CHAPTER 4

Temporal Patterns

The Namu faunal data provide an unprecedented opportunity to monitor the economic prehistory of a Northwest Coast site over a period of almost 7000 years. The vertebrate faunal remains from the 1977 and 1978 excavations exhibit evidence of significant changes and striking continuities in fauna utilization over this long time span. When these data are combined with the shellfish and vertebrate fauna data recovered during the earlier University of Colorado excavations they produce an unusually clear picture of shifts in economic emphasis and site settlement.

The temporal trends in fauna utilization have significance for understanding the site's occupational history, but they also provide insight into wider economic transitions on the Northwest Coast. Temporal patterns in the abundance of fauna from Northwest Coast sites have been used to support a variety of interpretations of economic and cultural transitions in the region. The Namu fauna exhibit a very site-specific pattern, which reflects local environmental changes and cultural responses to the shifting availability of marine resources, but it is still possible to extrapolate from the Namu data without necessarily reading the Namu economy as a microcosm of changes that characterize the entire Northwest Coast.

QUANTIFYING CHANGE

To appreciate the changing emphases of the Namu economy and their implications for Northwest Coast prehistory, it is critical to understand the methods used to quantify and compare the relative abundance of faunal classes over time.

The analysis of the Namu fauna was not undertaken with the aim of establishing relative species contribution to diet. Therefore it was possible to avoid many of the problems associated with the quantification of faunal-class abundance (see Grayson 1984). Faunal-class abundance was determined as the number of identified specimens. On this basis, salmon and herring (see Appendix C) were the most significant fish resources, while deer and harbour seal were the most significant mammal species.

It is much more difficult to use the raw frequencies of recovered faunal remains to determine changes in resource emphasis over time. Apart from variation in the intensity of resource exploitation, the abundance of recovered faunal remains is a function of the volume of excavated material, the length and intensity of site occupation, and the consistency of bone preser-vation and recovery. Rates of resource utilization can only be determined if deposition, preservation, and recovery rates are standardized.

Conversion to unit percentages is a common method for standardizing frequencies to a comparable base, but though percentages provide satisfactory standardization it is often difficult to interpret the meaning of changes in percentage magnitude. For example, a percentage decrease may be due to decreased species utilization, but more intensive use of other species that contribute to the percentage calculation would have the same effect (Grayson 1984:19-20).

In an effort to avoid the inherent problems of percentages, an early attempt was made to standardize faunal-class abundance according to the frequency of certain index species. The abundance of these species

Table 16. Fauna Abundance Standardized by Period
(Figures represent percentage of total fish, bird, and mammal (excluding salmon)).

Taxon	2	3	4	5	6
Rajidae	0.08	0.00	0.14	0.21	0.00
Squalus acanthias	5.60	2.51	1.37	3.01	4.72
Hydrolagus colliei	4.47	4.76	2.13	10.47	19.17
Clupea harengus pallasi	2.12	2.24	10.27	1.98	0.00
Oncorhynchus sp.	433.00	1173.00	1653.00	392.00	105.00
Gadidae	6.13	3.67	8.30	3.54	12.50
Sebastes sp.	24.07	14.27	21.18	33.59	11.39
Anoplopoma fimbria	0.30	1.09	0.53	1.98	0.28
Hexagrammidae	5.98	1.90	4.82	8.86	1.39
Cottidae	0.23	0.07	0.42	0.78	0.00
Pleuronectidae	3.63	3.94	5.19	6.06	2.50
Unidentified fish	4.01	4.96	1.80	4.53	5.00
Aves	5.22	21.88	2.44	3.42	3.61
Castor canadensis	0.83	0.34	0.42	0.33	0.00
Erethizon dorsatum	0.68	1.49	0.93	0.74	0.83
Delphinidae	1.51	1.15	0.67	0.91	0.00
Canis familiaris	2.88	3.94	2.58	4.20	9.72
Ursus americanus	0.45	0.14	0.22	0.08	0.00
Procyon lotor	0.00	0.00	0.03	0.00	2.22
Mustelidae	3.41	3.19	1.32	1.28	1.11
Lutra canadensis	0.76	0.48	0.25	0.58	1.11
Enhydra lutris	0.30	0.27	1.32	0.16	0.00
Otariidae	0.45	0.75	0.20	0.37	0.83
Phoca vitulina	6.13	5.16	14.61	0.95	0.28
Odocoileus hemionus	14.46	16.03	14.56	9.69	16.94
Oreamnos americanus	0.00	0.07	0.06	0.04	0.00
Unidentified mammal	6.28	5.64	4.24	2.31	6.39

was used as a representative standard of faunal deposition and recovery rates (Cannon 1989). Unfortunately the method proved to be unacceptably sensitive to minor sampling variations. It also introduced unwarranted assumptions and undue complexity in the calculation of standardized abundance. In the end, the temporal trends exhibited by the indexed totals were very similar to the trends in percentage abundance. Given the problems and assumptions involved in indexing faunal deposition and recovery rates, the calculation of faunal-class percentages was a preferable method of standardization.

The standardized faunal-class figures (Tab. 16, Figs. 3, 4) are calculated as percentages of the non-salmon vertebrate fauna from each period. Salmon are so abundant that their inclusion in the percentage calculations would have obscured any variation in the representation of other classes. The variation in salmon over time is calculated according to a different scale. Salmon abundance was standardized by calculating its ratio abundance per one hundred specimens of non-salmon vertebrate fauna. The resulting ratio gives a better impression of changes in the emphasis on salmon, though it may exaggerate differences between periods. When the abundance of salmon is calculated as a percentage of all vertebrate faunal specimens the apparent change from period to period is less pronounced. This problem is considered below in the discussion of temporal trends in salmon utilization.

Although the percentage figures in Table 16 give some impression of the relative contribution of each class to the fauna-based economy, it is inappropriate to put much weight on this impression. The number of identified specimens varies according to individual species characteristics (e.g. the identifiability of elements, preservation, recovery etc.), and percentage comparisons should only be made within the groups of fish, bird, and mammal. All faunal classes have been combined to calculate the figures in Table 16; therefore comparisons of percentage abundance within periods should be made with great caution.

There are advantages in standardizing abundance relative to the combined total of non-salmon vertebrate fauna. Changes in the abundance of any one faunal class has less effect on the representation of other classes when the combined total is based on a greater number of classes. In this case there are no completely dominant classes, though a change in the abundance of deer would have a greater effect than would a change in one of the lesser classes. A percentage change among the more abundant fish species also could have a disproportionate effect on the percentages of mammals. Appropriate caution must be used when evaluating percentage changes over time.

Apart from the effects of percentage calculations, there is always the possibility of significant changes in abundance due to relatively minor sampling effects (e.g. the inclusion of an anomalous concentration of bone as part of the excavated period matrix). In most cases such distortions should not be a major problem because of the large volume of excavated material and the abundance of recovered faunal remains. Nevertheless, greater interpretative weight is given to systematic patterns of change, which are sustained over more than one period, and to coincident changes in the abundance of more than one class of fauna. With these cautions, the percentage totals in Table 16 provide a basis for measuring robust change in faunal-class abundance over time. The results are a valid basis for interpreting temporal trends in the fauna-based economy.

PERIOD CHARACTERISTICS

Each of the major periods of site occupation exhibits a somewhat distinctive pattern of resource utilization. The period-by-period utilization of each of the major classes of shellfish, fish, birds, and mammals is described below. Changes in the abundance of identified fauna within each group are assessed and compared to trends in other major classes, and an effort is made to explain the temporal patterns that emerge. A summary description of temporal trends provides an overview of major developments in the economic prehistory of the site. No faunal remains were found in Period 1 deposits (11,000 - 7,000 cal. B.P.)

Period 2 - 7000 - 6000 cal. B.P.

Period 2 is characterized by the virtual absence of shellfish, which do not become a significant subsistence resource until after 6000 cal. B.P. The presence of isolated lenses of shellfish remains in the lowest levels of Period 2, and the enhanced preservation of vertebrate fauna remains are the major characteristics of the Period 2 deposits that distinguish them from the earlier Period 1 deposits.

The significance of the Period 2 vertebrate fauna assemblage is its inclusion of nearly the entire range of species recovered from later periods. The earliest fauna-bearing levels indicate utilization of the range of fish resources represented throughout later periods. The variety of habitats and behaviours exhibited by these fish (e.g. isolated individuals, schools, or anadromous runs) is evidence of a well-developed early fishing technology.

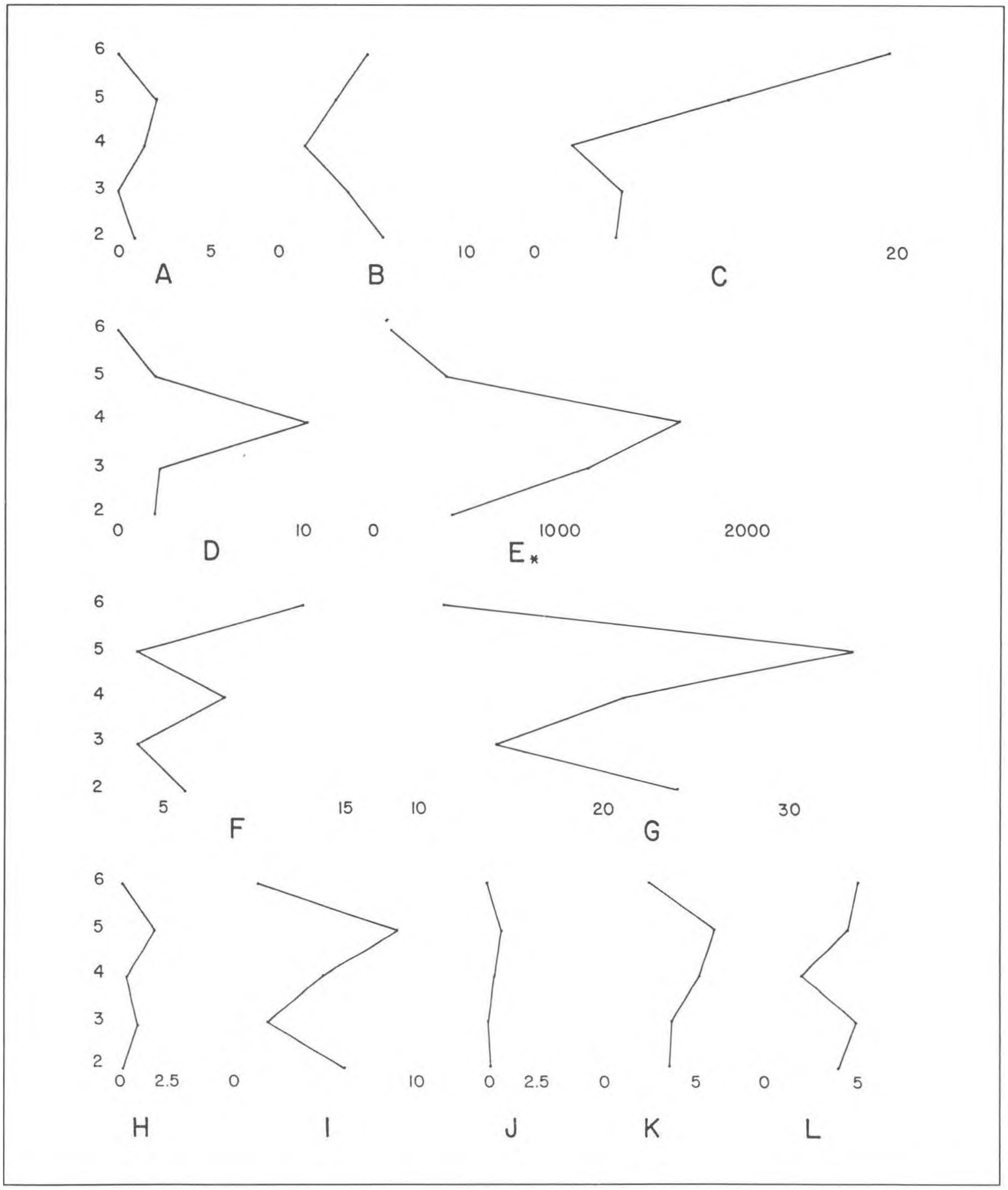

Figure 3. Temporal Trends in the Standardized Abundance of Fish (A - Rajidae, B - *Squalus acanthias*, C - *Hydrolagus colliei*, D - *Clupea harengus pallasi*, E - *Oncorhynchus sp.*, F - Gadidae, G - *Sebastes sp.*, H - *Anoplopoma fimbria*, I - Hexagrammidae, J - Cottidae, K - Pleuronectidae, L - Unidentified Fish) [Figures in % of non-salmon vertebrate fauna (* - Note scale change)].

The abundance of herring *(Clupea harengus pallasi)* and rockfish *(Sebastes sp.)* is comparable to later periods, as is the abundance of less common species. Only the dogfish *(Squalus acanthias)* is most abundant in this earliest time period, though it is not a major species at any time. Salmon is less abundant than in later periods, but it is still the dominant class of identified fish.

The below-peak abundance of salmon is probably a function of the failure of salmon streams to reach full productivity immediately following deglaciation. According to Fladmark (1975:207), full productivity was unlikely prior to 6000 cal. B.P. There are no obvious features of the environment that can explain the relative abundance of dogfish; it may reflect cultural preference. Given the historic use of dogfish as starvation food, and the almost complete lack of shellfish in the early deposits, it is reasonable to suggest that dogfish were exploited when other food was in short supply. Food shortages might have been particularly acute during Period 2, when salmon was less plentiful and shellfish were not yet exploited in appreciable quantities. Long-term trends show that the abundance of dogfish tends to vary inversely with the abundance of salmon.

The range of birds and mammals in the earliest fauna-bearing levels is virtually the same as throughout later periods; deer and harbour seal are the most abundant species. Period 2 exhibits the greatest percentage abundance of many mammalian species, though this may be partially due to slightly poorer preservation of fish remains in the early deposits, which would artificially inflate the percentage of mammals.

Period 2 exhibits the greatest abundance of many minor fur-bearing species such as beaver *(Castor canadensis)*, Mustelidae (mink, etc.), and black bear *(Ursus americanus)*. The abundance of fur-bearing species probably reflects their greater utilization in the early periods of site occupation. Long-term trends show a gradual reduction in the exploitation of fur-bearing animals.

The slightly higher percentage of Delphinidae in the Period 2 deposits is of interest in light of evidence from the Bear Cove site on Vancouver Island that shows an early emphasis on hunting dolphin and porpoise (C. Carlson 1979:188). However, the number of Delphinid remains from Namu is so low that little interpretative weight can be given to their percentage representation.

Period 3 - 6000 - 5000 cal. B.P.

Period 3 sees the first full development of shellfish gathering, with shellfish remains becoming the major component of the midden matrix. Detailed studies by Conover (1978) and visual assessment of the 1977 and 1978 excavations show a substantial increase in the use of shellfish, and a clear dominance of rock-dwelling species such as *Mytilus sp.* (mussel), *Balanus sp.* (barnacle), and *Thais sp.*(whelks). These are the species that would be expected to predominate as lower post-glacial sea levels exposed a rocky foreshore environment, which was still relatively unaffected by silt deposition from river estuary development.

The most significant change in the Period 3 fish assemblage is the sharp increase in salmon. During Periods 3 and 4, salmon completely dominate the recovered faunal assemblage. The increased emphasis on salmon is likely a function of their increased availability in the stabilized post-glacial environment (Fladmark 1975:207). During the period 6000-4000 cal. B.P., sea levels in the immediate site vicinity reached the limit of their post-glacial decline (Andrews and Retherford 1978:348). At this time, the Namu River, like other coastal streams, would have reached a stable gradient and downcut its bed sufficiently to reduce stream velocity and allow for peak salmon productivity (Fladmark 1975:204). Lower sea levels also would have increased the areal extent of the lower Namu River; studies of similar streams show the lower reaches to be the most productive spawning areas (Hunter 1959:854).

All other fish species were exploited to a degree roughly comparable to Period 2. The significant decline in rockfish *(Sebastes sp.)*, and to a lesser extent in greenlings (Hexagrammidae) is difficult to explain, but it may reflect lesser use of abundant but less predictable fish resources once salmon had become a reliable subsistence staple.

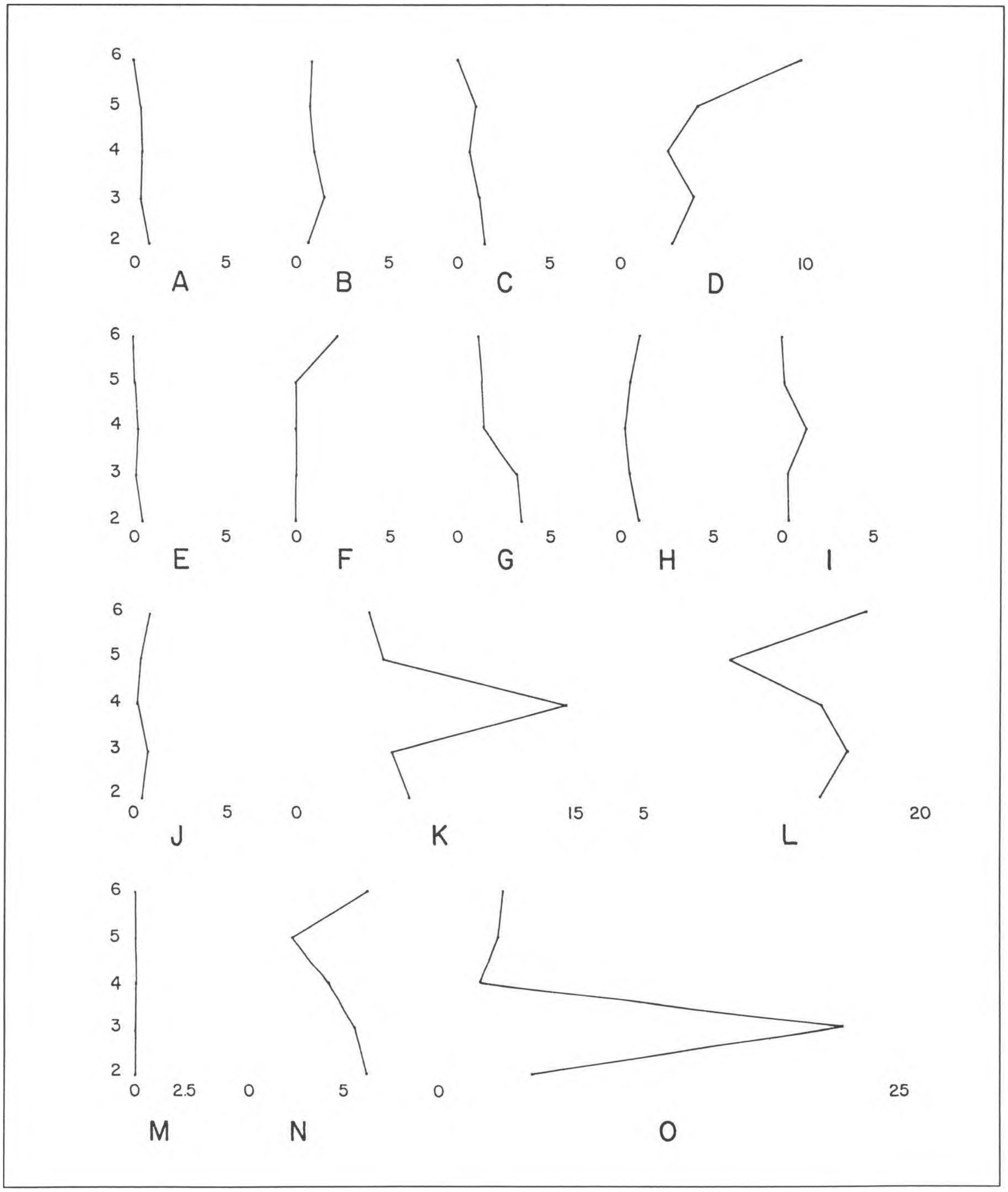

Figure 4. Temporal Trends in the Standardized Abundance of Mammal and Bird (A - *Castor canadensis*, B - *Erethizon dorsatum*, C - Delphinidae, D - *Canis familiaris*, E - *Ursus americanus*, F - *Procyon lotor*, G - Mustelidae, H - *Lutra Canadensis*, I - *Enhydra Lutris*, J - Otariidae, K - *Phoca vitulina*, L - *Odocoileus hemionus*, M - *Oreamnos americanus*, N - Unidentified Mammal, O - Aves) [Figures in % of non-salmon vertebrate fauna].

The Period 3 bird and mammal assemblage includes the same range of species exploited earlier. The abundance of most classes of mammal is little changed from Period 2. The only significant difference from Period 2 is the sharp increase in the number of birds. Nearly 60% of all the bird bones recovered from the site come from Period 3 deposits. As the graph of temporal trends reveals (Fig. 4), this increase in bird remains is out of line with their generally stable abundance throughout all other periods. The strong implication is that the Period 3 bird remains represent a sampling anomaly. It was suggested in Chapter 3 that the spatial concentration of bird bone in the vicinity of the Central Main Trench may indicate a habitation area, where the remains of birds that had been processed as soup were immediately deposited. Any alternative explanation based on changes in environmental conditions or cultural preference would have to explain the subsequent decline in birds in Period 4, when environmental conditions were roughly comparable. In the absence of a satisfactory alternative the peak in birds is best explained as the result of sampling effects.

Period 4 - 5000 - 4000 cal. B.P.

The range of shellfish is consistent with Period 3. The dominant species are whelks, barnacles, and mussel, but the frequency of clam increases toward its peak and dominance in Period 5.

The Period 4 vertebrate faunal assemblage exhibits a number of significant changes from earlier periods. Among the fish there is evidence of a further increase in the exploitation of salmon. This may reflect a real increase in salmon exploitation as the local population became further dependent on the large-scale catching, processing, and storage of salmon for winter use. Alternatively, the increase could be more apparent than real. One possibility is that the water-screening of Period 4 deposits (see Chapter 1) increased the recovery of salmon relative to their recovery from Period 3 deposits. The standardization of salmon abundance relative to other fauna also could have exaggerated their apparent increase in Period 4. In any case the dominant emphasis on salmon is consistent with that of Period 3, and any increase in emphasis would have to be viewed as a continuation of the trend that began earlier.

The Period 4 assemblage exhibits a significant increase in the abundance of herring *(Clupea harengus pallasi)*, which far exceeds earlier or later levels. Low sea levels may have enhanced spawning conditions in the Namu Harbour, but the availability of herring should have been comparable in Period 3. Unless the increase is entirely due to the increase in water-screening, the increase in herring may reflect a response to population growth, which was predicated on the abundance of salmon. The predictable abundance of herring in the spring would have provided a significant food supply to a population dependent on dwindling supplies of winter salmon. The increased use of supplementary fish resources is seen to a much lesser extent in the increase in rockfish *(Sebastes sp.)* and cod (Gadidae), but trends in the utilization of these relatively minor fish resources are too erratic for substantive interpretation. Most other minor fish species show levels of abundance comparable to other periods, though the decline in some species can be taken as an indication that screening effects were not solely responsible for changes in the Period 4 fish assemblage.

Period 4 also sees a sharp increase in the abundance of harbour seal *(Phoca vitulina)* and sea otter (*Enhydra lutris)*. Harbour seal are always much more abundant than sea otter, but the similarity in their temporal trends suggests that some common cause is at least partially responsible for their increase at this time. An expansion of their preferred habitat of rocky islets and reefs during the earlier decline in sea levels may have contributed to their increase in the area.

The dramatic increase in harbour seal also could be attributed to an increase in the availability of salmon and herring in the site vicinity, which would have provided food for a larger seal population. However, the consistency of environmental conditions between Periods 3 and 4 suggest that at least some of the increase in salmon, herring, and harbour seal was due to an enhanced cultural focus in Period 4.

Most of the rest of the Period 4 mammalian and avian assemblage is consistent with that of other periods.

Period 5 - 4000 - 2000 cal. B.P.

There are three major changes evident in the Period 5 shellfish remains: 1) an increase in shellfish volume (see Conover 1978:78); 2) a change in species composition from the primarily rock-dwelling species of mussel and barnacle to primarily silt- and sand-dwelling species of clam; and 3) a reduction in the degree of shell fragmentation and a consequent increase in the proportion of whole shell.

Many of the major changes in the Period 5 shellfish assemblage can be related to the conditions and consequences of the precipitous decline in the Namu salmon fishery, which is described below. The increase in shellfish volume likely represents an attempt to supplement food supplies in the face of declining salmon stocks. The maturation of the Namu River estuary (Conover 1978:82) and the buildup of fine-grain sediments in the site vicinity produced an ideal habitat for clam species, but it would have had a serious effect on salmon productivity. The rate of near-shore sedimentation likely increased after 4000 cal. B.P. when a moderate rise in sea level would have slowed the river outflow. The resulting increase in sedimentation appears to have been simultaneously responsible for an increase in the abundance of clam, a decrease in salmon productivity, and a possible reduction in the intensity of site occupation in Periods 5 and 6.

Conover (1978:98) noted a marked reduction in the degree of shell fragmentation in strata from the period between ca. 3000 and 1800 cal. B.P., as exhibited in the lower layers of the 1968 Front Trench. Many strata from this period are described as undisturbed layers of pure shell. Conover placed a narrow interpretation on these observations, describing them as evidence of reduced activity in this area of the site. An alternative explanation is that they reflect a reduction in the overall intensity of site settlement in Period 5. According to Conover (1978:98) this period represents a peak in site occupation, which was characterized by maximum shell deposition, increased variety of tool types, and proliferation of faunal species. However, as Conover suggests, the tool inventory may have been enhanced by the better preservation that resulted from the rapid buildup of untrodden shell. The proliferation of faunal species could represent an attempt to compensate for the loss of the salmon fishery and the decline in other important food resources. Failure to consider evidence of the salmon fishery seriously undermines Conover's interpretation of the site's economic prehistory.

The most significant change in the Period 5 fauna is the precipitous decline in the abundance of salmon. The decline is so abrupt and so complete that it suggests a near collapse of the Namu River salmon fishery. Around 3500 cal. B.P. the sea level on the Central Coast began to rise to its present level, which is at least three metres higher than the lowest post-glacial level (Andrews and Retherford 1978:348). This sea-level rise would have had a serious effect on the spawning beds of the Namu River. The lower reaches of coastal streams often provide the most productive chum and pink salmon spawning beds (Hunter 1959:854), and the lower sea levels of Periods 3 and 4 would have produced the maximum extent of these prime spawning areas. The subsequent rise in sea level would have greatly reduced the area of spawning beds.

A more damaging effect of a rise in sea level would have been the increase in sedimentation of the lower river. As the sea level rose, the river flow near the mouth would slow, causing the river to drop much more of its sediment load in its lower reaches. Sedimentation of spawning beds has an extremely deleterious effect on salmon-stream productivity (Hall and Lantz 1969:369; McNeil 1969:109), and the water flow in the upper Namu River is generally too swift to provide productive spawning areas. Contemporary escapement figures show the Namu River to be only low-to-moderately productive as a salmon stream (Pomeroy 1980:184).

Herring also exhibit a sharp decline in Period 5, which might be partially explained by changes in the foreshore environment. Sedimentation, rising sea levels, or both might have had some effect on the productivity of the herring fishery, but the evidence needed to assess the effects on herring is not available.

The ratfish *(Hydrolagus colliei)* exhibits a significant increase in Period 5. Although there is very little information concerning Native uses of this fish (see Chapter 2), its Period 5 abundance could be explained as the increased exploitation of a marginal marine resource at a time of need, though the lack of a general increase in other fish species and the unlikely use of ratfish as an important food resource argue against such an interpretation. The increase in ratfish is more important as an indication of the nature of environmental change in the site vicinity. The preference of ratfish for shallow water over a muddy bottom (Carl 1973:20) and its main diet of clam (Hart 1973:67) suggest that the increase in ratfish is further evidence of increasing sedimentation of the foreshore environment. The Period 5 fish assemblage exhibits increases in the abundance of several classes of fish that might have served to supplement the declining salmon and herring resources. Rockfish and greenlings show significant increases in Period 5. The abundance of dogfish also begins to increase at this time. Some Period 5 increase in the variety of marine species and the technologies used in their exploitation is supported by evidence from earlier site excavations (Hester 1978:102). It was suggested that this was an indication of a peak in the marine-fishing economy (Conover 1978:98; Luebbers 1978:62), but it is more suggestive of the need to expand the subsistence base in the face of a decline in the earlier economic mainstay.

The mammalian fauna provide further indications of a general economic decline in Period 5. The most significant decrease is in the number of harbour seal. The decline in harbour seal and sea otter may be partially due to the loss of an exposed rocky habitat due to the rise in sea level, though both species were more abundant in Period 2 when sea levels were as high or higher. Their decline in Period 5 must be due to more than the reduction of suitable habitat. Over-exploitation of harbour seal and sea otter during Period 4 might have contributed to their decline, and the loss of salmon and herring also could have contributed to the decline in harbour seal. In any case, the loss of harbour seal would have had a major impact on an already declining subsistence economy.

It might be expected that a reduction in harbour seal would result in increased emphasis on other mammalian species, but the Period 5 faunal assemblage indicates a decline in most categories of mammalian fauna. Even deer *(Odocoileus hemionus)* are reduced from their stable abundance in other periods. The implication is that there was a general reduction in sea- and land-based hunting. The further implication is that the loss of salmon did not simply encourage a shift to alternative resources, but instead encouraged the exploitation of resources such as fish and shellfish, which were most readily available and offered the surest return for labour invested. A smaller scale of site settlement may have discouraged greater investment in potentially low-return hunting expeditions.

Many of the characteristics of the Period 5 assemblage that indicate a decline in economic activity and a reduction in the scale of site settlement are more pronounced in Period 6.

Period 6 - 2000 cal. B.P. - Contact

Specific changes indicated in the Period 6 faunal assemblage must be viewed with caution since the assemblage size is very small and more subject to sampling distortion. The 1977 and 1978 excavations were also restricted to deposits dating to the early part of Period 6, and it is difficult to determine whether they fairly characterize later developments at the site. Nevertheless, the recovered Period 6 fauna indicate further decline in the scale of economic activity and site occupation

The Period 6 shellfish remains exhibit many of the characteristics evident in Period 5. Shell content is high, species of clams predominate, and many of the early Period 6 deposits consist of nearly pure lenses of whole shell. There is an overall decline in most classes of vertebrate fauna.

Salmon continues its decline to very low levels, and there is a decrease in the abundance of most other classes of fish. A notable exception is the continuing dramatic increase in the abundance of ratfish, which may reflect further sedimentation of the salmon spawning habitat. Dogfish also continue to increase, which probably indicates their increasing use as an emergency food supplement. The decline in groups such as rockfish is difficult to explain, but it seems to reflect a further reduction in economic activity.

Harbour seal are almost absent from the Period 6 mammalian assemblage. Only deer show a significant increase among potential food resources, and that increase may be exaggerated by the percentage decline in most other vertebrate fauna. A similar effect is probably responsible for the apparent increase in dog remains. There is a minor increase in the number of river otter *(Lutra canadensis)*, but it is difficult to account for this increase since there is a decrease in every other category of fur-bearing mammal. The increase in river otter may represent an attempt to replace the loss of sea otter, but there is no evidence to support this conclusion.

Although still rare, the number of raccoon *(Procyon lotor)* increases substantially. Raccoon is not a significant subsistence resource, but it may be evidence of less intense or more intermittent site occupation. The only other occurrence of raccoon in the 1977 and 1978 excavations is a single element from Period 3, and Conover (1978:86) also noted a lack of raccoon in the midden prior to ca. 2500 cal. B.P. Unless there was an unprecedented cultural focus on raccoon, there must have been either a general environmental change that extended their range to this area of the coast, or a specific change in the site environment that encouraged or at least allowed for the presence of raccoon. There was no change in climate or vegetation that would account for the increase in raccoon (Hebda and Mathewes 1984). It is more likely that their appearance indicates a specific change in the site environment. Rising sea levels are unlikely to have had a direct effect on raccoon, but smaller-scale or more intermittent human settlement might well have encouraged the encroachment of raccoon.

Conover's (1978:86) suggestion that raccoons were tolerated as scavenging competitors with Native dogs seems extremely unlikely unless the number of dogs in the settlement was greatly reduced from earlier periods. The consistent presence of dog remains argues in favour of periodic abandonment of the site as the reason for the raccoon encroachment. The occurrence of complete, articulated raccoon skeletons (Conover 1978:86) further suggests that the carcasses were left undisturbed during the periodic absence of the human residents.

The relative abundance of eagle *(Haliaeetus leucocephalus)* bones in Period 5 and 6 deposits (see Table 8) is further evidence of scavenger encroachment on the site. Eagles would be less likely to approach the immediate vicinity of a large and active settlement, but might be more common near a smaller or less continuously occupied settlement.

In contrast to earlier periods, Periods 5 and 6 saw increased exploitation of minor fish species and an increased emphasis on shellfish, particularly clams. This shift in economic focus probably represents an effort to compensate for the precipitous decline in salmon, herring, and harbour seal, which had been key resources in the earlier subsistence economy. However, these alternative resources certainly would not have been able to support the scale of earlier settlement. The subsistence economy underwent overall reduction from an earlier, large-scale, communally-based system to a smaller-scale, individually-based system. In terms of ethnographically-recorded settlement patterns, the shift was probably equivalent to a change from a large, multi-family village to a smaller band or extended family settlement.

Less intensive site occupation is indicated by the undisturbed deposits of whole shell, the low numbers of vertebrate fauna, and the increase in scavengers such as raccoon and eagle. A variety of evidence counters Conover's view that the late period fauna simply reflect a shift in activity focus to other parts of the site. Firstly, the character of the Periods 5 and 6 fauna is consistent in several different areas of the site, including the 1968 and 1977 Central Main Trenches, the 1977 Main North-South Trench, the 1978 Rivermouth Trench, and the basal levels of the 1968 Front Trench; in none of these excavations was there any indication of an alternate centre of more intense activity. Secondly, many fauna, particularly species of fish, are more abundant in these periods, which indicates that sampling effects are not responsible for the reduction in other classes. Finally, the characteristics of the late period fauna are consistent with an increase in the sedimentation of the site environment, which would have forced a shift in local economic emphasis.

All of the faunal changes could be explained as the result of culture change, but this is a particularly weak explanation given the complex of features involved. The reduced focus on previously important subsistence resources, the continued exploitation of the same range of species, with generally the same technological complex, and the increased emphasis on an unusual range of marginally important species including raccoon, eagle, and ratfish are unlikely to be due to any conceivable pattern of culture change. A pattern of resource decline and a consequent reduction in the scale of site settlement provides a better account of the available evidence.

TEMPORAL TRENDS

Temporal trends in faunal utilization must be set against the backdrop of continuity in resource range and emphasis. Against this backdrop dramatic fluctuation in minor resources such as rockfish *(Sebastes sp.)* are apparent but difficult to explain. Other sharp fluctuations, such as the Period 3 increase in birds can be explained away as the result of sampling effects. What remain are three classes of significant temporal change in the site economy, which include: gradual long-term shifts in species abundance (e.g. the increase in clam relative to mussel, and the gradual decline in fur-bearing mammals); major changes in economically important classes of fauna (e.g. the increase and subsequent decline in salmon, herring, and harbour seal); and coincident changes in faunal abundance that point to a single underlying set of environmental changes and cultural adjustments (e.g. the increase in silt-tolerant ratfish and clam, the decline in salmon, and the reduction in site settlement).

Most of the Namu faunal trends point to shifts in resource availability as the result of changes in the local site environment, though there are indications of cultural transitions that are more than a simple function of environmental conditions. In addition to the obvious implications for the site economy, these trends have wider implications for the interpretation of economic transitions on the Northwest Coast, though it would be a mistake to generalize too far on the basis of a single site.

The following discussion summarizes trends in the major taxonomic categories of shellfish, fish, and mammal, which taken together provide a summary overview of the prehistoric Namu economy.

Shellfish

A quantitative analysis of shellfish exploitation is not presented here, but there are obvious temporal trends in shellfish utilization, which are important to any discussion of the subsistence economy. The rarity of shellfish in Period 2; the increased utilization of shellfish after 6000 cal. B.P.; the changing species composition of shellfish remains, particularly after 4000 cal. B.P.; and the increase in whole, unmixed shell deposits in Period 6 are all trends that require further consideration and explanation.

Fladmark (1975:246-253) discusses a number of possible explanations for the scarcity of shellfish remains in Northwest Coast sites prior to ca. 6000 cal. B.P. He concludes that a lack of available shellfish resources was not responsible, since there is evidence that shellfish have been present in all coastal areas throughout the post-glacial period. Fladmark also dismisses suggestions that coastal inhabitants simply had not developed the cultural adaptation that would enable them to exploit shellfish resources. Fladmark (1975:253) explains the initiation of large-scale shell midden accumulation as "the result of a shift to the winter village settlement pattern following the development of peak salmon productivity". Once full reliance on salmon allowed large-scale population aggregates to become the prevalent settlement pattern, it was necessary to make use of shellfish in order to maintain large aggregates when preserved salmon were in short supply. Without salmon large aggregates would not be possible, and without large aggregates intensive exploitation of shellfish was not necessary. The fact that shellfish often were not collected in winter is not a relevant point against Fladmark's overall argument. Shellfish could be gathered in summer and preserved for winter use or gathered in the late winter and spring to extend the winter supply of preserved salmon until the first runs of the new season (see further discussion of this point in Chapter 6).

The subsistence value of shellfish and the conditions promoting their use following the end of the Pleistocene are subjects of world-wide debate (see Bailey and Parkington 1988). As generally documented on the Northwest Coast, the build-up of shell midden deposits is associated with the greater productivity and increased use of salmon (Fladmark 1975), though there are local exceptions (e.g. Mitchell 1988). At Namu the association between salmon and shellfish is clearly in evidence. Whether this is a simple function of population increase or the more subtle effects of an enhanced salmon fishery is a question that is considered below and in more detail in Chapter 7.

From the time that shellfish gathering was established as a major component of the Namu subsistence economy the most significant trend was the change in shellfish species composition from primarily rock-dwelling species such as mussel and whelk to primarily sand- and silt-tolerant species of clam. This transition in species composition is a pattern that is repeated at a number of localities on the Northwest Coast, including the Glenrose Cannery site in the Fraser Delta (Ham 1976:59) and sites on the Gulf Islands (Mitchell 1971:182). In all of these cases there is agreement with Conover (1978:82) that the explanation is stabilization of the marine/land interface and maturation of river and stream estuaries.

Wessen (1988:199-200) outlines a number of alternative explanations including human over-exploitation, which have been proposed to account for similar transitions in shellfish species at other Northwest Coast sites. Alternative explanations for the Namu transition have not been specifically evaluated, but the correspondence with changes in other fauna (e.g. the increase in ratfish and decrease in salmon) supports the interpretation of increased sedimentation of the near-shore environment. At Namu, it is likely that sedimentation of the inner harbour accelerated with the moderate rise in sea level after 4000 cal. B.P. The Period 5 increase in shell volume and the proportion of unbroken shell is likely the result of the precipitous decline in the salmon fishery, which would have increased demand for supplemental food resources such as shellfish. The rapid build-up of shell deposits, and a possible reduction in the scale of site settlement would have reduced the mixing and crushing of shell deposits.

Fish

Salmon dominates the identified fauna from every period of site occupation; its subsistence contribution was only rivaled by herring, and later shellfish. The importance of salmon in the ethnographically-recorded Northwest Coast economy was derived from its capacity for preservation and storage, which made it the economic mainstay that allowed for much of the elaboration of Northwest Coast culture and society. It is clear that salmon was equally important to the Namu subsistence economy, and variation in the local availability of salmon had a major impact on the entire course of prehistoric occupation of the site.

From the earliest period for which data are available, salmon and herring were the major subsistence resources, and their importance in Period 2 was enhanced by the low level of shellfish exploitation. The scale of salmon fishing increased dramatically around 6000 cal. B.P., when relatively stable sea levels allowed for full productivity of the Namu salmon fishery. This was also the initial period of full-scale shellfish exploitation. Salmon and shellfish appear to have been integral to the establishment of large-scale settlement at the site. During Period 4 the emphasis on salmon may have increased still further (Fig. 3), though the increase is insignificant if the abundance of salmon is taken as a percentage of all identified fauna (Period 3 - 92.15%, Period 4 - 94.43%). With the precipitous decline of the salmon fishery after 4000 cal. B.P. there was a reduction in the scale of site settlement and greater emphasis was placed on more readily available resources such as clam and minor fish species. The later Namu settlement may have been limited to a seasonal campsite (see Conover (1978:98-99) for a discussion of the latest periods of site occupation).

The initiation and collapse of the Namu salmon fishery is easily read as a function of changes in sea level and the consequent effects on salmon-stream productivity. The slight increase in salmon between Periods 3 and 4 is more difficult to explain. The implication is that there was increased cultural emphasis on salmon. Although quantitative assessments are lacking, there is comparable evidence for increasing utilization of salmon in the Fraser Delta (Boehm 1973:74; Matson 1976:96), as for example at the St. Mungo Cannery site, where the increase in salmon was matched by a decrease in the abundance of other fish species (Boehm 1973:74).

The other major food fish at Namu was herring, which is consistently abundant in Periods 2, 3, and 5. Its absence in Period 6 may be due to the low recovery of faunal remains from those deposits. The substantial increase in Period 4 stands out as an important development in the fishing economy of the site. It is difficult to estimate the abundance of herring, but based on the quantities of herring bone recovered from selected matrix samples (Fawcett: Appendix C) it is clear that herring was a major subsistence resource in all periods, with the possible exception of Period 6.

The five-fold increase in the percentage of herring bone in Period 4 suggests a substantial increase in the local reliance on herring as a food resource. However, several other considerations must be taken into account. More water-screening of Period 4 deposits relative to Period 3 (Tab. 6) may have increased the recovery of herring, though this would not account for the lower numbers of herring from Periods 2, 5, or 6. In addition, the use of pressurized water hoses to screen the material probably forced many herring bones through the 1/8 inch (3.2 mm.) screen, thereby reducing their recovery as much as it was enhanced by any greater visibility. The evidence from the matrix samples is inconclusive, but it also indicates a significant increase in herring in Period 4 (Fawcett: Appendix C). If the increased recovery of herring reflects its increased use, then this shift in economic emphasis must be explained.

The possibility of an enhanced Period 4 environment for spawning herring is not suggested by any of the available evidence. Sea level conditions were comparable to Period 3. The lack of a clear environmental explanation suggests the greater likelihood of an increased cultural focus on herring in Period 4. Although archaeological evidence is unavailable, one possibility is that an increase in settlement size put greater subsistence pressure on the local population by the late winter/early spring timing of the herring spawn. Such a situation might have forced greater investment in the herring fishery. A subsequent reduction in the scale of site settlement following the decline of the salmon fishery would then account for reduction of the Period 5 herring fishery to previous levels.

There are few clear trends in the use of other fish classes, with the exceptions of dogfish and ratfish. All species apart from salmon and herring make a relatively modest contribution to the local fishing economy, and it would be a mistake to accord too much significance to their variable abundance over time. The combined percentage of fish other than salmon, herring, and ratfish does not exhibit dramatic fluctuations over time (Period 2 - 46.0%, 3 - 27.4%, 4 - 41.9%, 5 - 58.0%, 6 - 32.8%), despite the sometimes significant variation in species composition. The decline in Period 3 may indicate less reliance on minor fish resources in the early stages of intensive salmon production. The slight increase in Period 5 may indicate an attempt to compensate for declining salmon stocks, while the decline in Period 6 marks the overall reduction in economic activity at the site. Beyond these observations there is little that can be inferred from the erratic changes in minor fish-class abundance. Dogfish are only notable for their tendency to occur in roughly inverse proportion to salmon, which may suggest their use as a food supplement during times of shortage, as suggested by recent Kwakiutl ethnography (Rohner 1967:17).

The substantial increase in ratfish in Periods 5 and 6 can be explained as part of the suite of faunal changes that indicate increasing sedimentation of the Namu River estuary and harbour area. However, despite the lack of ethnographic evidence to document its use as a food resource, it is still necessary to explain the presence of ratfish remains in the midden deposits. Ratfish were caught, kept, and used throughout the site occupation. Their increased abundance in Periods 5 and 6 may have been predicated on increased availability, but it also indicates that ratfish were increasingly utilized during this time period. One possible explanation is that ratfish were necessary to compensate for the reduction of fat in the diet due to the decline in salmon, herring, and harbour seal. The oil-rich ratfish could have become an increasingly important source of this critical dietary component.

Mammal

The utilization of most classes of mammalian fauna show little significant change over the entire period represented by the vertebrate fauna data. Deer is most common in all periods, and it was consistently exploited, with the exception of the anomalous decline in Period 5. The Period 5 decline may be a sampling effect, since it is followed by full recovery to earlier levels of exploitation. Alternatively, the decline in deer could be interpreted as consistent with an overall economic decline, possibly reflecting reduced demand for raw materials and reduced ability to mount high-risk, low-return hunting forays. The subsequent increase in deer in Period 6 can be explained as a result of the percentage decrease in most other classes of vertebrate fauna. The implication would be that deer hunting was still much below its earlier intensity.

The sharp Period 4 peak and subsequent decline in harbour seal would have had a profound effect on the subsistence economy. The increased exposure of reef habitats as the result of lower sea levels during Periods 3 and 4 could have contributed to a real increase in the local harbour seal population, though it is difficult to explain why the increase would not have occurred in Period 3. An increase in salmon in Period 4 could have attracted more seal to the site area, but the Period 3 salmon increase did not have a similar effect. The only possible environmental change specific to Period 4 that might be relevant is the increase in herring. If the herring increase reflects an actual increase in local availability, then it is conceivable that herring would attract larger populations of harbour seal to the site region. If the increase in herring is a function of cultural emphasis then the same explanation probably accounts for the greater exploitation of harbour seal.

If harbour seal hunting coincided with the pupping season in mid-June (see Chapter 6) then the Period 4 fauna indicate an increase in economic activity at strategic seasonal intervals – salmon in late fall, herring in early spring, and harbour seal in late spring. An increase in the scale of site occupation in Period 4 could have increased the demands on seasonally abundant resources. If so, then the Period 4 faunal assemblage points to a peak in site settlement between 5000 and 4000 cal. B.P.

Although it was less important to the site economy it is worth noting that sea otter also exhibit a peak in Period 4, though the increase and subsequent decline is far less dramatic. It is likely that this trend is more a simple function of increased availability at a time of minimum sea levels and maximum exposure of rocky islets and reefs in the immediate site vicinity, though the increase over Period 3 remains unexplained.

The only other noteworthy trend in the mammalian faunal assemblage is the gradual but steady decline in the abundance of fur-bearing species. Although their combined numbers are never very large there is a clear trend in the combined percentage abundance of beaver, bear, small mustelid, and river otter (Period 2 - 5.5%, 3 - 4.2%, 4 - 2.2%, 5 - 2.3%, 6 - 2.2%). Over-exploitation could be held responsible for some of this decline, though an increase in later periods might be expected if there was a decrease in the scale of site settlement. The fact that the decline in fur-bearing mammals occurs over such a long time span suggests that a gradual reduction in cultural demand is more likely than a decrease in species availability. Why such a reduction should have occurred is difficult to explain, and the significance of this trend will depend on similar findings from other sites and regions of the Northwest Coast.

Summary

A few major shifts in economic emphasis account for the bulk of the changes in the Namu fauna-based economy. From a well-established settlement dependent on a marine-based economy as early as 7000 cal. B.P., the settlement and its economy expanded with the enhancement of salmon productivity, which occurred between ca. 6000 and 4000 cal. B.P. This economic expansion put increased emphasis on the use of shellfish, and later contributed to the intensified exploitation of seasonally abundant salmon, herring, and harbour seal. Following a sharp decline in salmon after 4000 cal. B.P. the settlement and scale of economic activity was much reduced. After 4000 cal. B.P. there was a reduction in large-scale communal activity such as salmon fishing and processing, and some decline in high risk, low return activities such as large mammal hunting. With the reduction in economic activity and inferred reduction in site settlement, more marginal but predictably abundant resources such as clams became an increasingly important part of the subsistence economy.

All the major changes in the Namu economy were centred around one or another of the abundant resources of the marine environment. Given the consistent marine orientation of the economy, it seems hardly worth considering the question of a marine versus terrestrial economic focus. However this question has long played a key role in discussions of Northwest Coast culture history, and therefore the relevance of the Namu evidence for this question is briefly reviewed below.

ECONOMIC ORIENTATION

Interpretations of faunal transitions evident at other Northwest Coast sites present a common pattern of a terrestrial economic focus gradually giving way to an increasingly well-developed maritime adaptation. The implication is that a full maritime focus was a relatively late development in the region's culture history. The Namu data clearly do not support this pattern of shifting economic focus. The Namu economy was fully maritime from at least the time that faunal data are available at around 7000 cal. B.P. Nevertheless, it is still worth presenting the Namu data as a contrast to economic transitions in other areas of the coast.

Sea Mammal Versus Land Mammal

In relation to their subsistence contribution, mammalian remains have received an unwarranted amount of attention in the published reports of Northwest Coast site excavations. Fishing and shellfish gathering were the mainstays of the Northwest Coast subsistence economy in the ethnographic present and throughout most if not all of prehistory. Hunting was at most a supplementary subsistence activity, at least from the time that intensive salmon fishing was fully established. Nonetheless, the relative proportions of land and sea mammal remains in the faunal assemblages from Northwest Coast sites provide a source of interest and debate concerning regional cultural traditions.

In a survey of published reports from Northwest Coast sites, Boucher (1976:116-123) notes a tendency for land mammals to predominate over sea mammals in early periods, with the proportion of sea mammal gradually increasing over time. In a more recent survey of faunal data from sites in the Queen Charlotte Strait region of British Columbia, Mitchell (1988) describes an early emphasis on land-mammal species such as deer and elk, which was followed by a period that saw greatly increased ratios of sea- to land-mammal remains. Mixed trends or consistent species utilization over time is indicated for other regions of the Northwest Coast, but from the Queen Charlotte Strait evidence Mitchell infers a major cultural shift in the form of an intrusion of peoples adapted toward greater exploitation of salmon and sea mammals.

Borden's (1975) earlier reconstruction of prehistoric cultural affinities and transitions was also based in part on temporal and spatial variations in the relative emphasis on sea and land-mammal hunting. Following Conover's (1972:283) report of the early presence and increasing abundance of sea-mammal remains at Namu, Borden (1975:28-32) proposed an early Northern Boreal culture type on the northern coast, which had developed the beginnings of a maritime adaptation. In contrast, Borden (1975:39,84-85) proposed that the south coast was inhabited by an early Protowestern culture type, which had a subsistence focus centred on land-mammal hunting, as at the Glenrose Cannery site (Matson 1976:297). Croes and Hackenberger (1988:54) also note a common pattern of economic change on the southern Northwest Coast, in which an early (pre-5000 b.p.) emphasis on land mammals such as deer and elk is followed by decreased use of land mammals and increased use of shellfish, fish, and sea mammals.

In contrast to Borden's cultural explanation for an early land-mammal based economy on the south coast, and greater emphasis on sea mammals on the north coast, Fladmark (1975:260-262) proposed an environmental explanation, which focussed on the availability of species resulting from lower sea levels in the south and higher sea levels in the north. In short, lower sea levels expanded land-mammal habitat in the south, while higher sea levels diminished similar habitat in the north.

The Namu data do not provide a clear picture of shifting emphasis from land to sea mammal or vice versa; they indicate a consistent though minor focus on deer throughout the site's occupation. At no time in the site's economic prehistory was there a significant emphasis on hunting deer. Given the availability of marine resources and the successful adaptation to their use, the minor focus on deer is not surprising. In contrast to the consistency of deer, the abundance of harbour seal changes dramatically. However, the changes in sea mammal abundance, as represented primarily by harbour seal, are very specific and related to local environmental and economic conditions; they do not represent any long-term cultural or economic transitions in the region.

It is possible that the methods used to quantify faunal class abundance (e.g. minimum number of individuals, number of identified specimens, meat weight, species variety, etc.) have contributed to the varied interpretations of coastal economic orientations. Based on the number of identified specimens and the percentage abundance of identified fauna, there are no trends in economic orientation at Namu that are comparable to those reported from sites on the south coast.

Particular problems in comparing the proportions of sea and land mammal also may arise because the categories are too broad for meaningful comparison; they encompass a variety of different species from various habitats, including species that were ultimately used for many different purposes. However, even when comparisons are restricted to major food resources such as deer and harbour seal it is misleading to contrast the emphasis on mammalian resources in isolation from the overall subsistence economy, which was primarily based on fishing and shellfish gathering.

Marine Versus Terrestrial Focus

The problem of determining the degree to which the Northwest Coast economy was focussed on marine or terrestrial resources is more general than the problem of sea-mammal versus land-mammal exploitation. At issue is whether the overwhelming marine orientation recorded ethnographically developed in relatively recent times or was fully established from an early point in time. Recent analysis of Northwest Coast burial populations (including individuals from Namu) (Chisholm et al. 1983) shows that as early as 5000 cal. B.P., as much as 100%

of dietary protein was derived from marine resources. These results are consistent with the Namu faunal remains, which also indicate an overwhelming subsistence emphasis on marine resources.

All species of fish, especially salmon and herring, are important from the earliest time periods. Sea mammals and marine birds are also important from this time. From around 6000 cal. B.P., the focus on salmon, herring, and shellfish is fully developed, and accounts for the overwhelming majority of the fauna-based diet. The only significant source of terrestrial protein at any time is deer, but for most periods the number of deer, though relatively high for any single class of mammal, is insignificant in comparison to the dietary contribution of marine resources.

The results of carbon isotope analysis of 13 adult Namu burials, dating to between 5100 and 3000 cal. B.P., showed that marine-based sources accounted for 93-100% of total dietary protein intake (Chisholm et al. 1983:397). The 100% figures were all from Periods 3 and 4 burials, which is not surprising in light of faunal trends. Period 3 saw the inception of large-scale shellfish gathering and intensive salmon fishing. Period 4 saw the marine focus enhanced through increased use of salmon, herring, and harbour seal. Although deer was hunted in significant quantity throughout the site occupation, its potential dietary contribution was completely overshadowed by the contribution of the marine-based fauna. The Period 5 decline in salmon may account for the slightly lower percentages of marine-based dietary protein recorded for the later Namu burials.

Although species composition changed through time, the orientation of the Namu diet was always directed toward marine resources. Terrestrial sources of protein, principally deer, may have been slightly more important prior to 6000 cal. B.P., but from the time that the characteristic Northwest Coast subsistence economy based on salmon and shellfish was established terrestrial sources made little appreciable contribution to the diet. A well-established cultural orientation and adaptation to using the resources of the sea is evident from the beginning of the faunal record at 7000 cal. B.P.

CONCLUSIONS

Although Namu may have been occupied as early as 11,000 cal. B.P. (see R. Carlson: Appendix B), faunal data are only available for the period beginning about 7000 cal. B.P. These data show the full development of a marine-based economy, which possessed the technology and expertise necessary to exploit the widest range of marine and terrestrial resources. The earliest marine resources included the range of sea mammals (off- and near-shore), all varieties of fish (from a range of habitats), large numbers of salmon and herring, and limited quantities of shellfish. Despite exploitation of this full range of available resources, Period 2 can still be characterized as part of an initial phase in the development of the marine economy. There was less emphasis on the environmentally-restricted salmon resource and very little use of shellfish. Shellfish only became important once predictable supplies of salmon allowed for larger and possibly more permanent population aggregates at the site. The Period 2 occupation was probably below the peak intensity of later periods.

Periods 3 and 4 (6000-4000 cal. B.P.) exhibit the peak in economic activity, when salmon, herring, and shellfish became the dominant resources. The timing and the nature of this economic transition are in perfect agreement with Fladmark's (1975) suggestion of a palaeoenvironmental basis for changes in the Northwest Coast subsistence economy. Sea-level stabilization enhanced the productivity of salmon and allowed an increase in settlement size, and larger settlements made it necessary to meet shortfalls in salmon supplies through the increased exploitation of shellfish and other predictable and readily available marine resources.

The increased use of salmon and shellfish by around 6500 cal. B.P. also characterized economic transitions on the South Coast of British Columbia, as exhibited in the Fraser Delta in the transition between the Old Cordilleran and St. Mungo phases at the Glenrose Cannery site (Matson 1976:19,96). In contrast, Mitchell (1988) describes a much later (ca. 2500-1700 b.p.) transition to intensive salmon fishing in the Queen Charlotte Strait region of the southern Central Coast, which he ascribes to cultural intrusion. If his analysis and interpretation of these faunal shifts is correct, then it represents an interesting contrast to the apparent cultural and economic stability exhibited at Namu, which is only 150 km. to the north. It would imply that a significant cultural contrast had been maintained over this relatively short distance for a period of 3000 years. This scenario is not improbable, but more site data are needed, and alternative explanations focussing on site-specific environmental changes also should be explored. For example, at Mitchell's Hopetown and Echo Bay sites the lesser early-period abundance of salmon is matched by much greater abundance of ratfish. In later periods when salmon is more abundant ratfish is virtually absent. The Period 5 increase in ratfish at Namu is associated with the precipitous decline in salmon, which together with changes in shellfish composition indicates increasing sedimentation of the Namu River estuary. It is at least possible that there was significant environmental change in the vicinity of the Queen Charlotte Strait sites that reduced the sedimentation of the local environment and enhanced the productivity of salmon. Mitchell's cultural explanation would require the inhabitants of his sites to ignore salmon in favour of ratfish; this is certainly possible, but probably unlikely.

The economic trends at Namu are clearly defined. From an early well-established maritime orientation in Period 2 there is an increase to peak economic activity, which corresponds with the Periods 3 and 4 increase in salmon. Periods 5 and 6 represent a significant decline in economic activity. Salmon undergo precipitous decline due to increasing sedimentation of the river estuary, and minor fish and shellfish resources were more heavily utilized. Reduction in the degree of shell fragmentation, and a number of other indicators point to less intense and possibly more intermittent occupation of the site at this time.

Namu's economic prehistory can be characterized as a continuous process of economic transition involving progressively greater emphasis on smaller-scale, more localized, abundant, and predictable resources, such as salmon, herring, and finally shellfish. This overall pattern is typical of observed and modelled trends in resource utilization on the Northwest Coast and in coastal environments in other parts of the world; these trends have been attributed to one or a combination of: changes in environmental availability (e.g. Fladmark 1975; Pfeiffer 1978:197-199); population growth and resource depletion (e.g. Croes and Hackenberger 1988; Keeley 1988:393); and cultural innovation (e.g. Hayden 1981) and tradition (e.g. Mitchell 1988). The implications of the Namu faunal data for understanding these wider issues in economic prehistory are discussed more fully in Chapter 7.

Apart from the characterization of general economic and environmental transitions, interpretations of the faunal data also must acknowledge the specific pattern of the Namu economy, which was clearly a function of local micro-environmental circumstances and resource availability. The most significant changes in the local environment were those that affected the productivity of the salmon fishery. Most other major economic trends were affected directly or indirectly by the availability of salmon, and any interpretation of the site's economic prehistory must stress the character of the salmon resource and its utilization. To further characterize the nature of the Namu salmon fishery the following chapter presents a detailed analysis of the recovered salmon remains.