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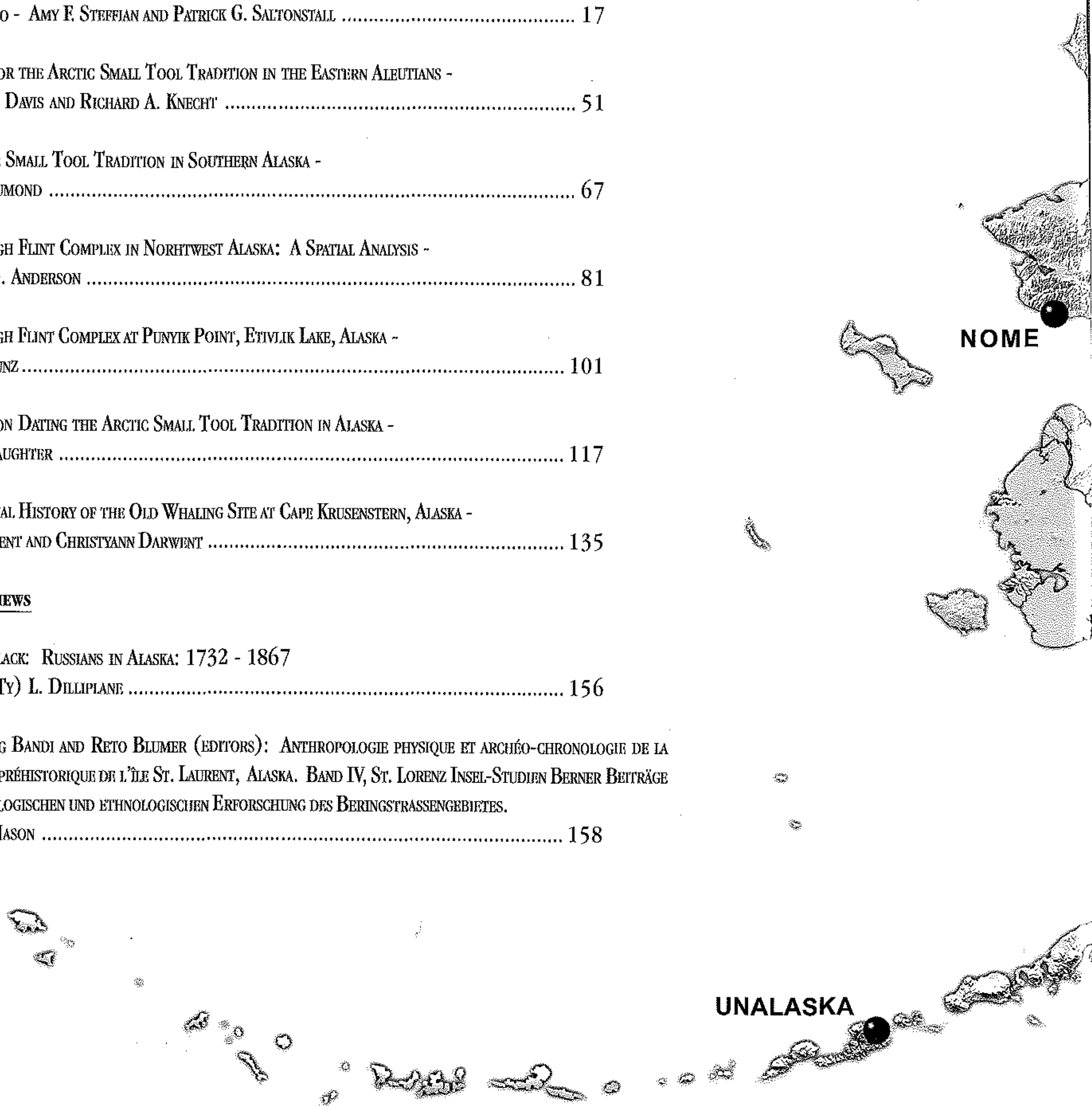

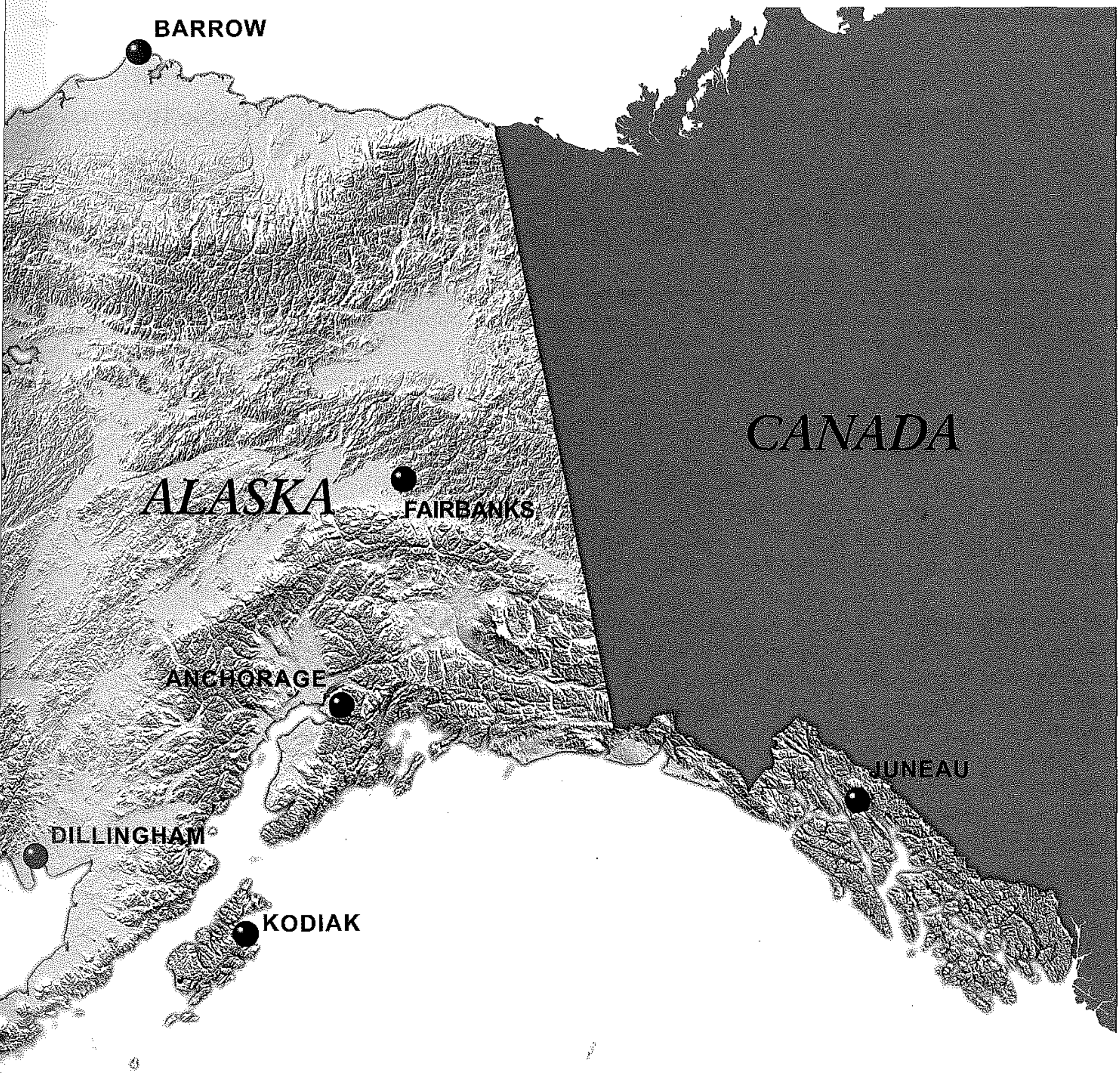
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The Arctic Small Tool Tradition Fifty Years On

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Abstract: The Arctic Small Tool tradition (ASTt) encompasses several culture complexes in Alaska, Canada, and Greenland. Research on the Alaskan members of the tradition has not kept pace with that in the rest of the North American Arctic. Despite the passage of more than fifty years since its discovery, there is still a great deal we do not know about the Denbigh Flint Complex, and much of what we think we know is based on received wisdom and ethnographic analogy rather than direct archaeological evidence. This paper assesses the state of our knowledge about the ASTt in Alaska and situates it within the broader framework of Arctic prehistory.

Keywords: Alaska Archaeology, Arctic Prehistory, Middle Holocene, Denbigh Flint Complex

Nearly fifty years ago, a young William Irving reflected on the similarities between the small, delicately flaked stone tools that had recently been discovered in Alaska (Giddings 1949, 1951), Canada (Giddings 1956; Harp 1958), and Greenland (Knuth 1954; Larsen and Meldgaard 1958; Meldgaard 1952), and suggested that they shared a common historical origin. Aware of the need for consistency in archaeological systematics and classification, he proposed that those tools belonged to a single technological *tradition*, which he aptly termed Arctic Small Tool (Irving 1953, 1957, 1962, 1964, 1969/1970; Julig and Hurley 1988).

Since Irving first defined the Arctic Small Tool tradition (ASTt) as an archaeological construct, there have been numerous methodological advances, chief among them radiocarbon dating. Hopkins' and Giddings' (Giddings 1955; Hopkins and Giddings 1953) initial view that Iyatayet, the Denbigh type site, dated to at least 8500 years ago has been disproven, as has Collins' (1953) belief that Denbigh dated to between 6000 and "little more than 8000 years" ago. The difficulties with dating bone and antler that plagued the discipline throughout the 1960s and 1970s have been recognized, explored, and resolved (Brown et al. 1988). The marine reservoir has been recognized as a source of old carbon and, by extension, anomalously old dates in the Arctic (Arundale 1981; Dumond and Griffin 2002; Dyke et al. 1996; McGhee and Tuck 1976). The need to calibrate radiocarbon dates to facilitate comparisons between data sets has been recognized and our ability to do so realized (Reimer et al. 2004; Stuiver et al. 1998). Accelerator mass spectrometry (AMS) has been developed and now permits us to date minute samples of organic matter from sites that would have been undateable in 1980. Equally important, AMS permits us to choose samples for dating based on the most appropriate context and association rather than on the basis of sample size. Sophisticated and increasingly detailed reconstructions of past environments now allow us to both situate humans on the landscape and to study how they have responded to past climate change at a variety of spatial and temporal scales. While problem-driven research is increasingly common in ASTt studies, basic culture history remains a fundamental concern because the time-space dynamics of prehistoric cultural manifestations in many parts of the Arctic are still poorly known.

One development that has had significant consequences for archaeology in the Arctic in general and Alaska in particular is the end of the Cold War. Communication across Bering Strait, once nearly impossible, is again routine as indeed it probably was in Arctic Small Tool times. The idea for this volume arose in a session on the Arctic Small Tool tradition organized for the Fifth International Congress of Arctic Social Scientists (ICASS-V) held in Fairbanks in 2004. With support from the Office of Polar Programs at NSF, several Canadian and Russian researchers were able to attend that conference and to share the results of their own work with an international audience. Such exchanges are now routine, but were virtually unheard of in Irving's day. Given the presence of Denbigh-like tools, particularly burins, in Neolithic sites in Siberia (Collins 1954), one wonders how conceptions of and work on the ASTt might have differed had Irving and his colleagues, particularly Louis Giddings, had greater access to researchers working in Northeast Asia.

TRADITIONS AND TRAJECTORIES

It seems appropriate in a volume such as this to comment briefly on the use the Arctic Small Tool *tradition* has had as an archaeological construct since Irving's day. Irving's original concept was one of geographic breadth, encompassing as it did archaeological material from Alaska to Greenland. Despite the lack of firm dating at the time, we now know that the archaeological complexes Irving included within his Arctic Small Tool tradition all date to within several centuries of one another. In Canada and Greenland, they span a period of a little over a millennium. Irving's definition was broad with respect to geography, but it was not deep with respect to time. In this sense, he was clear about historical relationships between a series of individually identified and more or less contemporaneous archaeological cultures over space, but did not intend his conceptual tool to trace what became of them over time. For Irving, ASTt in Alaska was largely restricted to the Denbigh Flint Complex.

In the years since then, considerable new evidence has come to light in both the eastern and western North American Arctic that bears on the taxonomic status of various complexes including Denbigh, Pre-Dorset, Independence I, and Saqqaq (see Helmer 1994b for discussion of the Eastern Arctic data), and, more importantly, on issues of cultural continuity and change between these and later cultures (e.g., Anderson 1980). In Canada and Greenland, the picture that has emerged is one of periodic depopulation and recolonization of large areas, but overall continuity at the regional level between the members of the Arctic Small Tool tradition as originally defined, and the subsequent Dorset culture (Odess 2002). It is now common among those working in the Eastern Arctic to refer to Independence I, Pre-Dorset, and Saqqaq as "early Paleoeskimo" or "early ASTt," Independence II and Groswater Dorset as "transitional," and the derivative Dorset culture as "late Paleoeskimo" or "late ASTt."

In Alaska, the relationships between the original ASTt member complex, Denbigh, and contemporary and subsequent cultures are less clear cut. Irving's definition of a Punyik Complex of the ASTt as distinct from Denbigh did not endure, and in post-dissertation years he referred to the ASTt material from Etivlik Lake as Denbigh. In a paper published in 1980, Anderson modified Irving's original construct of the Arctic Small Tool tradition to focus not on geographic breadth, but on temporal depth, and used it to articulate what he felt was a period of cultural continuity in northwestern Alaska that began with Denbigh and derived the subsequent Choris, Norton, and Ipiutak cultures from it. Such treatment is consistent with *tradition* as a conceptual tool as defined by Willey and Phillips (1958), but it is at odds with how Irving originally defined ASTt and how it has been used in Alaskan archaeology since then. The issues involved in identifying cultural continuity and change are complex, and they hinge in large measure on what sorts of materials are and are not preserved archaeologically, the geographic scale at which questions are being asked, and what lines of evidence individual researchers view as most telling. Anderson's interpretation is not universally accepted, particularly when the area of concern extends beyond northwestern Alaska. The principal difficulty with Anderson's reformulation of ASTt is that, since it was originally defined as a concept with tremendous geographic breadth, most researchers continue to use it in that fashion. The decision to retain the term while changing the emphasis to temporal depth and a relatively narrow geographic focus therefore introduces unnecessary confusion into the literature because of inconsistency in how the term *tradition* is used as a conceptual tool.

It is for this reason, despite being Anderson's student, that I have elected to retain Irving's original definition and, with a single exception, to include in this volume only papers that focus on cultures falling within Irving's original definition. That exception is the Darwents' paper on Old Whaling, long seen as one of the more enigmatic Beringian cultures. It is included here because the culture termed (in my view inappropriately) Old Whaling probably plays a significant role in what becomes of the Arctic Small Tool tradition, at least in northwestern Alaska. Stone tools that would be at home in the Old Whaling collection from Cape Krusenstern (Giddings and Anderson 1986) are found throughout much of the Noatak drainage and, as the Darwents note, some of the tools from the type site are made from Wrench Creek chert. Rather than a maritime-focused group who arrived by boat at Cape Krusenstern, we might instead consider whether the so-called Old Whalers are people who are best known from the coast, but who spent much of the year inland (Mason and Gerlach 1995).

WHAT HAVE WE LEARNED?

So what have we learned about the Arctic Small Tool tradition in the past fifty years? In the last few decades, research on Denbigh, the principal Alaskan member of the tradition, has lagged far behind that on early Paleoeskimo culture(s) in Canada (Cox 1978, 1988; Helmer 1986, 1994a; LeBlanc and Nagy 2003; Maxwell 1973, 1976, 1985; McGhee 1976, 1979; Morrison and Pilon 1994; Nagy 2000; Schledermann 1990, 1996) and Greenland (Appelt et al. 2000; Appelt et al. 1998; Elling 1996; Grønnow and Pind 1996; Møbjerg 1999), where the discovery, meticulous excavation, and well-reported analysis of many ASTt sites, including a handful of frozen ones (Grønnow 1988, 1994, 1996), has dramatically advanced our understanding of Paleoeskimo material culture and economy. In terms of the numbers of researchers involved, the levels of funding, and the number of publications that have resulted, ASTt research in Alaska has not kept pace with that in Canada and Greenland.

However, one area where there have been significant advances in Alaskan ASTt research is the Alaska Peninsula and adjacent islands. A slow but steady trickle of publications from that region, many of them bearing the name of Don Dumond, suggests some form of ASTt distinct from Denbigh is present and appears to be characterized by a far more sedentary subsistence–settlement system than any of the ASTt complexes found farther north and east. Few things discourage a subsistence–settlement system based on mobility like the presence of productive and reliable salmon runs.

There are a number of things we still don't know about the Arctic Small Tool tradition in Alaska, in particular the timing of ASTt arrival on this side of Bering Strait. Most researchers seem to accept that ASTt people came from Northeast Asia (Powers and Jordan 1990). If true, we should expect the oldest North American dates for the ASTt to be in Alaska, and we should expect progressively younger dates as one moves east through arctic Canada and into Greenland. Yet, with very few possible exceptions (e.g., Harritt 1994; cf. Slaughter, this volume), Alaskan ASTt sites appear no older than the oldest sites in northeast Greenland, where a suite of dates on musk ox bone places Independence I people at ca. 4000 radiocarbon years ago (Elling 1996). There is also evidence in eastern Canada for an ASTt presence coeval with the early dates from Alaska. On Ellesmere Island for example, Schledermann (1990) reports dates on willow charcoal and terrestrial mammal bone from two sites older than 3900 radiocarbon years in age. In Labrador, Cox (2003) reports an uncalibrated charcoal date of 3960 BP from a Pre-Dorset hearth.

Attempts to resolve the timing of ASTt arrival in North America are complicated by several factors. First, efforts to address the topic through application of radiometric dating are hampered by reversals in the abundance of atmospheric ^{14}C during the period between 5000 and 4000 calendar years ago (Reimer et al. 2004). Thus, a single assay from this period may provide several possible ages for a given sample. An additional factor that may explain the counterintuitive contemporaneity of the oldest dated ASTt material in Greenland and Canada with that from Alaska is the lower visibility of small lithic scatters on the lushly vegetated (at least by the standards of northeast Greenland) Alaskan landscape. In contrast to the Alaskan situation, early ASTt sites do not readily escape detection on the barren gravel ridges of northeast Greenland when they are subjected to careful survey. At the same time, as Owen Mason (personal communication 2006) points out, eustatic sea-level rise on the Beringian platform has largely inundated any coastal sites that might have been occupied prior to ca. 4000 years ago in Alaska north of Nome. With few exceptions, the record of early ASTt on the coast in the western Canadian Arctic is similarly afflicted.

How long ASTt people were present in Alaska before they became archaeologically visible remains an open question. If, as seems likely, the origins of the ASTt are to be found in the Siberian Neolithic (Powers and Jordan 1990) there is still a significant chronological (and geographical) gap between Bel'kachi, dated to ca. 5000 B.P., and the earliest dated Denbigh sites in Alaska. In this regard, the anomalously early dates at Kuzitrin Lake (Harritt 1994), though not universally accepted, fill an important and otherwise puzzling void.[1] The hypothetical loss to erosion of coastal sites greater than 4000 years in age aside, I have little difficulty imagining small bands of Denbigh ancestors present on the Alaskan landscape and all but archaeologically invisible for several centuries before they arrived at Onion Portage roughly 3950 radiocarbon years ago. I suspect that what evidence exists of their earliest passing has either not yet been found, or has gone unrecognized as just another undated and seemingly insignificant lithic scatter.

[1]Some of the dates from Iyatayet, the Denbigh type site, are also significantly older than most of the ASTt dates that have been reported in North America (cf. Slaughter, this volume). However, these dates were run on solid carbon in the very early years of radiocarbon dating, prior to standardization of pretreatment techniques. As the multiple ages derived from individual samples indicate, it is impossible to determine the age of the Iyatayet material with any certainty using the available data.

We know almost nothing about the cultural dynamics that existed between the entrenched, interior-oriented people whom Anderson (1968) termed Northern Archaic and the people who are the focus of this volume. Interaction between Denbigh and Northern Archaic peoples was not limited to simple hostility, if indeed their relationships were hostile at all. As Anderson (this volume) notes, Denbigh people who camped at Onion Portage had gained access to Batza Téna obsidian, as had those who camped at Punyik Point (Kunz, this volume). The fact that no Denbigh remains have been reported from the vicinity of Batza Téna (Clark and Clark 1993) suggests that this access was achieved through trade and exchange relationships developed with Northern Archaic people, indicating a social dynamic more complex than either hostility or avoidance. One can't help but wonder what Denbigh people, with access to the coast and, perhaps, with continued ties to Northeast Asia, might have exchanged for Batza Téna obsidian and how demand for materials that could only be obtained through trade might have affected both cultures.

The slow rate of ASTt penetration into the interior, as evidenced by the near absence of Denbigh dates earlier than 4000 BP, suggests that, at least initially, Northern Archaic peoples deflected would-be ASTt colonists north along the coast and into Canada, as well as south into what remains largely the archaeological *terra incognita* of the Yukon–Kuskokwim Delta, from whence they ultimately reached the Alaska Peninsula and, perhaps, the Aleutians. The role of ASTt people in the prehistory of Kodiak and the Aleutian archipelago is a matter of some debate, as the diversity of views expressed on the topic in this volume (e.g., Dumond, Davis and Knecht, Slaughter, Steffian and Saltonstall) and elsewhere (e.g., Maschner and Jordan 2001) demonstrates.

Until recently, discussions of pre-Thule relationships between the Eastern Arctic and Alaska relied almost exclusively on lines of evidence drawn from tool technology and morphology. The revolution brought about by the increasingly routine practice of extracting, amplifying, and comparing ancient DNA has added an important new area of inquiry. In this regard, one recently published study indicates that late ASTt (Dorset culture) skeletal remains from Southampton Island in the Eastern Canadian Arctic have their closest genetic relationships not to Neoeskimo Thule people who migrated east from Alaska, but to the Aleuts found at the opposite end of the Arctic Small Tool world (Hayes et al. 2003, 2005; O'Rourke 2005). While it is clear that additional research is required to resolve the question of how much *cultural* influence the ASTt people had on the Aleutian Islanders, the research reported by Hayes et al. suggests that the *biological* relationship between ASTt and Aleut populations is much closer than we suspected. While sample size continues to be a concern in such studies, these results are intriguing. Unfortunately, as of this writing, comparable genetic data on the human remains from the frozen Saqqaq site Qeqertasussuk, in West Greenland, have not been published, and no ASTt human remains have been reported in Alaska.

There is also a great deal that we don't yet know about Denbigh subsistence and settlement patterns. Suggestions that Denbigh people were on the coast in the summer but headed into the interior during colder months (e.g., Anderson 1988 and this volume; Giddings 1964) are both plausible and consistent with the ethnographically documented movement of groups living along the middle and upper Noatak River (Burch 1980, 1998). However, there is little in the way of actual archaeological evidence to support or refute this interpretation. Denbigh faunal remains, which might provide more direct evidence of site seasonality, are rare at most sites, both on the coast and in the interior. In their absence, it seems reasonable to invoke ethnographic analogy, but this form of archaeological explanation risks obscuring both variation and ingenuity in ancient human land use. If we look at how sites are located with respect to local and regional ecology and, in particular, in relation to seasonally variable availability of prey species, the picture becomes more nuanced. In the Brooks Range, for example, the Hicks Site (Odess 2003) and other sites in the vicinity of Primus Creek would provide their occupants access to abundant ground squirrels while awaiting the caribou that today arrive in late summer. Similarly, the Denbigh site at Punyik Point on Etivlik Lake (Irving 1964; Kunz, this volume) contains abundant but highly fragmented caribou bone and affords its occupants access to a reliable and predictable resource (fish, particularly lake trout) while awaiting the protein pulse of the August caribou migration. Whether people then remained in the vicinity of those sites throughout the winter is an open question. However, it is difficult to imagine them doing so without the ability to store a considerable quantity of food and, to date, caches have not been reported at Denbigh sites. Elsewhere in the Brooks Range, at Imaigenik, a site located in a dune complex near Anaktuvuk Pass, Irving (1953) reports abundant bone in association with Denbigh lithic material. Examination of bones from that site housed at the University of Alaska Museum confirms that they are caribou, but the lack of field notes with the collection precludes associating the faunal remains and the stone tools from the site with complete certainty.

The picture of ASTt subsistence and settlement patterns that is beginning to emerge is one of flexible systems in which land use is closely tied to local rather than regional ecology. ASTt people are often referred to as Palaeoeskimos because they were the first to adapt to year-round life on the arctic coast, including the frozen oceans of the far north (Odess 2005). Given the evidence in late ASTt sites in Canada (i.e., those of the early Dorset culture) for the use of snow knives to construct houses from blocks of snow (presumably out on the sea ice), I am inclined to wonder when this practice began, and whether Denbigh people in Alaska might have spent part of the year living out on the ice. Ice conditions in historic times have been such that Alaskan Eskimos did not do so, but perhaps we should entertain the idea that conditions were sufficiently different four thousand years ago to make such an adaptation possible or even advantageous. Indeed, if early ASTt people in Alaska were already familiar with life on the frozen ocean, that fact would go some distance to explaining the apparent rapidity with which they colonized the Canadian Arctic archipelago and Greenland.

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Tools but not Toolkits: Traces of the Arctic Small Tool Tradition in the Kodiak Archipelago

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Abstract: Archaeological data indicate that the prehistoric foragers of the Kodiak Archipelago had deep and enduring connections with societies of the Alaskan mainland. From trade to intermarriage, islanders maintained ties with their neighbors that reflect patterns of economic and social organization. This paper explores interregional interaction during Kodiak's Early Kachemak phase (4000 to 2700 BP), a period that coincides with Arctic Small Tool tradition (ASTt) occupations on the adjacent Alaska and Kenai peninsulas. Although this far southern corner of the Esk–Aleut world was not colonized by bearers of the ASTt, exotic raw materials and ASTt-type tools in Kodiak's Early Kachemak assemblages provide evidence of interaction across the Shelikof Strait.

Key Words: Early Kachemak phase, economic intensification, raw material sourcing, Kodiak Archipelago, Alutiiq people

INTRODUCTION

The spread of foraging societies across the North American Arctic roughly 4200 years ago is one of the most intriguing events in arctic prehistory. The ability of human societies to rapidly colonize this vast, ecologically varied landscape implies an enormously flexible cultural system, capable of remarkable economic adaptation. Bearers of the Arctic Small Tool tradition (ASTt) were the first to colonize the far north, inhabiting all areas of the North American and Greenlandic Arctic that would ever be peopled (Damas 1984:2; Dumond 1984:74).

While the dramatic eastward migration of ASTt foragers is well documented, the southern terminus of their movement, in southwest Alaska, is less understood. Although archaeologists have identified evidence of ASTt occupations on the central Alaska Peninsula (Dumond 1981; Harritt 1988; Henn 1978) and the southern Kenai Peninsula (Workman and Zollars 2002), researchers continue to debate the extent of ASTt occupations along the North Pacific Coast (Dumond 2001:292–298). ASTt-like tools occur repeatedly in adjacent areas, forcing researchers to consider broader connections with this pervasive culture. Did the remarkably versatile foragers of the ASTt spread into gulf coast environments to occupy places like Kodiak and the Aleutian Islands, or are signs of the ASTt among the populous, maritime societies of south-central Alaska an indication of interaction between highly mobile cultures (Dumond 2001:298; Hausler 1993:17, Workman and Zollars 2002)?

Part of the difficulty in discerning the spatial extent of ASTt occupations is the limited quantity of archaeological data from the fourth millennium BP. This pattern is changing, however, as researchers become more adept at locating sites and new data fill gaps in local chronologies. Recent excavations in the eastern Aleutian Islands (Knecht, Davis, and Carver 2001), the southern Alaska Peninsula (Maschner and Jordan 2001), and the Kodiak region (Steffian, Pontti, and Saltonstall 1998; Steffian, Eufemio, and Saltonstall 2002) have unearthed substantial archaeological samples from the middle Holocene. These finds have renewed interest in the relationships between North Pacific foragers and bearers of the ASTt and their implications for the evolution of later societies (Hausler 1993:17; Workman and Zollars 2002).

This paper summarizes new data from the very late Ocean Bay II and Early Kachemak phases in the Kodiak Archipelago—a period that extends from about 4400 to 2700 years BP and overlaps the ASTt elsewhere in Alaska. To investigate the links between the ASTt and Kodiak's societies, we first consider evidence for the structure of Kodiak societies three to four thousand years ago based on recent excavations in the Chiniak Bay region (Saltonstall, Kopperl, and Steffian 2001; Steffian, Pontti, and Saltonstall 1998; Steffian and Saltonstall 2003). How were these societies organized and what connections might they have had to the Alaskan mainland? This discussion is followed by a review of patterns in the frequency, distribution, and use of non-local materials and possible ASTt artifacts in Kodiak assemblages.

These data indicate strong cultural continuity in the Kodiak region. Early Kachemak societies appear to grow seamlessly from the preceding Ocean Bay tradition, and to reflect an intensification of fishing and storage practices. Within this economy, exchange with the Alaskan mainland was a consistent activity, as it was throughout Kodiak's human history. Non-local materials and tools of distant manufacture occur repeatedly in small quantities throughout Kodiak's Early Kachemak assemblages. Thus, although it is tempting to interpret ASTt-type tools on Kodiak as a sign of occupation, a broader view of the archaeological data indicates that this southern corner of the Esk–Aleut world lay beyond significant ASTt influence. While ASTt materials may have made their way to Kodiak via long-distance trade, ASTt foragers do not appear to have colonized the region or substantially altered the course of local cultural development (Clark 1997:83; Dumond 1998:195).

ESKIMO SOCIETIES IN THE GULF OF ALASKA

The Kodiak Archipelago lies in the central Gulf of Alaska, south of the Kenai Peninsula and east of the Alaska Peninsula (Fig. 1). Formed by the collision of tectonic plates, sculpted by glacial ice, and inundated with ocean water, the archipelago is a mountainous island chain with deeply incised coastal fjords. No inland area is more than twenty-nine kilometers (18 miles) from the ocean (Capps 1937:120).

The region's complex coastline provides habitat for an abundance of marine life and opportunities for maritime foraging. This land has been home to the Alutiiq people for millennia. From a cultural perspective, the Kodiak region lies at the heart of the Alutiiq world, an area that includes Prince William Sound, the lower Kenai Peninsula, and the Alaska Peninsula. Anthropologists consider the Alutiiq people to be Eskimo. Sug'stun, their language, is a member of the Esk–Aleut language family. Moreover, Alutiiq people share many cultural and biological ties with their Yup'ik neighbors to the west, from the use of sod houses, skin boats, oil lamps, and waterproof gutskin clothing, to a bilateral kinship system and origin stories common to Inuit peoples (Crowell and Lührmann 2001:25; Lantis 1938:163; Mishler 2003:102; Scott 1991:48). Thus, the Alutiiq homeland in the relatively warm, rainy environments of the North Pacific represents the southern limit of the world's Eskimo societies.

Despite the apparent Eskimo roots of Alutiiq culture, the origins of Alutiiq societies and their ties to other coastal peoples remain a topic of great debate. Anthropologists also note many connections between Alutiiq and neighboring North Pacific societies. From wood-working tools to weaving techniques, and from ranked social systems to the importance of bird iconography and raven stories (Black 1994; Crowell and Lührmann 2001:29; Lantis 1938:128; Lee 1981; Townsend 1980), the Alutiiq people share many practices with the Aleut and Tlingit. To many, these similarities indicate ancestral ties beyond the Eskimo world. It is not surprising, therefore, that anthropologists have long searched for northern connections in their attempts to explain Alutiiq ethnogenesis (Clark 1992; Dumond 1988).

As archaeological data from the central gulf accumulate, however, they provide a picture of cultural continuity. Despite notable environmental variation across the Alutiiq homeland, and attendant diversity in economic practices and technologies, each major prehistoric cultural tradition is represented in each area—beginning with the early mobile foragers of the Ocean Bay tradition, and moving through the seasonally sedentary village communities of the Kachemak phase to the ranked societies of the Koniag phase. From earliest occupation, the distribution of prehistoric cultures mimics the historic distribution of Alutiiq people (cf. Clark 1997:84; Hausler 1993:10) illustrating a broadly unified evolutionary trajectory. This pattern not only indicates enduring cultural ties across the major bodies of water that dissect the central Gulf of Alaska, but suggests a persistent population. Although not every area was continuously or heavily occupied (Clark 1997:69; Workman and Zollars 2003:46; Yarborough and Yarborough 1998:138), the region's prehistoric population was substantial enough to generate a continuous sequence of cultural development for over 7500 years.

A major exception to this pattern of continuity is the Arctic Small Tool tradition (ASTt). Between 4440 and 3805 cal BP, people bearing a distinctive chipped stone toolkit camped on the shores of Kachemak Bay (Workman and Zollars 2002:40–42). Evidence of their activities is preserved in small bipointed and stemmed projectile points, gravers, unifaces, one polished burin, and an array of debitage, manufactured largely from non-local materials and distributed around three small hearths at SEL-033 (Workman 1996:44). These materials bear striking resemblance to ASTt assemblages from northern Alaska and Canada, whose makers are widely believed to have contributed to the development of modern Inuit populations (Dumond 1984:74–75; 1998:194), and they have "little in common with late Ocean Bay a few centuries earlier

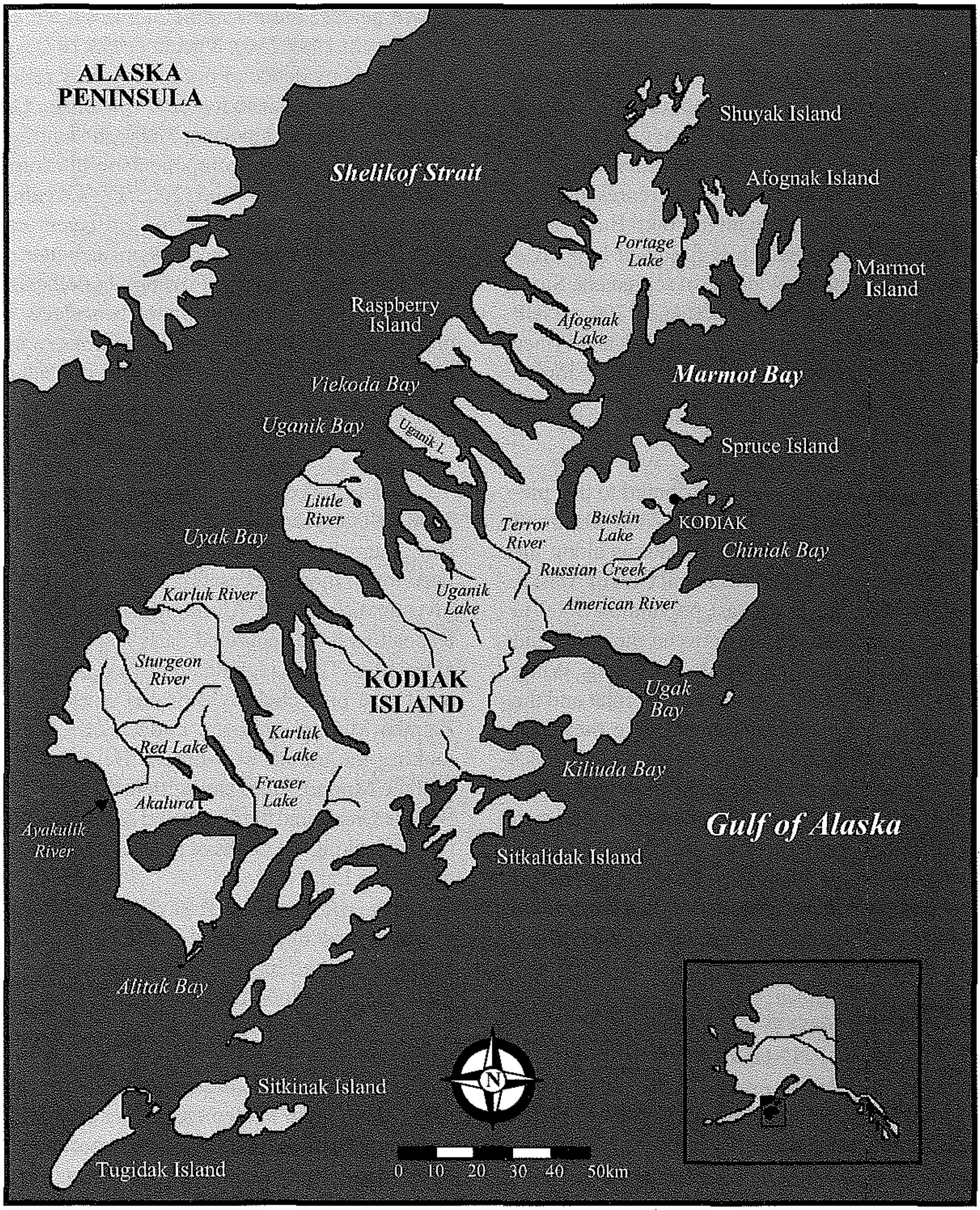


Figure 1. The Kodiak Archipelago.

or the early Kachemak tradition a millennium later" (Workman 1998:151). In Kachemak Bay, ASTt materials appear in a millennium-wide gap in the cultural sequence (Workman and Zollars 2002:46).

After about 3800 years ago, pervasive evidence of the ASTt appeared on the western Alaska Peninsula, on the periphery of the Alutiiq world (see Workman and Zollars 2002:40 for calibrated radiocarbon dates). On the banks of both the Ugashik and Brooks rivers, people of this tradition built small semi-subterranean sod houses and subsisted on salmon and caribou using tool assemblages characterized by bipointed endblades, sideblades, stemmed and shouldered projectile points, well-made scrapers, microblades, burins, and adzes. Here, this culture persisted for about 900 years before disappearing and precipitating a hiatus in occupation of the western Alaska Peninsula (Dumond 1998:194–195).

This southward expansion of the ASTt coincides with a time period when settlement of the central gulf coast appears spotty (Clark 1997:68–69). Despite strong continuities between Ocean Bay and succeeding Kachemak assemblages, sites spanning the transition between the two phases (ca. 3000 to 4000 cal BP) have been hard to locate. Almost thirteen centuries separate the known Ocean Bay and Early Kachemak occupations in Kachemak Bay (Workman 1998:151). Settlement of the Pacific coast of the Alaska Peninsula is represented by just a handful of sites affiliated with the Takli Birch phase (Dumond 1998:193–194), which is followed by a five-hundred-year period with no evidence of settlement. Similarly, sites dating between about 3800 and 2700 cal. BP have been consistently rare finds in the Kodiak and Prince William Sound regions (Fitzhugh 2003:173–174; Jordan and Knecht 1988:230; Yarborough and Yarborough 1998:138).

While sampling issues have contributed to this picture of limited settlement (Clark 1997:69; Dumond 1998:194), the presence of ASTt occupations along the periphery of the culturally cohesive central Gulf of Alaska, a possible decline in the gulf coast population 3000 to 4000 years ago, and connections between the ASTt and the development of Inuit societies are intriguing. While ASTt foragers inhabited the shores of Cook Inlet and the western slopes of the Aleutian Range, were they also exploring and settling adjacent regions, such as Kodiak? Did limited population densities provide opportunities for settlement? If so, what effect did interaction between coastal foragers and bearers of the ASTt have on the development of Alutiiq societies and their Eskimo roots? One way to approach these questions is to examine the organization of Kodiak societies, in the center of the region, during this time period.

NEW DATA FROM THE FOURTH MILLENNIUM BP

Archaeologists have studied Kodiak prehistory for more than seventy years, documenting over 1300 sites, recovering hundreds of thousands of artifacts, and publishing extensively on the region's prehistory. Until recently, however, the period between about 4200 and 3000 years BP, assigned to the Early Kachemak phase, remained poorly known. Although Clark's 1963 excavation of Old Kiavak, an Early Kachemak settlement in Kiavak Bay, helped to define Kodiak's long-standing cultural chronology (Clark 1966), additional sites from the Early Kachemak proved elusive (Clark 1997:69).

Jordan's multi-year survey of the Uyak Bay and Karluk River region of southwestern Kodiak Island yielded just three sites affiliated with the twenty centuries spanning the Ocean Bay II and the Early Kachemak, or two percent of his sample of 145 settlements (Jordan and Knecht 1988:230). Knecht (1995:107) suggests that this limited evidence of occupation may reflect a period of abandonment due to regional volcanism. On the opposite shore of the archipelago, Fitzhugh identified just three Early Kachemak site components in his comprehensive survey of Sitkalidak Island (2003:173). Again, these sites represent about two percent of settlement components, with both older and younger deposits better represented in the Sitkalidak sample. Fitzhugh hypothesizes that this decrease in occupational intensity reflects differential preservation of sites due to fluctuations in sea level or, alternatively, a regional redistribution of Kodiak's population due to changes in foraging patterns during the colder, wetter Neoglacial (Fitzhugh 2003:230).

While survey projects have located few sites in the 3000 to 4000-year-old range, recent excavations in Chiniak Bay, a large bay complex on northern Kodiak Island, have been much more successful. Since 1997, archaeological investigations by the Alutiiq Museum & Archaeological Repository have unearthed Early Kachemak components at six sites. These include: the Blisky site, a small settlement in a protected bight on the coast of Near Island; Zaimka Mound, a coastal midden on Cliff Point overlooking the mouth of Womens Bay; Bruhn Point and Salonie Mound, inner bay settlements near the mouth of Salonie Creek; and the Outlet and Array sites, inland settlements flanking the banks of the Buskin River at the outlet of Buskin Lake.

A review of published information (Clark 1997:79) and the Alaska Heritage Resources Survey (AHRS)—the state-maintained file of archaeological site information—suggests that there are at least seven additional Early Kachemak sites in the Chiniak Bay region (Table 1; Steffian, Pontti, and Saltonstall 1998:95). Like the excavated sites, these settlements occur in a variety of settings ranging from open coast to protected inner bay environments (Fig. 2). They are only absent in exposed outer coastal locations—a settlement trend generally shared with Ocean Bay and Kachemak-era sites across the archipelago (Fitzhugh 2003:194; Steffian n.d.). The occurrence of at least thirteen sites containing Early Kachemak deposits (some with multiple components, Steffian, Pontti, and Saltonstall 1998:43–46), in an area covering roughly forty-five square kilometers, suggests that people were not only present, but that their use of the region was extensive and enduring.

This impression is confirmed by a review of temporal settlement data from Chiniak Bay. Although the region has not been as fully or systematically surveyed as

Table 1. Characteristics of Early Kachemak sites in Chiniak Bay.

Site	Setting	Size (sq m)	Average Depth	EK Components	Assemblage Size
KOD-010 Kalsin Cove	Mid Bay	>750	ca. 100 cm	Unknown	NA
KOD-013 Zaimka Mound	Mid Bay	3,600	ca. 40 cm	>3	>1,963
KOD-016 Gibson Cove	Mid Bay	Unknown	Unknown	Unknown	NA
KOD-017 unnamed	Mid Bay	Unknown	Unknown	Unknown	NA
KOD-018 Ice House Lake	Protected Outer Coast	Unknown	Unknown	Unknown	NA
KOD-026 Monashka Bay	Mid Bay	Unknown	Unknown	Unknown	NA
KOD-210 Blisky	Protected Outer Coast	>325	ca. 30 cm	2	3,185
KOD-363 Rice Ridge	Protected Outer Coast	3,000	ca. 40 cm	1	NA
KOD-451 Salonie Mound	Inner Bay	1,000	ca. 22 cm	1	450
KOD-561 Array Site	Inland Riverine	Unknown	ca. 12 cm	1	>33
KOD-562 Outlet	Inland Riverine	1,600	ca. 40 cm	>1	299
KOD-909 Bruhn Point	Inner Bay	>500	ca. 5 cm	1	228
KOD-1053 Amak	Inner Bay	Unknown	ca. 20 cm	Unknown	NA

Sitkalidak Island or the Uyak Bay–Karluk River region, localized surveys (Clark 1965; Hrdlička 1944; Knecht 1991), proximity to the City of Kodiak, and the presence of a modern road system have resulted in the identification of many sites. To investigate regional settlement trends, we coded information on the known prehistoric archaeological sites for geographic setting and relative age for the area between Termination Point on the northwest coast of Monashka Bay to Cape Chiniak, which marks the far eastern edge of the bay. Site components were assigned to one of five cultural phases (Ocean Bay I, Ocean Bay II, Early Kachemak, Late Kachemak, and Koniag) based on temporally sensitive characteristics of surface features, site strata, and associated artifacts (cf. Clark 1997:65; Fitzhugh 2003:146–147; Steffian, Pontti, and Saltonstall 1998:57), and to one of five general settings (inland riverine, inner bay, mid-bay, protected outer bay, exposed outer coast). Historic sites were not included in the analysis.

There are sixty-eight known prehistoric sites in greater Chiniak Bay with a minimum of ninety temporally distinct components (Appendix A). Of these ninety components, twenty could not be assigned to a specific cultural phase. Table 2 summarizes the temporal distribution of the remaining seventy components (77.8 percent of the total sample). The results of this review suggest that Chiniak Bay was inhabited continuously and with increasing frequency throughout the prehistoric period. Unlike the results of previous studies, there is no decrease in occupational frequency during the Early Kachemak phase. The number of settlements rises in each phase, from eight in the Ocean Bay I phase to twenty-two in the Koniag.

Settlement counts are deceptive, however, as the cultural phases they represent are of varying duration. The Ocean Bay I phase, for example, spans twenty centuries, whereas the Koniag lasts just six centuries. To control for this bias, we divided the number of settlements by the number of centuries in each phase to produce a weighted site frequency value (Table 2). The resulting values indicate a near doubling of settlement frequency until the Koniag phase. Habitation of Chiniak Bay increased gradually through the Late Kachemak and then intensified significantly in the Koniag, a pattern observed elsewhere in the archipelago (Fitzhugh 2003:173; Saltonstall and Steffian 2003:51). While imperfect,[1] this data suggests the continued slow expansion of human groups through the Early Kachemak phase.

This broad picture of continuous prehistoric settlement is enhanced by a review of carbon dates from excavated sites in Chiniak Bay (Table 3). Deposits with Early Kachemak characteristics (strata, features, and artifacts; cf. Clark 1997) occur throughout the fourth millennium BP, from the terminus of the Ocean Bay II phase ca. 4300 before the present to the inception of the Late Kachemak after 2700 BP.[2] Although these dates come from just four sites, their two sigma calibrated ranges show no gap in the sequence (Fig. 3). At least in Chiniak Bay, Early Kachemak sites appear widely distributed across both time and space.

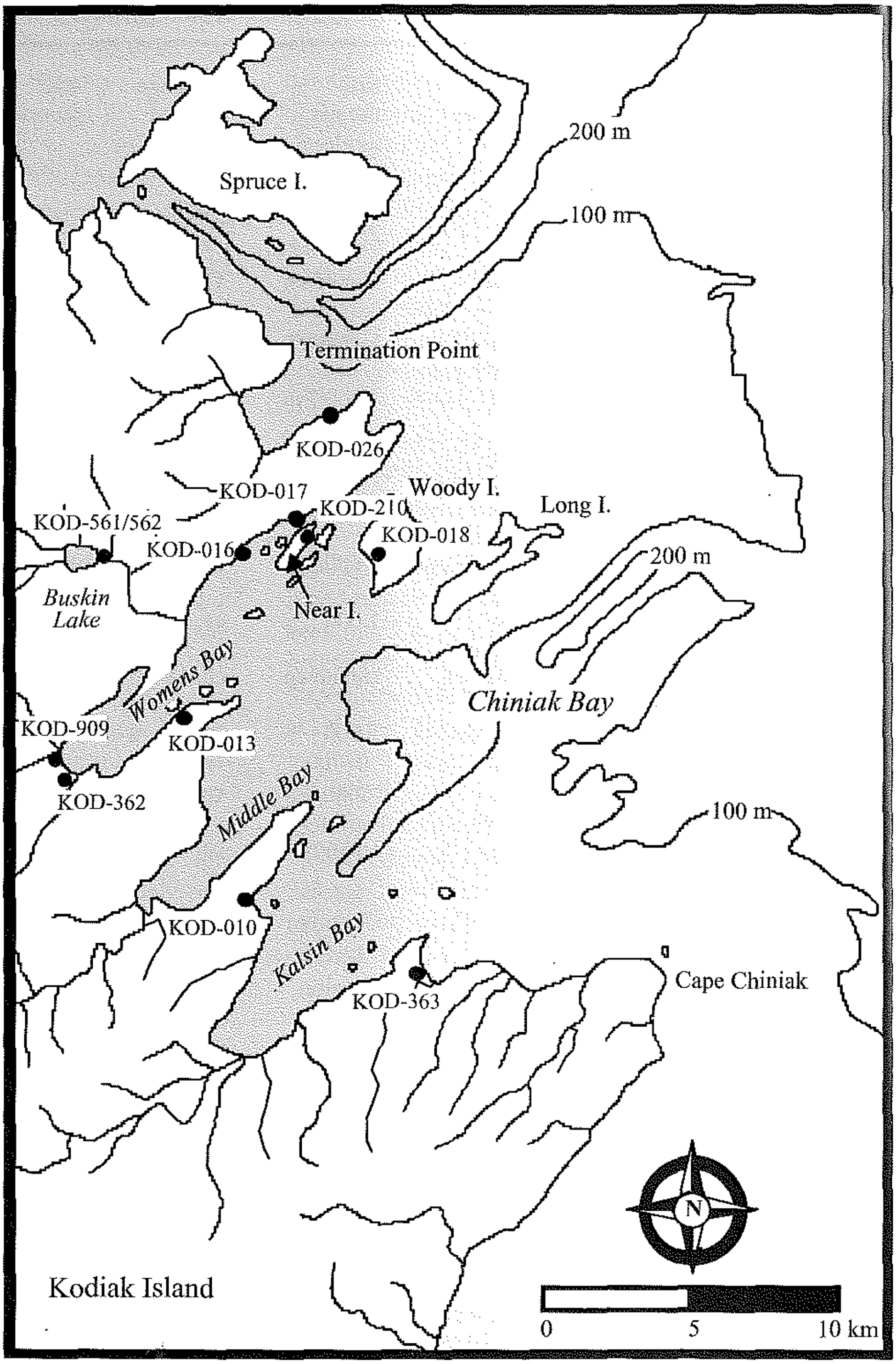


Figure 2. Early Kachemak settlements in Chiniak Bay.

Other archaeological evidence also suggests the presence of a substantial and enduring Early Kachemak population. First, Chiniak Bay's Early Kachemak settlements have large accumulations of debris. These are not ephemeral deposits indicative of passing or infrequent use of the region, but substantial middens suggesting extended stays and revisitation. Early Kachemak occupations are up to a meter thick with a minimum average thickness of a least twenty centimeters (see Table 1). Moreover, at least three of the

[1]We suspect that many of the sites with only surface information contain additional buried components. Eight of the eleven known Ocean Bay I and II components in Chiniak Bay were identified through subsurface testing or excavation. A contingency test of cultural phase (Koniag, Kachemak, or Ocean Bay) versus the method of component identification (surface or subsurface investigation) indicates that this pattern is statistically significant at the .05 level chosen for this study. Ocean Bay deposits occur with greater than expected frequency in the sample of components identified through subsurface inquiry (see also Fitzhugh 1996:214). Thus, the frequency of older deposits is underestimated in this study. Moreover, we note that it is likely that coastal erosion and resettlement have differentially impacted older sites (see Fitzhugh 2003:139–140), causing greater site attrition with age.

[2]The terminal date of the Ocean Bay II phase is unclear. While Clark (1997:82) postulates that the transition to Early Kachemak occurred about 3900 cal BP, the presence of black, charcoal-rich, rubble-filled midden deposits, fired gravels and pit features at Rice Ridge and Zaimka Mound suggest that this transition may be as much as 400 or 500 years earlier (see Table 3). For the purposes of this paper, we interpret levels 1 and 2 (stratum A according to Kopperl 2003:99) at Rice Ridge as Early Kachemak (Hausler, pers. comm. 2004).

Table 2. Prehistoric site frequencies in Chiniak Bay.

Phase	Temporal Span BP	# Centuries	# Components	% Components	Comp. per century
Ocean Bay I	7500 – 5500	20	8	11.4	.40
Ocean Bay II	5500 – 4000	15	6	8.5	.40
Early Kachemak	4000 – 2700	13	13	18.6	1.00
Late Kachemak	2700 – 800	19	21	30.0	1.11
Koniag	800 – 200	6	22	31.4	3.66
TOTAL	7500 – 200	73	70	100.0	

Note: BP (before present) = before AD 1950.

Table 3. Radiocarbon dates from Early Kachemak deposits in Chiniak Bay.

Site	Beta #	Provenience	RCYBP	Cal BP
Outlet	160046	Locus C: Pit	2650 ± 50	2849 (2755) 2743
Blisky	113164	HF1	2880 ± 120	3357 (2988, 2979, 2972) 2753
Blisky	113163	Level 1	3050 ± 60	3437 (3318, 3309, 3296, 3293, 3265) 3003
Outlet	145865	Locus B: Feature	3070 ± 70	3445 (3323, 3287, 3268) 3077
Outlet	145864	Locus A: L5 HF	3140 ± 60	3471 (3361) 3212
Zaimka	172028	Level 1, Pit D	3340 ± 70	3811 (3626, 3622, 3571) 3399
Zaimka	172027	HF1	3500 ± 80	3981 (3825, 3791, 3761, 3748, 3727) 3571
Rice Ridge	43135	Level 2	3850 ± 80	4508 (4244) 3989
Rice Ridge	43134	Level 2	3860 ± 90	4522 (4254) 3985
Zaimka	130190	Level 1	3890 ± 70	4519 (4350, 4327, 4299) 4092
Rice Ridge	171559	Level 2	3900 ± 70	4523 (4404, 4400, 4380, 4371, 4353, 4311, 4302) 4094

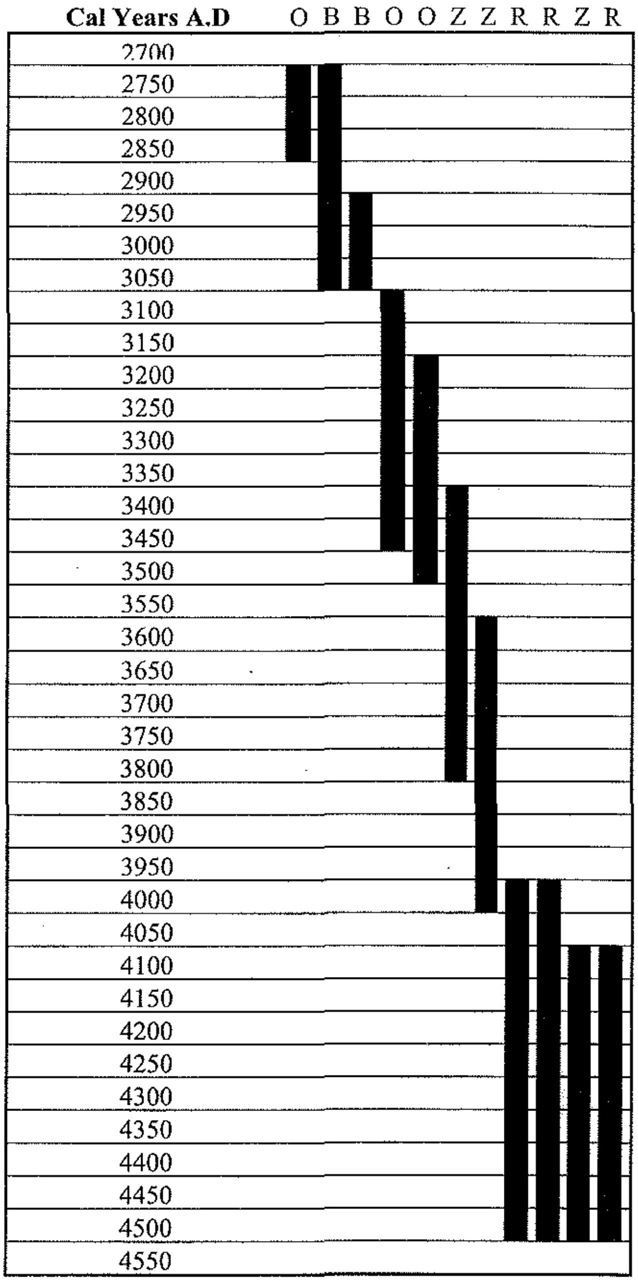
Notes: All dates were run on wood charcoal and calibrated by the authors using Calib 4.3 (see Stuiver and Reimer 1993). The resulting dates are presented as the two-sigma range of their calibrated intercepts.
Dates for the Rice Ridge site are from Kopperl 2003:117. Two of Kopperl's dates from Stratum A (Beta-171564) are not included here as Hausler, the site's excavator, suspects they are too old (pers. comm. 2004). The remaining dates were compiled from the Alutiiq Museum's files.

five excavated sites have more than one component. The Blisky site has two distinct Early Kachemak strata, one thirty centimeters thick, the other ranging from twelve to forty centimeters. The broad horizontal extent of deposits at the Outlet site and Zaimka Mound also suggests repeated use. At Outlet, Early Kachemak deposits follow the bank of the Buskin River for at least eighty meters, and at Zaimka Mound, they cover a horizontal area of roughly 3600 square meters. Both these sites have substantial, semi-subterranean features within their middens. At Zaimka Mound, these features appear at the top of the deposits, buried within the deposits, and excavated into underlying Ocean Bay II strata. Carbon dating indicates that this complex of structures formed as the result of revisitation rather than a single occupation, as their ages span a seven hundred year period from about 4300 to 3600 cal BP. Similarly, three Early Kachemak features spread along the Buskin River bank date to the six hundred year period between roughly 2750 and 3360 cal BP (Table 3, Figure 3).

Another indication of sustained settlement is the widespread construction of large permanent features, which are present at Blisky, Outlet, and Zaimka Mound and probably at Rice Ridge (Hausler, pers. comm. 2004).[3] Only the Array site, where excavators examined just six-

[3]At both Zaimka Mound and Rice Ridge, residents also used depressions created by older, underlying semi-subterranean features as pits.

Figure 3. Plot of radiocarbon dates from Early Kachemak deposits in Chiniak Bay.



Key: O = Outlet, B = Blisky, Z = Zaimka Mound, R= Rice Ridge
Notes: Dates are represented by their calibrated two-sigma range rounded to the nearest 50 years.

teen square meters of the site, failed to produce Early Kachemak features.[4] The remaining settlements contain at least three types of structures: dwellings, processing structures, and pits (Figs. 4, 5, and 6). Although their size and construction vary, all of these features are excavated into underlying deposits and most are substantial. A partially excavated house from the Blisky site is roughly 5.5 meters in diameter with a sod roof and up to thirty centimeters of floor deposit (Steffian, Pontti, and Saltonstall 1998:46–49). Similarly, a complete house from Zaimka Mound is 5 meters long by 3.5 meters wide with a sod roof, twenty centimeters of floor deposit and a slate slab hearth near the rear of the structure (Fig. 4).

The Outlet site also produced large (5 meters in diameter), oval, sod-roofed structures, but unlike the dwellings described above, these appear to be processing facilities. These structures were filled with charcoal and burned rock rubble and had large sub-floor pits and numerous postholes (Fig. 5). They lacked the centralized hearths characteristic of the dwellings identified at Blisky and Zaimka. We believe that the residents of this interior, riverside site were capturing salmon and drying or smoking them for later use in specialized structures. In essence, these structures functioned as smokehouses. Although over 150 cubic meters of excavation revealed only one formal processing structure at Zaimka Mound, the site's Early Kachemak layers are riddled with pits that range from sixty centimeters to 3.6 meters across, and from twenty-three to forty-three centimeters deep. These features are typically lined with large gravel and then filled with burned rock rubble and black soil (Fig. 6). Whatever their function, the construction of permanent facilities required a substantial investment of labor and materials. This suggests that site residents were not casual visitors, but people who devoted a portion of their annual round to inhabiting these locations and who intended to return.

Support for the idea that Early Kachemak foragers were processing quantities of food for storage also comes from the character of site deposits. Like the structure floors at the Outlet site, middens of this phase look like the contents of a heavily used firepit. Although carbonized wood is difficult to recover, the soil is charcoal-black and full of burned slate and gravel (Clark 1997:70), suggesting that the deposits accumulated as the result of extensive burning and dumping. Again, we believe that this reflects the use of fire (heat and/or smoke) to dehydrate animal flesh for storage.

Although meaningful quantities of faunal data are lacking to test this hypothesis, there is growing evidence that fish remains are significantly associated with Early Kachemak pits and middens. Profiles from the 1988 excavation of Rice Ridge (Hausler 1988) show lenses of compressed fishbone and thin shell bands within the loose black rubbles in the site's uppermost levels (see also Kopperl 2003:119). Similarly, a pit feature, exposed in an

[4]Features at the Blisky, Outlet, and Zaimka Mound sites were all revealed through larger excavations that uncovered broad horizontal areas of each settlement. Moreover, the Early Kachemak stratum at the Array site has been truncated in places by massive disturbance in the historic period.

Figure 4. Complete house from Zaimka Mound

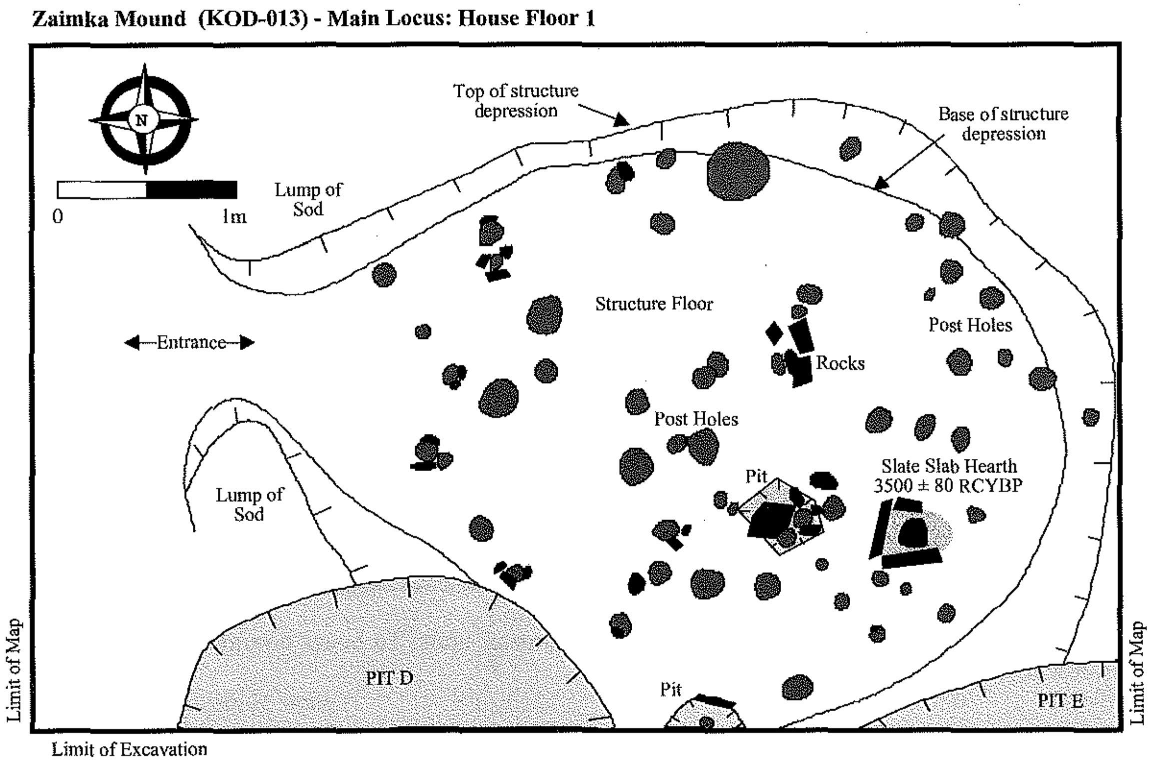


Figure 5. Processing structure from the Outlet site

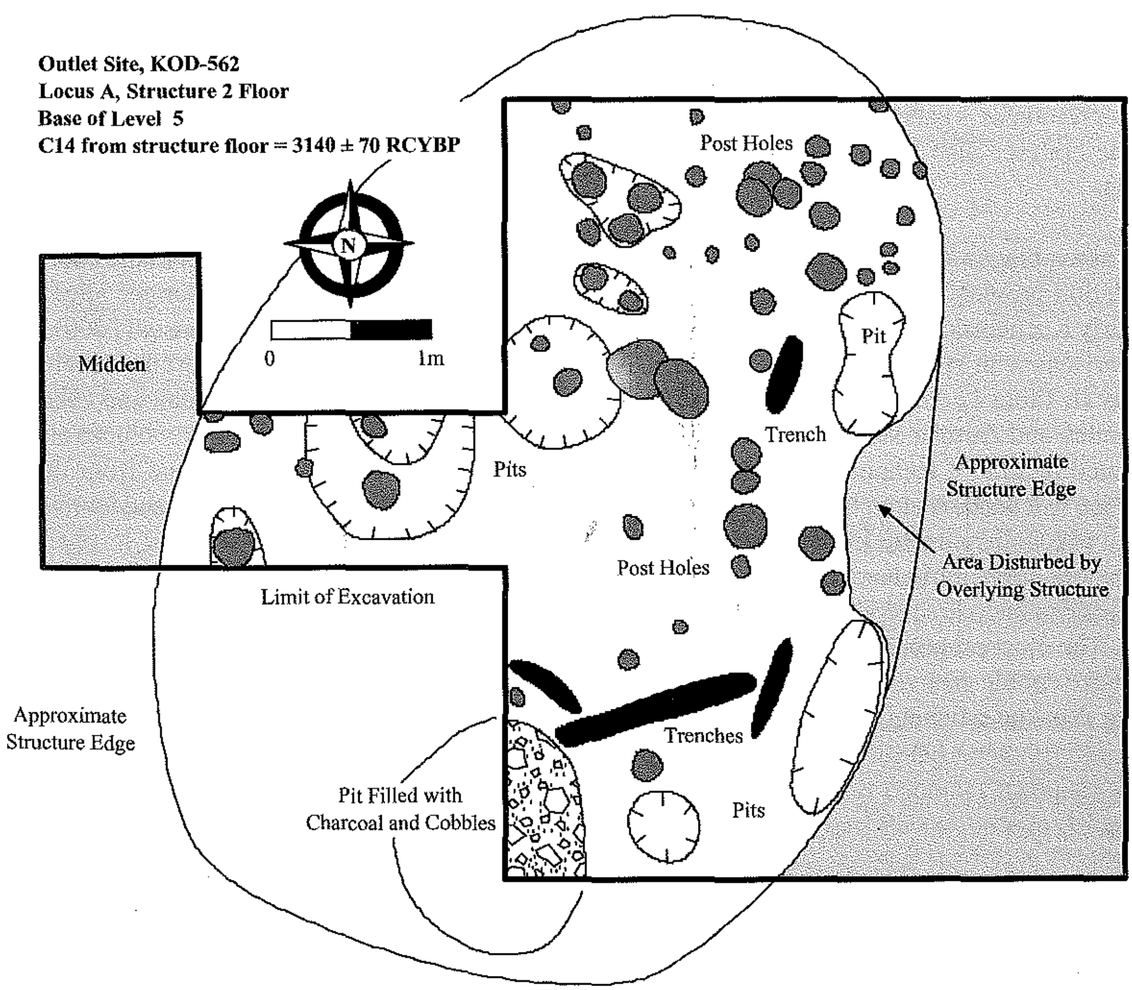
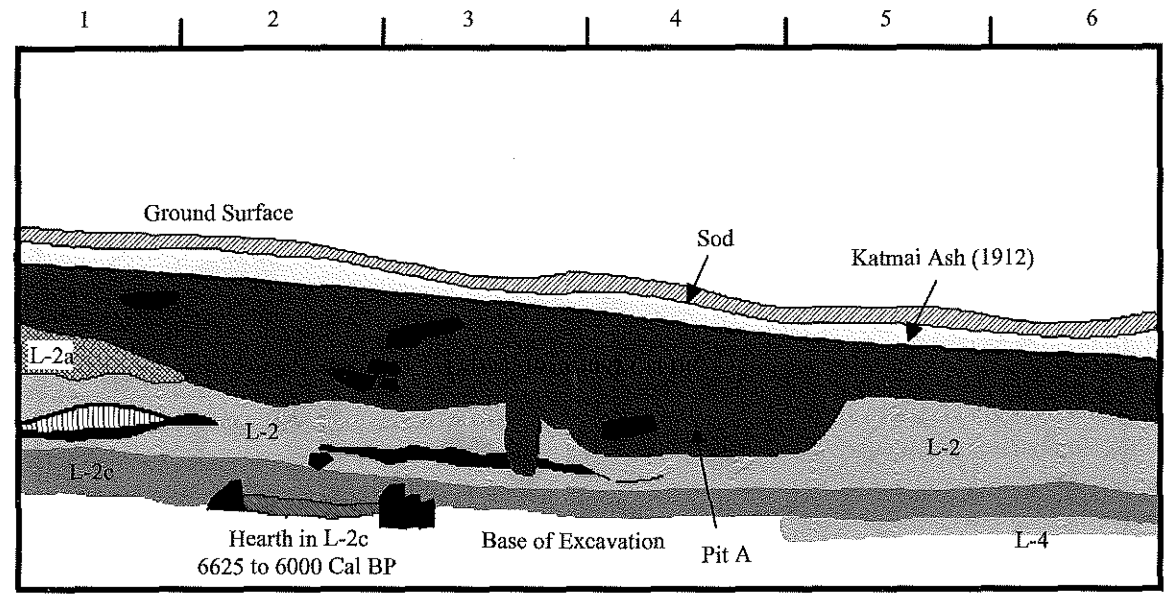


Figure 6. Early Kachemak pit feature in profile at Zaimka Mound (south wall of main excavation, 1998).



Notes: Squares marked on the horizontal axis are one-meter units. To better portray stratigraphic details, the vertical scale is twice the horizontal.

erosion profile at the Horseshoe Cove site on Uganik Island (KOD-415) and dated between 3467 and 3077 cal BP (Hedman 2003), holds well-preserved fish remains beneath a thick deposit of black soil and rubble. Moreover, Kopperl (2003:167) shows relatively greater abundance of fish in the uppermost stratum at Rice Ridge, suggesting that fish were gaining economic importance relative to other resources, a pattern that continues through the prehistoric era (see also Saltonstall, Kopperl, and Steffian 2001).

Artifact assemblages also enrich the picture of focused exploitation provided by site features and strata. Patterns in Early Kachemak toolkits are particularly evident in comparisons with assemblages from the preceding Ocean Bay II. Table 4 combines tools by phase from the Blisky, Outlet, and Zaimka Mound sites to provide a broad, integrated picture of technology in each phase.[5] Although the Early Kachemak and Ocean Bay II assemblages share a preponderance tool types, there are two notable differences. First, Early Kachemak stone tool assemblages expand to include several new fishing and processing tools. The most prominent of these is the plummet, a greywacke cobble grooved on one end to create a line weight for deepwater fishing (Clark 1997:39) that is a strong temporal diagnostic of this phase.[6] Other additions are mauls made from large greywacke cobbles, which may have been used to build weirs (Clark 1997:76–77), and ulu-shaped scrapers (Clark 1997:46) made from roughly flaked greywacke or coarse slate.

Second, fishing and processing tools that occur infrequently in Ocean Bay II contexts become common in the Early Kachemak phase. These include notched pebbles, which were presumably used as weights for the bottoms of fishing nets (cf. Knecht 1995). Although notched pebbles are not present in the enormous quantities associated with some younger sites (Jordan and Knecht 1988; Steffian and Saltonstall 2000), they are relatively common finds that suggest the development of net fishing (Clark 1997:77; Workman and Clark 1979:263). Our sample of Early Kachemak includes eleven notched pebbles from the Outlet site, one from the Array site, twenty-nine from Zaimka Mound, and four from the Blisky site. These sinkers occur adjacent to open water (e.g., Zaimka and Blisky [Steffian, Pontti, and Saltonstall 1998:64]), at river mouths (Old Kiavak [Clark 1997:39]; AFG-088 [Workman and Clark 1979:260]), and in inland settings (Outlet and Array [Saltonstall, Kopperl, and Steffian 2001]), suggesting that they were used for both riverine and marine fishing.

[5]The assemblage statistics present in this paper do not include a small number of Early Kachemak tools from the 2004 excavation of Zaimka Mound, as the authors collected these materials while this paper was in preparation for publication.

[6]We believe the presence of plummets in the Ocean Bay II deposits at Zaimka Mound reflects stratigraphic mixing at this large, complex site. Extensive construction, including the digging of pits, house foundations, and numerous postholes into older underlying strata have moved some material out of stratigraphic position. This mixing is also evidenced by the presence of a small amount of microblade technology, characteristic of the Ocean Bay I phase (Steffian, Eufemio, and Saltonstall 2002), in every level of the site.

Table 4. Comparison of Early Kachemak & Ocean Bay II assemblages from Chiniak Bay.

INDUSTRY	ALL EK	%EK	ALL OB	%OB
CHIPPED STONE				
bifaces	76	4.0	19	4.3
projectile points	16	0.8	14	3.2
scrapers	25	1.3	1	0.2
retouched and used flakes	146	7.7	74	16.9
burins	1	0.1	0	0.0
piecès esquillées	1	0.1	2	0.5
GROUNDSTONE				
adzes	10	0.5	3	0.7
bayonets	32	1.7	57	13.0
double-edged knives	3	0.2	5	1.1
projectile points	67	3.5	21	4.8
ulus	208	10.9	27	6.2
COBBLE TOOLS				
abraders	41	2.2	15	3.4
ball	18	0.9	0	0.0
burnishing stone	1	0.1	0	0.0
cobble spalls	942	49.4	131	30.0
grinding stones	6	0.3	7	1.6
grooved cobbles	2	0.1	1	0.2
hammerstones	133	7.0	36	8.2
hones	4	0.2	0	0.0
lamps	6	0.3	2	0.5
mauls	2	0.1	0	0.0
notched cobbles	44	2.3	2	0.5
plummets	25	1.3	2	0.5
U-shaped abraders	70	3.7	4	0.9
ulu-shaped scrapers	5	0.3	1	0.2
whetstones	21	1.1	13	3.0
TOTALS	1905	100.0	437	100.0

Note: Tool classes include preforms and miniatures.

Ulus also become more common in Early Kachemak assemblages. Although present in modest numbers (Clark 1997:76), they are accompanied by a variety of ulu-like tools—trimmed slate and greywacke pieces that resemble ulus (cf. Clark 1997:47–48; Workman and Clark 1979:261-262). As such, Early Kachemak assemblages contain larger relative quantities of processing tools (Clark 1997:46–47), particularly cobble spalls. These thick cortical flakes struck from Kodiak's ubiquitous greywacke beach cobbles were presumably used as expedient cutting and scraping tools.

A close look at Table 4 illustrates this trend. While processing tools (scrapers, retouched and utilized flakes, double-edged knives, ulus, cobble spalls, and ulu-shaped scrapers) make up 54.7% of the combined Ocean Bay assemblage from the Blisky, Outlet, and Zaimka Mound sites, these same tools account for two-thirds (69.8 percent) of the combined Early Kachemak sample. Similarly, the frequency of fishing weights (plummets, grooved cobbles, and notched cobbles) increases from just 1.1 percent in the Ocean Bay sample to 3.7 percent in the Early Kachemak sample.

The use of new fishing and processing tools is also evident in the Rice Ridge assemblage, with different but functionally equivalent artifacts. Although plummets and ulus are not found in this upper stratum, Hausler reports (pers. comm. 2004) that Level 2 produced large, flat, longitudinally grooved cobbles and a variety of large, handled, double-edged, ground slate knives not characteristic of older strata. As Rice Ridge Level 2 appears to be the oldest Early Kachemak deposit identified to date, these tools may be precursors of the plummets and ulus that become common a few centuries later. Additional samples from the period between 4500 and 4000 BP are needed to clarifier such technological changes.

In sum, although there are just a handful of truly new harvesting and processing tools, these new implements combined with the increased frequency of existing tools, the creation of processing facilities, evidence of extensive burning, and faunal data hinting at the increased importance of fish, suggest a qualitative change in economic activity.

Archaeological data from Chiniak Bay reveal a new picture of the Early Kachemak phase. They suggest that the archipelago was not minimally occupied. At least in Chiniak Bay, deposits spanning the fourth millennium BP are not rare, but widely distributed across the landscape. It now appears that the Early Kachemak enigma represents a sampling problem rather than a true absence of occupation. Part of the problem may be in identifying Early Kachemak sites. As these deposits are often poorly preserved, partially eroded, and contain artifacts common to later phases (e.g., ulus, net sinkers, cobble spalls, and red chert debitage), it is easy to misclassify Early Kachemak deposits as examples of Late Kachemak or even Koniag settlement. Still other sites with Early Kachemak dates and characteristics have been assigned to the Ocean Bay II (Nowak 1979:27). This confusion simply underscores the continuities in the region's prehistoric record and the inherent difficulties in splitting a continuous evolutionary sequence into discrete cultural units.

This perspective is further confirmed by continuities in land-use patterns, settlement locale, and long-distance exchange across the Ocean Bay II / Early Kachemak transition (Steffian and Saltonstall 2003). The Early Kachemak deposits at Blisky, Zaimkas and Outlet are all underlain by Ocean Bay II deposits, and although there are clear changes in the archaeological record across the late centuries of the fourth millennium BP, evidence of continuity is pervasive. An analysis of the Ocean Bay to Kachemak transition is beyond the scope of this paper. However, we agree fully with Clark (1997:84) that the Kachemak tradition developed out of Ocean Bay and add that the major changes across this transition appear locally derived and economic (Steffian and Saltonstall 2003).

Specifically, data from Chiniak Bay indicate that Early Kachemak foragers were processing animal flesh in quantity. The construction of specialized processing structures on the banks of the salmon-rich Buskin River, the adoption of new types of heavy line weights (Clark 1997:64), and an increase in the production of sinkers (Clark 1997:77), suggest that fish were their target. Thus, rather than a period of decreased settlement, the Early Kachemak now appears to have been a phase of increasing localization and of focused and intensified harvesting of fish for storage that emerged from the preceding Ocean Bay II phase. As such, Fitzhugh's (2003:230) hypothesis that the prehistoric population reorganized in relationship to the spatial distribution of subsistence resources seems likely. Unlike the Kenai Peninsula in the early fourth millennium BP, it appears that there was no settlement hiatus on Kodiak, or even a period of markedly reduced population.

CONNECTIONS WITH THE MAINLAND

While Kodiak's Early Kachemak foragers were focusing increasingly on the localized exploitation of fish, they were also maintaining ties with the mainland. This interaction is indicated by the presence of raw materials from sources beyond Kodiak (Clark 1997: 38, 48, 50; Workman and Clark 1979:274) as well as stylistically distinct, ASTt-like tools (Clark 1997:83; Hausler 1993:16–17; Knecht, Davis, and Carver 2001:58; Nowak 1979:figure 11). To characterize this interaction and evaluate the relationship between the southern Alaskan ASTt and Kodiak's cultural history, we examine patterns in the frequency, use, and distribution of both non-local materials and tools of potential ASTt manufacture. Throughout this study, we accept other researchers' assignment of assemblages from beyond Kodiak to the ASTt. Although a careful evaluation of the southern ASTt, its genesis, organization, and relationships to northern cultures is needed, these issues are beyond the scope of this paper. This paper aims to characterize economic organization and social interaction in the Kodiak Archipelago three to four thousand years ago independently of the issues surrounding the fuller definition of the southern ASTt.

Use of Non-local Materials

Kodiak's distinct biological and geological setting, the availability of alternative resources on the Alaskan mainland,[7] and the use of boats by foragers of all phases (Clark 1966:369; Steffian, Eufemio, and Saltonstall 2002:6) both facilitated and encouraged exchange. Archaeological and ethnographic data illustrate that Kodiak Islanders have long sought high-quality chippable stone (Fitzhugh 2001:150–151; Holmberg 1985:51; Merck 1980:106), land mammal products (Davydov 1977:4, 22, 27–28; Black 1977:92, 98; Holmberg 1985:39; Lisianskii 1968:207; Merck 1980:205; Kopperl 2003:133, 135; Shelikhov 1981:54, 77; Steffian 1992:126), plant materials (Davydov 1977:4; Lisianskii 1968:181; Merck 1980:102; Shelikhov 1981:54), and exotic materials such as ivory, coal and dentalium shell (Holmberg 1985:37; 45; Steffian 1992; Steffian and Saltonstall 2000) from neighboring mainland societies.

Importantly, as Kodiak's geological and biological histories differ markedly from those of the surrounding mainland, archaeologists can determine the general origin of most of the materials used to manufacture artifacts. Due to Kodiak's position on the subducting edge of the Pacific tectonic plate, its sedimentary and metamorphic rocks are distinct from the volcanic and sedimentary rocks found on the adjacent, volcanically active margin of the North American plate, part of which forms the Alaska Peninsula (Connelly 1978; Jacob 1986:150; Plafker, Moore, and Winkler 1994; Silberling 1994). Moreover, the fact that the archipelago has only five indigenous land mammals (Rausch 1969),[8] makes it possible to identify organic material from off-island sources (cf. Steffian 1992).

Despite the unique distribution of materials on Kodiak and adjacent areas of the Alaskan mainland, raw material studies must focus on the broad regional origins of materials and not on their precise source. For most inorganic materials, scientists have yet to locate quarry sites or to match the petrographic signatures of artifacts with specific outcrops.[9] As such, the patterns presented below provide only a general view of the movement of raw materials during the Early Kachemak phase. Further studies will undoubtedly refine these observations (see also Fitzhugh 2004).

As none of the four Early Kachemak assemblages included in this study contains organic artifacts, raw material analysis focused on stone objects. To investigate patterns of interregional interaction, we identified the material used to manufacture each artifact based on a comprehensive raw material inventory (Appendix B) developed from published sources and the Alutiiq Museum's prehistoric collections, and refined these identifications using thin sections (Steffian, Pontti, and Saltonstall 1998:80). Objects were then coded as being made of a local or non-local material. Throughout this study, we assumed that each raw material came from its closest source and that non-local materials (with the exception of pumice; see below) were transported to sites by people rather than by natural forces. Pumice, which originates on the Alaska Peninsula, floats. This material is commonly transported to Kodiak by wind and waves, and as such, we considered it locally available. Additionally, although there are a variety of brightly colored cherts in the assemblages (see Steffian, Pontti, and Saltonstall 1998:150–151), the color of chert can vary widely across a single outcrop and, as little is known about the chert sources on the Alaska and Kenai peninsulas, we combined all of these materials into one exotic chert type. Thus, this analysis tends to under represent the number and variety of non-local materials. Despite this bias, broad patterns in the use of raw materials are evident.

There are twenty-six raw material types in the Early Kachemak assemblages from Chiniak Bay: nineteen local, six non-local, and one from an unknown source (Table 5). Table 6 outlines the distribution of these materials in each assemblage and illustrates five patterns. First, although the variety of material types in each assemblage correlates with the size of the assemblage (large assemblages have more material types), multiple non-local material types are present in all but the very small assemblage from the Array site (Table 6). These materials account for a relatively consistent percentage of the total number of material types (from 22.7 to 27.3 percent). Thus, non-local materials do not simply represent the reduction of a single piece of exotic stone, but reflect use of a variety of materials from different distant sources.

Second, although tool assemblages are dominated by objects made of local stone, tools made of non-local materials are consistently present. They occur repeatedly in small quantities (from 1.4 to 6.7 percent of all raw materials). They are an infrequent but consistent part of Early Kachemak assemblages.

[7]48 km separate Kodiak from the Alaska Peninsula to the west.
[8]Our raw material-source model assumes that Kodiak's terrestrial fauna in the Early Kachemak phase mirrored the fauna documented at the time of Russian contact, but see Fitzhugh (1996:177–178) for a discussion of the possibility that caribou were once indigenous to Kodiak.
[9]There are indications that the quarry concept may not be broadly applicable to Kodiak, where intensive glaciation redeposited chippable stone. For example, a recent analysis of early Ocean Bay microblade technology illustrates a preference for cobble blanks and suggests that foragers were opportunistically collecting raw material eroding from area streams and beaches (Steffian, Eufemio, and Saltonstall 2002:18–19). Moreover, as Clark notes (pers. comm. 2004) materials collected from beaches and streams may actually be better suited for tool production as high-energy contexts may break weak or flawed material.

Table 5. Inorganic raw materials from Early Kachemak assemblages.

LOCAL	NON-LOCAL	UNKNOWN
granite 2	basalt 1	granite 1
granite 3	basalt 2	
greywacke	chalcedony	
grey chert	exotic chert	
meta tuff 1	rhyolite	
meta tuff 2	scoria	
meta tuff 3		
meta tuff 4		
meta tuff 5		
ochre		
pumice		
quartz		
red chert		
sandstone		
schist		
siltstone		
slate		
tuff 1		
tuff 2		

Note: Ochre is not included in the raw material analyses presented here as it typically occurs as staining in the soil and not in quantifiable pieces. Ochre is present in the Early Kachemak assemblages from the Blisky, Outlet, and Zaimka Mound sites, but not in the very small sample from the Array site.

Table 6. Frequency of non-local materials in Early Kachemak assemblages.

Site / Component	Stone Artifacts	Material Types	Non-Local Materials	Artifact of Non-Local Material	% Artifacts of Non-local Materials
Array/ C1	31	4	1	1	3.2
Outlet/ C3	298	11	3	4	1.3
Blisky/ C1 & C2	3185	22	5	87	2.7
Zaimka/ C1	3330	20	5	66	2.0
All/Early Kachemak	6813	25	6	154	2.2

Note: Ochre samples are not included in the statistics presented above.

Third, non-local materials occur not just as finished tools, but as pieces of debitage and unmodified raw material.[10] Tables 7 and 8 summarize the artifacts of non-local material in the four assemblages. These tables illustrate that debitage, including cores, flakes and shatter, dominates, constituting from 50.0 to 87.3 percent of the non-local artifacts from each site, again with the exception of the small assemblage from the Array site. These data indicate that the non-local materials were not simply imported as finished tools, but were employed in the fabrication of some implements on Kodiak.

Fourth, among the three major artifact industries represented in Early Kachemak assemblages—chipped stone, ground stone and worked cobble—non-local materials occur with greater than expected frequency among

[10]Unworked pieces of scoria were coded as non-local raw material. No other type of non-local material occurs as an unworked piece.

Table 7. Artifacts of non-local materials in Early Kachemak assemblages.

Object	Array	Outlet	Blisky	Zaimka
DEBITAGE				
cores			7	3
flakes		2	48	43
shatter			18	
raw material			3	3
TOOLS				
projectile point			1	
biface			2	2
scraper			5	
flake tool	1			3
utilized flake		1	3	4
burin				1
abrader		1		7
TOTALS	1	4	87	66

Table 8. Distribution of non-local materials by artifact class.

Site / Component	Total Tools	Total Debitage	Tools of Non-local Material	Debitage of Non-local Material
Array/ C1	15	15	1 (6.7%)	0 (0.0%)
Outlet/ C3	131	167	2 (1.5%)	2 (1.2%)
Blisky/ C1 & C2	473	2673	11 (2.3%)	73 (2.7%)
Zaimka/ C1	1302	2010	18 (1.4%)	50 (2.5%)

Notes: Percentages are of artifact classes (tools or debitage), not the entire assemblage. Artifacts interpreted as pieces of raw material are not included in this table.

chipped stone artifacts and with less than expected frequency in artifacts reflecting stone grinding and cobble working. This is not surprising. Kodiak's hard black slate is the primary material used to produce groundstone tools. This material is both abundant and widely available in the archipelago and absent on the Alaska Peninsula. Historic sources hint that slate and projectiles made of this slate were commodities that Kodiak Islanders traded with their neighbors (Merck 1980:207). Although Kodiak foragers may have exported slate and slate tools (see Holland 2001:179), they had neither a reason nor an opportunity to import material for stone grinding. Similarly, cobbles suitable for a variety of heavy stone tools (e.g., hammerstones, grooved cobbles) are also ubiquitous, and there is no reason to import such materials.[11] The cobbles available on the mainland are no better suited to tool production than those available on Kodiak beaches.

In contrast with slate and cobbles, the cherts available on Kodiak are of poor to moderate quality (e.g., flawed, fractured, and thus harder to work, Fitzhugh 2001:150, 2004). Kodiak's prehistoric craftsmen typically chipped a variety of local cherts, siltstones, tuffs, and meta tuffs (Appendix B), particularly a widely available red radiolarian chert (Connelly and Moore 1979). Glassy cherts and volcanic stones such as basalt and obsidian were potentially valuable commodities worth obtaining and transporting (see also Fitzhugh 2004). This idea is sup-

[11]Abraders made of scoria cobbles from the Alaska Peninsula are the one exception.

ported by the distribution of non-local materials among artifact classes.

Fifth, despite the dominance of chipped stone debitage among artifacts made from non-local materials, non-local materials are statistically more likely to occur as formal tools than are local materials. This pattern is not evident in each assemblage individually. The Array and Outlet sites' chipped stone artifact assemblages are too small for a statistically meaningful chi-square analysis, and such analyses on the Blisky and Zaimka Mound assemblages produced statistically borderline results (p =.0793 and .0698 respectively) at the .05 level of significance chosen for this study. However, when data from the four chipped stone assemblages are combined into one large sample, non-local materials appear with greater than expected frequency as chipped stone tools and with less than expected frequency as chipped stone debitage. In other words, where they appear, non-local materials occur disproportionately as tools in comparison to local materials. Where available, these materials were worked into formal tools.

Together, the small variety of non-local material types, the small but consistent quantities of artifacts made from these materials, the presence of non-local debitage, and the association between non-local materials and chipped stone tools suggest that long distance travel and exchange occurred with some regularity throughout the Early Kachemak and that these activities provided access to high quality chippable stone. We do not mean to imply that the procurement of high-quality stone was the central purpose of long distance travel and exchange, only that it was one result of such interaction. Non-local stone was not a necessary commodity. Early Kachemak phase foragers made the great majority of their stone tools from lesser quality, locally available stone, but basalt, chalcedony, rhyolite, and exotic cherts were desirable materials whose value derived from their greater workability and utility and perhaps from their ability to symbolize social affiliation with off-island groups (J. B. Fitzhugh pers. comm. 2004).

Artifacts of Non-local Manufacture

Patterns of raw material use suggest that Early Kachemak foragers interacted with mainland societies on a limited but repeated basis. Did this interaction bring them into contact with ASTt foragers from the Alaska or Kenai peninsulas? The presence of a few ASTt-like artifacts in Kodiak assemblages suggests that it did.

Archaeologists have long noted the presence of ASTt-like artifact types in assemblages from Kodiak's very late Ocean Bay II and Early Kachemak phases (Clark 1997:83; Hausler 1993:16–17; Knecht, Davis, and Carver 2001:58). To characterize these tools and their frequency, use, and distribution in Kodiak assemblages, we used published accounts of ASTt assemblages from the Alaska and Kenai peninsulas (Dumond 1981:120; Harritt 1988:193; Henn 1978:43; Zollars 1982:20–25) to develop a comprehensive list of the tool types characteristic of this phase (see Table 9). Then, we culled all of the similar objects from roughly contemporary Kodiak assemblages and coded them for object type, raw material type, condition, and degree of use (preform, new, used, or expended) (Appendix C). Items ubiquitous in both ASTt assemblages and Ocean Bay and or Early Kachemak assemblages were not included in this study (e.g., bifaces, edge-modified flakes, whetstones, etc.).

This analysis focused on assemblages from the Blisky, Array, Outlet, and Zaimka Mound sites, but included materials from the Rice Ridge and Refuge Rock (KOD-450) sites, as researchers have identified these assemblages as containing ASTt-like materials (Clark 1997:83; Hausler 1993:16–17). We also included one object—a ground burin—from the Malina Creek site (AFG-005). This artifact is identified as one of six found in "a thin ASTt occupation" (Knecht, Davis, and Carver 2001:58) (Table 9).[12] The remaining five objects—a stemmed point, a utilized blade, and three bilaterally barbed darts—were not included (Figure 7). The stemmed point is an Ocean Bay type (Hausler pers. comm. 2004), macroblade technology is not diagnostic of ASTt assemblages from southcentral Alaska but is found in Kodiak's earliest assemblages (ca. 7300 years old, Fitzhugh 2003:155),[13] and the darts are stylistically similar to those from the lower levels of the Uyak site (Heizer 1956:59[j,k], 170[a,k,l,m and o]). Clark believes these darts to be Early Kachemak forms (Pers. comm. 2004).

Our review of the seven assemblages, with an estimated combined total of at least 10,000 artifacts from the very late Ocean Bay II and Early Kachemak phases, produced just thirty-two objects that would be at home in

[12]A review of the provenience data associated with these six artifacts (Knecht 1993) illustrates that they were recovered from three different strata, at depths ranging from 318 centimeters to 458 centimeters below datum, on different days. Although we recognize the complexity of the site's stratigraphy, these artifacts do not appear to have been recovered from a discrete level or feature indicative of an occupation.

[13]Dumond (1981:120–121) and Harritt (1988:193) report a combined total of three possible blade cores, two tools made on blades, and two blades / microblades from assemblages of the Brooks River Gravels phase out of roughly 1000 stone tools. No blades were found in Ugashik Hilltop-phase assemblages or in the ASTt assemblage from Chugachik Island.

Table 9. Distribution of ASTt tool types in Kodiak assemblages.

ASTt Tool Type	Blisky	Outlet	Zaimka	Malina	Refuge Rock	Rice Ridge	TOTAL
lanceolate point					4	4	8
bipoint						1	1
sideblade			1				1
shouldered knife							0
flaked scrapers	5	2	5		4		16
drill bit							0
graver							0
burin							0
ground burin	1		1	1		1	4
ellipsoidal flake cores							0
microblade core		1	1				2
TOTAL	6	3	8	1	8	2	32

an ASTt assemblage (Table 9). This accounts for roughly 0.3 percent of all the artifacts from the study assemblages and represents a much smaller proportion than that represented by artifacts made of distant raw materials. Artifacts made of non-local raw materials are minimally four times more common than artifacts of potential ASTt manufacture.

Despite the extremely small number of potential ASTt tools, several tool types considered diagnostic of this phase (cf. Dumond 1981:120; Henn 1978:43) are present in the Kodiak sample. Moreover, all of the evaluated site assemblages, except for the very small assemblage from the Array site, have one or more potential ASTt artifacts (Table 9). These include carefully flaked, lanceolate points (Figure 8), a bipoint, a sideblade, a variety of flaked scrapers (particularly endscrapers and one angle-nosed scraper [Figure 9]), ground burins, and microblade cores. Thus, of the eleven artifact types considered diagnostic of the southern Alaska ASTt, six are tentatively present.

We say "tentatively" for three reasons. First, all of these sites have complex stratification and, with the exception of the Refuge Rock, all have older, underlying strata. Thus, objects such as bipoints, sideblades, burins, blades, and artifacts of microblade technology (Figure 10), characteristic of older Ocean Bay occupations (Clark 1979; Fitzhugh 2003:147; Hausler 1993), may be intrusive. They may have been introduced to Early Kachemak deposits by site formation processes (e.g., digging house foundations, pits, and postholes into underlying strata). Moreover, throughout the prehistoric era, Kodiak foragers collected artifacts from previous phases, some of which are waterworn, suggesting they were obtained from area beaches. For example, two waterworn ASTt-style endscrapers of exotic chert were found in historic period deposits at the Igvak site (AFG-016). Thus, artifacts diagnostic of different time periods are occasionally mixed into temporally distant assemblages.

Second, some possible ASTt artifacts, such as flaked scrapers (Figure 11), appear to be part of a spectrum of tools that may be indicative of both the Early Kachemak and the ASTt. Although flaked scrapers are rare on Kodiak (Clark 1997:48) and appear to be restricted to the Early Kachemak phase, sites of this age contain a variety of flaked scraping tools. The Blisky site produced twenty-six flaked scrapers of four different styles (based on the location and degree of edge flaking [Steffian, Pontti, and Saltonstall 1998:142–143]). The Blisky endscrapers, some of which closely resemble ASTt forms, may actu-

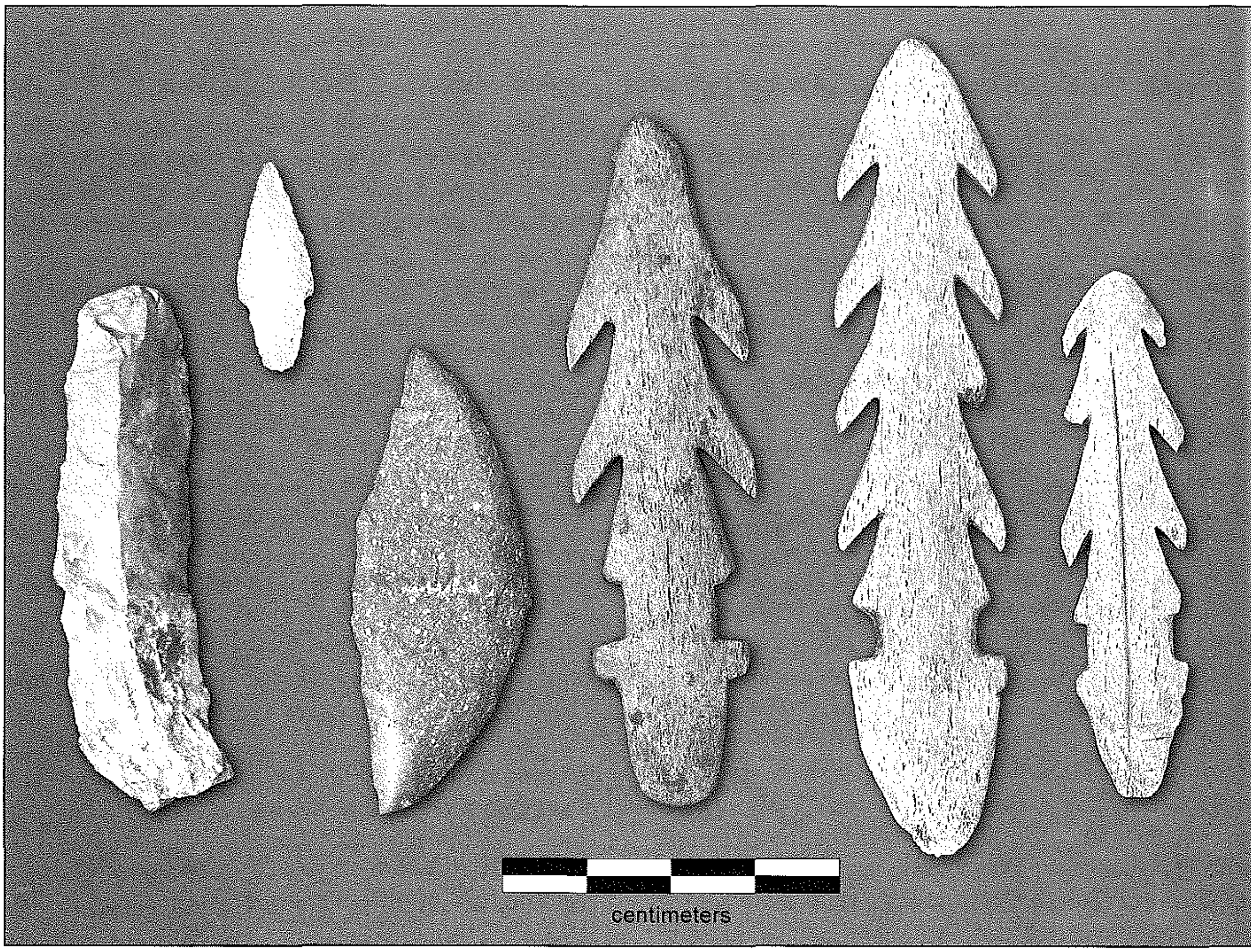


Figure 7. Purported ASTt artifacts from Malina Creek. From left to right: utilized blade of exotic chert (AM24.93.5160); stemmed point of chalcedony (uncataloged); ground burin of basalt (AM24.93.5199); bilaterally barbed dart of sea mammal bone (AM24.93.5154); bilaterally barbed dart of sea mammal bone (AFO-5.93.833); bilaterally barbed dart of sea mammal bone (AM24.93.5089).

ally be locally produced as part of the Early Kachemak typological system. Perhaps the increasing economic focus on fish, a small-bodied prey, fostered the production of smaller, more delicate scraping tools to process fish skins.[14] While this is not the only possible explanation, it highlights the potential for some ASTt-like tools to have locally derived origins.

Third, while some tools are reminiscent of the ASTt, they are not duplicates of those from the mainland. A red chert sideblade from Zaimka Mound illustrates this pattern (Figure 12). Although the size and style of an ASTt object, this tool is not finely flaked, but more crudely chipped, like other Early Kachemak tools. This sideblade is ASTt-like in form but not in execution and, therefore, its attribution is equivocal.[15] The choice of a lower quality raw material may have influenced the manufacturing process, or it may be an aberrant Early Kachemak artifact.

Similarly, archaeologists have found microblades but not microblade cores in association with the ASTt in southcentral Alaska (Dumond 1981:131, Harritt 1988:193). The characteristics of such cores are unknown and the microblade cores in the Kodiak sample must be considered equivocal evidence of ASTt technology (Figure 10). Although both examples have the parallel flake scars characteristic of microblade cores, both have been reworked and subsequently used as tools. A red chert example from the Outlet site (AM327:6673) is a core tab-

[14]Alutiiq people once used this strong, supple material for clothing.
[15]Knecht, Davis, and Carver (2001:58) note a similar pattern in the assemblage from Level 2 of the Margaret Bay site on Amaknak Island. Here, "some of the small points and endscrapers . . . are less gracile than those at some ASTt sites such as those of the Brooks River Gravels Phase."

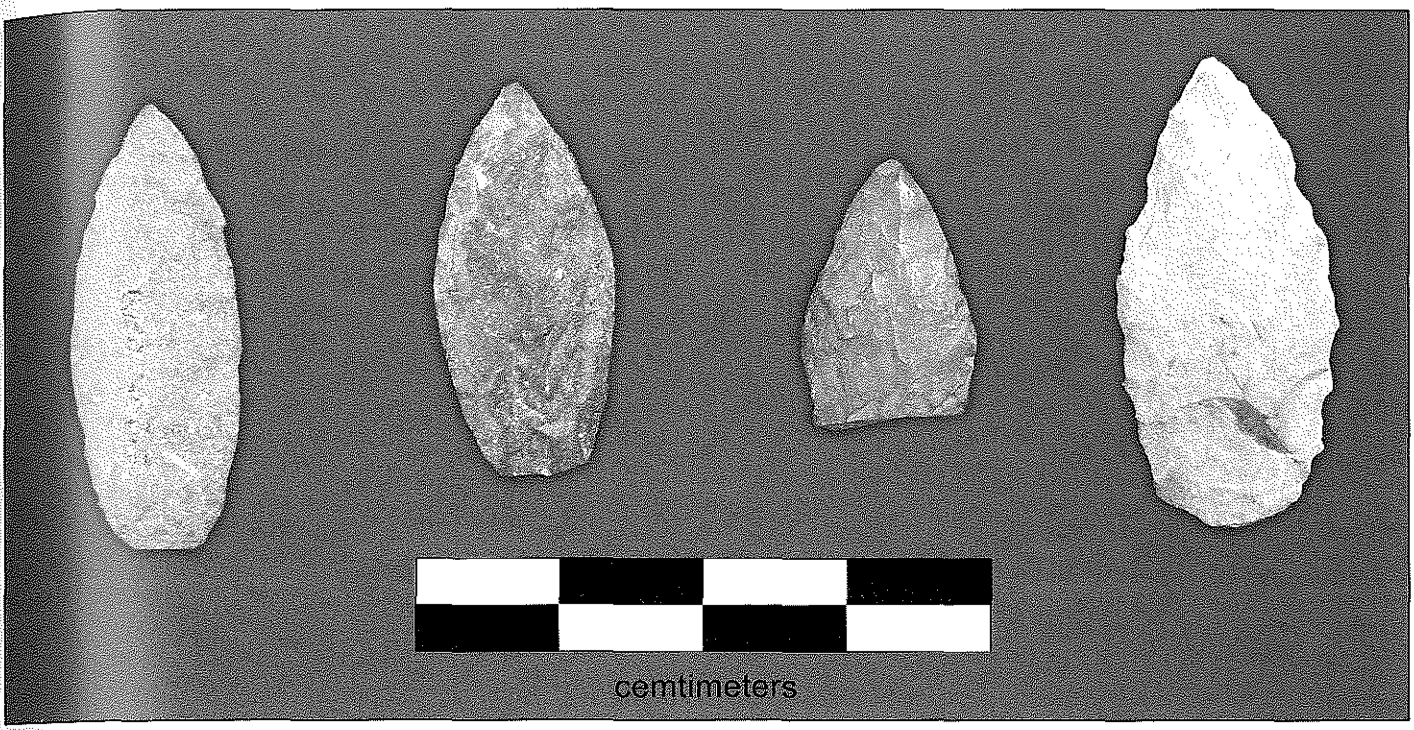


Figure 8. Projectile points from Refuge Rock. From left to right: basalt (KOD450:21); basalt (KOD450:854); red chert (KOD405:668); meta tuff (KOD450:639).

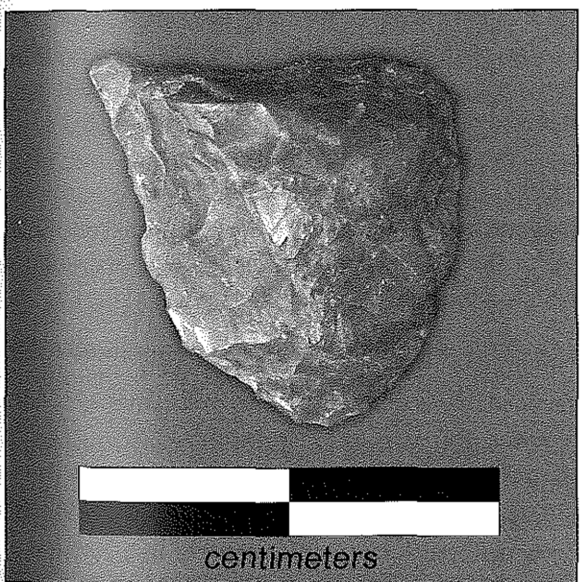


Figure 9. Red chert angle-nosed scraper from the Refuge Rock site (AM411:248).

let, struck from the face of the core platform. This piece was transversely burinated or snapped, and the resulting edge utilized. A chalcedony example from Zaimka Mound (AM411:13638) is a pièce esquillée, a spent core used as a wedge.

Despite these caveats, a few tools strongly resemble ASTt objects. The most notable is a chalcedony bipoint from Rice Ridge (Figure 13). This piece has delicate denticulate edges. Four ground burins are also strong ASTt candidates (Figure 14).[16] Carefully made burins are very rare on Kodiak, occurring primarily in the Ocean Bay I phase (Steffian, Eufemio, and Saltonstall 2002:26). Ground burins are even more rare, with just a few examples from the Early Kachemak phase. The ground burins in our sample are similar to those of the Ugashik Hilltop (Henn 1978:112) and Brooks River Gravel phases (implement classes 79 and 82; Dumond 1981: plates V:1[f] and VI:B [b,c]), as they were made on either bifacially or unifacially worked flakes. The Kodiak specimens, however exhibit a much greater degree of polishing. Two of these tools do not even exhibit burin blows, but are formed only by ground faceting. On two examples (Rice Ridge 363-90-GEN-1 and Malina AM24.93.5199[17]) the burin was created with four ground facets, and a third, incomplete specimen from the Blisky site (AM199:2149) has at least three facets. The only Kodiak example without extensive polishing is from Zaimka Mound (AM411:13024). This piece resembles a mitten burin. It is a burinated flake lightly polished on both its dorsal and ventral surfaces.

[16]Ground burins and other ASTt-type artifacts also occur in Norton; thus, there may be ancestral Norton on the Alaska Peninsula (Clark, pers. comm. 2004).

[17]This tool has two burin-like facets: one created by four ground facets and the other by two ground facets and a burin blow.

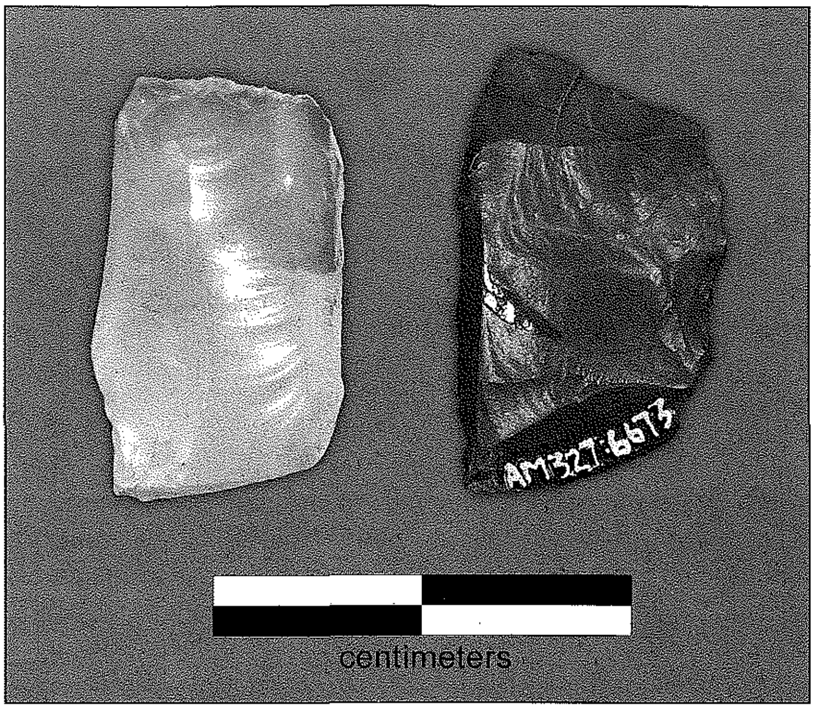


Figure 10. Microblade core fragments. From left to right; Outlet Site: chalcedony (AM327:6673); Zaimka Mound: red chert (AM411:13638).

exotic chert, and rhyolite). However, these materials are present in much greater quantities among the suspected ASTt tools. They make up 28 percent of these artifacts as compared to just a few percent of Early Kachemak tools (see Table 8 above). Chi-square analysis indicates that this pattern is statistically significant. Though extremely rare, tools of possible ASTt manufacture are made with greater than expected frequency from non-local materials. It is not surprising, therefore, that all but one of the best candidates for ASTt tools (see above) are made from non-local material. This pattern of raw material use suggests that at least some of the tools we identified are of ASTt manufacture.

Despite the notably higher percentage of non-local materials in the suspected ASTt assemblage, 72 percent of the possible ASTt tools are made from Kodiak materials—particularly the ubiquitous red chert. While it is possible that some of these tools were manufactured and traded to Kodiak from Kachemak Bay (where red chert is also available and was used by ASTt residents; Zollars 1982:20), or produced by ASTt visitors to Kodiak, it is unlikely that sustained trade, visitation, or occupation would produce so few typologically ASTt tools. Even the small tool assemblage from the briefly occupied Chugachik Island site is larger than the total number of possible ASTt tools identified in the much larger sample from Kodiak. Many of the artifacts made from Kodiak red chert may be ASTt-like rather than actual imports.

Additional clues to the origins of potential ASTt tools lie in the raw materials used in their manufacture. Presumably, objects obtained from the Alaska Peninsula would have been made of mainland materials, distinct from those available on Kodiak. Zollars (1982:20) reports such a pattern from his analysis of the ASTt assemblage from Chugachik Island. Here, non-local materials dominate the artifact sample, constituting roughly 75 percent of all objects, suggesting that the site's occupants imported both tools and raw materials to Kachemak Bay.

The distribution of raw materials in the possible ASTt sample from Kodiak shows a somewhat similar pattern. The same set of chippable, non-local materials found throughout Early Kachemak assemblages occurs in the sample of potential ASTt tools (i.e., basalt, chalcedony,

In sum, the evidence from non-local materials and artifacts suggests that while long distance exchange was a repeated but infrequent activity during the Early Kachemak phase, it was rare for Kodiak foragers to obtain or manufacture ASTt tools. There are very few un-

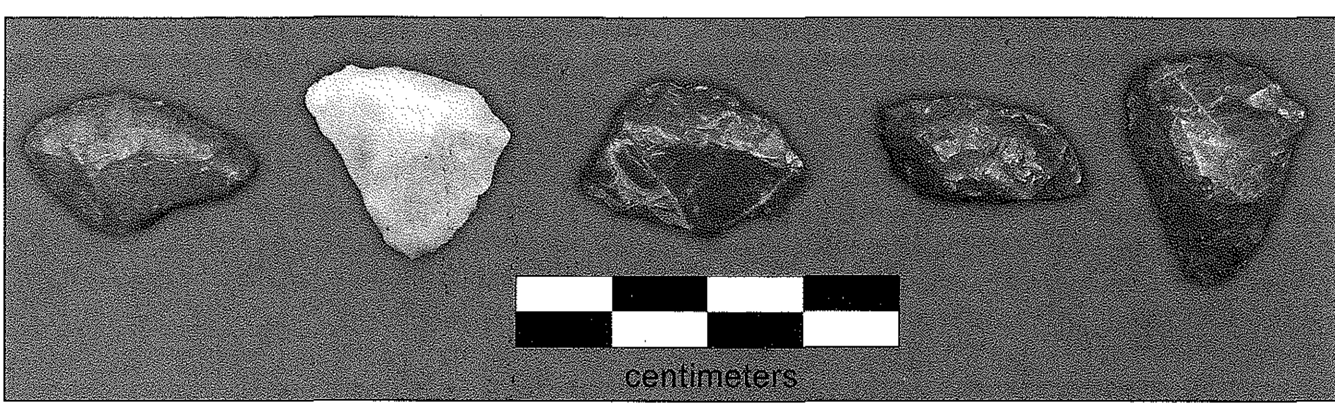


Figure 11. Flaked scrapers from the Blisky site. From left to right: red chert (AM199:2356); red chert (AM199:2135); red chert (AM199:3166); exotic chert (AM199:1639); exotic chert (AM199:1375).

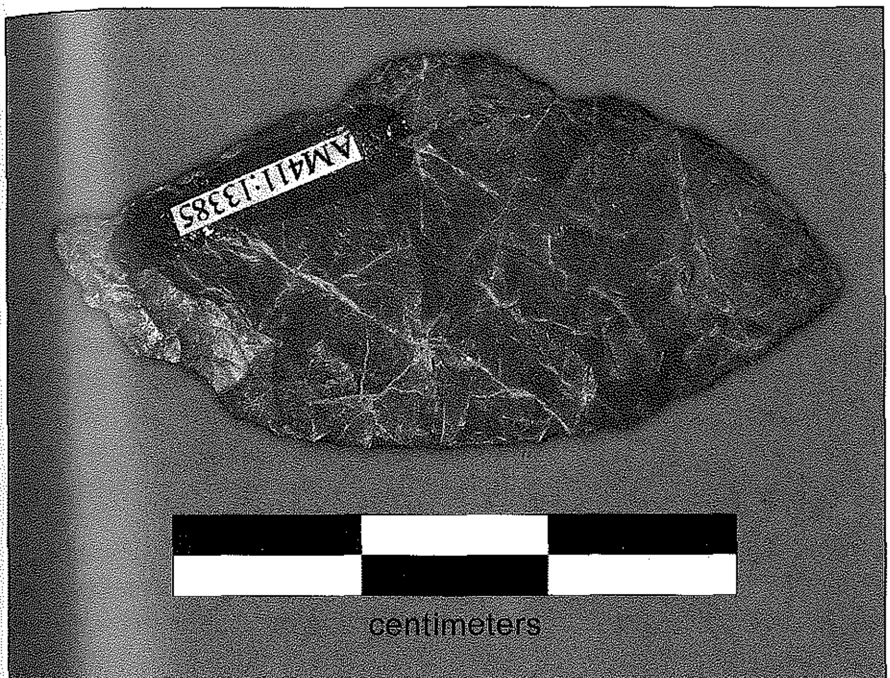


Figure 12. Red chert sideblade from Zaimka Mound (AM411:13385).

While these societies developed and flourished on Kodiak, they vanished from Kachemak Bay. Here, more than a millennium separates samples from the Ocean Bay II and Early Kachemak phases. During this settlement hiatus, bearers of the ASTt visited the Gulf of Alaska. Data from Chugachik Island site provide a unique view of their activities and offer an example of what an ASTt occupation of Kodiak might look like. On Chugachik Island, foragers inhabited an ephemeral structure and worked large quantities of non-local stone into toolkits characteristic of the ASTt while harvesting birds and small mammals (Workman and Zollars 2002:41–42). The remains of their brief visit were preserved in a thin stratum of just 4 to 7 centimeters of soil (Zollars 1982:13).

equivocal ASTt artifacts in Kodiak assemblages, and no ASTt assemblages. While it is possible that such an occupation will eventually be found,[18] the evidence at hand suggests that foragers of this widespread tradition did not colonize Kodiak. Kodiak foragers used non-local materials that were also widely used by bearers of the ASTt (Dumond 1981:120; Henn 1978:68; Zollars 1982:appendix H), but it is unclear whether they collected these materials or obtained them in trade. Whatever the answer, interaction with mainland societies seems to have contributed little to Early Kachemak technology.

IMPLICATIONS

New data from the Kodiak Archipelago enhance the regional picture of settlement and interaction during the fourth millennium BP. Rather than a decline in habitation, it now appears that the archipelago's population continued to increase gradually as new ways of using resources evolved. The Ocean Bay phase developed seamlessly into the Early Kachemak after 4300 years ago, as the islands' residents began harvesting and processing food for storage. Many categories of archaeological data—from settlement patterns to midden characteristics, features, and technologies—indicate an intensified economic focus on fish (Steffian, Saltonstall, and Kopperl in press).

The currently available data from Kodiak provide a very different picture. Kodiak's Early Kachemak sites have large, thick accumulations of debris, permanent semi-subterranean structures and features, assemblages demonstrating a focus on fishing and food processing, a strong preference for local materials, and toolkits that are clearly related to the preceding Ocean Bay phase. These differences, and the overwhelming continuity in Kodiak's prehistoric record, suggest that the archipelago was not extensively visited or colonized by ASTt foragers. Kodiak archaeologists have not identified any occupations similar to the ASTt component at Chugachik Island.

Why is the ASTt absent from Kodiak? One likely reason is that Kodiak was too densely inhabited. Elsewhere in south-central Alaska, the ASTt occurs during periods of minimal or no settlement by other cultures. From the data presently available, it appears to be an intrusive culture. The ASTt does not evolve out of the previous Ocean Bay, Ugashik Knoll, Brooks River Beach Ridge, or Brooks River Strand phases, but seems to reflect the southward movement of northern foragers into landscapes that were not extensively occupied (Dumond 1998:192, 194; Workman and Zollars 2002:42). Another factor may be the maritime character of the archipelago's resource base. Bearers of the ASTt are thought to have been terrestrial foragers, heavily dependent upon caribou and salmon (Dumond 1998:194). While Kodiak has ex-

[18] Our Early Kachemak sample comes exclusively from the northeastern side of the Kodiak archipelago. Samples from the western coast of the archipelago may yield more evidence of interaction with the Alaska Peninsula, as the peninsula is visible from this coast of Kodiak.

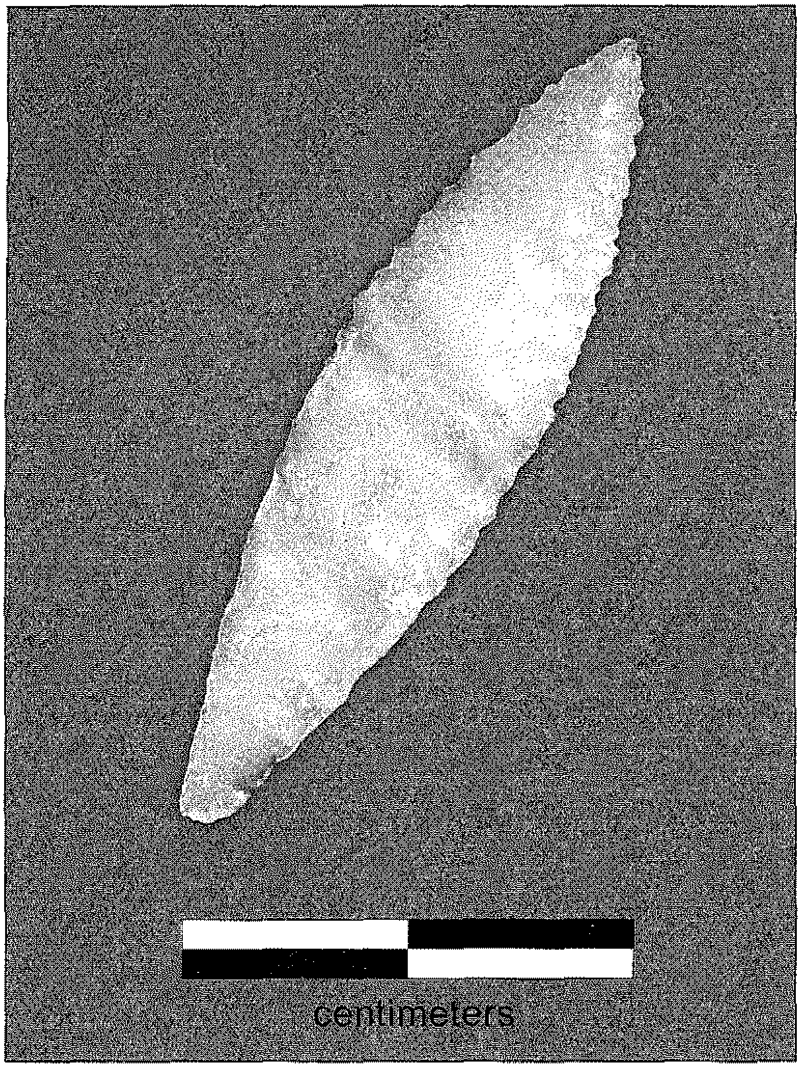


Figure 13. Chalcedony bipoint from Rice Ridge (363-90-10b-34-129).

tensive anadromous fish runs, it has a limited terrestrial fauna with no native cervids. The archipelago is outside the tundra-boreal forest ecotone where ASTt settlements are typically found (Workman and Zollars 2002:39).

Although colonization appears unlikely, a few ASTt-type tools do occur in Kodiak assemblages. However, these tools are so rare, and so seldom unequivocally ASTt, that we believe they reflect extremely limited contact. It is possible that Kodiak Islanders obtained these items in trade with culturally related foragers of the Pacific coast of the Alaska Peninsula. Dumond notes the presence of an extremely small number of ASTt-like tools in Takli Birch assemblage from this region (13 out of 2700 artifacts; Dumond 1998:195). The continual importation of non-local stone throughout the Early Kachemak phase indicates that Kodiak foragers maintained contact with the mainland. It is possible that some ASTt tools traded to the Pacific coast were passed on to Kodiak islanders. We note that the frequency of potential ASTt tools in Kodiak assemblages (0.3 percent) is even lower than that reported for the Takli Birch phase (0.5 percent; Dumond 1998:195). This pattern resembles that of hand-to-hand exchange (cf. Renfrew 1969), where materials become less common with distance from their source.

However non-local tools and raw materials arrived on Kodiak in the fourth millennium BP, they are best viewed in the greater context of prehistoric exchange. Interaction with mainland societies has always been a feature of Kodiak economies. From first colonization through the historic period, island residents obtained mainland resources unavailable locally. As a result, non-local materials occur in Kodiak sites of all ages and their frequency increases with time. As Kodiak's societies grew and intensified their use of the environment, exchange became a more common and economically important activity. This activity can be measured both in the frequency of non-local materials and in the distance from their sources. Ongoing studies of raw material use in Kodiak prehistory (Steffian n.d.) indicate that greater quantities of materials came from greater distances with time. The limited long distance exchange of the Early Kachemak phase brought small quantities of non-local materials to Kodiak and even smaller quantities of items from truly distant sources including those made by ASTt foragers.

From the data summarized here, the ASTt appears to have had little influence on the development of Kodiak societies. The ASTt does not appear to be the elusive Eskimo ancestor of Alutiiq societies. As Hausler (1993:17) and Clark (1997:84) have both argued, Kodiak's archaeological record indicates that Native societies evolved in place with plenty of external interaction but no interruption. The prehistory of the archipelago illustrates the steady adaptation of maritime foragers to a complex set of environmental, demographic, and social factors that promoted continual economic intensification. The Early Kachemak phase simply represents a step in this process.

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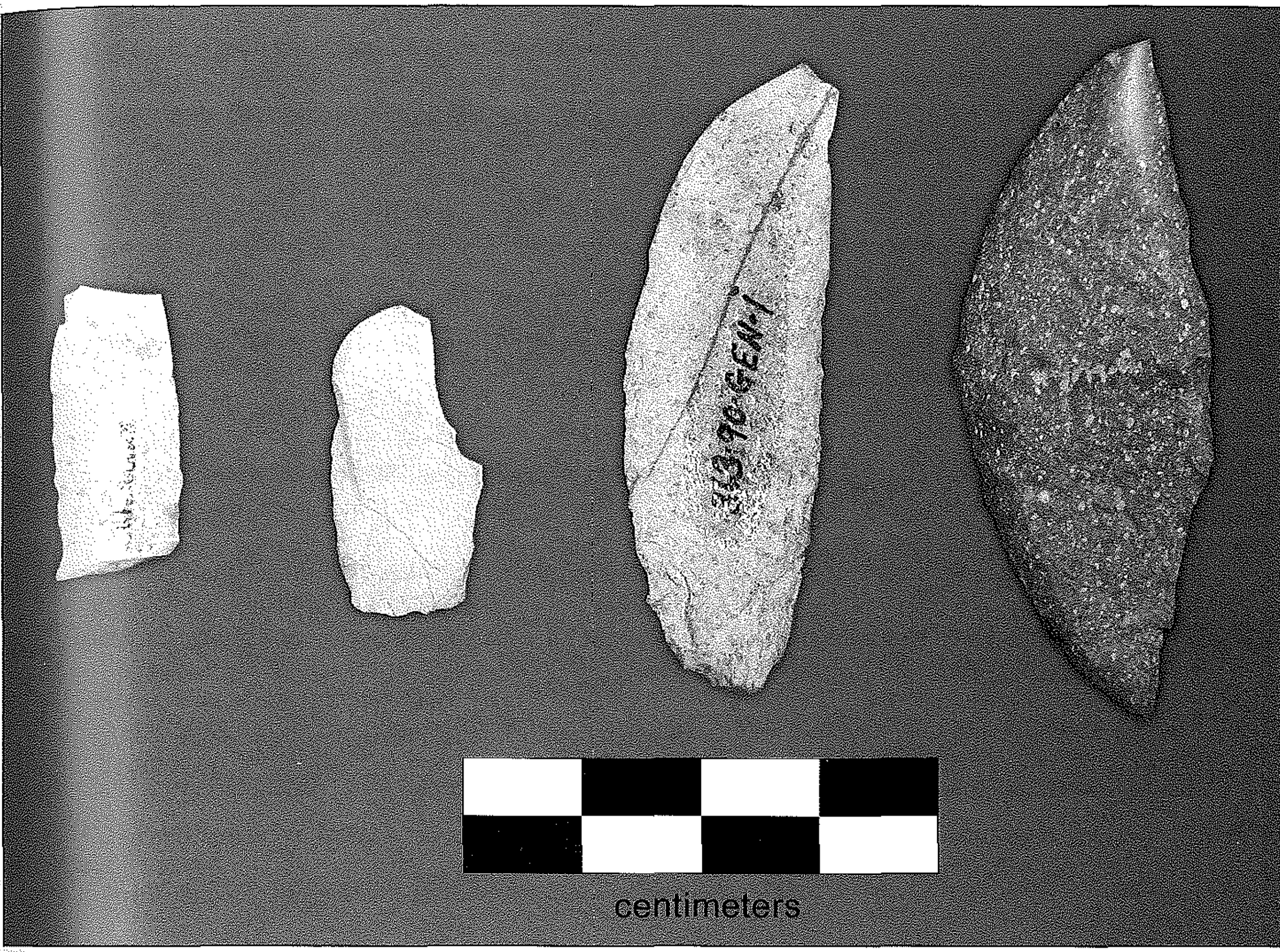

Figure 14. Ground burins. From left to right; Blisky: meta tuff (AM199:2149); Zaimka Mound: rhyolite (AM411:13024); Rice Ridge: meta tuff (363-90-GEN-1); Malina Creek: basalt (AM24.93.5199).

enhancing our knowledge of Alutiiq prehistory. We are very grateful for their assistance. We would also like to recognize the landowners who permitted archaeological research on their property and lent assemblages to the Alutiiq Museum. They include Leisnoi, Inc., the University of Alaska Fairbanks, the U.S. Coast Guard, the Rice Family, the Old Harbor Native Corporation, and Afognak Joint Venture. Drafts of this paper were reviewed by Philomena Hausler, Don Clark, Don Dumond, Bob Kopperl, Ben Fitzhugh, Dan Odess, Erica Hill, and Bill Sheppard, whose thoughtful comments helped to refine the ideas presented. Additional thanks go to Philomena Hausler for generously sharing information from her excavations of the Rice Ridge site, to Joan Dale at the Alaska Office of History and Archaeology for assistance using the AHRS, and to Dan Odess for inviting us to develop this paper for the symposium he organized at the 2004 ICASS-V meeting. Finally, we extend our appreciation to the Alutiiq Heritage Foundation and Sven Haakanson, Jr., Executive Director of the Alutiiq Museum, for providing time and space for this study. *Quyanaasinaq*—thank you very much. Patrick Saltonstall took all the photographs for this paper. Amy Steffian created the graphics.

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Appendix A: Chiniak Bay settlement data.

AHRS #	Era	Setting	Justification
005	ND	OCE	NA
006	ND	OCE	NA
007	ND	OCE	NA
008	ND	OCE	NA
009	ND	OCE	NA
010	EK	MB	Collection
012	LK	MB	Collection
013	EK	MB	Excavation
013	OBII	MB	Excavation
013	OBI	MB	Excavation
014	K	MB	Collection, Features
015	K	MB	Collection, Features
015	LK	MB	Collection, Features
016	EK	MB	Collection
017	EK	MB	Collection
018	EK	MB	Collection
019	ND	MB	NA
020	K	OCP	Historic Reference
021	K	MB	Collection
022	K	OCP	Collection
022	LK	OCP	Collection
023	LK	OCE	Collection
024	K	MB	Features
025	K	IB	Collection
026	K	MB	Excavation
026	LK	MB	Excavation
026	EK	MB	Collection
027	K	MB	Features
028	K	IB	Features
029	K	MB	Collection, Features
029	LK	MB	Collection, Features
056	ND	MB	NA
057	LK	MB	Collection, Features
059	ND	MB	NA
061	LK	MB	Features
129	ND	MB	Features
200	LK	MB	Tested, Collection, Features
201	LK	OCE	No Explanation
208	LK	OCE	Coll.
210	K	OCP	Excavation
210	LK	OCP	Excavation
210	EK	OCP	Excavation
210	OBII	OCP	Excavation
212	ND	MB	NA
303	ND	OCE	NA
350	K	OCE	Tested, Features
351	K	IB	Collection, Features
362	LK	MB	Features

363	EK	OCP	Excavation
363	OBI	OCP	Excavation
363	OBII	OCP	Excavation
368	LK	MB	Features
376	K	IB	Coll., Features
376	OBII	IB	Coll., Features
411	K	MB	Collection, Features, Excavation
411	LK	MB	Collection, Features, Excavation
411	OBI	MB	Collection, Features, Excavation
431	LK	OCP	Features
443	K	OCE	No Explanation
444	ND	MB	NA
445	ND	MB	NA
448	OBI	OCP	Features
449	K	OCE	Features
451	EK	IB	Tested, Collection
451	OBI	IB	Tested, Collection
458	K	MB	Features
561	EK	INT	Excavation
561	OBII	INT	Excavation
562	K	INT	Excavation
562	LK	INT	Excavation
562	EK	INT	Excavation
562	OBII	INT	Excavation
563	ND	MB	NA
605	ND	MB	NA
610	K	MB	Features
611	ND	OCE	NA
612	K	IB	Features
627	LK	IB	Collection
849	ND	OCE	NA
856	ND	IB	NA
892	ND	OCE	NA
893	LK	OCE	Features
895	LK	OCP	Features
909	OB	IB	Collection, Features
909	EK	IB	Collection, Features
911	LK	IB	Collection
1045	OBI	IB	Tested
1053	EK	IB	Tested
1053	OBI	IB	Tested
1054	ND	IB	NA

Notes: Abbreviations for phase are: K = Koniag; LK = Late Kachemak; EK = Early Kachemak; OBII = Ocean Bay II; OBI = Ocean Bay I. Abbreviations for setting are: INT = Interior; IB = Inner Bay; MB = Mid-Bay; OCP = Outer Coast Protected; OCE = Outer Coast Exposed.

LOCALLY AVAILABLE MATERIALS

ORGANIC

- baleen
- bird bone
- fish bone (halibut)
- grass
- land mammal bone (brown bear, fox, land otter)
- sea mammal bone (harbor seal, porpoise, sea lion, sea otter, whale)
- shell (chiton, clam, mussel, whelk, etc.)
- spruce root
- tooth (bear, seal, sea lion, etc.)
- wood (alder, cottonwood, willow)

INORGANIC

KODIAK BATHOLITH

- bog iron
- calcite
- granites
  - G3 Granite (from batholith)
  - G2 Tonalite (dike rock)
- iron ore
- iron oxide (red ochre)
- quartz

CHUGACH TERRANE

Kodiak Formation

- black slate
- greywacke
- cherts from density slide conglomerates

Uyak Formation

- meta tuffs
  - MT1 greenstone
  - MT2 gray slate
- radiolarian chert (red, gray, green)
- schists (green & blue facies)
- silicified meta tuffs
  - MT3 silicified tuff w/ metallic inclusions
  - MT4 spotted chert – silicified meta tuff
  - MT5 silicified greenstones

PRINCE WILLIAM TERRANE

- coal - sub bituminous, high in vitrinite
- conglomerate cherts
  - TC Tanginak gray chert
- sedimentary
  - S1 sandstone
  - S2 siltstone
- tuffs
  - T1 straight tuff (grainy and soft)
  - T2 indurated tuff (spotted w/ feldspars, not silicified or distorted by metamorphism)

Locally available materials from an off island source

- glacially transported pebbles (e.g., banded chert)

driftwood (e.g., cedar, hemlock, pacific yew)
drift metal (from flotsam, shipwrecks)
pumice

Non-local materials

ORGANIC

antler
exotic shell (dentalium, abalone)
horn (goat, sheep)
fossilized ivory
ivory (walrus, fossilized, etc.)
land mammal bone (caribou, moose, etc.)
tooth (beaver, marmot or porcupine incisors)

INORGANIC

PENINSULAR TERRANE

volcanics
basalt (fine grained mafic)
B1 with phenocrysts
B2 without phenocrysts
B3 olivine rich
obsidian
pumice (silicic, floats)
rhyolite (fine grained silicic)
scoria (mafic, does not float)

Other
canel coal (bituminous, high in liptonite)
chalcedony
chalk
copper oxide
exotic cherts – various colors
jadeite
limestone
metal (copper and iron)
red shale

UNKNOWN ORIGIN

aphinitic granite (G1)
coral
galena
graphite
quartz crystal

Appendix C. Possible ASTt tools from the Kodiak archipelago.

Site	Cat #	Object	Material	Condition	Use	Comments
Blisky	AM199:1375	End Scraper	Exotic Chert	W	Used	360 degree working edge
Blisky	AM199:1639	End Scraper	Exotic Chert	W	Used	360 degree working edge
Blisky	AM199:2135	End Scraper	Red Chert	W	Used	180 degree working edge
Blisky	AM199:2149	Ground Burin	Meta tuff	PF	Broken	unifacial retouch - 3 ground facets
Blisky	AM199:2356	End Scraper	Red Chert	W	Used	270 degree working edge
Blisky	AM199:3166	End Scraper	Red Chert	W	Used	360 degree working edge
Malina	AM24.93.5199	Ground Burin	Basalt	W	Used	ground & burinated at both ends
Outlet	AM327:6673	Microblade Core	Red Chert	F	Used	utilized
Outlet	AM327:6751	End Scraper	Red Chert	W	Used	180 degree working edge
Outlet	AM327:7121	End Scraper	Red Chert	W	Used	180 degree working edge
Refuge Rock	KOD450:123	End Scraper	Chalcedony	W	Spent	(some bifacial retouch) 270 degree working
Refuge Rock	KOD450:21	Lanceolate Point	Basalt	W	New	stem old bulb of percussion
Refuge Rock	KOD450:248	End Scraper/Graver	Red Chert	W	Used	360 degree working edge
Refuge Rock	KOD450:592	End Scraper	Red Chert	W	Used	360 degree working edge
Refuge Rock	KOD450:639	Lanceolate Point	Meta tuff	W	Preform	
Refuge Rock	KOD450:668	Stemmed Point	Red Chert	DF	Broken	contracting stem
Refuge Rock	KOD450:764	End Scraper	Red Chert	W	Used	180 degree working edge
Refuge Rock	KOD450:854	Lanceolate point	Basalt	W	New	stem old bulb of percussion
Rice Ridge	363-90-10-7-52	Lanceolate Point	Red Chert	W	New	boat shaped with flat base
Rice Ridge	363-90-10b-2-55	Lanceolate Point	Red Chert	PF	Broken	long parallel edges flat base
Rice Ridge	363-90-10b-34-129	Bipoint	Chalcedony	W	New	
Rice Ridge	363-90-10b-3-63	Lanceolate Point	Red Chert	PF	Broken	long parallel edges round base
Rice Ridge	363-90-10c-22-118	Lanceolate Point	Red Chert	W	Used	boat shaped with flat base
Rice Ridge	363-90-GEN-1	Ground Burin	Meta tuff	W	Spent	4 ground facets
Zaimka	AM411:10052	End Scraper	Red Chert	W	Used	360 degree working edge
Zaimka	AM411:13024	Ground Burin	Rhyolite	W	Used	mitten shape
Zaimka	AM411:13385	Sideblade	Red Chert	W	New	
Zaimka	AM411:13638	Microblade Core	Chalcedony	W	Spent	utilized & Burinated?
Zaimka	AM411:1934	Flaked Scraper	Meta tuff	W	Used	utilized blade? 180 degree UT edge
Zaimka	AM411:9148	Flaked Scraper	Red Chert	W	Used	270 degree working edge
Zaimka	AM411:9318	Flaked Scraper	Red Chert	W	Spent	270 degree working edge
Zaimka	AM411:9486	End Scraper	Red Chert	W	Used	360 degree working edge

Evidence for the Arctic Small Tool Tradition in the Eastern Aleutians

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Abstract: Excavations at Margaret Bay (UNL-48), a large, multicomponent archaeological site on Amaknak Island in the eastern Aleutians, have revealed clear signs of Arctic Small Tool tradition (ASTt) elements at approximately 3300 ^{14}C years BP. At that time Neoglacial conditions brought seasonal pack ice to the eastern Aleutians as well as many of the same marine mammals hunted earlier by ASTt peoples farther north. The ASTt's highly adaptable subsistence technology worked well in the eastern Aleutians where the rich Neoglacial environment provided the basis for relatively permanent settlement and population growth. Accumulating evidence points to an expansion of eastern Aleutian populations during the Neoglacial, and significant contacts with arctic peoples across vast distances of the American Arctic. Rather than an isolated archipelago, the Aleutians were a corridor for a surprisingly free flow of people, ideas, and materials.

Keywords: Unalaska Island, Neoglacial, Margaret Bay, Alaska prehistory

INTRODUCTION

The Arctic Small Tool tradition (ASTt) is generally understood by arctic archaeologists to be a terrestrially based archaeological culture with some coastal adaptations that originated somewhere in the western Arctic or Siberia a few centuries prior to 4000 ^{14}C years BP and spread rapidly across the High Arctic all the way to Greenland. It came as a surprise to us, therefore, that clear elements of the ASTt appeared in our excavations in the purely maritime environment of the eastern Aleutians. Our purpose here is to examine the case for ASTt in the eastern Aleutians and to suggest what significance the eastern Aleutians had in the second millennium BC for arctic cultures generally.

In 1996 we began a long-term program of archaeological research in Unalaska. Our initial objective was to sample a range of sites that would provide a reliable cultural historical outline of human occupation up until the time of European contact. This work has been previously summarized (Knecht and Davis 2001; Knecht, Davis, and Carver 2001). The first site we chose for excavation was Margaret Bay (UNL-48), which is located on Amaknak Island adjacent to the Museum of the Aleutians. It was an extensive, multicomponent site with more than two meters of deposits. In the course of our excavations we found in Level 2 many artifacts and features of a definite ASTt cast. Layer 2 averaged approximately 3300 ^{14}C years BP (Table 1).

In the course of subsequent excavations and analysis of a number of other single and multicomponent sites in the Unalaska Bay area, no other equally strong signals of ASTt elements have been discerned. Although the tiny scrapers and some other diminutive lithics persist in small numbers into the Amaknak Phase represented at the Summer Bay site (UNL-98), the variety of ASTt technology is not evident. We have good evidence for Unalaskan occupational continuity post 4000 ^{14}C years BP from a number of sites, and hence we should have encountered more ASTt evidence had that tradition's presence been extensive. Thus, we conclude, the present evidence for ASTt in the eastern Aleutians reflects a significant but episodic encounter.

Mitochondrial DNA analysis of living Aleuts shows the greatest degree of similarity with Chukotkan populations (Rubicz et al. 2004). Archaeologically the Siberian Neolithic is a strong candidate for ASTt ancestry

(McGhee 1996; Powers and Jordan 1990; Slobodin 2004). Thus, we expect that any ties the eastern Aleutians may have had with the ASTt would have come from the north and almost certainly would have followed the western Alaskan coastline where a number of ASTt sites have been identified.

ARCTIC SMALL TOOL TRADITION: DEFINITIONS AND CONCEPTS

The ASTt has been a frequent subject of archaeological discourse because of its primacy in the High Arctic, its apparent Old World affinities, and its placement at the base of the Eskimo/Aleut sequence. Dumond (2001:298–299) has summarized the history of the ASTt and has followed Irving's original definitions (1957, 1962) *sensu stricto*. For the most part, definitions of the ASTt have focused on the well-wrought chert and obsidian miniature chipped stone artifacts, including endblades, sideblades, scrapers, flake-knives and burins. Bone and wood artifacts are rare in most ASTt sites and are not part of most typological considerations. Ground or pecked stone artifacts such as lamps and bowls are also rare, but are found in some recognized ASTt assemblages such as Saqqaq in Greenland. Features such as hearths and cooking appurtenances, storage facilities, and structures are frequently seen to have local variants. Broader definitions encompassing time spans greater than a millennium for the ASTt have been advocated by Powers and Jordan (1990) and Anderson (1984).

What impresses us most about the ASTt is its widespread distribution, narrow chronological limits, and the variety of environments in which it is found. It is frequently described as intrusive, showing no connection to preceding archaeological cultures. There is near total agreement among investigators that there are no clearly identified North American antecedents to the ASTt; it basically appears full blown and extends quickly east across the High Arctic and slightly later south along the Alaskan coast and near coastal areas possibly as far as the Kodiak archipelago. In American archaeological parlance such a manifestation is referred to as a *horizon*, not a tradition. In the classic *Method and Theory in American Archaeology* Gordon Willey and Philip Phillips define a horizon as "a primarily spatial continuity represented by cultural traits and assemblages whose nature and mode of occurrence permit the assumption of a broad and rapid spread" (Willey and Phillips 1958:33). Nothing, in our opinion, better describes the distribution of the ASTt, which extended across the entire North American Arctic in only a few centuries. It is probably too late to persuade our colleagues to adopt the Arctic Small Tool horizon designation, but it is, we suggest, a more apt designation.

In Irving's first paper on the ASTt, he noted similar industries from the coastal Denbigh Flint Complex, the tundra of the western Brooks Range, and the Tyone River in the forested Susitna Valley. He grouped all these industries into the "arctic small tool tradition" and contrasted them with "the early industries of the boreal forest (e.g. the Campus site and Pointed Mountain, N.W.T.)" (Irving 1957:47). Thus, from the outset the ASTt was shown to be a widespread, broadly adaptable cultural group with a number of distinctive technological elements. In much the same way Bjarne Grønnow (1996:29) notes "the pioneers came to West Greenland with a remarkably functional and broad spectrum tool kit. With this the Saqqaq people were able to cope with any game or resource situation." Additionally, he notes that "no less than 45 different game species, from the largest whales to the smallest birds, were hunted, fish were caught and mollusks and plants were gathered" (Grønnow 1996:29).

ASTt ELEMENTS IN UNALASKA: THE MARGARET BAY SITE

In summary below are the salient characteristics of the Level 2 occupation at the Margaret Bay site (UNL-48) with respect to the ASTt. The site is located on a knoll on the edge of Iliuliuk Bay on Amaknak Island. At the time of occupation it was also adjacent to Unalaska Bay because of higher relative sea level. Beginning in 1996, we worked the site for two seasons and excavated some seventy-six cubic meters of deposit. The site was stratified, and we identified five major cultural stratigraphic levels. Level 2 contained the assemblage which we found to have several ASTt elements.

Chronology

Level 2 at Margaret Bay was overlain by the Level 1 series of bedded tephras, the lowest of which was coarse-grained and reflected a volcanic eruption of some magnitude. The Level 1 tephras were intact and showed no signs of disturbance until the WWII military trenches. The eruption, possibly in combination with a two-meter drop in relative sea level shortly after 3,500 BP appears to have led to the abandonment of the site. Three radiocarbon determinations have been made from Level 2 and one determination from Level 3, all of which are presented in greater detail in Table 1.

Note that two of the determinations in Table 1 came from the house floor of intact Structure 1. Numerous ASTt

Table 1. Radiocarbon determinations, Margaret Bay, Libby half-life and calibrated ages by Calib 4.4.2 (Stuiver and Reimer 1993; Stuiver et al. 1998).

Sample	Provenience	Measured C14 Age	Calibrated 2 Sigma Range BC
Beta-107806	Level 2 House Floor S1 Square 10	3110±60 BP	1517–1134 BC
Beta-95468	Level 2 Square 12, #108	3270±70 BP	1732–1410 BC
Beta-107807	Level 2 House Floor S1 Square 16D, #565	3280±70 BP	1735–1414 BC
Beta-107805	Level 3 Hearth Square 7@ 300 cm B.D	3630±70 BP	2198–1773 BC

artifacts were recovered from the Structure 1 floor surface. Level 2 extended over the entire area of the 6-by-12-meter excavation block. The three determinations are very close in time, and thus we believe that Level 2 represents a relatively brief episode of habitation. On the western coast of Alaska, the Alaska Peninsula, and Kachemak Bay, ASTt sites have been dated beginning at approximately 4000 ^{14}C years BP and continuing for nearly a millennium (Dumond, this volume). Thus, while Level 2 at Margaret Bay is by no means coterminous with the earliest ASTt in Alaska, it does fall into the accepted time range for it.

Artifacts

The Margaret Bay site on Unalaska Bay provides the clearest evidence of ASTt elements in the eastern Aleutians, although some traces of it persist as late as 2000 ^{14}C years BP (Knecht and Davis 2001:285). The ASTt artifact types are primarily found among the chipped stone tools (Knecht, Davis, and Carver 2001). They include microblades, small endscrapers, beaked endscrapers, burin-like tools, adzes with ground bits, small bifacially flaked points with flat tapered bases, bipoints, gravers, and flake-knives. The use of brightly colored cherts is notable among the small endscrapers as is the frequent use of obsidian for the points. Fine, denticulate edges were frequently evident on the points. Figures 1 through 4 illustrate many of these chipped stone varieties.

The Level 2 assemblage also included a number of other items not generally associated with the ASTt in Alaska but sometimes found in ASTt assemblages elsewhere. These include stone lamps, stone bowls carved from volcanic tuff, various fishing weights, pumice and scoria abraders, ochre palettes, and ground slate lance fragments.

Bone and other organic artifacts were rare in Level 2. Three single-barb unilateral bone harpoons with keystone-shaped bases were recovered, but virtually all other organic material decomposed in the acidic tephra-based sediments.

Features

There are many other notable aspects of Level 2 at the Margaret Bay site that bear on its ASTt affinities. First, it had substantial architecture. A nearly complete 3.5 by 2.5 meter oval semi-subterranean structure with large stone retaining walls was found in Level 2 and, as noted above, on the floor were many of the ASTt-type lithics. Remains of three other structures were associated with Level 2. Similar structures have been excavated at the Amaknak Bridge site (UNL-50), and the stonework of the semi-subterranean retaining walls recalls the partially excavated structure from lower Chaluka on Umnak Island (Knecht and Davis 2004; Laughlin 1980: fig. 37).

The structure has a hearth adjacent to the wall and has sub-floor flues defined by rows of upright rock slabs apparently connected to it. It differs in many respects, therefore, from the structures reported by Dumond (1981) on the Brooks River on the Alaska Peninsula, which were roughly square and had box hearths in the center of the floor. At the Amaknak Bridge site, which is located a few hundred meters from Margaret Bay and was occupied shortly after the Margaret Bay site was abandoned, we found a number of very similar houses. In the Amaknak Bridge houses, the linear sub-floor features were better preserved and we learned that they radiated from the hearth and may have been intended to provide a means of channeling heat farther into the house. We find these house features to be strongly reminiscent in plan to the so-called mid-passage hearth and/or axial features of

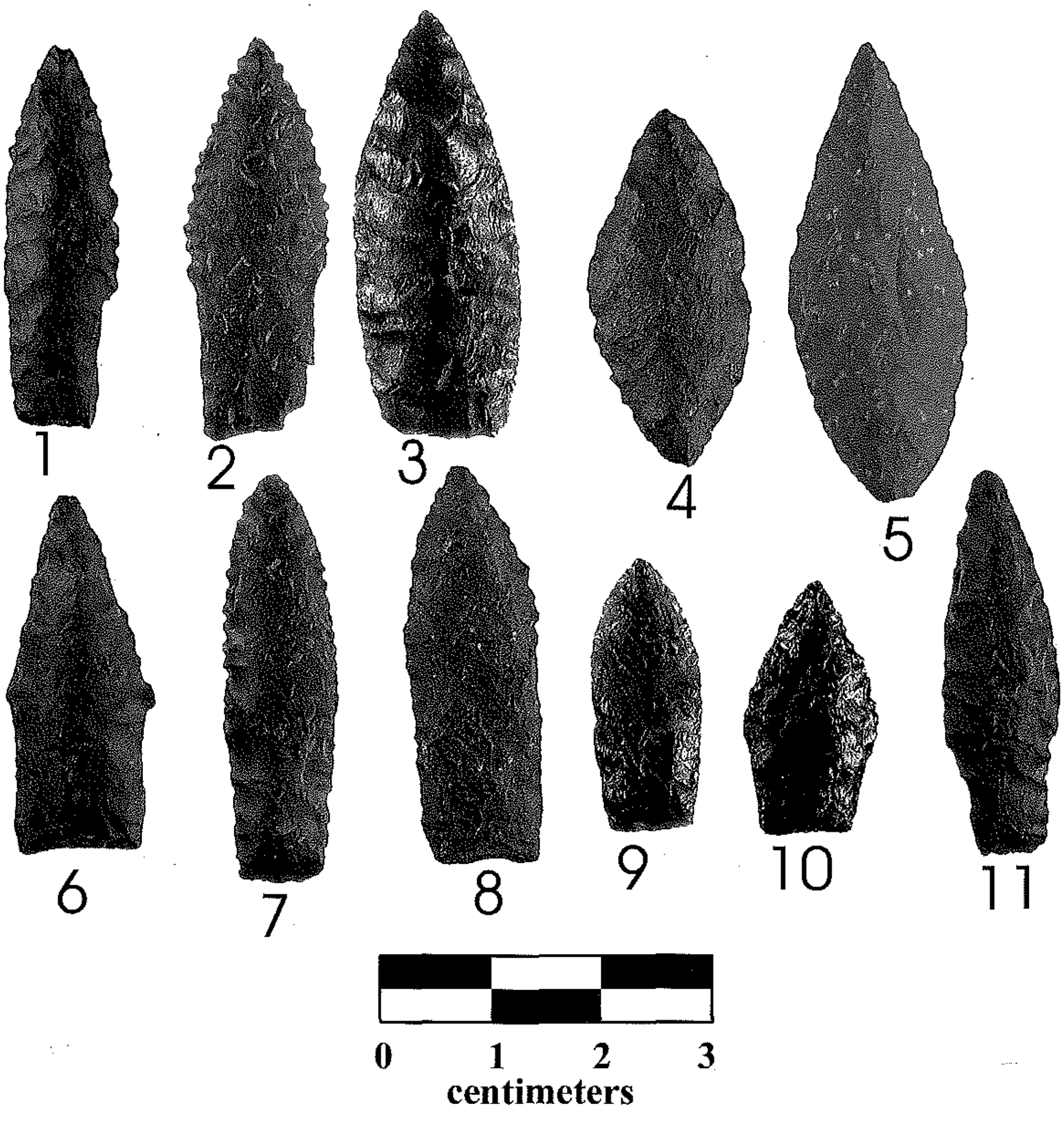

Figure 1. Chipped stone points from Level 2, Margaret Bay (UNL-48).

Figure 2. Chipped stone from Level 2, Margaret Bay (UNL-48): 1, retouched blade; 2, flake knife; 3, retouched blade; 4, retouched blade; 5-6, bell-shaped endscrapers.

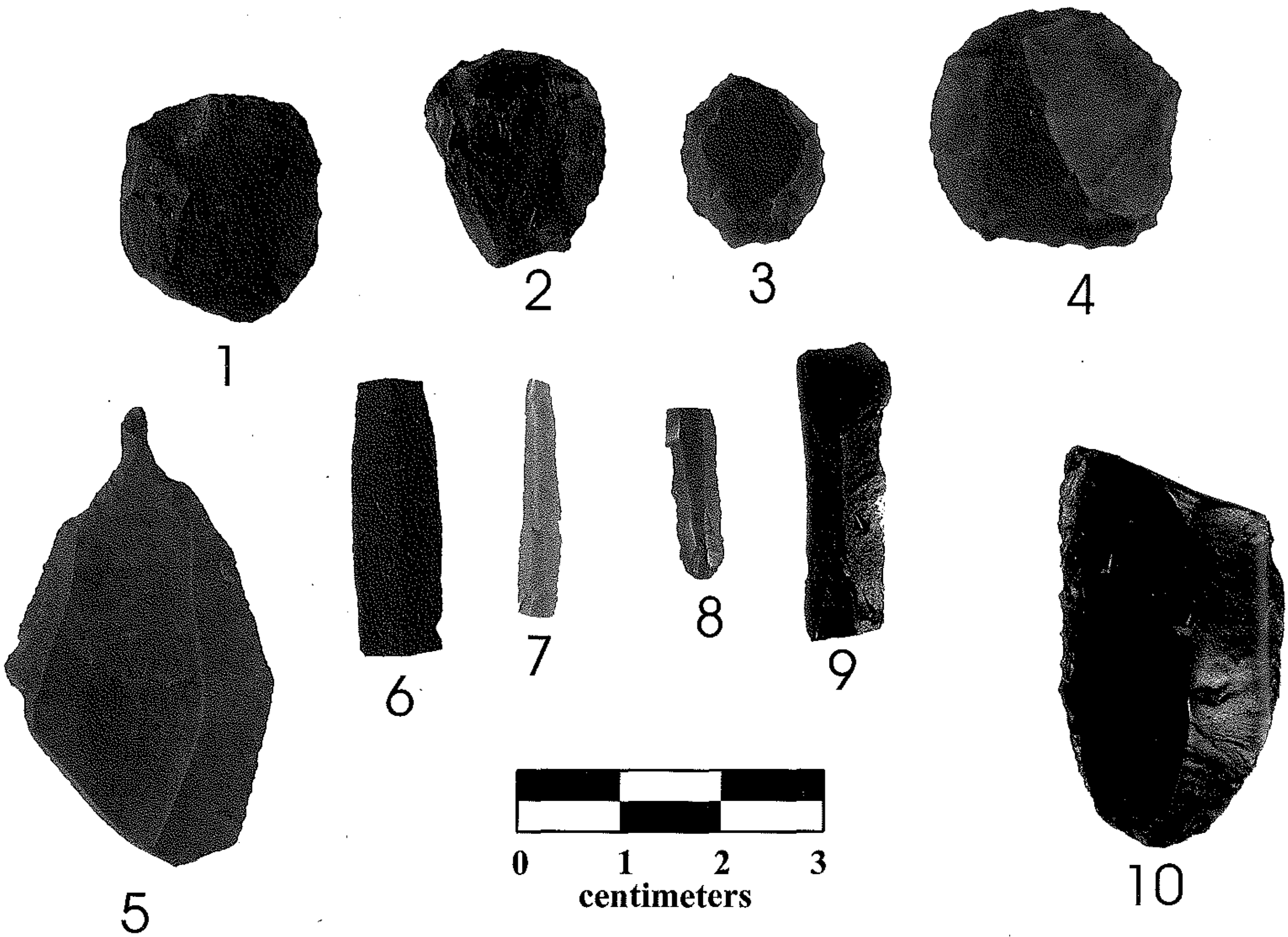

Figure 3. Chipped stone from Level 2, Margaret Bay (UNL-48): 1-4, thumbnail scrapers; 5, piercer; 6-9, microblades; 10, burin.

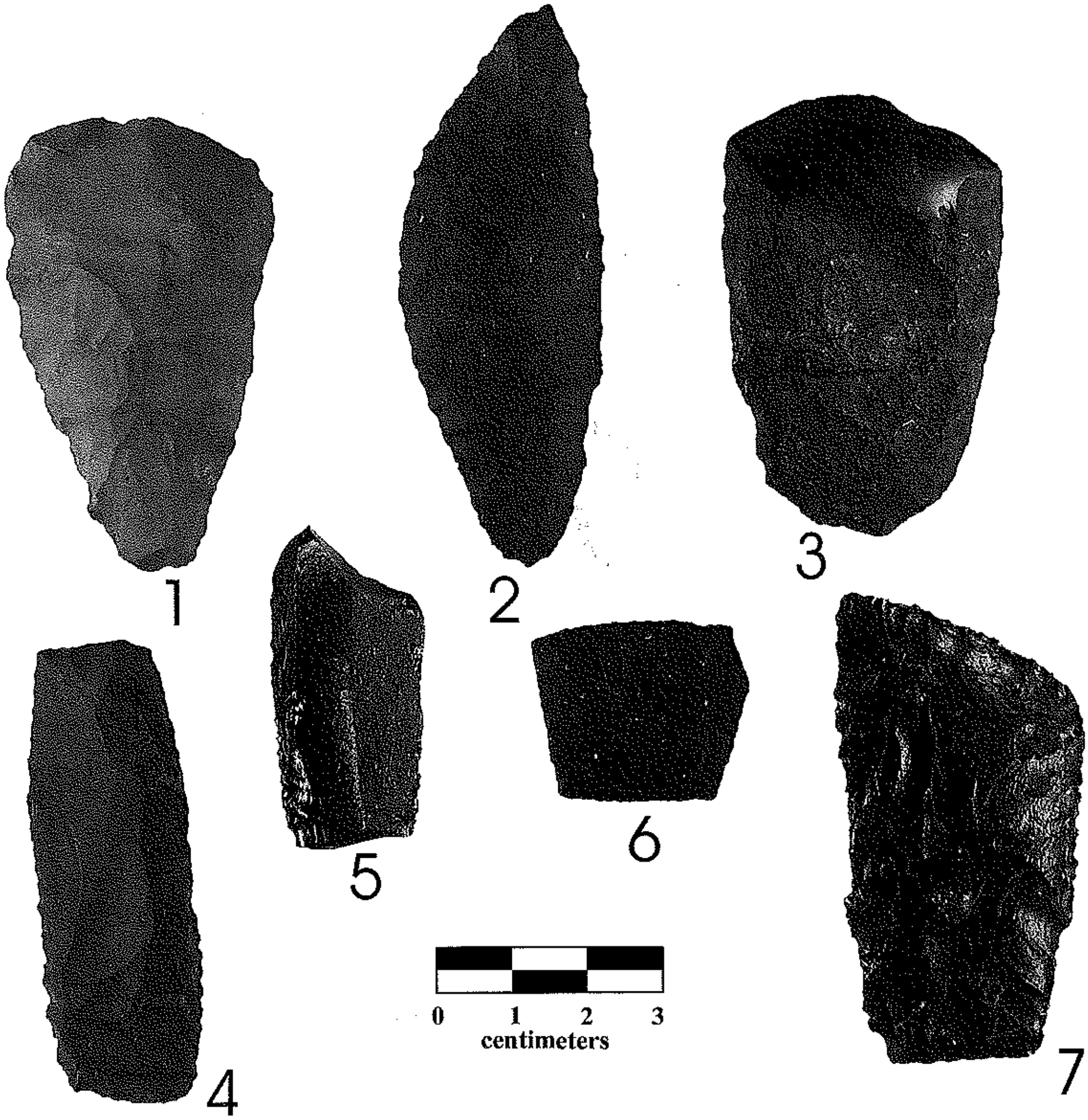

Figure 4. Chipped stone from Level 2, Margaret Bay (UNL-48): 1, adze blank; 2, bifacial flake-knife; 3 adze with polished facet; 4, retouched blade; 5, burin; 6, square knife; 7, bifacial knife.

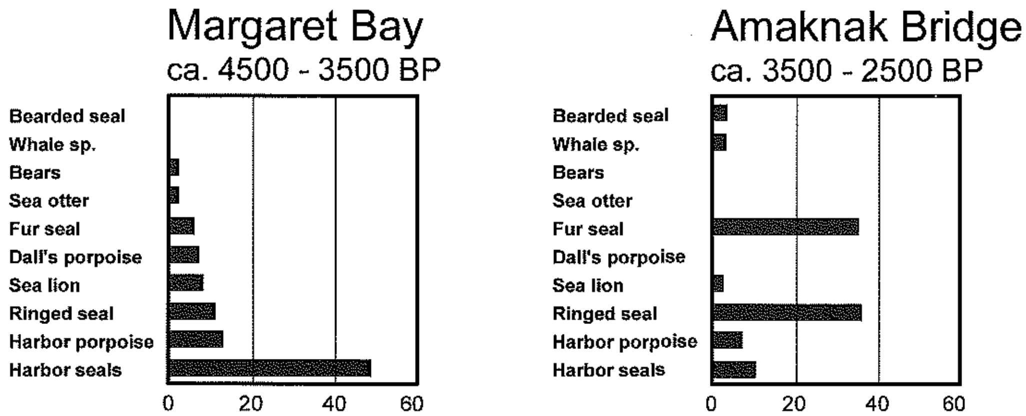

Figure 5. Comparison of marine mammal percentages from the Margaret Bay site (UNL-48, Unalaska; NISP 5392) and the Amaknak Bridge site (UNL-50, Unalaska; NISP 12,979). (Adapted from Crockford et al. 2004: vii).

ASTt and Early Dorset houses in the eastern Arctic as well as in pre-Denbigh levels at Onion Portage (Anderson 1988; Dumond 2001; Maxwell 1985).

The sediments at Margaret Bay, particularly those associated with the poorly preserved midden deposits behind the Structure 1 house, were heavily mixed with beach gravels and also contained a large cluster of smooth egg-shaped cobbles presumably used in cooking. This was also the case at the ASTt occupations of the Gravels phase on the Alaskan Peninsula and in the Denbigh Flint complex at Cape Denbigh (Dumond 2001; Giddings 1964). Dumond (2001:299–300) has suggested that abundant small cooking stones may be diagnostic of ASTt occupations in Alaska; however, their presence at Margaret Bay, the Amaknak Bridge site, and the Ocean Bay-affiliated Rice Ridge site on Kodiak indicates that this was a widespread technology in south Alaska from ca. 4000 to 3000 ^{14}C years BP.

Subsistence and Environment

Level 2 was poor in preserved faunal remains. Based on faunal remains analyzed from the nearby Amaknak Bridge site, which overlaps in time with Level 2, however, there were abundant ringed seal, fur seal, Pacific cod, various ducks and murres available in close proximity to the site (Crockford et al. 2004). The clearest technological indicators of subsistence from Level 2 are the abundant dart or arrow bifacial points, large lance points, and grooved and notched cobbles (net sinkers). All of the fauna are avian or marine species; there is no evidence of terrestrial game.

The faunal remains from the Margaret Bay Level 4 (Davis 2001) and Amaknak Bridge (Crockford et al. 2004) are the best indicators we have of changed climatic conditions from today's. The evidence as put together by Crockford suggests an initial cooling with pack ice forming as early as 4500 ^{14}C years BP during the occupation of Level 4 at Margaret Bay. By 3000 ^{14}C years BP as shown by the faunal composition at Amaknak Bridge, it was considerably cooler than today. The relative proportions of the most frequent marine mammals are summarized in Figure 5.

Note the high frequencies of ringed seal and fur seal at Amaknak Bridge—both associated with pack ice. Limited evidence of polar bear and walrus also testify to conditions significantly cooler than that of today.

Crockford et al. (2004:76) concluded:

> The presence in this assemblage of both weaned and unweaned (newborn/young juvenile) bearded seal and substantial numbers of newly weaned young juvenile ringed seal remains require us to conclude that inhabitants of the Amaknak Bridge site experienced a climate that was significantly colder than it is today. The faunal remains from this site provide irrefutable evidence that the pack ice habitat preferred by bearded and ringed seal for pupping, mating and hauling out must have been available close to the site location on Unalaska from spring through early summer (ca. March to June) during the entire occupation of the site.

The general picture developed from the excavations of Level 2 at Margaret Bay is of a substantial settlement that had been occupied repeatedly over a period of several decades. The full horizontal extent of Level 2 at Margaret Bay has not been determined, but it may extend over a much larger area of the knoll. The artifacts and features reflect both local forms (stone bowls, lamps, microblades, and blades), as well as a suite of tools described and illustrated above which carry clear markers of the ASTt.

Margaret Bay and the Arctic Small Tool tradition

Dumond (2001, 2004) has discounted the ASTt affinities of the Margaret Bay Level 2 assemblage, casting it into a "Macro Margaret Bay Phase," which includes the Russell Creek site from Unimak and Lower Chaluka from Umnak (Dumond 2001:294–295). Dumond (2001:295) observed that the "considerably more delicate" artifacts of the Brooks River Gravels Phase, an "acknowledged ASTt exemplar," along with the absence of stemmed points, stone bowls, and lamps distinguish it from Macro Margaret Bay. We grant that there is a range of variation from very lightweight to heavier pieces, but within some artifact categories, the entire aspect of the variation is quite delicate. For example, the distribution of weights is shown in Figure 6 for complete, small points which at Margaret Bay are generally bifacially flaked with parallel lamellar removals, flat based with either straight or slightly tapering lateral margins.

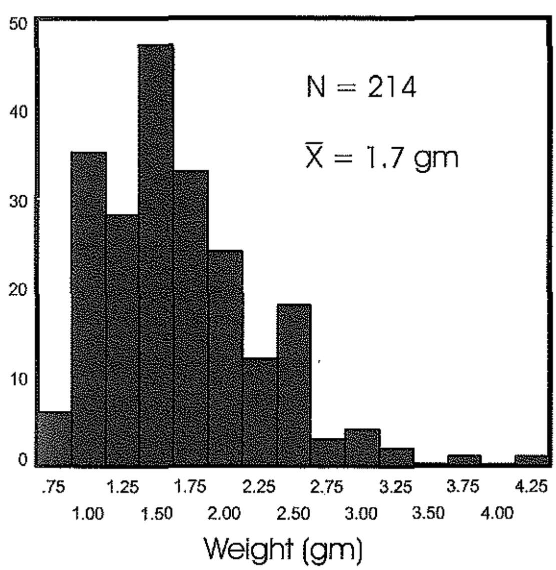

Figure 6. Histogram of unbroken small point weights from Level 2, Margaret Bay (UNL-48).

Many of these small points are exceptionally finely flaked with micro-denticulated lateral edges. Archaeological and ethnographic studies of projectiles have suggested size differences can be correlated with use as an arrow point or as a dart point (Cattelain 1997; Shott 1997). The very light weight (a mean of 1.7 gm) and narrow shoulder width (mean of 11 mm) of the small projectiles from Level 2 is certainly suggestive of use as arrow points. According to Cattelain (1997) and Shott (1977), dart points are significantly larger and heavier. In contrast to the total of 282 complete or broken small points from Level 2, there are only three small points catalogued for the earlier Level 3. This certainly indicates a cultural discontinuity, one which may reflect the introduction of bow and arrow technology. We suggest that the new projectile technology was introduced by ASTt-related people who came down the Alaska Peninsula by the beginning of Level 2 times, around 3300 ^{14}C years BP. The number of probable arrow points found in Level 2 at Margaret Bay far outnumbers those recovered from other prehistoric occupations we have excavated in Unalaska. This also suggests that ASTt people had superior weaponry and were unlikely to be inhibited in their movements across the fairly well settled coastlines of Alaska. Whether ASTt elements reached the Aleutians through direct contact with ASTt peoples or through cultural "middlemen" to the north is uncertain. The quantity and variety of ASTt lithics, along with the house features, suggest that contact may have been brief but direct.

The Eastern Aleutians in the Second Millennium BC Arctic World

Various authors have noted the appearance of the Arctic Small Tool tradition a few centuries before 4000 BP. Although its point of "origin" is not yet identified, the Siberian Neolithic is a strong candidate. As Dumond and Bland (1995:437) point out:

> However, we doubt that there is any single parent culture of the Arctic Small Tool tradition that can yet be satisfactorily identified in northeast Siberia, although it is evident that within the apparentlyearly stages of the various Chukotkan Neolithics all diagnostic artifacts of the Small Tool tradition can be found, and some single ancestral culture may eventually be found.

By 3600 ^{14}C years BP or earlier, the ASTt is found from Kachemak Bay and perhaps the Kodiak archipelago, across the Alaska Peninsula and the eastern Aleutians, up the western Alaskan coast and inland tundras to North Alaska and eastward across the North American Arctic all the way to West Greenland. Some representative ^{14}C determinations for the ASTt are given in Table 2.

The widespread, almost instantaneous AST horizon begs for some kind of explanation. An environmental change that affected the entire Arctic seems most plausible, but the actual mechanism remains unknown.

Table 2. Radiocarbon determinations for a sample of ASTt sites, Libby half-life and calibrated ages by Calib 4.4.2 (Stuiver and Reimer 1993; Stuiver et al. 1998).

Sample	Provenience	Measured C14 Age	Calibrated, 2 Sigma BC	Notes
WSU-4503	basal component, Chugachik Island, Kachemak Bay	4005±100 BP	2874–2210 BC	(Workman 1996)
SI-1856	BR16-8, Brooks River Gravels Phase	3610±85 BP	2199–1741 BC	(Dumond 1981)
SI-1857	BR16-6, Brooks River Gravels Phase	3100±105 BP	1603–1046 BC	(Dumond 1981)
P-998	"Classic Denbigh," Onion Portage	3950±70 BP	2657–2203 BC	(Anderson 1988)
S-1660	Cold Site, Feature 19, Port Refuge, Devon Island	3845±55 BP	2465–2142 BC	marine reservoir correction of 750 years (McGhee 1979:122)
Ua-2166	Qivitup nuua, Sisimiut District, Greenland	4010±90 BP	2871–2288 BC	(Kramer 1996)
Beta-95468	Level 2 Margaret Bay Square 12, #108	3270±70 BP	1732–1410 BC	(Knecht et al. 2001)

The general relationship of the AST horizon to the Neoglacial is complex and beyond the scope of this paper, but we will briefly consider here the eastern Aleutian region. By Powers and Jordan's account (1990) and similarly in McGhee's *Ancient People of the Arctic* (1996), the ASTt spread rapidly over the tundras of North America a few centuries prior to the onset of Neoglacial conditions. By 3500 ^{14}C years BP or so, however, summer temperatures were significantly depressed, and the High Arctic seems to have been abandoned. The Neoglacial is not as well-defined a climatic event as, for example, the Younger Dryas, but in broad outline it is a period of cooling beginning in the mid-Holocene following the Hypsithermal (Kaufman et al. 2004). The Neoglacial is marked by heightened storminess (Mason and Jordan 1993), cooler summer temperatures (Heusser, Heusser, and Peteet 1985), glacial readvances (Ager 1999; Ryder 1989), and vegetational changes (Walker and Pellatt 2003). The changes are not synchronous throughout Alaska, and it is unclear whether there was a gradual or abrupt transition from the Hypsithermal to the Neoglacial.

As described above, the clearest paleoenvironmental proxy we have in the eastern Aleutians for the mid- to late Holocene is the archaeofaunal record. The increase in ringed and fur seal, the decrease in sea otter, the presence of polar bear and walrus in the interval between 4500 and 3000 ^{14}C years BP are strong indicators of pack ice in Unalaska waters and Neoglacial conditions. It is just in this 1500 year interval that the archaeological record reflects a real growth in settlement. The large, permanent structures of Layer 2 at Margaret Bay and the multiroom structures of the Amaknak Bridge site accompanied by deep shell middens testify to substantial settlement growth. Why would settlements grow as climate cooled? We believe there are two main reasons that this occurred in the eastern Aleutians. First, the cooler climate with lower sea surface temperatures may have led to increased primary production in the marine ecosystem (Ware and Thomson 2005). As a result, fish such as Pacific cod, mammals such as ringed and fur seals may have become more plentiful, as well as avian fauna such as ducks and murres. A relatively predictable and abundant year-round set of marine resources provided the necessary subsistence for a growing, basically sedentary population. The second cause of growth may have been due to immigration or through adoption of technologies suited to marine environments. We note particularly the distinctive harpoons with lineguards from Level 4 at Margaret Bay which have clear analogs to artifacts from Ocean Bay sites in the Kodiak archipelago and to the ASTt elements described above from Level 2 at Margaret Bay.

An additional line of evidence for a growing Aleutian population during the Neoglacial has been developed through the analysis of contemporary mitochondrial DNA variation among Aleuts and other northern peoples (Rubicz et al. 2003). Distinct sub-clade clusters identified by reduced median network analysis is strongly suggestive of population expansion according to coalescence theory.

Table 3. Radiocarbon dates for Levels 4 and 5, Margaret Bay site (UNL-48), Unalaska, Libby half-life and Calibrated Ages by Calib 4.4.2 (Stuiver and Reimer 1993; Stuiver et al. 1998).

Sample	Provenience	Conventional C14 Age	Calibrated, 2 Sigma BC	Notes
Beta-109821	Level 4 Square 6	4660 ±80 BP	3641–3103 BC	(Knecht et al 2001)
Beta-140150	Level 4	4130±40 BP	2874–2580 BC	(Knecht et al 2001)
Beta-140151	Level 4 Square 12	4700±40 BP	3631–3369 BC	(Knecht et al 2001)
Beta-109820	Level 5 Square 5	5250±70 BP	4317–3944 BC	(Knecht et al 2001)
Beta-27792	base of lower test unit	5470±140	4595–3978 BC	(Knecht et al 2001) D. Yesner's 1988 test; probably Level 5

In the archaeological sequence we have established for the Unalaska region there is an unresolved occupation gap of almost 2500 years that comes between the Early Anangula phase sites on Hog Island and the Late Anangula Phase, which begins at the base of Margaret Bay (Knecht and Davis 2001). This would be approximately between 8000 ^{14}C years BP and 5500 ^{14}C years BP. One interpretation of this gap is that it represents a break in the occupation of this region, a time period that included major stratovolcano eruptions (Makushin on Unalaska and Okmok on Umnak) and a major cooling event—the "younger Younger Dryas" (Mason 2001). The volcanic events may have terminated the settlements on Hog Island and on Anangula Island. A second interpretation is that the gap is more apparent than real because there are several examples of technological continuity between the Early and Late Anangula phases (microblades, blades, lamps, transverse burins, stone bowls and ochre grinders) as well as a number of unexcavated sites that may fill in much of the apparent chronological gap. Some truth probably lies in both alternatives. In any event, the base of Margaret Bay approximately coincides with the onset of the Neoglacial , the estimated date for the appearance of the distinctive Aleut mtDNA, and the beginning of substantial population growth.

CONCLUSIONS

We have argued that around 3300 ^{14}C years BP there is clear evidence for Arctic Small Tool tradition elements combined with indigenous Aleutian artifacts and features in Unalaska. These elements may represent the movement of ASTt peoples toward a resource-rich area where their flexible and lightweight subsistence technology was well suited. Arguably, the ASTt technology coming to Unalaska included the bow and arrow; it is difficult to explain the sudden appearance of large numbers of lightweight and delicately flaked bifacial points in Level 2 of Margaret Bay in any other way. Bow and arrow technology is generally thought to be of little utility for marine mammal hunters, and we have recognized a phase-out of the small points after the Margaret Bay phase (Knecht and Davis 2001).

If the eastern Aleutians do not shed much light on the origins of the ASTt, the region may give some indication of what happened to it. In the later phases of the Neoglacial, ASTt people and technologies reached the Unalaska region and were assimilated by indigenous islanders. The resulting tool inventories were more elaborated than the highly mobile ASTt groups known elsewhere in Alaska. As our research in Unalaska has progressed, it has become increasingly clear that the Aleutians were not as isolated from other arctic cultures as has been supposed. As has been discovered in other archaeological studies of islands and archipelagos (Fitzpatrick 2004; Lape 2004), the metaphor of the insulated island has given way to a realization that for a maritime people, the Aleutians represented a corridor for a surprisingly free flow of people, ideas, and materials. As part and parcel of the ecological continuum of treeless coasts that stretches from southern Alaska to southern Labrador, the Aleutians presented the same menu of opportunity and challenges to ASTt populations as the rest of the Arctic. This would have been particularly true during the Neoglacial when the coasts of the eastern Aleutians were seasonally ice-bound.

The relatively large populations already inhabiting the eastern Aleutians probably precluded a long-term permanent settlement by ASTt populations, however ASTt peoples enriched the local sequences with new technologies and ideas. We can safely postulate that at least some innovations from South Alaska have accrued to ASTt people during their tenure there.

Although a full discussion is beyond the scope of this paper, we note the similar presence of a range of stone tools normally thought to be diagnostic of Dorset in Unalaska assemblages of the Amaknak Phase beginning around 3000 BP. The similarities are striking, particularly in the form of stemmed asymmetrical knives, stemmed asymmetrical scrapers, and polished burins. Miniature stone and ivory carvings with skeletal motifs are also hauntingly Dorset in appearance (Knecht, Davis, and Carver 2001). But as in the ASTt, there are important differences that lead us away from concluding that Dorset originated in the Aleutians. It seems probable however, that Dorset culture, regardless of its geographic origin, came into meaningful contact with ancient Unangan in much the same way that ASTt people did.

As in the case of ASTt, we again find that Aleutian data unexpectedly but undeniably relevant to an understanding of the processes that played formative roles in the prehistory of the Arctic as a whole.

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The Arctic Small Tool Tradition in Southern Alaska

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Abstract: By 3800 ^{14}C yr BP, representatives of the Arctic Small Tool tradition (ASTt) were present in the interior caribou range on the Bering Sea side of the Alaska Peninsula, and within a few centuries were plentiful in the area of the upper Naknek River drainage, with numerous semi-subterranean habitations positioned for fishing by people of the Brooks River Gravels phase. The earliest dated ASTt appearance in south mainland Alaska, however, is on the lower Kenai Peninsula, dated about 4000 ^{14}C yr BP. By about 3500 ^{14}C yr BP, possible vague reflections of ASTt technology are reported from the Pacific coast of the peninsula and among the developed culture of the Kodiak Archipelago, and somewhat stronger diffusional indications have been claimed for sites on the southwestern tip of the peninsula and in the easternmost Aleutian Islands, where certain ASTt characteristics appear in otherwise coast-oriented material cultures. By 3000 ^{14}C yr BP, Small Tool evidence disappeared from the northern peninsula, precisely where it had been strongest, leaving an occupational hiatus there that endured for nearly a millennium. At the peninsula tip and in the eastern Aleutians the ASTt effect was absorbed by the developing marine-focused cultures that led to the historic Aleuts.

Key words: Naknek River, Kenai Peninsula, Alaska Peninsula, Arctic Small Tool tradition, Aleutian Islands

INTRODUCTION

In the report of a survey conducted more than fifty years ago, William Irving (1957:47) suggested somewhat tentatively that a trio of artifacts he had recovered near Tyone Lake in the uppermost Susitna River drainage of south-central Alaska (Fig. 1, site 1) might pertain to an "arctic small-tool tradition" that he was later to characterize and define (Irving 1962, 1964, 1969–1970). As known at the time of his mid-1950s Susitna survey, candidates for membership in this proposed tradition were confined to the Denbigh Flint complex, recently discovered at Cape Denbigh, and a handful of sites from the north Alaskan Brooks Range, plus sites of arctic Canada and Greenland that apparently predated the Dorset culture. In the years that followed, numerous additional sites attributed to the Denbigh Flint complex were reported, but most of them were confined to Alaska north of Bering Strait.

Irving's original definition (1962) was obviously centered on characteristics of the Denbigh Flint complex, modified slightly by his own later work (Irving 1964) and with reference to certain other collections. These were characterized by what Irving (1962:56) had described as a "unique style and technique of workmanship," involving very delicate, narrow, and highly controlled flake removal, often parallel and diagonal. This technique was represented on very small and commonly bipointed endblades and crescentic sideblades less than four centimeters in length. Such artifacts appeared with microblades, diminutive burins struck on small bifaces, a few larger knife-like artifacts as much as ten centimeters long, small and finely made scrapers, a limited number of small chipped adze blades with polished bits, an equally limited number of small ("burin-like") grooving implements in which the burin facet was replaced by a polished face (e.g., Dumond 1977:79); however, relative frequencies of these types might vary rather substantially from site to site.

Here, I review evidence presented since 1960 for the appearance in southwestern and south-central Alaska of materials of the Arctic Small Tool tradition (ASTt) as defined in this way. I note that in this I trail a paper that was drafted some years ago, but published only recently

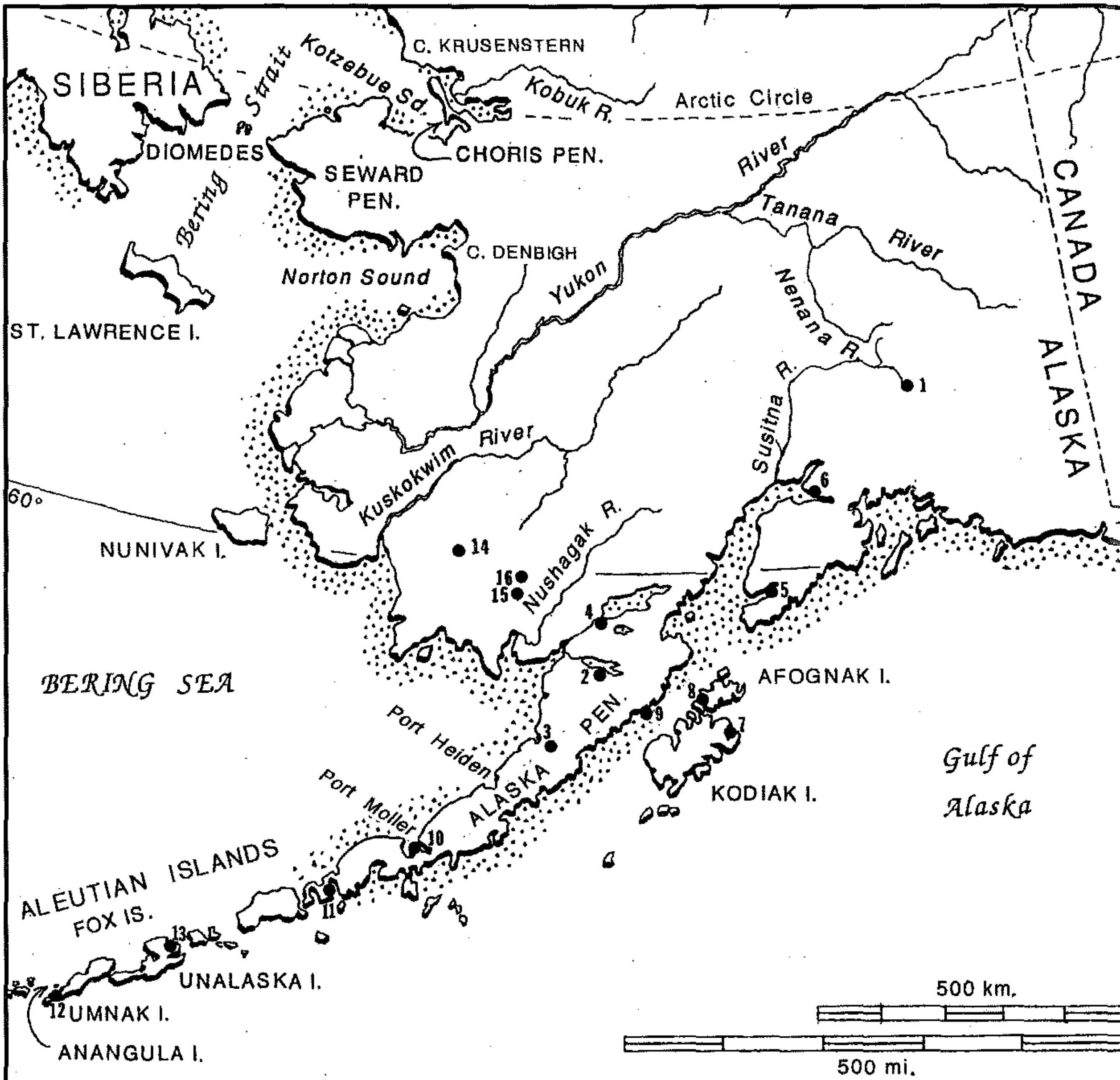

Figure 1. South mainland Alaska. Numbered site locations refer to: 1) site near Tyone Lake, upper Susitna River drainage; 2) Brooks River sites, upper Naknek River drainage; 3) Ugashik Narrows site, upper Ugashik River drainage; 4) Igiugig Airport site, upper Kvichak River; 5) Chugachik Island site, Kachemak Bay; 6) Beluga Point site, Turnagain Arm; 7) Chiniak Bay sites, Kodiak Island; 8) Malina Creek site, Afognak Island; 9) Takli site, Takli Island; 10) Hot Springs site, Port Moller; 11) Russell Creek site, near Cold Bay; 12) Chaluka site, Umnak Island; 13) Margaret Bay site, Unalaska Bay; 14) site near Eek Lake, upper Eek River drainage; 15) site DIL-153 at the outlet of Lake Beverley; 16) Raleigh Knoll site on Tikchik Lake.

(Workman and Zollars 2002), which covers much the same ground, although with a somewhat different focus.

THE NORTHERN ALASKA PENINSULA

After Irving's Susitna drainage site, the first more fully confirmed find of material from south mainland Alaska that was assignable to the Arctic Small Tool tradition as Irving came to define it, was in 1961 when two Denbigh-like sites on the Brooks River tributary of the Naknek River drainage of the Alaska Peninsula were dated at more than 3000 ^{14}C yr BP (Fig. 1, site 2). The similarity of this Brooks River Gravels phase to the Denbigh Flint complex was unmistakable, especially in the small, well-flaked bipointed endblades of cryptocrystalline silicates, the small adze blades with polished bit, and the diminutive scrapers, although frequencies of artifacts such as microblades and burins varied from those in the northern assemblages (Dumond 1963). Two years later more field evidence of the Gravels phase was revealed, with a vastly expanded artifact inventory that in addition to artifact types already recovered included a few more microblades, small burins, and polished ("burin-like") groovers, now supported by numerous radiocarbon dates (Dumond 1981).

In the first few years after the discovery of the Gravels phase, and in consideration of the linguistic and gross material cultural similarities between historic Eskimo (Inuit) and Aleut (Unangan) peoples, it seemed reasonable that the two had diverged from a common ancestor somewhere in southern or southwestern Alaska. Given the known presence in the eastern Aleutian Islands of the Anangula Blade site, which had been dated at 8000 BP or slightly earlier, in 1965 it seemed reasonable to hypothesize that sometime around 6000 BP an archaeologically recognizable common ancestor of Inuit and Unangan would be found on the Alaska Peninsula, and that it would forecast development of the earliest Arctic Small Tool tradition on one hand, and the lowest levels of the Aleutian Islands Chaluka site on the other, both of which were known to date from around 4000 radiocarbon years BP (Dumond 1965).

But when 6000-year-old sites on the Pacific coast of the peninsula were found and explored in 1964 and 1965 (especially the Takli site; see G. H. Clark 1977), they suggested no ancestral relationship at all to the 4000-year-old ASTt, whereas they did indicate relationship to the earliest assemblages then being reported from Kodiak Island (D. W. Clark 1966), and a similarity to what I took to be post-Anangula but pre-Chaluka artifact styles from the Aleutians (Dumond 1969–1970, 1971:appendix)—an opinion tentatively confirmed within the next decade by Laughlin's (1975) announcement of an eastern Aleutian "transition culture." In short, it appeared that ASTt people had arrived on the peninsula from the north sometime in the second millennium BC, intruding on earlier occupants of the region who were related both toward Kodiak and toward the Aleutian archipelago. There has been no reason to modify this conceptualization since the mid-1960s.

Brooks River

As research on the Alaska Peninsula continued into the 1970s, details of the Gravels phase occupation were further worked out. Whereas the few earlier users of Brooks River had camped exclusively at what was then the mouth of the river as it emptied into Naknek Lake, the succeeding Gravels phase people left their campsites along virtually the entire course of the two-kilometer length of the river that drained Brooks Lake into Naknek Lake. Indeed, these ASTt habitations and camps were found on essentially every river terrace that had been in existence at the time of their occupation, which was now dated between 3600 and 3100 ^{14}C yr BP. Occupation was especially heavy in proximity to the waterfall that had appeared in the central course of the river sometime around 4000 years ago as a result of the continued lowering of Naknek Lake through erosion at the head of its outlet stream, the Naknek River.

Although a few of these Brooks River camps were evidently surficial when occupied, the vast majority involved constructed houses, roughly square and about four meters on a side, excavated twenty centimeters or more through the thick layer of yellow tephra (volcanic ash G in our field sequence) that lay within the sod at that time, and entered by means of a sloping entrance passageway. A cluster of rocks was commonly central, around which was charcoal and a scattering of fire-cracked pebbles apparently used in stone boiling (Fig. 2). Postholes were not regularly identified.

Although small fragments of charred mammal bone were occasionally found, none was identifiable to genus. But careful screening and washing of floor samples led to the recovery of numerous salmonid teeth. Although there is no absolute certainty that these were salmon rather than large trout, the clustering of sites along the river and especially near the falls suggests that the occupation was based on the summer and fall availability of the Pacific salmon, which today transit through Brooks River in great numbers, leaving many to spawn there. This summer-seasonal conclusion is despite the fact that the form of the houses suggests winter residence. Nevertheless, by analogy with the ASTt elsewhere, one must suppose that caribou also provided a staple—and historically caribou of the strong Alaska Peninsula herd have been available in winter as far north as the Naknek region.

Thirteen of these houses have been uncovered in whole or in part, and a careful estimate based on known frequency and distribution suggests that remains of well over one hundred comparable structures lie along the two-kilometer length of the Brooks River as it existed during the second millennium BC (it is now some 2.4 km from head to foot). All houses have lain above the yellow volcanic ash mentioned, and all were covered by a later tephra. Ending by 3000 BP, the ASTt occupation was succeeded by a cultural hiatus of several centuries (Dumond 1981).

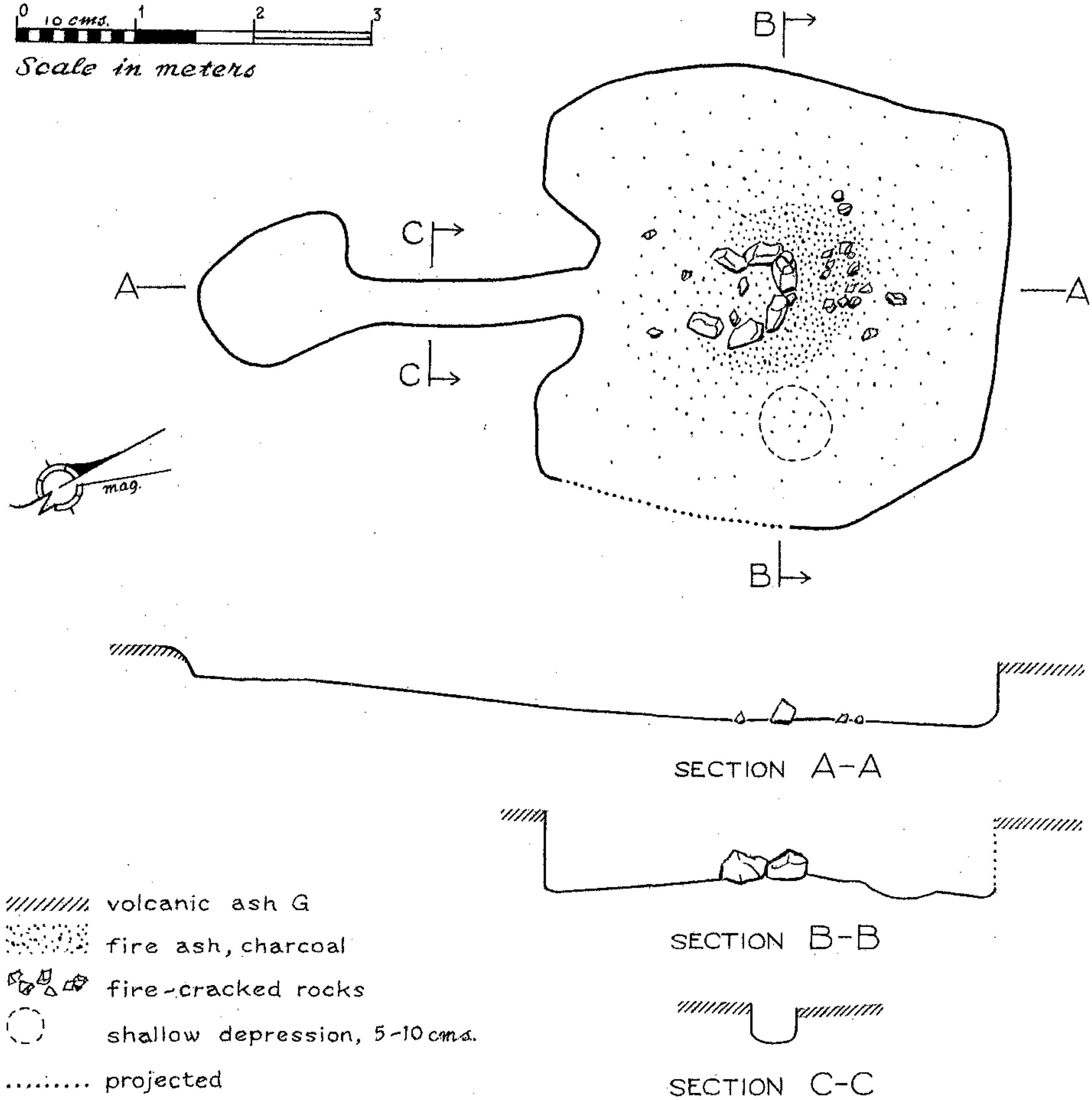

Figure 2. Plan and profiles of excavated house, Brooks River Gravels phase (from Dumond 1981:fig. 6.7). The first ASTt habitation to be completely cleared at Brooks River, its locality was field-designated BR-12, now identified in Alaska state site files as a portion of XMK-012.

Ugashik Narrows

In 1974 and 1975, field operations 150 km to the southwest, in the upper Ugashik River drainage system, revealed a similar habitation that yielded similar artifacts and was located in a similar geomorphic position—on a shallow and salmon-rich waterway or narrows connecting two lakes (Fig. 1, site 3). Again, a square, semi-subterranean floor, scattered hearth, with no postmolds identified. Again, cut through a recognizable tephra, and covered by a later volcanic ash deposit. This floor yielded two dates that place it between about 3900 and 3600 ^{14}C yr BP, possibly although not definitively earlier than the Gravels phase occupation at Brooks River. Other depressions nearby were suspected to indicate other houses, but time did not permit their exploration. Again, it appears that the ASTt occupation was followed by a cultural hiatus of some centuries (Henn 1978:fig. 11).

For some years the Brooks River and Ugashik Narrows occupations remained alone as the ASTt representatives not only on the Alaska Peninsula, but in all territory south of the Bering Sea. More recently, however, additional claims have surfaced of ASTt presence in the region. One of these involves the northernmost section of the Alaska Peninsula on the Upper Kvichak.

Upper Kvichak River

At Igiugig, located on the Kvichak River a short distance below its head at Iliamna Lake (Fig. 1, site 4), archaeologists of the Alaska Office of History and Archaeology excavated the roughly squared corner of a habitation floor yielding artifacts strongly reminiscent of the Gravels phase, especially small bipointed endblades of cryptocrystalline silicates as well as rhyolite microblades. In the center of the floor was a partial ring of stones with surrounding lenses of charcoal and flanked by another cluster of charcoal with fire-cracked rocks. Three possible postholes were identified near the circle of stones. Charcoal from within this "fire ring" yielded an age of 3330 ± 60 ^{14}C yr BP (Beta-76533, CAMS-16358) (Holmes and McMahan 1996). The form of the exposed floor, as well as the apparent date, suggests an occupation comparable to that of the Brooks River Gravels phase, although the artifact inventory departs slightly from the Gravels phase in its higher proportion of microblades.

Further suggestions of ASTt presence, of varying degrees of confirmability, involve other sites near Nushagak Bay, sites in the Cook Inlet region, in the Kodiak group of islands, on the lowermost Alaska Peninsula, and in the eastern Aleutians. These will be considered in turn.

VICINITY OF NUSHAGAK BAY

Wood River Lake System

In the mid-to-late 1980s, and again in 1995, archaeologists of the Bureau of Indian Affairs (BIA) investigated the site now identified as DIL-153, located at the outlet of Lake Beverley of the Wood River Lakes complex, at the extreme head of the Agulukpak River on its right bank (Fig. 1, site 15). Results have been analyzed and summarized by DePew (n.d.), but not yet published or presented in a final statement. DePew reports that the lowest of five identified components produced three slab-lined hearth features, a few small and delicately chipped endblades, microblades, and at least one scraper and a small whetstone. Four ^{14}C ages apparently associated with the hearth features produced a mean age of 3488 ± 29 ^{14}C yr BP (DePew n.d.:table 4). In 2005, I was able to examine the artifacts in the BIA office in Anchorage. The nature of the small collection and the ^{14}C age suggest that an affiliation with ASTt is entirely reasonable.

From some 45 km north of DIL-153, but still within the Wood River Lakes district, Shaw (1990) briefly describes and illustrates a small collection made at the Raleigh Knoll site, remnant of a temporary camp now "set back from the modern shore of Tikchik Lake" (Fig. 1, site 16). The illustrated artifacts (Shaw 1990:26) are of plausible ASTt affiliation, although the ^{14}C age thought most likely to date the occupation is reportedly about 2700 BP, a few centuries later than other the collections enumerated here.

Lower Kvichak River

A site tested briefly by BIA archaeologists in 1985 and identified as DIL-088, located approximately 30 km above the outlet of the Kvichak on Bristol Bay and thus well downstream from Igiugig (or Fig. 1, site 4), produced no clearly diagnostic artifacts of any identifiable archaeological complex. But a single radiocarbon determination on charcoal from more than eighty centimeters below surface provided a ^{14}C age of 3580 ± 150 yr BP (Beta-14507) (BIA 1986). The date is provocative and the area is that in which an ASTt presence might be expected, although the evidence is certainly not adequate to provide confirmation.

COOK INLET

Kachemak Bay

In the 1980s a relatively ephemeral but clear ASTt artifact assemblage was revealed at the base of a Kachemak tradition occupation on Chugachik Island near the upper end of Kachemak Bay (Fig. 1, site 5). Three small hearth areas with artifacts and waste flakes were confined to a roughly elliptical space of two by six meters. Bark and charcoal from a floor area provided ages of 4005 ± 110 (WSU-4303) and 4220 ± 110 ^{14}C yrs BP (Beta-87008) (Workman and Zollars 2002). Faunal remains and specific house features were lacking. Although no final description of the collection has appeared, after examining it firsthand on two separate occasions, I have no doubt that any of the artifacts could easily be lost in the Gravels phase assemblage from Brooks River.

As with the site on the Kvichak River, the Chugachik Island site can be accepted as closely related to the ASTt occupations at Brooks River. The Kvichak River site with its apparent constructed semi-subterranean dwelling is coeval with the Brooks River occupation, whereas that on Chugachik Island involves an occupation evidently earlier and also more ephemeral. With regard to all of the sites to be mentioned below, however, although ASTt relationships have been suggested—with differing degrees of commitment—they are poorly attested.

Turnagain Arm

The Beluga Point site on Turnagain Arm (Fig. 1, site 6) has been described as a Cook Inlet site in which certain artifacts are suggestive of ASTt contacts or even a possible presence (Workman and Zollars 2002, citing the Ph.D. dissertation of Douglas Reger). The samples, involving two separate components, are extremely small, in one dated case (close to 4000 ^{14}C yr BP) involving three artifacts associated with a polished slate piece that is entirely unlike an ASTt implement, and in the other (not directly dated) involving only knife bifaces of an apparent style that is present although comparatively rare in Brooks River and other southern ASTt assemblages.

KODIAK ARCHIPELAGO

In at least three cases, scattered artifacts identified by excavators as ASTt have been reported from sites with primary affiliations in other directions. These include two sites on Chiniak Bay of northeastern Kodiak Island proper (Fig. 1, sites numbered together as 7): the Rice Ridge site, in late Ocean Bay levels dated about 3800 BP; and a seasonal camp of Kachemak tradition on Near Island (next to the town of Kodiak), where it is overlain by materials dated to 3050 ± 60 ^{14}C yrs BP (Beta-113163). In addition, at Malina Creek on Afognak Island, a few ASTt-like artifacts were reportedly interstratified between an earlier Ocean Bay component and a later Kachemak one (Fig. 1, site 8). These occurrences are summarized by Workman and Zollars (2002), but are much more thoroughly examined by Steffian and Saltonstall (this issue) and will not be treated further here.

As concluded by Steffian and Saltonstall, the ASTt attributions are based on typological identifications of artifacts found scattered through other cultural contexts. In this sense they are parallel in incidence to a few artifacts found in deposits on the Pacific coast of the Alaska Peninsula, discussed below.

PENINSULA PACIFIC COAST

In the 1960s, a few small and well-made bipointed projectile blades were recovered in deposits of the Takli Birch phase, from Takli Island on the Pacific (i.e., Shelikof Strait) coast immediately offshore of the Alaska Peninsula (Fig. 1, site 9). Appearing in an assemblage of roughly 3500 ^{14}C yrs BP that is totally unlike the Gravels phase—an assemblage that includes large polished slate implements as well as large chipped bifaces, oil-burning stone lamps, and clear evidence of maritime subsistence—these scattered implements were long ago concluded to reflect just enough of the ASTt to verify contemporaneity with the Brooks River Gravels phase located on the opposite side of the Aleutian Range of mountains on the Bering Sea slope of the peninsula (G. H. Clark 1977; Dumond 1971). In the fall of 2004, however, I had the opportunity in Seattle to examine the collection from the Tanginak Spring site on Sitkalidak Island, located on the southeastern area of the Kodiak group; there I found essentially the same small bipoints, but from levels of a site that on the basis of multiple radiocarbon determinations must date entirely before 6000 radiocarbon years BP. These artifacts were evidently integral to the early Ocean Bay collection, although in low frequency (examination and ages courtesy of J. Benjamin Fitzhugh). Given this circumstance, the identification not only of the Takli Birch phase artifacts, but comparable items from the Kodiak Island sites mentioned above, appear much less clearly assignable to the ASTt. It may well be that none of them has anything to do with that more northern cultural complex.

THE LOWER ALASKA PENINSULA

Recently, two sites on the southwestern Alaska Peninsula have been represented as affiliates of the Arctic Small Tool tradition. These include certain isolated levels of a large village site (the Hot Springs site) located at Port Moller (Fig. 1, site 10), and the site of Russell Creek near Cold Bay (Fig. 1, site 11).

Port Moller

In their paper as first drafted several years ago, Workman and Zollars suggested that a limited assemblage of relatively small chipped artifacts from the base of one trench at the Hot Springs site, described by the original excavators as largely of cryptocrystalline material and associated with a radiocarbon age of 3520 ± 95 ^{14}C yrs BP (Gak-5416), was likely related to the ASTt collection from the Ugashik Narrows site. Following actual examination of the material recently by Workman, however, the suggestion has been essentially withdrawn, as is emphasized in one of the published paper's end notes (Workman and Zollars 2002:note 5). A suggestion of ASTt affinity for the same small assemblage as well as material from other strata of the same trench has also been made by Maschner and Jordan (2001). Nevertheless, examination of these collections with consideration of materials and scale shows no really substantial morphological similarity to known ASTt materials. This, together with evidence of an ocean-side adaptation at Port Moller that is unknown in Alaskan sites of ASTt affiliation as defined by Irving, is sufficient to rule out Port Moller as a bona fide ASTt site. This point will be returned to later, after a brief discussion of the second Alaska Peninsula site mentioned just above, and following attention given to the eastern Aleutian Islands in a subsequent section.

Russell Creek

As a centerpiece to their discussion of the Hot Springs site, Maschner and Jordan (2001) specifically assign occupation of their Russell Creek site, located near Cold Bay toward the tip of the peninsula (Fig. 1, site 11), to the Arctic Small Tool tradition. Dated somewhat after 3500 ^{14}C yrs BP, floors of two houses of elliptical plan were excavated completely and at least four others were partially cleared. Stone artifacts, almost all of basalt, included small indented- and contracting-base points, scrapers, polished "plummets," an adze blade with a polished bit, stone bowl fragments, and a stone lamp. Bone artifacts included fishhook and leister barbs, harpoon dart heads, awls, and wedges. The artifact collection was determined to be closely related to those assemblages from the Hot Springs site at Port Moller. Fauna were also well represented at Russell Creek, including many fish, especially cod; birds, especially geese; low frequencies of land mammals; and many sea mammals, especially seal, which was determined to be the major subsistence item. There seems to be no question that the focus was strongly oceanside, as was the case with the site at Port Moller.

THE EASTERN ALEUTIAN ISLANDS

Umnak Island

Concerning the eastern Aleutians, the first relatively concrete suggestion of ASTt involvement was made long ago by Denniston (1966), who called attention to a set of small chert artifacts from basal levels of one area of the Chaluka site on Umnak Island (Fig. 1, site 12). She concluded that they might represent ASTt imports into an otherwise prehistoric Aleutian context. This suggestion was repeated in the earlier version of the Workman and Zollars (2002) paper, and at least partially withdrawn when the paper was published. Knecht, Davis, and Carver (2001), however, revive Denniston's conclusions and use them in connection with their description of the Margaret Bay site near Unalaska Bay in Dutch Harbor (Fig. 1, site 13), addressed below.

Unalaska Island

At Margaret Bay, Knecht, Davis, and Carver suggest that remains from strata 2 and 3, producing radiocarbon ages from about 3600 to 3100 ^{14}C yr BP, are decidedly reminiscent of ASTt assemblages. Key implements are said to include small, well-flaked projectile blades, often of chert, as well as "small round and beaked endscrapers, bell shaped scrapers, [and] polished adzes" (Knecht and Davis 2001:276). The occupations represented in those strata, however, are also characterized by stone-lined and evidently semi-subterranean habitations, stone bowls, stone lamps, plummet and cobble fishing weights, labrets, and composite fishhooks of bone, as well as socket pieces and harpoon heads. Of these, the habitation style, stone vessels, fishing weights, labrets, and fishing and harpoon technology are unknown in the Alaskan sites commonly assigned to Irving's ASTt, although, to be sure, the absence of fishhooks and harpoon parts depends on organic preservation, which is essentially nil in Alaskan ASTt sites.

CONCLUDING DISCUSSION

To turn first and briefly to the assemblages of the lower Alaska Peninsula and the eastern Aleutians (Port Moller, Russell Creek, Chaluka, and Margaret Bay), all of them date between about 4000 and 3500 ^{14}C yr BP to about 3100 ^{14}C yr BP, and in their overall characteristics they are not strikingly dissimilar. In most but not all of these cases, the relatively small artifacts involved in the suggestions of ASTt affinity appear more consistently of chert and of smaller size than is usual in the collections in which they are found; many exhibit quite fine flaking, hence in those respects they do approach characteristics of ASTt assemblages. Compared with the diminutive Brooks River Gravels phase materials, however, the artifacts as a whole can only be called gross (see Dumond 2001:fig. 14.2).

In all of the cases, furthermore, the context includes stone vessels, oil-burning lamps, and abundant evidence of a specialized ocean-edge subsistence focus, all of which are foreign to Irving's conceptualization of the ASTt as it occurs in Alaska. Indeed, the only fairly well- explored coastal appearances of ASTt sites in Alaska are those at Capes Denbigh and Krusenstern, while traces have been reported in a handful of others. In most or all of these cases, the sites have been interpreted as seasonal hunting stops, possibly for spring sealing from shore-edge ice—cases in which hunting techniques may depart little from those used against terrestrial animals. This small number of sites contrasts with the dozens of ASTt sites reported from inland regions, especially the two slopes of the Brooks Range where sites lie athwart caribou migration routes (see, for example, the distribution shown in Dumond 1982:table 1, fig. 1).

Elsewhere I have discussed these peninsula and Aleutian sites at much greater length. On the basis of a trait comparison I suggested that the assemblages might relate to one another and thus might be lumped together in a classificatory cultural unit (which simply for operational purposes I termed a "Macro Margaret Bay phase"). But I suggested rather emphatically that they are not seriously to be assigned directly to the originally defined Arctic Small Tool tradition as it is known anywhere in Alaska or, presumably, Canada (Dumond 2001). I reassert those conclusions here.

Yet the calls for recognition of ASTt affinity must provoke further thought. The intrusive appearance of these artifacts within the local sequences in which they occur may result from some measure of contact with people related to the ASTt presence at Kachemak Bay and around Bristol Bay—a suggestion also made by Workman and Zollars (2002). What might be the mechanisms involved?

At Margaret Bay, though fauna are not well represented in Levels 2 and 3, the preceding Level 4, generally dated earlier than about 4000 ^{14}C yr BP, produced a large faunal assemblage that in addition to predictable ocean-side mammalian products from the Unalaska region as it is known today (e.g., harbor seal and porpoise) also included finite quantities of ice-edge fauna: ringed seal, walrus, and polar bear (Davis 2001). Although the Hot Springs site at Port Moller on the peninsula is known for both ringed seal and walrus, that site is positioned not far from what is today the southeastern edge of heavy winter drift ice of the Bering Sea, which on the peninsula commonly falls somewhere between Port Moller and Port Heiden, at about 57° N latitude. This point is 3° N and 500 km or so east-northeast of Margaret Bay. More directly to the northwest of Unalaska, the southern edge of winter ice often (but by no means every year) has appeared as far south as the Pribilof Islands—again, at 57° N and nearly 400 km distant from Margaret Bay, this time across the open Bering Sea (e.g., appropriate sections in USCGS 1954). That is, the occurrence of ice-edge fauna may indicate that the Margaret Bay people of the time traveled some distance to hunt at the ice edge—moving either north over the open Bering Sea and 3 degrees of latitude (and there has been no definitive evidence showing that precontact Aleutian Islanders ever visited the Pribilofs, for instance), or east-northeast along islands and the peninsula to a similar latitude. On the other hand it seems much more likely that during the crucial interval, which was the time of the so-called Neoglacial period (ca. 5000–3000 BP), it was winter ice that did the advancing, moving far to the south of its present limit, even if only during sporadic and unsettled environmental interludes.

Is an association of Margaret Bay people with the ice edge, perhaps intermittently, significant in terms of possible ASTt contacts? The known distribution of ASTt sites is virtually limited to tundra-covered lands adjacent to sea coasts that freeze fast in winter (Dumond 1965). Thus it is not impossible, or even unlikely, that the presence of sea ice and ice-edge fauna on the southernmost end of the Alaska Peninsula and the eastern Aleutian Islands would have played some part in facilitating contact between peoples who otherwise might have gone their ecologically separate ways. On one hand, the incursion of the ASTt people to the south might have been related to overall cooling of the climate with an attendant southward movement of the edge of winter sea ice. On the other, if people of the eastern Aleutians were introduced to ice-edge fauna near at home through the same climatic fluctuation, it would be reasonable for them to travel eastward to intercept the edge of the ice as it intersected with the southwestern Alaska Peninsula.

Whatever the immediate stimulus for movement, it seems clear that sometime around 4000 ^{14}C yr BP, campsites of ASTt people appeared at Kachemak Bay, and possibly elsewhere along Cook Inlet. Their absence on the northern Alaska Peninsula at this time may relate to the heavy deposit of tephra that suggests volcanic events that apparently affected much of the region on the Bering Sea slope of the Peninsula at that time. Within a few centuries, however, ASTt people had colonized salmon-rich rivers flowing over the peninsula to the Bering Sea as well, apparently, as parts of the Wood River drainage to the north. Here they established what seem to have been relatively stable settlements involving constructed habitations partially excavated into the contemporaneous ground.

By this time, there is also an indication of possible ASTt influence on people of the lower Alaska Peninsula and even of the easternmost Aleutians. The same may have been the case on the Pacific coast of the northern peninsula, and possibly even on Kodiak Island. Nevertheless, the earlier maritime focus of these lower peninsula and island peoples was retained. This alone, given the nature of ASTt remains elsewhere in Alaska as well as in the more easterly Arctic, sets them apart from the basically terrestrial ASTt as its assemblage components are known.

By not later than about 3000 ^{14}C yrs BP, the ASTt people of the Bering Sea slope of the Alaska Peninsula vanished, possibly again as a result of catastrophic volcanism, to judge from the presence of tephra. But is this sufficient to explain the relatively lengthy period of abandonment that evidently followed in that region? The Alaska Peninsula caribou herd of recent years has had its center of gravity, and its calving area, toward the center of the peninsula in the vicinity of Port Heiden. Immediately east of Port Heiden is Aniakchak Volcano, and a short distance to the southwest is Veniamenof Volcano. Sometime before 3000 ^{14}C yrs BP each of these volcanoes produced one or more massive eruptions in which pyroclastic material flowed to the shores of both the Bering Sea and the Pacific Ocean (Miller and Smith 1987). Any such occurrence, one must suppose, would have had a significant effect on the well-being of the peninsula caribou. Added to this, recent productivity studies in lakes of the Alaska Peninsula and Kodiak region have indicated the probable presence of some prehistoric intervals in which salmon runs were drastically reduced if not entirely absent (Finney et al. 2002). Thus, if any such traumatic event, especially concurrent events, served to remove one or more essential subsistence resources, they would certainly have encouraged the ASTt people to depart from the region. At the same time, the effects of any impact that ASTt contact may have had on more coastally oriented people of the general region would have been thoroughly integrated into local culture, producing not an ASTt occupation, but an amalgam.

A final question remains: Although ASTt affiliates on the Alaska Peninsula endured for a number of centuries, no sites of a comparable affiliation are conclusively known between the region around Bristol Bay and Cape Denbigh. This may be simply a sampling problem, for that region has been little surveyed. In addition to the report of the possible ASTt traces in the upper Susitna River drainage (Irving 1957) mentioned at the beginning of this paper, there is another of a possibly ASTt-affiliated surface scatter recorded in the mainland mountains of southwest Alaska near Eek Lake (Fig. 1, site 14), not far north of the Wood River Lakes site or sites. This attribution, however, appears to be based primarily on a single artifact (Ackerman 1979:9–10).

In addition to the matter of sampling, a further possibility lies with the location of major caribou herds, at least to the extent that the modern distribution of herds mirrors that of 4000 BP. Although a major herd is known to have occupied the Alaska Peninsula since at least the nineteenth century (and caribou remains are common in all prehistoric sites in which bone is preserved), and a somewhat smaller one is found on the Kenai Peninsula, much of the region south of the Seward Peninsula has recently been less well endowed in terms of strong herds (Hemming 1971). If, as one might suspect, the earliest ASTt immigrants were principally hunters of caribou, their route southward from north Alaska may have lain well inland from the coast, where other thriving herds are now located.

But when ASTt people finally arrived on the Alaska Peninsula, they found themselves beguiled by the presence not only of a vital caribou herd, but of major and relatively stable salmon runs that would provide an inducement to settle in more sedentary fashion than they had been accustomed. This relative stability lasted for half a millennium or slightly longer, only to be ended for at least some of the people (those best sampled to date) apparently rather abruptly, for reasons that — as indicated here — are at present uncertain. If at their departure they left behind any legacy, stylistic or adaptive, it was as reworked elements incorporated into lifeways of other peoples who were long native to the region.

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The Denbigh Flint Complex in Northwest Alaska: A Spatial Analysis

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Abstract: The uniformity of Denbigh Flint assemblages across different ecological zones in northwestern Alaska suggests that the typologies we have constructed for the analysis of lithic remains are insufficiently sensitive to reveal behavioral differences between sites. By integrating typological, materials, and spatial data, however, we are able to detect some differences that relate to ecology, seasonality and external relationships. I focus here on a spatial analysis of multiple Denbigh components from two site areas: Cape Krusenstern and Onion Portage. I employ two different analytical strategies to identify possible toolkits: a factor analysis of artifact clusters within a fixed distance from hearths and within house floors, and a more flexible cluster analysis based on the nature of artifact clusters in a variety of contexts. The factor analysis reveals five types of meaningful clusters, each with assemblages related to different sets of activities. The second, more ad hoc clustering method is based on five spatial variables: house floors; hearths; near hearths; artifact concentrations unassociated with formal features; and areas of randomly dispersed artifacts, and is especially effective in revealing differences in seasonality. This approach reveals sets of activities during snow-free seasons, some specifically late spring/early summer or fall, versus activity sets that occurred in winter. From a more regional perspective, Denbigh implements are seen to have been brought to the sites in finished or near finished form, indicating that the earlier stages in tool manufacture occurred elsewhere. The apparent importation of Denbigh tools in finished form adds fuel to William Irving's argument that the finest of the Denbigh artifacts were produced by itinerant flintknapping specialists. The lithic analysis also informs us about the nature of external contacts, especially between the coast, and the Kobuk, Noatak and Koyukuk rivers. Finally, I demonstrate that these different analytic methods for studying prehistoric activities have their own strengths and weaknesses, and without good spatial data even the best of the methods has major limitations. This is a call to increased attention in our excavations to recording precise provenience of all lithic materials — flakes as well as formal artifacts, a formidable task, but one with rewarding results.

Keywords: Alaska archaeology, Lithic Analysis, Inter-regional contact

The Denbigh Flint Complex, first discovered at Iyatayet in Norton Sound (Giddings 1949, 1964, 1967), is widely distributed throughout northwestern Alaska. Additionally, early cultural remains from southwestern Alaska (Dumond 1981, 1998), northern Canada (Maxwell 1985), and Greenland (Knuth 1967) are so similar to the complex that the same cultural designation, Arctic Small Tool Tradition (Irving 1957, 1962, 1969-1970), has been applied to all.

One of the remarkable features of the Denbigh Flint Complex (hereafter referred to as Denbigh or DFC) is the typological uniformity from Norton Sound northward of both the artifact forms and the makeup of the assemblages belonging to the complex, a uniformity that appears to transcend the differences in the varied ecological settings in which the complex has been found. Of the twenty-six major categories comprising the majority of Denbigh artifacts, most are represented in all sites in similar percentages. For example, the rank order of microblades, burins, burin spalls, weapon-point insets, endscrapers, flake-knives, and microblade cores are similar at the forest-edge site of Onion Portage, the lake-tundra site of Punyik Point, the Chukchi Sea coastal sites of Cape Krusenstern, and the Norton Sound coastal site of Iyatayet (Fig. 1).

Since microhabitat differences ought to have a considerable impact on the makeup of artifactual assemblages, the artifact categories we have created for Denbigh may mask clues about important behavioral differences that other variables can reveal. The following is an attempt to search for these finer distinctions in activities by adding the variable of artifact spatial distributions as it relates to archaeological features.

TYPE/RANK/%	OP	PP	CK	IY	OP%	PP%	CK%	IY%
MICROBLADE	1	1	1	1	36.3%	43.4%	24.2%	38.1%
BURIN SPALL	2	2	3	3	25.5%	14.4%	17.0%	16.9%
WEAPON INSET	3	3	4	2	7.3%	13.8%	11.3%	17.1%
BURIN	5	4	2	4	5.0%	9.9%	17.3%	14.9%
ENDSCRAPER	4	5	6	6	5.1%	2.5%	2.0%	1.9%
FLAKE-KNIFE	6	6	5	5	1.5%	2.3%	9.1%	8.1%
MBCORE	7	7	7	7	0.3%	0.6%	0.7%	0.9%
% OF TOTAL ASSEMBLAGE					81.1%	86.8%	80.5%	97.8%
NUMBER, TOTAL ASSEMBLAGE					2786	355	405	996

Figure 1. Ranking by relative quantity of the 7 most abundant artifact categories at the Denbigh Sites of Onion Portage (OP), Punyik Point (PP), Cape Krusenstern (CK), and Iyatayet (IY).

ORIGINS

Denbigh is one of the most easily recognized archaeological complexes in Alaska. It appears to have arrived in Alaska suddenly during the mid third millennium BC, notwithstanding some unconvincing suggestions of much older precursors in Alaska, yet Denbigh origins are still unknown. One can surmise that the complex was derived from the eastern Siberian interior, where many of the attributes were present 2000 to 3000 years earlier (Dikov 2003; Mochanov 1969; Slobodin 1999), but if so, we should have expected to find traces of its direct predecessors and compatriots in the part of Asia closest to Alaska. Thus far, none have been documented.

The primary subsistence base of Denbigh peoples was year-round caribou hunting, with at least some groups engaged in late spring or summer seal hunting and, apparently, fishing. Their geographical distribution in North Alaska largely coincides with that of modern Inupiat, and includes open tundra areas, lakeshores, wooded riverine areas, and the coasts of the Norton and Chukchi seas (Anderson 1988; Bockstoce 1979; Giddings 1949; Giddings and Anderson 1986; Harritt 1994; Irving 1964; Odess 2003; Stanford 1976). On the other hand, their seasonal rounds differed from most modern Eskimos inasmuch as none of the Denbigh groups wintered on the coast.

As exemplified by the river edge site of Onion Portage on the Kobuk River and at the lake edge site of Punyik Point overlooking Itivlik Lake on the North Slope, Denbigh peoples wintered both in the wooded interior, where their small river-edge settlements consisted of one or two semi-subterranean hemispherical houses three to four meters in diameter (Fig. 2), and in lake-edge tundra areas, presumably also in semi-subterranean houses, though of an undetermined form.

At other seasons Denbigh people, occupying both interior and coastal locations, camped around small, stone-lined hearths, many of which were likely enclosed by tents, and at least at Punyik Point they returned to the same location with sufficient frequency to have built up caribou bone-rich middens that also contained concentrations of artifacts and the remains of summer or fall campfires.

This much about Denbigh lifeways has been established by numerous previous studies. But generally missing in these studies are finer-scale observations on Denbigh activities. The following revisits the issue in an attempt to utilize newer analytical techniques to tease out additional information about Denbigh lifeways.

Considerable attention has already been paid to defining DFC typologically. In particular, Giddings' 1964 monograph on the type site of Iyatayet and William Irving's unpublished Ph.D. dissertation on Punyik Point (1964) outline numerous categories and sub-categories of artifact forms that are sufficiently detailed to give us a clear general picture of the complex. Nevertheless, their aims were to present a composite picture of the complex as a single archaeological unit, internally differentiated by artifact types, but with little consideration of context or, understandably given the nature of the sites, to finer chronological distinctions. Subsequent descriptions of the assemblages from Cape Krusenstern and Onion Portage have added to and somewhat clarified the typological characterization of Denbigh, but do not fully realize the potential for understanding the nature of Denbigh lifeways. This is where spatial studies become key.

SPATIAL ANALYSIS OF DENBIGH REMAINS

The identification of human activities represented by the spatial distribution of archaeological remains became a focus of general archaeological interest in the 1970s and 1980s, although after a period of considerable

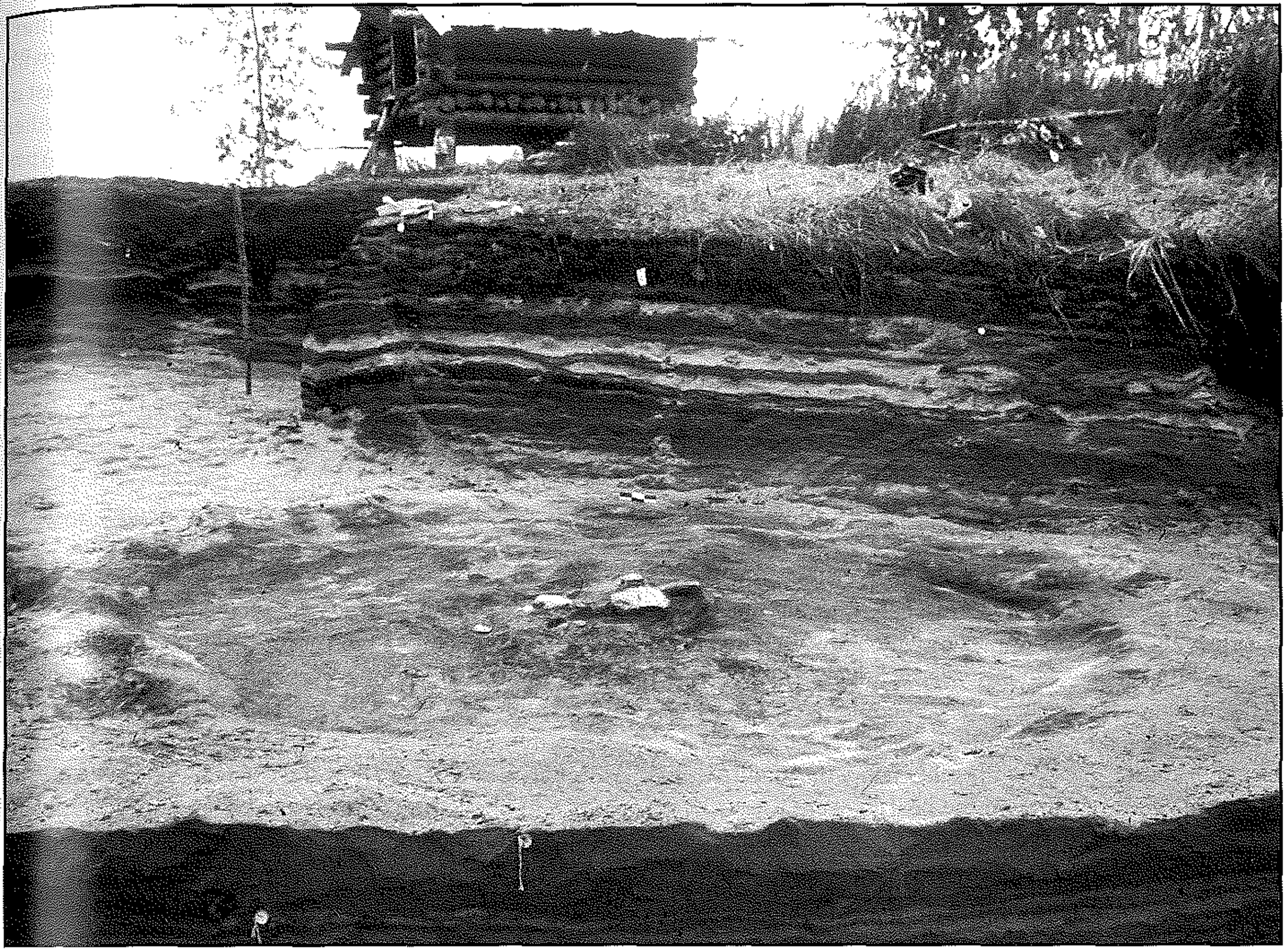

Figure 2. Photograph of a circular Denbigh house floor (House 5) at Onion Portage.

enthusiasm began to wane in the 1990s (Clarke 1977; Kroll and Price 1991). More recently, activity studies have been largely confined to sites with good preservation, where the wide range of organic as well as lithic remains allows for more robust conclusions.

But where does this leave sites with poor preservation like that characteristic of Denbigh sites? The numerous methodological studies accumulated in the 1980s, especially from Europe and the North America mid continent, were primarily cautionary, pointing out the confounding actions governing discard, geological and biological disturbances, and so on. But the few suggestions for how to correct for these analytical shortcomings have struck me as rather arbitrary and too site-specific to be much help in the analysis of the kinds of archaeological remains we normally encounter in the north.

On the other hand, northern researchers of lithic sites have shown signs of regrouping, a result of advances in field technologies that promote rapid and precise recording of archaeological materials and in the use of statistical techniques for spatial analysis (Lutz and Anderson 1993; Reanier 1992). These advances are especially welcome in arctic archaeology where scatters of lithics continue to be a major—and often only—source of cultural data available.

The following is a result of my reworking data on Denbigh material from Onion Portage and Cape Krusenstern, along with some comparisons to Iyatayet and Punyik Point. The Onion Portage and Cape Krusenstern assemblages have been analyzed by the same researcher, and so have the greatest degree of typological consistency necessary to reveal subtle but potentially meaningful differences within and between the assemblages.

CAPE KRUSENSTERN

Spatial analysis of the Cape Krusenstern Denbigh materials is based on groups of artifacts associated with forty-six hearths, half of which were stone-lined, the rest unlined, which were located on the inwardmost beach ridges of the site area as detailed in Giddings and Anderson (1986). Although we noted the associations of all objects with particular features, we did not record finer spatial detail. Our entire corpus of data on Cape Krusenstern Denbigh therefore comes from artifacts associated with hearth areas, where a total of 405 objects were concentrated in tight clusters within one meter of the center of hearths (Fig. 3). We have no information as to the particular arrangements of the objects around the hearths. The largest number of artifacts per hearth is thirty-two, but other hearths have as few as one or two associated artifacts (average less than nine). Since the artifact clusters are too small to allow us to derive meaningful results statistically, we are limited to making general observations based primarily on the presence or absence of artifact types and on the ecology of the region.

Perhaps the most revealing artifact type found in the Denbigh sites at Cape Krusenstern is the harpoon endblade inset, five examples of which are tabulated together with other weapon insets in Figure 3. Clearly, these endblades are related to seal hunting, a conclusion that is reinforced by the fact that the type is only found in Denbigh coastal sites. On the other hand, the majority of weapon-head insets around the hearths were for arrowheads, which suggests that the hunters were also after caribou, the only large land animal that would have frequented the cape at the time.

Considering only the location of the features on the beach ridges, we come up with several possibilities about their nature and season of occupation. First, these features could be the remains of campsites of late spring or early summer seal hunters, although other possible activities in that season include bird hunting and caribou hunting. If occupied in late summer or fall, caribou hunting, berry picking, bird hunting, or fishing (but not sealing) would have been possible. However, it is very unlikely that the Denbigh people would have found sufficient resources to prompt camping at Cape Krusenstern in the dead of winter (Uhl and Uhl 1977). Combining the locational and artifactual data, we thus conclude that the Denbigh campsite locations at Cape Krusenstern were selected primarily for seal hunting, but also served as base camps for caribou hunting.

The presence of other artifact categories associated with the Cape Krusenstern Denbigh hearths, however, provides a more complex picture. Although unutilized flakes are rare in the assemblages, which appears consistent with an interpretation that the features represent brief hunting camps, other artifacts such as burins and flake-knives are also present in numbers that suggest campsites of sufficient duration to accommodate the manufacture and repair of implements. Further, endscrapers are relatively common, and if associated with hideworking, suggest activities that are usually, at least in ethnographic times, carried out by women. In other words, a close inspection of the range of artifact types implies campsites of longer duration, around which more activities took place, carried out by more people than simply short-term camps of seal and caribou hunters.

ONION PORTAGE

By far, the more detailed analysis of Denbigh materials comes from Onion Portage, Kobuk River, where particular attention was paid to microstratigraphic and spatial contexts. At Onion Portage, 2787 artifacts and 161 features were located in eight stratigraphic levels of Denbigh occupation (Fig. 4).

Of the features, seven were house floors, 134 were hearth areas, and, of those unassociated with houses or hearths, six were stone concentrations, seven were bone concentrations, three were antler concentrations, and four were miscellaneous areas. We troweled and screened through a fine mesh all of the excavated deposits of the site, so I am confident that we recovered most, if not all of the artifactual materials present. In addition, we collected all concentrations of tiny chips *in situ* and bagged them within their soil matrix for shipping and later sorting in the laboratory.

Onion Portage Denbigh appears to have undergone a degree of cultural change that I originally categorized as Proto, Classic, and Late. All but the lowermost and the two uppermost Denbigh levels at Onion Portage were assigned to the Classic Denbigh phase. Classic Denbigh comprised assemblages of artifacts that were nearly identical to those from other Denbigh sites in Alaska: the same artifact types; presence of the "Arctic Small Tool" type of flaking (Irving 1964); and presence of a few ground burins and burin spalls. The uppermost levels were designated Late Denbigh. Assemblages from these levels included some artifact attributes that differed from the Classic Denbigh levels, such as the use of the burin blow to modify bifaces and the complete absence of the "Arctic Small Tool" type of flaking—attributes that appeared to anticipate Choris (Anderson 1968). The lowest level, Band 5, Level 1, was labeled Proto-Denbigh. This level also contained assemblages of artifacts with attributes that differed from Classic Denbigh: an absence of "Arctic Small Tool" type flaking; an absence of ground burins and burin spalls; and the presence of atypical Classic Denbigh types such as stemmed endscrapers and large semi-lunar bifaces. Another difference between the Proto- and Classic Denbigh was the sub-rectangular house

Feature	430	431	432	434	436	437	438	439	441	442	488	757	760	761	762	750	751	763	451
microblade	2	1	14						2	1			3	2	11		7		6
burin			3	1	4	1			2	6	1	1	3	2	3		3	1	6
burin spall			4			8	1	6				1		2	1		2		10
weapon inset	1		2					1	1				3	1	1	1	5	1	5
flake-knife			3	1			1				1	1	2	2	1				1
utilized flake							1	1	1		1		1	1	1		1		1
knife biface		1	3								1		1						
endscraper																			2
miscellaneous		1													1				
drill/graver				1									1				1		
mb core			1						1										1
adz blade				1															
Number	3	3	30	4	4	9	3	8	7	7	4	3	14	10	19	1	19	2	32

Feature	453	454	456	619	752	755	768	487	346	428	470	471	472	473	474	475	476	477	479
microblade	5	3	4	2		4		6			1	3	2	1	2	5		2	
burin	1		2	3				1	2		3	2	1	1		4		8	
burin spall	5	1	2	6				1	1	1	6	1		1	1	3		2	
weapon inset	3		3	3			1		2		3	1	1			3			
flake-knife	2		2	1	1			1	1	2	1	1	1			1		2	
utilized flake										5		1	1	1		1		2	1
knife biface											2	2	2	1	1	1	1	1	1
endscraper	1		1													1	1		
miscellaneous	1															1		1	
drill/graver									1		1					1			
mb core																			
adz blade																			
Number	18	4	14	15	1	4	1	9	7	8	17	11	8	5	4	21	2	18	2

Feature	480	482	483	485	753	754	756	1001	Total	%
microblade		1	2				1	5	98	24.2%
burin			1	1	1			2	70	17.3%
burin spall	1		1					1	69	17.0%
weapon inset	1	1	3		1	1	1	1	51	12.6%
flake-knife	4		3		1				37	9.1%
utilized flake	1		6		2	2		1	33	8.1%
knife biface	1					1			20	4.9%
endscraper	1				1				8	2.0%
miscellaneous	1		1			1			8	2.0%
drill/graver						1			7	1.7%
mb core									3	0.7%
adz blade									1	0.2%
Number	10	2	17	1	6	6	2	10	405	100.0%

Figure 3. Count and percentage of artifacts for Cape Krusenstern Denbigh features.

form with a "mid-passage" sectioning of the floor in the former and a circular house form lacking the mid-passage section in the latter (Figs. 5 and 6).

The radiocarbon dates for the Classic Denbigh layers at Onion Portage span the period between 4000 and 3600 years ago; the one date for Late Denbigh is about 3550 years ago (uncalibrated). The radiocarbon dates for the Proto-Denbigh layer are somewhat inconsistent with its stratigraphic position, although by doubling the standard error of all the Band 4 and 5 dates to achieve a 95% confidence level, the series of dates can be fit into a sequence consistent with site stratigraphy. By interpolating between the Band 5, Level 2 dates and the Band 4 dates, the age of Proto-Denbigh is estimated to be about 4100 BP, a date which seems somewhat too recent when com-

Onion Portage Denbigh Levels	Denbigh Phases	Houses	Hearths	Other
Band 3/4 and Band 4, level 0	Late Denbigh	0	21	2
Band 4, level 0, 1, or 2	Late or Classic Denbigh	0	5	3
Band 4, levels 1-4 and Band 4/5	Classic Denbigh	6	92	14
Band 5, level 1	Proto-Denbigh	1	16	1

Figure 4. Classification of Denbigh Flint complex phases at Onion Portage and number of features per phase.

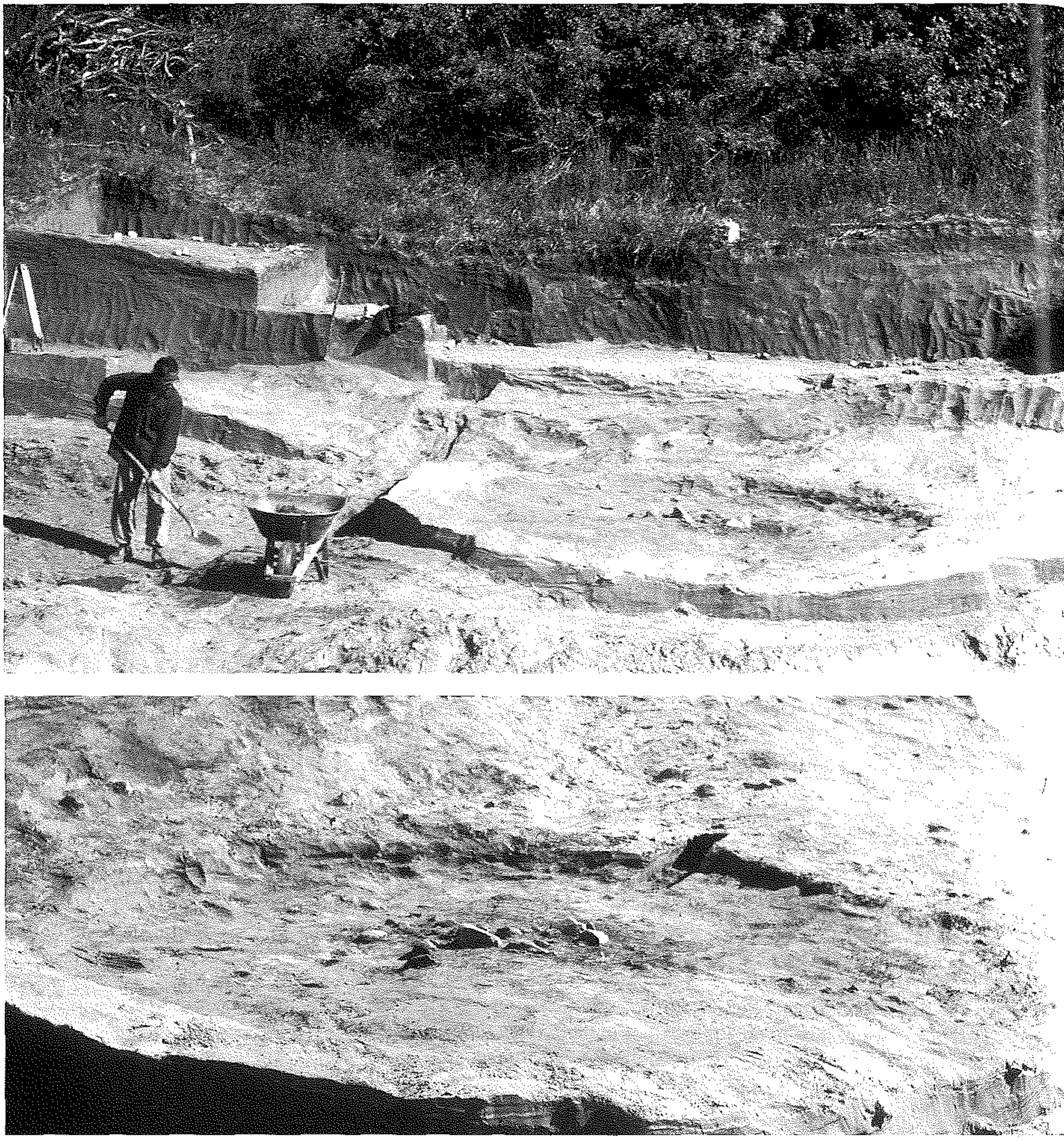

Figure 5. Photographs of Denbigh House 1 at Onion Portage. (Close-up below.)

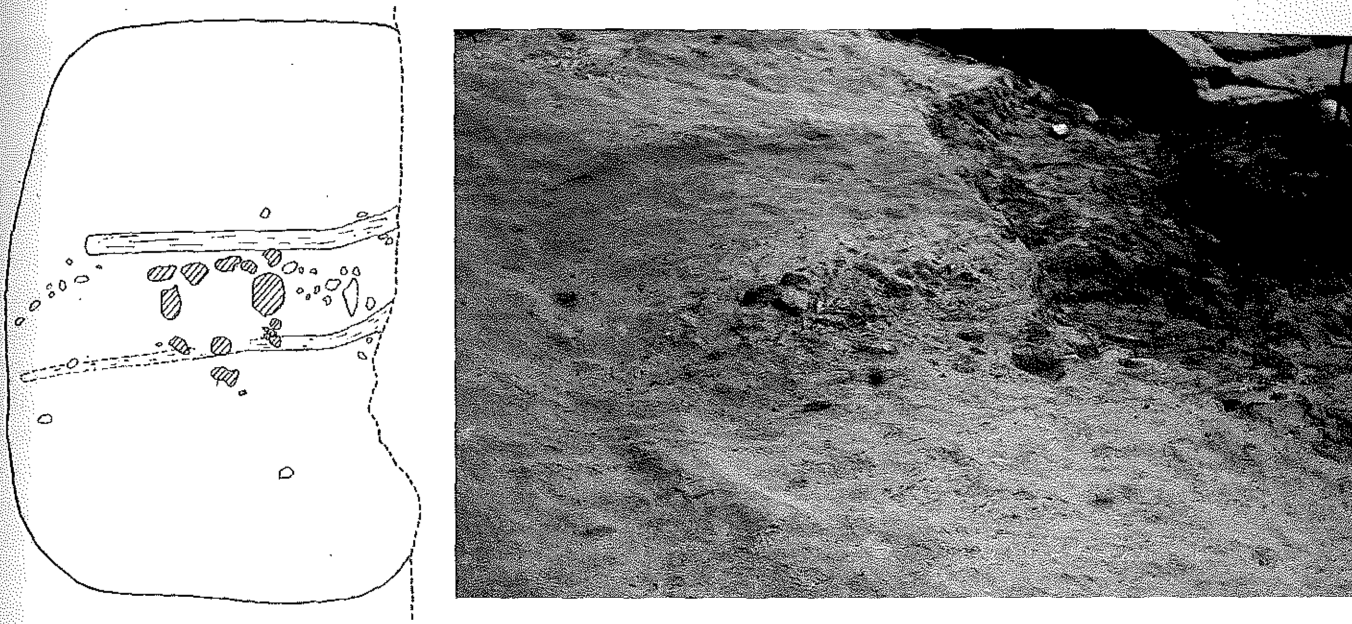

Figure 6. Floor plan and photograph of Proto Denbigh house 1, Onion Portage (Note: front of house had slumped away between excavation seasons).

pared to some ASTt dates from elsewhere in the North American Arctic (Maxwell 1985; Schledermann 1990). It should also be noted that the series of Denbigh dates from Onion Portage is, on the whole, more recent by a couple of centuries than dates from the type site at Iyatayet (Giddings 1964). Also, subsequent finds of Denbigh sites from northwestern Alaska that date Classic Denbigh-like assemblages earlier than our Proto-Denbigh age, prompt a re-examination of this original classification (Harritt 1993), but the issue will likely not be settled without further excavation.

Of the seven Denbigh house ruins at Onion Portage, six were located in the classic Denbigh levels, and one from Proto-Denbigh (Figs 7 and 8). I suspect that Denbigh peoples had constructed two additional houses at the site, but we did not recognize this in our original excavations.

By far most features in the Denbigh levels were stone-lined hearths around which lay a scattering of flakes and artifacts. Nearly all of the Denbigh hearths were circular, lined with waterworn cobbles between fist-size and about fifteen centimeters in diameter (Fig. 9).

Most of the hearth rocks were quartzite, a type of stone that does not easily spall or explode when heated. In some cases the interiors of the hearths were paved with smaller stones. Small spruce branches or willow shoots comprised the primary material burned in the Denbigh hearths. Also associated with hearths were fragments of antler or bone, concentrations of tiny chert and obsidian chips and, infrequently, stains of red ochre. The chip concentrations are clearly byproducts of tool finishing or sharpening.

All but two of the 2,787 Denbigh artifacts recovered from Onion Portage are of stone, over half of which are of gray chert (47.4%) or obsidian (23.0%). The remaining artifacts are of silicified slate (2.8%), micaceous siltstone (1.4%), sandstone (0.5%), fine-grained basalt (1.7%), and a variety of other kinds of chert. Almost none of the stone used for artifact manufacture was derived locally; the only exceptions are waterworn quartzite cobbles, used as boiling stones, and large river cobbles, used as anvil stones or hammerstones.

For the spatial analysis of Onion Portage Denbigh I have employed two different analytical strategies in order to identify possible toolkits, based on their associations in such contexts as houses and hearths. The first is a study of artifact clusters defined by their association within the confines of house floors and around hearths using a factor analysis and described in detail in Anderson (1988). Objects are spatially related to particular hearths on the basis of their provenience within a one meter radius of the center of the hearths. Artifacts that do not meet the one meter distance criterion of hearth association were excluded from the analysis.

The second strategy is a more flexible, *ad hoc* approach based on a visual inspection of the artifact provenience afforded by GIS plots of artifacts on the site's surfaces. I analyzed the locations of the objects with respect to how they cluster together in a variety of contexts, but without the rigid one meter distance-from-feature criterion. Although most of the objects do cluster and are more or less associated with features, others are not. I selected this strategy as a test against the factor analysis to see if meaningful results could be derived from

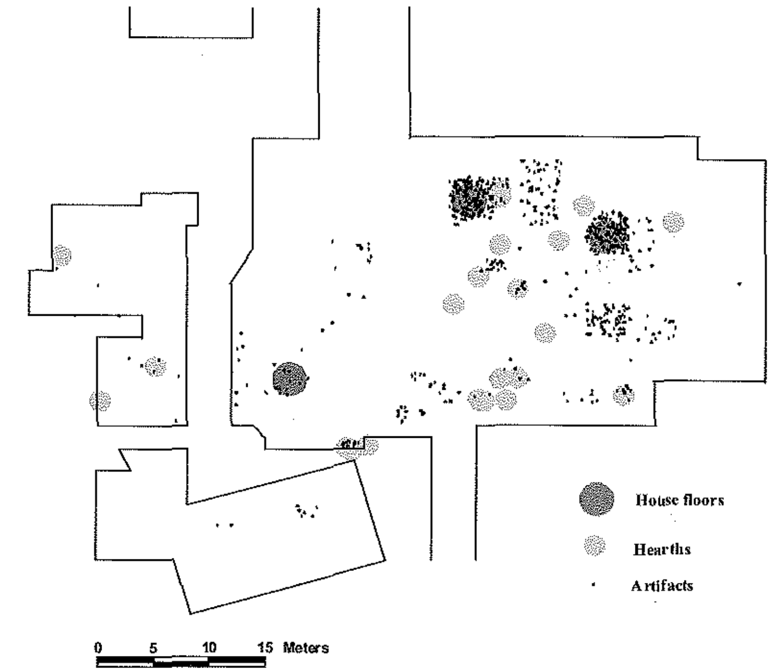

Figure 7. Site plan of Band 4, Level 1, showing the location and layout of Denbigh hearths and three of the Denbigh houses, and associated artifacts.

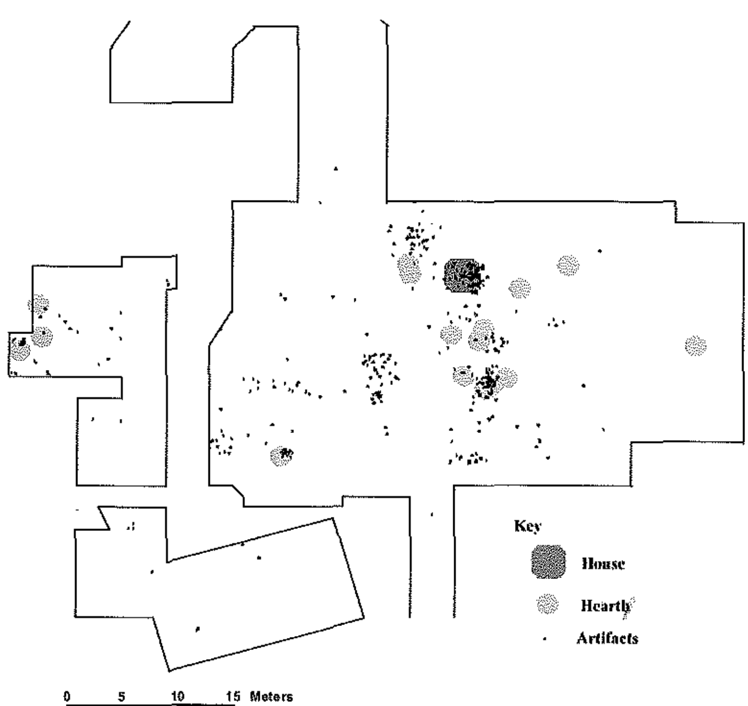

Figure 8. Site plan of Band 5, Level 1, showing the location and layout of Proto-Denbigh hearths, house, and associated artifacts.

an analysis of visually derived data. A further test, not attempted here, would be to compare some additional spatial analytical methods such as Richard Reanier's (1992) refinements to K-means clustering, by which he analyzed the spatial patterning of the Ipiutak Period Bateman Site at Itkillik Lake, arctic Alaska (1992).

TOOLKITS BASED ON A FACTOR ANALYSIS

To confirm the initial observations that most Denbigh artifacts are associated with features, I first counted the artifacts and flakes by type that lay respectively within 1m, 1.5m, 2m, 2.5m, and 3m of the center of each feature. Through this procedure we determined that most of the artifacts lay within one meter of the center of the features. The count drops off sharply beyond that distance, an observation that forms the basis for selecting one meter as distance from the center of hearths within which to group the artifacts associated with that feature. I treat house floors differently from the other features, inasmuch as I assign all cultural materials contained within the border of each floor to the assemblage of that house, irrespective of their distance from the center of the floor.

The factor analysis performed on the Onion Portage data was the Cluster Centroid Factor Analysis method developed by R.C. Tryon, as modified by James M. Sakoda of Brown University (Anderson 1988). I selected this method because it is a simple, yet elegant approach to the problem of selecting the number of factors used for the final solution. The method involves the identification of key variables that are as different from each other as possible. Membership in the clusters is determined by its correlation coefficient; for the clusters in this analysis a lower limit of belongingness of .60 is selected. In addition, a cluster must have a membership of at least three variables, i.e., features, in order to be considered a meaningful factor. The meaningful factors are labeled numerically, starting with factor 1.

On the basis of 1,370 artifacts from sixty-one features and feature-groups that fall within a one meter radius of hearths or are enclosed within the limits of the house floors, the Denbigh materials group themselves around five significant clusters that form the basis of our discussion of toolkits (Fig. 10).

The first factor, which clusters 782 artifacts from seventeen hearths and five of the houses, is characterized by a wide variety of artifact types. In fact, thirty-six

Figure 9. Photograph of a typical stone-lined Denbigh hearth from Onion Portage.

of the forty artifact types included in the factor analysis are present, as compared to twenty-five in cluster 2, twenty in cluster 3, ten in cluster 4, and fourteen in cluster 5. Cluster 1 has a high percentage of microblades (44.4%), and, compared to the other clusters, a relatively high percentage (3.2%) have been used or retouched. Likewise, burin spall artifacts are well represented (10.0%), and although the cluster contains low percentages of straight and convex edged side scrapers (1.8%), these are better represented here than in any of the other clusters. Interestingly, the only adz blades from Onion Portage Denbigh belong to this cluster, even though none were found in the house assemblages. In all, the high percentages of utilized microblades and burin spall artifacts are as one would expect where people were intensively engaged in tool use and fine detail work on materials, such as engraving slots for insets. Also, the number of artifact types indicates a wide range of activities, as would be expected in assemblages from houses where people lived for an extended period of time.

On the other hand, some artifact types that one might expect to be part of the activities in winter houses are surprisingly rare in the house middens, for example burins (3.2%) and unused burin spalls (9.6%). Assuming that at least some burins were used for grooving antler, the rarity of burins in the houses may reflect the fact that the initial stages of antler working were carried out outside the houses, perhaps at the time caribou from the late summer and fall hunt were brought into camp.

The second cluster contains only hearths. Numbering ten hearth areas with 130 artifacts, it contains high percentages of chipped burins (7.7%) and burin spalls (42.3%), but a low percentage of microblades (8.5%). Of the burin spalls and microblades present, very few show signs of use. That these may represent fall camps where initial stages of antlerworking by burins is supported by the presence of a high percentage of weapon parts: endblade insets (6.9%); lance points (2.3%); sideblade insets (2.3%); and end- or sideblade insets (1.5%), respectively. Numerous utilized flakes, likely used in woodworking as would be necessary for manufacturing arrow and spear shafts are also present, although not so frequent as in two of the other clusters. Although the burins and weapon points make sense for fall camps, the abundance of unused burin spalls is more difficult to explain. Since they lack traces of wear, these burin spalls cannot be simply the result of resharpening antler-working burins.

Artifact Type (N=1370)	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Adz blade	0.3%				
Flake with burin blow		0.8%			
Biface fragment	1.3%	0.8%	1.0%	4.3%	
Biface, other	0.1%				
Burin, chipped	2.4%	7.7%	6.2%		1.9%
Burin, polished	0.8%		1.5%		1.9%
Burin spall, chipped	9.0%	42.3%	29.9%	6.4%	21.0%
Burin spall, polished	0.6%	0.8%	1.0%		
Burin spall artifact	10.0%	2.3%	27.3%		4.8%
Core	0.4%				
Hand drill			0.5%		
End blade inset	1.3%	6.9%	2.6%	2.1%	1.9%
Elongate knife side blade	0.6%	2.3%			
Endscraper	2.0%	1.5%	0.5%	4.3%	11.4%
End or side blade inset	1.3%	1.5%	1.5%		
Flake	0.8%	0.8%		10.6%	
Flake-knife	1.4%	2.3%	1.0%	2.1%	1.9%
Graver	0.3%				
Ground slate	0.3%		0.5%		
Grooved stone		0.8%			
Hammerstone	0.3%				
Knife end blade	0.1%	0.8%			
Lance point	0.5%	2.3%	1.0%		
Microblade	44.8%	8.5%	9.8%	2.1%	22.9%
Microblade core	0.6%				
Microblade flake-knife	0.1%				
Microblade graver	0.3%				
Microblade, utilized	3.2%	0.8%	1.5%		2.9%
Notched sinker	0.1%	0.8%			
Other	1.2%				1.0%
Other chipped stone	3.5%	0.8%	3.1%	48.9%	12.4%
Other ground stone	0.1%				
Sideblade inset	2.8%	2.3%	3.1%		4.8%
Sidescraper, compound	0.1%	1.5%			
Sidescraper, convex	0.9%	0.8%			
Sidescraper, straight	0.9%		0.5%		
Sidescraper, concave	0.1%	0.8%			
Slab knife					
Utilized flake	7.4%	9.2%	6.7%	2.1%	10.5%
Whetstone	0.3%	0.8%	0.5%	17.0%	1.0%

Figure 10. Factors associating artifacts with hearths and houses of Onion Portage Denbigh.

A third cluster, containing 194 artifacts from eight hearths, has an unusually high percentage of burin spalls and burin-spall artifacts. As the frequencies of the other artifact categories are neither especially high nor low, the activities associated with these hearths are difficult to interpret. The sizable representation of both unused and used burin spalls suggests that whatever manufacturing activities were being carried out, they included some fine detail work.

Cluster 4 contains only forty-seven artifacts from three hearths, so it is difficult to place much confidence in any interpretation. Burins and burin spalls are underrepresented, whereas flakes, "other" chipped stone objects and utilized flakes are well represented. The activity most readily suggested by this assemblage is stoneworking, but inasmuch as the cluster does not contain primary flakes or even a particularly high number of secondary or tertiary flakes, the activity was likely not flintknapping. An additional aspect of note is that few artifact categories are represented, but this may be a result of the small sample.

Cluster 5, which contains 105 artifacts from six hearths, is also represented by only a few artifact categories, although given the larger sample size relative to Cluster 4, this appears to be significant. Especially noteworthy is that endscrapers are well represented. However, if this represents hideworking (assuming that endscrapers were used to process skins), it is difficult to interpret the presence of the other artifacts around these hearths, especially burins and burin spalls.

In all, the results of the factor analysis, coupled with the nature of the features present, indicate a full range of activities that would have taken place at a settlement occupied in winter and in other seasons. The activities poorly represented at the site include flintknapping and hideworking. The absence of flintknapping materials is likely because quarrying, roughing out stone blanks, and finishing stone tools took place elsewhere. The paucity of hide-working implements is more difficult to explain, since it is difficult to imagine that hides were not prepared there. The most likely explanation for this apparent anomaly is that Denbigh hidescrapers were made of organic materials that have not survived the rigors of time.

TOOLKITS AND ACTIVITIES AS IDENTIFIED THROUGH VISUAL INSPECTION OF GIS PLOTS

The basic unit of analysis for the second approach to the study of Denbigh toolkits and activities is the set of objects associated or, as the case may be, unassociated with features. As with the factor analysis, the primary archaeological features under consideration are hearths and house ruins. Many artifacts from Onion Portage were not obviously associated with any feature, a situation rather different from that observed at Cape Krusenstern. For the study I have singled out five spatial variables pertaining to features: (1) house floors; (2) hearths; (3) near hearths; (4) artifact concentrations unassociated with formal features; and (5) areas of randomly dispersed artifacts. Some other features—bone, antler, stone, and red ochre concentrations—were also identified in the Denbigh levels at Onion Portage, but initial analysis of these features has yielded so little meaningful information that I have excluded them from the full analysis. Even at a cursory glance, artifact types from the five spatial variables reveal some significant differences (Fig. 11).

INTERPRETATION

To establish the composition of the clusters, I sorted 2156 Denbigh artifacts representing forty-four types according to their associations with respect to one of the five spatial variables noted above. These types include all identified artifacts from the levels for which we have adequate spatial data, and represent 77% of the total 2787 artifacts from the Denbigh occupations at Onion Portage. Three-quarters of the artifacts were directly associated with obvious features—nearly a quarter were from the house floors and over half from the hearth areas. On the other hand, 17% of the artifacts were clustered in areas lacking obvious features and the remaining 6% were scattered as isolated objects over the Denbigh surfaces. The vast majority of artifact types are represented in varying frequencies in all five feature types. As regards temporal considerations, the distribution of artifact types by feature type is more similar on all the Denbigh levels at Onion Portage than I had expected. Thus, notwithstanding the presence of the very small number of attribute differences that informed the original designation of Proto-, Classic, and Late Denbigh, there seems to be very little evidence of change in the majority of artifact types throughout the several centuries of Denbigh occupation at Onion Portage. At the same time, this degree of similarity, which suggests that the toolkits were at once sufficiently specialized and multifunctional, may help explain why Denbigh assemblages seem to be indifferent to habitat.

Although these interpretations suffer sample sizes too small to satisfy minimal statistical standards, I suggest that some spatial patterning appears worthy of note. Most importantly, the feature and artifact associations appear to have a strong seasonal signal. The distribution of artifacts is especially dense within the limits of house floors, with a sharp drop-off in numbers immediately beyond the floor areas. Since the house floors were semi-subterranean, having been excavated to an undetermined depth below the ground level, the dwellings were likely occupied in winter and the activities carried out within the walls of a confined space.

Additionally, as noted above, many artifacts cluster within a one meter radius around stone-lined hearths. This suggests that activities producing these artifacts were carried out within a heated enclosure, such as a tent. Historically in the region, heated tents have been used during all seasons execpt high summer. But at Onion Portage, cold season use of such tents by Denbigh peoples is precluded by the fact that the stones for lining the hearths would have been unavailable during the periods of frozen and snow-covered ground. I therefore conclude that the Denbigh hearths at Onion Portage were most likely used during late spring/early summer or in the fall.

HEARTHS			HEARTH AREAS			HOUSES			NON HEARTH CLUST			SCATTERED		
Total	721	100%	Total	451	100%	Total	498	100%	Total	360	100%	Total	126	100.0%
Microblade	195	27.0%	Microblade	124	27.5%	Microblade	191	38.4%	Microblade	121	33.6%	Microblade	21	16.7%
Burinspall	139	19.3%	Burinspall	62	13.7%	Burinspall	58	11.6%	Burinspall	41	11.4%	End scrapear	18	14.3%
Burinspall artifact	85	11.8%	Other	53	11.8%	Burinspall artifact	53	10.6%	Utilized flake	40	11.1%	Other	15	11.9%
Utilized flake	63	8.7%	Utilized flake	42	9.3%	Utilized flake	34	6.8%	Burinspall artifact	36	10.0%	Utilized flake	14	11.1%
Other	62	8.6%	Burinspall artifact	40	8.9%	Burin chipped	26	5.2%	Other	24	6.7%	Burinspall	10	7.9%
Burin chipped	23	3.2%	Endblade	23	5.1%	Utilized microblade	19	3.8%	Endscraper	18	5.0%	Burinspall artifact	6	4.8%
Sideblade	22	3.1%	Burin chipped	17	3.8%	Other	16	3.2%	Sideblade	11	3.1%	Endblade	6	4.8%
Utilized microblade	16	2.2%	Endscraper	15	3.3%	Endscraper	14	2.8%	Biface fragment	9	2.5%	Burin chipped	5	4.0%
Endblade	16	2.2%	Sideblade	15	3.3%	Sideblade	13	2.6%	Endblade	9	2.5%	Flake	4	3.2%
Biface fragment	14	1.9%	Biface fragment	10	2.2%	Flake-knife	10	2.0%	Burin chipped	8	2.2%	Sideblade	4	3.2%
Flake	10	1.4%	Flake-knife	7	1.6%	Endblade	9	1.8%	Utilized microblade	8	2.2%	Hammerstone	3	2.4%
Endscraper	10	1.4%	Flake	6	1.3%	Biface fragment	8	1.6%	Burin polished	6	1.7%	Utilized microblade	3	2.4%
End or sideblade	7	1.0%	Utilized microblade	6	1.3%	End or sideblade	8	1.6%	Knife sideblade	4	1.1%	Biface fragment	2	1.6%
Burinspall polished	7	1.0%	Lance point	4	0.9%	Knife sideblade	6	1.2%	Flake-knife	4	1.1%	End or sideblade	2	1.6%
Burin polished	6	0.8%	Sidescraper convex	4	0.9%	Lance point	5	1.0%	Ground slate	3	0.8%	Lance point	2	1.6%
Lance point	5	0.7%	Burin polished	3	0.7%	Flake	4	0.8%	Sidescraper convex	3	0.8%	Sidescraper straight	2	1.6%
Flake-knife	5	0.7%	End or sideblade	3	0.7%	Sidescraper convex	4	0.8%	Sidescraper straight	3	0.8%	Adz blade	1	0.8%
Whetstone	4	0.6%	Adz blade	2	0.4%	Sidescraper straight	4	0.8%	Burinspall polished	2	0.6%	Anvil stone	1	0.8%
Microblade core	4	0.6%	Knife sideblade	2	0.4%	Burin polished	2	0.4%	Flake	2	0.6%	Biface	1	0.8%
Knife sideblade	4	0.6%	Ground slate	2	0.4%	Burinspall polished	2	0.4%	Lance point	2	0.6%	Burinspall polished	1	0.8%
Sidescraper straight	3	0.4%	Sidescraper straight	2	0.4%	Graver on mb	2	0.4%	Whetstone	2	0.6%	Knife sideblade	1	0.8%
Sidescraper convex	3	0.4%	Whetstone	2	0.4%	Sidescraper concave	2	0.4%	Core	1	0.3%	Microblade core	1	0.8%
Adz blade	3	0.4%	Burinspall polished	1	0.2%	Core	1	0.2%	Drill	1	0.3%	Sidescraper multiedge	1	0.8%
Notched sinker	2	0.3%	Hammerstone	1	0.2%	Ground slate	1	0.2%	Sidescraper multiedge	1	0.3%	Sidescraper convex	1	0.8%
Knife endblade	2	0.3%	Knife endblade	1	0.2%	Grooved artifact	1	0.2%	Slabknife	1	0.3%	Semi-lunar knife	1	0.8%
Graver	2	0.3%	Microblade core	1	0.2%	Hammerstone	1	0.2%						
Core	2	0.3%	Flakeknife on mb	1	0.2%	Knife endblade	1	0.2%						
Slabknife	1	0.1%	Notched sinker	1	0.2%	Microblade core	1	0.2%						
Sidescraper multiedge	1	0.1%	Sidescraper multiedge	1	0.2%	Flakeknife on mb	1	0.2%						
Hammerstone	1	0.1%				Sidescraper multiedge	1	0.2%						
Ground slate	1	0.1%												
Flake w burin blow	1	0.1%												
Drill	1	0.1%												
Biface	1	0.1%												
ABSENT														
Anvil stone			Anvil stone			Adz blade			Adz blade			Burin polished		
Flake-knife on mb			Biface			Anvil stone			Anvil stone			Core		
Graver on mb			Core			Biface			Biface			Drill		
Grooved artifact			Drill			Drill			End or sideblade			Flake w burin blow		
Semi-lunar knife			Flake w burin blow			Flake w burin blow			Flake w burin blow			Flake-knife		
Sidescraper concave			Graver			Graver			Flake-knife on mb			Flake-knife on mb		
			Graver on mb			Notched sinker			Graver			Graver		
			Grooved artifact			Semi-lunar knife			Graver on mb			Graver on mb		
			Semi-lunar knife			Slabknife			Grooved artifact			Grooved artifact		
			Sidescraper concave			Whetstone			Hammerstone			Ground slate		
			Slabknife						Knife endblade			Knife endblade		
									Microblade core			Notched sinker		
									Notched sinker			Sidescraper concave		
									Semi-lunar knife			Slabknife		
									Sidescraper concave			Whetstone		

Figure 11. List of artifact frequencies sorted by five spatial variables.

Some less tightly clustered groups of artifacts surround other hearth areas. Following the reasoning outlined above, I suggest that these represent artifact-producing activities carried out in unenclosed spaces, which implies their use during the snow-free seasons.

Weak clusters of artifacts not associated with any observable features were produced by activities that took place beyond the immediate areas of the hearths or houses. For these activities, I cannot suggest a season, since they could just as readily have taken place on snow as on grass.

Finally, as can be seen in Figures 7 and 8, several hearth areas have no associated artifacts. Since most of these are stone-lined, they were likely not used during winter. But what purpose they served at other seasons is unknown, other than that, given the absence also of flaking debitage, they were likely not areas of manufacturing stone implements.

Interpretations of artifact distributions as they relate to non-seasonal variables are more tenuous. For this I focused on comparisons of artifact frequencies of the five feature types as they relate to specific activities.

Complete, or nearly complete microblades represent the largest single category of artifacts in the Denbigh levels at Onion Portage, ranging from 17% to 45% of each individual cluster sorted by feature type. However, despite the abundance of these microblades—most of which appear to have been used or at least were usable—there is very little debitage, such as truncated forms, rejuvenation flakes, etc. that is normally associated with their manufacture. Unless we conclude that the flintknappers were so expert that they rarely made a false step, this suggests that the microblades were made elsewhere, which may also account for the rarity of microblade cores and core debitage in the site as well. The highest percentage of microblades is found in the houses (38% to 43%) and the lowest in the intermediate areas (19%), with moderate representation within the hearths and near hearth areas (29%). Over half of the microblades show signs of edge-wear, but I have yet to work out the patterns that might reveal details of specific manufacturing activities.

Burins are present in about the same proportion in all feature types (4%), but burin spalls, including burin-spall artifacts, are more commonly associated with the hearths (32%) and least common in the scattered areas (13%), with similar percentages in the other clusters (23%). Burin spalls were scattered about away from clusters in significantly lower percentages (14%), possibly because they would have been too light to have traveled far by "tossing."

Weapon side- and endblade insets are equally common in all artifact clusters. This suggests that weapon manufacture took place in settings in which multiple manufacturing activities were carried out. Adz blades are absent from the house assemblages, although since only four adz blades were located in the Denbigh levels at Onion Portage, this may have little significance. On the other hand, their association with whetstones, which were also absent from the houses, suggests that adzing was indeed an activity that took place in seasons other than winter.

Endscrapers are more frequent in areas unassociated with hearths or houses, and especially abundant as isolated objects. If we accept that endscrapers are hide-scraping implements, one could envision their use some distance from the other activities taking place around the campfires. On the other hand, compared to most of the other cultural complexes at Onion Portage, stone endscrapers are unexpectedly rare in all of the Denbigh layers at Onion Portage, something echoed in most Denbigh sites. This suggests to me that for Denbigh people, the important activity of skin working involved bone or antler scrapers, as was the practice of many other arctic peoples (Mathiassen 1928:110). Further, given that endscrapers are frequently also found in other Alaskan archaeological sites with contexts that seem inappropriate for hideworking, I question the validity of the simple end scraper-to-hidescraping correlation, and suspect that a closer analysis of the individual artifacts will implicate a variety of activities. My own examination of wear patterns on the Onion Portage Denbigh endscrapers has yielded equivocal results: certainly none exhibit the pronounced wear that is characteristic of obvious skin scrapers from later Arctic Small Tool assemblages in Alaska (Anderson 1988:97, 119).

Utilized flakes are underrepresented in the house middens (7%) and hearths (9%), but more common away from the formal features (11%). We had expected to find very high percentages in the houses owing to constant repetition of the manufacturing activities carried out indoors throughout the winter, so this was a surprise. This suggests that utilized flakes, as well as sidescrapers, are more likely *ad hoc* implements, used once as an occasion arises and then tossed away, an eventuality that is compatible with the high frequency of the implement type in areas some distance from the obvious features. I also note that in the houses, the flake-knife, the formal implement most functionally similar to the utilized flake and sidescrapers, is more frequent than elsewhere. It appears that for the usual manufacturing activities, the worker had at hand the full range of specialized implements anticipated for the task, so that there was no need to resort to *ad hoc* implements.

Evidence also indicates that Denbigh implements were brought to the site in finished, or at least in near finished form. Nearly all flake debitage, for example, is from either the final stages of biface reduction or are tiny pressure flakes from the final stages of tool finishing and resharpening. Most of the microblades were also produced elsewhere. This fact is surprising since since the safest way to protect the delicate microblade edges before use is to leave them on the cores until the moment they are needed.

The location of objects designated as "scattered" may well have resulted from the "tossing" factor (Kroll and Price 1991), and thus is the least interpretable.

The flake debitage from Onion Portage Denbigh layers reinforces the evidence from the artifactual remains that most of the implements were manufactured elsewhere. A close inspection of a sample of thirty-nine clusters of flakes from the layers revealed that nearly three-quarters of the flakes were tiny pressure flakes from either the final stages of manufacturing or, more likely, from resharpening tools. The second largest category, slightly over a quarter of the flakes, was comprised of secondary biface reduction flakes produced from late stages of tool manufacture or reshaping broken implements. Primary biface reduction flakes were relatively uncommon, representing only 1.4% of all the flakes in the Denbigh assemblages. We could detect no significant difference in the proportions of flakes sorted by feature type.

The nature of the lithic remains from these major Denbigh assemblages clearly indicates that we are missing at least two other kinds of Denbigh sites: quarry sites and sites where blanks were processed into their finished tool forms.

Based on available information, the importation of Denbigh tools in finished form appears to be duplicated at the other major Denbigh sites in North Alaska. This brings to mind speculation by Irving (1964) that the finest of the Denbigh artifacts may have been produced by itinerant flintknapping specialists.

Finally, the analysis of lithic materials from the Denbigh sites has yielded some insights into the nature of external contacts, either through trade or long-distance raw material procurement. This can best be seen by focusing on Koyukuk River drainage obsidian, since of all the raw materials utilized by Denbigh peoples, obsidian was originally and apparently exclusively derived from outside the currently known distribution of Denbigh (Clark and Clark 1993; Griffin, Wright, and Gordus 1969; Patton and Miller 1970).

Interestingly, although obsidian is a common material in the Onion Portage Denbigh assemblages, it is not found in any sizable quantity on the coast. At Cape Krusenstern, only 1% of the Denbigh objects are of obsidian, despite the fact that in other parts of the Denbigh world obsidian was apparently a highly desired material for certain artifact types. This pattern suggests that, while there was some contact between the forested riverine and coastal areas (as evidenced by the presence of obsidian), those who produced the Denbigh campsites at Cape Krusenstern were not from the Kobuk River area. Had they been, I would expect the proportions of materials used for similar tool types to be more similar.

As for trade routes among Denbigh peoples via the coast and the major rivers of Northwest Alaska, we turn to chert distributions. The majority of lithic artifacts from Denbigh sites everywhere are of chert, including black cherts of several textures and a glassy light gray chert. Although chert sources are more difficult to pinpoint than are obsidian, the work of Natalia Malyk-Selivanova (1998) has provided us with the first useful indications. According to her analysis of a few Denbigh cherts from Onion Portage and Cape Krusenstern the glassy gray chert examples came from outcrops in the lower half of the Noatak River area. If so, the fact that this chert type accounts for more than 70% of the Denbigh materials at Cape Krusenstern suggests that the most direct link between Cape Krusenstern and the interior was via the Noatak River. I might even conclude that the Denbigh peoples responsible for the late spring–early summer camps at Cape Krusenstern wintered in the Noatak Region, even though we have yet to find any sizable Denbigh sites there.

The light gray Noatak cherts were also an important tool source at Onion Portage, which thus links the middle Kobuk with the lower Noatak area. And, given the absence of direct Kobuk - coast connections, the Kobuk-Noatak linkages must have been via the passes, not along the primary rivers. If the lithic materials were carried overland, it is not surprising that considerable attention was paid to carrying only finished – or near finished – objects.

COMPARING THE RESULTS FROM THE TWO ANALYTICAL STRATEGIES: A CAUTIONARY NOTE

A comparison of the two methods used to analyze spatial distributions of Onion Portage Denbigh materials highlights the complexity of archaeological spatial analyses in general, a conclusion underscored by Reanier (1992). Each method produces somewhat different results, even when using the same data set, and each method seems better able to capture information from particular data sub-sets than do others. For example, the factor analysis of artifact clusters associated with hearths, using a one-meter diameter criterion of belonging is ideal for its replicability, but the strict spatial limits imposed on the data exclude many artifacts and types of settings that are important in understanding the behavior of the Onion Portage Denbigh peoples. On the other hand, beginning with a visual clustering of artifacts and features at the site, we are able to incorporate the entire data set into a single analytical framework, but the drawback is the more *ad hoc* nature of the clusters, which reduces the replicability of our categories.

For Arctic lithic sites, each analytic method has strengths and weaknesses. The weaknesses are all too apparent. With few exceptions, we have too little control over the temporal dimension to assume that clusters of artifacts belong to functioning social units. Even where we have reason to believe that multiple artifacts were deposited by people in face to face situations, the number of objects is usually so small that we are limited in the use of statistical techniques to identify toolkits or activity sets. Perhaps even more fundamental, though, there is no assurance that the artifact numbers have any relationship to the intensity or frequency of the activities they represent. On the other hand, by restricting analyses to the archaeological record of a particular time and place, where all materials have gone through a similar "filter" of use and discard, we at least have a basis for comparison. At Onion Portage, for example, the fact that similar feature types from all of the Denbigh levels yield similar proportions of artifacts suggests that there is a positive relationship between numbers of artifacts and activities and that the spatial categories have some basis in reality. If I had found no correlation between feature types and artifact quantities or types, I would have been alerted to the need to reconfigure the methodology or perhaps abandon the effort. But perhaps even more importantly, greater attention to integrating the spatial criteria with artifactual data can stimulate interest in matters beyond culture history to the degree that recording precise provenience is valued as a matter of routine—something we are still struggling to achieve in the Arctic. With each attempt to identify toolkits and activities of prehistoric peoples, we move ever closer to realizing the goal of breathing life into the thousands of lithic scatters that cover arctic landscapes.

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The Denbigh Flint Complex at Punyik Point, Etivlik Lake, Alaska

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Abstract: In 1954 William Irving initiated excavations at Punyik Point, a site that was to prove central in the thinking that ultimately led him to define the Arctic Small Tool material as a tradition. This paper traces the history of work at Punyik Point and reports on recent investigations at the site including a number of new radiocarbon dates. Irving's conclusions regarding four periods of occupation are assessed, and the presence of European trade materials dated to the period before direct contact confirmed.

Keywords: Denbigh Flint Complex, Arctic Small Tool tradition, Alaska Archaeology

INTRODUCTION

In 1948, Louis Giddings, working at Cape Denbigh on Norton Sound, initiated excavation at Iyatayet, the Denbigh Flint Complex (DFC) type site and three years later published an article naming and describing the assemblage (Giddings 1951). In 1950, William Irving began archaeological reconnaissance and testing in the Brooks Range in the vicinity of Anaktuvuk Pass and along the Killik River. He noted that several of the sites he located contained materials similar to those excavated by Giddings at Iyatayet (Irving 1962, 1964). Irving continued his work in the Anaktuvuk Pass region in 1951, engaging in excavation at selected sites (Irving 1953). During the summer of 1952 Irving floated the Colville River from Umiat to the Arctic Ocean Coast looking for "archaeological traces of the coastal aspect of inland Eskimo culture" (Irving 1952). The following summer Irving's father Laurence, a biologist at the University of Alaska, and his assistant, Simon Paneak of Anaktuvuk Pass, conducted biological reconnaissance in the region east of Howard Pass (Irving and Paneak 1954). They noted several archaeological sites on the shores of Etivlik Lake, one of which was later named Punyik Point, and collected a representative sample of exposed artifacts at several of the sites. William Irving was given a description of the sites as well as the collected artifacts (Irving 1964).

In the early 1950s Giddings was of the opinion that the Denbigh Flint Complex might be quite ancient (Hopkins and Giddings 1953). This may well have piqued Irving's interest both in the DFC and the Punyik Point site at Etivlik Lake, which contained Denbigh-style artifacts and was much larger and offered more research potential than any of the sites he had located in the Anaktuvuk Pass region. During the summer of 1954, accompanied by Leonard Douglas, a Kobuk Eskimo, Irving surveyed the shores of Etivlik Lake (Fig. 1), located eleven sites and conducted excavations at three of them (Irving 1954). Although this is speculation on my part, Irving may have regarded Punyik Point as a possible research locale that could bear on the question of the peopling of the New World. By the same token, he had expressed an interest in similarities and differences between inland and coastal prehistoric Eskimos and he may have considered Punyik Point to be a good locale for gathering inland Eskimo data.

In regard to the antiquity of the Denbigh Flint Complex, at the time Giddings was engaged in his work at Iyatayet, Willard Libby was developing the radiocarbon dating technique (Libby 1952). Giddings corresponded with Libby to arrange for charcoal from Iyatayet to be dated. In the early 1950s a radiocarbon assay was performed on solid carbon, which required a lot of charcoal, and in 1952 Giddings returned to Iyatayet for the sole purpose of collecting sufficient charcoal. Libby processed the samples, which returned dates that ranged between

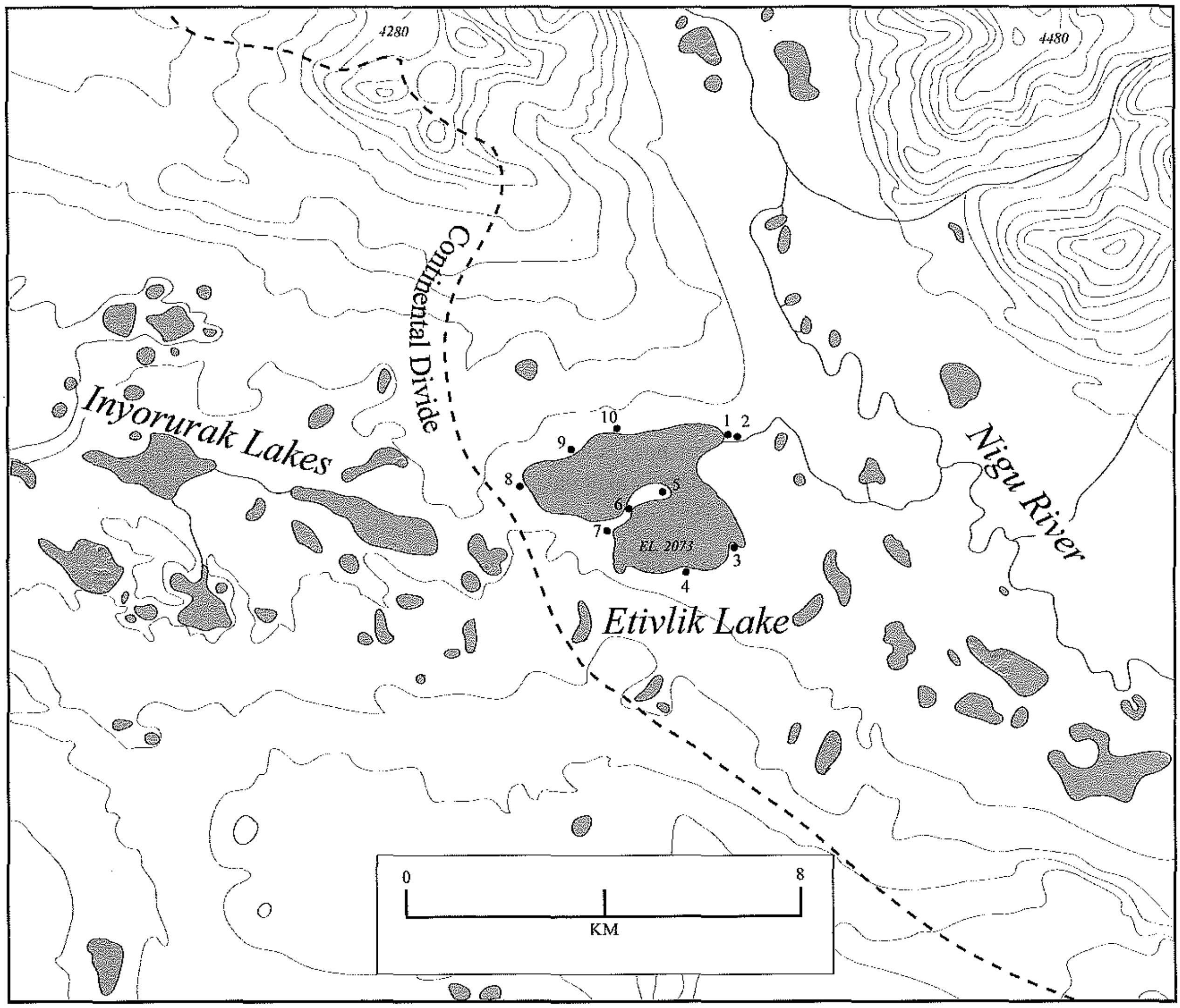


Figure 1. The local geomorphology and archaeological sites of Etivlik Lake: (1) Outlet site, with twenty to thirty late prehistoric houses; (2) Outlet knoll, a lookout station and campsite with materials dating to several periods; (3) Isugnak Point, with several temporary camps; (4) Kaksrauk Point, with late prehistoric winter houses; (5) Gale Point, meat cellars; (6) Isthmus, with a "stone platform hearth" and microblades; (7) West Point, with temporary late prehistoric camps; (8) Portage Point, with traces of a large, unidentified structure; (9) Punyik Point, a site with Denbigh Flint Complex and late prehistoric Eskimo materials, houses, middens, and caches (Irving 1964); (10) Lookout Knoll, undetermined occupation or use.

5000 BP and 3400 BP, thousands of years younger than Giddings had anticipated.[1] In light of this, it is worth noting that Irving's initial excavations at Punyik Point were conducted in 1954, and shortly thereafter the Iyatayet dates were released suggesting that Denbigh was far too young to have anything to do with the initial peopling of the New World (Libby 1955). Whether or not it resulted from the release of the Denbigh dates by Libby, following the 1954 field season Irving abandoned his research at Punyik Point and the Brooks Range for seven years.

Over the remainder of the decade as more research was conducted in the Canadian Arctic and Greenland and the lithic assemblages were described (Giddings 1956; Larsen and Melgaard 1958; Mathiassen 1958; Melgaard 1952, 1955), Irving began to see a technological relationship between the Denbigh Flint Complex and the Pre-Dorset (Sarqaq) and Independence I cultures of the central and eastern Arctic. These circumstances, the possibility of identifying a techno-cultural entity that extended from Alaska to Greenland, may have rekindled his interest and lured him back to Punyik Point. Speculation aside,

[1] An interesting sidebar is that while the dates did not support Giddings' thesis, he was not ready to change his mind and he was less than happy when Libby made the results public. This is evident from the tone of Giddings' (1955) *American Antiquity* article, "The Denbigh Flint Complex is Not Yet Dated."

subsequent to his 1961 excavations at Punyik Point, Irving (1962) described for the first time the Arctic Small Tool tradition (ASTt). Despite attempts by later archaeologists (Giddings and Anderson 1986) to modify the ASTt without an accompanying nomenclature adjustment, Irving's construct, as originally defined, remains viable today.

LOCATION

Etivlik Lake lies in the southeasternmost portion of the National Petroleum Reserve-Alaska (NPR-A), less than 2 km north of the Continental Divide, at the head of a glaciated valley 32 km east of Howard Pass (Fig. 2). Punyik Point is located along the northwest shore of the lake and occupies an area of more than five hundred meters east to west and extends more than 150 m back from the lake (Fig. 1). Lying just inside the range front in the western Brooks Range, the site is situated 160 km above the Arctic Circle and more than 65 km beyond latitudinal treeline. As a result, willow is the only readily available fuel or wood suitable for sled, boat, implement, and dwelling construction. The landscape of the region has changed little since the emergence of the tundra ecosystem roughly 9000 years ago and throughout that period caribou have been the primary subsistence animal for the human inhabitants of the region (Kunz, Bever, and Adkins 2003). Flora Creek, a tributary of the Noatak

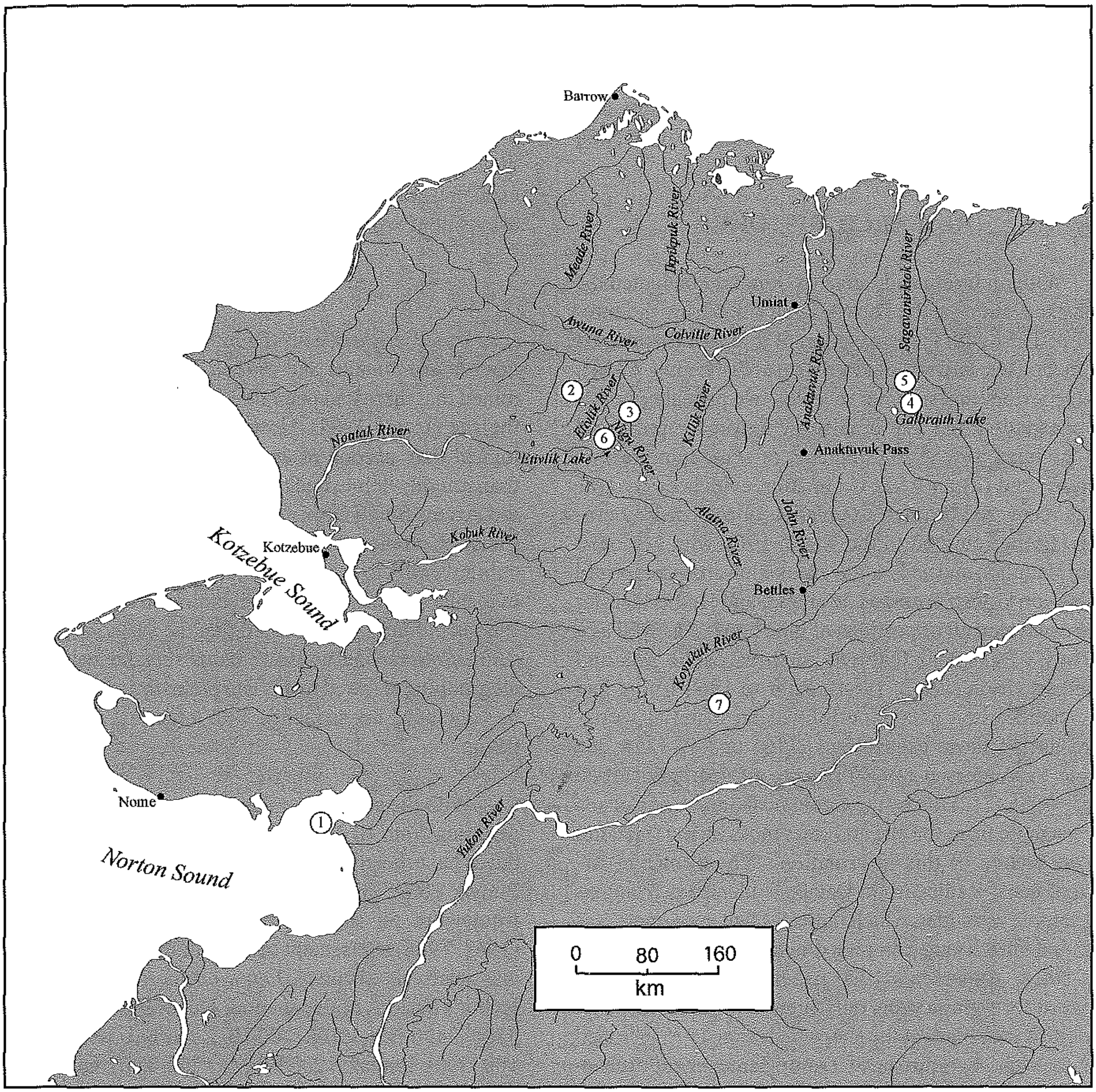


Figure 2. Northern Alaska site locations: (1) Iyatayet; (2) Croxton; (3) Mesa and Lisburne; (4) Mosquito Lake; (5) Gallagher Flint Station; (6) Punyik Point; (7) Batza Téna.

River, heads in the Inyorurak Lakes on the south side of the divide, slightly more than a kilometer to the west of the site. The creek provides access to an excellent year-round travel route to the Kotzebue Sound area 380 km to the southwest (Giddings and Anderson 1986). About 3 km to the east of the site the Nigu River flows northward to join the Etivlik River, a tributary of the Colville. In turn the Colville provides access to the Arctic Coast at its mouth, 440 km to the northeast and to the Point Barrow area more than 320 km to the north on the Beaufort Sea coast via the Awuna, Meade, and Ikpikpuk river drainages (Bockstoce 1988; Burch 1975, 1976) (Fig. 1). The Nigu River heads 32 km to the southeast of Punyik Point, less than 2 km from the headwaters of the Alatna River, a tributary of the Koyukuk, which provides access to interior Alaska. In the past, and as is still the case today, for overland travel, the river systems were the primary routes through this vast area. Punyik Point's presence at the nexus of these important travel corridors suggests that it may have functioned as a place of meeting and trade as well as habitation.

RESEARCH HISTORY

William Irving and Leonard Douglas conducted the first excavations at the Punyik Point site during the summer of 1954 with the excavation of three semi-subterranean houses and associated features (Irving 1954). Irving's work that summer revealed two primary periods of occupation: (1) late prehistoric Eskimo represented by the numerous visible remains of semi-subterranean houses; and (2) an ASTt occupation evidenced by artifacts recovered through excavation or exposed by erosion. Irving returned to the site in 1961 with geologist Tom Hamilton and an Eskimo excavation crew comprised of Nelson Griest, Truman Cleveland, and Herbert Custer and excavated all or portions of nine houses, as well as a variety of external features, such as cache pits and middens (Irving 1962, 1964). Prior to 1964 Irving had two radiocarbon assays performed on material recovered during those excavations (P-64 and W-1154; see Table 1). Anderson (1970) reports a third radiocarbon assay (GSC-712) run by the Geological Survey of Canada on a sample from the site and references Irving (no date) as the source of this information.[2] The Canadian Archaeological Radiocarbon Database identifies Irving as the sample submitter, which indicates that the sample was assayed after Irving completed his dissertation in 1964, but before Anderson's 1970 paper was published. For the next forty-three years only limited informal research activities took place at the site, which after 1976 included annual visits by Bureau of Land Management archaeologists monitoring the site's condition. It was on a monitoring trip in 1989 that John Cook, Rick Reanier, and I collected two samples of cultural charcoal. Both of the samples were directly associated with artifacts from two different eroding middens: Beta 36803 (charcoal scrapings from the exterior surface of a pot sherd) and Beta 36804 (charcoal associated with an obsidian microblade) (Table 1). In 2004, prompted by twenty-eight years of monitoring data, a BLM archaeological team was flown to the site to conduct an in-depth evaluation. A comprehensive topographic map pinpointing the location of all visible cultural features was completed using a EDM total station interfaced with a global positioning system. Adversely impacted areas of the site were documented, exposed artifacts collected, previously unexamined areas of the site were tested, a metal detector survey of the entire site was conducted, and radiocarbon samples from Irving's partially excavated features as well as our own test locales were collected. The assay of these samples has resulted in sixteen new radiocarbon dates for the site (Table 1). In 2005 the archaeological team returned to the site and continued the assessment work.

SITE OCCUPATION

Based primarily on the presence of semi-subterranean house remains and artifact typology, Irving determined that there had been five episodes of occupation at the site (Irving 1964). However, he lacked the chronological data needed to assign the occupations to more than roughly delineated time periods. He recognized that the Arctic Small Tool tradition as represented by the Punyik Complex (Denbigh Flint Complex) was the first cultural entity to utilize the site locale, and that there was evidence suggesting later occupations by the Norton and Ipiutak cultures. He assumed that the surficially evident semi-subterranean house remains represented a catch-all grouping referred to as "late prehistoric Eskimo," and he concluded his sequence with a historic period occupation.

With the addition of the sixteen radiocarbon assays resulting from BLM's 2004 work, a total of twenty-one dates have been obtained on material recovered from Punyik Point. These dates provide a solid chronological framework for the site and demonstrate that Irving's (1962, 1964) assessment of the culture history of the site was relatively accurate. Our work corroborates four of Irving's periods of occupation: Denbigh Flint Complex, 3300–3490 BP (1900-1700 BC); Norton, 1810 BP (AD 100–300); Ipiutak, 1200 BP (AD 700–900); and late pre-

[2]Anderson (1970) provides no additional information regarding the "Irving no date" citation in his bibliography.

Table 1. Punyik Point (XHP-308) Radiocarbon Dates

Lab. Number	^{14}C Method	Measured ^{14}C yr BP	^{13}C/^{12}C Ratio	Conventional ^{14}C age BP	2-Sigma Calibration (95.4% probability)*	Material/Comment
W-1154#	Standard	Not Reported	Not Reported	4470 ± 300	3810–2343 BC	Wood fragments: geological date relating to the formation of delta/fan upon which the site lies
GSC-721#	Standard	Not Reported	Not Reported	3660 ± 150	2356–1600 BC (95.2%)† 1597–1591 BC (0.02%)	Charcoal: 1961 excavation of a house or midden the exact provenance of which is unknown
Beta-193798	AMS	3500 ± 40	-25.6	3490 ± 40	1829–1654 BC (91.6%)† 1636–1616 BC (03.8%)	Charcoal: from the hearth in House H'61J associated with ASTt artifacts
Beta-193794	AMS	3460 ± 40	-25.7	3450 ± 40	1798–1590 BC	Charcoal: truncated midden remnant adjacent H'54B
Beta-36803	AMS	Not Reported	Not Reported	3435 ± 65	†1830–1532 BC (93.3%)† 1501–1486 BC (01.1%) 1479–1467 BC (01.0%)	Charcoal: recovered from a large shore-edge slump block directly associated with an *in situ* obsidian microblade
Beta-193799	AMS	3370 ± 40	-26.0	3350 ± 40	†1659–1626 BC (94.4%)† 1619–1457 BC (01.0%)	Charcoal: from Hearth #6 test pit on alluvial fan ridge crest; associated with chert microblade
Beta-193795	AMS	3310 ± 40	-25.8	3300 ± 40	1608–1427 BC	Charcoal: from lower hearth H'54A; Irving's sample from this hearth assayed at 2600 BP (see P-64 below) associated with ASTt artifacts
P-64#	Standard	Not Reported	Not Reported	2600 ± ???	~ 796 BC	Charcoal: Lower hearth H'54A (see above) associated with ASTt artifacts
Beta-193800	AMS	1840 ± 40	-26.9	1810 ± 40	AD 115–251 (80.7%)† AD 263–316 (12.5%) AD 82–100 (02.2%)	Charcoal: from H'61H, floor 2; chert discoids were associated with the hearth.
Beta-193796	AMS	1180 ± 40	-23.8	1200 ± 40	AD 725–857 (77.8%)† AD 657–717 (13.2%) AD 876–904 (04.4%)	Charcoal: from H'54A upper hearth; associated with discoids
Beta-193802	AMS	540 ± 40	-25.1	540 ± 40	AD 1386–1441 (56.8%)† AD 1308–1362 (36.8%)	Charcoal: from the hearth of House 11, late prehistoric Eskimo (LPE); one occupational event, associated with glass bead, copper scrap
Beta-36804	AMS	Not Reported	-27.6	485 ± 60	AD 1383–1521 (76.5%)† AD 1320–1366 (15.2%) AD 1591–1620 (3.6%) AD 1579–1580 (0.1%)	Charred material: material scraped from outside surface of an *in situ* pot sherd recovered from a shore edge slump block 2 m southeast of H'61B, a late prehistoric Eskimo house

Table 1 (continued). Punyik Point (XHP-308) Radiocarbon Dates

Lab. Number	^{14}C Method	Measured ^{14}C yr BP	$^{13}C/^{12}C$ Ratio	Conventional ^{14}C age BP	2-Sigma Calibration (95.4% probability)*	Material/Comment
Beta-201353	AMS	420 ± 40	-22.0	470 ± 40	AD 1397–1489 (94.3%)† AD 1331–1338 (0.7%) AD 1604–1608 (0.4%)	Sinew: wrapped-around ends of copper bangle that was recovered with glass beads and iron pendants 11 m southeast of House 6; late prehistoric Eskimo house
Beta-193805	AMS	450 ± 40	-24.7	450 ± 40	AD 1407–1513 (92.0%)† AD 1601–1616 (3.4%)	Charcoal: from the hearth in House 7; late prehistoric Eskimo house
Beta-203437	AMS	450 ± 50	-26.6	420 ± 50	AD 1415–1527 (70.4%)† AD 1554–1633 (25.0%)	Willow: used to close gap between bangle ends; attached to bangle with sinew
Beta-193801	AMS	330 ± 40	-24.6	340 ± 40	AD 1462–1642 (95.4%)	Charcoal: H'61G, layer 3; late prehistoric Eskimo
Beta-193804	AMS	340 ± 30	-25.8	330 ± 30	AD 1477–1642	Charcoal: hearth, House 15; late prehistoric Eskimo
Beta-193803	AMS	360 ± 30	-27.6	320 ± 30	AD 1483–1645	Charcoal: hearth, House 6; late prehistoric Eskimo
Beta-193806	AMS	360 ± 40	-27.3	320 ± 40	AD 1469–1648	Charcoal: H'61G, layer 7; late prehistoric Eskimo
Beta-193797	AMS	320 ± 30	-26.3	300 ± 30	AD 1489–1603 (69.3%)† AD 1611–1654 (26.1%)	Charcoal: M61C (midden); mixed materials ASTt-LPE
Beta-202502	AMS	210 ± 40	-20.4	290 ± 40	AD 1483–1665 (93.5%)† AD 1784–1795 (1.9%)	Sinew: wrapped around ends of copper bangle holding willow over gap; cf. Beta-203437

* The 2-sigma calibrations were performed by the author using Calib Rev. 5.0 (IntCal 04).

† Where multiple intercepts of an calibrated age occur, the dagger symbol indicates the date of greatest probability.

These are standard radiometric dates that were run more than thirty-five years ago and have standard deviations three or more times greater than the AMS dates. Therefore they are not statistically comparable at the level of precision represented by the AMS dates (Stafford et al. 2005) and are included in this table as a record of the radiocarbon assay of the Punyik Point site.

historic Eskimo, 540 – 300 BP (AD 1300–1650). However, we found no evidence to support a historic period (post-AD 1732) occupation. Irving believed there had been historic period use of the site in part because during his excavations, he unearthed four blue glass beads, a copper bangle, and a copper bracelet (Irving 1964). He remarked that the bead type appeared to be unknown in interior and northern Alaska, but identified the copper as being "undoubtedly material of recent Euro-American origin" (Irving 1964).

Because of the copper artifacts that Irving recovered, we decided to conduct a systematic metal detector survey of the site. As a result eighty-six metallic objects were located, flagged, enumerated, tied into the site datum, and subsequently exposed through excavation. Most of these objects can be attributed to either Irving's excavation activities in 1954 and 1961, or to more recent campers. However, the survey also located copper ornaments and associated beads very similar to material recovered by Irving. While in the field we assumed that the metal and beads represented a historic-period occupation of the site. However, later, upon receipt of the radiocarbon dates (Table 1) it was clear that the latest occupation of the site probably occurred around AD 1620 and certainly no more recently than AD 1660—more than seventy years before the first contact between Europeans and Alaska Natives (Black 2004). Other hallmark artifacts, which are found in almost all historic-period occupations in archaeological sites in arctic Alaska, were not present at the site. Such items include saw-cut bone, antler, and ivory; musket balls, bullet molds, cartridge cases, and other firearm paraphernalia; and tools of aboriginal manufacture made from bartered or salvaged metal, such as barrel hoops, saw blades, and cartridge brass. These types of artifacts postdate the late 1700s and none were recovered from Punyik Point. Thus, despite the presence of glass beads and metal ornaments, there is no historic period occupation at Punyik Point (Mills, Ross and Kunz 2006).

To this point I have identified the first inhabitants of Punyik Point as ASTt or DFC, and while in this paper I use the two terms interchangeably, in actuality, the DFC is an Alaskan component of the Arctic Small Tool tradition (Irving 1962, 1970). Irving, in his dissertation "Punyik Point and the Arctic Small Tool Tradition," never identifies Punyik Point as a DFC site. What he says is that the site's earliest occupants were ASTt people whose material remains comprise an archaeological assemblage that he calls the Punyik Complex. However, to Irving in his post-dissertation years (Irving 1970), the Punyik Complex material is DFC, although between 1954 and 1964 Irving did not view it as such. There are probably several reasons why Irving initially saw the Punyik Point material as a separate complex. His work at Punyik Point took place at a time when many of the prehistoric cultural entities in Alaska were newly discovered at only a few locations and cursorily described. The Denbigh Flint Complex type site, Iyatayet, was a coastal manifestation and Punyik Point was more than two hundred miles from the coast in the middle of the Brooks Range in a totally different ecological setting (Irving 1964). In accord with the paradigm of culture history, Irving tended to split rather than lump categories. This mindset can be seen in his dissertation when he explains what he sees as the differences between the Denbigh Flint Complex assemblage at Iyatayet and the Punyik Point materials. An even better example of his perspective can be seen in his separation of the Punyik Complex from his Imaigenik Complex of Anaktuvuk Pass. Although comprised of tool types and styles identical to those of the Punyik Complex, Irving considered the Imaigenik assemblage, made up of *only seventy-three artifacts*, to be a separate complex because of slight differences in tool-type percentages and the absence of endblades (Irving 1964). From my perspective, these differences represent nothing more than intersite variation manifested by the same cultural entity. Having excavated at a number of DFC sites, I know the assemblages always display some variation, yet they are all undoubtedly Denbigh. Hereafter, Irving's Punyik Complex will be referred to by the term "Denbigh Flint Complex."

THE SITE

Undoubtedly some portion of the Punyik Point site has been lost to beach erosion which, by virtue of the prevailing winds, occurs annually through ice bulldozing at breakup and wave erosion during the open water months. This is evidenced by truncated middens and semi-subterranean houses revealed in profile along the beachfront, as well as slump blocks, artifacts, bone, and fire-cracked rock (FCR) scattered along the shore, in the wash zone, and in the shallow water. Based on a comparison of the shoreline and shore edge features shown on Irving's 1961 site map[3] and the site map we produced in 2004, as much as 1.5 m of shoreline may have been lost over the last forty-three years. However this loss is not uniform across the entire site; some beachfront areas were significantly affected and others were not. How much of the site has been lost since

[3]In 1961 Tom Hamilton mapped the Punyik Point site using a plane table and alidade. We were able to locate his datum monuments and determined that his map was extremely accurate.

Denbigh times is unknown; nor do we know how long the current erosional agents have been active. My gut feeling, based on impromptu observations over the past three decades, is that there has not been significant loss.

As a result of his two seasons of excavation at Punyik Point, Irving arrived at much the same conclusion we did after our fieldwork there: almost the entirety of the site area was initially occupied by people of the Denbigh Flint Complex. Denbigh material has been found scattered along the entire beachfront of the site and revealed in the majority of the locations where excavation and testing has taken place. Denbigh material was also encountered and displaced by later prehistoric occupants of the site during their excavation and construction of semi-subterranean houses.

Irving also encountered semi-subterranean houses that pre-date the late prehistoric Eskimo (LPE) period. He encountered these older features by chance during excavation, as they are not visible in topographic relief. Several of the LPE houses were superimposed over and partially excavated through earlier features, which Irving identified as houses and middens and, in at least one case, one of the older houses partially overlapped an even older house. However, after he had been excavating for a while, Irving realized that there was a recognizable vegetation community atop most midden deposits indicating their presence even though there was no visible topographic indication (Irving 1964). With all of the aboriginal excavation, the resulting stratigraphy was an archaeological nightmare and in a effort to decipher it, it is little wonder that Irving tended to split categories. To confuse the situation even more, some of the older houses had been used as trash dumps by subsequent site occupants. Still later inhabitants dug through all of that to construct their houses. Fortunately this scenario does not play out continually across the site and there are areas where the occupational sequence is straightforward and resolvable.

Primarily, Irving used style and manufacturing technique to identify formal DFC flaked stone artifacts. Their presence or absence in a deposit largely determined what cultural assignment was given to the deposit. Irving (1962, 1964) refers to what he calls, "the Arctic Small Tool tradition technique" as the primary defining trait for DFC tools. Visually this "technique" appears as a finished pattern of very narrow parallel flake scars that run obliquely across both surfaces (faces) of bifacially flaked stone tools. Occasionally a single flake scar might run across the entire face of the tool, but generally flake removal initiated at the edge of the tool and terminated at the tool's longitudinal midpoint abutting the termination of a flake initiated at the opposite edge. End and side blades, other bifaces, and burins displayed this technique to the greatest degree, while knives, scrapers, and discoids occasionally displayed it to a more limited degree. However, Irving was not a complete stickler for adherence to the ASTt technique criterion. While he did use the highly diagnostic "mitten-shaped" burin, its distinctive spalls, and, to a lesser degree, microblades to identify DFC deposits, when the deposits were mixed (Norton/Ipiutak), there were problems.[4] Depending upon which excavation unit an artifact came from, it may be designated ASTt without any trace of ASTt technique based on Irving's *feel* for the situation. By the same token, a number of artifacts that may well be DFC were not identified as such by Irving. This statement should not be viewed as, "Irving bashing". Like Irving, I rely primarily on artifact type, style and form to decide what is DFC and what is not. However, in most cases, if I were to encounter an *in situ* lithic assemblage, devoid of diagnostic artifacts and comprised of end and side blades, discoids, flake knives, etc., none of which display the "ASTt technique", I have radiocarbon dating and an extensive radiocarbon chronology available to me as a resource at a level unavailable to Irving. As an example, it was the use of AMS radiocarbon assays that demonstrated that the Punyik Point beads, bangles, and pendants – seemingly historic artifacts – were actually prehistoric in age.

Along the eastern limit of the site there is an alluvial fan that runs downslope from the hills above to the edge of the lake. A low crest, less than a meter above the surrounding tundra, runs the length of the fan from a point roughly 60 to 140 m upslope from the lake shore. Although we noted no surface indication of any cultural materials or features along this ridge, in 1954, Irving excavated what he referred to as "a scarcely detectable depression marked by dwarf birch and willow that appeared unnatural and suggested a house" (1964). His excavation of the depression (H'54A) revealed two hearths and what appeared to be two living floors separated by a layer of sterile gravel (Irving 1964). Artifacts associated with the upper hearth are not described by Irving; he only indicates that they are neither ASTt nor LPE. The artifacts associated with the lower hearth are described as ASTt. In 2004 we tested what remained of this feature[5] and although we did not find stratigraphy

[4]Norton and Ipiutak end and side blades, discoids, flake-knives and scrapers are generally indistinguishable from Denbigh artifacts of the same type that lack evidence of the ASTt technique

[5]Using Hamilton's map and Irving's (1964) dissertation as guides, we were able to relocate all of Irving's excavation locales and features.

quite as Irving described it, we did find an *in situ* microblade and an endblade as well as the remnants of both hearths, which we sampled and subsequently dated (Fig. 3, Table 1). The upper hearth returned a date of 1200 ± 40 RCYBP (Beta 193796) and the lower hearth 3300 ± 40 RCYBP (Beta 193795). Irving also assayed a charcoal sample from the lower hearth that yielded a date of 2600 BP (P-64), a date he found unacceptable for the DFC. Based upon our assay of charcoal we collected from the same hearth, it appears that the results of Irving's assay are incorrect for unknown reasons.

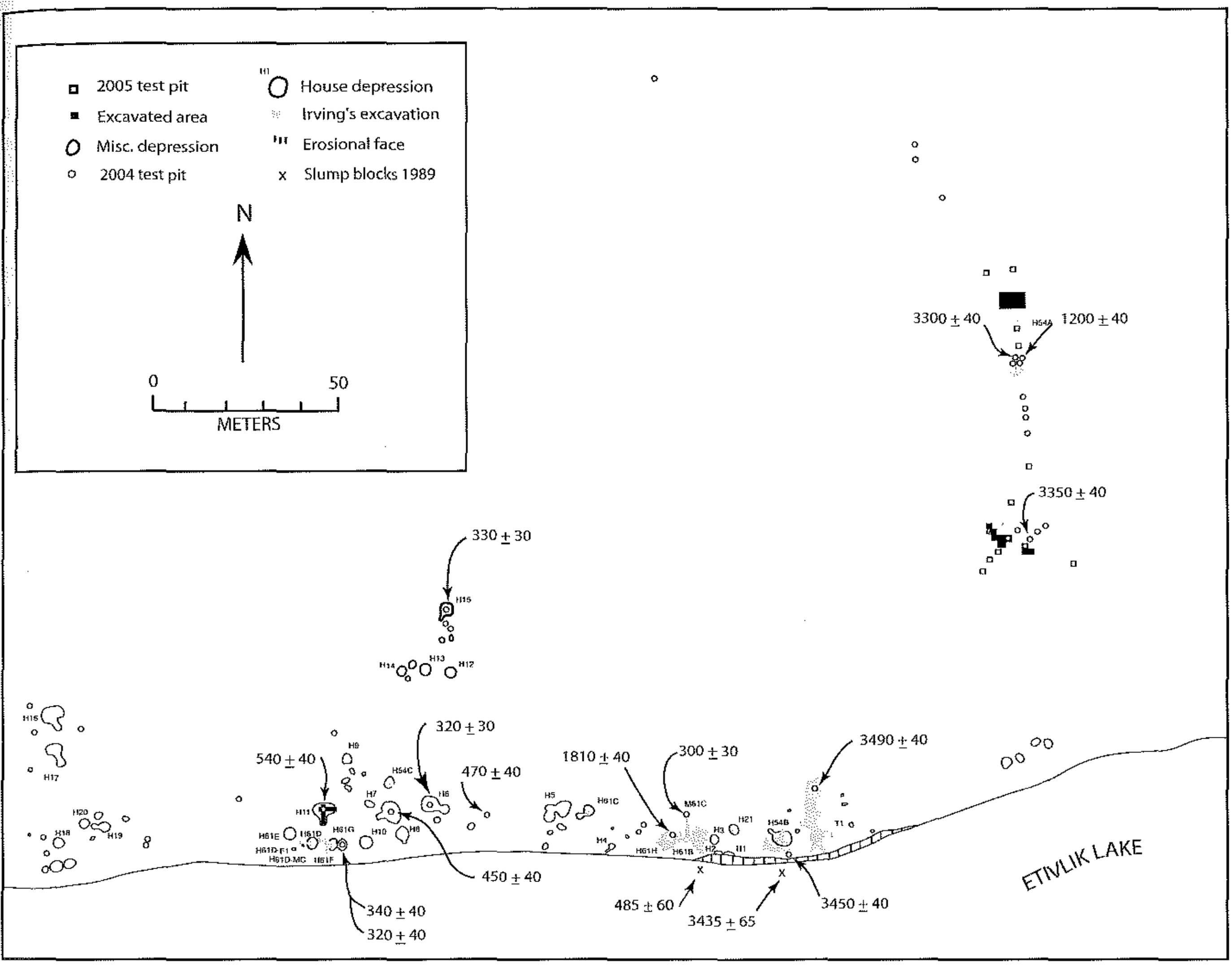


Figure 3. Punyik Point site map. The extreme western portion of the site is not shown on this map and is not discussed in the text. Although oval house depressions and cache pits are present in that portion of the site, neither Irving or BLM archaeologists conducted excavations there.

Because this area of the site is the least disturbed and offered the best opportunity for gathering data relating to the Denbigh component, we randomly tested along the fan crest both up and downslope from Irving's excavation and found cultural material in all eight of the ca. 50-square-centimeter test excavations, two of which contained Denbigh diagnostics. One of the two also contained a hearth. Charcoal from the hearth was assayed and returned a date of 3370 ± 40 RCYBP (Beta 193799).

In 2005, I placed eleven ca. 50-square-centimeter test pits along the fan in an effort to determine the extent of the occupation. That work demonstrated that cultural material is concentrated along the longitudinal crest of the fan in an area roughly 20 m east-west by 80 meters north-south. Formal excavation was conducted in the southern (lower) third of this eighty-meter stretch in two locations totaling 2.5 m^2 and in the northern (upper) third at a single location totaling 3 m.[2]

Based on the testing and formal excavations the following is the generalized stratigraphy for the fan: Unit 1 is the surface. In all areas of the fan crest the surface

Figure 4 (right). Artifacts recovered during the 2005 alluvial fan excavation (artifact toolstone is chert unless otherwise noted). (a) Reworked Denbigh burin exhibits parallel oblique flaking on both surfaces. (b–d) Denbigh burins; b and d exhibit parallel oblique flaking on at least one surface. (e) Unifacial tool; dorsal surface completely worked by parallel oblique flaking. (f and g) Endscrapers.(h, i, k, l) Endblades; h, i and l exhibit parallel oblique flaking; k is obsidian and exhibits random flaking. (j) Sideblade exhibiting parallel oblique flaking.(m–p) Microblades. (q and r) Retouched microblades; q is obsidian.

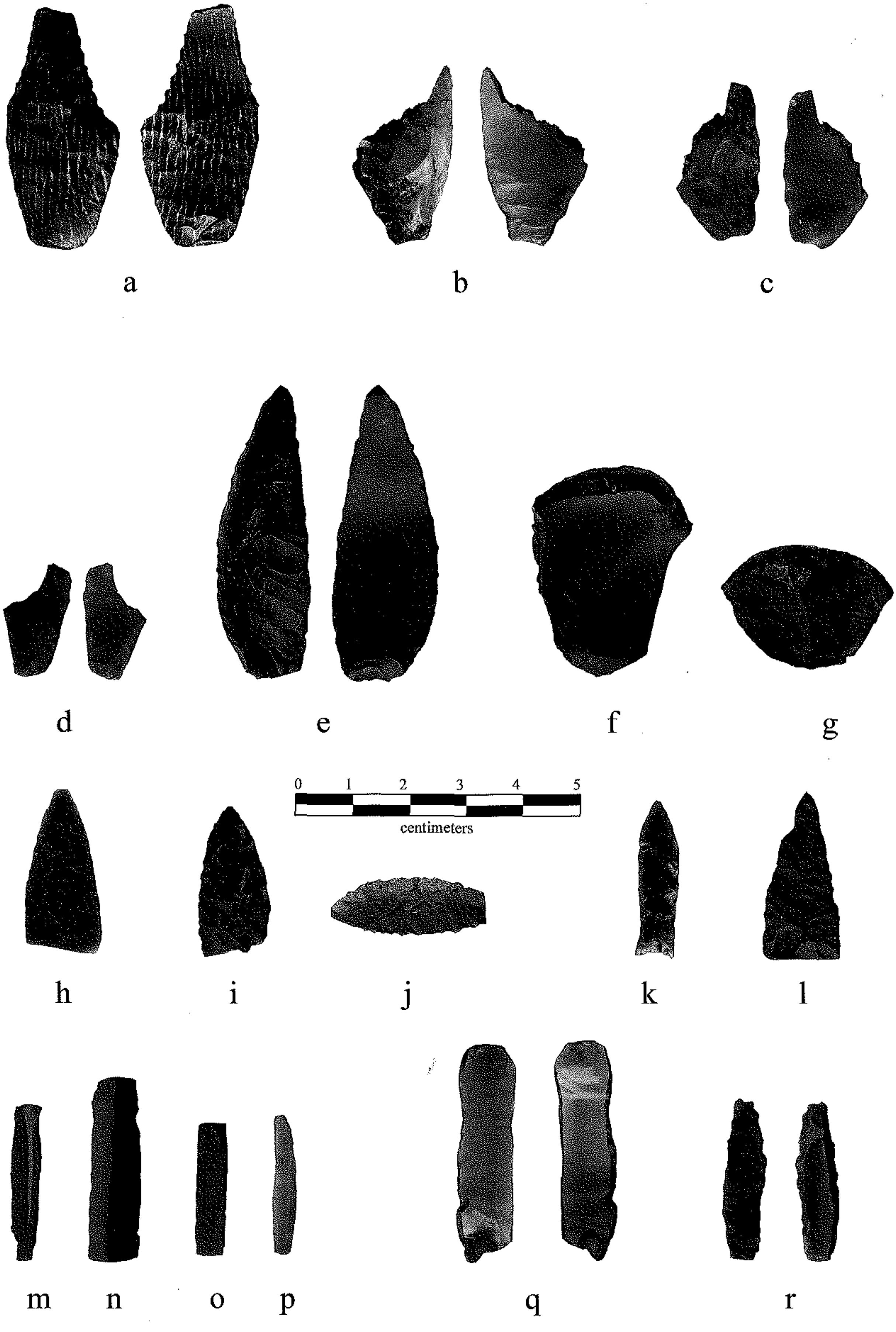
is robustly vegetated by willow, dwarf birch, moss, lichen, Labrador tea, *Dryas*, *Vaccinium*, grass, and other low woody and herbaceous plants. Occasionally small cobbles protrude and, rarely, fire-cracked rock (FCR). Unit 2 is the root mat, which is composed of the roots of the surface vegetation bedded in a dark brown organic soil averaging 4 to 6 cm in thickness. Fire-cracked rock and cobbles often protrude into the bottom of the root mat from below accompanied by an occasional flake. Other than these intrusives, the root mat is culturally sterile. Unit 3 is composed of a very dark brown organic-rich soil that varies in thickness from 3 to 6 cm depending upon location along the crest, tending to be thicker on the southern third of the fan. This unit contains a large amount of FCR and small cobbles. At the bottom, flakes, charcoal, and artifacts are often found. Although some cultural material is present in the bottom of Unit 3 and the top of Unit 5, the vast majority of the cultural material occurs in Unit 4. Unit 4 is subdivided into two co-occurring manifestations. 4A is a light gray sandy loam containing small cobbles, FCR, flakes and other artifacts and is a readily identifiable marker for the cultural deposit. 4A rarely exceeds 2 cm in thickness and is somewhat discontinuous, usually being replaced by 4B—a very dark charcoal-soil matrix that is often more than twice as thick as 4A but of lesser areal extent. Artifacts and flakes occur with greater frequency in 4A than in 4B but both are rich in cultural material. In a few spots, topographic high points of the underlying Unit 5 replace the Unit 4 components. The discontinuous nature of the Unit 4 components suggest disturbance resulting from past daily living activities of the site's inhabitants, which appear to have been intense. Unit 5 is a reddish brown, sandy, gritty soil that contains some pea gravel and numerous small-to-medium-size cobbles. The uppermost 1 cm may contain a scattering of artifacts, flakes, charcoal, and FCR. This unit can be more than 10 cm in thickness, becoming more gravelly with increased cobble size as the depth increases. Other than the uppermost portion, Unit 5 is culturally sterile. Unit 6 is a yellowish, sandy gravel-cobble matrix that is culturally sterile and extends to an unknown depth.

The crest of the fan is well drained and the increase in the field of vision gained from the crest and the hillside combine to make it an attractive place to camp. The apparent intensity of use of the fan crest is significant. Subsurface testing off the crest revealed a total absence of Unit 4 in the stratigraphy, indicating that Unit 4 derives totally from cultural activities. Every test pit and excavation on the crest contained an almost unbroken layer (Units 3 and 4) of fire cracked rock and charcoal smears and flecks. Further, it is my belief that the light gray color of Unit 4A results from ash, charcoal, and other cultural residues. I have never seen an area this size (approximately 2400 m^2 estimated from testing and excavation) display such artifact density and intensity of use. A test pit anywhere in this area would probably reveal a charcoal deposit that could be interpreted as a hearth.

All of the artifacts recovered through our testing and excavation of the fan crest can be attributed to the Denbigh Flint Complex (Figure 4). Although a few of the bifacial tools do not exhibit the "ASTt technique," based on the cultural stratigraphy of the fan, there is little reason to think they do not represent the Denbigh occupation. On the other hand, we did obtain a 1200 BP date from Irving's H'54A "upper hearth," which he said was associated with non-ASTt artifacts. It would be easy to consider the 1200 BP date anomalous (especially since our date from the H'54A lower hearth is in appreciable disagreement with Irving's date) if other areas of the site had not produced artifacts commonly associated with Norton and Ipiutak assemblages.[6] While our testing and subsequent excavations were adequate for our task, they were not extensive. Other than Irving's H'54A, we encountered nothing that we recognized as an architectural feature on the fan crest.

The evidence suggests that the fan crest was an open-air camping locale, primarily used during the summer months when aggregations of people tended to be greater than in the winter. The dwellings were probably caribou-skin tents and much of the daily activity occurred

[6]According to Irving (1964) there are not a lot of these artifacts but they usually manifest themselves in a clustered context and are numerous enough to unequivocally establish a limited presence for Norton and Ipiutak.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outside the tents, which accounts for the layer of fire-cracked rock that appears to carpet the entire fan crest. The fan crest was probably utilized on a regular if not annual basis during much of the period of Denbigh presence at Punyik Point, but saw little use thereafter. Sequential occupations during the snow-free months would account for the dense and compacted cultural layer (stratigraphic Unit 4), while the culturally sterile, straightforward, well developed and unbreached soil profile overlying it is evidence of little or no use following the Denbigh occupation.

More than twenty late prehistoric Eskimo semi-subterranean houses are spread across the more than 400 meters of site that extend to the west of the alluvial fan. This area of the site is much better suited to the construction of semi-subterranean houses than is the fan; however, Irving (1964) remarked that he did not think that this area was a particularly good camping spot. The fact that middens exist in close proximity to most of the house features excavated by Irving suggests that the presence of houses indicates a significantly different mode of living than that which occurred on the alluvial fan ridge, where there are no middens. Since it is generally accepted that semi-subterranean houses indicate a winter occupation, the presence of middens containing only DFC materials suggests the presence of considerably more Denbigh houses than the few "ancient features" that Irving encountered (such as house H'61J; see Table 1, Beta 193798).[7] As previously mentioned, our testing of the site has demonstrated a general DFC presence throughout, although it is more prevalent in the eastern half of the site. While the area west of the alluvial fan is dominated by semi-subterranean houses and associated features—DFC through LPE—I think it is likely that some summer occupation may have occurred there as well during DFC times.

With the exception of the excavation of H'54A on the alluvial fan, all of Irving's work occurred in the central portion of the site where the majority of the house features are located. Although he does not say much regarding flaking detritus, Irving does note that the vast majority of waste flakes are small, suggesting that primary reduction was being conducted off-site. In the absence of waste-flake numbers, which are usually a good indicator of occupational intensity, artifact numbers provide good insight. Irving recovered 145 side blades, 52 endblades, 155 burins, 604 microblades, and 10 microblade cores from an excavation area of about 200 m^2, which represents a small portion of the site. That is a ratio of a little less than five artifacts for every square meter excavated. The only other large Brooks Range Denbigh site extensively excavated is Mosquito Lake, 260 km to the east and about a kilometer north-northeast of Trans-Alaska Pipeline Pump Station No. 4, near Galbraith Lake (Kunz 1977). There, the excavation of more than 550 m^2 produced 53 side blades, 18 endblades, 46 burins, 167 microblades, and 5 microblade cores for an artifact-to-square-meter- excavated ratio of slightly less than two. While Mosquito Lake was not a multiple-season habitation site like Punyik Point, both sites have about the same area available for use. However, the excavated area at Mosquito Lake is more than twice that of Punyik Point, yet the artifact-to-area-excavated ratio is much smaller. This comparison graphically demonstrates the intensity of the Denbigh occupation at Punyik Point.

Irving categorizes toolstone in four categories: black, light gray, other chert, and obsidian. While it is difficult to extrapolate summary data from his work, the percentages of types seem to correspond roughly to those of other large sites in the area such as Lisburne (Bowers 1982) and Mesa (Kunz, Bever, and Adkins 2003), 28 km and 20 km to the northeast respectively. This suggests that regional toolstone sources were providing the majority of the lithic material used by the site's occupants. However, the use of obsidian at Punyik Point was considerably greater than at Lisburne or Mesa. Our research has shown that obsidian found in Brooks Range–North Slope archaeological sites is most often from the Batza Téna deposit on the Indian River about 320 km south of Punyik Point. The relatively common occurrence of obsidian in the Punyik Point Denbigh occupation suggests greater mobility or more extensive trade network during Denbigh times than had been the case earlier.

The sum of the archaeological work conducted at Punyik Point over the past fifty years as determined by artifact numbers, concentration, and areal extent unequivocally demonstrates that the most intensive use of the site occurred during DFC times. Not only was the site locale more completely used by the Denbigh folks than it was by more recent inhabitants, the population size at any given episode of DFC occupation may have been greater as well. There are several aspects of the

[7]Faunal remains suggest that the temperate season occupation at Punyik Point (and similar lake-side sites in the region) generally occurred in response to caribou availability. The presence of cache pits suggests that caribou were being "put by" to help sustain the inhabitants through the winter while the lake provided a reliable fish resource when the cached reserves were depleted and/or local game resources were meager. At Punyik Point the visible cache pits are associated with the late prehistoric Eskimo house depressions. It seems reasonable to assume similar circumstances prevailed during DFC times.

DFC occupation of Punyik Point that I think are particularly interesting. It is the only interior Arctic site that I am aware of that has such extensive evidence for multiple seasons of use or use of such intensity. Punyik Point may be the only DFC site to exhibit such unequivocal evidence of multi-season use. Additionally, the radiocarbon assays indicate that this use was short-lived, spanning only a two-hundred-year period between 3500 and 3300 radiocarbon years ago, a somewhat shorter duration than the ca. 350 years the Denbigh folks utilized the nearby Croxton site, 40 km to the northwest at Tukuto Lake (Slaughter this volume) and considerably shorter than the seven-hundred-year use of two large Brooks Range DFC occupations—the Mosquito Lake site and the Gallagher Flint Station, which lies near the headwaters of Oksrukuyik Creek 16 km east of the University of Alaska's Toolik Field Station (Bowers 1983; Kunz 1977; Slaughter personal communication 2006).

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Radiocarbon Dating the Arctic Small Tool Tradition in Alaska

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Abstract: This paper presents an annotated list of Alaskan Arctic Small Tool tradition dates. The goal is to assemble all extant Alaskan ASTt dates. In view of unpublished dates and a vast amount of gray literature, it seems unlikely that this goal was achieved. The paper does, however, present a large number of dates in a single source along with as much data as the constraints of the table format permit.

Key words: Alaska prehistory, mid-Holocene, human migration

The Arctic Small Tool tradition[1] (ASTt) is remarkable not only for small, exquisitely made tools, but also for its immense geographic range. As presently understood, the ASTt ranges from Kachemak Bay and the Alaska Peninsula northward and eastward to the northern tip of Greenland - a region that is not only at the edge of the habitable earth, but at the edge of earth itself. Perhaps even more remarkable is the fact that the oldest site at the southern extreme of that range dates within a century or two of the oldest securely dated sites at the northern extreme.

This paper presents a roster of 86 radiocarbon dates from ASTt sites in Alaska, the presumed home of the tradition. An attempt was made to assemble all Alaskan ASTt dates. The key word, of course, is attempt. There are probably published dates that were overlooked; there is little doubt that there are unpublished dates and dates in the gray literature and other obscure sources that are not included.

The dating of the ASTt in Alaska hardly had auspicious beginnings and it is instructive to reflect upon the dating of the type site before proceeding with the paper.

DATING THE FIRST ALASKAN ASTt SITE

Nearly sixty years ago, on the very eve of the advent of radiocarbon dating, J. Louis Giddings uncovered the small, superbly fashioned tools of the Denbigh Flint Complex at Iyatayet on Cape Denbigh (Giddings 1949). The Denbigh Flint Complex, now an integral component of the Arctic Small Tool tradition, was initially thought to be at least 8500 years old and possibly as old as 12000 years (Hopkins and Giddings 1953:29).

Understandably, little charcoal was collected when Iyatayet was excavated and the single sample submitted to the University of Chicago in 1951 was too small to date. Consequently, the site was revisited in 1952 to collect charcoal for radiocarbon dating (Giddings 1955:375). When the samples were dated – by Willard Libby himself, incidentally – the results were far younger than Giddings had anticipated (see below [Table 1, Numbers 54-57]). The title of Giddings (1955) response to the dates "The Denbigh Flint Complex is Not Yet Dated" is a masterpiece – one hardly needs to read the paper. Not only did Giddings disagree with the dates, he was "somewhat dismayed" that they had been made public without comment from him.

Giddings soon abandoned claims of great antiquity for Iyatayet, but even in the Cape Denbigh monograph Giddings (1964) clearly still felt that the Denbigh Flint Complex was older than radiocarbon dating indicated, as did some of his colleagues (Larsen 1968; Rainey and Ralph 1959). For example, in the monograph, Giddings (1964:246) alluded to a 6000 year old date from Trail Creek Caves[2] "in levels where Denbigh-like microblades occurred" and expressed the hope of finding more satis-

[1]Arctic Small Tool tradition is used here as originally conceived by Irving (1962), i.e., it is limited to the Denbigh Flint Complex and the suite of more or less coeval and typologically similar cultures occurring in Alaska, northern Canada, and Greenland. This definition eliminates Choris, Norton, and Ipiutak dates from consideration.

[2]This date, 5993±280 BP (C-560), could not be confidently associated with artifacts from the same level (Larsen 1968:71).

factory dates at Cape Krusenstern and at stratified sites in the interior. This was not to be – the ASTt sites at Cape Krusenstern remain undated (Giddings and Anderson 1986 [Figure 19]) and the oldest dates from Onion Portage are younger than the oldest Iyatayet dates. Ironically, if one accepts solid carbon dates at face value, Giddings' Iyatayet dates are among the oldest ASTt dates ever obtained.

The intent of this paper is not to argue for or against the great antiquity of the ASTt in Alaska, but rather to present a comprehensive roster of Alaskan ASTt dates that will, hopefully, allow readers to form their own conclusions.

THE DATE ROSTER

The annotated dates are presented in Table 1 and the locations of dated sites are shown in Figure 1. Each date in the table is assigned a number in the first column. This is done primarily to simplify discussion of specific dates or groups of dates in the text. The second column contains the site name, if one occurs in the literature, and the Alaska Heritage Resources Survey (AHRS) designation consisting of a three letter designation for the US Geological Survey Quadrangle Map the site occurs on and a three number site identifier. An exception to this occurs with several sites excavated by Dumond (1981) in the Naknek River drainage that are all subsumed under XMK-001. Here individual site identifiers are appended to the AHRS designation (e.g., XMK-001-BR4 is Dumond's Brooks River Site 4). Sites are listed in the column from north to south and west to east.

The third column contains the lettered radiocarbon laboratory identification code and the laboratory assigned sample number. The fourth column list the date in uncalibrated radiocarbon years before the present (^{14}C yrs BP). The following, fifth, column identifies the type of material dated by lettered code; a key to the codes is found at the bottom of each page in Table 1. The sixth column provides references. Each reference is assigned a number and the key to the references is provided by Table 2.

The final column, Remarks, is a catchall that requires considerable explanation. The first entry in this column is the location since this is not always apparent from the site name. At best this gives a precise location to a person unfamiliar with the site (e.g., Cape Denbigh), at worst it provides a "ballpark" region (e.g., Killik River).

The assigning of assemblages to the ASTt is the most subjective aspect of the table. Generally, cultural assessments in the literature are taken at face value and phase names or other designations given by authors are enclosed in quotes. Assemblages that appear to contain only ASTt materials are simply listed as ASTt in the column. Assemblages containing a mixture of ASTt artifacts and those from other cultures are listed as ASTt and examples of extraneous elements are listed.

Dates from the purported ASTt sites at Russell Creek on Cold Bay (Maschner 1999; Maschner and Jordan 2001) and Margaret Bay (Knecht et al. 2001) on Unalaska Island are not included in the table. These sites indeed exhibit some ASTt traits, but these assemblages are sufficiently different from those listed that it seems inadvisable to include them. Similarly, several apparent ASTt dates from the Gallagher Flint Station (PSM-050) were not included because they do not appear to be associated with ASTt materials (Gal 1982).

As a final note on this column, an attempt is made to provide the general provenience from which the dated sample was obtained, although this was not always possible. As much information is given as the constraints of the table format permit. The phrase containing this information begins with "from" (e. g., from hearth in house, from lowermost level, etc.).

DISCUSSION

Although this paper is primarily a date roster, some discussion is in order. Recent research by Reuther (2003) has a bearing on dating the ASTt in Alaska. That work will be briefly discussed here since many readers may not yet be aware of it. Several authors have noted that dates by the now defunct Dicarb Radioisotope Company, or Dicarb (DIC), on the Croxton Site are incongruously young when compared to dates from that site rendered by other laboratories (Gerlach and Mason 1992; Minc and Smith 1989; Reanier 1992). Joshua Reuther (2003) recently examined this problem by resubmitting samples of material dated by Dicarb (as well as new samples from the same provenience as Dicarb-dated material) to Beta Analytic, Inc. and NSF-University of Arizona for accelerator mass spectrometry dating. Although the bulk of Reuther's work concerned the Ipiutak component at Croxton, a number of samples were from the smaller ASTt component, as shown in Table 3.

Table 1. An annotated listing of Alaskan ASTt dates

No.	Site Name AHRS No.	Lab. No.	^{14}C yrs BP	Mat'l Dated	Reference	Remarks
1	Walakpa BAR-013	GAK-2290	3400±520	BO	23	Walakpa Bay, ASTt plus ceramics, ground jade and discoids, "Walakpa Phase, L. Denbigh-Choris transition", from lowest occupational surface.
2	Walakpa BAR-013	GAK-2300	2260±300	BO	23	See No. 1.
3	Putuligayak R. XBP-007	UGA-3719	2075±70	B	16	Simpson Lagoon, L. ASTt?, small assemblage, bipointed endblade, burinated biface and sideblade, microblades, flakeknife.
4	Central Cr. Pingo XBP-008	Beta-50661	4060±130	C	17	Prudhoe Bay, Loc. 2, small assemblage, sideblade, mitten-shaped burins, and microblades.
5	Central Cr. Pingo XBP-008	Beta-50662	3580±80	C	17	Loc. 8, contained debitage only.
6	Jack's Last Pingo XBP-044	Beta-149167	2140±40	C	18	Prudhoe Bay, L. ASTt?, small assemblage, edge-ground endblade, microblade.
7	Croxton, Loc. J XHP-311	GX-8636	1670±160	C	6, 19	Tukuto Lake. ASTt, from level 2 hearth, same hearth as No. 8.
8	Croxton, Loc. J XHP-311	Beta-129944	1410±40	C	19	See No. 7.
9	Croxton, Loc. J XHP-311	DIC-2464	290±100	C	6, 19, 20	Level 2, ASTt plus discoids, organic artifacts; sample may be mixed by cryoturbation, same sample as No. 10.
10	Croxton, Loc. J XHP-311	Beta-138715	3620±40	C	19	See No. 9.

Key to material dated: A - antler; B - terrestrial bone; BO – burned organic matter; BR – bark; C – Charcoal; CW – charred wood; N/A – not available; W – wood; T – twigs

Table 1 (continued). An annotated listing of Alaskan ASTt dates

No.	Site Name AHRS No.	Lab. No.	^{14}C yrs BP	Mat'l Dated	Refer-ence	Remarks
11	Croxton, Loc. J XHP-311	GX-8637	3680±205	C	6, 19	ASTt, level 6, combined sample, from same charcoal deposit as No. 12.
12	Croxton, Loc. J XHP-311	Beta-138716	3420+40	C	19	See No. 11.
13	Croxton, Loc. J XHP-311	Beta-154782	3630±40	C	6, 19	Level 3, associated with microblade and burin spall.
14	Croxton, Loc. J XHP-311	DIC-2204	4420±410/430	C	6, 19	Level 5, ASTt, from charcoal stain.
15	Croxton, Loc. J XHP-311	DIC-2465	2210±155	C	6, 19	Level 5, from hearth containing mitten-shaped burin, microblade, same hearth as No. 16.
16	Croxton, Loc. J XHP-311	Beta-136257	3650±50	C	6, 19	See No. 15.
17	Croxton. Loc. J XHP-311	DIC-2469	3350±60	W	6, 19	ASTt, level 5, from same charcoal deposit as No. 18 and 19.
18	Croxton, Loc. J XHP-311	Beta-134995	3760±40	W	19	See No.17.
19	Croxton, Loc. J XHP-311	Beta-134996	3700±40	T	19	See No. 17.
20	Punyik Point XHP-308	P-64	2600 ± ?	C	13	Etivlik Lake, ASTt, "Punyik Complex", solid carbon?, rejected by excavator, from hearth in house H'54A
21	Punyik Point XHP-308	GSC-712	3660±150	C	1	ASTt, date referenced Irving n.d. without further comment
22	Punyik Point XHP-311	Beta-193789	3490±40	C	26	ASTt, hearth in house H'61J
23	Punyik Point XHP-308	Beta-193799	3350±40	C	26	ASTt, open hearth
24	Punyik Point XHP-308	Beta-193794	3460±40	C	26	ASTt, from eroding midden on lake terrace

25	Punyik Point XHP-308	Beta-193795	3310±40	C	26	ASTt, from hearth in house H'54A.
26	KIR-124	WSU- 2532	3540±80	C	22	Kurupa Lake, ASTt, "Cascade Phase", from house fill .
27	KIR-124	DIC-2660	3450±230	C	22	See No. 26, date also listed as 3480±110 in same source.
28	Tingmiukpuk KIR-273	Beta-49165	3380±55	A	21	ASTt, from surficial antler.
29	Tingmiukpuk KIR-273	Beta-49164	3425±60	B	21	ASTt, from surficial bone.
30	Mosquito Lake PSM-049	Beta-4080	2135±160	C	14	"Mosquito Lake" near Galbraith Lake, Loc. 3, ASTt, from open hearth.
31	Mosquito Lake. PSM-049	GX-4079	2425±160	C	14	Loc. 4, ASTt from open hearth.
32	Mosquito Lake PSM-049	GX-4104	2665±155	C	14	Loc. 5, ASTt, from open hearth.
33	Mosquito Lake PSM-049	GX-4075	2705±160	C	14	Loc. 2, ASTt, from open hearth.
34	Mosquito Lake PSM-049	GX-4250	3515±160	C	14	Loc. 8, ASTt, from open hearth.
35	Mosquito Lake PSM-049	Beta-36802	3410±75	C	26	Loc. Annex, ASTt, from open hearth.
36	No NameKnob PSM-049	GX-4072	3855±155	C	6	Near Gallagher Flint Station, Loc 4, from hearth, ASTt plus medial labret, burins on thick flakes.
37	No Name Knob PSM-058	GX-4071	3440±160	C	6	See No. 38

Key to material dated: A - antler; B - terrestrial bone; BO – burned organic matter; BR – bark; C – Charcoal; CW – charred wood; N/A – not available; W – wood; T – twigs

Table 1 (continued). An annotated listing of Alaskan ASTt dates

No.	Site Name AHRS No.	Lab. No.	^{14}C yrs BP	Mat'l Dated	Refer-ence	Remarks
38	Blip PSM 037	GX-4084	3480±180	C	6	Near Gallagher Flint Station, North Kame Loc., ASTt plus historic material.
39	AMR-041	Beta-14648	3655±85	C	15	Kipmik Lake, ASTt, from open hearth.
40	Onion Portage AMR-001	P-1068	3530±60	C	2	Kobuk River, Band 3/4, ASTt,"Late Denbigh", burinated bifaces present, ASTt flaking absent.
41	Onion Portage AMR-001	P-1069A	3640±60	C	2	Band 4, level 1, ASTt, "Classic Denbigh:"
42	Onion Portage AMR-001	P-1801	3642±63	N/A	1	Band 4, Level 1, House 1, ASTt, may be based on 5370 half-life, date appears in Anderson 1970:10, but not in Anderson 1988: Figure 44.
43	Onion Portage AMR-001	P-987	3860±70	C	2	Band 4, Level 2, ASTt,"Classic Denbigh"
44	Onion Portage AMR-001	P-1109	3700±60	C	2	Band 4, Level 3, ASTt, "Classic Denbigh"
45	Onion Portage AMR-001	P-988	3850±70	C	2	Band 4, Level 4, ASTt, "Classic Denbigh"
46	Onion Portage AMR-001	P-998	3950±70	C	2	Band 4/5, ASTt, "Classic Denbigh"
47	Onion Portage AMR-001	P-1070	3710±60	C	2	Band 5, Level 1, ASTt, "Proto-Denbigh"; ASTt flaking, ground burins and burin spalls absent, stemmed end-scrapers, large semi-lunar bifaces present
48	Onion Portage AMR-001	P-1071	3710±60	C	2	See No. 47
49	KTZ-122	ETH-5945	3750±80	C	10	Cape Espenberg, no ASTt diagnostics, material "not inconsistent with ASTt", ASTt sites nearby.
50	BEN-053	Beta-39517	3770±80	C	10	Kuzitrin Lake, Feature 37, ASTt, from combined samples, inconsistent with stratigraphic position.

51	BEN-053	Beta-39518	4750±170	C	10	Feature 37, ASTt, from combined samples, inconsistent with stratigraphic position.
52	BEN-053	ETH-70378	3810±65	C	10	Feature 43, ASTt, from lowest portion of deposit.
53	BEN-053	Beta-39514	4770±260	C	10	Feature 43, ASTt, from "lowest extent" of deposit.
54	Iyatayet NOB-002	C-792	3477±310	C	9	Cape Denbigh, ASTt, "Denbigh Flint Complex", solid carbon, from hearth in Cut Z-5B.
55	Iyatayet NOB-002	C-792	3541±315	C	9	Second assay of No. 54 after acid treatment.
56	Iyatayet NOB-002	C-793	4253±290	C, T	9	ASTt, "Denbigh Flint Complex" solid carbon date from Cut R.
57	Iyatayet NOB-002	C-793	5063±340	C, T	9	Second assay of No. 56 after acid treatment.
58	Iyatayet	P-103	3430±280	C, T	9	ASTt, "Denbigh Flint Complex", solid carbon date from Cut R.
59	Iyatayet NOB-002	P-103	3520±290	C, T	9	Second assay of No. 58.
60	Iyatayet NOB-002	P-102	3290±290	C, T	9	Solid carbon, same sample as No. 55, 56.
61	Iyatayet NOB-002	P-102	3320±200	C, T	9	Second assay of No. 60.
62	Iyatayet NOB-002	W-298	3974±600	C	9	ASTt, "Denbigh Flint Complex", apparently the only Iyatayet CO_2 determination, from same layer that produced No. 54, 55, 58, 59.
63	DIL-153	Beta-34417	3220±80	C	3	Beverly Lake, Wood-Tikchik Lakes, ASTt.

Key to material dated: A - antler; B - terrestrial bone; BO – burned organic matter; BR – bark; C – Charcoal; CW – charred wood; N/A – not available; W – wood; T – twigs

Table 1 (continued). An annotated listing of Alaskan ASTt dates

No.	Site Name AHRS No.	Lab. No.	^{14}C yrs BP	Mat'l Dated	Reference	Remarks
64	DIL-153	Beta-85193	3450±60	C	3	See No. 63.
65	DIL-153	Beta-34416	3460±90	C	3	See No. 63.
66	DIL-153	Beta-85194	3490±40	C	3	See No. 63.
67	DIL-153	Beta-34421	3540±90	C	3	See No. 63.
68	ILI-002	Beta-76533	3350±60		12	Igiugig, ASTt, similar to Brooks River Gravels, from hearth.
69	SEL-033	WSU-4303	4005±100	BR	24, 25	Chugachik Island, Kachemak Bay, ASTt, similar to Brooks River Gravels, from basal component.
70	SEL-033	Beta-87008	4220±110	C	25	See No. 71.
71	XMK-001-BR4	I-1159	3052±250	CW	4	Brooks River, ASTt, "Brooks River Gravels phase", open(?) hearth.
72	XMK-001-BR5	I-517	3125±200	CW	4	ASTt, Brooks River Gravels phase", from an open (?) hearth.
73	XMK-012-BR5	I-518	3250±200	C	4	See No. 74.
74	XMK-001-R10-3	I-1629	3900±130	CW	4	ASTt, "Brooks River Gravels phase", from open hearth, rejected by excavator, see No. 75.
75	XMK-001-BR10	Beta-97078	3170±120	C	5	Redating of No. 74.
76	XMK-001-BR15	I-1157	3088±200	C	4	ASTt, "Brooks River Gravels phase", from house floor.
77	XMK-001-BR15	I-3115	3390±110	C, CW	4	ASTt, "Brooks River Gravels phase", from hearth charcoal and house structural wood.
78	XMK-001-BR16	SI-1857	3100±105	C	4	ASTt, "Brooks River Gravels phase", from hearth in house.
79	XMK-001-BR16	SI-1860	3280±60	C	4	ASTt, "Brooks River Gravels phase", from hearth in house.
80	XMK-001-BR16	I-1947	3450±110	CW	4	See No. 79.

81	XMK-001-BR16	SI-1859	3470±65	C	4	See No. 79.
82	XMK-001-BR16	SI-1856	3610±85	C	4	See No. 79.
83	UGA-001	SI-2644	3460±75	C	11	Ugashgik Narrows, ASTt, "Ugashik Hilltop Phase."
84	UGA-001	SI-3200	3525±80	C	11	Listed in Henn 1978: Table 2, but not discussed in text.
85	UGA-001	SI-2551	3615±60	C	11	ASTt, "Ugashik Narows Phase" from slightly above house floor.
86	UGA-002	SI-2552	3880±60	C	11	ASTt, "Ugashik Narrows Phase", from house floor.

Key to material dated: A - antler; B - terrestrial bone; BO – burned organic matter; BR – bark; C – Charcoal; CW – charred wood; N/A – not available; W – wood; T – twigs

Table 2. Key to author codes used in Table 1

1	Anderson 1970	10	Harritt 1994	19	Reuther 2003
2	Anderson 1988	11	Henn 1978	20	Reuther and Gerlach 2005
3	DePew and Biddle n.d.	12	Holmes and McMahan 1996	21	Robertson 2003
4	Dumond 1981	13	Irving 1964	22	Schoenberg 1985
5	Dumond 2001	14	Kunz 1977	23	Stanford 1971
6	Gal 1982	15	Kunz 1986	24	Workman 1996
7	Gerlach 1989	16	Lobdell 1981	25	Workman and Zollars 2001
8	Gerlach and Hall 1988	17	Lobdell 1995	26	This volume
9	Giddings 1964	18	Reanier and Wenzel 2002		

Table 3. Comparison of Dicarb and Beta Analytical radiocarbon dates from Locality J of the Croxton site

NO.	LAB. NO.	^{14}C YRS BP	MAT'L DATED	REFERENCE	COMMENTS
9	DIC-2464	290±100	charcoal	Gal 1982 Reuther 2003	Sample may have been mixed by cryoturbation. Reuther and Gerlach 2005: note 1
10	Beta-138715	3620±40	charcoal	Reuther 2003	Same charcoal deposit as No. 9
15	DIC-2465	2210±155	charcoal	Gal 1982 Reuther 2003	From hearth
16	Beta-136257	3650±50	charcoal	Reuther 2003	From same hearth as No. 15
17	DIC-2469	3350±60	charcoal	Gal 1982 Reuther 2003	
18	Beta-134995	3760±40	wood	Reuther 2003	From same wood/charcoal deposit as No. 17
19	Beta-134996	3700±40	charcoal	Reuther 2003	From same wood/charcoal deposit as No. 17

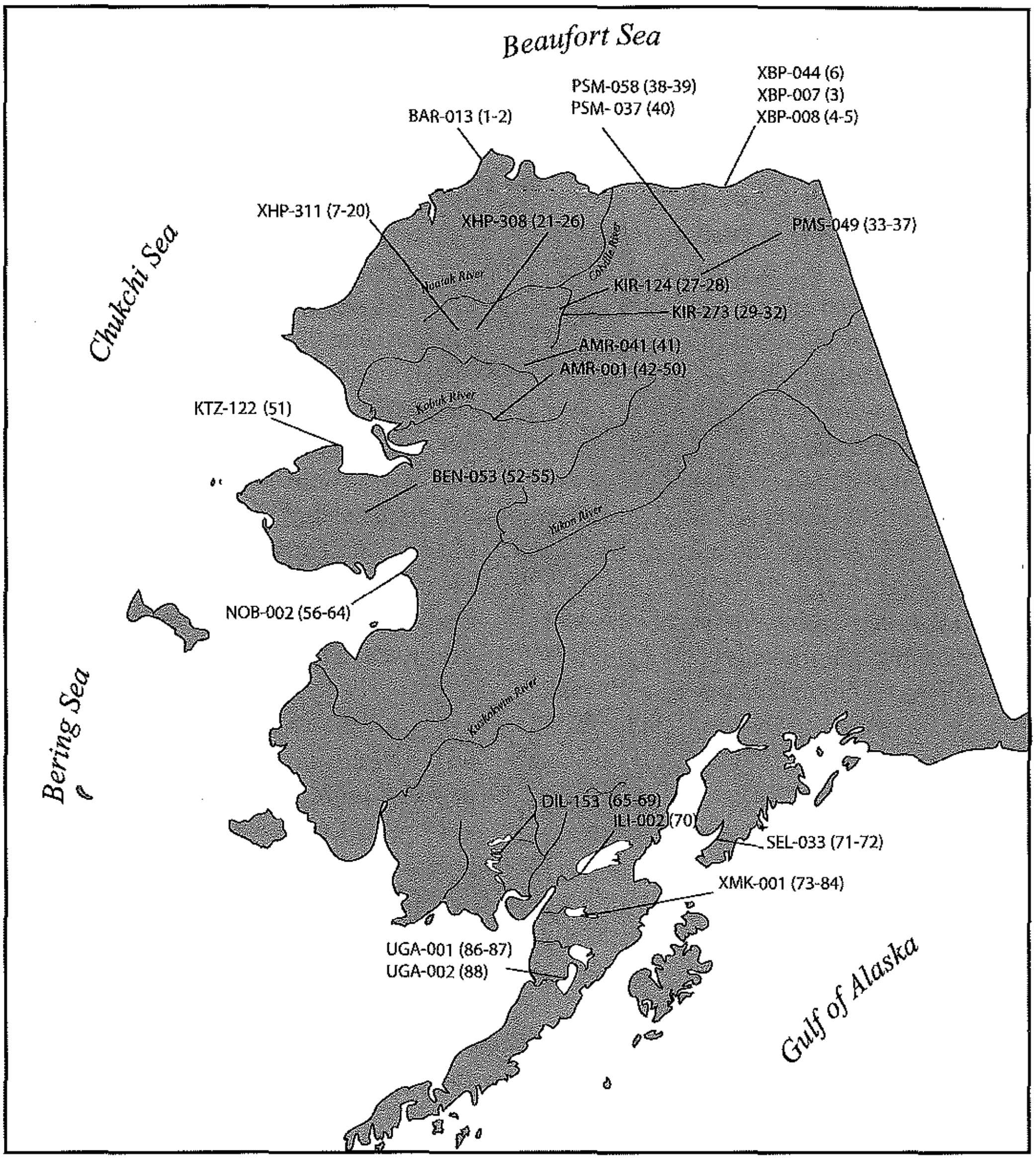

Figure 1. Map showing locations of sites discussed in text

As apparent in Table 3, samples used in the first comparison were from a heavily cyroturbated unit; the exceedingly young Dicarb date may actually have been derived from younger carbon than the Beta Analytical date. This does not seem to be the case with the two remaining two sets of dates, however. The Dicarb dates are consistently younger than those produced by Beta, in one case by over 1400 years. It should be pointed out that similar results were obtained with the larger sample of Ipiutak dates. Unfortunately, Reuther (2003:99-100) was unable to find any material correlating to the oldest Croxton sample (#14) that has an excessively large standard deviation. Reuther's work and a recently published synopsis of that work (Reuther and Gerlach 2005) strongly suggest that all Dicarb dates be viewed with caution. Fortunately, apart from the Croxton site dates, only one other Dicarb date (# 27) appears in Table 1.

Eighteen (21%) of the dates in the table are from coastal locations but, with two possible exceptions, none of the dates are derived from sea mammal products. The likely exceptions are the two dates from Walakpa Bay, where the dated material is given as "burned organic matter" without further comment (Stanford 1971:6). One of the coastal dates (#3) is from terrestrial bone, but the remaining dates were probably obtained from driftwood or a combination of driftwood and twigs. While driftwood is far from an ideal source for radiocarbon dating, it seems unlikely driftwood lying on relatively humid and warm beaches of Alaska for centuries or even millennia could be used for fuel as is the case in the High Arctic (McGhee and Tuck 1976:6).

Some comment also seems warranted on the temporal extremes of the table. Eleven dates are less than

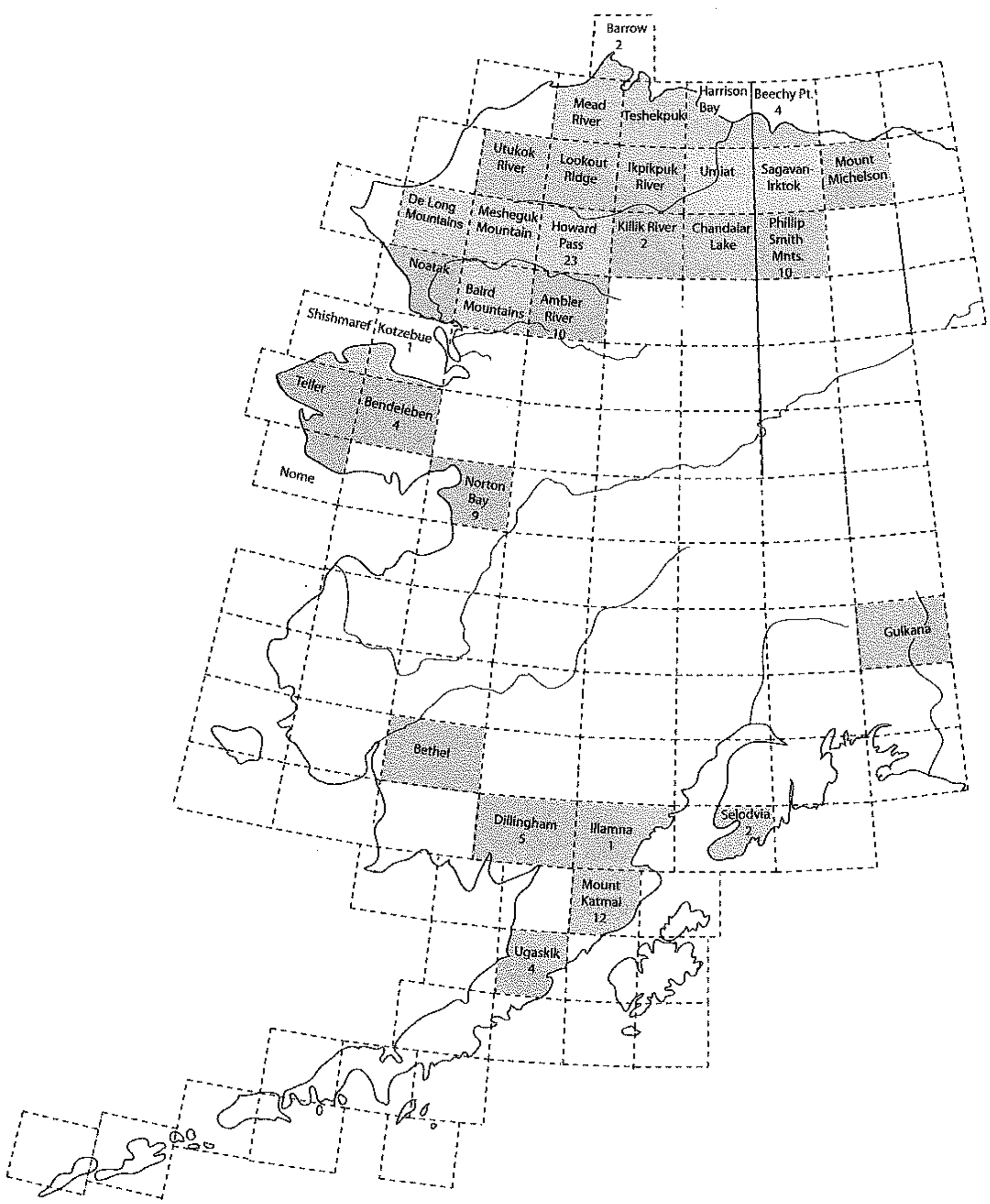

Figure 2. Map showing distribution of Alaskan ASTt sites by quadrangle; shaded quadrangles contain ASTt sites, numbers indicate the number of radiocarbon dates obtained

3000 years old (Numbers 2, 3, 6, 7, 8, 15, 20, and 30-33). Of these, Number 2 is from the "transitional Denbigh-Choris level" at Walakpa Bay that also produced a typical ASTt date (i.e., #1). It seems best to disregard this date since it is likely, as suggested by Dumond (2000:90), that the transitional level is actually a mixture of ASTt and Norton components. Similarly, Numbers 7 and 8, both from the Croxton site, perhaps should be disregarded even though both seem to be from a solid ASTt context, because the ages are anomalously young even to one who accepts a late ASTt presence in northern Alaska. Another Croxton date (#15), noted above, was found to be too young when compared to a date on the same sample by another laboratory. Lastly, Number 20, gathered from an ASTt house at Punyik Point, apparently was correctly rejected by the excavator since recent work there by the Bureau of Land Management obtained a "typical" ASTt date (# 25) from the same structure.

Still remaining, however, are six ASTt dates, all from northern Alaska, all less than 3000 years old. The strongest case for a late ASTt presence lies with the Mosquito Lake localities (Numbers 30-33). These localities produced a substantial amount of apparently unmixed ASTt materials in clear association with the charcoal used to date them.

Turning to the older dates, nine ages in the table are 4000 years old or older. Two dates are solid carbon assays of a single sample from Iyatayet (Numbers 56 and 57), will not be further considered. Interestingly, Number 4 from Prudhoe Bay and Numbers 69 and 70 from Kachemak Bay constitute the northernmost and southernmost dates in the table. All three dates are from coastal settings, bringing up the possibility of a bias due to the use of driftwood. The Prudhoe Bay date is almost certainly on driftwood. The Kachemak Bay dates may also be on driftwood: birch(?) bark, which apparently would not have been locally available 4000 years ago (Workman and Zollars 2003:42), was dated for one of them (#69). The other date (#70) is from small flecks of unidentified charcoal.

The other dates are from interior locations. The two oldest dates (Numbers 51 and 53) are from Kuzitrin Lake on the Seward Peninsula. One of these (#51) is somewhat compromised in that it is from a combined carbon sample and out of stratigraphic position with other dates from that unit. However, if Harritt (1994:214-229) is correct in his stratigraphic interpretations, there is little reason to question the ASTt context of either dates.

The occurrence of seven 4000 year old ASTt dates provided some much needed theoretical wiggle-room for those who believe that the ASTt originated in Alaska and subsequently spread eastward. There are few, if any, dates from the Canadian High Arctic or Greenland in excess of 4000 years are not from sea mammal products or driftwood. On the other hand, dates in excess of 3800 years are available on short-lived willow charcoal from both Greenland (Grønnow and Jensen 2003:329) and High Arctic Canada (Helmer 1991: Table II; Schledermann 1990:26).

Lastly, several interesting trends arise from examining the spatial distribution of dated ASTt sites in Alaska. Figure 2 shows the pertinent portion of Alaska, along with the quadrangle map boundaries. The quadrangle maps in which ASTt sites occur are shaded gray and the number of dated sites from each quadrangle is inset. The ASTt finds in the Gulkana quadrangle, the most isolated ASTt-bearing quadrangle, are limited to a small collection found near the Tyone River by Irving (1957). The most conspicuous feature of the distribution of ASTt sites is the large gap between the Norton Bay quadrangle that contains Iyatayet and the Bethel quadrangle; bearing in mind that the ASTt presence in the Bethel quadrangle is limited to a single site consisting of a few undated ASTt end blades found in a mixed assemblage at Eek Lake (Ackerman 1979). Shaw (1982:61) suggested that Norton people were the first to colonize the Yukon-Kuskokwim delta in substantial numbers and any ASTt presence was transitory. Certainly, it is difficult to disagree with Shaw on the basis of the present archaeological record. On the other hand, southwestern Alaska in general, and the Yukon-Kuskokwim delta in particular, seem to be the unwanted stepchildren of Alaskan archaeology: the region has been sorely neglected and we have much to learn about its culture history. Further, as noted by Dumond (1982:44), the advent of Norton culture brought about increased sedentism and profound changes in economic focus. By extension, this suggests that ASTt remains would not *necessarily* be found underlying Late Prehistoric and Norton settlements; the only sites thus far excavated in this region, but will be found elsewhere.

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Occupational History of the Old Whaling Site at Cape Krusenstern, Alaska

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Abstract: A three-person crew returned to the Old Whaling locality at Cape Krusenstern National Monument to assess the potential for remaining archaeological resources in 2003. Based on J. L. Giddings' (Giddings 1967; Giddings and Anderson 1986) original excavations of five "summer" houses and five "winter" houses, it was initially anticipated that features related to one shallow occupation of the summer settlement and one possibly deeper occupation of the winter settlement would be identified. However, evidence for as many as four separate occupations was revealed through a program of systematic auger testing and test excavations. Here we present the results of these investigations in terms of the formation of the beach ridge and the sequence of occupation of both the summer and winter settlements of the Old Whaling locality.

Key words: Alaska Prehistory, Old Whaling Culture, beach ridge stratigraphy

INTRODUCTION

Cape Krusenstern is located just west of the town of Kotzebue in northwestern Alaska at the confluence of Kotzebue Sound and the Chukchi Sea. In his book *Ancient Men of the Arctic*, J. Louis Giddings (1967) painted a simple scenario for the Old Whaling occupation of Beach Ridge 53 at Cape Krusenstern, based on the arrangement of ten dwelling structures. Five of the structures, which were buried, semi-subterranean, and deemed winter houses, were found in one cluster, and the five other structures, which were shallow depressions found near the beach-ridge surface and deemed summer houses, were in another cluster approximately 100 m away (Fig. 1). Because of the mirror-like arrangement of the houses in each settlement, Giddings (1967:241) came to "the conclusion that people of the winter village simply moved into these other, summer, houses when melting ice flooded the floors of their winter homes."

In June and July of 2003, a three-person team from the University of California at Davis (UCD) returned to Cape Krusenstern with the objective of identifying and assessing archaeological features adjacent to the previously excavated houses on Beach 53 at the Old Whaling locality. The reasons for undertaking this work were based largely on assessing the adequacy of the Old Whaling faunal sample because Giddings only excavated and recovered materials from dwelling structures and did not use screens (Darwent 2003, 2005). In particular we were interested in whether middens with preserved faunal remains were associated with the houses. In 2003, we devised a testing scheme in consultation with Robert Gal of the National Park Service (NPS) based on systematic auger testing supplemented by 50 X 50 cm test units and 1 X 2 m stratigraphic-control units to discover these features.

When beginning the project, we anticipated finding evidence for one shallow occupation of the summer settlement and one possibly deeper occupation of the winter settlement based on Giddings' (1967; Giddings and Anderson 1986) confidence in the contemporaneity of the houses both within and between the settlements. However, we quickly found that this was not the case; instead, there is evidence for multiple stratigraphically separated occupations in both Old Whaling settlements (Darwent and Darwent 2005).

Here we present the results of the 2003 UCD field investigations at the Old Whaling locality on Cape Krusenstern National Monument. We demonstrate that there were minimally three occupations of both the winter and summer settlements, and that the stratigraphic position of cultural material in the beach-ridge strata negates the possibility that five families moved directly from the winter houses into the summer houses as part of their seasonal round. The apparent pairing of the houses in

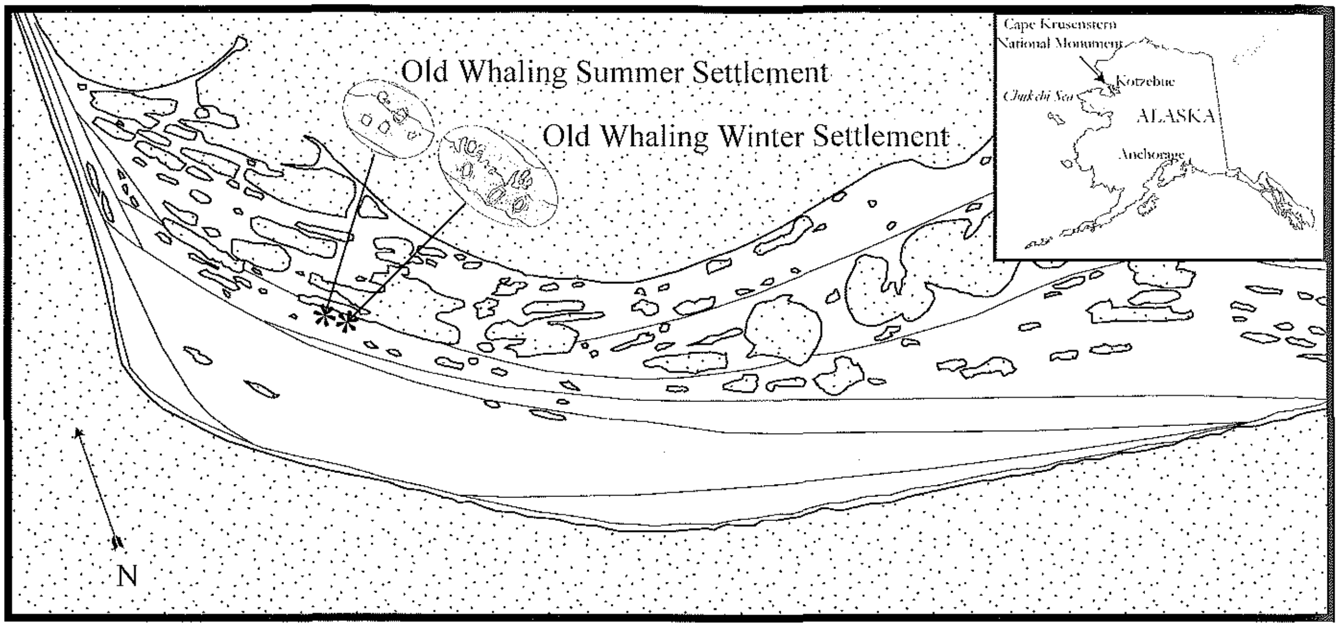


Figure 1. The location of the Old Whaling locality on Cape Krusenstern National Monument in northwestern Alaska.

each settlement is misleading because an additional dwelling feature was found underneath a previously excavated house in the summer settlement. The implications of these discoveries are discussed in terms of the interpretations surrounding the Old Whaling culture. Although Giddings' synchronic five-family-occupation scenario can be discarded, both the artifacts and radiocarbon dates associated with the Old Whaling occupation suggest that activities here occurred in relatively rapid succession and that the artifactual remains generated at this locality were deposited by the same group of people. In addition to Old Whaling use of Beach 53, we identify evidence for use of the area either later in time or by members of another cultural group. This evidence consists of two rectangular tent pads—one found adjacent to a winter house and the other in the inter-settlement area—along with a surface find of a finely worked chipped-stone biface not indicative of the Old Whaling culture but more typical of Arctic Small Tool tradition (ASTt) assemblages, such as Choris (e.g., Dumond 1987; Giddings 1967; Maxwell 1985).

METHODS

The archaeological remains at Cape Krusenstern were placed on the National Register of Historic Places in 1973; the area in general was declared a National Monument in 1978. Cape Krusenstern is administered by the National Park Service and several other federal agencies. Because of this status, it was necessary to design a research strategy that would effectively meet our objective of feature discovery but at the same time minimize impact on cultural resources. After consultation with the NPS, we decided that a program of systematic auger tests at 2 m intervals would provide adequate horizontal coverage while at the same time limit site impact. If soils or artifacts indicative of a feature were encountered during the auger testing, 50 X 50 cm test units were used to open a larger window and assess the nature of the deposit. In addition, because it is difficult to evaluate the depositional sequence of the beach ridge from auger tests or 50 cm units, we were permitted to dig up to four 1 X 2 m stratigraphic-control units per settlement peripheral to the intra-house areas.

A three-inch (7.62 cm) bucket auger was used for auger testing, and all soils and gravels brought up during the testing were screened through quarter-inch mesh. Depths were taken in instances when artifacts were recovered or when major strata changes were encountered. Initially, all auger tests were excavated to permafrost; however, because of time constraints, some auger tests were halted at a distinctive stratum change in the summer settlement. The 2m grids placed on each settlement for the auger testing were aligned with the beach ridge and tied to two baseline datums previously established by the NPS (Klingler 1995).

Excavation of both the 50 X 50 cm and 1 X 2 m units was carried out with trowels in natural levels. As with the auger tests, all excavated soils and gravels were screened through quarter-inch mesh. Artifacts were collected by natural level and quadrants. When formed tools or carbon samples were encountered *in situ*, three-point provenience was taken. Excavation of these units was halted when it became impractical which, in the case of the 1 X 2 m units, was at the water table or permafrost.

Profiles were drawn for three walls of the 1 X 2 m units and one representative wall of the 50 X 50 cm units.

FIELD RESULTS

A total of 283 auger tests, six 50 X 50 cm units, and six 1 X 2 m units were excavated in the Old Whaling locality during the four-week period of the project in 2003. Based on the results of these tests, six distinctive zones of deposition were identified at the Old Whaling locality, which are depicted in a representative site profile (Fig. 2). Most auger tests could be taken to a depth of around 1 m below surface before permafrost was encountered, but in some instances, especially in the seaward or front portion of the beach ridge in the winter settlement, tests could be augered to a depth of up to 140 cm. Descriptions of William Simmon's initial discovery of the Old Whaling settlements in 1958 note that he was forced to halt excavations at approximately two feet (60 cm) below surface because of permafrost (Giddings 1967:227). Thus, permafrost levels have dropped substantially in the past forty-five years.

Zone 1 was found at the start of most of the auger tests and all of the units and consisted of a layer of silty to sandy loam deposited since the stabilization of the beach approximately 2400 years ago. It varied in thickness from a few cm to 20 cm and usually was topped with a thin vegetation mat.

Zone 2 consisted of alternating layers of wind-blown sand, water-deposited sand, and storm-deposited gravel. Although there are likely layers within this zone that cover large areas of the locality, there were no means to correlate individual layers within this zone between units or between settlements because of the complexity of deposition. Nor was it possible to determine the boundaries of the usually thin strata in this zone during auger testing because of mixing of sediments in the bucket auger, with one notable exception. The exception is a very dark grayish brown to black loamy sand layer that was identified in all the 1 X 2 m units and most of the 50 X 50 cm units toward the front of the beach ridge at approximately 28 cm below surface. The darker color of this stratum suggests a period of soil development; therefore, an open, stabilized surface characterized the beach ridge for some time after its deposition. Unfortunately, because the layer was usually less than 5 cm thick, it was not detectable by auger testing despite its darker color. Cultural material was recovered only in secure association with depositional Zones 1 and 2 in both the summer and winter settlements.

Zone 3 became affectionately known as the "espresso-bean" layer because it typically consisted of coffee-bean-sized gravel virtually free of sand covered with a dark reddish-brown to black coating. The thickness of the layer varied throughout the settlement and was absent in some locations. However, the deposition of this layer was a widespread event found in both the winter and summer settlements. How this stratum was deposited is unclear, but the rounded and well-sorted nature of the gravel suggests water deposition, although not necessarily through wave action. In some instances, auger testing was halted in the summer settlement at this layer to save time.

Zone 4 consisted of reddish-brown colored gravels and sands that were usually weakly bonded at the top of the layer by some form of cementum. In some units the red coloring of this zone was quite vivid and likely developed as the result of deposition of iron oxides carried by groundwater percolating above permafrost.

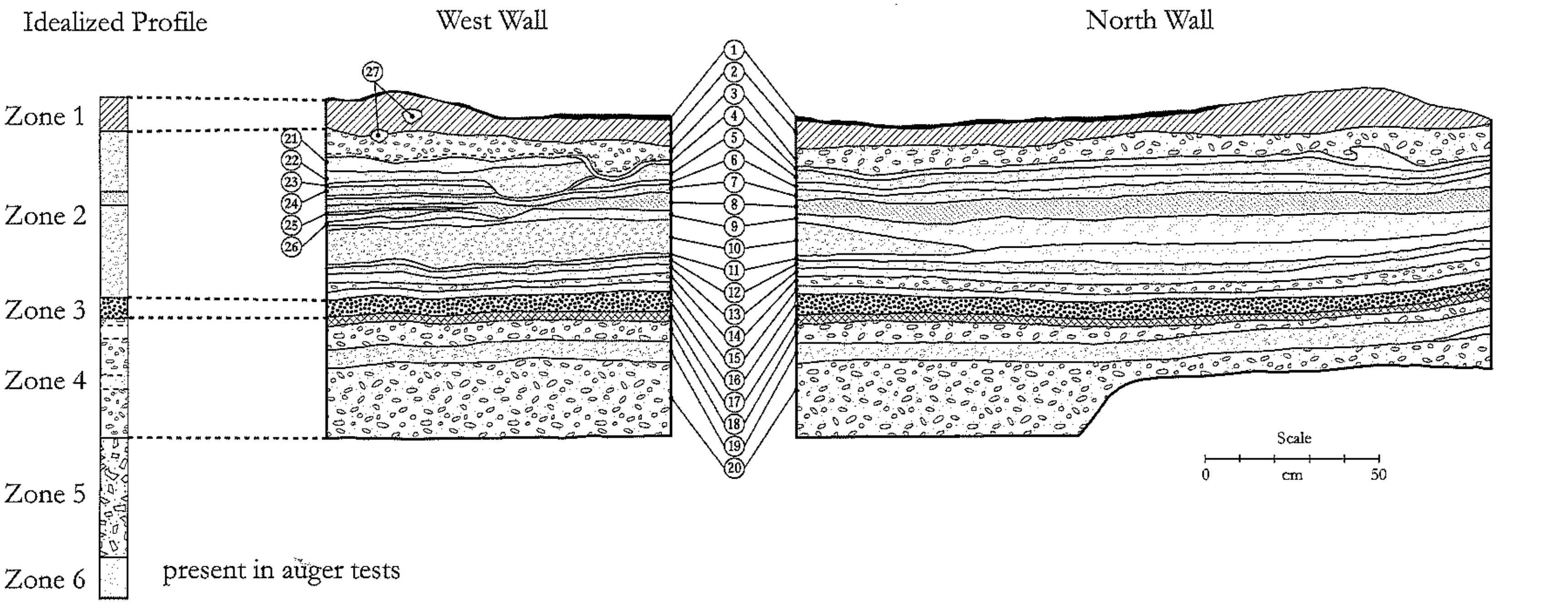
Zone 5 was composed of coarse gravels with varying amounts of sand that were predominantly gray in color. Occasionally, sand layers were noted but none had any organic materials. During excavation of the auger tests, the water table and/or permafrost were typically encountered in this layer.

Zone 6 was sporadically present to the front of the beach ridge in the winter settlement, largely depending on the depth to which permafrost levels would allow the auger to penetrate. This zone consists of well-sorted gray sand with intermittent gravels—likely the product of marine deposition, meaning that it was formed under water and not on a surface-exposed beach. However, further investigation is needed to confirm this hypothesis.

Cultural Occupations

What constitutes an occupation in an archaeological site has been discussed thoroughly in the literature (e.g., Dunnell 1971; Lyman, O'Brien, and Dunnell 1999; Willey and Phillips 1958), and it is beyond the scope of this paper to critically evaluate the various notions and definitions. Here we borrow Dunnell's (1971:151) definition of an occupation as "a spatial cluster of discrete objects which can reasonably be assumed to be the product of a single group of people at that particular locality deposited over a period of continuous residence comparable to other such units in the same study."

For this project, we use strata deposited during beach-ridge formation as our primary means of telling time.



* 1. 10 YR 2/1 (black) loam (vegetation mat)
* 2. 7.5 YR 3/1 (very dark gray) sandy loam
* 3. Mixed-color coarse gravel coarse inclusions
* 4. 10 YR 3/3 (dark brown) fine sand
5. Mixed-color fine gravel
6. 10 YR 3/3 (dark brown) fine sand
7. Mixed-color fine gravel coarse inclusions
8. 10 YR 3/2 (very dark grayish brown) fine sand
9. 10 YR 3/3 (dark brown) fine sand
10. Mixed-color fine gravel coarse inclusions
11. 10 YR 3/3 (dark brown) fine sand
12. Mixed-color fine gravel coarse inclusions
13. 10 YR 3/3 (dark brown) fine sand
14. Mixed-color medium to coarse gravels
15. 10 YR 3/3 (dark brown) fine sand
16. 5 YR 3/2 (dark reddish brown) coarse gravel
17. 10 YR 2/1 (black) coarse and very coarse gravel - cementum
18. 7.5 YR 5/8 (strong brown) coarse gravels
19. 7.5 YR 3/4 (dark brown) medium gravels with fine sand
20. Mixed-color coarse gravel with coarse inclusions
* 21. 10 YR 6/2 fine sand
22. Mixed-color fine gravel with coarse inclusions
23. 10 YR 3/2 fine sand
24. Mixed-color fine gravel
25. Mixed-color fine gravel
26. Mixed-color fine gravel
27. 2.5 YR 7/1 very fine silt
* cultural material present

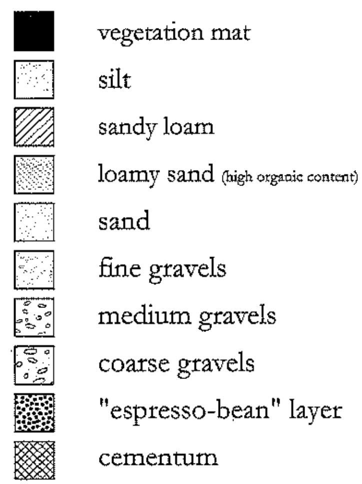


Figure 2. An idealized profile of Beach 53 at the Old Whaling locality compared to the stratigraphic profile of the north and west walls of 1 X 2m Unit B.

Therefore, we consider cultural material and features found at the same relative position in the beach ridge an occupation. Ideally, this position would be a single stratum found across the beach ridge, which, because it was deposited at the same time, would more likely contain artifacts generated at the same interval. In reality, it was not possible to obtain this level of precision—partly because of the accuracy of the bucket auger, but also because of the inability to trace many strata across the site due to discontinuity resulting from irregular deposition (i.e., there are more strata in the front of the beach ridge) and unconformity (i.e., scouring during storm events was evident in some of the unit wall profiles).

Summer Settlement

Artifacts were recovered from Zone 1 (Fig. 3), which is consistent with the shallow dwelling structures excavated by Giddings in the summer settlement area. However, artifacts were also recovered throughout Zone 2 down to a depth of 80 cm below surface. There had to be multiple occupations of the beach ridge because the formation of Zone 2 was not a synchronic event, but rather a series of stable beaches punctuated by storm events. Based on data generated from the 2003 field season, we believe there were minimally three occupations of the summer settlement.

Evidence for initial occupation of the summer settlement area stemmed from the discovery of an unrecorded and deeply buried dwelling structure during excavation of a 1 X 2 m stratigraphic control unit. A text pit, 1 X 2 m Unit E was situated 4 m in front of previously excavated House 204 (Giddings and Anderson 1986) in order to assess the stratigraphic sequence of the seaward portion of the beach ridge. Excavations of the upper strata of the unit were relatively unproductive (only one piece of debitage was recovered at a depth of 26 cm below surface). However, at approximately 60 cm below surface, and 40 cm below the base of House 204's excavation, we came upon a dark, reddish-brown sand layer that contained 61 pieces of fire-cracked rock (FCR), 18 bone specimens (17 ringed/small seal, and one caribou), 14 pieces of chert debitage, two utilized flakes, one core, one hammerstone, and one microblade-like flake.[1] Most of this material was found "sandwiched" between wood timbers on the western half of the unit (Fig. 4), which might have been roofing and/or flooring. Based on descriptions of the "winter" semi-subterranean houses given by Giddings and Anderson (1986:233–246), this material could be associated with the edge of a similar form of dwelling structure.

Ten auger tests had cultural material greater than 40 cm below surface, and in two of the tests, E18 and F18, dark organic-rich sand was brought up between 40 and 60 cm below surface, which suggested the presence of a house structure (Fig. 5). These two tests were located immediately to the north of 1 X 2 m Unit E, and one test, F18, likely passed through a hearth as 14 pieces of FCR and one piece of debitage were recovered in conjunction with multiple charcoal fragments. Therefore, to confirm the presence of a house floor, 50 X 50 cm Unit E was excavated immediately adjacent to E18. Between 49 and 57 cm below surface, 48 pieces of FCR, 32 pieces of debitage, eight pieces of bone, and two retouched flakes were interspersed through black, loamy sand. Poorly preserved wood fragments were noted in the northwest corner of the unit. This deposit is consistent with descriptions of house floors from structures previously excavated in the winter settlement area (Giddings and Anderson 1986).

Because our permit was for inventory and assessment only, we did not open a larger "window" into the deposits in order to define the shape or collect more information concerning the nature of the buried structure. Although the potential roofing and flooring timbers suggest that the structure is similar to a semi-subterranean winter house, no upright timbers were identified. Based on our current information, the structure was minimally 4.5 m long north to south and 2 m east to west, but could be up to 6 m long. Two dates, 1188-810 BC (Beta-187946) and 902-794 BC (Beta-193490), which were obtained on wood charcoal collected from 1 X 2 m Unit E and auger test F18, respectively, are associated with this house floor (Table 1). Unfortunately, no distinctly "Old Whaling-style" artifacts were recovered from the house deposits; thus, while the two ^{14}C dates fall into the range estimated by Mason and Ludwig (1990) for Old Whaling, it is not possible at this time to conclusively ascribe this house to the Old Whaling culture.

With the exception of one auger test, all the deeply buried cultural material was recovered from the front part of the beach ridge (Table 2; Figure 3, left map). This material included debitage and fire-cracked rock that was likely related to activity areas associated with the newly discovered house, as no further evidence for dwelling floors was recovered from this depth. Why the occupa-

[1]Giddings and Anderson (1986:265) report that only seven possible microblades were identified in the "thousands of flakes . . . examined" despite cautious scrutiny. They refer to these specimens as ridged flakes rather than microblades because, although the specimens resemble microblades, they are not classic examples. Similarly, none of the potential specimens recovered in 2003 could definitively be identified as blades or microblades.

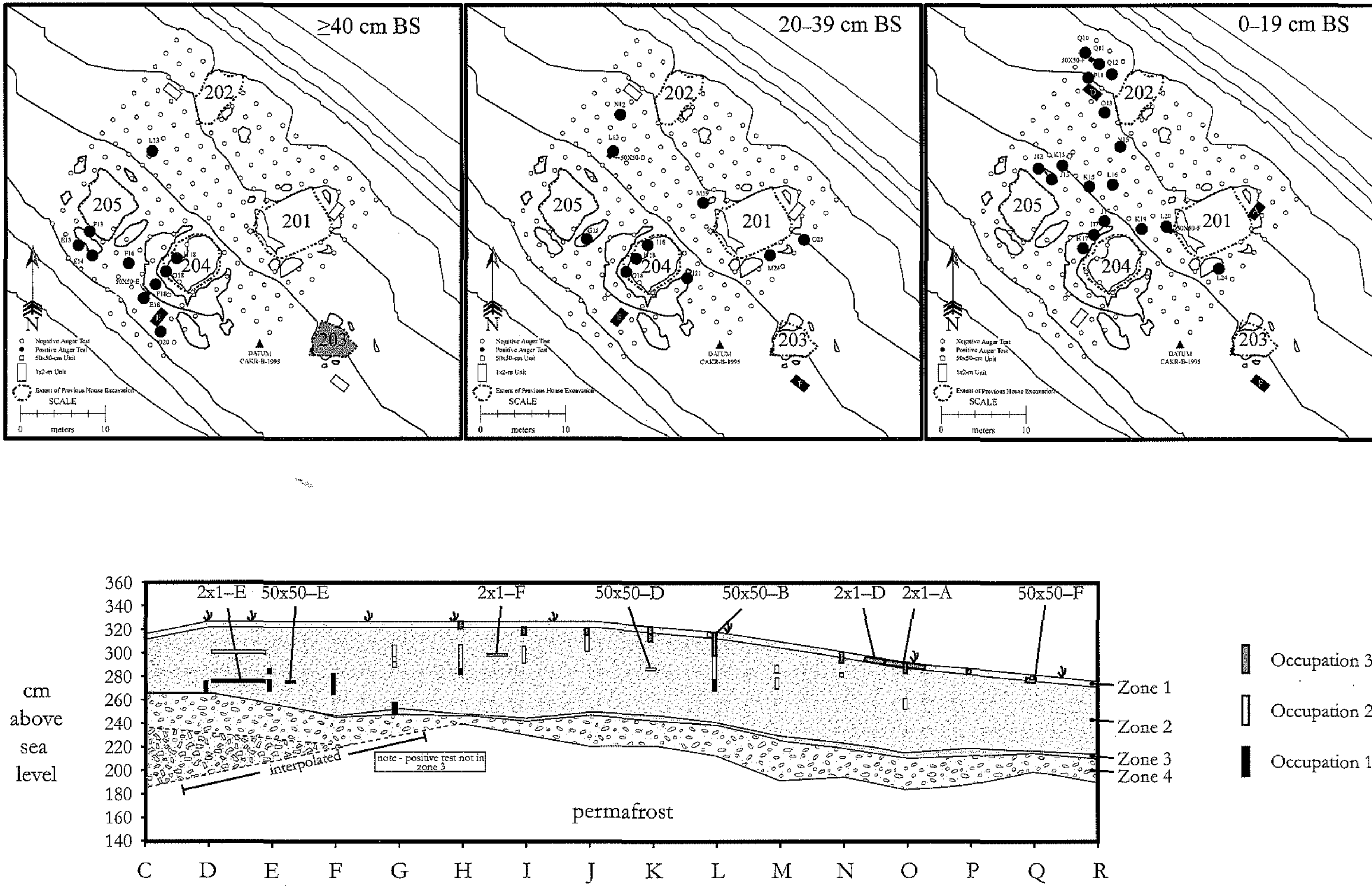


Figure 3. Location of positive auger tests at >40 cm, 20–39 cm, and 0–19 cm below surface across the summer settlement (top) and the depth of positive auger tests in relation to beach-ridge structure (bottom). In the lower diagram, the vertical bars represent positive auger tests and the horizontal bars represent positive excavation units. The association of the positive tests with one of the three occupations of the site is indicated.

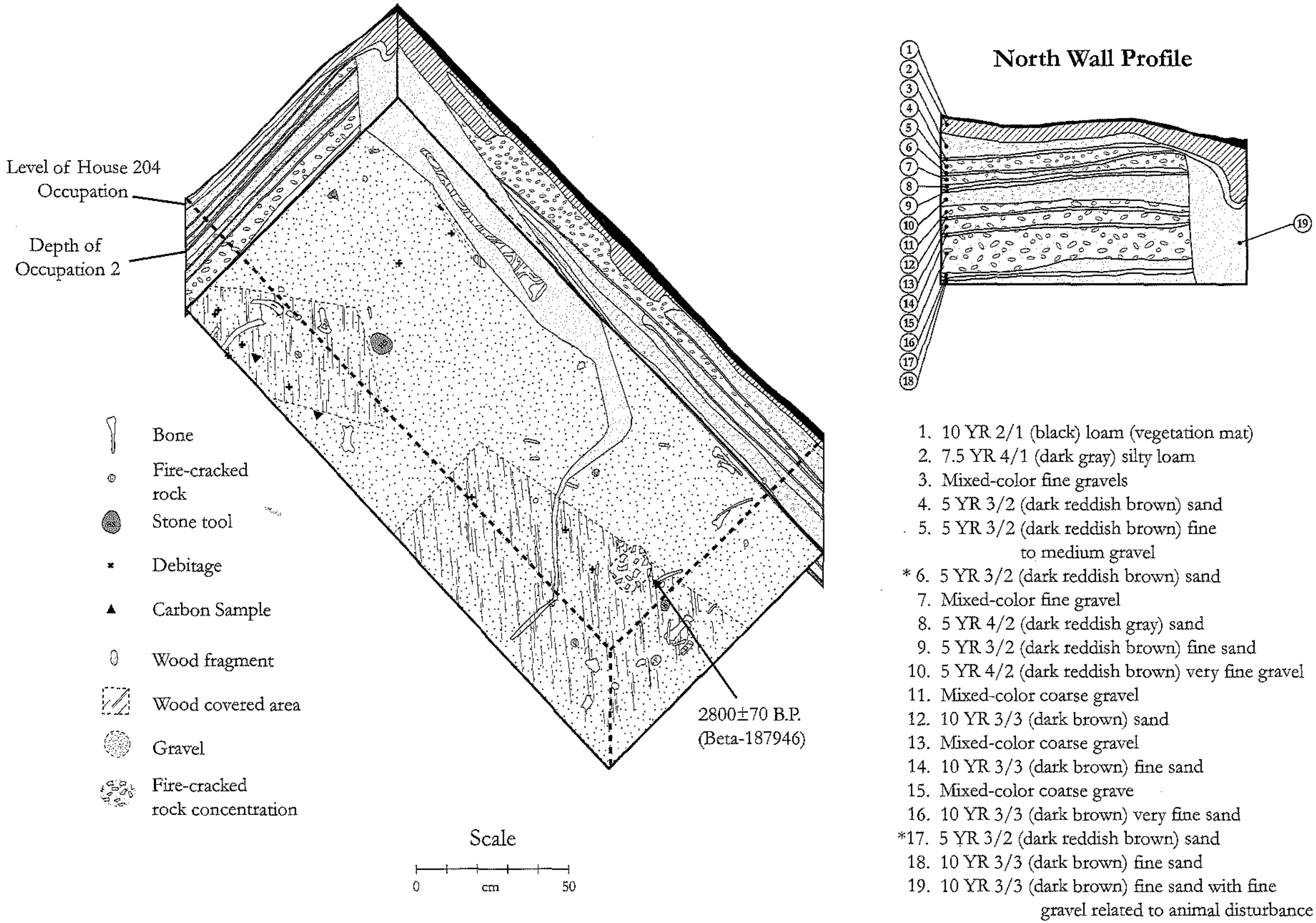


Figure 4. Three-dimensional profile-planview of 1 X 2m Unit E at the depth of first occupation of the summer settlement demonstrating the distribution of artifacts and wood timber. The north wall profile is illustrated on the right.

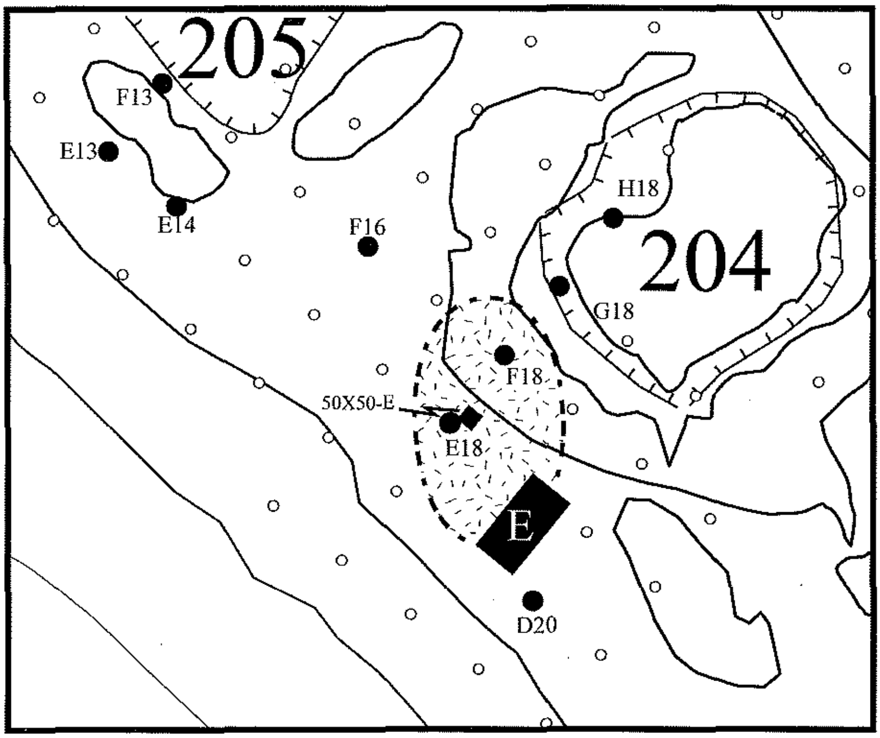


Figure 5. Location of potential house structure (dashed-line stippled area) in the summer settlement in relation to positive auger tests (black-filled circles) with material greater than 40 cm below surface.

rounding Unit F, but artifacts did show up at around this depth across the middle of the settlement during augering (Fig. 3, center map). In several instances, artifacts were found directly below or immediately adjacent to previous excavations at this depth. In auger test F14, a very dark brown midden-like soil was encountered at roughly 35 to 40 cm below the original ground surface, which suggested the presence of a buried feature. Based on depth, this feature may be associated with a second occupation. However, because cultural material was not found in association with the soil and because of time limitations, a 50 X 50 cm unit was not placed in proximity to this probe.

One relatively large piece of debitage was also recovered from 50 X 50 cm Unit D at around 38 cm below surface at the contact between a gravel layer and an underlying sand layer. Unlike the sand layer at 28 cm below surface in 1 X 2 m Unit F, this sand layer was not particularly rich in organic material, which, in combination with depth, suggests that the piece of debitage is associated with a different occupation. Our knowledge of the second occupation of the summer settlement is limited to the few artifacts recovered and the one possible buried feature. There is a distinct possibility that there are several occupations of the beach ridge represented between 20 and 39 cm below surface. Future investigations will be needed to sort this issue out.

tion of the ridge was primarily confined to the front part of the beach ridge at this time is unclear. This area is the highest section of the beach and may have been the only inhabitable part of the ridge, as the water levels associated with the lake behind the beach might have been higher than today. However, further investigation of the beach ridge is needed to test this possibility.

The second occupation of the summer settlement is represented by cultural material found between 20 and 39 cm below surface in eleven auger tests, one 1 X 2 m unit, and one 50 X 50 cm unit. Although this seems like an arbitrary cutoff, the distinct stratum mentioned for Zone 2 occurs at approximately 28 cm below surface in the front of the beach ridge. Because the bucket auger generally has an accuracy of ±5 cm, artifacts associated with this layer could have been recovered from anywhere within this range.

Most of the cultural material related to Zone 2 occupation came from 1 X 2 m Unit F, which is situated on the far southeastern side of the settlement. Here, nineteen pieces of debitage, two pieces of FCR, one utilized flake, one core fragment, one microblade-like flake, and one small seal radius were recovered between 26 and 34 cm below the surface in association with dark brown loamy sand. Unfortunately, time constraints dictated that the auger testing could not be extended into the area sur-

Undoubtedly, most of the artifacts recovered from the first 19 cm below surface are associated with the features excavated in 1960, which represent the third occupation of the summer settlement. Giddings and Anderson (1986:249) report that the back two houses (201 and 202) may have been built directly on the surface of the beach ridge and that the front three houses were slightly excavated into the beach crest. As evidenced by the still-opened excavation blocks, excavation of the front houses into the beach ridge was less than 20 cm below the surface. Therefore, it should be expected that artifacts related to this occupation should be in Zone 1, or possibly the upper portions of Zone 2.

Eighteen auger tests had cultural material present between 0 and 19 cm below surface, as well as three 1 X 2 m units, and two of the 50 X 50 cm units, which were

Table 1. Conventional radiocarbon years BP and Calibrated BC dates at the two-sigma range (95% confidence). Dates were calibrated using IntCal04 (Stuiver and Reimer 1993). Samples obtained from 2003 excavations are italicized and were run by Beta Analytic. Other conventional dates for Old Whaling are from Giddings and Anderson (1986), but exclude samples that might be marine contaminated (following Mason and Ludwig 1990). The approximate age range for the Old Whaling site is 850 to 1110 BC (ca. 2700 to 2900 BP) with an average age of 1000 BC; this excludes the youngest date for the site as it has a standard deviation more than twice that of the other dates.

Lab No.	^{14}C Yr Years BP	Cal BC at 2 Sigma (intercept)	Old Whaling Feature	Material
B-267b	2530 ± 150	1005 to 232 (620)	House 21 (winter)	wood
Beta-193490	*2670 ± 40*	*902 to 794 (850)*	*Auger test F18 (adjacent to House 204)*	*wood charcoal*
Beta-187947	*2740 ± 40*	*976 to 810 (895)*	*50 X 50 cm Unit A (between houses 20 and 23)*	*wood charcoal*
P-627	2775 ± 50	1042 to 817 (930)	House 20 (winter)	wood
Beta-187946	*2800 ± 70*	*1188 to 810 (1000)*	*1x2-E (adjacent to House 204)*	*wood charcoal*
P-404	2829 ± 63	1193 to 834 (1015)	House 24 (winter)	wood
P-403	2850 ± 63	1252 to 845 (1050)	House 23 (winter)	wood
P-621	2859 ± 63	1258 to 850 (1050)	House 23 (winter)	wood
P-618	2865 ± 49	1207 to 913 (1060)	House 24 (winter)	wood
P-615a	2907 ± 55	1286 to 929 (1110)	House 23 (winter)	wood

Table 2. Depth and type of cultural material recovered from positive auger tests in the summer settlement area.

Auger Test	Depth Below Surface	Cultural Material
0–19 cm BS		
H17	0–5 cm*	1 piece fire-cracked rock
I17	5–10 cm*	1 piece debitage
J12	15–20 cm*	1 utilized flake
J13	10–25 cm*	2 pieces debitage 3 pieces fire-cracked rock
J17	5–10 cm*	1 utilized flake 1 piece fire-cracked rock
K13	0–5 cm*	1 piece debitage
K15	0–10 cm*	1 piece debitage
K19	0–5 cm	1 piece fire-cracked rock
L16	10–25 cm	1 piece debitage
L20	3–20 cm	1 piece fire-cracked rock
L24	10–15 cm*	1 piece fire-cracked rock
L24	15–20 cm*	1 piece debitage
N15	0–10 cm	1 piece debitage
O13	0–10 cm	1 piece debitage
P11	0–5 cm	1 piece fire-cracked rock
Q10	0–5 cm	1 piece fire-cracked rock
Q11	0–5 cm	1 piece debitage
Q12	0–5 cm	1 piece debitage
20–39 cm BS		
G15	30–35 cm*	3 pieces debitage
G18	20–40 cm**	3 pieces fire-cracked rock
H18	20–40 cm**	2 pieces fire-cracked rock
I18	25–40 cm**	1 piece debitage
I21	15–25 cm*	1 piece fire-cracked rock
L13	20–30 cm	2 pieces debitage
L13	30–40 cm	2 pieces debitage

Table 2 (continued). Depth and type of cultural material recovered from positive auger tests in the summer settlement area.

M19	30–40 cm	2 pieces debitage
M24	20–25 cm	1 blade-like flake
N12	20 cm	1 piece fire-cracked rock
O25	30–40 cm	1 piece fire-cracked rock
40–75 cm BS		
D20	50–60 cm	2 pieces debitage
E13	45–55 cm*	3 pieces fire-cracked rock
E14	40–45 cm*	1 piece fire-cracked rock
E18	50–60 cm	2 pieces debitage 1 piece fire-cracked rock 1 *Phoca sp.* metatarsal
F13	50–65 cm*	1 piece fire-cracked rock
F16	45–50 cm	1 piece fire-cracked rock
F18	40–50 cm*	1 piece debitage 14 pieces fire-cracked rock 1 carbon sample (2670 ± 40 B.P., Beta-193490)
G18	70–80 cm**	1 piece debitage
H18	40–45 cm**	1 piece debitage
L13	40–50 cm	1 piece debitage
Artifacts from positive auger tests associated with Giddings' previous investigations		
H16	0–10 cm	1 piece debitage
I15	0–5 cm	1 piece debitage
J17	0–25 cm	1 piece debitage
P17	0–20 cm	1 piece fire-cracked rock
Q12	0–5 cm	2 pieces debitage 1 piece fire-cracked rock

* Depth adjusted to reflect original surface level by removing Gidding's backdirt.
** Depth adjusted to reflect original surface by adding the depth of the previous excavation below surface.

distributed throughout the settlement (Fig. 3, right map). Two new features were identified.

In the northern part of the settlement, a thin midden deposit was identified in auger tests Q10 through 12 and P11, and 1 X 2 m Unit D and 50 X 50 cm Unit F. This area is covered with vegetation associated with midden deposits described for other localities on Cape Krusenstern (Giddings and Anderson 1986). When tested, artifacts were recovered only in the top ten cm of the beach ridge and exclusively with soils associated with Zone 1. However, the soils were thicker here than in other parts of the settlement, which suggests a high organic content in line with a midden deposit. Similarly, the type and quantity of artifacts—this area was the most productive for the 2003 investigations—suggest a midden. One hundred and forty-one pieces of debitage, sixty pieces of FCR, three microblade-like flakes, two utilized flakes, one blade-like flake, and one flake-knife were recovered, mainly from 1 X 2 m Unit D. The flake-knife (Fig. 6) was made on a large blade-like flake of greenish-gray chert and is similar to flake-knives reported by Giddings and Anderson (1986:262). Based on proximity and the recovery of an artifact stylistically similar to Old Whaling forms, it is likely that the midden is associated with House 202.

A second midden was identified in the wall of the previous excavation of House 201 where eroding FCR was observed. Initially, the feature was thought to be a hearth, and thus a 50 X 50 cm unit was excavated to investigate the nature of the feature because hearths were reported to be at the center of each of the excavated summer houses (Giddings and Anderson 1986). Although 156 pieces of FCR in conjunction with 15 manuports, 10 flakes, and one utilized flake were recovered from the unit—all from the top 11 cm in Zone 1 contexts—the charcoal, heat alteration, and soil staining that should accompany a hearth were not present. In addition, there was no apparent patterning to the FCR. Therefore, the material was probably dumped by the occupants of House 201 and became a midden accumulation. While this feature per se does not add greatly to our knowledge of Old Whaling, its presence does suggest that there are other shallow features to be found at the site.

Winter Settlement

The "footprints" of Giddings' previous excavations in the winter settlement of the Old Whaling locality are reminiscent of craters produced during a bomb strike. The five previously excavated houses at the settlement are represented by gaping holes surrounded by mounds of backdirt; most hold pools of water that are now home to the larvae of multiple species of mosquitoes that abound at Cape Krusenstern. In addition, there are at least nineteen unfilled test pits scattered through the settlement. Because of the extent of disturbance—particularly the high backdirt piles—the amount of work undertaken was curtailed compared to the summer settlement.

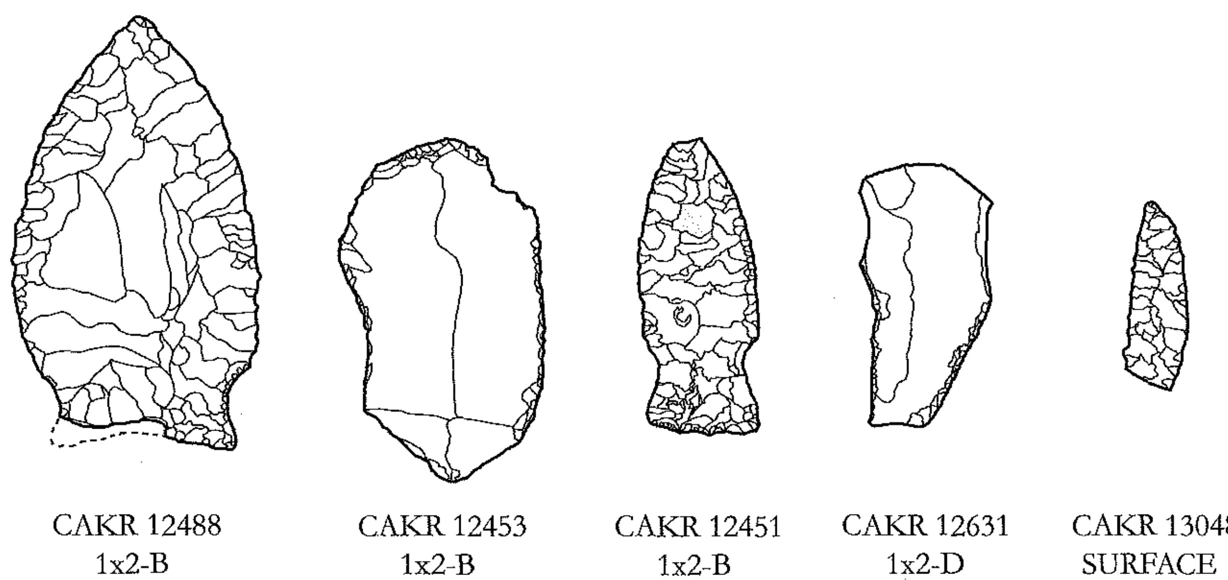


Figure 6. Diagnostic artifacts recovered during the 2003 investigations. The two projectile points and two flake-knives are artifacts typically associated with Old Whaling, whereas the asymmetrical knife on the far right is likely associated with Choris.

Determining the point at which the beach ridge was first occupied in the winter settlement is complicated. Unfortunately, little information was recorded by Giddings about the construction of the winter houses in relation to the beach-ridge strata. The floors of the houses were recorded as being between 1 and 1.2 m below the current surface, but:

> The upper layers of gravel in the excavation were nearly free of cultural material.... As in other Old Whaling houses, the gravel started where the timbers were first uncovered in the walls and extended down to the floor region. A strong, red stain coated the rocks and impregnated the rotten wood, yet did not emanate from the house ruins themselves. The same stain was found outside the house excavation areas at about the same levels as the house pits. Near or at the floor level, this red discoloration gave way to the black charcoal. However, tests into the adjacent pure gravel disclosed a stratification of a velvety black coating on the gravels immediately below the zone of red stain (Giddings and Anderson 1986:234).

Comparing this description to our findings, it appears that Giddings and Anderson (1986) transposed the stratigraphic position of the red and black gravel layers, as we always found the red-stained gravel layer (Zone 4) *below* the "velvety" (espresso-bean) black layer (Zone 3) in our excavations and auger tests (Fig. 2). Nevertheless, it would appear that minimally the house depressions were dug by their builders into Zone 4 based on the red color of the stained timbers and surrounding gravel. Whether the house depressions extended into Zone 5 is unclear, but based on the reported depths of the house floors and the lack of red staining of the floor deposits, it is entirely possible that this was the case.

Giddings and Anderson's (1986) account does not indicate whether the house depressions were hollowed out by the past occupants from the level of the current beach surface or from a deeper buried surface. The houses were reported to be barely visible before excavation and a considerable amount of overburden, most of which was gravels, needed to be removed before cultural material was encountered (Giddings 1967; Giddings and Anderson 1986). These materials must have accumulated through storm events that filled and subsequently buried the house depressions after their abandonment. Undoubtedly, there would have been deposition of gravels on the adjacent beach ridge as well during these events. Therefore, the original ground surface at the time of the house occupation must be buried. A good candidate for this original surface was found in three of the four excavation units—Layer 8 in 1 X 2 m Units B and C and 50 X 50 cm Unit A—and consists of black to very dark, grayish-brown loamy sand at a depth of between 23 and 30 cm below surface. This layer was also present in the summer settlement. One complication, which will likely never be resolved, is that there could have been staggered occupations of the winter houses. Some of the previously excavated houses (e.g., House 24) did not show any traces on the beach surface (Giddings 1967:237), a condition that may indicate that these houses were originally deeper in the beach ridge and therefore older.

In auger tests B21, I19, and M21 (Table 3, Fig. 7), cultural material may have been recovered from depths of 75, 103, or as deep as 145 cm below surface, which would place these finds either in Zone 4 or 5. However, we are doubtful that these tests actually represent "true" hits, mainly because there was no evidence in the excavation units or the auger testing to suggest that the beach could have been inhabitable below Zone 3. In the case of M19, a 50 X 50 cm unit was placed adjacent to the auger test to investigate the hit. This unit was sterile, and no evidence was present below 30 cm for a stable beach surface. Similarly, stable surfaces were lacking in the deeper strata of both 1 X 2 m Units B and C. Although it is possible that the artifacts from the three auger tests were marine deposited from features eroded elsewhere or trickled down through the beach gravels (unlikely), the most plausible scenario for the presence of these artifacts was that they were knocked in from above during testing.[2]

Four auger tests had artifacts present between 20 and 39 cm below surface, located mainly in the front portion of the beach ridge between houses 20 and 23. Another four tests produced artifacts between 35 and 45 cm below surface in the same area. These materials, in conjunction with artifacts found in 50 X 50 cm Unit A at 28 cm below surface, most likely constitute the first occupation of the winter settlement. Despite being spread over 25 cm, we associate these artifacts because of the poor resolution of the bucket auger and the lack of organic-rich strata at this depth, other than the layer found

[2]The artifacts from B21 and I19 were recovered just before termination of the auger tests, and in both cases there were difficulties in bringing up the sediments from the lower depths because of the water table. Essentially, the saturated gravels and sands would drain out of the auger bucket before it could be brought to the surface for screening unless it was brought up rapidly. Inevitably rapid removal would result in soils from the sides of the auger test being knocked down by or scooped up into the bucket, and thus potentially introducing artifacts from higher layers.

Table 3. Depth and type of cultural material recovered from positive auger tests in the winter settlement area.

Auger Test	Depth Below Surface	Cultural Material
0–19 cm BS		
A17	0–20 cm	1 piece debitage
A18	0–20 cm	1 piece debitage
A22	15–20 cm*	1 piece debitage
D23	0–20 cm	1 piece debitage
E24	10–15 cm	1 piece fire-cracked rock
K23	0–20 cm	1 piece debitage
20–39 cm BS		
A17	20–30 cm	1 piece debitage
D23	25–35 cm	1 piece debitage
E21	25 cm	1 piece fire-cracked rock
H21	20–30 cm	1 piece debitage
	30–40 cm	1 piece debitage
40–145 cm BS		
A18	35–45 cm	1 piece debitage
C22	35–45 cm	1 piece debitage
H20	35–45 cm	1 piece debitage
D20	35–45 cm	1 piece debitage
M21	50–75cm	1 piece debitage**
I19	83–103 cm	1 piece debitage**
B21	120–145 cm	1 piece debitage**
Artifacts from positive auger tests associated with Giddings' previous investigations (backdirt)		
G19	0–25 cm	1 piece debitage

* Depth adjusted to reflect original surface level by removing the thickness of Giddings' backdirt.

** Artifact likely displaced, see text for explanation.

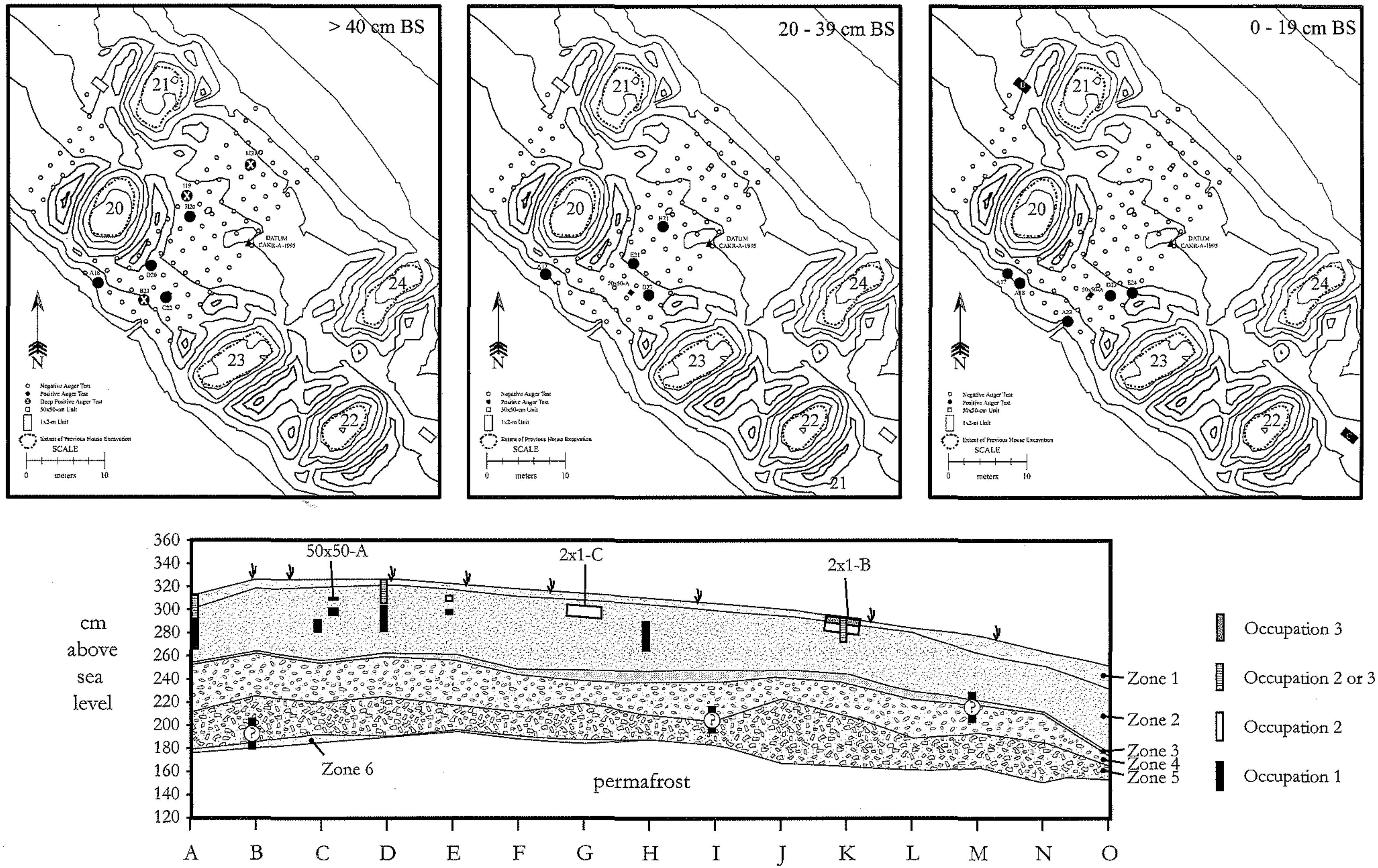


Figure 7. Location of positive auger tests at >40 cm, 20–39 cm, and 0–19 cm below surface across the winter settlement (top) and the depth of positive auger tests in relation to the beach-ridge structure (bottom). In the lower diagram, the vertical bars represent positive auger tests and the horizontal bars positive units, with the association of the positive tests with one of the three occupations of the site indicated.

23 to 30 cm below surface in the excavation units (1 X 2 m units B and C). The loamy sand layer present 25 to 30 cm below surface in 50 X 50 cm Unit A (Fig. 7) and associated with the artifacts was particularly black and flecked with carbon. The dark color may be due to human activity. Seven pieces of debitage, one utilized flake, and one nodule of wood charcoal were recovered, the latter of which was dated to 2740±40 BP (Beta-187947) (Table 1). Although it was not possible to define a specific feature in this area, it is likely that 50 X 50 cm Unit A is intrusive into an activity area or midden associated with the occupation of House 20 or 23.

The second occupation of the beach ridge in the winter settlement is represented by artifacts recovered down to 19 cm below surface. The artifacts were present in six auger tests, one 50 X 50 cm unit, and both 1 X 2 m units. All of the auger tests were located in the inter-house area between houses 20 and 23; however, the most significant finds at this depth were in 1 X 2 m Unit B, located to the west of House 21. Here in a gravel layer immediately beneath the silt loam of Zone 1 (Fig. 2, Layer 3), forty-three items were recovered, including two projectile points, one unifacially retouched flake-knife, three blade-like flakes, one utilized flake, one core fragment, thirty-five pieces of debitage, and one piece of FCR. Based on comparisons to previously excavated specimens reported by Giddings and Anderson (1986), the two projectile points and the flake-knife are Old Whaling-style artifacts (Fig. 6).

An additional twenty-nine artifacts (twenty-six pieces of debitage, one retouched flake, one blade-like flake, and one humanly transported stone) were recovered from Layer 2 (Zone 1) of 1 X 2 m Unit B. In all likelihood these finds relate to the second occupation of the settlement. However, the perimeter of 1 X 2 m Unit B crosses a small projection—interpreted as an entrance—of a larger rectangular area of cleared sod, which appears to be a tent pad cut slightly into the beach-ridge surface. A second similar but better-defined example was identified in the inter-settlement area with nine pieces of debitage and six pieces of FCR in association, as well as several larger likely human-transported stones (Fig. 8). There was also one piece of debitage noted on the surface in association with the tent-pad feature next to 1 X 2 m Unit B. Although these associations would seem to be of prehistoric origin, at present it is not clear whether the debitage and fire-cracked rock were exposed by cutting into a previously existing deposit or generated during use of the tent-pad features.

One possible clue to the age of these tent-pad-like features was the discovery of an asymmetrical bifacial knife on the surface of the inter-settlement area that appears to be Choris rather than Old Whaling in cultural affiliation (Fig. 6). There is no direct association between the knife and the tent pads, but the find demonstrates that Beach 53 was used by members of cultural groups besides Old Whaling. Future research of the inter-settlement feature should resolve the chronological position of the tent pads. Nevertheless, even with an unknown date (Choris or later?), the tent pad feature adjacent to Unit B represents the third and likely final occupation of the winter settlement.

DISCUSSION

Based on the results of the 2003 investigations, it is time to put aside the simple picture painted for the Old Whaling locality of five families moving seasonally from winter homes into summer homes. There are clearly multiple occupations at each settlement that may or may not be associated. Based on superposition, the occupation of the winter houses excavated by Giddings cannot be associated with the occupation of the summer houses because the winter houses were found buried in the beach ridge and the summer houses were found on top. The only scenario that could connect the occupations is one where occupants of the winter houses were forced to abandon them because of storm activity, which destroyed and buried the houses, and they subsequently built and moved into the summer houses. However, this scenario is improbable in light of the multiple layers of deposition separating the two, some of which may have been stable open beach surfaces for some period of time.

Because the summer and winter beach structures are so similar, it is possible to propose a sequence of occupation for the Old Whaling locality (Fig. 9). Based on its position in the beach ridge, the new dwelling structure identified deep in the summer settlement is probably the first occupation of the locality. Unfortunately, because no diagnostic artifacts were recovered, it is not clear whether this is an "Old Whaling" occupation or represents use by some other cultural group. One radiocarbon date associated with the occupation of this feature suggests that it could date to between 1188 and 810 BC (2800±70 BP; 1 X 2 m Unit E); however, a second date of 902 to 794 BC (2670±40 BP; auger test F18) indicates that this may be too early (Table 1). This transposition might indicate a problem with the dates, but because of the overlap between the two dates it is more likely that both are related to a single occupation.

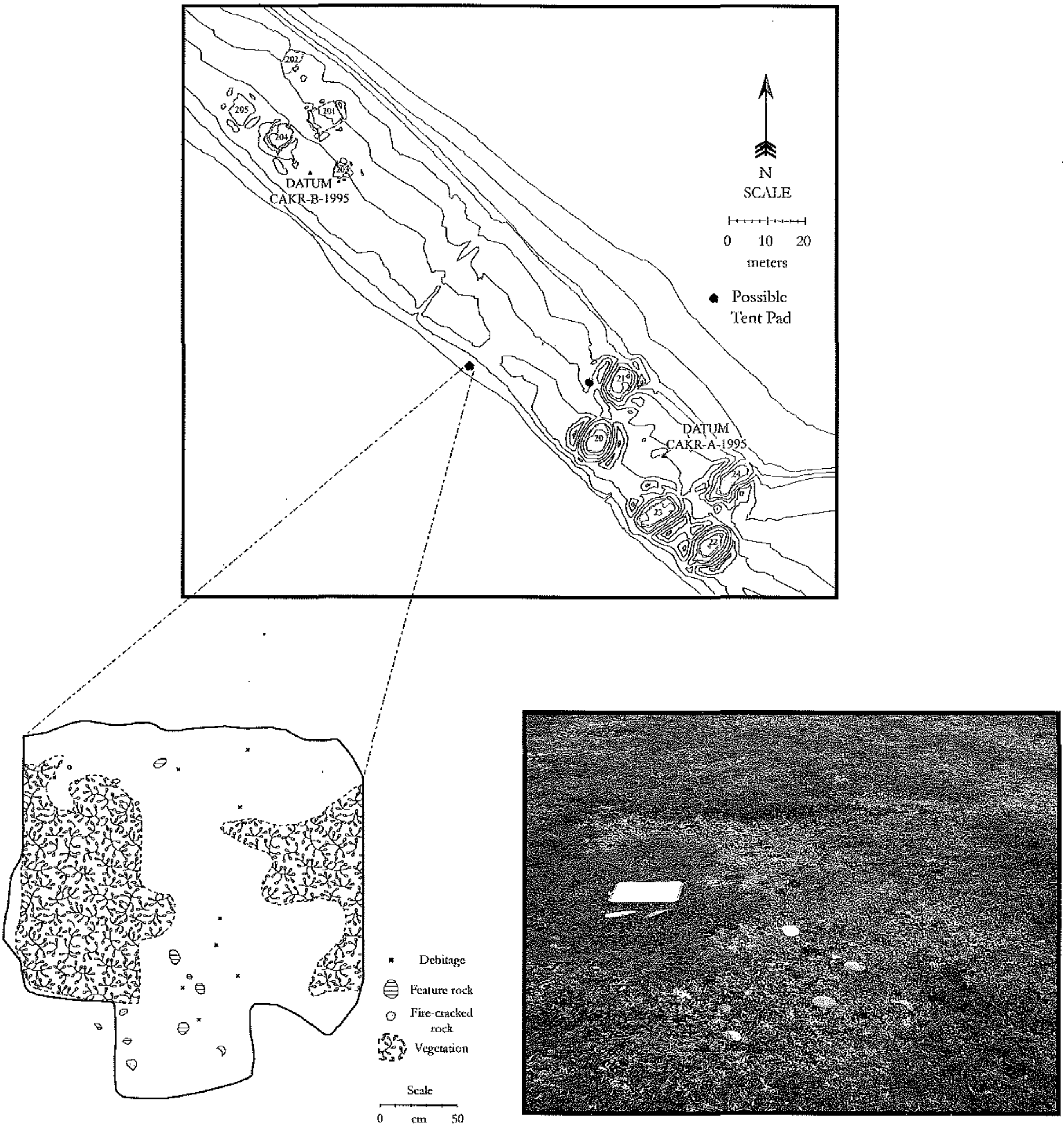


Figure 8. The location of two possible tent-pad features (Choris or later) at the Old Whaling locality (above) with the planview and photograph of the inter-settlement tent-pad feature (below).

A second occupation of the Old Whaling locality corresponds with the proposed second occupation of the summer settlement and the first occupation of the winter settlement, which associates it with the winter houses excavated by Giddings. This assessment is based on the relative depth of the cultural material in the beach ridge 20 to 40 cm below surface. The third occupation of the locality is associated with cultural materials found in and immediately below the sod layer in the beach deposits. In the summer settlement this includes the occupation of the summer houses and corresponds to the occupation of 1 X 2 m Unit B with the two Old Whaling-style projectile points. The fourth occupation of the Old Whaling locality is the most tenuous and consists of the two tent-pad impressions that were noted in the winter settlement and in the inter-settlement area (Fig. 8). These features may be associated with Choris material, but further work needs to be completed to establish their origin.

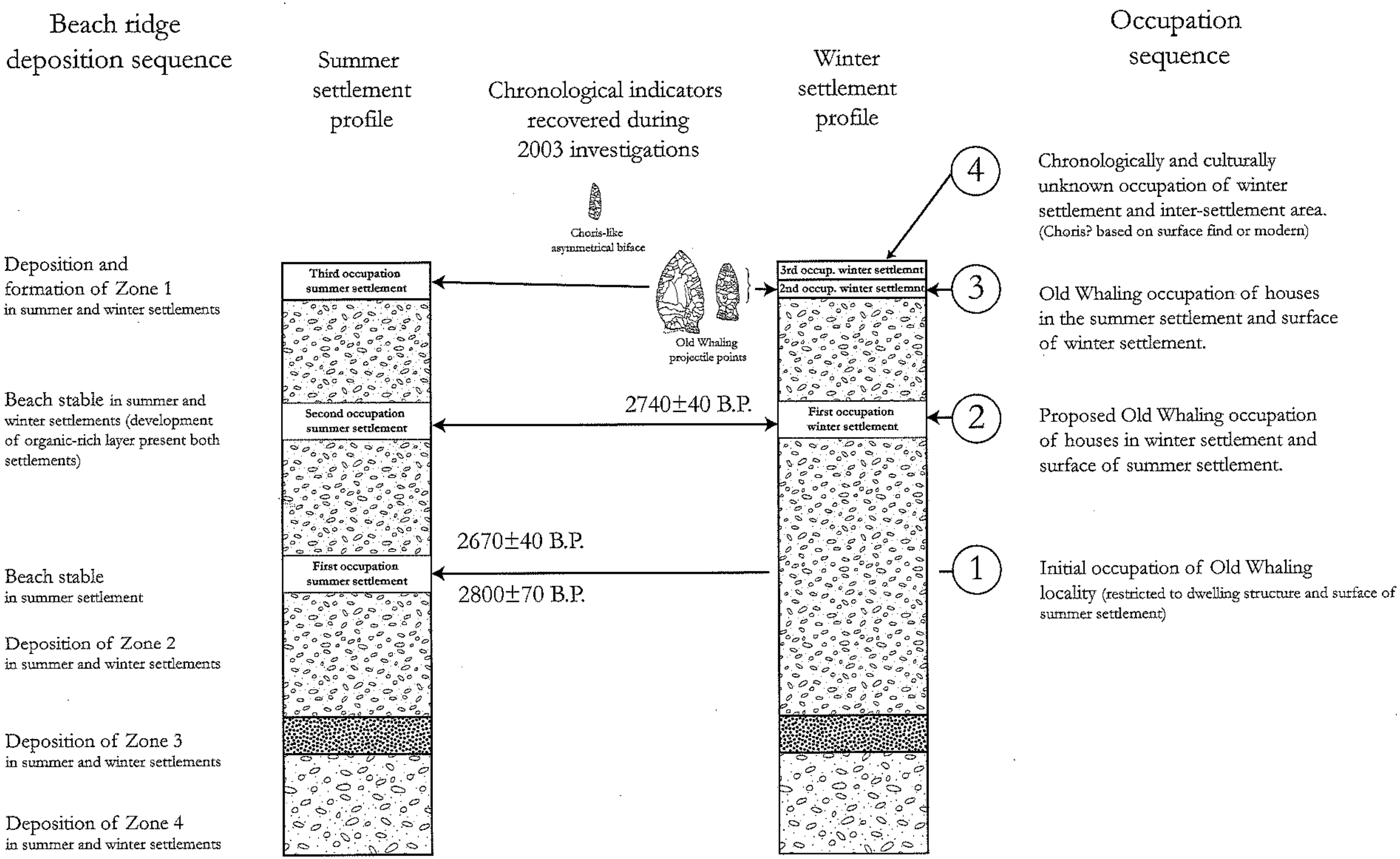


Figure 9. Proposed occupation sequence of the Old Whaling locality in relation to the formation of Beach 53.

Despite the fact that there is now evidence for repeated occupations of the Old Whaling locality, most of the artifacts were likely generated by the same archaeological "culture" over several generations. The 2003 radiocarbon dates overlap one another at the 2 sigma range. When compared to previous radiocarbon dates for this site (Giddings and Anderson 1986), the dates from the 2003 season fall within the conservative range for Old Whaling estimated by Mason and Ludwig (1990) (Table 1), which excludes materials that might have marine contamination. The age range for the Old Whaling site is approximately 850 to 1110 BC (ca. 2700 to 2900 BP) with an average age of 1000 BC; this excludes the youngest date for the site as it has a standard deviation more than twice that of the other dates. The narrow age range for these dates reinforces the notion that the Old Whaling occupations occurred over a short period of time—so short that radiocarbon dating is unlikely to have the resolution to sort them out. Although radiocarbon dating gives a range for general site occupation at Old Whaling, the results reinforce the need to use stratigraphy to tease out the sequence of cultural occupations and beach ridge formations.

Thus, instead of seeing five families moving seasonally from winter dwellings into summer dwellings, we envision a group of people that repeatedly returned to the same beach ridge over several generations. Reanalysis of the faunal remains recovered from Giddings' excavations of the Old Whaling houses indicates a different seal demographic profile between the winter and what have been called the "summer" settlements (Darwent 2005). Ringed seals from the winter settlement appear to have been hunted through breathing holes in the sea ice, whereas seals from the "summer" settlements appear to have been hunted at ice leads. Thus, the shallow tent-ring dwellings are most likely spring settlements since Kotzebue Sound is typically ice-free by July, and ringed seals are ice-obligatory animals. Based on this seal demographic evidence, it appears that the coast would have been abandoned each year shortly after ice thaw, perhaps to follow the annual caribou migration inland in early August.

Although not fully addressed in this paper, the side-notched style of the projectile points from Old Whaling and the black chert from which many of the artifacts were made[3] suggest that people from the Interior, possibly associated with the Northern Archaic archaeological culture (Anderson 1968), returned to Cape Krusenstern seasonally to make use of coastal ringed-seal resources in the winter and then returned to the Interior after the late spring/early summer caribou migration and fishing season. Future research will be needed to assess this supposition. However, the 2003 investigations demonstrate that the Old Whaling locality still has archaeological research potential, especially in terms of sub-surface features, which could shed light on this issue.

ACKNOWLEDGEMENTS

Research at Cape Krusenstern was funded by University of California at Davis faculty research grants. Our thanks are extended to Bob Gal, Steve Klingler, Jerry Post, Chris Young, and Sabra Gilbert-Young of the National Park Service in Anchorage and Kotzebue who provided logistical and intellectual support for this project. We thank Doug Anderson and the Haffenreffer Museum at Brown University for allowing access to the Old Whaling faunal material excavated by Giddings. Thank you to Laura Smith for field assistance.

[3]Natalia Malyk-Selivanova has sourced black chert from Old Whaling to Wrench Creek in the Noatak drainage some 150 km to the interior (Robert Gal 2003, written communication).

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Book Reviews

Russians in Alaska: 1732 – 1867

By Lydia T. Black, University of Alaska Press, Fairbanks, AK, 2004.
328 pages, 18 plates., 95 figures., Index. ISBN: 1-889963-05-4

Reviewed by Timothy (Ty) L. Dilliplane
Instructor, Department of Social Science, Massachusetts Maritime Academy

As an Historical Archaeologist specializing in the study of Russian America, it is truly a pleasure to see the publication of this book. An authoritative, easy-to-read account of the largely forgotten Russian colonial period in North America was badly needed, and this work fills that need in every respect. Dr. Black's longstanding dedication to revealing the history of Russian America, along with her own native understanding of Russian culture, makes her authorship of this book truly a "natural."

Dr. Black states the importance of this work in concise and clear terms (2004:xv): "A great deal of what I have to say, based on the perusal of documents not readily accessible, is contrary to the received wisdom. In a sense, this book is not simply a new synthesis, it is also a reinterpretation." Indeed. The "reinterpretation" aspect comes from, at least in part, the wealth of information—and hence new insights—uncovered and provided by the author, much of which has not been generally available previously.

The first part of the book is devoted to explaining Russia's advance into Siberia which, of course, would eventually lead to the Russian colonial presence in Alaska and California. The author provides rarely seen data about the colonization of Siberia gleaned from a variety of primary documents, many available only in their native Russian. Chapter One yields an overview of Russian expansion to the north and east, of patterns connected to that expansion that would be carried forward to North America, and of the reason behind the Tsarist government's taking a strong interest in this movement. We are provided intriguing visions of Russian lifeways in early Siberia, directly reflecting the author's knowledge of this typically ignored slice of history. Also presented is an outstanding review of the Bering and Shestakov exploratory expeditions, (Chapters 2, 3), as well as background on the beginnings of the Russian maritime fur rush eastward following the return of the survivors of Bering's shipwrecked vessel, *Sv. Petr* [St. Peter] (Chapter 4). The focus then shifts once again to the east, and the history of Russian colonization in Alaska and California is clarified with a scope and depth both detailed and fascinating. Discussion includes 18th century Russian commercial activities in the Aleutian Islands (Chapter 5); commercial competition between Russian fur-trading companies in the Aleutians (latter decades of the 18th century); the background of the formation of the Russian American Company (RAC); and the founding of the Russian Orthodox Church (Chapter 6); challenges to, and contributions of, Alexander Baranov (first colonial manager); late 18th century English activity in southern Alaskan waters; and Native leadership in the colonies (Chapter 7); and the doggedness of Baranov with regard to the RAC's expansion plans (Chapter 8). The following chapters include information concerning the attack and destruction of the first New Archangel (Sitka) colony, and why this attack was so devastating to Baranov (Chapter 9); N. P. Rezanov's proposals, and several myths about Russian America for which he's responsible; Baranov's initiatives in expanding colonial trade to the south (California) and west (including Japan, Java, and Canton, China); and the relieving of Baranov and his death (Chapter 10); the reasons for Baranov's removal, and the succession of governors / highlights of their activities, through 1845 (Chapter 11); and the Creoles of Russian America, with note made of their importance in the running of the colonies (Chapter 12). The book concludes by examining the Russian Orthodox Church in North America, and how it got started, to include data concerning Saint Innocent (Venaminov) and Saint Netsvetov (Chapter 13); the three RAC charters and the RAC's mid-century challenges, such as the fading fur market and the Crimean War; and alternative industries in the colonies (whaling, coal mining, ice production) (Chapter 14); and the reasons for selling Russian America, in spite of good economic and social times, along with activities relating to the actual transfer of the colonies to the United States (Chapter 15).

Missing from the Bibliography are the authors of significant historical archaeology reports—both Russian and U.S.—related to / concerning Russian America. These archaeological projects have uncovered elements of the historical fabric that add significantly to what the documents and oral histories tell us. Should a future, second edition be published, the inclusion of this information would enrich this excellent work even more. Also, the book does not have a glossary for terms and currencies used during the period of Russian America, and could benefit from the addition of such in a second edition.

Russians in Alaska, 1732 - 1867 sparkles with scholarly competence. The notes which follow each chapter alone reflect the author's command of the subject. They are plentiful and rich in detail, and are an invaluable resource for the serious researcher. Rarely seen—and engrossing—descriptions of daily activities are provided throughout the book, nuggets of information so important to those attempting to understand this little-known area of North American history. Examples include the now extinct sea cow and the hunting technique used to secure it, and hunting procedures used for the sea otter. There are a good number of illustrations in the book, and these do much to allow the reader a "window" into what life was like in the colonies. These include views not often seen, such as Plate 18, a plan view of Kiakhta, the trading center on the Chinese - Russian border, and Figure 12, a Russian *shitik* (a vessel made of planks lashed together with sea mammal leather, and used commonly during the early years of the Russian advance across the Aleutians). In addition to daily lifeway information, Dr. Black clearly delineates the international economic and military strategic concerns which influenced Euroamerican activities (Russian, English, U.S., Spanish, and French) in Alaska and adjacent regions.

This book is an absolute must for the libraries of all those, beginners to experts, interested in exploring and understanding the colorful, rich, and mostly forgotten period of history known as Russian America.

Anthropologie physique et archéo-chronologie de la population préhistorique de l'île St. Laurent, Alaska. Band IV, St. Lorenz Insel-Studien Berner Beiträge zur archäologischen und ethnologischen Erforschung des Beringstrassengebietes.

Hans Georg Bandi and Reto Blumer (editors), 2004. Academica Helvetica 5, Bern. Hard cover, 173 pages, 95 figures, 43 tables, 74 photographs, 1 map. ISBN 3-253-06720-1, EUR 45.00 ; order online from <www.haupt.ch>. 4 papers in French, 1 in English, abstracts in German, French and English.

Reviewed by Owen K. Mason,
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Many American scholars and students labor in ignorance of the prodigious efforts of pioneering Swiss archaeologist Hans Georg Bandi on St. Lawrence Island. This despite several papers in various languages (French, German, but rarely in English, cf. Bandi 1984a, 1995) and the high quality and well produced volumes (Bandi 1984b) of his *St Lorenz Insel Studien* [St Lawrence Island Studies] of which this volume is the fourth and final. Unlike some retirees, Dr. Bandi has continued his writing and research, enlisting a younger generation to extend his grasp, specifically Yvon Csonka and Reto Blumer. Dr. Csonka inaugurated a series of Russian-Canadian-Swiss investigations at Ekven. Mr. Blumer has analyzed a house that Bandi excavated at Kitngipalak, as well as assessing and calibrating the four dozen ^{14}C dates collected by Bandi from the Gambell cemeteries, the few from Collins' (1937) efforts and the ages from archived museum samples submitted by Lewis (1995) and Dumond (1998).

Hans Georg Bandi was inspired by the prodigious discoveries of Soviet archaeologists within the Cape Dezhneva cemeteries in the late 1950s and sought to uncover the burial grounds near Gambell that had eluded Henry Collins in the 1930s. Dr. Bandi, now in his mid-eighties, is the scion of the European cadre of arctic specialists, schooled in Greenland by Therkel Mathiassen and lured to Alaska by Helge Larsen. Bandi commenced his research in the vicinity of Gambell in 1967, focusing on excavating burials south of Mayughaaq. The archaeological campaigns of the Swiss/University of Alaska team represent one of the last scientific enterprises of traditionalist and pioneering archaeology in Alaska, conducted from 1967 to 1974—four seasons of excavation (1967, 1972, 1973 and 1974) and two of survey (1969 and 1971). In total about 100 graves were located, preservation was adequate for detailed forensic analyses.

The Fourth volume of the St. Lawrence Island series presents the results of the physical anthropological studies, including a lengthy photographic essay of the cemeteries in the Gambell region; these photographs alone render the volume of great significance. The presentation of data, in plan view and in line drawing, is a hallmark of the Swiss research effort and partially transcends the language disability of many American readers. Another strength of the Swiss effort is on radiocarbon dating of burials, >40 ^{14}C ages, a project not matched until recently by the Russians or Americans. The weakness of Bandi and his collaborators has been on synthesis; a deficiency partially remedied in this volume, with the enlistment of the prodigal Reto Blumer who synthesizes all the radiocarbon ages from St. Lawrence Island and systematically defines a reasonable chronology for its various "cultures." Bandi and Blumer also co-authored a comprehensive summary of all the results on the project; ten offering sites ("dense accumulations of animal bones in small spaces") scattered about the Gambell graves deserve to be appreciated as a significant part of mortuary activities at Sivuqaq—as important as the burials.

While the volume offers important results, its value is diminished in that several of the most important contributions, about half the volume, have appeared earlier in other contexts, the anthropological papers of either the University of Oregon or Alaska (Bandi and Blumer 2002, Blumer 2002, Scott and Gillispie 2002)—all published in English and, thus, more accessible for the majority of anglophone arctic specialists. However, the paper quality and the figure quality is considerably higher in this Bern Museum volume—for some this might justify purchase of the official version. In the case of the French contributions, it may be that certain subtleties of meaning are better expressed and appreciated in the language of the author.

Speaking as a devotée of ^{14}C age calibration, the significance of Blumer's contribution cannot be underestimated and needs to be emulated in many other places before archaeologists truly understand prehistory. Blumer acknowledges his debt to the efforts of Dumond (1998) and Lewis (1995) in greatly supplementing the ^{14}C data base of the Sivuqaq region. The contribution by Blumer (in Bandi 2004, this volume) offers a too brief critique of a competing effort in dating and reorganizing St. Lawrence Island prehistory, the dissertation of Michael Lewis (1995), completed at the University of Alaska, still unpublished. Briefly, Lewis (1995) sought to recast the entirety of Bering Strait archaeology through a program of statistical objectivity, purging it of a concentration on aesthetic characteristics (i.e., Old Bering Sea styles) that could not be proven to be stratigraphically based. Lewis had also undertaken a chronological analyses of St. Lawrence Island ^{14}C ages. With candor uncommon in American research, Blumer (2004:120-121) dismisses some of Lewis' assumptions as simplistic and showing ignorance, concluding that descent cannot be proven between OBS and Birnirk and that evidence is lacking for an Okvik or Ipiutak amalgam with OBS, or for the gradual appearance of Punuk from two hypoethical groups. Further, Blumer (2004 :120) argues, Punuk, « est une culture à part entière, probablement la mieux définie de la région ».[1] Blumer remains undecided if the ^{14}C chronology reinforces Collins' (and Bandi's) belief that Punuk arose in Chukotka or from within St. Lawrence Island. One loose end remained unplumbed by Blumer, who lacked Staley's ^{14}C ages, available in Staley and Mason (2004).

Blumer (2004:120), nonetheless, accepts that Lewis (1995) established empirically that Collins' (1937) scheme does not explain cultural evolution on the island. I cannot quite agree with Blumer that Lewis's chi square tests have proven anything, in that the stratigraphic and taphonomic limitations of the Collins' data remain: "garbage in, garbage out" in computer parlance. In trying to replace style with function, Lewis (1995) refused to name new archaeological categories: to change discourse, one must invent words. In addition, his sizable sample of harpoon heads (n=1614) derived predominantly from the youngest levels of Kukulik, late prehistoric (78%) the late prehistoric or Punuk (15%) (Lewis 1995:167).

The most noteworthy—and hitherto unpublished effort—within the volume is that of E. Leemans-Stojkoviè who synthesizes the physical anthropology of the three cemeteries in the Sivuqaq region. The associated maps and figures provide firm and accessible data on the spatial distribution of graves and the sex of the internees. From this work, the following demographic profile of Sivuqaq prehistoric residents can be offered: a considerable number of men and women lived to older ages—if one can believe the age estimates, into their seventies and eighties!

Several non-metric traits of the cranium, studied by Arnaud and Arnaud (2004) provide insights into the genetic history of St. Lawrence Islanders, at least those around Gambell. The large growths or tori on mandibles occur even in young people within the burial population, proof very likely of a genetic origin. Most of the abnormalities on the bones derive from afflictions and occupational stresses, although a number of bones show the effects of infection and even of malignancies.

The 20 pages of photographs of grave features serve as coda for a lost standard of reportage; each image speaks for itself and should occasion much reflection. The appendix to the volume contains a brief notice on an array of exquisite objects extracted from an elaborate Old Bering Sea grave by "subsistence diggers" apparently in the presence of the renowned visual anthropologist and controversial art collector, Edmund "Ted" Carpenter of New York City. This (unfortunately) undated grave contained one of the most elaborate sets of grave goods ever documented in the vicinity of Mayughaaq and Gambell (Staley and Mason 2004). Some idealistic and/or ethical purists will aver strenuously about publishing this material. However, sooner or later, archaeologists will have to acknowledge the returns from unsupervised digging—if for no better reason, than the fact that the collections will be purchased or willed to institutions as *objet d'art*.

Although no scientific research has been conducted in the Gambell area since Bandi's efforts, cultural resource management requisites in the last 20 years have nearly tripled its cemetery data base. Unfortunately, Bandi apparently never has encountered the CRM reports produced by David Staley in the early 1990s and of Mark

[1]Punuk "is a fully-fledged culture, probably the best defined in the region." Blumer believes that the unity of Punuk as a culture is self-evident, although the basis for this view is restricted to the work of Collins (1937).

Pipkin in the late 1990s; these are on file at the Office of History and Archaeology of the State of Alaska and are available to qualified researchers. The burials encountered during CRM monitoring since 1974 were as poorly preserved and contained about the same low amounts of grave goods as those excavated by Bandi and were also largely from the time attributed to the "Punuk" archaeological culture; these data were synthesized by Staley and Mason (2004).

A persistent undercurrent in any discussion of St. Lawrence Island archaeology is its inchoate and incomplete nature. Unfortunately, Henry Collins penned his premier *opus magnum* too authoritatively: *The Archaeology of St. Lawrence Island,* as does H.G. Bandi has in his *St. Lorenz Insel studien.* The reality is that comparatively little of the archaeology of St. Lawrence Island was revealed by the efforts of either expedition. Further, Collins (1937) had not even completely analyzed his own material from Kiyaligaq (Southeast Cape) and his work preceded Rainey's (1941) description of the Okvik site. Both Collins (1937) and Bandi (this volume) spent little effort comparing Sivuqaq with Kukulik (Geist and Rainey 1936). The 1979 survey of Crowell (1984) documented the far-flung extent of large sites around St. Lawrence Island. Sadly for archaeologists, the history of St. Lawrence was more complex and productive than Bandi (or Collins) discovered, if the objects arriving in private hands, from the spades of subsistence diggers, are any measure (Julie Hollowell, pers. communication, 2004). Nonetheless it is the great fortune of archaeologists that Hans Georg Bandi has both lived long and achieved what few ever do, complete their work in their retirement.

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Études/Inuit/Studies **Volume 29(1-2), 2005**

Préserver la langue et les savoirs

Preserving language and knowledge

En s'inspirant des travaux du professeur Michael Krauss, ce numéro essaie de comprendre jusqu'à quel point les langues et les savoirs autochtones peuvent être préservés et rester dynamiques ou, à tout le moins, viables face à la mondialisation. En d'autres mots, comment la diversité linguistique et cognitive encore présente au Nord peut-elle, grâce à une inversion du processus de changement, survivre à ce rouleau compresseur que constituent la pensée occidentale et les langues majoritaires européennes soutenues par l'État.

Inspired by research conducted by Professor Michael Krauss, the present issue tries to understand up to what point can Aboriginal languages and knowledge systems be preserved as vibrant or, at least, sustainable phenomena against globalization. Put it in other words, how the linguistic and cognitive diversity still in existence in the North can survive, through a reversal of shift, the steam-roller effect of Western thinking and of state-supported European majority languages.

Études/Inuit/Studies, une revue scientifique bi-annuelle, est publiée depuis 1977. La revue se consacre à l'étude des sociétés inuit traditionnelles et contemporaines du Groenland à la Sibérie, dans la perspective très large des sciences humaines (ethnologie, politique, droit, archéologie, linguistique, histoire, etc.). La revue s'est constituée au fil des ans comme le pivot d'un vaste réseau de communication scientifique, ouvert à toutes les disciplines et à tous les horizons scientifiques. Outre les articles, on y retrouve des réflexions, des recensions, informations scientifiques et revues annuelles de thèses de doctorat et articles parus dans d'autres revues.

Études/Inuit/Studies, a biannual scholarly journal, is published since 1977. The Journal is devoted to the study of Inuit societies, either traditional or contemporary, in the general perspective of social sciences and humanities (ethnology, politics, archaeology, linguistics, history, etc.). The Journal has grown to become a major crossroads of information on northern endeavors. As well as a number of articles, each volume contains book reviews, a list of scientific events, and annual reviews of recent dissertations and articles published in other journals.

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ERRATA

In AJA Volume Three, Number One, page 111, the Figure 1 Map in James Kari's article "Language Work in Alaskan Athabascan and its Relationship to Alaskan Anthropology" should be credited to Matt Ganley, Map Alaska.