

**A REVIEW OF THE ETHNOGRAPHIC AND ARCHAEOLOGICAL EVIDENCE
RELATING TO MOUNTAIN GOATS IN THE
OLYMPIC MOUNTAINS**

Author
Randall F. Schalk

INFOTEC Research, Inc.
2135 North 51st Street
Seattle, Washington 98103



Submitted to
National Park Service
Pacific Northwest Region
83 South King Street, Suite 212
Seattle, Washington 98104

In fulfillment of
Purchase Order No. 1443-PX9000-92-223

15 March 1993

ABSTRACT

Mountain goats have generally been considered an introduced species in the Olympic Mountains, but this view has been challenged recently. The present study is a review of the ethnographic and archaeological data pertaining to mountain goats on the Olympic Peninsula. To place these data sources into a broader context, ethnographic data on uses of mountain goats and the archaeological occurrence of goat remains are briefly examined for other regions of the Northwest Coast.

The primary ethnographic sources for the Olympic Peninsula tribes are in agreement that mountain goats were not present in the region historically. However, the Peninsula tribes obtained mountain goat wool for weaving and horns for making spoons as trade items from surrounding tribes. The Cascade Range of Washington and the Coast Ranges of British Columbia and southeast Alaska are consistently identified as the sources for mountain goat wool and horn along the Northwest Coast.

Several of the Olympic Peninsula tribes kept long-haired dogs ("wool dogs") as an alternative fiber source for the weaving of blankets and clothing. Because the historical distribution of these dogs seems to be non-congruent with the distribution of mountain goats, their ethnographically documented presence ethnographically suggests the absence of mountain goats in the region.

Twenty-four archaeological sites on the Olympic Peninsula have yielded mammalian faunal remains, but mountain goat bones have yet to be reported from a single collection. This sample, however, does not permit conclusive determination of either the presence or absence of mountain goat since late Pleistocene times because even the largest collections do not contain large numbers of land mammals, are located at some distance from mountain habitats, and do not represent major time intervals. Additional research on regional ethnography or further analyses of extant archaeofaunal collections are unlikely to overcome these limitations. It is recommended that future research focus on finding and recovering faunal remains from natural or cultural deposits in the subalpine zone of the Olympic Mountains. Such deposits offer the greatest potential for providing data that are decisive in answering questions about the former distribution of mountain goats.

TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	ii
LIST OF FIGURES	iv
1 INTRODUCTION	1
2 THE ETHNOGRAPHIC DATA	3
2.1 Methods	3
2.2 Usage of Mountain Goats along the Northwest Coast	4
2.3 Ethnographic Data for the Olympic Peninsula Tribes	7
2.4 Discussion	16
3 THE ARCHAEOLOGICAL DATA	19
3.1 The Archaeofaunal Data	19
3.2 The Archaeological Distribution of the Wool Dog	30
3.3 Artifacts Related to Mountain Goats	31
3.4 The Archaeological Record of the Subalpine Zone	32
3.5 Mountain Goats in Faunal Assemblages from Regions Where Goats are Definitely Indigenous	33
4 CONCLUSION	37
4.1 Summary	37
4.2 Management Recommendations	42
4.3 Conclusion	44
REFERENCES CITED	46
APPENDIX A: SCIENTIFIC NAMES FOR MAMMALS	A-1
APPENDIX B: ANTHROPOLOGISTS CONSULTED	B-1

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Indian Tribes of the Olympic Peninsula	8
2	Locations of Archaeological Sites on the Olympic Peninsula that have Produced Mammalian Faunal Remains	21

1: INTRODUCTION

The mountain goat (*Oreamnos americanus*) has generally been viewed as a non-indigenous inhabitant of the Olympic Mountains. This view is based partially on the knowledge that mountain goats from British Columbia and Alaska were released in the 1920s to establish a population that could be hunted (Moorhead and Stevens 1982). The mountain goat population in the Olympics has increased since these releases to an estimated 1100-1200, and subalpine habitat studies indicate that goats have degraded vegetation (Pfritsch 1980; Pike 1981; National Park Service [NPS] 1982, 1983, 1984). Also contributing to the view that mountain goats are not native to the Olympics has been a general lack of reliable historical, ethnographic, or archaeological evidence for the presence of this species. Faced with strong evidence for environmental deterioration of montane habitats in the Olympics and a burgeoning goat population, the National Park Service has implemented efforts to reduce the number of goats.

In the past few years, however, the view of mountain goats as a non-indigenous species has been questioned, and the National Park Service's management policy for this species has drawn criticism (Lyman 1988). Noting that the perception of mountain goats as an alien species is founded on ethnographic and archaeological data, Lyman (1988:14) questions the adequacy of these data. He suggests mountain goats might have been present in this region, but because of cultural factors, simply might not have been used by native people and, consequently, were not mentioned in ethnographic documents. Lack of archaeological evidence for mountain goats, Lyman argues, might be due to the limited amount of archaeology that has been done and the small size of faunal samples that have been recovered, the focus of most archaeological research on coastal sites rather than sites in the mountains, and the lack of temporally representative faunal samples for the Holocene. Using a biogeographical model previously applied in the Great Basin (Brown 1978), Lyman argues that mountain goats might have populated the Olympics in late glacial times (17,500-13,500 B.P.) from a source in the Southern Cascades. Once established, this population may have survived unnoticed or undocumented into the nineteenth or even the twentieth century or may have been extirpated in the Olympics during the Holocene.

Whether the mountain goat should be viewed as an alien species in the Olympics has become the subject of a controversy that has attracted media attention. Recognizing a need to clarify the status of mountain goats, the National Park Service has initiated a systematic review of available information regarding the history of mountain goats in the Olympics. This report is a part of that effort.

The objective of the present study is to review and summarize the anthropological evidence pertaining to the existence of mountain goats on the Olympic Peninsula. Two kinds of anthropological data are available and of direct relevance to development of reliable

knowledge about the former existence of the mountain goat in this region. The first is ethnography—the written records documenting the cultures of the native people of the Olympic Peninsula. These data are especially valuable for gaining information about resource species that were available to native people in the nineteenth century. The second is the archaeological record. The material remains including animal bones and artifacts associated with villages and campsites offer a source of information of considerable relevance to past distribution of animal species. Although ethnography and archaeofauna have been alluded to in previous discussions of mountain goats on the Olympic Peninsula (Lyman 1988; Schalk 1988), there have been no systematic reviews or summaries of these data sources with respect to this issue. The purpose of this effort is not only to carefully examine the evidence but also to consider the adequacy of these data sources.

In the remaining sections of this paper, ethnographic and archaeological information pertaining to the existence of mountain goats is described, critically evaluated, and considered in the broader context of the Pacific Northwest. Chapter 2 examines the ethnographic data for mountain goat along the Northwest Coast in general and for the tribal populations of the Olympic Peninsula in particular. Chapter 3 reviews the archaeological data for the Peninsula. Chapter 4 discusses and summarizes the findings of this study.

2: THE ETHNOGRAPHIC DATA

2.1 METHODS

To understand the ethnographic data and to recognize its limitations, traditional ethnographic fieldwork methods must be discussed. Ethnographers who conducted fieldwork in the first half of the twentieth century were, with few exceptions, primarily concerned with salvaging information about rapidly vanishing lifeways. The objective of much of their fieldwork was the reconstruction of a picture of traditional culture—the lifeways as they existed when the first Europeans arrived. Interest in the contemporary communities at the time of fieldwork was limited.

Two methodological characteristics of their research followed from this salvage perspective. First, elderly individuals were nearly the exclusive focus of interviews. Although the ages of informants are not always provided, most were probably at least 60, and informants in their 90s were not uncommon. Second, a typical ethnography was a blend of both primary field ethnographic research and the ethnohistoric record—the accounts of early explorers, government agents, or anyone else who visited the area and produced a written account (c.f. Elmendorf 1960; Gunther 1927). Consequently, the time frame for which ethnographic data are most directly meaningful is the nineteenth century and, in some cases, the final decade or two of the 18th century. The ethnographic data considered below cannot dependably be extended further back in time without making assumptions about the nature of orally transmitted history. Archaeological data must be brought to bear on questions pertaining to time periods prior to the 19th century.

Before examining the ethnographic data, some additional comments on the methods that guided the review of ethnographic documents are necessary. Initial review involved examining major ethnographic sources on several Northwest Coast tribes outside the Olympic Peninsula. Consideration of sources outside the Olympic Peninsula is necessary for understanding interregional phenomena such as native trade systems. The review anticipated that a general perspective on the usage of mountain goats for the Northwest Coast would provide an important background for evaluating the specific ethnographic accounts available for the Olympic Peninsula. Having established such a context, the second step involved reviewing the principal ethnographic sources for each of seven tribal populations surrounding the Olympic Mountains. These main sources were identified by searching bibliographies of recent anthropological and archaeological reports from this region, by examining the sources identified in the Northwest Coast volume of the Handbook of North American Indians, and by searching at the libraries of the University of Washington and the Washington Office of Archaeology and Historic Preservation.

More than 30 anthropologists and archaeologists were consulted about mountain goat usage by native Northwest people. These individuals were asked about their knowledge of published or unpublished ethnographic and archaeological data pertaining to native use of mountain goats on the Olympic Peninsula and other regions of the Northwest Coast. Many of these anthropologists (at least 13) have conducted primary ethnographic or archaeological research on the Olympic Peninsula and, therefore, were especially helpful in providing current information on research in progress or in identifying sources that might otherwise be overlooked.

During the review of ethnographic documents, simply scanning sections dealing with the environment or hunting was not sufficient. It was clear after the survey of ethnographies of groups outside the Olympic Peninsula that information pertaining to mountain goats might be encountered under many different subject headings in an ethnography. For example, mountain goats are the subjects of art, myths, and folklore in other regions of the Northwest Coast and, if present, such information for the Olympic Peninsula tribes offered the potential to supplement the ethnographic descriptions of subsistence or hunting. Consequently, the review of ethnographic data involved searching through sections of documents dealing not only with economy but also those discussing technology, clothing, weaving, place names, mythology and folklore, art, and other subjects.

Ethnographic and ethnohistorical sources that were reviewed have been cited. To the extent possible, the dates or time span of original data collection and the number, ages and sex of native informants have been specified. A systematic consideration of these kinds of information allows for the evaluation of reliability and representativeness of the source documents in historical perspective. Exploitation of land mammals, use of the Peninsula's interior, and reliance on mountain goat wool or horns are summarized for each tribal population. Finally, the role of dog hair as an alternative or supplement to mountain goat wool is considered.

Appendix A lists the common and scientific names for the mammalian species discussed in this report.

2.2 USAGE OF MOUNTAIN GOATS ALONG THE NORTHWEST COAST

To understand the role of mountain goats in aboriginal cultures of the Olympic Peninsula, it is first useful to consider a broader geographic unit, the Northwest Coast. From Southeast Alaska to the Olympic Peninsula, native people depended on mountain goats in a variety of ways. Mountain goats offered a source of meat, fat, and raw materials such as wool, hides, and horns that were used for numerous purposes.

Techniques for hunting mountain goats varied. Bows and arrows, spears, snares, and dead-fall traps are mentioned as hunting devices (Boas 1921:173; De Laguna 1990:209; Kennedy and Bouchard 1990:325; Hilton 1990; Stern 1934:92; Suttles 1955:25). Drive and ambush techniques were used (Krause 1956:125) and frequently, hunting dogs were employed to drive the goats (De Laguna 1972:210; Hamori-Torok 1990). Most sources indicate that hunting took place in the fall, when animals tend to have the maximum body fat (De Laguna 1990:206; Duff 1952:72). Hunting grounds often appear to have been owned and inherited (Codere 1990:364; Garfield 1966:16; but see Duff 1952:72-73). Apparently meat was often processed and dried at or near a kill-site to minimize the weight that had to be carried out of such rugged terrain (Duff 1952:72-73).

Mountain goat flesh was a valued food for groups with access to these animals, but the flesh was probably of secondary importance to the other parts of the goat. The fat was eaten (Garfield 1966:13; De Laguna 1972:40;) but it was also used as a cosmetic (De Laguna 1972:40, 395; Smith 1988:181), sunscreen (De Laguna 1972:446-447; McIlwraith 1948); ointment and base for medicine (Kennedy and Bouchard 1990:325); boot grease (De Laguna 1972:437), condiment (Kennedy and Bouchard 1990:325); and occasionally on the northernmost coast as a lamp oil (De Laguna 1972:307). Mountain goats were a source of sinew (De Laguna 1972:425) and, once plucked clean of its wool, the skin could be pit-roasted and eaten (Boas 1921:443-444). The horns were steamed and carved to form spoons that were often ornately decorated (e.g. Drucker 1965:32; Eells 1985:107) but horns might also have been used to craft digging stick handles (Smith 1988:270) or, in the historical period, as powder containers (De Laguna 1972:1990:210). Although the skins were primarily treated as a source of wool, the Copper River Eyak made goatskin boats (De Laguna 1972:330).

Wool was probably the most important and widely used product mountain goats provided for native people. This wool was woven into blankets (Eells 1985:122), chiefly robes (Collins 1974:72; Drucker 1951:101,103); hair ornaments (Drucker 1951:139); caps and bonnets (Haeberlin and Gunther 1930:38); belts (Suttles 1974:263); strings on which dentalia shell were strung (Drucker 1951:139); loincloths (Suttles 1974:263); and women's skirts, mantles, and head bands (Eells 1985:119-123). The highly valued materials woven of goat wool tended to be associated with upper class status, and articles of goat wool were frequently used in special contexts such as potlatches (Elmendorf 1960:197), spirit dances (Stern 1934:57,65), bride-price payment (Suttles 1974:463), mourning ceremonies (Stern 1934:36), and burials (Suttles 1974:19). While mountain goat wool might be used alone in weaving, it was often mixed with other fibers including dog hair, waterfowl down, fireweed, and nettle (Collins 1974:54,70; Gunther 1927:222; Suttles 1974:245-264; Waterman 1973:34-36).

Differences in the availability of resources from region to region formed the basis of extensive aboriginal trade systems (Gibbs 1877:169-170). Along the larger mainland rivers,

such as the Columbia, Skagit, Fraser, Skeena, Nass and Stikine, coastal resources were exchanged for resources from the mountains and the interior. Similarly, differences in the availability of resources from one coastal region to another favored trading of resources between different coastal groups (e.g. Drucker 1951:9; Garfield 1966:16; Gibbs 1877:220; Eells 1985:204; Singh 1966:80-81).

Mountain goats, unlike deer, were not widely available along the Northwest Coast, their habitat being limited to the subalpine and alpine zones of the higher mountains along the mainland mountain ranges from Alaska through the Washington Cascades. For tribes whose territories included such areas, access to mountain goat hunting grounds provided them with highly valued commodities that could be traded with surrounding tribes which, while they lacked direct access to mountain goats, might have had access to other resources.

For the native groups in those regions lacking direct access to the high mainland mountain ranges offering mountain goat habitat, usage was largely limited to easily transported non-perishable products such as the wool and the horns. In the highly developed and stratified social systems of the Northwest Coast, scarce items tended to be markers of high status. The demand for these commodities undoubtedly exceeded the supply, and mountain goat wool or the clothing and blankets manufactured from it served as prestige items for the wealthy (Hirabayashi 1955:51; Elmendorf 1960:205; Suttles 1974:264).

Suggesting that the value of mountain goat wool was merely the result of its scarcity, however, may be an oversimplification. The Northwest Coast has a combination of climatic characteristics that place some distinctive constraints on clothing. The suitability of wool for wet, cool marine settings undoubtedly enhanced its value. The marine climate is cool enough to require substantial clothing but, at the same time, mild enough that most precipitation falls as rain rather than snow. Leather is not well suited to such climates (Drucker 1965:37). Although the ethnographic documents reviewed do not specifically discuss the thermal properties of mountain goat wool, it is likely that it tends to remain warm when wet like other kinds of wool. This property may derive from a wicking action or possibly from the way wool swells when damp to trap air pockets in its fibers.

Having mentioned the functional qualities of mountain goat wool, it is also necessary to consider other animal fibers that appear to have served a similar purpose. The expeditions of Cook in 1778 and Vancouver in 1792 documented the use of dogs as a source of fiber for weaving among the natives of Nootka and Puget sounds (Gleeson 1970; Howay 1918). Among many tribes of the southern Northwest Coast, dog hair was used in the weaving of blankets and clothing. A special breed of dog referred to as the "wool dog" was kept for the specific purpose of providing long, wooly hair that could be shorn and woven into blankets and clothing. Large packs of these dogs were apparently kept and, to avoid interbreeding with hunting dogs, were placed on islands, in special pens, or in houses (Gleeson 1970:20; Elmendorf 1960:97).

The distribution of wool dogs along the Northwest Coast at the time of European contact may be more than a historical accident. Gleeson (1972:20) describes the distribution of the wool dog as being "an area bounded to the south by the southern end of the Olympic Peninsula, to the east by the groups along the edge of Puget Sound and the Strait of Georgia, to the north by the Fraser river, and to the west by the Pacific Ocean." Anthropologists such as Gunther (1927:225) have noted that Northwest Coast tribes that kept wool dogs lacked mountain goats. Similarly, Suttles and Lane (1990:490) report that in the Puget Sound area the keeping of wool dogs was associated with saltwater peoples. In other words, ethnographic data on the distribution of wool dogs suggest a mutually exclusive relationship to the distribution of mountain goats. Barnett (1955:256; cited in Gleeson 1970:85) identifies dog hair as a substitute for goat wool, which was preferred in the weaving of blankets and clothing. In light of these ethnographic accounts, the presence of wool dogs on the Olympic Peninsula historically might be interpreted as indirect evidence for the absence of mountain goats in the region. Therefore, in considering the ethnographic information on mountain goats for the various Peninsula tribes below, information on wool dogs is also discussed. In a later section, the archaeological distribution of wool dogs is also considered, because this information may provide an indirect means of mapping the former distribution of mountain goats.

The ethnographic data indicate that the use of dogs as a fiber source declined in the decades following European contact (Gunther 1927:221), possibly as the result of interbreeding with European dogs (Elmendorf 1960:97; Boas 1891; cited in Waterman 1973:32) and/or as the result of the introduction of alternative fiber products such as trade blankets (Drucker 1965:197). Makah women were apparently observed weaving dog-hair blankets in 1850 (Gibbs 1877:174). By 1855 in Puget Sound, dog-hair and down blankets were most common among those Indians who had the least contact with whites (Gibbs 1877:174).

2.3 ETHNOGRAPHIC DATA FOR THE OLYMPIC PENINSULA TRIBES

The sections below discuss Peninsula tribes in a clockwise direction, beginning with the Quinault on the southwestern portion of the Olympic Peninsula. The approximate territories of the Peninsula tribes are shown in Figure 1. This map depicts tribal distributions in the early 19th century. Today the reservations for these tribes occupy small portions of their earlier territories. The Quinault Reservation today occupies the lower portions of the Quinault, Queets, Raft, and Moclips river basins. Descendants of the 19th century Quileute live today on the Quileute Reservation at La Push and the Hoh Reservation at the mouth of the Hoh River. Klallam people today occupy three reservations—at Jamestown, Port Gamble, and at the mouth of the Elwha River. The Chemakum disappeared as a separate tribal grouping by the early 20th century. Twana people now occupy the Skokomish Indian Reservation at the mouth of the Skokomish River on Hood Canal. The Humptulips, Wynoochee, and Satsop are subdivisions of the Upper and Lower Chehalis. Descendants of

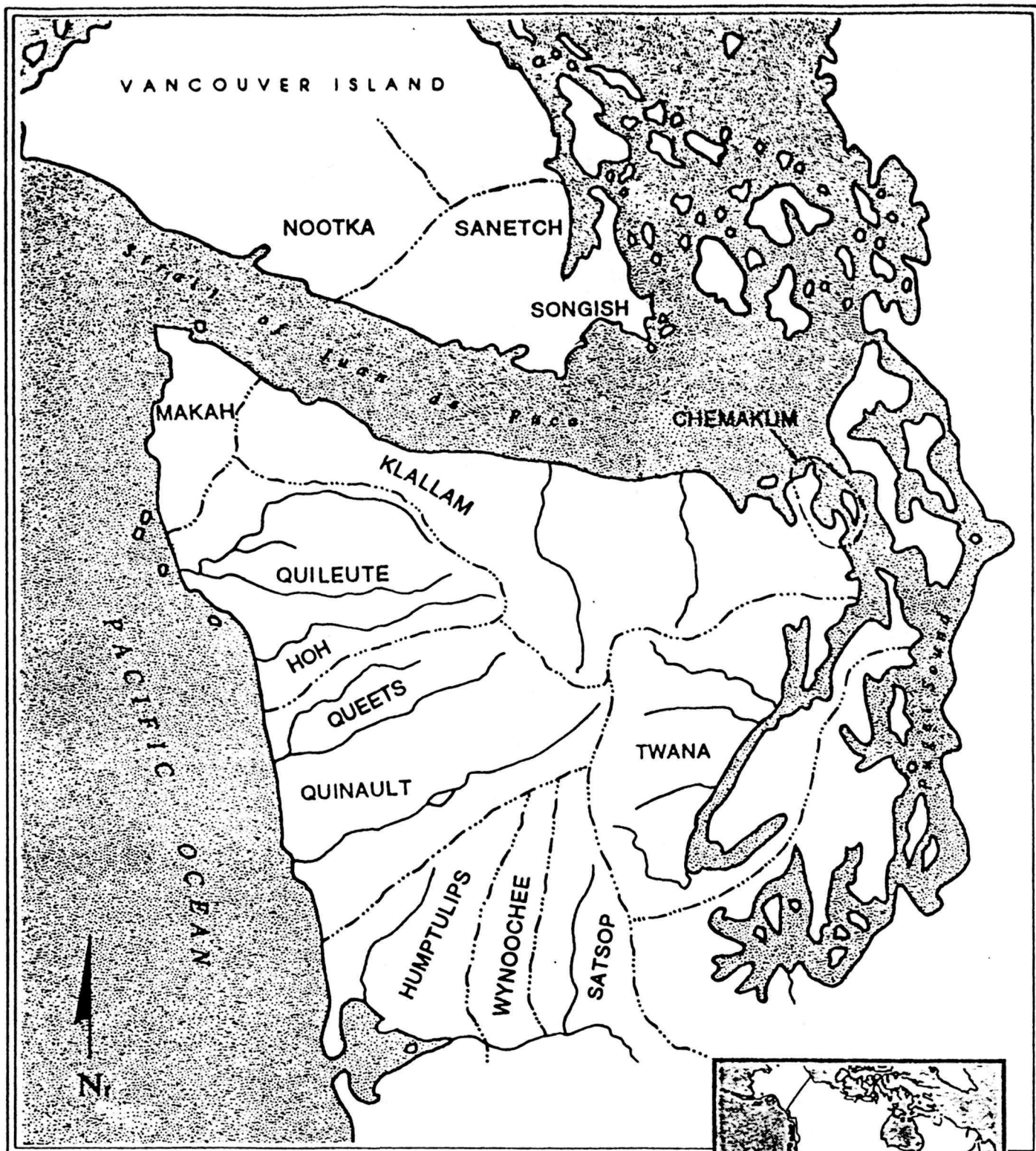


Figure 1 Indian tribes of the Olympic Peninsula in the early nineteenth century (redrawn from Elmendorf 1960:Map IV).

these people may be found on the Chehalis, Quinault and Shoalwater Bay reservations (Hajda 1990).

2.3.1 Quinault

The primary ethnographic source on the Quinault is Ronald Olson's 1936 monograph, *The Quinault Indians*. Sources of secondary importance include Curtis (1970), Farrand (1902), and Hajda (1990). Olson's study reports ethnographic research carried out on the Quinault Reservation between 1925 and 1927. Olson (1936:3) identifies five individuals as "chief informants" and another three as "informants of less importance." At the time of Olson's fieldwork, all informants were more than 60 years of age; five were males and three were females. Bob Pope, who was more than 90 years old, had hunted often in the mountains as a young man (Olson 1936:182). Based on informant ages and the time of Olson's fieldwork, first-hand observations by these informants can be extended back to about 1840.

In the mid-nineteenth century, the Quinault population was distributed along a lengthy reach of the Quinault River to locations upriver from Lake Quinault and well into the Peninsula's interior. The Quinault were among the most riverine of Peninsula tribes, and the upriver groups made substantial use of land game (Curtis 1970:11). Their upriver settlements were located where resources such as mountain goat, had these been present, would have been in close proximity.

In characterizing the mammals of this region, Olson (1936:3) states:

The mammals were those found over the greater part of the Northwest coast. Elk were especially abundant. *It is claimed that mountain goat and mountain sheep were unknown.* (emphasis added)

Although the focus in subsistence for many Quinault villages was riverine and marine, seasonal hunting in the mountains occurred in the late summer or early fall:

The entire family, or several families from the same village (usually relatives), frequently moved to the mountains during the late summer. Elk . . . , bear, and deer were most sought after, but no hunter could afford to scorn lesser game. Once in the mountains, the family proceeded to erect a semi-permanent camp of poles and brush, and . . . the hunter, or hunters, ranged far and near in search of game, while the women and children stayed at camp drying the meat and in their spare time gathering berries and basket grasses and barks. (Olson 1936:41)

Olson (1936:43) later enumerates the mammals he considers "lesser game"; these include marmot, beaver, land otter, raccoon, wildcat, rabbit, mink, and wolf. Hunting techniques are discussed for elk, deer, and bear, but again, mountain goats are not mentioned.

In his discussion of Quinault clothing, Olson (1936:57) says that robes were made of marmot, sea-otter, seal, bear, wildcat, mountain goat, bison, cougar, land-otter, and beaver. He identifies sea-otter and bison robes as being worn only by chiefs, the latter because they were scarce, having moved through an early nineteenth-century trade network. This network extended from the Quinault to the Lower Chinook, all the way to the Upper Snake River, and possibly to the eastern flanks of the Rocky Mountains.

Elsewhere, Olson (1936:81) states:

Spoons . . . were carved from soft or vine maple. Early in the nineteenth century trade with the Columbia river tribes resulted in the bringing in of buffalo skins and horns and after that time a few horn spoons were made. One informant stated, however, that horns of mountain goat and sheep were known earlier.

Although the Quinault kept wool dogs whose hair was used for weaving, no details are provided regarding the weaving of mountain goat wool.

Farrand (1902) conducted fieldwork among the Quinault in 1898 and produced a study of Quinault myths (1902). While many different animals are mentioned in these stories (e.g., wolf, wildcat, elk, dog, squirrel, owl, chickenhawk, wren, woodpecker, eagle, raven, crow, and blue jay), mountain goat was not mentioned.

2.3.2 Quileute

The principal ethnographic sources examined for the Quileute are Pettitt (1950) and Powell (1990). Pettitt does not specifically identify the dates of his fieldwork, but apparently it was undertaken in the mid-1940s. The ages and composition of his sample of informants are not systematically presented, but it appears that the sample included 15 or 20 individuals, both males and females. Some of his informants apparently formerly lived in upriver settlements (Pettitt 1950:3-4).

Pettitt (1950:5) summarizes Albert Reagan's (1917) account of fauna recovered in excavations of the La Push middens:

The great variety of sea products used by the Quileute is indicated by the long list of identifiable remains recovered from the kitchen middens of old Indian settlements. This list includes six varieties of salmon, halibut, cod, skate, dogfish, shark, trout, fifty-one species of shellfish, and various kinds of seaweed. These same middens yield remains of elk, bighorn sheep, mountain goat, black bear, deer, wildcat, beaver, raccoon, duck and geese.

Pettitt gives no indication that he is offering primary data that he personally collected in his ethnographic research among the Quileute; in fact, he indicates his reliance on Reagan for this resource information. Reagan's account is discussed in detail in the discussion of archaeological data.

In his discussion of hunting techniques, Pettitt offers no comment on mountain goats, and he makes no mention of them when enumerating the game species (Pettitt 1950:43). Aside from a reference to horn spoons (Pettitt 1950:10), Pettitt offers no other clues as to the use of mountain goats other than the single statement that clearly comes from Reagan. In fact Pettitt makes no mention of the use of mountain goat wool or dog hair in weaving. Other sources (Frachtenberg 1916; cited in Powell 1990:433), however, indicate that weaving of mountain goat wool occurred at least occasionally and that the Quileute kept wool dogs prior to European contact.

2.3.3 Makah

The principal ethnographic source dealing with nineteenth century Makah subsistence and culture is *The Indians of Cape Flattery* by James G. Swan (1870). Swan lived among the Makah from 1864 and 1868 while working as a teacher. His information regarding Makah culture as directly observed by his informants, therefore, can reasonably be extended back to the early nineteenth century. Other ethnographic sources providing additional details on the Makah include Gibbs (1877), Gunther (1936), Singh (1966), Renker and Gunther (1990), and Olson (1936). According to Dunn (1845:14), the Makah "manufacture some of their blankets from the wool of the wild goat. . . ." He provides no comment regarding the source of this wool.

The Makah territory lies at the extreme northwestern tip of the Olympic Peninsula (see Figure 1). This area is distinctive from most others on the Peninsula because it is drained by small streams drawing tribute exclusively from lowlands and foothills. This environmental feature of Makah territory partially accounts for the fact that, compared with other Peninsula tribes, such as the Quinault, Makah dependence upon terrestrial mammals, especially elk, was quite limited (Singh 1966:24).

Swan lists the fauna of the area:

The animals most common are elk, deer, black bears, wolves, beaver, otter, raccoons, skunks, minks, squirrels, etc. But these are found in limited numbers, although they abound in the interior. They are not much sought after by the Indians, who devote their attention more particularly to the marine animals. . . . (1870:2)

Of land animals they eat the flesh of the elk, deer, and bear; but, although these abound a short distance in the interior, the Indians very seldom hunt for them (1870:24)

Singh (1966:43) suggests that the Makah obtained elk, deer, beaver, and land otter hides from the Quileute and Quinault.

Describing information obtained from a Makah seal hunter and trapper, Gunther (1936:117) says of mountain goats:

Although the mountain goat does not occur on the Olympic peninsula the informant was familiar with the animal. . . . Mountain-goat wool was bought in Victoria through the Klallam. Finished blankets were bought more often than the raw wool.

The Makah kept wool dogs (Olson 1936:81; Howay 1918) and wove blankets of dog's wool before whites introduced wool trade blankets (Swan 1870:16, 43-44, 60; Gibbs 1877:174,176; Gleeson 1970). According to Dunn (1845:157), the Makah "manufacture some of their blankets from the wool of the wild goat. . . ." He offers no comment, however, on the source for wild goat wool.

Although the Makah traded with other groups that also did not have access to mountain goats, clearly they obtained some items through their trade partners from still more distant groups. For instance, Swan (1870:27) states that spoons of mountain sheep horn, obtained from tribes to the north, were used for eating at feasts. As the editor of this study by Swan, George Gibbs injects in a footnote attached to Swan's statement that ladles were made of wood or mountain sheep horn, but the spoons were manufactured from mountain goat. In other words, Gibbs' interpretation of Swan's statement is that Swan mistook mountain goat for mountain sheep.

2.3.4 Klallam

Erna Gunther's research among the Klallam in 1924 and 1925 constitutes the basis for her Klallam Ethnography, the most comprehensive ethnographic study of this tribe. Gunther (1927:173) identified three informants—one male and two females—by name. The male informant is described as being "especially well versed in fishing and hunting techniques," one of the females as knowledgeable about "woman's occupations," and the other female as an excellent source of folktales. Their ages are not provided, but Gunther was clearly interested in obtaining information about the "old life." Her work integrates the published literature available at the time of her study with her own informant data.

Klallam settlements extended from the mouth of the Hoko River on the west to Port Discovery Bay on the east (see Figure 1). The inland distribution of Klallam territory coincided roughly with those northern Peninsula drainages flowing into the Strait of Juan de Fuca. Although most Klallam villages were located on the saltwater coastline of the strait, Gunther (1927:177) describes the upper Elwha division of the Klallam as living about 20 miles up the Elwha River.

As indicated by the following passage, the hunting of land mammals was not of quantitative importance to the Klallam, nevertheless, land mammals were exploited systematically and this usage involved travel by specialized hunters into the mountainous interior.

Hunting is of least importance, economically, to the Klallam. What little of it is done is carried on at sea rather than on land. The mountains back of the Klallam territory are known only to the few hunters who go there for elk and deer. Occasionally a hunter will take his family along to help him dry the meat and carry it home. There is generally only one hunter to a village. He usually becomes wealthy because the skins he gets are in great demand. (Gunther 1927:204)

Gunther (1927:204, 205, 215) describes Klallam hunting techniques, but deer and elk are the only land mammals specifically mentioned. She describes the Olympic mountains as being "free to everyone," (Gunther 1927:205), suggesting the absence of owned territories as reported for groups such as the Kwakiutl and Tsimshian (Codere 1990:364; Garfield 1966:16).

The Klallam kept wool dogs as a source of fiber for clothing and bedding (Gunther 1927:221). This "wool" was mixed in a variety of combinations with the down of birds (such as geese, ducks, and gulls) or plant fibers such as fireweed cotton and cattail spikes (Gunther 1927:221). Mountain goat wool also was woven in combination with these materials. Nettle fiber served as the warp in a weaving technique that was based on a roller loom. The woven blankets were trade items and were also used as potlatch gifts (Gunther 1927:221). The Klallam stopped using dog hair in their weaving before Gunther's informants were born:

Gunther explicitly identifies the Klallams' source for mountain goat wool.

Mountain goat wool was bought by the Klallam from the Songish of Vancouver Island, who in turn secured it from the Cowichan of the mainland. Occasionally it was gotten from the Skagit and Snuqualmi who were good hunters. (Gunther 1927:222)

Gunther (1927:225) offers an important observation regarding the relationship between access to mountain goats and the keeping of wool dogs. She notes that the possession of wool dogs on the Northwest Coast was characteristic of those groups that did not hunt the mountain goat. Conversely, groups that had access to mountain goats within their own territories, such as the Snoqualmie, Skykomish, and Nisqually, did not keep this variety of dog. This seems to suggest that the fiber from wool dogs was a substitute for mountain goat wool, apparently used by groups lacking access to mountain goats to "stretch" the highly valued mountain goat wool or replace it altogether. In this light, the keeping of wool dogs by tribes of the

Olympic Peninsula would be difficult to explain if mountain goats were present in this region.

2.3.5 Chemakum

The Chemakum are probably the least known people of the Olympic Peninsula. According to Curtis (1970:141), warfare had reduced the Chemakum to about 90 individuals by 1855. Aside from stating that the Chemakum were probably quite similar to adjacent groups (Elmendorf 1990:438; Gibbs 1877:178) such as the Klallam, little direct or indirect information is available on the use of mountain goat by this tribe.

2.3.6 Twana

The traditional territory of the Twana included much of the eastern Olympic Peninsula, an area drained by streams flowing into Hood Canal (see Figure 1). A major division of the Twana, the Skokomish, had settlements along the Skokomish River. William Elmendorf's (1960) ethnographic research among the Twana is the principal anthropological data source on this group. His research is based primarily on the fieldwork he conducted between 1935 and 1955. He supplemented this primary data with the works of Eells (e.g. 1889) and Curtis (1970). Elmendorf relied mostly on three male informants—one born in 1860, a second in 1865, and the third for which a date of birth is not provided. He states that the information provided by his informants pertains to the time before 1870.

Twana hunting, similar to that of other Peninsula tribes, was undertaken by specialists, and the most important land animals were deer and elk. Black bear, beaver, otter mountain beaver, raccoon, hare, muskrat, and marmot were game species of lesser importance. The Skokomish, who occupied the primary drainage of the southeastern Olympic Peninsula, conducted communal elk hunts in the fall in the Olympic Mountains. These hunts, along with the specific mention of the hunting and roasting of marmot, are significant indications that the Twana hunted where goats would be encountered if present. In fact, the mountainous back country of Twana territory is currently an area of primary importance for mountain goats.

Elmendorf states in unequivocal terms that the mountain goat was not native to the region and that mountain goat horns, mountain goat blankets, and unspun goat wool were products obtained from eastern Puget Sound tribes, such as the Nisqually and Puyallup.

Mountain-goat horn was obtained in trade, from Puget Sound groups, but spoons of this material were probably not manufactured by the Twana. They were valuable and expensive articles. Spoons of butt-end elkhorn were made locally. Informants were doubtful whether mountain-sheep horn spoons were ever obtained; *this animal, like the mountain goat, did not occur in Twana territory.* (Elmendorf 1960:135; emphasis added)

The Twana bought or traded for most of their goat-wool blankets; *the mountain-goat did not occur locally*. Goat wool was sometimes obtained as a potlatch gift by women or in trade, and woven locally. (Elmendorf 1960:197; emphasis added)

One of Elmendorf's informants told the story of Transformer, which he had heard from a Satsop man. According to this narrative, "He (Transformer) put no goats in our mountains here [Olympics] but he gave the Skagit goats in their mountains, to eat and use the wool of" (Elmendorf 1961:23).

These ethnographic statements are of considerable importance because they clearly contradict Lyman's (1988) assertion that inferences regarding mountain goats from ethnography are based on negative evidence. Elmendorf's statements unambiguously exclude the mountain goat from this region during the period documented in ethnography.

The source for goat wool and horns was the Cascade mountains and, as Curtis (1970:13) notes, goat wool and hemp fiber were obtained through the Satsop division of the Upper Chehalis, who were intermediaries in the trade network.

Goat wool was highly valued, and its possession signified wealth. Mountain goat skirts, blankets, and shirts were markers of the upper class (Elmendorf 1960:203). Elmendorf (1960:197) was uncertain whether mountain goat wool was mixed with dog hair in weaving. The Twana did, however, keep wool dogs, and their hair was used in the weaving of blankets. The Twana kept their wool dogs in their houses, apparently to maintain them as a separate breed from their hunting dogs. Elmendorf suggests that the wool dogs were "bred out of existence by dogs introduced by whites in the mid-nineteenth century" (Elmendorf 1960:97).

2.3.7 Chehalis

Hadja's recent summary (1990) of the Southwestern Salish encompasses the Quinault, Lower Chehalis, Upper Chehalis and Cowlitz. The groups of interest here are those occupying the drainages that flow off the southern slopes of the Olympic Mountains. These are the Humptulips and Wynoochee subdivisions of the Lower Chehalis and the Satsop division of the Upper Chehalis (Elmendorf 1960:Map IV). Very little ethnographic information regarding the subject of interest is available for these specific groups as no comprehensive ethnographic study was ever conducted. Information is limited to a brief statement by Curtis (1970), and to Adamson's unpublished fieldnotes (Adamson 1926-1927) and her study of Upper Chehalis mythology (Adamson 1969).

Curtis (1970:13) identified the Satsop as the intermediaries in a network that traded mountain goat wool and hemp fiber from tribes east of the Cascades to the Twana. Adamson's field notes state that there "were not goats here" (1926-1927:40). She describes people receiving

mountain goat wool, finished mountain goat spoons, and buffalo horn spoons from relatives who lived east of the Cascades (1926-1927:40). Underskirts were fashioned of goat wool to wear under cedar-bark skirts.

2.4 DISCUSSION

In addition to the ethnographic data for individual tribes, some general information is available regarding the distribution of mountain goats. Referring to the Indians on the west side of the Cascades, Gibbs states:

There are mountain-sheep or, more properly goats, in the higher parts of the range (the Cascades); but they probably never constituted an important article of food, their wool being the principal object of their capture. Elk and deer are hunted to a certain extent, chiefly by the bands nearest the mountains. . . . (1877:193)

The Indians of the Sound and the Straits of Juan de Fuca attained considerable skill in manufacturing a species of blanket from a mixture of the wool of the mountain-sheep and the hair of a particular kind of dog. . . . *The wool is obtained from the hunting tribes next to the Cascade Mountains, and is an article of trade.* (Gibbs 1877:219-220; emphasis added)

Gibbs (1877:220) also mentions that bowls made from mountain sheep horn and spoons made from mountain goat horns were traded from the northern Northwest Coast (probably from tribes north of Vancouver Island such as the Tlingit, Bella Coola and Tsimshian) southward along the coast as far as California. Beyond the specifics of Gibbs comments, they are interesting because their relevance can be extended back to the early nineteenth century. In fact, in Gibbs' day, the Indians still remembered the arrival of the first European explorers in the region.

Ethnographies for Olympic Peninsula groups as well as those for groups in surrounding regions reveal that the sources for mountain goat wool and horns were external to the Peninsula. Significantly, these ethnographies do not identify the Olympic Peninsula or the tribes that occupied the Peninsula as a source of mountain goat products. Ethnographies for the Nootka north of the Peninsula (Drucker 1951), and Southern Coast Salish groups east of the Peninsula (Suttles and Lane 1990:490) identify either the Coast Mountains of British Columbia or the Washington Cascades as mountain goat hunting locations. Specifically mentioned as source groups are the Skagit, the Snoqualmie, and unnamed people east of the Cascades. The Songish of Vancouver Island are also mentioned as a source and this group was an intermediary with the Cowichan and other British Columbia mainland groups.

The assumption that the Peninsula's interior was simply unexploited or that because of "cultural differences," mountain goats were not used even though they were present on the Peninsula (Lyman 1988), is inconsistent with the evidence. Some of the Peninsula tribes, such as the Quinault, Elwha, and Twana, had riverine settlements, and the existence of specialized hunters is documented for these groups. The ethnographic data clearly indicate that a number of Peninsula groups hunted in the mountains of the Peninsula's interior. Even if "cultural differences" were involved in the failure to exploit mountain goats living in the Olympics, explaining why Peninsula groups valued mountain goat wool and horns and obtained them from their trading partners outside the Peninsula is difficult. If mountain goats were present but unexploited historically because of "cultural differences," this would be the first known instance in which a large ungulate was purposefully ignored by any Northwest Coast tribe. The ethnographic evidence for the Northwest Coast strongly argues for the opposite interpretation: that mountain goat products were valued throughout virtually the entire area whether locally available or obtained through trade.

Mountain goat flesh, even though it was valued by those that actually hunted these animals, was probably not as important as the wool and horns. These materials were sought well beyond the goats' range. Although the goat habitats were quite limited, extensive trading networks moved goat products throughout the Northwest. These networks were apparently in place at initial European contact.

The unusual climatic characteristics of the Northwest Coast seem to make wool a particularly valuable fiber for clothing. The hair of the wool dog was apparently a functional substitute for goat wool and, for groups that lacked access to goats, a serviceable if less prestigious alternative. The keeping of wool dogs is well documented for the Quinault, Quileute, Makah, Klallam, and Twana—every Peninsula tribal population for which substantial ethnographic data are available. The distributions of wool dogs and mountain goats seem to be non-congruent on the Northwest Coast. For the Olympic Peninsula, this seems to provide additional and independent, albeit less direct, evidence for the absence of goats during the historic period. How long the practice of raising wool dogs can be extended into the past is an archaeological question that is discussed in the next section.

Finally, it should be noted that there is potential for confusion regarding biological nomenclature when dealing with early historic accounts. According to George Gibbs (Swan 1870:27), Swan did not accurately distinguish between mountain goat and mountain sheep.

One of the more dramatic examples of how misleading imprecise names for animals can be is an account described by Aurel Krause (1956:277). According to this account, Russians at Sitka, Alaska purchased 2774 mountain goats from Tlingit hunters who had dispatched the animals after a heavy snow. Subsequent research has shown that the animals referred to were actually the small deer native to that area (Madonna Moss, personal

communication 1992). In this instance, the translation from Russian to English may be the source of the confusion but idiosyncratic uses of animal names in early accounts are common. Similarly, the mountain goat has occasionally been listed as indigenous to the Olympic Mountains by archaeologists (e.g. Blukis-Onat 1976:21; Daugherty et al. 1982:3). These instances apparently represent inferences about the past resulting from reliance on modern distributions of mountain goats (Astrida Blukis-Onat, personal communication, 1992).

3: THE ARCHAEOLOGICAL DATA

Four kinds of archaeological evidence will be considered in this chapter. The first is perhaps the most direct—the archaeofaunal data pertaining to mountain goats. These data are considered in brief, site-by-site discussions of those Peninsula sites from which some mammalian fauna remains have been recovered. The second kind of evidence is less direct and involves the archaeological distribution of the wool dog because, as suggested earlier, the keeping of dogs for fiber may indicate the absence of locally available alternatives such as goat wool. The third class of evidence involves a brief consideration of the archaeological distribution of artifacts related to weaving, with an eye to examining the time depth of weaving. The fourth kind of evidence is the archaeological record of the subalpine zone of the Olympics. As a context for evaluating the results of this review, the final section considers how mountain goats are represented in archaeofaunal assemblages from other Northwest regions.

3.1 THE ARCHAEOFAUNAL DATA

Typical faunal collections from the Olympic Peninsula include shellfish, land mammals, sea mammals, birds, marine fish and sometimes freshwater fish. Quantification of these different faunal classes has not been standardized in the various archaeological investigations. For the purposes at hand, the mammalian faunal collections are those of particular interest, but even for these collections few sites have quantitative information available in a form that can be compared directly with other sites. Some assemblages are characterized in terms of minimum numbers of individual animals (MNIs) represented, others in terms of numbers of identified specimens (NISP), a few in terms of both of these measures, and several that provide no absolute numbers at all. This is not, however, a serious limitation to the present effort because the concern is not with quantification or relative abundance of different resource species but rather with their presence or absence. When available, quantitative information has been included with the intent of gaining an impression of sample size and diversity. Sample sizes are, of course, relevant for evaluating the adequacy of the available faunal data for addressing past faunal distributions on the Olympic Peninsula.

In the discussions that follow, an attempt has been made to summarize for each site the basic type of site and the scale of the excavations conducted. Usually scale of excavation can be expressed in volumes of sediment excavated but, for lack of estimates in some instances, scale of investigations is characterized more qualitatively. Because the purpose here is to gain insight into the temporal distribution of a species, the age of the site deposits is characterized to the extent possible. Often this can be accomplished through reference to radiocarbon dates, but in other instances more loosely as late prehistoric (i.e., less than 3000 years old) or historic (i.e. occurred after ca. 1790). After establishing these aspects of

background information, the mammalian fauna is enumerated. Further details regarding the nature of the faunal analysis are provided where appropriate.

The sites are discussed in a rough geographic order starting on the southwestern Olympic Peninsula, moving northward along the Pacific Coast, then eastern along the Strait of Juan de Fuca, then southward along Hood Canal, and finally terminating in the interior. Figure 2 shows the general locations of the sites discussed.

3.1.1 Minard (45-GH-15)

The Minard site, a late prehistoric shell midden, is on the northern end of Grays Harbor (see Figure 2). Washington State University archaeologists investigated this site in 1969 and 1970 (Roll 1974). A total of 204 m³ was excavated in blocks placed in seven areas of the site. Prehistoric residential and burial areas as well as Euroamerican occupations spanning most of the nineteenth century were revealed.

Although mammalian faunal remains were collected from all areas, only those from Area B were analyzed. The basal deposits in this area yielded dates of 1080 \pm 110 and 980 \pm 95 B.P. (Roll 1974:209). A third date from overlying deposits yielded an age of 865 \pm 95 B.P. The presence of historical artifacts suggested continuation of site occupation through much of the nineteenth century.

Faunal data for this site are difficult to interpret because analytical methods are not explicitly discussed and the units of quantification are unclear. Determining the number of bones recovered, how many were analyzed, or how many were actually identified is impossible. But a collection from an excavation of more than 200 m³ of midden probably contained at least a few thousand mammal bones. In any case, the species identified are of primary interest here and these include snowshoe hare, Columbian black-tailed deer, elk, sea otter, Northern fur seal, harbor seal, mountain beaver, beaver, domestic dog, coyote, river otter, muskrat, black bear, sea lion, porpoise, whale, and Northern elephant seal (Roll 1974:Table 15). No changes through time in faunal species were noted.

3.1.2 Toleak Point (45-JE-9)

Toleak Point, a shell midden site, located on the Peninsula's outer coast between the mouths of the Quileute and Hoh rivers, was tested by Washington State University archaeologists in 1958 (Newman 1959). The site is described as the location of plank houses and is characterized as a small village. The presence of an historical component is noted, but dating of the earlier deposits at this site is problematic because no radiocarbon dates were assayed. Based on artifact typology, the site can be characterized as late prehistoric and probably contains deposits that are less than 1000 years old. No faunal analysis of this collection has occurred and the only information available on its content is Newman's cursory remarks that land mammal bones were infrequent relative to sea mammal bones and that for the land mammals "the main types of identifiable bones were elk and deer" (1959:92).

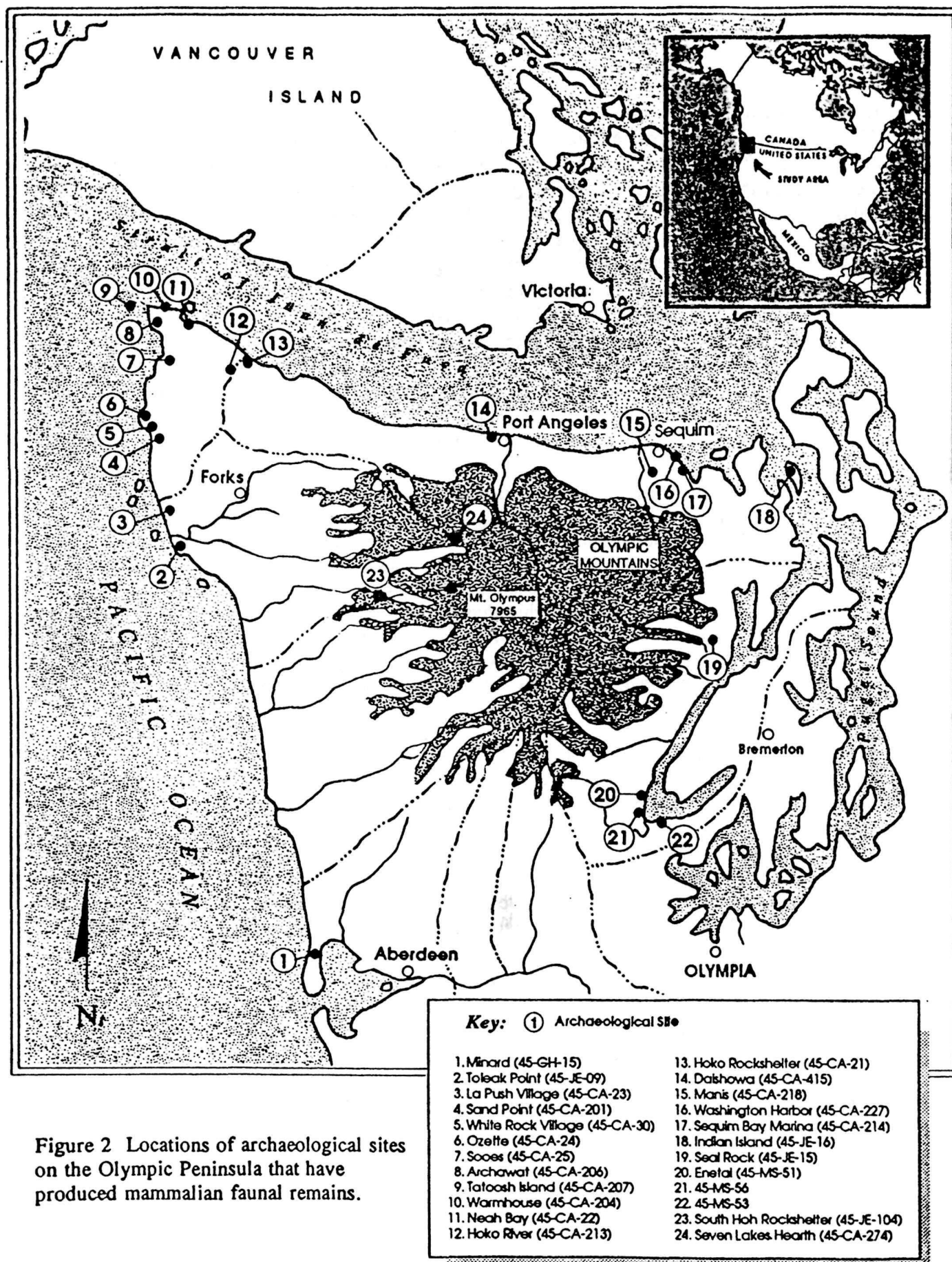


Figure 2 Locations of archaeological sites on the Olympic Peninsula that have produced mammalian faunal remains.

3.1.3 La Push Village (45-CA-23)

While serving as a government agent on the Quileute and Hoh reservations between 1905 and 1909, Albert Reagan investigated many archaeological sites in the area (Reagan 1917). Near the mouth of the Quillayute River, Reagan discovered several middens including one at the village of La Push that covered approximately 20 acres (see Figure 2). Other middens Reagan mentions were located up and down the coast from La Push, on James Island, at Beaver, Forks, and Quillayute prairie, and along the Quillayute River. By modern archaeological standards, his account is extremely vague because he provides little linkage between artifacts and specific sites. No information is provided about the nature of excavation techniques or the scale of excavations undertaken.

Reagan (1917:14-16) provides a list of "fish, animal, and plant remains found in the middens at La Push, Washington, and vicinity. . . ." His statement regarding the animal bones that were recovered deserves full quotation:

Bones of hair seal (*Phoca vitulina*), fur seal, sea otter, porpoise, sea lion, and bones of the following species of whale: sperm whale, black fish, fin-back, sulphur bottom, California gray, and killer whale; also bones of the following fishes: Halibut, bastard cod, codfish, squid?, (*Octopus tuberculatus*)?, skates, dogfish (*Acanthias suckleyi*), sharks, trout (*Salmo* spp.), Anarrhichthys, species, spring salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), silver salmon (*O. kisutch*), dog salmon (*O. keta*), humpback salmon (*O. gorbuscha*), and steelhead trout (*Salmo gairdneri*). (Reagan 1917:15-16)

Bones of animals identified: Elk, big horn, mountain goat,² black bear, Putorius, species?, black-tailed deer, wild cat, beaver, raccoon and otter. (Reagan 1917:16)

The footnote after mountain goat reads "The latter two are found usually only in the ladle form of the horns" (Reagan 1917:16). The meaning here seems reasonably clear. Reagan was referring to horn spoons that, as discussed earlier, were traded rather widely throughout the Northwest Coast. As well-known trade items that might travel several hundred miles from their original source, horn spoons of mountain sheep and mountain goat cannot be interpreted as evidence that these species were indigenous to this particular region. In fact, the footnote seems to be offered as a qualification to preclude such an inference. Moreover, the known habitat requirements of mountain sheep seem to eliminate the Olympic Mountains as suitable habitat for this species. Valerius Geist, an authority on mountain sheep, suggests that mountain sheep "are not found in areas with high precipitation, be it rain or snowfall, and therefore are confined to dry mountains." (1971:9)

A few other comments are noteworthy regarding the above-cited passage by Reagan. These comments are useful because they call attention to the fact that Reagan could not have actually identified all of the species in his list from faunal remains recovered from archaeological sites. For example, squid have no osseous or non-perishable anatomical parts. This may be the only archaeological site in the Pacific Northwest from which squid remains of any kind have been identified. A second example involves what appear to be impossible species distinctions among the salmonids. Distinguishing the bones of the five species of Pacific salmon is extremely difficult, and it is quite unlikely that Reagan or his colleagues did so in 1917. A few techniques for this do exist now, but these were not known or in use at the time of Reagan's study and most involve anatomical elements rarely recovered archaeologically (e.g. scales and otoliths). In other words, Reagan's list of species cannot be considered an objective listing of species he actually identified from the archaeological sites. His faunal list appears to be a statement of his expectations about the species he assumed were present based upon non-archaeological information sources. His suggestion that mountain goats were usually represented by horns and spoons in the middens at La Push may reflect an expectation based upon his observation that these items were kept as valued heirlooms by Quileute people at the time of Reagan's visit. The keratinous materials such as horn, nails, hair and hooves do not typically preserve in midden deposits or even waterlogged midden deposits of the Northwest.

The 20-acre shell midden site described by Reagan at La Push was subsequently designated 45-CA-23. This site was tested in 1975 to assess the effects of construction of a sewage system at the village of La Push (Duncan 1981). A single 1 x 2 m test pit was excavated to 2.7 m below surface. Four radiocarbon assays produced dates of 550 ± 75 , 590 ± 75 , 470 ± 90 , and 765 ± 75 B.P. The presence of cultural deposits beneath all the assayed charcoal samples suggests that the deposits may span eight centuries or more (Duncan 1981:62). Regarding the mammalian fauna represented, Duncan (1981:31) lists Northern fur seal, California sea lion, whale, deer, elk, and beaver. No faunal analyst is identified, and aside from mentioning that 21.8 kg of mammal bone were recovered from the single test unit, quantitative data are lacking.

In 1978, archaeological monitoring was conducted for human burials during the backhoe excavation of a long trench through this deposit (Chatters 1978). Mammalian remains observed during backhoe trenching through about 111 m of midden deposits included "in order of abundance . . . sea lion and fur seal, elk, harbor seal, deer, whales, sea otter, bear, beaver and dog" (Chatters 1978). No other quantitative data are provided.

3.1.4 Sand Point (45-CA-201)

Sand Point, a large shell midden, lies on a marine terrace overlooking the Pacific Ocean about 5 km south of Cape Alava (see Figure 2). In 1979 the site was tested by Wessen and Associates (Wessen n.d.). Testing involved the excavation of one 1 x 2 m test pit and eight 10-cm soil auger probes. Two radiocarbon dates were assayed from the upper and

lower strata of the deposits, and these yielded dates of 1600 ± 75 B.P. and 2270 ± 75 B.P. The faunal assemblage included 313 identifiable mammal bones. The actual numbers of specimens assignable to individual taxa are not provided, but based on estimates of minimum numbers of individuals, sea mammals strongly dominate this small assemblage, with fur seals greatly outnumbering all other mammals (Wessen n.d.:Table 4). Sea lion, hair seal, dolphin, and whale are also represented in the collection. The only land mammals identified are deer and elk.

Additional testing in 1992 involved the excavation of one 2 x 0.5 m unit (Gary Wessen, personal communication 1992). Analysis of faunal remains from this unit is in progress but preliminary results indicate that deer, elk, Northern fur seal, and possibly dog remains are present.

3.1.5 White Rock Village Site (45-CA-30)

The White Rock Village Site is located on the Pacific Coast of the northwestern Olympic Peninsula about 1.5 km south of Cape Alava (see Figure 2). In 1955 University of Washington archaeologists conducted cursory tests at this site using two short trenches (Stallard and Denman 1955). A whale bone is mentioned in their report but no actual faunal data resulted from their effort and it is not clear whether faunal remains were collected. In 1961 Washington State University archaeologists excavated a 25 ft long trench that extended in places to 5.5 ft below surface (Guinn 1963). A single radiocarbon date from the lowest stratum of this stratified shell midden produced an age estimate of 387 ± 42 B.P. A historical component is also present. Aside from casual remarks about the presence of whale bones and a bone tool manufactured of elk or deer bone, this project produced no faunal data. The faunal collection has not been analyzed.

3.1.6 Ozette (45-CA-24)

The Ozette Site (45-CA-24) is located at Cape Alava, along the Peninsula's outer coast (Figure 2). Between 1966 and 1982, Washington State University archaeologists intensively excavated portions of this site's late prehistoric and historical deposits (Gleeson 1980; Huelsbeck 1983). Although deposits as much as 2000 years old are present, excavation was concentrated in deposits spanning the past five centuries and extending into the early twentieth century. Wessen (1990:420) says that types of fauna at this site remained relatively constant throughout the past 2000 years and that the culture apparently remained much the same during that time span as well. Because of the unusual presence of water-saturated deposits at the site, organic preservation was exceptional and the excavations uncovered not only preserved plank house structural elements but thousands of other perishable artifacts.

The total sample of identified mammal bone from Ozette amounts to nearly 53,000 elements (Huelsbeck 1983:13). Sea mammals strongly dominate this collection and include Northern fur seal (47,296), porpoise (1104), sea lion (930), sea otter (501), harbor seal (377), and Northern elephant seal (2). Land mammals in this collection include dog (1974), deer (485),

elk (100), raccoon (32), black bear (21), beaver (23), mink/weasel/skunk (23), river otter (15), marten (8), wolf (4), red squirrel (5), rabbit (2), mouse (5), and cow (2). Beyond the obvious fact that no mountain goat remains were identified in this large collection, the most salient characteristic is that sea mammals represent 94.9 percent of all identified mammal remains. A single species of sea mammal, the Northern fur seal, constitutes nearly 90 percent of the total site assemblage. Land mammals constitute 5.1 percent of the mammalian assemblage, and most of the land mammal remains are domestic dog, which comprise 3.7 percent of the total mammalian assemblage.

As was mentioned under the discussion of the Makah, the northwestern corner of the Peninsula offers relatively limited terrestrial mammal food resources. Unlike most other tribes on the Peninsula, the Makah did not have territory extending into the mountainous interior of the Peninsula. This is clearly displayed in the Ozette faunal assemblage which, as Huelsbeck (1983:31) notes, is composed entirely of species that occur today in the site vicinity. Considering the size of this assemblage, the low frequency of deer and elk as well as the absence of the alpine-dwelling marmot, seem to suggest the lack of montane habitats in the hunting territory of the occupants.

3.1.7 Sooes (45-CA-25)

The Sooes Site lies near the Peninsula's northwestern tip and faces the Pacific Ocean (see Figure 2). This site, a historically occupied village, was tested by Washington State University archaeologists in 1976 (Friedman 1976).

Excavations of one 2 x 2 m unit and two 1 x 2 m units yielded 577 identifiable faunal elements (Friedman 1976:Table 13). Among the 419 sea mammal elements identified are fur seal (335), dolphin or porpoise (21), sea otter (33), Steller sea lion (8), Northern elephant seal (1), and harbor seal (21). Land mammals include dog (26), beaver (8), elk (68), black bear (1), river otter (5), bobcat (2), and black-tailed deer (48).

3.1.8 Archawat (45-CA-206)

The Archawat Site faces the Pacific Ocean, slightly south of the northwestern tip of the Olympic Peninsula (Figure 2). Washington State University archaeologists recovered a very small sample of mammal bones during a test in 1976 at this site, which was a Makah spring and summer fishing camp historically (Friedman 1976:Table 9); Swan 1870:6). Thirty-five identifiable bones were recovered from a 2 x 2 m square and a 1 x 3 m trench. Sea mammals represented include Northern fur seal (15), dolphin or porpoise (2), and harbor seal (2). Land mammals include deer (12), dog (3), and black bear (1).

3.1.9 Tatoosh Island (45-CA-207)

Located on a very small island off the far northwestern corner of the Olympic Peninsula, the Tatoosh Island Site was tested by archaeologists from Washington State University in 1976 (Friedman 1976). Consistent with its location and the ethnographic accounts suggesting

usage as a summer fishing camp (Swan 1870:6), mammal remains from this site are primarily fur seal.

Excavation of three units totaling 11.9 m³ at this shell midden produced 635 mammal bones, including fur seal (531), dolphin or porpoise (6), sea otter (5), Steller sea lion (16), Northern elephant seal (2), and harbor seal (14). Species represented among the 61 identifiable land mammal bones include dog (15), beaver (1), elk (5), black bear (1), deer (38), and raccoon (1).

3.1.10 Warmhouse (45-CA-204)

The Warmhouse Site, another ethnographically recorded Makah summer fishing camp, is also located on the northwestern Olympic Peninsula, facing the Strait of Juan de Fuca (Friedman 1976). Excavation of two 1 x 2 m units totaling about 5 m³ resulted in the recovery of 97 identifiable mammal bones. Of these bones, 62 are sea mammal and the remaining 35 are land mammal. Sea mammals identified include Northern fur seal (4), dolphin or porpoise (42), Steller sea lion (1), Northern elephant seal (1), and harbor seal (14). Identified land mammal species are dog (1), elk, (2), and black-tailed deer (32).

3.1.11 Neah (45-CA-22)

The Neah Site, located on the northeastern tip of the Olympic Peninsula in the town of Neah Bay (see Figure 2), was a Makah winter village historically (Swan 1870:6). The site lies at about 7 m above sea level and was tested by Washington State University archaeologists in 1976 (Friedman 1976).

Excavation of about 7.4 m³ of the deposits yielded 107 identifiable mammal bones from 11 taxa, 10 of which are identified to the species level. Sea mammals include fur seal (61), dolphin or porpoise (6), Steller sea lion (4), Northern elephant seal (1), and harbor seal (3). Land mammals represented include dog (7), beaver (1), elk (7), river otter (2), black-tailed deer (12), and raccoon (3).

The Makah Cultural and Research Center has recently tested one area of this site to evaluate the effects of modifications to an existing church (Wessen 1991). A single 1 x 2 m test unit was excavated to 1.2 m below surface (2.4 m³), and 23 soil auger probes were excavated. Two radiocarbon dates were obtained, yielding estimates of 2170 ± 60 B.P. and 2070 ± 70 B.P. More recent prehistoric deposits may be present, and historical artifacts recovered from this locality are considered to relate to the last half of the twentieth century (Wessen 1991:27). Only 19 mammalian faunal remains were recovered, including dog, rat, and possibly sea otter. Several fragments of unidentifiable marine mammal bone fragments were also recovered.

3.1.12 Hoko River (45-CA-213)

The Hoko River Site is located on the northwestern Olympic Peninsula near the mouth of a small river. A multiyear investigation of this site by Washington State University revealed waterlogged deposits dating between 3000 and 2200 B.P. (Croes and Hackenberger 1988). The site, which has yielded a large number of marine fish and bird bones, is interpreted to be a fishing camp. Of 4367 bones analyzed from the water-saturated portion of the deposit, only 23 were identifiable mammalian faunal elements (Croes 1991). Among the species identified are black-tailed deer, elk, beaver, black bear, Pacific killer whale, gray whale, Northern fur seal, Northern sea lion, and harbor seal (Croes 1991:Table 3.1).

3.1.13 Hoko River Rockshelter (45-CA-21)

A second site investigated by Washington State University near the mouth of the Hoko River is the Hoko River Rockshelter (45-CA-21). This shell midden deposit is approximately 400 m downstream from the waterlogged deposits of Site 45-CA-213 described above. The deeply stratified midden deposits of the rockshelter date between 900 B.P. and the historic period. In addition to large quantities of marine fish and birds, excavations at this site yielded a sizable sample of mammalian remains (Wigen and Stucki 1988). A total of 3262 mammalian faunal elements was recovered and 83.5 percent of these are marine mammals. As with the Ozette faunal assemblage, Northern fur seal dominates the sea mammals, in this case representing 82.5 percent of all sea mammals. The terrestrial mammals amount to 16 percent of the total mammalian assemblage, and the taxa identified include deer, elk, dog, raccoon, river otter, skunk, mink, marten, black bear, rabbit, small rodent, beaver, and squirrel (Wigen and Stucki 1988:Table 1). A few elements possibly representing wolf and cougar were also recovered.

3.1.14 Daishowa (45-CA-215)

The Daishowa Site, located on Ediz Spit in Port Angeles (see Figure 2), was investigated in 1992 by Larson Anthropological Services, and a report of this work is now being prepared (Lynn Larson, personal communication 1992). A single 1 x 2 m excavation unit yielded 1894 faunal elements. These include fish (850), mammals (926), birds (61), shellfish (56), and turtle (1). A total of 143 faunal elements was identified to at least the genus level including canids (36), *Lynx* sp. (1), elk (4), deer (5), harbor porpoise (52), sea lion (36), and harbor seal (9).

3.1.15 Manis Site (45-CA-218)

The Manis Site is about 3 km south of Sequim, Washington, at an elevation of approximately 165 m (see Figure 2). In 1977 the discovery of mastodon tusks at the site by the landowner attracted the attention of Washington State University archaeologists, who carried out intensive excavations in 1978 (Gustafson et al. 1979). Radiocarbon dates from wood and seeds associated with the skeletal remains of the mastodon produced dates of $12,000 \pm 310$ B.P. and $11,850 \pm 60$ B.P. Overlying the mastodon level are more recent deposits, some of which appear to underlie 6800 year old Mazama ash deposits.

Although the status of the mastodon and associated remains as cultural deposits has been questioned (e.g. Fladmark 1982), the faunal collection is of relevance to the problem at hand regardless of how it accumulated. Investigations have only been partially reported, but non-quantitative faunal data have been summarized (e.g. Gustafson et al. 1979; Gilbow 1981; Petersen et al. 1983). The fauna associated with the mastodon include caribou, bison, black bear, and muskrat.

3.1.16 Washington Harbor (45-CA-227)

The Washington Harbor Site, located on the west side of Sequim Bay (see Figure 2), contains historical and prehistoric components. In 1981 Rice and Woodruff (1981) excavated a 2 x 2 m block to a depth of 2.8 m with a resulting volume of 11.2 cubic meters. The excavation resulted in the recovery of fish, shellfish, bird, and mammal remains, but quantitative information is limited to the statement that "a surprising quantity of faunal remains was recovered from the test pit excavation" (Rice and Woodruff 1981:23). Elk, deer, and dog were the mammalian fauna mentioned.

Later in 1981, Blukis Onat Applied Sciences, Inc., screened 6.3 m³ of sediments removed from a backhoe trench (Blukis-Onat and Larson 1984). A single radiocarbon date of 650 B.P. was obtained from basal deposits at the site and occupation of the site was interpreted as being continuous to the present. Among the 82 mammalian faunal remains recovered were elk, deer, Northern fur seal, harbor seal, and canid (dog, wolf, or coyote specimens).

3.1.17 Sequim Bay Marina (45-CA-214)

The Sequim Bay Marina Site (45-CA-214) is on the west side of Sequim Bay near Pitship Point (see Figure 2). The site was investigated by the Office of Public Archaeology as a part of marina development planning in 1976 (Kennedy and Thomas 1977). Two 1 x 2 m test pits yielded a small number of mammal bones, most of which proved to be from domestic cow although deer, elk, and black bear are also represented. A single radiocarbon date obtained from one locality produced a date of 2200 \pm 75 B.P., but the investigators concluded that the site had been severely disturbed.

In 1983 and 1984, other portions of this site were evaluated by Wessen and Associates after shell midden deposits were discovered in the intertidal zone during monitoring of marina construction (Wessen 1984). Two radiocarbon dates from the shell midden deposits yielded dates of 390 \pm 50 B.P. and 570 \pm 70 B.P. In addition to the shellfish, fish, and bird remains, this testing effort recovered a sample of 30 mammal bone fragments. Land mammals represented in this small collection include harbor seal, deer, elk and "undetermined large mammal" (Wessen 1984:Table 7).

3.1.18 Indian Island (45-JE-16)

Indian Island is located near the Olympic Peninsula's northeastern tip about 5 km south of Port Townsend (see Figure 2). In 1975 salvage excavations were undertaken there by Washington State University in anticipation of Navy construction activities (Blukis-Onat 1976). The excavations were substantial, including 23 2 x 2 m units and four 1 x 1 m units all excavated to depths varying from 0.5 m to 2.6 m below surface. Site occupation is placed in the last millennium based on the presence of historical artifacts and three radiocarbon dates yielding age estimates of 950 ± 65 , 315 ± 60 , and 90 ± 60 years B.P. Mammalian fauna data from 45-JE-16 are expressed only as minimum numbers of individuals (numbers of specimens are not provided). Elk (11), deer (9), seal (9), dog (6), and porpoise (5) are strongly represented with beaver (2), sea otter (2), bear (1), raccoon (1), sea lion (1), skunk (1), hare (1), pig (1) and cow (1) also present.

The Buggy Spit site (45-JE-6) and others on Indian Island were also tested, but recovered fauna have not been analyzed (Astrida Blukis-Onat, personal communication 1992).

3.1.19 Seal Rock (45-JE-15)

The Seal Rock Site, a late prehistoric shell midden, is about two kilometers north of Brinnon, Washington (see Figure 2). Investigations involved excavation of one 1 x 2 m test excavation unit and 26 10-cm-diameter auger holes (Wessen 1987). Three radiocarbon dates place occupations between 410 and 720 B.P. (Wessen 1987:Table 10). These excavations yielded 120 mammal bones, of which 32 are identified as deer and 16 are identified as elk. This small faunal collection also included two antler fragments, 45 elements described as unidentifiable large terrestrial mammal, four elements described as unidentifiable dog-size mammal, and 20 elements listed as unidentifiable marine mammal (Wessen 1987:Table 80).

3.1.20 Enetai (45-MS-51)

Enetai, a complex midden deposit, is located on lower Hood Canal near Hoodspport, Washington (see Figure 2). The University of Washington Office of Public Archaeology excavated 1.4 m³ in a single test unit at this site in 1977 (Kennedy 1979). The site contained both historical and prehistoric components. Besides the quantities of fish and shellfish remains, the test unit yielded remains of elk, deer, harbor seal, wolf, and marten. Quantitative information is not provided for the faunal remains. In addition to the historical artifacts (1930–1970s) in the upper stratum of the deposits, three radiocarbon dates provide temporal control. These dates are 1470 ± 55 B.P., 1545 ± 65 B.P., and 1555 ± 60 B.P.

3.1.21 Site 45-MS-56

Site 45-MS-56, a shell midden deposit, is located on the Skokomish River delta at the southern end of Hood Canal. Three 1 x 1 m test excavation units (about 1 m³ total) were excavated at this site by the University of Washington Office of Public Archaeology in 1977 (Kennedy 1979). The site contains both historical and prehistoric components. Information on mammalian fauna recovered is limited to the statement that a single unidentified large

mammal bone fragment was recovered from prehistoric deposits and that the remains from the historical component include artiodactyl. A single radiocarbon date from the prehistoric deposits returned a contemporary age estimate, interpreted as more recent than A.D. 1690. The historical component is assigned to about the last quarter of the nineteenth century.

3.1.22 Site 45-MS-53

Site 45-MS-53, a deeply stratified shell midden, was tested by the University of Washington Office of Public Archaeology in 1977 (Kennedy 1977). A total volume of less than 2 m³ was excavated in a single 1 x 1 m test unit. Two radiocarbon samples returned age estimates of 1745 ± 45 B.P. and 1180 ± 65 B.P. Kennedy (1977:10,12) also reports that a third radiocarbon date of 565 ± 90 B.P. was obtained during a previous investigation involving removal of two burials that were exposed during highway construction. A historical component is dated to about 1850 to 1865. Shellfish, fish, and mammal remains were recovered from the prehistoric site deposits. Harbor seal and deer are the only two mammals identified, and no quantitative information is provided.

3.1.23 South Hoh Rockshelter (45-JE-104)

The South Hoh Rockshelter is located at 830 ft above sea level on the South Fork of the Hoh River (Bergland n.d.). The dry interior is sheltered by a large overhanging boulder. A single 50 x 50 cm test unit excavated in 1983 recovered mammal bone fragments, fire-altered rock, and charcoal (Bergland n.d.:46). The bones were apparently unidentifiable, and the deposits have not been dated. According to Eric Bergland (personal communication 1992), the bones may not be cultural but instead the result of recent scavenger activity.

3.1.24 Seven Lakes Hearth (45-CA-274)

The Seven Lakes Hearth Site is in the Upper Soleduck basin approximately 6 km southeast of Sol Duc Hot Springs. The site lies adjacent to Lunch Lake in the Seven Lakes Basin at 4450 ft above sea level. A charcoal sample was collected from a surficially exposed hearth feature containing a charcoal lens associated with bone fragments and nearby basalt debitage (Bergland n.d.:18). This sample yielded a radiocarbon date of 4990 ± 60 B.P. The hearth also contained unidentified volcanic ash. The bone fragments were too incomplete to be identified.

3.2 THE ARCHAEOLOGICAL DISTRIBUTION OF THE WOOL DOG

The temporal and spatial distribution of the wool dog in the archaeological record of the Northwest is at present poorly known. Although dogs are one of the most common land mammals identified in most faunal collections, few faunal analyses have attempted to distinguish different varieties of dogs on the basis of skeletal features. In fact, distinguishing between dogs and other canids, such as wolf and coyote, can be difficult and has not been consistent. King (1950) reports that dogs were second only to deer in abundance in the

mammalian fauna from the Cattle Point Site on the southern end of San Juan Island. He also mentions size variations and questions whether three distinctively smaller dogs recovered from the most recent (Maritime phase) prehistoric stratum were remains of wool dog. Bryan (1963:Appendix B:7) mentions the recovery of bones of a "miniature dog" at the Penn Cove Site (45-IS-50) on Whidbey Island and wonders whether these represent the wool dogs of historic times.

The bones of dogs at Ozette greatly outnumber all other land mammals combined (Huelsbeck 1983:Table 1). Based on an analysis of the skeletal remains of dogs from the Ozette Site, Gleeson (1972) concluded that two varieties of dogs were present as described in the ethnography. His analyses of the dog bones from Ozette were aimed at determining whether these two varieties could be distinguished in the archaeological population. The Ozette dog bones do suggest the presence of at least two dog varieties based upon size and morphology differences, with the larger variety likely to be the hunting dog and the smaller the wool dog (Gleeson 1970:45-46; 83). Gleeson was not able to estimate with the available data the time range during which the two distinct dog varieties existed. If the Salish weaving complex relied on wool dogs as a source of fiber, then this breed may have existed for 1500 years or more.

3.3 ARTIFACTS RELATED TO MOUNTAIN GOATS

Two kinds of artifactual evidence are relevant to the discussion on the presence of mountain goats on the Olympic Peninsula. The first is the archaeological occurrence of tools, ornaments, articles of clothing, and other artifacts manufactured from mountain goat horns, wool, hides, or bones. The second includes those items related to weaving, either of mountain goat wool or dog hair. Presumably the archaeological distribution of loom elements, spindle whorls, and other weaving-related items would be informative about the spatio-temporal distribution of weaving of goat wool, dog hair, or both.

Aside from Reagan's (1917:16) account of mountain goat horn ladles from the middens at La Push, no examples of artifacts manufactured from mountain goat wool, horn, or bone have been reported from Olympic Peninsula archaeological sites. None of the anthropologists consulted were aware of such finds anywhere in this region. For wool and horn, exceptional conditions would have to be met for preservation to occur. Water-saturation apparently does not preserve horn or, judging by the absence of deer and elk hooves, other keratinous materials.

For the Strait of Georgia, Mitchell (1971:49-65) infers the presence of woven clothing for at least the past 1000-1500 years. Based on the scarcity of tools related to hide-working, he suggests the possibility that woven clothing also may have been used during the earlier Marpole culture type, which encompasses the interval between about 2500 B.P. and

1200 B.P. On the southern coast of British Columbia, spindle whorls and blanket pins signal the presence of the Salish weaving complex by 1500 B.P., and spindle-like artifacts appear in the Gulf of Georgia archaeological sequence as early as 4500 B.P. (Fladmark 1982:111, 116). The archaeological distribution of this weaving complex may extend as far north as Comox on the east coast of Vancouver Island (Grant Keddie, personal communication 1992). Weaving tools have been recovered from two sites on the Olympic Peninsula—Hoko River Rockshelter and Ozette. At the Hoko Rockshelter, a spindle whorl of whale bone was found (Dale Croes, personal communication 1992). At Ozette, weaving-related tools, typically fashioned of wood or non-perishable materials, are quite common in the waterlogged deposits. The site inventory includes 23 spindle whorls, 10 weaver's swords, 5 spools, 3 spindle whorl shafts, 14 loom uprights, 14 loom beams, and 4 weaving tools (Gleeson 1980:Appendix B). One fragment of a dog wool blanket was also recovered (Dale Croes, personal communication 1992).

3.4 THE ARCHAEOLOGICAL RECORD OF THE SUBALPINE ZONE

Two archaeological reconnaissance efforts in the subalpine zone of Olympic National Park in recent years have resulted in the identification of about 60 archaeological sites. Most of these are located at elevations above 4500 ft in the subalpine parklands (Bergland 1983; Schalk 1988). With few exceptions, these sites can be described as lithic scatters and, to date, faunal remains have been reported from a single site only—the Seven Lakes Hearth Site (Bergland 1983). As mentioned earlier, the hearth exposed on this site also yielded a radiocarbon date of 4990 ± 60 B.P. and this is the only archaeological deposit that has been dated in the Olympic Mountains. With the exception of this single site, all are known only from their surface exposures.

The montane sites seem to be concentrated around water sources and in saddles. In addition to lithic debitage, the artifacts observed on these sites tend to be mainly projectile points, biface fragments, and edge-modified pieces. The patterns of site location and the nature of the lithic assemblages support the interpretation that these sites were used in summer or fall ungulate hunting activities (Schalk 1988:149–151). No archaeofaunal data have been recovered that will permit more specific identification of prey species.

Based on the projectile points observed and the kinds of debitage present, most of these sites seem to be more than 4000 years old. Some may be 6000–9000 years old, which encompasses a time when the climate was warmer and dryer and the forest was more open. The apparent scarcity of artifacts of late prehistoric age may be the result of a shift in prehistoric hunting strategies. However, considering the general scarcity of flaked stone tools in archaeological sites that are less than 1500 years old over a broad area of the Northwest, an alternative interpretation is that late prehistoric usage of these portions of the

landscape may have very low archaeological visibility because of the reliance upon perishable hunting technology (e.g. bone projectile points).

To date, archaeological reconnaissance in the Olympics has failed to reveal stone walls or blind features that might be construed as traps or ambush hunting features for goats or other ungulates.

3.5 MOUNTAIN GOATS IN FAUNAL ASSEMBLAGES FROM REGIONS WHERE GOATS ARE DEFINITELY INDIGENOUS

To place the Olympic Peninsula archaeofaunal data into a broader context, it is relevant to consider how mountain goats are expressed archaeologically in other regions where their prehistoric presence is not debatable. This question has two facets. The first involves the distance from high elevation habitats that archaeological deposits containing mountain goat remains occur. Lyman (1988:14) raises this issue and suggests that available archaeofaunal collections from the Peninsula may be too distant from mountain goat habitats to make reliable inferences regarding the past distribution of this species. The second concern is the kinds of goat remains occurring in archaeological contexts. In view of extensive ethnographic evidence documenting the importance of mountain goat wool and horns as trade items, the anatomical parts found and their distance from goat habitats must be ascertained.

In an effort to evaluate these issues for the Northwest Coast, archaeological occurrences of mountain goat along the Northwest Coast were compiled. While there are undoubtedly some occurrences that have been missed, the sites discussed here include all that were identified by numerous archaeologists who have worked extensively and intensively in western Washington, coastal British Columbia, and southeast Alaska (see Appendix B). In addition, a number of archaeological reports containing faunal data from these areas were examined. About 15 archaeological occurrences of mountain goat along the Northwest Coast were identified. These finds are discussed from north to south along the coast.

The Old Town Site, located on Knight Island in Yakutat Bay, southeast Alaska, yielded 32 mountain goat bones representing about 13 individuals during test excavations of a prehistoric site less than 400 years old (Freed and Lane 1964:77-83). This site is unique among those identified because a large number of goat bones were identified and mountain goat was the most common terrestrial mammal represented in the assemblage (goat was surpassed by both harbor seal and porpoise). Anatomical parts identified include cranial parts, teeth, horn (core?), and various upper and lower limb elements. Mountain goats could be hunted within a few miles of Knight Island and, with watercraft, goats could be transported to the site within a few hours. A historical burial interpreted as that of a shaman was located nearby and contained the remains of a mountain goat wool blanket (Riddell and de Laguna 1964:35).

Several sites in coastal British Columbia have yielded mountain goat remains. The Boardwalk site, located on an island in Prince Rupert Harbour in northern British Columbia, produced four mountain goat elements from an assemblage of 849 mammalian elements (Savage 1973). The goat remains were recovered from a stratum estimated to be between 2500 and 4000 years old. Information on the anatomical parts is not provided. Assuming watercraft transport, this site is probably less than a day from subalpine settings.

Site FbSx6, a shell midden on Roscoe Inlet of central British Columbia, yielded one mountain goat horn core and a metapodial fragment (Conover 1978:84; Hester and Nelson 1978:Table XXVIII). The site is described as being within a few miles of current mountain goat habitat (Conover 1978:84).

Two other shell middens that have yielded mountain goat horn cores (2) are Hopetown (EfSq21) and EeSp95, both in traditional Kwakiutl territory (Mitchell 1988:264; Rebecca Wigen, personal communication 1992). Both sites are on islands close to mainland goat habitat. At Hopetown two mountain goat horn cores were recovered from burials in strata dated between 1610 and 2500 B.P. At EeSp95, an undated deposit where a small test was conducted, one horn core and one postcranial element were recovered (Rebecca Wigen, personal communication 1992).

Several archaeological sites have produced mountain goat bones in the North Cascades of Washington. Four sites in the Upper Skagit River drainage have yielded remains of mountain goat (Robert Mierendorf, personal communication 1992). The Newhalem Rockshelter, at an elevation of 500 ft, has yielded about six lower limb elements of mountain goat in deposits dated at 1350 B.P. Limb elements of mountain goats have been identified among quantities of charred and crushed bone and fire-altered rock from hearth features at three sites on Ross Lake. Sites 45-WH-228 and 45-WH-229 each yielded a single limb element identified as mountain goat. At site 45-WH-303, 21 bones were identified as possibly being from mountain goat. Remains from these four sites are highly fragmented, perhaps indicating bone crushing and bone processing for bone grease (Robert Mierendorf, personal communication 1992). The age of all these sites is estimated at less than 1000 years old.

In Washington's south Cascades, four sites have produced remains identified as mountain goat or as either mountain goat or mountain sheep. All these sites are rockshelters located in the mountains. Wild Rose Rockshelter (45-YK-39) lies at an elevation of 2650 ft in the upper Tieton River basin near White Pass. The earliest deposits in this site are estimated to be about 600-700 years old (Rice 1964). A single element was identified as mountain goat and 18 others as either mountain sheep or mountain goat (Gustafson 1983:29-32). Portions of the anatomy represented are not specified but include both fragmentary bone and teeth.

Frying Pan Rockshelter (45-PI-43) lies at an elevation of 5300 ft and contains deposits estimated to be between 300 and 1000 years old (Rice 1965). Based on the presence of fragmentary hypsodont/molariform teeth (Gustafson 1983:28), either mountain sheep or mountain goat appear to be represented.

Judd Peak Rockshelter (45-LE-222), located at an elevation of 1370 ft, contains deposits less than 800 years old. A single element was identified as either mountain goat or mountain sheep and two other elements as either sheep, goat, or deer (Gustafson 1983:35-36). Again, the anatomical parts represented are not clear.

Located at an elevation of 2100 ft, Layser Cave (45-LE-223) has produced five tooth fragments identified as either bighorn sheep or mountain goat (Daugherty et al. 1987). Analysis of this large collection was limited mainly to mammalian teeth, so mountain goat skeletal elements may be present in the unanalyzed portions of the collection.

Although mountain faunal remains have not been reported from the vicinity of The Dalles, several unmistakable petroglyphs of these animals were described from the Petroglyph Canyon area near Spedis (Strong and Schenck 1925). Elderly Wishram informants reported that the nearest mountain goats were on Mount Adams but that formerly these animals inhabited the area near The Dalles. If mountain goat remains have been recovered from archaeological sites in the Oregon Cascades, they have not come to the attention of several Oregon archaeologists who were consulted and who have extensive familiarity with that region.

The review of mountain goat finds revealed only one reported archaeological occurrence of mountain goat bones in western Washington outside the Cascades. Mountain goat bones are reported from the Cattle Point Site (45-SJ-1), a stratified shell midden on San Juan Island. These deposits are undated but probably are less than 2000 years old. This occurrence is anomalous in many respects. King (1950:Table 12) lists a single mountain goat element from the Maritime phase deposits at the site. Seeming to contradict this information, King (1950:91) states elsewhere that "A few bones of the mountain goat (*Oreamnos canadensis*) and mountain sheep (*Ovis canadensis*) occurred in the Maritime strata." No information is provided on which anatomical parts are represented. San Juan Island does not offer habitats suited to either of these species. Moose also seems out of place here, considering the absence of this species in reported faunal assemblages from numerous more recent excavations around the Strait of Georgia and Puget Sound. Yet King (1950:90-91) reports finding 19 faunal elements of moose dispersed through all layers of the deposit. Reanalysis of substantial portions of the collection from this site within the past decade have apparently not identified mountain sheep, mountain goat, or moose (Walter Bartholomew, personal communication 1992). Until this collection has been thoroughly reanalyzed, the questions raised here cannot be answered.

Returning to the original question regarding the known archaeological distribution of mountain goat remains in Northwest sites, some tentative patterns may be identified. Archaeological sites containing mountain goat in this sample range in elevation from a few feet to 5300 ft above sea level. Clearly, some mountain goat remains do occur in lowland sites or, more specifically, in coastal shell middens. These coastal sites, however, are in virtually every instance located where little or no coastal plain separates the sites from the mountains. The Cattle Point Site on San Juan Island may be the single exception but, as discussed above, the accuracy of this identification is uncertain. In several instances, mountain goat remains are reported on islands lacking habitats suitable for mountain goats. Goat remains on island sites, whether from primary game procurement or trade, were undoubtedly transported in watercraft from the mainland. Even in these cases, the sites are not separated by more than a few hours' travel time from high elevation habitats. It does appear that the archaeological occurrence of mountain goats decreases rapidly with increasing distance from mountain habitats. In this regard too, it seems significant that a number of sizable excavations on Vancouver Island (Calvert 1980; McMillan and St. Claire 1982) the Fraser River Delta (Ham 1982; Ham et al. 1984; Matson 1976), and Puget Sound (Livingston 1987; Lyman 1981) have not yielded mountain goat remains.

Mountain goat horn cores are reported from several sites but the occurrence of the horns themselves is rarely reported. This is of interest because it seems to suggest that the horns themselves may not preserve in most archaeological deposits.

4: CONCLUSION

4.1 SUMMARY

The two major goals of this study were to provide an overview of the ethnographic and archaeological data pertaining to mountain goats. This review relied not only on published reports and unpublished written records, but also on consultation with numerous anthropologists who have conducted research in this region. To place the region-specific data for the Olympic Peninsula into a broader context, ethnographic information on mountain goat usage in other regions of the Northwest Coast was briefly considered. Similarly, some attention was directed at the archaeological occurrence of mountain goat remains in other regions of the Northwest.

4.1.1 Results of the Ethnographic Review

A review of ethnographic documents for the Olympic Peninsula indicates that this region's mammalian fauna did not include mountain goats in the nineteenth century. Multiple and independent ethnographic sources unequivocally support this conclusion, which goes well beyond negative evidence or simple failure to mention mountain goats. Mountain goat wool and horn were highly valued materials obtained by Peninsula tribes through interregional trade networks. These trade systems moved mountain goat wool and horns widely throughout the Northwest Coast from high mountain sources in the Cascades of Washington and the Coast Mountains of British Columbia and Alaska to distant regions where goats were not available. Identification of these source areas for mountain goat products is corroborated by ethnographic data for multiple tribes that were neighbors to the tribes of the Olympic Peninsula. How long the trade in mountain goat wool can be extended in the past is unclear but there is reason to believe that this system was in place before European contact.

In addition to these substantial and direct ethnographic data suggesting the absence of mountain goats on the Olympic Peninsula, this conclusion is supported indirectly as well. There are three types of indirect ethnographic evidence. First, the ethnographies document the keeping of wool dogs by the Quinault, Quileute, Makah, Klallam, and Twana. Because of the lack of data on the Chemakum and Chehalis groups, it cannot be confirmed that all Peninsula tribes kept these dogs, but it is clear that most, if not all, did. Because dog hair was an alternative to mountain goat wool in the weaving of clothing and blankets, the keeping of wool dogs by Peninsula tribes suggests the lack of availability of goat wool. In fact, the historical distribution of the wool dog seems to coincide with those areas of the southern Northwest Coast that lacked mountain goats. While archaeological evidence suggests wool dogs were kept in prehistoric times, available data for the Olympic Peninsula do not permit estimating the antiquity of this practice. The weaving-related artifacts described, however, seem to be from deposits less than 1000 years old.

The second kind of indirect evidence comes from the ethnographic sources for surrounding regions, such as Vancouver Island and the Straits of Georgia. These sources corroborate that interregional trade systems existed in which mountain goat wool was exchanged for other resources and that the sources for goat wool were the Cascades of Washington and the Coast Range of British Columbia.

A third line of indirect evidence for the absence of mountain goats in the region is the apparent lack of reference to this animal in folklore, mythology, and decorative art. In scanning the ethnographic literature for tribes that lived near mountain goats, it became clear that goats were encoded in various aspects of culture including crests, totems, myths, and narratives. A narrative about Transformer collected by Elmendorf (1961:22-23) from a Satsop informant is the only ethnographic reference of this type that was encountered for a Peninsula group. Significantly, this narrative relates that Transformer failed to put mountain goats in the mountains of the Satsop people.

4.1.2 Results of the Archaeological Review

A review of the available archaeofaunal data from the Olympic Peninsula indicates that mountain goat bones have not been identified in any site in this region. The finding of mountain goat bones, especially those parts of the anatomy that would not be attached to either hides or horns, would provide the strongest evidence for the existence of mountain goats in the Olympics. Because animal bones tend to preserve quite well in shell middens, and such deposits are relatively common along the Peninsula's coastline, there are undoubtedly many sites containing mammal bone. However, relatively few have been investigated, fewer have had their mammalian fauna analyzed, and fewer still have produced sizable samples of land mammal bones. At least 24 archaeological sites have yielded some mammalian faunal remains on the Peninsula. Of these, four yielded mammal bones, but information on taxa is not available. For seven sites, some species or taxa are listed but the information is not complete or quantitative information is not available. For 13 sites, mammalian faunal remains have been thoroughly analyzed to produce quantitative information concerning the number of identified specimens or the minimum numbers of individuals, or both.

From the collections that have been analyzed, at least 21 different mammalian taxa have been identified, exclusive of domestic animals. Mountain goat bones have not been reported from a single archaeological site. Mountain goat horns, however, were reputedly recovered in one instance—at La Push (Reagan 1917). Considering the extent of the trade in mountain goat wool and horn along the Northwest Coast, even well documented occurrences of these materials would not constitute evidence for the presence of mountain goats in the Olympic Mountains. Considered in the larger context of the other fauna reported for La Push, some doubt exists about whether a faunal analysis was actually conducted or whether, instead, Reagan's faunal list represents species conjectured to be present in the middens on the basis of other information.

Because of limitations of sample size, distribution, and temporal range, the present archaeofaunal data do not allow conclusive statements regarding the presence of mountain goats in the Olympics during the Holocene or Late Pleistocene. The relationship between sample size and species diversity in archaeofaunal collections is well known (Grayson 1984), and the collections from the Olympic Peninsula clearly conform to this pattern. For the faunal collections for which the investigators explicitly identify numbers of recovered mammalian faunal specimens, only two, Ozette and Hoko Rockshelter, have more than 1000 specimens. Others, such as Minard and Manis, may also have more than 1000 faunal specimens. With the exception of these few sites, however, remaining site investigations were mostly exploratory and produced relatively small faunal collections. Even though the archaeofaunal record for the Olympic Peninsula is probably as good or better as those of other regions of comparable size along the Northwest Coast, the assemblages are still not of sufficient size to adequately address questions of land mammal biogeography. While the Ozette site collection is an order of magnitude larger than all others in terms of total numbers of mammals, this assemblage contains only 725 identified land mammal elements when the domestic dog elements are excluded. Other than sea mammals and dog, the Hoko Rockshelter collection contains only 449 identified land mammal bones. Species such as muskrat, mountain beaver, skunk, cougar, and coyote are not represented in the Ozette assemblage. Similarly, mountain beaver, bobcat, coyote, and muskrat are not identified among the Hoko Rockshelter mammalian fauna, and black bear is represented by only one element. The Olympic marmot has not been identified in any archaeofaunal assemblage from the Olympic Peninsula.

What constitutes an adequate faunal sample depends on the question being asked. Faunal collections such as those from Ozette and Hoko River may be quite adequate for defining the character of economic dependence upon mammalian resources by the human occupants of these sites. However, these same assemblages may be less adequate for the purpose of inventorying the mammalian fauna for the entire region. It is not clear that samples of any size will assure the identification of species that are typically associated with relatively distant habitat types. The available archaeofaunal collections for the Olympic Peninsula are almost exclusively from lowland settings where mountain goat remains are expected to be infrequent even if goats were in the mountains. Although a sizable number of sites have been recorded in the past decade in high elevation settings of the Olympics, faunal data are unavailable from them and, in many cases, are unlikely to be preserved.

The largest faunal assemblages from the Peninsula tend to be from localities most distant from the Olympic Mountains—the Peninsula's northwestern corner (e.g., Ozette and the Hoko Rockshelter) and its southeastern corner (e.g., Minard). The late Pleistocene faunal collection from the Manis site is probably the most strategically located in terms of proximity to goat habitat, yet it too is situated in a lowland setting.

To what extent is searching for mountain goat bones in lowland archaeological sites a useful way to determine their past presence in the mountains? On one hand, it does not seem altogether unrealistic because there are conditions in which mountain goats apparently move into lowland areas. Banfield (1974) lists the elevational range of the mountain goat as sea level to 8000 feet. Considering the essentially periglacial conditions that exist in areas such as southeast Alaska, this is not surprising. But mountain goats may occasionally travel to sea level to obtain salt (De Laguna 1972:40) and to escape severe winter conditions (Conover 1978:84; Drucker 1965).

On the other hand, this is a species that perhaps more than any other mammal is known for being at home in the high peaks and crags where hunting is extremely difficult and often dangerous. Considering the ruggedness of terrain, transport factors can be expected to favor maximal processing of animals at or near kill-sites followed by minimal transport of inedible or low-utility animal parts. In other words, intensive carcass processing should typically occur in the high country before hunters began the steep ascent with heavy loads down mountain trails through dense coniferous forests. Weight reduction through air-drying, smoking, or discard of bones is likely to have been employed under such circumstances. Ethnographic sources frequently mention drying the goat meat in the mountains and concern about the weight to be carried back to lowland villages (Duff 1952:72-73; De Laguna 1972:78,98,210, 394-395; Kennedy and Bouchard 1990:445; see also Hancock 1927:123-124). The frequency of mountain goat bones deposited at archaeological sites may be expected to decline steeply with distance from alpine habitats, probably at a rate faster than for other ungulates. Because the exploitation of mountain goats was aimed primarily at the recovery of hides and wool rather than meat, the drop in frequency of bones as distance from alpine areas increases should be even more marked.

In examining the archaeofaunal collections for mountain goats, the most salient limitation of the database from the Olympic Peninsula is that no data exist for major time intervals and the data are scanty for other intervals. Most collections from the Peninsula relate primarily to the last 1000 years of the prehistoric record. Although the available faunal data range from the 12,000 year old collection from the Manis Site to several shell midden deposits containing historic period remains, there are essentially no faunal data representing the 9000-year interval between 12,000 and 3000 B.P. For the interval between 3000 and 1000 B.P., faunal collections are few and the number of identified specimens is very small. The bulk of available faunal data for the Olympic Peninsula derives from deposits less than 1000 years old.

Mammalian biogeography in the western United States offers extensive evidence suggesting the distributions of many mammals have changed significantly during the Holocene. Consequently, the distributions of mammals known from historical accounts cannot reliably be extrapolated into the prehistoric record—even for intervals of relative climatic stability.

This point is perhaps best illustrated on the Columbia Plateau where numerous large, geographically dispersed mammalian faunal collections temporally representative of most of the Holocene have been recovered. Pronghorn antelope were not present in eastern Washington in the early nineteenth century, yet numerous archaeological deposits document their presence in the centuries preceding European contact (Osborne 1953). Bison seem to have disappeared from this area at around the same time (Kingston 1923; Osborne 1953) and, although the arrival of the horse may have played an important role in this disappearance (Christman 1971; Kingston 1923), bison populations may have been decreasing after the sixteenth century (Schroedl 1973). Bighorn sheep are found rather widely in the archaeological deposits of the canyons and coulees of eastern Washington but apparently disappeared from these areas in the late eighteenth or early nineteenth centuries too. Diseases brought by domestic sheep and overhunting may have been factors in the displacement of mountain sheep populations (Geist 1971:14). The distribution of elk exhibits a similar pattern and again suggests that the biotic conditions observed during the historic period and described in ethnographies are not always in agreement with archaeological evidence (Gustafson 1983:39; McCorquodale 1985).

Closer to the Olympic Peninsula, some archaeological evidence suggests that black bear may have been extirpated prior to the nineteenth century in the San Juan Islands (Kenady 1991:44). Suttles (1974:92) suggests that bears were not present "in the ethnographic past," but the bones of black bear have been reported from West Sound (45-SJ-133) on Orcas Island (Kenady 1991:44). Black bear bones were also found throughout the Cattle Point (45-SJ-1) midden deposits on San Juan Island during King's excavations (King 1950:91). The massive reduction of Northwest Coast sea otter populations by 1810 was quite clearly a consequence of overhunting associated with the fur trade (Drucker 1965:195).

All the changes in mammalian distributions mentioned here illustrate the point that the biogeography of many large mammals seems to have been dynamic, even in recent centuries. In most cases, the causes for those changes are poorly understood but climatic change, disease, and overhunting by humans facilitated by firearms or horses are possible factors. The late eighteenth century and first half of the nineteenth century was an interval of rapid and generally profound cultural change for aboriginal people of the Northwest. Introduced diseases dramatically reduced populations at this time, and some research suggests that aboriginal populations across North America may have experienced earlier Old World disease contagions (Strong 1945; Dobyns 1983; Ramenofsky 1987; Campbell 1989). The implications of such changes for resource species exploited by native peoples are not at all clear. What can be stated with reasonable certainty is that the distribution of mammals during the early nineteenth century cannot be extrapolated into the prehistoric record or throughout the Holocene.

Lyman (1988:21) suggests that mountain goats may have disappeared from the Olympics during the late eighteenth or early nineteenth centuries—the approximate time when this species apparently disappeared from the Oregon Cascades, the Wallowa and Owyhee mountains, and northern California. If mountain goats have been present on the Olympic Peninsula during the Holocene, the ethnographic data indicate local extinction must have occurred before the late eighteenth century.

4.2 MANAGEMENT RECOMMENDATIONS

Ironically, archaeological deposits having the best faunal preservation tend to be coastal shell middens. Because of the distance from alpine environments, however, many of these sites seem to have limited potential for the recovery of the bones of alpine mammals. However, middens located in closer proximity to the mountains are likely to have the best potential to yield information of relevance on mountain goats. From Port Angeles around the Peninsula's northeastern corner and southward along the Hood Canal are the saltwater settings that most closely approximate those yielding mountain goat remains in British Columbia and southeast Alaska. If mountain goats were present in the Olympic mountains during the past 2000–3000 years, their remains are probably more likely to show up in shell middens here than elsewhere around the margins of the Peninsula. From a management viewpoint, however, further analyses of shell midden faunal collections are probably much less likely to produce decisive results than other alternatives.

The portion of the landscape that would be most heavily used by mountain goats, the alpine zone, generally offers poor conditions for faunal preservation. Fortunately, such general patterns always have exceptions and these exceptions can provide useful opportunities to answer questions of mammalian biogeography. As illustrated for the Seven Lakes Hearth Site and others recently investigated on Ross Lake in the North Cascades, burned animal bones may be preserved in places where faunal preservation would otherwise be poor. The best places to look for such sites seems to be where mountain goats are found in greatest numbers today. The subalpine zone of the Olympics should be the geographic focus for future research efforts aimed at the recovery of direct evidence for the presence or absence of mountain goats in the past.

Sites that could provide critical information need not be cultural deposits. Naturally accumulated deposits may be just as useful if these can be found with preserved faunal remains. Predators and scavengers drag bones removed from carcasses into rockshelters and dens. Where appropriate depositional conditions occur, bones and teeth might be preserved. If mountain goats use rockshelters for shelter from the weather as mountain sheep do (Geist 1971:261; Swanson 1972), then deposition of goat skeletons from natural deaths may occur in such locations too. At least a few rockshelters are known from the high country in the Olympics (Schalk 1988:Appendix C) and undoubtedly others exist. Identification of

many rockshelters could probably be done effectively through aerial reconnaissance. Once a list of rockshelters has been compiled, they should be ranked in terms of their potential for faunal preservation and then visited for testing. A single subalpine deposit with conditions for faunal preservation could provide definitive evidence regarding the prehistoric presence or absence of mountain goats in the Olympics.

Non-cultural deposits containing mammalian remains of Pleistocene age are reported periodically on the Olympic Peninsula, although apparently most of these are isolates rather than sizable collections of mammal bones that attract systematic investigation. Individual mastodon bones and tusks erode periodically from the high bluffs overlooking the Strait of Juan de Fuca near Sequim, Washington. Places where these finds have been made include Fort Worden State Park and the nearby John Wayne Marina. Mastodon and bison are also reported from glacial gravels in the vicinity of Lake Quinault (Wessen 1978:10). Since the Manis site was created 12,000 years ago, caribou, bison, and mastodon have disappeared on the Olympic Peninsula. It seems unlikely that this single site has documented all of the mammals that have disappeared. Whether cultural or non-cultural, late Pleistocene faunal deposits are of considerable importance, and a review of paleontological finds for this region might prove informative.

The antiquity of the Southern Salish weaving complex and its relationship to the keeping of wool dogs is a subject that may be of direct relevance to past distributions of mountain goat in the Northwest. Potentially informative analyses here might focus on distinguishing this particular variety of dog in archaeofaunal collections and examining how its distribution relates to the temporal and spatial distribution of weaving-related artifacts. If the wool dog has been accurately depicted as a substitute for mountain goats as a source of fiber for weaving, then the distribution of these dogs is of considerable relevance to the prehistoric distribution of mountain goats. Such research, however, should be considered much lower in management priority to efforts that will result in recovery of more direct evidence.

Blood residue analysis on stone tools, especially hunting-related items such as projectile points, offers a technique that might provide information on which animals were hunted. Such analyses on stone tools from high elevation lithic scatters in the Olympics might provide an alternative to finding deposits with preserved faunal remains. If bones are recovered that are too fragmentary to identify visually, as at the Seven Lakes Hearth Site, DNA analysis offers a technique that might also be informative about the taxa represented.

In general, conclusive determination of the presence of a particular species in a region is probably much easier than conclusive demonstration of its absence. In this case, if it is assumed that mountain goats *were* present in this region in the past, then a few well-documented occurrences of mountain goat bones in good, pre-20th century archaeological contexts would probably be considered sufficient to demonstrate the animal's former presence. If, however, mountain goats *were not* formerly present, a conclusive

demonstration of their absence may be more difficult to achieve. Regardless of how much archaeological research and faunal analysis is done, it might always be argued that because of sampling error mountain goats were present but simply not detected. The inference that mountain goats were not present based on a failure to find goat remains can always be questioned on the grounds that the inference is based on "negative evidence"—no matter how much searching for evidence has been undertaken.

Nonetheless, inadequacies in the available faunal data have been identified and the highest priority for future management should be to overcome those inadequacies. Of particular importance here is the fact that available faunal data come from coastal locations at some distance from habitats preferred by mountain goats. Recovering faunal remains from a subalpine setting in the immediate vicinity of locations attractive to goats today offers the highest potential for obtaining unequivocal information about the presence or absence of mountain goats in the past.

4.3 CONCLUSION

A review of the ethnographic record for the Olympic Peninsula indicates that this region's mammalian fauna did not include mountain goats in the nineteenth century. This conclusion is supported by multiple and independent ethnographic sources. Although the ethnographic sources indicate the lack of mountain goat populations in this region, they document the existence of a trade network that brought mountain goat wool and horns to native populations of the Olympic Peninsula. Mountain goat wool was highly valued for weaving of blankets and clothing. Native weavers often mixed mountain goat wool with the hair of wool dogs, waterfowl down, and vegetal fibers. The keeping of wool dogs by the native people of the Olympic Peninsula conforms to a broader pattern in which these dogs were kept by groups lacking direct access to mountain goat populations.

A review of the available archaeofaunal data from the Olympic Peninsula indicates that mountain goat bones have not been identified in any site in this region. At least 24 archaeological sites in the region have yielded mammalian faunal remains, and mammalian fauna have been thoroughly analyzed for 13 of these site collections. Excluding domestic animals, at least 21 mammalian taxa have been identified. There are reasons to question the reported finding of mountain goat horn spoons at La Push in early twentieth-century excavations. Even if such finds could be verified, they would not support the inference that mountain goat populations existed in the region. Horn spoons were extensively traded on the Northwest Coast and, therefore, might be encountered in archaeological deposits in areas far removed from the regions where the mountain goats themselves lived.

Because of limitations of sample distribution, temporal range, and size, available archaeofaunal data do not allow conclusive statements regarding the presence or absence of mountain goats in the Olympics during the Late Pleistocene or Holocene prior to the 19th century. Additional ethnographic research and further analyses of extant archaeofaunal collections are unlikely to overcome these limitations. Future research should be directed at finding either cultural or natural faunal deposits in the subalpine zone of the Olympic Mountains. Such deposits offer the highest potential for providing data that are decisive in resolving questions about the former distribution of mountain goats.

REFERENCES CITED

Adamson, Thelma

- 1926 Unarranged Sources of Chehalis Ethnology. Ms. on file, Melville
-1927 Jacobs Collection, University of Washington Libraries, Seattle.

- 1969 *Folk-tales of the Coast Salish*. Reprinted. Memoirs of the American Folk-Lore Society 27. Kraus Reprint, New York. Originally published 1934.

Banfield, A. W. F.

- 1974 *The Mammals of Canada*. University of Toronto Press, Toronto.

Barnett, Homer G.

- 1955 *The Coast Salish of British Columbia*. Studies in Anthropology 4. University of Oregon Monographs, Eugene.

Bergland, Eric O.

- 1983 Lithic Remains from the Blue Mountain Area, Olympic National Park, Washington. Paper presented at the 36th Annual Northwest Anthropological Conference in Boise, Idaho. On file at the Pacific Northwest Region of the National Park Service, Seattle.

- n.d. Olympic Archaeological Basemap Study Summary Report to Superintendent Chandler. Ms. on file at the Pacific Northwest Region Office of the National Park Service, Seattle.

Blukis-Onat, Astrida R.

- 1976 *Archaeological Excavations at Site 4JE16, Indian Island, Jefferson County, Washington*. Washington Archaeological Research Center Project Report No. 30. Washington State University, Pullman.

Blukis-Onat, Astrida R., and Lynn L. Larson

- 1984 *Report of Testing of 45CA227, Washington Harbor and Cultural Resources Overview at the Battelle Marine Research Laboratories Sequim, Washington*. Blukis Onat Applied Sciences, Inc., Seattle.

Boas, Franz

- 1921 *Ethnology of the Kwakiutl*. Twenty-Fifth Annual Report of the Bureau of American Ethnology. Smithsonian Institution, U.S. Government Printing Office, Washington, D.C.

Brown, James H.

- 1978 The Theory of Insular Biogeography and the Distribution of Boreal Birds and Mammals. In *Intermountain Biogeography: A Symposium*, edited by K. T. Harper and J. L. Reveal, pp. 209-227. Great Basin Naturalist Memoirs No. 2. Provo.

Bryan, Alan L.

- 1963 *An Archaeological Survey of Northern Puget Sound*. Occasional Papers of the Idaho State University Museum, No. 11. Pocatello.

Calvert, Sheila Gay

- 1980 A Cultural Analysis of Faunal Remains from Three Archaeological Sites in Hesquiat Harbor, British Columbia. Ph.D. dissertation, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Campbell, Sarah K.

- 1989 Post-Columbian Culture History in the Northern Columbia Plateau: A.D. 1500-1900. Ph.D. dissertation, Department of Anthropology, University of Washington, Seattle.

Chatters, James C.

- 1978 Monitoring of Water Line Excavation on Archaeological Site 45-CA-23 to Ensure that No Human Burials Were Disturbed. Letter Report prepared by University of Washington Office of Public Archaeology. Submitted to the Quileute Indian Tribe. On file at the Washington State Office of Archaeology and Historic Preservation, Olympia.

Christman, Gene M.

- 1971 The Mountain Bison. *American West* 8(3):44-47.

Codere, Helen

- 1990 Kwakiutl: Traditional Culture. In *Northwest Coast*, edited by Wayne Suttles. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Collins, June M.

- 1974 *Valley of the Spirits: The Upper Skagit Indians of Western Washington*. University of Washington Press, Seattle.

Conover, Kathryn

- 1978 Matrix Analyses. In *Studies in Bella Bella Prehistory*, edited by James J. Hester and Sarah M. Nelson. Publication No. 5. Department of Archaeology, Simon Fraser University, Vancouver.

Croes, Dale R.

- 1991 Hoko River Wet-Site Faunal Data. Ms. in possession of author.

Croes, Dale R., and Steven Hackenberger

- 1988 Hoko River Archaeological Complex: Modeling Prehistoric Northwest Coast Economic Evolution. In *Prehistoric Economies of the Pacific Northwest Coast*, edited by Barry L. Isaac. Research in Economic Anthropology Supplement 3. JAI Press, Greenwich, Connecticut.

Curtis, Edward S.

- 1970 *The North American Indians: Being a Series of Volumes Picturing and Describing the Indians of the United States, the Dominion of Canada and Alaska*, edited by Frederick Hodge. 20 vols. Plimpton Press, Norwood, Massachusetts.

Daugherty, Richard D., Selma Thomas, and Sheila Stump

- 1982 *A Cultural Resource Survey of the Proposed Port Gamble Indian Reservation Solid Waste Disposal Facility*. Western Heritage, Inc., Olympia.

Daugherty, Richard D., J. Jeffrey Flenniken, and Jeanne M. Welch

- 1987 *A Data Recovery Study of Layser Cave (45LE223) in Lewis County, Washington*. Studies in Cultural Resources Management 7. USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

De Laguna, Frederica

- 1972 *Under Mt. St. Elias: The History and Culture of the Yakutat Tlingit*. Smithsonian Contributions to Anthropology 7. Washington, D.C.

- 1990 *The Tlingit Indians*, by G. T. Emmons. University of Washington Press, Seattle.

Dobyns, H.

- 1983 *Their Numbers Become Thinned*. The University of Tennessee Press, Knoxville.

Drucker, Philip

- 1951 *The Northern and Central Nootkan Tribes*. Smithsonian Institution Bureau of American Ethnology Bulletin 144. U.S. Government Printing Office, Washington, D.C.
- 1965 *Cultures of the North Pacific Coast*. Harper and Row, New York.

Duff, Wilson

- 1952 *The Upper Stalo Indians of the Fraser Valley, British Columbia*. Anthropology in British Columbia, Memoirs 1. Victoria.

Duncan, Mary Ann

- 1981 *Archaeological Investigations at La Push, Clallam County, Washington*. Institute for Environmental Studies, Office of Public Archaeology, University of Washington, Seattle.

Dunn, John

- 1845 *History of the Oregon Territory and British North American Fur Trade; with an Account of the Habits and Customs of the Principal Native Tribes on the Northern Continent*. Edwards and Hughes, London.

Eels, Rev. Myron

- 1889 The Twana, Chemakum, and Klallam Indians, of Washington Territory. In *Annual Report of the Smithsonian Institution for the Year 1887*, pp. 605-681. Smithsonian Institution, Washington, D.C.
- 1985 *The Indians of Puget Sound: The Notebooks of Myron Eells*, edited by George B. Castile. University of Washington Press, Seattle.

Elmendorf, William W.

- 1960 *Structure of Twana Culture*. Monographic Supplement No. 2. Washington State University Research Studies, Pullman.
- 1961 Skokomish and Other Coast Salish Tales. 3 Pts. *Washington State University Research Studies* 29(1):1-37. Pullman.
- 1990 Chemakum. In *Northwest Coast*, edited by Wayne Suttles. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Farrand, Livingston

- 1902 *Traditions of the Quinault Indians*. Memoirs of the American Museum of Natural History 4, pp. 77-132. New York.

Fladmark, Knut R.

- 1982 An Introduction to the Prehistory of British Columbia. *Canadian Journal of Archaeology* 6:95-156.

Ford, Pamela J.

- 1984 Appendix B: Terrestrial Vertebrates of the Region Surrounding the Shasta/I-5 Project, Northern California. In *Archaeological Investigations in the Sacramento River Canyon, Volume I: Report of Testing at Seven Aboriginal Sites*, by C. M. Raven, S. K. Goldberg, M. J. Moratto, and K. M. Banks, pp. 359-381. California Department of Transportation, Sacramento.

Freed, J. Arthur, and Kenneth S. Lane

- 1964 Analysis of Faunal Remains from Old Town, Knight Island. In *Archeology of the Yakutat Bay Area, Alaska*. Bureau of American Ethnology Bulletin 192. Smithsonian Institution, Washington, D.C.

Friedman, Edward

- 1976 An Archaeological Survey of Makah Territory: A Study in Resource Utilization. Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

Garfield, Viola E.

- 1966 The Tsimshian and Their Neighbors. In *The Tsimshian and Their Arts*, by Viola Garfield and Paul S. Wingert, pp. 3-70. University of Washington Press, Seattle.

Geist, Valerius

- 1971 *Mountain Sheep*. University of Chicago Press, Chicago.

Gibbs, George

- 1970 *Tribes of Western Washington and Northwestern Oregon*. Contributions to North American Ethnology 1, pp. 157-361. Reprinted. Shorey, Seattle, Washington. Originally published 1877, U.S. Geographical and Geological Survey of the Rocky Mountain Region.

Gilbow, Delbert W.

- 1981 Inference of Human Activity from Faunal Remains. Master's thesis, Department of Anthropology, Washington State University, Pullman.

Gleeson, Paul F.

1970 Dog Remains from the Ozette Village Archaeological Site. Master's thesis, Department of Anthropology, Washington State University, Pullman.

1980 *Ozette Archaeological Project, Interim Final Report, Phase XIII*. Project Reports 97. Washington Archaeological Research Center, Washington State University, Pullman.

Grayson, Donald

1984 *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. Academic Press, Orlando.

Geist, Valerius

1971 *Mountain Sheep*. University of Chicago Press, Chicago.

Guinn, Stanley James

1963 *A Maritime Village on the Olympic Peninsula*. Laboratory of Anthropology Report of Investigations No. 22. Washington State University, Pullman.

Gunther, Erna

1927 Klallam ethnography. *University of Washington Publications in Anthropology* 1(5):171-314.

1934 Field Notebooks. University of Washington Libraries Archives and Manuscripts Division. Accession No. 614-70-20.

1936 A Preliminary Report on the Zoological Knowledge of the Makah. In *Essays in Anthropology Presented to A.L. Kroeber*, edited by Robert Lowie, pp. 105-118. University of California Press, Berkeley.

Gustafson, Carl E.

1983 *Wapiti Populations in and Adjacent to Mount Ranier National Park: Archaeological and Ethnographic Evidence*. Washington State University. Submitted to the Pacific Northwest Region, National Park Service.

Gustafson, Carl E., Delbert Gilbow, and Richard D. Daugherty

1979 The Manis Mastodon Site: Early man on the Olympic Peninsula. *Canadian Journal of Archaeology* 3:157-164.

Hadja, Yvonne

- 1990 Southwestern Coast Salish. In *Northwest Coast*, edited by Wayne Suttles, pp. 503-517. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Haeberlin, Hermann K., and Erna Gunther

- 1930 *The Indians of Puget Sound*. University of Washington Publications in Anthropology 4, pp. 1-83. Seattle.

Ham, Leonard C.

- 1982 Seasonality, Shell Midden Layers, and Coast Salish Subsistence Activities at the Crescent Beach Site, DgRr1. Ph.D. dissertation, Department of Anthropology and Sociology, University of British Columbia, Vancouver.

Ham, Leonard C., Arlene J. Yip, and Leila V. Kullar

- 1984 *A Charles Culture Fishing Village*. Submitted to the British Columbia Ministry of Transportation and Highways and the Ministry of the Provincial Secretary and Government Services, Parliament Buildings, Victoria, British Columbia.

Hamori-Torok, Charles

- 1990 Haisla. In *Northwest Coast*, edited by Wayne Suttles, pp. 306-311. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Hancock, Samuel

- 1927 *The Narrative of Samuel Hancock, 1845-1860*. Robert McBride, New York.

Hester, James J., and Sarah M. Nelson

- 1978 *Studies in Bella Bella Prehistory*. Department of Archaeology Publications 5. Simon Fraser University, Burnaby, British Columbia.

Hilton, Susanne F.

- 1990 Haishais, Bella Bella, and Oowekeeno. In *Northwest Coast*, edited by Wayne Suttles, pp. 312-322. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Hirabayashi, Joanne

- 1955 The Chilkat Weaving Complex. *Davidson Journal of Anthropology* 1(1):43-61.

Howay, F. W.

- 1918 The Dog's Hair Blankets of the Coast Salish. *The Washington Historical Quarterly* 9(2):83-92.

Huelsbeck, David R.

- 1983 *Mammals and Fish in the Subsistence Economy of Ozette*. Laboratory of Anthropology, Washington State University, Pullman.

Kenady, Stephen M.

- 1991 *A Content Based Study on the West Sound Shell Midden Disturbance (45SJ133), San Juan County, Northwestern Washington*. Contributions in Cultural Resource Management No. 33. Washington State University Center for Northwest Anthropology, Pullman.

Kennedy, Hal

- 1977 *Summary of Archaeological Investigations Skokomish Indian Reservation Tideland Margins*. Office of Public Archaeology, Institute for Environmental Studies, University of Washington. Submitted to the Skokomish Consulting Services, Seattle.

Kennedy, Dorothy I.D., and Randall T. Bouchard

- 1990 Bella Coola. In *Northwest Coast*, edited by Wayne Suttles, pp. 323-339. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Kennedy, Hal, and Robert S. Thomas

- 1977 *Archaeological Testing of a Disturbed Site on Sequim Bay, Clallam County, Washington*. Office of Public Archaeology, Institute for Environmental Studies, University of Washington, Seattle.

King, Arden

- 1950 *Cattle Point: A Stratified Site in the Southern Northwest Coast Region*. Memoirs of the Society for American Archaeology No. 7. Menasha, Wisconsin.

Kingston, C. S.

- 1923 Buffalo in the Pacific Northwest. *Washington Historical Quarterly* 23(3):163-72.

Krause, Aurel

- 1956 *The Tlingit Indians: Results of a Trip to the Northwest Coast of America and Bering Straits*. Translated by Erna Gunther. University of Washington Press, Seattle.

Livingston, Stephanie

- 1987 Birds and Mammals. In *The Duwamish No. 1 Site: 1986 Data Recovery*, pp. 11.1-11.15. Prepared by URS Corporation and BOAS, Inc. Submitted to the Municipality of Metropolitan Seattle. On file at the Washington Office of Archaeology and Historic Preservation, Olympia.

Lyman, R. Lee

- 1981 Mammal Bone. In *The Duwamish No. 1 Site: A Lower Puget Sound Shell Midden*, edited by Sarah K. Campbell, pp. 199-212. Research Report 1. Institute for Environmental Studies, Office of Public Archaeology, University of Washington, Seattle.
- 1988 Significance for Wildlife Management of the Late Quaternary Biogeography of Mountain Goats (*Oreamnos americanus*) in the Pacific Northwest, U.S.A. *Arctic and Alpine Research* 20(1):13-23.

McCorquodale, Scott M.

- 1985 Archaeological Evidence of Elk in the Columbia Basin. *Northwest Science* 59(3):192-193.

McIlwraith, Thomas F.

- 1948 *The Bella Coola Indians*. 2 vols. University of Toronto Press, Toronto.

McMillan, Alan D., and Denis E. St. Claire

- 1982 *Alberni Prehistory: Archaeological and Ethnographic Investigations on Western Vancouver Island*. Theytus Books and Alberni Valley Museum. Penticton and Port Alberni, British Columbia.

Matson, R. G.

- 1976 *The Glenrose Cannery Site*. Archaeological Survey of Canada Paper No. 2. National Museum of Canada, Ottawa, Canada.

Mitchell, Donald

- 1988 *Changing Patterns of Resource Use in the Prehistory of Queen Charlotte Strait, British Columbia*. Research in Economic Anthropology, Supplement 3, pp. 245-290. JAI Press, Greenwich, Connecticut.
- 1990 Prehistory of the Coasts of Southern British Columbia and Northern Washington. In *Northwest Coast*, edited by Wayne Suttles, pp. 340-358. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Moorhead, B. B., and Stevens, V.

- 1982 Introduction and Dispersal of Mountain Goats in Olympic National Park. In *Ecological Research in National Parks of the Pacific Northwest*, pp. 46-50. Oregon State University Forest Research Laboratory.

National Park Service

- 1981 *An Environmental Assessment on the Management of Introduced Mountain Goats in Olympic National Park*. Report on file, Olympic National Park, Port Angeles, Washington.
- 1982 *Mountain Goat Ecology and Management Investigations, Olympic National Park, 1981*. Report on file, Olympic National Park, Port Angeles, Washington.
- 1983 *Mountain Goat Ecology and Management Investigations, Olympic National Park, 1982*. Report on file, Olympic National Park, Port Angeles, Washington.
- 1984 *Mountain Goat Ecology and Management Investigations, Olympic National Park, 1983*. Report on file, Olympic National Park, Port Angeles, Washington.

Newman, Thomas S.

- 1959 *Toleak Point: An Archaeological Site on the North Central Washington Coast*. Washington State University. Reports of Investigation 4. Laboratory of Anthropology, Washington State University, Pullman.

Olson, R. L.

- 1936 The Quinault Indians. *University of Washington Publications in Anthropology* 6(1):1-190.

Osborne, Douglas

- 1953 Archaeological Occurrences of Pronghorn Antelope, Bison, and Horse in the Columbia Plateau. *Scientific Monthly* 47(5):260-269.

Petersen, Kenneth L., Peter J. Mehringer, Jr., and Carl E. Gustafson

- 1983 Late-Glacial Vegetation and Climate at the Manis Mastodon Site, Olympic Peninsula, Washington. *Quaternary Research* 20:215-231.

Pettitt, George A.

- 1950 *The Quileute of La Push, 1775-1945*. University of California Anthropological Records 14. Berkeley.

- Pfitsch, W. A.
 1980 The Effect of Mountain Goats on the Subalpine Plant Communities of Klahhane Ridge, Olympic National Park, Washington. Master's thesis, University of Washington, Seattle.
- Powell, James V.
 1990 Quileute. In *Northwest Coast*, edited by Wayne Suttles, pp. 431-437. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.
- Ramenofsky, Ann F.
 1987 *Vectors of Death: The Archaeology of European Contact*. University of New Mexico Press, Albuquerque.
- Reagan, Albert B.
 1917 Archaeological Notes on Western Washington and Adjacent British Columbia, *Proceedings of the California Academia of Sciences* 7:1-31.
- Renker, Ann M., and Erna Gunther
 1990 Makah. In *Northwest Coast*, edited by Wayne Suttles, pp. 322-430. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.
- Rice, David G.
 1964 Test Excavation at Wild Rose Rockshelter. *The Washington Archaeologist* 8(4):24-30.
 1965 *Archaeological Test Excavations in Fryingpan Rockshelter, Mount Rainier National Park*. Report of Investigations 33. Laboratory of Anthropology, Washington State University, Pullman.
- Rice, David G., and Dana Woodruff
 1981 *The Washington Harbor Village Site*. Submitted to the Port Gamble Klallam Tribe under Washington Commission for the Humanities Mini Grant No. 24M-3081. Seattle.
- Riddell, Francis, and Frederica de Laguna
 1964 Old Town, Knight Island. In *Archaeology of the Yakutat Bay Area, Alaska*. Bureau of American Ethnology Bulletin 192. Smithsonian Institution, Washington, D.C.

Roll, Tom E.

- 1974 *The Archaeology of Minard: A Case Study of a Late Prehistoric Northwest Coast Procurement System.* Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

Savage, Howard

- 1973 *Faunal Changes Through Time in British Columbia Coastal Sites and the Implications Thereof.* Paper presented at the Canadian Archaeological Association Meeting, 16 March 1973. Burnaby, British Columbia.

Schalk, Randall F.

- 1988 *The Evolution and Diversification of Native Land Use Systems on the Olympic Peninsula.* Institute for Environmental Studies, University of Washington. Submitted to the National Park Service Pacific Northwest Region, Seattle.

Schroedl, Gerald F.

- 1973 *The Archaeological Occurrence of Bison in the Southern Plateau.* Reports of Investigations No. 51. Laboratory of Anthropology, Washington State University, Pullman.

Singh, Ram Raj Prasad

- 1966 *Aboriginal Economic System of the Olympic Peninsula Indians, Western Washington.* Sacramento Anthropological Society, Sacramento.

Smith, Allan H.

- 1988 *Ethnography of the North Cascades.* Washington State University Project Report 7. Center for Northwest Anthropology, Pullman.

Stallard, Bruce, and Clayton Denman

- 1955 *An Archaeological Site Survey of the Coast of Western Washington.* Ms. on file, Department of Anthropology, University of Washington, Seattle.

Stern, Bernard J.

- 1934 *The Lummi Indians of Northwest Washington.* Columbia University Press, New York.

Strong, William Duncan, and W. Egbert Schenck

- 1925 *Petroglyphs Near The Dalles of the Columbia River.* *American Anthropologist* 27(1):77.

Strong, William Duncan

- 1945 *The Occurrence and Wider Implications of a "Ghost Cult" on the Columbia River Suggested by Carvings in Wood, Bone and Stone. American Anthropologist* 47:244-261.

Suttles, Wayne

- 1955 *Katzie Ethnographic Notes. Anthropology in British Columbia Memoir No. 2. British Columbia Provincial Museum, Victoria.*
- 1974 *The Economic Life of the Coast Salish of Haro and Rosario Straits. Reprinted. Garland Publishing Company, New York. Originally published 1951, Ph.D. dissertation, Department of Anthropology, University of Washington, Seattle.*

Suttles, Wayne, and Barbara Lane

- 1990 Southern Coast Salish. In *Northwest Coast*, edited by Wayne Suttles, pp. 485-502. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C.

Swan, James

- 1870 *The Indians of Cape Flattery. Smithsonian Contributions to Knowledge* 220. Smithsonian Institution, Washington, D.C.

Swanson, Earl H.

- 1972 *Birch Creek: Human Ecology in the Cool Desert of the Northern Rocky Mountains 9,000 B.C.-A.D. 1850. Idaho State University Press, Pocatello.*

Waterman, Thomas T.

- 1973 *Notes on the Ethnology of the Indians of Puget Sound. Miscellaneous Series* 59. Museum of the American Indian, Heye Foundation, Indian Notes and Monographs, New York.

Wessen, Gary C.

- n.d. *A Report on Preliminary Archaeological Investigations at 45-CA-201: A Second Terrace Shell Midden Site near Sand Point, Olympic National Park, Washington. Wessen and Associates. Submitted to the Pacific Northwest Region, National Park Service, Seattle.*
- 1978 *Archaeological Reconnaissance of River Valleys of the Western Olympic Peninsula, Washington. Project Report No. 69. Washington Archaeological Research Center, Washington State University, Pullman.*

- 1984 *Archaeological Activities at the Sequim Bay Marina Site, Pitship Point, Clallam County, Washington.* Wessen and Associates. Submitted to the Port of Port Angeles. Report on file at the Washington Office of Archaeology and Historic Preservation, Olympia.
- 1987 *Archaeological testing at Seal Rock (45-JE-15) Olympic National Forest, Washington.* Wessen and Associates. Submitted to the Olympic National Forest. On file at the Washington Office of Archaeology and Historic Preservation. Olympia.
- 1990 Prehistory of the Ocean Coast of Washington. In *Northwest Coast*, edited by Wayne Suttles, pp. 412-421. Handbook of North American Indians, vol. 7. Smithsonian Institution. U.S. Government Printing Office, Washington, D.C. In
- 1991 *Archaeological Testing at the Presbyterian Church in Neah Bay (45CA22), Washington.* Makah Cultural Research Center Reports of Investigation No. 1. Neah Bay, Washington.
- Wigen, Rebecca J., and Barbara Stucki
- 1988 Taphonomy and Stratigraphy in the Interpretation of Economic Patterns at Hoko River Rockshelter. In *Prehistoric Economies of the Pacific Northwest Coast*, edited by Barry L. Isaac, pp. 87-146. Research in Economic Anthropology, Supplement 3. JAI Press, Greenwich, Connecticut.

APPENDIX A

Scientific Names for Mammals Discussed in the Text

Land Mammals

River Otter	<i>Lutra canadensis</i>
Mink	<i>Mustela vison</i>
Marten	<i>Martes americanus</i>
Olympic marmot	<i>Marmota olympus</i>
Mountain beaver	<i>Aplodontia rufa</i>
Raccoon	<i>Procyon lotor</i>
Squirrel	<i>Tamiasciurus</i> sp.
Rabbit	<i>Leporidae</i>
Skunk	<i>Mephitis mephitis</i>
Cougar	<i>Felis concolor</i>
Bobcat	<i>Lynx rufus</i>
Beaver	<i>Castor canadensis</i>
Black bear	<i>Ursus americanus</i>
Elk	<i>Cervus canadensis</i>
Black-tailed deer	<i>Odocoileus hemionus</i>
Caribou	<i>Rangifer</i> sp.
Moose	<i>Alces alces</i>
Mountain goat	<i>Oreamnos americanus</i>
Mountain sheep	<i>Ovis canadensis</i>
Mastodon	<i>Mammuth americanum</i>
Bison	<i>Bos</i> sp.
Cow	<i>Bos taurus</i>
Pig	<i>Sus</i> sp.
Muskrat	<i>Ondatra zibethicus</i>
Dog	<i>Canis familiaris</i>
Wolf	<i>Canis lupus</i>
Coyote	<i>Canis latrans</i>

Sea Mammals

Sea Lion	<i>Eumetopias jubata</i>
Harbor seal	<i>Phoca vitulina</i>
Sea otter	<i>Enhydra lutris</i>
Northern fur seal	<i>Callorhinus ursinus</i>
Elephant seal	<i>Mirounga angustirostris</i>

Porpoise/Dolphin

Delphinidae

Whale

Cetacea

Northern elephant seal

Mirounga angustirostris

APPENDIX B

Anthropologists Consulted About Mountain Goats in the Northwest

Donald Abbott
Kenneth Ames
Walter Bartholomew
Eric Bergland
Astrida Blukis-Onat
Gay Fredericks
David Chance
Susan Crockford
Dale Croes
John Dewhirst
William Elmendorf
Delbert Gilbow
Paul Gleeson
Yvonne Hadja
David Huelsbeck
Karen James
Stephan Kenady
Grant Keddie
Lynn Larson
R. Lee Lyman
Richard McClure
R. G. Matson
Daniel Meatte
Robert Mierendorf
Madonna Moss
Richard Pettigrew
David Pocotylo
David Rice
Julie Stein
Gail Thompson
Jim Thomson
Gary Wessen
Robert Whitlam
Rebecca Wigen
Jacilee Wray