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Dorset Settlement and Subsistence in Northern Labrador

STEVEN L. COX[1] and ARTHUR SPIESS[2]

ABSTRACT. Archaeological surveys in northern Labrador have supplemented previous evidence from the central coast concerning the Dorset subsistence-settlement system. The evidence suggests a flexible Dorset economic base capable of exploiting a wide variety of environments; but lacking full development of certain food procurement systems that would later become important in Thule culture. In particular, site location and faunal analysis indicate that breathing hole sealing was not strongly developed by the Dorset, and that winter and spring settlement was oriented toward ice edge seal and walrus hunting.

RÉSUMÉ. Les relevés archéologiques dans le Labrador Septentrional ont confirmé les preuves évidentes antérieures d'un système de colonisation de subsistence, à l'époque Dorset, sur la côte du Labrador Central. Il parait évident, qu'à l'époque Dorset, la base de l'économie était assez souple pour exploiter une grande variété d'environnements mais sans atteindre un plein développement des moyens de se procurer certaine nourriture comme celà arrivera plus tard dans la civilisation de Thulé. En particulier, l'emplacement des sites et les analyses faunistiques indiquent que la chasse au phoque aux trous de respiration, n'était pas pratiquée à l'époque Dorset; les colonies d'hiver et de printemps étaient plutôt fixées en vue d'une chasse au phoque et au morse à la limite de la banquise. Traduit par Alain de Vendegies. Aquitaine Company of Canada Ltd.

INTRODUCTION

Archaeological surveys on the northern Labrador coast by members of the Torngat Archaeological Project during 1977 and 1978 have considerably expanded our knowledge of the Dorset settlement-subsistence system within Labrador. One of the central concerns of the north coast surveys was the question of how the Dorset settlement pattern seen in previous surveys of the central coast would be applied in a mountainous fiorded coast that generally lacked the protective island skerries found further south. Central to this question is an understanding of the degree of flexibility present within the Dorset system.

In the following paper we summarize some of the information available from both central and northern Labrador concerning Dorset settlement pattern and economy, and examine more closely one hypothesis that has grown out of the Labrador surveys: that the Dorset did not have a fully developed breathing hole sealing adaptation. It is beyond the scope of this article to fully present all of the Labrador Dorset settlement pattern evidence gathered in the past decade or to fully describe and justify the analysis of that evidence. What we hope to do here is to present some ideas which may be useful to other researchers working in the eastern Arctic, and to suggest ways in which the ideas can be further tested. However, there is a brief summary of certain of the more important analytical techniques at the end of the paper.

[1]Smithsonian Institution, Washington, D.C. 20560
[2]Maine Historic Preservation Commission, Augusta, ME 04333

CENTRAL COAST SURVEY RESULTS

Between 1974 and 1976 archaeological surveys in the Nain-Okak region of the central Labrador coast located many Dorset sites, but with one major exception, the sites did not produce significant faunal assemblages because preservation was poor. As a result, in reconstructing Dorset subsistence-settlement systems within the region we had to rely heavily on comparative information about site placement and configuration from historically and archaeologically known Labrador Inuit sites and data on seasonal distributions of animal resources (Cox, 1978).

At Okak, the distribution of Dorset site types parallels that of the Labrador Inuit, with semi-subterranean houses on the inner islands and tent or snow house sites on the outer islands. The evidence suggests a fall and winter settlement on the inner islands, which in those seasons offer good fall harp seal hunting, a centralized location with respect to both bay and outer island resources, protection from the fall north-westerly gales, and available wood. It appears that in the late winter or spring the Dorset moved to the outer islands to hunt seal and walrus at the ice edge and intercept the spring harp seal migration. The surveys located very few Dorset sites back in the bay, and those that were found were very small, apparently overnight bivouacs or short-term activity stations. The scarcity of Dorset sites within Okak Bay does not appear to be the result of sampling problems, since a large number of Pre-Dorset and Labrador Inuit sites were located in the inner bay. Rather, the evidence suggests that the Dorset spent the summer on the islands rather than in fishing camps in the bay as was the Labrador Inuit pattern.

In the Nain area, the surveys concentrated on the outer island zone; so little information is available from the inner islands and bay. Unlike at Okak, the Nain surveys found some Dorset semi-subterranean houses on the outer islands, perhaps because of the greater extent of the Nain island chain and the greater distances from the outer coast/inner island area to the winter ice edge.

A Middle Dorset house at site Koliktalik-1 (HdCg-2) on Dog Island was fully excavated, producing a large faunal collection that Spiess (1978) has analyzed. Summarized briefly, the Koliktalik faunal assemblage contains over 5000 bones identifiable at least to genus, of which over 98% are *Phoca* species (Table 1). Judging from auditory bullae identification and counts, roughly half the *Phoca* assemblage is harp seal and half ringed seal, with a few harbour seal also represented (Table 2). Bearded seal, walrus, caribou, bear, fox and wolf are present, but none make up more than 1% of the faunal assemblage. Tooth sections of seven harp and ringed seal teeth show both fall and spring kills. None of the tooth sections show mid-winter kills, and the relatively high proportion of harp seal (not present in the region during the winter) and the lack of ice edge species, such as bearded seal and walrus, suggest that the house was abandoned during the period January to March, probably in favor of camps on more seaward islands near the *sina*. Several such sites have been found, including a paved mid-passage tent ring on St. Johns Island (HeCf-1) that produced a small faunal collection of seal and walrus bones. Both historical records (Taylor, 1974:46)

and archaeological evidence from several Dorset and Neo-Eskimo sites indicate that walrus were normally taken in Labrador during the late winter and early spring.

In general, then, the central coast surveys suggest an orientation toward the outer coast and more protected island areas for semi-subterranean house settlements during the cold weather months. These settlements were supplemented by tent or snow house camps farther out near the *sina* in mid-winter and possibly in some cases, the spring. Ordinarily the inner bay zone was not utilized.

The pattern of Dorset settlement seen on the central coast, with cold weather settlements of both sod houses and more temporary structures always located within a day's journey to the ice edge, suggested the possibility that the Dorset may have lacked a fully developed breathing hole sealing technology, and were consequently more dependent on winter and spring ice edge resources than were the Neo-Eskimos. Support for this suggestion lies in the apparent absence or scarcity in Dorset culture of an important element of the breathing hole sealing adaptation, the dog. While a few Dorset sites have produced some evidence of dogs (Maxwell,1976; Arnold, 1979), none of the Labrador Dorset sites contain definite dog remains, and neither do the great majority of Dorset sites in the eastern Arctic. The lack of dogs would not greatly affect early winter breathing hole sealing, but the heavier snow cover of late winter and early spring would make breathing hole sealing without dogs not impossible, but more difficult and less efficient. Additionally, the lack of dogs would restrict not so much the hunter's range, but the distances from which he could efficiently bring meat back to the settlement. The obvious alternative is to settle near the *sina* or in areas with winter-long open water leads, and this is the pattern we felt we were seeing on the central coast.

Unfortunately, the evidence from the central coast surveys alone was not adequate to test the hypothesis due to the scarcity of Dorset sites with bone preservation in that region. The distribution of sites was suggestive but by no means conclusive. As noted above, the distribution of Dorset sites at Nain and Okak is not greatly different than that of the historic Labrador Inuit, and it is certainly reasonable to expect that a culture would exploit the relatively rich resources of the ice edge in the winter and spring even if it did possess a breathing hole sealing adaptation.

When the Torngat Project turned researchers' attention to the north coast, we hoped to test the breathing hole sealing hypothesis as part of a more general study of how the Dorset pattern of the central coast would be applied in a mountainous fiorded coast that generally lacked the protective island skerries found further south. Settlements near the mouth of the fiord would provide immediate access to the winter ice edge but would lack protection from the fierce winds and waves common to the region in the summer and fall; operating a boat from fiord mouth sites at these seasons would be virtually impossible. The inner fiord areas would be at a severe disadvantage during the winter and spring because they are a long distance from the ice edge and lack access to major food resources during these seasons.

These environmental constraints plus the anticipated better bone preservation in northern sites made the north coast appear better suited to test the hypothesis concerning the lack of Dorset breathing hole sealing. The hypothesis together with the general lack of Dorset sites in the inner bays of the central coast implied that Dorset semi-subterranean houses representing multiseasonal cold weather settlement (fall to spring) should not be present in the inner fiord zones. In more general terms, the lack of a breathing hole sealing adaptation would make an already harsh environment even more difficult to live in, and therefore Dorset settlement in the north coast fiord region should be very sparse.

NORTH COAST SURVEY RESULTS

The Torngat Project surveys revealed that there was significant Dorset occupation of the Torngat coast, although possibly at lower population levels than the central coast. Surveys of the Nachvak fiord, perhaps the classic northern Labrador fiord, revealed Dorset semi-subterranean houses both deep within the fiord and near its mouth. Although the fiord sites unfortunately lacked bone preservation and difficult weather and sea conditions made surveys at the mouth of the fiord rather brief and incomplete, clearly something different was happening on the northern coast, and the evidence did not appear to support the breathing hole hypothesis. However, during the second field season two Dorset sites with faunal preservation were located and tested, and the evidence from these sites indicates that it was perhaps the initial interpretation of the fiord data rather than the hypothesis itself that was incorrect.

The two sites, one on Avayalik Island east of McLelan Strait, and the other at Akulialuk in Lenz Strait on the north side of Killinek Island, contain thick Middle Dorset middens with excellent bone preservation. At Akulialuk (JcDe-6) the Dorset deposit occurs under, and can clearly be distinguished from, overlying Neo-Eskimo deposits. The Dorset faunal samples come largely from two 1-m test squares, one dug in the center of a probable eighteenth century Inuit sod house and the other in the same house's midden. The excavation in the interior of the house encountered two layers of Dorset pavement below the Neo-Eskimo house floor, and it seems likely that the Neo-Eskimo house was built squarely on top of a Dorset semi-subterranean house, which had itself seen several occupations. The thick midden deposit encountered in the other test square probably is associated with these Dorset houses.

Over 98% of the mammalian bones in the Akulialuk sample are small seal bones, with harp seal bones outnumbering those of ringed and harbour seals (Tables 1 and 2). Based on bullae inspection, there are a minimum of five harp, three ringed and one harbour seal represented in the collection. Bearded seal was not present in the sample, and walrus, caribou and bear are present only in trace amounts.

However, the really striking aspect of the Akulialuk midden was the number of bird bones it contained. The midden was essentially a solid mass of bird bones, with an occasional seal bone interspersed here and there. Equally surprising, the majority of the bird bones apparently belong to the family Procellariidae

Table 1. Mammalian bone frequency and percentage

	Koliktalik-1 H-1 HdCg-2	Akulialuk A-4 JcDe-6	Avayalik-1 H-1 JaDb-10	T-1
Phoca Sp.	5223 (98.3)	609 (98.5)	898 (52.9)	2426 (62.6)
Erignathus	38 (0.7)	0 (0.0)	52 (3.1)	304 (7.8)
Odobenus	31 (0.6)	3 (0.5)	596 (35.1)	438 (11.3)
Rangifer	3 (0.1)	5 (0.8)	28 (1.6)	29 (0.7)
Ursus	6 (0.1)	1 (0.2)	42 (2.5)	17 (0.4)
Fox sp.	7 (0.1)	0 (0.0)	72 (4.2)	659 (17.0)
Canis	7 (0.1)	0 (0.0)	2 (0.1)	0 (0.0)
Small whale	0 (0.0)	0 (0.0)	6 (0.3)	0 (0.0)
Large whale	0 (0.0)	0 (0.0)	2 (0.1)	0 (0.0)

Table 2. *Phoca* species bone counts.[1]

	Koliktalik H-1	Akulialuk-A-4	Avayalik-1
P. hispida	142 (57)	8 (4)	13 (2)
P. groenlandica	92 (53)	21 (10)	4 (0)
P. vitulina	15 (4)	2 (1)	2 (2)

[1]Numbers in parentheses are bullae totals.

(shearwaters and fulmars), pelagic birds that rarely approach land. Opinions vary as to whether these birds are edible. One report states "The shearwaters were the only sea fowl which proved to be totally inedible" (Bigelow, 1902), while conversely, there is a report of Newfoundland fishermen catching thousands of shearwaters from boats during the summer, using baited hooks or long poles with hooks on the end. The people at Akulialuk were also taking and probably eating gulls and ravens, although they may have also used the birds for other purposes, such as making needles from long bones and carpets and clothing from feathers and skin. A layer of feathers lying on one of the floor pavements at Akulialuk may be the remains of a feather mat.

Reconstruction of season of occupation at Akulialuk is hampered by the small sample size and by the fact that we recovered no sectionable teeth in the tests. The bird remains, particularly shearwater and a number of juvenile ducks, indicate that the site was occupied during the summer. The harp seal indicate that the occupation lasted into the fall, probably until freeze-up (November or early December). In Labrador harp seal are available in both the fall and spring, but are hunted with greatest success during the relatively leisurely fall migration when the harps stay in areas longer and penetrate into the bays and fiords. The relative importance of harp seals versus ringed seals and the lack of such ice edge species as bearded seal and walrus indicate that the Akulialuk Dorset occupation may not have lasted into the winter and spring.

The Avayalik-1 (JaDb-10) sample is a considerably larger and more reliable one, taken from ten 2-m squares dug into a frozen Middle Dorset midden deposit. As at Akulialuk, in the excavation area the Middle Dorset deposit was overlain by a later occupation, in this case a late Dorset house. Pavement slabs thrown into the midden surrounding the Late Dorset house and traces of a possible entrance tunnel suggest that late Dorset house may have been dug into one or more Middle Dorset semi-subterranean houses, but the form of these houses and their relationship to the surrounding midden deposits remains unclear. Since virtually all of the Late Dorset material occurs above the permafrost zone, we can be confident that the faunal assemblage is essentially all Middle Dorset. A more detailed account of the Avayalik-1 site is presented by Jordan (this volume).

At Avayalik, birds are again an important part of the faunal assemblage; large gulls, diving ducks such as eiders and scoters, alcids, and again, shearwaters and fulmars are most common. Juvenile ducks, probably taken at the end of the summer, are also fairly common. However, at Avayalik the relative and absolute numbers of bird bones are much less than at Akulialuk, and the assemblage is dominated by pinnipeds, particularly walrus. Nearly 600 bones, or 35% of the analyzed faunal sample, are walrus. About 900 small seal bones, or 53% of the sample, represent perhaps a larger number of individuals than walrus but certainly a much smaller amount of meat. Ringed seal was the most common species identified. Other mammals are present in relatively small numbers, with bearded seal making up 3.1% of the assemblage, polar bear 2.5%, fox 4.2%, and caribou, probably taken on the coast in late spring and summer, 1.6%. Two large canid bones are almost certainly wolf; small whales are represented by six unmodified bones and several sections of narwhal tusk which have been made into wedges or adzes. At both Avayalik and Akulialuk baleen occurs in the midden, often in the form of knotted strands, but we cannot determine whether these pieces come from hunted or scavenged whales.

In addition to the walrus remains found in the Avayalik-1 midden, we found large numbers of walrus bones with associated Dorset tools in caches along rock ridges upslope from the site. The distribution of skeletal elements suggests that these caches were associated with the Avayalik-1 midden. The skeletal elements in the caches, primarily skull parts, are those which are under-represented in the midden. A dozen teeth from Avayalik-1 were sectioned and successfully read for seasonality, including six walrus, one seal, two caribou, one bear, and two fox teeth; all were late winter to summer kills.

Bearing in mind that the faunal collection from Akulialuk is from a very limited test and therefore may not be representative, present evidence nevertheless suggests major differences between the Avayalik and Akulialuk assemblages. Aside from the bird remains, both are dominated by pinnipeds, but at Akulialuk we have almost all small seals, whereas at Avayalik walrus were of prime importance and there is a wider range of species taken. When one turns to relative representation of seal species (Table 2), there is also an important difference between Akulialuk and Avayalik. The most common species at Aku-

lialuk is the harp seal, hunted with greatest success in the fall. At Avayalik ringed seals dominate, with a low percentage of harp seal. Interestingly, there is also a difference in species between Akulialuk and Koliktalik, which probably was occupied in both the fall and spring. At Koliktalik there were roughly equal proportions of harp and ringed seals. Finally, the tooth sectioning data from Avayalik strongly supports an occupation limited to the late winter, spring and summer months, whereas at Akulialuk the dominance of harp seal and the low numbers of ringed seal, bearded seal and walrus suggest a fall occupation, beginning by August to account for the bird remains.

While the present samples are too limited to be conclusive, we suggest that Akulialuk and Avayalik represent the two major components of the northern Labrador Dorset settlement cycles. Akulialuk, a protected location with good harp seal and bird hunting potential, was occupied in the fall and early winter (August-January). The Dorset then moved to a new location, and in the case of Avayalik possibly to a second semi-subterranean house, for ice-edge seal and walrus hunting, and later, basking seal and bird hunting. The island occupation appears to have lasted into the summer, although people may have moved to adjacent tent camps during the warmer months. We do not mean to suggest that the same family necessarily occupied both sites, although preliminary analysis of the artifact collections suggests that they are close in time, but rather that this pattern seems to fit the data best, and also provides a clue to the nature of the Dorset fiord occupations.

Those inner fiord semi-subterranean houses make much more sense if they are regarded as summer and fall occupations rather than fall-winter-spring settlements. During the open water months they would offer the advantages of protection, a restricted hunting area advantageous to open water sealing, and immediate access to the abundant summer fish and caribou populations of the inner fiord. With freeze-up the Dorset would have moved to the fiord mouth to take advantage of the rich walrus hunting and ice-edge sealing known from historic accounts of the area. They may have moved into a second semi-subterranean house (presumably constructed earlier) or a snow house or tent structure — they possibly used all three alternatives at various periods. During the frozen months, the lack of protection from winds would have been of less importance for hunting activities.

Further excavation and larger samples are needed to confirm the proposed Dorset settlement pattern. However, if the suggested Labrador Dorset seasonal cycle is at least generally accurate, there appears to be a strong orientation toward ice edge hunting in the winter and spring months and support for the hypothesis of little Dorset semi-subterranean houses located to date in northern Labrador are relatively near the winter landfast ice-edge — within a day's round trip walking journey. In areas such as Nachvak where we have located houses farther from the *sina*, we have always found houses further seaward as well, and we have evidence from Akulialuk and Avayalik to suggest that people may have occupied two different semi-subterranean houses during the same year. In general the distribution of Dorset sites along the coast suggests a preference for areas with offshore islands, offering better opportunities for sheltered camp sites near the *sina*.

A final piece of evidence for the Dorset de-emphasis of breathing hole sealing lies in the age demography of the seal remains from Dorset sites. Only adult seals maintain open breathing holes in the ice, while juveniles generally remain in open water areas, congregating at the *sina* (Smith, 1973). Thus, extensive use of breathing hole sealing techniques should produce a higher percentage of adult ringed seals, whereas avoidance of breathing hole sealing in favor of hunting at the *sina* or at leads should produce a higher proportion of juvenile ringed seals.

Table 3 presents a demographic comparison between the samples from the three Dorset sites and from four north coast Labrador Inuit semi-subterranean house sites. Age stages are based on humeral epiphyseal fusion and growth. The samples are again too small to be anything more than suggestive, and the picture is complicated because juvenile *Phoca* humeri cannot be identified to species, making it difficult to factor out the harp seal input. Additionally, most of the sites include varying lengths of occupation during open water months. However, the figures do suggest a significant difference between Dorset and Labrador Inuit, with the higher percentage of juvenile seals in two of the three Dorset samples supporting the hypothesis that the Dorset strongly preferred open water sealing to breathing hole sealing. The high proportion of adult humeri in the Akulialuk sample may be explained by the high proportion of harp seal in the sample — all adult humeri identified to species are either harp or harbour seal.

Table 3. Age stages of *Phoca* remains based on humeral epiphyseal fusion and growth

	DORSET			THULE/LABRADOR INUIT			
	Koliktalik-I H-1	Avayalik-I H-1	Akulialuk-A H-4	Akulialuk Neo-Esk.	Komaktorvik-I H-2	Komaktorvik-I H-7	Big Head
Adult	71	2	18	28	2	3	10
Adolescent	15	0	2	4	0	0	0
Juvenile	59	8	6	12	0	1	6
Foetal/newborn	14	1	0	7	1	2	6

DISCUSSION

The evidence from Labrador suggests a broad-based Dorset economy in which the most important species economically were the harp seal, taken primarily in the fall on its southward migration, and the walrus, taken in the late winter and early spring. Areas in Labrador that historic sources show had good walrus hunting are invariably rich in Dorset sites. This resource was probably the reason for the heavy Dorset occupation of Nachvak, which lacks the attractive island chains but historically supported a sizeable walrus population around the shallows at its mouth. This pattern of heavy walrus exploitation by the Dorset is not confined to Labrador. In general walrus appear as an important species to the Dorset throughout the eastern Arctic. For example, at the T-1 site on Southampton Island (Collins, 1956; 1957) we find again a respectable percentage of walrus, and in fact the T-1 faunal assemblage compares quite closely with

that of Avayalik (Table 1). At T-1 there were also bird bones in all of the test cuts, varying in relative quantities. Of 21 seal, fox and caribou teeth that we sectioned in a recent study of the material from that site, all but one showed late winter, spring or summer kills. This evidence suggests that at Southampton Island, at least, the Dorset settlement pattern might not have been greatly different from the pattern of northern Labrador.

Clearly it would be a mistake to over-emphasize Dorset dependence on walrus or any other single species. Walrus were probably not an important food resource in the Nain area, Newfoundland, south Baffin Island, and in other areas with Dorset occupation. The faunal collections available from Labrador and other regions in the eastern Arctic suggest a broad-based Dorset economy. In fact, with the possible exception of large whales, the Dorset seem to have taken just about everything in sight. The many birds in the Akulialuk, Avayalik and T-1 middens were almost certainly not starvation rations. There seems to have been ample pinniped meat available in all cases, and most of the birds were taken during seasons when food should not have been scarce. Similarly, foxes are present in significant numbers at several Dorset sites in Labrador and Hudson's Bay, and we have the evidence of interior caribou hunting camps in several regions to show that the Dorset economic system was not solely maritime based. Within Labrador alone we note several variations on a basic settlement pattern theme, and the ability to cope with a variety of regional environmental conditions, including on the Torngat coast some of the harshest conditions found anywhere in the eastern Arctic. The evidence continues to support William Taylor's (1968) characterization of Eskimo economy in general, including Dorset, as being fundamentally omnivorous and flexible.

However, within this general pattern of flexibility there appear to be some rather fundamental economic differences among Eskimo cultures. If, as the evidence suggests, the Dorset lacked strong whaling and breathing hole sealing adaptations, then they lacked what were probably the two most important economic bases of Thule culture. Breathing hole sealing is particularly important as a supplementary or backup system for obtaining food in the event of a partial or complete failure of primary food sources. A reduced capacity for breathing hole sealing coupled with a greater emphasis on open water and ice edge hunting might be expected to reduce flexibility and increase sensitivity to adverse weather conditions, particularly extended periods of high winds which would prevent use of boats and make the ice-edge increasingly unstable. Such conditions would have adverse effects on both Thule and Dorset, particularly in terms of boat-based procurement of food supplies in the fall (whales, harp seals), but might be expected to favor Thule in terms of relative survivability during the course of the winter.

As we have noted, at this point the evidence from Labrador concerning the form and operation of the Dorset subsistence-settlement system is far from conclusive. We hope that the model presented here, right or wrong, will be of use to other researchers in the eastern Arctic, and will stimulate further discussion and research on the problem. To date there has been a rather surprising scarcity of published Paleo-Eskimo settlement pattern studies beyond the site report

level. This is particularly unfortunate in view of the high potential of the Arctic for such studies. Hopefully further work in Labrador and elsewhere, both field work and continuing analysis and publication of extant collections, will increase our understanding of what was without doubt a much more complicated system than we are presently able to perceive.

ANALYTICAL TECHNIQUES

Our specific identifications of isolated bones of the three species of genus *Phoca* present in the eastern Arctic are based on morphological criteria and metric data. Bulla form is species specific, and the tooth morphology of *P. vitulina* is easily differentiated from the other two species, for example. However, most specific identifications are based on a measurement system developed by Spiess (unpublished): 48 measurements on the mandible and postcrania collected from 23 adult specimens of the three species in the Museum of Comparative Zoology (Harvard), the U.S. National Museum of Natural History, and the Field Museum. Single measurements can often separate *P. hispida* from the other two species, while *P. groenlandica* can often be separated from *P. vitulina* on a "rugosity" basis (length versus width measurements can only be applied to bones with fused epiphyses, which leaves most subadult and juvenile *Phoca* bones in the *species indeterminate* category.

Demographic data on the *Phoca* assemblage is compiled from the humerus sample. The humerus is the most commonly unbroken postcranial longbone in pinniped assemblages. Spiess (unpublished) has developed a tentative epiphyseal fusion sequence for genus *Phoca* by seriating 27 immature skeletons from museum collections. The proximal and distal humeral epiphyses fuse to the diaphysis relatively close to each other in time, in the middle of the sequence at about 2½-3½ years of age. Humeral epiphyseal fusion therefore becomes an ideal criterion for separating adults from subadults.

Spiess has generated four age classes based on the humerus: 1) adults with epiphyses fused; 2) subadults with either epiphysis fusing; 3) juveniles with unfused epiphyses and length of humerus greater than 2.2 cm; and 4) foetal or newborn seals with unfused epiphyses and length of humerus less than 2.2 cm. We realize that these age divisions are arbitrary, and that two seals of the same age could conceivably fall into two different categories due to developmental timing differences. However, consistently applied in large samples these criteria provide useful archaeological data.

Spiess (1976) and Bourque, Morris and Spiess (1978) have reported adapting wildlife management aging techniques involving tooth-sectioning to determining season of death in archaeological samples. Some species of mammals deposit annual growth layers in tooth cementum or dentin in alternating opaque and translucent layers. In several species season of formation of the translucent lines, usually called "rest" lines indicating growth cessation, is well known. Determination of season of death is then based upon a subjective judgment of the state of the last-forming layer at the time of death: its dentin/cementum type and

relative width compared with previous layers. Precision to a span of 2-3 months is the practical limit of the technique.

Each successfully sectioned tooth is assumed to come from a different individual, unless otherwise indicated. Teeth are selected from isolated midden specimens, or extracted from jaws, on the basis of observed good preservation. Depending on the site, only 10-75% of attempts yield readable sections. Thus, the sample of "read" teeth is much smaller than the original archaeological population. In a few cases, two teeth from one individual have been sectioned and analyzed independently, as a check on our methodology. The ring pattern is so idiosyncratic in seal canines as to be recognizably from the same individual. Recognizably identical patterns are not reported as separate readings.

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