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Title: Whale Cove (35LNC60): An Archaeological Investigation on the Central Oregon Coast.

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The Whale Cove Site, 35LNC60, is a shell midden, showing occupations from 3010 B.P. to 330 B.P., spanning the Early and Late Littoral Periods. Analysis of mammalian faunal remains, bone and antler tools, lithics and discriptions of recovered shellfish artifacts allows for chronological refinement of the previously mentioned archeologically defined periods. The data suggest that during the Early Littoral Period terrestrial resources were still a major focus of the subsistence system; that the distribution of marine mammals, specifically northern fur seals and California sea lions, were not similar to their known historic distributions and that the coastal area was occupied for most of the year, if not year around. The data from the Late Littoral suggest the utilization of the coast in terms of a subsistence economy similar to that of a logistic collector focusing on the seasonal exploitation of harbor seals and with less diversity in the other analysed material culture remains.

Whale Cove (35LNC60): An Archaeological Investigation on the Central Oregon Coast

by

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This thesis is dedicated to the memory of Ida and Simon Collier,

and Roberto Joseph Rogers.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

WHALE COVE (35LNC60): AN ARCHAEOLOGICAL INVESTIGATION ON THE CENTRAL OREGON COAST

CHAPTER I

INTRODUCTION

The central Oregon coast has been inadequately studied by anthropologists. Ethnographic and archaeological information is generally poor for the area (Draper 1981; Lyman and Ross 1988). The cultural element list by Barnett (1937) consists of presence/absence data and represents a belated attempt to collect as much information as possible about the aboriginal Oregon coastal groups. At the time of the publication of Barnett's work, Kroeber (1937:199) wrote, "the culture of the Oregon coast Indians was known to have been violently and deliberately shattered by anglos seventy years before." Barnett's total number of informants was low, and they had already participated in reservation life for a number of years.

There is also a lack of ethnographic information suitable for archaeological model building and analogy. Drucker's (1939) studies tended to focus on specific aspects of the cultures under study. In his Alsea ethnography (Drucker 1939), discussion of the subsistence pattern focuses on exploitation of anadromous fish resources. Other researchers working in closer proximity to the Alsea culture area have found his accounts to be of limited use (Rambo 1978; Draper 1981). Summaries of western North American native groups often show distribution maps along the Oregon coast as empty due to lack of detailed ethnographic data (cf. Jorgensen 1980:7), while to the south and north of the modern political boundary of Oregon, numerous group territories are identified.

Oregon coastal Indian groups are represented by Salish, Penutian, and Athabascan linguistic groups (Zucker et al., 1983). Ethnographically, adaptation to the coastal environment was similar for these linguistic groups. The settlement pattern consisted of permanent coastal or riverine villages occupied by family household units, with village populations of about 50 (Beckham 1977). Camps were established for hunting and gathering seasonally available resources. Seasonal migration routes were up rivers (Zucker et al. 1983) or to the highlands (Kroeber 1925). Using the Athapascan speaking Tolowa as an example, permanent pit house villages were located as much as 18 miles inland (Kroeber 1925; Gould 1966). Archaeological information on the locations of some of these villages suggests that larger villages were located closer to the coast, in order to more intensively exploit marine and riverine resources.

In general, coastal groups were stratified on the basis of wealth, usually measured in terms of exotic items. High status (wealthy) people were usually the family leaders. Subordinate to them were the commoners, followed by the slaves. Leadership was not institutionalized, but village leaders and family leaders were often in decision making positions. Cutting across social strata was the shaman (Zucker et al. 1983).

These coastal peoples were first encountered by explorers traveling by sea in the 1770s and 1780s and who were searching for sea otter hunting grounds and trading ports. These maritime traders, early explorers, and fur traders did little to directly impact the Indians' environment, social and political organization, and subsistence patterns. Trade goods, such as beads, pots, and mirrors, began to appear in the material culture of the coastal peoples, but the basic manner of living remained the same.

For aboriginal Oregon coastal peoples, contact resulted in depopulation, a breakdown in political and social organization, disruption of subsistence activities, and finally, relocation and the loss of their traditional land base. These negative effects of contact began with an epidemic between 1782 and 1783. Estimates of depopulation of indigenous peoples reach 75% of the population (Zucker et al. 1983). Numerous villages were depopulated and abandoned. Survivors were forced to establish new political and social alliances. Groups affected by these epidemics may have further suffered such side effects as starvation, because illness prevented them from pursuing their seasonal rounds. In addition, a breakdown in trade may have threatened alliances and hampered wealth acquisition. This is the beginning of cultural change for the coastal Indians. Missionaries attacked the indigenous ideological system, which bound the societies together. In the 1830s and 1840s

Euro-American settlements were established, and Euro-American settlers introduced an agricultural adaptation to the coastal areas. Traditional camus gathering areas were plowed. Seasonal migratory rounds were disrupted by the construction of fences. The increase in guns reduced the game population of both terrestrial and marine animals. Traditional subsistence patterns became inoperable. Direct conflicts between Indians, farmers, and gold miners led to the establishment of the reservation policy. The purpose of this policy was to assimilate the Indians; the Siletz reservation was established in the mid-1850s.

Archaeological investigations along the central Oregon coast have been limited in scope, with a total of 51 sites previously sampled. In conjunction with investigations from the northern and southern Oregon coast, a stage model of the nature of prehistoric adaptations has been constructed. Lyman and Ross (1988), after extensively and intensively reviewing the published and unpublished literature, developed the three-phase stage model summarized in Table 1.

The earliest stage is the Pre-Littoral, represented by the components of sites dated 8300 B.P. to about 6000 or 5000 B.P. Cultural material (lithics) from the Neptune (35LA3) and Tahkentich Landing sites (35DO130) (Minor and Toepel 1986) have been assigned to this stage. Cultural material associated with this occupation is, however, very limited and should not be considered an adequate representation for that time period. These Pre-Littoral people are

Table 1. Coastal settlement and subsistence model.

Time Period	Stage Name	Sea Level	Subsistence Economy	Attributes of Subsistence Economy	Reference Sites
1856 A.D. to 2000 BP	Late Littoral	Slow rise	Logistically oriented collector	Scheduled spring/summer seasonal exploitation of coastal resources including shellfish and marine mammals; maintenance of a food storage system.	35LA3 35LNC14 35LNC53 35LNC56
2000BP to approx. 6000 BP	Early Littoral	Slow rise	Seasonally structured forager	Increased exploitation of marine mammals, especially pinnipeds; decreased emphasis on terrestrial mammals.	35DO83 35DO130
approx. 6000 BP to 8300 BP	Pre-Littoral	Sharp increase	Generalist forager	Migratory lifestyle, with limited exploitation of marine resources; no maintenance of a food storage capacity.	35LA3 35DO130

considered to be generalist foragers (Binford 1980). Groups employing a generalist forager strategy will make seasonal moves among a series of resource patches. Food is not stored for long periods, and subsistence resources tend to be gathered daily on an encounter basis. In accordance with these activities, sites should reflect the seasonal scheduling of activities and differential occupational duration. There is little or no exploitation of marine resources during this stage which is analogous to Ross' (1983; 1986) description of the Pre-Marine period.

This early avoidance and non-utilization of marine resources has been noted in many coastal settings. Arguments for this include that marine resources were considered inferior to terrestrial resources, and the later shift to marine resources resulted from environmental stress, over-exploitation, and population increases (Osborn 1977). Yesner (1980), noting the high productivity of coastal zones in terms of resource concentrations, especially in areas of upwelling such as the Oregon coast, suggests maritime procurement strategies became fully operative worldwide during the Holocene. Changing environments resulting from Holocene climatic changes and the pressure on inland resources forced groups to orient food-getting activities along the coast.

The Pre-Littoral stage is succeeded by the Early Littoral from 5000 B.P. to 2000 B.P. This coincides with middle Holocene stabilization of sea level on the west coast of North America. Fladmark (1983) places this stabilization at 4000 to 5000 B.P. for the west coast of Canada. In the San Francisco Bay area of

California, this has been placed also between 5000 and 3000 B.P. (Bickel 1978). Basically, sea level rose rapidly from 8000 to 5000 B.P., after which it rose at a slower rate and apparently even declined on portions of the central Oregon coast (McDowell 1986). There is a shift in the subsistence strategy from the previous stage to that of a seasonally structured foraging strategy (Binford 1980) focusing on intertidal resources. Marine mammals, such as pinnipeds, may have surpassed terrestrial mammals in subsistence importance. The material culture is characterized by an artifact assemblage that includes lithics and a broad range of bone and antler implements. Examples of this include components from the Umpqua-Eden site (35DO83) and Tahkentich Landing (35DO130).

There is a continuation of this Early Littoral into the Late Littoral stage. This poorly documented transition was completed by 2000 to 1500 B.P. This transition is not easily documented and may be gradual because sites characterized by an Early Littoral component usually also have the later component. In addition, recovered artifact inventories used to identify these components are usually small in size. Shell middens have long been noted for a low density of artifacts. In general, not more than two or three implements per cubic yard of sediment are recovered (Kroeber 1925).

During the Late Littoral, shell midden sites are larger, probably reflecting a less mobile or more sedentary lifestyle. The subsistence shift may be defined as a logistically oriented collector strategy (Binford 1980). For logistically oriented collectors, specific resources are supplied through specifically oriented task groups. In contrast to foragers, collectors maintain food storage for at least part of the year and have organized food procurement parties. Site types associated with this kind of subsistence strategy include a residential base and locational camps, field camps, stations, and caches. The locational sites are usually larger than the locational sites of foragers and are, therefore, more visible archaeologically, because the organized group is seeking raw materials in larger quantities to serve as stores over a period of time.

The Late Littoral stage may be described as basically similar to ethnographically documented lifeways. During the winter, villagers would be located adjacent to estuaries and rivers from the mouth to the end of tide water. Estuary dwelling villagers exploited both terrestrial and riverine resources. During the spring the villagers dispersed to the outer coast to exploit the minus low tide zones and sea mammal rookeries, or traveled upriver to obtain inland resources. Coastal shell midden sites were, therefore, occupied from the spring until the early summer for shellfish, fish, and marine mammals, although some exploitation of terrestrial resources continued. In the middle to late summer when the anadromous fish runs began, the population relocated to fishing camps. At the end of the fish runs, in the fall, the population returned to their winter villages. This logistical collector exploitation pattern is supported by the analysis of shell fish from the Neptune site (35LA3) which dated to 320 B.P. (Barner 1982:68), pinniped remains from Seal Rock (35LNC14) which dated to 160 B.P. and 375 B.P. (Rambo 1978:4), and fish remains from Neptune and Seal Rock (Zontek 1983), as well as material recovered from Cape Perpetua (35LNC55 and 35LNC56) which dated to 1180 B.P. and 1470 B.P. for the former (35LNC55) and 330 B.P. and 1350 B.P. for the latter (35LNC56) (Minor et al. 1985).

The organizational principals used for a given subsistence system will condition the nature and character of archeological intersite variability. Understanding this variability is one of the important factors in placing sites within a regional context. Detailed analysis of mammalian faunal remains, lithics and bone and antler tools from Whale Cove site offers a data base for refining and clarifying the previously mentioned model. This study of variability in the material culture will aid the further theoretical development of the archaeological nature of adaptions to the central Oregon coast from a diachronic perspective.

Since the 1960s, it is estimated that 80% of the 45 large coastal sites identified by Berreman and Collins have been destroyed (Newman 1973). Ross (1983) conservatively estimates that 40 to 60% of the 131 prehistoric sites identified in the 1953 survey by Collins have been destroyed or disturbed enough to eliminate full research potential. The disappearance of these nonrenewable resources emphasizes the importance of controlled scientific excavations conducted within the framework of regional studies. The results of the excavations at Whale Cove, when placed in a regional context, will contribute significantly to future research.

PHYSICAL SETTING

The Whale Cove site is located in the SW 1/4 of the NW 1/4 of Section 17, Township 96, Range 11W of the Willamette Meridian, 15 minute USGS Cape Foulweather (1957 Quad). The site is situated on a small knoll overlooking Whale Cove to the south (Figure 1). To the north is Little Whale Cove, a freshwater estuary fed by two unnamed drainages. The site is on the western margin of the Coast Range physiographic province (Baldwin 1976). Whale Cove sandstone, a thick Fournoy sandstone of Middle Eocene origin, is surrounded by basaltic agglomerates of probable Eocene age of Cape Foulweather, Otter Crest, and the headlands at Depoe Bay. The present temperate, humid marine climate is characterized by relatively wet, mild winters and dry, moderately cool summers. Annual precipitation ranges from 60 to 90 inches with approximately 80% of this precipitation occurring between October and March. This area is currently being developed for residential and vacation homes.

VEGETATION

The site is covered with an extensive salal and sitka spruce growth, which obliterates visual identification of most cultural material from the surface. Prior to excavation, cultural material was only visible from the eroding cliff face overlooking Whale Cove and in the root system of tree throws. Modern vegetation on the site, and in the immediate vicinity, is summarized in Table 2.

Figure 1. Location map of site 35LNC60.

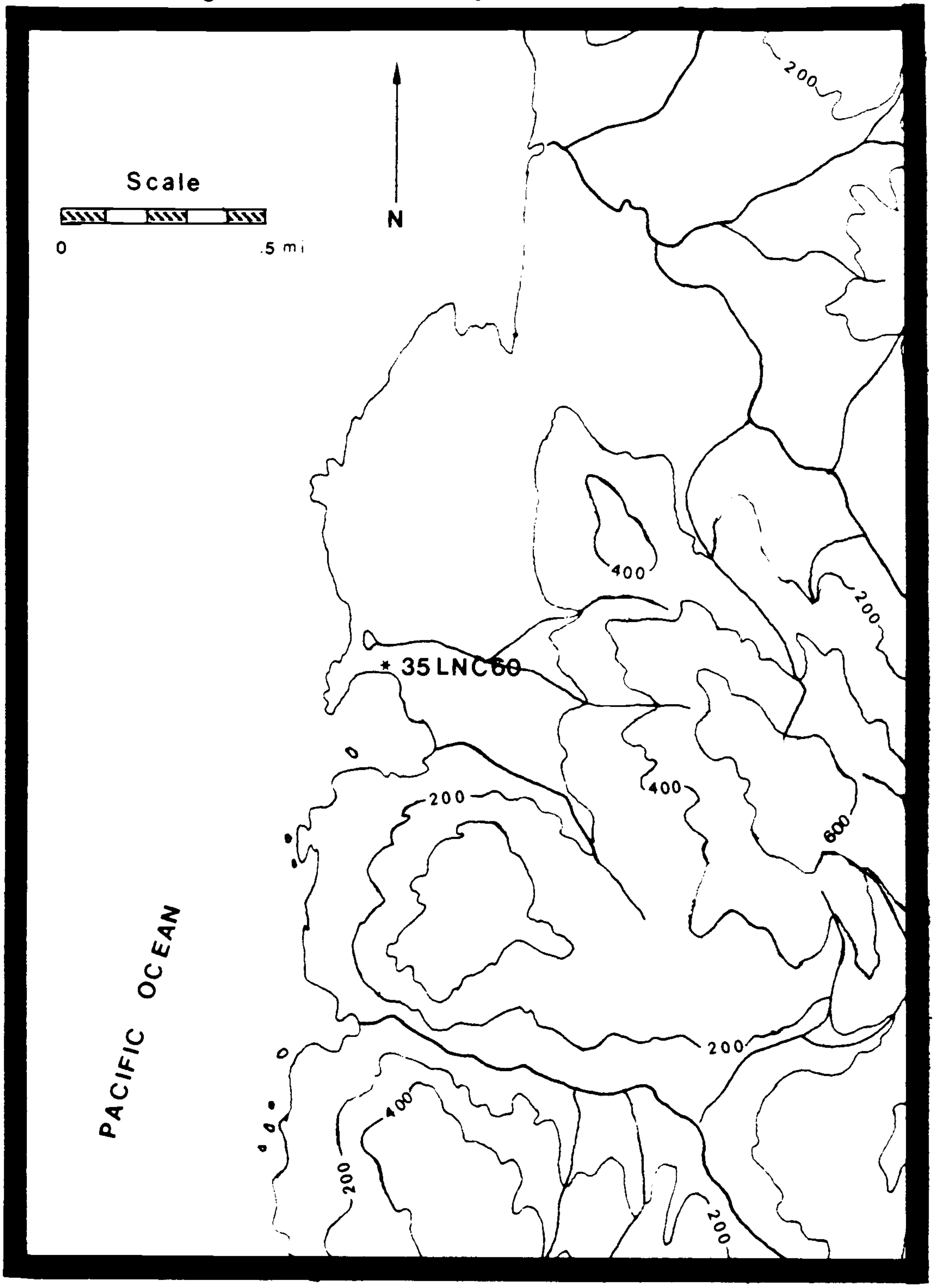


Table 2. Summary of vegetation noted in the project area.

Genus Species	Common Name	Ethnographically Utilized
Achillea millefolium	yarrow, milfoil, common milfoil	+
Anaphalis margaritacea	pearly everlasting	+
Angelica hendersonii	Henderson's angelica	+
Cakile maritima	sea rocket	-
Carex obnupta	slough sedge	+
Epilobium angustifalium	fireweed, blooming Sally	+
Equisetum telmateia	giant horsetail	+
Erechtites minima	toothcoast fireweed, burn weed	-
Gaultheria shallow	salal, Oregon wintergreen	+
Lonicera involucrata	swamp honeysuckle, turnsberry	-
Lysichitum americanum	skunk cabbage	+
Maianthemum dilatatum	deerberry, May lilly, false Lilly of the Valley, snake berry	+
Marah oreganus	bigroot, manroot	+
Picea sitchensis	Sitka spruce	+
Polystichum munitum	holly fern, Christmas fern, sword fern	+

Table 2, continued

Genus Species	Common Name	Ethnographically Utilized
Prunella vulgaris	self-heal, all-heal	+
Pseudotsuga taxifolia	Douglas fir	+
Salix sp.	willow	+
Scripus microcarpus	small fruit bulrush	-
Stachys mexicana	great betony, Mexican betony	-
Tolmiea menziesii	youth-on-age	+
Vicia gigantea	giant vetch	+

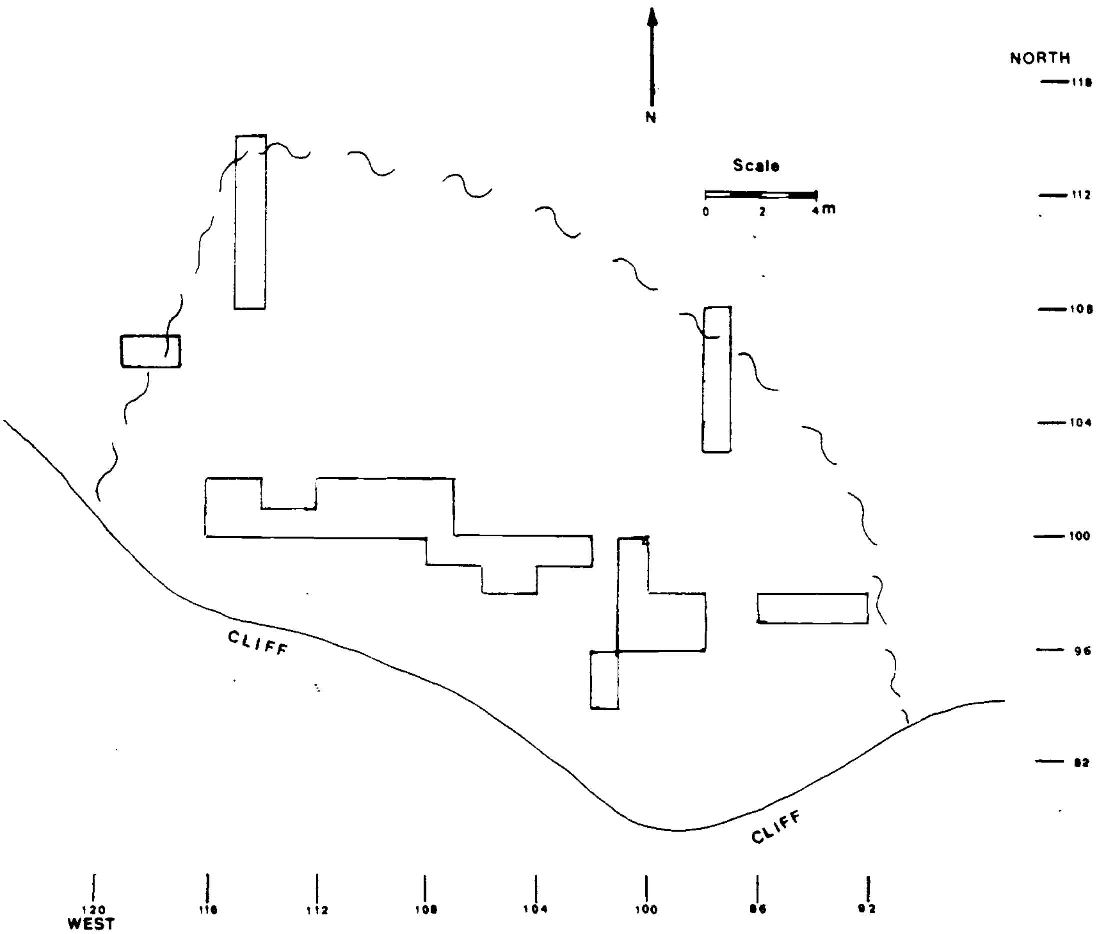
Ethnographic and ethnobotanical information from the Northwest were used to identify plants of possible economic value. Plants were collected and identified by Mandy Cole and the author.

SITE DISCOVERY, TESTING, AND TEMPORAL PLACEMENT

The property owners, Thomas MacDonald and Michael Lynch, approached the Department of Anthropology, Oregon State University, to see if they would be interested in undertaking unsponsored research at Whale Cove, where a shell midden site was threatened by erosion and possible development. The site was subsequently recorded by R. Lee Lyman. Test excavations were conducted in conjunction with the 1985 Oregon State University Archaeological Field School. The testing strategy was designed to identify site boundaries and obtain as much stratigraphic information as possible to aid in temporal placement and to provide a data base to be employed in the study of comparable coastal sites.

Initially, a series of discontinuous test units were laid out along the north-south and east-west axes of the site. These were subsequently expanded towards each other in a zigzag manner (due to the large sitka spruces that inhabit the site; Figure 2). Most of the units were excavated in 10 cm arbitrary levels with an attempt made to preserve context in terms of the appropriate major stratigraphic units. All excavated material was passed through quarter-inch screens, and in a few instances eighth-inch screens. The basic size of the recovery units varied and included 1 x 1

Figure 2. Site map 35LNC60 showing location of excavated units.



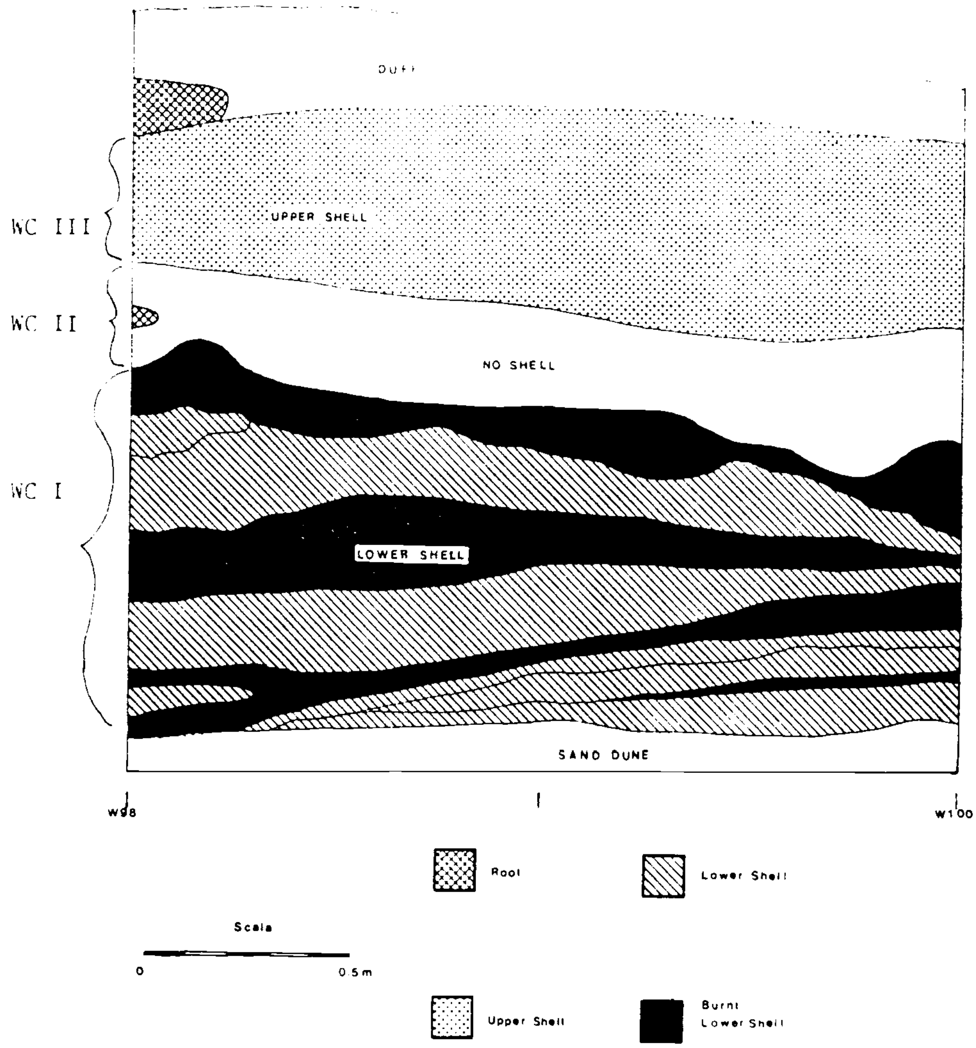
meter, 2 x 1 meter, and 2 x 2 meter units. All lithics, worked bone and antler, faunal remains, and most shell (excluding _Mytilus californianus_) were kept. Excavators noted in some instances that they could identify incidents of dumping of specific shellfish and faunal remains.

At the completion of the seven-week field season in 1985, 51 square meters had been opened, of which 36 square meters had been excavated to the culturally sterile consolidated sand dune that underlay the cultural deposits. A total of 63.5 cubic meters were excavated. All cultural material was assigned to one of four temporally and stratigraphically defined components illustrated in Figure 3. Three major strata were correlated with these temporal components. The defiitions of each component follows.

Whale Cove III: This is a culturally deposited stratum predominately made up of large, intact _Mytilus californianus_ shells. The layer is not continuous across the site, but is up to 40 cm thick in places. Faunal remains consisted primarily of harbor seal (72% of the number of identified specimens [NISP]) with deer and elk (19% of the NISP). This level was radiocarbon dated to 330 B.P. + 50 / - 60 (DIC 3256). The total excavated volume from this stratum was 5.8 cubic meters.

Whale Cove II: This is a dark brown silty loam, with a medium fine granular structure. The stratum associated with this temporal component is possibly an "A" horizon soil that developed between shell depositional episodes associated with Whale Cove III and I. This stratum is up to 30 cm thick in places and mammalian faunal

Figure 3. Stratigraphic profile Unit N98 W100.



remains follow a similar pattern as Whale Cove III. This level was radiocarbon dated to 610 B.P. + 40 / - 50 (DIC 3258). The total excavated volume from this stratum was 8.4 cubic meters.

Whale Cove I: This is a thick layer of culturally deposited shell containing primarily Mytilus edulis remains, however, they are more crushed and compacted than the stratum associated with Whale Cove III. The Whale Cove I shell inventory is characterized by greater diversity in shell species, including Margaritifera, a freshwater mussel. The stratum associated with Whale Cove I is subdivided into numerous facies consisting of layers of unburnt shell, overlaid by a similar facies that was burnt. The mamalian fauna is dominated by deer and elk (67% of the NISP). Fur seals, California sea lions, Stellar sea lions, harbor seals, as well as the first reported wolf remains from the Oregon coast area are associated with this component. The upper protion of this deposit was radiocarbon dated to 2830± 70 (BETA 27968) and the base of this deposit was radiocarbon dated to 3010 B.P. ± 50 (DIC 3257). The total excavated volume of this stratum was 17.4 cubic meters.

In addition, Whale Cove IV was defined. This includes all material from mixed context where stratigraphic provenience was indeterminable or inadequate control during excavation was evidenced. The total volume for this Whale Cove IV component was 31.8 cubic meters. This includes 12.5 cubic meters of mixed stratigraphic provenience; 1.1 cubic meters of secondarily deposited pit fill from Feature 8, an intrusive pit into the Whale Cove I and possibly contemporaneous with Whale Cove II; 7.5 cubic meters of secondary deposit house fill from the western end of the site and identified from profiles after excavation of the units; 0.1 cubic meters from Feature 1, a partially excavated disturbed burial reported elsewhere (Tasa 1987); 7.7 cubic meters of loam which underlies the Whale Cove I shell stratum, 1.3 cubic meters of duff, and 1.7 cubic meters of topsoil overlying the Whale Cove III stratum. All analysis was done within this framework of horizontal control (in terms of excavation unit) and vertical control (in terms of stratum).

PROBLEM STATEMENT

The main objectives of this work are to:

1. Define and describe the distribution of mammalian faunal remains as they change through time.
2. Define and describe the lithic assemblages of each major stratigraphic component.
3. Define and describe the worked bone and antler implements.

This study, while inadequate for detailed statistical analysis, will provide a data base for comparison with other coastal Oregon sites. The analysis will also attempt to use the faunal remains to evaluate the model proposed by Lyman and Ross (1988).

CHAPTER II

FOOD FOR THOUGHT--YOU ARE WHAT YOU EAT

INTRODUCTION

Mammalian faunal remains from 35LNC60 and their spatial distribution are important elements in the interpretation of the archaeology of the central Oregon coast. Historically, the coastal region is known for the richness of marine and terrestrial mammals. Cass (1985) documents the extent of exploitation by Euro-Americans and provides some idea of the degree to which whaling and sealing operations depleted the marine mammal populations. For example, by 1851 offshore whaling could no longer be accomplished due to the scarcity of whales along the coastlines (Scammon 1874). Some researchers estimate that only 4% of the original precommercial whaling populations survive today (Smith and Kinhan 1984). Cass (1985) suggests the decline of California sea lions (Zalophus californias) and Steller sea lions (Eumetopias jubatus) are the result of legal and illegal hunting practices primarily for oil and pet food.

Shell midden sites are one of the richest sources for the recovery of mammalian archaeofaunas (Butzer 1971). This is attributable to the preservation qualities of the shell midden matrix which is known for its low pH. Therefore, shell middens are excellent contexts for studying the range of subsistence resources, change in resource exploitation practices through time, and changes in the zoogeographic distribution of species through time.

Analysis of faunal materials recovered from Whale Cove indicate changing patterns of availability and exploitation. Temporal variations in patterns of species representation at 35LNC60 are observable by using stratigraphic levels as the analytic units. In contrast, a synchronic approach to the study by midden deposits often views these palimpsest accumulations as a single horizon.

Knowledge of the differences in the distribution of mammalian remains through time, along with knowledge of the seasonal availability of species, provide direct information regarding prehistoric exploitation patterns. These data also help answer paleo-environmental questions concerning the presence of mammalian species in the area surrounding the site. Additionally, variability in species representation through time refines the general model described by Lyman and Ross (1988). Interpretation of mammmalian fauna in conjunction with the tool inventory, permits inferences regarding site function.

The Whale Cove mammalian faunal assemblage includes terrestrial and marine mammals, and aggregations of skeletal material that represent almost complete individual skeletons, isolated skeletal elements, and weathered and fragmented pieces of bone. Mammalian remains were distributed throughout the site both horizontally and vertically. The majority of the mammalian faunal material is horizontally clustered towards the periphery of the excavated area, suggesting the midden deposits are not homogeneous.

QUANTIFICATION OF MAMMALIAN FAUNAL REMAINS

A summary of all mammalian remains classified by stratigraphic component is given on Table 3. Species representation was determined by using two differing quantitative measures of taxonomic abundance. The measures used are: (1) number of identified specimens per taxon (NISP) and (2) minimum number of individuals (MNI). There are methodological problems associated with measures. The major problem with NISP is the unknown degree of specimen interdependence. Interdependence means there is no way to demonstrate which bones and teeth and fragments thereof came from different individuals in the assemblage, and thus using NISP counts or percentages one must assume each item counted is independent of every other item counted (Grayson 1984). MNI values control for this problem of specimen interdependence. The MNI, however, is a derived measure and is subject to sample size effects. The difference in aggregation techniques can thus cause variations in measuring relative taxonomic abundances (Grayson 1984).

The MNI and NISP values were calculated following procedures suggested by Grayson (1984) and Klein and Cruz-Uribe (1984). Species identifications were made by R. Lee Lyman (Lyman 1988a,b). Lyman identified the mammalian remains to the lowest taxonomic level

Table 3. NISP and (MNI) values for each species and strata.

Species	Stratum WCI	WCII	WCIII	WCIV
Deer	40(3)	6(2)	4(1)	23(4)
Elk	112(4)	5(2)	2(1)	11(4)
Fur seal	19(7)	...	...	3(2)
Steller sea lion	19(3)	1(1)	2(2)	7(3)
Harbor seal	11(2)	34(2)	33(3)	39(6)
Zalophus sp.	4(3)	...	...	2(1)
Sea otter	8(1)	1(1)	2(1)	8(3)
Raccoon	...	...	...	2(1)
Canis F.	...	...	...	1(1)
Canis L.	1(1)	...	...	...
Phoecema sp.	2(1)	...	...	...
Ursus sp.	1(1)	...	...	...
Eutamis townsendii	11(1)	...	...	...
Lepus sp.	...	...	...	1(1)
Sylviagus sp.	2(1)	...	1(1)	...
Scapus sp.	...	...	...	1(1)
Sorex sp.	...	...	...	1(1)

possible, which includes species, age, sex, body part, and specific osteological element. Non-identifiable fragments were excluded from this analysis, with the exception of counts and weights of fragmented whale bone, which are discussed separately. No attempt was made to evaluate MNI and NISP in terms of rank-order abundances as suggested by Grayson (1984) because it was readily apparent that insufficient sample size had been recovered (Table 3). The MNI and NISP values, however, are used in this study to establish some preliminary "abundance" parameters. Thus, the NISP can be viewed as the upper limit and the MNI as the lower limit of abundance values, while the nature of the distribution between these limits remains unknown (Grayson 1984). In general, NISP frequencies are employed to portray the assemblages and to evaluate diachronic change. The NISP per taxon provides the best unit available for measuring the relative abundances of vertebrate taxa in archaeological sites (Grayson 1984:92).

SEASONALITY

When possible, inferences about seasonality were made based on the nature of the recovered mammalian faunal remains. Seasonality is used to mean the time of year at or during which a particular event (i.e., birthing, mating, migration, etc.) is likely to occur (Monks 1981:178). Seasonality was measured as presence/absence data in terms of calendar months assuming those same seasonal events found in contemporary populations as well as patterns of seasonal availability were also operating in the past. Physiological events in the animal's life that were evident in skeletal material, such as epiphysal fusion to derive age, given an assumed month of birth and other age and sex information associated with specific calendric dates, such as breeding and migration seasons, were utilized to determine seasonality and summarized on Table 4. In order to control for the bias caused by species with a large number of skeletal seasonality indicators, Monks (1981) suggests a method of quantification be employed to counteract the problems of interdependence of specimens. All seasonality estimates were made on the basis of the MNI values. Calendar months employed to estimate seasonal availability species were obtained from Maser et al. (1984). When no indicators for seasonality are noted, the apparent gap(s) does not necessarily mean that the site was unoccupied at these times (Monks 1981:226). Seasonality information is summarized on Figure 4.

THE MAMMALIAN FAUNAL DATA IN SUMMARY FORM

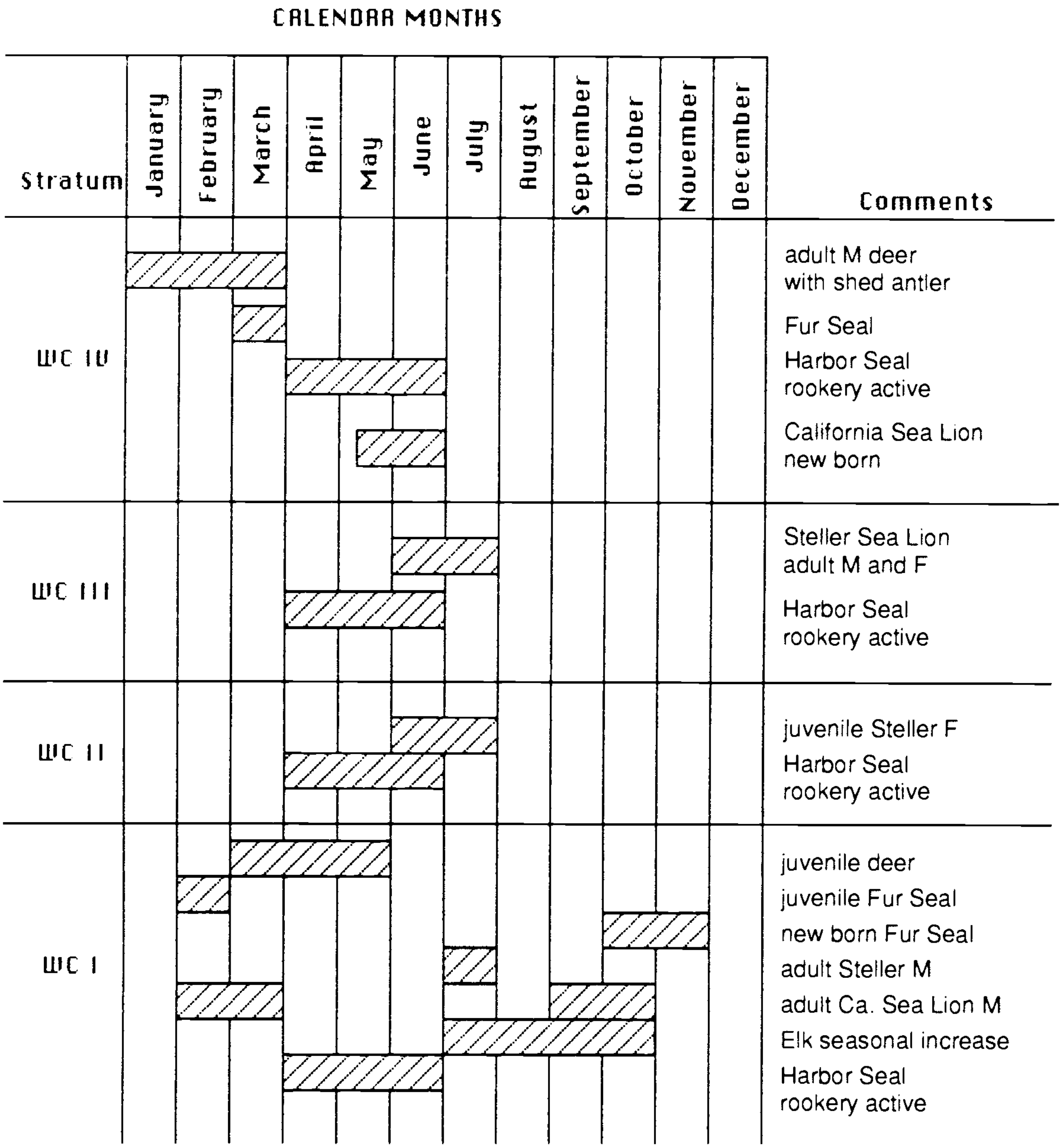
WCI--THE EARLY LITTORAL PERIOD

The WCI component as summarized in the tables and figures, and with the exception of the site totals, demonstrates the largest variety and quantity of species as measured by MNI and NISP. What is noteworthy is that it includes the first reported remains of wolf

Table 4. Frequency of age and sex classes used to determine seasonality, measured in MNI.

Species	Stratum WCI	WCII	WCIII	WCIV
Deer	1 adult	1 adult F	1 adult	1 adult M
	1 juvenile	1 juvenile	...	2 juvenile
Elk	2 adult	2 adult	2 adult	1 juvenile
	1 adult F	...	...	...
	1 juvenile	...	...	...
Harbor seal	1 adult	1 adult	1 adult	1 adult
	1 new born	1 new born	1 juvenile	1 juvenile
	...	...	1 new born	2 new born
Steller sea lion	1 adult F	1 juv. F	1 adult F	1 adult F
	1 adult M	...	1 adult M	1 juv. M
	1 juv. F	...	...	...
Northern fur seal	1 adult F	...	1 juv. M	...
	2 adult M	...	1 new born	...
	3 juvenile	...	...	...
	1 new born	...	...	...
California sea lion	2 adult M	...	...	1 adult M
	1 juv. M	...	...	1 new born
Sea otter	1 adult M	...	1 juvenile	1 juvenile

Figure 4. Seasonality influences based on mammalian faunal remains.

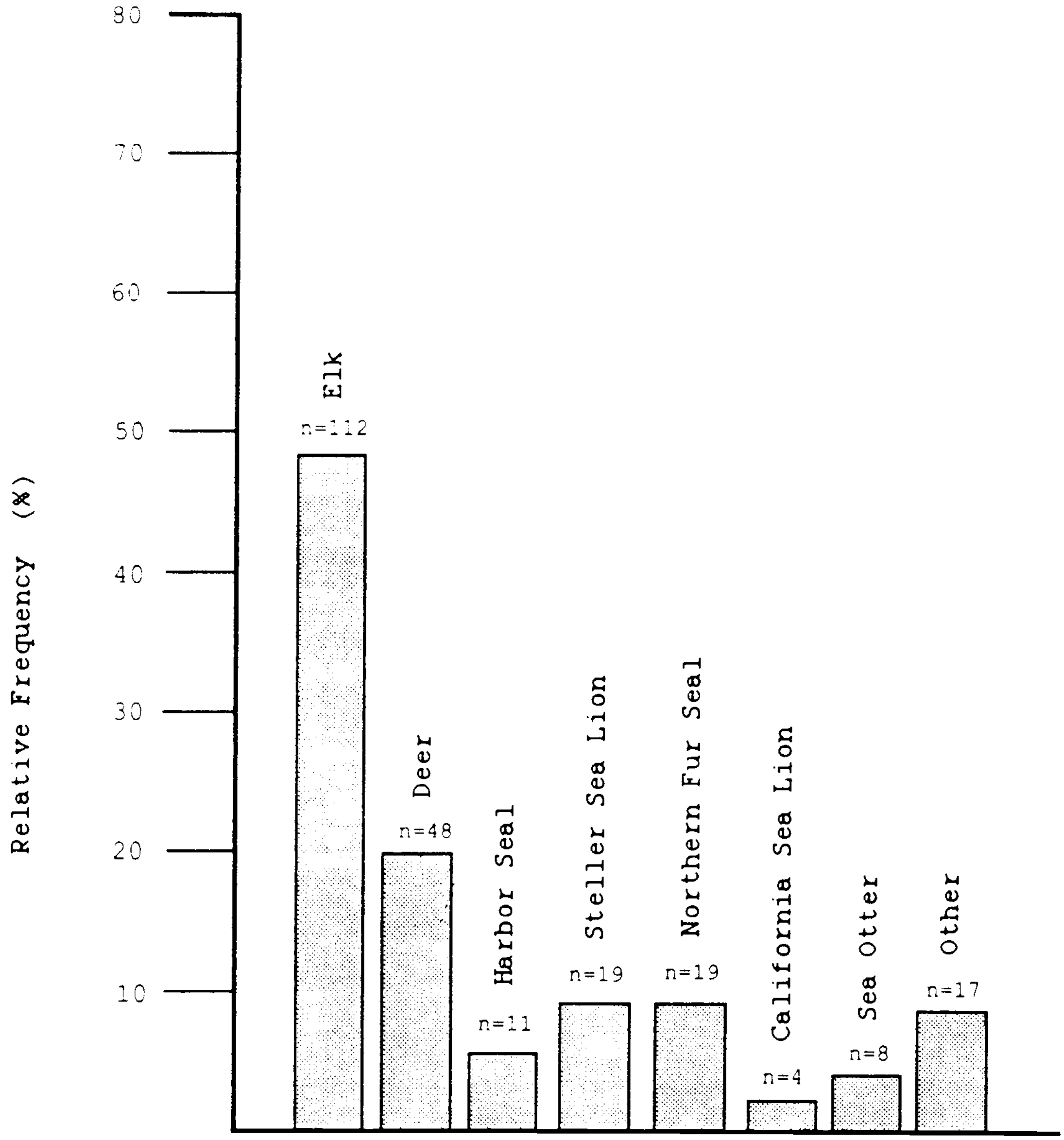


(*Canis lupis*) on the Oregon coast. In addition, there is a large variety of marine mammals (Table 3; Figure 5) that are not present in later components. The marine mammals recovered from this earlier component including harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*), northern fur seal (*Callorhinus ursinus*) and sea otters (*Enhydra lutris*). Of these marine mammals, northern fur seals are rarely seen ashore on the Oregon coast and are considered pelagic most of the year as they are usually found from 16 to 160 km offshore. Given a birthing season of June-July and the presence of an eight-month-old male and a four-month-old male suggest they were harvested in March and November, respectively. Fur seals have been recovered from other sites including 35LNC14 (Rambo 1978; Clark 1988). California sea lions are represented by three males, two with fused epiphyses and one that is unfused. No age estimates were made for these remains. There is no known breeding population in the Northwest, for contemporary breeding populations utilize areas south of the Channel Islands, California (Maser et al. 1984). Today the seasonal peak for migratory males in Oregon is reached during September and October. California sea lions represent 2% of the NISP. Stellers make up 8% of the NISP from the WCI component, with three individuals represented, including a mature female, an immature female, and a mature male. Steller males tend to migrate north to British Columbia after the mid-July breeding season, thus the male represented in this collection was probably obtained during that time period. Stellers are easily harvested during the breeding season in their rookeries (Cass 1985; Rambo 1978). Stellers were also heavily exploited by commercial fisheries up until 1972 (Cass 1985). Stellers prefer rocky areas, which are readily available in the Whale Cove vicinity.

Harbor seals, considered the most common pinniped in the northern hemisphere, are non-migratory and are represented at Whale Cove by 5% of the NISP. They are represented by one adult and one newborn seal. Birth and breeding take place from April until mid-June. They are the most readily available marine mammal in Whale Cove today, where a rookery of about 25 individuals resides. The last marine mammal to occur in any noticeable frequency was the sea otter, represented by one adult male, and representing 3% of the NISP. Sea otters were known to occur off the Oregon coast and were historically hunted as part of the fur trading economic network by Native Americans and Euro-Americans since 1741. Sea otters have been extinct on the Oregon coast since 1906. The only other marine mammals recovered from the site occur in the WCI component also. They include porpoise (Phocoena), represented by two vertebrae, and the numerous whale (Cretacean) bone fragments, totaling 1343 fragments, weighing a total of 9.4 kilos.

Terrestrial mammalian taxa account for the largest frequency of recovered material in WCI. Elk (Cervus elaphus) make up 47% of the NISP, and are represented by two adults of indeterminant sex, an adult female, and a juvenile. Rutting season occurs from late August to mid-November, suggesting this would be the time of densest concentration of elk and, therefore, highest availability. Deer

Figure 5. NISP frequencies for WCI.



(*Odocoileus* sp.) make up 20% of the NISP, making them the second most abundant taxon exploited by the prehistoric occupants during the deposition of WCI. They are represented by one adult, one eight-month-old (available in September given a May calving period), and one 28- to 30-month-old, which should have been available some time between March and May.

Wolf, porpoise, bear (*Ursus* sp.), rabbit (*Sylvilagus* sp.), and Townsend chipmunk (*Eutamias townsendi*) are rare elements probably recovered only because excavated sediment volume is largest for this stratum, and sample size was large enough to pick up these rarer elements (cf. Grayson 1984).

WCII AND WCIII--THE LATER LITTORAL PERIOD

Strata refered to as WCII and WCIII are similar in terms of distributions of terrestrial and marine mammals. They are marked by consideraby less variability in the assemblages WCI. Examining Figures 6 and 7, one notes quickly that their distributions are similar, and are in sharp contrast to WCI (Figure 4). Because of this similarity, they will be discussed together.

In examining the marine mammals of these two components, one of the most striking features is the high frequency of harbor seals in the NISP. MNI values are not as striking but show that the frequency is 33% for the WCIII stratum and 50% for the WCII stratum, both of which are noticeably higher than other MNI values. For

Figure 6. NISP frequencies for WCII.

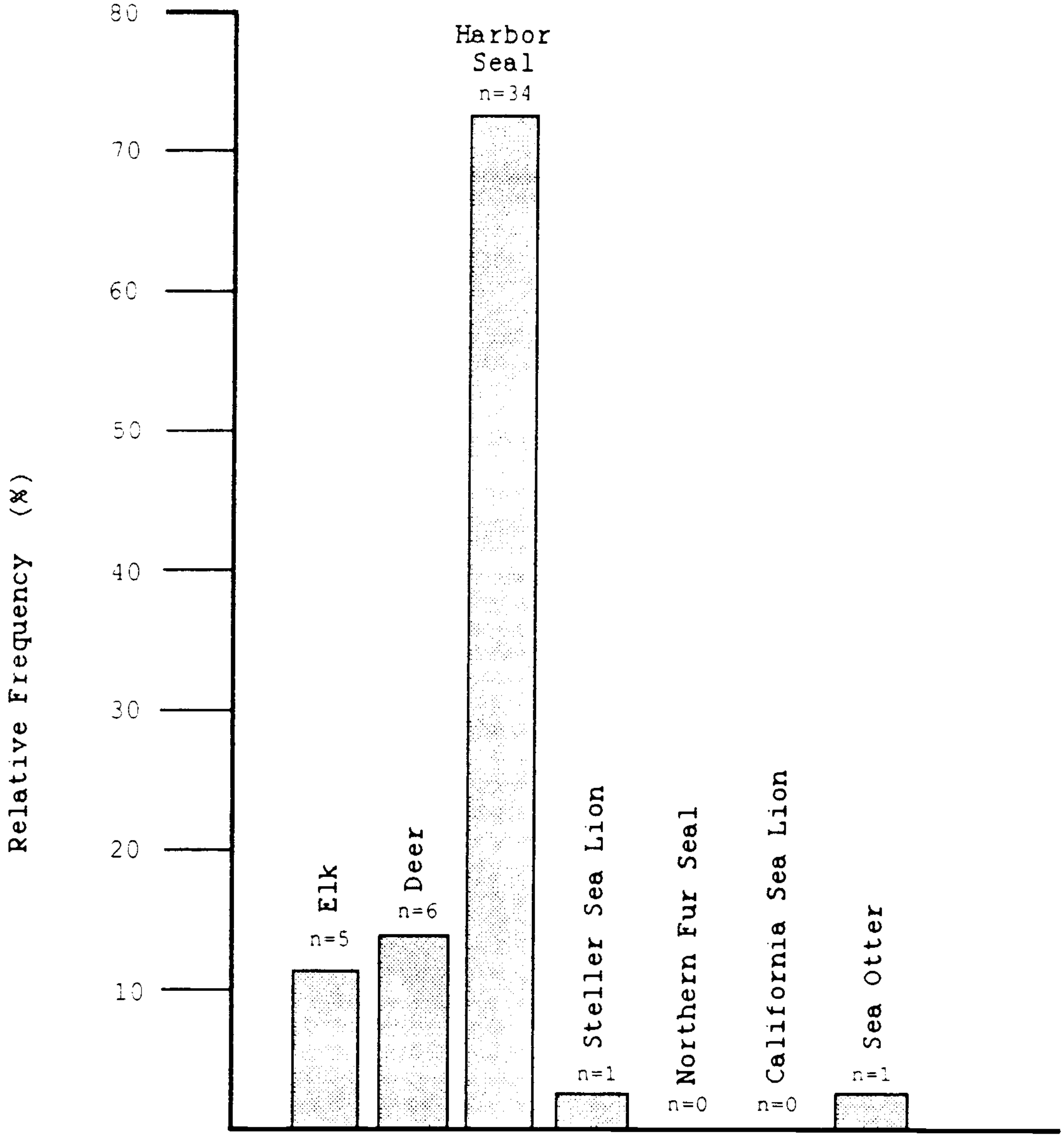
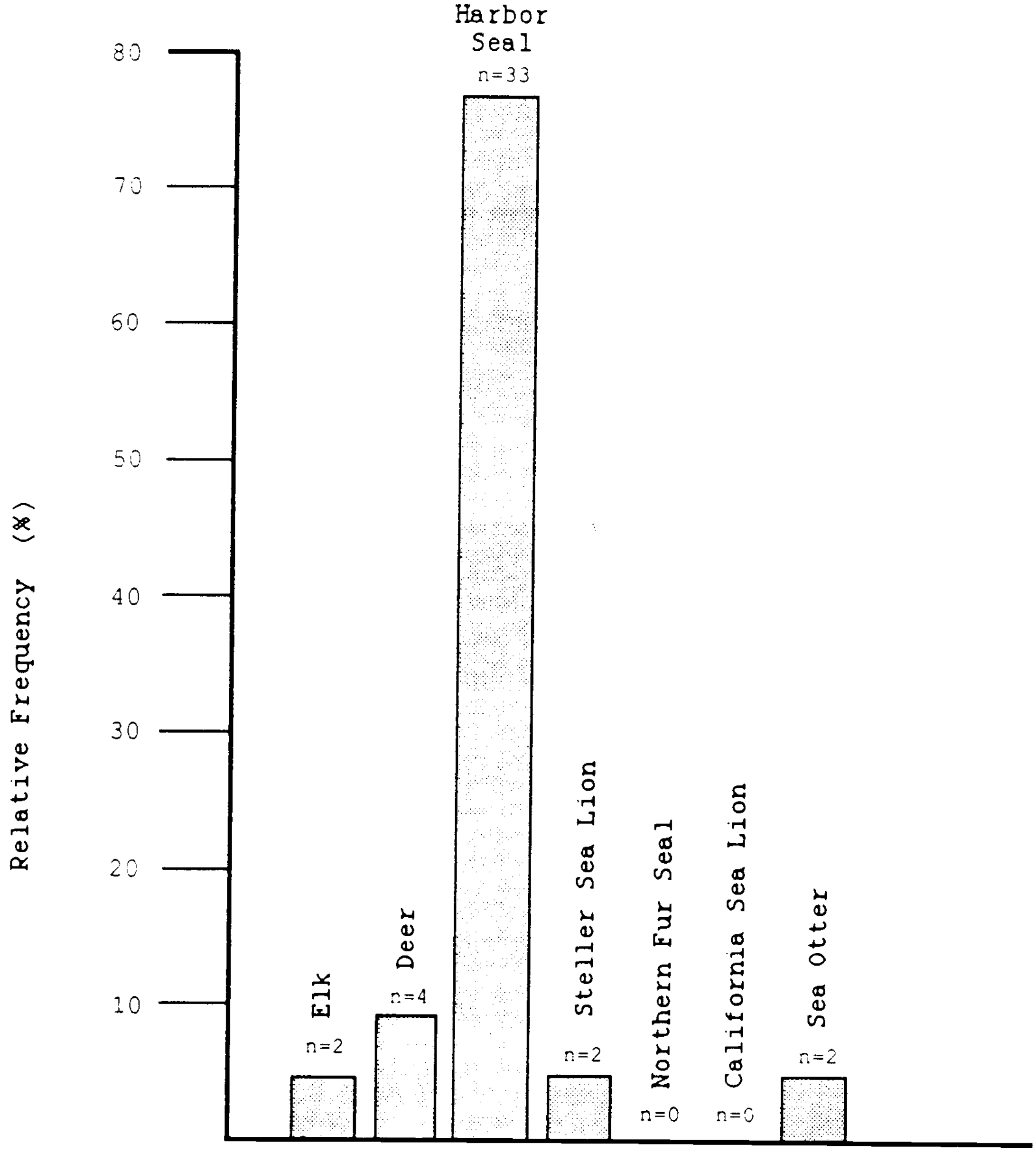


Figure 7. NISP frequencies for WCIII.



these strata, part of the discrepancy between the MNI and NISP values is probably due to the number of complete or nearly complete individuals recovered. The harbor seals are represented in the WCIII stratum by an adult, a juvenile, and a baby. In the WCII component, these seals are represented by one adult and a baby. Seasonality information suggests that availability was probably greatest during the breeding and pupping season of April to mid-June, as previously discussed.

Steller sea lions make up 2% of the WCII stratum and 5% of the WCIII stratum. In the WCIII stratum they are represented by the remains of an adult female and an adult male. In the WCII stratum the Stellers consist of only a female, with an unfused epiphesis. Although there is no positive evidence, Stellers were probably harvested seasonally, as in the WCI component, during the breeding season of June and July.

The only other marine mammal to continually be present in all strata is the sea otter. Sea otters make up 2% of the NISP in the WCII stratum, represented by an adult, and 5% in the WCIII, represented by a juvenile with deciduous teeth and an unfused femur. Other marine mammals (California sea lion and northern fur seal) are not represented in the recovered samples.

Deer and elk are represented by 13% and 11%, respectively, in the WCII stratum, and 9% and 5% in the WCIII stratum. Age information indicate there are two adult elk in both the WCIII and WCII components. There is one juvenile and one adult female deer in the WCII and an adult deer in the WCIII components.

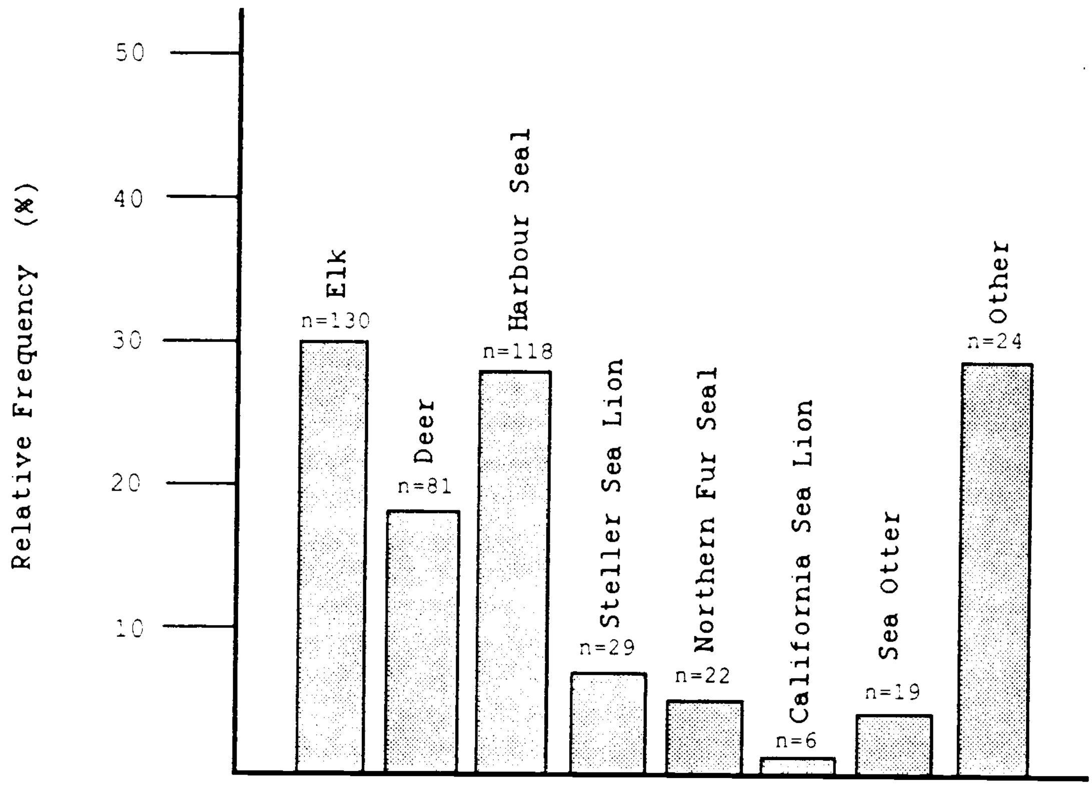
CONCLUSIONS, TEMPORAL RELATIONSHIPS AND THEIR IMPLICATIONS

The preceding discussion of the mammalian faunal characteristics of the major analytical stratigraphic units demonstrates that there is not a consistent pattern of mammalian exploitation through time. The dissimilarity between the WCI component and the subsequent depositional episodes represented by the WCII and WCIII strata suggests a shift in resource procurement strategies occurred. WCI has a greater diversity of mammalian species. Seasonality information suggests utilization of 35LNC60 at most times of the year, thus following the pattern expected of Binford's (1980) foraging groups. The high frequency of terrestrial mammals in WCI is unexpected, given the supposed littoral adaptation proposed by Lyman and Ross (1988). This is, however, based on an assemblage where measures of taxonomic abundance excluded any mention of whale (1343 pieces totaling 9400 grams).

Later components represented by the WCIII and WCII strata, follow similar patterns and suggest a spring-summer or April-to-July seasonal occupation. The lower diversity of faunal species and the apparent targeting of harbor seals, and Stellers to a lesser degree, suggests that the collector procurement strategy (Binford 1980) was being utilized. Apparently, deer and elk were not ignored but they were not the main focus of subsistence related activities. This follows the proposed model for the Late Littoral Period. This apparent specific focus on harbor seals seems to be similar to the Steller exploitation pattern noted for the Seal Rock site (Rambo 1978; Clark 1988).

This diachronic variation can be explained in terms of shifts in subsistence procurement strategies, but I am unable to determine if this shift is in response to increased social complexity requiring scheduling of task groups and the necessity to maintain some type of food storage system, or a shift in the zoogeography of the northern fur seals and California sea lions, for they are found archaeologically in distributions that are not analogous to their modern day distributions (Lyman 1988a,b; Bennett 1987). Attempts to resolve these matters require further research at sites with comparable time depth and stratification that permits delineation of temporally associated cultural units. As seen in Figure 8, when the stratigraphic analytical units are collapsed into one unit, and the frequency distributions of mammalian remains at the site are viewed as a whole, a much different interpretation would be obtained and the diachronic changes in distributional patterns would be masked, thus the necessity for analytical units to be chronologically controlled.

Figure 8. NISP frequencies for all periods.



CHAPTER III

THROWING STONES

This chapter describes and summarizes the lithic artifact assemblage recovered from 35LNC60. The assemblage is first summarized in terms of technologically defined artifact classes with a discussion of raw material type. This is followed by further analysis of the lithic assemblage, including a use-wear functional analysis of all artifacts exhibiting use wear, a debitage analysis of the by-products of lithic manufacture, and a detailed description of the recovered projectile points based on temporally sensitive variables.

LITHIC ARTIFACT CLASSES

A total of 18 artifact classes were identified during the examination of the 517 recovered lithics. These are summarized in Table 5. Most of the assemblage through time consists of debitage and will be discussed later in this chapter. Various frequencies of cores, cobble tools, and flaked or ground stone make up the remainder of the collection.

Flaked lithics are the formal and informal stone tools produced from flakes that exhibited a platform and a bulb of force at their

Table 5. Lithic data in summary form.

Lithic Class	Stratum WC I	WC II	WC III	WC IV	Total
Debitage	104	107	26	177	414
Flaked lithics					
Utilized flakes	16	3	...	16	35
Uniface	...	1	...	...	1
Bifaces	2	...	2	2	6
Scrapers	2	...	...	...	2
Drills/perforators	...	...	...	3	3
Projectile points	2	2	3	3	10
Cobble tools					
Utilized cobbles	...	2	1	...	3
Choppers	1	...	...	2	3
Hammerstones	1	...	...	2	3
Worked schist	3	...	...	...	3
Abraders	7	...	2	4	13
Anvils	...	...	...	1	1
Ground stone					
Manos	2	1	...	...	3
Grinding slabs	1	...	...	1	2
Stone bowl fragments	1	...	...	1	2
Pecked/ground sphere	1	...	...	...	1
Cores	3	3	1	4	11

proximal end and were produced by percussion or pressure flaking. At 35LNC60 six types of flaked lithic tools were identified. Utilized flakes, the most common type of flaked lithic tool recovered, are flakes which exhibit modification only by use (i.e., nibbling on the margin). A uniface is a flake that exhibits intentional retouch flaking on one surface only. A biface is a flake possessing intentional retouch flaking on both surfaces. Five bifaces were recovered including fragments of an obsidian wealth blake. Scrapers are implements with beveling on one or more margins of a flake to obtain a strong cutting edge (Crabtree 1972). The category of drills and punctates are flaked tools designed to have functional points. Projectile points are a functional category with a point, a hafting element and are generally bilaterally symmetrical.

Cobble tools are those objects that still retain the morphological aspects of a cobble. A utilized cobble is a split cobble with an unmodified utilized edge, exhibiting wear analogous to a utilized flake. Choppers are heavy cobbles which have a unifacially or bifacially worked edge that was presumably utilized for chopping. Hammerstones are the implement employed to fabricate a flaked artifact and are cobbles characterized by crushing or battering on one or more surfaces. The worked schist artifacts are pieces of tabular shist with abrading along the margins but otherwise unmodified. Abraders are characterized by a straight groove or grooves that have been ground across the surface of the rock. Anvils are cobbles that were used for the bipolar technique of lithic manufacture as a rest for the core while striking it with a hammerstone. The majority of the CCS (crypto-crystalline silicate) flakes and cores recovered were probably collected from locally available beach pebbles and cobbles and were initially reduced by employing this bipolar technique.

Groundstone tools have a surface or surfaces shaped through use by grinding and or pecking. Groundstone recovered from 35LNC60 included manos or handstone. These were unmodified cobbles which functioned as abraders on grinding slabs. Recovered grinding slabs, the unshaped companion tool to the mano, functioned as the abradee (Satterhwait 1971). Along the Northwest Coast and Coast Range of California grinding slabs are sometimes considered a temporally sensitive attribute of certain site types (McCarthy et al. 1982; Hayes 1986). The only two intentionally modified pieces of ground stone were stone bowl fragments, each characterized by a shaped concave and opposing convex surface were recovered. The dimensions of these bowls is unknown since only vessel wall fragments were recovered.

The last category of lithics recovered consisted of cores. A core is defined as any mass with negative flake scars (Crabtree 1972:54). All recovered cores showed evidence that a bipolar reduction technique was employed at the site. The bipolar technique requires placing the core on an anvil stone and striking it with a hammerstone (Crabtree 1972:10).

Artifact class richness and assemblage size have been demonstrated to be strongly influenced by sample size (Jones et al. 1983; Betz 1987). Diachronically the WCI stratum shows the highest tool diversity with 12 artifact classes, exclusive of debitage and cores, that describes 39 lithic tools, with utilized flakes and abraders dominating the collection. The later WCII and WCIII strata are represented by fewer artifact classes, five and four respectively. The lithic artifact count, exclusive of debitage and cores, is still less, than WCI yet only seven artifact classes were recovered from the combined WCII and WCIII.

Ten distinct raw material types were identified in the lithic assemblage and are enumerated on Table 6. It is assumed that differences in the representation of material types results from preferential selection and local availability. All lithic raw materials are locally available with the exception of obsidian. A piece of obsidian, an assumed fragment of the wealth blade, was characterized by a chemical signature of no known source in western Oregon, and obsidian hydration revealed to hydration rim (Skinner 1987). The dominant type of raw material is the previously mentioned CCS.

Table 6. Lithic raw material types.

Raw Material Type	Stratum WCI	WCII	WCIII	WCIV
CCS	108	112	30	193
Quartzite	2	1	1	2
Basalt	21	5	.	15
Sandstone	10	.	2	3
Obsidian	.	.	1	1
Granite	.	1	.	.
Pumice	2	.	.	.
Tuff	.	.	1	.
Schist	3	.	.	.
Mudstone	.	.	.	2

FUNCTIONAL TOOL ANALYSIS

The variable quantities of tool types and the evidence for their manufacture is generally used to suggest the range of activities which were carried out at the site. The majority of lithic studies of Oregon coastal sites have focused on the functional tool in some cases seeming to exclude other lithic categories such as debitage (cf. Minor and Toepel 1986). Tool types were usually based on morphological descriptions resulting in taxonomies that were mixtures of functional, technological, and stylistic attributes (Jelenick 1976).

A paradigmatic functional classification (Dunnell 1978), based on the macro-analysis of wear pattern, serves also to classify lithic artifacts into general function types. Function use was assigned to lithics when use wear (i.e., nibbling, crushing, chipping, etc.) was noted during macroscopic analysis. A paradigmatic typology has been employed elsewhere in the far west (Rice and Dobyns 1982; Rice 1979) and specifically in the Pacific Northwest by Beck (1984), Dunnell and Beck (1979), and Lyman and Matz (1985). This method results in each discrete lithic being inspected for evidence of use wear. Each discontinuous instance of wear was then recorded, thus allowing an artifact to display from one to several instances of use. This allows for more uses to be recorded than actual artifacts.

The complete functional classification used at this level includes four dimensions (variables) each consisting of a number of modes (attributes). This classification is employed then to create categories by the systematic reference to characteristics of the worn areas. All utilized lithic materials and traditional defined tool types (i.e., drill, scraper, chopper, etc.) exclusive of projectile points and other bifaces were included in this analysis.

The system generates 360 possible classes, using four dimensions is as follows:

Dimension 1. KIND OF WEAR. This dimension describes the physical expression of wear on an object, as a function of the manner of use for areas of contiguous wear.

Modes:

1. Chipping: small concoidal fracture scars along an edge like nibbling and is the same as Keeley's (1980:24-35) scalar damage.

2. Abrasion: a smoothed edge sometimes associated with striations. Abraded edges are generally rounded.
3. Crushing: irregularly shaped fractures on an edge or surface.
4. Polishing: extreme abrasion such that striations are not longer visable, the utilized area is glossy and smooth to the touch.
5. Grinding: abrasion on a surface, sometimes associated with strations.

Dimension 2. LOCATION OF WEAR. This dimension records the basic object geometry at the site of wear, identifies the kind of solid that displays the wear and does not include duration of use (Beck 1984:184).

Modes:

1. Edge: damage is confined to the intersection of two plane surfaces creating an abrupt edge.
2. Surface: wear occurs on a single flat or rounded plane.
3. Point: wear occurs at the intersection of three or more planes.

Dimension 3: SHAPE OF WORN AREA. This dimension relates planimetric configuration of the wear at the edge/surface of the tool (Beck 1984:185).

Modes:

1. Convex: the plane of wear describes a gradual convex arc.
2. Concave: the plane of wear describes a gradual concave arc.

3. Straight: the plane of wear closely approximates a straight line or a flat surface.
4. Point: the plane of wear describes an abrupt convex arc/angle.
5. Notch: the plane of wear describes an abrupt concave arc.
6. Concave and convex.

Dimension 4. EDGE ANGLE CATEGORY. This dimension is defined as the angle formed by the intersection of two surfaces at the site of wear. The edge angle was recorded approximately one millimeter back from the edge. This corresponds to the functional angle, rather than the production angle (cf. Hayden and Kamminga 1979:7). These edge angles were subsequently assigned functional categories (Wilmsen 1968).

Modes (after Beck 1984):

1. Acute angle: 0 to 30° suggestive of cutting or slicing.
2. Medium angle: 31°to 60° suggestive of heavy duty sawing.
3. High angle: greater than 61° suggestive of chopping, adzing or scrapping.
4. Not applicable: angle is not measurable as on a point or surface.

When the tool assemblage is examined as a whole, 85 tools were recovered and 31 functional tool type groups were identified. These 31 tool type groups are defined in Table 7. Tools types as distributed by stratum are defined in Table 8. The use wear analysis clearly shows a variety of tasks were carried out at

Table 7. List of functional tool types.

1111	Chipping on a convex edge of less than 31°
1112	Chipping on a convex edge of 31° to 60°
1113	Chipping on a convex edge of more than 60°
1122	Chipping on a concave edge of 31° to 60°
1131	Chipping on a straight edge of less than 31°
1132	Chipping on a straight edge of 31° to 60°
1133	Chipping on a straight edge of more than 60°
1162	Chipping on a concave and convex edge of 31° to 60°
1344	Chipping on a point (e.g. drills)
2112	Abrasion on a convex edge of 31° to 60°
2144	Abrasion on a point
2162	Abrasion on a concave and convex edge of 31° to 60°
2163	Abrasion on a concave and convex edge of more than 60°
2214	Abrasion on a surface
2224	Abrasion on concave surface
2234	Abrasion on a straight surface
3112	Crushing on a convex edge of 31° to 60°
3113	Crushing on a convex edge of more than 60°
3121	Crushing on a concave edge of less than 31°
3122	Crushing on a concave edge of of 31° to 60°
3123	Crushing on a concave edge of more than 60°
3132	Crushing on a straight edge of 31° to 60°
3133	Crushing on a straight edge of more than 60°
3153	Crushing in a notch of more than 60°
3224	Crushing on a convex surface
3234	Crushing on a surface (e.g. hammerstones)
4234	Polishing on a straight surface
4264	Polishing on a concave and a convex surface (e.g. bowl fragments)
5214	Grinding and pecking on a convex surface (e.g. stone sphere)
5224	Grinding and pecking on a concave surface
5234	Grinding and pecking on a straight surface (e.g. milling stones and mano)

Table 8. Composition of stone tool sample.

Functional Tool Type	Stratum WC I	WC II	WC III	WC IV	Total
1111	2	...	...	1	3
1112	4	1	1	4	10
1113	1	...	1	1	3
1122	...	1	...	...	1
1131	1	1	...	1	3
1132	3	2	...	2	7
1133	...	1	...	...	1
1162	...	2	...	1	3
1344	...	...	...	2	2
2112	2	...	...	...	2
2144	...	...	...	1	1
2162	2	...	...	...	2
2163	2	...	...	...	2
2214	...	...	...	1	1
2224	5	...	...	1	6
2234	6	...	1	1	8
3112	1	...	...	1	2
3113	...	...	...	1	1
3121	...	...	...	1	1
3122	...	...	...	1	1
3123	...	1	...	...	1
3132	3	1	...	3	7
3133	1	...	...	1	2
3153	1	...	...	...	1
3234	1	...	...	3	4
3224	...	1	...	...	1
4234	...	...	1	1	2
4264	1	...	...	1	2
5214	1	...	...	...	1
5224	...			1	1
5234	2	...	...	1	3

35LNC60. Table 9 summarizes the number of tools types and the number of tools defined per stratum. Most of the functionally defined tool types recovered were complete (see Table 10). This is probably related to their depositional pattern and further suggests that the tool assemblage was expedient, not curated, because the tool assemblage is not retouched numerous times. Only one flaked implement demonstrated multiple instances of retouch. Multiple instances of utilization were more common on the abraders and worked schist.

Table 9. Number of tool types and total number of tools recovered per stratum.

	Stratum				
	WCI	WCII	WCIII	WCIV	Total
Number of tool types	18	9	4	22	31
Number of tools	39	11	4	31	85

Table 10. Artifact condition of tools.

	Stratum			
	WCI	WCII	WCIII	WCIV
Complete	16	7	1	20
Fragmentary	19	.	2	10

DEBITAGE ANALYSIS

The purpose of the debitage analysis is to place all chipped stone material lacking evidence of macroscopic wear into mutually exclusive categories. Non-tool or debitage analysis has generally been confined to the categories of primary, secondary, tertiary flakes and chunk shatter. These categories, however, are influenced by a variety of independent technological and non-technological factors, which influence cortical variation, and so it is misleading to exlusively employ them to describe a technology (Sullivan and Rozen 1985:756). B. Stafford (1980:111) has demonstrated elsewhere the primary and secondary flakes are more similar than tertiary flakes, suggesting these may not be discrete flake categories.

Following the categories outlined by Sullivan and Rozen (1985), all debitage was placed into one of the following four categories:

1. Complete flake: has a single interior surface, with positive percussion features, with evidence for a platform and all margins are intact.
2. Broken flake: has a single interior surface, with part or all of a striking platform, but lacking one or more of the margins.
3. Flake fragment: has a single interior surface, but lacking a striking platform, and lacking some or all margins.
4. Debris: lacking flake margins and with multiple occurences of bulb of percussion or bulb not discernible.

Table 11. Debitage data in summary form.

	Stratum			
Debitage Type	WCI	WCII	WCIII	WCIV
1	45(43.3%)	50(46.7%)	5(19.2%)	70(39.5%)
2	13(12.5%)	20(18.7%)	2(7.7%)	22(12.4%)
3	16(15.4%)	14(13.1%)	4(15.4%)	30(16.9%)
4	30(28.8%)	23(21.5%)	15(57.7%)	55(31.1%)

The debitage data are summarized in Table 11. The high frequency of complete flakes (Type 1) and debris (Type 4) suggests core reduction was a major activity at the site, and not tool reduction. Sullivan and Rozen (1985) have shown that the high frequency of Type 1 and 4 is indicative of core reduction; it is therefore suggested that at 35LNC60 lithic material was acquired, manufactured, and used at the site.

In addition, all recovered lithic debitage material was weighed to the nearest tenth of a gram, and maximum length, width and thickness measurements were taken to the nearest millimeter. These flake size measurements are summarized on Tables 12, 13, 14, and 15. It has been demonstrated elsewhere that these measurements have been shown useful for differentiating stages of lithic reduction, and that flake weight is patterned much like these flake size attributes (Lewenstien and Brown 1982). In examining these values, it is apparent that the size of debitage types decreases from WCI to the subsequent WCII and WCIII. A two-way analysis of variance of the

Table 12. Debitage statistics for length.

Debitage Category		Stratum WC I	WC II	WC III	WC IV
1	$\bar{x}$	32.42	26.30	20.80	26.52
	s	9.93	10.95	9.98	11.75
	n=	45	50	5	70
2	$\bar{x}$	30.46	24.80	28.50	27.36
	s	13.07	7.77	16.26	10.03
	n=	13	20	2	22
3	$\bar{x}$	25.44	24.64	19.50	26.10
	s	7.58	6.45	8.96	9.51
	n=	16	14	4	30
4	$\bar{x}$	32.76	25.96	25.33	27.20
	s	9.82	7.87	12.61	8.92
	n=	30	23	15	55

Table 13. Debitage statistics for width.

Debitage Category		Stratum WC I	WC II	WC III	WC IV
1	$\bar{x}$	25.62	20.72	15.00	20.20
	s	9.06	9.14	9.14	9.75
	n=	45	50	5	70
2	$\bar{x}$	24.69	22.65	18.00	23.00
	s	10.59	8.96	4.24	9.38
	n=	13	20	2	22
3	$\bar{x}$	22.62	18.92	14.50	18.43
	s	7.71	7.39	7.42	9.51
	n=	16	14	4	30
4	$\bar{x}$	22.23	17.69	16.73	18.78
	s	7.23	6.36	9.09	6.44
	n=	30	23	15	55

Table 14. Debitage statistics for thickness.

Debitage Category		Stratum WC I	WC II	WC III	WC IV
1	x	6.42	5.04	3.80	4.97
	s	3.10	3.02	1.92	2.84
	n=	45	50	5	70
2	x	6.08	5.35	2.50	5.18
	s	3.43	2.54	0.71	1.71
	n=	13	20	2	22
3	x	5.44	4.14	3.25	4.53
	s	2.55	1.91	2.50	2.27
	n=	16	14	4	30
4	x	10.50	7.83	8.53	9.04
	s	3.94	4.22	4.03	4.45
	n=	30	23	15	55

Table 15. Debitage statistics for weight.

Debitage Category		Stratum WC I	WC II	WC III	WC IV
1	x	7.330	3.136	2.320	4.980
	s	9.200	4.986	2.962	9.756
	n=	45	50	5	70
2	x	5.208	3.945	1.900	5.254
	s	6.452	4.263	1.556	5.769
	n=	13	20	2	22
3	x	3.706	3.350	1.125	3.580
	s	3.116	3.576	0.918	5.706
	n=	16	14	4	30
4	x	7.170	3.808	4.186	5.438
	s	6.446	4.149	5.479	7.275
	n=	30	23	15	55

maximum length and log(10) weight (weight was transformed to normalize a positively skewed distribution) for each debitage type suggest that this trend is significant [for length $p = .0021$ and for log(10) weight $p = .001$]. Since debitage was produced at the site from locally available material it is suggested that the WCI inhabitants utilized the larger pieces of locally available material and the subsequent WCII and III inhabitants were forced to utilize smaller pieces of available raw material.

PROJECTILE POINTS

A temporally sensitive projectile point typology for the Oregon Coast is poorly developed. Pullen (1982) employs a two-stage diachronic typology to identify an Early Period characterized in general by leaf-shaped points, referred to as the Oregon Series in the North Coast Range of California and a subsequent Late Period characterized by tanged points similar to the Gunther series of Northwest California (Hayes 1986; Hayes and Hildebrandt 1984; Hildebrandt and Hayes 1983; Baumhoff 1982). Development and refinement of a projectile point typology was not possible due to insufficient existing typologies and the small number of points from dated sediemnts. Descriptions, however, of recovered points based on temporarily sensitive morphological attributes specified by Thomas (1981) are summarized in Table 16 and the points are illustrated in Figure 9.

The attributes define morphological types that are consistently associated with a particular time span in an area (Thomas 1981:14). These projectile point attributes assume attrition occurs at the distal end of a point so the basal attributes would therefore be the most stable indicators of a temporal period. The attributes are defined as:

1. LT: total length regardless of point type.
2. LM: length between the proximal end and maximum width position.
3. WM: maximum width.
4. WB: basal width.
5. NW: neck width.
6. WMP%: Maximum width position which is W_m=100LM/LT, with a range from 0 to 90
7. DSA (°): Distal Shoulder Angle, with a range of 90° to 270°.
8. PSA (°): Proximal Shoulder Angle, with a range of 0° to 270°.

It is hoped these descriptions will aid researchers in developing a more temporally sensitive coastal projectile point typology.

Table 16. Projectile point metric attributes.

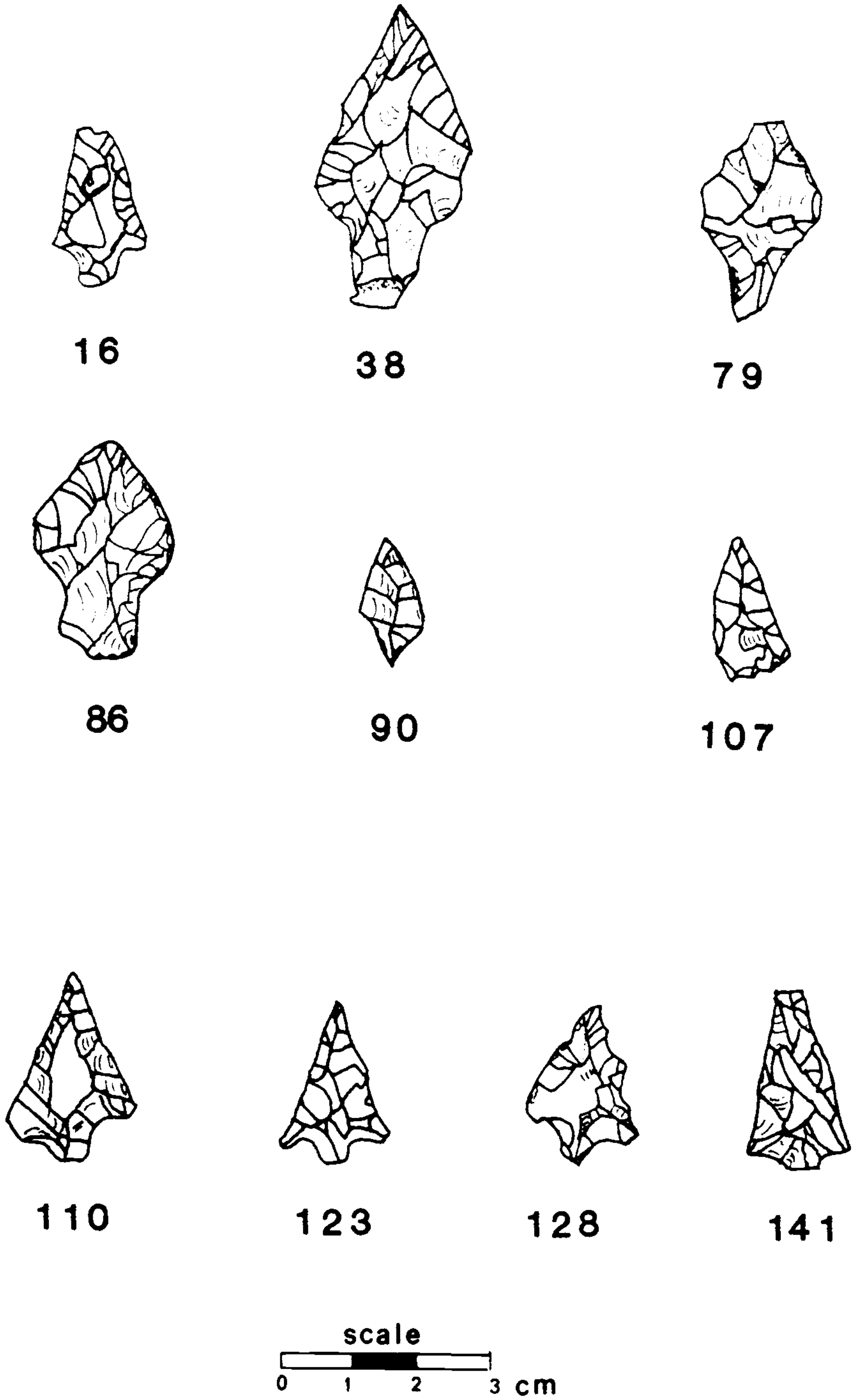
Catalog #	Stratum	LT	LM	WM	WB	NW	WMP%	DSA(°)	PSA(°)	Condition
16	WCIV	2.2*	0.6	1.3	0.4	0.7	2.73	212	77	tip snapped
38	WCIV	4.2	1.7	2.1	1.0	1.1	40.48	225	90	complete
79	WCI	2.8	1.3	1.9	0.6	1.1	46.43	180	64	complete
86	WCIV	3.0	1.6	2.0	1.2	1.2	53.33	222	90	complete
90	WCIII	1.8	0.6	1.0	0.3	0.6	3.33	148	66	complete
107	WCIII	2.0	---	---	---	---	-----	NS	NS	complete
110	WCIII	2.6	0.6	1.9	0.4	0.6	2.31	167	81	tang snapped
123	WCII	2.3*	0.2	1.6	0.4	0.5	8.70	138	90	base snapped
128	WCII	2.3	0.5	1.6	0.2	0.6	21.74	150	90	complete
141	WCI	2.6*	---	1.5	---	0.6	-----	180	67	base and tip snapped

* estimated length

--- unable to measure

NS no shoulder

Figure 9. Recovered projectile points.



DISCUSSION AND SUMMARY

In designing the lithic analysis for 35LNC60, there were few suitable models to be found among previous studies. For this reason the data from the different types of analysis are summarized on tables in order to condense and organize the information that would be helpful to allow technological and functional comparisons to be made for the central Oregon Coast. The recovered lithic data consisted primarily of debitage, which has traditionally not been the focus of previous studies. The people who utilized Whale Cove to obtain subsistence resources used the locally available lithic sources with skill and efficiency suited to the tasks they wished to perform. In a logistically organized subsistence system the residential base camp will display the widest range of lithic materials. The widest range was recovered from the WCI component, in contrast to WCII and WCIII. Expediency tool technologies, such as that recovered from 35LNC60, are characterized by large quantities of debitage with few resharpened tools (Binford 1977). The lithic materials tend to suggest that the lithic technology was characterized through time by expediency tools that were rarely retouched, deposited where used, and not the object of high labor input.

CHAPTER IV

BONE AND ANTLER TOOLS, PREHISTORIC RECYCLING

Bone and antler artifacts or faunal remains that demonstrate alteration beyond that of butchering and discard are frequently recovered from Oregon coastal sites (Minor and Toepel 1986; Minor et al. 1987; Atkinson n.d.; Barner 1982; Rambo 1978; Newman 1959; Berreman 1944; Stubbs 1973) in contrast to interior areas of Oregon where conditions do not favor the preservation of such artifacts (e.g., Schmitt 1986). Although shell middens are generally characterized by the presence of bone and antler artifacts, the low density of this artifact type within sites has prevented the development of any typological categories based on function or style, and minimal chronological control. Because of this lack of a well defined bone and antler tool assemblage, material rcovered from sites in California and the Great Basin and ethnographic literature from classic Northwest Coast cultures were employed in conjunction with the available Oregon coastal literature to serve as analogs.

Numerous bone and antler artifacts (n = 136) were recovered from 35LNC60. These artifacts are discussed within the following morphological and functionally derived categories: pointed bone (n = 31); wedges and chisels (n = 24); beaver incisors (n = 4); fish lures (n = 4); decorative and utilitarian miscellaneous artifacts (n = 8); miscellaneous bird bone artifacts (n = 7); miscellaneous worked terrestrial mammal bone (n = 31); miscellaneous worked antler (n = 9); and worked marine mammal bone (n = 18).

POINTED BONES

A total of 31 pointed bone artifacts including awls, miscellaneous pointed bone and needle fragments, was recovered (see Table 17). All display various degrees of manufacture and are usually characterized by a polished tip. They were produced from either bird or terrestrial mammal bones. The majority of the material (n = 20) was recovered from the WCI component, with 13 of these artifacts recovered from a central area of the site measuring six meters square.

Sixteen awls or awl fragments were recovered. Tips are generally characterized by a highly polished sheen. Striations sometimes circumscribe the margins adjacent to the tip, and possibly resulted from manufacture as well as use. Awls are shown in Figure 10.

Miscellaneous pointed bone is a morphological group that includes bipoints (n = 8), blanket pins (n = 2) and a punch, and represents a wide variety of implied and unknown functions. "Bipoint" is a non-functional descriptive term applied to small, narrow, double-pointed bone objects. They are usually assumed to be employed in hunting and fishing gear such as leister barbs, fish gouges and insert points for composite points (Loy and Powell 1977;

Table 17. Pointed bone artifacts.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
			Awls and Awl Fragments				
32	N100 W106	WCI	0.8	5.8	1.9		terrestrial mammal
55	N100 W106	WCI	8.0	3.2	14.4		left proximal metatarsal, elk
66	N102 W106	WCI	3.4	0.4	0.5		terrestrial mammal
80	N96 W102	WCIV	5.5	0.9	2.2		terrestrial mammal
84	N100 W106	WCI	7,9	0.9	3.7		terrestrial mammal
97	N100 W016	WCI	6.7	0.9	0.4	complete	terrestrial mammal
98	N100 W106	WCI	8.2	1.6	4.5		terrestrial mammal
114	N98 W94	WCI	7.1	1.7	1.4	complete	terrestrial mammal
119	N98 W94	WCI	7.9	0.8	1.5		bird bone
151	N100 W106	WCI	9.4	1.1	3.2		right ulna shaft, deer
172	N100 W106	WCI	7.1	0.9	3.2		ventral border of mandible, deer
175	N100 W104	WCI	6.9	0.6	0.8	complete	bird bone
175	N100 W104	WCI	6.9	0.5	0.5	complete	bird bone
182	N100 W106	WCI	5.5	1.2	1.2		bird bone
184	N98 W96	WCI	2.5	0.5	0.4		terrestrial mammal
187	N98 W96	WCI	4.1	0.4	0.4		terrestrial mammal

Table 17, continued

Miscellaneous Pointed Bone

11	N102 W116	WCIV	13.7	0.8	4.7	complete	terrestrial mammal blanket pin
14	N100 W106	WCIV	4.8	0.7	1.2	complete	terrestrial mammal bipoint
50	N102 W112	WCIV	4.0	0.6	1.0	complete	terrestrial mammal bipoint
59	N102 W112	WCIV	4.2	0.4	0.4	complete	terrestrial mammal bipoint
61	N102 W112	WCIV	5.2	0.5	0.8	complete	terrestrial mammal bipoint
87	N102 W112	WCI	5.1	1.1	2.5	complete	terrestrial mammal bipoint
138	N98 W94	WCI	4.1	0.6	0.9	complete	terrestrial mammal bipoint
144	N102 W112	WCI	4.4	0.6	0.7		terrestrial mammal bipoint
147	N102 W112	WCIV	8.8	0.5	1.8	complete	terrestrial mammal blanket pin
517	N98 W101	WCII	10.3	1.5	8.9		terrestrial mammal punch
639	N100 W106	WCI	4.3	0.6	0.9	complete	terrestrial mammal bipoint

Needle Fragments

109	N100 W108	WCIII	7.5	2.7	1.0		bird bone
263	N102 W112	WCII	12.2	0.4	1.2		bird bone
560	N98 W96	WCI	6.5	0.6	0.8		bird bone

Figure 10. Awl and awl fragments.

A. 151
B. 172
C. 114
D. 84
E. 97
F. 80
G. 98
H. 182
I. 32
J. 66
K. 184
L. 187
M. 175
N. 119
O. 175
P. 55

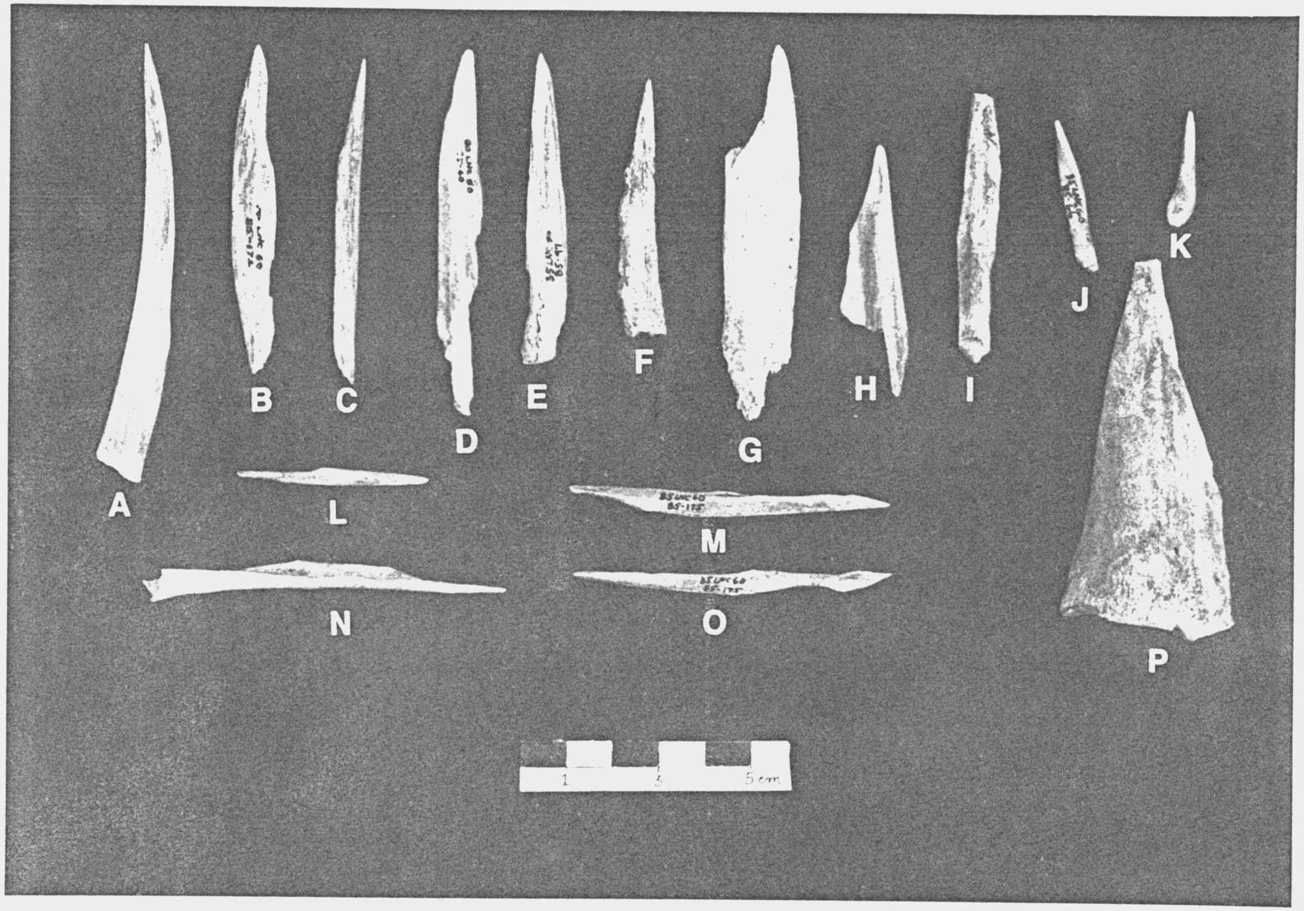


Figure 10. Awl and awl fragments.

Figure 11. Miscellaneous pointed bones.

A. 517
B. 138
C. 639
D. 50
E. 14
F. 59
G. 61
H. 87
I. 144
J. 147
K. 11

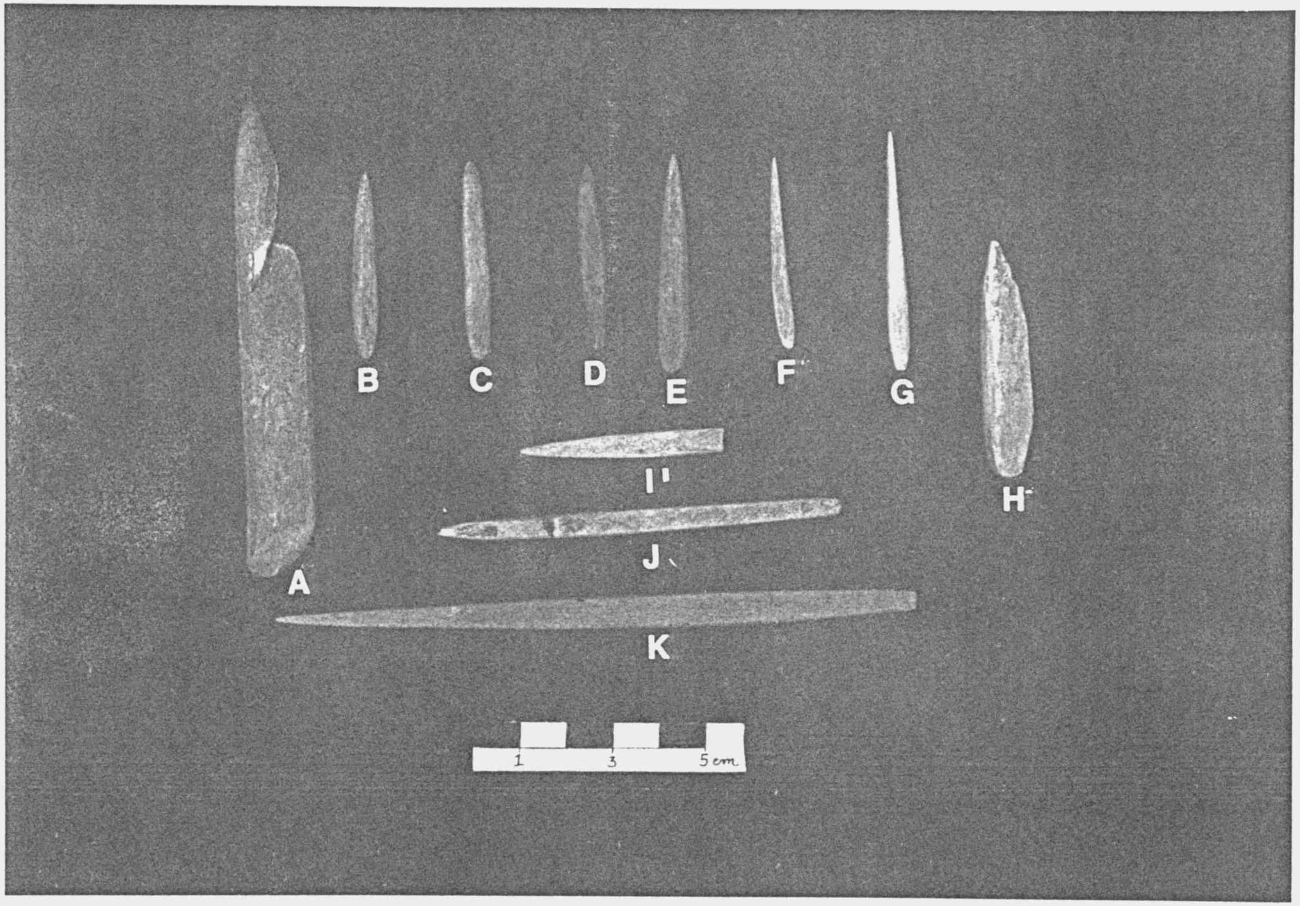


Figure 11. Miscellaneous pointed bones.

Figure 12. Bone needles.

A. 109
B. 263
C. 560

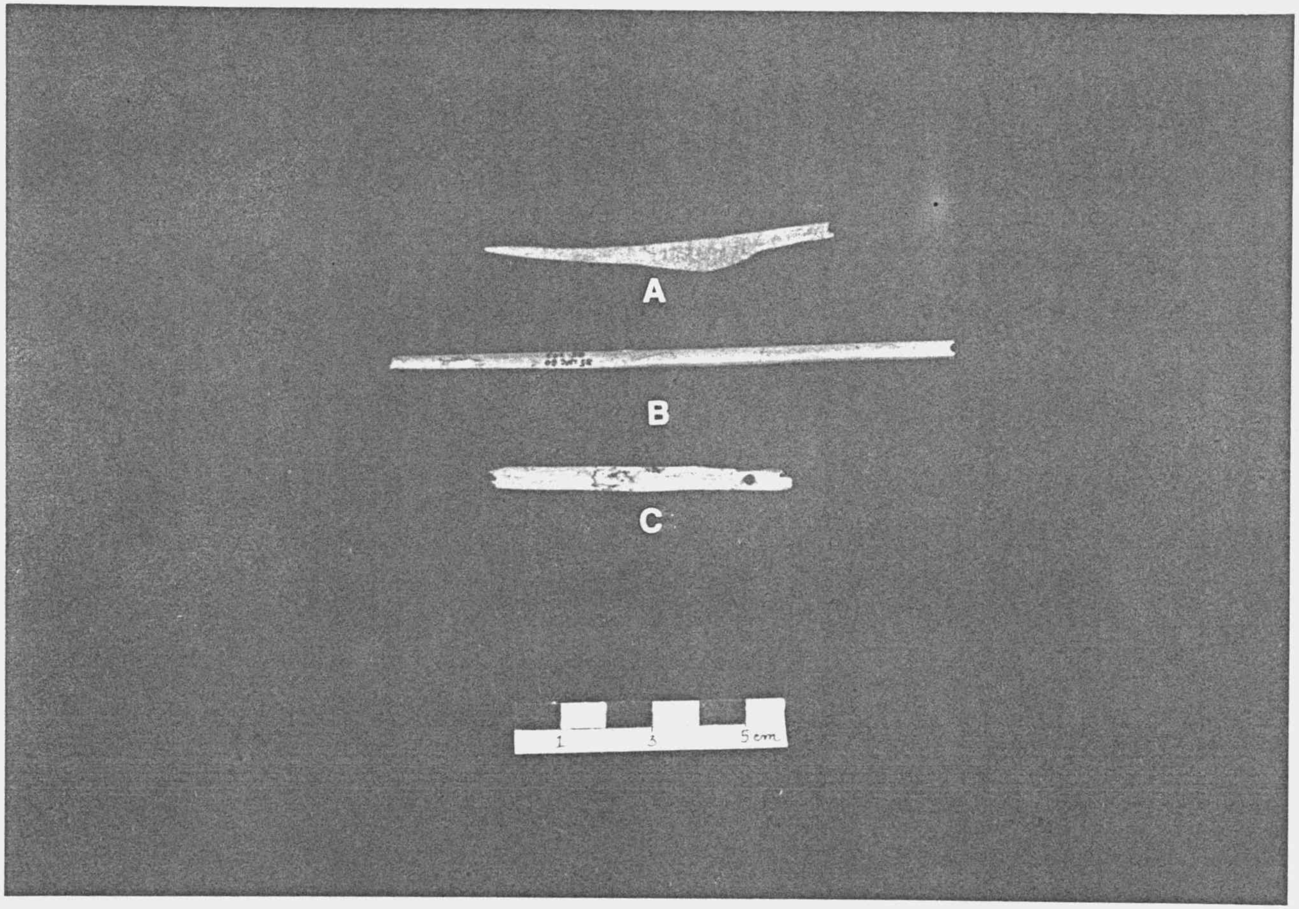


Figure 12. Bone needles.

Stewart 1977). Bipoints were recovered from the WCI and WCIV components, and were complete, with one exception. All bipoint bases were either tapered (59, 51, 87, 144, 639) or faceted (14, 50, 138). The two recovered blanket pins (11, 147) are large bipointed artifacts. The functional name is derived from stylistically similar artifacts used by the Coast Salish to secure blankets (Stewart 1973). Both undecorated specimens were recovered from disturbed context and subsequently assigned to the WCIV component. The remaining miscellaneous pointed bone (catalog number 517) probably represents a punch from the WCII component. This punch is characterized by a rounded pointed tip, with a beveled base and a smoothed out narrow cavity, with a portion of the lateral edge missing. All miscellaneous pointed bone pieces are shown in Figure 11.

Three needle fragments (109, 263, 560), all lacking points but possessing eyes, were recovered, one from each dated component. All were constructed from splintered bird bone and display smoothed and polished lateral edges. All needle eyes were drilled Figure 12).

WEDGES AND CHISELS

The presence of wedges and chisels is considered evidence for woodworking because wedges and chisels were the basic woodworking tools of Northwest Coast Indians. They were employed to split-off workable sections of straight grained wood such as cedar, and chisels served to chisel as well as pry bark off (Stewart 1973).

Geographically, their distribution extends from the Northwest Coast cultures of British Columbia (Stewart 1977) to the San Francisco Bay (Uhle 1907).

The material recovered from Whale Cove included 24 wedges and chisels. The majority (n = 15) were recovered from WCI. These tools were produced from both cervid antler as well as from terrestrial mammal bones. Antler wedges and chisels reflect a preference for selecting the tines. Antler tines are the densest part of the antler, with density decreasing on the lower end of the main beam. This density is due to the absence of spongy bone and increased mineralization (Miller et al. 1985). Both chisels and wedges, regardless of raw material, are characterized by beveled tips. Often those in a good state of preservation were characterized by a highly glossed and polished tip. Recovered material ranges from tip fragments to complete tools. One artifact (99) had a hinge fracture on the worked base, probably the result of pounding during its use life.

No attempt was made to differentiate wedges and chisels because previous researchers have not identified mutually exclusive definitions, and the small population of wedges and chisels recovered from Whale Cove was too fragmentary to begin to address this functional typological question. These artifacts are summarized on Table 18 and shown in Figures 13, 14, and 15.

Table 18. Wedges and chisels.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Tip Angle (in degrees)	Completeness	Description
12	N102 W116	WCIV	11.3	2.8	19.6	43		antler
21	N102 W116	WCIV	12.4	1.5	29.6	28	complete	antler
44	N98 W100	WCI	7.6	2.8	10.3			bone
62	N102 W112	WCIV	2.8	2.1	2.5	32		antler
63	N102 W112	WCIV	5.7	3.0	9.2	50		antler
99	N96 W102	WCI	14.5	4.3	59.8	30		elk antler
118	N100 W101	WCIII	9.0	1.3	9.5	28		bone
126	N98 W94	WCIV	13.3	3.0	22.2	35		antler
127	N102 W110	WCII	2.7	1.3	1.6	50		antler
154	N102 W110	WCI	1.4	1.4	1.1	33		bone
158	N96 W102	WCIV	6.6	3.7	16.6	31		bone
163	N102 W108	WCI	3.4	1.7	7.3	37	complete	antler
164	N102 W108	WCI	3.7	2.0	3.9			bone
165	N100 W106	WCI	9.8	4.2	35.4	30		elk antler
169	N100 W104	WCI	5.7	1.9	6.6	25		antler
171	N96 W102	WCIV	4.2	2.0	3.3			antler
173	N100 W106	WCI	5.1	3.2	7.4	28		elk antler
177	N96 W102	WCI	9.6	4.0	23.6			left proximal metacarpal,
178	N96 W102	WCI	5.5	1.2	4.7	30		antler
186	N99 W104	WCI	11.4	2.7	38.4			antler
232	N102 W112	WCI	6.2	1.2	5.1			bone
262	N102 W112	WCI	8.2	3.0	19.8	42	complete	bone

Table 18, continued.

130	N100 W108	WCI	9.3	1.5	3.4		smoothed bone tabular piece
132	N100 W108	WCI	4.9	1.0	2.6		polished and flaked splinter
136	N100 W108	WCI	6.7	2.3	4.7		smoothed and polished splinter
142	N98 W96	WCI	6.4	2.8	8.7		polished splinter, proximal metacarpal, elk
143	N98 W96	WCI	8.3	2.3	8.7		smoothed splinter
152	N98 W96	WCI	4.4	1.3	2.6	complete	polished splinter
153	N102 W112	WCI	3.7	1.2	1.7		flaked splinter
155	N98 W96	WCI	5.5	0.9	2.1		flaked splinter
176	N100 W104	WCI	3.9	1.3	2.1		polished splinter
179	N98 W96	WCI	4.0	0.6	1.0		polished splinter
204	N101 W114	WCIV	4.8	2.0	3.6		smoothed bone with tapered tips
204	N101 W114	WCIV	5.4	2.9	2.5		polished splinter
405	N100 W108	WCI	4.5	3.9	12.5		polished splinter rt proximal metatarsal elk

Figure 13. Wedges and chisels, group 1.

A. 186
B. 99
C. 165
D. 126
E. 21

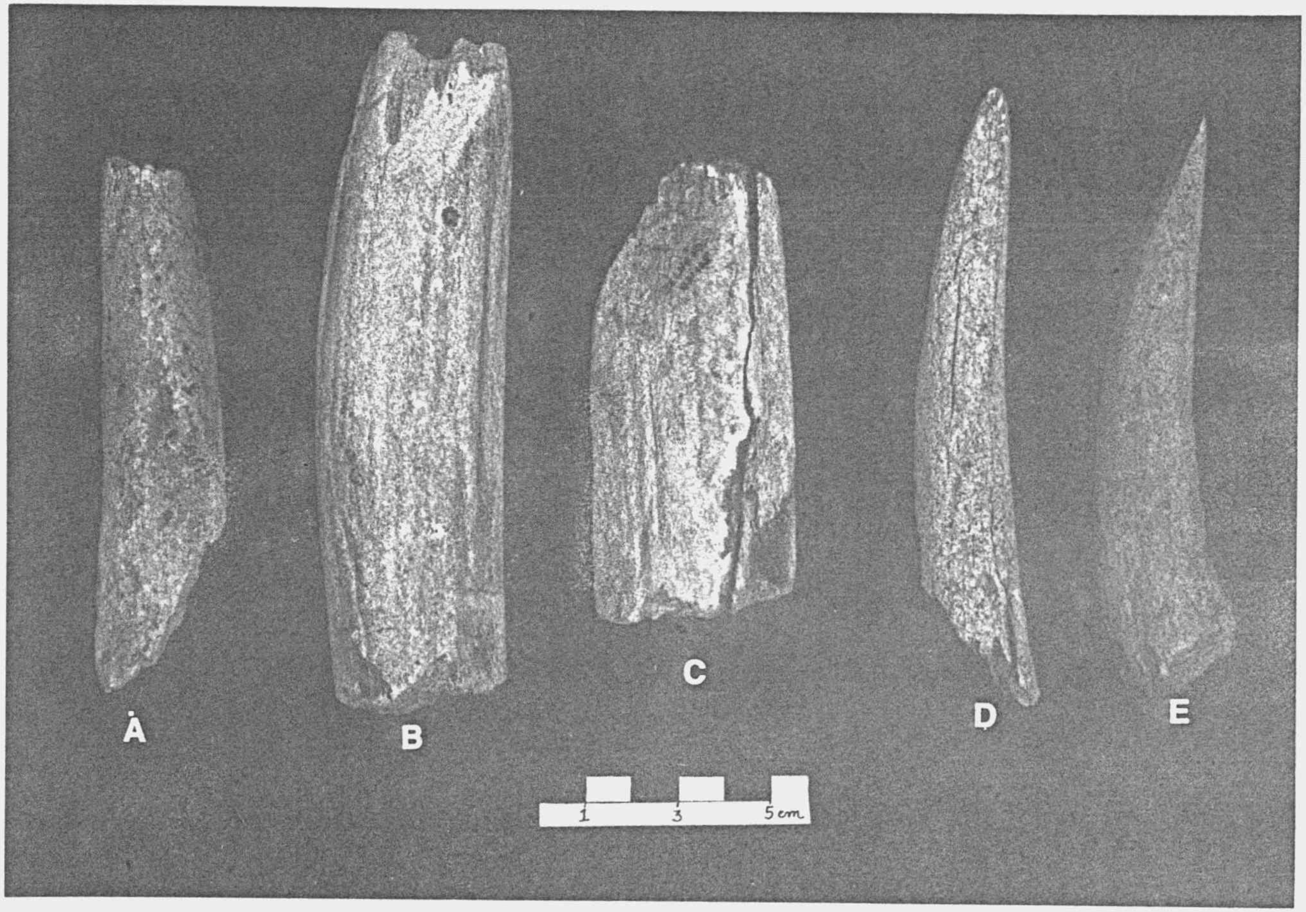


Figure 13. Wedges and chisels, group 1.

Figure 14. Wedges and chisels, group 2.

A. 169
B. 63
C. 178
D. 173
E. 171
F. 275
G. 12
H. 163
I. 62
J. 531

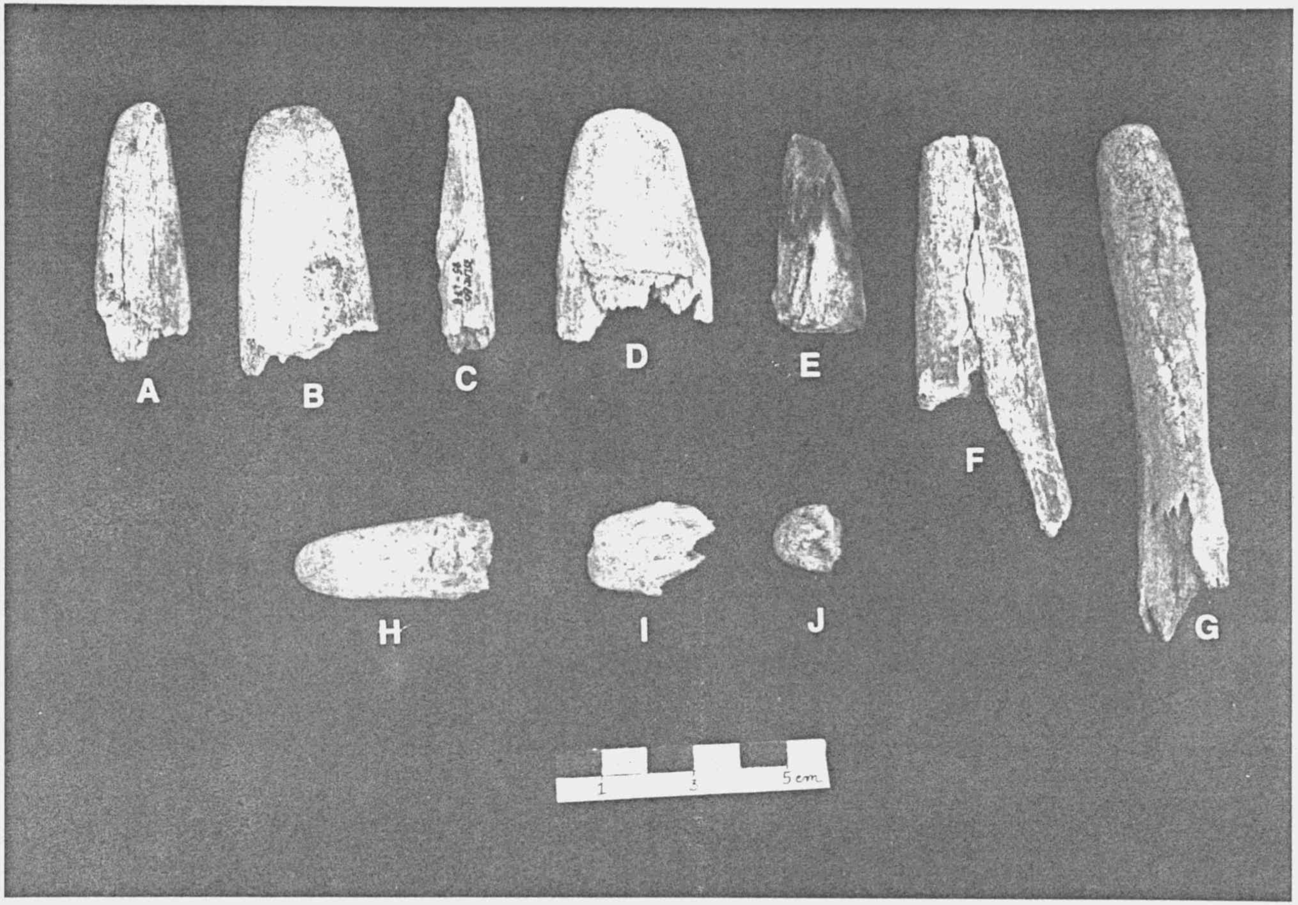


Figure 14. Wedges and chisels, group 2.

Figure 15. Wedges and chisels, group 3.

A. 177
B. 232
C. 164
D. 118
E. 158
F. 44
G. 262
H. 157
I. 127

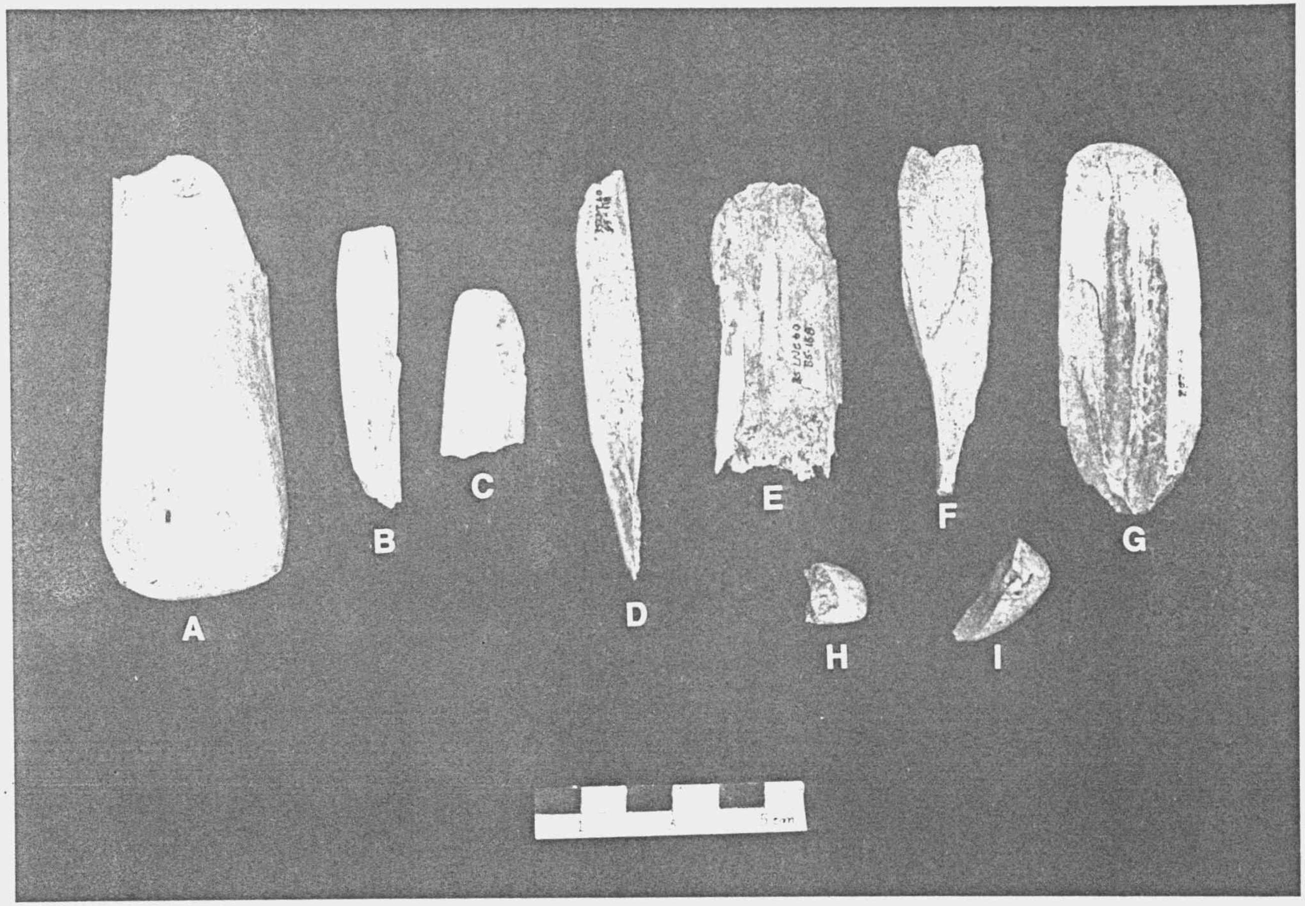


Figure 15. Wedges and chisels, group 3.

BEAVER INCISORS

Beaver incisors are another indicator of woodworking activities. A total of four such artifacts were recovered, all from the WCI component (Table 19). These beaver incisors were often hafted in tandem or multiples to form a chisel edge (MacDonald 1982). All are very fragmented due to splintering and splitting.

MISCELLANEOUS DECORATIVE AND UTILITARIAN BONE ARTIFACTS

This category consists of unique artifacts that could not be assigned to another group. Included are utilitarian as well as decorative artifacts. The utilitarian artifacts include a spoon (145) produced from the distal end of a terrestrial mammal bone, and this entire piece has been smoothed and polished. A flesher (91) produced from a terrestrial mammal bone shaft with flaked and polished ends and sides was also recovered. The last utilitarian object is a barbed bone fragment (166) with a shaped, smoothed singular barb.

The decorative artifacts include a tooth pendant (42) made of a sea otter canine, with a portion of the root notched for lashing. Another pendant (111) possibly produced from a bracelet fragment is characterized by an incised geometric design which is the most complex decoration of the three recovered incised artifacts. The other incised artifacts include a bone fragment (51) incised with a single straight line and one of the fragmented bracelets (69)

Table 19. Beaver incisors.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Description
57	N100 W106	WC1	4.5	0.6	0.8	
68	N100 W106	WCI	6.1	0.9	3.5	polished on side
638	N100 W108	WCI	4.0	0.6	1.7	
638	N100 W108	WCI	2.9	0.6	0.9	beveled tip

Table 20. Miscellaneous decorative and utilitarian bone artifacts.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
42	N100 W106	WCI	3.7	0.9	2.0	complete	sea otter canine pendant
51	N102 W112	WCIV	3.6	1.3	1.6		incised bone
69	N96 W102	WCIV	12.8*	1.4	2.4		incised bracelet fragments
91	N102 W112	WCI	8.3	2.5	16.0	complete	flesher
111	N101 W114	WCIV	2.4	0.9	0.3		incised pendant
145	N102 W108	WCI	9.1	2.8	11.7	complete	spoon
150	N102 W108	WCI			3.4		bracelet fragments
166	N100 W104	WCI	3.2	0.7	1.2		barbed bone fragment

*estimate

Figure 16. Miscellaneous decorative and utilitarian bone artifacts.

A. 150
B. 69
C. 51
D. 111
E. 42
F. 91
G. 166
H. 145

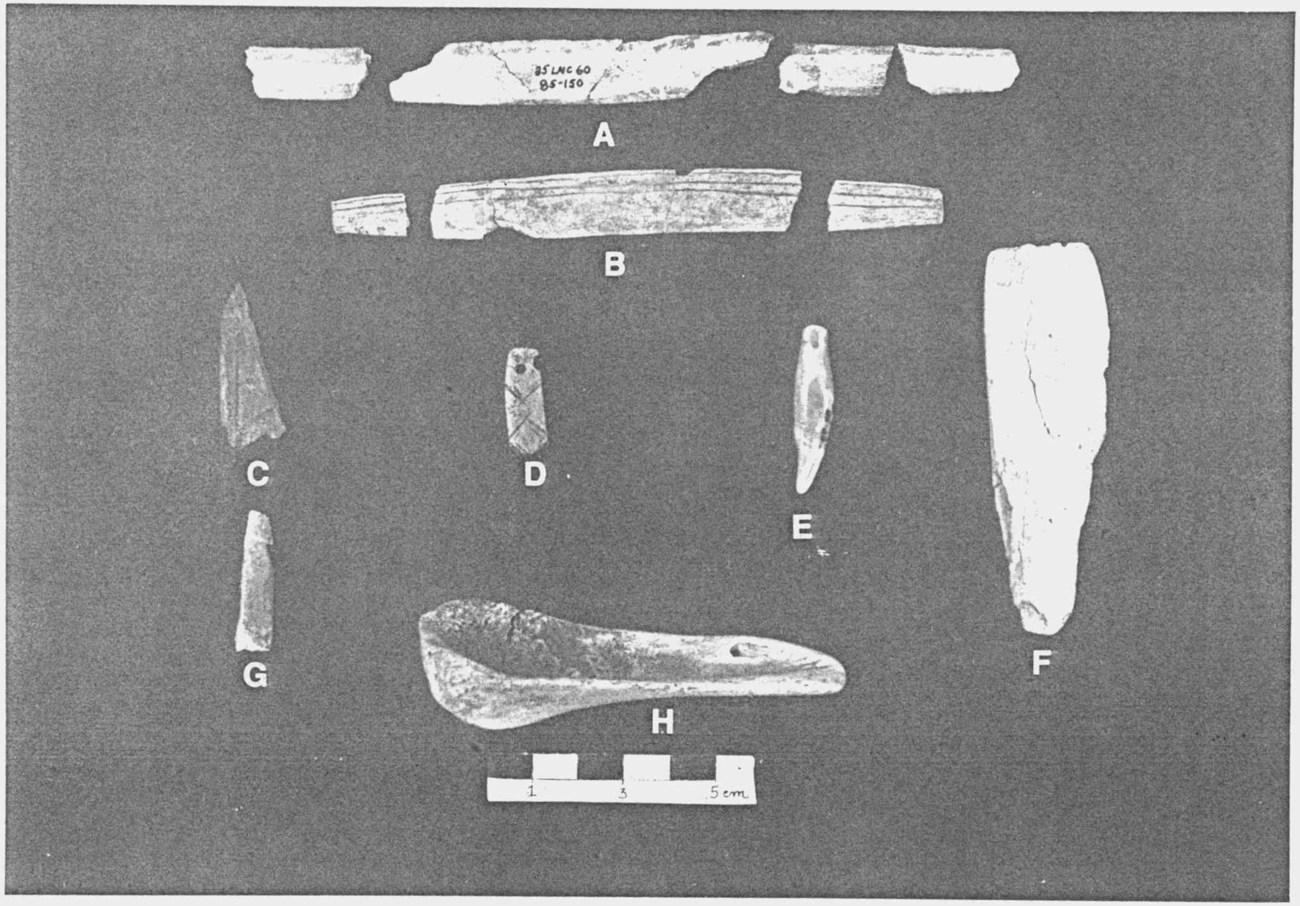


Figure 16. Miscellaneous decorative and utilitarian bone artifacts.

incised with three parallel lines. The remaining bone bracelet has been shaped to be trapezoidal in cross-section and this shaping has resulted in areas of color contrast due to surface texture differences. These artifacts are summarized on Table 20 and shown in Figures 16.

FISH LURES

Four fish lures, all from WCI component, were recovered. Ethnographically the Kwuakiutl employed "V" shaped fish hooks for trawling, and a line was often run from the base to the other end (Berreman 1944). Berreman suggested the thick body and peculiar shape of lures, when used for trawling, would give the device a wobbling motion in the water, thus attracting the game fish to the lure. The lures recovered from Whale Cove consist of a lure with a curved hook (174), with the remainder representing the fragments of similar artifacts or the shanks of composite trolling hooks. This artifact type has not often been recovered from central coastal Oregon sites. The lures are summarized in Table 21 and shown in Figure 17.

Table 21. Fish lures.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
41	N100 W106	WCI	7.2	1.9	6.7		notch for lashing
160	N96 W102	WCI	8.6	2.9	12.9		
174	N100 W104	WCI	10.2	2.1	8.8		longitudinal slit for lashing and hook
188	N102 W110	WCI	9.3	2.1	11.7		notch for lashing

Figure 17. Fish lures.

A. 174
B. 188
C. 160
D. 41

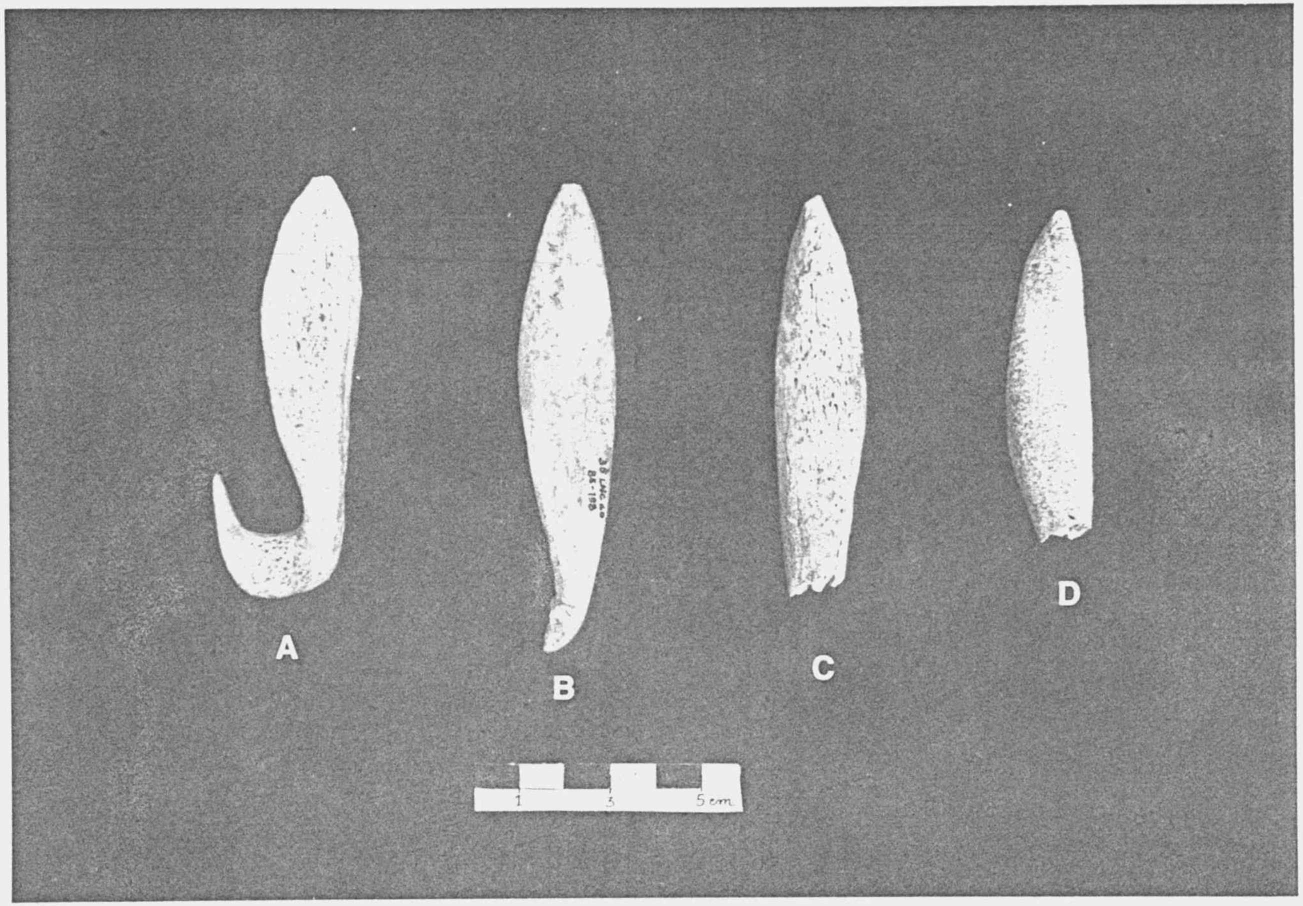


Figure 17. Fish lures.

MISCELLANEOUS BIRD BONE ARTIFACTS

Seven miscellaneous bird bone artifacts were recovered. These include two whistles produced on long bone shafts with a single perforation. Two tube beads (76-208) similar to artifacts recovered from the Tahkenitch Landing site (Minor and Toepel 1986) are also included in this assemblage. An incomplete tube (85-148) with both ends broken could possibly represent a fractured whistle or tube bead. In addition, two specimens (47, 48) showing evidence of transverse circumference sawing were recovered. Transverse circumference sawing is accomplished by placing a groove completely around the circumference of the bone until it is either sawn completely through of sufficiently weakened so a portion can be sawed off (Dalley 1973, 1977). The tube beads also show evidence of manufacture by transverse circumference sawing. The presence of these pieces demonstrating sawing with opposing anatomical ends unsuitable for tubes or whistles is taken to suggest that the production of whistles and tube beads was undertaken at the site and that these cut pieces are waste from the manufacture of these artifacts. The miscellaneous bird bone artifacts are summarized on Table 22 and shown in Figure 18.

Table 22. Miscellaneous bird bone.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
29	N100 W106	WCI	5.5	1.0	2.4	complete	whistle
47	N98 W100	WCI	2.5	0.9	1.0		transverse circumference sawing
48	N98 W100	WCI	4.8	1.7	1.3	complete	transverse circumference sawing
76	N102 W112	WCIV	5.8	0.9	2.9	complete	tube bead
148	N100 W106	WCI	4.8	0.9	0.7		tube
208	N102 W116	WCIV	4.0	0.6	0.6		tube bead
335	N100 W108	WCI	6.5	0.4	0.7	complete	whistle

Figure 18. Miscellaneous bird bone artifacts.

A. 48
B. 47
C. 148
D. 29
E. 335
F. 76
G. 208

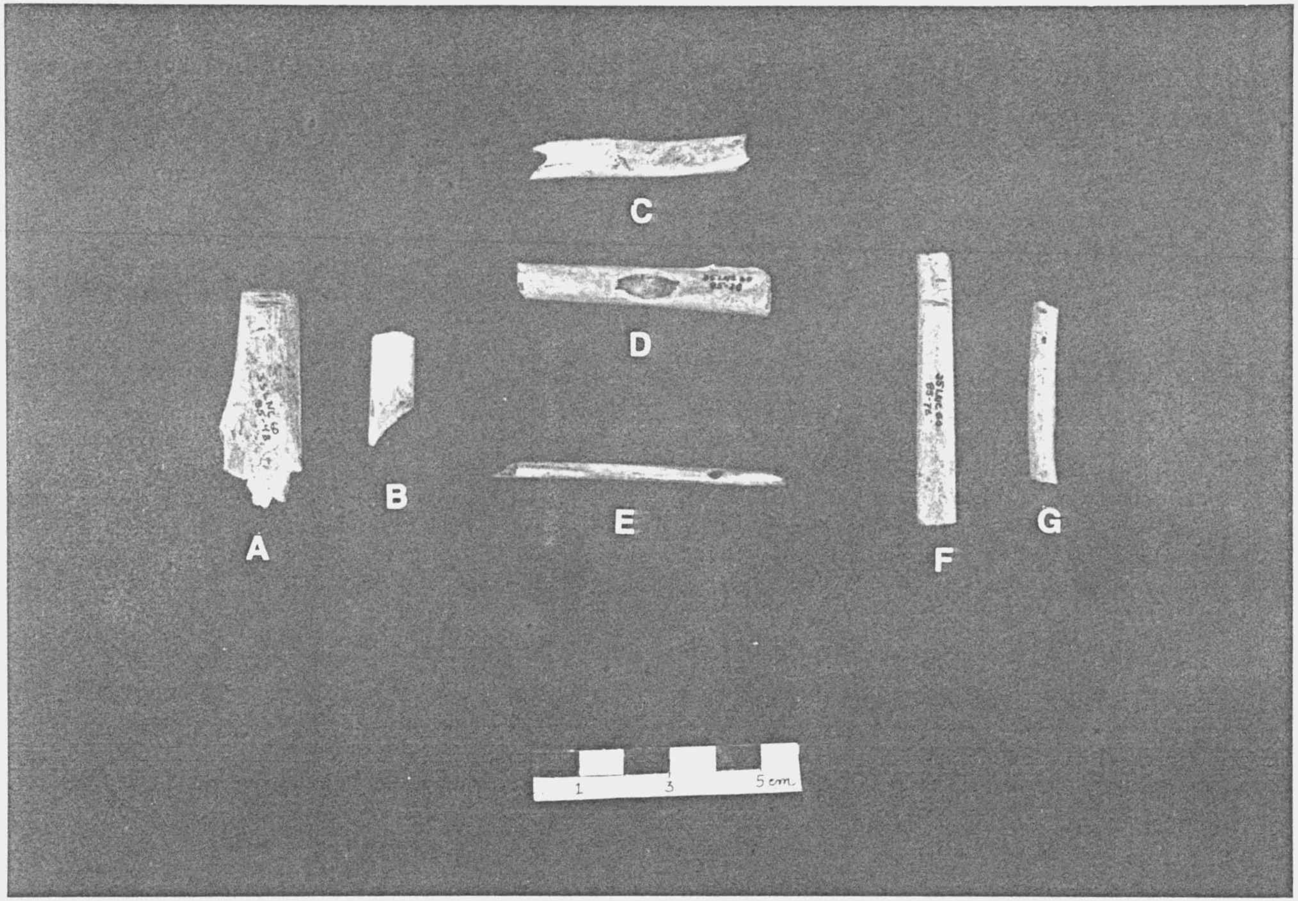


Figure 18. Miscellaneous bird bone artifacts.

WORKED MARINE MAMMAL BONE

Eighteen pieces of worked marine mammal bone were recovered, including shaped tubular pieces (33, 159, 180, 204, 205, 213, 215, 216, 231, 240, 469, 610), miscellaneous pieces showing evidence of transverse sawing (125, 238), a cylindrical fragment (43), a miscellaneous shaped piece (139), and a flaked piece (215) (see Table 23 and Figure 19).

In general, this artifact category has not been extensively reported for the Oregon coast. Ethnographic information for the Northwest Coast cultures (Stewart 1973) and for coastal California and Oregon (Kroeber 1925; Berreman 1944; Gould 1966) suggest that some of these artifacts may represent fragments of whale bone clubs or staffs, as well as unknown functional artifact types and also the detritus from manufacturing such artifacts.

MISCELLANEOUS WORKED ANTLER

Nine miscellaneous pieces of cervid antler were recovered. This category includes six antler splinters, of which five are smoothed and one shows cut marks, one tine flaker, and two worked bases of elk antler. All the splinters lack evidence of the spongy core and consist of the more durable compact sheath from an unknown portion of the antler. The antler tine flaker, like the previously mentioned wedges and chisels, consists of the densest portion of the

Table 23. Worked marine mammal bone.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
33	N100 W106	WCI	6.6	1.4	10.0		
43	N98 W100	WCIV	2.1	0.8	0.9		
125	N101 W114	WCIV	11.7	2.2	18.3		
139	N101 W114	WCI	10.4	2.5	21.1	complete	
159	N96 W102	WCI	2.9	1.1	1.1		
180	N100 W106	WCI	17.9	6.2	87.4		
204	N101 W114	WCIV	4.3	3.8	11.2		
205	N101 W114	WCIV	5.9	4.1	13.4		
213	N101 W114	WCI	7.5	3.3	11.0		
215	N101 W114	WCI	9.6	9.6	78.1		
215	N101 W114	WCI	22.7	5.4	116.2		
216	N101 W114	WCIV	7.4	3.4	16.0		
231	N102 W112	WCIV	6.0	2.3	6.8		
234	N102 W112	WCIV	15.8	4.5	43.1		
238	N98 W96	WCI	16.5	4.0	96.2		
240	N102 W116	WCIV	7.1	4.5	22.5		
469	N100 W104	WCII	5.0	4.0	9.0		
610	N100 W104	WCI	17.5	2.9	29.4	complete	

Figure 19. Worked marine mammal bone.

A. 215
B. 234
C. 238
D. 180
E. 125
F. 139
G. 469
H. 240
I. 213
J. 216
K. 610
L. 469
M. 231
N. 33
O. 204
P. 205
Q. 215
R. 159

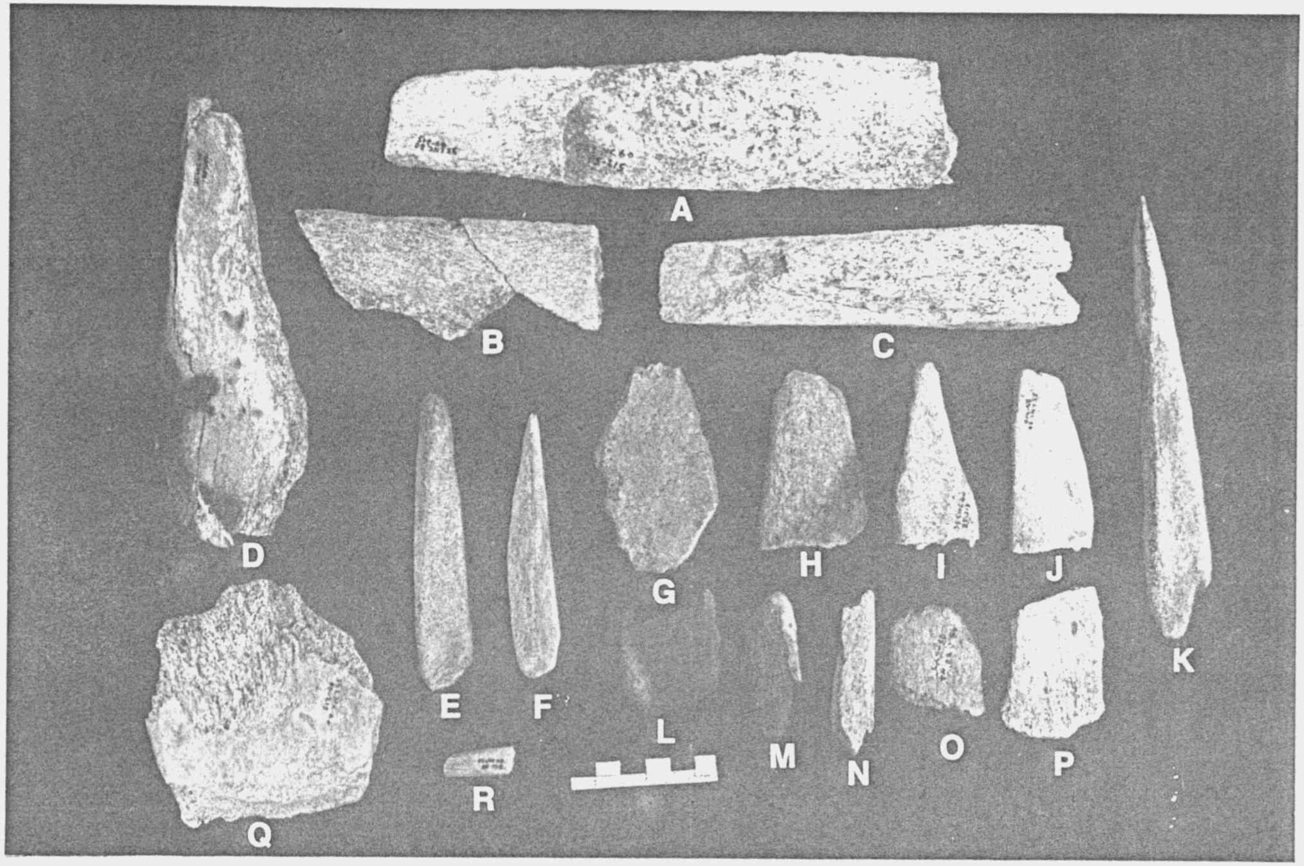


Figure 19. Worked marine mammal bone.

antler. The worked bases of elk antler utilize the most dense portion of the main beam (Miller et al. 1985). This high density is attributed to the relative abundance of pearl exostosis on the antler surface, and thus results in a higher portion of compact bone and therefore higher densities (Miller et al. 1985:695). These artifacts are summarized on Table 24 and shown in Figures 20 and 21.

MISCELLANEOUS WORKED TERRESTRIAL MAMMAL BONE

Thirty-two bone artifacts that were obviously worked beyond butchering practices or too fragmentary to be placed in any of the previously identified categories were recovered. Some of these possibly represent expedient bone tools (Johnson 1982). Expediency tools tend to lack evidence of intensive manufacture, but were purposely or fortuitously broken or splintered from the parent bone, with the intent of utilizing it. Numerous bone splinters display modification that includes flaking, smoothing and polishing, detritus fragments, polished anatomical bases, and smoothed pieces. This material is summarized on Table 25 and shown in Figures 20, 23, 24, and 25.

Table 24. Miscellaneous worked antler.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
46	N98 W100	WCI	4.0	2.3	2.8		smoothed splinter
64	N109 W115	WCIII	4.0	0.8	2.1		tine flaker
124	N98 W100	WCII	9.0	3.7	18.0		smoothed splinter
133	N100 W108	WCI	11.6	3.0	30.6		smoothed splinter
134	N100 W108	WCI	6.0	3.5	18.8		splinter with cut marks
137	N101 W114	WCI	17.7	7.5	181.2	complete	worked elk antler base
168	N100 W106	WCI	15.0	5.0	61.4		worked elk antler base
208	N102 W116	WCIV	7.6	3.0	8.7		smoothed splinter
222	N101 W114	WCIV	9.7	2.3	11.6		smoothed splinter

Figure 20. Miscellaneous worked antler, group 1.

A. 168
B. 137

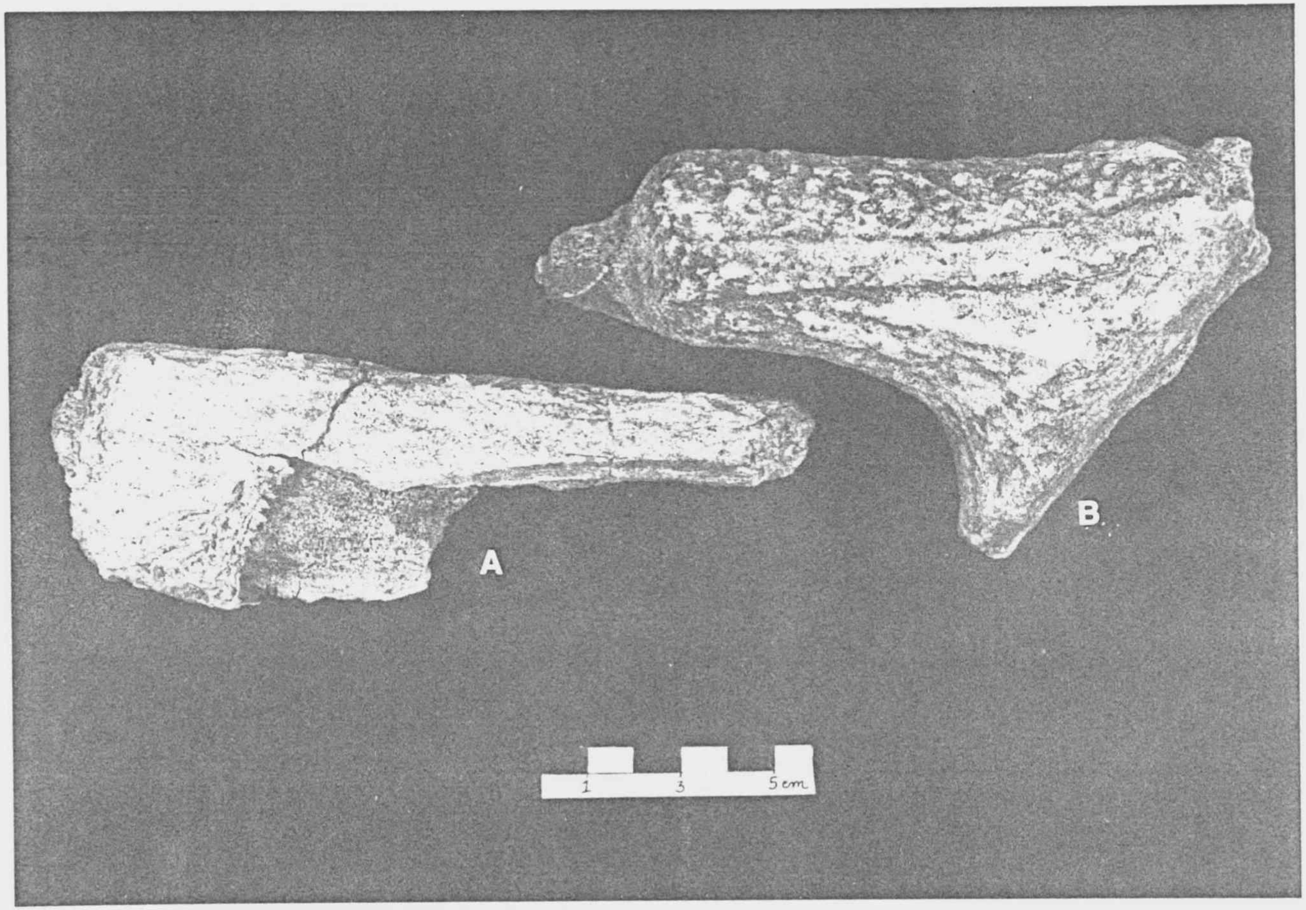


Figure 20. Miscellaneous worked antler, group 1.

Figure 21. Miscellaneous worked antler, group 2.

A. 46
B. 64
C. 208
D. 222
E. 134
F. 124
G. 133

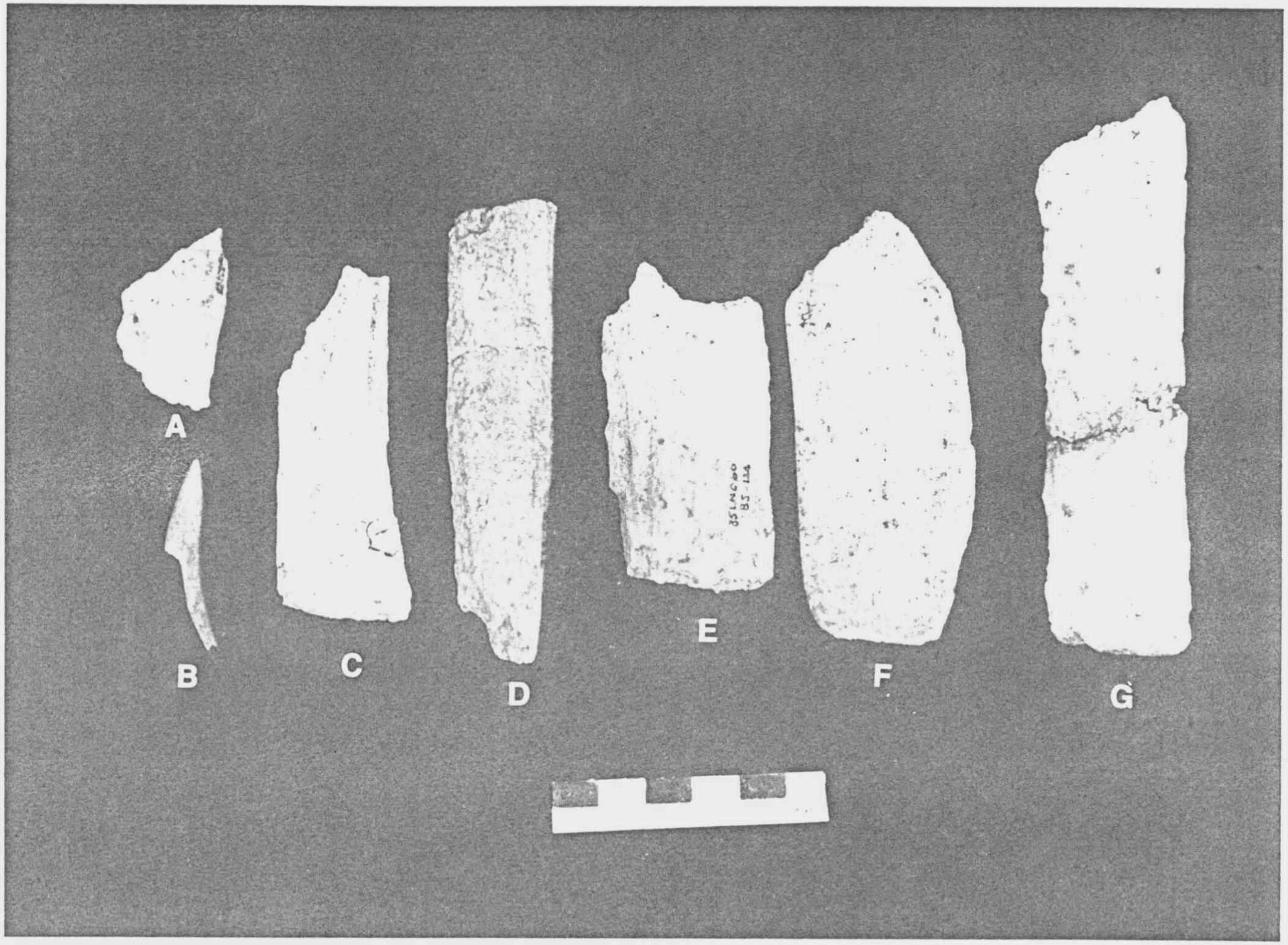


Figure 21. Miscellaneous worked antler, group 2.

Table 25. Miscellaneous worked bone.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
5	N102 W112	WCIV	5.7	0.9	5.1		smoothed, curved, with longitudinal striations on ventral surface
17	N102 W112	WCIV	14.2	8.9	23.2	complete	smoothed metacarpal shaft splinter, elk
18	N102 W112	WCIV	2.3	2.9	7.7	complete	smoothed and polished right proximal metacarpal, deer
19	N102 W116	WCIV	8.8	1.6	12.3		flaked splinter
23	N102 W112	WCIV	3.1	2.2	2.5		cut and polished
31	N100 W106	WCI	4.9	1.6	3.5		detritus
34	N100 W106	WCI	3.5	1.1	1.9		smoothed splinter
45	N102 W112	WCIV	9.3	1.5	8.1		transverse cut polished splinter
47	N98 W100	WCI	6.0	2.4	10.0		polished and flaked
52	N102 W112	WCIV	2.4	1.0	0.7		polished splinter
56	N100 W106	WCI	4.4	0.9	1.4		ground splinter
75	N100 W106	WCI	8.9	1.0	3.2	complete	polished and smoothed splinter
92	N96 W102	WCIV	2.4	1.1	1.69		detritus
93	N96 W102	WCI	3.7	1.6	4.0		smoothed splinter
103	N102 W110	WCIII	3.0	0.6	0.3		smoothed and polished splinter
104	N98 W94	WCI	3.1	1.2	1.7		polished splinter
113	N98 W94	WCI	7.3	1.4	4.8		flaked splinter
116	N101 W114	WCIV	3.0	1.0	1.2		polished splinter
121	N98 W94	WCI	3.2	1.5	1.6		smoothed splinter

Table 25, continued.

130	N100 W108	WCI	9.3	1.5	3.4		smoothed bone tabular piece
132	N100 W108	WCI	4.9	1.0	2.6		polished and flaked splinter
136	N100 W108	WCI	6.7	2.3	4.7		smoothed and polished splinter
142	N98 W96	WCI	6.4	2.8	8.7		polished splinter, proximal metacarpal, elk
143	N98 W96	WCI	8.3	2.3	8.7		smoothed splinter
152	N98 W96	WCI	4.4	1.3	2.6	complete	polished splinter
153	N102 W112	WCI	3.7	1.2	1.7		flaked splinter
155	N98 W96	WCI	5.5	0.9	2.1		flaked splinter
176	N100 W104	WCI	3.9	1.3	2.1		polished splinter
179	N98 W96	WCI	4.0	0.6	1.0		polished splinter
204	N101 W114	WCIV	4.8	2.0	3.6		smoothed bone with tapered tips
204	N101 W114	WCIV	5.4	2.9	2.5		polished splinter
405	N100 W108	WCI	4.5	3.9	12.5		polished splinter rt proximal metatarsal elk

Figure 22. Miscellaneous worked terrestrial mammal bone, group 1.

A. 18
B. 47
C. 142
D. 405

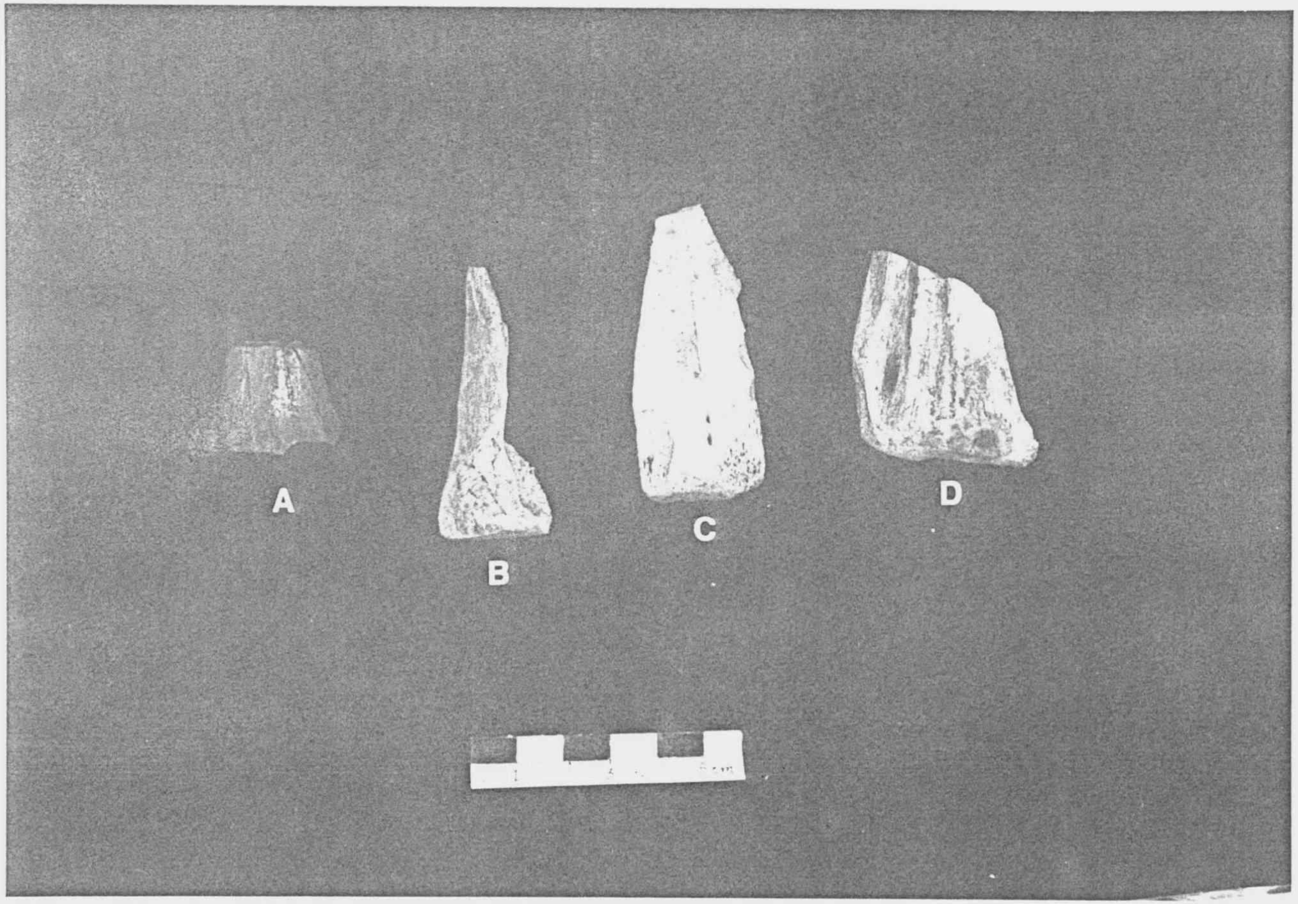


Figure 22. Miscellaneous worked terrestrial mammal bone, group 1.

Figure 23. Miscellaneous worked terrestrial mammal bone, group 2.

A. 179
B. 104
C. 23
D. 103
E. 204
F. 5
G. 92
H. 176
I. 45

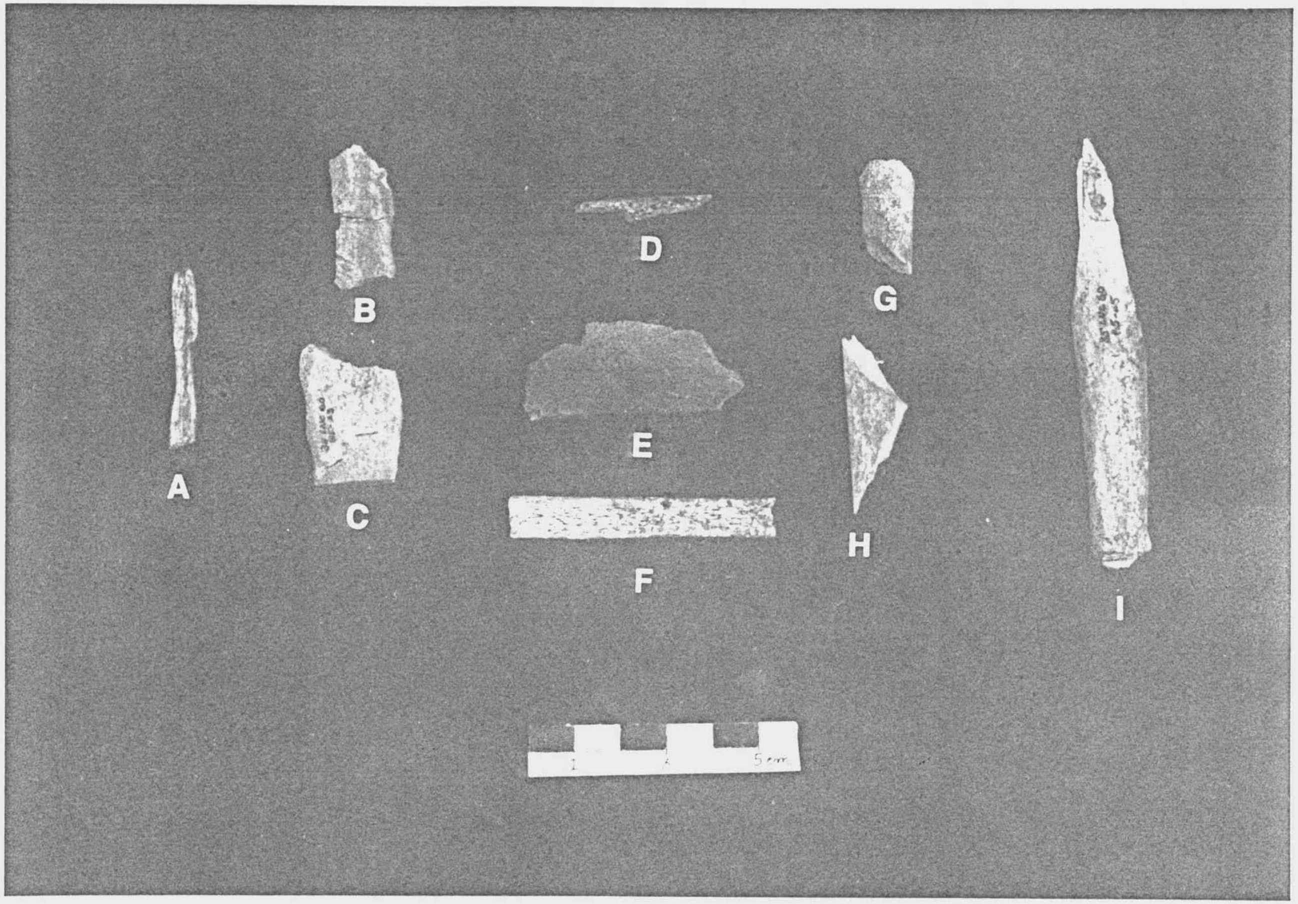


Figure 23. Miscellaneous worked terrestrial mammal bone, group 2.

Figure 24. Miscellaneous worked terrestrial mammal bone, group 3.

A. 75
B. 130
C. 17
D. 136

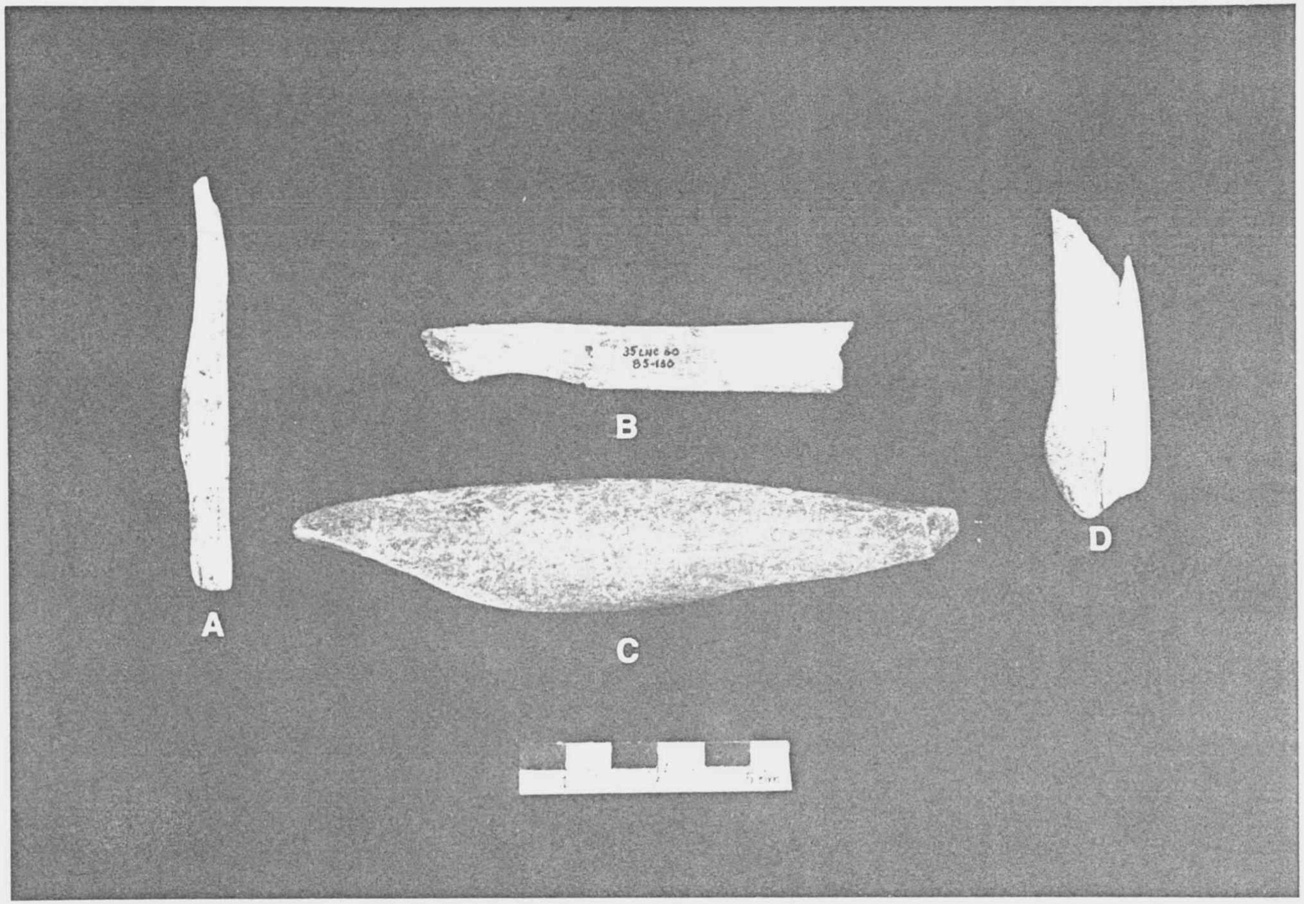


Figure 24. Miscellaneous worked terrestrial mammal bone, group 3.

Figure 25. Miscellaneous worked terrestrial mammal bone, group 4.

A. 132
B. 152
C. 34
D. 93
E. 153
F. 52
G. 116
H. 56
I. 121
J. 155
K. 31
L. 113
M. 19
N. 143

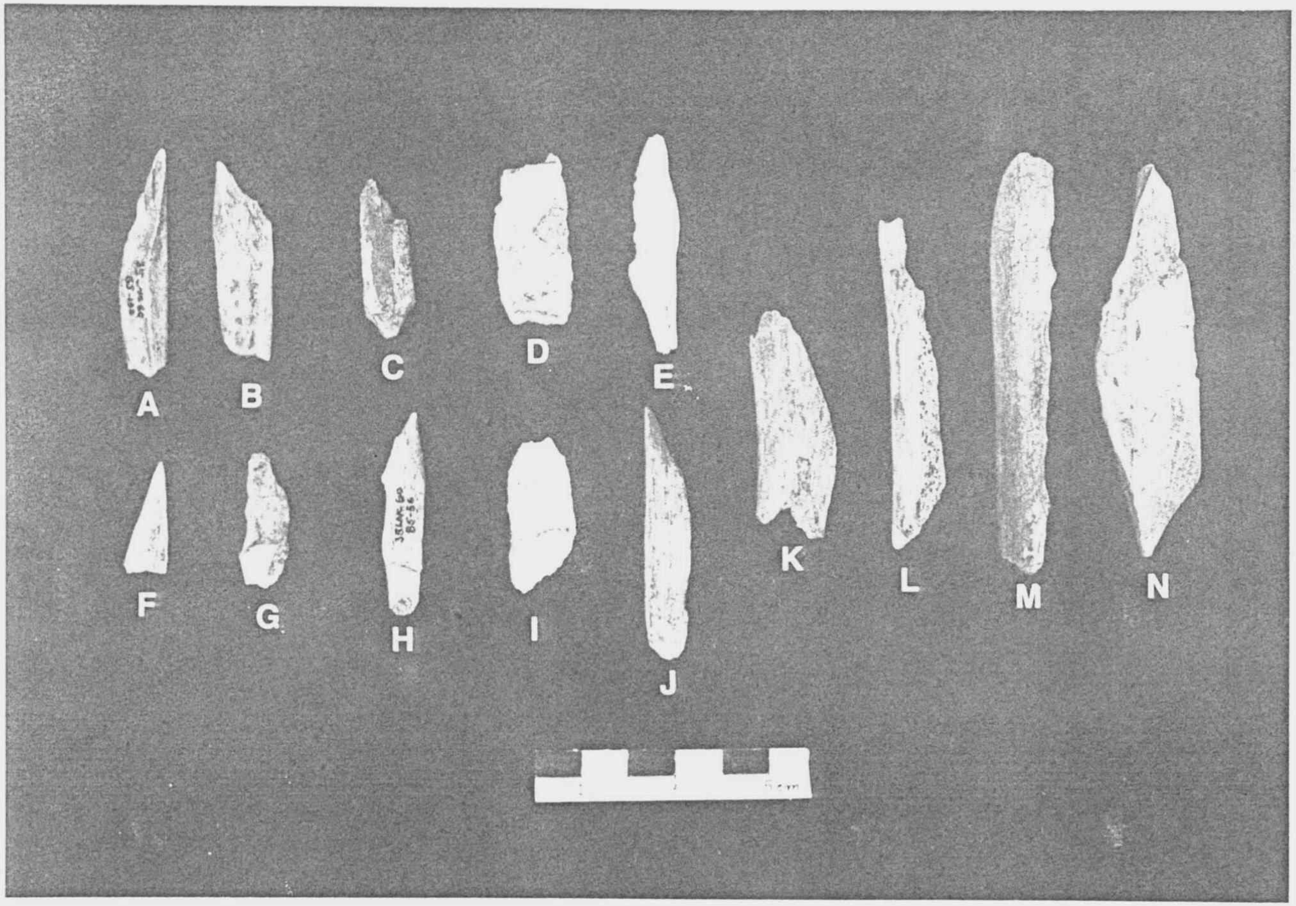


Figure 25. Miscellaneous worked terrestrial mammal bone, group 4.

DISCUSSION

The variety of bone and antler artifacts suggests numerous activities were being carried out at the site beyond the subsistence activities associated with the mammalian faunal remains and the procurement of shellfish. Indications of woodworking suggested by the wedges, chisels and beaver incisors are not often found to such an extent at previously excavated sites on the central Oregon coast. The assemblage is also temporally sensitive in that 64% of the material was recovered from the WCI component. Post-depositional disturbances and a poor initial understanding of site stratigraphy resulted in 29% of the bone and antler tools being assigned to the WCIV component, but even this does not negate the noticeable difference in terms of the bone and antler assemblage through time from a WCI assemblage showing a large diversity of functional, utilitarian and decorative items as compared to the subsequent less diverse WCII and WCIII assemblages.

It should also be noted that only 22% of the recovered bone and antler artifacts are complete. In general, artifacts appear to only be abandoned at the site if they were no longer functionally useful. Even the spoon, although complete, has a crack in the bowl.

CHAPTER V

SHELLFISH REMAINS

Detailed shellfish analysis is usually accomplished by the use of column samples; however, as Barner (1982; 1985) has pointed out, this is a very time-consuming activity. In her review of the shellfish from previously excavated coastal archaeological sites she suggests that a large variety of shellfish were exploited prehistorically from the intertidal zones. These presence-absence data suggest that there is variability between sites in the shellfish remains recovered. The use of species lists has been demonstrated to provide valuable information on the distribution of species by Lyman (1986) for mammalian faunal remains. Shellfish remains have the same potential to inform on ecological setting, zoogeography, and sea level fluctuations and climatic change.

SHELLFISH SPECIES LIST

A total of 21 shellfish species were identified during excavation. All shellfish that was not *Mytilus californianus* was retained from each analytically defined excavation unit. This species list, summarized on Table 26, is derived from shellfish species noted during preliminary level bag processing. The identifications presented here were made using the Oregon State University Department of Anthropology type collection, with the aid of Pepé Nuñez, Oregon State University Department of Fisheries, and Ken Yates, Hatfield Marine Science Center.

Shellfish are described by their Latin name, common name, and zone or zones of habitation. Zones are defined on the basis of tidal movements (Flora and Fairbanks 1977) as summarized in Barner (1982). The zones are defined as:

Zone I: above average spring high tide

Zone II: from the average neap high tide level up to the average spring high tide

Zone III: from the average neap low tide to the average neap high tide

Zone IV: from the average spring low tide level up to the average neap low tide

Zone V: below the average spring low tide line

The wide range of shellfish species suggests that Barnett (1937) underestimated their importance, especially in contrast to coastal areas where more ethnographic information is available (cf. Barner 1982). Barnett (1937:166) does, however, provide information on the processing of shellfish. He states that some Oregon coastal groups roasted mussels on stick grates over open fires. Five hearth features were identified in the process of excavation that may have functioned as part of shellfish processing activities.

The most notable feature of the shellfish species list is the presence of *Magaritifera*. This freshwater species has not been

Table 26. Shellfish species list for all components excavated at 35LNC60.

Genus Species	Common Name	Zone
SALTWATER UNIVALVES:		
Acmaea digitalis	finger limpet	II
Acmaea mitra	white cap limpet	IV
Acmaea pelta	shield limpet	II
Diodora aspera	rough keyhole limpet	
Olivella biplicata	purple Olivella	IV-V
Thais emargianta	short spired purple	IV
Thais lamellosa	wrinkled purple	III-IV
SALTWATER BIVALVES:		
Clinocardium nuttallii	cockle	IV
Mocoma nasuta	bent nose clam	III-IV
Mytaluis edulis	blue or bay mussel	III
Protothaca staminea	little neck clam	III-IV
Siliqua patula	razor clam	IV
Tresus nuttallii	gaper clam	IV

Table 26, continued.

Genus Species	Common Name	Zone
OTHER SALTWATER SHELLFISH:		
Balanus glandulus	acorn barnacle	II-IV
Cryptochiton stelleri	gumboot chiton	IV-V
Katherina tunicate	black Katy chiton	IV-V
Littorina sp.	periwinkle	
Mitella polymerus	goose barnacle	II-IV
Tigula funebralis	black turban snails	III-IV
Searlesia dira	dire whelk	
FRESH WATER BIVALVE:		
Magritifera sp.	fresh water mussel	

previously noted in an archaeological context for the Oregon coast. Barnett (1937:166), however, notes that coastal groups dried river shellfish, which prefers to inhabit rivers with a fairly rapid current at about 0.5 to 1.5 meters depth, with a substrata of sand and gravel (Lyman 1984). All the *Magaritifera* remains were recovered from the WCI component. A contemporaneous populatio of *Magaritifera* has been noted in Rocky Creek, located approximately 0.5 miles sout of 35LNC60.

SHELL ARTIFACTS

A total of 15 shell artifacts were recovered during the course of excavation. Twelve *Olivella* shell beads were recovered from the WCI component. Other material recovered included a drilled fragment of probably a Gaper clam disk from WCI, a perforated littleneck clam shell from WCIII, and a perforated and grooved whelk shell from WCIV. This material is described on Table 27 and shown on Figure 26.

The WCI component is, as previously mentioned, characterized by a more diverse shellfish inventory than the subsequent WCII and WCIII components. In addition, the only shell artifacts were recovered exclusviely from the WCI component. The lack of diversity in the shellfish inventory in the WCII and WCIII components suggest a collecting subsistence strategy in contrast to a foraging subsistence pattern as suggested by the WCI shellfish inventory.

Table 27. Shell artifacts.

Catalog #	Provenience Unit	Stratum	Maximum Length (cm)	Maximum Width (cm)	Weight (grams)	Completeness	Description
Perforated Shell:							
65	N102 W112	WCIV	16	10	.5		perforated sliced and grooved whelk
67	N109 W115	WCIII	40	45	9.95	complete	perforated little neck clam
261	N98 W96	WCI	29	14	1.20		perforated clam species
Olivella Shell:							
100	N96 W102	WCI	16	9	0.55		bead fragment
140	N101 W114	WCI	17	11	1.1	complete	bead
154	N102 W108	WCI	18	11	0.8	complete	bead
167	N102 W108	WCI	20	12	1.1	complete	bead
257	N102 W116	WCI	19	12	1.1	complete	bead
499	N100 W106	WCI	16	9	0.4	complete	bead
499	N100 W106	WCI	17	10	0.7	complete	bead
499	N100 W106	WCI	17	15	0.6	complete	bead
500	N100 W106	WCI	18	10	0.7	complete	bead
502	N102 W108	WCI	16	10*	0.5		bead fragment
503	N102 W108	WCI	17	10	0.5		bead fragment
604	N100 W106	WCI	21	13	1.3	complete	bead

* estimate

Figure 26. Shell artifacts.

A. 67
B. 261
C. 65
D. 100
E. 140
F. 154
G. 167
H. 257
I. 499
J. 499
K. 499
L. 500
M. 562
N. 503
O. 640

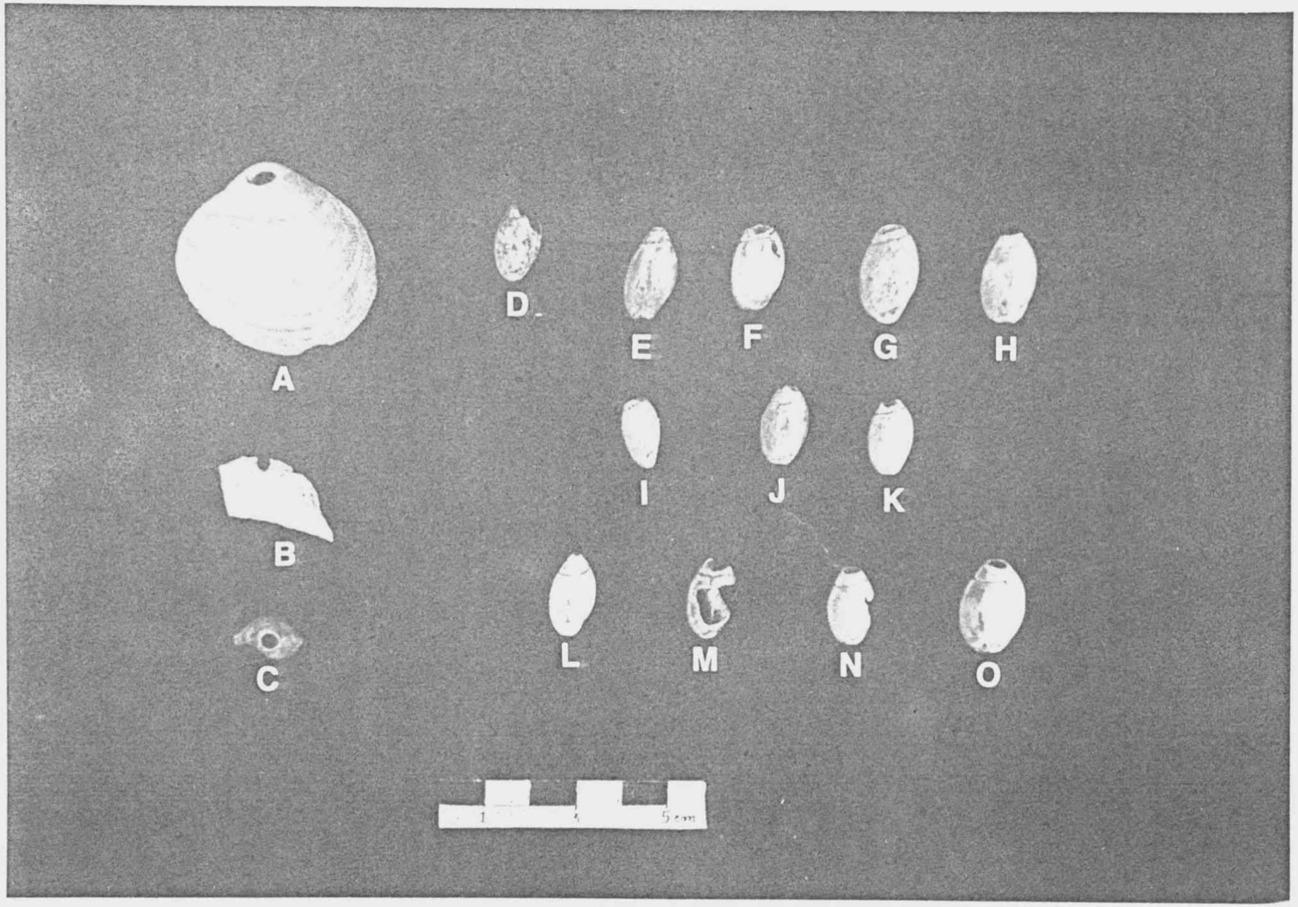


Figure 26. Shell artifacts.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The unifying objective of the research was to illuminate past cultural lifeways on the central Oregon Coast. The cultural material recovered from 35LNC60 provides insight into the prehistoric utilization of the central Oregon Coast. The diachronic analysis allows modification and refinement of the model developed by Lyman and Ross. Analysis of cultural remains suggests that the forager and collector subsistence economies are a continuum with the generalist forager subsistence and settlement system persisting into the Early Littoral and culminating in the logistically oriented collector pattern that was known ethnographically. Chronometric dates and stratigraphic relationships were used to identify temporally distinctive assemblages. There is a general trend in that the WCI component represents a generalist forager strategy during the Early Littoral that is characterized by a greater diversity of cultural material than the subsequent WCII and WCIII components. The WCII and WCIII components, temporarily associated with the Late Littoral suggest that the subsistence and settlement system identified ethnographically was being practiced. The relationship of 35LNC60 to the model developed by Lyman and Ross is summarized on Table 28.

Table 28. Coastal settlement and subsistence at 35LNC60.

Stage Name	Component	Radiocarbon Date	Subsistence Economy	Attributes of Settlement and Subsistence System
Late Littoral	WCIII	330 BP	Logistically oriented collector	Spring/summer coastal occupation in seasonal camps to harvest shellfish and with the exploitation of marine mammals surpassing terrestrial mammals.
Late Littoral	WCII	610 BP	Logistically oriented collector	Spring/summer coastal occupation in seasonal camps to harvest shellfish and with the exploitation of marine mammals surpassing terrestrial mammals.
Early Littoral	WCI	2830 BP 3010 BP	Generalist forager	Year round coastal occupation, harvesting of shellfish and the exploitation of terrestrial mammals surpassing marine mammals.
Pre Littoral	not represented at 35LNC60			

The stratigraphic distribution of mammalian faunal remains demonstrates that there is not a consistent pattern of mammal exploitation through time. The dissimilarity between WCI and the subsequent cultural depositional episodes 2000 years later represented by WCII and WCIII suggests that a shift in resource procurement strategies occurred. The WCI stratum has a greater diversity of mammalian species. Seasonality data suggest that 35LNC60 was used during most of the year. This follows the pattern expected for foraging groups. The high frequency of terrestrial mammals is unexpected if one supposes the littoral adaptation proposed by Lyman and Ross. However, in this case taxonomic abundances exclude consideration of the whale bone fragments. The WCII and WCIII strata, representing the Late Littoral of the Lyman and Ross scheme have a similar distribution and suggest a Spring/Summer (or April through July) occupation. The lower diversity of faunal species and the apparent targeting of harbor seals and steller sea lions to a lesser degree indicate a collector procurement strategy was practiced, but deer and elk were not ignored. This follows the proposed model for the Late Littoral Period.

The preceding discussion demonstrates that there is not a consistent pattern of mammal exploitation through time. The disappearance of Northern fur seals and California sea lions from this diachronic variation can be explained in terms of shifts in subsistence procurement strategies. One is unable to determine if this shift is a result of increased social complexity or due to a change in the zoogeography of marine mammal resources.

The lithic assemblage is dominated by the debitage category. It has formal tools from 17 artifact classes representing 31 functional tool types. This assemblage reflects an expedient tool assemblage produced primarily from locally available resources. The debitage analysis supports the expedient nature of the assemblage in that the high frequency of complete flakes and debris indicates core reduction in contrast to tool production. The deposition of the rarely retouched tools, as well as the local availability of all raw materials (exclusive of obsidian) demonstrates that lithics were not the object of high labor output. The temporal distribution of the lithics indicates more variability in the WCI distribution than the later periods.

The variety of bone and antler artifacts recovered, totaling 136, suggests numerous activities were carried out at the site beyond subsistence activities associated with the mammalian faunal remains and the procurement of shellfish. Indications of wood working (i.e., wedges, chisels and beaver incisors) are not often found to such an extent at reported excavated sites on the Oregon Coast. Only the site at Seal Rock (35LNC14), which was occupied during the Late Littoral, appears to have an extensive bone and antler assemblage, and appears to contain primiarily artifacts relating to subsistence activities (i.e., toggling harpoon valves) and less to other activities such as woodworking. The lack of bone and antler artifacts at other coastal sites occupied during the

Early and Late Littoral may reflect the sample size concerns of artifact class richness addressed by Jones et al. (1983) and Betz (1987). The 35LNC60 bone and antler artifact assemblage is also temporally sensitive in that 64% of the material was recovered from the WCI component. The WCI assemblage shows a large diversity of functional, utilitarian and decorative items as compared to the subsequent less diverse WCII and WCIII assemblages.

A total of 21 shellfish species identified during excavation as well as 15 shell artifacts continue to demonstrate a greater diversity in cultural materials during the WCI. The comparative lack of diversity in the shellfish inventory of the WCII and WCIII components suggests a collecting subsistence strategy in contrast to a foraging subsistence pattern that characterizes the WCI.

The WCI component suggests that 3000 years ago subsistence resources were exploited almost continuously throughout the year at the site, that terrestrial resources were a significant item in the coastal subsistence economy, and marine mammals not known to historically occupy the Oregon Coast were exploited. A wide range of activities beyond the mere procurement of food resources are represented by the material culture. The diversity of the bone and antler tools and the lithic tools is not found in the subsequent WCII and WCIII. These later periods suggest that the logistically oriented collector subsistence economy had become well established by 660 BP. The clear focus on marine mammals, specifically harbor seals when seasonally available in their rookeries, is similar to other contemporaneous Late Littoral coastal sites (e.g., Rambo 1978;

Clark 1988). The material culture associated with these temporal units shows a decreased diversity of lithic and nonlithic artifact classes. The lack of diversity during the WCI and WCII reflects the decreased number of activities carried out at seasonal camp in contrast to the year round activities found in WCI and the wide range of activities represented in the material culture, suggesting the site may have functioned as residential base camp.

The analysis of material recovered from 35LNC60 has proven valuable to our understanding of the prehistoric utilization of the central Oregon coast. Further archaeological investigations at the site should continue to refine chronology by continuing controlled stratigraphic excavation techniques. It is only by recovery of cultural materials within a stratigraphic context, at a multicomponent site, that any attempt to study change in cultural processes through time can be attempted. By employing such controlled techniques with detailed analysis of recovered cultural material a coherent picture of the behavior of the prehistoric occupants. Further explanation of (1) horizontal differences (to identify activity areas); (2) vertical differences (to refine chronology); (3) environmental differences (including the analysis of shell and pollen columes); and (4) refinement of seasonality would add insights into the prehistoric settlement and subsistence models for the Oregon Coast. This analysis of material from 35LNC60 has been hampered by the lack of comparable reported data from other coastal sites. Recovered cultural material has often been reported as a palimpsest, which masks diachronic differences.

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Appendices

Appendix A

List of Features

Feature no.	Horizontal Unit	Temporal Component	Description
1	N102,W112	WCIII or WCIV	Portion of a child burial, apparently disturbed by root action and tree throws. Reported in Tasa (1987).
2	N102,W112	WCIII	Fire hearth with piled fire crack rock, charcoal and burnt soil. Radio-carbon dated to 330 BP +50/-60 (DIC 3256).
3	N102,W112	WCI	Fire hearth characterized by a circular burned area with burned soil and shell.
4	N98,W100	WCI	Fire hearth characterized by a circular concentration of sand and charcoal with fire cracked rock piled adjacent to the hearth. Radiocarbon dated to 3010 BP ± 50 (DIC 3257).
5	N96,W98	WCI	Concentration of whale bone.
6	N102,W112	WCIV	Fire hearth with a concentration of fire cracked rock.
7	N100,W104	WCIV	Pit with light colored sand and burnt shell, intrusive into the WCI component, and not completely excavated. reported in Tasa (1987).

Appendix B

Key to Appendix B

column 1	catalog number	
column 2	strata designation	
	I = WCI	
	II = WCII	
	III = WCIII	
	IV = WCIV	
column 3	length of artifact in centimeters	
column 4	width of artifact in centimeters	
column 5	thickness of artifact in centimeters	
column 6	weight of artifact in grams	
column 7	material type	
	1 = CCS	
	2 = quartzite	
	3 = basalt	
	4 = sandstone	
	5 = obsidian	
	6 = granite	
	7 = pumice	
	8 = tuff	
	9 = schist	
	10 = mudstone	
column 8	condition	
	f = fragment	
	c = complete	
column 9	functional type	
column 10	description	

2	III	4.4	2.5	1.2	12.4	1 4	1	1	1	2	biface
7	IV	4.5	3.0	2.5	35.4	1 c					core
10	III	6.2	4.7	3.5	129.8	8 f	1	1	1	3	utilized cobble
13	IV	4.6	3.3	0.8	11.4	1 4	1	1	1	2	utilized flake
							1	1	3	2	
15	IV	5.2	2.3	1.2	8.4	1 c	1	3	4	4	drill
20	IV	3.0	1.4	1.0	4.4	1 c	1	1	3	2	utilized flake
26	II	3.2	2.7	0.3	4.9	1 c	3	1	3	2	utilized flake
28	II	2.8	2.4	1.0	13.1	2 c	3	1	2	3	uniface
30	I	12.6	5.6	5.1	426.9	4 f	2	2	2	4	abrader
37	IV	6.9	5.1	3.1	167.8	3 c	3	2	3	4	hammerstone
39	IV	10.2	6.7	5.0	514.4	3 c	3	2	3	4	chopper
77	I	3.7	3.6	1.0	11.0	1 c	1	1	1	3	utilized flake
78	I	2.8	2.0	0.8	3.7	1 c	3	1	1	2	utilized flake
81	IV	2.1	1.5	0.3	1.3	1 f	1	1	3	1	utilized flake
82	II	4.4	3.6	0.8	10.0	1 c	1	1	6	2	utilized flake
							1	1	6	2	
							1	1	2	2	
							1	1	3	2	
83	IV	2.7	1.8	1.1	4.1	1 c	1	1	1	2	utilized flake
84	I	5.8	4.5	1.7	64.2	9 f	2	1	6	3	worked schist
85	IV	2.1	1.1	0.7	1.4	1 f	3	1	3	2	utilized flake
85	IV	2.4	2.5	0.4	1.8	1 c	1	1	1	1	utilized flake
88	I	6.4	5.4	1.3	54.3	4 c	2	1	1	2	utilized cobble
94	I	2.4	0.3	2.4	2.4	1 c	1	1	1	2	scraper
101	I	2.9	2.9	1.5	14.8	1 c					core
102	III	7.1	3.0	1.8	55.4	4 f	2	2	3	4	abrader
112	IV	3.5	2.2	1.7	8.8	1 f					biface

115	IV	21.6	17.5	4.2	0.0	4	f	5	2	3	4	grinding slab
117	II	1.5	2.7	0.9	11.7	1	c	1	1	3	3	utilized cobble
129	II	13.6	9.9	5.6	1269.9	6	c	3	2	2	4	mano
135	I	4.5	3.8	2.1	4.5	7	f	2	2	3	4	pumice/tuff abrader
146	IV	5.8	2.4	1.4	17.9	1	c	3	1	3	2	utilized flake
149	III	5.2	2.1	0.7	10.0	1	c					biface
161	I	3.2	3.0	1.0	9.8	1	f					biface
161	I	3.0	2.8	1.2	9.8	1	f					biface
170	I	4.0	2.9	1.6	27.1	1	c	1	1	1	2	scraper
181	I	5.6	5.3	1.5	68.3	4	f	4	2	6	4	stone bowl frag
185	I	5.9	4.3	1.1	41.3	3	c	1	1	1	2	utilized flake
200	I	5.8	4.3	1.6	62.8	4	f	2	2	3	4	abrader
201	IV	2.2	2.7	1.4	11.4	1	c	3	1	3	3	utilized flake
204	IV	3.0	2.1	0.8	6.5	1	c	1	1	3	2	utilized flake
		4.5	3.8	0.6	13.0	1	c	1	1	5	2	utilized flake
223	IV	5.3	3.8	2.1	57.9	1	c					core
231	IV	3.3	2.4	0.3	3.7	1	c	3	1	2	1	utilized flake
244	IV	7.0	8.8	4.2	373.9	3	c	3	1	1	3	chopper
249	I	3.8	2.5	2.3	25.6	1	c					core
251	II	3.7	2.9	1.5	23.0	1	c	1	1	1	2	utilized cobble
266	I	12.8	8.0	4.8	821.9	3	c	3	1	3	3	chopper
298	IV	3.3	2.8	0.7	8.5	1	c	3	1	1	2	utilized flake
315	I	1.7	2.0	0.4	1.3	1	c	1	1	3	1	utilized flake
319	IV	5.4	2.5	1.1	10.6	1	c	1	3	4	4	drill
319	IV	3.1	1.7	1.7	8.9	1	c					core
334	I	6.6	6.7	1.2	86.4	4	f	2	2	3	4	abrader
		4.2	3.2	0.6	16.9	4	f	2	2	3	4	abrader
336	I	7.8	3.8	0.8	37.0	9	f	2	1	6	3	worked schist

384	I	13.2	9.5	4.2	979.7	4	c	2	2	3	4	mano
385	I	2.4	2.5	0.4	1.8	1	c	1	1	1	1	utilized flake
392	I	3.7	1.9	0.9	8.0	1	c	1	1	3	2	utilized flake
399	II	3.0	2.6	0.6	6.1	1	c	1	1	3	2	utiilized flake
404	I	3.6	1.1	0.5	2.4	1	c	1	1	1	2	utilized flake
406	I	4.3	3.6	0.9	13.1	3	c	2	1	1	2	utilized flake
407	I	2.3	1.9	0.3	2.2	1	f	3	1	3	2	utilized flake
409	IV	1.9	1.4	0.3	0.9	1	f	2	1	4	4	punctate
409	IV	9.0	5.2	1.2	47.8	5	f					biface (wealth blade)
409	IV	6.4	4.4	1.6	38.2	1	c	3	1	2	2	utilized flake
409	IV	4.5	1.5	0.6	4.9	2	f	1	1	2	2	utilized flake
410	I	3.2	2.8	1.2	18.8	1	f					core
417	I	6.9	7.0	3.3	170.3	4	f	2	2	3	4	abrader
421	III	3.4	3.0	1.4	29.4	1	c	4	2	3	4	abrader
430	I	4.0	4.0	4.0	88.9	4	c	5	2	1	4	pecked/ground sphere
439	I	5.2	3.5	1.1	21.3	3	f	3	1	5	3	utilized flake
		4.2	3.4	2.0	52.5	1	c	3	2	3	4	hammerstone
441	I	10.6	3.4	3.2	229.5	3	f	5	2	3	4	mano
443	I	3.9	2.3	0.6	5.6	9	f	2	1	6	2	worked schist
								2	1	6	2	
450	I	4.4	3.2	1.1	12.3	1	f	3	1	3	2	utilized flake
451	IV	5.6	2.1	1.8	16.7	1	f					core
453	IV	3.0	1.6	0.3	1.6	1	c	1	1	1	3	utilized flake
481	I	3.8	2.6	3.1	7.9	7	c	2	2	2	4	abrader
								2	2	2	4	
								2	2	2	4	
								2	2	2	4	
489	IV	13.6	5.0	1.3	151.0	4	f	4	2	6	4	stone bowl fragment
497	III	4.3	3.8	1.9	7.1	1	c					core

500 I	3.3	3.8	0.6	5.8	1 f	1	1	3	2	utilized flake
501 I	2.7	3.1	0.6	6.2	2 f	3	1	3	2	utilized flake
503 I	4.9	1.4	0.3	3.6	1 f	1	1	1	1	utilized flake
511 IV	5.6	4.6	2.3	32.8	10 c	2	2	1	4	abrader
511 IV	3.8	3.3	2.3	29.8	10 c	4	2	3	4	abrader
516 II	2.8	3.4	1.2	25.8	1 f					core
516 IV	2.8	2.3	0.8	7.1	1 f					core
517 II	6.4	3.4	3.0	90.7	1 c					core
517 II	4.3	5.2	1.7	44.6	1 c					core
528 IV	12.2	3.2	2.3	118.7	4 f	2	2	2	4	abrader
531 I	2.5	2.3	0.6	5.1	1 f	1	1	3	2	utilized flake
543 IV	5.5	3.9	2.3	60.0	2 f	3	2	3	4	hammerstone
576 IV	6.6	4.6	2.1	75.5	4 f	2	2	3	4	abrader
583 IV	11.3	11.3	7.2	1481.9	3 c	5	2	2	4	anvil
620 IV	3.2	2.2	0.4	3.3	1 c	1	1	1	2	utilized flake
637 I	20.2	20.5	6.9	0.0	4 f	5	2	3	4	grinding slab