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THE NORTHWEST COAST: Complex Hunter-Gatherers, Ecology, and Social Evolution

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INTRODUCTION

Northwest Coast cultures have long held a central place in anthropology. Recently, the coast has become important in two major topics of theoretical interest: 1. the existence and socioeconomic evolution of complex hunter-gatherers (74) and 2. the origins and evolution of permanent forms of social inequality (3). The coast's culture history also has intrinsic value to its native and non-native peoples. This review focuses on recent developments in the coast's archaeology relevant to theories and questions about its culture history and the evolution of social complexity among hunter-gatherers.

THE NORTHWEST COAST

The Northwest Coast extends some 2000 linear km from Icy Bay, Alaska, to Cape Mendocino, California. It is divisible into three subareas: the northern coast (the northern British Columbia mainland, the Queen Charlotte Islands, and southeast Alaska), the central coast (most of Vancouver Island and the adjacent mainland), and the southern coast (southern British Columbia mainland, southern Vancouver Island, western Washington and Oregon, and the northern California coast). Archaeological coverage of the coast is spatially

and temporally spotty. The Gulf of Georgia on the southern coast is the best known archaeological region (see 116). Some portions of the coast remain archaeologically unknown. The earliest sites tend to date ca 9000–10,000 B.P., but few excavated sites pre-date 5000 B.P. (dates in this paper are based on uncorrected ¹⁴C dates). Almost all excavated sites post-dating 5000 B.P. are highly visible shell middens.

SOCIAL COMPLEXITY ON THE NORTHWEST COAST

Ethnographically described Northwest Coast societies varied among themselves, but shared basic traits: the extended household was the long-term unit of production and consumption; crucial resource localities were owned, but variation existed in what social entity owned them; and households were partially to fully sedentary, reliant on winter stores, and resided together in villages and towns ranging from only a few score to over a thousand people. Household members were ranked by ascribed statuses; the highest ranking household members formed an elite dependent on slave labor (49, 92). Subsistence emphasized a wide range of pelagic/littoral/riverine/terrestrial resources, but focused on salmon. Specialists were economically important and the sexual division of labor was relatively strong (but see 99). Seasonal mobility patterns could be complex, requiring water-borne cartage. Key issues in the evolution of these societies include the importance and strength of variance in the coast's environment; the role of salmon, including salmon ecology and intensification of salmon fishing, in social and economic evolution on the coast; the mode of production; and the tempo and mode of cultural evolution.

Suttles (114) was the first to examine the importance of variability in the coast's environment. His major insight was that although the coast is a rich environment for humans, it is also a variable one. He criticized earlier workers for emphasizing the coast's average production, ignoring its variance. Recent workers, rejecting functionalist or adaptationist models, sometimes miss this point, basing models on mean environmental conditions or simply ignoring the issue. Temporal and spatial variations in salmon runs are a major source of the variance stressed by Suttles.

Salmon are anadromous, spawn in fresh water, achieve maturity in saltwater, and return to their natal streams to spawn and die. Salmon have advantages for foragers (72, 111); they occur at predictable times, in predictable places, and in once prodigious numbers. But they also have disadvantages. For storage, they must be processed promptly (105). Runs are sensitive to environmental insults (72, 111), particularly on small streams and upper tributaries. Runs on large rivers, such as the Columbia and Fraser, are buffered by the sheer volume of fish in them. Salmon runs, rich in the aggregate, are highly variable species to species, stream to stream, and year to year. They are subject

to patterned variation (72), with large runs only every second, third, or fourth years. Absolute fish abundance may be less important for labor organization and settlement patterns than is the temporal clumping of runs (104). In a good year on the Klukshu River in the Southwest Yukon, for example, half the sockeye salmon run passes in 7.5 days; in a bad year (in terms of clumping, not numbers) half go by in only 2.5 days (104). Such variation in clumping is not predictable.

Several issues surround the intensification of salmon harvesting (measured as increased production per capita): 1. What resources in what quantities and variety were required to sustain historic Northwest Coast societies? 2. Virtually all workers accept the crucial role of salmon intensification in socioeconomic evolution on the coast. But differences exist over whether salmon intensification alone was sufficient to produce major socioeconomic changes, or whether it should be understood as part of a diverse set of subsistence strategies initiated to achieve higher levels of food production. 3. When did the coast's historic storage-based economy evolve? 4. Salmon occupy a central position in Northwest Coast ritual, world view, and cultural identity. Documenting the history of salmon's non-subsistence roles is a major cultural-historical problem. The focus on salmon production has tended to inhibit consideration of other elements of the mode of production in the coast's social and economic history.

Large households were the elemental units in production during the early nineteenth century (95). These households featured complex divisions of labor along lines of gender, age, free/slave, specialist/non-specialist, and elite/non-elite. Such households were parts of a mode of production requiring multiple simultaneous tasks and management of spatially clustered, temporally varying, and clumped resources (120). These households were integrated into larger social and economic spheres (e.g. villages, regions) through exchange and kin ties. Archaeologists interested in Northwest Coast production typically stress linkages between household production of salmon and elite formation, usually without exploring other aspects of household production. The relationships among households, production, regional interaction, and elite formation are more complex than previously thought.

The final issue raised above stems from disagreement among archaeologists over the mode and tempo of cultural evolution on the coast. Some are inclined to see all aspects of ethnographic culture as developing together at the same time, while others see cultural evolution on the coast as a mosaic, in which different aspects of the ethnographic pattern developed at different times and at different rates. This is essentially a disagreement over whether the ethnographic pattern appeared fully developed and integrated at a certain time, and then persisted, unchanged over long periods (31), or whether that pattern is the

result of either cumulative gradual changes, or swift, saltative changes (or both) during a long and complex history (6).

Fladmark (54) proposed the first recent model of the evolution of complexity on the coast. In his model, social complexity resulted from the exploitation of regular, large salmon runs when they developed. The key questions were when and why intensification occurred. He argued that it happened ca 5000 B.P., when post-glacial sea levels and river drainages achieved their modern positions, permitting the growth of salmon runs. People inevitably began taking advantage of the rich, predictable resource. Increased salmon production led to semi- to full-sedentism, evidenced by the appearance at ca 5000 B.P. of large shell middens along the coast. Aspects of Fladmark's model, most importantly the proposed temporal relationship between sea-level stabilization and the appearance of large middens, was later refuted (e.g. 8). But his work, coupled with Suttles' earlier papers, sparked the current interest in social evolution on the coast.

A second model, by Burley (21), saw specialized salmon production developing along the region's major salmon streams, where the fish are more accessible than in coastal waters. In British Columbia this would have happened first in the Fraser River canyon before spreading downstream to the coast. Burley dates the arrival of specialized salmon production at the mouth of the Fraser to ca 2400 B.P. But this model is too limited geographically to account for social complexity along the entire coast.

Schalk (111) focuses on the spatial and temporal variations in salmon productivity, arguing that salmon intensification was not an automatic result of salmon abundance. Intensification occurred as a result of human population growth and greater reliance on storage. There were population size thresholds below which salmon intensification would not occur. Expanding storage resulted from innovations in storage technology. Elite leadership roles evolved from the needs of households to coordinate complex subsistence tasks. Groups intensifying fish production experienced increasing scheduling conflicts, requiring increased coordination. Schalk argues that storage, as delayed consumption, was the systemic cause of Northwest Coast complexity (112). Fladmark saw the cause as regular large bursts of energy, whereas Schalk sees it as the delayed consumption of those bursts.

For Ames (3), inequality resulted from the interplay among 1. circumscription caused by the temporal and spatial distribution of resources, resource ownership, and sedentism; 2. a specialization in salmon fishing (amending that now to a focus on salmon fishing and an array of other aquatic and terrestrial resources) requiring specialized tackle, knowledge, and coordination of complex tasks; 3. population growth; 4. sedentism; and 5. ritual promotion (a process by which certain individuals or families in a group gain control over ritual or central social symbols, and manipulate these to turn themselves into

an elite). In the original model, societies with elites had a competitive edge because of their greater efficiencies in information processing capabilities, relative to non-hierarchical societies. These advantages existed in variable environments where, because of circumscription, groups were unable to move or fission as a response to environmental problems (3). The initial steps toward permanent leadership were consequences of organizational stresses (4) caused by a complex domestic economy, logistical mobility patterns, and circumscription. The evolution of the Northwest Coast subsistence and political economies was rooted in the evolution of the Northwest Coast's version of a domestic mode of production (DMP) (4). Besides household subsistence (9, 10), the Northwest Coast DMP involved household participation in exchange networks of varying scale, including some quite large interaction spheres (5). The evolution of an elite on the Northwest Coast, then, must be seen in two contexts: the DMP and regional interaction and exchange.

Kelly (71) stresses the interplay among sedentism, storage, and particular environmental stresses. Sedentism or storage are insufficient by themselves to account for inequality. Critical dimensions in his model are the amplitude of resource fluctuations and the degree of spatial heterogeneity of those fluctuations. If resource fluctuations are strong and heterogenous, storage alone will not dampen their effects, and groups will need access to other groups' resources, while restricting access to their own. Kelly suggests that as a result of restricting such access, access in both directions will be funneled through a few individuals who control the "social activities of individuals in his or her group" (71:145). It is from this circumstance that inequality evolves.

Matson's model emphasizes resource productivity and predictability (84–87). Although intensification of salmon production was the ultimate cause of status differentiation on the coast, the proximate cause was ownership and control of resource patches. Among Northwest Coast cultures, social entities owned the rights to exploit resource patches. Variation existed among them as to what social entity owned these rights (ranging from individuals to villages) and the way patches were owned (106). In some instances, the entire patch was owned, including the ground and all the organisms therein; in other cases, only a certain resource in the patch was owned, and everything else was free for harvesting (106). Matson reasons that intensification, sedentism, and ownership of resource patches evolved among hunter-gatherers when the resources were sufficiently abundant, reliable, predictable, and limited geographically and temporally. Groups came to depend on resources with these qualities, increasing production levels if possible, and settling near such resources, becoming sedentary, and trying to control the resources. Because resource patches inevitably varied in relative productivity, groups owning them eventually differed in relative wealth, leading to ranking. This argument rests upon Donald & Mitchell's demonstration that relative group rank and size among

the Northern Kwakiutl is predicted by the productivity of the group's salmon stream (50). Matson holds that intensification, inequality, and sedentism each flow as inevitable consequences of the structure of the resource base, but only intensification and status differentials are causally linked. Sedentism is not a cause of inequality. Intensification results from resource abundance as people become increasingly knowledgeable about their environment and develop means to more efficiently exploit it.

Suttles, Ames, Schalk, and Kelly stress that the Northwest Coast's environment was rich but subject to important variation and that Northwest Coast social forms were in part responses to these twin circumstances. Matson's view is that Northwest Coast societies would only develop in an environment that was reliably rich and predictable. O'Leary's work undercuts aspects of both perspectives. She shows that abundant salmon coupled with storage led neither to specialized use of salmon nor to storage-based sedentism (104).

Coupland (37, 39–41) adopts Matson's premise in a Marxist form, contending that Northwest Coast elites developed when individuals or families gained control over crucial resource patches directly through violence. For Matson, differences in social rank were the inevitable result of differences in the resource base. But for Coupland, rank itself arose from individuals' efforts to control that base. Coupland also stresses the need to understand the evolution of social hierarchies on the coast within the context of the household as the basic unit of production, but emphasizing salmon production, rather than the overall DMP (39).

Maschner (81, 82) rejects adaptationist models, particularly those resting on population pressure, arguing for an approach based on evolutionary psychology and methodological individualism. Elites were neither a response to nor a consequence of qualities of the resource base, but rather the consequence of individuals striving for prestige (and ultimately reproductive advantage) in a rich environment. His arguments are similar to those advanced recently by Hayden (61), but Maschner places heavier explanatory emphases on warfare.

In contrast to the foregoing, Croes & Hackenberger (44, 45) tackle these issues with a simulation model of subsistence changes at the Hoko River locality on the northern Olympic Peninsula. For them, population growth is the prime mover of social evolution and their model uses Malthusian population assumptions. The simulation was developed to predict the optimum resource mix for the locality's subsistence economy. Some of their results are provocative and discussed where appropriate below. The simulation's predictions are difficult to test elsewhere on the coast because its empirical base is closely tied to the Hoko locality, and the simulation is so complex that it is difficult to know why predictions are met or not met. The authors adopt Matson's approach to the development of social inequality.

Carlson is developing a complex model for the development of Northwest Coast culture, of which social inequality is only one part (28–31). Carlson sees salmon intensification as the major causal factor in the evolution of Northwest Coast culture, but he emphasizes ritual and Northwest Coast art (52) and their origins in shamanism, a view shared by MacDonald (78). Carlson is the primary proponent of the view that the major traits of ethnographic Northwest Coast culture developed as a single, integrated complex and then persisted with little change.

DEMOGRAPHY

Boyd (19) reconstructs late eighteenth and early nineteenth century population levels for Northwest North America and the region's disease history from contact to the end of the nineteenth century. His study is now the base line for all work on Northwest Coast demography. He conservatively estimates the coast's immediate pre-contact population at 188,000, based on a estimated 33% loss from what he considers the region's first smallpox epidemic at ca 1775. Cybulski reviews the coast's ancient demography, drawing on the region's extensive sample of excavated human skeletons spanning the last 5000 years (47).

There are only three limited studies of Northwest Coast population trends spanning a significant portion of the entire prehistoric period. Fladmark built a curve for the entire coast using radiocarbon dates. Ames (6) and Maschner (81) present similar ^{14}C date-based curves for the southern and northern Northwest Coasts, respectively, based on much larger samples than Fladmark's. These latter curves suggest somewhat differing patterns of population growth for the two regions and that peak populations may have occurred several hundred years before contact (ca 900 B.P.). Croes & Hackenberger (45) predict that population growth in the region entered a log phase between 4000 and 3000 B.P., a prediction paralleled by Ames' southern coast curve. Archaeologists have estimated general patterns of population growth from increasing rates of shell midden accumulation (79) and site numbers. As will be seen below, many crucial socioeconomic developments on the coast occurred during times of apparent population growth and/or high densities.

SUBSISTENCE AND SEDENTISM

Aquatic vs Terrestrial Resources

Researchers often stress the importance of aquatic resources in the evolution of complex hunter-gatherers (e.g. 15, 63). On the Northwest Coast, the relative importance through time of terrestrial and maritime resources is an old re-

search question (e.g. 17, 76). The evidence for the period between 10,000 and 5500 B.P. indicates broad spectrum foraging with hunting, fishing, and gathering by the end of that period. This assessment must be based on a small sample of sites: Five Mile Rapids (42), Glenrose Cannery (83), Chuck Lake (2), Namu (26), and Bear Cove (27). These sites show that large and medium land mammals, marine mammals (seals and sea lions), and an array of fish, including salmon, smelt, sturgeon, and large minnows were taken. Mollusks and probably plant foods also were collected.

Analyses of human bone chemistry of a male skeleton dating 8200 B.P. from interior British Columbia (48) indicates 9% to 18% of his diet was from marine resources, presumably salmon given the site's upstream position in the Fraser River drainage (33). Similar analyses (34, 35) of a small sample of skeletons recovered from burials along the British Columbia coast spanning the last 5000 years concluded that marine resources contributed as much 90% of the diet during that period.

Salmon Intensification

Research on intensification on the coast emphasizes the timing of increases in salmon production and the development of a storage-based economy. There is no consensus as to when these occurred. This uncertainty results from several factors: the small sample of sites pre-dating 5000 B.P.; differing assumptions about the causal connections among salmon production, storage, sedentism, and evolving social hierarchies; and a lack of consensus as to what constitutes direct evidence for salmon intensification and storage. Some researchers have concluded on good evidence that heavy reliance on salmon coupled with storage began along the coast ca 3500–3000 B.P. These data are summarized in a series of recent papers (40, 87, 99a).

A few sites on or near the coast show evidence of local heavy use of salmon much earlier than 3500 B.P. Two of these are Namu on the central Northwest Coast and Five Mile Rapids on the Columbia River in Oregon. Salmon dominate archaeofaunas from Namu dating 4000–5000 B.P., leading Carlson (29) and Cannon (26) to argue that coast-wide reliance on salmon dates from that time, if not earlier. Deposits at Five Mile Rapids at the upstream end of the Columbia River Gorge dating ca 7600–9800 B.P., produced 150,000–200,000 salmon vertebrae (42), convincing Cressman that the ethnographic salmon focus existed by that early date. Recent work (23, 24) tested the possibility that the presence of these bones was the result of natural formation processes but showed that the fish were deposited through human agency. Other sites predating 3500 B.P. contain salmon bones and, occasionally, fishing gear. These and other data (52) do not seem to indicate a coast-wide intensification of salmon before 3500 B.P. They do show that subsistence intensification proceeded at

different tempos in different places and that the resources intensified were determined by local ecology rather than by regional levels of productivity.

Whenever it began, salmon intensification did not end at 3500 B.P. Several subsequent technological changes (55, 72, 91) and innovations (51) indicate continuing efforts to raise productivity. A significant aspect of intensification was probably expansion of the number of habitats from which fish could be taken (72). There is also evidence of resource depletion (45).

Storage

Although it is widely accepted that storage played an important role in the evolution of complexity, the nature of that role is controversial. The relative shelf life of stores (105) is as important in these dynamics as is the simple act of putting up stores. Several lines of evidence suggest the appearance of a storage-based economy by ca 3500–3000 B.P. (much of this evidence also suggests salmon intensification): 1. Rectangular surface dwellings and villages appeared by 3000 B.P. These dwellings were the major food processing and storage facilities during the last millennium (9, 10, 12, 67, 69, 114, 118), and their presence suggests the potential for that role at 3000 B.P. The houses and villages indicate some degree of sedentism, which is quite implausible without storage on the coast (38, 111). 2. The use of wooden boxes as coffins indicates that the technology and skill needed to make storage boxes was present by 3500 B.P. (46). 3. Evidence for expanded use of mass-harvesting techniques, including nets and weirs, points to larger harvests and, indirectly, to increased demand for and capacity to process more fish for storage (100). 4. Large numbers of smelt and salmon remains have been recovered as far away as 100 km from where they were caught. Transportation of such large volumes of fish and the likely presence of freight canoes both imply processing and storage (8). 5. Tools have been found that may have been part of gear for processing fish for storage (91). 6. Head element/vertebrae ratios are currently viewed as the definitive indicator of salmon storage on the coast. It is reasoned, based on ethnographic data (25), that where salmon are stored, cranial skeletal elements will be rare or absent relative to post-cranial elements. However, this ratio has taphonomic problems, because salmon head bones have lower structural densities than do vertebrae. If both cranial and vertebral elements undergo similar destructive processes, cranial elements will be rarer than would be predicted based only on their relative frequency in the fish's skeleton (24).

The development of a storage-based economy may have required innovations in technology or technique (87, 111), but the basic simplicity of the key storage techniques (air drying [via sun and wind], smoking, and freezing) impose no special technological barriers to storage having great antiquity (15). The Northwest Coast's recent climate, which has persisted perhaps 5000–6000 years, makes sun and air drying chancy. The major technological innovation

required for large-scale and long-term food storage would have been large smoke houses. Arguments for storage before 4000 B.P. rest ultimately on the presence of large numbers of salmon remains in a few particular sites (29), or evidence for the capacity to harvest large numbers of fish (52).

Secondary Resources

Some workers feel that the anthropological focus on salmon obscures the importance of other resources. This issue results in part from increasingly sophisticated analyses of vertebrate and invertebrate archaeofaunas with results that do not fit expectations based on salmon as the single most important resource on the coast (e.g. 57, 59, 60, 97, 105, 107). In some cases, salmon are rather minor members of the assemblages (e.g. 60). These studies also show considerable inter-locality variation in subsistence. Ethnographically a variety of organisms were exploited, some certainly for purposes other than food, but the diet was diverse. Secondary resources were necessary for nutritional and physiological reasons (e.g. 105). Dietary sources of oil, fats, and carbohydrates were particularly prized. In an ingenious argument, Monks (96) attempts to show that some Northwest Coast hunting/fishing practices were designed to exploit as wide an array of resources as possible from a single, well-placed facility. Establishment of the relative dietary roles for these resources and the techniques used for getting them raises some important methodological issues that have yet to be resolved, including recovery techniques and quantification methods (e.g. 64, 75, 76, 119).

The most obvious evidence for subsistence intensification anywhere along the coast is the widespread appearance of large numbers of shell middens at ca 5500–4500 B.P. Much earlier shell deposits exist (2) but are thin and discontinuous, in marked contrast to the sometimes massive later middens. Croes & Hackenberger's simulation suggests that shellfish along with elk and deer, rather than salmon, limited human populations on the Straits of Juan de Fuca (45).

Sedentism and Mobility Patterns

Sedentism is widely seen as a significant factor in the development of social complexity among hunter-gatherers; however, alone it cannot explain that development. In fact, sedentism, as well as mobility and settlement patterns, have received little separate attention on the coast. The appearance of large shell middens is usually thought to signal the beginnings of semi- to full sedentism on the coast. Although seasonality studies have also been used (e.g. 107), direct or indirect evidence of substantial houses (similar to the nineteenth century houses [115] on the coast) and villages is the best primary evidence for some degree of sedentism. Substantial rectangular surface houses appear around 3000 B.P., although these are not the earliest structures on or near the

coast. There is at least one pit-dwelling above the mouth of the Fraser River that dates to ca 4000 B.P. (73). It has long been supposed that pit houses preceded plank houses on the coast. Pit houses appear east of the Cascades by 5500–5000 B.P., becoming common after 3500 B.P. (7). In the absence of contrary evidence, it is reasonable to conclude that shell middens on the coast were associated with residence in pit houses. The associated (and preceding) mobility patterns are unknown. Pit houses by themselves are poor predictors of mobility patterns (7).

The oldest firmly dated village on the coast, the Paul Mason site near the northern coast, contains depressions of twelve small, rectangular houses, ten of which are in two rows (37). It dates to ca 3200–2800 B.P. (37). The Boardwalk site, on the northern British Columbia coast, is a two-row village that may be contemporary with Paul Mason (8). The Palmrose site in Seaside, Oregon, has a large rectangular house as old as 2600 B.P. (36). Given the presence of these dwellings at both ends of the coast, they probably were also present along the intervening coast. The apparent absence of such dwellings in between probably reflects methodological problems. Dwellings are hard to recognize in shell middens (e.g. 16); most of those excavated are either on shell midden surfaces, or are not associated with middens at all. Historic Northwest Coast houses were large, and excavations were not always of sufficient scope to find or identify them (76). Many excavations have not been designed to find houses. The appearance of rectangular structures may indicate the formation of closed corporate groups (62), but it may also point to the evolution of an economy heavily reliant on extensive food processing and storage. By all evidence, houses were the primary food processing and storage facilities in Northwest Coast material culture (9, 12, 32, 69, 109, 114, 118).

The appearance of villages is accompanied by evidence for logistical mobility patterns, at least in the Gulf of Georgia and Prince Rupert Harbor on the northern coast. Gulf of Georgia settlement patterns grew increasingly complex through time, particularly after 1500 B.P. (117). In Prince Rupert Harbor there is evidence for increased use of inshore and offshore islands near rich, shallow saltwater habitats and for long-distance bulk transport of resources, suggesting movements requiring large canoes (8). There also appear to have been major shifts in regional settlement patterns, including episodes when some regions were abandoned or the residents displaced by others (93, 122).

SOCIAL, ECONOMIC, AND POLITICAL ORGANIZATION

Household Archaeology

The study of households provides perhaps the best entry point into questions about power (80), specialization (32), control of production (10), gender (103),

and trade (68) on the coast. A growing sample of excavated plank houses spanning the last 3000 years on the southern coast (e.g. 12, 32, 37, 53) includes the famous Ozette houses, which date to the early eighteenth century (see 110). Despite the methodological difficulties sketched above, these excavations show that it is possible to archaeologically investigate aspects of Northwest Coast households, including their modes of production and how those modes evolved.

Production

Matson argues that ownership of scattered resource patches by households was the crucial socioeconomic development in the evolution of stratification (84, 85). Work at Ozette and other excavated houses (32) shows that such ownership patterns can be demonstrated empirically for the period immediately before contact. Different Ozette households exploited different resource patches and the higher status house had access to more culturally preferred foods (69, 118). Matson argues that the practice of resource ownership was a result of exploiting predictable, clustered resources. Research elsewhere on peasant agriculturalists suggests (a) that owning several, scattered patches is a predictable outcome of strategies to minimize the risk of crop failure in a variable environment (121) and (b) that ownership of such plots does not inevitably lead to elite formation (102). The latter work also shows that a complex division of labor does not necessarily require leadership for coordination, undermining Ames' and Schalks' arguments that elites developed from the need to manage the Northwest Coast's complex subsistence economy. Indeed, Ames' own recent work suggests that management may have been more apparent than real (10).

There is evidence for elite control of some elements of production on the southern coast immediately before European contact (12, 69, 109). Dwellings were the objects of considerable labor and resources (89) and control of the house as an instrument of production may have been a crucial base for the authority of the coast's elite (9, 10, 114). There is also evidence for complex production patterns before ca 1000 B.P., including the existence of intrahouse specialists in food procurement by ca 1600 B.P. (32). The presence of well-made copper artifacts in burials along the coast (9, 22) indicates that specialized production of copper prestige goods occurred by ca 2500 B.P. Some specialization in carving and woodworking could be considerably earlier (31). There may have been village-level specialization in the production of prestige and wealth goods (2a), and regional specialization in the production of red cedar and whale bone products (68). Interestingly, although North America's major dentalium sources lie off Vancouver Island's west coast, there is no evidence for its production.

Gender (98) and the division of labor have played little role in discussions of the evolution of production on the coast. Recent work, including Norton's (103) and Moss' (98, 99) studies, clearly show that such inquiry is necessary. Their research demonstrates the significant roles played by women in economic production both at the household and regional level. In addition, as the archaeological evidence summarized below indicates, gender was one of the major dimensions structuring the evolution of Northwest Coast systems of status, including both elite status and slavery.

Rank, Stratification, and Social Organization

Our knowledge of the development of stratification comes from analyses of burials, including burial patterns, grave goods, labrets (lip plugs), and patterns of cranial deformation. People were buried in shell midden sites between ca 5000 and 1500 B.P., after which inhumations virtually ceased. Only a minority of all deceased individuals were buried in these places; mortuary treatment for the majority of the population during that lengthy period is unknown (47). Stone labrets leave facets on the wearer's teeth (46), which indicate a labret-wearer even in the absence of the labret, although postmortem tooth loss can obscure these patterns (46). In the nineteenth century, free women on the northern coast wore labrets (70). Labret wear occurs on the teeth of very few individuals dating between ca 5000 and 3500 B.P. It is more common between 3500 and 2500 B.P. On the south coast, cranial deformation appears to have replaced labrets as a visual, permanent status marker (5) after 2500 B.P., although the practice persisted on the northern coast until the nineteenth century. The reasons for that change are unknown. The social significance of labrets in early periods is an important problem. Matson speculates that the presence of both labret wear and a labret in a burial indicates achieved high status, and the presence of labret wear without a labret indicates ascribed status (in this case, the labret is an heirloom) (86). Moss critiques the idea that labret wear alone equals high status, showing that all free north coast women wore labrets (99). High status women wore large labrets.

Mortuary patterns of at least two of the earliest burial populations on the coast (Pender Island in the south and Blue Jackets Creek in the north) were complex, including both prone and seated individuals, red ochre and grave goods. The grave goods at Blue Jackets Creek appear to be utilitarian items (113), but those at Pender Island include ten antler spoons with zoomorphic effigy handles (31). Richly furnished graves (with costly or exotic grave goods other than labrets) occurred before 2500 B.P., but they became common along the entire coast after that date (22). To some (22), including me, the coast-wide advent of elaborate burials at 2500 B.P. signals the appearance of an elite. Others place that development at ca 3500 or earlier, based on the presence of labrets or labret wear (see 99) and complex burial rituals (31).

Gender and region-of-origin play crucial roles in structuring these patterns. On the northern coast between 3500 and 1500 B.P., labret wear is restricted primarily to males, but in contemporary samples in the Gulf of Georgia both labret wear and cranial deformation are more evenly distributed among males and females. After 1500 in the north, labret wear occurs only on females. Gender also plays subtle roles in the distribution of grave goods in the northern burials between 3500 and 1500 B.P. (8). Contrasting regional patterns of cranial deformation and labret wear would clearly mark the region-of-origin of high status individuals after 2500 B.P. (5). Cybulski speculates that the balanced sex ratios in the south for both labret wear and cranial deformation reflect bilateral kinship organization, while the shifting sex ratios in the north point to a change from a patrilineal to a matrilineal system (47).

The distinctive status of labret-wearer predates both the subsistence and settlement changes at 3500–3000 B.P. and the widespread appearance of rich burials. This suggests a complex and theoretically important interplay among a preexisting special status, household and cooperate group formation, intensification, storage and sedentism—more complex, I believe, than current models accommodate. There is tantalizing evidence for that interplay. Acheson (1), Coupland (41), and Maschner (81, 82) independently conclude from limited evidence that large high status households and large multi-kin group villages only formed on the northern coast after 1500 B.P., at the same time as the shift in labret wear patterns in the north.

Establishing the development of slavery on the coast is exceedingly difficult. Buried remains show that individuals (usually female) were sometimes bound and decapitated in the north (see 8, 46) and scalped in the south (13), perhaps indicating slave raiding between ca 3500 and 2200 B.P. (46). Cybulski (46) suggests that the biased sex ratio among the Prince Rupert Harbor burial population (1.89 males:1 female) indicates slavery. Historically, slaves were seldom buried, and hence would rarely be recovered. If a significant portion of a population were female slaves, then such a biased ratio would result. However, any relationship between biased sex ratios and slavery needs further exploration. Similarly biased sex ratios occur in such diverse burial samples as Yangshao China (58) and the Natufian (14). Sex ratios in burial populations on the south Northwest coast approach 1:1, which would mean, in Cybulski's logic, that slavery did not exist there prehistorically. The Tsawwassen data cited above (13) suggests otherwise.

Some researchers have uncovered evidence of potlatching and associated feasting. Huelsbeck (69) infers feasting by high status individuals from the spatial distribution of food remains in the late prehistoric Ozette houses. Carlson (31) speculates that the funerary ritual at Pender Island before 3500 B.C. included feasting and potlatching. Cybulski (46) wonders whether plant and animal remains associated with later burials (ca 1600–1000 B.P.) at Green-

ville may also be the results of funerary feasting, and by implication, potlatching. Generally, however, workers on the coast are reluctant to speculate on the history of the potlatch.

REGIONAL DYNAMICS: INTERACTION, TRADE, AND WARFARE

Although there is little doubt of strong regional interaction through time (5, 115), available archaeological evidence is limited. The spatial patterning of a number of traits (labret wear, cranial deformation, art styles) indicates that the Northwest Coast had one or more large overlapping interaction spheres (5, 115) during the last several millennia (5, 77). Obsidian sourcing indicates relatively far flung trade networks extending well back into prehistory (28a). The copper present in graves by 2500 B.P. suggests long-distance movement of the metal by that time (8, 22). The distributions of particular art motifs also suggests long-distance contact along the coast between 4000 and 3300 B.P. (5, 66). Some researchers are beginning to investigate the history of ethnicity on the coast using material culture (43, 94).

There is evidence for continual warfare on the coast during the past 5000 years. Evidence of violence-caused trauma is found on adult skeletons from the period between 5000 B.P. and contact, peaking in frequency after 1500 B.P. (47). Such trauma is more common in the north, at least for the period between 3500 and 1500 B.P. In Prince Rupert Harbor these skeletons were buried with trophy skulls and weapons. Other evidence for increased levels of warfare after 1500 B.P. includes the construction of fortifications throughout southeast Alaska (100) and perhaps in the Gulf of Georgia as well (55). This trend is contemporary with possible evidence for peak population densities and changes in organization. Maschner (82) suggests that the post-1500 B.P. increase in warfare resulted at least partially from the diffusion of the bow and arrow into the region. Given the wealth of warfare accounts in the north coast's oral traditions, this period of warfare probably extended into the nineteenth century (8, 122).

ART AND RITUAL

Archaeological studies of Northwest Coast art have focused on dating the emergence and evolution of the nineteenth century style (e.g. 30). Ironically, given the modern emphasis on the style's northern variant (e.g. 65), the richest and longest archaeological record is from southern British Columbia (18, 30, 66). Basic motifs of the nineteenth century style are at least 4000 years old (66). The style (in a comprehensive sense) existed by 2500–2000 B.P. with some of its most subtle compositional rules in play by then (56, 90). Some

aspects of the northern style may not have been fully established until after ca 1000 B.P. (78). Theories on the origins of the art style seek its roots in shamanism (28, 29, 52) and diffusion from Northeast Asia (see 52a). The history of regional and temporal variation of motifs is little known. Archaeological artifacts displaying zoomorphic or anthropomorphic motifs are rare (66). Motifs and their execution are quite variable. Holm suggests this variability reflects the social functions of particular carving techniques and the visibility of the motifs (66).

Studies of context and disposal patterns may give insights into the style's evolution. For example, in the Gulf of Georgia, zoomorphic effigies are commonly recovered either as grave goods or in association with graves. In Prince Rupert Harbor, zoomorphic effigies are rarely grave goods (only one has been found) and are seldom recovered in cemetery areas. The condition of these objects when discarded may also be important. Labrets were frequently broken before they were discarded.

Burials are the only obvious archaeological record for ritual on the coast. When that record began, the dead were already being handled in complex and varying ways (31, 113). Carlson argues there is evidence at Pender Island for mortuary feasts, and therefore, funerary potlatches, before 3000 B.P. (31). There is no similar evidence in Prince Rupert Harbor (8). The coast-wide shift away from inhumation began before 1000 B.P. and indicates a significant change in ritual. Although this change probably marks the development of ethnographically documented funerary practices, its causes and ramifications are little understood and are a major research problem. Interestingly, this shift appears to have occurred all along the coast at about the same time. Finally, recent excavations (G Coupland, personal communication) in southern British Columbia suggest that we do not have a representative sample of the range of funerary practices prior to the shift away from inhumations.

CONCLUSIONS

Cultural evolution on the Northwest Coast was a mosaic of local and regional events and dynamics at differing temporal and spatial scales (6). The theories and models reviewed here, including my own, do not yet adequately address that fundamental fact, but after many years of work, Northwest Coast archaeologists have begun to achieve a critical mass of evidence with which to address these and other issues.

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