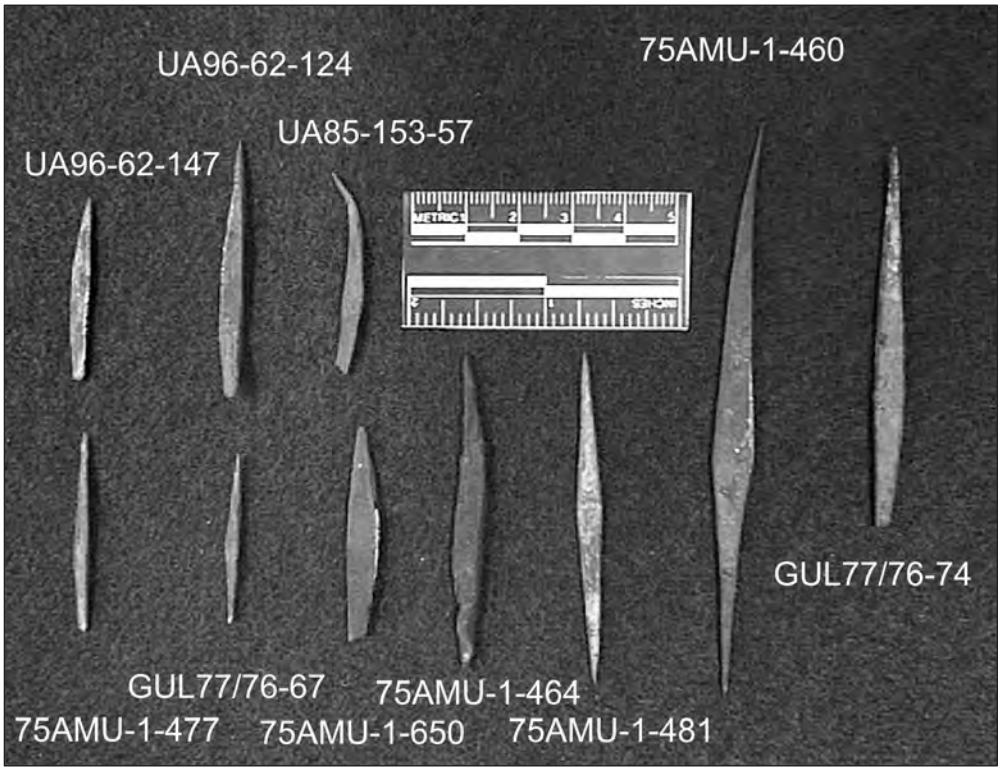

Figure 10: Copper bipoints (UA and GUL artifact accession numbers are followed by the excavation year. AMU accession numbers are preceded by the year of excavation)

recovered in 1996 from Gulkana led to speculation that these may be European-manufactured points traded into the region. Metallurgical analysis was required to determine the origin of the copper. Cooper et al.'s (2008:1744) recent analysis of GUL-077 copper artifacts demonstrates that all the copper from GUL-077 except UA96-62-0234 were from sources with similar trace signatures. Their analysis included UA96-62-229. Therefore, this point was made with local copper, perhaps in a European style or by Europeans using local copper.

Two copper bipoints were found in 1996, one was recovered in 1985, and sixteen were recovered by Workman (1976; Fig. 10). Fig. 10 shows all the bipoints collected from GUL-077. Workman (1976) classified these artifacts by the characteristics of the proximal end, shape, and manufacturing stage. He concluded that these were used either as "hafted awls or perforating tools" (Workman 1976:56). Awls or bipoints are still used to punch holes through birch bark to insert the spruce root stitching used to sew birch bark baskets (Titus and Titus 1990). A sewing kit collected by Catherine McClellan from Lily Birkle and Elsie Smith of Haines Junction, Alaska, had two steel awls with bone handles (Boudreau 1974:96). Another possibility is that these copper points may have functioned as punches in stone tool production. Modern knappers prefer copper punches over antler for pressure flaking because it is soft and flexible and can be placed more precisely than antler tips. It might be worth examining the characteristics of edges of flaked stone tools from the site to determine if copper tools were used to remove small pressure flakes. The bipoints may have multiple functions. They may have served as intermediate forms in the production of other artifacts, as one of the basic forms used in trade, and still served satisfactorily in this form as awls and punches.

The better-known copper knife styles ethnographically are the large daggers or bear spear heads with a bifurcated, voluted handle, but only backed knives were recovered (Fig. 11). Backed knives have squared or blunt backs with a thinner cutting surface on the opposite side. One copper fragment found in 1996 appears to be the distal end of a backed knife (UA96-62-267).

Workman (1976) recovered twelve cones and another two were recovered by OHA (Fig. 12). These are flat sheets of copper coiled so one end of the cone is narrower than the other. Some have two sides of the small metal sheet meeting in the middle, and others have the ends wrapped over the midline. One Gulkana resident indicated that a line was run through the cone that was set on the end of a metal rod or bipoint, which was in turn set on the tip

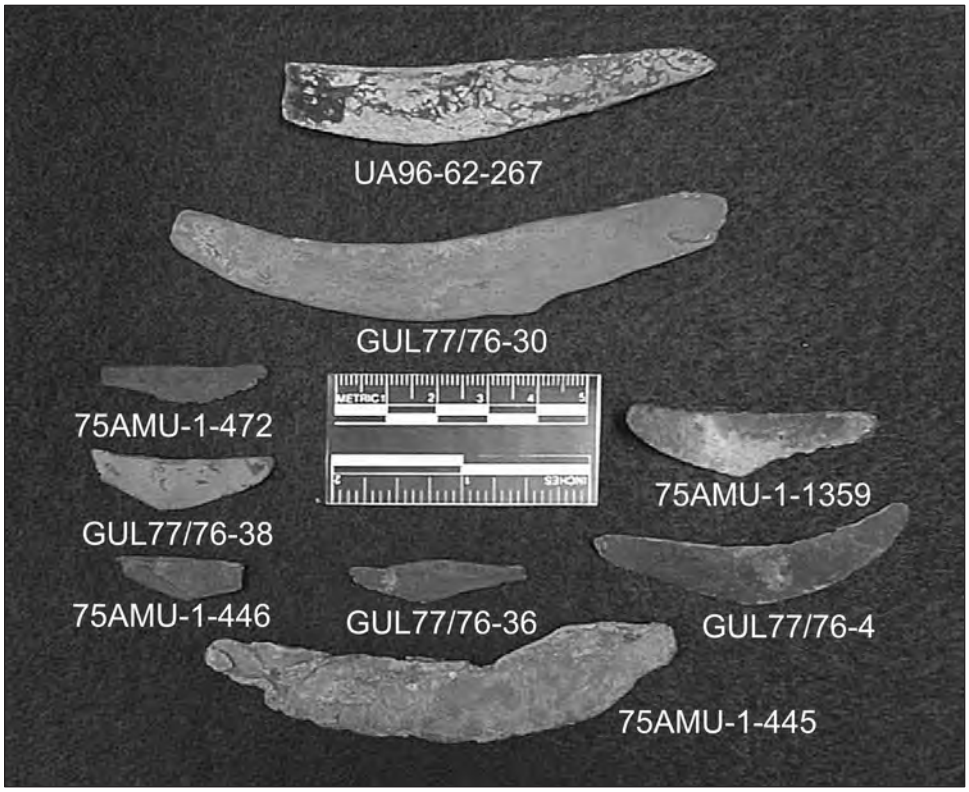

Figure 11: Copper backed knives (UA and GUL artifact accession numbers are followed by the excavation year. AMU accession numbers are preceded by the year of excavation)

of a spear. When a fish was speared, the cone slipped off and remained embedded in the flesh, with the line still attached, the cone acting as a toggling fish spear point. This would explain why one cone was found over a bipoint or rod by Workman (Fig. 12, AMU-1-459). Similar metal cones, however, were attached to fringes of Athabascan dance regalia as noise makers. Menstruating girls and adolescent boys wore fringed hoods with animal hooves attached to the fringes so the dangling hooves would clack together and warn people they were nearby. Workman (1976:64) and Shinkwin (1979:26) suggested that copper cones may have served the same purpose.

Cones and bipoints are also described as initial forms in the production stages for projectile points and knives (Franklin et al. 1981; Workman 1976). Franklin and her colleagues (1981) identified four production sequences used to make copper projectile points. In Production Sequence IV, a cone is placed over a bar then pounded flat onto the bar to make the blade portion, and the bar becomes the stem (Franklin et al. 1981). This may also explain the cone/bipoint combination (AMU-1-459) recovered by Workman (1976:Fig. 26). The cones may have served a variety of purposes, from blanks for making other tools to being finished forms (Workman 1976).

One small spiral-shaped copper fragment (Fig. 13: UA96-62-146) is similar to the spirals at the end of the large metal daggers with bifurcated handles. The spiral object from Gulkana may have broken off a larger item. Shinkwin (1979:101, Figs. 28k and j) and Rainey (1939a:367, Fig. 8) recovered similar artifacts with spiraled or coiled ends at Dixthada. Shinkwin (1979:26, 141) suggested that spirals or coils were a common theme in copper working among many Athabascan groups. Patrick Saylor (2001:106) from Healy Lake confirmed her observation. He stated that the spiral design was tattooed on warriors' faces and carved on knife handles and spear points:

> The spiral represents the caribou fences. The caribou fence had an opening with two corrals on both sides, which once the caribou went to the main opening, he'd spiral to both sides. They'd shut one gate when it's full, take what they needed then open up the other. And they'd have this continuous cycle.
>
> It also represented the Upper Tanana, the mother's side because that meant the mother's womb. The fence, the opening of it on both sides is the same. (Saylor 2001:107)

Workman also recovered a pendant and a ring (Fig. 13). The ring (75 AMU-1-458) was made from a small, thin bar of copper bent around until the ends overlapped. Workman (1976:65) assumed that because the ring was closed it was probably not a nose ring or an earring, but it was so small that it may have been a finger ring for a child. De Laguna and McClellan (1981:649) reported that men and women wore jewelry made from metal and dentalium shells on their ears and noses. The other decorative item recovered by Workman was a pendant about the same diameter as a United States dime, with a small rectangular

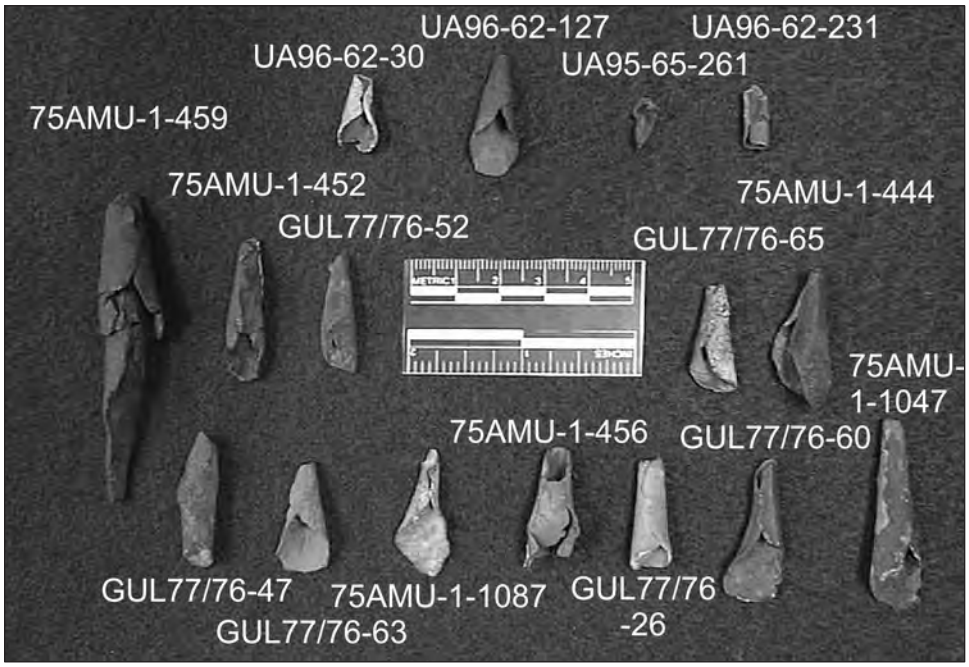

Figure 12: Copper cones (UA and GUL artifact accession numbers are followed by the excavation year. AMU accession numbers are preceded by the year of excavation)

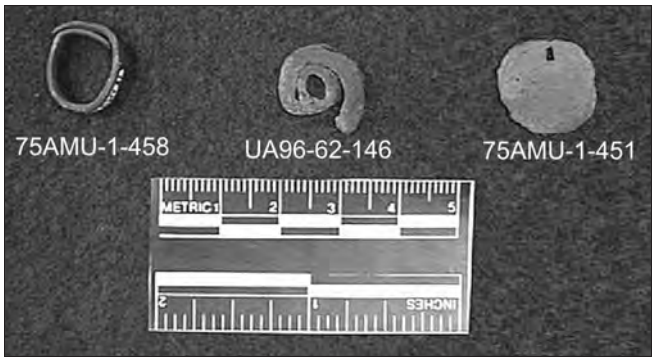

Figure 13: Copper "ornamental" objects (UA and GUL artifact accession numbers are followed by the excavation year. AMU accession numbers are preceded by the year of excavation)

hole cut near one side that might have been sewn to clothing or to a hat or hood, and may not necessarily have been hung from the neck (1976:66).

Cooper (1997) observed that copper artifacts farther from the Copper River Valley were more likely to be decorative. Of 48 copper items reported by De Laguna at the Old Town site, there were 7 rings, 6 bracelets, and 5 beads, while of the 169 items in the copper assemblage from GUL-077 collected by Workman, there was only the pendant and the ring. Cooper suggested that, as one moved away from the copper source, there was a shift from utilitarian materials to status-conferring wealth in the form of decorative objects.

There are also numerous miscellaneous copper items: implements with finished transverse working edges (UA95-65-209), implements with unfinished transverse edges (UA96-62-286), unfinished copper implements (UA96-62-287), copper implement fragments (UA96-62-148 and UA95-65-0178), copper byproducts (UA96-62-136 and 336), small thin copper sheets (UA96-62-232), large thin copper sheets (UA95-65-208), slender thin copper rectangles, thick flat worked copper pieces (UA96-62-230 and 235; UA85-153-81), and copper nuggets (UA96-62-233; Fig. 14). More complete descriptions of these categories and artifacts can be found in Workman (1976), Hankins (1997), and Hanson (1999). These artifacts represent all stages of manufacturing at the site, from the copper nuggets representing the raw material, bars that may be similar to bars De Laguna (1972:349) described as trade items, folded and flattened sheets, to fragments of artifacts broken from larger objects. Many of these items were associated with hearths at GUL-077.

The use of copper and the development of copper-working technology attracted the attention of explorers and later archaeologists when they first began working in the Copper River region. "The discovery of native copper and how to work it is credited to a poor Atna (sic) boy who received the knowledge in a supernatural way" (De Laguna 1972:412). Sam, an Upper Tanana man, watched his father make copper tools: "Find nugget pure copper on hill back from Nebesna river; hammer it out on stone anvil with sharp stone pick; flatten out and shape; then

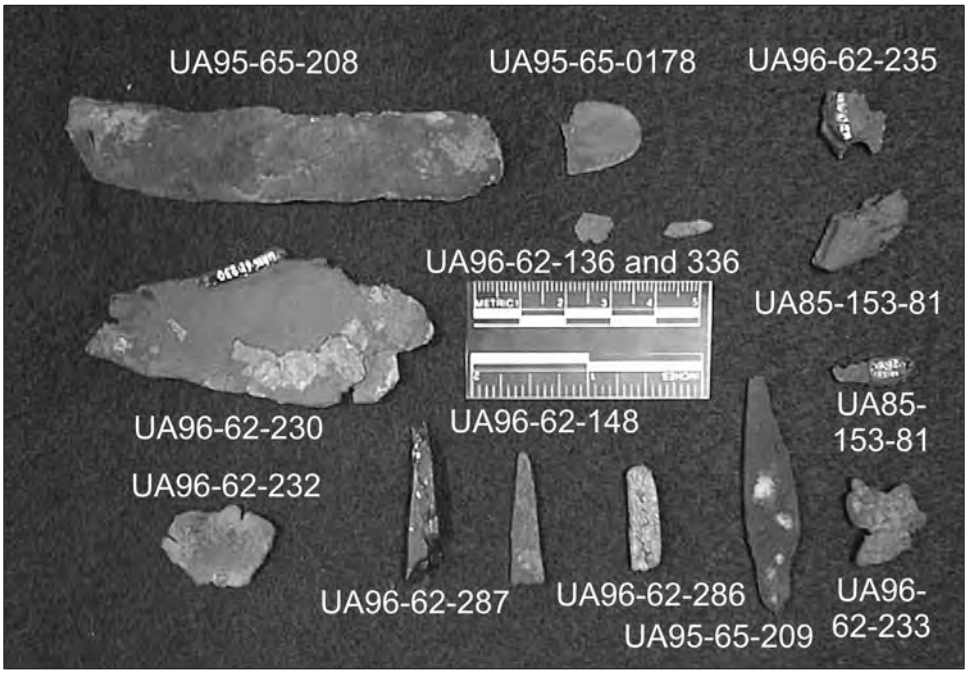

Figure 14: Miscellaneous copper items (UA and GUL artifact accession numbers are followed by the excavation year. AMU accession numbers are preceded by the year of excavation).

hammer edge down to paper-thin; break off residue with fingers" (Rainey 1939b). Then the edge was sharpened using a grinding stone.

Allen (1970:263) reported in 1886 that copper bullets were made by hammering. One individual stated that the copper was heated in fish oil and pounded (in Shinkwin 1979:26), while Powell (1910 in Workman 1976:51) stated that urine was poured onto the copper to harden it. De Laguna and McClellan stated that during the early part of the twentieth century, a man from Chitina manufactured copper knives for tourists by heating and pounding the metal (in Shinkwin 1979:26). Patrick Saylor (2001) of Healy Lake described his grandfather Sam and his uncle Nothol making copper tools. His uncle would trade red paint for copper from the Ahtna. He would use a rock to hammer the metal "which we'd pound and folded until we had a triangular like dagger. . . . It went from the very tip to the very base it was a triangle and with cur-. They pounded the curls on the end" (Saylor 2001:106).

Franklin et al. (1981) concluded that cold hammering alone could not have been used when forming small bars like those recovered from Gulkana, because the hammering would have caused the metal to become brittle and the sheets would have broken and cracked rather than folded. "However, through the process of annealing, i.e., heating a cold worked piece at temperatures above approximately 300 degrees Centigrade, sufficient ductility could have been restored to permit folding of the material" (Franklin et al. 1981:26). Most of the bone from GUL-077 was calcined, which requires temperatures of 450–500°C or burning for three to four minutes or both (Lyman 1994:389). It is clear that the campfires at Gulkana were sufficiently hot, not only to cause calcining of the bone associated with the hearths, but also to provide a heat source that would allow annealing of the copper found in the same hearths. Cooper (2007) examined the crystalline structures of the copper recovered from GUL-077 and confirmed that annealing was used to create the artifacts.

Surface copper outcrops and nuggets were available in approximately forty-six different sources in eastern Alaska and southwestern Yukon Territory area (Cooper et al. 2008:1736). There are sources at Chitistone Creek, Nizina River, Chititu, Kennicott, Copper River, and Nebesna River in Alaska; at numerous sources in and near the Whitehorse Mining District; at the White River in Alaska and Yukon Territory; and at Beloud Creek, Bullion Creek, Sheep Creek, Kimberley Creek, and Burwash Creeks, all in the Yukon Territory (Rapp et al. 1990). The next closest outcrops are in the central Arctic in the Coppermine River area and Great Bear Lake, or in northern British Columbia (Rapp et al. 1990). Workman (1976:52) suggested that the copper collected and brought to Gulkana probably came from the Dan and Chititu rivers, tributaries of the Chitina River.

Determining the source for the copper used in artifacts is a problem because of its purity. Franklin et al. (1981:16) analyzed samples from GUL-077 and concluded that they could be separated by arsenic content:

> It is possible that these groupings reflect exploitation of different copper sources, or different collecting localities within the Copper River source area. However, it should be noted that arsenic concentrations can also vary within a single native copper deposit (Broderick 1929). The two groupings observed for the Gulkana copper do not appear to correlate with the different temporal or spatial units within the occupation history of the site.

Cooper's (2007, Cooper et al. 2008) research is the most thorough examination of the manufacturing and sources of the copper in the Copper River Valley. He reexamined the copper analyzed by Franklin from the Gulkana site. Partly because of the difficulty of reaching copper sources in the area, he was unable to determine the copper sources for the Gulkana artifacts. He was able to state that, based on the trace element analysis of the metal, Kletsan Creek was probably not a source, and the Gulkana metals were most similar to copper from Dan Creek and Chititu Creek (Cooper 2007:136; Cooper et al. 2008:1744), supporting Workman's suggestion.

Lithic Artifacts: Lithic artifacts from the 1995–96 excavations of the Ringling site were not analyzed beyond placing formal artifacts into categories established by Workman (1976). Boulder spalls, scrapers, and cores were the primary lithic artifacts recovered in 1995 and 1996. Workman (1976:83) concluded that copper versions replaced many of the tools previously made from stone, such as knives and points. There may also have been heavy curation of many of the tools, and the unanalyzed flakes may have been tools once hafted into wood, bone, or antler handles.

In the literature, boulder spalls are called *chitho*s and locally they are called *bendaasi*s (Kari 1990). Each Athabascan region appears to have had its own name for this basic tool. The older residents of Gulkana were more interested in the boulder spalls than other tools from the

site, possibly because they were intimately familiar with them. They said that when they were children, their mothers and grandmothers sent them to scrape hides with these tools. Alexandra Lindgren (1998, oral communication) of the Kenaitze Indian Tribe on the Kenai Peninsula stated that, based on experiments by her students in the culture camps, the boulder spall scrapers were found to be the most efficient hide-scraping tool. While many archaeologists might consider them expedient tools, Albright (1984) noted that these were important household items. "Although the stone material is abundant and the method of manufacture fairly simple, many stone dressing tools appear to be highly curated. Several tools observed in 1979 and 1980 are reputed to be over 100 years old. When first starting to work on hides, a woman is given her first tools by an aunt or her mother. These are kept and handed down again as heirlooms" (Albright 1984:58). Caching boulder spall scrapers was evident in Unit 4908/E4948, where two (UA96-62-22 and 23) were found beside each other (Fig. 15). One was lying flat and the other was in a vertical position.

Gulkana residents said that to break a spall from a larger rock, one had to whistle around the stone and throw it down. Albright (1984:57) reported that the Tahltan of northern British Columbia made their spall tools using a bipolar flaking technique by holding a larger cobble edgewise on a stone anvil and breaking a spall off with a larger hammer stone. They dulled the edges by flaking around the cobble so it would not cut the hide.

Chipped stone flakes and other lithic items were made from obsidian, basalt, chert, quartz, and quartzite. Chert colors ranged from deep reds, browns, and black to white and translucent. John Cook, then with the Bureau of Land Management (1997, personal communication), determined that Batza Tena on the upper Koyukuk River was one of the sources for the obsidian at GUL-077. Other sources were not identified at the time but he called the unknown source "Group A." Slobodina and Speakman (2008) also had problems identifying the quarry sources during their reexamination of obsidian samples from GUL-077. Most of the samples from GUL-077 fell within the "Group A" source (n=109), fewer came from the Wiki Peak (n=11) source, from Batza Tena (n=4), and "Group P" (n=4), another unknown source. Wiki Peak is 360 km west of Gulkana near the Yukon Territory–Alaska border (Slobodina and Speakman 2008:8). It needs to be determined if the cherts and quartzite are also present in the glacially deposited gravels available locally, but the variety of lithic materials would be consistent with the Ahtna's participation in a complex trade network recorded later by Euro-American explorers.

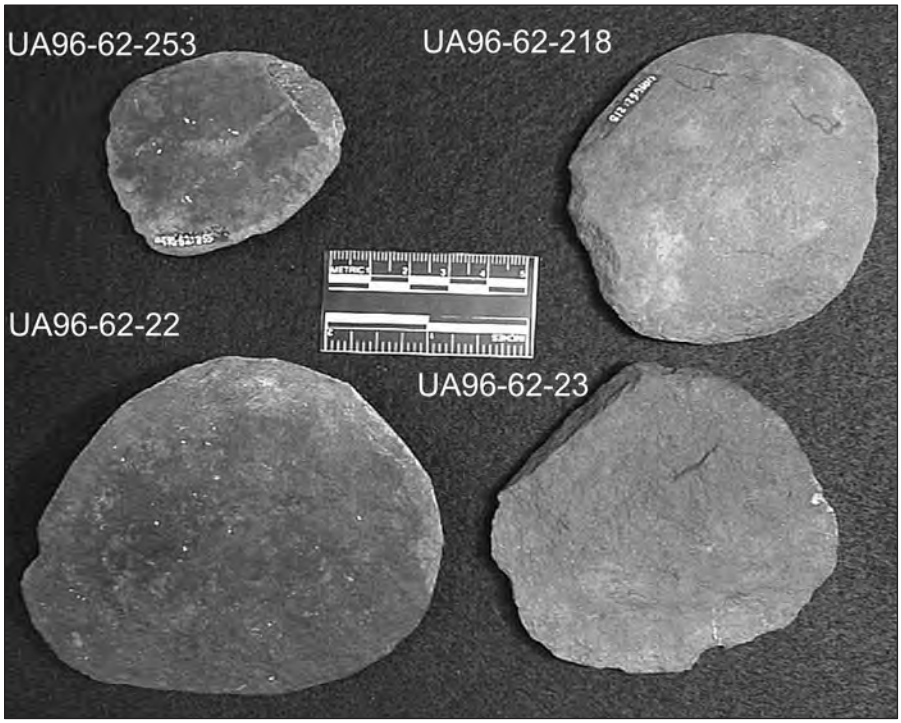

Figure 15: Boulder spall scrapers or bendaasis

Bone and Antler Artifacts: Many of the bone artifacts are burned, particularly the unilaterally barbed bone points (Fig. 16). An awl and a drill or awl haft were not burned and were recovered in excellent condition, indicating that the high frequency of burned bone artifacts may be a result of cultural practices rather than preservation biases. The most commonly recovered items were fragments from unilaterally barbed bone and antler points. Only a single edge was recovered from UA96-62-123 and 125. The fragments recovered in 1995 and 1996 have a longitudinal groove or barbline etched laterally along the base of the barbs. These are similar to barbed points recovered by Workman (1976), Shinkwin (1979), and LeBlanc (1984) and the antler points recovered from ice fields in the

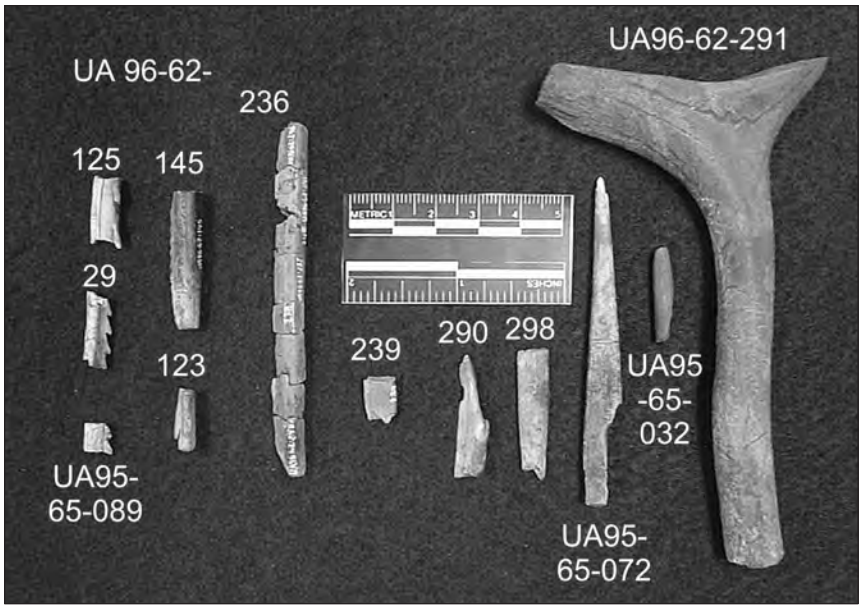

Figure 16: Bone and antler artifacts

Wrangell–St. Elias National Park and Preserve (Dixon et al. 2005) and in the Alaska Range west and northwest of Paxson (VanderHoek et al. 2007). There is variability in the position of the longitudinal lines from the different sites, but the most consistent feature is a laterally placed line along the base of the barbs. UA96-62-125 appears to have a medial but no lateral groove. There is more variability in the barbing from the 1995–96 collection than in Workman's (1976:75) assemblage. UA96-62-145 is more scalloped, UA96-62-29 has short distinct barbs, and UA96-62-125 has slender, widely spaced barbs.

There were no bone awls in Workman's (1976) collection, but one awl made from an ungulate metapodial was found at the site in 1995 (UA95-65-072). The base is not complete and a line is incised around the midsection. The T-shaped antler object (UA96-62-291) found in a postmold from Unit N4908/E4948 may have been the handle of a drill (Fred Ewan 1996, oral communication) or hafted awl. Workman (1976:72) suggested that the scarcity of bone awls or punches at Gulkana was because copper punches replaced bone awls.

Faunal Remains: Approximately 10,850 bone fragments were analyzed from the 1995 excavations, or nearly two-thirds of the bone recovered that year. The 1996 assemblage was not analyzed. The bones were collected either *in situ* or from ⅛ in. mesh screens and analyzed using the comparative zooarchaeological collection at the department of anthropology of the University of Alaska Anchorage. The bones were weighed with a triple beam balance (OHAUS, Pine Brook, New Jersey) and counted. Surface discoloration was used to record burned bone, using color classifications similar to Shipman et al.'s (1984) categories for burned bone (brown, black, gray, white, or combinations of these).

The bones in the 1995 assemblage were highly fragmented and only 0.8 percent by count (4.7 percent by weight) were identified to the level of family or a more specific taxon. Only three taxa were identified: sixteen ungulate bones (2.0 percent), sixty-nine lagomorphs (5.7 percent), and one ptarmigan or spruce hen (Phasianidae) sternum (Table 2). Nearly all of the bones were burned (99.3 percent), which also accounts for the extensive fragmentation. Of the burned bones, 96 percent were calcined or had some portion of the bone that was calcined. Unburned bones generally came from disturbed contexts or surface layers of the site. There was more variation in the 1996 assemblage, and beaver (*Castor canadensis*) and salmon bones were recovered. Well-preserved unburned bone was noted in lower levels under the hearth in Unit N4908/E4948. The remaining assemblage, however, was not analyzed.

Lyman (1994:389) discussed David's 1990 experiments with bone burning. David had determined that bone became calcined at temperatures greater than 450° to 500° C, for durations of three to four minutes, or both. In his experiments, no bone was calcined in a brush fire, 24.5 percent of the bones were calcined in a hearth fire, and 95 percent were calcined after being

Table 2: Fauna from GUL-077

	Lobdel 1976 (NISP)	Hanson 1999 (NISP)
Lagomorphs	448	69
Castor canadensis	219	
Rangifer tarandus	35	
Alces alces	32	
Cervidae	15	16
Canidae	16	
Tamiasciurus hudsonicus	10	
Bird unidentified	2	
Phasianidae (Ptarmigan)		1
Fish unidentified	0	
Unidentified fragments	est. ⅔ sample	10,845
Total		

burned in a hearth for six hours. Hearth fires are more likely to produce calcined bone than carbonized bone (Lyman 1994:389). Clearly, to get the extensive representation of calcined bone seen in the Gulkana assemblage, most of the bone must have come from a cultural context and is not a result of forest fires passing over the site. Ethnohistorical accounts confirm that it was important to burn food remains and animal carcasses to keep the bones from being chewed by dogs (De Laguna and McClellan 1981:648).

Acidic coniferous forest soils are not generally conducive for bone preservation. There is a common assumption that calcined bone preserves better than unburned bone because the organic component has burned away, making it less susceptible to decay. To test this assumption, Lubinsky (1996) demonstrated that salmonid bones burned two hours at 250° C and, placed in an acidic solution, decayed 1.4 to 2.5 times faster than boiled bones. Raw bones decayed more slowly than boiled elements. Knight's master's thesis on taphonomic processes was reviewed by Lyman (1994). In his thesis, Knight also noted the decay rates of burned beaver bone were faster than fresh bone in both acidic and basic solutions (Lyman 1994). If the conditions were unfavorable for raw bone preservation, then the burned bone would also have disappeared. Clearly this is not the case, given the amount of unburned bone recovered in 1996. The high fragmentation rate is probably the result of the combination of burning and damage caused by excavation. When bone is burned it becomes brittle, and bone is particularly susceptible to breaking if the bone is hot when it is moved, as when a hot fire is stirred or more wood is placed into the fire. McKinley (1994) noted that much fragmentation takes place during excavation and afterwards during handling.

Lobdell analyzed the faunal assemblages collected between 1974 and 1976 and also remarked on the generally fragmented and burned bone assemblage (Workman 1976). He identified less than one-third of the bone assemblage by weight to family or a more specific taxon, which is considerably greater than the 4.7 percent identification rate by weight of the 1995 assemblage. It may be that there was some culling during the excavations during the mid-1970s, and crew members may have been collecting bone they considered diagnostic. Screens were generally not used until the end of the excavations (Workman 2008, oral communication); therefore, the assemblage would have been dominated by larger and more recognizable elements. This would also explain Lobdell's higher identification rate compared to the 1995 analysis.

Lobdell identified rabbit, beaver, caribou, moose, canid, cervid, red squirrel, bird, and fish, in descending order of abundance at the Ringling Site (Table 2). He identified 777 elements to taxon compared to 86 from the 1995 assemblage. The larger assemblage explains the wider range of taxa. It is difficult to determine how large Lobdell's total assemblage was because it does not appear that he counted unidentified bone from the site (Workman 1976).

Based on the high attrition rate of bone, it may not be appropriate to use the faunal assemblage to determine the relative contributions of specific animals to the diet, and it may be necessary to use other evidence to determine diet. The faunal remains do, however, provide information about patterns of discard and perhaps information about religious beliefs concerning the appropriate treatment of animals.

DISCUSSION

The tendency for archaeologists to place a shovel test in the center of an Athabascan housepit may not provide the most useful results. Yesner and Holmes (2000:68) noted that most artifacts in a historic period house from the upper Kenai Peninsula were from the sleeping platforms along the edge of the house depression. Brady (1976) placed a 2 x 2 m test pit in the center of the feature 95-36, a large depression on the south side of GUL-077, and produced a possible boulder spall in a gravel layer and a thin bark layer. The 1996 excavations in the same feature concentrated along the wall and recovered information about the construction of the house, parallel lying timbers, and a radiocarbon date from the timbers. The unproductive test in the 1970s led to the initial conclusion that the feature was not a house and "not even a very productive cache" (Workman 1976:48). It will take more extensive excavation to determine the purpose of this large depression.

Workman (1976) had a greater opportunity to observe the structure of depressions at the site because of his more extensive excavations. Arndt's (1977) thesis addressed the structure of caches based on those excavations. Workman (1976:117) noted that the cultural depressions often extended down to the gravels under the surface sediments. Many of the features had poles or timbers from covers and roofs, or bark on the floors. "Mr. Fred Ewan of Gulkana Village told us that the fish were sometimes put 'right down on the ice' in caches where they would keep

all summer. He says these caches would be dug up before freeze-up in the fall. He also said that poles were interlaced over the top of the ground caches to protect them from bears" (Workman 1976:119). Caches from GUL-077 received little attention in 1995 and 1996. There were no remains recovered from them, and they were usually not found in large numbers near the larger cultural depressions assumed to be house features. If the 1995–96 project had continued, soil samples would have been submitted for lipid analysis to determine the use of the caches. The analysis would have been used to determine if there was a differential distribution of cache types based on content. Mr. Markel Ewan told Workman (1976:120) that fish were stored in the caches, but not meat.

The most interesting information about lithic and copper artifact manufacturing, seasonal activities, religious behavior, subsistence, and temporary structures came from the campsites outside of the large cultural depressions. Investigators using metal detectors to find copper artifacts usually discovered hearths and lithic artifacts associated with the metal. Calcined bone associated with copper fragments demonstrated that the inhabitants of GUL-077 had fires hot enough for annealing, and may have used the same hearths to heat the copper and burn meal scraps.

Faunal remains, while scarce, also provided information about life at GUL-077 beyond diet. Bones under the post holes may have had significance greater than simply supporting posts placed in the ground. The bones found in the base of post holes under the hearth in Unit N4908/E4948 were aquatic species (fish and beaver). Additional excavation, or a more detailed examination of the context of the faunal remains already recovered, may provide more patterns that can demonstrate the continuity of beliefs about proper treatment and disposal of animals.

The season of site occupation might also be gleaned from the fauna present at the site. The Ahtna placed animals into functional groups (De Laguna and McClellan 1981). The meat animals were the large ungulates, including caribou, moose, sheep, and goat. The fur animals were lynx, wolverine, marten, fox, beaver, and otter. The third category was one that does not translate easily into English categories. The food mammals and "bear, lynx, beaver, porcupine, rabbit, ground squirrels, muskrats, game birds," and fish were the primary animals eaten by the Ahtna (De Laguna and McClellan 1981:648). Some animals, such as the small tree squirrels and marten, were only eaten during periods of starvation. Porcupines and rabbits were usually eaten when other primary sources of food were less frequently encountered in the late winter to early spring. Dogs, wolves, and mink were not eaten (De Laguna and McClellan 1981). The most frequently identified taxa at GUL-077 were lagomorphs, probably snowshoe hares. GUL-077 is still a popular area for snaring animals, based on the presence of snares on the hill. Small animal bones are more likely to be identified in highly fragmented assemblages, however, because the diagnostic attributes can still be recovered on small pieces of bone. Caribou were the next most commonly identified animals, and the general ungulate category probably included moose as well.

It appears that based on the fauna and the features, the site was inhabited year-round. Caches and the large pits would need to have been excavated when the ground was thawed in the summer and fall. Numerous caches that could have been used to store fish, meat, and berries were probably filled and covered in the summer and early fall. Many of the features are outside of the large cultural depressions and may be from aboveground campsites, likely spring-through-fall structures, although Workman (1976:119) has interpreted these camps as late winter/early spring based on the fauna from these features. If the large 13-m-long cultural depression (95-26 or AMU 21) is a semisubterranean house, this could be used as evidence of a winter occupation. The food stored in the caches would likely be used in the winter, and the presence of hare and squirrel bones is indicative of periods of stress that would occur in the late winter and spring. The absence of furbearers is interesting; however, De Laguna and McClellan (1981) noted that bones and meat not used from furbearers were burned, and that some were kept away from the house and processed elsewhere. Based on the information now available, it can be argued that any or all seasons are represented at GUL-077.

Several authors have discussed the importance of copper and fur trade networks in the Copper River area (Cooper 1997, 2006, 2007; De Laguna and McClellan 1981; Pratt 1998; Workman 1976). It still needs to be determined if Euro-American copper items were being traded into the region in competition with locally made items. Based on Cooper's (2008:1742) analysis, the copper from GUL-077 is from local sources. The wide variety of lithic materials at GUL-077 may also provide information about these trade networks. Slobodina and Speakman's (2008) analysis has demonstrated that some of the obsidian has a wide distribution among sites in interior Alaska. Determining the sources of the cherts found in the site

may also help define these networks unless they come from locally available chert transported by glaciers during the Pleistocene and deposited locally.

This Ahtna site still has much information to offer about precontact Athabascan people living on the Copper River. The north and south sides of the site are still intact. The 1995–96 soil samples, artifacts, wood samples, and other materials would benefit from more thorough analysis. From trade and interaction with other interior groups and with coastal people, to subsistence, social organization, construction methods, copper working, and the transition from stone tool manufacturing, this large site still has the integrity to provide important information on Ahtna and Athabascan history.

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THE VOLCANO IN ATHABASCAN ORAL NARRATIVES

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ABSTRACT

This article suggests that some Athabascan oral traditions support Workman's hypothesis of early Athabascan movement after cataclysmic volcanic eruptions in the Wrangell–St. Elias region of Alaska. Oral traditions collected in the nineteenth and twentieth centuries contain key metaphors that link Athabascan notions of language change, environment, and history to periods of unusual hardship and migration. The association between story and environmental shifts contributes to the body of scientific knowledge about human ecology in context with volcanism. Moodie et al. (1992) made similar interpretations based on similar findings in the eastern Subarctic.

KEYWORDS: Alaska ethnohistory, volcanic impact on humans, migration

INTRODUCTION

This study formed part of an interdisciplinary master's thesis completed at the University of Alaska Anchorage in 1990 (Fast 1990:239–278). Dr. William Workman's (1974) study of volcanoes as a contributory determinant of Northern Athabascan distribution formed a central issue in my research regarding the potential impact on culture of a massive volcanic eruption. Beginning in 1915, geologists and archaeologists studied a layer of ash covering about 125,000 square miles in the Upper Yukon basin in northern Canada and Alaska (Fig. 1). This geographic area corresponds to the distribution of a popular Gwich'in oral narrative called *Ko'ehdan* (Man Without Fire). The archetypal characters, Ko'ehdan and his wife, L'AtPa-Natsandé, are central characters in numerous stories, of which the most commonly told depicts L'AtPa-Natsandé's kidnap by enemies and eventual rescue by her husband. Slobodin (1975) detailed one of the most complete versions of this dramatic narrative told to him by a Canadian Loucheux or Gwich'in man. Workman postulated that northern Athabascans moved into eastern Canada and northern Alaska as a consequence of the fall of volcanic ash on the Upper Yukon basin around fourteen hundred years ago.

Slobodin (1975) suggests the enemies who kidnapped the archetypal woman are Inuit, and that the kidnap of L'AtPa-Natsandé fits a common theme among Gwich'in Athabascans of so-called Prize Women who were repeatedly kidnapped by Inuit and later rescued by their Athabascan husbands. According to Workman, the Athabascans of Canada and the Gwich'in of northwestern Alaska are the descendants of a group of Athabascans who had migrated east to escape the disastrous environmental effects of a massive volcanic eruption that occurred in the Wrangell–St. Elias Mountains near the present-day border between Alaska and Canada as noted on Fig. 1. Others have indicated the importance of the eruption. For instance, Émile Petitot (1888:415–416n1, as noted by Moodie et al. 1992:155), speculated that the Athabascan discovery of metal occurred because of the volcanic eruption of St. Elias along the Copper River. Workman proposed that the Athabascans of interior Alaska are descendants of people who migrated north due to an eruption from the same volcano approximately one millennium earlier. In support of Workman's hypothesis, my argument here is that the *Ko'ehdan* tale developed among the

eastern Canadian Athabascans, including the Gwich'in, subsequent to the second eruption and that this tale is not part of the traditional tales of Athabascans in other parts of Alaska because of cultural adaptations occurring one thousand years later. Athabascans may have adapted to the resistance they may have encountered by Inuit peoples, who were also entering Canadian territory as they moved from Asia along the northern coastline of North America in roughly the same era as the volcano may have moved Athabascans northward and eastward. Slobodin's summary of Gwich'in Athabascan Prize Women narratives suggests that early conflicts might have been explained in oral tradition through the metaphor of kidnap. In other words, the metaphor of Athabascan Prize Women suggested by Slobodin (1975:285–299) may have become the counterpoint to what Burch (2005:19) suggests as Iñupiat customs regarding inter-national marriages. Burch points out that when two nations, such as the Gwich'in and Inuit, found themselves in conflict, they had to find a way to safely rescue their emigrant daughters from Athabascan husbands. It's my suggestion that Gwich'in families also faced the same problem and that their solution was to kidnap their emigrant daughters. Indeed, Slobodin suggests that such kidnappings occurred in both directions across the Inuit-Gwich'in boundaries, and that the boundaries have been in continuous negotiation because of two separately motivated migrations by the Inuit and Athabascans into northeastern Canada.

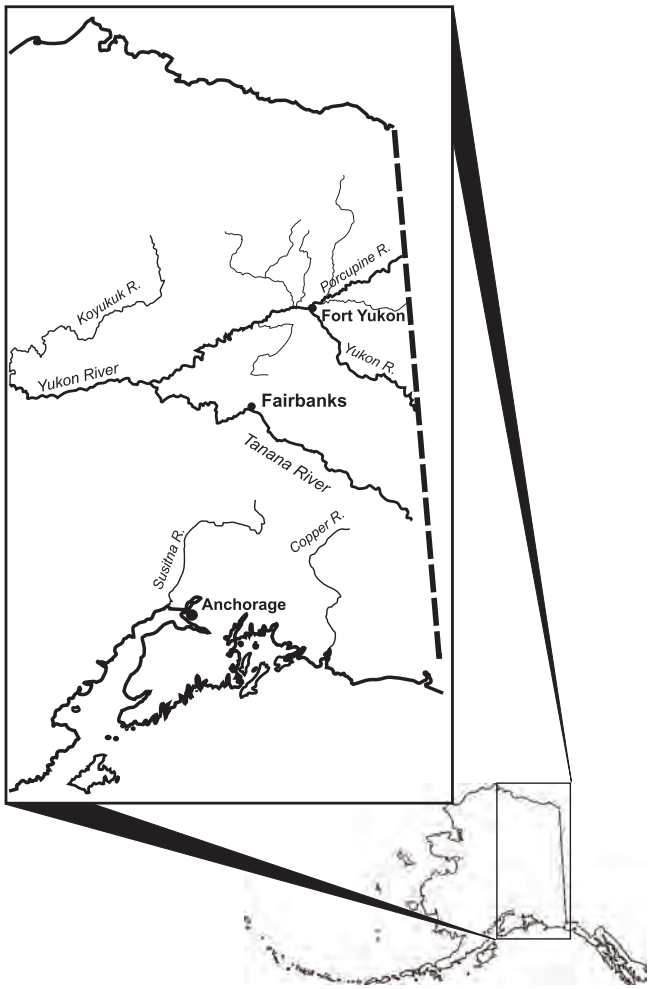

Figure 1. The area of eastern Alaska discussed in this paper.

DISCUSSION OF WORKMAN'S HYPOTHESIS

The body of this hypothesis is found in Workman's article "The Cultural Significance of a Volcanic Ash which Fell in the Upper Yukon Basin about 1400 Years Ago," which he originally presented at the International Conference on Prehistory and Paleoecology of Western North American Arctic and Subarctic and later published in 1974. Geologic reports indicate that ash deposits seem to have originated from a vent in the St. Elias Mountains in Alaska. The first ash deposit occurred in the north along the Tanana River valley from 1,750 to 2,005 years ago, with an average estimate of 1,890 years ago (Workman 1979:349). Ash from this event would have affected the area occupied by the present-day Han, Northern and Southern Tuchone, and Upper Tanana Athabascans. The second, eastern lobe event probably occurred around 1,250 years ago, with a range of 1,175 to 1,390 (Workman 1979:349), and its ash deposits spread over a great deal of the Yukon Territory and some of the Northwest Territories in Canada.

As a hypothetical reconstruction of the environment prior to the eruption in the affected areas, Workman summarized climatic occurrences believed to have happened since the glacial retreat occurred approximately ten millennia ago. First were the probable high winds and blown loess and silt conditions contributing to an extensive dry period. These could have lasted until the maximum warm/dry period of the Hypsithermal, some four thousand to twenty-eight hundred years ago, depending on the area and limited information available. In response to the presumed warming period, the glaciers in the St. Elias Mountains withdrew inside their present boundaries, and "at least one (The Kaskawulsh) was to retreat at least 13.7 miles [22 km] above its present terminus" (Workman 1974:241, citing Denton and Stuiver 1969:173). During the Hypsithermal the tree line in Alaska may have extended north of where it is now by as much as 300 km

(Dumond 1977:47). The environment after the eruption may have featured cooler, damper periods in which the moisture prevented volcanic ash from blowing as it would have during the era of high wind velocity.

In the Desadeash and Shakwak valleys on the southern periphery of the ashfall area in Canada, ice that had dammed the Alsek River broke up and moved out, thereby opening up new land that later became the grasslands and prairies of today. This was followed by a cooler, damper period that probably occurred between twenty-five hundred and sixteen hundred years ago, and was likely similar to contemporary conditions. The first eruption probably occurred during this moist cooling period.

What kind of life was it for people in this area after the eruptions? Increased moisture would have permitted the forest to expand, cutting into the prairie lands. Pre-ash faunal remains indicate that bison, inhabitants of the grasslands, disappeared along with the prairies of that region more than two millennia ago. Some possible physical effects of volcanic eruptions include the emission of noxious fumes and substances, including sulfur dioxide, fluorine, and chlorine, which even in small amounts could do extensive damage. Workman suggests that evergreens, a common presence in Alaska and northern Canada, are more susceptible than deciduous plants to such toxins (Workman 1974:247). The Katmai eruption of 1912, for example, emitted an acid rain that caused painful burns to humans, vegetation and metal, reportedly affecting areas 400 to 580 km from the volcanic source. Again citing Workman (1974:247), fumes "sufficient to tarnish brass in a few moments were reported 700 miles [1,100 km] downwind" of the Katmai eruption. It is possible to infer some of the long-term effects of ashfall from contemporary volcanic activity. For instance, Mount St. Helens spewed ash for six months prior to erupting in 1980. The ash from that vent is much coarser than the St. Elias volcano, so few other comparisons are possible. The Alaska Volcano Observatory records ashfalls from many volcanoes, such as Mount Redoubt and Mount Augustine in southcentral Alaska, that have produced ashfall hundreds of miles away. A consequence of ashfall putatively includes damage to the environment that must have come in a variety of forms, and the extent of damage depends on the season. Workman, since his first writing, has found several lines of evidence suggesting that the second, easterly eruption in the White River valley occurred in the winter (Workman notes, 1988). A winter eruption corresponds to at least one Upper Tanana oral tradition in the area around Beaver Creek (Isaac 1990).

Workman suggests that if the seasonal effect of the major eruption in the upper Yukon region occurred in the winter, ash on snow could have precipitated flooding, just as Redoubt's minor eruptions have done near Beluga Point at the base of the mountain. Travel would have been difficult, and subsistence activities would have been interrupted at a time when food was likely already scarce. "From several points of view the worst time for the ash to have fallen would have been in late winter or early spring, the best perhaps between midsummer and early fall" (Workman 1974:249).

Workman (1974:249–250) argues that the ashfall would have rendered the area uninhabitable, or at least unable to support as many people as before. If the trees were already laden with snow, severe ashfall in the quantities suggested by geological records might have damaged and killed trees. There may have been a number of subtle changes to drainage and vegetational patterns. Potable water may have been in limited supply, and herbivores may have been unable to survive given the limited or reduced availability of food resources.

Psychological effects would have been great, particularly since mountains have symbolized sources of metaphysical powers to many Athabascan peoples, northern as well as southern. For instance, the version of the *Ko'ehdan* tale documented by the nineteenth-century French Oblate missionary Émile Petitot includes a prayer translated as "Oh great mountain, my grandfather, in the beginning I sacrificed a fattened animal for you. What have you done with it?" (Petitot 1976:67) This is probably a prayer to the Navigator, a common northern Athabascan mythic character who first retreated to the top of a mountain to escape the great floods, and then built a canoe into which he loaded the small animals, thus saving the world. That person is also commonly referred to in many Athabascan oral traditions as "Grandfather" (Petitot 1976:6). There is no way to ascertain how much of this legend has been intertwined with the Christian story about Noah and the Ark, which Petitot probably taught a number of Athabascans himself.

Workman cited Verne F. Ray, who recorded a comment made by a woman of the Sanpoil-Nespelem Plateau cultural region who had been in the vicinity of a "very minor fall of ash" (Workman 1974:248). Briefly, she recounted a time when ash fell along the Columbia River when she was a little girl. Her people were so frightened

that they didn't gather food for winter, but instead prayed and engaged in ritual dancing, "something they never did except in winter" (Workman 1974:238). The import of this citation is to support the potential psychological impact ashfall might have on a community that had little experience with volcanic activity.

DISPERSION OF NORTHERN ATHABASCANS AFTER THE SECOND ERUPTION

Speculating that a large area around the base of the St. Elias mountains might have been rendered uninhabitable for several years after the second eruption, Workman argues that many of the residents would have been inclined to move toward the north and south of the Wrangell–St. Elias Mountains, rather than toward the east (where the ash was falling) or west toward Prince William Sound (near the source of ash). He suggests the following three possibilities about the region prior to ashfall: (1) the entire area was occupied by humans; (2) the population at the time was about the same as it is now for "boreal hunters without access to salmon runs"; or (3) the population was depleted due to the ashfall. Workman speculates that in the best case only 50 people may have been affected, but in the worst case as many as 1,550 people might have been impacted by ashfall, and that a probable figure is around 500 people.

Linguist Michael Krauss (1980), using glottochronology, suggests that Athabascan languages started to diverge from each other approximately twenty-five hundred years ago. This date correlates to the approximate beginning of neoglaciation, a period characterized by the onset of cooler and moister climatic conditions (Workman 1974, 1979). It is also relatively close to the hypothetical date of the first eruption, between 1,635±80 and 1,990±30 years ago. Krauss (1980) also suggests that the southern Athabascan languages (Navajo and Apache) originated north of where they are now approximately twelve hundred years ago, tantalizingly close to the time of the second eruption.

Where the original Athabascans were or may have come from prior to the dispersion of the modern Athabascan languages twenty-five hundred years ago is a question still open for debate. There is archaeological evidence indicating that people have occupied interior Alaska for at least ten thousand years, but there are few indications that those ancient people were ancestral Athabascans. The stone tools used by the ancient peoples are not the same as those used by Athabascans of the seventeenth and eighteenth centuries.

Richard Slobodin (1981:517) points out that Gwich'in culture is dominated by two "overriding principles, namely flexibility and opportunism, and a tendency to act out and mark status relationship in terms of physical relationship." These principles are supported by my own fieldwork in the Gwich'in area from 1993 to 1995 (Fast 2002). Slobodin and I both have written that the Gwich'in view themselves as different from their neighbors, whether Iñupiat or Athabascan. An overarching Gwich'in cultural premise is having a relationship to caribou. This cultural principle operates in a geographic way by having regional boundaries that match the migratory patterns of the Porcupine caribou herd. By contrast, Koyukon and other river-based Athabascans focus their territorial interests around fishing sites rather than terrestrial mammals such as caribou. While caribou and moose provide a larger volume of food and related products, such as hide for clothing and bone for tools, it is more practical to rely on fish migrations for annual food requirements. Caribou herds frustrate fish and wildlife experts because of their unpredictable migratory patterns, whereas fish reliably keep to their own spawning streams unless there are significant environmental changes. Moodie et al. (1992:159–160) brought forward a Hare narrative ("Seated at the Zenith") that associates Hare migration from the Rocky Mountains to the MacKenzie River because they discovered fish spawning there after sighting a comet.

The Gwich'in, western neighbors to the Hare, seem to have a powerful affiliation to the Canadian area rather than Alaska, and, in fact, have continued to maintain strong family and political ties despite the nation-state boundary imposed by Canada and the United States through the Gwich'in Nation (Fast 2002). The Gwich'in affinity to Canada is borne out by the unusual distribution of the key oral traditions. For instance, other Alaskan Athabascans do not have the *Ko'ehdan* epic tales in their traditional canons. Some northern Athabascan oral traditions occur throughout the vast region as well as in other indigenous regions, including tales of the dog-husband, the Traveler, and the flood. On the other hand, there are narratives from eastern Canada that have no widespread counterpart in Alaska except among the Gwich'in. In addition to the *Ko'ehdan* tales, there are tales about the Copper Woman, all part of a body of oral traditions that Petitot referred to as the Dene Bible. The Gwich'in share these tales with the

eastern Canadian Athabascans, but not with their western or southern neighbors. Why not?

In agreement with Workman, I suggest the Gwich'in have a common history, and therefore a common body of oral traditions, with eastern Canadian peoples, and that they are descendants of the people who migrated away from the ashfall toward the east into the forbidding flat lands left by the Laurentide Ice fields of the Pleistocene era. The emigrants would have encountered hostilities wherever they went, and their need to establish their own territories as well as their need to defend those territories would have caused them to develop an interest in cultivating heroes such as Akaitcho of the Yellowknife. *Ko'ehdan* is such a hero, particularly as portrayed in the western Gwich'in versions of the tales.

EVIDENTIARY SUPPORT FROM ATHABASCAN ORAL TRADITIONS

Several tales from the Petitot collection and one more recently collected support Workman's hypothesis about the psychological effects of an environmental catastrophe like volcanic eruption. In gathering these data I kept in mind that no version of any story is exactly like others, and variations always stem from social, political, environmental, historical, cultural, and personal issues. As Athabascan tales, they offer a traditional emphasis on relationships between people, mortal and spiritual, as well as survival issues pertinent to the needs of the moment. The most important of these in terms of indigenous support of the migration of Athabascans after an eruption is from the Hare Athabascan from the Petitot collection.

THE ÉMILE PETITOT COLLECTION

Émile Petitot collected, transcribed, and translated a collection of tales from several Athabascan nations that were published in 1886. They were translated into English from French in 1976 by the Programme Development Division of the Department of Education of Yellowknife, Northwest Territories, Canada. There are discrepancies between the 1886 and the 1976 editions, apparently stemming from a twentieth-century comparison of versions in the original languages. Among the discrepancies are changes in national designation, such as from Hare to Slavey. While some of the trouble may have come from problems in cross-cultural communication, it may also have been related to choices made by Petitot or later First Nations people. As an example, Petitot's 1886 edition presents two self-designations for the Hare: *Kha-tchö* on the east, and *Kha-tPa gottiné* in the west. The 1976 translation classified all of Petitot's Hare tales as neither of these, but as *Gahchodene* (Slavey). When in doubt I relied on the French version. What follows are summaries of the tales.

Hare Tale: "L'atpa-Natsandé Et Kpon-Édin"

Petitot encountered this version of the *Ko'ehdan* narrative from the Hare Athabascans of northeastern Canada. Of the narratives offering support for the hypothesis that Athabascans might have migrated from another location into northeastern Canada due to volcanic activity, this tale is the most compelling. The 1976 translators named the tale "The Man Without Fire and the Woman Who Was Ravished." To paraphrase, everyone fought over Without Fire's (*Ko'ehdan*) wife (*L'AtPa-Natsandé*). A chief, *Yamon-kha* (Petitot 1886:162) or White Horizon (Petitot 1976:38), kidnapped her and took her to his people. *Yamon-kha* lived near a mountain beside a big lake. His people lived inside the mountain. The men who lived inside the mountain behaved just as men did who lived outside the mountain. Dogs played inside, as did foxes. *L'AtPa-natsandé* was determined to escape, so she built a fire inside the mountain and escaped to live with her husband once again (Petitot 1886:162–164; 1976:38–39).

Yamon-kha or White Horizon has been seen by some scholars as a metaphoric reference to the Inuit, possibly the Mackenzie River Eskimo or Copper Eskimo of Nunavut, bordering Athabascans in Canada. Ironically, the Athabascans of the Canadian east do not have the matrilineal system of other northern Athabascans, and yet *L'AtPa-natsandé* is an obvious metaphor for the Prize Women as Slobodin (1975) describes for the Kutchin (now known as Gwich'in) of the story. Such Prize Women, characterized by superior intelligence, were reputed to be abducted frequently between Inuit and Athabascan villages. Because the kinship system of eastern Canadian Athabascans is bilateral, the emphasis on female power is radically different from western Alaskan Athabascans, and like that of their Inuit neighbors. Athabascan women in this tale and other versions like it are structurally represented as intermediaries who are at ease in two worlds (that of their enemies as well as that of their Athabascan husbands), while men of both cultures are either in one place or the other.

The dog and fox are also depicted as spiritually ambivalent beings associated with the men who occupy the spiritual source in the mountain. Another Slavey tale collected by Petitot ("The Little Loved One and Running Raven") ends with the death of a puppy. The protagonist, Little Loved One, "killed a puppy, cut off its nose, mixed its droppings and its blood together and smeared the tent with it." The last line of the story reads "Then it was really bad and Raven merely said: 'they have cursed the Great Mountain!'" (Petitot 1976:47). Dogs, thus, are metaphorically equated with the power of the mountain.

Chipewyan Tale: Deneyat'ié L'an Adjya (The Multiplication of Language)

This tale states that at first all people spoke the same language. One day a child, mimicking adults, killed, skinned, and butchered a moose, and shared its meat in each tent. The people became very troubled because they believed that the spirits fled away because the child broke a cultural rule against such mimicry. People forgot the common language, and since then many different languages have been spoken (Petitot 1886:383–384; 1976:8).

The central theme of this tale is disruption focused on language and due to a failure in a relationship with the spirits. This is a typical cultural attitude among northern Athabascans, who attribute ill fortune to their lack of respect toward spirits who control natural forces. Good fortune is usually attributed to shamanic intermediaries. One may also note the thematic bond regarding language between this tale and the next.

Dogrib Tale: Shiw Gul'a Akutchia (The Mountain That Melted)

Petitot collected this tale in 1869 from Têti-wotca, the chief "Montagnard." According to this narrative, the Old Man remade the earth and everyone headed for the high ground, where they built a tall round tower on a mountain, near the great tubes of burning rock (*derkPonni* in the original Dogrib language). As they were building it, they heard terrible voices inside saying in a sinister way, "You speak a strange language." At that instant the bitumen mines began smoking and caught fire. Then the ground began to tremble, there was a landslide, and the mountain began to melt and the fire spread. The mountain disappeared and in its place was a flat plain covered with smoking debris. The people spread out in all directions, and from then on people spoke different languages (Petitot 1886:332–333; 1976:23).

This tale, while obviously engaging in both Christian and contemporary coal mining symbolism, also culls the dominant Athabascan theme of mountains as a source of the spiritual power. Again, language themes are related to issues of disruption. While which cultural motif dominated the storyteller's version is always an interesting question, a more salient issue is to expect that the storyteller was using whatever tropes he or she had in common with Petitot to communicate the basic text of the story. The tower imagery obviously pertains to the coal mining industry of Canada on one level, and perhaps on another it may signify an ancient source of cultural trauma.

Hare Tale: KokkPalé (The Spiker Woman, or the Rainbow)

The 1976 translation of this tale is identified as a Slavey narrative called "The Rainbow," while Petitot refers to it as a Hare tale. Both versions feature two brothers who chase a rainbow until they reached a mountain slope. An old man was there. The old man gave them an arrow and told them to use the arrow to shoot something on the condition that they not reclaim the arrow. One brother shot a squirrel and then tried to retrieve the arrow. The arrow kept running away. Suddenly a gigantic mountain surged up in front of them. Inside they heard voices of giants saying, "Your language is different." The brothers tried to throw the arrow away, but it was stuck to their hands, and eventually it led them to the top of the mountain where there were many men. They lit a fire to warm themselves. Suddenly the mountain destroyed itself, and became a vast plain. The terrified people ran in many directions, and from then on, no one spoke a common language (Petitot 1886:126–130; 1976:32–33). (The 1976 version differs from the French version only slightly.)

It should be noted that unlike the popular *Ko'ehdan* tale that narrates a typical Athabascan storyline about intertribal warfare, tales of environmental catastrophe are also common in Athabascan oral traditions. The Hare storyteller incorporated the history of a volcano into the northern Athabascan saga of two brothers who encounter a number of troublesome people or problematic hunting events. The *Ko'ehdan* story is included in the Gwich'in version of that saga. The old man is often termed the Sailor, the Traveler, the Wise Man, the person who saved the peo-

ple and animals from the flood. A common trope in these legends is that he lives on top of a mountain.

All three of the narratives presented here have many common elements. As Petitot pointed out, they all form part of a Dene Bible, meaning a body of knowledge that explains important epistemological themes for future generations. Included in those themes is the function of language in history, the role of mountains as a housing for wisdom, and, above all, the notion that mountains contain living entities that cause change. While the storytellers have also used industrial (coal mining) as well as Christian tropes, the indeterminacies implied in their narrative roles are manifold.

Hare Tale: Kottené-Tchö (The Giants)

In the 1976 version, this tale is identified not as a Hare tale but as a Slavey tale as Petitot recorded it, and in that version it is called "The Huge Giants." The story narrates a time before the Wise Man existed and all people disappeared. It is part of a saga about how Raven helped the Sailor/Wise Man repopulate the world.

The Wise Man saw a moose and went to it. He discovered a fork in the trail and turned himself into an ermine to save himself in case the people were giants. He found a perch in a tree and watched. He saw a giant hurrying toward a mountain. The giant penetrated the mountain, and the Wise Man heard voices inside. "It smells as if something is burning!" There was a big fire and the whole mountain burned along with all the giants inside (Petitot 1886:254–255; 1976:32–33).

In other Athabascan tales, the protagonist's name is translated differently from the local vernacular to Wise Man, Sailor, Grandfather, and in some, the Giant. The transformation of humans into ermines or weasels is a common mechanism among Northern Athabascans. See Deacon (1987) and Osgood (1959) for Deg Hit'an comparisons in which men and animals inhabit a great mountain, the center of their cosmological world. A giant living in a mountain once again situates the power of the numinous in mountains. The giant who lives underground or in a mountain is seen in a number of Athabascan metaphors. For instance, some of the Yukon and Tanana River Athabascan matrisibs are sometimes identified by visual symbols about underground elements such as copper or bears who hibernate in winter. Petitot also translated the Giant as "He Who Sees Ahead and Behind," possibly an allusion to notions of ascendancy and descendancy, similar to the Tlingit term *shuká*, a genealogical term that also indicates the importance of balancing past, present, and future through kinship (Dauenhauer and Dauenhauer 1987). The main concern in this context is to recognize the importance of mountains as a source of spiritual power in Athabascan symbolism.

The four oral narratives presented above provide evidence of the metaphoric importance that Athabascans of Canada place on mountains. Such an emphasis could simply be taken as environmental coincidence and common sense—that its metaphors are drawn from what is important in everyday life. Indeed, most scholars have observed the importance of rivers and mountains to interior Athabascans. However, it should be observed that the most ubiquitous environmental phenomenon, snow, is not imbued with supernatural qualities as are the mountains of these narratives. The next example in this study brings the metaphor of supernatural mountains into notions of traumatic change.

Hare Tale: Nné Ehta-son-tagé (The Changing of the Earth)

Like the preceding tales, in the 1976 translation this story, "The Earth Revolved on Its Axis," is identified as a Slavey rather than a Hare tale. It begins with Phantoms who lived in the east. The Phantoms were once dogs, but had become men. Thus, the Dene people lived in the west and are men, and men fight constantly with Phantoms.

The narrative then describes the earth turning from one side to the other, as if it was doing pirouettes. Since then the Phantomes have lived in the west and the Dene have lived in the east. At first they moved to the big sea on the east after living in the high mountains. One day an old man (*Tchanézele,* The Old Bald Man) went down to the river and discovered the fish swimming in it. He caught many of them. That was why the Dene now live beside the river (Petitot 1886 230–231; 1976:57–58).

The 1976 translation refers to the Phantoms as Koloshes, a widespread term for Tlingit. The narrative's reference to a former life in the mountains could mean many things, including a reference to a time in the distant past when the Dene lived in the mountains to the west and had to move east because of the Phantoms. The earth turning on its axis might refer to earthquakes that might have occurred in conjunction with volcanic activity.

The 1976 version alludes to a metal similar to bear dung, which may be a reference to copper, found abundantly in

Yellowknife and other parts of eastern Canada. Copper is also abundant along the Copper River of Alaska, near the Wrangell–St. Elias mountains. As mentioned previously, bear is also a metaphor for Athabascan kin groups, although the origins and consistency of its use that way are as ambiguous and tantalizing as the relationship between volcanoes and Athabascan migration. Bears, as mentioned before, are seen as creatures of the underground in Athabascan traditions, as is copper.

The final narrative from the Petitot collection brings in notions of migration. Petitot's 1886 version terms it Gwich'in, while the 1976 translation has it as Slavey. Petitot noted that he collected it from Sylvain Vitoedh in 1870 in Fort Bonne-Esperance (Fort Good Hope), a community in the Slavey area. It is possible that Vitoedh was from or had traveled to Gwich'in territory, as he also told him the Gwich'in version of *Ko'ehdan*. Thus, the potential for confusion about its national source is obvious.

Gwich'in Tale: Kpan-t'et NaxatsetoetPal (Funeral Passage among the Tents)

This story begins at night with the time of snowfall during a lunar eclipse. People cook meat and put it into bags that the young people circulate among the tents. The people divide into two groups and circle around the tents. As they walk, they sing, "Pass! Shrew mouse two times in a cross jump over the earth quietly! Mountain pines, come!" (Petitot 1886:70–71). This is done at a lunar eclipse to beseech abundance from the Man in the Moon.

The 1976 translation has this variation: "It's heavy! Shrew-mouse, you have carried me on your back. Wooded Mountain, come!" (Petitot 1976:47–48).

While this tale does little to support the notion of volcanic eruption leading to a migration into northeastern Canada, it does reveal two of the most important Athabascan tropes: migration and mountains. The metaphoric association of the moon with abundance is common throughout the world, and like this Athabascan narrative, there are many ways of calling upon that power to assure human beings of food. The Man in the Moon could refer to the tale of the boy who used his shamanic power to call caribou to his band. When the people disobeyed his restrictions, he left them and became the Man in the Moon. The people were supposed to save a hindquarter from the leader of the caribou to give to the boy. In other versions, they are to let the leader pass without killing it. This form of ritual feeding is intended to guarantee more food will be available as well as to instruct young people on the need to reserve food for needs that are not immediately obvious.

The second important Athabascan custom is more prosaic and very common. Harvesting such deposits of food left by mice is a common practice in many parts of Alaska. Along with this custom is the idea of leaving some food behind for the mice. In addition, the shrew is omnivorous, living beneath the leaf litter and grass that would be covered by ashfall (Hall and Kelson 1959:22). Their fortitude and example of survival would be important reminders after a traumatic volcanic eruption. Thus, a story heralding mice as having carried the people on their backs is a gentle tribute to the value of harvesting mouse food to stave off times of starvation.

Another important metaphoric construction in the story is the idea of breaking into two groups, a possible reference to the jig dancing styles that French Canadian fur trappers introduced to both Canadian and Alaskan Athabascans. It could also reveal another practical idea that when migration is a must, a family should break into two groups in hopes that at least one half will survive. In any event, it should be noted that since the major contents of the narrative are both metaphoric as well as instructive, it is also possible that the idea of a funeral march through the tents is equally metaphoric and instructive. During times of starvation, a notion supported not only in narrative but by archaeological discoveries as well, migration might be necessary.

The shrew mouse among Koyukon and Gwich'in is an omen of death as well as a characteristic of power. Having a mouse as one's spirit guide is still considered an honor among Alaskan Gwich'in.

Han Gwich'in Tale: Däänooje (Long Time Ago Story), Sraa Ko,ey Cha,Lut Clut (No Sun and Lots of Ice)

A contemporary oral narrative collected by Gerald R. Isaac of Whitehorse gives an indication of the impact that might stem from an environmental catastrophe. Isaac transcribed and translated a story told by his grandmother, Eliza, who told him the story in about 1955, when he was five. According to his grandmother, there was a year when there was no sun and the ice stayed in the river a long time. The people were afraid that the Creator was punishing them. The *luk cho* (salmon) had to swim under the ice and it wasn't easy to catch them in the fish traps. *Gah* (rabbit) did not change color, and moose and caribou were confused. The bull moose got very friendly with each other during

rutting season instead of fighting as they normally did at that time (Isaac 1990). Isaac also wrote that he discovered some of the literature regarding the volcanic eruption in the Wrangell Mountains, and he considers that the geological findings substantiate his grandmother's story.

Many elements in Isaac's tale support Workman's hypothesis, particularly the winter occurrence of the eruption and the devastating effect it had on subsistence activities. However, it is also possible that the climatic changes Isaac's grandmother describes may have occurred due to the 1815 eruption of the Tambora stratovolcano (Decker and Decker 1989:211–212), which reportedly affected weather on a worldwide scale, including Alaska. That event occurred well over a century before she told the story to Gerald Isaac, giving an idea of how long a traumatic event can remain in cultural history via oral traditions. Of more importance is to acknowledge that Athabascans have reported the impact of volcanoes through oral tradition, making note of the environmental changes that have both a physical as well as a subsistence orientation.

CONCLUSION

This has been a study of the relation between environmental catastrophic events and Athabascan oral narratives. While not directly supporting Workman's hypothesis of the Mount St. Elias volcanic eruption of over a millennium ago, there is sufficient evidence in tales collected in the nineteenth and twentieth centuries to indicate how Athabascans would react and, moreover, how durable such narratives can be. In this study I noted that some themes, such as mountains with internal fires, are reported in the eastern Canadian Athabascan area rather than in the Alaskan Athabascan area. This coincides with the distribution of ashfall and the potential need to remain aware of why and how their ancestors came to be in that particular part of the world. Workman enlisted the glottochronological reconstruction of Na Dené language distribution by Michael Krauss to support his hypothesis. Three of the narratives presented here attempt to explain the plurality of languages, and two of them tie that issue to mountains with internal fires. Athabascan oral traditions explain key factors about the world and enjoin the upcoming generations to be successful by knowing the past. Important clues are encoded in oral tradition and explained outside of the narrative to children in a variety of enculturative techniques, such as song, ritual, and dance. It is my opinion that Athabascan oral narratives offer important support to William Workman's hypothesis of Athabascan migrations.

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ONE OF THE BOYS: ALAN MAY'S THREE SEASONS WITH ALEŠ HRDLIČKA IN THE ALEUTIAN ISLANDS

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ABSTRACT

Aleš Hrdlička recruited a number of young men as crew members for his three seasons of archaeological fieldwork for the Smithsonian Institution in the Aleutian Islands from 1936 to 1938. However, only one of his "boys," Alan May, an apple grower from Wenatchee, Washington, endured the experience for all three seasons. Why this might have been so, and what it was like to work with the "Old Man," are revealed in glimpses from May's carefully kept journals from those years.

KEYWORDS: Alaska memoirs, physical anthropology, archaeological field methods

INTRODUCTION

Earned the old-fashioned way—through his own published works, by professional accomplishments, as well as through personal contact with those whom he met and with whom he worked—Aleš Hrdlička's reputation remains secure in the annals of Alaskan anthropology. Today, he is well remembered as the country's most renowned physical anthropologist of the first half of the twentieth century, yet one whose appalling field procedures created repercussions lingering even now (Krogman 1976; Mason 2006; Miraglia 1992; Prokopec 2004; Pullar 1994; Schultz 1945; Street 1994). Hrdlička is also remembered, as Loring and Prokopec (1994) titled a review of his life, as "A Most Peculiar Man." He was certainly an irascible and elitist academician, and one with a misogynist bent (e.g., Montagu 1944:116). William Laughlin, a young crew member with Hrdlička in the Aleutian Islands in 1938, wrote that "the deprecation of females recurred often and included skeletons" (Laughlin n.d.:8).

Yet while his scholarly contributions have been the subject of numerous published discussions and critiques, Hrdlička's personal idiosyncrasies today live on mostly through oral tradition—passed down over the last three-quarters of a century from those in the academic world who knew him firsthand to their students, and from them to their students. Similarly, stories of Hrdlička persist in those Alaska Native communities in which he worked. In Atka, for example, some elders in the 1970s told me about the "Doctor," or "Hard Liquor," who had visited the island before World War II. (This appellation, also recorded by Mason [2006:130] in Larsen Bay on Kodiak Island, charmingly rendered Hrdlička's unfamiliar name easier to pronounce, but, since Hrdlička rarely drank, was misleading.) In his recent review of the life and contributions of William Laughlin, who died in 2001 and had first traveled to Alaska in 1938 as a student crew member of Hrdlička's final field season in the Aleutian Islands, Albert Harper, a former student of Laughlin's, noted with perhaps only slight exaggeration that Laughlin recounted stories of his summer in the Aleutians with Hrdlička "on a daily basis for the next 55 years" (Harper 2002:7). Like William "Bill" Workman, I and others who also studied with Laughlin would likely not dispute Harper's claim.

As it turned out, Laughlin survived his experience with Hrdlička to become the foremost Aleutian anthropologist of the 1960s and 1970s (Frohlich et al. 2002). It may also be noted that it was Laughlin who, as one of

Bill Workman's professors at the University of Wisconsin, was instrumental in getting Bill to the field in Alaska—to Kodiak Island—in 1962. By my admittedly tenuous reckoning, therefore, Bill, like me, is a direct lineal academic descendant of Aleš Hrdlička. It is fortunate for Bill and me that intellectual, unlike genetic, inheritance allows for substantial change and evolution within a mere generation, since there are now many of us in the broad field of Alaskan anthropology who can work our own lineages back to Hrdlička.

On a more serious note, I offer this brief perspective on the work of a pioneer Alaskan anthropologist to honor the importance Bill Workman has always given—in his classes, in his writings, and in personal conversations—to acknowledging and placing in historical context the efforts of those anthropologists and others who, for better or worse, led the way in northern studies. Bill himself has been an exemplary leader in our field, and I pay tribute to him here for his own contributions, for his generosity, and for the sense of history that he has consistently imparted to his efforts.

HRDLIČKA IN THE ALEUTIANS

For three field seasons, from 1936 to 1938, the nation's most prominent physical anthropologist, Aleš Hrdlička, set forth to southwestern Alaska—returning to complete several years of archaeological investigations on Kodiak Island and, for his first time, to the Aleutian Islands and to Russia's Commander Islands, west of the Aleutians (Hrdlička 1945). These ventures continued his program of anthropological studies in Alaska, begun in 1926 and continued in the late 1920s and early and mid-1930s (Hrdlička 1930, 1943, 1944).

In each of his three Aleutian seasons, Hrdlička took with him a small group of young men—"boys," as he often referred to them. In 1936, the group included George Corner, Sidney Connor, M. Osborne, and Alan May. The following year, he was accompanied again by May and Connor, along with newcomers Paul Guggenheim, Paul Gebhard, Walter Wineman, and Stanley Seashore (Fig. 1). The final season, 1938, saw Hrdlička with four new faces, William Laughlin, Laughlin's Willamette University friend William Clemes, Harold Cowper, and James Botsford (the latter two both from Buffalo), along with, for his third season, May. It appears for the most part that these men had come to Hrdlička's attention through chance encounters and personal and family contacts (Laughlin, for example, recommended Clemes to Hrdlička). Regardless, almost all seem to have been young college men who, perhaps significantly, had little, if any, background in archaeology, anthropology, or Alaska.

All, that is, except Alan May. Born in Norwich, England, in 1895, May served as an officer in the British Army in World War I before immigrating to the United States in 1918. May was in his early forties and married at the time of his three seasons with Hrdlička. Moreover, although he was then an apple grower in Wenatchee, Washington, May had a long-term interest in archaeology, having traveled extensively and having served in the mid-1930s as president of the Columbia River Archaeological Society. It was in the summer of 1935, when Hrdlička made a visit to this organization, that the two met. May showed him some skeletal materials and artifacts from the area, an encounter that ultimately led to his joining Hrdlička the following summer.

This paper is based on the personal diaries of Alan May, not only the only one of Hrdlička's "boys" to take part in all three seasons of Aleutian Island fieldwork, but also, as far as I know, the only one to have maintained a detailed, extended written account of almost every day of his time with Hrdlička. To my knowledge, no similar document exists for any other part of Hrdlička's career.[1] Following each field season, May faithfully and carefully typed his daily handwritten notes and bound them with his own photographs and items such as telegrams, letters, and newspaper clippings pertaining to his trips. May's commentaries, totaling well over four hundred pages of text, range broadly over his varied experiences. From the other passengers aboard the steamers from Seattle to Alaska (including such luminaries as the artist Sidney Lawrence), to the villages and towns they made brief stops at along the way, to his fellow crew members, May offers a rich chronicle of his adventures to the Aleutians.

Although I was familiar with May from both his own (May 1942) and Hrdlička's (1945) accounts, my opportunity to know him personally occurred in 1982, when he contacted the Anchorage Museum of History and Art (now the Anchorage Museum at Rasmuson Center) to discuss donating some of his personal collection of arti-

1 Paul Gebhard, a member of Hrdlička's 1937 crew, recently kindly gave me a copy of his diary and photographs from that year. It is much briefer than May's.

Figure 1. The 1937 field crew on Unalaska Island. From left: Wineman, Gebhard, Guggenheim, Connor, May, and Seashore (University of Alaska Anchorage Archives, Alan May Collection, Photograph 42a).

facts from his world travels, including specimens from the Aleutian Islands collected during his trips with Hrdlička. The museum contacted me regarding this potential donation, prompting me to begin a correspondence with May that lasted through the 1980s. In 1983, I had the good fortune to visit May at his home on Whidbey Island, Washington, outside of Seattle (Fig. 2). I again saw May when he came to Alaska to visit and to arrange transfer of his papers to the University of Alaska Anchorage Archives. May died in 1993.

This paper, then, is really about two people. On one hand, it explores the manner and personality of Aleš Hrdlička over the course of three Alaskan field seasons in the late 1930s, as seen through the words of May. On the other hand, we also glimpse May himself and come to appreciate how it was that he was drawn to work for such a difficult task master. I focus on two quite interrelated

Figure 2. Alan May outside an outbuilding at his home on Whidbey Island, Washington, in 1983 (Photograph by Douglas W. Veltre).

subjects about which May frequently wrote in his diaries—first, Hrdlička's archaeological interests and field methods, and, second, Hrdlička's personality and treatment of those around him. Perhaps because May was too old to accept without question Hrdlička's often harsh ways, and perhaps because he was by nature somewhat outspoken, his diaries, though polite and perhaps even restrained at times, nevertheless speak with some candor about his feelings towards Hrdlička and, to a lesser extent, the others on the crews. In this regard, it should be noted that May was clearly aware of the sensitive and critical nature of many of his entries. In a brief preface to the diaries he wrote: "It should be remembered that this account has been copied from a diary written at the time of the occurrences and that it has not been rewritten. If it had been rewritten, doubtless many of the remarks, criticisms, and statements would have been modified or left out entirely." What follows, much in his own words, is but a sampler from May's experience with "The Doctor," or, more frequently, "The Old Man."

HRDLIČKA'S ARCHAEOLOGICAL INTERESTS

That Hrdlička was not much of an archaeologist is beyond dispute. He was fixated on acquiring human remains, often so disinterested in other materials that he frequently let his "boys" keep artifacts they found, including items from various burial caves. On top of this, he was generally a frustrating man to work for. Over and over again, May's diaries reveal Hrdlička's stubborn and arbitrary nature. For example, in 1938, Clemes, Laughlin, and May collected some blades from the Anangula site on a small island offshore from Nikolski village on Umnak Island. May "suggested to the Doctor that he had better come and look, but no, he preferred to go to the show [i.e., movies were shown aboard the ship they were traveling on]—'dere is nothing dere' he said. A foolish statement considering that he had never been on the island and had no means of knowing anything about it" (5 June 1938).[2] That site, which might not have interested Hrdlička in any case since it contained no organic remains, including burials, would eventually become one of the oldest known sites in the entire Aleut region (McCartney and Veltre 1996).

Similarly, when May learned from someone in Nikolski of a possible mummy cave on Ilak Island in addition to the one they had been to the year before, he approached Hrdlička with the suggestion that they add the island to their itinerary, as they were planning on sailing past it anyway. "'Dere is nothing to it—I am not interested' he replies. What can one do with a man like that? Inconsistent to the nth degree" (6 June 1938).

Excavating always went quickly—there were no small hand tools, only picks and shovels, and there was little or no effort made to take notes, make plan drawings, or the like (Figs. 3–5). An occasional photograph might be taken, but usually only if the subject were an especially well-laid-out burial and only if the picture could be made before Hrdlička insisted that the burial be removed. Hrdlička was always impatient with the progress the boys made while digging, but actually slowed them down with his advice. May wrote (14 June 1938):

> We, that is, Clemes, Laughlin and I were working along in fine shape and then when the Doctor came out he had so many suggestions . . . to make, had to show the boys how to dump a wheelbarrow and so on that he generally upset things. He never gives a word of appreciation or praise no matter how well the boys do. He is a hard man to work for.... While he stayed around we could only accomplish about half as much work. . . . He [would] tell the boys they were not holding their shovels the correct way and so on. Discouraging.

A delightful drawing made by Gebhard in 1937, included in May's diaries, illustrates the working conditions (Fig. 6).

On another occasion, when May had excavated alone in the morning, he visited Hrdlička at lunch time and inquired if the Doctor was going to work in the afternoon. Obviously feeling rejected by the crew, Hrdlička replied, "Of course I vork, but nobody seems to vant me to vork with them." May, very politely and diplomatically, invited Hrdlička to join him, but in his diary silently complains, "he cannot make a straight line and generally messes up my nice clean looking cut. ... He does not seem to realize that he spoils it when he works with me" (25 June 1938).

Interestingly, May's realization that Hrdlička was a poor archaeologist came early. After returning home from his first season, May wrote the following as a postscript to his 1936 journal:

> Dr. Hrdlička's method of excavation was completely new to me, but, of course, I assumed such a prestigious man knew what he was doing. His method was to commence at the bottom of the site using a pick until undercut enough to cause

2 Here and subsequently, citations to May's diaries consist of the date of entry.

Figure 3. Excavation on Amaknak Island, Unalaska Bay, in 1936. Corner (far left), Hrdlička (far right), and unidentified visitor to the site (University of Alaska Anchorage Archives, Alan May Collection, Photograph 148b).

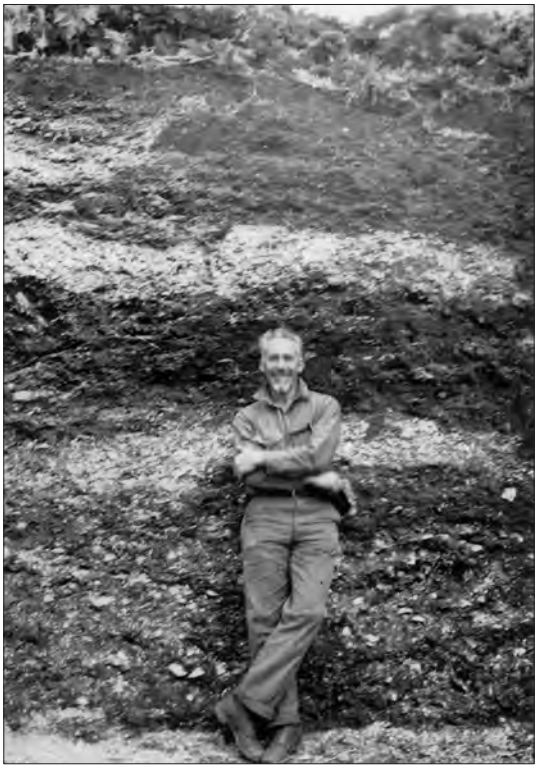

Figure 4. Alan May in front of twelve feet of midden exposure, probably on Amaknak Island, Unalaska Bay, in 1937 (University of Alaska Anchorage Archives, Alan May Collection, Photograph 55c).

Figure 5. "'King of Attu,' seated on his throne of whale bones." Alan May in 1936 (University of Alaska Anchorage Archives, Alan May Collection, Photograph 124a).

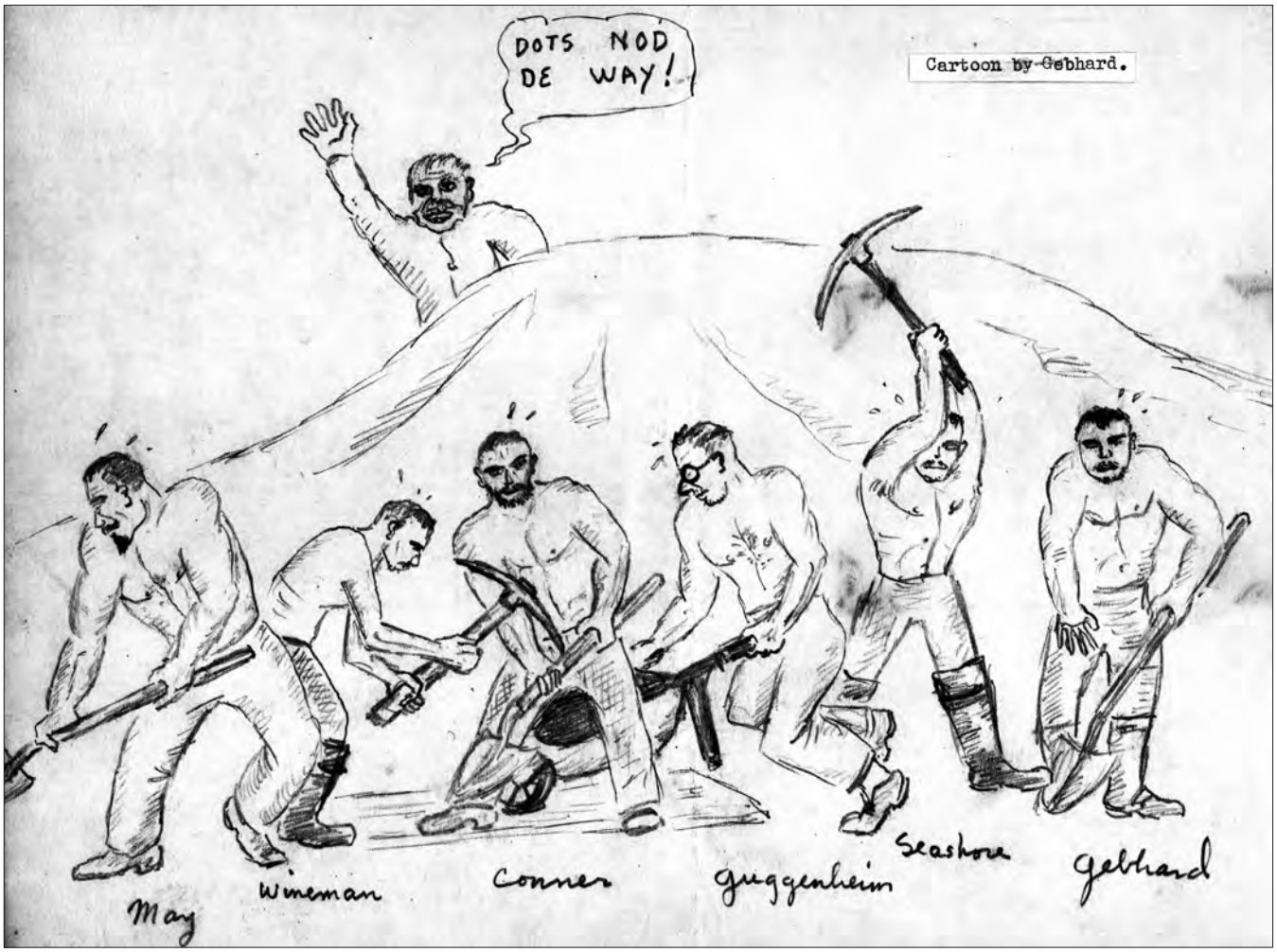

Figure 6. Drawing by Paul Gebhard in 1937, showing Hrdlička, in the rear, shouting digging instructions to that summer's crew. From left: May, Wineman, Connor, Guggenheim, Seashore, and Gebhard (University of Alaska Anchorage Archives, Alan May Collection, unnumbered illustration).

> some of the upper portion to fall down. This debris was visually searched for artifacts and then wheelbarrowed to the dump. Many artifacts were found on the dump later. Stratigraphy [i.e., excavating by following observed stratigraphic units] as I knew it was non-existent. The Doctor divided the site into three parts—the bottom, the middle, and the upper, and we were supposed to know which level the specimens came from. Portions falling from the upper level would, of course, include some artifacts from the middle level or even possibly the bottom level. Thus, stating that artifacts came from such and such a level was haphazard in the extreme. The usual way, of course, is to start at the top and work down six or perhaps twelve inches at a time. I think this was too slow for the Doctor, for his main interest was to obtain as many skulls as possible.

Regarding Hrdlička's preoccupation with human remains, May includes in his diary a poem written by crew member Osborne recounting their excavation of mummies from Kagamil Island—an enterprise that involved transporting bags full of bones over a rough beach and into a small boat in a "bucket brigade" style. A portion of that poem (undated 1936) reads:

> Let the world beware
> And stay out of his hair
> When a harvest of skulls he's a-reaping.
> He'd rather have bones than all precious stones,
> Hot coffee or snoreless sleeping.
>
> On Kagamil he had his will,
> Two caves right full of mummies.
> And on the shore of the bight

Was a very strange sight,
Mummies relayed by the dummies!

That the boys felt that they were, indeed, "dummies," mere unskilled laborers, is attested to by another poem—actually, a song—written by Clemes and meant to be sung to the tune of "Oh My Darling, Clementine." One stanza goes:

Here's the Doctor, here's the Doctor
Who has combed the U.S.A.
For the boys with mighty muscles
And their brains of straw and hay.

Hrdlička did, in fact, have his doubts about the capabilities and maturity of his crew members, and his paternalistic attitude comes through time and again. In his own posthumously published account of his Aleutian expeditions, much written in diary-like form, Hrdlička wrote (1945:353):

> The boys are disorderly, as usual. Their wives should thank me some day for the little discipline I am able to instill into them. The average American college boy is certainly short of a paragon in many respects. And their discussions are often so juvenile. Not one I have ever had knew how to sing or play an instrument, nor how to keep a house and even himself in order, cook a decent meal, or properly pack a box. But perhaps this was due to some un-natural selection. . ..

However, Hrdlička did favor May, who, it should be reiterated, was older and more experienced in archaeology than the other crew members. Frequently, Hrdlička asked May to take charge of the boys, and Hrdlička occasionally spoke to him about career opportunities in archaeology.

Hrdlička's paternalism towards his "boys" included his fancying himself as quite a cook. With apparent self-satisfaction, he wrote: "Make wonderful cooking inventions! At every meal have something new and tasteful—and never a drop or crumb left over. Cooking, right cooking such as ours, is not a drudgery but a high art, art to make much from little, and that tasteful. And there is no end of possible inventions. Time and again the boys wonder where I get it all, yet it's the same few substantials . . ." (Hrdlička 1945:353). Not surprisingly, the boys had a different take on things, as May described (13 July 1938):

> Our food supplies seem to be somewhat off balance. Apparently the Doctor ordered exactly what he wanted and paid no attention to my revised list. [More than once May was asked to help make supply lists for Hrdlička, only to have his efforts ignored.] ... We have fifty pounds of coffee and only two coffee drinkers amongst us! With half a pound of bacon per person per day the Doctor at the last minute decided to get another side! Then there is the large amount of cheese, 75 pounds, but only three of us eat cheese.

But, ever the problem-solver and optimist, May simply wrote, "However, we'll get along all right."

In this vein, the song by Clemes quoted above continues with the following stanzas:

Here's the Doctor, Here's the Doctor
Every morning just at six
Bellows "Time" and grunts a warning
Better start to swing your picks.
Fries the cookies in the washpan
Pours the butter in the tea
Makes us sniff his queer concoctions
Tastes like kelp weed from the sea.

Other examples of Hrdlička's poor planning skills, combined with extreme frugality, fill May's diaries. When they were camped in two cabins on Amchitka Island, for example, May wrote concerning their equipment and food supplies: "I find that the Doctor's idea of sufficient equipment for us three to cook and live with is one small frying pan, two pots and one pail. No plates, cups or any thing else" (12 July 1938). Hrdlička, living in a different cabin from May, "complains that he has no knife, fork or spoon for himself 'and now de ship is gone'!" May scrounged about the two cabins and found utensils for the helpless Hrdlička.

Some of Hrdlička's lack of foresight is quite remarkable; one can almost hear the exasperation in May's voice: "the Old Man has come up here [to the Aleutian Islands], of all places in the world, without any hip boots. And he was always so insistent on the remainder of us having them. It looks as if we shall have to carry him across all rivers and in and out of the launch at most landings" (2 June 1938). This situation was captured on film (Fig. 7).

Another of Hrdlička's traits that frustrated the crew was his frugality. One of many examples occurred on Kodiak Island when Hrdlička had the opportunity to purchase some new nails for crating up the last of the materials from his work at the Uyak site. May wrote of Hrdlička's reaction to the new nails: "'No, no. Does wont do, ve vant old ones, rusty ones' he said. So after a while some old rusty bent nails were found and given to him. This made him quite happy for he had saved a few cents by not buying new nails!" (27 May 1938).

Figure 7. Carrying Hrdlička ashore in Nikolski Village, Umnak Island, 1938 (photograph courtesy of Paul Guggenheim).

Paternalism aside, Hrdlička could also be quite selfish. Once (27 May 1938), when Laughlin was "so terribly sick and weak" on board ship, Hrdlička did not even offer him the use of the second, unused bunk in his cabin, and Laughlin had to remain sleeping on the floor. On another occasion, this time on Amchitka Island when the group was split between two nearby cabins, May and the boys with him needed the gasoline that was in Hrdlička's cabin. Because Hrdlička wasn't going to use it, they asked if they could have it: "However, although he has no use for it he will not let us have it" (13 July 1938).

DISCUSSION

May's diaries are full of fascinating glimpses into the methods and manners of Aleš Hrdlička.[3] As such, they comprise documentation not found elsewhere of one of the key figures in American anthropology. While unfortunate, it might not be particularly surprising that such a prominent figure would be so difficult to work for. Hrdlička's elite manner, likely much more prevalent in the early twentieth century, might still be found among anthropologists and other academics.

Far more difficult to reconcile from May's diaries are Hrdlička's horrendous field methods and his sole preoccupation with human remains, even when put in the context of his times. Although the younger crew members may not have been fully aware of Hrdlička's shortcomings in this regard, Alan May certainly was. In an undated postscript to his three-year journal he wrote:

> He was the foremost physical anthropologist in the country, but he definitely was not an archaeologist. I think his interest in archaeology was merely a means of obtaining more skeletal material. He wanted human bones; often he would say 'Don't bother with that... vat ve vant is bones.' There is no doubt in my mind that by failing to use the accepted stratigraphical method of excavation he ruined more than one site.

Hrdlička's ability to organize and lead three seasons of work in the Aleutian Islands resulted from his autocratic decision-making—his unchallengeable "father knows best" attitude—and this outweighed his lack of scientific rigor (Fig. 8). I have no doubt that, had he been in charge of a crew of "boys," May *himself* would have done a better job of conducting an archaeological program in the Aleutians than did Hrdlička. That for his Aleutian expeditions Hrdlička sought the field assistance, with the exception of May, of crews who lacked substantial archaeological experience and, hence, were not likely to challenge his authority is consistent with his lifelong pattern of preferring to work alone (Street 1994:10).

His criticisms aside, however, May certainly liked Hrdlička, and he catered to him with only occasional outward complaint. This was especially clear during the third field season, 1938, when May noticed that Hrdlička's physical condition had deteriorated over the previous year. One night (9 June 1938) on board ship while anchored off Kanaga Island, Hrdlička accidentally dropped his notebook to the floor. As he picked it up for him, May saw a separate paper with "My Last Will and Testament" written in Hrdlička's hand. "I do feel sorry for the Old Man, he has aged so much in the last twelve months," May wrote. That night, Hrdlička's failing health haunted May: he had a nightmare in which Hrdlička died while they were on Amchitka Island, and the crew did not know what to do with the body. It is obvious that, despite Hrdlička's peculiarities, May truly felt affection for him (Fig. 9).

In his obituary for Hrdlička, who died in 1943 at age seventy-four, M. F. Ashley Montagu (1944:116) wrote: "Hrdlička was a kindly soul, and appeared much more formidable than he really was. . . . In some ways Hrdlička reminded one of a little boy, a shy little boy." This perception was also noted by May, a portion of whose postscript offers a fitting end to this paper:

3 Preparation of May's full diaries for publication is in progress.

"The Old Man" as we called him was, to say the least, an odd character, but in spite of all his strange idiosyncrasies I sincerely liked the old chap.

The Old Man was a hard man to work for. It was rarely he ever gave a word of commendation and just saying Thank You appeared to be an effort for him.

Actually he was an enigma, totally incomprehensible, for he was egotistical, imperious, domineering, arrogant and selfish while he also had many child-like qualities. Despite all this I learned to like the old chap though of course there were times when I detested him. Oftimes his manners were atrocious though he knew better. When the occasion warranted it he could turn on the charm like a faucet, and when he wanted he could indeed be most charming. . . . Yes, I liked him, admired his erudition, even though he was quite impossible most of the time.

Figure 9. Hrdlička (left) and May share a laugh in 1938 (photograph courtesy of Paul Guggenheim).

Figure 8. Hrdlička lectures to his crew and others aboard the Ariadne***, 1938 (University of Alaska Anchorage Archives, Alan May Collection, Photograph 16b).***

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TALES OF THE NORTH PACIFIC

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ABSTRACT

I present a series of "just maybe so" stories in six sets or interludes, in the referents of many of which William Workman has had some hand. Connections between any or all of them may be subject to argument; all of them—of course—are told from a vantage point on the northern Alaska Peninsula. These interludes include: (1) Of Anangula Times; (2) Of AST Times (episode 1); (3) Of Ocean Bay Times; (4) Of AST Times (episodes 2 and onward); (5) Of Kachemak Times; and (6) Of Koniag Times.

KEYWORDS: Alaska Peninsula archaeology, Aleutian Islands archaeology, Kodiak Island archaeology

INTRODUCTION

From Prince William Sound westward (Fig. 1), the northwest coast of the Pacific Ocean is home to open-water maritime peoples of related language stocks and superficially similar material cultures. In the past those people have sometimes been lumped as one. But by now they should be recognized as having a history much more complicated than superficial views might suggest—a history complicated enough to inspire the creation of some number and variety of narratives, not necessarily accurate, not necessarily mutually uncontradictory, but always nominally explanatory. These are "just so" stories—or what with a certain scientific skepticism I prefer to call "just maybe so" stories. I give some examples.

OF ANANGULA TIMES

The Anangula Blade site, located on an islet off the coast of the larger Umnak Island, was discovered in 1938 by William Laughlin and a companion, both members of Aleš Hrdlička's crew visiting the Chaluka midden nearby on the main island. Fourteen years later Laughlin revisited the site and collected artifacts from blowouts—blades, scrapers, and cores (Laughlin and Marsh 1954). It was in 1962 that one of Laughlin's college crews trenched the Blade site and located the buried occupation layer that was radiocarbon aged at around 8,000 ^{14}C yrs BP (Laughlin 1963; McCartney and Turner 1966). Through the influence of the geologist Robert Black it was then argued that the late-glacial sea level, tens of meters lower than modern levels, had exposed the Bering Platform to a point where it had been possible for ancestral Anangula people to reach the site by tramping across dry land (Black and Laughlin 1964)—an idea that Laughlin would maintain and elaborate, together with arguments presuming to connect the people of the 8,000 ^{14}C yrs BP Blade site with those represented at 4,000 ^{14}C yrs BP Chaluka across a gap of thousands of years (e.g., Laughlin 1967, 1980; Laughlin and Aigner 1975).

In 1974, however, the geologist Black reversed himself and concluded that when the Blade site was occupied the local sea level was several meters higher than it is now. Further, he concluded that a major volcanic ash deposit immediately overlying the Blade site showed that an eruption had caused the site to be abandoned (Black 1974).

By the mid-1980s apparently related blade sites were recorded from the Unalaska Bay region of northernmost Unalaska Island (Veltre et al. 1984). Two of them on small Hog Island have been excavated, dated at about 8,000 ^{14}C yrs BP ago, and, like a third related site, lie 20 m or more above modern high tide and significantly higher than later

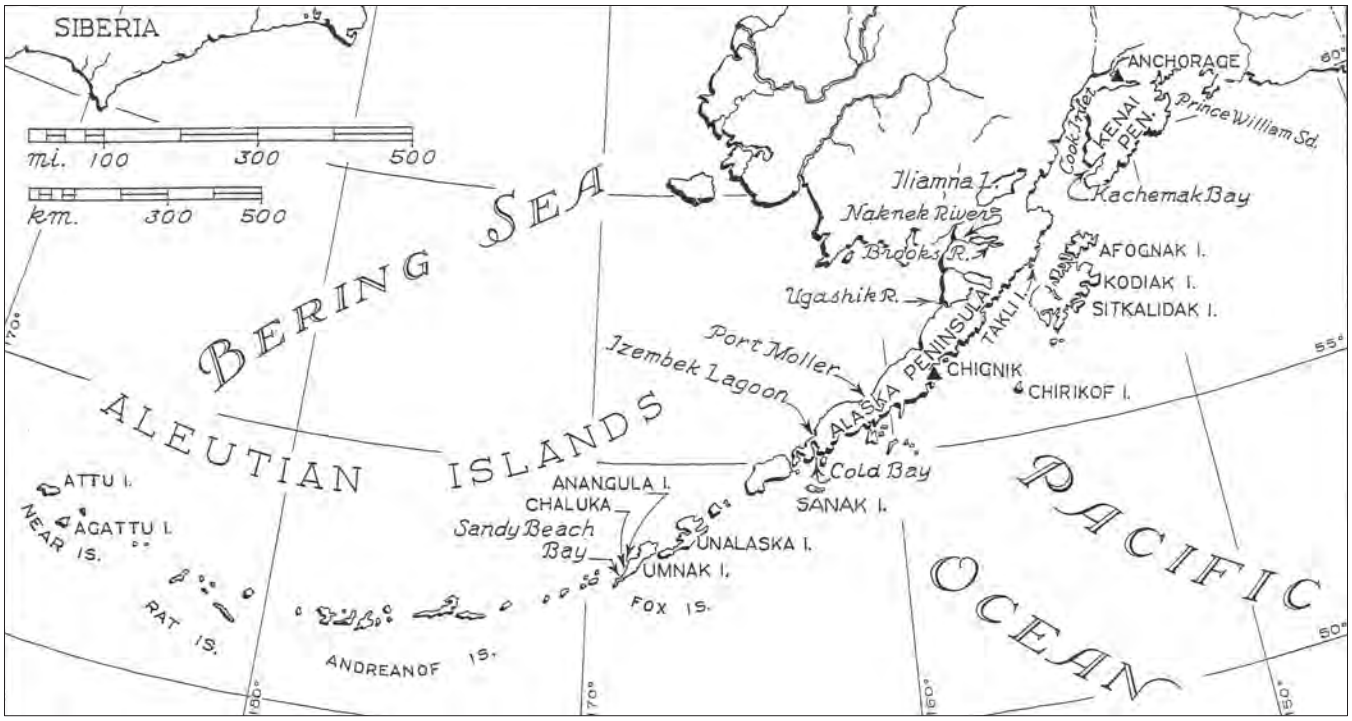

Figure 1. The North Pacific region, with major locations mentioned in the text.

sites in the vicinity—implying that sea level was indeed higher at the time of occupation. Furthermore, all were found to lie beneath volcanic material of a pyroclastic flow from nearby Makushin Volcano, which would have ended occupation of the sites with a fiery bang, or at least with a very heated hint to the people to go away fast (Dumond and Knecht 2001; Knecht and Davis 2001).

Where would the Anangula-related people have come from if water was high? Presumably by boat from the tip of the Alaska Peninsula, although sites that might be related to the Blade site have thus far been found only higher up the same peninsula (e.g., Dumond 1981:103–110; Henn 1978:61–65, 75–78). And where would those people have gone? Where indeed? All one can say is that the only related sites excavated so far have shown no sign that they waited around anywhere nearby.

OF AST TIMES (EPISODE 1)

In 1960, the first scant traces of people of the Arctic Small Tool (AST) tradition were discovered in the Naknek River region of the Alaska Peninsula and labeled the Brooks River Gravels phase (Dumond 1971, 1981:120–131). As more and better traces were recovered over the next few years, including square semisubterranean houses, I decided that people like those of the Anangula Blade site must have been ancestral not only to later Aleuts but also to the microblade-making Arctic Small Tool people and what I then presumed to be their Eskimo descendants. With the Anangula site and Small Tool sites closest together near the Alaska Peninsula, it seemed to me in my simplicity that intermediate relatives between the two should have lived there as well. In a paper written at the beginning of 1964, I predicted that on the Alaska Peninsula "site-unit similarities which serve to unite the Aleut and Eskimo areas will be found at a time preceding 4000 BC" (Dumond 1965:1251).

That is, these would be people descended from Anangula and ancestral to those responsible for the Chaluka midden on one hand and for the Brooks River Gravels phase of the AST tradition on the other. That was my own maybe-so story of the time, and as that paper awaited publication, I waited for an Alaska Peninsula complex 6,000 radiocarbon years old.

OF OCEAN BAY TIMES

The first site of what would be known as the Ocean Bay tradition was found in 1963 in a roadcut near Ocean Bay on Sitkalidak Island of the Kodiak group, by a party led by Donald W. Clark with William B. Workman as a member. Their collection represented two components: The lower

included heavy stemmed and stemless bifaces of chipped stone, a formed stone lamp, and a very few pieces of polished slate, and was called Ocean Bay I. The upper had a higher proportion of polished slate knives and lance blades, generally sawed to shape, and became Ocean Bay II. When the first published description appeared, the radiocarbon age for Ocean Bay I was given as about 5,500 years, for Ocean Bay II roughly 3,900 (D. W. Clark 1966).

In 1964, a collection morphologically similar to Ocean Bay I was blundered onto by an Oregon survey party on Takli Island, immediately off the Pacific coast of the Alaska Peninsula, and within the next year two similar sites were found not far away, yielding what we called the Takli Alder phase, with ^{14}C ages of about 5,600 and 5,800 years, all from strata stained very red with ochre (G. H. Clark 1977:28). When related sites on Afognak Island were excavated by D. W. Clark and Workman in the early 1970s it became clear that there was also something of a blade industry in the Ocean Bay I culture (D. W. Clark 1979)—a finding that like the red ochre-covered floors has been amply confirmed since that time in a number of Kodiak-area sites by a number of investigators. These have produced radiocarbon ages in excess of 6,500 years (summarized in Steffian et al. 2002). In one case a single age in excess of 7,000 radiocarbon years was obtained in relation to what the investigator called a maritime vestige of the otherwise terrestrial Paleoarctic tradition of mainland Alaska (Jordan 1992), although the attribution is rejected by a number of archaeologists who interpret the collection as a poorly dated representative of early Ocean Bay (Steffian et al. 2002:4, with references). But this gets ahead of the rest of this story.

Back to the Takli site: First of all, the nearly six-thousand-year-old Alder phase collection was nothing like one might imagine for the common ancestor of Chaluka on one hand, and the delicate little tools of the Arctic Small Tool tradition on the other. Second, as the heavy basalt tools were spread out in the lab, the late Albert Spaulding, then at the University of Oregon, volunteered that they looked a lot like the assemblage from Krugloi Point on Agattu Island in the far western Aleutians, which he had recently published (Spaulding 1962). In 1967 I borrowed the Krugloi Point collection and saw that similarities with the Takli Alder collection rested not only in a mutually high proportion of heavy flaked bipoints but also in elongated points with weakly developed tangs or stems, and in a series of smaller points with long stems that had triangular cross sections and beveled butts. This set of similarities appeared despite the fact that the Krugloi Point assemblage was dated no earlier than about 2,600 radiocarbon years ago, and so must be some 3,000 ^{14}C years younger than the Takli Alder sample. Nevertheless, my new story was that there must have been a common early culture from Kodiak to Agattu, only later intruded upon in the Alaska Peninsula region by AST people from the north.

The next year I read a paper in an international meeting in which I hypothesized that about 6,000 radiocarbon years ago the culture represented by the Takli Alder phase of the Pacific coast of the Alaska Peninsula and by the Ocean Bay I collection of Sitkalidak Island existed throughout most of the Pacific Eskimo area and the Aleutian Islands; this was an occupation of ancestral Aleuts. (Dumond 1971:Appendix, 45)

I'm sure it won't surprise any reader to hear that this maybe-so story aroused some skepticism (e.g., McCartney 1971). Not long afterward, however, research in the eastern Aleutians added other elements for discussion.

In 1972, the sites at Sandy Beach and Idaliuk Bays near the southwestern tip of Umnak were discovered and tested, together providing radiocarbon ages ranging from about 5,400 to 4,200 years. Although the collections are described as being without blades, the excavator took pains to argue a connection closer to the Anangula Blade site than to the Chaluka midden, but culturally intermediate between the two (Aigner 1983a, 1983b). Then in 1974 Laughlin hosted a party of Russian archaeologists to work with his crew at the Blade site itself. The combined party also trenched the nearby Anangula Village site, where they produced some blades as well as bifacially retouched artifacts and radiocarbon samples with determinations ranging in age from about 5,900 to 4,500 radiocarbon years. This was characterized by Laughlin as a "transitional" occupation between the Blade site and the Chaluka midden (Laughlin 1975); unfortunately, the collection remains unpublished in detail.

Finally, excavations in 1996 and 1997 on Amaknak Island in Unalaska Bay dated the early levels of a site at small Margaret Bay to between about 5,500 and 4,000 radiocarbon years ago. The levels produced a series of blades and microblades, with cores; large and small leaf-shaped and bipointed implements, some with what appear to be weakly defined tangs; lanceolate points, some with relatively long and well-defined stems; and other items (Knecht et al. 2001).

In short, although some of these collections have thus far been described only sketchily, and while the need for

a careful and definitive comparison is obvious, it still seems fair to say that all of them are superficially more like Ocean Bay I than like the Anangula Blade collection. So it becomes less risky to suggest that these sites of intermediate age did bear some significant relationship to the roughly contemporary early Ocean Bay tradition; further, that the distinctive "western Aleutian phase" of the Near Islands, which was defined by McCartney (1971) and which rests in part on Spaulding's Krugloi Point collection from Agattu, does indeed represent a later survival of similar material culture.

But an important question remains: Did this intermediate culture descend within the Aleutians from the Anangula Blade–related manifestations? Or, given that all of the Anangula Blade–related sites so far excavated came to an end with volcanic events, might this intermediate culture represent new arrivals from north Pacific areas to the east? There are links here that are still missing. The next maybe-so version of the story could have it either way.

So much for Ocean Bay I. The spread of Ocean Bay II was more restricted geographically. Between 4,500 and 3,500 ^{14}C BP, affiliated sites are characterized by certain chipped stone artifacts, but especially by long, slender bayonet-like points of polished slate and by ochre-covered floors as in Ocean Bay I. Related regions now include Kachemak Bay in outer Cook Inlet—known from work by Workman and his colleagues (Workman 1998). Other relatives include not-yet-published sites along the Pacific coast of the Alaska Peninsula itself (Jeanne M. Schaaf 2004, personal communication; see also age determinations in Crowell and Mann 1996) and sites in two interior regions of the northern Alaska Peninsula where caribou hunting was an activity (Dumond 1981:116–119; Reger 2004). There are a few telltale bayonet fragments from the Takli site in what is called the Birch phase—which overlies material from the Ocean Bay I–related Alder phase (G. H. Clark 1977:32–47). Farther southwest, the Old Islander assemblage from Chirikof Island, analyzed long ago by Workman, may be a peripheral member of the family (Workman 1966:291; 1969:746–749), as may some recently reported material from Sanak Island south of the tip of the Alaska Peninsula (Maschner 2006). Beyond this, the slate-polishing practice of Ocean Bay II apparently did not spread into the Aleutians, nor is it known to appear in major sites of the more southwestern portions of the Alaska Peninsula itself (e.g., Maschner 1999).

OF AST TIMES (EPISODE 2 AND ONWARD)

Ten years after AST remains were documented in the Naknek region at Brooks River, Oregon crews working farther southwest in the upper drainage of the Ugashik River excavated part of a square semisubterranean house floor that yielded distinctive AST artifacts and radiocarbon ages of about 3,600 and 3,900 years (Henn 1978:41–45). In 1994, to the northeast at the present village of Igiugig on the Kvichak River a short distance below its head at the southwest rim of Iliamna Lake, archaeologists of the Alaska Office of History and Archaeology cleared part of a semisubterranean house similar to those at Brooks River and Ugashik Lakes, with a radiocarbon age of about 3,300 years (Holmes and McMahan 1996). These sites located both north and south of Brooks River amply confirm the presence of houses of the AST period located on salmon migration streams on the northern Alaska Peninsula.

But there is a new twist: in 1981 Workman and his collaborators discovered an AST campsite beneath a Kachemak tradition site on upper Kachemak Bay, an occupation dated at about 4,000 and 4,200 radiocarbon years ago (Workman and Zollars 2002). Artifacts are essentially identical to those of the Brooks River Gravels phase, despite the somewhat earlier date at Kachemak Bay. That is, it appears that AST people arrived in the south by 4,000 ^{14}C yrs BP, and before 3,500 ^{14}C yrs BP had adapted to the salmon resource so important in the region in later periods (Dumond 2005a). And the influence of these evident immigrants may have extended farther.

Workman and Zollars (2002) have discussed sites in the Kodiak Archipelago in which the presence of AST-related artifacts has been claimed; Steffian and Saltonstall (2005) subject these and other sites to intensive scrutiny and conclude that the very few Kodiak Archipelago tools of truly acceptable AST type have all been recovered from within Kodiak-type components at sites otherwise yielding only elements of the known Kodiak sequence. They argue that these artifacts should be viewed as the result of some sort of limited exchange between societies that otherwise maintained their social distance. "Tools but not tool kits," are their words (Steffian and Saltonstall 2005).

Still farther to the west, AST affinities have recently been claimed for certain levels at the village site at Port Moller, for the Russell Creek site on the banks of Cold Bay (Maschner and Jordan 2001), and for upper levels at the Margaret Bay site at Unalaska Bay (Davis and Knecht 2005; Knecht et al. 2001)—all dating between 3,500 and

3,000 radiocarbon years ago, and all indicating subsistence bases more maritime than is the case with Alaskan AST sites in general. Objections to an out-and-out identification with the AST tradition have been entered by Workman and Zollars (2002) and by Dumond (2001), based both on tool types and on subsistence evidence, while accepting that these sites may reflect some more nearly arm's-length contact with the AST people who arrived on or near the Pacific coast by 4,000 radiocarbon years ago. With regard to the dating—between 4,000 and 3,000 radiocarbon years ago—two environmental issues call for attention.

Presumably it was the shift from the Holocene Hypsithermal to the colder early Neoglacial period after 5000 BP that brought the ice-edge fauna preserved in the lower levels of the Margaret Bay site (Davis 2001)—this on the presumption that the edge of winter sea ice suddenly lay immediately at Unalaska itself. The present ice edge does not push below the Pribilof Islands, three degrees of latitude and about 400 km north of Unalaska. Such a southward shift would have occurred sometime before 4000 ^{14}C yrs BP, about the time AST people apparently first arrived at Kachemak Bay, and a very few centuries before the time for which excavators at Margaret Bay have asserted AST relationships. Was it increasing cold that led AST people farther southward than they are known to have been before? A new maybe-so story might be designed to say so.

Also, the period between 4,000 and 3,000 radiocarbon years ago was one of catastrophic volcanism around the midsection of the Alaska Peninsula, northeast of Port Moller. The major caldera-forming eruption of Aniakchak Volcano has been dated at slightly more than 3400 ^{14}C yrs BP, that of Veniaminof Volcano at 3700 ^{14}C BP, with the eruptions of both of them ejecting surface pyroclastic materials sufficient to reach both the Bering Sea coast and the Pacific shore (Miller and Smith 1987). The two possible fringe AST components just mentioned for the Alaska Peninsula—Port Moller and Russell Creek—are southwest of the volcanic zone. Did the volcanic events induce movements southwestward into the eastern Aleutians and to Margaret Bay? It makes for a good maybe-so story.

OF KACHEMAK TIMES

Following de Laguna's periodization of the collections she recovered in the early 1930s from Kachemak Bay (de Laguna 1934), and some generally similar material excavated by Hrdlička from his Uyak site on Kodiak Island (Heizer 1956), Clark formalized the Kachemak Tradition of the North Pacific region (D. W. Clark 1966, 1975). He specifically recognized changes occurring within an overall similar material culture over a substantial period of time. Although Kachemak artifacts were largely of polished slate, they departed from the modes of the preceding Ocean Bay II phase of the Kodiak region in the abandonment of long bayonet points based on parallel-sided blanks produced by sawing, by the adoption of the polished slate ulu, and by the appearance of lip ornaments and other elements, including the movement toward large and decorated oil-burning lamps of stone.

As a result, and because of sampling deficiencies, there was uncertainty regarding Kachemak parentage, which was satisfied only when closer analysis of Early Kachemak collections and additional excavations identified a transition. The linear relationship between Ocean Bay II and the succeeding Kachemak phases thus became more of a certainty (D. W. Clark 1997; Steffian and Saltonstall 2005). The date of this transition now stands at about 3,500 ^{14}C yrs BP or a century or so earlier, with the stages of early and late Kachemak enduring until around 800 or 900 ^{14}C yrs BP.

Although D. W. Clark (1997) suggests the tradition appeared earliest in the Kodiak group of islands, it is well represented on the western Kenai Peninsula, where Workman (2002) has confirmed its presence at Kachemak Bay from near its beginning until at least the middle first millennium AD. Related elements are reported by Reger (1998) in a more inland Kachemak version farther north in Cook Inlet. Certain aspects of it are at least tentatively recognized in Prince William Sound (Yarborough and Yarborough 1998; cf. de Laguna 1956).

Nevertheless, the long Kachemak period is one of considerable diversity on the north Pacific. Thus, on the Alaska Peninsula coast the bulk of the Birch phase collection from Takli Island, in part related to Ocean Bay II, is thought to date from about the time of the beginning of the Kachemak period. Correspondingly, although the Kachemak introduction of labrets and ulus is represented in the Takli Birch phase, there are in addition some apparent hangovers from Ocean Bay I in the form of flaked points as well as in a comparable shape in polished slate artifacts. In the same Birch phase there is a scattering of AST-like points, and not long after 1,900 BP there is increasing evidence on the Pacific coast of the Alaska Peninsula for contact across the mountains with people of the Norton tradition, who a few centuries earlier had appeared on the fringe of the southern

Bering Sea from the north. By 1,600 ^{14}C yrs BP the telltale artifacts of the Takli Cottonwood phase included pottery of Norton type, and thereafter artifactual evidence of cross-peninsula contact steadily increased (e.g., G. H. Clark 1977; Dumond 1971, 2003).

On Chirikof Island, a far outlier of the Kodiak group, the situation of increasing Norton influence was paralleled by the appearance of the Anchorage complex (Workman 1969:723–724, 739–743), and although scraps of apparent Norton pottery are known from the southwestern end of the Alaska Peninsula itself, the influence there was evidently much less. Rather, in that lower Peninsula area following the 3,500 BP appearance of collections that may at least somewhat reflect the AST presence south of the Bering Sea—as at the Russell Creek site—there was a stabilization in what Maschner has called the Early Izembek phase, with the development in the last millennium BC of the large site on Morzhovoi Bay called Adamagan. This involved essentially no appearance of polished slate in what was evidently a vital center devoted especially to sea mammal harvest. Thereafter on the southwestern peninsula, although patterns of settlement shifted, major reliance on chipped stone endured through the first millennium AD, a pattern that also appears to be represented at the Hot Springs site at Port Moller (e.g., Maschner 2004).

Meanwhile, around the eastern Aleutian island of Unalaska, the Margaret Bay phase, with some indication of parallels in artifacts with Russell Creek, was followed by the Amaknak phase (Knecht and Davis 2001, 2004), with a continued rarity of polished slate artifacts. A notable feature of the earlier phase carried into the later was the stone-lined semisubterranean house. This element was evidently shared with Umnak Island at the time of the beginning of the Chaluka midden deposit (Aigner 1978). Unfortunately, it is not clear that the Chaluka artifact assemblage associated with such houses has been adequately presented, with the more detailed descriptions confined to work only of the earlier years of excavation (Aigner 1966; Denniston 1966). This Chaluka material relates to what McCartney (1984:124) characterized as the Aleutian tradition, the assemblage consisting of biface implements made from flakes, tanged and untanged knives and scrapers, with some ground adze blades and a few ulu blades—the latter an introduction to the eastern Aleutians from the east, apparently in the first century AD (Holland 2001).

Although the Chaluka midden material has been estimated to date from about 4,000 ^{14}C yrs BP or even before, comparisons with the Margaret Bay and Amaknak phase materials of the Margaret Bay and Unalaska Bridge sites of Unalaska brings the suggestion that at least the bulk of the Chaluka material postdates 3,000 BP (Dumond 2001). In addition, it must be noted that such faunal collections as have been reported from Umnak, reportedly prehistoric but not clearly dated (e.g., Denniston 1974), include no identified Neoglacial period ice-edge fauna such as that found at both Margaret Bay and the slightly later Unalaska Bridge site (Crockford et al. 2004; Davis 2001).

Finally, I leave Kachemak times with the observation that 3,500 BP was a time that saw significant cultural modifications in the Kodiak region with the switch from Ocean Bay II to early Kachemak, on the Alaska Peninsula with the riverside adaptation of AST folk in a number of sites, and with the changes on the eastern Aleutians involved in the Margaret Bay phase. Clearly, melting pots were being stirred. And as was mentioned earlier this very time was one of massive volcanic eruptions on the lower Alaska Peninsula that must have impelled human movements. All together, there is an implicit invitation here for more just-maybe-so stories—which may now be left to the readers' imaginations.

OF KONIAG TIMES

As with the Kachemak tradition, the later Koniag phase—the latest prehistoric material culture of the Kodiak Island group—was identified and then more fully defined by D. W. Clark (1966, 1974) as the culmination of the prehistoric Kodiak sequence, beginning somewhere around 800–900 ^{14}C yrs BP. In comparison with the preceding late Kachemak phase, the changes on the Kodiak Archipelago were significant. In William Workman's words,

> Almost all late Kachemak tradition traits were modified at least on the stylistic level or lost in a few centuries. The elaborate burial ceremonialism complex disappeared, as did decorated stone lamps and the high standards of late Kachemak tradition craftsmanship. The personal adornment complex was profoundly modified, large multi-roomed houses replaced the small single room models and population and village size increased. New traits such as the vapor sweat bath . . . , ceramics, incised slate tablets and the large grooved splitting adze heads came into vogue over part of the archipelago and there were basic changes in projectile point styles, fishing equipment and most other domains of the technology. (Workman 2002:338)

The genesis of this transformation has been under some dispute, with archaeologists specializing on the immediate Kodiak vicinity insisting that continuing population density and the persistence of many (but somewhat abstract) material traits indicate that the origin of the phase was virtually entirely in situ. D. W. Clark (1974) has been almost unique in conceiving some elements of the change as introductions from outside—from both the Alaska mainland and the Northwest Coast—although even he admits fewer such influences than some others of us prefer (D. W. Clark 1992).

This was another time of substantial changes more broadly. Kachemak Bay, an integral part of the Kachemak tradition sphere, was apparently abandoned (Workman 2002; Workman and Workman 1988). The Bering Sea slope of the northern Alaska Peninsula, which had been home to three sequential phases of the Bering Sea–oriented Norton tradition, experienced some revolutionary changes in material culture, consisting especially of a series of introductions evidently from the north. These involved a dramatically increased reliance on polished slate rather than chipped stone implements, including base-faceted slate insert tips for harpoons and arrows and an especially characteristic slate lance blade with marked medial ridge; sharply different pottery vessel forms and paste; oil-burning lamps of clay replacing Norton lamps of stone; the sunken or "cold-trap" entrance tunnel leading to the semisubterranean dwellings; and the heavy "splitting adze" blade of stone (often considered southern in origin, but with only ambiguous evidence concerning any actual source) (e.g., Dumond 1988).

These were characteristic of the Brooks River Camp phase of the Naknek River drainage region, the best sampled of the northern Alaska Peninsula drainage systems, where it is dated between about 850 and 600 BP. By 800 BP a phase identical in material culture to the Camp phase (the Kukak Mound phase) appeared on the Pacific coast of the peninsula (G. H. Clark 1977; Dumond 1971), only a short distance across Shelikof Strait from the Kodiak Island group. It was at about the same time that comparable and diagnostic artifacts—including thick gravel-tempered pottery, slate dart points with pronounced medial ridge, and base-faceted slate endblades for arrows or harpoons—appeared on Kodiak, marking what has been defined as a phase transitional between the late Kachemak tradition and the succeeding Koniag archaeological phase (Jordan and Knecht 1988).

It was with this latter manifestation that there appeared together all of the characteristics listed in the quotation from Workman (2002) above. Other characteristics of the succeeding historic Koniag or Alutiiq that also hark northward involve ceremonial aspects detailed long ago by Margaret Lantis (1947), which include the customary use of the Eskimo-style men's or community house known in southern Alaska as the *kashim* or *kazhim*. They also include the evident linguistic relationship of the Koniag or Alutiiq language to Eskimoan languages around the Bering Sea and farther north and east (Leer 1991; Woodbury 1984), and certain local origin stories that reflect an arrival from the north of at least some of the later inhabitants of Kodiak (D. W. Clark 1974:180; Desson 1995). These combine to suggest to some of us an influx of a significant number of people from the Bering Sea region. Of the material elements, the pottery in particular is found in greatest frequency in far southwestern Kodiak Island (e.g., D. W. Clark 1956), the area in which relatively little archaeological research has been conducted. Indeed, this led me earlier to run the risk of suggesting a possible immigration route to that area from the Ugashik River region of the Alaska Peninsula (Dumond 1991:Fig. 2.7).

It is this set of circumstances, including the distribution and internal relationships of the Eskimoan linguistic family and the social characteristics alluded to, that has led to arguments that despite incomplete assessments of Kodiak-area population densities through time, the evidence suggests an influx of Eskimoan-speaking people into Kodiak in significant number (e.g., Dumond 1971, 1988, 1991). Whatever the final resolution of these questions regarding Kodiak and Prince William Sound, scattered evidence seems to indicate an expansion of northward-oriented people along the Alaska Peninsula as far as the Chignik region (Dumond 1992), with at least one outlier appearing near the very tip of the peninsula—first reported by McCartney (1974; see also Maschner 2004)—and another on isolated Chirikof Island (Workman 1969:722, 732–739). And ongoing studies of ancient DNA as well as other aspects of burials at Chaluka on Umnak Island, and in caves on Ship Rock and Kagamil islands not far from Umnak, suggest the real possibility of a surge westward of some Aleutian-area populations at about the same time (Coltrain et al. 2006; Hayes 2002).

Although, as noted above, some polished slate implements were appearing in the Aleutian Islands by the end of the first millennium AD—evidently as borrowing either

from the Kodiak area or the southern Bering Sea—such influence as it represents was not strong enough to effect any major change in the ongoing Aleutian tradition of the islands and particularly in the somewhat variant form of Aleutian material culture found in the western Near Islands of the Aleutians. This apparent complex of local traditions continued through the time of the archaeological Koniag phase of Kodiak until the arrival of the Russians in the eighteenth century. Still, the similarity to one another of the three known Aleut dialects of the eastern, central, and western portions of the chain (Bergsland 1959; Woodbury 1984) appears comparable to similarities among the Inuit dialects extending from north Alaska to Greenland. These latter are concluded to be the result of a movement of people across the north not earlier than the beginning of the second millennium AD. Some such shift through the Aleutians at about the same time seems likely.

In the Kodiak region—the cultural center of the northern Gulf of Alaska—changes in the Late Koniag stage of culture brought a shift from single-room to multi-room houses with what must have been a related shift in family organization, evidence of an increased reliance on fish runs, and, of course, stylistic changes in numerous artifacts (e.g., Jordan and Knecht 1988; Knecht 1995)

Concurrent changes similar to those within the Koniag phase are observable on the Bering Sea slope of the northern Alaska Peninsula in what has been designated the Brooks River Bluffs phase (Bundy et al. 2005; Dumond 1981, 2003, 2005b; Harritt 1988). This accords with the evident linguistic and cultural closeness of Peninsula and Kodiak Island people at the time of the Russian arrival at the end of the eighteenth century. Indeed, evidence for widespread volcanism on the peninsula at about AD 1350 marks the end of the Brooks River Camp phase, precedes the construction of multi-room houses of the ensuing Bluffs phase, and has led to the conclusion that the peninsula was in fact repopulated from the Kodiak Island region after AD 1350 (Dumond 2003, 2005b).

Finally, to return to Kodiak, this second period of major cultural change—a century or so after AD 1000—apparently coincided with an earthquake felt in an area from the Copper River to the southern Kenai Peninsula through tectonic changes rivaling those of the great 1964 earthquake in the same region (e.g., Combellick 1993; Mann and Crowell 1996; Plafker et al. 1992:446–450). If there was no major tectonic upheaval on Kodiak, it was at least hit by a massive tsunami (Gilpin 1995:Ch. 2). Although thus far there is no certain evidence of a major human demographic impact in the Kodiak group, it would be remiss of any spinner of just-maybe-so tales to fail to point out that this transition period, which followed Kachemak times of regular and more gradual change, is reminiscent of that of the Ocean Bay-to-Kachemak transition. That is, it was an interval of obviously increased stirrings of people in the North Pacific region, punctuated by a major environmental perturbation.

So, again, the opportunities for new explanatory tales beckon all of us, whatever our favorites of the past may have been, to dream again—and of more than only one "just-maybe-so" story.

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EXPANDING THE RADIOCARBON CHRONOLOGY OF KACHEMAK BAY, KENAI PENINSULA, ALASKA

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ABSTRACT

The cultural chronology of Kachemak Bay, near the southern end of the Kenai Peninsula, southcentral Alaska, documents human activity occurring as early as 8,000 years BP (Klein and Zollars 2004). Dates of this magnitude from North Pacific maritime sites remain extremely rare, being limited to a few sites in the eastern Aleutians, Kodiak Island, and the Alaska Peninsula. Equally rare are the scholars who have, in the last three decades, fashioned regional archaeological time lines for North Pacific coastal areas that continue to benefit present-day researchers. William Workman, often working with others between 1974 and 1997, began the development of the radiocarbon chronology for Kachemak Bay. Many of the dates and artifact assemblages he procured demonstrate cultural continuity with the Alaska Peninsula, Kodiak Archipelago, and beyond. Presently, about fifty dates document six discontinuous cultural traditions. Most represent the Kachemak tradition. Of the twenty-one dates obtained by the authors, seventeen pre- or postdate the Kachemak tradition, two represent it, and two were discarded. This paper presents those dates and demonstrates how they support or fill gaps in the chronology of Kachemak Bay.

Keywords: Kachemak tradition, Early Holocene, pottery

INTRODUCTION

Kachemak Bay (Fig. 1) is a 64-km-long, glacially carved embayment off the southeast end of Cook Inlet, southcentral Alaska. Pleistocene glaciers shaped the Kenai Mountains, which define the south shore, the submarine contours of the bay, and the Kenai Lowland, which defines the north shore. Deglaciation began prior to 15,000 ^{14}C yrs BP (Reger and Pinney 1996:27). The geology, physical geography, biology, botany, and climate have transitional characteristics from the south to the north shore.

In the three decades prior to his retirement from the University of Alaska in 2005, William Workman focused on excavating large shell midden sites in Kachemak Bay. He and Karen Wood Workman established a systematic, long-term approach to understanding the peopling of the region, often spending multiple seasons excavating extensive sites at Cottonwood Creek, Chugachik Island, and Yukon Island. Their publications detail the Kachemak tradition, a complex tradition of marine mammal hunters and fishermen who occupied primarily coastal sites on the islands and fringes of the rugged and geologically complex south shore of Kachemak Bay (Workman 1992).

Millennia before the Kachemak tradition, people representing the Arctic Small Tool tradition (ASTt), described by Workman and Zollars (2002); the Ocean Bay culture, described by Workman et al. (1993); and those occupying a still earlier site of an unknown culture (Klein

Figure 1. Map of Southcentral Alaska locating Kachemak Bay near the southern end of the Kenai Peninsula.

and Zollars 2004) used Kachemak Bay. Temporally, there was an approximate fifteen-hundred-year gap between the Kachemak tradition and the antecedent ASTt. Several dates presented here narrow that gap and, along with the artifact assemblage, suggest the possibility of another cultural entity in the region. In addition, centuries after the Kachemak tradition, people continued to utilize Kachemak Bay, as shown by many new radiocarbon dates from the Late Prehistoric Period.

HISTORY OF FIELDWORK

Field research has occurred sporadically in Kachemak Bay since 1883, when Johan A. Jacobsen, a Norwegian collecting for the Berlin Ethnological Museum, dug at a Native village called Soonroodna (Jacobsen 1977:198–199). The first survey, testing, and excavations by a professional archaeologist, however, were conducted by Frederica de Laguna in 1930–32. Then representing the University of Pennsylvania Museum, she excavated, described, and named the Kachemak Culture, later renamed the Kachemak tradition when similar assemblages were identified elsewhere. Following de Laguna's enduring work and the publication of her monograph, *The Archaeology of Cook Inlet, Alaska* in 1934 (second printing, 1975), a forty-one-year hiatus occurred in archaeological work in Kachemak Bay until the Homer Society of Natural History initiated a site assessment survey. Douglas Reger, then at Washington State University, conducted the 1973 Kachemak Bay Archaeological Evaluation Project (Reger 1974). On his heels came the team of William and Karen Workman, often partnered with John Lobdell. Over the years, the Workmans led numerous large-scale, student-assisted excavations of the artifact- and fauna-rich Kachemak tradition sites. Their work expanded, elaborated, and refined de Laguna's. As they began what would become ten field

seasons in Kachemak Bay, other research occurred: the 1975 survey of Cook Inlet (Cook Inlet Native Association 1975), the 1976 survey of Eldred Passage (Lobdell 1976), and the 1977 survey of Halibut Cove and vicinity (Zinck et al. 1977).

We spent our first field seasons under Bill Workman's tutelage, digging into Kachemak tradition sites: Zollars as a student on the 1978 Yukon Island dig and Klein as curator of collections at the Pratt Museum in Homer, on the 1987 Yukon Island Fox Farm Site excavation. Zollars continued to excavate the basal component on Chugachik Island, served as Bill's field crew chief on several digs, and, along with Klein, joined him to excavate an Ocean Bay site at Aurora Lagoon in 1992 (Fig. 2).

On our own, we continued to survey, test, and excavate sites on private, state, and federal lands throughout Kachemak Bay. Bill supported us by signing the necessary permits, lending us the University of Alaska's Zodiac, and by being available for discussions about our excavations. Unlike Bill, we generally avoided deep Kachemak tradition middens (with one exception), and discovered instead numerous small, discrete, surface or near-surface erosional sites, which have provided datable materials to help expand the cultural chronology of Kachemak Bay.

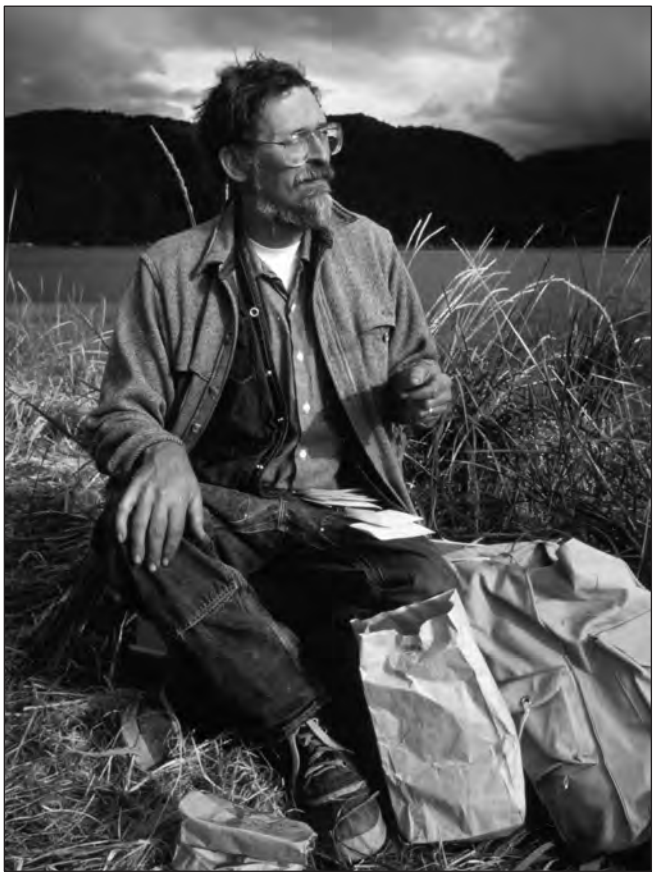

Figure 2. Bill Workman ponders artifacts from the excavation of a late Ocean Bay site in Kachemak Bay. Photograph by Janet R. Klein.

SITE DESCRIPTIONS, EXCAVATION DATA, AND RADIOCARBON DATES

PRE-KACHEMAK TRADITION SITES

Aurora Spit in upper Kachemak Bay is a 1.2-km-long, 0.2-km-wide barrier spit that forms the west shore of Aurora Lagoon (Fig. 3). About mid-spit is a cluster of five rock knobs, the remains of former islands. On the larger northernmost knob is the Faulkner Site, SEL 009, which has a shell midden atop a north-facing, vertical erosional surface that lacks midden yet contains charred materials associated with several hearths (Klein and Zollars 2004:120).

Six radiocarbon dates (Table 1) were acquired from the actively eroding, stratified Faulkner Site, named for the landowners. One date represents the Kachemak tradition, while five represent the lowest sections of the lower component. The latter dates range from 6220 to 5470 BC (Klein and Zollars 2004:121). Due to an absence of diagnostic materials, we were unable to suggest an ethnic affiliation for the occupants, so we simply identified the site as early Holocene in age. Now the oldest radiocarbon dates in southcentral Alaska, they form the foundation of the Kachemak Bay chronology.

Eastward across Aurora Lagoon is the Sylva Site, SEL 245. The artifact assemblage and a radiocarbon date of 3059 BC (Reger and Boraas 1996:160) reflect a late Ocean Bay occupation. However, Level K, a deeper cultural component that lacked datable materials, could predate it (Workman et al. 1993:4). How the Ocean Bay site relates to the nearby early Holocene site has yet to be determined.

Another site, the stratified Island Creek Site, SEL 250, is located in the middle of the China Poot Bay estuary. It is situated on the south-facing side of a rock knoll that becomes insular when tides rise above 5.8 m. Eroded and exotic flakes, found in 1992 by resident Michael McBride, led to the discovery of the shallow dual-component site, which we tested in 1993 and 1994. The lowest component lacks datable materials; however, its artifact assemblage shares lithic similarities and typological characteristics with early Ocean Bay materials from the Kodiak archipelago.

Figure 3. Aurora Lagoon, in upper Kachemak Bay, has radiocarbon dated sites from an Early Holocene occupation and a Kachemak tradition occupation on distant Aurora Spit and from a late Ocean Bay site on the mainland in the foreground. Photograph by Janet R. Klein.

Table 1. Radiocarbon dates obtained by the authors.

AHRS # SEL-	Laboratory #	14 C yrs BP	13/12 C Ratio	Calibrated Yrs	Sigma	Material Dated
009-Aurora Spit	Beta-152922	7150 ± 100 BP	25.9 ‰	6220–5810 BC	2	charred material
009-Aurora Spit	Beta-158403	7070 ± 90 BP	25.3 ‰	6080–5740 BC	2	charred material
009-Aurora Spit	Beta-152923	6830 ± 90 BP	25.6 ‰	5880–5610 BC	2	charred material
009-Aurora Spit	Beta-152924	6790 ± 70 BP	26.2 ‰	5790–5610 BC	2	charred material
009-Aurora Spit	Beta-158402	6670 ± 90 BP	26 ‰	5720–5470 BC	2	charred material
269-Yukon Island	Beta-100545	3520 ± 70 BP	25.0 ‰	2015–1670 BC	2	bark (Level G)
269-Yukon Island	Beta-100544	3010 ± 100 BP	25.0 ‰	1450–930 BC	2	wood (Level G)
041-Yukon Is. Trench	Beta-152920	2450 ± 70 BP	24.1 ‰	790–390 BC	2	hearth material
009-Aurora Spit	Beta-152921	1750 ± 70 BP	26.4 ‰	AD 110–430	2	charred material
250-China Poot Bay	Beta-152928	1430 ± 50 BP	26.2 ‰	AD 540–680	2	charred material
269-Yukon Island	Beta-115450	1030 ± 70 BP	25‰	AD 885–1175	2	charred material (Level F)
275-Tutka Bay	Beta-152927	1030 ± 70 BP	25.7 ‰	AD 880–1170	2	charred material
275-Tutka Bay	Beta-152926	930 ± 80 BP	24.5 ‰	AD 980–1270	2	charred material
250-China Poot Bay	Beta-76534	910 ± 60 BP	not requested	AD 1010–1260	2	charred material
250-China Poot Bay	Beta-76535	900 ± 60 BP	not requested	AD 1010–1260	2	charred material
269-Yukon Island	Beta-115449	790 ± 40 BP	28.4 ‰	AD 1195–1290	2	charred material (Level F)
269-Yukon Island	Beta-110244	530 ± 50 BP	unknown	AD 1310–1355	2	charred material (Level E)
248-Seldovia	WSU-4471	515 ± 90 BP	26.4 ‰	AD 1450	1	birch bark
269-Yukon Island	Beta-100543	480 ± 50 BP	25.0 ‰	AD 1400–1485	2	charred material (Level E)
041-Yukon Is. Trench	Beta-152925	39,880	23.6 ‰	discarded		
269-Yukon Island	Beta-110245	30,250	26.7 ‰	discarded		

Yukon Island, a gateway island to inner Kachemak Bay, was occupied over the millennia by numerous cultures. Prior to our work, the oldest radiocarbon date from the island was 883 BC, obtained from materials de Laguna excavated from the depths of the Kachemak tradition midden (Reger and Boraas 1993:3). Although de Laguna avowed that the date was based on contaminated materials, Reger and Boraas accepted it for inclusion in the cultural chronology of Kachemak Bay (Reger and Boraas 1993:3).

SEL 269, a relatively shallow stratified site on Yukon Island, was discovered in July 1996 after Zollars and Anna Jacobs, a University of Alaska Anchorage student, found a piece of pottery on the beach near where we were excavating a historic Dena'ina midden. Because pottery is relatively rare in Kachemak Bay sites, we stopped our dig to locate its source and to test the site. In 1997, we continued to excavate SEL 269, which is located on a south-facing slope rising from the beach. The only features were two hearths loosely defined by culturally placed rocks. In Level G, exotic lithics and numerous tool types suggest an ASTt occupation, yet other materials and tool types are not reflective of the ASTt.

The radiocarbon dates from SEL 269 are intriguing. A sample of bark was dated at 2015–1670 BC, and a piece of wood at 1450–930 BC. These oldest dates from Yukon Island predate the onset of the Kachemak tradition by hundreds of years when using de Laguna's incipient date of 883 BC, and postdate the ASTt in Kachemak Bay by roughly a millennia: 3100–2450 BC and 2900–2200 BC (calibrated by Owen Mason from Workman's and Zollars's dates of 4205–3805 range BP and 4440–4000 range BP [Workman and Zollars 2002:40]). Do the dates represent an earlier beginning of the Kachemak tradition? Do they expand the tenure of the ASTt? Are we seeing a not-unexpected Norton or Norton-like occupation narrowing the temporal gap between the ASTt and the Kachemak tradition? Or are there other explanations for them and the associated eclectic artifact assemblage? With such a small inventory and the absence of diagnostics from either the Kachemak or the Norton tradition, we can only cogitate on the meaning of the unusual combination of lithics, artifacts, and dates.

KACHEMAK TRADITION SITES

The Fox Farm Site, SEL 041, is located slightly above sea level in a lush meadow on the southeast corner of Yukon Island. In 1978, de Laguna and K. Workman excavated a trench through a Kachemak tradition midden. Because the trench was not backfilled, the landowners invited the authors to continue excavations. Sporadically over numerous seasons, we removed the slough, widened the trench, and excavated to sterile gravel. We obtained two radiocarbon dates: the deeper, Beta-152925, which dated to 39,880 ^{14}C yrs BP, was discarded; the other, 790–390 cal BC, and the artifact assemblage represent the poorly documented phase II of the Kachemak tradition and support the only other Kachemak II date of 858 BC obtained from Chugachik Island (Reger and Boraas 1996:160).

The Kachemak tradition midden that capped the early Holocene site on Aurora Spit was initially located, tested, and identified by de Laguna in 1931 (de Laguna 1975:24 [1934]). We encountered the same midden, with numerous postholes, during our excavation. Charred material provided a date of AD 110–430 (Klein and Zollars 2004:120). The date and artifact assemblage, which represent the late Kachemak tradition phase, correlate nicely with the many late Kachemak dates acquired by the Workmans and others.

Post-Kachemak Tradition Sites

SEL 269, the stratified site on Yukon Island, is about a mile from the Bluff Site, where abundant pottery was unearthed by W. Workman and Lobdell (1980:395). At SEL 269 one upper component (Level E) contained abundant pottery among slate points and knives, adzes, other artifact types, and fauna (Fig. 4). Four hearths, containing abundant carbon, were constructed with rocks weighing 9–13.6 kg. Smaller hearths, lacking large rocks, were lined with cobbles. Level F, the next deeper component, also contained pottery.

A minimum of ninety-two undecorated sherds were excavated from the two levels, including a few rim sherds and a sizable basal sherd. There are striking similarities between the sherds from SEL 269 and those from the Bluff Site. Dates associated with the pottery-producing components at SEL 269 are AD 885–1175, AD 1195–1290, AD 1310–1355, and AD 1400–1485. Pottery from the Bluff Site, SEL 041, dates to the late first millennium (Workman 1982:111).

Pottery, rather rare in Kachemak Bay, is known from four sites in Kachemak Bay. Three are on Yukon Island: SEL 269, SEL 041, and SEL 001, where de Laguna found a few enigmatic pieces (de Laguna 1975:68 [1934]). The only other known source is Soonroodna, the abandoned village, where Jacobsen excavated sherds, possibly from

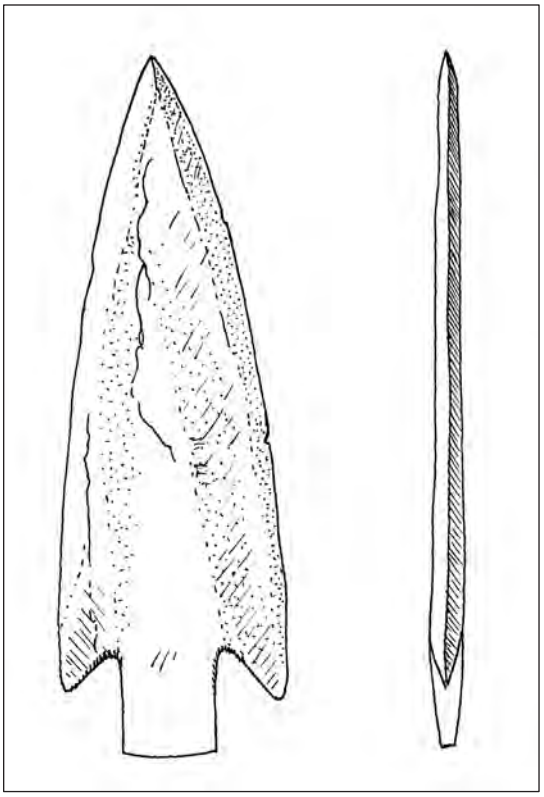

Figure 4. This point, crafted of black slate and associated with potsherds at SEL 269 on Yukon Island, was identified as a Three Saints Bay-style point by Douglas Reger. Length = 9.3 cm. Illustration by Lee Post.

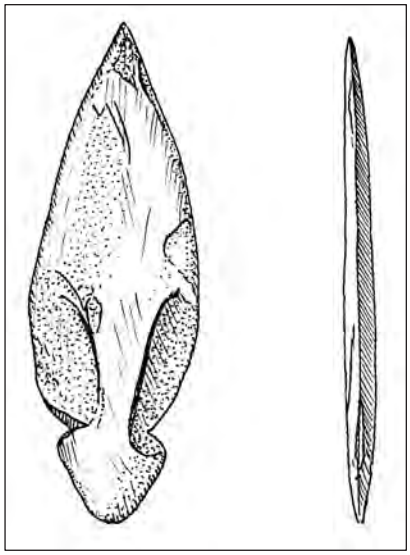

Figure 5. Crafted from brown slate, this point was found in the younger component at SEL 250, the Island Creek Site on the China Poot Bay estuary. Length = 6.6 cm. Illustration by Lee Post.

two levels (Jacobsen 1977:198–199). When Klein viewed the potsherds at the Berlin Ethnological Museum in 2002, she noted that six were similar to each other while the seventh was considerably different (cf. Klein 1996:84). It would be fascinating to see how the Soonroodna pieces compare with those from Yukon Island. For many reasons, including the presence of potsherds, Klein, along with Frederica de Laguna and Alaska historian Morgan Sherwood, believes that Soonroodna is located at the abandoned Waterbury Fox Farm in China Poot Bay.

Several dates from SEL 269 correlate temporally with the three dates obtained by the Workmans at SEL 027, the Port Graham Cannery Site. Those dates range between AD 1300 and 1500 (Workman and Workman 1998:100).

Another post-Kachemak tradition site, the Eckles Site, SEL 275, is a shallow dual-component site just above the high tide line inside a bight on the west shore near the entrance to Tutka Bay. An ash layer separates the two components. The uppermost is a shell midden from which charred material was dated at AD 980–1270. The lower component consists mainly of a housepit with a hearth well-defined by large rocks. Charred hearth material was dated at AD 880–1170. No ethnic affiliation was assigned to either component.

The Island Creek Site, SEL 250, which we excavated in 1993 and 1994 with the assistance of Thomas Eidel in 1994, contained about six hundred artifacts. Most lithic materials were siltstone flakes and tuffaceous materials, although a brown slate projectile point was unearthed (Fig. 5). No diagnostic artifacts were recovered.

Charred materials from two hearths of the uppermost component of the Island Creek Site date to AD 540–680 and AD 1010–1260. The latter dates complement the AD 915 date from the nearby Late Kachemak tradition site on Point West of Halibut Cove (Boraas and Klein 1992:183); however, no lithics or artifacts at Island Creek suggest a late Kachemak tradition use. The dates also form a neat chronological ladder with those from SEL 275, AD 880–1170 and AD 980–1270, with another date from SEL 269, AD 885–1175, and with a date from SEL 245 of AD 999 (Reger and Boraas 1996:160).

Atop and at the edge of a 4.27-m-high sea bluff near Seldovia is a shallow, eroding shell midden, SEL 248. The Hawkey Site was reported in 1993 by Susan Springer, a resident of Seldovia, and named in honor of her father. An excavation was sponsored by the Seldovia Native Association and the City of Seldovia. A 1.5 x 2.14 m test hole produced abundant fauna but few artifacts (Klein

1996:73). The 3-m deep midden was lined with birch bark, beneath which was sterile ash. A radiocarbon date of AD 1450 at one sigma places the site within the Late Prehistoric Period and is the first date for the Seldovia area. The small extent of the excavation and the paucity of artifacts, however, preclude any speculation about the ethnic affiliation of the occupants.

DISCUSSION

The nineteen radiocarbon dates obtained by the authors between 1990 and 2003 have added depth and some continuity to the chronological sequence of Kachemak Bay. However, they have also raised new questions, especially as to the ethnic affiliation of the occupants of numerous sites. Diagnostic materials were seldom unearthed in these often surprisingly shallow, multicomponent sites. The challenge to future archaeologists will be to obtain additional data from which they can describe the peoples who have utilized Kachemak Bay for over eight millennia.

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FISHTAILS, ANCESTORS, AND OLD ISLANDERS: CHIRIKOF ISLAND, THE ALASKA PENINSULA, AND THE DYNAMICS OF WESTERN ALASKA PREHISTORY

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ABSTRACT

William Workman's 1962 Chirikof Island archaeological survey, and his 1,020-page master's thesis based on the collections from that expedition, marks a landslide event in the archaeology of the Gulf of Alaska. His interpretations and speculations about the cultures, behaviors, and regional connections that generated that unique collection have been tested and shown to be highly consistent with what is now known of the area over forty years later. His discussion of the concave-based endblades, now called "fishtails," and his initial descriptions of the four-thousand-year-old complex he named "Old Islanders," has in the last fifteen years become critical to our understanding of Peninsula Aleut ethnogenesis. Equally poignant, his early 1990s publication on the Kachemak ceremonial complex was the first in-depth treatment of religious beliefs characteristic of any archaeological culture in the western Arctic. Together, these two studies have set the stage for a reformulation of western Alaska prehistory, one that is dynamic, complex, and interconnected from the Western Gulf of Alaska to the Chukchi Sea and beyond.

KEYWORDS: archaeology, William Workman, cultural interactions

INTRODUCTION

In 1962, William Workman and Donald Clark spent eleven isolated days on Chirikof Island, undertaking an archaeological reconnaissance in one of the more remote landscapes in the central Gulf of Alaska region (Fig. 1). In the context of finding twenty-four sites (four were already known from an earlier expedition), they made extensive surface collections and completed a number of small excavations. The results of this foray are entombed in one of the largest (1,020 pages) archaeological master's theses ever produced, titled "Contributions to the Prehistory of Chirikof Island, Southwestern Alaska" (Workman 1969); it was also the basis of a widely distributed but unpublished manuscript on the Old Islanders complex from Chirikof Island (Workman 1984). Working with no ability to date most of the material, Workman presents one of the classic comparative assessments of arctic archaeology, relying on dispersed and other poorly dated excavations from the Aleutians to Point Hope to place the Chirikof materials in a regional and temporal context. Fourteen intensive field seasons on the western Alaska Peninsula now allow us to place much of the Chirikof materials in a temporal and regional context, but also demonstrate clearly that Workman's conjectures were largely correct. Moreover, the seminal Chirikof study, at the boundary between Kodiak and the western Gulf of Alaska, allows the creation of a North Pacific and western Alaska archaeology

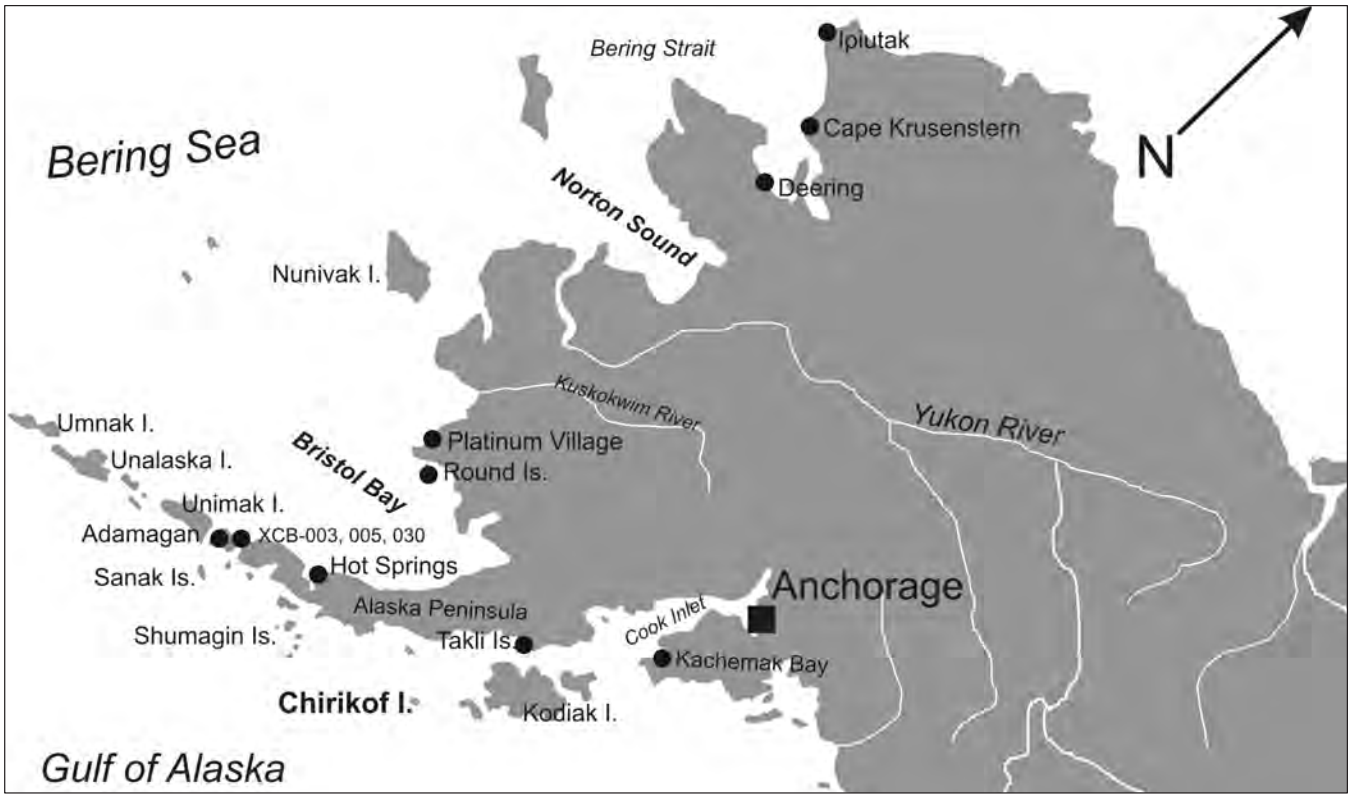

Figure 1. Map showing places of interest for this study.

that is connected, dynamic, and leads to a new view of the prehistory of the region.

Here I discuss three key elements of the prehistory of western Alaska that are either connected directly to Chirikof Island or are a product of those connections. Working backwards in time, I will begin with the classic "fishtail" projectile point, which was a key trait in Workman's Chirikof thesis. I will then move to a discussion of small ivory figurines and small masks, first documented for the region at the Hot Springs Village site; while not preserved on Chirikof Island, their distribution appears to mimic the distribution of the fishtails, demonstrating broad regional connections first implied by Workman. I will then review Workman's Old Islanders concept through what we now know about the distribution of similar culture types across the western Gulf region. I will conclude by demonstrating that four to five thousand years ago, the regional connections were east-west along the Gulf of Alaska from the Kenai Peninsula to the Aleutian Islands. From approximately three thousand to fifteen hundred years ago, however, the connections are more clearly north-south, with the Chirikof Island materials representing the eastern edge of a broad regional pattern that extends northward into the Bering Sea and beyond.[1]

"FISHTAIL" PROJECTILE POINTS

I remember being almost spellbound the first time I actually held one of the fishtail endblades from Chirikof Island (Fig. 2). Chipped from iron-rich and iron-hard andesitic basalt, the Chirikof blades are nearly 90 mm long but only around 10 mm wide and 4 mm thick, facially ground, perfectly flaked and symmetrical, with lightly serrated edges—clearly representing one of the finest stone technologies ever produced in Alaska prehistory. Part of a group of sites that Workman named the "Anchorage Complex," these endblades were commonly associated with hafted knives, drills, and a number of other artifact types. He believed these to be arrow points, probably used for warfare, stating that "Non-human targets for the archers of Chirikof (Island) are, and presumably were, quite rare" (Workman 1969:123–124). The only comparable materials at the time were a few similar versions from the Hot Springs Village site, which Workman (1969:364–366) had examined in the context of writing up a sample of the 1960 Hot Springs excavations (Workman 1966a:138, 148), along with similarly shaped endblades found in the Ipiutak excavations (Larsen and Rainey 1948:Pl. 35) and

1 All dates in this paper are in calibrated calendar years using Oxcal 3.0.

Figure 2. Fishtail projectile points from throughout the region: Nos. 1–3 from XCB-003 excavated by McCartney (1974), Nos. 4–6 and 13–15 from XCB-105 Adamagan, No. 7 excavated by Okada et al. (1984) from the Hot Springs site. No. 8 from Sanak Island, Nos. 9–12 recovered by Workman (1966a) from Chirikof Island.

items from the Norton deposits at Platinum Village on the north edge of Bristol Bay (Larsen 1950:Fig 56B). Undated on Chirikof Island, Workman interpreted these projectiles as "reflecting an indigenous Southwestern Alaskan culture of probable peninsular origin and ultimate Aleut affiliation" (Workman 1966b:190). But he expanded on the lithic similarities throughout the region by writing:

> [I]t appears that we have clear indications that there was contact between the lithic technology of Chirikof … and the late (?) Norton/'Ipiutak' stone technologies more at home further north. Probably this contact took place late in the First Millennium B.C or early in the First Millennium A.D. (Workman 1969:366; see also Workman 1980:86–87)

The next major find of fishtail points occurred in 1971, when a crew led by Allen McCartney (1974) excavated a whale-bone house at site XCB-003 in Izembek Lagoon on the western Alaska Peninsula, in the exact region where Workman had predicted that they would find the ultimate origin of these points. However, the reported dates between AD 800 and 900, and the association of the points with an assemblage containing polished slate, ceramics, and other items of clear eastern Bering Sea origins called into question some of Workman's conclusions—at least as far as dating was concerned. At nearly the same time, however, the Okadas and colleagues were excavating at the Hot Springs Village site and finding, much like the previous excavations at the site (Weyer 1930; Workman 1966a), that fishtail points were not only present (although rare) but were certainly earlier than those in Izembek Lagoon, with new dates placing them in either the first millennium BC, the early first millennium AD, or both (Okada et al. 1984:24, Pl. 4). This was around the same date that had been suggested by Workman (1966a) based on his comparisons of Alaska Peninsula with Norton and Ipiutak materials.

This is where things stood throughout the rest of the 1970s to the mid-1990s. In 1995 when, as part of a growing Lower Alaska Peninsula archaeological project, I visited site XCB-005 in central Izembek Lagoon (previously recorded by a U.S. Fish and Wildlife Survey team in 1979), we began to add more data on the temporal and spatial range of fishtail endblades. Site XCB-005 had undergone a considerable amount of erosion, and two fishtail-style endblades (out of thousands of artifacts) were found on the beach. Over the next few years, a series of dates were run on the site, mostly ranging between AD 100 and 400 (overlapping a part of the Hot Springs sequence), but no fishtail-style projectile points were ever found in stratigraphic context. At other sites that were eroding, such as XCB-028 in Moffett Lagoon, thousands of artifacts were collected from eroding deposits, but no fishtail endblades were found, even though these sites apparently dated to the same period as the reported dates from McCartney's (1974) whale-bone house. The dating of the classic fishtail point, and its ultimate use as a diagnostic temporal marker, has now been settled through three interrelated research efforts during the last eight years.

In 2000, the Adamagan site excavation was begun. Adamagan, in Morzhovoi Bay near the southern tip of the Alaska Peninsula, is a massive village covering nearly 150,000 m^2, and has over nine hundred surface depressions and perhaps thousands of buried house floors. There are four occupations at the site, with a brief occupation around 1700 BC, a small village between 800 and 500 BC, a massive village between 400 BC and AD 100, and a small, brief occupation around AD 1000. The deposits, for the most part, are spatially distinct, with the bulk of the occupation becoming the type site for the Adamagan phase, dating between 400 BC and AD 100. The drills, side-notched hafted knives, bifaces, and other tools are so similar to Workman's Anchorage Complex that, even without paying attention to the endblades, one would instantly relate the two assemblages. But the fishtail endblade is the type fossil for the Adamagan phase, in which dozens of these were found (Fig. 2).

The second project to clarify the fishtail endblade's position in regional prehistory was the re-dating of the Hot Springs site (Maschner 2004a). Don Dumond (2002) noted that many of the Hot Springs dates run from excavations in the same deposits undertaken in different years were over a thousand years apart. I then ran a suite of new AMS radiocarbon dates on charcoal curated in the Hot Springs site collections. The scattered fishtail endblades in the Hot Springs collection all dated to what I term the Hot Springs 2a occupation, or approximately AD 100–300, exactly the same date as at site XCB-005, and in similarly low frequencies.[2]

The third project was instigated by Allen McCartney, who asked me to re-date his Izembek excavations with

2 L. L. Johnson (1988:155) has also published a drawing of a fishtail endblade from the Shumagin Islands, dating to about 100 BC. The significance of this find was not apparent to me until these other studies had been completed. I have also seen a private collection made in Stepovak Bay on the mainland coast north of the Shumagin Islands which has a number of classic fishtail endblades.

new AMS determinations, organize and catalogue the collections, and write a new report. In the context of going through the collection, especially in reevaluating the finds from site XCB-003, two things became clear. First, the dates on the whale-bone house, rather than being in the AD 800–1000 range, were actually in the AD 1350 range. Second, in going through the fieldnotes it became apparent that none of the fishtail endblades found in the excavation were from the house floor; all were in the fill around the house, making their association with the AD 1350 materials dubious at best (Maschner 2004b).

Thus, Workman's estimated dates on (at that time) poorly dated comparisons with Ipiutak and Norton have turned out to be dead on. The fishtail endblades in the Adamagan phase, and from all adjacent regions, appeared to date between 400 BC and AD 100, with a few lasting until approximately AD 300—exactly the same time period when they occurred in Nowak's (1982) Norton Duchikmiut Phase on Nunivak Island! This further substantiated Workman's more controversial assertions that this style of projectile point, showing up at exactly the same time on the Alaska Peninsula, in Bering Sea Norton assemblages of Platinum and adjacent east Bering Sea mainland shorelines, on Nunivak Island, and even in the Ipiutak of Point Hope indicates a widespread north-south region of interaction and influence extending from the Gulf of Alaska to the Arctic.

SHAMANS AND ANCESTORS

In 1992 Workman published *the* major work on Kachemak tradition religion and ceremonialism. Building on data from Kachemak Bay and the greater Cook Inlet region, and making strong reference to the Kodiak Island materials known at the time, Workman clearly demonstrated that about two thousand years ago, there was a powerful ancestor-based belief system in the central Gulf of Alaska. This belief system resulted in the disarticulation and defleshing of human remains, the curation of body parts, the rearticulation of skeletal remains, and perhaps the display of dead relatives in houses and communities (Workman 1992:19–25).

Interestingly, this is exactly the same time that the Aleut appear to have begun to use mummification to preserve the dead for display in houses, for elite burials in caves and shelters, and to preserve the remains of dead children (see Laughlin 1980). Bettinger and Baumhoff's (1982) important paper on Numic culture change made it clear that one of the most resistant elements in culture change is the belief system. The fact that both the Aleut sequence and the Kachemak sequence have ancestor worship in the early first millennium AD, and that Aleut societies as late as AD 1800 did as well but Koniag apparently did not, has monumental implications for Aleut-Eskimo ethnogenesis, migration, and regional developments. The recognition of this pattern has resulted in a reformulation of Aleut-Eskimo prehistory (Maschner 2007, and in progress) that argues for a strong Aleut-Kachemak connection, but a less obvious Kachemak-Koniag connection. While the comparison between Kachemak and Aleut sequences will be discussed in great detail in a forthcoming paper, these patterns raised an obvious question: how far back in time can one trace ceremonialism in this region and what might it look like?

The basic answer to this question is around 1400 BC, but the connections are not as obvious as in later times, and they go in a completely different direction. In the analysis of the Hot Springs materials, it has become clear that there was a powerful religious aspect to Aleut life over three thousand years ago. This is seen in the artwork, which is dominated by small masks made of whalebone and small ivory figurines, many with human faces carved on them (Figs. 3, 4). The masks are not unique to the Hot Springs site, as they have been found at Izembek Lagoon (one is in the Anchorage Museum of History and Art, and one is in a private collection). Both the masks and similar figurines have been located near Unalaska, dating to the same time period (e.g., de Marban 2008; Michael Yarborough 2007, personal communication) and in the "Pre-Aleut" levels from the Chaluka site on Umnak Island (Hrdlička 1945:464–465), which we now know encompass the same 3000–3400 BP time period. The mask with secure context from the Hot Springs Village site (shown in Fig. 3) is bracketed stratigraphically by dates of 3030±90 and 3100±40 yrs BP, yielding a calibrated date of ~1350 BC). The figurines from the Hot Springs site occur right at the disconformity between the early and middle Hot Springs occupations. Of the eighteen small figurines found there, thirteen are in contexts dated to between 1300 and 900 BC. While one was found out of context, four others are from a single house floor that dates in the middle of the first millennium AD. Since this house sits in the middle of deposits dating fifteen hundred years earlier, I must consider the association suspect. For the sake

Figure 3. Left: Whalebone mask from the Hot Springs Village Site excavated by Okada et al. (1984). Right: Norton sculpture from Round Island indicating a probable explanation for how these small masks were worn (courtesy of Robert Shaw).

of this study, I will assume that the earlier context is the more secure.[3]

The small masks are interesting with a range of styles and features. One from the Hot Springs site excavated by Weyer had inset human teeth (Weyer 1930:258, Fig. 12), some have eyebrows or other features, some are flat-faced. However, of the eight that I have seen in publication, museums, presentations, or collections, all are remarkably similar. I want to stress that they are very small, so small in fact that Hrdlicka (1945:464) reported that his find was "evidently for a child." I do not believe that they were masks for children. Those samples that are well preserved have a carved groove around the outline, behind the face, as if it were hung from the neck, perhaps against the chest. As such, they were never meant to be worn on the face.

A similar case can be made for the figurines. Much like the small masks, these small carvings also have a groove carved behind the face, again as if they were tied with a string and perhaps hung around the neck (as do the few I have seen from the Unalaska region). Many of these figu-

3 I would like to leave open the idea that these small figurines occur in both the 1000 BC and the AD 600 deposits. I have spent considerable effort attempting to identify differences in the form or style between the two time periods, and no real differences exist. This implies to me that the deposits must be mixed, because I find it hard to believe that exactly the same form of sculpture would endure across a fifteen-hundred-year period, which includes a thousand-year break in the site sequence. This is especially true since, 120 km to the southwest, the massive excavations at Adamagan, dating to the break in the Hot Springs occupation, failed to produce anything even remotely similar to these items. On the other hand, the Okadas were excellent excavators, and probably would have noticed if these items appeared out of context. What I do know is that nearly 70 percent of them were found in the 1300–900 BC deposits.

Figure 4. Left to right: No-face variant from the Hot Springs Village Site, full-face variant from the Hot Springs Village Site, dot-face variant from the Hot Springs Village Site, full-face variant from the Choris houses on the Choris Peninsula (adapted from Giddings 1967:Fig. 77, where it is mistakenly listed as from Cape Krusenstern).

rines have eyes, noses, eyebrows, tattoos, or other facial features; some have blank faces, and some appear as simple expedient outlines, with no features at all.[4]

The masks and figurines appear to be quite time-sensitive. Barring the few at the Hot Springs site that have what I believe to be spurious stratigraphic association, all of these masks and figurines date between approximately 1400 and 900 BC. This is the one time period for which I have done no primary excavation. However, in all of the extensive excavations on the lower Alaska Peninsula and adjacent Sanak Islands dating 2000 to 1600 BC, and in the extensive excavations dating between 600 BC and AD 1, there are no examples of these masks or figurines. The lone example directly from my excavations is from a test pit on Elma Island in the Sanak Archipelago, where a rough outline of a figurine was found in a 1200 BC deposit. The

4 Laughlin and Marsh (1951) make an argument, which is reiterated in Laughlin's *Aleut: Survivors of the Bering Land Bridge* (1980), that these small figurines are "Images of the Deity," although it is never clear to which deity they are referring. Based on informant interviews, the groove around the back of the head was to hang it by a string from the house beams. Laughlin never discussed why a society with a clearly animistic belief system would have an anthropomorphic image of a deity in the first place, or why informants would refer to these images as such, when there is no evidence of them in the archaeological record after about AD 800–over twelve hundred years before his informants were born. As we will see shortly, there is circumstantial evidence that these figurines were worn around the neck.

mask from XCB-030 in Izembek Lagoon (Anchorage Museum) is without dated context.

Unlike the ancestor worship of the early first millennium AD, I have been unable to find a direct connection between early Aleut spiritualism as manifested in these masks and figurines and anything happening in the early Kachemak phase thirty-four hundred to three thousand years ago. Of course, so little is known, and less is published, about this time period on the Kodiak Archipelago and Cook Inlet that perhaps comparisons are not prudent anyway. But other than the clear regional similarities stretching from Hot Springs on the Alaska Peninsula at least as far west as Umnak Island, there are connections to the north that mimic the distribution of fishtail endblades. Perhaps the most interesting example is the figurine from the Choris site on the Choris Peninsula (Fig. 4) that looks identical to those from the Hot Springs Village site (Giddings 1967:Fig. 77; see also Giddings and Anderson 1986:Pl. 109). Also dating to approximately three thousand years ago, the large oval houses (without entries) of Choris are identical to the Alaska Peninsula houses of the period, and the typological similarities between Choris and Aleut harpoon forms three thousand years ago was noticed by Laughlin (1962:123) nearly forty-five years ago. In fact, except for the pottery, entire Choris assemblages could be lost if placed within an Eastern Aleutian or Alaska Peninsula assemblage of the same time period.

Thus, small figurines, which were probably amulets worn around the neck, were being carved with similar shapes and faces that may have symbolized a shared system of beliefs that spanned the eastern Bering Sea. Perhaps a belief system was in place that located ancestors or spirits in the chest area, providing spiritual power from within. Or, perhaps, the masks may have reflected an outward display of an early form of ancestor worship, in which the figurines represented actual past individuals. Regardless, this was apparently such a powerful and entrenched belief system that, a thousand years later, when the Aleut and Kachemak peoples were experimenting with mummification and body part curation, the Norton culture was still associating masks with the chest (Fig. 3), and the Ipiutak people were burying their élite dead with masks placed on the chest, both at Point Hope (Larsen and Rainey 1948:Pl. 54) and at Deering on the Seward Peninsula (Mason n.d.; Steinacher 1998). This suggests the existence of a strong Aleutian-Choris connection, one that influenced both the Norton tradition and Ipiutak, perhaps reflecting an eastern Bering Sea–wide shared system of spiritual beliefs (and maybe even shared styles of spiritual artifacts) that endured for over fifteen hundred years.

OLD ISLANDERS

Returning now to Chirikof Island, one of the more interesting discoveries by Workman (1969, 1984) in his brief foray and detailed analysis was the identification of an archaeological assemblage referred to as the "Old Islanders." Combining charcoal from two stratigraphically separate levels, a 4044±-63 yrs BP date was received, which calibrates to the mid-2000s BC. Here flaked tools outnumbered polished tools in about 2:1 ratio, and the flaked tools were the most interesting, with large, contracting-stem endblades with ground edges. While some effort was made in later decades to relate these finds to the growing body of knowledge about the Ocean Bay tradition on Kodiak Island and the Kenai Peninsula (1984), Workman recognized that the relationship was not clear, and appeared to lay more with the similarly dated Takli Birch phase of the Alaska Peninsula (Clark 1977), which was considered a mainland descendant of the Ocean Bay culture.

In the greater Gulf of Alaska region, Dumond recognized the connection between the archaeology of the eastern Aleutian Islands and the Ocean Bay tradition of Kodiak Island and its upper Alaska Peninsula variants, before there were even any obvious data to allow making such a connection (e.g., Dumond 1987a, 1987b; Dumond and Bland 1995). However, when excavations at Margaret Bay and related sites started producing what were clearly Ocean Bay–style endblades (Knecht et al. 2001), the relationship became impossible to deny. What was missing were archaeological materials from the area between Kodiak and Unalaska, and ten years of research on the western Alaska Peninsula had failed to produce them, although there were some tantalizing finds. A small slate endblade dating to 2800 BC in Izembek Lagoon—perhaps a toy version of an Ocean Bay II slate blade—as well as a Takli Birch–style harpoon with a T-shaped base found at the Hot Springs site and dating to around 2000 BC, and a scattering of large lanceolates in isolated finds from a number of locales across the region, all testified to at least some connection with cultures both east and west.

It was on Sanak Island, however, that clear evidence of an Ocean Bay continuum, and a further connection with the Old Islanders of Chirikof, was finally uncovered. In 2004 we found a deeply buried deposit on the southeastern end of the island. Subsequent testing in 2006 and

2007 revealed a midden dating to 2400 BC and containing well-preserved harpoons with T-shaped bases (Fig. 5), which we now recognize as a signature artifact type for the entire central and western Gulf of Alaska and eastern Aleutian region for the time period from 3000 to 2000 BC (see Clark 1977: 225–226:Figs. 52, 53; Knecht et al. 2001:66–67). While few stone tools are present in this deposit, a number of microblades, small bifaces, and other items look more like the Unalaska assemblages than those of either the Hot Springs or Takli Island sites. However, it is also clear that, as both Workman and Dumond have stated, while the Ocean Bay I looks much like the Takli Alder phase on the Alaska Peninsula, the subsequent Takli Birch phase looks little like Kodiak's Ocean Bay II culture. It appears that, in this 5000 to 4000 BP window, while Ocean Bay II on Kodiak was making a huge investment in polished slate technologies (the island has extensive natural slate deposits), those areas without polished slate diverged into a suite of regional patterns, with broad macroregional similarities but increasing local variation. This is why early Takli Island, early Hot Springs, and early Sanak Island cultures from the Alaska Peninsula, along with contemporaneous assemblages from Unalaska and Umnak Islands in the eastern Aleutians, have broad similarities in harpoon styles but local differences in amounts of polished slate, presence or absence of microblades, and styles of large bifaces. It also appears that the one controlling factor in the use of slate is simply distance from the source area on Kodiak Island, implying that slate is not a good measure of regional interactions or cultural connections.

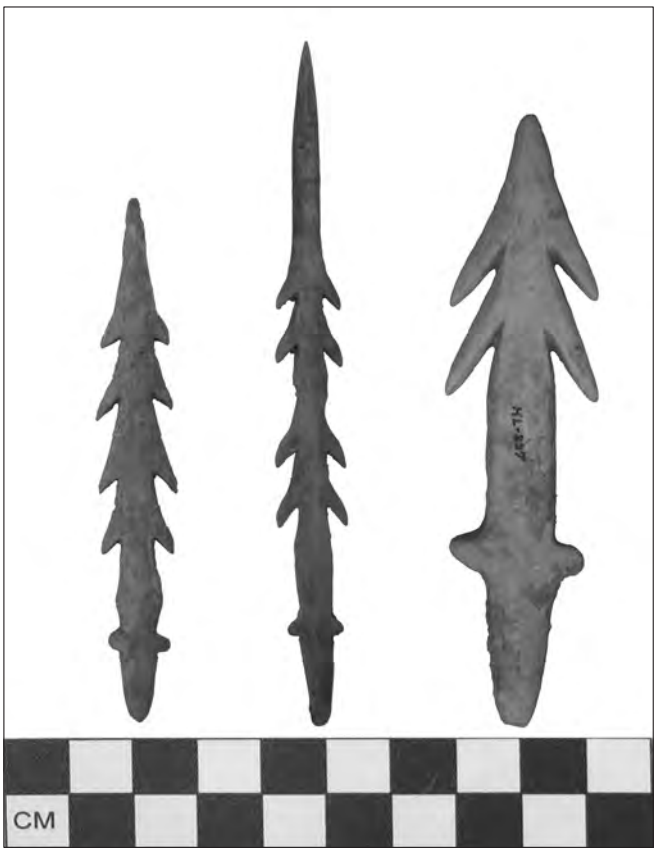

Figure 5. "T"-shaped or crucifix-based harpoons (two on left from XCB-111, Sanak Island; one on right from Hot Springs Village site).

The Old Islanders assemblage dates to the very end of the Ocean Bay II period, so perhaps it was never appropriate to find connections there. If the above scenario is correct, then we might expect Chirikof to have already diverged significantly from the Ocean Bay culture on Kodiak Island by forty-five hundred years ago. The regional significance of Old Islanders came to the forefront when, in 2002, James Jordan and I discovered a massive eroding village site on Sanak Island and collected a few large lance-shaped endblades. In 2004, a greater exposure and a number of AMS dates showed that these large blades dated to approximately 2100 BC and, thus, were nearly contemporaneous with the Old Islanders of Chirikof.

The eroding house floors of the earliest deposits at the Sandy Dunes site on Sanak Island were not depressions but rather more tentlike floors with charcoal-stained surfaces, flake and spall tools, and fire-cracked rock distributed over approximately a 4 m x 3 m area, although the extensive erosion of the land surface made house outlines difficult to determine in this area of the site. The lanceolate endblades were identical in shape, but somewhat smaller than those from Chirikof Island (Fig. 6), but when combined with the assemblage as a whole, the Old Islanders construct could now be extended far to the west, although a few hundred years younger. What was not present on Sanak Island was the polished slate part of the Chirikof Island collection. I must reiterate, however, that with increasing distance from Kodiak, the natural source of the region's slate, the amount of slate in collections dropped off dramatically.

Further afield, I think that many of the characteristics of the 2500 BC deposits at Margaret Bay level 4 (Knecht et al. 2001:65–66) would also fit into the Old Islanders construct, but with the addition of microblades and other features of the eastern Aleutian Island sequence. Moreover, the recent excavations by Schaaf et al. (2007) at Round Island on the northern edge of Bristol Bay revealed an earlier, but no less related, manifestation of the

Figure 6. Lanceolate endblades: two on left from the Old Islanders Complex, Chirikof Island; three on right from XFP-054 Sandy Dunes site, Sanak Island.

Old Islanders construct, one in my opinion with clear ties to the later Takli Birch phase on the Alaska Peninsula.

DISCUSSION AND CONCLUSIONS

It is easy to be blinded by academic traditions, such as being constrained by the historic culture boundaries of the Aleut-Alutiiq frontier on the central Alaska Peninsula. However, technologies can be equally blinding, such as the overwhelming influence of polished slate on the chronologies of the Kodiak Archipelago, when, in reality, these materials may be simply a reflection of geography, and might be irrelevant in measuring variations in culture, society, and ethnic interactions, much less chronological trajectories. With these caveats in mind, three important trends allow the reconstruction of a dynamic north Pacific and Bering Sea prehistory that crosses phases, traditions, archaeological cultures, and historic ethnic boundaries. Working from oldest to youngest, I will attempt to put these topics in a spatiotemporal context that may have relevance for delineating variation in the development of western Alaska societies. This builds on Workman's (1980) substantial synthesis in which he described his construct entitled the "North Pacific Maritime Co-Tradition." Given new data from the last twenty years of research on Kodiak Island, the Alaska Peninsula, and the Unalaska region, the

co-tradition concept is perhaps outdated today, but the basic themes described by Workman (1980) are still relevant, as they are founded in macroregional interaction and local variation.

Stretching from Cook Inlet to Kodiak Island, to the Alaska Peninsula, out to Unalaska and Umnak Islands, and also northward to Bristol Bay, an early northern maritime tradition certainly existed between around 3500 and 4500 BC. With strong elements of the better-defined Ocean Bay tradition, regional and local variation was already being manifested by 3000–2000 BC. In terms of stone projectile points, the hallmarks of this early tradition include either large lanceolate endblades (on Round Island, on Takli Island, at Margaret Bay, and at various Kodiak Island sites) or the better-known shouldered and stemmed varieties (for which Sitkalidak Road Cut is the type site, but they are also present at Takli Island, Margaret Bay, Sandy Beach Bay, and perhaps Sanak Island). One of the more widely spread elements of these early traditions is the presence of bilaterally barbed harpoons with a "T-shaped or crucifix-shaped base for line attachment, which are found in numbers at Takli Island, Hot Springs Village, Sanak Island, and Unalaska.[5] By 2500 BC there was increasing variation in this tradition, with Ocean Bay II and Takli Island quite different on opposite sides of Shelikof Strait; a use of microblades in Unalaska; use of smaller, lance-shaped endblades at the Hot Springs site; and use of large, symmetrical lance blades on Chirikof and somewhat smaller ones on the Sanak Islands (Old Islanders Complex). I believe it is now clear that, since there is a continuous sequence in the eastern Aleutian Islands over this time range, we may assume given the described similarities that the entire north Pacific may have been occupied by some form of ancestral Aleut population between 3500 and 1600 BC.[6]

With increasing population levels and time, there is growing subregional variation. Some trends are more widespread, however, and while there appears to be an early break between Kodiak Island and all groups to the west in relation to material remains, a number of macroregional patterns are identifiable. Since one of the more enduring aspects of any society is its belief system, it is important to note the strong similarities between the Kachemak ancestor beliefs and the ancestor worship system of the Aleut in the first millennium AD. These must have a historical connection. It is unfortunate that the Kodiak peoples had such little access to ivory, because if they had, we might see the presence of small figurines in that area at 1000 BC, just as we see everywhere else where there were ivory and people at that time. Exactly what these figurines and the contemporary small mask-like sculptures actually mean will be open to endless debate, but the most important point is that, much like the expansion of Aleut peoples seen in early Ocean Bay times, the distribution of these materials in time and space indicates macroregional interactions stretching from the Aleutian tradition of the Hot Springs site to the Choris culture on the Choris Peninsula, and suggests evolutionary relationships spanning from the Aleutian tradition/Choris time frame to later Norton and Ipiutak occupations of the eastern Bering and Chuckchi seas.

These interactions and relationships are further manifest in the distribution of fishtail endblades. Above I argued for an evolutionary relationship between the western Gulf of Alaska/southern Bering Sea at 1000 BC, and the 100 BC cultures of the eastern Bering Sea and Bering Straits. In the case of fishtail endblades, however, I am arguing for a complex interaction sphere stretching from Chirikof Island on the southeast to Unimak Island on the west (but apparently not into the eastern Aleutian Islands), then northward to Bristol Bay and Nunivak Island, and on to Ipiutak at Point Hope on the northwest Alaskan coast. If a macroregional tool type is seen at 100 BC across the entire region, then that lends much more support to the notion that these societies have a long history of interactions and co-developments, especially in the area of belief systems.

It was William Workman who first argued that fishtail endblades could be compared with Norton and Ipiutak, and it was Workman who made the Chirikof connection to the Alaska Peninsula for the ultimate derivation

5 Popov and Yesner (2006) have noted that the same cross-shaped base, bilaterally barbed harpoons are diagnostic artifacts for early Neolithic coastal cultures in Primorie in the Russian Far East, dating to the same time period (i.e., from 4000 to 3500 bc). Human remains associated with these materials, as well as with ground slate bayonets, from the Boisman II site have been characterized as "proto-Chuckchi-EskAleut" based on cranial morphology (Popov and Yesner 2006).

6 Workman (1979) has made a powerful statement about the role of volcanism in Alaska prehistory, and my arguments presented in the current paper have omitted one critical event in the history of this region—the massive eruptions of Aniakchak and Veniaminov volcanoes in the mid-second millennium bc. Both Richard VanderHoek and I have argued in a number of independent presentations that this event was probably responsible for the initial split of the Aleut, and the ultimate development of an independent Eskimo line after 1600 bc. Indeed, it is at this time that the eastern and western Gulf regions take independent trajectories in technologies (but not necessarily in belief systems).

of his Anchorage Complex (arguing against Kodiak as the source). It was Workman who inspired me to take a serious look at belief systems in the western Gulf of Alaska. It was Workman's Old Islanders that helped place the newly discovered Sanak materials in context, bridging the geographic gap between the Kodiak Archipelago and the eastern Aleutian Islands, and tying the entire region into a coherent package. In the folklore of Alaskan archaeology, William Workman is famous for his intellectual investment in the artifacts of the different complexes found across the state. One might often hear in regards to Workman that "he really knows his rocks." It was Workman's keen interest in the material remains of these past societies that inspired this study. Without his observations about the relationships among and between things, it would not have been possible to reconstruct the social, political, and religious relationships among the societies defined by those material remains.

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FIVE SEASONS WITH THE LATE KACHEMAK

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ABSTRACT

Over a number of seasons the Afognak Native Corporation and the Native Village of Afognak have undertaken archaeological excavations at Afognak Bay on Afognak Island in the Kodiak Archipelago. Here are summarized the results of work at three sites of the Kachemak tradition directed by the author in 1999 through 2003. Flaked stone implements at two sites at the mouth of the Afognak River were more numerous than had been expected. Some degree of relationship to the Norton tradition appears to be indicated.

KEYWORDS: Archaeology, Kachemak tradition, Kodiak, Afognak Island, Norton culture

INTRODUCTION

Single house excavations allow prehistory to be approached on the basis of households rather than an amalgamation of village or tribal data, as often is the case with trench excavations in deep midden sites. This allows a sharper, more precisely defined view of the events of prehistory, even without recognition of what went on outside the houses. This approach was brought to Kodiak Island to the Karluk sites KAR-0001 and Nunakhnak KAR-037 by Richard Jordan and Richard Knecht (Knecht and Jordan 1985), and was continued by the excavations of Amy Steffian at the Late Kachemak Uyak Site (1992) and of Patrick Saltonstall at the Koniag Settlement Point Site (1997).

Further pursuit of precontact Kodiak household archaeology was made possible by the work of the "Dig Afognak" program, excavating sites on Afognak Bay on Afognak Island of the Kodiak Archipelago (Figs. 1–2). Participating archaeologists during the 1990s were Richard Knecht, Patrick G. Saltonstall, and Katharine Woodhouse-Beyer. For six years, through 2004, the author made additional, small-scale excavations at Afognak Village and the mouth of the Afognak River (Fig. 2).

Work was at four sites, three of them late Kachemak in age. Here the focus is on the late Kachemak sites excavated over the course of five seasons. Two were located at the mouth of the Afognak River (Figs. 1–2). The other late Kachemak site was "Aleut Town" at Afognak village. Both inner bay and exposed coastal settlement locations are involved. The attraction of the inner location is a multispecies series of salmon runs. The outer coastal location is free of the winter constraints experienced at the river mouth (deep snow and river ice), and has access to whales, a seal haulout, sea otters, shellfish, and a halibut hole. The sites should thus show a likely contrast between main or winter villages and summer settlements.

ALEUT TOWN SITE

For two seasons one paid assistant and the author, and at times other staff of Dig Afognak and visitors, conducted small-scale excavations of the part of old Afognak Village called "Aleut Town" (Fig. 3). Identification of the Aleut Town site as late Kachemak in age is based on both artifact styles and radiocarbon dating. Aleut Town (local usage, on maps as "Aleut Village") was reported in a 1795 census of Kodiak attributed to Baranov and was not totally vacated until 1961. Its Alutiiq name is recalled by former Afognak residents essentially as it was recorded 210 years ago: "Nashkukhalik" or "Nashqualuk" (in a

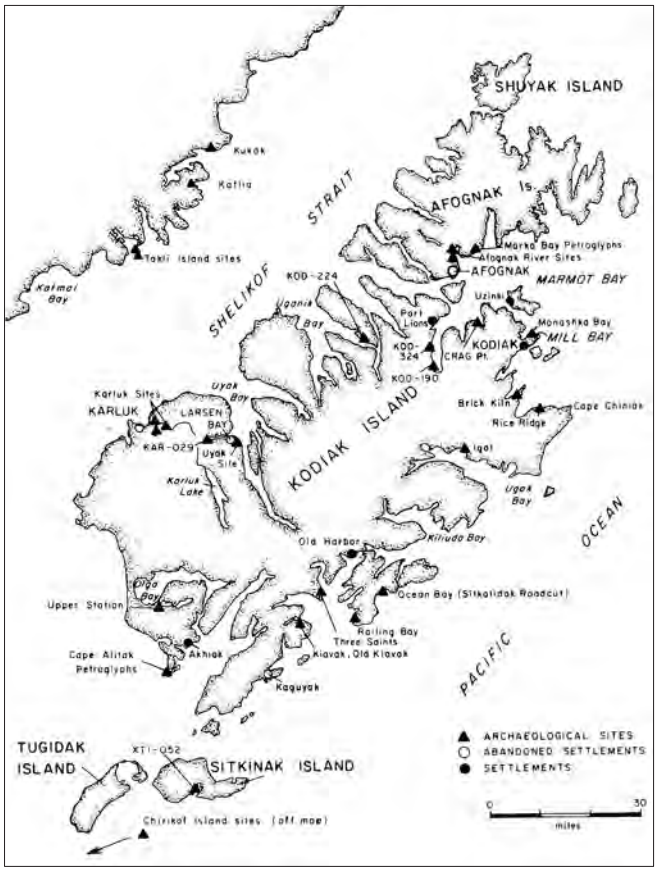

Figure 1. Map of Kodiak Island.

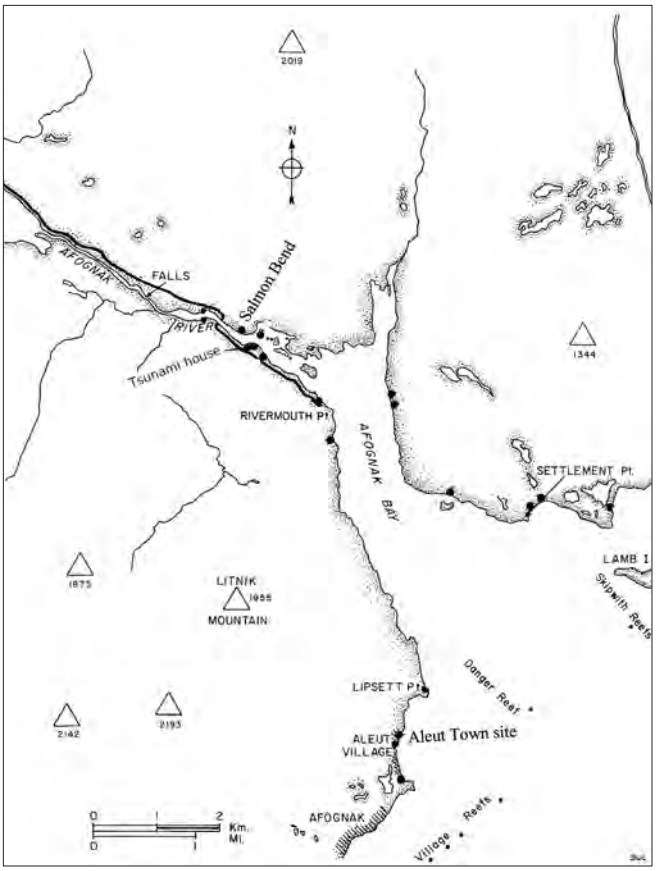

Figure 2. Map of Mouth of the Afognak River.

Figure 3. Erecting a Weatherport shelter over part of the Aleut Town site.

Gedeon manuscript published with highly variant spellings by Langsdorff [1993]) (see also Luehrmann 2008:30). A substantial Koniag (ancestral Alutiiq) occupation was expected at this site, but instead there was a late Kachemak midden and only two distinctive Koniag tools were found on the surface. A major part of the site had been lost to erosion, which might account for the paucity of Koniag tradition material dating from after AD 1200. Two radiocarbon dates placed the occupation at about AD 1000 (Table 1). Although the site was occupied until 1961, most of the remains probably dated close to the time of the radiocarbon dates.

A grid of 1 m squares was laid out over the excavation area for 1999 and 2000 (Fig. 4). It was almost impossible to maintain the grid stakes because of the large number of slate slabs located close to the surface. Consequently, grid corner positions were marked on planks strung along each side of the excavation. For vertical control there were several line level substations keyed to a master datum.

Excavation at the Aleut Town site revealed part of a historic bathhouse (banya) and an array of Kachemak features including two proximal housepits, stone slab hearths, slate slab-covered subfloor pits, additional slate flagstones, and postholes. The last had cobble and small slab props to hold the posts in place during installation. Excavation did not extend to the inner (landward) end of either housepit, in part because of the location of a U.S. Coast and Geodetic Survey monument. Thus, it is uncertain whether or not they were connected by a passage.

The house floors were well defined, but they were almost devoid of artifacts; the occupants seem to have kept their floors free of debris.

The late Kachemak was a time of small notched pebbles of uniform size and shape, most probably fishnet weights. Distributional evidence favors the salmon fishery, but not exclusively. There were no notched pebbles at the Aleut Town site. The people who lived there may have kept their salmon fishing gear elsewhere, perhaps at netting sites on the Afognak River. There was also a striking paucity of flaked chert artifacts. There were only two chert tools and a spearhead, flaked but not made of chert. Even in slate-grinding Koniag tradition sites there is relatively more flaked chert, and most late Kachemak sites have a modest amount of chert and other flaked stone including basalt. Barbed dart heads were common and a disproportionately large number of toggle heads of simple "self-armed" unbarbed format were recovered. Styles of harpoon heads (Fig. 5) and labrets and other ornamental items (Fig. 6) are in keeping with distinctive Kachemak modes, lateness of the radiocarbon dates notwithstanding. Late Kachemak labrets, unlike those of the Koniag tradition, usually have flaring flanges. One widely distributed style, represented by slate and "jet" (coal) examples from Aleut Town, has the shape of a pulley.

Table 1. Radiocarbon Dates

Site	Date (^{14}Cyr)	Lab Number	Calibrated Range*	Context
Aleut Town	950±50 BP	Beta-150810	AD 1010–AD 1230	N/A
Aleut Town	1090±80 BP	Beta-150811	AD 770–AD 860	N/A
Tsunami	880±40 BP	Beta 165141	AD 1030–AD 1250	Above tsunami sand
Tsunami	1320±80 BP	Beta 165139	AD 600–AD 890	Under tsunami sand
Tsunami	1750±60 BP	Beta 165140	AD 130–AD 420	Tsunami house floor
Salmon Bend	1420±80 BP	Beta-170060	AD 530–AD 780	"Annex" area
Salmon Bend	1330±60 BP	Beta-170061	AD 620–AD 790	Main room, not floor

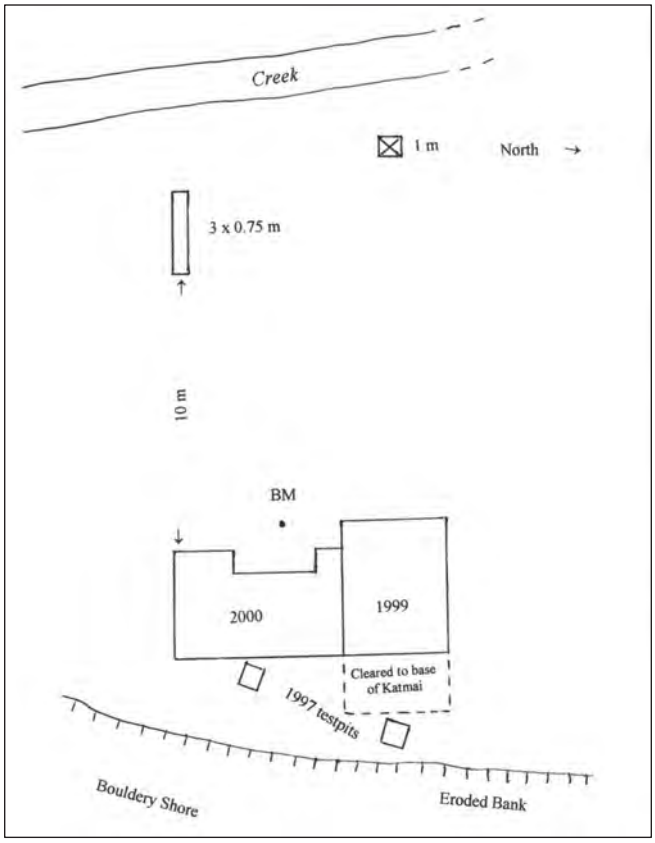

Figure 4. Excavation layout at Aleut Town site.

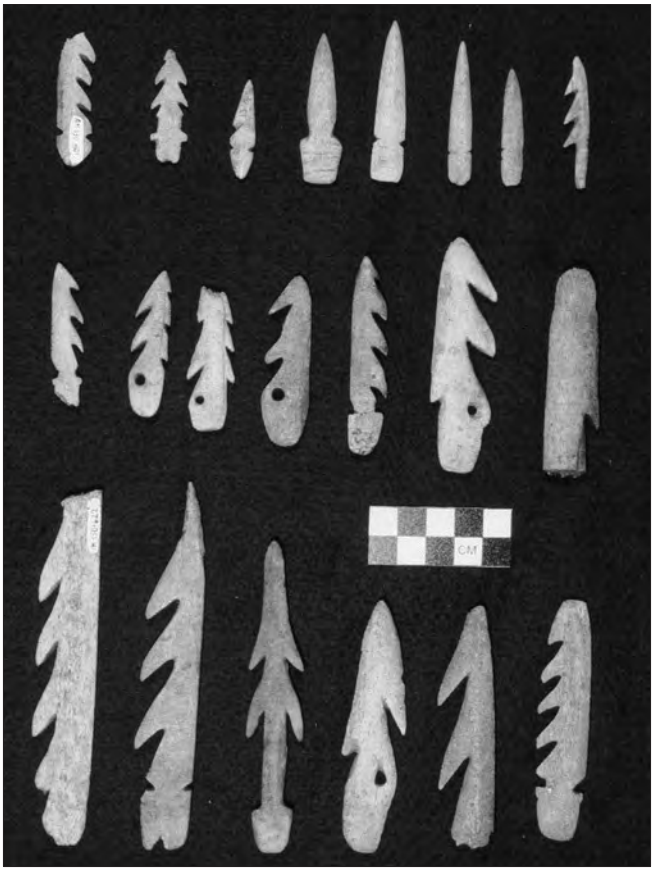

Figure 5. Harpoon heads, Aleut Town site.

This site has good preservation of bone artifacts (Fig. 7) and faunal remains, unlike the next two discussed. The two small spindle-shaped objects in bone (Fig. 6), probably nose pins, are of interest inasmuch as an identical specimen comes from a site at Dutch Harbor on Amaknak Island near Unalaska (McCartney 1984:Fig. 9n). Two lamps, one a fragment, show rounding and smoothing of edges that evidently occurred as the lamps were being rolled about in the surf. They illustrate a trait of the ancient Kodiak Islanders to recycle implements washed out of sites. Evidently, even a thousand years ago Afognak sites were being destroyed by the sea. Three incised slate tablets (Fig. 8) appear to be from an antecedent to the incised slate figurine tablets that appeared on Kodiak in great numbers during early and middle Koniag tradition times (Clark 1964). They, however, do little to explain the origins of the presumed ritual for which these figurines were made.

Figure 6. Ornamental and small objects from Aleut Town, including two Koniag/Aleut-style ornaments (top row, spindle-shaped, sometimes identified as nose pin), a doll arm (middle left), and the bone core of a raptor claw. Two discs are from halibut vertebrae and are shaped, not break outs. At the top right are two miniature harpoon heads.

Top row (L to R): Item cut from tooth AM330:1006; 2 "nose pins" 589, 607; grooved bone ball 691; 3 bone tube beads 682–657–741; miniature harpoon heads 923, 651. Second row: doll arm? 750; pin (end missing) 929; ornament? 792; head of pin (end missing) 788; pendant bead; halibut vertebra discs 787–783; miniature mask (walrus?). Bottom row: bear molar; eagle claw core J.L6; grooved pin (broken) 888; miniature spear 939; labret 689.

Finally, among the faunal remains were scattered human bones, a condition typical of Kachemak culture. These included two short segments cut out of the dental arcade with the surfaces of the incisor teeth ground flat. Hrdlička (1944) commented nearly fifty times on Kachemak treatment of the dead and human remains but did not mention this specific artifact. The human skeletal material was reburied on the site. The fauna is in storage and has not been analyzed. Some midden layers consisted of densely packed deposits of fish bones. Sea otter, fox, and especially dog bones also were recovered.

TSUNAMI SITE

The second set of excavations was conducted in the Afognak River estuary where there is a progression of sites extending up the river, beginning with Ocean Bay I, Ocean Bay II, then early Kachemak that largely overlaps the OB II zone, followed by late Kachemak. Above this, but still within the tidal zone, are Koniag tradition houses and deposits (Workman and Clark 1979). Finally, at the head of tidewater there are Russian-period Alutiiq houses and a fish trap or *zapor* (Moser 1902:Pl. XX).

During three seasons two houses were excavated, one on either side of the river. Each had noteworthy features. A grid of 1 m squares was placed over the Tsunami excavation, set (imperfectly) to encompass the very disturbed edges of a house structure (Fig. 9).

A band of tidal wave-deposited sand directly overlaid the main occupation. This layer served importantly for stratigraphic control. Geologist Gary Carver ran a soil probe into a nearby sediment trap and found as many as nine tidal wave deposits. Funnel-shaped, shallow inner Afognak Bay undoubtedly caught and intensified every tidal disturbance that came along. There is also a date (Beta-165140) of AD 250 for the structure floor.

Figure 7. Awls, beaver tooth gouge, fish hook barbs, and shanks, Aleut Town site. Left column: bird bone awls 1456, 1512, 751; needle (eyed end missing) 604; pointed sawn bird bone strip 1087; bird bone with strip for needle blanks cut out 941; awl on mammal bone chip 1623; mammal bone awl 1427; bird bone awls 756,1163, 649. Right side: beaver tooth gouge bit 864; fish-hook barbs 630, 917, 915, 1519; fishhook shanks 638, 856; kayak joint bearing? 704.

There were many stone slabs in this house used for hearth boxes, to cover crypts in the floor, and for other undetermined purposes (Fig. 10). In the 7-m-long, 4-m-wide house there also were many clay-lined pits, some of them old and filled in, others voids covered with stone slabs (Fig. 11). There were no noteworthy pit contents, but a small lamp had been pressed into the clay lining of one pit. Another depression, located next to the hearth, contained a larger lamp encrusted with a red-orange substance (not the usual red ochre). In four corners there were clusters of small-to-medium-sized boulders that may have supported

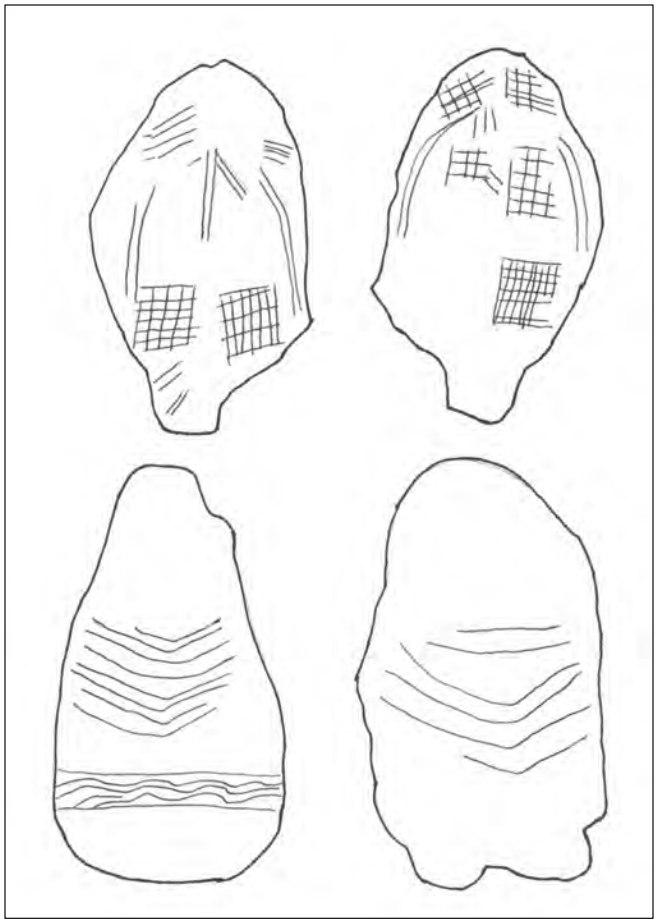

Figure 8. Drawing of three incised figurines on slate pebbles.

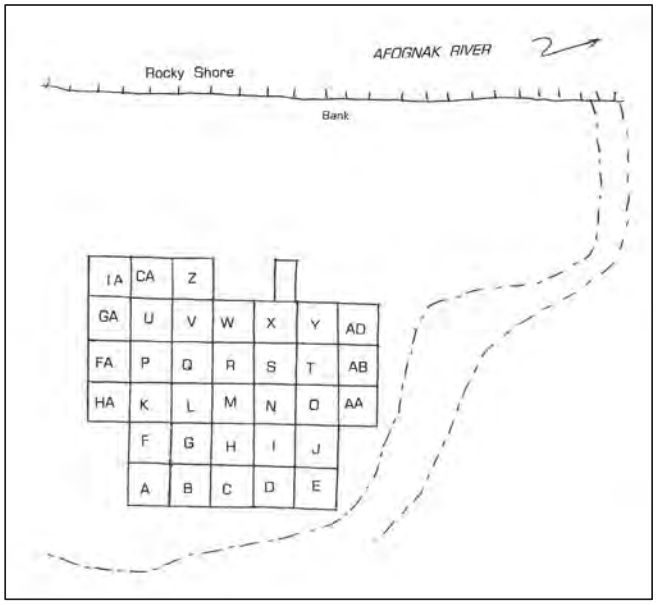

Figure 9. Excavation layout, Tsunami site

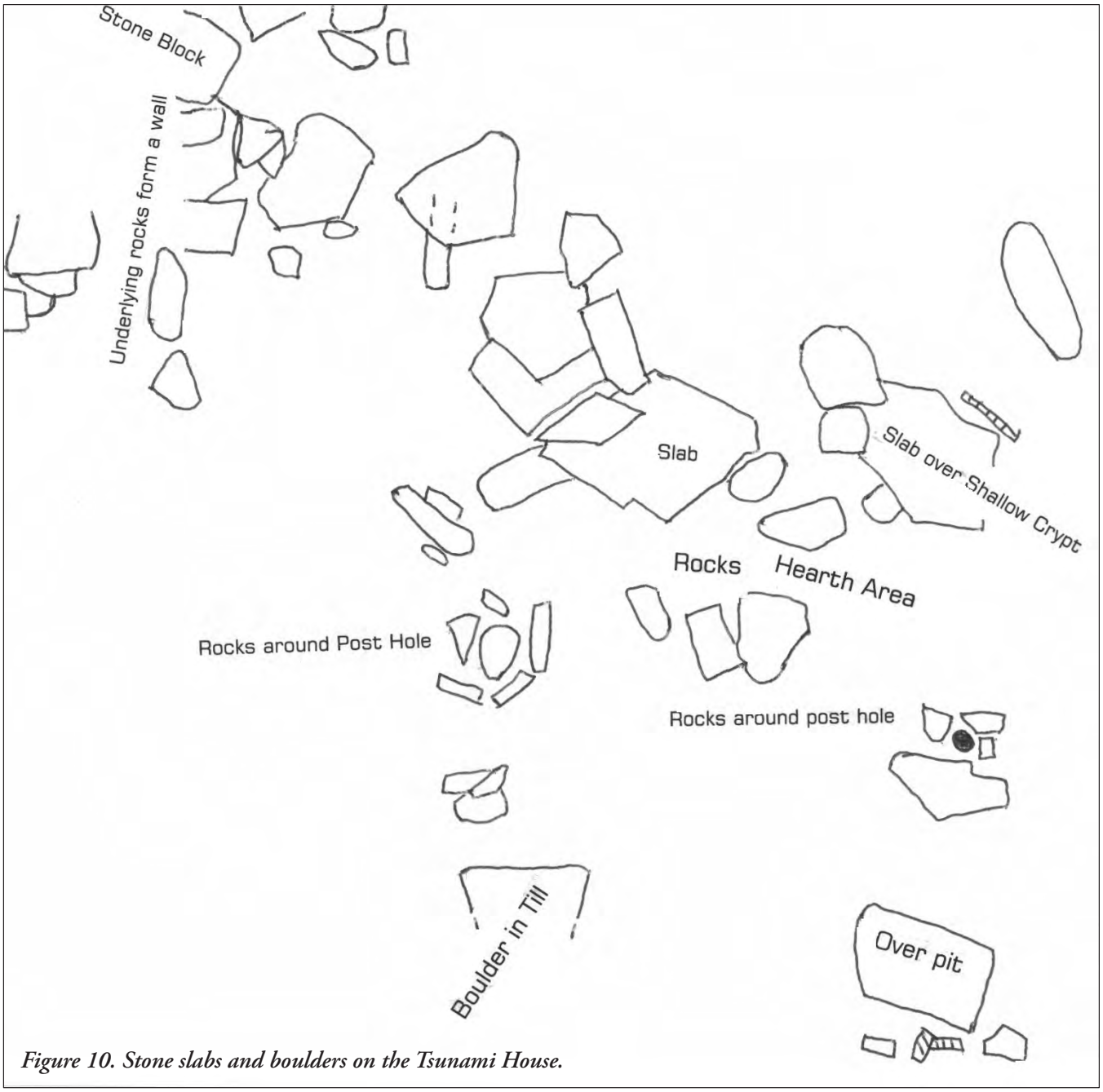

Figure 10. Stone slabs and boulders on the Tsunami House.

wall stringers midway above the floor for the wall-roof construction. Adze bits were uncommon at this and other late Kachemak sites, so use of stone pylons would have reduced the necessity to laboriously cut wooden posts to length. But they did use posts in considerable numbers. Postholes often were ringed by small slate slabs. These slabs could have held the posts in place while the structural framework was being tied together with headers. The floor was formed from yellow-orange clay, which appears to have been residual from the volcanic ash soil that mantled the local glacial till. This so-called "butter clay" is very plastic and slippery, as was discovered when we attempted to work atop it after a brief rainshower. Additional stripes of yellow-orange clay complicated the task of following and interpreting the stratigraphy. They probably are from tephra in soil attached to sods carried in for construction.

The house entrance was not identified. It appeared that excavation had not completely exposed one end of the structure. Two years later further excavation was done at that end of this structure, and it appeared that excavation actually had gone beyond the housepit into the fill of another house that had sliced off the end of

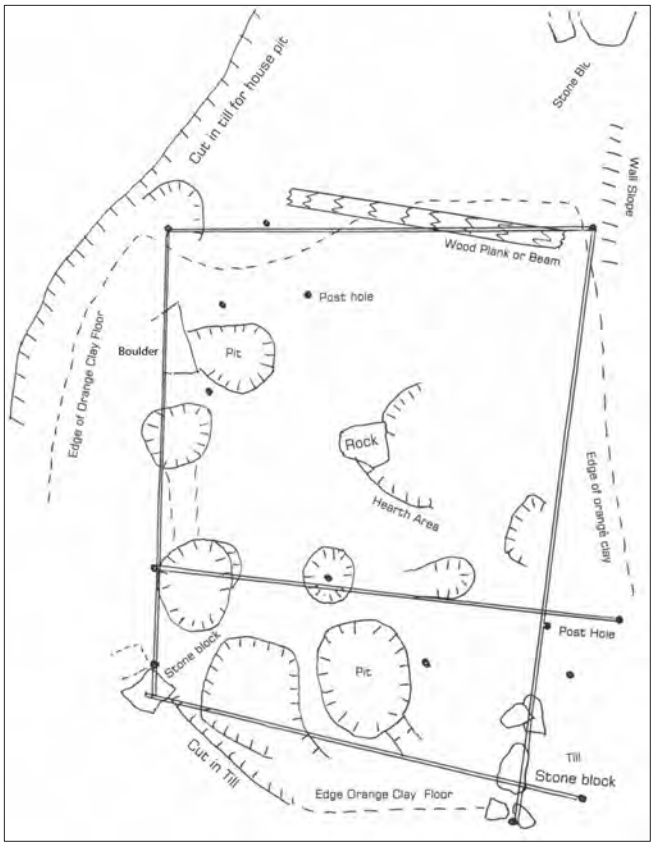

Figure 11. Subfloor pits and post holes in the Tsunami House, with one hypothesized arrangement of beams.

the Tsunami house deposit. In so doing it had destroyed the entrance. Thin archaeological deposits overlying the tsunami sand layer might have resulted from reuse of the housepit or could have been derived from other construction on the site.

Artifacts (Table 2) include fifty notched pebble weights, numerous slate ulu blades (mostly fragments), stone lamps, labrets, and flaked chert and ground slate projectile points in several styles, but lacking are the barbed slate points that usually are a hallmark of the late Kachemak tradition. Only stone artifacts were recovered. There was a large array of abraders and whetstones, which would have been used to finish ground stone, wood, and bone items. Compared with Hrdlička's (1944) late Kachemak at the Uyak site, which he called "pre-Koniag" (see Heizer 1956), and the author's excavations at Three Saints and Crag Point (Clark 1971), the main divergence seen in this assemblage is a considerably greater abundance of flaked stone items. Along with the occurrence of notched pebble sinkers, this sets the Tsunami house apart from the Aleut Town houses. Greater evidence of fishing with nets had been anticipated. Initially, it was thought that the frequency of flaked chert indicated greater antiquity for the Tsunami site. That may be the case, as the Tsunami radiocarbon dates are older than the Aleut Town dates, but this is by only a few centuries. There was a certain time, though, near the beginning of the Koniag tradition, when there was a shift in lithic frequency to almost exclusive use of ground slate. The Tsunami site may precede this shift and Aleut Town may follow it. As is noted below, the Salmon Bend site also has a frequency of flaked lithics comparable to that of the Tsunami site. Dates for the two sites are also comparable.

SALMON BEND SITE

The succeeding year, 2002, after the Tsunami site excavation, the worksite was across the river at the Salmon Bend site (Fig. 12). Collections from the eroding beach indicated that again there would be a late Kachemak occupation (Fig. 13). Surface outlines showed the likely presence of a rectangular house with an attached structure. At the

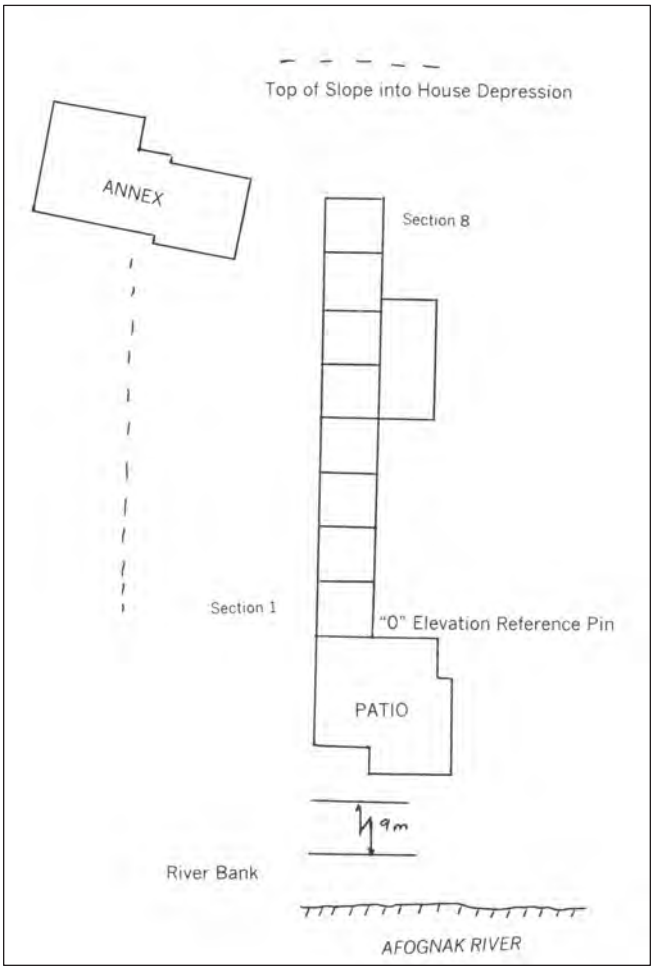

Figure 12. Excavation layout, Salmon Bend site.

Table 2: Selected late Kachemak stone artifacts

Artifact	KOD-044 Crag Point[1]	AFG-004 Aleut Town	AFG-215 Tsunami[2]	AFG-108 Salmon Bend[3]	AFG-108 Beach[4,5]
Whole ulu	21/23% c	10/6.2%	19/5.3%	10/2.2%	
Ulu major frag.	17	c 15	31	27	
(Total above)	38	25/15.4%	58/13.9%	37/8.2%)	18
Grooved cobble	4	3/1.9%	5/1,4%	5/1.1%	10
Notched pebble	578/64.5%	0/	50/13.9%	134/29.7%	322
Slate point, frag.	11/1.3%	17/10.5%	12/3.3%	14/3%	8
Flaked point	1	1/0.6%	11/3.1%	27/6.0%	1 frag.
(Total points)	12/1.3%	18/11%	23/6.4%	41/9.6%	8)
Other flaked chert	0?*	1/0.6%	10/2.8%	18/4%	6
All abraders	39/4.4%	52/32%	51/14.2%	27/6%	
Used cobble spall	30/3.3	some	6/1.6%	ca 6/1.3%	4
(All above)			26/7.2%	39/8.6%)	
Stone lamps	0	2/1.2%	3/0.8%	2/0.4%	3
Adze bits	1+beach	1/0.6%*	4/1.1%	2/0.4%	2
Beads	16/1.8%	8/4.9%	4/6.1%	3/0.7%	
Labrets	15/1.7%	5/3%	0/	5/1%	1
Other stone	151	52	105	91	15
(Total stone)	895	162	360	451	
Bone	462	ca 279	0	0	0

Notes:

1 Some chert, not listed here, eroded out of Crag Point and was found on the beach there. This material may be derived mainly from the basal early Kachemak component, but some also may be from the Ocean Bay and late Kachemak components.

2 Tsunami artifacts do not include the second year's excavation situated outside the house in the fill of another structure. That collection is small and also of late Kachemak age.

3 Artifacts collected or seen at the Salmon Bend site, AFG-108, in 1964 (132 items plus flakes) and 1971 are described by Workman and Clark (1979). Most of these items were discarded at the site.

4 Slender ground slate rods are counted as slate points. Six of these, one of them barbed, were found on the beach at AFG -108c.

5 In addition to the six chert implements from the beach, there were 224 flakes and chunks, mainly of red chert from AFG-108c.

Clark also had visited the site in 1951 and found on the beach a large number of notched pebbles although the site was not being washed out at that time. There could have been historic disturbance here as this location is the outer terminus of the Litnik-Afognak hatchery tramway that preceded the gravel road to Afognak Lake. Over the years many artifacts also were picked up from the beach at AFG-108 and brought back to the Dig Afognak base camp. They are not counted here.

time, this was an unexpected feature for a Kachemak period house but is now known from the early Koniag period (Saltonstall and Steffian 2006). Excavation showed that the Salmon Bend house actually was a compound. The attached structure (Fig. 14) was not completely excavated, nor was the main room, but a relatively broad passage into the main house was fully exposed. Within this annex structure there were so many slate slabs at an intermediate elevation above the floor that it seems the roof had been covered with them. There were clay-lined pits in the floor and hearths. The so-called "annex" was apparently more than just a sleeping room.

An 8 m trench was run through the main room from front to back (Fig. 15). Due to crew limitations, the trench was only 1 m wide except locally where it was expanded to 2 m width. Clay-lined basins and stone-slab hearths were uncovered. There were distinct postholes, but not enough area was uncovered to define a post pattern. A large number of angular boulders had been dumped into the entry area inside the house, and there were stacked stone slabs along the sides of this apparent internal passage. As the excavation there was only 1 m wide, it was not determined to what extent, if any, the boulder fill extended across the front of the structure. The house evidently had been rebuilt, or the location reused. Strong evidence for this is offered by a "patio" or stone slab pavement outside the structure pit at the front (Fig. 16). The patio was buried under a modest amount of artifact-bearing soil. Below that there was substantially more cultural deposit. Other

than for these features, stratigraphy consisted of the various soil layers noted in Table 3.

Under the patio slabs was the outer end of a sunken entrance passage that had been filled in before the slabs had been laid down. When the passage stopped at its outer end, so did the excavation. Almost immediately slender lanceolate points were found. Additional points were later recovered, making a total of eighteen. One point of the same format was also recovered from the "annex," tying the annex to the main structure and showing that the occurrence of the point cache in the entry area was not an isolated event. These points are a Norton caribou-hunting arrow type, in the Kodiak area previously found only on Chirikof Island. They are out of place on Kodiak, but at home in the Bristol Bay–Bering Sea region, including the western Alaska Peninsula (cf. McCartney 1974:Fig. 6v).

Figure 13. Female lamp, Salmon Bend site, in hand and exposed at edge of eroded bank.

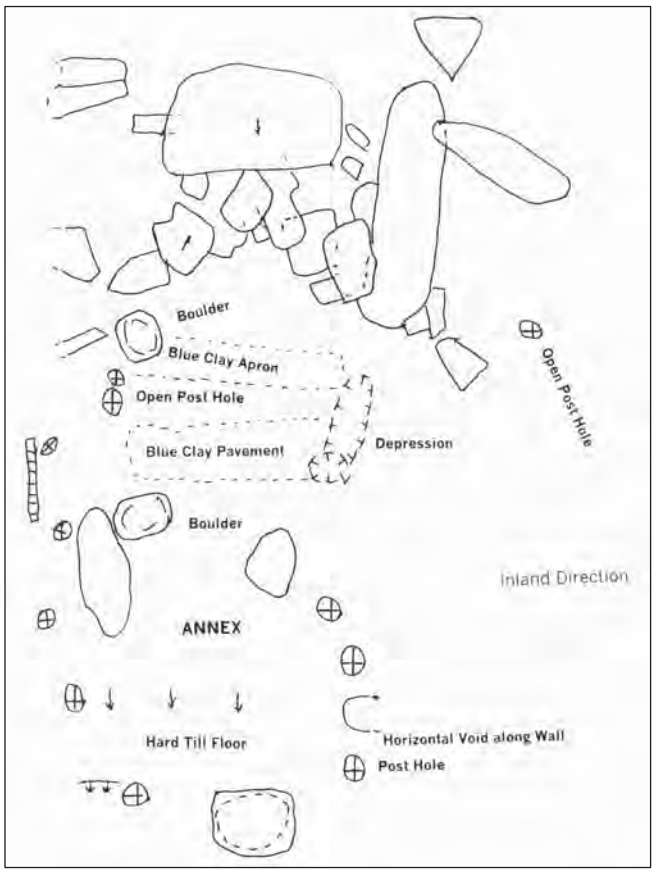

Figure 14. Annex features, Salmon Bend site. Arrows indicate slope. "Horizontal Void along Wall" appears to mark the juncture with the main room.

Table 3. Stratigraphy in main trench, face of sections 13, 14 And 15

Thickness of layer	Matrix
25 cm	Turf
	Secondary impure volcanic ash deposited by water in 1964
	Thin soil band from 1912–1964
	1912 Katmai-Novarupta volcanic ash
Approx. 10 cm	Black soil grades downward into variegated brown soil
2 cm	Fine gravel (disappears in upriver direction)
Variable	Many thin bands of brown, dark brown, and black soil
Variable	Traces of orange volcanic ash in some places
Beginning at 48 cm below 1912 Katmaiash Katmai-Novarupta volcanic ash	Glacial till/hardpan at base of site

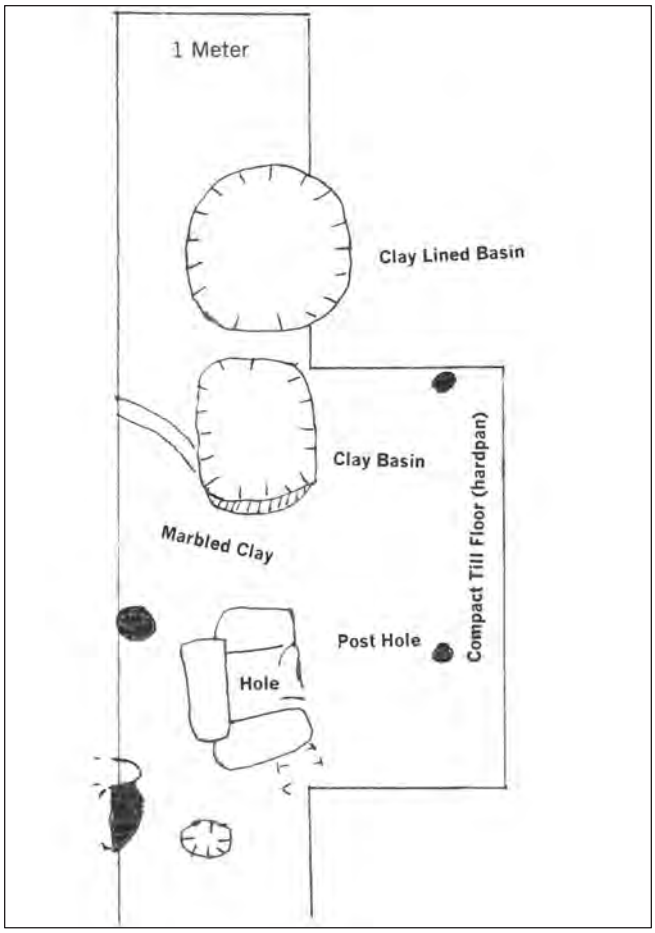

Figure 15. Main trench features at Salmon Bend site.

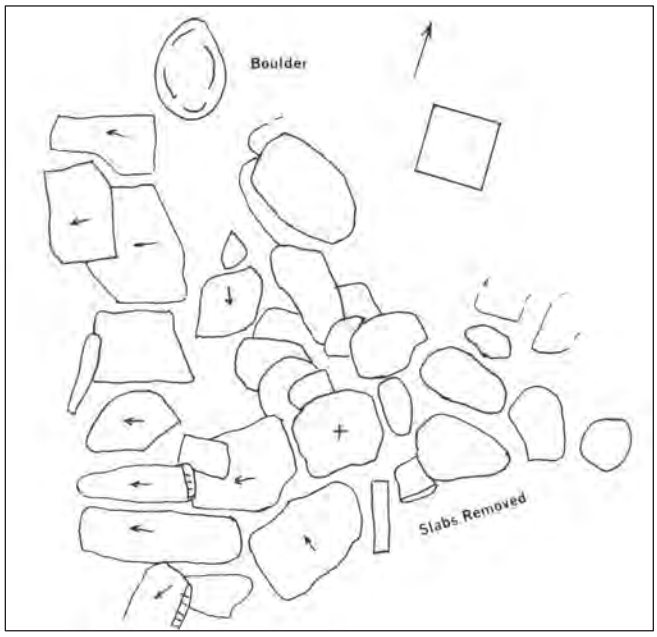

Figure 16. "Patio" flagstones, Salmon Bend site.

They are larger than Ipiutak arrow points of the same format (Clark 1977:Pl. 1) and could be dart tips. Concerning the possibility that they may be tips for war arrows (as they are identified in a display at the Alutiiq Museum), it has been said that preparation for war among Alaskan Eskimos consisted mainly of producing arrows. The inhabitants at Salmon Bend would have been able to put these arrows to good use during hunting expeditions to the Alaska Peninsula or for a stock of arms reserved for defense. However, the points were obviously brought in from elsewhere. The late Kachemak tradition is well enough known on Kodiak for it to be asserted that making this style of weapon was not part of the Kodiak Island technological repertoire. Moreover, none of the points was made of red chert whereas the abundant flaked industry waste found at eroded sites in the Afognak River area, including AFG-108, show an almost exclusive reliance on the local red chert.

Radiocarbon dating of both the annex and the main room is in accord with the accepted age of this artifact in western Alaska. These dates comfortably place the house several centuries before the end of the Kachemak tradition at about AD 1200–1250.

Additional flaked chert artifacts were recovered from the eroded shore at Salmon Bend, including many notched pebbles (Table 2). Again, only stone artifacts were recovered. Here, too, compared with the late Kachemak on Kodiak Island, this assemblage diverges by having a greater abundance of flaked stone tools. As at the Tsunami site, the occupation may come just before a period of rapid change away from the production of flaked stone artifacts.

We had hoped to find in these assemblages differences between permanent settlements and seasonal fishing camps. Interpretation involves some knowledge of Alutiiq seasonal activities. For instance, would a person make wooden equipment (correlated with small adzes and wood working tools) at the main settlement, or would this be done at a fishing camp during a lull between salmon runs? Obvious targets for interpretation are the frequency of fish net weights and fish processing tools such as slate ulu blades, as well as fish storage features. As anticipated, at the Afognak River there were numerous net sinkers, but elsewhere some late Kachemak sites that are not obviously salmon fishing stations also have notched pebbles. For nearly a century notched pebbles have been a subject of discussion among archaeologists who suggest that not all of them were used on salmon fishing nets.

Hearths at all sites were inside. Floors were sunken to some degree. Construction and roofs were substantial, judging from the abundant postholes. Subfloor pits, though numerous, were not large. These attributes should belong to substantial cold-season houses, not seasonal warm-season camps along a fishing stream. Concomitantly, this case is focused on houses in a circumscribed setting that should have dictated summer (May through October) occupation for the salmon fishery. While the absence of notched fish net weights at Aleut Town may have a correlated ecological basis, for instance in a shift to traps and weirs or exclusive curation of net gear at the fishing stream, numbers of such small weights usually are not found in Koniag-phase contexts. Aleut Town was occupied at the end of late Kachemak times. Possibly by that time Alutiiq people had stopped making these net weights, though they continued to use large notched and grooved cobble weights (related to deep sea fishing). Ulu blades were twice as numerous at the Tsunami site as at the outer location, Aleut Town, while stone projectile points of all types were roughly comparable in frequency and the number of abraders and hones (for making and sharpening ulu blades) also was about equal. Figures for the Salmon Bend site are less contrastive (Table 2). The conclusion is that one might not always be able to distinguish with confidence between fishing camps and main or winter villages on the basis of either artifact frequencies or structural remains.

DISCUSSION

The focus of the excavations described here has resulted in the recovery of information on house structures and artifactual contents making distinct activity sets. With caveats the results can be interpreted as household studies. The Aleut Town excavations encountered two buried structures. The Tsunami site excavations focused on a previously discovered house structure (there had been other occupation of the site, but most of the information and artifacts recovered appear to pertain to a single house). At Salmon Bend, work was confined to a single complex house. Large collections obtained from the shore in front of and immediately upstream from the Salmon Bend house apparently were derived from the same settlement occupation, though it is uncertain that the artifacts on the eroded beach were produced by the persons who had lived in the excavated house. They are mainly notched pebble sinkers (Table 2).

We have already considered the possibility that site differences, especially between Tsunami and Salmon Bend on one hand and Aleut Town on the other, might be due to a modest difference in their span of occupation within the late Kachemak period, especially as seen against the background of a period during which the frequency of flaked artifacts was changing regionally. An alternative explanation is that the incidence of flaking varied along a cline extending from Kodiak Island to Kachemak Bay, with greater emphasis on flaked stone towards Kachemak Bay (see Workman and Workman 1988). It might also be that vagaries of small sample size are involved, although the redundancy provided by the Tsunami and Salmon Bend site flaked stone collections lessens the possibility of significant sample variation.

Styles of certain flaked artifacts from the Kodiak archipelago discussed here suggest Norton culture influence. At about the time under discussion, and particularly from AD 600 to 800, there appeared in Kachemak Bay at the Yukon Island Bluff site an occupation that strongly reflects the Norton culture of the Alaska Peninsula. Workman and Workman (1988:348) consider the Yukon Island Bluff occupation to be intrusive. They note, too, that exotic lithic materials are commonplace in this assemblage. To some degree we also find exotic lithic material in the Afognak assemblages, even though ample local sources of red chert were available. By the time the Yukon Island Bluff occupation appeared, the Kachemak tradition had faded in Kachemak Bay. This does not prove that these people moved to Afognak—but they may have. It is perhaps no coincidence that when Kachemak people left Kachemak Bay—whether or not eased out by Norton people—Norton influence is manifested at Afognak Bay. This appears to have been a two-way situation, as Norton–Pacific Coast cross ties are so numerous (see Clark 1982) that Norton and Kachemak may be considered parts of a single archaeological co-tradition.

Considering the development of the Koniag tradition, we have already discussed some of the pertinent facts, such as the association of flaked chert and notched pebble sinkers with late Kachemak but not with the succeeding Koniags. The absence of notched pebbles and flaked chert at Aleut Town, the youngest of the three sites described here, points in the direction of the Koniag tradition, but not conclusively, since notched pebble distribution is erratic. However, there are other indicators that align Aleut Town with the Kachemak tradition. These include styles of harpoon heads, absence of flat-rimmed Koniag-style stone

lamps, absence of heavy splitting adzes, paucity of planing adze bits (which are exceptionally abundant at Koniag tradition sites at the mouth of the Afognak River), maintenance of the very precise "Three Saints" mode of forming barbed point bases, and the absence of a certain style of long faceted ground slate (often hollow-ground) projectile heads with medial ridges, said to be "transitional" Koniag (see Knecht 1995:Pl. 35 C-F) and much more. Hrdlička (1944) asserted that the Koniags ousted their predecessors, who were late Kachemak people, from the Uyak site, but many archaeologists consider this proposal to be unsubstantiated in the light of Hrdlička's uncontrolled excavation methods. Instead, *in situ* cultural development and cumulative change are often considered to be the most likely explanation. However, Dumond finds that a strong case can be made for some migration to Kodiak between AD 1000 and 1500, resulting in a culture amalgam forming the historic Koniag (Dumond 1991:106–107). Evidence from the Aleut Town site suggests that such an amalgamation may have in fact occurred very rapidly.

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DENA'INA USE OF MARINE RESOURCES FOR FOOD AND TOOLS

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ABSTRACT

Archaeological excavations around lower and middle Cook Inlet are providing insights into traditional Dena'ina Athapaskan marine resource use, despite the paucity of remains typical in Dena'ina sites. Data from twenty-three sites show an impressive number of marine species used, especially north of Kachemak Bay. Sites containing marine species are found far from the natural distribution of the resource, indicating the effort the Dena'ina went to obtain some marine resources. Interpretations of faunal remains in archaeological sites, especially shellfish in noncoastal sites, need to go beyond the traditional dietary analysis and consider whether tool use or manufacture is a better context for analysis. The recent discovery of a prehistoric cache in a house wall at a site near Kasilof (KEN-360) provides a rare opportunity to examine the organic and inorganic contents of a Dena'ina tool kit. The cache contained shells used for containers and tool manufacture, indicating some of the nondietary purposes to which marine resources were put.

KEYWORDS: archaeology, shellfish, nondietary

INTRODUCTION

The Cook Inlet Dena'ina are unique among Northern Athapaskans in having territory on the North Pacific Coast. Cornelius Osgood's (1966) study of the Dena'ina documented the Kachemak Bay Dena'ina's extensive use of marine resources as they borrowed hunting and fishing techniques, other items of material culture, and language from Pacific Eskimo neighbors. But Osgood collected less information on marine resource use by more northern Dena'ina, possibly because his informants were less knowledgeable about such practices or because fewer marine resources are available north of Kachemak Bay. More recent ethnographic work and archaeological research are enlarging the picture of traditional Dena'ina marine resource use on the western Kenai Peninsula.

The importance of salmon to the Dena'ina is undeniable, but rather than salmon this paper focuses upon other marine resources found in Dena'ina sites, using data from unpublished collections and contracted compliance studies of limited distribution. This paper reviews the current archaeological data about Dena'ina marine resource use, specifically sea mammals, fish, and shellfish. Goals of this paper are, first, to recognize data showing the use by prehistoric Dena'ina north of Kachemak Bay of the marine resources available to them. A second goal is to document that the prehistoric Dena'ina used marine resources, particularly shell, as raw material and as containers.

Identifying traits of Dena'ina sites have been summarized by Reger and Boraas (1996:161): Dena'ina sites north of Kachemak Bay typically contain cache pits, rectangular housepits with raised earth walls, and within each house a central hearth consisting of ash without a rock-lined perimeter. In addition to these criteria, sites

were considered Dena'ina for this study because the original investigators so concluded or because they are late Prehistoric to historic in age and well within traditional Dena'ina territory. Sites of questioned ethnicity have generally been excluded from the sample.

NATURAL ENVIRONMENT

When Europeans began recording ethnographic data in Alaska, the Dena'ina inhabited several microenvironments including the full marine setting of Kachemak Bay and lower Cook Inlet, the river-like setting of the upper Cook Inlet, and an almost continental environment in the Susitna Valley and the Iliamna Lake/Stoney River areas (Reger 1998:162). From the full maritime setting in their southern range the Dena'ina's environment transitioned to a more riverine setting about halfway up Cook Inlet (Fig. 1). The shift occurs within a fluctuating zone at about the south end of Kalgin Island, just south of the Kasilof River on the eastern coast of the inlet. Freshwater laden with glacial sediment flows out of the Susitna, Knik, and other large watersheds in upper Cook Inlet and eventually converges with clear Gulf of Alaska saltwater near Ninilchik in a zone known to local fishermen as the "mid-channel rip" (Burbank 1977:163). Marine animals such as sea otter (*Enhydra lutra*),[1] sea lions (*Eumetopias jubatus*), and porpoise (*Phocaena* sp.) are found south of the transition zone, while belugas (*Delphinapterus leucas*), harbor seals (*Phoca vitulina*), and larger whales (Cetacea) venture north of the zone during the summer season. Individual belugas have been tracked into upper inlet water even during the winter, but only occasionally, and not in conditions where they might be human prey.

Razor clams (*Siliqua patula*) are now present in sufficient numbers to be a food source to people as far north as Harriet Point on the west side of Cook Inlet and just south of the Kasilof River to the Homer Spit on the east shore (McLean et al. 1977). Hard shell clams such as Washington clams (*Saxidomus giganteus*), Pacific littlenecks (*Protothaca staminea*), and cockles (*Clinocardium nutalli*) thrive in clearer waters and sandy gravel beaches in the lower inlet. Cockles and surf clams (*Spisula* sp.) are occasionally collected on Clam Gulch area beaches and become slightly less rare in the Deep Creek area. Some very small mollusks can be found in the upper inlet but not species useful to area inhabitants.

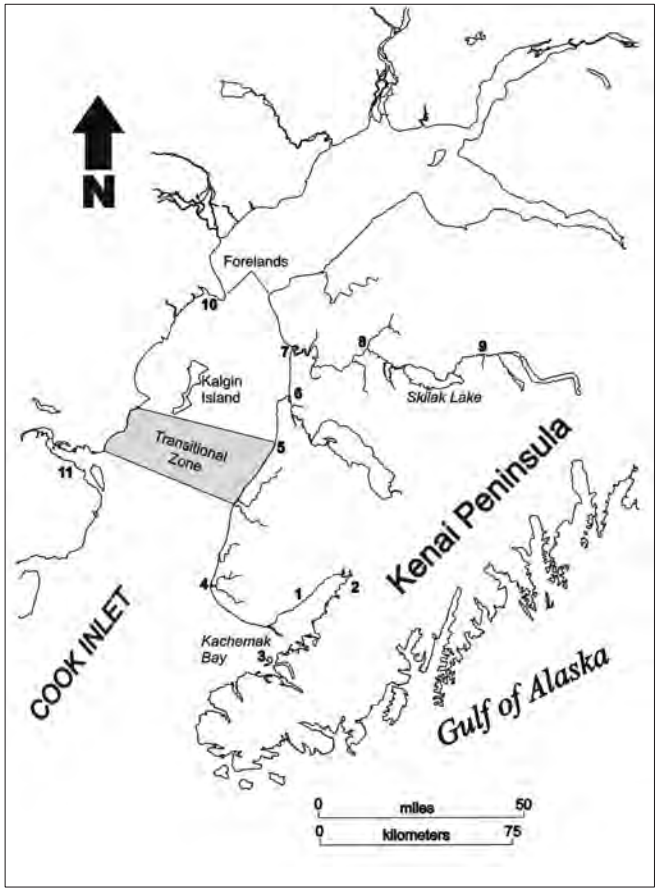

Figure 1. Cook Inlet map and localities mentioned in text. (1) Cottonwood Creek, (2) Seal Beach, (3) Yukon Island, (4) Anchor Point, (5) Clam Gulch, (6) Kasilof River, (7) Kenai River, (8) Moose River, (9) Russian River, (10) Kustatan, (11) Tuxedni Bay.

Marine fish are primarily found south of the transition zone, with migrating salmon (*Oncorhyncus* spp.) the major food source seasonally found north of the zone. The salmon join late spring runs of herring (*Clupea pallasi*) that spawn along the inlet shore in limited numbers and eulachon (*Thaleichlys pacificus*) that spawn in streams as far up the Inlet as Turnagain Arm.

ETHNOGRAPHIC DATA

Osgood (1966) describes Dena'ina hunting of marine mammals most commonly in Kachemak Bay. Seal was the

1 Many species names have changed in the scientific literature through time. The most recent usage is noted here for marine species where known. Because of the focus of this paper and space restrictions, terrestrial fauna and birds are not identified with scientific notations.

most important species there and in the upper inlet. Sea lion, sea otter, porpoise, and beluga whale were also hunted. Seal and beluga were hunted into the upper inlet area, where an elaborate method of hunting beluga involved using tree stumps as a hunting platform (Stanek 1996:135). The upper inlet Dena'ina erected platforms of poles or tree stumps with the roots upper-most, then waited to harpoon passing beluga and pursue the stricken whales to kill them (Kari and Fall 2003:75; Wrangell 1970:12). Seabirds were taken as the opportunity arose.

The Dena'ina harvested salmon along the shore of Cook Inlet by using weirs or A-frame structures to dip-net passing fish (Alexan 1965:60; Elliott 1886:95), but most salmon fishing took place in streams or lakes.

In addition to salmon, deep-sea fish were caught, especially halibut (*Hippoglossus stenolepus*) and cod (*Gadus* sp.). Crab and shellfish were harvested throughout their ranges and the Dena'ina traveled long distances to dig clams. The Iliamna Dena'ina traveled to Cook Inlet even into modern times to hunt brown bear and seal and to dig clams. The clams were shucked, smoked, and dried on a stick (Jensen 1985). Tyonek people traveled as far as Tuxedni Bay to collect razor clams (Stanek et al. 1982). Peter Kalifornsky described how the Kustatan people processed razor clams, storing them in beluga stomachs for winter food (Kalifornsky 1991:213).

ARCHAEOLOGICAL DATA

Faunal remains in Dena'ina sites are not abundant but most have a few specimens. The reasons for the lack of remains may include cultural proscriptions on disposal of household waste and personal effects (Boraas and Kalifornsky 2000; Boraas and Peter 1996), as well as acidic soil conditions. A few sites—notably in the more southern range of Dena'ina territory—defy that generalization. Kachemak Bay Dena'ina sites with significant midden deposits (i.e., larger numbers of faunal remains) include the Seal Beach site, Cottonwood Creek (upper layer), the historic component at the Yukon Island Fox Farm, and the upper component in the site west of Halibut Cove (SEL-010). The Clam Gulch site, further north, is a seasonal Dena'ina site with abundant faunal remains. Another Dena'ina site near Anchor Point (SEL-247) contains a small but significant faunal collection. A number of Dena'ina sites with limited faunal remains are scattered along the coastal bluff between Anchor Point and the Kenai River. Eight more late prehistoric sites identified as Dena'ina and containing limited fauna, mostly shells, have been documented along the Kenai River. Sites and collections mentioned here are discussed in the following sections.

The sampling and collecting strategies used during archaeological excavation of two deep shell midden sites in the Kachemak Bay area, Cottonwood Creek (SEL-030) and the Fox Farm Bluff site (SEL-041), were described by Lobdell (1980:97ff). All bone was collected during excavation while shells were identified in the field and not systematically collected. Midden was not screened in favor of careful trowel excavation. A similar approach to collecting faunal remains was true at virtually every other site mentioned in this paper. The data reviewed and new data presented are adequate for demonstrating the breadth and types of marine resource use by the Dena'ina. Consideration of the intensity of Dena'ina usage, which would require rigorous statistical analysis of the data, is outside the goals of this effort.

KACHEMAK BAY

Archaeological evidence shows that prey mentioned in ethnographic accounts was also harvested in prehistory. Seal and porpoise bones dominated the faunal assemblage at the Kachemak Bay sites of Cottonwood Creek (SEL-030) and Seal Beach (SEL-079), both of which contain Dena'ina cultural deposits overlying extensive shell midden deposits from the earlier Kachemak tradition (Lobdell 1980; Workman and Workman 1988). The Dena'ina component at Cottonwood Creek remains undated and the Dena'ina component at Seal Beach is historic. The Workmans observed that shellfish were less represented at the two sites compared to sea mammals, and that otherwise "subsistence patterns were relatively unchanging both through time and across cultural boundaries in Kachemak Bay" (Workman and Workman 1988:351). Yesner (1996:227) noted that a small increase of land animal species in the upper levels at Cottonwood Creek and Seal Beach fit the broader pattern seen in other Dena'ina faunal collections.

The post-ash component identified by K. Workman at the Seal Beach Site contained abundant harbor seal bones, with lesser numbers of porpoise and beluga (K. Workman 1996:216; W. Workman 1980). Fish remains were uncommon. The most numerous shellfish present were surf clams, whelk (*Neptunea* sp.), and Nuttall cockle. Soft-shell clams (*Mya* sp.), Washington clams, Pacific littleneck, limpets (*Notoacmaea* sp.), and dogwinkle (*Nucella lima*) were also

present in smaller numbers. Many terrestrial animals were also represented in the later levels of the Seal Beach site, including porcupine, marmot, bear, beaver, canids, lynx, weasel, marten, land otter, red squirrels, and rabbit (Karen Workman 2005, personal communication).

The historic Dena'ina collection excavated from the Yukon Island Fox Farm site (SEL-041) in Kachemak Bay by the Workmans contained marine mammals including harbor seal, porpoise, and sea otter, though land animals (caribou, marmot, porcupine, beaver, rabbit, red squirrel, and bear) were more broadly represented (Yesner 1992:173; 1996:229). Shellfish were not common.

When de Laguna (1975:22) reported the site located west of Halibut Cove (SEL-010), she described as Dena'ina a housepit and thin midden containing unspecified shell, beluga, and seal remains. Boraas and Klein (1992:186) dated the Dena'ina occupation to AD 1260, but did not report significant faunal remains from the deposit.

To summarize, in Kachemak Bay the marine fauna reported in late prehistoric and historic Dena'ina sites indicates a people well attuned to harvesting local resources, though they appear not to have pursued offshore fish or birds to the same extent as did the earlier Kachemak tradition people.

NORTH OF KACHEMAK BAY

Few Dena'ina sites north of Kachemak Bay contain extensive faunal remains. On a high bluff overlooking the Anchor River is a site (SEL-247) consisting of three small cache pits and a two-room house with raised walls, a short entry, and a central hearth lacking a rock perimeter. A radiocarbon date of 400±90 ^{14}C yrs BP (WSU-4473) was obtained from hearth charcoal and another of 220±85 ^{14}C yrs BP (WSU-4474) was derived from wood recovered near one corner of the house. Averaged and converted to a calendar date, the samples place the occupation at around AD 1575±75.

Cultural deposits around the central hearth and immediately outside the entry at SEL-247 contained scattered shell and bone. Sea mammals were represented by seven harbor seal bones, two bones from an immature sea otter, and two beluga teeth. A spine barb with attached skin from a rockfish (*Sebastes* sp.) was found, as was an unidentified otolith. Shellfish consisted of sea urchin (*Strongylocentrous* sp.) (n = 44), blue mussel (*Mytilus edulis*) (n = 40+), Nuttall cockle (n = 32), Arctic surf clam (*Mactomeris polnyma*) (n = 14), Pacific littleneck clam (n = 1), and eighteen thick unidentified clam fragments. Bear, moose, wolverine, porcupine, and rabbit were represented among the few land mammal bones.

Frederica de Laguna (1975:132) reported a two-room housepit containing bones and shell near Cape Starichkof (SEL-024). Her field notes identified the shells as mussel, "plain" clam, barnacles (*Balanus* sp.), and cockles (de Laguna 1930:79). One surf clam shell contained red hematite pigment (de Laguna 1975:146).

Bacon and Maxwell (1987) reported a two-room housepit (KEN-219) north of Ninilchik near Corea Creek that contained no artifacts and no fauna except for dogwinkle shells. The presumed late prehistoric site is probably Dena'ina. Not far away is a historic Dena'ina site (KEN-347) consisting of at least two small houses, numerous cache pits, and a midden containing dogwinkle shells and a clam shell fragment (Mobley 2000:11).

The Clam Gulch site (KEN-045) is a Dena'ina midden containing a variety of faunal remains (DePew 1992; Reger 1987). Marine mammals represented include harbor seal, toothed whale, porpoise, and a single bone of sea otter. Marine fish bones are from salmonids, halibut (*Hippoglossus stenolepis*), starry flounder (*Platyichthys stellatus*), and cod (*Gadus* sp.). The most numerous shellfish are dogwinkle, razor clam, surf clam, Washington clam, blue mussel, whelk, and Nuttall cockle, with four more species each represented by a single shell. Small numbers of land mammal species and various birds were also recovered (Reger 1987:Table 1).

Four thick clam shell fragments were fashioned into artifacts. Two were shaped into flat rectangular pieces, well polished on both faces and all four edges (Fig. 2). Two hinge pieces were grooved for breaking, and one had a triangular groove in the outer surface. No marine

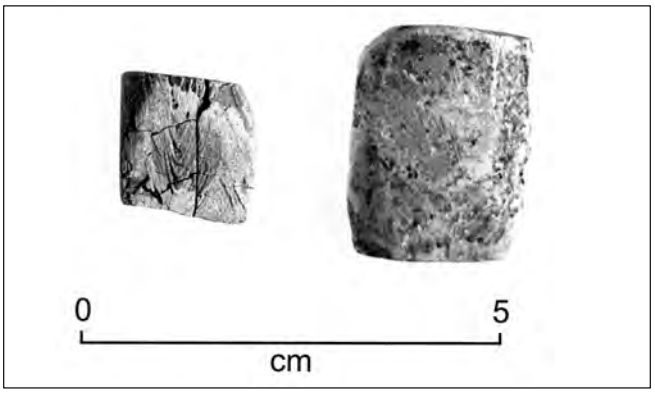

Figure 2. Cut and polished shell rectangles from the Clam Gulch site.

mammals are represented among the many bone artifacts. Radiocarbon dates from the site document the occupation at about AD 1500 (Reger 1987:98).

Five miles up the Kasilof River are two sites containing marine shells. A cache pit site (KEN-369) located up a tributary of the Kasilof River yielded more than twenty-three razor clam shells, fifteen surf clam shells, and twenty-five thin unidentifiable shell fragments that may have been either razor or surf clams. Land animals present were rabbit, beaver, and unidentified bird. No diagnostic artifacts were recovered at the site where several hearths were excavated. Charcoal from the site yielded dates of 610±60 ^{14}C yrs BP (Beta-173687) and 770±60 ^{14}C yrs BP (Beta-173685), placing the occupation between calibrated ages of AD 1280 and AD 1430 (Mobley et al. 2003:76).

The second Kasilof River site (KEN-366) consists of four cache pits and a typical Dena'ina housepit with raised walls and an unlined hearth. A narrow test trench through the hearth yielded four blue mussel shell fragments and a salmon vertebra. Charcoal from the hearth produced a date of 730±60 ^{14}C yrs BP (Beta-173688), or a calibrated range of AD 1200 to AD 1390 (Mobley et al. 2003:73). No diagnostic stone or bone artifacts were recovered.

Several miles north of the Kasilof River is Kalifornsky Village (KEN-014), a late prehistoric to historic Dena'ina site. Excavations in a late prehistoric house uncovered "hundreds" of dogwinkle shells, mostly concentrated near the entry and in side rooms, but no other marine faunal remains were recovered (Boraas 1975:9).

A housepit at the Coyle site (KEN-007), near the mouth of the Kenai River, yielded a small faunal collection containing seven seal bones, a porpoise bone, and a shell (Kent et al. 1964:125). Examination of the collection in the University of Alaska Museum (Accession No. 971) revealed the shell to be Washington clam, and the artifacts indicate a Dena'ina occupation around the mid-nineteenth century.

SITES UP THE KENAI RIVER

The Moose River site (KEN-043) at the confluence of the Moose and Kenai rivers yielded no marine faunal remains except for one unworked Washington clam shell from House 7 (Reger 2004a:Vol.2–34). The occupation has been radiocarbon dated between 250 and 500 ^{14}C yrs BP (Reger and Boraas 1996:158). The Dena'ina component also contained bones of several rabbits, moose, bald eagle, owl, and salmonid.

Another undated but undoubtedly late prehistoric Dena'ina housepit with mounded walls at KEN-178, eroding from the bank of the Kenai River forty-seven miles up from the river mouth, yielded a single Washington clam shell (Reger 2004a: Vol. 2–77). Two housepit sites near the junction of the Russian and Kenai rivers have yielded marine shells and shell artifacts. KEN-094 contained forty-one shell fragments, a shell labret (Fig. 3), and a cylindrical shell bead (Gibson 1985:133). The labret and bead were made from thick shell—probably clam. Intact shells were identified as surf clam, Alaska great-tellin (*Tellina lutea*), blue mussel, California mussel (*Mytilus californianus*), Nuttall cockle, and Greenland cockle (*Serripes groenlandianus*) (Yesner 1986:IV-45). A charcoal radiocarbon date from the housepit, Feature 1, at KEN-094 places occupation of the house 335±55 ^{14}C yrs BP (Reger and Boraas 1996:159). The second housepit site (SEW-214) contained fifty-seven marine shell fragments and a single cylindrical shell bead (McMahan 1985:210). The shell fragments were of surf clam, Washington clam, razor clam, Pacific littleneck clam, soft-shelled clam (*Mya* sp.), blue mussel, Nuttall cockle, and Greenland cockle, with the most numerous being surf clam. A radiocarbon date from Feature 6, where the shell was found, placed the occupation at about 565±65 ^{14}C yrs BP (WSU-3089) (McMahan 1985:170).

Another small collection of marine fauna was recovered from a complex of housepits near the Russian River (SEW-756), with a Dena'ina occupation radiocarbon dated from about 1000 ^{14}C yrs BP to the historic period (Corbett 2000:3, 5). Corbett reported the excavations produced one spine of a marine rock fish, one sea otter bone, and one cormorant bone, along with unidentified and uncounted marine shell.

Even further up the Kenai River from the Russian River mouth is the historic New Village housepit site (SEW-298), where excavations produced numerous salmonid remains as well as three unidentified clam shells, a

Figure 3. Shell labret from KEN-094, Feature 1. The labret is 2.78 cm long.

single Pacific littleneck shell, and a Washington clam shell (Reger 2004b:12ff). Artifacts of European or American manufacture indicate an occupation dating around AD 1750–1800.

The furthest upstream site in the Kenai River drainage where clam shell was found is along Quartz Creek, which empties into Kenai Lake. There, in a rocky midden (SEW-187) probably reflecting late prehistoric Dena'ina fishing, Yarborough (1983:24–29) found a fragment of unidentified clam shell.

WEST SHORE OF COOK INLET

Frederica de Laguna noted numerous depressions around the historic Dena'ina village of Kustatan (KEN-034) on the west shore of Cook Inlet. Her testing in a vaguely defined house on the second beach terrace revealed a 0.75-m-thick midden containing beluga bones, surf clams, and large cockles (de Laguna 1975:139). She noted one piece of worked shell but did not describe or illustrate it. De Laguna compared the small artifact collection to "a culture like that of Kachemak Bay," but she did not specifically link the areas or cultures. Photographs of the Kustatan artifacts suggest they are probably Dena'ina, comparable to the late prehistoric artifacts from KEN-360 and the Clam Gulch site.

At a pictograph and rock shelter site (KEN-229) near the head of Tuxedni Bay, where de Laguna (1975:138) uncovered seal, porpoise, clams, and whelk shells, National Park Service archaeologists recently collected several charcoal samples. Though the stratigraphic setting is complex and disturbed, the samples dated to 490±40 ^{14}C yrs BP (Beta-186616) and 460±50 ^{14}C yrs BP (Beta-186617) (Baird 2006:138). The site is within traditional Dena'ina territory, but the samples were from a shallow depth and not definitely associated with the faunal remains de Laguna uncovered.

KEN-360

Recent testing at a large complex of house and cache pits (KEN-360) near the mouth of the Kasilof River produced an exceptional amount of shell and bone for a Dena'ina site, with all tested (six of seven present) houses containing marine fauna (Mobley et al. 2003:42). More house and cache pits (KEN-370) across Kalifornsky Beach Road may be an extension of the same village. One house at KEN-360 contained a few elements of mustelid, salmon, and cod, another contained a sea otter bone, and another contained bones of unspecified cod fish. Radiocarbon dates from the houses of KEN-360 cluster between AD 1500 and AD 1650.

House 8 (though KEN-360 contained only seven houses, all features—cache pits as well as housepits—were numbered in one consecutive feature series) contained a central hearth containing thirty-one cod otoliths and a large number of shells. Also found in the hearth were more than 450 dogwinkle shells, blue mussels, and cockles, with several Washington clam shells nearby. Land mammal bones included fox and moose.

A bark-lined cache excavated by the House 8 occupants into the raised wall berm contained stone and bone artifacts, as well as Washington clam, blue mussel, probably razor clam, and a single valve of unspecified chiton (Class Amphineura). The cache contents were packed tightly with clam shells nestled together and inside one another, mussel shells inside larger Washington clam shells, and stacked pieces of broken clam. In addition to shell the cache contained hammerstones, stone flakes and nodules, faceted pumice abraders, baked siltstone, a stone planing adze bit, broken bone pieces, a spoon made from a scapula, and an antler foreshaft. One large clamshell contained a worked piece of bone cemented to the shell with an iron oxide or ocher substance. Another Washington clam shell displayed a flat ground facet and a deep parallel groove representing an unfinished attempt to saw—probably with an abrasive-laden cord—a shell blank for further manufacture into a small tool (Fig. 4).

DISCUSSION

The archaeological data confirm Dena'ina use of marine resources as mentioned by historic accounts and Osgood's (1966) informants. But the fauna assemblages are typically small and not described in equal detail from site to site, with bone counts or presence/absence by species being the norm. Only two sites—Seal Beach and Yukon Island Fox Farm—contained large enough samples to produce meaningful counts of minimum number of individuals. We thus cannot discuss Dena'ina use of marine resources in terms of meat weight or calories. However, evident in Kachemak Bay is an adaptation to the marine environment balanced with use of terrestrial resources. Sites as far north as Kenai and Kustatan confirm the exploitation of *available* marine fauna, specifically seal, beluga, porpoise, and shellfish, comparable to the opportunistic approach that

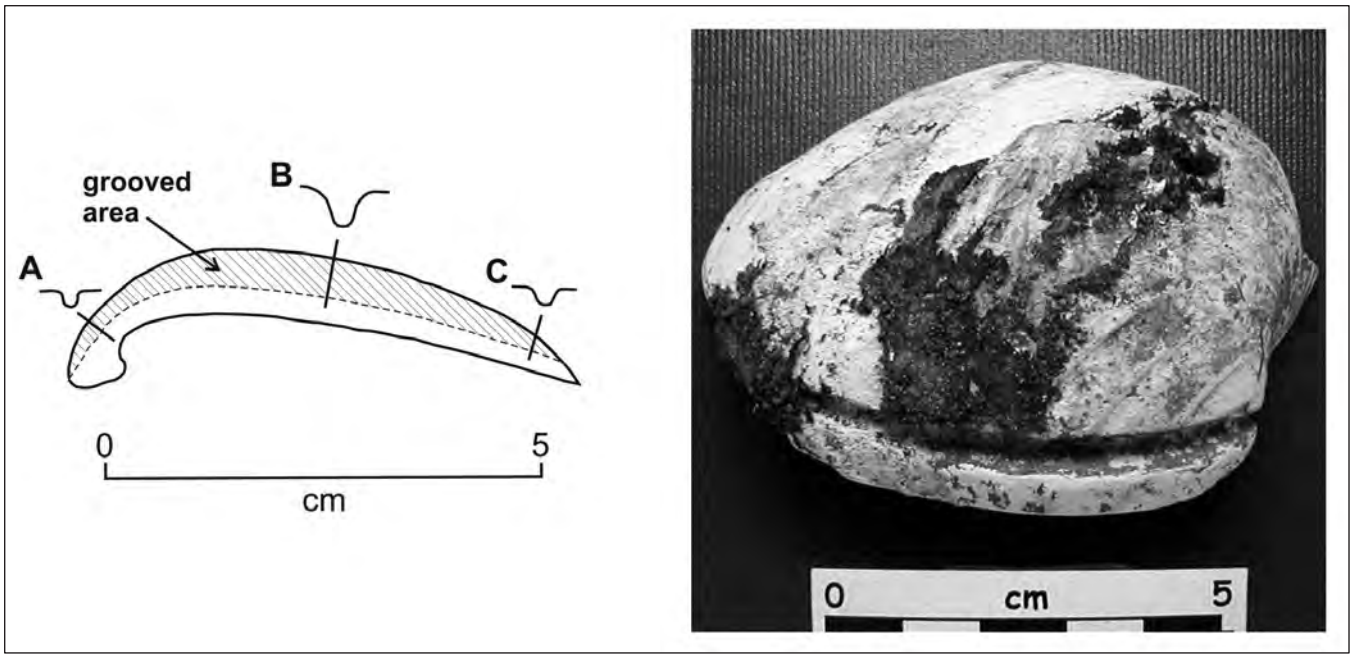

Figure 4. Cut** Saxidomus **shell from KEN-360. A-C are profiles of the cut in this cross-section view.** Mytilus edulis **shell is plastered to the surface of the** Saxidomus **shell in the right side image.

Yesner (1996:225) noted for Dena'ina use of land animals. The marine environment contributed to the Dena'ina diet in diversity and quantity depending on species availability, as reflected in the diminished numbers of elements and species in sites north of Kachemak Bay. No sites tested north of the Forelands have produced marine fauna.

On the surface, use of shellfish follows the "generalist" pattern. The same species used in the earlier Kachemak tradition were favored by the later Dena'ina inhabitants. Surf clams, Washington clam, Pacific littleneck, cockles, and blue mussel were staples in the Dena'ina shellfish harvest. As one proceeds north up Cook Inlet, however, razor clams and dogwinkles appear in increased percentages at sites, and the numbers of Pacific littleneck (never numerous) and Washington clam decrease. The increase in razor clam in sites to the north is understandable given their need for sandy beaches and absence in most of Kachemak Bay. An interesting change is the increased percentage of dogwinkle in the sites north of Kachemak Bay. Dogwinkle do occur in some Kachemak Bay Dena'ina sites, but in low numbers. The major occurrences are at Clam Gulch and the Kasilof River sites, where dogwinkle counts vastly outnumber those of other shellfish. That may be the result of thickness and durability of the dogwinkle shells in acidic soils, but clam shells seem to endure just as well. Thinner-shelled species such as blue mussel, surf clams, and razor clams are less durable, but they are present in sites. The possible use of dogwinkles to obtain a dye has been noted (Lobdell 1980:207), but their primary value was probably as food.

The sea mammal suite of sea otter/seal/beluga/porpoise is represented in coastal Dena'ina sites as far north as Kustatan and as far back as AD 1200–1450, though not every species is found in every site and most collections cluster around AD 1500. Frequently a site may contain only a single bone of a particular species. Sites containing shellfish date as far back as about AD 1200. The adaptation to marine resource use described ethnographically by Osgood therefore extends at least five hundred years into prehistory and perhaps more.

Studies of faunal remains—particularly shellfish—from Cook Inlet archaeological sites have dwelt almost exclusively on their value as food. Lobdell (1980) considered only the nutritional value of species found in Kachemak Bay sites, for example. Yesner (1986) used a similar approach to analyze the faunal remains from upper Kenai River sites, including not just shellfish but land mammals, birds, and fish. But the Kenai River collections and that from KEN-360 provide an opportunity to view use of some faunal remains, specifically shells, differently.

Dena'ina used shellfish not only in their diet but they used shells as raw material for production of other items. Osgood (1966:52) discussed Dena'ina decoration and display of wealth using *Dentalium* shells, which were

obtained from sources far away on the Northwest Coast. *Dentalium* shells required little or no alteration to produce easily strung beads, and were highly prized. Osgood mentioned nothing about use of local shell, but his interviews occurred 150 years after European trade items entered the economic picture, by which time the collective Dena'ina memory may have lost knowledge about the craft of making beads from local shells. Glass trade beads were among the earliest goods sought by the Dena'ina of Cook Inlet and probably replaced most local bead materials.

The wall cache in House 8 at KEN-360 demonstrates the utilitarian value of marine shells to the Dena'ina. The cache contained numerous Washington clam shells, one of which contained red and yellow iron oxide, and another which had been worked prior to its storage. The worked specimen was in the process of being slabbed into rectangular strips by sawing parallel grooves through the shell (Fig. 4). The modified edge of the piece is ground flat, probably obliterating saw marks from the cut that removed the previous strip. The groove parallel to the edge facet is U-shaped in cross section, suggesting a cord and abrasive was used for cutting the shell. Judging from the fit of the groove on the shell surface, a bow saw was used. Other nonmarine objects such as a piece of long bone shaft from a large land mammal, hammerstones, nodules of agate or quartz, stone flakes, and unfinished tools attest to use of the cache to store raw material and finished tools.

The presence of single or a few marine shells—particularly thicker shells—in sites along the Kenai River becomes more understandable in light of the House 8 wall cache. The shells were likely items saved by the Dena'ina for their utilitarian value, rather than simply representing the discarded remains from a meal. This interpretation is logical when considering the distance to where shells such as Washington clam, cockle, or blue mussel could be harvested. No Dena'ina concerned about load weight or food freshness would consider keeping shellfish in the shell during the days needed to travel distances of 120 or 160 km. Sea food is notorious for spoiling rapidly and causing gastric distress. Historically and ethnographically, the Dena'ina shucked, smoked, and dried shellfish for storage or transport.

Types of shell items made by the prehistoric Dena'ina are illustrated by the shell labret and bead from KEN-094, the shell bead from SEW-214, and the shell squares and partially cut shell pieces found in the Clam Gulch site (Fig. 2). Use of large clam shells as containers is indicated by the shell in the House 8 wall cache containing the bone artifact cemented by iron oxide pigment, and the shell containing pigment reported from Cape Starichikof. Shells found in sites far from their source should be regarded as tools or raw material for tools rather than dietary discards.

Marine fauna found in archaeological sites as far north as Kustatan and Kenai raise questions about the past environment of Cook Inlet. Reger (1987) suggested that perhaps the clear water–turbid water interface in the late prehistoric period may have been further up Cook Inlet than it is now. The modern interface is centered near the south end of Kalgin Island and moves up and down Cook Inlet with each tide. A more northerly interface zone centuries ago was originally suggested because of the rich marine shellfish and offshore fish remains in the Clam Gulch midden (Reger 1987:95). Reports of porpoise in a decidedly nonmarine environment at Kenai and up Tuxedni Bay add fuel to the question of such a shift. Surf clam and cockle shells found in those northern sites also suggest a more marine, less estuarine environment. A long-term shift in Cook Inlet's clear-turbid interface zone could result from changes in relative sea level due to tectonic factors (earthquakes), isostatic rebound in which the earth's crust compensates for the removal of glacial ice, or global sea level changes, or such a shift could result from local changes in Cook Inlet currents.

For example, tidal marshes at the mouths of the Kenai River and Kasilof River were examined during the past decade to detect evidence of major Holocene earthquakes, leading Combellick (1994) to conclude that a major earthquake on the scale of the 1964 Great Alaska Earthquake occurred in the Cook Inlet basin between seven hundred and nine hundred years ago. A recent study (Hamilton and Shennan 2005:106) used diatoms to document accurate relative sea levels and suggest that rebound to pre-subsidence levels was rapid—a critical factor determining the rate at which shellfish beds would migrate up the inlet.

Alternatively, a climatic shift such as the Little Ice Age could change the location of the clear-turbid interface by changing the volume of silt-laden freshwater entering Upper Cook Inlet. Wiles (1992:222) has dated the Little Ice Age glacier advances in the southern Kenai Mountains to about AD 1300 to 1850. A decline in silty glacial runoff due to colder temperatures would allow the clearer oceanic water to penetrate further up the inlet. Movement of the interface 16 to 24 km north would align more with the marine resource suite recovered from archaeological sites. This simple model would be difficult to test given the dynamic geology and hydrology of the region.

We conclude that the Dena'ina, beginning in prehistory, used the near-shore marine resources available to them. They also traded to obtain marine resources, as shown by the chiton valve found at KEN-360 or clam shells recovered from sites near Russian River. Ethnographic accounts and historic studies also demonstrate that the Dena'ina took long journeys to dig clams and hunt seals, but they don't describe the nondietary importance of marine resources, especially of shells, that the archaeological data would otherwise indicate. The archaeological evidence shows that the Dena'ina people on the Cook Inlet coast were adept at using marine resources for at least the past five hundred years.

ACKNOWLEDGMENTS

We would like to acknowledge the following contributions. Karen Workman shared unpublished data from the Seal Beach site for this study. Diane Hanson identified faunal remains from the SEL-247 site near Anchor Point. Susan Bender identified the fauna from KEN-360. Jeanne Schaaf shared unpublished radiocarbon dates from the Tuxedni Bay area, dates that were subsequently published in Baird (2006:138). Interpretations of those data are the responsibility of the authors. Thoughts and conclusions about the archaeology of Cook Inlet, particularly the lower inlet area, have benefited considerably from many discussions with Bill Workman, and we thank him for his observations.

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THE ROLE OF *BEGGESH* AND *BEGGESHA* IN PRECONTACT DENA'INA CULTURE[1]

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Abstract

Excavation at precontact Dena'ina village sites in southcentral Alaska typically produces few artifacts or faunal remains despite the presence in some cases of fifteen to twenty large semisubterranean houses (*nichił*) with village populations of up to several hundred people. The paucity of material remains is disproportionate to the large population who lived at these intensive salmon fishing localities on a semisedentary or sedentary basis. The explanation is rooted in behavior motivated by the concepts of *beggesh* and *beggesha* wherein negative or positive information might be encoded in an artifact or a place and the emission of that information could be detected by spiritually aware Dena'ina, animals, ancestor spirits, and other spirits, with potentially adverse consequences.

KEYWORDS: spirituality, interpretive archaeology, northern subarctic

INTRODUCTION

Most southcentral Alaskan archaeological studies have been based on principles of cultural materialism and related concepts of cultural ecology, which have provided the foundation for chronology building and understanding the context within which cultures adapted to prehistoric environments of the region. Archaeological materialism rests on the principle of inferring cultural behavior from material remains; however, in one instance, that of the late prehistoric Dena'ina Athabascans, there is a distinct lack of material remains in the archaeological record, and reliance solely on materialist interpretations leads to a skewed version of the prehistoric record. Were it not for oral tradition and the linguistic and ethnographic record, the Dena'ina would have become virtually invisible to history as hundreds, perhaps thousands, of Dena'ina house depressions and associated cold storage pits, most lacking associated artifacts, erode into obscurity leaving almost no material trace of their existence. However, through the postcontact ethnohistoric record we know a vibrant culture operated in the Cook Inlet basin and upper reaches of the Bristol Bay drainage before European contact, and from this we can make inferences about the late prehistoric time period (see Fig. 1).

The question "why so few artifacts and faunal remains in the late prehistoric Dena'ina archaeological record?" cannot be explained by materialist principles alone, but is related to deeply held spiritual beliefs that motivated behavior and in themselves reflect practices

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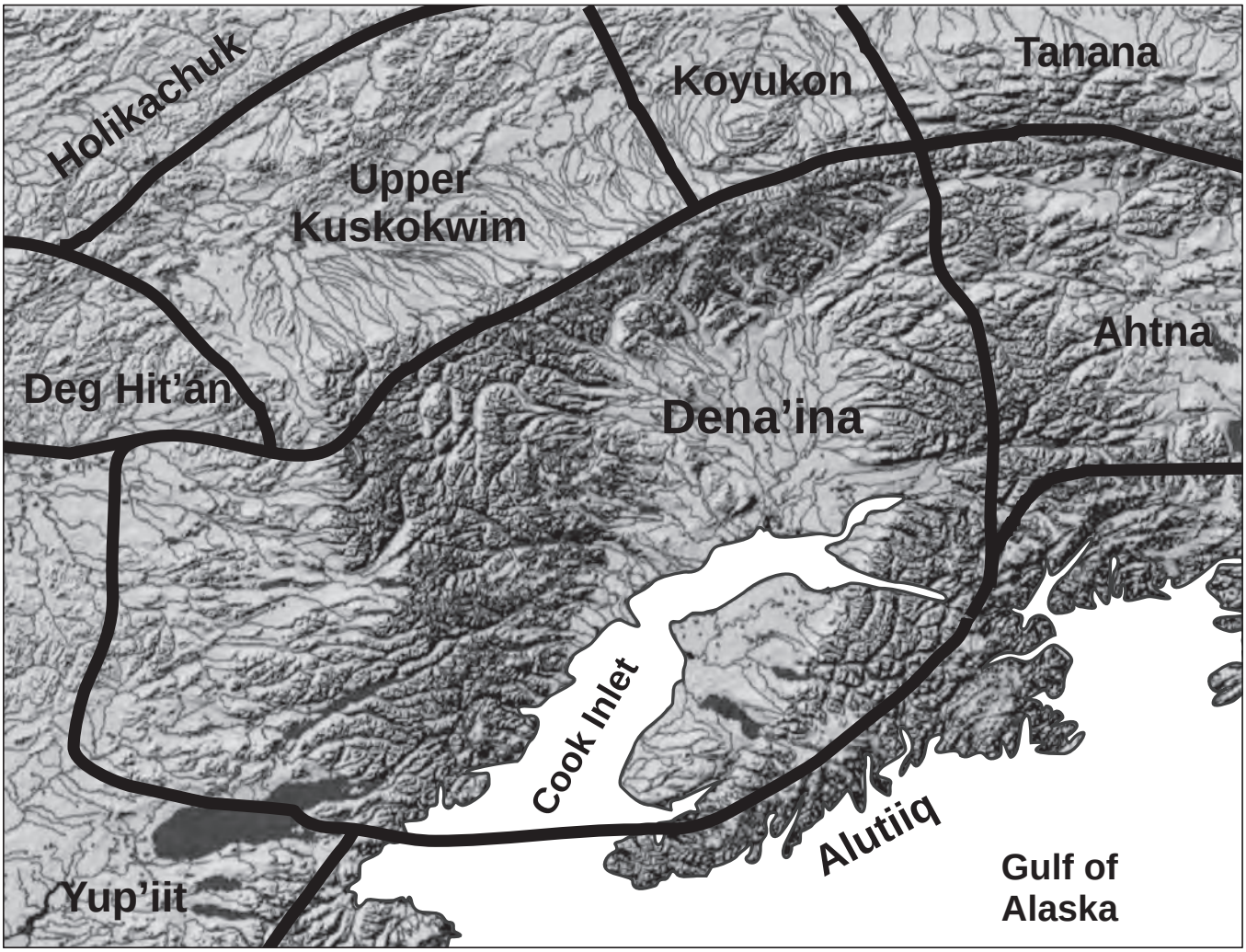


Figure 1. Dena'ina territory and Surrounding indigenous territories at the time of European contact. (Map by Alan Boraas.)

symbiotic with an ecological adaptation to southcentral Alaskan environments. In this paper we offer the position that principles of symbolic and interpretive anthropology provide a useful context to answer this question. This "interpretive archaeology," to use a phrase coined by Christopher Tilley (1993), draws primarily upon Dena'ina oral tradition, in this case cosmological perspectives, to understand late prehistoric Dena'ina culture. Our thesis is that precontact Dena'ina were motivated through spiritual beliefs related to concepts termed *beggesh* and *beggesha* to carefully control the disposal of artifacts and bone refuse and to imbue certain places with a kind of power that told the history of interaction with the land. The result, with a few exceptions such as certain coastal sites, is a sparse archaeological record of artifacts that in itself is affirmation that these beliefs motivated precontact Dena'ina behavior.

ARCHAEOLOGICAL EVIDENCE

When compared to the periods immediately preceding (Riverine Kachemak) and immediately following (historic Dena'ina), it is clear from empirical evidence that there are far fewer artifacts in precontact Dena'ina sites in Cook Inlet (Fig. 2). Evidence from three Kenai Peninsula house excavations from the three cultural periods, each located at a prime salmon fishing locality, is compared in Table 1. In each case the samples are drawn from 1 m wide trenches bisecting the long axis within a house excavated down to culturally sterile subsoil. The samples enumerate total artifact finds and exclude unworked faunal remains and fire-cracked rock but include cultural detritus such as unmodified waste flakes (of which there were few). The earlier non-Athabascan Riverine Kachemak excavation (KEN-147, Kenai River site) yielded 125 artifact finds

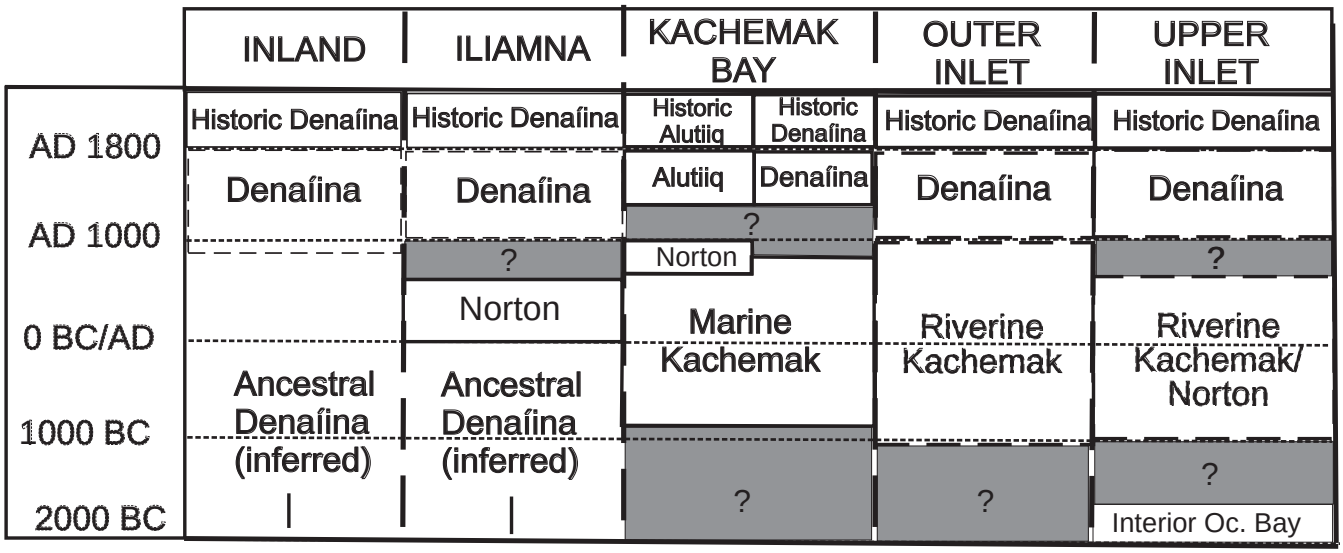


Figure 2. Recent cultural chronology of Dena'ina territory (calibrated radiocarbon years). Data from Reger (1998), Reger and Boraas (1996), Reger and Townsend (2004) Workman (1998), and Workman and Workman (1988).

per cubic meter while the more recent historic Dena'ina site (KEN-014, Kalifornsky Village) yielded 232 finds per cubic meter. The historic Dena'ina house sample (from KEN-014) included numerous fragments of broken window glass, which inflated a sample that would otherwise approximate that of the Riverine Kachemak find density. In marked contrast to the previous and following periods, a sedentary late prehistoric Dena'ina house excavation at *Shqit Tsatnu* (KEN-230) yielded only two finds per cubic meter, only one of which was particularly distinguished, a slate point that was fit together from three fragments found in the central hearth (counted as one find). Extensive testing outside the houses at this and similar age precontact Dena'ina sites also yielded few artifacts while excavation outside Riverine Kachemak and historic Dena'ina houses yielded substantial finds, though not as dense as within the houses themselves. Though variations occur, these results are typical of comparable age dwelling sites in Cook Inlet and in the Lake Clark area.[2] It is difficult to estimate with precision the length of occupancy of each house; houses occupied for a short time would, of course, be expected to yield fewer artifacts. In each instance the houses consisted of substantial log structures consistent with a sedentary or semisedentary settlement pattern and would be expected to have been occupied for a number of years, perhaps decades, until the log structure became too decayed to permit continued occupancy. It is also likely prehistoric houses were rebuilt at the same location since excavation of the semisubterranean pit would have involved substantial labor.

Several hypotheses have been formally and informally made to account for the lack of Dena'ina artifacts in archaeological sites. Before a substantial number of radiocarbon dates were available, the suggestion was made that perhaps the Dena'ina did not occupy their territory long enough to leave substantial material remains (Dumond and Mace 1968:18–19), a prospect first commented on by de Laguna (1975:14–15). Cook Inlet radiocarbon chronology now firmly establishes a Dena'ina occupation by AD 1000 (Reger and Boraas 1996). Because virtually all the late prehistoric Dena'ina radiocarbon dates are drawn from hearths within decayed log structures (*nichił*),[3] it is most likely that the AD 1000 dates represent the advent of sedentary fishing practices, and that the earlier Dena'ina were nomadic, tent-dwelling, caribou hunters utilizing harder to find, and therefore radiocarbon date, temporary camps (identified as "Ancestral Dena'ina" in Fig. 2); thus, the duration of the Dena'ina in southcentral Alaska is actually much longer than the past thousand years. A thousand years is enough time to leave a substantial artifact trail—but none is evident.

2 Examples of sites with similar artifact inventories and densities: Riverine Kachemak: KEN-029 (Reger 1977), KEN-043 (Dixon 1980), and KEN-066 (Reger, field notes); late prehistoric Dena'ina: KEN-230–3 (Boraas 1991 field notes), KEN-360 (Mobley et al. 2003), and SEL-010 (Boraas and Klein 1992); Historic Dena'ina: ANC-036, (Seager-Ross and Bowden 2000), KEN-007 (Kent et al. 1964), KEN-068 (Yesner and Holmes 2000), and XLC-001 (VanStone and Townsend 1970).

3 Unless otherwise noted, all Dena'ina words are from James Kari (2007), *Dena'ina Topical Dictionary*.

A second suggestion is that the Dena'ina were "artifact poor" and therefore had few material remains to leave behind. Table 2 identifies the personal, portable, durable artifacts as recorded in Osgood's (1976) *Ethnography of the Tanaina*.[4] While precontact Dena'ina material culture emphasized perishable items of wood, hide, and skin, there were potentially forty-two types of artifacts made from durable stone, bone, horn, or shell, most of which would have been in common everyday use and could be expected to have been found in precontact sites.[5] The inventory ranges from stone adzes and knives to war clubs, and the ethnographic and oral historic records indicate each individual had a wide range of artifacts at his or her disposal. The Dena'ina were not artifact poor during the precontact period and had both a durable and nondurable material culture to successfully adapt to their environment. Third, it may be that the precontact Dena'ina, while occupying Cook Inlet and the upper Bristol Bay drainages for at least a thousand years, did not occupy any single sedentary dwelling or site long enough to leave artifact remains. That remains a possibility if it can be demonstrated by fine-tuned radiocarbon or another form of dating, but it seems unlikely because short-term house occupation also meant abandoning a prime salmon fishing locality altogether. Sedentism at prime fishing localities with a seasonal round radiating from a central village consisting of stout log houses suggests that an artifact accumulation concentrated around the dwelling places would have been the consequence of day-to-day living, but this was not the case. We do not think any of these arguments satisfactorily account for the lack of material remains at Dena'ina sites.

Whereas the Riverine Kachemak and historic Dena'ina sites exhibit a kind of material entropy of highly disordered, meaning highly probable, artifact and bone scatter, late prehistoric Dena'ina depositional processes of artifacts and bone were mediated by some cultural practice that caused an investment of energy to create highly ordered (i.e., highly improbable) sites with virtually no artifact scatter. We suggest that the Dena'ina were motivated to control artifact disbursement because of beliefs related to the concept of *beggesh*—that artifacts could absorb and exude information of events associated with their use; this potentially negative information was believed to send unwanted messages to other Dena'ina, animals, ancestor spirits, and other spirits disrupting social and ecological order. The meaning of *beggesh* is to be understood within the overall context of precontact Dena'ina cosmology, which involved a set of beliefs that many Dena'ina still understand today but few have communicated to non-Dena'ina for fear of being misunderstood.

TRADITIONAL DENA'INA COSMOLOGY

The traditional Dena'ina world consisted of six dimensions. First, and most familiar to Western thought, was the human physical dimension described by the terms "body" and "breath" (Osgood 1976:169), which are described by the Dena'ina terms *benest'a* (his or her body, Kari 2007:86) and "breath" (*beyich'*, his or her breath, Kari 2007:97). The body was the corporal self while breath was an expression of a life force and associated with health that Kalifornsky (1991:202) describes as *deshishch'idnulk'edi niłtu qghech'ex*, which literally means "for durable breath they breathe" (Kari n.d.). The second dimension was the human spirit or soul of that body called a "shadow-spirit," termed *beyiga*, "his or her shadow spirit" (Kalifornsky 1991:54), while alive, or *k'eyiga,* "someone's shadow spirit" (Kari 2007:307) if the person had died. The person in the form of a shadow spirit would seek a purpose that would guide them in life (Kalifornsky 1991:13). While the person was alive the shadow spirit was capable of leaving the body and traveling to other dimensions in dream

Table 1. Artifact density from three Kenai Peninsula excavations representing historic Dena'ina, precontact Dena'ina, and riverine Kachemak cultural periods.

Cultural Period	Site	Average Occupation Date	Cultural Feature	Area	Volume	Total Finds	Finds per cubic meter
Historic Dena'ina	KEN-014, Kalifornsky Village	AD 1900	House	1x10x0.5 m	5 m^3	1,161	232
Pre-Contact Dena'ina	KEN-230, Shq'it Tsatnu	AD 1200	House	1x12x0.5 m	6 m^3	11	2
Riverine Kachemak	KEN-147, Kenai River	200 BC	House	1x12x1.5 m	18 m^3	2,243	125

4 The spelling "Tanaina" with an initial "t" and no glottal stop (') can be traced to Russian documents originally published in German. An initial "d" and a glottal stop more accurately reflects the pronunciation of the ethnonym, Dena'ina, and will be used in this paper.

5 Osgood's inventory is listed in Table 2. A complete inventory of durable items from other sources, including museum repositories, remains to be undertaken.

states (Osgood 1976:169), and shamans were capable of controlling their shadow spirit to willfully pass into other dimensions through trance states. Upon death, the shadow spirit was transformed into the third dimension, the ancestor dimension, through a cremation ritual and subsequent memorial potlatch. Ancestor spirits, *k'eyiga*, "someone's shadow spirit" or the "spirit of the recent dead" (*q'egh nutnughel'an*, literally "he looks at his tracks again") (Kari n.d.:789; see also Kari 2007:310), were human souls who had not achieved their purpose as determined by a vision quest and at some point in time would be reincarnated. Ancestor spirits were generally discomforting and potentially ominous to the living because they knew your thoughts and could detect information about your life from your material items. Animals and their spirits represented a fourth dimension wherein potent animal spirits could become one's spirit helper and had power to aid an individual (Mamaloff 1993:2–3), but their power also made them ominous, and, if treated badly, a sentient and willful animal spirit could take action detrimental to humans. Like ancestor spirits, animals could detect actions, words, and even the thoughts of the living and respond accordingly. Animals could also receive information from human artifacts concerning how those artifacts had been used and events they were associated with as well as receive information from a place where a bad or good event happened. The fifth dimension included over twenty spirits that populated the Dena'ina world (see Table 3) and operated as part of what Osgood (1976:169) called a "semi-visible world which exists as a shadow of their own environment." Some were spirits of place—good or bad—and some were universal and powerful such as the mountain spirits, the *Dghely Dnayi*; *Gujun*, the "Spirit of the Animals"; and *Gujun*'s wife *Kunkda Jelen*, the "Mother of the Animals." The final dimension was that of *Naq'eltani,* first reported to the Western world by Sheldon (1908:277), who described *Naq'eltani* (written Nah-critah-ny) as a kind of "supreme being" (see also Osgood 1976:174); today the word is often used as a synonym for God among Christian Dena'ina. But *Naq'eltani*, literally the "breath that passes over us," is very ancient and in a traditional context was thought of as a dimension that encompassed a state of purity, goodness, and harmony not unlike the Navaho Dené concept of *hozho* (cf. Wyman 1983:537). Many traditional Dena'ina believe that one is reborn out of the ancestor dimension until one achieves his or her purpose in life and at that point the shadow spirit permanently enters the dimension of *Naq'eltani.*

Each dimension operated in parallel space and time and that was the basis of communication between them. In traditional Dena'ina cosmology human actions, words, thoughts, and information absorbed by artifacts traveled across the dimensions as a form of energy much like light radiating from its source through a window and would potentially be received by an animal, an ancestor, or another spirit existing in the parallel dimension. Thus, the Dena'ina were consciously motivated to control their thoughts, words, actions, and artifacts and their associated informational energy so only intended messages were sent and unintended messages were suppressed. Artifact information in the form of *beggesh* fit into this system because, without control, an artifact left lying about could have inadvertent negative consequences.

BEGGESH AND *BEGGESHA*

Osgood (1976:169) states, "The idea of inanimate objects speaking is commonplace among the Tanaina [sic]," and we now know the concept through which the information is retained and relayed is *beggesh.* To the Dena'ina *beggesh* is a trace, like a scent, carried by humans and their artifacts or attributed to a place, and transmits information about past events associated with the thing or place, or it can express an abstract idea. The root *-ggesh* translates as "impurity, trace, scent, dirt, or smell" (Kari n.d.:300) depending on the context of the sentence, and the prefix *be-* is a possessive pronoun meaning "his/her"; so *be+ggesh* literally means "his/her impurity, trace, scent, etc." *Beggesh* denotes that the "trace" or "scent" is negative or impure, but the opposite was also found. The enclitic "*-a*" negates the action of the stem and hence *be+ggesh+a* denotes the absence of *beggesh* or the absence of impurity or a pure state and would refer, for example, to the pure essence of a child, which, because it has yet to live life fully, has no *beggesh* (cf. Kalifornsky 1991:37)

Negative events could impart *beggesh* to the artifacts associated with that event. For example, an object may absorb *beggesh* by having been used by someone in a hostile act, by someone who violated taboos regarding animals, or by someone who otherwise had an unrepentant spirit toward violations of social norms. In a similar vein malevolent shamans were said to be able to cause their spirit to invade an object, usually an effigy of their own making, giving it *beggesh*. For example, in the shaman war described in "The Kustatan Bear Story" (Kalifornsky 1991:290–301) a shaman-made effigy had the power to

Table 2. Durable late prehistoric Dena'ina material items. From Osgood (1976); other durable material items are known in addition to those listed here. A complete inventory of museum collections has yet to be made.

Item	Durable Part	Use	Reference
Fish spear	Barbed bone point, bone fore shaft	Salmon, halibut fishing	Osgood 1976:83
Harpoon (three types)	toggle point barbed bone point stone inset point bone fore shaft	Sea mammal hunting	Osgood 1976:83-5
Killing lance	bone lance point	Sea mammal hunting	Osgood 1976:85-6
Bear Spear	slate point bone lance point	Brown bear hunting/ protection	Osgood 1976:86
Arrows	Slate point with bone fore shaft Bone point Blunt point	Land mammal hunting, avifauna hunting	Osgood 1976:88
Harpoon arrows	bone toggling harpoon fore shaft	Fishing, seal hunting	Osgood 1976:88-9
Deadfall knives	bone horn	Bear protection	Osgood 1976:96-7
Halibut hook	bone barb	Halibut fishing	Osgood 1976:101
Knives	Man's straight slate knife Copper knife (cold hammered) Woman's slate ulu Curved bone knife	General use	Osgood 1976:101-3
Adze	Stone Copper (cold hammered)	Wood working, picks, ice-chipping	Osgood 1976:103
Scrapers	Chipped Stone Slate scrapers Beaver teeth Shell scrapers Boulder spall scrapers	Wood, skin working	Osgood 1976:103
Awls/Needles	bone awls bone needles	Skin sewing	Osgood 1976:103
Wedges	bone	Log splitting	Osgood 1976:104
Spoons	Sheep horn	Eating/household use	Osgood 1976:106
Lamps	Serpentine stone (Iliamna only)	Light/heat	Osgood 1976:108
War clubs	Horn (antler?), oil soaked chipped stone point inset	Warfare	Osgood 1976:110
Shields and Armor	Bone shield sand/spruce gum	Warfare	Osgood 1976:111
Calendar	Bone	Event recording	Osgood 1976:115
Shamanic Artifacts	puffin beak rattles bone tube	Shamanic activity, curing	Osgood 1976: 119;178-9
Amulets	Lucky agates	Luck	Osgood 1976:175-6

cause sickness and death (Dena'ina Legacy Tapes, Tape 3, February 19, 1991).

The pure or positive aspects of *beggesha* are exemplified by the Dena'ina concept of a lucky agate stone (*nudech' ghela*), one of the principal amulets of the Dena'ina. Lucky agates were sometimes found in unusual circumstances (Osgood 1976:175–176), and Kalifornsky (1991:47) writes, "And whoever would find it [a lucky agate stone], when he found it, he would put a scent on it, so it [the luck] wouldn't disappear." The English term "scent" is translated from *qbeggesha* (*q+be+ggesh+a*) wherein the *-a* negates the impurity referenced by the stem *-ggesh,* and the *q-* refers to the quality of abstractness; so the scent or trace, in this case, is a positive, abstract force associated with his/her good luck. Luck, in the Dena'ina case, is a form of energy, not unlike gravity, which is universally present and can potentially be used to good advantage, and not a random event as generally perceived by Western culture. *Beggesha* was imparted to the object by positive thoughts and proper behavior in the opposite way that negative thoughts and behavior created *beggesh*.

"The Kustatan Bear Story" (mentioned above) and "The Other Half of the Kustatan Bear Story" (Kalifornsky 1991:290–301, 302–307) exemplify how shamanic power described by *beggesh* and *beggesha* could be incorporated into animals or objects. In these stories two powerful early twentieth-century shamans, or "*elegena*," from Kijik invaded a bear at Kustatan and shortly after a moose at Kalifornsky Village and threatened the people, inciting what Kalifornsky describes as a shaman war (Dena'ina Legacy Tapes, Tape 3, February 19, 1991). The villagers could not kill the shaman-occupied animals by normal means until, in each case, a spiritually powerful man baptized three bullets with holy water, blessed them with incense, and carved an Orthodox cross into the lead and then killed the spirit-animals. Kalifornsky uses the phrase *beggesh qul'i miłni* to refer to Russian Orthodox "holy water." The term *qul'i* is another form of negation, expressing that *beggesh* is reversed and *miłni* means "water"; hence the bullets contained a powerful force imparted through blessing by holy water that was able to negate the power of the evil animals. Some Dena'ina men today still carry a blessed bullet with an Orthodox cross carved in the lead for use in special circumstances, carrying on the tradition of *beggesha*.

The Dena'ina believed that shamans, true believers termed *k'ech eltanen* (see Boraas and Peter 1996), spirits, and animals could detect *beggesh* and *beggesha*. Because information travels across the dimensions, animals, sensing negative information, would abandon a place if artifacts containing *beggesh* were present. Shamans were capable of doing "shaman work"—spiritual practices learned through apprenticeships—on objects suspected of having *beggesh* to detect and contain the negative information they emitted (cf. Kalifornsky 1991:37, 105). Some modern Dena'ina speak of those capable of doing a "reading" on artifacts detecting characteristics of past users or past events associated with the artifact. As with shaman work, the details of this practice are considered privileged cultural property rights and non-Dena'ina are not generally allowed to observe a reading. Only some Dena'ina have this ability and in the past they would have been channeled into a shamanic role or encouraged to pursue true belief (*k'ech eltani*). The aptitude to do a reading is said to be passed matrilineally, suggesting that this ability has some degree of biological inheritance through the mother's genetic lineage that is made manifest through learned cultural practice.

Beggesh was imparted to objects solely by human actions or thoughts, not by supernatural entities, and reflects that component of self that is bad or evil (again the similarity to Navaho Dené *hozho*). Animal spirits and supernatural entities were not believed to be capable of producing *beggesh* and, as a result, shamans could not detect their trace. Kalifornsky (1991:61) writes:

> They say that the Dena'ina would see supernatural animal spirits. If they would see an animal spirit they would be afraid. And the shaman would use his powers to understand its meaning. But he could not figure it out. It left no trace [no *beggesh*].

And describing Dena'ina spirits, Kalifornsky (1991:55) writes:

> The Dena'ina hear things and see things: supernatural things, and various kinds of monstrous animals. Then the shaman works on it, but he can't find out about it. It has no *beggesh*, it has no shadow-spirit. The shaman looks around, but there is no trace of anything there.

The concepts of *beggesh* and *beggesha* are not limited to artifacts but also extend to places (Boraas and Peter 2005). Dena'ina spirituality of place involves a message of a past event that emanates from a location which some can detect whether or not they had been part of the original event. The events are sometimes morally neutral everyday occurrences; some can be morally good, while others are bad. According to a Dena'ina elder, the late Nellie Chickalusion, the concept of "evil" did not enter the Dena'ina lexicon until it was introduced by Orthodox priests (personal communication to her granddaughter Donita Peter), and Peter Kalifornsky taught that there is good and bad in all things (Dena'ina Legacy Tapes 1990; personal communication to Donita Peter). Thus, the Western distinction between absolute good and absolute evil is better reflected by the concept that good or bad can emerge or be suppressed by willful intent. Events of this "emerging good" or "emerging bad" can be encoded in the landscape, and for a Dena'ina to travel was to encounter the moral history of the people as detected by feelings, images, emotions, or thoughts experienced at a place.

Most often placenames are geographically descriptive, for example *Nibena*, or Island Lake—a lake with a small island in it. Other placenames are descriptive of relatively benign events that happened there; for example, *Ts'ats'dulqet't* on the Kenai River translates as "where we tipped over" and *Shk'ituk't*, the Dena'ina Village at Kenai, was called "we slide down place" (Kalifornsky 1991:347, 349). Places, however, can carry a deeper meaning than that conveyed by the placename and this is often expressed through the

spirits of place. Table 3 identifies some of those spirits. The name is a collective that describes the habitat or physical entity the spirit occupies, but can also describe specific places. Marmot people, *sq'uła dnayi*, for example, are found above tree line throughout Dena'ina territory where the *sq'uła dnayi* of a specific place could be good, bad, or neutral depending on the events that happened there. Good tree spirits, *ch'wala dnayi*, might exist at a place below tree line that was associated with a good event and where one regularly got a good feeling, while menacing tree spirits might populate a place where an aggressive or hostile act occurred and an ominous feeling would be felt by someone who ventured there. Those with acute perception might be able to detect the event in picturelike form while others might only get a generally good or generally bad feeling. Although he was apparently unaware of the depth of Dena'ina cosmology, Osgood alluded to this when he wrote in 1937, "The trees and grass talk to people and so do stones and mountains" (1976:169). Spirits of place are described by the term *dnayi*. which derives from the Dena'ina root for "people" and reflects the fact that these are willful, sentient entities, not the ghosts of the people who committed the act but rather the ghost of the act itself.

Some places became associated with good events and became revered. One such place is thought to be *Nduk'eyux Dghil'u*, or Telaquana Mountain, which means "animals went into the mountain." There are four versions of a story associated with animals emerging from a mountain, one by Kalifornsky (1991:72–77), two by Alexi Evan (in Tenenbaum 1984:178–191 and in Rooth 1971:68–70), and one by Ruth Koktelash (Kari and Balluta 1986:A-63, English; A-86, Dena'ina), which describe the Dena'ina moving into the western portion of their present territory in the Stony River area due to starvation in their former homeland to the north. In the mountains they find abundant food resources, which they utilize using new cultural practices. Kalifornsky and Evan describe the new cultural practices in their new homeland as having *beggesh qistlagh*, "no impurity," meaning the practices were good. Telaquana Mountain remains to this day a special place to the Dena'ina people, representing all that is good and prosperous about the people and their territory. Other places became known as bad or, after contact, evil places. *Tiduqilts'ett* means "Disaster Place" (Kalifornsky 1991:270) and is an abandoned village on the Cook Inlet bluff between the Swanson River mouth and the mouth of Bishop Creek on the Kenai Peninsula. The "disaster" is the influenza epidemic of 1918–19 in which as much as half of the Dena'ina population of Cook Inlet died (Boraas 2002; Fall 1987:21–22; Mishler 1985). As a consequence many Dena'ina villages became too depopulated to sustain themselves and the survivors moved to nuclear villages

Table 3. Partial List of Dena'ina Spirits

English Name	Dena'ina Name	Reference
Barking Dog	Łik'aqwa yetsayi	Kalifornsky 1991: 278
Evil spirit	Nantina	Osgood 1976:170 Kalifornsky 1991:57
Detached hand	Qujexa	Kari 2007:309
Giant (Mountain Spirit)	Gujun	Kalifornsky 1991:157
Giant, (Mountain Spirit)	K'eluyesh	Kalifornsky 1991:65
Giant	Gilyaq	Kalifornsky 1991:59
Giant, First Man	Chiyałchin	Kari n.d.:74
Household spirit	Yuh Ht'ana or Kin'i	Kalifornsky 1991:55, 372
Mother of Everything	K'unkda Jelen	Kalifornsky 1991:327
Steambath spirit	Neli Qelch'eha	Kalifornsky 1991:49, 51
Chinook Wind people	Chuł dnayi	Kari 2007:309
Glacier people	Łi dnayi	Kari 2007:309
Lake people	Yen'at dnayi	Kari 2007:310
Marmot people	Sq'uła dnayi	Kari 2007:310
Mountain people	Dghili dnayi	Kalifornsky 1991:30 Kari 2007:310
North Wind people	Ezhi'i dnayi	Kari 2007:310
Rock people	Tsayan dnayi	Kari 2007:310
Sky people	Yuht'ana	Kari 2007:310
Sunshine people	N'uyi dnayi	Kari 2007:310
Spruce Tree people	Ch'wala dnayi	Osgood 1976:Kari nd.:7
Underwater creature	Tatl'uh beł qiz'uni	Kari 2007:309
Kingfisher figure	Ch'iduchuq'a	Kari 207:310

like Kenai, Tyonek, Nondalton, or Eklutna; *Tiduqilts'ett* was one of the abandoned villages. This village seems to have been particularly hard hit and Kalifornsky identifies a number of people, including Nikiski Pete Baktuit, Max Maxim, and Fred Chulyin, who left the village and subsequently reestablished themselves in Kenai in the early twentieth century (Dena'ina Legacy Tapes, June 8, 1990). The influenza epidemic was taken as a premonition of political disaster involving Dena'ina loss of sovereignty and *Tiduqilts'ett* took on the meaning of an uncontrollable adversity (Peter Kalifornsky 1990, personal communication to Alan Boraas). Many Dena'ina refused to go near *Tiduqilts'ett* well into the twentieth century because of the evil forces that linger there.

Whether places or artifacts will ever be shown through Western positivist science to absorb and emit information is debatable. String theory and the Einstein, Podolsky, Rosen Paradox of Quantum Theory have each been implicated as possible mechanisms through which information can become coded into matter, and the pituitary gland, the "third eye," has been hypothesized as a possible receptor for "sixth sense" information. Unfortunately, pseudoscience, New Age recontextualization of Native American cosmology, and outright quackery are rampant in what is considered the paranormal in the West, and scientists risk censure if they tackle such questions. Moreover, just as cultures can create maladaptive socioeconomic systems resulting in their collapse, cultures or subcultures may temporarily go ideologically awry and create maladaptive structures having no or little bearing on reality.[6] But cultures also cannot last long if mentally construed cognitive reality does not match external natural reality, and the thousands of years the Dena'ina practiced these beliefs suggest at the very least they are neutral from the standpoint of an adaptation to subarctic environments and very likely contain perspectives and practices that enhance a symbiotic interaction between culture and nature. The question we wish to ask, however, is not "Is this form of psychometry scientifically valid?" but rather "How did the centuries-long practice involving multiple dimensions and *beggesh* and *beggesha* motivate and direct Dena'ina behavior?"

HUMAN CREMATIONS AND THE RITUAL PURIFICATION OF ARTIFACTS

Before the introduction and spread of Orthodoxy, the Dena'ina cremated their dead (Osgood 1976:165–168), a practice directly related to a belief in human reincarnation (Osgood 1976:160). It was the function of the cremation ceremony to resolve the interpersonal conflicts that had accumulated between the deceased and the living and is based on the premise that after death the shadow spirit of the deceased knew the thoughts of the living. After death the body was attended by close relatives in a twenty-four-hour watch during which conciliation in the form of prayers, songs, or one's personal thoughts was sought with the deceased's shadow spirit regarding unresolved conflicts during life. Normally, balance and order were achieved by a simple recognition—spoken, sung, or thought—of the things unsaid during life. Sometimes, however, the nature of the relationship was such that the apology took the form of hysterical grief involving uncontrolled crying, self-torture, and occasionally suicide, sometimes carried out at the cremation ceremony itself (Osgood 1976:168). The "dead that holler from the grave" (*nuqnujełen*) (Kari 2007:309) are distraught ancestor spirits potentially harmful to humans whose spirit has not been propitiated. As a measure of protection from ancestor spirits (and other spirits as well), Osgood (1976:170) reports that Dena'ina would leave a container of water at the doorstep to prevent the passage of an ancestor shadow spirit into their house.

Regarding personal artifacts of the deceased, Osgood (1976:166) states they were burned in the funeral pyre along with the body: "Outside [of the village], about two or three miles away, the Indians make a crematory by building up a pier of logs. On the top they finally place the body together with the particular implements and necessaries of the deceased." In addition to sending the soul to be reincarnated, the funeral pyre ritually purified the artifacts of *beggesh*, and hence any stone points or similar durable objects that survived the fire would not affect the animals or spirits while nondurable artifacts would, of course, be consumed by the fire.

The memorial potlatch (big potlatch) followed the cremation after a year or so and ritually commemorated the fact that all the bad feelings between the deceased and

6 Examples of beliefs that resulted in significant dissonance between cultural practice and physical world reality include the Shaker religion (strict celibacy); the Ghost Dance (becoming impervious to bullets while wearing the ghost shirt); various Christian, Islamic, and Jewish "end-times" sects resulting in maladaptive incidents such as the Jonestown mass suicide; and, arguably, the cult of Hitler, which led to the Holocaust.

the living had been resolved during or after the cremation ceremony. The memorial potlatch was a powerful liminal state of renewal reestablishing harmony in the social order. Details of the ceremony varied, though it always involved memorial songs, adulatory speeches, feasting, games, and gifts from the deceased's moiety. Gift-giving at a memorial potlatch was not purely a materialistic transfer of goods from one village to another, because a village was composed of families formed through moiety exogamy and avunculocal rules of residence; thus most, if not all, clans were present in a particular village. Rather, what was given were artifacts imbued with *beggesha*, or "love," intended to commemorate the reestablishment of harmony both within the human dimension and the ancestor dimension of the now deceased.

FIRE AND WATER RITUALS INVOLVING ANIMAL BONES

In addition to a lack of artifacts, Dena'ina sites exhibit a remarkable lack of faunal remains for a hunting-and-gathering culture relying on salmon, halibut, a wide range of freshwater fish, caribou, bear, hare, and other animals of the subarctic north for a substantial portion of their diet. Boraas and Kalifornsky (1991) described the Dena'ina practice of cremating faunal remains as an explanation for the lack of animal bones at precontact sites wherein the bones of hunted and consumed animals were ritually treated either by burning them in the fire or depositing them in a lake or stream. These fire and water rituals initiated a set of events that sent the animal spirit to a "reincarnation place" presided over by the spirit *K'unkda Jelen*, "The Mother of the Animals," also described as "The Mother of Everything Over and Over," where they would become animals again. Proper attitudes and proper behavior toward animals are primary themes of the mythology associated with becoming a true believer (*k'ech eltanen*) and are represented in a traditional story (*sukdu)* recorded by Peter Kalifornsky titled "*K'ech' Eltani*, Belief in Things a Person Cannot See," which, like many Dena'ina stories, has a preamble that defines the belief in question:

> The Dena'ina, they say, had some beliefs about animals. After they killed and butchered an animal in the woods while hunting or trapping they would put the bones in one place. In the winter they would cut a hole in the ice and put the animal bones in the water. At home in the village, too, they put all the animal bones into the water, either in a lake or in the Inlet, or they would burn them in the fire. They did this so the animals would be in good shape as they returned to the place where the animals are reincarnated. They say they had that kind of belief about the animals. (Kalifornsky 1991:41)

The story goes on to relate how a man listened to the stories of the elders but did not believe them. In particular he did not believe in any special treatment of the animal bones after butchering, and so he simply cast them out where people would inadvertently walk on them—a practice severely prohibited by the stories. While out hunting, he is beset by mice and wantonly kills them by pouring scalding water on them—another practice with adverse consequences. As a result of his actions, he is plagued by bad hunting luck and later he has a dream in which he travels to a mythical place where a beautiful woman, *K'unkda Jelen*, "The Mother of the Animals," chastises him for his inappropriate actions and shows him the horribly disfigured animals he mistreated that are being tended to but are unable to be reincarnated as animals again. Then she shows him the place where the ritually treated animals are being reincarnated to return to the human land to be used again. She states:

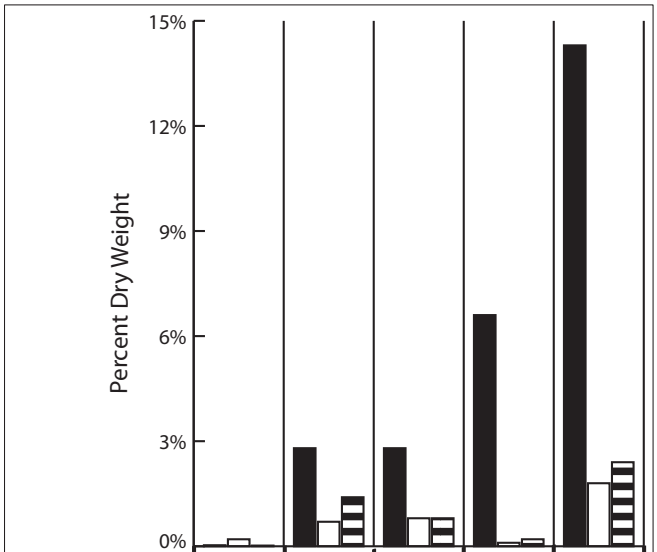
> The Campfire People [Dena'ina] take good care of us. They take our clothes [skins] for their use and if the humans treat us with respect, we come here in good shape to turn into animals again. We will be in good shape if the humans put our bones into the water or burn them in the fire. (Kalifornsky 1991:45)

When the man wakes from his dream he is ashamed of his actions and confesses the error of his ways in front of the people of his village. There are many levels to this story, but the most significant for the purpose of this study is the prohibition against leaving butchered bones scattered about and to assure natural recycling by ritual disposal of bones in fire or in water—essentially a spiritual expression of ecology.

The mythological prescription of fire and water transformations was realized in actions described ethnographically and can be illustrated by a few examples. Several sources indicate great care was taken with animal bones. Peter Kalifornsky relates that at Kalifornsky Village, during the first part of the twentieth century, bones were piled in one place during the winter and dogs were kept from scavenging the mound. In the spring the bones were taken to Cook Inlet, where they were dispersed in the

tide (Peter Kalifornsky 1991, personal communication to Alan Boraas). According to information told to Priscilla Russell (letter in Boraas's files, December 11, 1989), twentieth-century inland Dena'ina buried land animal bones, but water animal bones were returned to water. Bear bones, for example, were never put in water because, as Russell was told, "bears don't belong in water." Among the inland Dena'ina, as with other Dena'ina, it was important not to scatter animal bones or place them where animals or people might bother them because, as Russell was told, it showed lack of respect and would cause the bones to "leave the country."

While extracting charcoal from fire hearths during a 1989 project involving excavation of four precontact Dena'ina houses at the mouth of the Kenai River (KEN-230, KEN-231, KEN-232, and KEN-233), Boraas observed an inordinately large amount of bits of bone in a matrix of what can best be described as "bone meal" and saved the entire contents of each of the four hearths as bulk samples. Random samples were taken from the four hearths within the Dena'ina houses and analyzed using an atomic absorption spectrophotometer for three elements which would indicate the presence of bone: calcium, magnesium, and orthophosphate.[7] As a control, a noncultural sample from a nonhearth area 100 m beyond the perimeter of KEN-230 was also analyzed for the same three elements to indicate the presence of calcium, magnesium, and orthophosphate in the natural soil in the vicinity of the prehistoric houses. The results are portrayed graphically in Fig. 3 and indicate the Dena'ina hearths contained as much as 470 times the amount of calcium, 9 times the amount of magnesium, and 120 times the amount of orthophosphate as the nonhearth control test. We conclude from this analysis that the late prehistoric Dena'ina were burning bone in their fire hearths, and the most obvious explanation for this practice is that they were conforming to the dictates of traditional stories (*sukdu*) to ritually transport the animals back to the place where they are reincarnated, and this behavior accounts for the lack of abundant animal bones at most precontact Dena'ina dwelling sites.



	Natural	KEN-230	KEN-231	KEN-232	KEN-233
Calcium	0.03%	2.8%	2.8%	6.6%	14.3%
Magnesium	0.20%	0.7%	0.8%	0.1%	1.8%
Orthophosphate	0.02%	1.4%	0.8%	0.2%	2.4%

Figure 3. Chemical analysis reflecting burned bone content of four Dena'ina hearths compared to natural, noncultural soil. (Redrawn from Boraas and Kalifornsky 1991.)

HISTORIC DENA'INA ARTIFACTS AND FAUNA

Artifact recovery at nineteenth- and early twentieth-century Dena'ina historic village sites such as at historic Kijik (VanStone and Townsend 1970), Kenai (Kent et al. 1964), Cooper Landing (Yesner and Holmes 2000), and Kalifornsky Village, among others, indicates a return to an abundance of recoverable artifacts in the archaeological record. Whereas the 1975 excavation of a prehistoric house at coastal Kalifornsky village yielded only a handful of artifacts (Boraas 1975), a 2002 excavation done as a collaborative effort between Kenai Peninsula College and the Kenaitze Indian tribe of the remaining historic house (beach erosion having taken the other seven) yielded an abundance of artifacts, including firearms, broken and whole bottles, European ceramics, beads, sewing implements, nails, and even some leather goods. The historic site was abandoned in the mid-1920s after being reestablished about 1822 by Qadanalchen, who had taken the baptized name Nikolai Kalifornsky. Over a thousand artifacts from a 1 x 10 m trench span this hundred-year period (see Table 1). We can infer that during this time either the concept of *beggesh* was weakened by colonial ideology or Orthodoxy,

7 The hearth and nonhearth samples were refluxed with hydrochloric acid to prevent sulfate precipitation, brought to volume with deionized water, and analyzed for calcium, magnesium, and orthophosphate using a Perkin Elmer atomic absorption spectrophotometer. A digest blank was run with the samples and the results of the blanks, though negligible, were subtracted from the sample results before calculation. The analysis is reported as percent of dry weight. The analysis was done by Sheree VanNatta Ross.

or, in the indigenization process, artifacts of Euro-American manufacturing origin took on a different cognitive conceptualization and operated according to different rules that restricted their capacity to absorb and emit *beggesh*. During early historic times, a short prayer was said to cleanse items of Euro-American manufacture of residual *beggesh*, but it is not known how prevalent this practice is today. In addition, through the potlatch, purchased items could be ritually infused with *beggesha*. Traditional Northern Dené still practicing the potlatch speak of manufactured items given in the ritual setting as being infused with "love" (John 1996:59; Madison 1992), a concept similar to *beggesha*. Rifles, blankets, and other manufactured items take on special meaning when given in a potlatch ceremony (Simeone 2002) such that to give a rifle, for example, is giving of one's love to another both symbolically and literally. Euro-American items obtained and/or given outside of the context of the potlatch do not necessarily take on this quality, and thus their disposal is not as critical as that of items made from natural materials and transformed through knowledge and skill into artifacts. Since artifact finds are common at historic Dena'ina sites, either items of Euro-American manufacture gradually came to lack the capacity to retain *beggesh* or they are regulated by other means and thus, unlike their prehistoric cousins, their disposal did not have to be ritually controlled.

An additional factor is that the artifact finds at KEN-014, with the exception of sharpening stones, are all of European or American origin. Some traditional artifacts such as bone arrow points and harpoon arrows survived well into historic times, and, because they were of personal manufacture potentially carried *beggesha* or *beggesh*—good or bad spiritual qualities associated with their use—and would have had to be disposed of in a traditional way and thus are seldom found at nineteenth- or twentieth-century sites. There might have been additional pressure not to spiritually cleanse artifacts in the old way since this was traditionally done in a cremation pyre. Orthodoxy forbids cremations because one's body as well as one's soul potentially goes to heaven. Since the later villagers who died at Kalifornsky Village were buried in wooden caskets in Orthodox ceremonies (Peter Kalifornsky, personal communication, July 1975), there would have been no cremation and the practice of cleansing artifacts of *beggesh* gradually disappeared. Interestingly, the early twentieth-century house excavated at Kalifornsky Village was occupied by Simeon and Annie Unishev, both devout Orthodox, while she was also among the last practicing shamans on the Kenai Peninsula (Peter Kalifornsky 1991, personal communication to Alan Boraas). As described by Kalifornsky, the Unishevs' religion was not syncretic blending but a practice that involved fundamental truths common to both Orthodoxy and traditional Dena'ina shamanic belief.

Peter Kalifornsky stated that when he was a child at the village the practice of performing fire and water rituals was continued (see above). The people would save all the fish, hare, and other bones in a pile over the winter, keep the dogs away from them, and then when the inlet thawed in the spring they would take the bones down to the beach and distribute them in the water where they would be scattered by the tide. True to Kalifornsky's words, the 2002 excavation at Kalifornsky Village turned up few animal bones with one exception: butchered moose bones. In random excavation units scattered mostly outside the house area we found numerous cut and butchered moose bones. Kenai Dena'ina recognize that moose have appeared fairly recently on the Kenai Peninsula. According to oral history, a Dena'ina man named Fred Chulyn was the first to kill a moose near Kenai; this happened in the early 1900s (Kalifornsky 1991:271; Mamaloff 1993:20–21). Caribou, once the dominant ungulate, disappeared on the Kenai Peninsula at the beginning of the twentieth century and moose became the primary land mammal hunted for food. Because they were new the people appear to have treated them differently than other food animals, and the bones no longer needed to be ritually disposed of through fire and water rituals for the animals to return.

SUMMARY

The interaction between spiritually driven ritual practices and material items and places is complex. Had the Cook Inlet Dena'ina of the late prehistoric period existed, say, five thousand years ago, they would have become invisible to history because of the lack of artifacts they left behind; it would have resulted in a thousand-year gap between the periods that came before and after and, without a written record, there would have been no evidence of their existence. Undoubtedly other cultures have similarly disappeared from history, or interpretations of their artifact record have been substantially altered, because of spiritual practices involving disposition of material items. As it is we have significant ethnohistoric, linguistic, and oral tradition and mythological evidence through which to contextualize the general lack of recoverable artifacts and faunal refuse during the late prehistoric Dena'ina period, and

it can be characterized as a case of material negentropy. If entropy is the most probable state of matter or energy, ultimately a form of disorganization, negentropy (Bateson 1979) is a highly improbable organization of matter and energy (from the standpoint of physical laws) and is driven by either biological or cultural processes. In this case the cultural process is a Dené version of spirituality that motivated precontact Dena'ina people to prevent artifact and faunal scatter, and thus precontact Dena'ina villages became highly ordered places in the sense that one had to invest a substantial amount of energy to keep a place occupied by fifty to a hundred people so devoid of discarded artifacts and refuse. At the same time the precontact Dena'ina minimized the amount of recoverable information from artifacts by later archaeologists, they also minimized impact on the land and thus, along with spiritually driven practices involving plant and animal use, become an archetype of a sustainable society.

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A HISTORIC ALUTIIQ VILLAGE ON THE OUTER KENAI COAST: SUBSISTENCE AND TRADE IN THE EARLY RUSSIAN CONTACT PERIOD

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ABSTRACT

The Early Contact Village site,[1] located on the Gulf of Alaska coast of the Kenai Peninsula, provides an archaeological record of Alutiiq economy and cultural interaction during the initial expansion of the Russian fur trade across southern Alaska. The site includes a midden mound and the remains of both winter and summer houses. Testing and excavation were carried out in 1993 and 2003 by the Arctic Studies Center (Smithsonian Institution) in cooperation with the National Park Service and the Alaska Native villages of Nanwalek, Port Graham, and Seldovia. Artifacts and stratigraphy indicate a brief occupation (probably less than two years) that took place between AD 1790 and AD 1810, when Russian companies were exploiting the region for sea otter furs and operating a shipyard at nearby Voskresenskii (Seward). The artifact assemblage, including a forged iron knife, Russian coin, lead finger ring, copper, flat glass, and numerous glass beads, suggests that opportunistic *free trade* was the predominant mode of Alutiiq-Russian interaction on the outer Kenai coast in contrast to the *forced labor* regime imposed by the Russians on Kodiak Island and in the Aleutians. Diverse and abundant faunal remains at the Early Contact Village site indicate an independent, unrestricted subsistence effort rather than incorporation into the full Russian labor and fur production system.

Key words: Russian colonialism, Alutiiq subsistence, trade beads

INTRODUCTION

In AD 1784, an expedition led by Irkutsk fur merchant Grigorii Shelikhov overwhelmed Alutiiq resistance on Kodiak Island and built a stronghold at Three Saints Harbor, the first step in Shelikhov's plans to expand the Russian fur trade into the central and eastern Gulf of Alaska (Black 1992; Crowell 1997). Within ten years, the

1 Editor's note: AHRS numbers pertaining to sites in Kenai Fjords National Park were removed from this article by request of the National Park Service.

Shelikhov-Golikhov company had established additional outposts on Kodiak Island, the Shumagin Islands, the Alaska Peninsula, and the Kenai Peninsula, competing with the Lebedev-Lastochkin Company in areas as far east as Yakutat Bay (Black 2004:104–111; Fedorova 1973). In AD 1799, the assets of the rival firms were consolidated into the Russian-American Company (RAC), a quasi-governmental trading monopoly that ruled southern Alaskan and controlled its fur trade until AD 1867.

The outer (Gulf of Alaska) coast of the Kenai Peninsula may have had an Alutiiq population of about 600 at the time of first Western contact (Oswalt 1967). A number of historic settlements and place-names are recorded in Russian records and Alutiiq oral history (Cook and Norris 1998; Crowell and Mann 1998; De Laguna 1956; Leer 1980). Native villages included Kaniag, Qutaḷeq, Ayalik (Aialik Bay), Yálik, Agmílek, Kangiliq (Port Dick), Nunacungaq (Rocky Bay), and Qugyugtuliq (Fig. 1). Russian forts were built at Aleksandrovskii (Nanwalek, lower Cook Inlet) in AD 1786, Voskresenskii (Seward, Resurrection Bay) in AD 1793, and Fort Konstantine (Nuchek, Prince William Sound) in AD 1793. Outer coast indigenous residents were employed at Voskresenskii, traded furs there, and joined Russian-organized kayak fleets that were dispatched from Kodiak each year during the 1790s and early 1800s to hunt for sea otters along the Kenai Peninsula, Prince William Sound, and the mainland coast to the east (Cook and Norris 1998:41–42; Davydov 1977:193–197; Gideon 1989:62–64, 69–71; Tikhmenev 1979 Vol. 2:35, 46–52, 66). George Vancouver encountered one such flotilla at Port Dick in AD 1794 that numbered over 400 men (Cook and Norris 1998:41; De Laguna 1956:34; Vancouver 1967). On return trips, some of the hunters stayed behind at "the islands near Voskresensk [Resurrection] Bay" to hunt birds for parkas (Davydov 1977:194). The location is an apparent reference to seabird colonies in the Chiswell Islands off Aialik Bay or at Renard, Rugged, Hive, and Cheval islands in Resurrection Bay.

Recent archaeological excavations at the Early Contact Village in Aialik Bay—rendered "Ayalik" as an Alutiiq (Sugcestun) placename—contribute to an understanding of indigenous life and ethnic interaction during these first decades of Russian contact. Aialik Bay is a 30-km-long fjord located just west of Resurrection Bay, in Kenai Fjords National Park. The Early Contact Village is situated on the western shore of the bay, about 55 km from the former

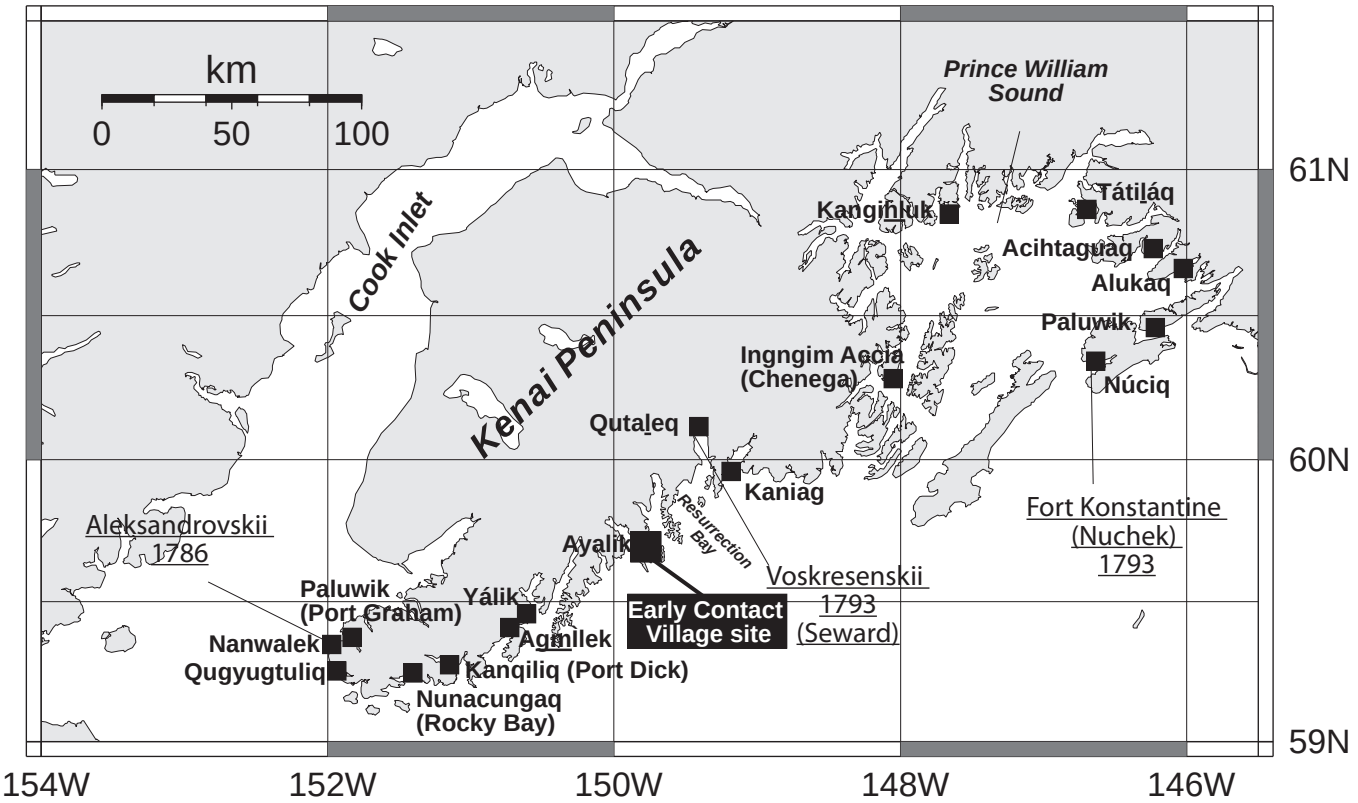


Figure 1. Historic Alutiiq villages of the outer Kenai Peninsula coast and Prince William Sound, with locations of Russian forts (underlined) and study site.

Voskresenskii fort (at Seward) by water, and only 5 km from the nearest of the Chiswell Islands.

The site is the first Russian-era Native settlement to be excavated between Cook Inlet and Prince William Sound (Crowell 2004, 2007). The village is not remembered in Alutiiq oral history, although Eleonore McMullen and other elders at Port Graham and Nanwalek recall stories of ancestral residence at Ayalik in Aialik Bay, which can be securely identified as the Denton Site where late-nineteenth-century artifacts have been recovered (see discussion below). Neither the Early Contact Village nor the village of Ayalik appear on Russian or American period maps of the region.

Our analysis of artifacts and site formation processes at the Early Contact Village suggests that the site was occupied for a very brief period—probably less than two years—between AD 1790 and 1810. Artifacts found include stone and bone components from traditional hunting weapons (lances, darts, harpoons, arrows) as well as glass beads and other Russian imports. As discussed below, the beads are comparable to assemblages from southern Alaskan sites with dates between AD 1785 and 1820, while several other glass and metal artifacts are identical to items excavated at Three Saints Harbor (occupied AD 1784–ca. 1805). A Russian half-kopeck coin dated AD 1748 provides a *terminus post quem* for the Early Contact Village but was issued at least four decades prior to its earliest possible occupation. A charcoal sample from the base of the midden (Beta 74860) yielded a radiocarbon date of 180 +/– 60 yrs BP at one standard deviation. Calibrated with InterCal04 (Reimer et al. 2004), the probabilities at two standard deviations are AD 1650–1700 (15.4%), AD 1720–1820 (36.4%), AD 1830–1870 (2.8%), and AD 1910–1960 (13.6%).

ARCHAEOLOGY OF ALASKA NATIVE SETTLEMENTS IN THE EARLY RUSSIAN PERIOD

Of particular interest at this and other Alaska Native settlements of the early Russian period is evidence pertaining to the colonial political economy, which was based largely on the "impressment" of Alaska Native labor for fur and food production (Black 2004:133). As Russian merchant voyagers expanded across the Aleutian Islands and southern Alaska, they sometimes engaged in peaceful trade with indigenous populations, but more frequently sought to coerce and exploit them through armed force, killings, harsh punishments, and the seizure of hostages (Black 2004:128–135; Gideon 1989:69–71; Liapunova 1987; Okun 1979). On Kodiak, Shelikhov imposed a policy of universal Native service that was formalized in the RAC charter of 1821 (Dmytryshyn et al. 1989:362). By the terms of the charter, half of the male population between ages 18 and 50 could be taken for sea otter hunting (for up to three years of service), but in reality most able-bodied men, women, and children were required to hunt, fish, trap, harvest birds, prepare food, make clothing, or tan skins for company use (Davydov 1977:191–197; Gideon 1989:61–69; Okun 1979:200). This system brought hunger and hardship to Alutiiq communities because labor for the Russian companies undermined the subsistence effort needed to lay in sufficient food supplies for winter (Davydov 1977:196; Gideon 1989:70).

Russian dependence on Alaska Native production of food and goods was related to the great difficulty of transporting supplies from Siberian ports, and the forced labor system itself—which generated a minimal need for exchangeable goods such as glass beads, tobacco, and metal tools—was also adapted to this constraint (Fedorova 1973:232–242; Gibson 1976). Based on these conditions, Crowell's world system model for Russian American archaeology derived archaeological predictions for Alaska Native settlements (Crowell 1997:20–30). Especially during the earliest phase of the colonial period (pre-1799), when all goods were shipped with great difficulty from Okhotsk, indigenous village sites should be characterized by: (1) very limited quantities and varieties of trade goods; (2) the predominance of cheap, small, and easily transported trade items such as beads; (3) little evidence for the substitution of imported tools, clothing, or foods for traditional equivalents; (4) evidence for the continuation of hunting by traditional techniques (e.g., harpoon and dart hunting for sea mammals), as mandated by the Russian companies; (5) the absence of guns and iron knives or other weapons, which were prohibited in trade (Crowell 1997:52: Shelikhov 1952:35); and (6) restricted subsistence patterns including a shift toward foods harvested by women (shellfish, eggs, fish, and plant foods) because male labor was diverted for sea otter hunting.

These predictions apply in particular to the so-called "dependent" or "settled" regions where Russian control was strongest, listed in the 1844 RAC charter as the Aleutian Islands, Kodiak Island, and the Alaska Peninsula (Dmytryshyn et al. 1989:470).

Alaska Native village sites from these areas generally conform to the model, showing continued use of bone

and stone tools for many decades after contact. Beads are common but only very limited quantities of iron, copper, ceramics, and bottle glass appear until the 1840s (Clark 1974a,b; Knecht and Jordan 1985; Veltre 1979, 2001; Veltre and McCartney 2001; Workman 1966).

Although the 1844 RAC charter also claimed the "Kenaits" (Dena'ina) and "Chugach" (Prince William Sound and outer Kenai Coast Alutiiq) as dependent peoples, Russian labor documents consistently referred to these groups as "semi-dependent," meaning that the RAC had little or no actual control over their lives (Fedorova 1975:17; Okun 1979:206). In this situation, Native hunters were not subject to impressments but instead received payment for their furs in tobacco, beads, iron, copper, and other imported trade goods (Fedorova 1975; Hassen 1978). Archaeologically, indigenous settlements in these "semi-dependent" areas—including the Early Contact Village—should show characteristics of a *free trade* mode of interaction with the Russians rather than a *forced labor* mode, including more goods received in trade and little or no evidence of restricted subsistence. However, because the Early Contact Village dates to the earliest phase of Russian colonialism, when supply links to the home country were poor, large quantities of trade goods would still not be anticipated. As Aleksandr Baranov lamented about the state of trade at Voskresenskii in 1793:

> As you know, we have no trading goods here, only beads and they are of small size. The large beads are of the kind for which there is no demand. There are not enough to buy sea otters with, and even our native workers no longer take them in exchange for fox skins. (Tikhmenev 1979 vol. 2:32)

SITE DESCRIPTION

The Early Contact Village was discovered in 1989 during post–*Exxon Valdez* oil spill surveys, followed by mapping and testing for the National Park Service in 1993 (Mobley et al. 1990; Crowell and Mann 1998:103–109). The present paper focuses on excavations conducted in 2003 by the Smithsonian Institution's Arctic Studies Center, in cooperation with the National Park Service and the descendant Alutiiq communities of Nanwalek, Port Graham, and Seldovia (Crowell 2004). The site consists of a midden mound and cluster of seven house depressions (Structures 1, 2, 3, 4, 10, 12, 16), four cache pits (Structures 5, 7, 11, 14), and two aboveground sod wall features (Structures 6, 13), centered in a swale between relic beach ridges (Ridges 1 and 2; Fig. 2). The spit is growing to the west so that this portion of the beach is older than Ridge 1 and the current storm berm. Late-nineteenth-century log cabin mounds of the Denton Site and a small midden dating to about AD

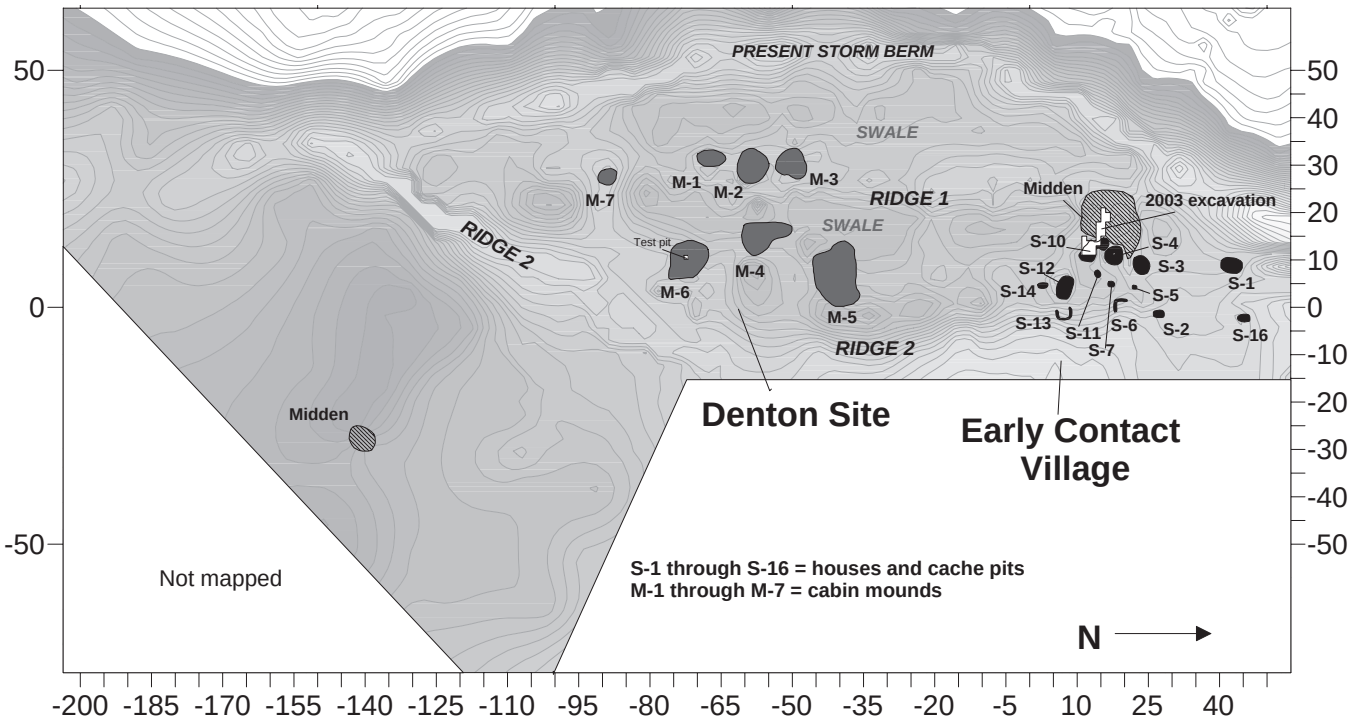


Figure 2. Site locations and structures at the Early Contact Village and Denton sites, Aialik Bay, Kenai Fjords National Park. Scale in meters.

1400 are located nearby (Crowell and Mann 1998:101–112). Dwellings at the Early Contact Village appear to be a combination of summer houses (aboveground, with sod walls) and semisubterranean winter houses.

The Early Contact Village site is partially overgrown by living spruce trees that are up to 70 years old (based on tree cores). Mature spruce that were killed by saltwater inundation after the AD 1964 earthquake are located on the crest and flank of the adjacent storm berm, and ring counts show that these trees started growing in about AD 1815. It therefore appears that the village was surrounded by open, treeless beach at the time of its occupation. A detailed description of the geomorphology and formation history of the site area is provided by Mann (Crowell and Mann 1998:44–51).

The innermost beach ridges, located 100 to 200 m east from the Early Contact Village, are covered by old-growth mountain hemlocks that are almost all about 180 years old. Many are growing from even-height decayed stumps. This pattern suggests that an original stand of large trees was extensively logged in the AD 1790s.[2] It is possible that this timber was cut to supply the Voskresenskii shipyard (Crowell and Mann 1998:88–89).

MIDDEN AND HOUSE EXCAVATIONS

In 1993, we dug two 1 x 1 m test units (A and B) in the midden mound and a third 1 x .5 m unit (C) inside Structure 4. In 2003, we excavated a 22 m^3 block that cut through the deepest part of the Early Contact Village midden, partially subsuming the earlier A and B units and extending into an adjacent house pit (Structure 10) (Fig. 3). In 2003, we also excavated a 1 x 2 m test in Structure 13. Excavations and field recording followed cultural strata, which when sufficiently thick were subdivided into 10 cm levels for vertical control. All excavation was done by trowel. Three-dimensional coordinates were recorded for all artifacts, bones, and flakes discovered *in situ*, and 100 percent of excavated soil was wet-screened through ⅛ in. mesh to ensure nearly total recovery of beads and other small artifacts.

MIDDEN

The midden is a low, grass-and-spruce-covered mound approximately 225 m^2 in extent and up to 60 cm thick. Residents of the village disposed of hearth waste, household refuse, and food remains at this central location rather than in a more dispersed pattern around the houses. The midden has several distinct strata (Fig. 4):

Stratum 1: Dark reddish-brown post-occupation humus.

Stratum 2: Fire-cracked cobbles (graywacke and granite) in a loose matrix of dark brown mineral soil, with circular lenses of charcoal that may represent individual hearth dumping episodes; contains artifacts and some bone and shell.

Stratum 3: Charcoal-stained, loose mineral soil with few rocks; high density of faunal remains and numerous artifacts. Fish bone is concentrated in a single large lens, overlain by crushed shell.

Stratum 4: Very rocky and deeply stained by charcoal; relatively few artifacts and very little bone or shell. Originally designated as "Lower Stratum 3."

Stratum 5: (Noncultural.) Loose graywacke pebbles and cobbles with deteriorated driftwood logs; the original beach surface.

As discussed below, we infer that Stratum 3, with its high density of faunal remains, represents a spring/summer layer between two winter/fall layers (Stratum 2 and Stratum 4).

STRUCTURE 4

Structure 4 is a shallow (30 cm), sub-rectangular house pit measuring about 4 m on each side. Results from test unit "C" excavated in 1993 (Crowell and Mann 1998:106–107[2] and Fig. 57) revealed an upper stratum of wood debris, a house floor consisting of gravel over charcoal-stained peat, and a lower house floor of densely charcoal-stained sand.

STRUCTURE 10

Structure 10, a semisubterranean house pit, has a square central chamber about 45 cm deep and 4 m on each side, with a 1 x 2 m side room extending to the northwest and

2 This observation and estimate was made in 1993 by Thomas Hamilton (United States Geological Survey). It includes a lag time of 20 years after cutting for trees to germinate and reach 1 m coring height.

3 The house was incorrectly identified as Structure 8 in the 1998 report.

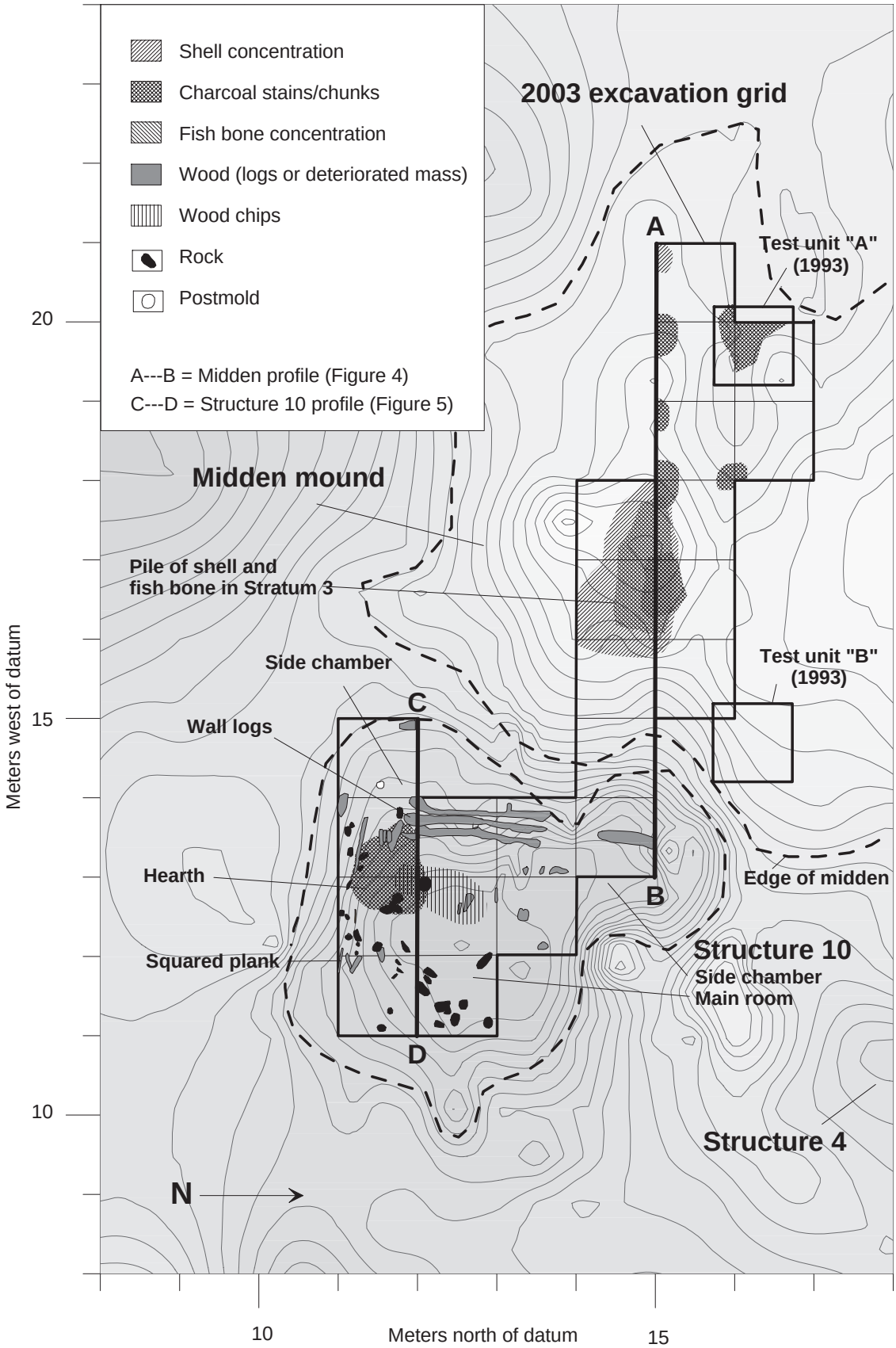


Figure 3. The 2003 excavation block and subsurface features at the Early Contact Village midden and in adjacent house depression, Structure 10. Midden test pits A and B, excavated in 1993, are also shown.

a smaller, less distinct side room on its west side. Interior deposits (Fig. 5) were found to consist of:

S-10 Stratum 1: Post-occupation turf.

S-10 Stratum 2: Charcoal-stained house floor mixed with beach pebbles, small pieces of fire-cracked rock, and fragments of burned (calcined) bone.

S-10 Stratum 3: Dark reddish-brown peat containing wood chips, bark, and stringers of charcoal.

S-10 Stratum 4: Culturally sterile beach pebbles and cobbles.

The basal peat layer (S-10 Stratum 3) is thin in the center of the dwelling, where it may represent the compressed remains of grass that was laid down as an insulating layer over the beach rock. At the house margins, this peat layer becomes much thicker. Although there is no distinguishable break or change in its composition, here it probably represents collapsed wall sods.

The house floor deposit (S-10 Stratum 2) is up to 10 cm thick and contains thin intermediate stringers of peat that may indicate a grass re-flooring episode. A similar double

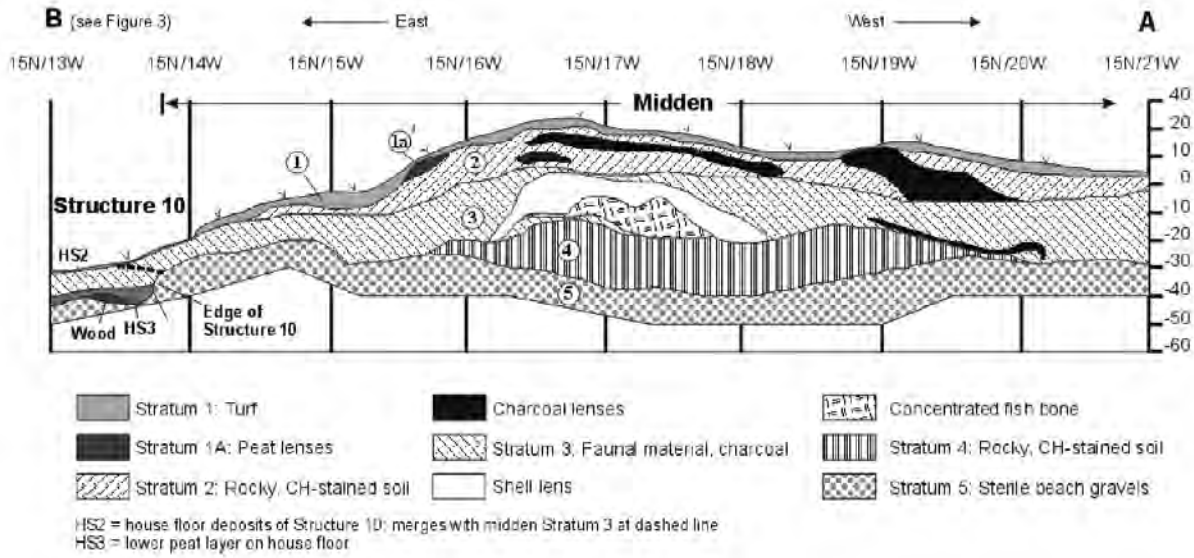


Figure 4. East-west stratigraphic profile through the Early Contact Village midden (labeled A-B in Figure 3).

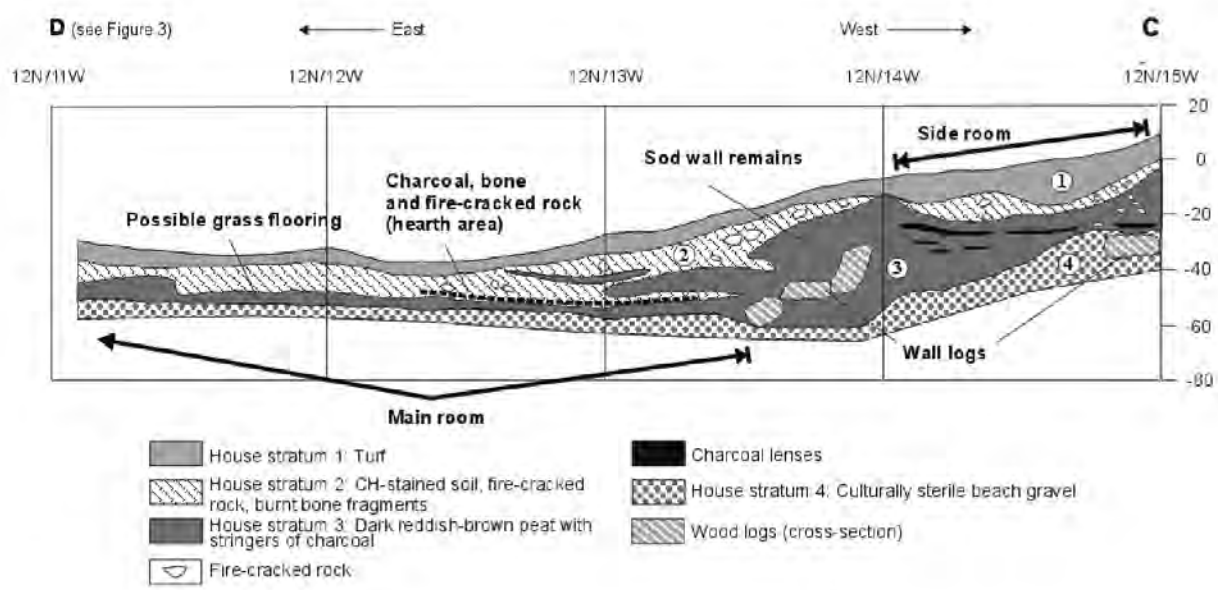


Figure 5. East-west stratigraphic profile through Structure 10, Early Contact Village site (labeled C-D in Figure 3).

layer of house floor deposits was noted in Structure 4 (above). The interior stratigraphy of these houses suggests probable use over a period of two winters, with re-flooring at the start of each occupancy. Structure 13, one of the Early Contact Village houses with aboveground sod wall mounds—interpreted as a probable summer dwelling—was found to have only a single floor level with no peat layers (see below).

A thin lens of charcoal-stained soil in the southwest corner of Structure 10, interpreted as a hearth, was surrounded by a scatter of small, calcined bone fragments. No other bone was preserved on the house floor. Nick Tanape Sr. of Nanwalek suggested that the occurrence of burnt bone in the vicinity of hearths (noted also at the precontact Bear Cove site in Aialik Bay) is evidence of the Alutiiq custom of *pinahsuhtut* ("they are hunting for good weather"), in which bones are tossed into a cooking fire to quell stormy weather (Tanape 2002, personal communication).

Horizontal spruce logs and fragments were found in place along the western and southern walls of the main room, apparently once part of a retaining wall that prevented inward slumping of the loose beach gravel (Figs. 3 and 5). The floor of the western side room is at the same level as the top of this log wall, which may once have extended all around the main chamber. The end of a squared board was found along the southern edge of the main chamber, possibly part of the retaining wall or else a remnant of interior planking as reported for Chugach Alutiiq winter houses of this time period (Walker 1982:140–141).

Two postholes about 10 cm in diameter were found in the interior, but the minimal evidence for roof support posts and absence of a collapsed sod roof layer suggest that the house had a lightweight covering, probably spruce or hemlock bark laid over a light wooden frame. Walker described an equivalently built, although much larger, winter dwelling—with subterranean floor, sod walls lined inside with planks, and a light roof covered with "chingle or pine bark" over "small Beams or Branches bent in circular form" in Prince William Sound in 1786 (Walker 1982:140–41). Georg Steller found a bark-roofed, semi-subterranean Alutiiq dwelling on Kayak Island in 1741 (Steller 1988:67).

STRUCTURE 13

Structure 13 is a square house depression (3 x 3 m x 10 cm deep) enclosed on its north, east, and south sides by linear sod mounds (10 cm high x 50 cm wide). These mounds appear to have been embankments around a mostly aboveground structure such as a small hut made of wooden planks. This type of construction was typical of reported Chugach summer dwellings (Crowell and Mann 1998:129–130; Portlock 1968 [1789]:253; Steller 1988:197). A 1 x 2 m test unit was excavated just inside the structure along its western edge. The excavation revealed 15 cm of heavily charcoal-stained floor deposits without any internal layering. Artifacts from the house included glass beads (11) and a few slate flakes and fragments of burnt bone. Based on the artifacts, this dwelling was probably contemporaneous with the other tested houses.

ARTIFACTS

Artifacts from the Early Contact Village (Table 1) reflect a period of cultural transition when Alutiiq tools, weapons, and other manufactures were largely unchanged but when Russian trade goods were beginning to be incorporated into the culture. Glass beads are the most common imported items in the assemblage, while iron, copper, and glass artifacts are rare. Ceramics are completely absent.

STONE TOOLS

Stone artifacts from the site include components of hunting weapons and tools for cutting, scraping, and grinding. Hard black slate, which was shaped into finished tools by sawing, flaking, and grinding, was the primary raw material. Over 800 unmodified slate fragments, representing debitage from the manufacturing process, and 60 slate preforms and preform fragments were recovered from the midden and house depressions.

Barbed lance blades (*n*=11; Fig. 6:bases F–K and tips A–E, all slate) with short, square stems are typical of the last millennium of Chugach (Alutiiq) prehistory in Prince William Sound, including Palugvik 4 and the historic Chugach phase (De Laguna 1956:60; Yarborough and Yarborough 1996:56–66). They were probably used to arm "repeating" lances with detachable heads, used for killing harpooned or netted sea mammals (Birket-Smith 1953:25; Davydov 1977:219; Nelson 1983:145). Similar blades occur in Late Koniag phase sites in the Kodiak archipelago, including Kiavik where they date to between the mid-fifteenth and mid-seventeenth centuries (Clark 1974a:Pl. 17w). Over half of the examples from the Early Contact Village site were found in Stratum 3 or Stratum 2 of the midden, in

Table 1: Artifact counts and stratigraphic contexts, Early Contact Village site. Totals include results from 1993 test pits and 2003 excavations.

	Midden 2003 + 1993 Test Units A & B				Structure 4 1993 Test Unit C		Structure 10 2003			Structure 13 2003		
	Strat. 2	Strat. 3	Strat. 4	N/D	Strat. 4	Strat. 5	Strat. 2	Strat. 3	N/D	Strat. 2	Strat. 3	Total
Stone Tools												
Barbed lance blade	1	4	2	1			2	1				11
Triangular endblade	2						1	3				6
Stemmed arrow point		2					3	1				6
Burin-like tool	1	1										2
Chisel bit	1											1
Slate flake	99	195	87	23	7	1	239	168	3	10		832
Slate preform	12	14	3				12	14	1	4		60
Slate tool fragment	2	7					3	2		1		15
Projectile point (fragment, unidentified type)	2	3	1					2				8
Notched cobble scraper	1											1
Cobble spall	2	2	2		1		1					8
Quartzite slab scraper			1									1
Whetstone								1				1
Bone tools												
Composite fish hook	1	2										3
Toggling harpoon head		1	1									2
Barbed dart or harpoon head			2									2
Worked bone		3	1									4
Bone awl			1									1
Unidentified bone tool		1										1
Bone preform		2										2
Trade artifacts												
Glass beads	76	63	15		1	3	41	44		10	1	254
Flat clear glass	4	2		1								7
Bottle glass							1					1
Coin		1										1
Copper arrow point		1										1
Copper fragment			2	1								3
Lead finger ring							1					1
Iron knife blade with tang	1											1
Iron nail/spike	2						1					3
Mica fragment	1	3										4
Totals	**208**	**307**	**118**	**26**	**9**	**4**	**305**	**236**	**4**	**25**	**1**	**1,243**

association with sea lion, harbor seal, and porpoise bones. Only tips and bases (no complete artifacts) were found, a pattern probably resulting from impact breakage when the lances were used, followed by discard of the broken pieces and rearming of the weapons. Stages in the manufacture of these tools are illustrated by a flaked preform (Fig. 6L) and a preform with flat-ground margins (Fig. 6M).

Triangular endblades (*n*=6; Fig. 6O–P, all slate) appeared about 1,000 years ago in the Alutiiq region and continued to be used into historic times (Clark 1974a:54 and Pl. 16a–c; De Laguna 1956:Pl. 28:9–10). They were

employed as tips for arrows, toggling harpoon heads, and lances. A midsection with medial ridge (Fig. 6Q) could be from either a barbed or triangular point. Three very small endblades (Fig. 6W–Y, slate) do not appear to have analogues at other published sites in the Alutiiq region. One possible use for these implements was as tips for small toggling harpoons.

Stemmed arrow points (*n*=6; Fig. 6R–S, slate) are considerably smaller than similarly shaped points from other parts of the Alutiiq region (e.g., Heizer 1956:Pl. 45; De Laguna 1934: Pl. 31). The two complete points (Fig. 6R–S) are from Structure 10. Small, sharp tips (Fig. 6:T–V) are probably from this type of projectile. Highly acute marginal angles distinguish these from lance blade tips.

Burinlike tools (*n*=2; Fig. 7A) are ground on both faces. The illustrated example, from Stratum 2 of the midden, is made of greenstone. One margin of the tool was ground to a sharp edge and the other was ground flat to make a perpendicular striking platform for removing burin flakes. A single burin scar (upper left corner of the tool as shown) makes a right-angled cutting edge. There is no evidence of use wear. A second example from Stratum 3 of the midden (not illustrated) is flat-ground on the cutting edge and shows slight use wear.

This type of carving tool for bone is a classic Paleoeskimo form seen in the Arctic Small Tool, Old Bering Sea, and Ipiutak traditions of Alaska, as well as the Dorset tradition of Canada. The geographically closest examples include flaked and polished burins from the Brooks River Gravels phase on the Alaska Peninsula (Dumond 1981:Pl. V:a–e) and the lower component of SEL-033 on Chugachik Island on Kachemak Bay (Workman 1996:44–45), both between 3,100 and 4,000 years old. The presence of this antique form at the Early Contact Village site is unexplained.

Chisel bits with bifacially ground cutting edges (*n*=1; Fig. 7B, slate) were probably hafted with bone or wooden handles and used for fine wood carving. They have been found at the Northwestern Lagoon Site (Crowell and Mann 1998:144–45) and McArthur Pass site (Betts et al. 1991:137) in Kenai Fjords National Park, as well as other sites of the last millennium in Prince William Sound (De Laguna 1956:Pl. 15–6; Yarborough and Yarborough 1996: Fig. 34) and the Kodiak archipelago (Clark 1974a:98; Heizer 1956:49).

Notched cobble scrapers (*n*=1; Fig. 7C, quartzite) were probably used as spokeshaves for shaping wood. Comparable examples have been reported from the Bluffs Phase on the Alaska Peninsula, dating to about AD 1450–1800 (Harritt 1988:Pl. 19d), from the sixteenth-to-seventeenth-century Kiavik and Rolling Bay sites on Kodiak Island (Clark 1974a:Pl. 27n and Pl. 28), and from the Uyak Site on Kodiak Island (level and date unknown) (Heizer 1956:Pl. 29a).

Cobble spalls (*n*=7; Fig. 7E, H, I, quartzite) have been reported for Gulf of Alaska sites of all time periods and were general-purpose tools used as knives, scrapers, wedges, choppers, or saws (Clark 1974a:81–83; De Laguna 1934:60–61).

Other stone artifacts include a thin slab of quartzite used as a scraper (Fig. 7D), which bears a rust stain left by contact with a piece of iron. A fine-grained, tabular whetstone (Fig. 7F) has a smooth, slightly concave surface and was probably used to hone the edges of lance blades and other slate tools.

BONE TOOLS

Composite (two-piece) fish hooks (*n*=3) are represented by a shank (Fig. 8A) and two barbs (Fig. 8B–C). On this type of hook, which was used for cod, rockfish, and other medium-sized ocean fish, the barb section was lashed to the shank with sinew cord (Birket-Smith 1941:Fig. 23). One of the barbs from the site has a lashing groove around its base. Archaeological examples are widespread in the Gulf of Alaska, with dates ranging from more than 6,000 years ago to the historic period (De Laguna 1934:Pl. 43 5–13; De Laguna 1956:Pl. 36 7–11; Hausler-Knecht 1993; Knecht 1995:163–169).

Toggling harpoon heads (*n*=2; Fig. 8D) include one full-sized example, probably for seals, with a broken slot for a stone endblade, a transverse line hole, and a closed socket. In the Gulf of Alaska, toggling harpoon heads were used from about 3,500 years ago into the twentieth century, but were less common than barbed harpoon heads (Birket-Smith 1953:24–26; De Laguna 1934:Pl. 38; De Laguna 1956:171–173; Heizer 1956:Pl. 58). A miniature toggling head (Fig. 8F) may be from a fish harpoon, or may possibly be a toy. It has a slot for a tiny endblade (see possible examples, Fig. 6W–Y), transverse line hole, closed socket, and bifurcated toggle. No examples of this size from other sites have been identified.

Barbed dart or harpoon heads (*n*=2), represented by an eroded base (Fig. 8E) with off-center line hole and an additional small fragment, were commonly used for seals and sea otters. Eighteenth and nineteenth-century ethnographic examples are ubiquitous (e.g., Birket Smith

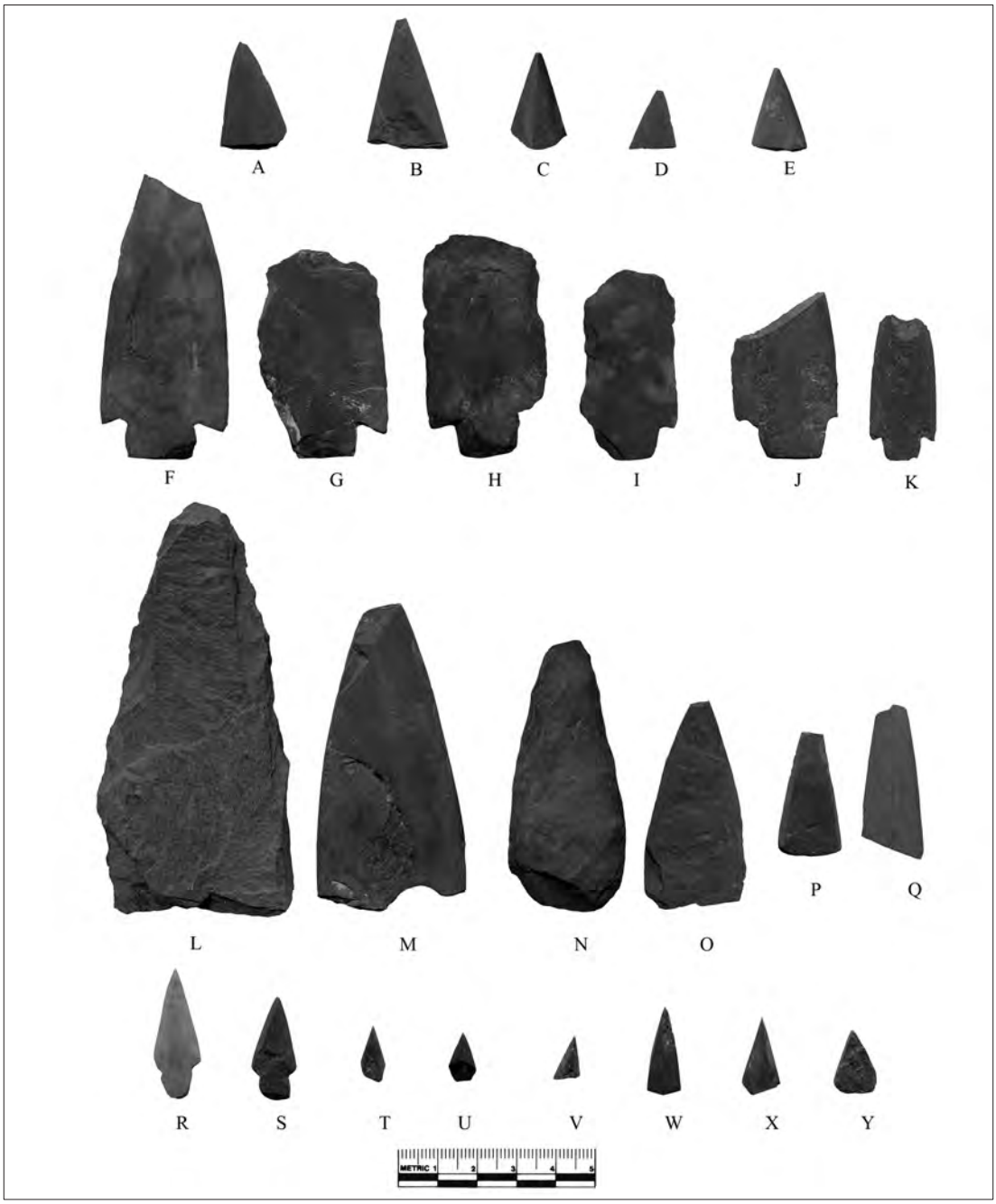


Figure 6. Ground slate projectile points, Early Contact Village site. A. KEFJ-137:2354 barbed slate lance blade tip; B. KEFJ-137:2332 barbed slate lance blade tip; C. KEFJ-137:1970 barbed slate lance blade tip; D. KEFJ-137:1682 barbed slate lance blade tip; E. KEFJ-137:2106 barbed slate lance blade tip; F. KEFJ-137:1684 barbed slate lance blade base; G. KEFJ-84:1161 barbed slate lance blade base; H. KEFJ-137:2059 barbed slate lance blade base; I. KEFJ-137:2098 barbed slate lance blade; J. KEFJ-137:2212 barbed slate lance blade base; K. KEFJ-84:1216 barbed slate lance blade base; L. KEFJ-137:1934 flaked slate lance preform; M. KEFJ-137:2258 slate lance preform with flat-ground margins; N. KEFJ-137:1855 chipped perform for triangular point; O. KEFJ-84:1077 medium triangular slate endblade; P. KEFJ-137:1704 small triangular slate endblade; Q. KEFJ-84:1092 midsection of medium triangular slate endblade with medial ridge; R. KEFJ-137:1857 small stemmed slate arrow point; S. KEFJ-137:1687 small stemmed slate arrow point; T. KEFJ-137:1732 small slate arrow point tip; U. KEFJ-137:2342 small slate arrow point tip; V. KEFJ-137:2006 small slate arrow point tip; W. KEFJ-137:1949 very small triangular slate point; X. KEFJ-137:1821 very small triangular slate point; Y. KEFJ-137:1733 very small triangular slate point.

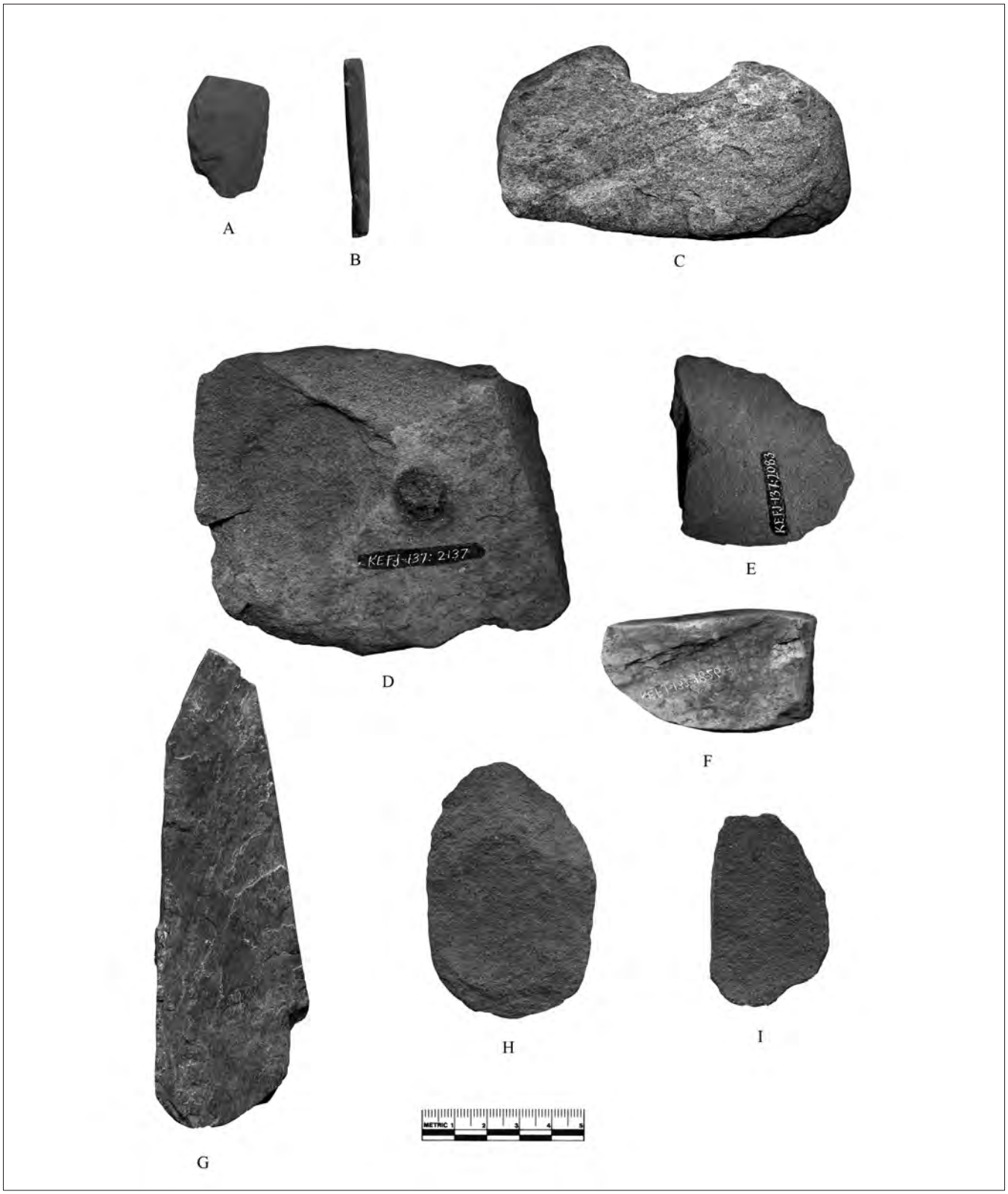


Figure 7. Stone tools, Early Contact Village site. A. KEFJ-137:2019 greenstone burin-like tool; B. KEFJ-137:2038 slate chisel bit with bifacially ground cutting edge; C. KEFJ-137:2358 notched quartzite cobble scraper; D. KEFJ-137:2083 quartzite slab scraper with iron stain; E. KEFJ-137:2137 quartzite scraper; F. KEFJ-137:1826 fine-grained tabular whetstone; G. KEFJ-137:1706 unground slate lance blade blank; H. KEFJ-137: 2037 quartzite cobble scraper or slate saw; I. KEFJ-137:2169 quartzite cobble scraper

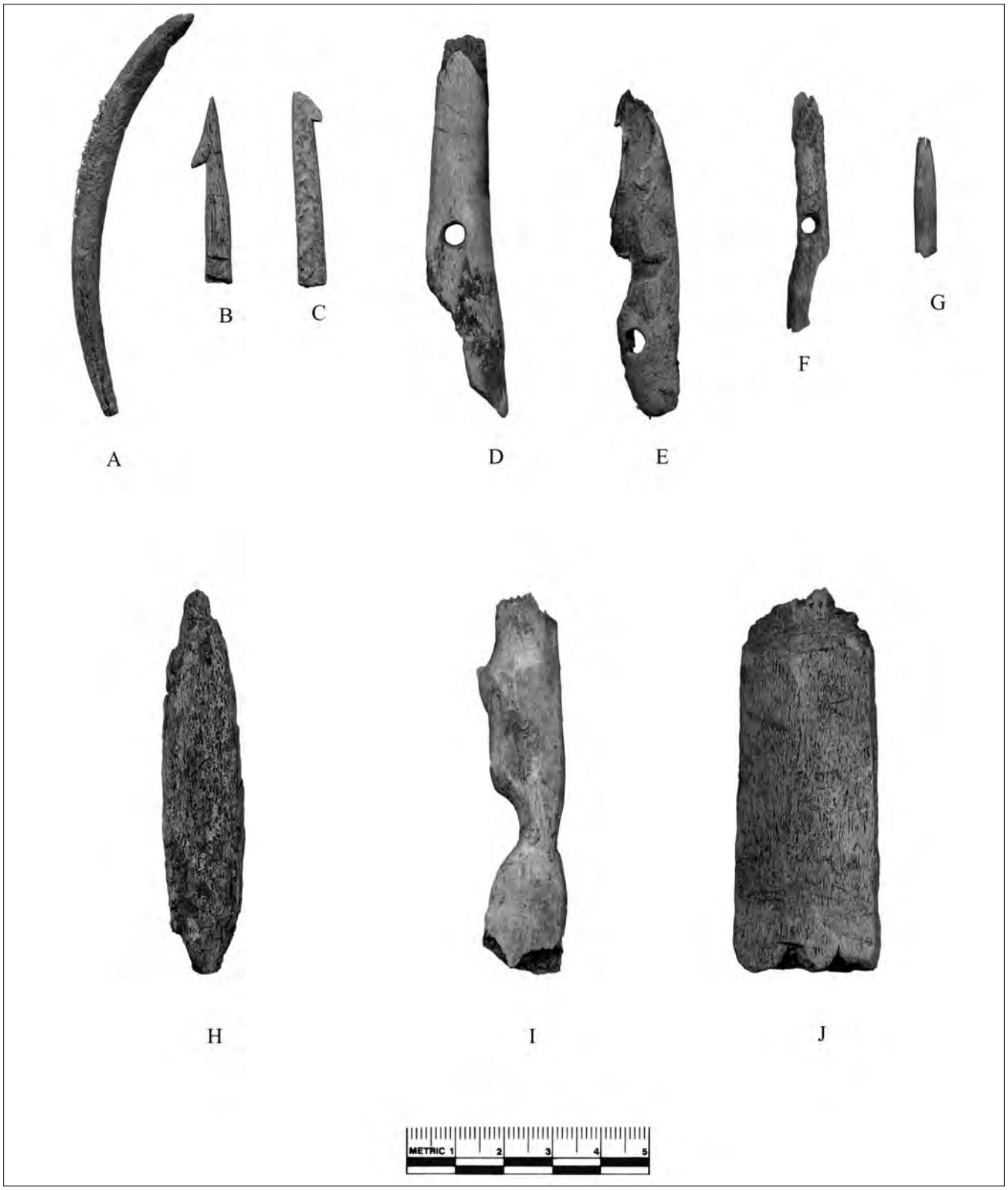


Figure 8. Bone tools, Early Contact Village site. A. KEFJ-137:2400 bone fish hook shank; B. KEFJ-137:2179 bone fish hook barb; C. KEFJ-137:2299 bone fish hook barb; D. KEFJ-137:2163 bone toggling harpoon head; E. KEFJ-137:2155 bone barbed dart or harpoon head; F. KEFJ-137:2077 bone miniature toggling harpoon head; G. KEFJ-137:2196 bone awl tip; H. KEFJ-137:2405 unidentified bone implement; I. KEFJ-137:2075 bone implement in early stage of manufacture; J. KEFJ-137:2318 whale bone implement in early stage of manufacture

1941:135–137) and they are found in many Gulf of Alaska archaeological sites of the last six millennia (De Laguna 1934:Pl. 39; De Laguna 1956:Pl. 33; Heizer 1956:Pl. 57).

Other bone tools include a sharp, round point, possibly the tip for an awl (Fig. 8G), an unidentified implement (Fig. 8H), and two roughly shaped pieces (Fig. 8I–J) representing early stages of manufacture.

GLASS

Beads (Fig. 9). A total of 254 glass beads was recovered from the midden trench and Structures 4, 10, and 13. Bead identification and analysis were undertaken by Rita Eagle.

A large proportion of the assemblage (*n*=226) consists of small (2–4 mm in diameter) to medium-sized (4–6 mm in diameter) drawn beads in various colors. Most are simple hot-tumbled drawn or "pound" beads (dark red, *n*=3; yellow, *n*=3; dark blue, *n*=10; green, *n*=14; greenish blue, *n*=111; and clear over white, *n*=60) (Fig. 9D–I). There are also two dark blue cylindrical drawn beads (Fig. 9A). Composite drawn beads include red-and-white striped over clear centers (*n*=5), and plain "cornaline d'Aleppo" brick-red beads with clear or greenish centers (*n*=18, Fig. 9B–C). The latter are typical of pre-AD 1840 archaeological sites in Alaska and the Northwest Coast, replaced after that date by white-centered cornaline d'Aleppo beads (Crowell 1997:171; Ketz 1983; Oswalt 1980; Ross 1990).

Wound beads are less common (*n*=28). Examples include medium-sized (4–6 mm) transparent green and blue wound beads (*n*=2, Fig. 9M–N), medium opaque white beads (*n*=4), and large (6–10 mm) opaque white and light blue beads (*n*=13, Fig. 9O–P), all probably Chinese. The Russian fur trade in Alaska was carried out primarily to obtain furs for exchange with the Chinese, and this trade was limited to the Mongolian border town of Kiakhta (Gibson 1976:viii). Beads were one of the few commodities obtainable at Kiakhta without paying duty (Francis 1999:85).

Other wound beads in the collection were probably brought from Venice and transported across Siberia. There

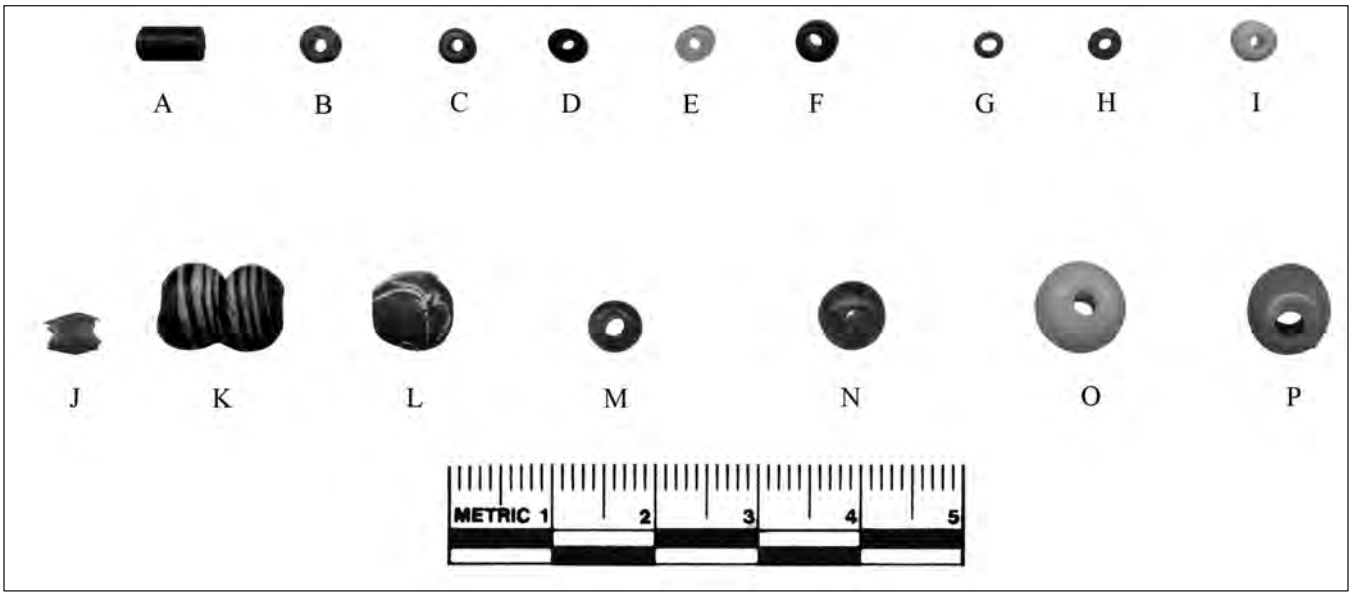


Figure 9. Glass trade beads, Early Contact Village site. A. KEFJ-137:1813 dark blue cylindrical bead; B. KEFJ-137:1809 drawn bead with red and white stripes over clear glass interior; C. KEFJ-137:1841 composite drawn bead with brick-red exterior and clear glass center ("cornaline d'Aleppo"); D. KEFJ-137:1810 small dark red drawn bead (appears black); E. KEFJ-137:1914 small yellow drawn bead; F. KEFJ-137:1808 small dark blue drawn bead; G. KEFJ-137:2263 small green drawn bead; H. KEFJ-137:1972 small green-blue drawn bead; I. KEFJ-137:2308 small clear over white drawn bead; J. KEFJ-137:2024 light red wound and press-facetted bead; K. KEFJ-137:1685 conjoined spherical black (dark green) wound bead with white stripes; L. KEFJ-137:2204 red barrel-shaped wound bead with applied combed loops; M. KEFJ-137:1874 transparent green medium-sized wound bead; N. KEFJ-137:2111 transparent blue medium-sized wound bead; O. KEFJ-137:1944 large white wound bead; P. KEFJ-137:1714 large light blue wound bead

are small (2–4 mm) light red, wound and press-faceted beads (*n*=4, Fig. 9J). The two most elaborate styles are barrel-shaped wound red beads with applied combed loops of white glass (*n*=4, Fig. 9L) and one conjoined spherical very dark green wound bead with white stripes (Fig. 9K). This bead is composed of two simple wound beads that touched and fused during the manufacturing process.

General bead types and colors (Table 2) are consistent with the early decades of Russian contact as determined by seriation analysis of bead assemblages from seventeen southern Alaska historic and protohistoric sites (Crowell 1997:171–177). As shown in Fig. 10, the assemblage is certainly prior to 1840 and most similar to several sites with pre-AD 1820 dates, including Three Saints Harbor (AD 1784 to ca. 1805) and Reese Bay (ca. AD 1765–1810).

In the Alutiiq region, beads were used for jewelry and dance regalia including necklaces, anklets, belts, earrings, nose ornaments, lip ornaments, and headdresses (Crowell at al. 2001). A cluster of thirty-two blue, white, and red-over-clear drawn beads found together in the midden may have been from a single earring.

Flat clear glass. A few small fragments of flat, clear window glass (*n*=7) were found in the midden, including a piece flaked along one edge to make a small "thumbnail" scraper (Fig. 11A).

	Estimated Date	Cornaline White Center	Cornaline Grn/Clr Center	Wound	Seed	Tubular	Faceted	Drawn Blue	Drawn White	Drawn Other	Sample Size
Kolmakovskiy (Amer. Phase)	1870–1917	▮		▏	▬	▏	▏	▬	▬	▬	1,541
Kijik	1800–1910	▮	▏		▬	N.D.	▮	▮	▬	▬	1,229
Ft. Reliance	1874–1886	▮	▮	▏	▬	N.D.	▏	▮	▬	▮	865
Kolmakovskiy (Russian)	1841–1866	▏		▏	▬	▏		▬	▬	▮	866
Tikchik	Pre-1829–1900	▏	▮	▏	▬	▏	▏	▬	▬	▮	407
Akulivikchuk	Pre-1843–1890	▏	▏	▮	▬	▮	▏	▬	▬	▮	537
Denton Site	1850s–1900	▮	▏	▏	▮	▮	▮	▮	▮	▬	874
Crow Village	1843–1900	▮	▏		▮	▮	▏	▬	▬	▮	416
Taral Creek	Late 19th Century	▮	▬	▏	▬	▬	▏	▬	▬	▬	246
Point Site	Circa 1875	▮	▬	▏		▮	▮	▬	▬	▬	166
Chirikof Island	1790–1867	▏	▬	▏	▮	N.D.	▏	▮	▬	▬	257
Knoll Site	1850s		▬	▏		▮		▮	▬	▬	147
Dakah De'Nin	1816–1840		▬					▬	▬		72
Reese Bay	1765–1810		▮	▮	N.D.	N.D.		▬	▬	▮	495
Uqciuvit	Early 19th Century?		▮	▮			▏	▬	▬	▬	1,654
Early Contact Village	1790–1810		▮	▮		▏		▬	▬	▬	254
Korovinsky	1820–1870		▮	▬		▏	▏	▬	▬	▏	625
Three Saints Harbor	1784–Ca. 1800		▮	▬	▮			▬	▬	▮	511
Pedro Bay	1750–1800			▬				▬			15

Figure 10: Seriation of trade bead assemblages from southern Alaska sites. Modified from Crowell 1997.

Table 2: Trade bead counts and stratigraphic contexts, Early Contact Village site. Totals include results from 1993 test pits and 2003 excavations.

	Midden			House Pit, Structure 4		House Pit, Structure 10		House Pit, Structure 13		Total
Bead Types	S2	S3	S4	S4	S5	S2	S3	S2	S3	
Cornaline d'Aleppo, White Center										0
Cornaline d'Aleppo, Grn/Clr/Red Center	4	7				5		2		18
Wound	9	9		1		3	5	1		28
Seed										0
Tubular						2				2
Faceted										0
Drawn Blue	32	31	7		2	16	22	1		111
Drawn White	20	13	1		1	8	11	5	1	60
Drawn Other	11	3	7			7	6	1		35
Totals (*n*=254)	76	63	15	1	3	41	44	10	1	254

Bottle glass. A single dark green fragment (Fig. 11B) is from a "case bottle" used for liquor, a type also found at Three Saints Harbor (Crowell 1997:179–181).

METAL ARTIFACTS

Coin (Fig. 11c). A brass or copper one *denga* Russian coin with "Денга 1748" on one side and double-headed eagle on the obverse had an original value of ½ kopek or 1/200 ruble. *Denga* coins were minted from 1700 to 1828 (Uzdenikov 1992).

Copper arrow point (Fig. 11d). A copper arrow point and three thin fragments of copper were found in the midden deposits. These could be Russian in origin, or native copper acquired through trade with the Ahtna (Hassen 1978:46).

Lead finger ring (Fig. 11e). The ring is identical to two examples found at Three Saints Harbor, along with copper rings (Crowell 1997:190–192).

Iron knife blade with tang (Fig. 11F). The tool is hand-forged, wrought iron, very similar to knives from Three Saints Harbor (Crowell 1997:187).

Iron nails. A square-headed short spike (Fig. 11G), a headless nail with square cross section (Fig. 11H), and the tip of a similar nail (not shown) were found. These objects closely resemble fasteners made at the Three Saints Harbor site, where Russian blacksmiths forged them from wrought iron bars and sheets (Crowell 1997:183–187). A blacksmith was also employed at Voskresenskii to forge iron nails for shipbuilding (Tikhmenev 1978:63).

Mica fragments. Several small flakes of mica (*n*=4) were found in the midden deposits. Mica sheets were used as an alternative to glass for glazing windows, and numerous pieces were found at Three Saints Harbor (Crowell 1997:195).

FAUNAL ANALYSIS

Vertebrate faunal remains from the 2003 excavations (Table 3), including bones of sea mammals (*n*=3,956), land mammals (*n*=30), birds (*n*=885), and fish (*n*=12,709), were analyzed by David Yesner (Yesner 2004) and Diane Hanson (Hanson 2007). Linda Yarborough reported on faunal remains from the 1993 test excavations (Yarborough 1998:A8–A12).

Land mammals make up only .6 percent of the non-fish fauna in the 2003 sample, and include marmots, porcupines, mountain goat, and domestic dog. The dominant subsistence focus was on maritime hunting. Identifiable sea mammal remains (NISP=2,604)[4] include Cetacea (whales) (2.1%), Otaridae (sea lions, 18.8%), Phocidae (harbor seals, 33.7%), Phoeoenidae (porpoises, 20.2%), and Pinnipedia (either seals or sea lions, 25.1%). No sea otters or fur seals were identified. It was not possible to distinguish individual species of whales and porpoises, although both harbor and Dall porpoise are probably present. Age and sex patterning within the Otaridae and

4 NISP stands for Number of Identified Specimens, i.e., raw counts of individual bones. MNI (Minimum Number of Individuals) estimates were not computed.

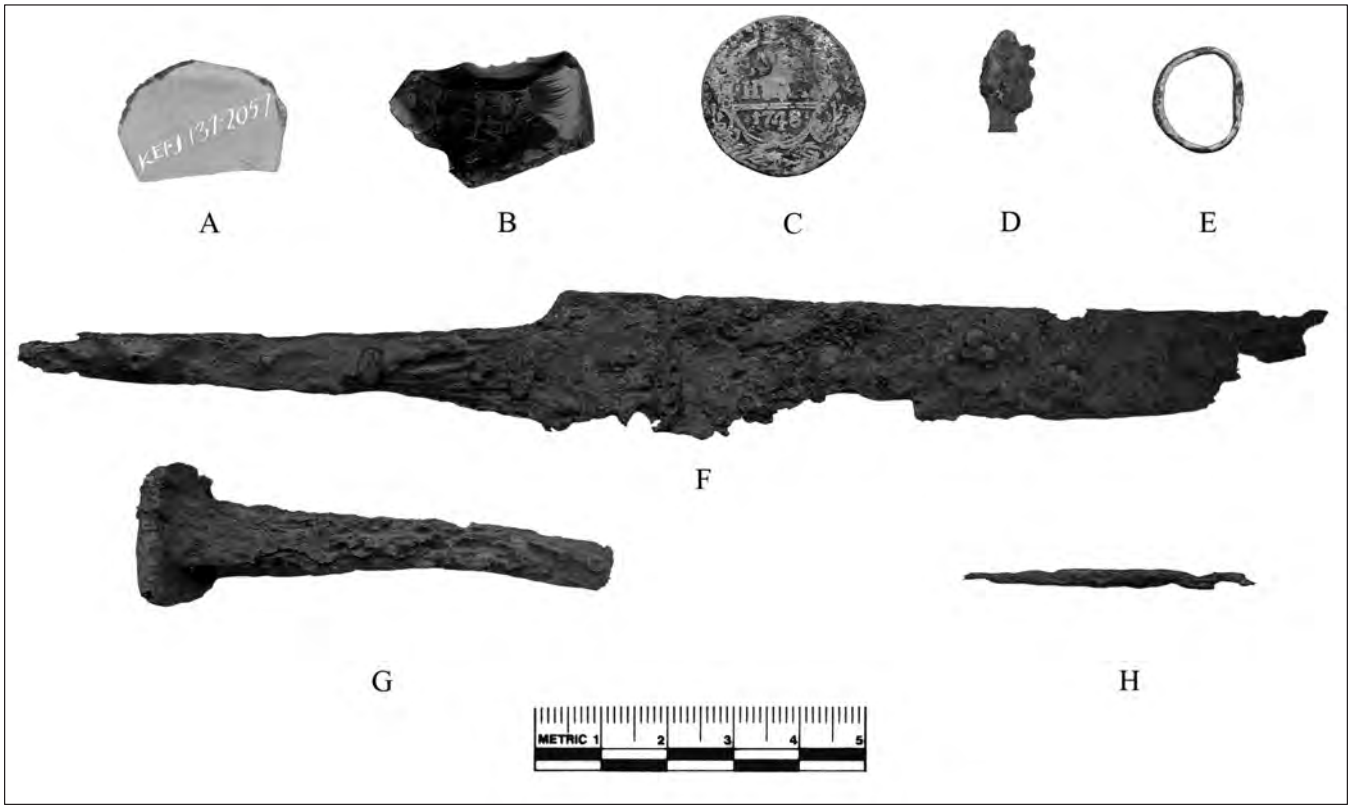


Figure 11: Russian trade items, Early Contact Village site. A. KEFJ-37:2057 thumbnail scraper made of window glass; B. KEFJ-137:1715 "case bottle" fragment; C. KEFJ-137:2097 Russian ½ kopek dated 1748; D. KEFJ-137:2259 copper arrow point; E. KEFJ-137:1888 lead finger ring; F. KEFJ-137:2054 iron knife blade with tang; G. KEFJ-137:2202 square-headed short iron spike; H. KEFJ-137:2237 headless iron nail with square cross-section

Phocidae suggest differences in hunting patterns. Sea lions show a nearly balanced sex ratio (44.6% female, 55.4% male, *n*=65) and normal age distribution (39.5% immature and juvenile, 60.5% mature, *n*=357), indicating that they were probably hunted at sea rather than at rookeries. Harbor seals show a much higher proportion of younger animals (76% immature and juvenile, 24% mature, *n*=737) as well as a bias toward females (61.5% females, 38.5% males, *n*=26), suggesting that young seals were taken at pupping grounds. Alutiiq kayak hunting at the head of Aialik Bay, where female seals give birth to their young in May on ice floes in front of Aialik Glacier, is documented for the late nineteenth and early twentieth century (Stanek 1985, 1999; Nick Tanape Sr. 2002, personal communication).

Identifiable bird remains (NISP=579) include seven main families or suborders: the Gaviidae (loons, 0.9%), Phalacrocoracidae (cormorants, 3.6%), Anatidae (waterfowl, 5.2%), Accipitridae (eagles and hawks, 0.5%), Charadriidae (shorebirds, 0.2%), Galliformes (gallinaceous birds, e.g., ptarmigan, 0.5%), and Alcidae (puffins, murres, pigeon guillemots, murrelets, auklets, 89.1%). There was a clear focus on seabirds (alcids), with puffins the most common of these (66% of alcids). There is a possibility that the high number of puffin and murre bones is the result of Russian-directed harvesting of these birds at breeding colonies in the Chiswell Islands or Resurrection Bay for parka making, as mentioned above (Davydov 1977:194). Both the upper mandibles (including upper beaks) and lower limbs of puffins are virtually absent from the site, suggesting a particular butchering and usage pattern. Puffin beaks were often used for making rattles and to decorate clothing (Crowell et al. 2001).

Relatively few fish taxa are present at the Early Contact Village site. These are cods (Gadidae); rockfish (Scorpaenidae); sculpins (Cottidae); flatfishes, in particular the halibut (Pleuronectidae); lings (Hexagrammidae); salmonids (Salmonidae); and a single representative of the sardines or herring (Clupeidae).

Of the 2,620 fish elements that were identified, cod are clearly the dominant taxon (NISP=1,815, 69.3%), followed distantly by the rockfish (NISP=603, 23%). All

Table 3: Faunal counts (NISP) from 2003 midden excavations at the Early Contact Village site.

Vertebrate Faunal Remains	NISP	
Land Mammal Assemblage		**% Land Mammal**
Bovidae (sheep or goat)	2	7.0%
Canidae (dog)	4	13.0%
Cervidae (antler)	1	3.0%
Mustelidae (weasel family)	2	7.0%
Rodentia (marmots and porcupines)	21	70.0%
	30	
Sea Mammal Assemblage		**% Sea Mammal**
Cetacea (whales)	55	2.1%
Otariidae (sea lions)	490	18.8%
Phocidae (harbor seals)	878	33.7%
Phocoenidae (porpoises)	527	20.2%
Pinnipedia (seals or sea lions)	654	25.1%
Identifiable sea mammal fragments	2,604	99.9%
Unidentifiable sea mammal fragments	1,352	
	3,956	
Bird Assemblage		**% Bird**
Accipitridae (eagles and hawks)	3	0.5%
Alcidae (auks and auklets)	516	89.1%
Anatidae (waterfowl)	30	5.2%
Charadriidae (shorebirds)	1	0.2%
Galliformes (ptarmigan)	3	0.5%
Gaviidae (loons)	5	0.9%
Phalacrocoracidae (cormorants)	21	3.6%
Identifiable bird bone fragments	579	100.0%
Unidentifiable bird bone fragments	306	
	885	
Fish Assemblage		**% Fish**
Clupeidae (herring/sardines)	1	0.0%
Cottidae (sculpins)	42	1.6%
Gadidae (cod)	1,815	69.3%
Hexagrammidae (greenlings)	31	1.2%
Pleuronectidae (halibut)	108	4.1%
Salmonidae (salmon)	20	0.8%
Scorpaenidae (rockfish)	603	23.0%
Identifiable fish bone fragments	2,620	100.0%
Unidentifiable fish bone fragments	10,089	
	12,709	

other species are incidental in comparison. In order of abundance they are flatfishes (NISP=108, 4.1%), greenlings (NISP=31, 1.2%), sculpins (NISP=42, 1.6%), salmon (NISP=20, 0.8%), and herring/sardines (NISP=1; 0.04%).

Only the 1993 test pit shellfish samples have been analyzed (Yarborough 1998:A10). Test Units A and C produced one shell fragment each (both Pacific blue mussel), while Test Unit B in the midden yielded 817 fragments. These were Pacific blue mussel (*Mytilus trossulus*, NISP=637, 78%), chitons (*Amphinura sp*., NISP=147, 18%), cockles (*Cardiidae sp*., NISP=14, 1.7%), Pacific littleneck clam (*Protothaca staminea,* NISP=1, .1%), and unidentified bivalves (NISP=18, 2.2%).

SITE FORMATION PROCESSES AND SPATIAL DISTRIBUTIONS OF ARTIFACTS AND BONE

The spatial distributions of bone and stone artifacts (Fig. 12a), glass beads (Fig. 12b), and the bones of sea mammals and sea birds (Fig. 12c) suggest human behaviors that shaped the archaeological context. Although bird and mammal bones were scattered across the midden, they were concentrated at its center. Fish were even more concentrated in this area; over 99 percent of the bones in the analyzed sample (*n*=11,991) came from one central lens (c.f. Figs. 3 and 4), and most of the shell was in a discrete layer overlying the fish. While bone tools (fish hooks and harpoon heads) had a centralized midden distribution, the much larger numbers of stone tools and glass beads were widely and relatively evenly distributed across the midden and inside Structure 10.

One interpretation of these contrasting patterns would be that beads, stone artifacts, and debitage were lost or discarded inside the houses, then tossed randomly onto the midden along with charcoal, fire-cracked rock, and other debris when the houses were cleaned. Some faunal remains (from food consumed inside the houses) were dispersed in the same way. To account for the concentration of faunal remains at the mound center, we posit that during the warm months this area was used for outdoor butchering and processing of sea mammals, birds, fish, and shellfish, generating large quantities of discarded bone in primary depositional context. It is likely, for example, that the fish lens represents a single event, when a large number of cod and rockfish were caught and cleaned at the same time.[5] Butchering on top of the

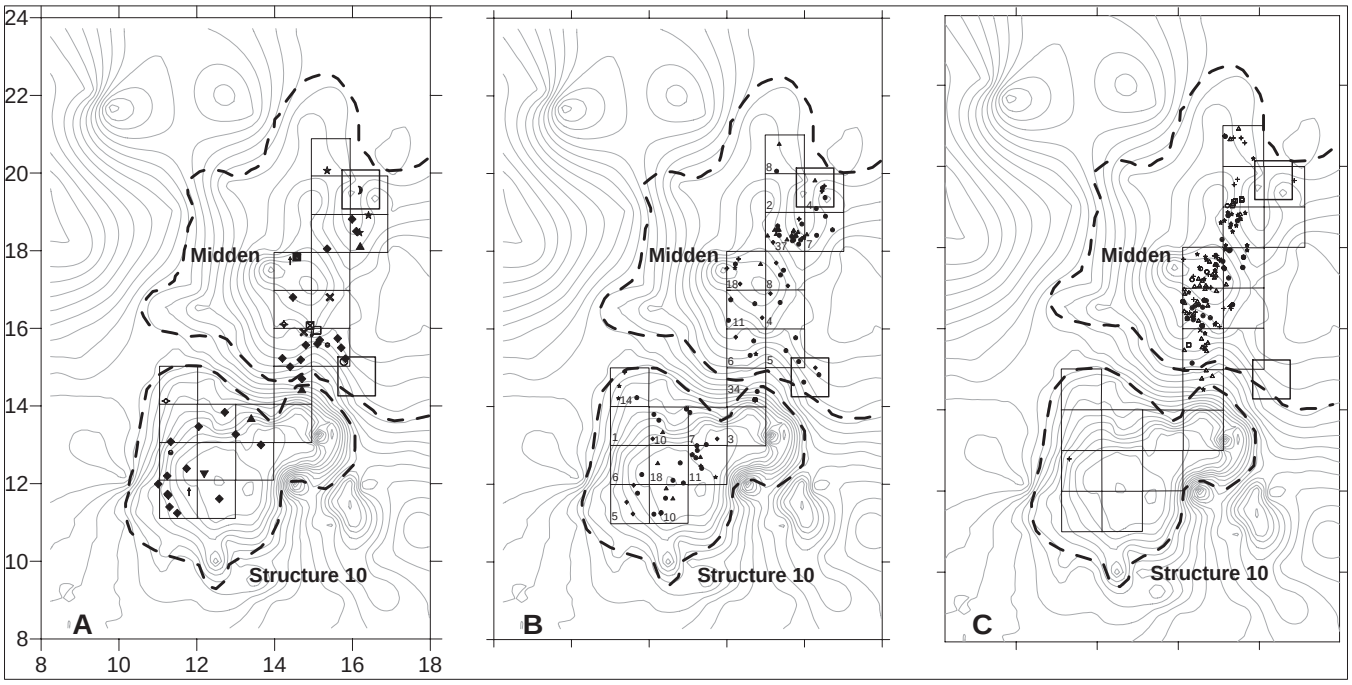


Figure 12: Horizontal distributions of (A) bone and stone artifacts; (B) beads; and (C) bird and mammal bone from 2003 excavations at the Early Contact Village

5 The scanty remains of other species (flatfishes, sculpins) in the fish bone pile are from small specimens that may have been stomach contents of the larger fish (Hanson 2007).

midden may also have generated primary deposition of broken slate endblades and bone harpoon heads as these were removed from the animal carcasses.

The stratigraphic composition of the midden and the vertical distributions of bone and artifacts within it are also informative. During excavation, it appeared that the midden strata might represent successive seasons. Stratum 3 suggested a spring-summer layer because of its diverse and abundant mammal, bird, fish, and invertebrate remains, reflecting the intensive food-harvesting activities of the warmer months. Stratum 2 and Stratum 4 suggested fall or winter layers because of their high fire-cracked rock content (associated with winter steam bathing) and lower faunal content, consistent with the more restricted hunting and fishing activities of the colder part of the year.

The vertical distributions of sea bird and sea mammals are shown in Fig. 13. Bone counts for both categories increase steadily from the bottom of the midden (Stratum 4) to a peak in the middle (Stratum 3, Level 2) and then decline through Stratum 2. Hypothetically, this curve (from bottom to top) indicates the changing intensity of overall harvesting efforts during the course of about 15 to 18 months. If the three midden layers do represent seasonal progression, then the sea mammal taxa—predominantly harbor seals, sea lions, and porpoises—had more extended hunting seasons than the April–July period reported for Kodiak Island (Fig. 14). However, fall and winter hunting for seals and sea lions is historically documented for Prince William Sound (Birket-Smith 1953). Bird bones (mostly alcids) are more numerous than mammal bones in Stratum 2, Level 3, and puffins are at their highest number (n=114) in this probable late-summer or early-fall level. As noted above, the taking of seabirds at nearby colonies for making parkas occurred at this time, when the kayak fleets were returning home after sea otter hunting (Davydov 1977:194). The base of the cod-dominated fish lens is at Stratum 3, Level 3, suggesting that the catch occurred in spring or early summer when these fish move into warmer water near the shore. These data are provisionally supportive of the seasonal progression hypothesis, but further study is needed including sectioning of bivalve shells and sea mammal teeth to determine exact ages and season of death.

Artifacts (Fig. 15) follow vertical trends that are roughly similar to that of the faunal remains, with a notable exception—large numbers of stone tools, slate flakes, and beads occurred at the very top of the cultural deposit (Stratum 2, Level 1), just under the post-occupation turf. This suggests a final cleaning of the house interiors, per-

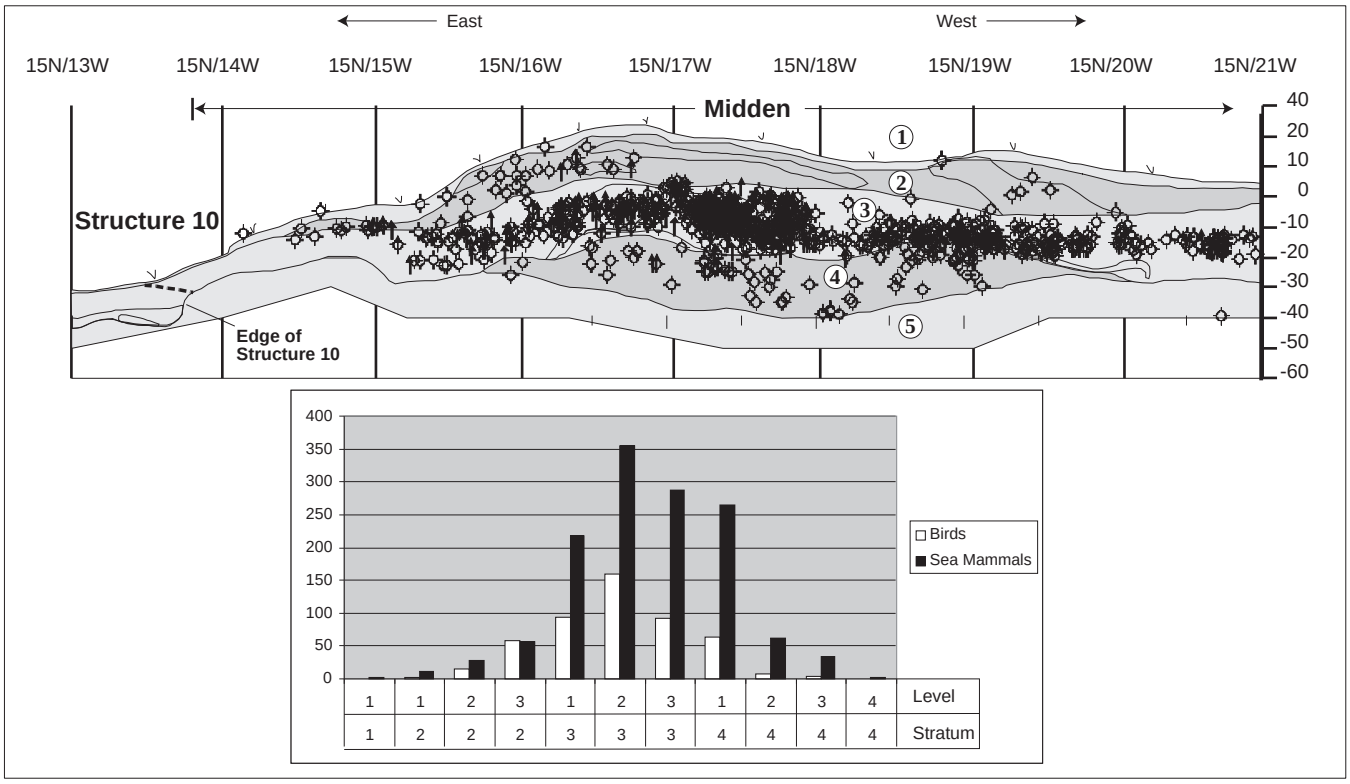
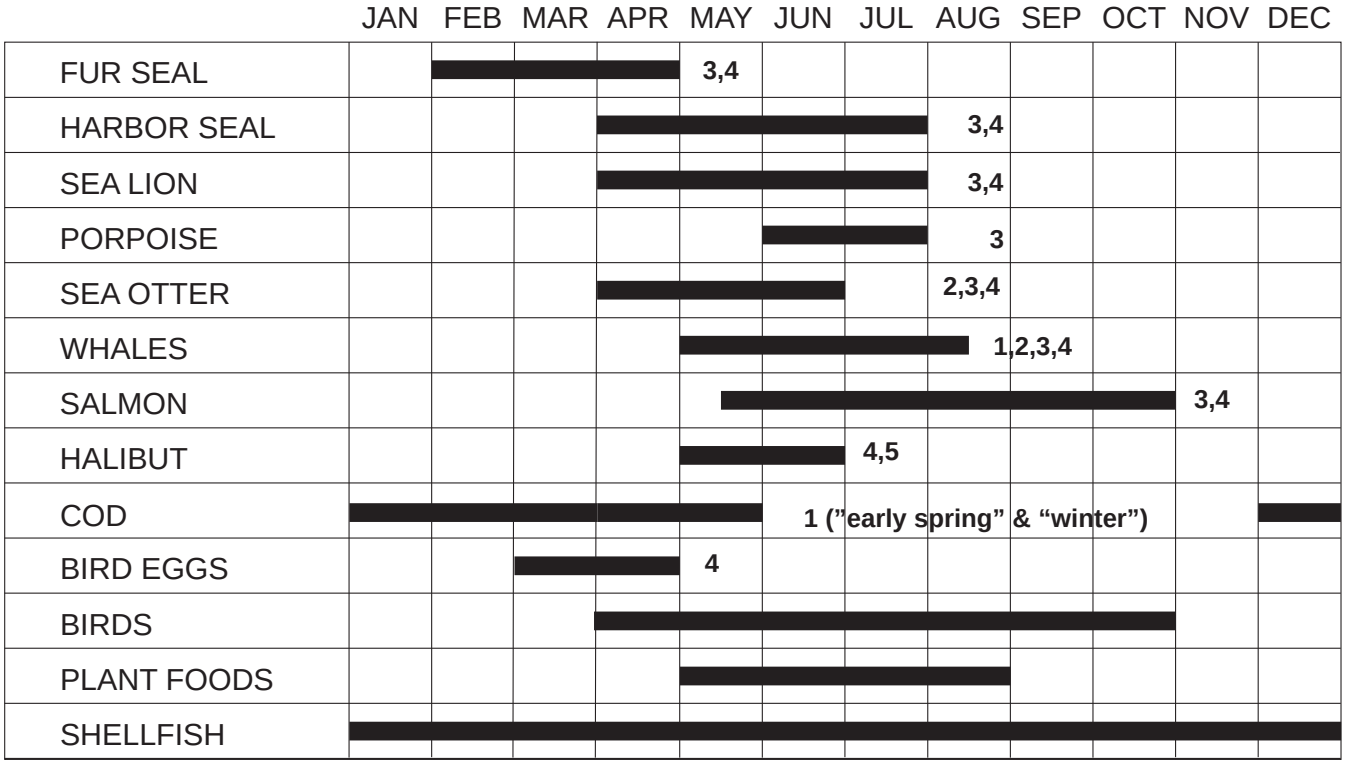


Figure 13: Vertical distribution of bird and mammal bone in the Early Contact Village midden



1. Davydov (1977:175, 224, 232)
2. Holmberg (1985:48, 50)
3. Merck (1980:106-106)
4. Sauer (1802:178)
5. Billings (in Merck 1980:206)

Figure 14: Reconstructed Alutiiq seasonal round, Kodiak ca. AD 1800.

haps at the end of the second winter at the site. Beads and artifacts show a secondary peak at Stratum 3, Level 1, perhaps the result of similar activity at the point of moving into winter quarters.

DISCUSSION

Our analysis of midden and house stratigraphy and of the seasonality of faunal remains at the Early Contact Village suggests a brief occupation spanning two winters with an intervening spring/summer/fall. This time estimate implies a rapid buildup of the midden, which is volumetrically composed largely of fire-cracked rock and faunal remains. In turn this implies a relatively large resident population. If all seven of the small semisubterranean houses were simultaneously occupied, a group of 40 or more people might have been present during that season. The summer population is more difficult to estimate. Although two sod-walled features (Structures 6 and 13) may be summer dwellings, plank-walled summer houses used in Prince William Sound and possibly on the outer Kenai coast would not necessarily have left noticeable surface imprints and so may remain undiscovered at the Early Contact Village site (cf. Crowell and Mann 1998:129–131).

The brief duration of this settlement is anomalous in comparison with the centuries-long usage of late prehistoric village sites on the outer Kenai coast including Bear Cove (~ AD 950–1800), the Northwest Lagoon site (~ AD 1225–1750), and McArthur Pass (~ AD 250–1400) (Crowell and Mann 1998). On the other hand, the site's multiseason occupation is too long a period to be consistent with an on-shore encampment by one of the transiting sea otter fleets. The Early Contact Village thus has the appearance of an opportunistic response to the new Russian presence, representing a brief settlement shift by families from another part of the Kenai coast or perhaps from Prince William Sound. They may have been seeking remunerative opportunities to trade, hunt sea otters and birds for the Russians, or cut timber for the shipyard at Voskresenskii.

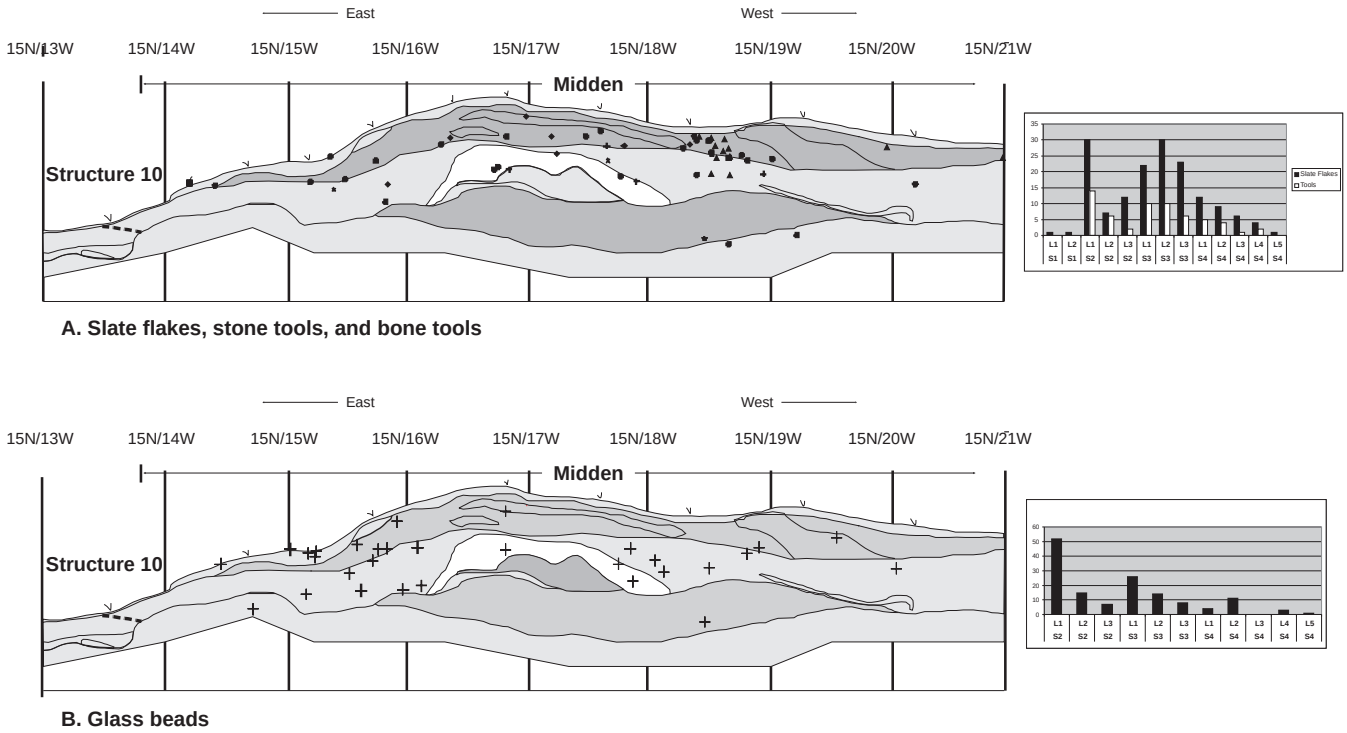


Figure 15: Vertical distribution of (A) stone tools, bone tools, and slate flakes; and (B) beads in the Early Contact Village midden.

Artifacts from the site are largely indigenous, including traditional forms of hunting weapons, fish hooks, and household tools. Slate debitage, slate preforms, and tools for shaping bone and wood (burins, notched cobble scrapers) indicate on-site manufacture of weapons and household articles. Skin preparation (with cobble scrapers) and sewing (awl tip) are also indicated.

Of the imported trade items, glass beads are most common (*n*=254), comprising 20 percent of the total artifact inventory from the site (*n*=1,243, including slate flakes). This number is substantial, especially in light of Baranov's complaint that bead supplies for trade were very limited at Voskresenskii. However, it is not exceptional; the area density of beads in our excavations (10.2 beads per m^2 or 254 beads in 25 1 x 1 m units) is lower than the corrected bead density in and around Longhouse 2 at the early contact Reese Bay site on Unalaska Island (14.1 beads per m^2) (Veltre and McCartney 2001). At the Early Contact Village, beads were found on the house floor as well as in the midden, and may have entered the archaeological record by loss or discard during the manufacture or wearing of jewelry. Jewelry and headdresses were strongly associated with Alutiiq midwinter dances and hunting ceremonies (Crowell 1992; Crowell et al. 2001).

Bead varieties and the proportional representation of types (e.g., a relatively high percentage of wound beads) are consistent with other southern Alaskan assemblages of the late eighteenth or early nineteenth centuries and especially similar to bead inventories excavated from Russian buildings at Three Saints Harbor. Other glass and metal items from the Early Contact Village are similar or identical to artifacts from Three Saints, placing the site securely in the Russian expansionary phase that followed Shelikhov's arrival on Kodiak Island. It is notable that no imported porcelain or earthenware shards were found. Ceramic cups and bowls were fragile and difficult to ship from the Russian Far East, and remained scarce in Alaska indigenous sites until the 1840s (Jackson 1991). Finally, no evidence of firearms or imported clothing (e.g., buttons) was recovered in our excavations.

Several imported artifacts found at the Early Contact Village are of special note. The forged iron knife must have been a rare and especially valuable item, since knives were initially prohibited in Native trade and iron was a scarce commodity even for the Russians themselves. For example, construction of the vessel *Phoenix* at the Voskresenskii shipyard in AD 1793–1795 was hampered by a shortage of iron for nails, tools, and fittings (Cook and Norris 1998:50–51;

Tikhmenev 1978:63). The half-kopeck coin is also unusual. Although Russian coins in half- and quarter-kopeck denominations have been found at Sitka, the Russian American capital after 1804 (McMahan 2002), coins were in very short supply and rarely used to pay Native hunters[6] (Pierce 1990). Both objects imply a higher rate of exchange for furs or labor than obtained in most colonial locations, and add support to the hypothesis that the outer Kenai coast was an independent, free trade region.

The large quantity of sea mammal remains and evidence for active hunting through an entire subsistence cycle suggest both an abundance of food and the ready availability of male labor. There is no hint of the food shortages and outright starvation induced on Kodiak Island by the forced summer-long absence of most able-bodied men for service in the sea otter fleets, reinforcing the impression that Russian control of labor on the outer Kenai coast was limited.

CONCLUSION

Overall, artifacts and faunal remains at the Early Contact Village in Aialik Bay are indicative of the *free trade* mode of Russian colonialism that prevailed in the "semi-dependent" and "independent" regions of the mainland coast and the Alaskan interior, among such groups as the Chugach, Dena'ina, Tlingit, Yup'ik, and Ahtna, rather than of the *forced labor* mode that was enforced in the Aleutian Islands and Kodiak archipelago. At the same time, the site reflects the constricted colonial logistics of the late eighteenth century, when Russian capabilities to supply trade goods to its colonial periphery were far weaker than those of its North American competitors, the British and French (Wallerstein 1989; Wolf 1982).

Continuing research is focusing on comparisons between the Early Contact Village and the adjacent Denton site, an Alutiiq hunting and trapping camp that was used from the 1850s through the early twentieth century (Crowell 2004, 2007; Crowell and Mann 1998; Schaaf 1989). The Denton site illustrates the great economic changes that took place in the Alutiiq region during the second half of the nineteenth century, when it became linked much more directly to the material relations of the industrialized world system. After the cessation of Russian rule in AD 1867, the Alaska Commercial Company (ACC) established its own trading posts on the Kenai coast and Prince William Sound, introducing a wage labor and credit system (Cook and Norris 1998:65–70). Until the collapse of fur prices in AD 1897, the ACC paid well for sea otter pelts and sold factory-made clothing and shoes, beads in many varieties, imported foods (flour, teas, condiments), "china" cups and serving dishes, iron tools, traps, and firearms to Alutiiq residents. All of these consumer goods—scarce or nonexistent during the early Russian period—are abundantly represented at the Denton site while only a few traditional tools and weapons (e.g., harpoon and arrow parts and sea mammal spears with metal heads) have been found there. Salmon canneries, established in Cook Inlet between AD 1882 and 1920, provided another source of cash income and drew Alutiiq populations away from the outer coast, promoting a pattern of seasonal use rather than permanent settlement there.

This comparison underlines the significance of the Early Contact Village, which richly represents a historical moment close in time to first Russian contact when the cultural, economic, and political transformations of the colonial period were just beginning to unfold.

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6 It is interesting to note that the coin's 1748 date coincides with the first decade of Russian merchant activity in the Aleutians following the Bering-Chirikov expedition of 1741. It was probably in circulation for 50 years or more before being left at the Early Contact Village. Several of the half-kopeck coins found at Castle Hill in Sitka were also minted in 1748 (David McMahan, personal communication, 2008.)

Early Contact Village site in 2003, and with this paper we express our tremendous regard for Bill's contributions to the archaeology of the Alutiiq region. Other colleagues, students, and volunteers who worked in the field and laboratory include Forest J. Kvasnikoff, Tim Johnson, Nicole Tozzi, Maribeth Murray, Richard Galloway, Zach Strong, Binh Tam Ha, Derek T. Shaw, Dan Anahonak, Connie Hedrick, Katrina Dupree, Cora Denae Moonin, and Stacy Leona Hetrick. Robin Mills and Linda Yarborough provided excellent and helpful reviews of an earlier draft of this paper.

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TOOTH-TOOL USE AND YARN PRODUCTION IN NORSE GREENLAND

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ABSTRACT

During a dental study of medieval Norse skeletons from Greenland, Iceland, and Norway, a distinct pattern of wear was observed on twenty-two anterior teeth of twelve Greenlanders. Further examination revealed that cultural notches were limited almost exclusively to settlement-period Greenlandic females interred at Thjodhild's church (AD 1000–1150). The most likely explanation for this patterned wear revolves around the manner in which females manipulated woolen thread on their maxillary incisors and canines during the production of a coarse woolen cloth (frieze) that was generated in large amounts during the early medieval period for local consumption and export to Europe.

KEYWORDS: teeth, abrasion, wool

INTRODUCTION

Anthropologists have long studied normal crown wear to evaluate the diet and dietary behavior of earlier human populations (Hinton 1981, 1982; Kieser et al. 2001; Molnar 1971, 1972; Molnar et al. 1983; Walker 1978; Walker and Erlandson 1986). Several methods have been developed to score such wear (Brothwell 1963; Dreier 1994; Murphy 1959; Scott 1979; Smith 1984) with the primary emphasis on pattern of dentine exposure. When crown wear is a long-term product of normal food mastication, the occluding surfaces of the upper and lower anterior teeth and premolars are often worn flat, with cupping on the cusp tips where the wear breaks through the hard enamel into the softer dentine. The molars sometimes show a buccal to lingual gradient of wear in the upper molars and a lingual to buccal wear gradient in the lower molars due to a side-to-side rotary chewing motion (Smith 1986). However, whether normal wear is flat or angled, it is normally evident that it is primarily a result of normal mastication, with varying contributions of attrition (tooth-on-tooth contact) and abrasion (foreign particles in food) (Hillson 1996; Scott and Turner 1988).

As the most directly visible aspect of the skeletal system, teeth are also subject to the vagaries of human cultural behavior (cf. Milner and Larsen 1991). For that reason, they are useful in bioarchaeological research for making inferences on the behavior of past human populations. Behaviorally induced alterations fall under four general categories: (1) intentional mutilation; (2) unintentional modification from objects in mouth; (3) oral hygiene; and (4) occupational behavior.

The most common form of dental alteration falls under the category of intentional modification. In Africa, this custom goes back at least fifteen hundred years to the early Iron Age (Van Reenan 1977). Mutilation is often accomplished through chipping or filing (Pindborg 1969; Singer 1953; Van Reenan 1986; Van Reenan and Briedenhann 1986), with tooth removal (ablation) another frequent practice (Singer 1953). Motivations vary, but in some cases modifications take on very specific forms that provide a visual signal of tribal identity (Van Reenan 1986). When Africans were forcibly removed from their homes and taken to the New World, dental modification was not

abandoned altogether as African-type tooth mutilations have been found in the Caribbean and North America (Corruccini et al. 1982; Handler et al. 1982; Ortner 1966; Stewart 1942; Stewart and Groome 1968).

Another center of dental modification was Mesoamerica, where anterior teeth were not only chipped and filed but also incised, banded, and inlaid with precious metals or gems (De La Borbolla 1940; Romero 1970). In South America, dental deformation was not as common in prehistoric times and more often took the form of filing and inlays (Saville 1913; Stewart 1963). In historic times, chipped and filed teeth became more common in South America after this practice was introduced by African slaves (Stewart 1963). North of Mexico, there are sporadic cases of dental modification in the American Southwest and along the Mississippi, where the practice was presumably introduced directly or indirectly from Mesoamerica (Autry 1991; Holder and Stewart 1958; Stewart and Titterington 1944; Turner and Turner 1999; Willey and Ubelaker 1976).

Dental modifications involving insets, blackening, filing, ablation, and cross-hatching are also common practices in Southeast Asia and the Pacific (Ikehara-Quebral and Douglas 1997; A. Jones 2001; Scott and Turner 1997). These practices were far less common in Europe, although Arcini (2005) has reported carefully filed labial surfaces of the maxillary incisors and canines in twenty-four Viking Age males from Sweden and Denmark.

In addition to intentional cultural modifications, other practices produce patterned crown wear distinct from that generated by normal mastication. Unintended alterations can result from habitually holding and/or manipulating nonfood objects in the mouth, such as pipes, bobby pins, nails, and the like (Blakely and Beck 1984; Hillson 1996; Lous 1970; Lukacs and Pastor 1988; Morris 1988; Schour and Sarnat 1942; Ubelaker 1996). Labrets worn in the cheeks or lips also produce unintended wear facets on the buccal or labial surfaces of the teeth that could not possibly be produced through tooth-on-tooth wear (Cybulski 1974; Scott and Turner 1997; Torres-Rouff 2003).

Interproximal tooth grooves may reflect early attempts at dental hygiene where food debris between the teeth would be removed by objects similar to toothpicks (Berryman et al. 1979; Formicola 1988; Frayer 1991; Ubelaker et al. 1969). Such grooves were relatively frequent in fossil hominids from Atapuerca and Krapina where the focus was on the cheek teeth (Bermudez de Castro et al. 1997; Frayer and Russell 1987). Not all favor a "toothpick" interpretation of interproximal grooves. Brown and Molnar (1990) found that grooved teeth were very common (41 percent) in nineteenth-century Australian aboriginal skulls. With but few exceptions, the grooved teeth were premolars and molars. Overall, males were more than twice as likely to express grooved teeth, with most grooves on the mesial rather than distal surface (93 of 98). These authors prefer task activity to the use of a palliative probe to explain this pattern.

Of the different types of tooth modification, occupational behavior has received the least attention. Schulz (1977) found occlusal and approximal grooves in a small sample of prehistoric California Indians. The foci for both types of grooving were the anterior teeth of the lower jaw, where task activity, involving fibrous materials (for baskets, nets, mats, etc.) was considered the likely cause. In a much larger sample (n = 171) from the Great Basin, Larsen (1985) found 16 of 1,931 teeth exhibited transverse grooves on the occlusal surfaces of the teeth of five older adult males. Given the emphasis on tools made from plant materials in the Great Basin, task activity aimed at producing nets, baskets, and footwear was considered the likely explanation for these occlusal grooves.

Cruwys et al. (1992) distinguish three types of notched teeth. Occupational notches are produced when hard objects are held by the teeth during an activity that requires the use of both hands (see Turner and Anderson [2003] for dramatic example of this type of wear, likely caused by habitually holding square iron nails between the anterior teeth). Habitual notches refer to nonoccupational behaviors such as pipe smoking. Finally, cultural notches are those that relate to specific task activities, such as stripping sinew or producing and manipulating fiber cordage. The authors note that occupational and cultural notches overlap in the sense that both are tied to task activities. The difference is in geographic distribution, with cultural notches more common and widely distributed.

In a study of 1,029 British skulls from the Neolithic to late medieval periods, Cruwys et al. (1992) found cultural notches on the teeth of eight individuals, all of which dated to the Anglo-Saxon period (AD 410–1066). Notches were limited to the anterior teeth and each jaw was equally affected (thirteen notched teeth in both the maxilla and mandible). All eight individuals with notches were males. Although reluctant to speculate, the authors note "the notches may well have been caused by some habitual activity involving the teeth and an abrasive material, not metal

or stone, but wood or fibres, producing these small oval notches" (Cruwys et al. 1992:219).

Bonfiglioli et al. (2004) operationally define three grades of cultural notches that run from slight indentations on the enamel to deep and wide depressions with heavily worn dentine. In a twentieth-century skeletal collection from Italy, Bonfiglioli (in Bonfiglioli et al. 2004) found a number of notched teeth. For certain occupations, such as carpenters and shoemakers, these notches were observed primarily in males (six out of seven). Tailors showed the opposite pattern where three of four individuals were female.

Originally, research on Greenlandic, Icelandic, and Norwegian populations focused on diet-related tooth crown wear, chipping, linear enamel hypoplasia, and dental pathologies, along with tooth size and morphology (Scott et al. 1992). Cultural notches, which had not been anticipated, were common enough to warrant a follow-up survey.

MATERIALS AND METHODS

Focus is on a type of unintended tooth wear manifested on the occlusal surfaces of the anterior teeth of medieval Norse Greenlanders. This wear pattern varied between a U-shaped and V-shaped notch and occurred primarily on the upper incisors and canines (see Fig. 1). During the initial set of observations on the Greenlanders, only marginal notations were made on cultural wear. During the reexamination, the presence or absence of cultural wear was recorded for all maxillary and mandibular anterior teeth. Exceptions were made for children (<10 years) and older individuals who exhibited advanced attrition. In the latter case, cultural notches might have been eliminated by subsequent wear. Although the advantage of scoring these notches on a ranked scale is now evident, they were only recorded as present or absent. Slight notching might have been overlooked so the values reported should be considered conservative.

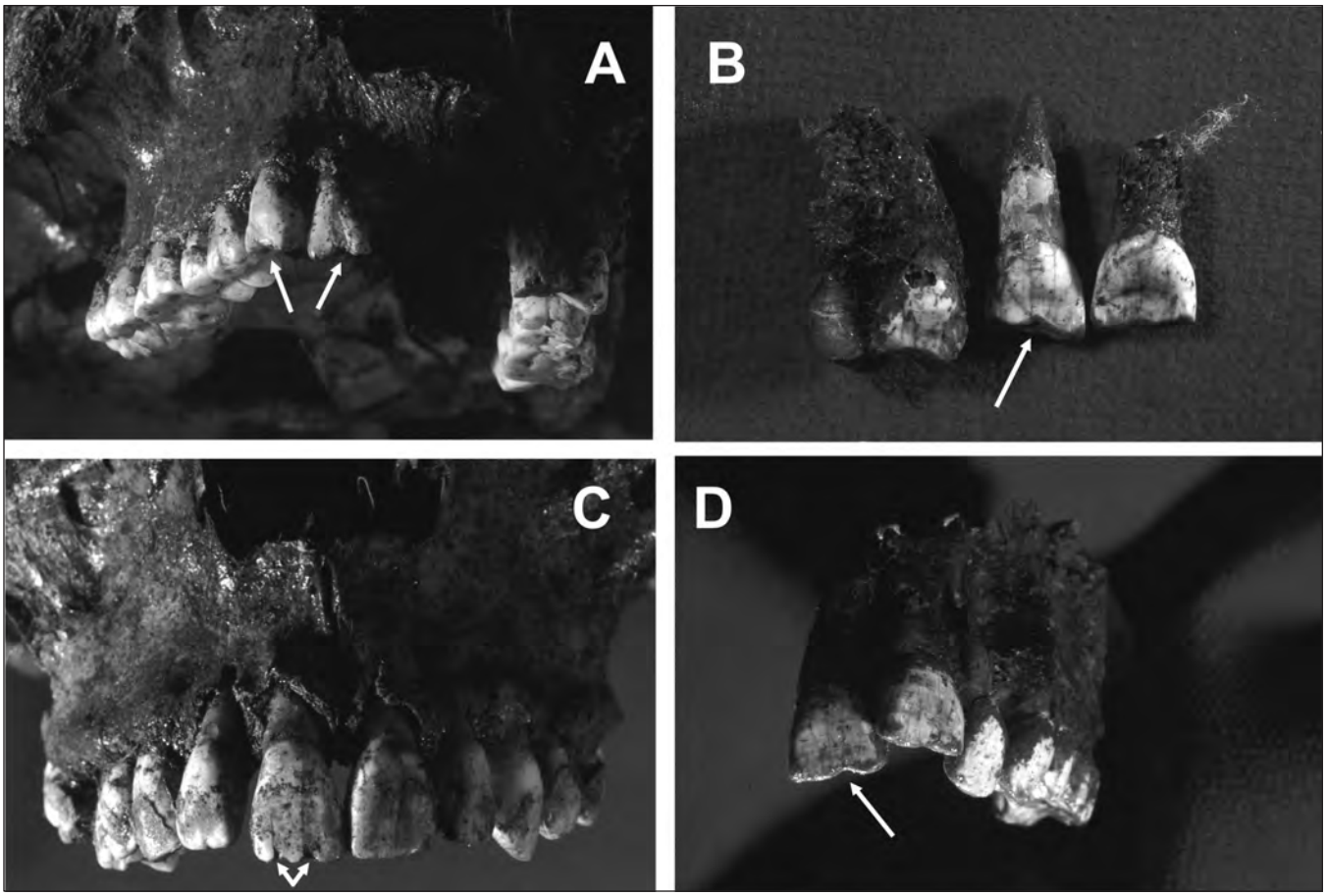

Figure 1. Four examples of notched teeth in settlement-period Greenlanders from Thjodhild's Church: (A) T.C. 66, female, 20–30; (B) T.C. 46, female, 20–30; (C) T.C. 63, female, 20–25; (D) T.C. 2, female, 20–25.

All Greenlandic Norse skeletons excavated are housed at the Panum Institute, University of Copenhagen. Remains come from two regions referred to as the Eastern and Western Settlements (Krogh 1967). There is variation across sites in terms of age and preservation. The oldest site, Thjodhild's Church, dates to the settlement period in Greenland, spanning the time from about AD 1000 to 1150 (Arneborg et al. 1999). Skeletal preservation was fair to good at this site. The latest site was Herjolfnes, where the cemetery dates from the fourteenth and fifteenth centuries. Although bone preservation was poor due to acidic soils, woolen textiles were well preserved. Between these early and late sites, there is a small sample from the bishop's compound at Gardar and another from the cemetery at the Benedictine convent. The direct dating of skeletal remains puts these samples in the range of AD 1200–1400 (Arneborg et al. 1999). The Western Settlement sites of Sandnes and Anavik, where preservation was generally good, also date to this time range (see Scott et al. 1992 for more details on samples). We employ the same temporal designators that were used in earlier studies: Eastern Early (Thjodhild's Church), Eastern Middle-Late (Gardar, Benedictine convent, Herjolfnes), and Western (Sandnes, Anavik) (Halffman et al. 1992; Scott et al. 1992).

RESULTS

Most studies of cultural wear focus on individual cases rather than entire samples, but the pattern observed in the Greenlanders was relatively common. Table 1 shows the individuals who exhibited one or more cultural notches on their anterior teeth. The initial impression of cultural wear was that it affected the upper anterior teeth of females. Upon closer examination, we had to expand this characterization but only to a minor extent. Two males from Thjodhild's Church exhibit cultural wear on the left upper canine and right lower central incisor, respectively. Two individuals of unknown sex also exhibited notches. Eight of the twelve individuals who exhibited notches were females. With but two exceptions, they fall in the age range of twenty to thirty years (young adult category). Two females and both males from Thjodhild's Church were over the age of thirty while an individual of unknown sex was twelve to sixteen years old.

Table 2 provides a more detailed summary of cultural notches by sample, sex, and jaw. In many instances, skeletons were represented by both upper and lower jaws. In some cases, however, an individual might have only one jaw. That explains why there is not a one-to-one relationship between individual samples for the upper and lower jaws. The Eastern Early sample was represented by the greatest number of jaws (50 maxillae and 48 mandibles) and teeth (156 maxillary and 173 mandibular). This sample also exhibited the highest frequencies of cultural notches by individual (18.0/6.3) and tooth (9.6/1.7). While the maxillary teeth in this sample show much more notching than the mandibular teeth, this pattern does not hold in the Eastern Middle-Late sample where the frequencies by individual (6.3/7.7) and tooth (2.4/3.4) are about the same in the two jaws. Overall, the Eastern Early sample has a distinctly higher frequency of notches by individual (12.2 percent) and by tooth (5.5 percent) than the Eastern Middle-Late sample where the overall frequencies were 7.1 percent for individuals and 3.2 percent by tooth. The major contrast, however, is to the Western Settlement, where 118 anterior teeth in 50 jaws

Table 1. Individuals exhibiting one or more cultural notches.

Sample	Individual No.	Sex	Age category	Tooth affected*
Thjodhild's Church	T.C. 2	Female	20–25	R-UI1, R-UC, R-LI1
	T.C. 14	Female	20–25	R-UI1
	T.C. 46	Female	20–30	L-UI1, R-UC
	T.C. 62	Female	30–40	L-UI1, R-UI1
	T.C. 63	Female	20–25	R-UI1
	T.C. 66	Female	20–30	R-UI1, R-UC
	T.C. 70	Female	30–40	L-UI1, R-UI1, L-UC, R-LC
	T.C. 83	Male	30–40	L-UC
	T.C. 134	Male	35–45	R-LI1
	T.C. F5	Unknown	12–16	R-UII2
Benedictine convent	A.S. 129	Female	20–25	L-LI1, R-LI1
	A.S. 137	Unknown	20–25	R-UC, R-LC

*Side (R, L) Jaw (U, L), Tooth (I: incisor, C: canine), number (1: central, 2: lateral)

failed to exhibit one instance of cultural notching. In general, cultural modifications focused on females, maxillary teeth, and settlement-period Greenlanders.

DISCUSSION

Southwest Greenland was colonized by Icelanders in AD 986. At that time, the climate was milder than it is now, and there were no resident Inuit in the area to impede Norse settlement of the inner fjords. Erik the Red and his fellow colonists introduced a classic Scandinavian economy into Greenland, bringing with them cows, horses, sheep, and goats. Although grain production was a significant problem in this subarctic setting, their pastoral economy was adequate to meet protein and caloric needs, especially when supplemented by hunting caribou, seals, and walrus (G. Jones 1986; Krogh 1967).

In their early years of life in Greenland, the Norse maintained contact with Icelanders and Norwegians and were occasionally mentioned in European accounts (e.g., King's Mirror). Leif Eiriksson brought Christianity to Greenland in AD 1000, ultimately leading to the construction of at least nineteen stone and turf churches (Arneborg 2000). As an extreme outpost of Christianity, the Greenlanders were given their own bishopric at Gardar. Religious developments in this new land generated a constant set of obligations to the church in the form of tithes. For purposes of both trading and tithing, the Norse exploited the unique bounty available in Greenland in the form of walrus hides (for rope) and tusks (for ivory), with Greenlandic gyrfalcons and live polar bears as prized trade or gift items (Seaver 1996). There was also a market for caribou skins and blubber. In addition, the Greenlanders produced large amounts of frieze, a coarse woolen cloth, which served as a valuable trade item as well as a staple of the Greenlandic clothing industry (Ryder 1983).

Several issues have to be addressed regarding the manifestation of cultural notches in the Greenlanders. First, were the notches produced intentionally or were they a by-product of occupational behavior? Second, there is a noteworthy sex difference in the occurrence of cultural notches in the Greenlanders. What culturally prescribed activities might account for this distinction? Third, there is a marked temporal difference in the presence of notches. They are relatively common around the time of initial settlement, but two hundred to three hundred years later, few individuals developed these notches.

Intentional modification can be ruled out based on the location, nature, and orientation of the notches. They arise through a gradual and long-term process on the incisal surfaces of the anterior teeth following a labiolingual axis. They match the illustrations and descriptions of cultural notches provided by Cruwys et al. (1992) and Bonfiglioli et al. (2004) and resemble in no way the intentionally modified anterior teeth that Arcini (2005) found in Vikings. While some individuals have more than one notch, they are never exhibited in the manner that characterizes purposeful dental modification. They are a by-product of behavior but one that is unintended.

What habitual behaviors of the Greenlanders might be responsible for notched anterior teeth? We feel the difference between males and females provides the biggest clue. That is, the production of textiles was a task activity that fell primarily on females. Ethnographic accounts and descriptions bear testimony to this distinction:

Table 2. Frequency of cultural notches in teeth and individuals by sample, sex, and jaw.

		Upper Jaw				Lower Jaw			
Sample	Sex	Tooth Frequency	(affected/ total)	Individual Frequency	(affected/ total)	Tooth Frequency	(affected/ total)	Individual Frequency	(affected/ total)
Eastern Early (Thjodhild's Church)	M	1.3	(1/76)	3.8	(1/26)	1.0	(1/97)	3.4	(1/29)
	F	23.6	(13/55)	50.0	(7/14)	3.8	(2/53)	15.4	(2/13)
	?	4.0	(1/25)	10.0	(1/10)	0.0	(0/23)	0.0	(0/6)
	Total	9.6	(15/156)	18.0	(9/50)	1.7	(3/173)	6.3	(3/48)
Eastern Middle-Late (Benedictine convent, Gardar, Herjolfsnes)	M	0.0	(0/10)	0.0	(0/3)	0.0	(0/17)	0.0	(0/5)
	F	0.0	(0/17)	0.0	(0/8)	4.1	(2/49)	6.7	(1/15)
	?	6.7	(1/15)	20.0	(1/5)	4.5	(1/22)	16.7	(1/6)
	Total	2.4	(1/42)	6.3	(1/16)	3.4	(3/88)	7.7	(2/26)
Western	M	0.0	(0/4)	0.0	(0/2)	0.0	(0/1)	0.0	(0/1)
	F	0.0	(0/23)	0.0	(0/13)	0.0	(0/43)	0.0	(0/12)
	?	0.0	(0/21)	0.0	(0/9)	0.0	(0/26)	0.0	(0/13)
	Total	0.0	(0/48)	0.0	(0/24)	0.0	(0/70)	0.0	(0/26)

> The Greenland farms were each a unit, self-supplying not only as regards food and drink, the production of implements for agricultural work and for hunting and fishing, and of domestic utensils, but also as regards the making of clothes from the farm's own products. On every single farm wool was carded, spun, and woven into frieze. The looms were very busy both summer and winter. The young girls had to make their own bridal clothes, and the housewife had to renew her store of textiles, and Greenland frieze was in demand as an article of commerce. In exchange for the rolls of cloth many exciting and useful things could be bought when the trading vessels arrived. All day long the women spun or wove. From the tuft of carded wool the thread was pulled between the women's fingers on to the little whirring wooden spindle which was spun by the small soapstone whorls. The ruins teem with spindles with their small round whorls, and big loom weights for the upright looms—all evidence of this work. (Krogh 1967: 71)

Many textile experts feel the term wadmal (or vaðmál) is more specific to the type of frieze cloth that Norse Greenlanders were making and using (Arneborg and Østergård 1993; Østergård 2004; Tortora and Merkel 2000:619). Wadmal was a coarse and stout fabric created all over Scandinavia and Great Britain in medieval times (Carmichael et al. 1947). Woolen yarn was used to make wadmal. Following Emery (1994:10), "yarn" is taken to mean an "assemblage of fibers or filaments which has been put together in a continuous strand suitable for weaving." Wadmal was woven on a warp-weighted loom using woolen yarns in a plain tabby or 2/2 twill structure (Carmichael et al. 1947; Hoffman 1974:194–195), although other twill varieties have been noted. "Vað" translates to "cloth," and the Norse Greenlanders wove many types of cloth such as bragðarvað and smávaðmál, depending on the intended use (Østergård 2004:61–63). Wadmal, literally translating to "cloth measure," was used as a form of currency and was an important trading good. Indeed, until the fourteenth century, wadmal was the most important item exported from Greenland (Damsholt 1984:81). In domestic contexts, Norse Greenlanders used wadmal for everything from clothing to bed curtains and ship sails (Andersson 2003:50).

Along with highly prized cattle and horses, the Greenlanders reared goats and sheep for their milk, meat, hair, and wool. The fibers harvested from their livestock were of no less importance than the meat. The Greenlanders processed a variety of animal and plant fibers, aside from those obtained from goat (*Capra hircus*) and sheep (*Ovis aries*), such as arctic hare (*Lepus arcticus*) and flax (*Linum usitatissimum*). Yet, archaeological evidence and historic documents indicate that the majority of textiles preserved are mainly woven from sheep's wool. The breed of sheep used by medieval Norse Greenlanders, the Icelandic Northern short tail, is still in existence and has changed little in the last five hundred years (Østergård 2005; Ryder 1983).

Østergård (2004) estimates conservatively that the amount of wool needed in the production of wadmal per person, per capita, in medieval Norse Greenland was 5 kg. This quantity covers personal use, but does not include the amount needed to pay taxes or church tithes, or for trade. Given the prominence of wadmal in Norse Greenlandic life, a huge amount of time and effort went into processing fibers and weaving cloth. Women in Norse Greenland were primarily responsible for the manufacture of woven goods and the products made from the cloth, and so fiber-related tasks presumably consumed a great portion of their waking hours. Indeed, Barber (1991) notes that before the industrial revolution, women in Europe spent almost every available moment spinning, weaving, and sewing. Occasionally, men and boys contributed to textile production by gathering raw materials or producing weaving implements.

The morphology of wool fiber easily distinguishes it from silk, mineral, or plant-derived fibers. For example, many plant-derived fibers and silk look smooth under magnification while wool is rough and scaly (Emery 1994). A single wool fiber is composed of three layers. The first layer is the medulla, which is overlaid with cortical tissue, all of which is covered with the outermost epidermal layer of horn tissue (Matthews 1924). Horn tissue consists of flattened cells that look like scales, whose ends overlap each other in a serrated manner (Fig. 2). Generally, older breeds of sheep have more prominent scales on the epidermis of the wool fiber. Correspondingly, Greenlandic sheep are an old and archaic breed with pronounced epidermal scales (Ryder 2005). Additionally, different body parts of sheep yield different degrees of wool coarseness. For example, the wool on the shoulders is finest while the wool on the hind legs is coarsest (Kroll 1981).

After shearing or plucking the wool from the sheep, and before spinning, Norse Greenlanders washed the wool with a mixture that included stale urine (Østergård 2004). Urine is useful in removing excess grease trapped in wool. Stale urine is alkaline and treating wool with an alka-

line compound has the effect of making the wool fibers' epidermal scales swell and become even more prominent (Matthews 1924) and, thus, more abrasive. The natural lanolin in a sheep's wool protects the epidermal scales, but washing the wool with hot water has the effect of corroding the epidermal scales. Washing wool, however, only removes some of the accumulated dirt and grease from the fleece, but not all foreign particles. Given the fineness of some of the loess soils in Greenland, some abrasives would have remained in the wool.

After the wool was washed and combed or carded, the next task facing the Norse Greenlandic women was to spin the wool into a yarn suitable for weaving on their warp-weighted looms. Spinning refers to the process of drawing out and twisting raw fibers of finite length into a thread of continuous length (Emery 1994). While spinning can be accomplished with no tools but the hands, medieval Norse Greenlanders used spindle whorls and distaffs to make the process easier and more efficient (Arneborg and Østergård 1993). A distaff is a rod on which raw fibers about to be spun are placed. In spinning with a distaff, some of the fiber about to be spun is taken from the distaff and placed on a stick, called a spindle, which is twirled in one direction, causing the fiber to twist tightly. To make the spindle heavier, and therefore spin faster to produce a tighter yarn, a weight is sometimes added to the spindle. This weight is called a spindle whorl.

Imperfections in the wool, such as hair, dirt, and so forth, need to be picked out before the yarn is spun because imperfections cause the finished yarn to be uneven and difficult to work with. Although there is no documentary evidence for women using their teeth in the production of wool in Greenland, women in central Europe used their teeth to pick out imperfections in their wool until a generation ago (Sigrid Piroch, personal communication). Spinners would hold the fiber about to be spun from the distaff in one hand, while the other hand held the spindle and whorl. Only the teeth were free to pick out the imperfections like short, useless fibers and snarls; otherwise the spinner would have to put down her spindle or the distaff and pick out the imperfections by hand, which would have considerably slowed down the spinning process. Even when the distaff was secured so that the hands were free (such as tying it to a belt), it was often easier to use one's teeth to pick out the imperfections. The spinner would bite down on the section of the wool yarn that contained the imperfection and simultaneously pull up on the yarn through the teeth to remove the offending imperfection. The manner of biting and angling up while pulling the thread accounts for why there is often only wear on the upper teeth and not the corresponding lower teeth as well. As master handweaver Sigrid Piroch notes, "when many women got older and lost too many of their teeth they could no longer spin" (Sigrid Piroch, personal communication)!

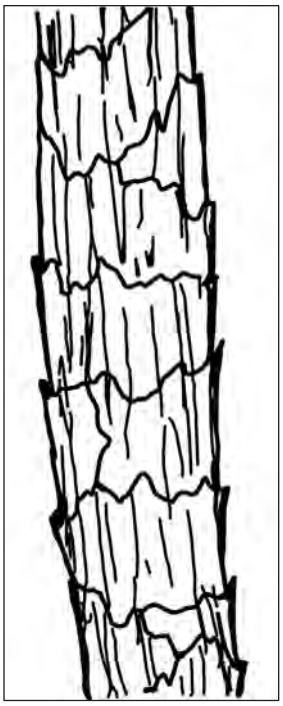

Figure 2. Illustration of a single wool fiber under x500 magnification. Note the scaly, roughened surface (adapted from Matthews [1924:Figure 47]).

Similar physical motions that occur during spinning also occur during the act of sewing. The same pulling and biting actions that spinners use are sometimes employed by sewers as well, but for the purposes of cutting yarn. Many modern sewers do not take the time to pick up a pair of shears when a thread needs to be cut. Rather, they use their teeth to quickly bite and cut the thread. After a lifetime, many devoted sewers remark that this habit leaves a notch in the tooth that acts as impromptu scissors (Margaret Coe, personal communication). Although scissors were found archaeologically with Norse Greenlandic burials, it is reasonable to suggest that medieval Norse Greenlandic spinners and sewers would not have behaved differently than their modern counterparts. The very act of smoothing and dampening thread, by pulling it through the teeth to facilitate threading a needle, would probably cause abrasions to a sewer's dentition.

If yarn production was primarily responsible for the patterned cultural notches in mostly Greenlandic females, this still does not explain the temporal disparity between settlement period and later Greenlanders. The Thjodhild's

Church sample is larger than later samples but only slightly so (e.g., 48–50 individuals for Eastern Early and 40–52 individuals for Eastern Middle-Late and Western). Part of the explanation might be tied to climatic events over the course of the Middle Ages that significantly affected the Norse economic system.

The garments and footwear that preserved so well at Herjolfnes demonstrate that wadmal production continued in Greenland from settlement (tenth century) to abandonment (fifteenth century). However, animal bones from archaeological contexts indicate that with increasingly colder temperatures through the Middle Ages, domestic livestock decreased while the bones from hunted animals (e.g., seal) increased. It is striking that the Western Settlement, about 350 miles north of the Eastern Settlement, had no examples of culturally modified teeth. While we cannot rule out an accident of sampling, the frequency of affected teeth (23.6 percent) and affected individuals (50 percent) in the female sample from Thjodhild's Church suggests that more is involved. There are other possible explanations for this disparity of tooth modification. The Western Settlement, so much further north, was in an even more economically perilous position than the Eastern Settlement. It is conceivable that Western Settlement families traded for cloth because they could not, or did not want to, make their own. Alternatively, women from the Western Settlement could have adopted a tool to facilitate combing impurities out of the wool and not relied on their teeth. Additional possibilities may include more grit in the Eastern Settlement's sheep's wool, or differences in standards of removing grit. Indeed, it is plausible that the Eastern Settlement consisted of a group of related, either physically or socially, women who learned how to process wool in the same manner. This is consistent with other fiber-related arts where the learning patterns are very conservative (i.e., one learns how to spin from one's aunt or grandmother and does not generally deviate from the norm) (Greenfield 2004; Pryor and Carr 1995).

During their first two centuries in Greenland, the Norse population and economy thrived. Significant changes occurred, however, during the thirteenth and fourteenth centuries that threatened the maintenance of a Norse lifestyle. With the onset of the "little ice age," the northern ice pack drifted ever further south, blocking traditional shipping lanes and decreasing contact between Greenland and both Iceland and Europe. Diseases sweeping Europe (e.g., the Black Plague) also limited the Greenlanders' contact with the outside world. It seems likely that textile production was declining along with mean annual temperatures and numbers of domestic livestock on the Greenlandic homesteads. McGovern (2000:333) notes that "[a]s time passed, most farms appear to have followed the route of a very small and poor farm, V48, which reduced the number of cattle, eliminated most domestic animals, and became increasingly dependent on seal meat for survival." Another factor was Greenland's increasing isolation from Europe after AD 1300. Although a negative in many regards, this isolation probably brought some relief from church-imposed tithes, including the production of wadmal beyond the immediate needs of the people.

CONCLUSIONS

Woolen textile manufacture was a constant household task carried out by Norse Greenlandic women. Morphologically, wool is rough and abrasive, as evidenced by the scaly barbs covering each fiber. The breed of sheep raised by the medieval Norse Greenlanders was an archaic one, with rougher wool than other breeds known today. During spinning, the spinner would have used her teeth to pick out imperfections in the rough and coarse wool. Over a lifetime of using teeth as tools for processing wool, textile production would have left its mark in the form of cultural notches on the medieval Norse Greenlander's anterior teeth.

By the mid-fourteenth and early fifteenth centuries, the end was in sight even if the Greenlanders were not aware of it. Around AD 1350, the Western Settlement was abandoned. Encroachment by the Inuit, who were moving southward along the coast, may have been a contributor but climatic factors played a role as well. Around a hundred years later, the Eastern Settlement was abandoned, bringing to an end the Norse chapter in Greenland's history. Many workers have addressed the factors that contributed to the demise of the Greenlandic Norse (Berglund 1986; Diamond 2005; Lynnerup 2000; McGovern 1980, 2000), but the general pattern followed a trajectory of discovery and rapid colonization (AD 986 to 1050), building period and heyday (1050–1300), followed by relatively rapid decline and abandonment/extinction (1350–1450?). Division of labor and economic system may explain why culturally induced notches occurred primarily in young females. A deteriorating environment brought about by climatic change and cultural trends may account for the temporal difference in these unintentionally modified teeth.

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REVIEW

BEING AND PLACE AMONG THE TLINGIT

By Thomas F. Thornton, 2008, University of Washington Press in association with Sealaska Heritage Institute, Seattle
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While numerous but generally limited studies of the complex place-naming practices and patterns developed by Alaska's indigenous groups have appeared over the years, Thomas F. Thornton's new volume offers a more expansive and holistic ethnographic view of how place characteristics and names are woven into the fabric of existence by the Tlingit people of southeast Alaska. *Being and Place among the Tlingit* is not only an outstanding contribution to Tlingit ethnography but also offers a powerful set of conceptual tools that other anthropologists, not just those in Alaska, should find illuminating and stimulating.

The book consists of six chapters and includes a guide to the Tlingit language at the front, a preface, and a somewhat dangling appendix listing living resources used by Tlingit and their seasonality of use. In the preface, Thornton describes his fieldwork in various Tlingit village communities initially while working as a researcher for the Subsistence Division of the Alaska Department of Fish and Game and then subsequently through numerous grants that enabled him to elicit and compile place-names for virtually all of the Tlingit kwaans (regional groupings) from an impressive group of Tlingit-speaking elders, many of whom are now deceased. I was a co-participant in one of the projects directing place-name collection among the Hinyaa Tlingit. Thornton does not inform us about the actual amount of time spent during fieldwork nor does he tell us that an early phase of the research provided the data for his doctoral thesis at the University of Washington, which puzzlingly is not cited in the bibliography. Having worked with Thornton on place-names for many years, I am aware that he has accessed and obtained numerous additional Tlingit place-names from a variety of published (such as de Laguna's volumes on the Yakutat Tlingit) as well as unpublished (Thomas Waterman's manuscripts) sources and developed a database incorporating both the elicited and the manuscript-based place-names, but this database is neither identified nor discussed as an analytical tool used in developing the materials presented in this book.

Theoretical perspectives are laid out in chapter 1, where Thornton positions his understanding of a "sense of place" as both a powerful universal dimension of human experience and an existential location of wide-ranging cultural construction involving language, image, and power, among other things. He holds the view that the experience and understanding of culturally constructed place can only be accomplished through the intersection of being on-site with a substantial degree of awareness of the cultural system. I am in full agreement with this claim. Thornton lays out four "cultural structures of emplacement," which he regards as central to the Tlingit fusion of place and being. These are social organization, language and cognitive structure, material production, and ritual processes. The next four chapters explore each of these in turn. In the elaboration of these conceptual sites, Thornton frequently references Tlingit narratives collected in the 1940s by Walter Goldschmidt, a volume Thornton edited for its publication as *Haa Aanyi, Our Land* (1998), and Tlingit

oratorical performances presented in volumes edited by Nora and Richard Dauenhauer. Chapter 2 elaborates on the practices through which Tlingit bring their social organization (matrilineal descent, kwaan, moiety, clan, and house principles) into contact with geographic locations by providing names that, among other things, illustrate critical events of the past that are viewed as creating the relationship of the people to the place. Here, as in chapter 4, Thornton draws heavily on his long-term, deep relationship with Herman Kitka to demonstrate how understanding of place and past ancestral activities in places inform and dictate Kitka's sense of self. Thornton might have included discussion of petroglyphs (Fig. 1) as Tlingit markers of emplacement, but this is an example of regional differences not addressed in the book; Thornton is not nearly as conversant with southern Tlingit cultural practice (where there are far more petroglyphs) as his research has primarily been with northern Tlingit. In chapter 3, Thornton elucidates the linguistic and cognitive foundations of Tlingit place-naming principles in answer to the query "What's in a name?" He provides a case study of Tlingit place-names embedded in a version of the Salmon Boy story/myth told in Sitka that illuminates ancestral ecological conditions and provides detail useful for travel, resource timing, and locational contexts. Intriguingly, the story takes place from the vantage point of a salmon and thus demonstrates an important principle of Tlingit relationality—how to see from the perspective of another. In this chapter, the syntactic structure of Tlingit language, which produces an active rather than passive orientation, is presented as are the Tlingit words (for example, *heen* = stream, river) that provide the basic building blocks of Tlingit place descriptions and names. Thornton shows how Tlingit provides a fine-grained terminology for locating phenomena in relation to the observer. Material production as a "structure of emplacement" is elaborated in chapter 4. The seasonal round of activities of "subsistence" production occurs in "locales" where "projects" of "procurement" take place and thus create the impetus for landscape-making through experiences and naming. Thornton lays out and discusses the way traditional (ecological) knowledge, embedded in the names and traditions, when linked to the relational and spiritual dimensions of Tlingit resource acquisition, makes for responsible, sustainable resource continuity. The exquisite Tlingit ceremonial, the memorial potlatch (*koo'ex*), serves as the focus of chapter 5, where ritual as a site of emplacement is explored. Thornton provides excellent examples of how potlatch oratory grounds Tlingit existence in place and links generations. He also shows how Tlingit potlatch speakers utilize powerful emotional themes, linguistic forms and demonstrations of deep personal affect to fuse these elements and use them as an agent of collective bonding. In the conclusion, Thornton eloquently lays out how a philosophy of place and being that emphasizes connections and care-taking promotes "biocultural health," and persuasively argues that such enormously valuable but endangered systems need to be cherished, celebrated, and emulated.

Throughout the volume, Thornton deftly weaves in accounts of how Tlingit practices associated with place were continually challenged and eroded by white immigrants and government officials and how various Tlingit resisted and found means to sustain their cultural system, albeit somewhat altered, in the face of this onslaught. He also explores how technological adoptions, economic changes, and governmental policies have also altered and eroded the manner in which Tlingit are able to experience place. Despite these significant changes, Thornton contends that Tlingit "emplacement structures" "persist and adapt . . . as axes of identity, community, and place-building" providing "wellsprings of being" (p. 196).

The ethnographic approach taken by Thornton provides an insightful foundation for encountering Tlingit cultural practice, but it is important to recognize the limitations of that approach as well. It does not provide a systemic gazetteer à la Robert Galois' (1994) impressive study of Kwakwa̱ka̱'wakw settlements in British Columbia, nor is it a single-source-based comprehensive approach to a region like Shem Pete's Alaska (Kari and Fall 2003). Unfortunately, Thornton's approach sometimes gets bogged down in what might be termed a panethnic presentist perspective (he refers to it as an "idealized temporal composite") that does not pose or even countenance variability along the well-recognized linguistic (dialectical), regional (kwaan division), or social (clan and house groups) divisions that characterize Tlingit life. Nor does he explore how that variability may in fact be the basis for contested claims in Tlingit existence, a reality that continues to surface in certain Tlingit groups. Another vantage point missing from the panethnic presentist perspective is a temporal one in which place-name characteristics such as distribution and construction might be used to approach significant questions about Tlingit longevity on the coast, patterns of movement identified in clan oral traditions, and other topics related to change through time. However, it should be noted that Huna Tlingit place-

names in Glacier Bay (Seeti Geeyi) are used in the book to demonstrate the processual (becoming rather than existing) aspects inherent in Tlingit place-naming, which in turn can be used to implicate temporality as it relates to periods in the past when processes revealed by the place-name could be observed. Also missing is attention to the impacts of the historical period on place-naming, although, as noted above, Thornton describes the forces that have increasingly separated Tlingit from the places and language that traditionally fused to provide their template of being. Since the late 1700s, the Tlingit have been in contact with and interacted with various Westerners, but Thornton does not examine how those contacts might have affected places named and place-naming practices. Finally, although Tlingit groups interacted extensively with their neighbors, such as the Eyak, Haida, Nishga, and Coast Tsimshian among others, Thornton does not examine the possibility that some Tlingit names may have entered the language as loan words resulting from contact with these groups. Particularly significant in this regard is Jeff Leer's observations about the apparent Eyak linguistic foundation for a number of Tlingit place-names in northern southeast Alaska.

It is interesting that while it is commonly assumed (and Thornton leans in this direction as well) that Western (European and American) visitors typically engaged in place-naming colonialism by ignoring or rejecting indigenous place-names, such practices were far more characteristic of the early explorers and traders due to their minimal contact with and lack of linguistic comprehension of the Tlingit than they were of at least certain American colonizers who came later. John Muir, perhaps surprisingly, eschewed his own elaborate place-naming schemas for locations he visited in order that subsequent mapping expeditions would identify and utilize local Tlingit names. Some of the later map and chart makers of the Coast Survey acted upon similar sentiments as can be seen in the vicinity of Tuxecan Island (along the west coast of Prince of Wales Island) where virtually all the cartographic names are Anglicizations of Tlingit terms elicited from Tlingit experts, perhaps those hired to guide the Americans through these waters. In this area of the Prince of Wales Archipelago, it appears that the Coast Surveyors memorialized one such assistant by naming a prominent peak in the vicinity of Mount Kogish after him. This name is a relatively discernible Anglicization of Kaukeesh (now Kookesh), a prominent Raven "chief" in the area at the time as noted in Orth's *Dictionary of Alaska Place Names* (1971).

A final ironic note on the failure of the volume to address how place-names and place-naming practices were altered by contact with Europeans and Americans is the cover of the book. I am quite familiar with the image, as it has been a powerful iconic statement for generations of Tlingit fishermen from the village of Hoonah linking them to their territorial fishing grounds in the Inian Islands of Icy Strait. The drawn image is of a rock formation that is called the "Indian Head" by the aforementioned fishermen. In that sense the rock formation and its name are emblematic of the processes that Thornton carefully and elaborately details. However, the physical features of the head profile appear to correspond more to the classical aquiline form of the Plains Indian (the American Indian in the eyes of nonindigenous Americans) than they do to the more flat-nosed profile characteristic of the Tlingit. The ironies here are that there is no Tlingit term for this rock (it has only an English name) and that the rock was likely recognized for its form and given this name by American fishermen (perhaps of Slavic descent) in the early part of the twentieth century, when salmon fishing in the Inian Islands began. The Tlingit in turn not only adopted the visual perspective and the term but wedded it in quasi-traditional fashion to their being. We can certainly hope that there will be future publications in which Thornton will follow up on this truly special volume to provide us with additional analyses drawing on the extensive database he has developed and his excellent interpretive skills to illuminate more of the complexity of place and being in Tlingit life.

Figure 1. Noyes Island petroglyph

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REVIEW

ANÓOSHI LINGÍT AANÍ KÁ: RUSSIANS IN TLINGIT AMERICA. THE BATTLES OF SITKA, 1802 AND 1804

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This monumental study, which links wide-ranging ethnographic, historical, and aboriginal sources of knowledge about Russian-Tlingit interactions in the early contact period, is volume 4 in the Classics of Tlingit Oral Literature series. Some twenty years in the making, this volume represents a significant departure from the previous three, which focused on Tlingit oral traditions (vol. 1), ceremonial oratory (vol. 2), and biography (vol. 3). *Anóoshi Lingít Aaní Ká: Russians in Tlingit America* is a rigorous intercultural exploration of two critical episodes in Alaska's history: the Russian-Tlingit battles of 1802 and 1804 at Sitka, where Russia ultimately gained its strongest foothold in the New World. The book explores how complex events leading up to the battles unfolded, involving cross-cutting relationships among not only Russians and Sitka Tlingits, but also among other non-Native (e.g., American and English) traders and nonlocal Natives (e.g., Aleut and Chugach, and other Tlingit tribes). It also demonstrates that the outcomes of the battles were neither inevitable nor particularly decisive. Like Daniel K. Richter's perspective-shifting explorations of Indian-White relations in the East in *Facing East from Indian Country: A Native History of Early America, Anóoshi Lingít Aaní Ká* seeks to shift our grounding of history in the Pacific Northwest by elevating the status of Native oral traditions in understanding Alaska's colonial birth and its legacies. Similarly, the study leads the reader to imagine what possibilities might have played out had relations between the Russians and the Tlingits blossomed rather than soured in the early nineteenth century, or if the powerful Tlingits had prevailed as decisively in the battle of 1804 as they did in 1802.

The editors employ a number of tools in executing this paradigm shift. The centerpiece of the volume consists of Tlingit oral narratives recorded in the twentieth century from elders born in the late nineteenth century, when the oral traditions of the battle were still very young. These include Alex Andrews' and Sally Hopkins' detailed bilingual texts (carefully transcribed and translated by the Dauenhauers), which are presented at the end of the volume but referenced throughout, as well as English narratives by Andrew P. Johnson and twentieth-century-born elders Mark Jacobs Jr. and Herb Hope. The latter are interspersed throughout the earlier sections alongside a wide-range of documents and articles produced by Russian, European, and American scholars or participants in Russian America. The sheer number of voices and range of sources creates some obvious challenges for narrative flow. The editors seek to overcome this in three ways. First, they offer a comprehensive introduction which lays out the development and aims of the project, encapsulates the overall story, and explains how the documents were chosen and organized in putting the history together. This can be read both as an overture and a synopsis. Second, they structure the sections chronologically with the following titles: I. The Prelude: First Encounters of Russians and Tlingits (eight documents); II. The First Battle Encounter: Prince William Sound, 1792 (two documents); III. The First

Settlement in Tlingit Territory: Yakutat, 1796 (one document); IV. The Russian Push into Southeast Alaska before 1799 (one document); V. The Founding of Old Sitka, 1799 (ten documents, including translations by Lydia Black of Russian-American Company manager Aleksandr Baranov's correspondence); VI. The Battle of 1802 at Old Sitka (eight documents); VII. Baranov Returns: The Battle of 1804 at Indian River (ten documents); VIII. And Life Goes On: 1805–1806, 1818 (five documents); and IX. Bilingual Texts (the two oral narratives by Andrews and Hopkins). Appendices include lists of casualties, biographies, personal and place names, a glossary, and other pertinent information. Third, most sections and documents have editors' introductions, which lay out further context for selection of the documents and how they fit within the broader narrative and historiography of the Sitka battles. This is critical because many of the documents contravene accepted tenets of the historical record, but must be read carefully to discover this.

Importantly, the editors are not hostile to the Russian sources, which would be a poor, if justifiable, antidote to the hostility and ignorance that many Western historians have shown for Tlingit historical sources. On the contrary, they skillfully embrace all the sources and use them to interrogate and enlighten each other in fruitful ways, such that Russian sources shed light on Tlingit history and Tlingit sources shed light on Russian history, including biases, omissions, and misperceptions. Many of the documents are translated here for the first time. Professor Black, who passed away only months before the book was completed, translates or re-translates much of the Russian material with help from Richard Dauenhauer, while Nora and Richard Dauenhauer transcribe and translate the Tlingit texts. The editors' careful attention to details, such as personal and place names, and to the divergence and convergence of points in the sources results in something more than a classical ethnohistory: *Anóoshi Lingít Aaní Ká* is a truly intercultural history. Just how productive this approach can be is richly evident in exploring the very origins of contact between Russians and Tlingits. Tlingits have oral traditions about encounters with the Russians dating back to Aleksei Chirikov's expedition with Bering in 1741. In his "Early Encounters between the Tlingit and the Russians," elder Mark Jacobs, Jr. reports on the Tlingit history that men presumably from Chirikov's vessel were sent to shore to acquire freshwater and decided, upon meeting a friendly Tlingit party, to desert the Russian expedition. The Tlingits were said to have adopted the refuges and intermarried, the descendants ultimately settling in Klawock. According to Jacobs, the incident took place near Sitka on the outer coast of Kruzof Island. In a separate essay (p. 11-20), Allen Engstrom, using a variety of sources as well as his own ground-truthing expedition to verify, among other things, a petroglyph resembling a Russian sailing ship, makes a convincing case for Surge Bay on the outer coast of Yakobi Island, further to the north. Interestingly, the latter locale was suggested by a Hoonah Tlingit elder I spoke with in the early 1990s, who related a story very similar to Jacobs'. If true, this rewrites the genesis of contact between the Russians and the Tlingits, pushing it back a half century and placing it in a very different light.

Other revelations are more prosaic but no less useful in helping us understand the character of Tlingit-Russian relations. For example, few know that Baranov, along with being a capable administrator and hard-nosed negotiator (a Tlingit nickname for him I learned from Tlingit elder Herman Kitka Sr, was Loosh Téix', "No Heart"), wrote at least one song. The melody is lost but the sentimental lyrics are preserved, including: "Though nature here [Alaska] appears wild,/ and the people are of bloodthirsty habits,/ the important benefits/ needed by the Fatherland/make boredom and labor bearable" p. 132). Apparently one of the ways the rank and file promyshlenikii soothed their boredom was by harassing Tlingit women, a condemnable practice brought out in the Tlingit narratives as partial justification for the hostilities that developed between the two sides.

Another important revelation is that diplomacy and peacemaking are central to the story as much as the warring. Good diplomatic skills on the part of both the Russians and the Tlingit helped avoid conflicts at a number of turns. The peacemaking facet of Tlingit culture is often overlooked or deemphasized in Western accounts of their "savagery" and "bloodthirstiness," but the Russians experienced it firsthand within a year after the battle of 1804. Realizing that his operation was both dependant on the Tlingit for subsistence, labor, and trade and vulnerable to another attack (or blockade, as Herb Hope relates from his Kiks.ádi clan's history), Baranov made numerous overtures for peace, and eventually the Tlingits accepted. A formal "Deer Peace Ceremony" eventually was conducted, gifts exchanged, and, as Alex Andrews succinctly sums it up, "things were made good

with the Russians/ … The Russians then became our relatives" (pp. 344–345).

As Andrews also makes clear, however, some matters were not completely resolved. The great Kiks.ádi warrior, Katlian's (Kalyáan's) Raven helmet and the gold peace hat given to the Tlingit by the Russians at the peace ceremony were alienated from the Tlingit and put into museums. Thus, the politics of peace did not end in 1805 but continued into the present era of repatriation and commemoration. By 2004, the two-hundredth anniversary of the battle of 1804, they yielded a second ceremony in which both hats, now repatriated to the Tlingit, were brought out to celebrate a more lasting and just peace. With these actions, and this book, it seems that the question "who owns history?" provocatively posed in the prelude to *Anóoshi Lingít Aaní Ká* and wrestled with throughout this remarkable project, now has a more inclusive and balanced answer. As a consequence, this book will be an indispensable reference for any student seeking to understand this watershed period in Tlingit, American, and Russian history.

REVIEW

TAYMYR: THE ARCHAEOLOGY OF NORTHERNMOST EURASIA

By Leonid P. Khlobystin, 2005. Contributions to Circumpolar Anthropology No. 5. National Museum of Natural History, Smithsonian Institution, Washington, D.C.
Paperback, xxvii + 235 pp., illustrations, bibliography, index

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An important synthesis of archaeology and prehistory in northern Siberia, encompassing the Taymyr Peninsula, is represented in this monograph written by the late Leonid P. Khlobystin (1931–1988). This region (and northern Siberia in general) has seen relatively little archaeological investigation compared with the Lena River basin, the Altay and Sayan mountains in southwestern Siberia, Angara River and Lake Baikal areas in southern Siberia, and the Russian Far East. The Taymyr Peninsula is the northernmost portion of Siberia, lying north of 75° north latitude, encompassing over 850,000 square km. This book represents the first English language monograph on this vast region.

A substantial portion of Khlobystin's professional work is reflected in this volume; the primary excavation data are derived from 1967–1974 and 1981 surveys through a large portion of the interior of the Taymyr Peninsula. This monograph is largely derived from Khlobystin's full doctoral dissertation (completed in 1982), originally titled *Drevniaia istoriia Taimyrskogo Zaporliar'ia I voprosy formirovaniia kul'tur severa Evrazii* or *Ancient History of Taymyr and the Formation of North Eurasian Cultures*. It was co-edited by V. V. Pitulko and V. IA. Shumkin from the original dissertation. This volume is translated by Leonid Vishniatski and Boris Grudinko and edited by William W. Fitzhugh and Vladimir V. Pitulko. Editorial changes were limited to additions of more recent literature, a preface, Khlobystin's bibliography, and an appendix of relevant literature published after 1990.

The book consists of four chapters arranged to cover the archaeology in chronological order, illustrating successive periods of occupation in Taymyr, from initial colonization (Chapter 1), Neolithic (Chapter 2), early Bronze Age (Chapter 3), and early Iron Age and Medieval Period (Chapter 4). Each of these chapters includes a relatively self-contained summary of important sites and brief discussions of pertinent problems of each period. Site summaries in these chapters follow a similar format, with one- to three-page overviews of important sites (generally those radiocarbon dated and/or stratified), then shorter summaries of undated sites/components with technologically or stylistically similar artifacts. A summary of technological and typological differences and similarities among Taymyr and other Siberian regions is presented at the end of each chapter. Khlobystin includes discussions of raw material use, tool function, and population movements, the last inferred from typological similarities with artifacts from dated sites in other regions. Chapter 5 is a more theoretically oriented chapter, focusing on somewhat disparate topics (e.g., social organization inferred from settlement patterns, bronze casting technology, and the origins of reindeer herding), but those where Taymyr data shed some illumination. A brief five-page conclusions section (Chapter 6) summarizes the wealth of information provided in Chapters 1–4. Each chapter will be described and considered in turn.

Chapter 1 reviews the evidence of the initial colonization of the polar regions of Eurasia (summarizing per-

tinent information up to 1982, but this is conveniently supplemented with more recent data by the editors). The Tagenar VI site is the only radiocarbon-dated assemblage for this early period in Taymyr, at about 6,000 ^{14}C BP. Several other undated sites are described with similar assemblages (primarily microblades, conical microblade cores, and microburins), termed by the author of a "Mesolithic-type," broadly similar to other assemblages in northeastern Asia (p. 27). These sites represent a unifacial blade industry, with little evidence of bifacially worked materials. Inferences about tool function are provided for artifacts from these (and subsequent) sites, apparently derived from low-powered microscopic evaluation. There is also an interesting discussion of the problem of the "relictual Mesolithic" or "Epi-Paleolithic" in Siberia, where a clear demarcation between Late Pleistocene and Holocene material culture could not be made, and Khlobystin includes a review of Siberian Mesolithic assemblages (pp. 17–23). The author interprets the change from Paleolithic to Mesolithic and reliance on blade technology as related to the transition to colder steppe vegetation, forcing a change in subsistence strategies and employment of a more mobile toolkit (p. 42). He concludes that Mesolithic sites in the Aldan region (of the Sumnagin Culture, Mochanov 1977) are related to the Taymyr Mesolithic/Early Neolithic sites, though separated by an immense distance, and interprets the initial colonization of Taymyr from the east (p. 43).

Chapter 2 reviews the Taymyr Neolithic, where Khlobystin's interpretations are somewhat hampered by lack of radiocarbon-dated assemblages. Sites like Abylaakh I, Glubokoe I, and Maimeche IV are dated to this period, and form the basis of the characterization of the Taymyr Neolithic on the basis of ceramic typological comparisons with other Siberian regions. Lithic technology in this period is similar to the preceding but with additions of new arrowheads and small net-impressed pottery vessels. The Maimeche IV site is notable for personal ornaments, including possible bracelets and medial and lateral labrets. Khlobystin proposes that the origin of wearing lip ornaments was eastern Siberia, where it then spread east to North America and west to Taymyr (pp. 69–71).

Chapter 3 reviews the Early Bronze Age period, which Khlobystin links with two cultural traditions: (1) Pysasina, descended from the Taymyr Neolithic; and (2) Ymiakhtakh, part of a widespread culture found in the Aldan region, the latter derived primarily from similarities in pottery design, morphology, and temper (pp. 84–85). Khlobystin links check-stamped pottery development and spread with the spread of the Ymiakhtakh culture across Siberia. Abylaakh I is the most significant Taymyr Ymiakhtakh site, with a hearth dating to about 3,100 ^{14}C BP. This date is also associated with crucible fragments and drops of bronze. Artifacts relating to bronze casting (sandstone and clay molds and crucibles) also provide evidence for early bronze-casting technology in the region. Khlobystin makes an interesting argument for Yukagir ethnogenesis, using linguistic correlates for copper and iron among Yukagir, Samoyedic languages, and languages of other unrelated Siberian groups (pp. 108–109).

Chapter 4 reviews the early Iron Age and Medieval period, periods little understood in northern Asia given the relatively few sites found and investigated (p. 111). Khlobystin identifies and investigates several Iron Age and Medieval cultures in the Taymyr region. The Ust-Polovinka site provides important information about this period, with stratification, rectangular semisubterranean houses (about 30 sq. m), and evidence of five successive settlements dating to three occupation periods (between 2,500 and 900 ^{14}C BP). Hearths were the locus of bronze casting, and a number of metal forms are described. Pyasina and Malokorenninsk cultures are defined by pottery typology and technology, as both are characterized by similar lithic assemblages. A third cultural tradition, Ust-Cherninsk, characterized again by distinctive pottery, is derived from the Ymiakhtakh culture and contemporaneous with Pyasina. The Vozhpay culture reflects an intrusion from west Siberia and is reflected in the Dyuna III site (pp. 155–169), dating to about 1,000 ^{14}C BP, and this last is linked by Khlobystin to Samoyedic speakers and direct ancestors of Nenets and Enets (pp. 168–169).

Chapter 5, entitled "Early Economic and Social Development of Taymyr," is written in a different vein from the preceding chapters. Khlobystin synthesizes three disparate topics: settlement pattern/social organization, development of bronze casting, and development of reindeer herding. He reconstructs settlement patterns and social organization for the Taymyr region in a sequential fashion. He situates archaeological data from Taymyr within a theoretical framework reliant on ethnographic analogy. His approach consists of inductively reconstructing social and economic organization from archaeological data, assessing ethnographically derived analogs, and interpretation through examination of similarities and differences among these analogs and the archaeological data. Using this approach, Khlobystin reconstructs settlement strategies (temporary camps for the Mesolithic, temporary sum-

mer camps and semisubterranean winter sod houses for the Early Neolithic, etc.) and subsistence (reindeer hunting supplemented by fishing from the Bronze Age (though no distinctive fishing implements were found) (pp. 172–173). He argues these temporary camps tied into caribou migrations. Khlobystin's use of the direct historical approach in linking more ethnographic and archaeological analogs provides the reader with useful detailed descriptions of northern Siberian dwelling types. Khlobystin also examines social variables such as kinship and gender roles with respect to the Taymyr archaeological record (e.g., the origin of the bilateral kinship system of the Nganasan, speculations about ritual behavior and bronze anthropomorphic figures of the Bronze Age).

The origin and development of bronze casting industries are extensively discussed, including resulting inferred changes in economy (pp. 181–186). This work provides a fundamental baseline from which numerous early metal industry studies could be conducted. The origin of reindeer herding is examined (pp. 186–193) from the perspective of excavation results from Dyuna III and elements of the Vozhpay culture. Khlobystin suggests early Samoyedic-speaking groups shifted to reindeer herding before moving north from the taiga to the tundra (pp. 188–189). He outlines various scenarios by which reindeer herding could have developed (e.g., reindeer decoy use in hunting).

Chapter 6 primarily summarizes the complex cultural history of Taymyr over the last 6,000 years, focusing on ethnogenesis of prehistoric cultures and Samoyedic speakers (Enets, Nenets, Yukagir). Khlobystin links the colonization of Taymyr by the Sumnagin culture, later Neolithic cultures adopting Belkachi technology, followed by migration of Ymiakhtakh culture intermixing with descendents of earlier cultures during the Bronze Age. In this manner, successive cultures in Taymyr reflect both migration and diffusion from cultures in the Aldan region and can be linked with widespread movement of ideas and people. This chapter synthesizes the data in a clear manner, and one should read this chapter before Chapters 1–4 to better situate the numerous cultural traditions mentioned throughout the text (often with little context).

The analyses and syntheses of a large amount of cultural material from numerous excavations will be a welcome addition to the English-language archaeological literature of Siberia. Many researchers' knowledge of northernmost Asian archaeology is limited to a few site-specific publications (e.g., Giria and Pitulko 1994; Pitulko et al. 2004). The effect of this work for Western understanding of the Taymyr and northern Asian prehistory in general will be considerable. In addition to the regional coverage, Khlobystin developed many key ideas about the development of bronze casting and reindeer herding through the excavations described in this monograph.

This volume is very well illustrated with excellent line drawings of ceramic and lithic artifacts, photographs of ongoing excavations and artifacts, and line drawings of stratigraphy. The edited nature of the work is evident in the disparate styles used to illustrate artifacts (black and white photographs with varying backgrounds and resolutions, illumination, and quality, and line drawings) and stratigraphy. With 173 figures, this volume provides excellent data on lithics and pottery for important sites, and the inclusion of thirteen plan maps of sites or portions of sites are welcome additions. However, there is only one regional map of the Taymyr Peninsula as a whole, and this does not include information on site locations, topography, or ecological zones. Such information provided in graphic form would help the reader locate sites and understand changes in environment and the potential effects on human populations. A master table or figure illustrating the major periods and cultures would also have been useful for those unfamiliar with this region. In some cases, more detailed spatial information might be useful, such as at Kapkannaya II, where assemblages identified as Ymiakhtakh, Pyasina, and Mesolithic/Early Neolithic were found together in a relatively small area (p. 33).

The interpretations offered by Khlobystin are somewhat hampered by the relative lack of radiocarbon-dated assemblages. Several of the important sites could have been treated to monographs of their own (e.g., Taegar, Ust-Polovinka, Dyuna III), but the summaries provide critical information for Taymyr and Siberian prehistory in general. His theoretical orientation—reliance on typological similarities among assemblages (e.g., correlations of largely undated pebble tool industries), concern with ethnogenesis, and relative importance of migration and diffusion (external factors of culture change) over internal cultural systems change—may strike North American archaeologists as "old-fashioned" cultural historicism, but Khlobystin's inferences are well-developed and substantiated by an encyclopedic knowledge of the primary data and of overall Siberian prehistory.

The editing on this monograph is excellent, especially in the placement of figures and their citation in the main text. The translators did a superb job, with subtle differences in scientific description (e.g., specific lithics or landscape

terms) rendered clear and succinct. Minor quibbles aside, this work offers important primary data, regional synthesis, and interpretation that are a most welcome addition to the English language corpus of Siberian archaeology. The book is approachable by nonspecialists, and communication is not fatally hindered by unfamiliar terminology and jargon. Western scholars who are not fluent in Russian but are interested in northern Eurasian or Arctic studies have been helped considerably by the publication of this monograph, and all involved should be commended.

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