ARTICLES

THE SIGNIFICANCE OF DOG TRACTION FOR THE ANALYSIS OF PREHISTORIC ARCTIC SOCIETIES

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Abstract: Dog traction was a central element of Eskimo cultures from Greenland to Southwestern Alaska, yet has received relatively little attention from northern archaeologists. This mode of transportation likely emerged in the last 1500 years and was a necessary element in the mobile subsistence strategies and social networks of historic Eskimo societies. An understanding of the effects of adopting dog traction is necessary for analyzing prehistoric societies that preceded and came after its development. The increased mobility conferred by the use of dogs likely had effects on functional and stylistic variability in archaeological assemblages, the costs of resources and means of procurement, settlement strategies, and other aspects of Eskimo culture.

Keywords: Mobility strategies, Cultural ecology, Prehistoric change

INTRODUCTION

The use of dogs as draft animals to haul sleds, or dog traction, is one of the traits universally identified with Eskimo culture. Despite the centrality of this mode of transportation in the societies and economies of Eskimos from Greenland to southwest Alaska, surprisingly little attention has been given to its inception and the roles it played in those systems. This is particularly interesting given that it is widely held that dog traction is a relatively recent development in Eskimo prehistory (Anderson 1988; Bandi 1969; Dumond 1977; Giddings 1952, 1964; Hall 1978; Jenness 1940; Larsen and Rainey 1948; Rainey 1941; VanStone 1955). Almost all researchers who have been concerned with prehistoric Eskimo or Eskimo-like cultures have considered dog traction to a limited extent, and some have briefly considered some of its potential implications (Anderson 1988; Larsen and Rainey 1948; Sheppard 1986). But despite the obvious importance of this technological adaptation, to date only Hall (1978) has made a concerted attempt to focus on the many changes that it may have initiated in prehistoric Eskimo culture and ecology.

One of the principal objectives of modern anthropologists is to understand how cultures function as systems. This requires one to examine how the social and economic components of the cultures connect and interact, and to do so we must understand the mechanisms that allow the flow of information and resources. For human systems we are talking about communication and transportation and, for most of human history, those mechanisms have been equivalent—the actual movement of people has controlled the flow of information and resources across the landscape, by foot or by other means of travel.

In the prehistoric Arctic there have been two non-pedestrian modes of transportation: water travel and dog traction. The former must be of equal antiquity with the settlement of most of the North American Arctic, which would have been logistically and economically unfeasible without it. Because of that, waterborne travel and subsistence activities can be treated as more of a constant in analyzing cultural systems during the last 5-6000 years of North American Arctic prehistory. The presence of dog traction, on the other hand, cannot be similarly dealt with because it originated at some intermediate point of time and likely involved significant systemic changes. Therefore, we must consider what the implications are for its adoption, especially for the time before dogs were used—when we really do not have an adequate ethnographic model on which to base analyses.

In this paper, I will look at the social and economic implications of dog traction and explore as well the potential ramifications of those changes for archaeological interpretation. In part, one significant goal is to stimulate more interest in this question, particularly since, as will be seen, my analysis raises as many questions as it answers. It is not my intent to "dot every i and cross every t" regarding the issue, but to start addressing the significant

conceptual issues involved. It is also not my intent to discuss all aspects of the domestication, use, and consumption of dogs by Eskimo peoples, most of which have no significant bearing on my analyses. This is not a paper about dogs and dog traction *per se*, but about the systemic implications of the latter.

In the subsequent discussion, I will address the following issues. First, I will examine what are reliable archaeological indicators of dog traction and when this mode of transportation is likely to have arisen. Next, I will look at how dog traction functioned in real societies, using Northwest Alaska as a model. Given that ethnographic framework, I will look at the possible structure of pre-dog traction societies by removing the capabilities provided by dog transport. With that in mind, I will consider how the pre-dog traction system might be materially reflected in the archaeological record. Finally, I will ruminate briefly on how Northwest Alaskan prehistory may reflect the adoption of dog traction and make some general comments about its consideration in relation to broader issues of northern prehistory.

ORIGINS

The issue of when dog traction first emerged is a thorny one since there are no good indicators of its actual inception. The first use of dogs to pull loads across snow doubtless involved little more than a length of raw hide and whatever else was at hand. This could be as insubstantial as a frozen hide toboggan such as used by the Iglulik Eskimos (Mathiassen 1928:79ff). Thus, early dog traction was probably largely indiscernible if not invisible in the *artifactual* archaeological record. A variety of *biological* indicators might be used to signal the expanded use of dogs in a broad sense. These could include skeletal deformations, increased frequency of bones overall, evidence of selective breeding, and other factors. Some researchers have considered spinal deformation of dog bones found on Banks Island dating over 2000 years ago as relating to dog traction (Morrison, personal communication), however, a case can also be made for such damage to have been produced by use as a pack animal (Arnold, personal communication).

In contrast to the above, dog traction in its fully developed form has several reliable indicators that may be preserved in the archaeological record. These include whips and whip handles, harness parts, trace buckles, and swivels (Giddings 1952; Hall 1978). The simple presence of sled parts is not adequate evidence since these were clearly used prior to the use of dogs, although more than one researcher has proposed the so-called "built-up" sled as a possible indicator, an idea which I will return to later.

So when do we have evidence for the emergence of developed dog traction? Historical descriptions of dog traction in northeast Asia date to the late 13th century (~700 B.P.) when Marco Polo recorded the following:

> In order to travel over the frozen surface of the ground, they construct a sort of vehicle, not unlike that made use of by the natives of the steep and almost inaccessible mountains in the vicinity of our own country, and which is termed a *tragula* [emphasis in original] or sledge. It is without wheels, is flat at the bottom, but rises with a semicircular curve in front, by which construction it is fitted for running easily on the ice. For drawing these small carriages they keep in readiness certain animals resembling dogs, and which may be called such, although they approach the size of asses. They are very strong and inured to the draught. Six of them, in couples, are harnessed to each carriage, which contains only the driver who manages the dogs, and one merchant, with his package of goods (Polo 1958:325-326).

Other sources, originally uncovered by Birket-Smith (1929:169), suggest other contemporaneous use of dog traction in Asia. Most specific is the account of Ch'ang Te who observed the Kirghiz use of dogs as draft animals around A.D. 1259 (Bretschneider 1910 [I]:129). Field and Prostov (1940-1941: 388-406) noted the presence of dog harness parts in a site near the mouth of the Polui River that dates between the first and sixth century A.D. The Asian sources imply at a minimum the contemporaneity of dog traction between Asia and North America, if it did not actually originate on the west side of Bering Strait.

Although several authors (Ackerman 1984:110; Ford 1959:156; Rainey 1941:547) have been willing to concede at least the potential for dog traction as early as Birnirk times, others (Giddings 1952:62-63; 1960:124; Hall 1978:212-216; Hickey 1979:427) have only conceded its existence in the last three to five hundred years. On the other hand, in Canada there is long-standing evidence of dog traction accompanying the spread of Thule culture (by whatever means) dating to at least 1000 years ago on Banks Island in the Amundsen Gulf region (Arnold, personal communication) and on Ellesmere Island no later than 900 years ago (McCullough 1989). Thus, unless we believe dog traction emerged in full form immediately after

the expansion to the east, it must have been adopted in Alaska before 1000 B.P.

Returning to the issue of built-up sleds, I believe, as suggested by VanStone (1955:115) and others, that the change in sled construction is indicative of dog traction. It provides an intermediate point between no evidence of dog traction and the presence of all *definitive* elements.

As its name implies, the built-up sled featured a raised cargo area, lifted above the runners by curved wood or antler arched supports which increased clearance by a factor of two or more. Built-up sleds featured much narrower sled shoes and were altogether lighter and more flexible than their counterparts which had a series of cross slats connected directly to wider, heavier runners.

The built-up sled featured several advantages in moving about snow-covered terrain. One improvement would be in traversing snow and snow-covered ice, where a built-up sled would be less likely to accumulate snow between the runners. It would also be less likely to hang up on rough terrain, especially the roots and snags one would find in interior areas. The shorter, narrower sled would also be better fitted for close, windy trails that would be found in forested or brushy conditions. For Northwest Alaska, Burch (1998a:196) notes that the built-up sled or *uniapiaq* (Figure 1) was preferred in interior districts while the long, low *qamun* (Figure 2) was preferred in coastal areas. In general, it is hard to visualize much travel through soft conditions without the assistance of dogs. If we accept built-up sleds as evidence (or at least a necessary precursor) for the beginnings of developed dog traction, then it began as early as 1500 B.P. during Birnirk times. In any event, it is very hard to make a case for its adoption any later than 1200 B.P., assuming the eastward Thule expansion with dog traction post-dates somewhat the actual beginnings of that transportation. Interestingly, as far as I can tell, built-up sleds which show up in Alaskan Birnirk assemblages never made an appearance in the eastern Arctic, even in historic times. Thus, there is a situation where people, if they actually migrated to the eastern Arctic as late as 1000 B.P., left behind or discarded a significant component of dog traction technology.

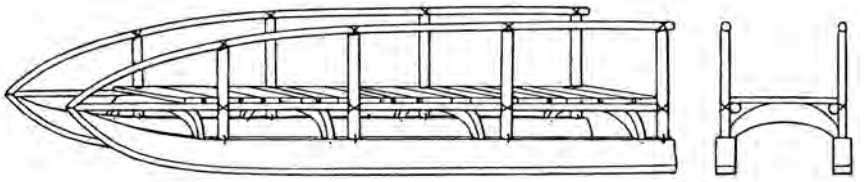

Figure 1 - *Uniapiaq* or built-up sled (from Murdoch 1892: 354 [Figure 356]).

Figure 2 - *Qamun* or low sled (from Murdoch 1892: 355 [Figure 357]).

DOG TRACTION IN HISTORIC ESKIMO SOCIETIES

The following discussion is based mainly on the vast body of data compiled by Burch for Northwest Alaska (especially 1998b, but also 1972, 1975, 1976, 1980, 1981, 1984a, 1984b, 1998a), on my own field research in the region (Sheppard 1983, 1986, 1988; tapes and field notes 1979, 1980, 1982, 1984, 1985 and 1987), and from University of Alaska/Bureau of Indian Affairs ANCSA 14(h)(1) research in Northwest Alaska between 1975 and 1992 (BIA ANCSA Oral History Collection, Bering Straits tapes 1975-1992, NANA tapes 1987). To avoid cumbersome over-citation, the reader may assume the sources of information are citations above unless otherwise noted.

The role of dog traction in historic Eskimo societies before the late 1800s was quite different from how it was used during the gold rush and later periods, when it filled much the same niche as the modern snowmachine. Rather than being a mode of personal transport, it can more correctly be conceived of as an improvement in freight hauling associated with pedestrian movements. In general, it allowed people to move more pounds of food and possessions at a faster pace. Eskimo families throughout the Arctic typically had small dog teams and often augmented canine power with that of women and children. Estimates of the number of dogs per household are quite variable, but I believe about three per family is reasonable. People seldom rode on the sleds. The limitation in the number of dogs was reflective of the economic cost of the teams themselves, which required sustenance. In Siberia, the size of a family's team was directly correlated to its economic well being (Schnirelman 1994:183-185) and it is reasonable to suppose this relationship existed elsewhere. When times were good the number of dogs expanded and when times were bad the numbers decreased, by neglect and human consumption. Although individual families might have few dogs, they did augment their teams with those of other families for specific trips or activities.

It is important to re-emphasize that the husbandry and maintenance of dog teams was not simply a labor

saving development, it did have a significant economic cost. The actual investment in labor and resources could be very difficult to estimate. Historically, the pattern was generally not to feed the dogs in the royal manner in which they were kept in modern times. They were often left to fend for themselves (particularly in the summer) or ate items, bones, etc., that were generally not fit for human consumption. However, working dogs could not function on a maintenance diet and even their consumption of bones took away from potential starvation foods of their human keepers. Before the introduction of the snowmachine, a significant proportion of the subsistence effort was devoted simply to acquiring dog food, and after the adoption of mechanized transport some major species actually dropped out of the subsistence regime in certain locales. In Norton Bay, for example, almost all seal hunting ceased except for bearded seals (*Erignathus barbatus*); much of this decrease was attributed directly to the adoption of snowmachines and decreased need for dog food (Sheppard, tapes and field notes, 1979). Burch has shown that most of the 30 percent decline in daily subsistence consumption between 1966 and 1984 could be accounted for by the subtraction of working dogs from the community (1985:110-112). Clearly, modern people faced much greater dietary demands from large teams used for trapping and other activities, but still one must factor in a significant level of subsistence effort for pre-contact societies. As will be seen below, dog traction facilitated a more diverse diet, but it also required it.

Dogs were important for both summer and winter travel. During the summer, families harnessed the animals to umiaqs and used them to help move the heavily laden craft upstream. They were also used as pack animals. The discussion below will, however, concentrate on winter use of dogs with sleds—partly for the sake of simplicity, and because of the relative invisibility of summer use in the archaeological record.

Winter use of dog teams can be roughly classified into three main areas: household movements, retrieval, and visiting. Families within most Northwest Alaskan societies had two types of household movements, small-scale point to point camp shifts in mid- to late-winter and longer-distance, major household movements from winter areas to break-up-time subsistence sites. The former consisted of the movement of nuclear or small extended families from one resource area to another and did not necessitate moving all possessions that had been hauled to winter sites. In contrast, the latter involved the movement of many people and all their goods, including kayaks and umiaqs, over many miles.

Retrieval took two forms as well. Long distance, seasonal retrieval involved the recovery of cached food acquired earlier in the year. The best example of this is the retrieval of caribou meat which was stored near kill sites while items of higher priority, mainly hides and sinew, were hauled back to settlements on foot. Short-distance retrieval involved the fetching back, usually by women, of harvests by pedestrian hunters.

Visiting varied in scale depending on the abundance of harvests, ranging from the aggregation of members of a single society, to larger inter-societal gatherings at messenger feasts, and occasionally even larger trade fairs involving several societies. Visiting, in effect, amounted to household movements, but typically of intermediate to long distances without the need to haul all of a household's possessions. But sleds could be used to haul food, needed possessions, trade goods, and occasionally people. To give some quantitative perception of the mobility provided by dog traction, the following table (using data from Burch 1998b) presents some estimates of distances between winter and spring settlements (the second column) and maximum distances for intra-societal aggregation (the third column). Looking just at the ability of these societies to aggregate, several have maximal distances of over 30 miles, two or more days by dog team and perhaps double that without the teams. Figure 3 shows the distributions of the societies named below.

Kivalina - Kivalliñiġmiut	2-30	20
Lower Noatak - Napaaqtuġmiut	20-25	10
Upper Noatak -Nuataaġmiut	-	45
Upper Kobuk - Kuvaum Kaġianiġmiut	-	60
Middle Kobuk - Akuniġmiut	-	50
Lower Kobuk - Kuuġmiut	-	10
Kotzebue - Qikiqtaġruġmiut	30	20
Lower Selawik - Kiitaaġmiut	-	18
Upper Selawik - Siilvim Kaġianiġmiut	-	35
Buckland - Kaġiaġmiut	0-35	55
Deering - Pittaġmiut	0-4	40

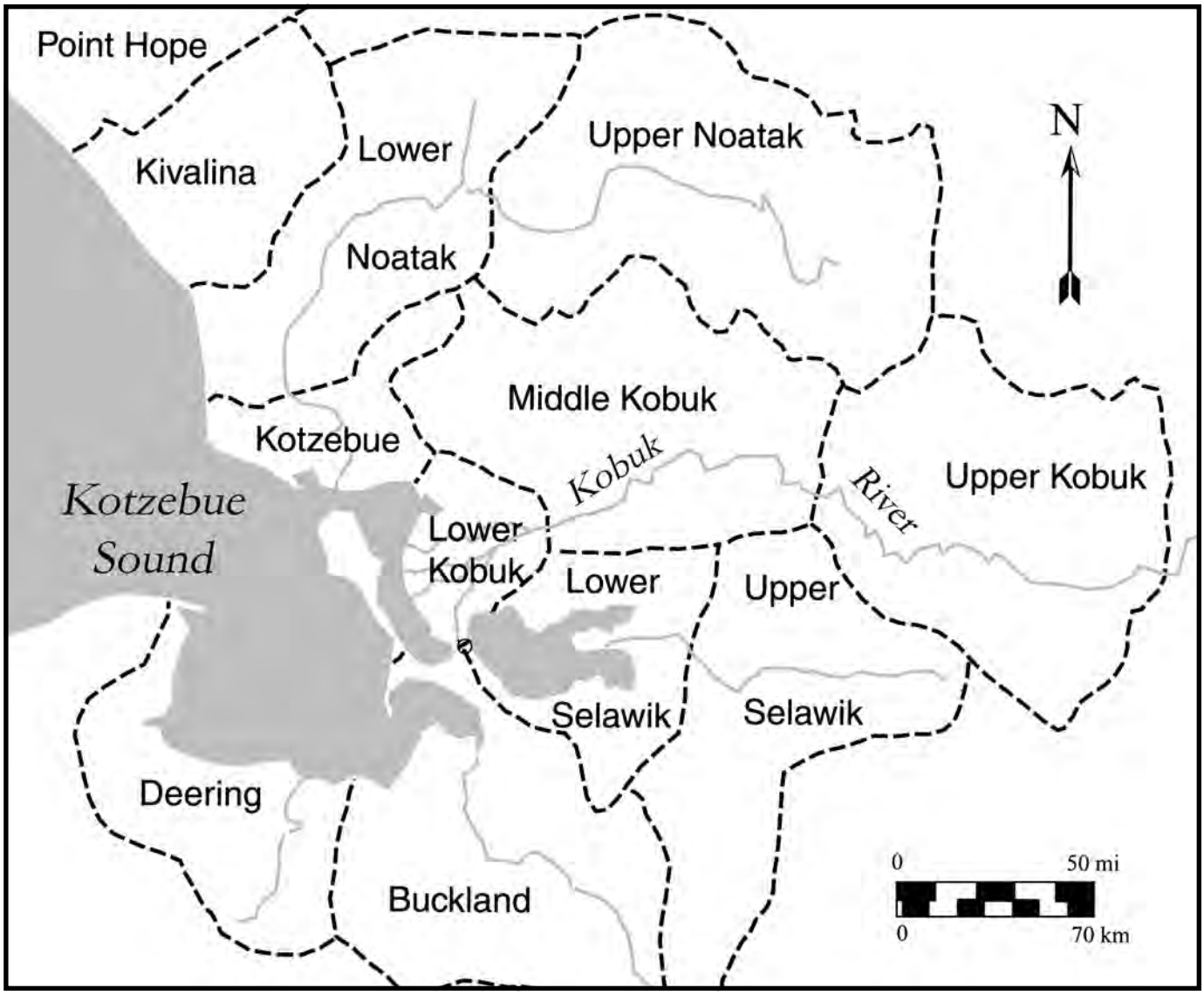

Figure 3 - Northwest Alaskan Eskimo Societies mentioned in text.

MODELING THE ABSENCE OF DOG TRACTION

If one took away dog traction from an early historic Eskimo society, what would be the result? It should be recognized that there was nothing that was done with dog sleds that could not have been done, at least theoretically, by humans pulling sleds. However, the use of dogs decreased the effort involved in moving people and goods and increased range and speed.

In looking at the probable effects of the absence of dog traction it is most reasonable to propose general trends. Some of the logical implications of a more burdened, pedestrian society would be as follows: (1) smaller overall yearly-ranges; (2) increased coastal orientation away from inland resources; (3) a reduction in the amount of tools and supplies carried away from coastal areas; (4) longer stays at more widely separated locales; and (5) decreased winter visiting activities, especially between members of different groups.

In terms of more specific impacts, one of the greatest would be on mid-winter caribou hunting carried out from scattered small settlements. By all accounts such an enterprise was problematic at best with dogs and would be very difficult without that increased mobility. Dog traction allowed a greater search range in looking for prey as well as quicker and more efficient retrieval of the cached proceeds of hunts. In the absence of dog traction, caribou exploitation would track much more closely to up-cycles when peaks in the prey population would mean greater likelihood of pedestrian hunters encountering the animals at widely distributed locations. In down cycles, exploitation might be limited to late summer hunts, which were indispensable in providing good hides,

sinew, and other products but less important for the food supplies. The absence of dogs would require pedestrian packing of the summer harvest in a less efficient manner in terms of total time, number of round trips, and potential loss of cached items.

A variety of secondary impacts can be predicted; among these would be a less buffered economy. As Halstead and O'Shea (1989:123) have noted, there are a variety of ways in which hunter-gatherers can buffer themselves against economic uncertainty, including: (1) a more heterogeneous resource base; (2) exploitation of a broader hunting range; and (3) increased exchange. The absence of dog traction limits all of the above because fewer resources could be effectively exploited and people would have less ability to increase their overall hunting range. The absence of improved transportation would also limit the ability of families and larger groups to disperse in hard times. It would also be more difficult to simply pack up and leave an entire territory, which was the last resort for historic Eskimos.

The impact of smaller ranges would be in smaller group sizes. This in turn would likely result in a greater percentage of exogamy. Although historic groups had a decided preference for societal endogamy, in practice a great deal of exogamy occurred. For smaller groups, out-marriage would be an absolute necessity and thus the level of relatedness between adjacent populations would be high.

The combination of small group size and increased kin connections suggests that violence at both local and regional levels would be much more rare. This commonsense statement is supported by observations of modern tribal warfare. Amongst the Yanomamo, stable alliances between villages, hence less violence between them, were predicated on the exchange of women (Chagnon 1992:160-162). Elsewhere, Pospisil noted for the Kapauku of Papua New Guinea an inverse relationship between relatedness and the level of violent conflict. Additionally, there are obviously basic logistical problems for small groups to organize the type of large-scale, long-distance conflict that characterized the immediate pre-contact and early historic period.

The decrease in group size, general mobility, and reduced ability for broader inter-societal interaction would mean that information flow would be slower and more localized. This might lead to more pronounced local differences in dialect, art, clothing and other cultural aspects that are not so closely tied to local economy and material problems, and thus have a greater ability to drift. Technological innovations developed in one area would also move more slowly across long distances.

It is simplistic to contrast only the total absence of fully developed dog traction with its most sophisticated late prehistoric form. It is very arguable, however, that technological changes following the development of built-up sleds are minor, thus most of the significant structural changes resulting from fully developed dog traction are the result of the new sled form. On the other hand, the use of heavier, lower coastal sleds pulled by dogs could have enhanced coastal adaptations and settlement with little definitive appearance archaeologically. One could visualize the changes as "Dog Traction Lite," with changes restricted mainly to the coastal zone.

ARCHAEOLOGICAL MANIFESTATIONS

How would the preceding affect what one might find in the archaeological context? From a settlement standpoint there would be a greater concentration of winter sites in coastal locations. In the absence of dog traction, it would be harder for families to move people and supplies overland. Fewer sites would occur away from the coast and those that were found in interior locations would be more restricted to ones that were more readily accessible by waterborne transport. Fewer interior sites would reflect winter occupations because use of the sites, even if accessed initially by water, would require pedestrian movement back to the coast carrying all goods, supplies, boats, and people moved there earlier in the year. Bascially, the absence of dog traction would encourage coastal settlement and discourage settlement away from the coast, but it would not absolutely require or eliminate either option.

Coastal and interior sites would likely differ significantly in assemblage size and diversity. It stands to reason that if one must bear the full burden of one's tool kit and use it for a shorter period of time, fewer, more multifunctional tools would be preferable over many tools with very specific uses. One would also be encouraged to manufacture tools on site using locally available materials. Both of those factors would encourage the use of chipped stone over ground slate in interior contexts. The latter would be more time consuming to make and would be less widely distributed. Ground stone tools also tend to have been manufactured for single or limited functions.

Increased local stylistic variability should be reflected in the archaeological context. Such variability would be most apparent in more permanent coastal settlements where there would be a more elaborate and diverse tool kit.

DOG TRACTION AND NORTHWEST ALASKAN PREHISTORY

I believe there is a strong case to be made that many of the major prehistoric changes in the last 1500 years are the consequence of the adoption of dog traction. In particular, I would contend that reduction in stylistic variability in late prehistoric assemblages owes much to the leveling influence of significantly increased information flow. Prior to about 1000 B.P., Northwest Alaska can be characterized as having regional styles of art and tool forms, including Okvik, Old Bering Sea, Ipiutak, and Birnirk. This stylistic variation was conventionally interpreted in terms of cultural sequences, but there is now good reason to believe all of those archaeological classifications are essentially contemporaneous (Gerlach and Mason 1992). Regional stylistic variation would be encouraged by the absence of dog traction, which would limit long-distance interaction to summer months when people could travel by boats.

The ability to exploit caribou more efficiently in the winter is likely, as Hall (1978) suggested, the factor that promoted the gradual expansion of Eskimos up the Kobuk and Noatak drainages. Winter caribou hunting provides an explanatory basis for settlement shifts observed by Harritt (1994) at Kuzitrin Lake and Hall and Gerlach (1988) at Tukuto Lake. In both cases, earlier occupations of these inland locales was evidently the result of short-term summer use, whereas late prehistoric occupations were characterized by winter use long-term enough to warrant the construction of more substantial and more enduring semisubterranean structures.

One of the most significant general issues facing archaeologists in northern Alaska and indeed throughout the Arctic is the adoption of whaling. Previously, it has been suggested (for example McCartney 1984) that surpluses generated by whaling would have allowed the maintenance of dog teams. I believe it is worthwhile to turn this question around and consider the transportation and

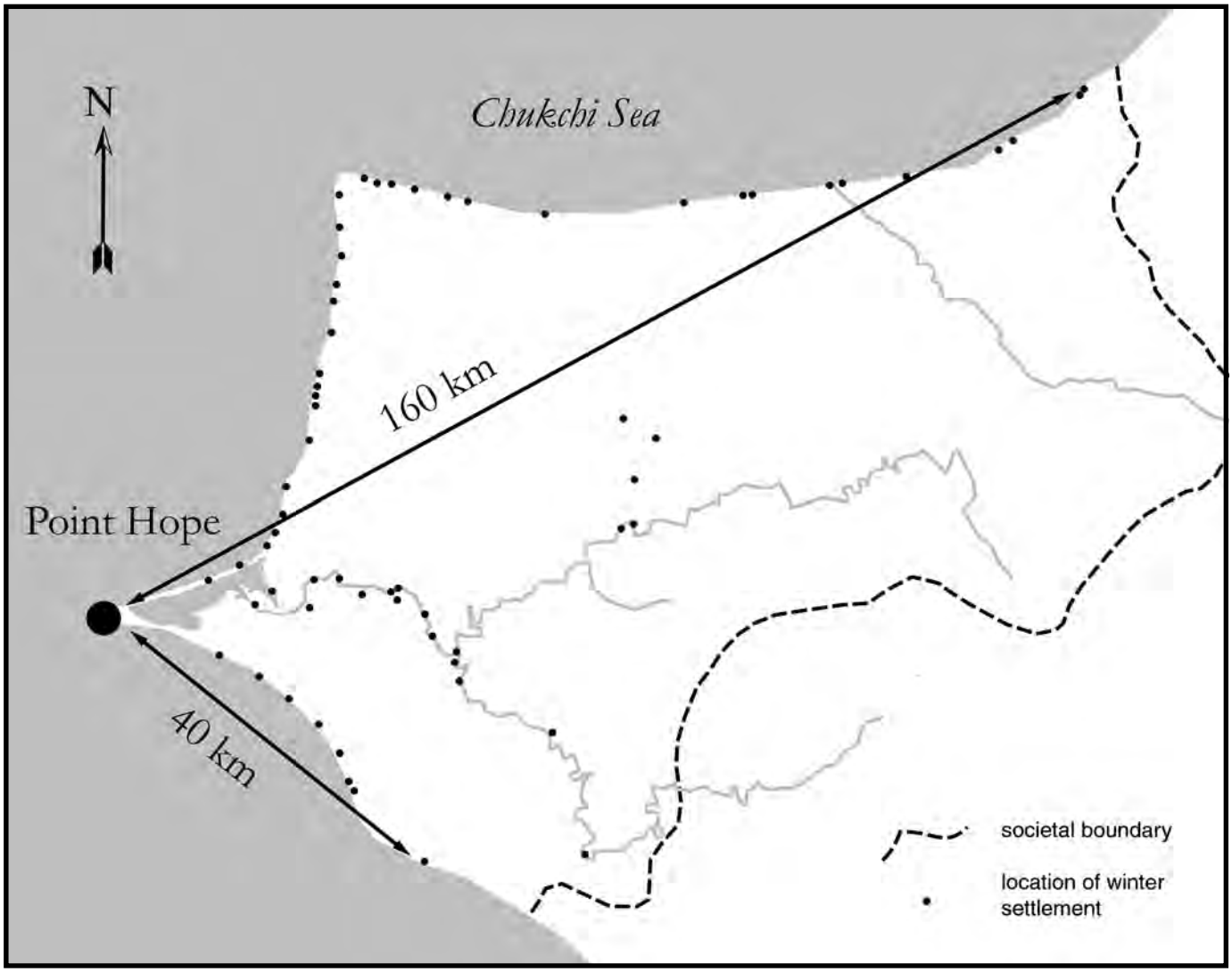

Figure 4 - Maximum aggregation distances for Point Hope whale hunters.

logistical issues related to whaling. At best, even with modern harpoon technology, indigenous whaling can be characterized as highly stochastic. The chances of an individual strike yielding a capture are low, as are the chances of an individual crew making a kill. Thus, the success and effectiveness of whale hunting, particularly with prehistoric technologies, would be contingent on the degree to which multiple crews could be mustered. For example, consider the hypothetical aggregation of six crews. Each crew of eight fit adults would likely represent the manpower contribution of several households composed of four to six people. If households supplied on average two adult hunters then the total manpower of 48 whaling crew members for six boats might involve the total aggregation of at least 24 families, or 96 to 144 people. Even in the best cases, this concentration of people would require the coalescence of families dispersed over literally thousands of square miles. For example, Figure 4 shows the maximum travel distances for Point Hope society members to aggregate for whaling at *Tikiġaq* (Point Hope). While such aggregation is technically feasible by foot travelers, it would have been greatly enhanced by dog traction and may have significantly increased the ability of people to be at the right place at the right time. Naturally, there would be feedback in terms of acquisition of surplus and increased team size; however, I believe there is a strong case for dog traction to be considered integral to the adoption of whaling, not simply a consequence. This is even more clearly the case if one adopts such complex formulations as Sheehan's (1995) model of the interrelatedness of whaling and interior subsistence.

The implications of dog traction for mobility, interaction, group size and other factors also cannot be neglected in analyzing changes in prehistoric social relationships. In a recent paper, Mason (1998) has used the concept of "polities" in analyzing Birnirk, Old Bering Sea, and Ipiutak site distributions and assemblages. Mason's polities are equated with the territorially defined "societies" as developed by Burch (1980, 1984, 1998a, 1998b). While it is laudable to treat the regional prehistory in cultural rather than archaeological terms, it is evident from the preceding discussion that such polities in the historical sense were largely predicated on the integrative ability of dog traction. One wonders whether anything remotely resembling the historical model could have been present without it. I am in greater accord with Burch (1998b:316-317) that a regional system of societies and boundaries likely may have existed as early as Punuk times, and this is more consistent, for example, with the best concrete evidence of warfare, that is armor, which does not occur until that time.

One of the subtler considerations about the effects of dog traction in changing prehistoric societies relates to the recognition that overtly similar archaeological reflections of prehistoric ecologies [faunal remains, technology and the like] can be the result of dramatically different systems. This recognition, or lack thereof, can involve striking differences in interpretation. For example, Giddings and Anderson (1985:318-322) characterize the levels of Choris, Birnirk, and Western Thule caribou exploitation at Cape Krusenstern as essentially the same. Despite the apparent similarities in utilizing this terrestrial resource, the comparable faunal assemblages could have been produced in very different ways. For example, the relatively high level of caribou exploitation by Choris people was likely sustained by local availability of the animals during periods of higher resource levels. Birnirk and Thule occupants of the area could have sustained similar harvest levels either through local hunting or in inland hunts.

Another problem to be considered is how almost exactly the same activity could reflect a system of very different costs and benefits. Harritt (1994:372), for example, notes very similar levels of harvesting of ringed seal (*Phoca hispida*) in Ipiutak and Early Western Thule occupations on Cape Espenberg. The historic pattern for exploiting that resource from Cape Espenberg was to haul tents and other gear far out onto the ice where entire families camped for sustained periods (Burch 1998b:301). Such a pattern was predicated on the use of dog traction for moving camps, hauling harvested seals, and enlarging the breadth of the hunting area. In the absence of dog traction all of those activities would consume more time and energy. Thus, while the archaeological reflection of the activities between the two periods is comparable, one might propose different underlying structural differences in the exploitation of that resource, with and without dog traction, such as size and organization of the hunting groups or perhaps a more protracted period of seal hunting at the expense of other seasonal activities.

In the examples above, the lack of consideration of differences related to dog traction produces a situation where similar archaeological remains can be interpreted as reflecting essentially the same cultural ecology. Looking outside Northwest Alaska, a study by Helmer (1992) illustrates an inverse phenomena, where the same lack of consideration exaggerates differences between two prehistoric traditions. Looking at Devon Island settlement strategies, Helmer concluded that Early Paleo-Eskimo inhabitants did not locate their settlements optimally with respect to resource distributions, while Thule people did

do so. In his analysis, optimal locations were those that minimized the distances to the overall range of resources. But clearly the very definition of optimality would vary for people with markedly different mobility strategies. It makes sense for highly mobile Thule foragers to situate themselves to make most efficient use of several resources from a more fixed residential base. Whereas fixed residential bases make less sense for earlier pedestrian hunters with doubled or tripled travel times and significantly less ability to either haul the proceeds from a hunt long distances or to cache and retrieve them at a later date. The utility of Helmer's analysis would be considerably improved by looking at optimality in terms of both residential versus logistic mobility strategies, in the sense discussed by Binford (1980). It is my contention that many of the other apparent differences between Dorset and Thule are exaggerated by the effects of changes in transportation and derivative effects on settlement patterns, assemblage diversity, and other areas. But that is another paper.

CONCLUSIONS

Given the critical importance of the dog traction issue, several related questions need to be addressed. First, we need the ability to establish the use of dog traction in the absence of definitive technological indicators. Until that problem is solved, the date for the actual inception of this technology is educated guesswork. A first step might be an examination of skeletal deformation in modern working sled dogs and comparison to prehistoric remains. Second, differences in the technological development of dog traction in the eastern Arctic versus the west need to be addressed. The development proceeded differently in the two areas; the east was more advanced in some respects with the early adoption of swivels and buckles but very conservative in the late use of pegged versus lashed runners. Third, if indeed I am correct in my assertion about the use of dog sleds before 1000 B.P., we need to focus on factors involved in the significant time lag before the Eskimo expansion into interior areas such as the Kobuk and Noatak rivers. Finally, there remains another nagging question. If dog traction was so advantageous to Eskimo societies that they were willing to incur the cost of adopting this technology, why was it not adopted by neighboring subarctic Athapaskan and Algonkian peoples as well?

I have long believed that dog traction is the "polar bear in the living room" for Arctic archaeology. Its largely ignored presence has significant implications for virtually every previous discussion and analysis of Eskimo prehistory. More serious consideration of this issue has, I believe, the potential to overturn some of the main pedestals of northern prehistory. One must underscore the essential need to consider all analyses of prehistoric Arctic cultural systems in light of how dog traction, or its absence, fundamentally effects the functioning of those systems and how they might be reflected in the archaeological record.

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