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The Evolution of Collector Systems on the Pacific Coast of Northwest North America

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Late Holocene hunter-gatherers of the Pacific Northwest region of North America supported large permanent communities through an economic system characterized by logistical task group organization, mass harvesting and processing of select resources such as salmon, and large scale storage. This is the “collector” socio-economic system which appears to have its origin in this region during the Middle Holocene between 3500 and 5000 years ago. Despite its importance, the evolution of the collector system remains poorly understood. This paper offers a new model for the evolution of hunting and gathering during the Middle Holocene period relying on taxic macroevolutionary theory. Briefly, the model suggests that cultural diversification occurred during the period of 4000 to 5000 b.p. under optimal environmental conditions. A wide range of different hunter-gatherer systems emerged, including a variety of foraging systems not reliant upon storage or any complex forms of logistical mobility, as well as at least one collector system. The Neoglacial temperature downturn shortly after 4000 b.p. brought new pressures upon these hunter-gatherers and resulted in decimation of many systems. Continuity of the collector system was fortuitous and resulted in its rapid spread throughout the region. These data suggest that on the macroevolutionary scale, cultural evolution proceeds through cultural cladogenesis or splitting and subsequent systems scale selection. The emergence of radically new cultural patterns, such as hunter-gatherer “collector” systems in the Pacific Northwest, through diversification and decimation, may be common in many worldwide cultural sequences.

INTRODUCTION

Arguably, the most fundamental problem to be addressed by archaeologists of the Pacific Northwest region of North America is the emergence of complex hunter-gatherers featuring relatively high population densities, semi-sedentary communities, status inequality, and monumental art and architecture [DRUCKER 1955]. Ethnographic and Late Prehistoric Pacific Northwest Coast and Interior communities were supported by “collector” socio-economic systems [BINFORD 1980] that emphasized specialized task-groups, and mass-harvesting and storage of select resources such as salmon, herring, and sea mammals. Indeed, few archaeologists would dispute the importance of the collector strategy as the basic economic

foundation for the elaborate cultural traditions in this region [MATSON and COUPLAND 1995]. Most agree that before the complex cultures of the late Holocene could arise, this basic economic infrastructure had to be in place [AMES 1981, 1983, 1985; BURLEY 1980; CANNON 1998; CARLSON 1998; CHATTERS 1995; COUPLAND 1985, 1998; FLADMARK 1975; MASCHNER 1992; MATSON 1983, 1992, MATSON and COUPLAND 1995; MONKS 1987]. Though there is some debate [CANNON 1995, 1998, in press; CARLSON 1998], most also agree that the collector system appeared during the later Middle Holocene, perhaps well after 5000 b.p. [BURLEY 1980; CHATTERS 1995]. What remains fundamentally unclear is the process by which this adaptation emerged. Indeed, Moss and Erlandson [1995: 35] state that archaeologists "have only sketchy notions of the Middle Holocene cultural changes that accompanied the transition from relatively egalitarian Early Holocene peoples to the complex Pacific Coast societies of the Late Holocene." In the same article [1995: 33], Moss and Erlandson urge archaeologists not to "shoehorn" archaeological cultures of the complex Middle Holocene (and other periods) into "arbitrary stages," as additional data accumulate. We argue, following Eldredge and Gould [1972], that such pitfalls can only be avoided through the *a priori* consideration of new ideas about the past and the evolutionary process, rather than simple continuous data collection. We suggest that, though much further work is required, the current data base exhibits patterning which can be understood with an alternative theoretical framework.

In this paper, we present a taxic macroevolutionary model of cultural evolution and apply our understanding of the model to the crucial Middle Holocene period in the Pacific Northwest. Our aim is a better understanding of the rise of collector systems in this region. In particular, we demonstrate that the collector system of the later prehistoric period was probably organizationally and technologically far more complex than systems dominant earlier in the Holocene. Indeed, for much of the Holocene, the risk of experimenting with this new form of organization may have been largely prohibitive for most groups. Widespread emergence of collecting as the dominant socio-economic system may have been a consequence of significant environmental change after 4000 b.p., and a failure of many local foraging systems that were then replaced by collecting systems. The collector strategy appears to have its origin in semi-isolated small populations prior to this time, and was favored by these new environmental conditions.

FORAGER AND COLLECTOR SYSTEMS

As outlined by Ames [1995], Chatters [1995], Hayden [1992], and others [e.g., MATSON and COUPLAND 1995] Pacific Northwest societies, whether on the coast [MATSON and COUPLAND 1995] or the interior Plateau [CHATTERS and POKOTYLO 1998], supported their large populations and complex societies through economic activities best described as logistically organized collecting. Indeed, it is unlikely that the ethnographically documented cultural pattern from this region could have evolved without a system of this nature. An important aspect of explaining the rise of these cultures then concerns the evolution of the collector system [CHATTERS 1995].

The concept of logistically organized collectors derives most prominently from the work of Binford [1980, 1982] who argued for a continuum of hunting and gathering subsistence and mobility adaptations ranging from forager to collector. Though many of Binford's conclusions

mirrored earlier works on hunter-gatherer economic tactics [BEARDSLEY et al. 1956], his work offered critical new linkages between patterns of hunter-gatherer behavior and potential patterning of the archaeological record. Since Binford's seminal papers, a number of archaeologists have added to our understanding of ecological and archaeological correlates of the forager-collector continuum [BAMFORTH 1991, 1997; CHATTERS 1987; KELLY 1983, 1992; SHOTT 1986; TORRENCE 1983].

At one end of the scale, foragers "map-on" to new resource patches, generally utilizing an immediate-return subsistence tactic [WOODBURN 1982]. Foragers have been described as residentially mobile, rarely staying in a given place for more than a few weeks. Bamforth [1997] notes however, that forager mobility strategies may be quite variable. Residential group populations are generally low, food sharing is usually obligatory and social status economically egalitarian [HAYDEN 1981, 1995]. The archaeological record of foragers tends to include residential base camps and resource procurement places or "locations" [BINFORD 1980]. Subsistence activities are scheduled according to the availability of resources. Risk of seasonal shortage is mitigated by residential mobility and an often diverse diet [CHATTERS 1987, 1995]. In contrast, collectors are residentially less mobile, while employing far more complex "logistical" mobility strategies [KELLY 1983]. These require the collection of specific resources by specialized task groups. Many resources are mass-collected for eventual storage, allowing such hunter-gatherers to reduce seasonal variation in resource supply. Scheduling by collectors can be complex, as illustrated by Alexander [1992], when multiple resources must be harvested and processed in short order during a single season. This typically requires forms of technology, labor organization and task specialization largely unknown to those using a foraging system [AMES 1995; BINFORD 1978; HAYDEN 1992, 1995; HAYDEN *et al.* 1985]. Collectors often have larger populations [BAMFORTH 1997] and tend towards at least some degree of economically-based status inequality [AMES 1995; HAYDEN 1995].

Binford [1990] argues that the different aspects of mobility and subsistence linked to foraging and collecting will occur in organizationally distinct combinations depending upon local ecological conditions. This could be interpreted to imply that an almost infinite array of adaptive systems may exist, ranging from sedentary foragers to mobile collectors. Indeed archaeologists have recognized variation of this nature. Chatters [1995] documents a high degree of sedentism in the Pithouse I forager system of the Columbia Plateau, while Kelly and Todd [1988] argue for high residential mobility combined with equally high logistical mobility among early Paleoindians of North America. These distinctions should not be interpreted to imply that hunter-gatherers can simply and freely choose among this array of economic behavioral options, thus reinventing economic systems to suit their current social and ecological environment. Rather, a strong body of evidence suggests that, once established, economic systems remain stable for some period of time before evolving or going extinct. Binford [1990: 147] suggests that mobility constraints will produce a "punctuated pattern" of change and geographic variation in hunter-gatherer systems. Ames [1983] suggests that some systems will be relatively "resilient" and others "stable," noting that resilient systems tend to be more adaptively flexible while stable systems are more specialized and subject to adverse effects of external heterogeneity. Chatters [1995: 489] concludes that economic systems (or the "adaptive strategy") tend to act like organisms, with each behavior integrated with others "in an annual

or supra-annual scheme that delivers a predictable and nutritionally sufficient food supply.” Further, Chatters [1995: 389-390] argues that “addition or deletion of a key resource, or change in the time expended on an existing resource will send ripples throughout the system, altering the time available for gearing up, non-food resource gathering, inter-group interaction, and so forth...” Eventually, positioning of the human group may be altered to such a degree that collection of key resources becomes unfeasible, necessitating system change or collapse. Rosenberg [1994] views cultural systems as “ideationally regulated” evolutionary entities with the ability for self replication. To Rosenberg [1994] evolutionary change comes about through weakening of regulatory constraints. Taken to its logical extreme, an expanded frequency of maladaptive behaviors can lead to cultural disintegration.

If these arguments are correct, then, though economic systems of hunter-gatherers can be extremely variable from an organizational standpoint per Binford [1990], Chatters [1987, 1995], and others [KELLY and TODD 1988], evolution of economic strategies cannot be viewed as a consequence of individual people gradually and freely picking and choosing between the full array of cultural ecological options, but rather more often as a record of competition and differential success of cultural systems [MASON 1998]. As Chatters [1995] notes, any changes to economic strategies such as adding and deleting resources, adjusting procurement and processing schedules and tactics, or reorganizing labor could be risky to the individual practitioner [CASHDAN 1980; HITCHCOCK and EBERT 1984] or to entire human populations [FLANNERY 1986]. This would serve to enforce powerful restraints against variation in all but the most unusual situations. A major change such as the shift from a forager-like to a collector-like model could represent a particularly extreme example of this. Indeed, Chatters [1995] suggests that the evolution of collecting may have been as traumatic and culturally significant to Pacific Northwest peoples as the emergence of agricultural systems in other regions. No wonder that archaeologists record long term patterns of relative stasis or even oscillatory hunter-gatherer cultural evolution, particularly in consistently extreme environments such as the Great Basin, Subarctic, Northwestern Plains, and notably, the early to middle Holocene of the Pacific Northwest.

THE EVOLUTION OF COLLECTOR SYSTEMS IN THE PACIFIC NORTHWEST REGION

Explanations for the evolution of collector systems in the Pacific Northwest region have been well reviewed in a series of recent publications [AMES 1994; AMES and MASCHNER 1999; LIGHTFOOT 1993; MATSON and COUPLAND 1995; MOSS and ERLANDSON 1995]. Briefly these models can be organized into several basic groups. First, Fladmark [1975], Carlson [1998], Carlson and Hobler [1993], and Cannon [1998] link environmental opportunity to the rise of systems characterized by salmon and shellfish intensification, storage and sedentism. Carlson and Hobler suggest that Middle Holocene environmental conditions in the Gulf of Georgia area permitted the rise of the complete ethnographic Northwest Coast pattern prior to 4000 b.p.

Second, a number of researchers fall back on the familiar population pressure arguments of Binford [1968], Boserup [1965], and Cohen [1977]. These arguments suggest that culture does not change unless significant pressures develop requiring new adaptive responses. Cohen

[1981], Schalk [1981], Croes and Hackenberger [1988], and Lohse and Sammons-Lohse [1986] argue for late Middle Holocene population rise leading to intensification of fish resources and associated development of storage and semi-sedentism. Kuijt [1989] suggests that declining access to ungulates favored subsistence diversification ultimately incorporating large numbers of salmon in subsistence economies during the Middle Holocene.

A third group requires the combination of environmental opportunity and technological advancement to facilitate the rise of collectors [BURLEY 1980; HAYDEN 1981, 1990; MASCHNER 1991]. The development of semi-sedentism, storage and intensification then permits social inequality to develop due to resource control [COUPLAND 1985, 1988; MATSON 1989], development of more efficient information processing capabilities through hierarchical social relations [AMES 1981, 1985], and/or through activities of self-interested aspiring elites [HAYDEN 1990, 1995; MASCHNER 1991; MASCHNER and REEDY-MASCHNER 1998]. These models offer important insight into the evolutionary process but recent theoretical discussions [LYMAN and O'BRIEN 1998; ROSENBERG 1994; SCHIFFER 1996; SPENCER 1997] suggest that some assumptions may be in error. Two major issues are the lack of a role for natural selection and the assumption of anagenesis.

Many models exclude any explicit role for natural selection and can consequently be defined as adaptationist [CHATTERS 1995; DUNNELL 1980]. The environment either offers problems to be solved (population-resource imbalances per Cohen [1977, 1981], Croes and Hackenberger [1988], Schalk [1981]) or provides opportunities for new adaptations allowing populations to enjoy benefits not inherent in older systems [BURLEY 1980; CARLSON 1998; FLADMARK 1975; FLADMARK *et al.* 1990; HAYDEN *et al.* 1985]. Maschner and his collaborators [MASCHNER 1991; MASCHNER and PATTON 1996; MASCHNER and REEDY-MASCHNER 1998] employ evolutionary psychology suggesting that selection in organic evolution has produced an organism programmed for socio-economic competition. Maschner and Patton [1996: 102] state that we must assume "that social ranking and political complexity will arise, whenever and wherever it is adaptively possible." It becomes the job of the archaeologist to "determine where and when these possibilities occur, what environmental and social variables were significant, and what the prehistoric actors did about it" [MASCHNER and PATTON 1996: 102]. This model implies natural selection in the biological realm (for *Homo sapiens*) but excludes any clear role for selection in cultural change. Thus, cultural evolution is the gradual unfolding of human potential as limited by psychological constraints. Though methodologically individualist, it remains adaptationist by excluding a role for selection of cultural variants. By excluding cultural selection, adaptationist models relinquish a mechanism for defining adaptations [O'BRIEN and HOLLAND 1990] and for sorting between competing variants [CHATTERS 1995].

A perhaps greater problem with adaptationist models is their implicit assumption of cultural anagenesis [LYMAN and O'BRIEN 1998; ROSENBERG 1998]. Use of anagenetic models does not necessarily preclude cultural evolution as it only refers to a directional pattern of evolution without branching or splitting [GOULD and ELDREDGE 1986]. Chatters [1995: 343] notes that for evolution to proceed, "alternate technologies and strategies...must exist and be expressed as behaviors on which natural selection acts." In other words, non-Darwinian models of culture change lack a mechanism for producing the variation to be acted upon by selection.

A good example in cultural evolution could be cultural bottlenecks [PRENTISS and CHATTERS 2003] whereby an isolated human population and its associated cultural system evolve under pressure to avoid extinction (similar to the biological model outlined by Stanley [1998]). Despite perhaps occasional relevance, the exclusively anagenetic models may be largely inappropriate for the process of cultural evolution in the Pacific Northwest as they exclude cultural variation in their developmental schemes, whereas a significant body of research now suggests that the emergence of variation is a fundamentally necessary part of the cultural evolutionary process [BARTON and CLARK 1997; BOYD and RICHERSON 1982, 1992; DUNNELL 1980; LYMAN and O'BRIEN 1998; ROSENBERG 1994; SPENCER 1997]. Lyman and O'Brien [1998: 626] go as far as to argue that, if cultural evolution is anagenetic then it can only occur through "saltation" or sudden appearance of entirely new species through some special transforming event [see also MAYR 1988]. A more appropriate approach would be to accept the possibility of cultural cladogenesis [LYMAN and O'BRIEN 1998; ROSENBERG 1994, 1998]. Cladogenetic models recognize cultural evolution as a process of periodic cultural splitting or diversification where, for example, alternative strategies may emerge and exist geographically adjacent to older systems. This recognizes the ability and opportunity for local populations to diverge occasionally from more dominant regimes. It also provides the raw material on which selection can operate across multiple scales [ROSENBERG 1994; SPENCER 1997].

Though no Pacific Northwest archaeologists have published a comprehensive evolutionary model incorporating cladogenesis and selection, a number have recognized the importance of these factors in their formulations. Carlson [1998], Cannon [1998], and Kuijt [1989] have suggested that ecological conditions may have significant longer term effects on local cultural variants. Cannon [1998] infers an early appearance of salmon intensification at the Namu site. Hayden [1981, 1992, 1995] suggests that local conditions may have the effect of allowing certain individuals and groups to succeed in implementing new cultural practices which might be disallowed elsewhere. Matson [1989] and Coupland [1985, 1988] recognize that control of resource access and the evolution of social complexity require local combinations of appropriate resources and technologies. Ames [1983] clearly recognizes that variant systems may co-exist and potentially even compete. Chatters [1995] also recognizes this fact, suggesting that collector systems may have come about in isolation or perhaps in multiple unique locales. In the following discussion, we present a model theoretically linked to evolutionary ideas from the field of paleobiology, recognizing cultural entities on multiple scales as evolutionary individuals and incorporating selection and cladogenesis. We argue that the model provides a more comprehensive accounting for the middle Holocene evolution of collector systems in the Pacific Northwest.

A TAXIC MACROEVOLUTIONARY APPROACH TO CULTURE CHANGE

Taxic macroevolutionary theory has been developed by paleontologists frustrated with the inability of the synthetic and "hardened" neoDarwinism to fully explain the complex evolutionary patterns and processes indicated by the paleontological record [GOULD 1982]. Taxic macroevolutionists suggest that the findings of mathematical genetics or "microevolution" cannot be directly extrapolated to the scale of macroevolution where unique processes are also

recognizable. Taxic macroevolutionists recognize a nested hierarchy of evolutionary individuals that includes species [ELDREDGE 1985; ELDREDGE and SALTHER 1984]. Evolution on the macroevolutionary scale occurs as a process of emergence and sorting of species within clades [VRBA and GOULD 1986] producing punctuated equilibrium, though some cases of gradual evolution are also recognized [STANLEY 1979]. Although taxic macroevolutionists acknowledge the importance of natural selection at the individual organism and gene level, they give analytical priority to sorting mechanisms operating at higher levels [ELDREDGE 1989a; VRBA and GOULD 1986] sometimes described as “species selection” [STANLEY 1975]. Long-term evolutionary patterns illustrating variant histories of species “birth” and “death” are assessed, allowing macroevolutionists insight into the broader questions of evolutionary biology [ELDREDGE 1985; STANLEY 1998]. We argue that many of these ideas have relevance for better understanding the cultural evolutionary process (a more comprehensive version of these arguments is found in Prentiss and Chatters [2003]).

A key component of the biological model is the recognition of the nested hierarchy of biological entities ranging from gene to species and higher. It is impossible not to see similar hierarchy in culture. Thus, following the work of Eldredge [1989b], Lyman and O’Brien [1998], Marks and Staski [1988], Rosenberg [1994], and Spencer [1997] we argue that culture is organized as a hierarchy of evolutionary individuals. These individuals (or entities) are “born,” have histories, and “die” [MARKS and STASKI 1988] and are thus no different from the definitions of “individual” provided by Eldredge and Cracraft [1980], Ghiselin [1974], and Hull [1976]. Rosenberg [1994] postulates dual cultural hierarchies: ecological and genealogical. Culture, viewed from the perspective of ecology, is defined by a nested hierarchy of human populations from small groups, such as families, to societies. Parallel to the cultural ecological hierarchy is the cultural genealogical hierarchy composed of information, progressing from individual traits or “memes” to integrated information systems such as those of cultural “systems.” Traits are inherited through human communication and imitation and are sorted by selection on their “ability” to self-replicate, in some cases by conferring biological fitness on their users [BOYD and RICHERSON 1985; CAVALLI-SFORZA and FELDMAN 1981]. The cultural hierarchy consists of progressively more complex arrays of integrated cultural information expressed “phenotypically” as cultural behavior and maintained by the economic actions of human organisms [ROSENBERG 1994].

Selection operates on cultural (genealogical) entities in the same way it acts on organisms. Thus, in Rosenberg’s [1994] terms, “contracultural” behavior leads ultimately to economic failure and extinction while cultural “reproduction” ultimately derives from effective economics [ELDREDGE 1989a]. Cultural entities interact and compete with “peer” entities — for example competing corporate groups within the villages on the Northwest Coast [HAYDEN and CANNON 1982]. They are also affected by events and processes operating at higher and lower levels of the cultural hierarchy. For example, when the Chacoan System of the late prehistoric U.S. Southwest collapsed, it had the direct effect of destroying a host of lesser entities such as the Great House groups of Chaco Canyon [TAINTER 1988].

The important microevolutionary research of Boyd and Richerson [1985] has suggested that variation between cultural systems is favored by isolation — separation preventing homogenization or domination. Indeed it is hard to imagine just how a dramatically new form

of organization could possibly even emerge, much less survive under conditions of high interaction and/or subjugation. Significant change first requires disruption to the old or “parent” system as argued by Arnold [1993], Earle [1997], Hayden [1995], Rosenberg [1994] and others [e.g., CASHDAN 1980; SCHNIRELMAN 1992; SPENCER 1997; TAINTER 1988]. Disruptions reorganize social relationships and reduce pressure to conform — in essence a relaxing of competition among middle level entities on the cultural hierarchy. Lifting the pressure for conformity allows local variation to emerge. If rapid changes occur in the cultural equivalent of regulatory genes [STANLEY 1998: 149], particularly ideologies structuring the organization of technology, labor, and, to varying degrees, social relations [EARLE 1997: 7], then we can expect new forms of organization — in essence new cultural entities, to appear extremely fast (too fast to find the period of transition in the archaeological record). These new systems will often be initially small in scale, operated by limited populations. Macroevolutionary theory [ELDRIDGE 1989b, 1989a] suggests that they must be highly differentiated from the parent system to avoid extinction for the same reasons as the parent system or to avoid the deleterious effects of direct competition with a still-powerful parent system. For this reason, successful emergent systems are often characterized by new subsistence practices (for example, intensification or diversification), and in some cases new forms of intra-group social organization such as the competitive social environments described by Hayden [1981, 1995, 1998].

An abundance of research suggests that the most novel forms of life evolve during diversification and radiation events associated with reduced competition [CARSON 1968; GOULD 1989; MACFADDEN and HULBERT 1988; STANLEY 1992]. Cultural evolution should operate in much the same way. Under conditions of high selective pressure, for example sparse resources, severe climatic conditions, and high predation pressure, opportunity for different cultural variants will be heavily curbed through cultural prohibitions, direct competition, or simple economic failure [HITCHCOCK and EBERT 1984; ROSENBERG 1994]. With loosened economic restrictions, opportunities for economic independence or semi-independence among groups may increase in frequency. With independence and at least partial isolation, we can expect the evolution of variant cultural practices [BOYD and RICHERSON 1985]. Conversely, competitive conditions can lead to cultural “decimation” [GOULD 1989; STANLEY 1998]. Under new or renewed competitive conditions, cultural failures or extinction can come about through direct competition and exploitation as well as more basic economic collapse. This implies a role for historical contingency in the form of rapid environmental changes, but also in the development of competitive relations between cultural groups and cultural “swamping” (cultural equivalent of gene flow) or homogenization.

CULTURAL EVOLUTION IN THE PACIFIC NORTHWEST REGION

The taxic macroevolutionary model outlined above suggests that novel forms of culture should come about cladogenetically under conditions of reduced pressure or competition. Diversity will shrink as competitive conditions renew. The Pacific Northwest region of North America (Figure 3.1) provides an example of this process whereby very low system diversity during the earlier Holocene undergoes sudden diversification just after 5000 b.p. The

diversification pattern shifts to a decimation pattern after 4000 b.p. such that by approximately 3000 b.p. nearly all hunter-gatherers are operating a collector system. Throughout the following discussion we attempt to categorize the evidence for distinctive hunter-gatherer socioeconomic systems, where possible, by identifying them with period, phase, or complex designations (e.g. Locarno Beach, Pithouse I, etc.). We assume, following Jochim *et al.* [1999], that higher-level cultural systems can be recognized archaeologically as a consequence of groups with a common cultural history “who thus maintained a dynamic interaction involving exchange of goods, personnel, and information...”. We give priority to the economic or infrastructural component of cultural systems because, first, it is most directly reflected in human behavior and consequently in the archaeological record and, second, because in small scale societies, the basic mode and relations of production are particularly fundamental and reflective of the larger cultural “*Bauplan*” or cultural pattern [HARRIS 1999; ROSENBERG 1994]. Thus, our analysis does not seek to reconstruct ethnicity or ideology, but is more concerned with understanding diversity in basic behavioral adaptations as indicators of broader cultural changes.

Earliest Holocene occupations are generally associated with the North Coast Microblade tradition (Figure 3.2) at sites including Groundhog Bay 2, Hidden Falls, Chuck Lake 2, Namu, and several sites recently identified on the Queen Charlotte Islands, collectively dated in the range of 9500-8000 b.p. [Ackerman 1968, 1992; Ackerman *et al.* 1985; Carlson 1991; Davis 1989; Fedje and Christensen 1999]. Slightly later dates are found in the central and southern portions of the region, typically associated with the Old Cordilleran culture [Carlson 1979; Matson 1976; Matson and Coupland 1995; Moss and Erlandson 1995] (Figure 3.2). Old Cordilleran technological patterns are also recognizable after 8000 b.p. on the interior Plateau.

Subsistence strategies in northern and southern coastal contexts appear to have emphasized a relatively broad array of shellfish, and bottom and anadromous fish [Ackerman *et al.*, 1985; Casteel 1976]. Little evidence is present on the North Coast for strong reliance on mammals [Ackerman 1992; Davis 1989; Fedje and Christensen 1999], while both sea and terrestrial mammals were important in Old Cordilleran components to the south [Imamoto 1976; Matson and Coupland 1995]. Early to Middle Holocene sites on the Plateau reflect use of broad spectrum upland fauna and flora in addition to varying degrees of reliance on anadromous fish [Carlson 1998; Chatters 1995; Chatters and Pokotylo 1998; Stryd and Rousseau 1996]. No evidence in the form of faunal data or storage facilities has been effectively presented to suggest that any population in the Northwest relied upon a delayed-return subsistence strategy prior to approximately 5000 b.p.

Recent study of interior Old Cordilleran or Cascade technological organization [ANDREFSKY 1995] indicates a pattern of frequent expedient tool production and discard using local raw materials, combined with a pattern of procurement and long term transport of select materials resulting in accumulations of some nonlocal materials. As argued by Andrefsky [1995: 109], this implies high mobility within Cascade times. Although no analyses of raw material distributions have been undertaken on the southern coast, the higher frequencies of expedient tools and use of local coarse-grained raw materials coupled with the lack of structural remains in coastal Old Cordilleran components also implies high residential mobility [MATSON 1976, 1996; MATSON and COUPLAND 1995]. Lithic assemblages from the north coast also appear to fit this pattern, with frequent use of local raw material sources combined with occasional

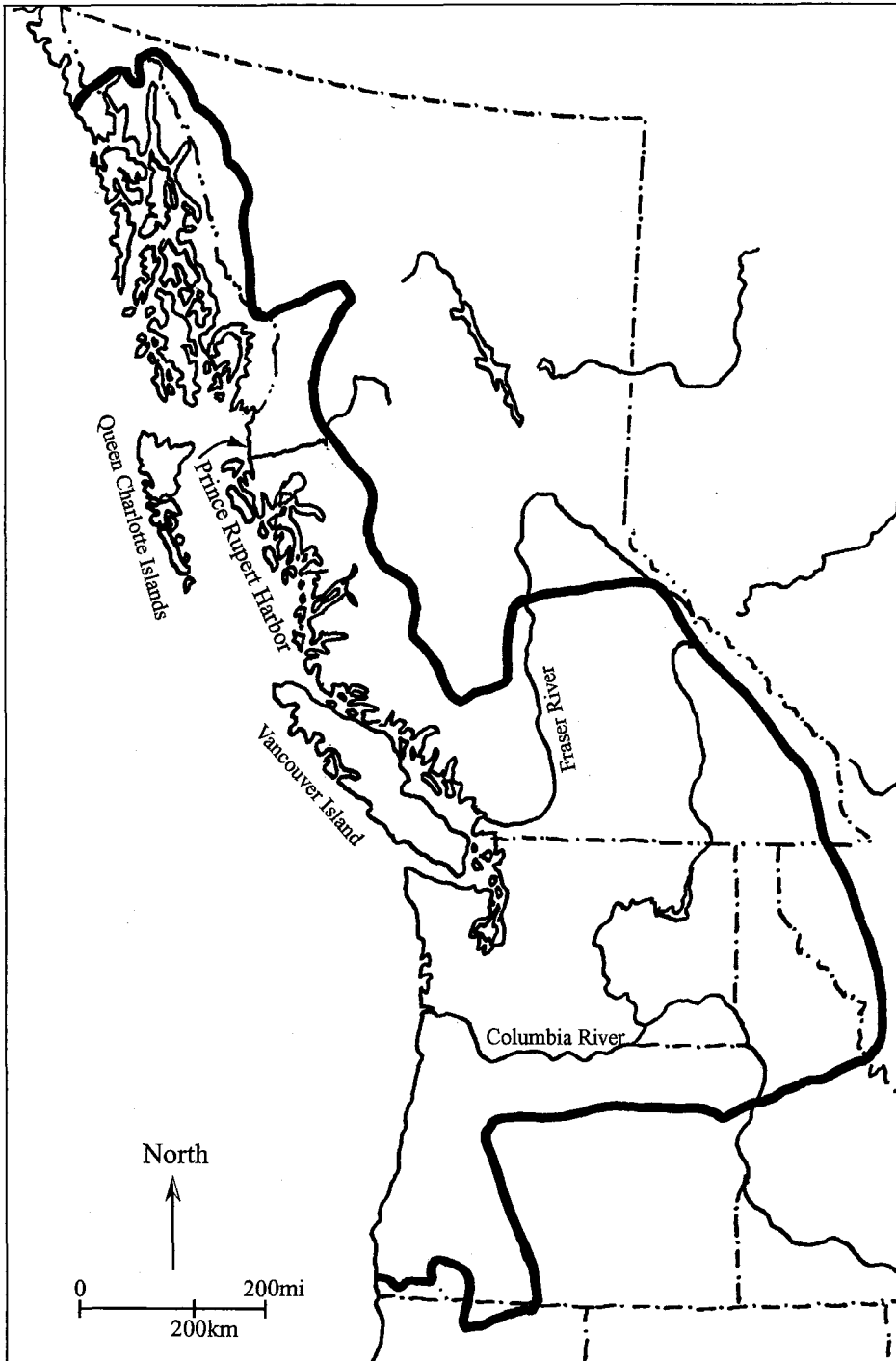


Figure 3.1 Map of the Pacific Northwest region of North America.

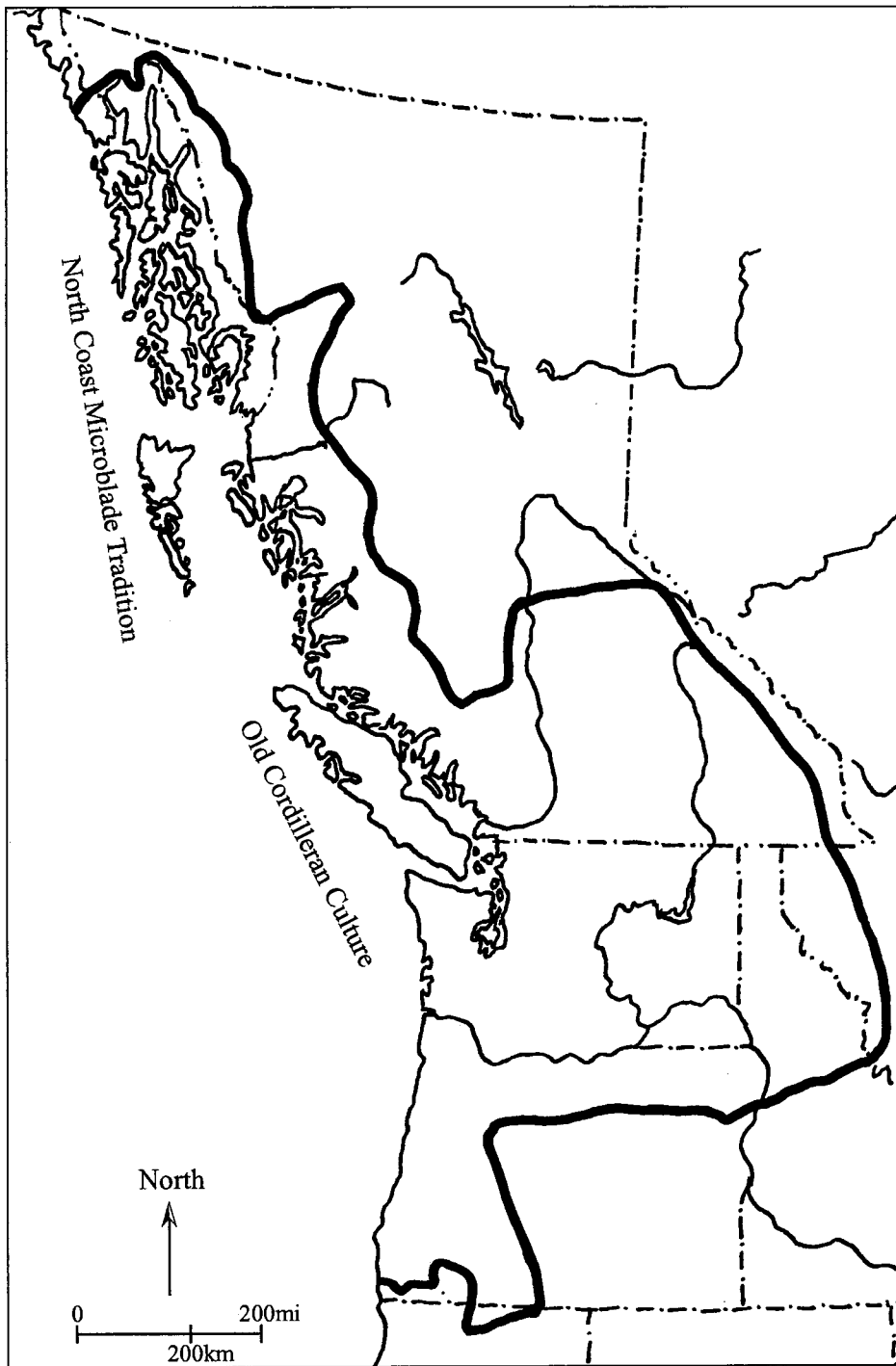


Figure 3.2 Early Holocene cultures in the Pacific Northwest region.

nonlocal sources such as Mount Edziza obsidian [DAVIS 1989]. Stylistic similarity in some forms of lithic tools (particularly bifaces) between the interior Plateau and south and north coasts [FEDJE and CHRISTENSEN 1999; MATSON 1996] also reflects mobility and likely, interaction.

Matson (1996) and Matson and Coupland (1995) identify some variation in faunal remains between Old Cordilleran sites despite similarity in lithic assemblages, offering the possibility of intersite variation in subsistence pursuits and seasonality. They do not demonstrate however, that resource procurement tactics are organizationally distinctive. Indeed, none of these sites fit expectations (BINFORD 1978, 1980, 1982) for either foraging locations or logistical/task specific locations or camps. Thus, for now, we argue that the intersite variation may reflect primarily residential mobility and foraging emphases varying with ecological context, rather than the sort of complex settlement organization that might be expected under a collector-like system.

Although there is undoubtedly spatial and temporal variation in the roles of mobility and subsistence during the Early to Middle Holocene, current evidence suggests a relatively stable pattern of residential mobility, with frequent moves and relatively short occupation spans, broad-spectrum foraging in marine, riverine, and terrestrial contexts, and immediate food consumption. Culture change during this time is best described as microevolutionary with no major turnovers in socio-economic systems or even artifact styles until approximately 5000 b.p. [CHATTERS and POKOTYLO 1998; MATSON and COUPLAND 1995; MOSS and ERLANDSON 1995; STRYD and ROUSSEAU 1996].

Relative cultural homogeneity of the Early to Middle Holocene gave way to significant diversity after 5000 b.p. (Figure 3.3). We recognize multiple unique socio-economic systems active in the range of 5000-3000 b.p. in the Pacific Northwest though some appear to be very short-lived with "lifespans" of no more than 600 years.

Chatters [1989, 1995] documents the Pithouse I system, which is prominent on the Columbia Plateau after 4500 b.p. but abruptly disappears from the record by 3800 b.p. Chatters sees the Pithouse I system as a forager-like subsistence strategy that is coupled with a high degree of annual sedentism. He gives several reasons for this conclusion. First, intersite variation is extremely low, including only residential sites (often with housepits) and resource procurement locations. This implies forager-like mobility without use of any special places for intensive food harvesting and processing, as becomes common in later times. Second, seasonality assessments of many residential sites indicate occupancy spanning both cold and warm seasons. Third, there is no evidence for food storage. Cache pits are lacking and faunal remains suggest immediate consumption. Indeed, salmon remains are relatively few in Pithouse I sites compared to later Pithouse II, suggesting access may have been limited ecologically, but also organizationally and technologically. Finally, there is absolutely no indication that Pithouse I peoples ever favored any single particular resource, as is critical for logistically organized collectors [ALEXANDER 1992; BINFORD 1978, 1980]. Indeed, Pithouse I faunal assemblages are the most diverse of any in the entire prehistoric sequence from the Columbia Plateau [CHATTERS 1995].

Canadian Plateau archaeologists argue for the co-existence of two unique cultural systems termed the Lehman and Lochnore phases, between 5500 and 3500 b.p. [POKOTYLO and

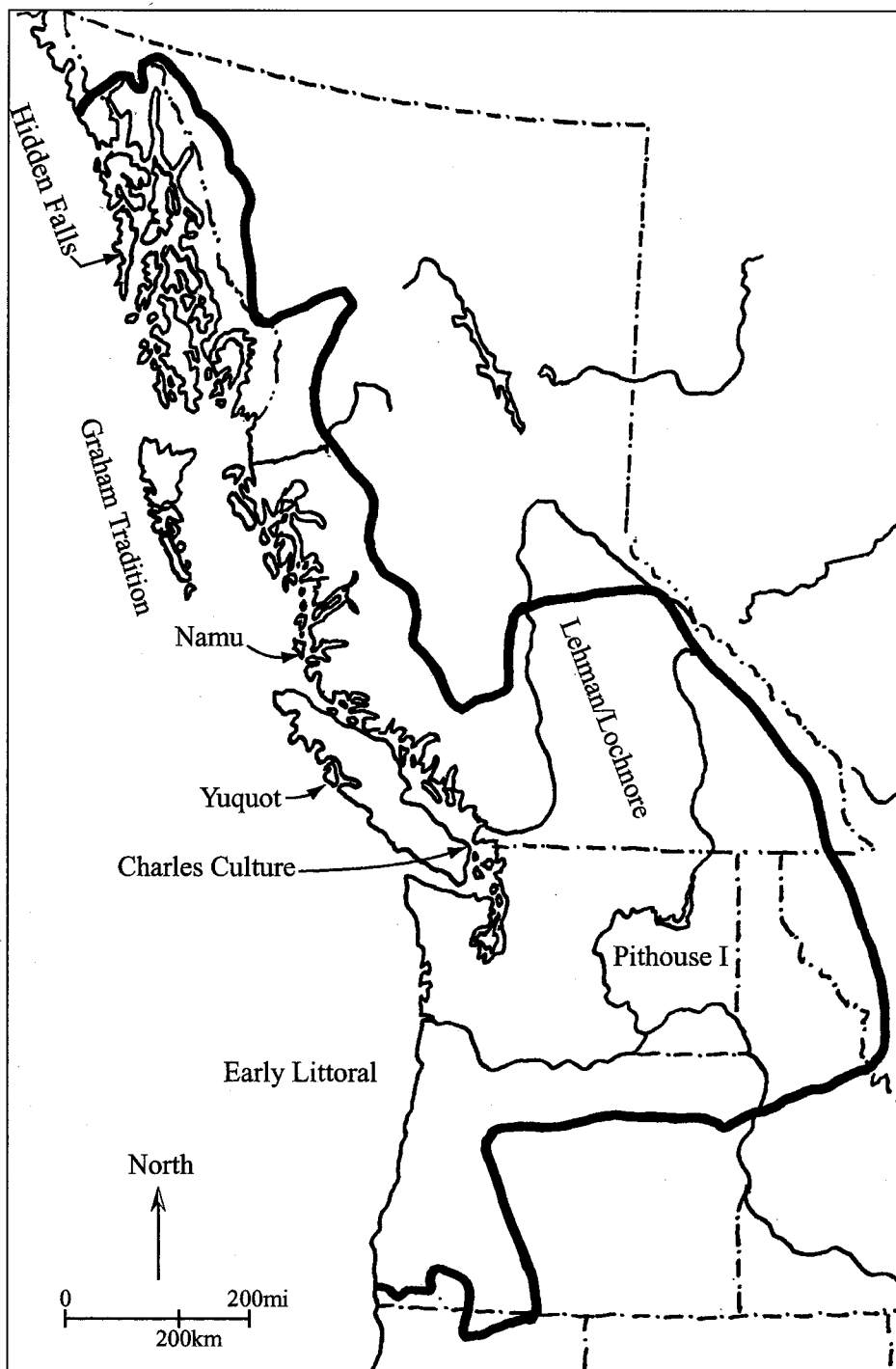


Figure 3.3 Cultures from 6000 to 3500 b.p. in the Pacific Northwest region.

MITCHELL 1989; STRYD and ROUSSEAU 1996]. Although a significant amount of additional data collection and analysis is necessary, recent research into the Lehman phase has documented field locations (per Binford [1980]) and small campsites [ARCAS CONSULTING ARCHEOLOGISTS 1985, 1986; RICHARDS and ROUSSEAU 1987; SANGER 1970], lacking housepits or storage features. Subsistence remains include deer, various fish, shellfish, and turtle, but there is no strong reliance on salmon [STRYD and ROUSSEAU 1996]. This evidence suggests that Lehman phase foragers were residentially mobile, employing an immediate return subsistence economy, and were likely egalitarian in social relations. The Lochmore phase is represented by open campsites, field locations, and a single housepit site [ARCAS CONSULTING ARCHEOLOGISTS 1983, 1986; RICHARDS 1978; SANGER 1969; WILSON CONSULTANTS, LTD. 1992]. Subsistence data suggests a wide range of prey species including deer, bear, various birds, fish, and molluscs [STRYD and ROUSSEAU 1996]. With the exception of the Baker site, evidence for use of storage has been lacking, though Stryd and Rousseau [1996] do suggest a much stronger reliance on salmon fishing than that associated with the Lehman phase.

Wilson Consultants, Ltd. [1992] argue on the basis of excavations at the Baker site, dated 4500-4000 b.p., that a collector system can be recognized on the upper Thompson drainage due to the presence of storage pits and salmon lacking head parts. We find this argument highly tentative given the fact that many salmon head parts were indeed recovered and that the volume of the Baker storage pits was extremely limited. Further, faunal assemblages associated with individual housepits are very diverse and vary significantly on an inter-house basis. The exceedingly large and complex lithic tool inventory from the site however, is instructive. It suggests that a high degree of planning depth may have been integrated into resource procurement operations. We suggest that if any elements of logistical organization were present at the Baker site, they may have focused on solving timing problems associated with simultaneously available, but spatially discontinuous resources [ALEXANDER 1992] without embedding a high degree of long term storage into the overall system. Thus, some aspects of logistical organization that existed prior to 4000 b.p. on the Canadian Plateau may have been similar to later systems, while socio-economic systems as a whole were still organized quite differently.

The Charles culture of the Gulf of Georgia and Lower Fraser Valley in southern British Columbia appears by 4500 b.p. and lasts until possibly 3300 b.p. [MATSON and COUPLAND 1995; MOSS and ERLANDSON 1995; PRATT 1992]. The Charles culture may reflect two distinct systems. The Gulf of Georgia appears to have featured a pattern of shellfish, salmon and flatfish intensification, but with little evidence for storage and delayed consumption [MATSON and COUPLAND 1995; MOSS and ERLANDSON 1995; PRATT 1992]. Lack of evidence for house structures in the middens at sites such as Glenrose Cannery [MATSON 1976], Crescent Beach [MATSON *et al.* 1991], and Pender Canal [CARLSON and HOBLER 1993] may reflect a maintenance of high residential mobility precluding establishment of house forms common in later times [MATSON and COUPLAND 1995] or, conversely, this may also reflect sampling bias and complex formation processes. Variability in site occupation seasonality and midden contents may imply the possibility that the Charles Culture was organized around "serial" foraging strategies, taking advantage of temporally structured resource availability (per Binford [1980]). Data provided by Carlson and Hobler [1993], Cybulski [1991], and Arcas Consulting

Archeologists Ltd. [1991, 1994] also suggest that despite the lack of a collector system prior to 3500 b.p. late Charles Culture burials do reflect the possibility of emergent status competition as marked by variability in grave goods, grave positioning, and labret marks. The Pender Canal site contained multiple burials, one of which contained elaborate grave goods in the form of carved horn spoons illustrating masks, and the possible presence of funeral potlatching and "feeding the dead" predating 3500 b.p. [CARLSON and HOBLER 1993: 45]. A burial from the Tsawwassen site was found containing thousands of beads also predating 3500 b.p., among other similarly dated burials without lavish grave goods [ARCAS CONSULTING ARCHEOLOGISTS 1991, 1994]. The dramatic differences between those burials "with" and those "without" implies to us the possibility of at least some form of achieved status difference between members of late Charles Culture groups on the lower British Columbia mainland and Gulf Islands. This is not to say, however, that there is evidence for ascribed status organization, as recognized by Burley and Knusel [1989] for the Marpole culture over 1000 years later.

The Charles culture is also present approximately 100 km east of the Gulf of Georgia, where a very different pattern has been reconstructed. Schaepe [1998] and Mason [1994] document the presence of large, rectangular, semi-subterranean house structures at the Mauer and Hatzic Rock sites dating 4500-4000 b.p. Schaepe [1998] argues on the basis of house size and lithic artifact inventory that the houses at Mauer and Hatzic Rock reflect a collector-like system. However, the lack of subsistence remains and storage facilities, combined with a lithic assemblage primarily reflecting expedient tool production and utilization does not strongly support this idea. Rather, it appears more likely that a unique Middle Holocene system was in operation here, featuring a high degree of residential stability supported by localized foraging without significant storage, perhaps not unlike that of Pithouse I. It is significant here that these sites are found in ecotones as are the pithouse hamlets of Pithouse I, suggesting the strong possibility that foragers were optimizing access to the widest array of seasonal resources. No indications of socio-economic status competition have been recovered to date.

Data from the Early Littoral of the Oregon Coast, dating between possibly 5500 and 3000 b.p. or slightly later, reflect an immediate-return foraging system similar to the St. Mungo Phase of the Charles culture [LYMAN and BENNETT 1991; MATSON and COUPLAND 1995]. The Early Littoral differs from the Charles culture, however, in its limited emphasis on salmon and lack of evidence for socio-economic status variation.

The Namu site on the British Columbia Central Coast offers even greater evidence for divergence from either the earlier Old Cordilleran/North Coast Microblade traditions or the Charles Culture [CANNON 1991, 1995, 1998, n.d.; CARLSON 1998]. A significant pattern of salmon and shellfish intensification is recognized at Namu dating prior to 5000 b.p. and lasting until 3800 b.p. [CANNON 1998; COUPLAND 1998]. Significantly, salmon remains appear to be lacking in head parts [CANNON 1998, in press], prompting Cannon [1991, 1998] and Carlson [1998] to argue that an early collector-like system was operating. Ames [1998] argues that Namu and other early sites with abundant evidence for salmon such as Five-Mile rapids on the Columbia River, could reflect temporary aggregations. Indeed, other Middle Holocene data from the central coast area do not reflect a collector pattern [MITCHELL 1988]. We suggest that cultural variation may be present, but that further research is necessary [CANNON 1998, in press]. Also in the central portion of the Northwest Coast is the Yuquot I site featuring Middle

Holocene dates of 4300-3000 b.p. [COUPLAND 1998; DEWHIRST 1980; FOLAN and DEWHIRST 1980]. The artifact assemblage here is almost completely at odds with patterns recognized in the Charles Culture, the Obsidian Culture [MITCHELL 1988] or at Namu, displaying an almost complete lack of lithic artifacts and an abundance of shell and bone tools. Although further reporting of faunal remains is necessary, Coupland [1998] suggests that a marine adaptation was present.

The northern Northwest Coast offers two distinctive patterns. Data from Hidden Falls and Prince Rupert Harbor [LIGHTFOOT 1989, MACDONALD and INGLIS 1981, MATSON and COUPLAND 1995, MOSS 1998] suggest a generalized subsistence strategy that became increasingly narrow, emphasizing deer and salmon in some locales. Evidence for food storage is lacking. One structure is documented at Hidden Falls II and artifact assemblages are similar to those of the Charles Culture, including ground slate points, abrading stones and labrets [LIGHTFOOT 1989, MOSS 1998]. As in the Charles Culture, serial foraging is an economic possibility here.

Fladmark *et al.* [1990] offer a provocative argument suggesting an early collector-like system on the Queen Charlotte Islands. Ames [1998] and Matson and Coupland [1995] urge caution, however, in interpreting the Middle Holocene archaeological data from the Queen Charlotte Islands. Researchers must recognize that the excavations were undertaken with the goal of developing cultural chronology rather than developing ideas about adaptive systems. Further, not all results have been published. Nevertheless, it would be a major omission not to discuss the important record from the Queen Charlottes. Thought to date 5000-3000 b.p., with most intense occupation probably occurring at 4000 b.p. [FLADMARK *et al.* 1990: 237], the Blue Jackets Creek site offers a deep shell midden and extensive bone, shell, antler and groundstone tool industries featuring fish hooks, harpoons, clubs, labrets, and knives. Excavated burials feature high degree of variance in grave goods, labret marks and burial positioning. Features include hearth pits with fire-cracked rock, other pits, post holes, and "living floors" [FLADMARK *et al.* 1990: 237]. Though faunal remains are inadequately published, fauna include a preponderance of sea mammals and a wide diversity in shellfish, with multiple seasons of occupation represented [MATSON and COUPLAND 1995]. Fladmark *et al.* [1990] conclude that the site may reflect a higher degree of sedentism than previously known on the Queen Charlottes. The data published so far may reflect a very early pattern of specialized task organization and semi-sedentism while the role of storage remains unclear. The burials suggest early and significant status differences in these populations.

Archaeologists recognize cultural continuities in the form of stylistic and technological traditions in almost all the regions discussed here. Matson [1996] sees cultural continuity between Old Cordilleran and the Charles Culture (particularly the St. Mungo phase). Matson [1996], Matson and Coupland [1995], Carlson and Hobler [1993], and Mitchell [1990] also suggest the strong possibility of continuity between the Charles Culture and many later developments on the coast. Chatters [1995] and Chatters and Pokotylo [1998] recognize continuity between the Cascade Phase and Pithouse I on the Columbia Plateau. Fladmark *et al.* [1990] argue for the possibility of long term cultural continuity on the Queen Charlotte Islands, though we note that the transition between the Moresby and Graham traditions is not well understood. Further research considering these issues is also necessary on the north coast mainland. Finally, there is the possibility that some Canadian Plateau variation is a consequence

of Lochnore Phase expansion, presumably from an originally coastal context [STRYD and ROUSSEAU 1996].

Peak variation in settlement and subsistence systems appears to have occurred at approximately between 4500 and 4000 b.p., immediately prior to the temperature downturn associated with the advent of the full Neoglacial climatic episode [CHATTERS 1995; MANN *et al.* 1998]. During this time the region may have featured highly mobile generalist foragers, semi-sedentary foragers, serial foragers, supra-annually sedentary foragers, and finally, some early collectors. At least two local systems (Graham tradition and St. Mungo/Mayne phases of the Charles Culture) may have been experimenting with status inequality while most remained egalitarian. Between 4400 and 3000 b.p. cultural diversity in the Pacific Northwest declined significantly. On the Canadian Plateau, no Lehman Phase assemblage post-dates 4400 b.p. and Lochnore occupations appear to terminate shortly after 4000 b.p. The inland Charles Culture or Eayam Phase appears to be gone by 4000 b.p. Pithouse I disappears by 3800 b.p. The Gulf of Georgia Charles Culture (St. Mungo/Mayne phases) and mainland North Coast systems are no longer visible after 3500-3300 b.p. The unique adaptation represented at Yuquot is gone by 3000 b.p. and the foraging system of the Oregon Coast vanishes just under 3000 b.p. The Graham Tradition of the Queen Charlotte Islands appears to survive the environmental changes of 4000 to 3500 b.p., illustrating a pattern of cultural continuity well into the later Holocene.

Socio-economic systems in the interior appear to have been the first to decline. This may be because they were most poorly prepared for the downturn in water and air temperatures and the linked restructuring of food resources. Chatters [1995] demonstrates dramatic population collapse associated with the demise of Pithouse I. Similar processes may have affected the Lochnore and Eayam phase peoples. Coastal areas were affected next, but perhaps less drastically, as many coastal shell midden sites contain unbroken sequences of occupation spanning the Middle to Late Holocene [ARCAS CONSULTING ARCHEOLOGISTS 1994; CARLSON and HOBLER 1993; MATSON and COUPLAND 1995]. Despite occupational continuity in many shell middens, cultural systems do change dramatically at approximately 3500-3000 b.p. throughout the coastal region. The change in all cases is from forager-like to collector systems.

There is little evidence to suggest that the entire region slowly and anagenetically evolved toward the collector model. Changes were often abrupt, and, as noted, sometimes featured significant population collapse. Change with collapse may have been associated with actual population replacement whereas change without dramatic population flux may have been linked to transmission of integrated concepts via receptive populations. The collector system appears to have evolved initially on the Central or North Coast, associated with the early Graham Tradition of the Queen Charlotte Islands and/or the Namu site population. Salmon intensification does abruptly stop at Namu at the same time that alternate systems elsewhere on the coast and interior are apparently struggling. Outside of these locales, collecting appears first in the Locarno Beach Phase of the Gulf Islands and Lower Mainland of British Columbia [MATSON and COUPLAND 1995], the Period II middens of Prince Rupert Harbor [MACDONALD and INGLIS 1981], the Paul Mason site of Kitselas Canyon [COUPLAND 1988], and the Shuswap Horizon of the Canadian Plateau [RICHARDS and ROUSSEAU 1987]. From these locales, it appears to shift to the Columbia Plateau with the Pithouse II system [CHATTERS 1995], to southeastern Alaska as represented at Hidden Falls III [DAVIS 1989; MOSS 1998] and specialized fishing sites

[MOSS *et al.* 1990], and eventually on to the west coast of Vancouver Island, the South Coast and Northern California [CHATTERS 1995; DRAPER 1988; MATSON and COUPLAND 1995].

DISCUSSION

We now consider two fundamental questions. First, why did cultural variation emerge and then decline in the Middle Holocene? Second, why did the collector system spread rapidly at approximately 3500 b.p.? The cultural diversification process witnessed in the Pacific Northwest between 5000 and 3500 b.p. provides an example of a process we suspect is typical of many archaeological sequences worldwide. Other North American examples could include Great Plains and Great Basin socio-economic diversification in the late Holocene [PRENTISS and CHATTERS 2003]. Similar examples are known from Old World contexts as well, such as the Neolithic diversification in southwestern Asia during the late Pleistocene and early Holocene [BAR-YOSEF and MEADOW 1995; ROSENBERG 1994].

In the Pacific Northwest, this diversification occurs at the beginnings of Neoglaciation, a period associated with relatively warm temperatures but significantly increased moisture. Although some will be tempted to argue that environmental changes are insignificant and best viewed as incidental, we counter, first, that the structure of small-scale foraging societies is strongly affected by ecological contexts [KELLY 1995] and, second, that the environmental changes between 5400 and 3500 b.p. were anything but insignificant. The lengthy Hypsithermal period of the Early to Middle Holocene was marked by warm and dry conditions. Many interior Plateau landscapes now dominated by forests were typified by steppe-like vegetation [CHATTERS and LEAVELL 1994; MEHRINGER 1985]. Coastal and interior forests began to take their modern form after 5400 b.p. due to increased moisture [HEBDA and MATHEWES 1984; HEUSSER 1985; MANN *et al.* 1998]. Despite increased precipitation, temperatures appear to have remained relatively warm until approximately 3900 b.p. Major drainages such as the Columbia still maintained warm waters and flooded frequently [CHATTERS 1992, 1995; CHATTERS *et al.* 1995; CHATTERS and HOOVER 1992].

Sea levels began to reach their current levels between 4000 and 5000 b.p. in most parts of the coast [CANNON 2000; FEDJE and CHRISTENSEN 1999; FEDJE *et al.* 1996; MANN *et al.* 1998] and archaeological evidence suggests that inshore fisheries and shellfish beds became fully established [IMAMOTO 1976, MATSON 1992; MATSON *et al.* 1991]. However, prior to 4000 b.p. relatively warm water and air temperatures, and frequent riverine flooding and aggradation in many areas would not have favored major expansion of anadromous fish populations.

Long growing seasons and increased precipitation expanded seasonal access to a wide array of terrestrial resources. Access to marine resources also improved due to sea level stability. Subsistence risk and uncertainty were significantly reduced, allowing populations to grow and fission. Group fission under relaxed competition favored exploration of new economic strategies and reorganized inter-group relations. A major consequence of this appears to have been varying degrees of isolation brought about by increased sedentism and expansion on a more permanent basis into areas previously only visited for short periods. Partial isolation and economic opportunity allowed cultural variance between groups to increase [BOYD and RICHERSON 1985].

The subsequent decline in cultural variation came about through two related processes: an

environmental “roll of the dice” [GOULD 1989] and an increase in socially mediated competition. As full Neoglacial conditions emerged just after 4000 b.p., resource access was significantly rearranged. On the Plateau there is a significant increase in conifer pollen and a parallel decrease in fire frequency after 4000 b.p. [MACK *et al.* 1978, 1978a, 1978b; SMITH 1983]. There is also a major increase in cedar and hemlock in southeast Alaska [MANN *et al.* 1998]. River temperatures drop beginning at 3900 b.p. as marked by changes in rates of mollusc shell growth [CHATTERS *et al.* 1995]. Finally, glacial expansion is fully underway after 4000 b.p. [BURKE and BIRKELAND 1983; CHATTERS 1995; DAVIS 1988; MANN *et al.* 1998]. Cave sedimentation rates increased at 4000 b.p., marking a colder regime [THOMPSON 1985]. Colder and more moist climates caused forests to quickly reach maximum extent and density, thereby increasing search times for accessing terrestrial resources. Absolute numbers of anadromous fish increased, although the season in which they were available became significantly shorter [CHATTERS 1995, 1998; CHATTERS *et al.* 1995; MANN *et al.* 1998]. Marine ecosystems as a whole were probably more productive, but also featured greater seasonal and annual variance [MANN *et al.* 1998]. For hunter-gatherers, the yearly cycle in most areas probably shifted from one of low variance in seasonal resource accessibility (pre-4000 b.p.), to high variation (post-4000 b.p.) with a warm season peak and major winter low.

The geologically sudden nature of this intense change selected against some systems, particularly those in the interior that relied on diurnal foraging, little to no storage, and varying degrees of sedentism to support rapidly growing populations. This does not mean that socio-economic systems associated with Pithouse I, the Eayam Phase, and possibly the Lochnore Phase were not well adapted prior to the temperature downturn. Merely, that these systems were most precariously positioned to survive a major ecological shake-up. Some coastal systems may also have been affected by this process as well, since they too are largely gone between 3500 and 3000 b.p.

Increased environmental pressure will always have the effect of “heating up” the economic relations between neighboring groups of people. Thus as the effects of Neoglaciation were increasingly felt by coastal and interior peoples, opportunities for uncontested variance shrank. Direct inter-system competition may have eliminated some systems. For example, as early as 4500 b.p. the Lehman phase foraging pattern vanishes from the Canadian Plateau, possibly swamped by the presence of the new techno-economic tradition, Lochnore [STRYD and ROUSSEAU 1996]. It remains unclear whether the Lochnore system failed like Pithouse I, to be later replaced by Shuswap horizon collectors, evolved into the Shuswap collector system, or was directly outcompeted or culturally swamped by populations bearing the Shuswap collector system. The decline of the various forager systems and subsequent rise of collectors on the Coast appears not to have been separated by any distinct hiatus in occupation of the sort that occurred on the Plateau and even slightly inland on the Coast (i.e. Eayam Phase). This suggests that either older systems were abruptly replaced by expanding collector populations or that some local groups were receptive to dramatically different economic strategies. With reference to the former option, McMillan [1998] argues that although data are somewhat sparse, a north to south population expansion on the west coast of Vancouver Island may have occurred immediately prior to 2000 b.p. Although this date is too late for our period of concern, it does suggest the possibility that population expansions did occur on the Northwest Coast with some

fairly dramatic consequences.

Receptiveness of populations to change of this scale would require relatively specialized conditions. Rising population [CROES and HACKENBERGER 1988] and increasingly constrained resource availability could inspire expanded social competition. Under these conditions, aspiring elites, who were exposed to alternate economic strategies, such as the technology and labor organization required to implement a collector-like system, could be expected to seize the opportunity, particularly if the new system was observed to be successful in neighboring areas. The Gulf of Georgia area could provide an example of this process. If, as Carlson and Hobler [1993] argue, some Charles Culture peoples had already developed some form of a social hierarchy as reflected in the mortuary complexes at Pender Canal as well as Tsawwassen [ARCAS CONSULTING ARCHEOLOGISTS 1991, 1994], but were yet lacking the basic characteristics of a collector system, emergent elites may have maintained power through means other than amassing stored resources, such as through control of foraging space [MATSON 1983, 1985]. Control of territory could be an economically efficient strategy if resources were predictably abundant, but access was spatially and temporally variable [DYSON-HUDSON and SMITH 1978]. Declining economic returns on foraging patches at the Neoglacial temperature downturn could have destabilized social relations. Competitive success at this point may have been dependent on the ability of some to implement strategies that permitted maintenance of surplus subsistence goods during periods of otherwise short supply. If the collector system had emerged to the north, possibly 1000 years earlier, it could not have been entirely unknown to the peoples of the Gulf of Georgia. Some groups probably took the risk, exploring these tactics to gain socio-economic advantage. Success of the new collector-like strategies quickly drove alternative systems to extinction, resulting in declining cultural variance. This is similar to the process envisioned by Carneiro [1970] for the rise of complex societies elsewhere.

We therefore argue that though the collector system arose during the Middle Holocene as only one of many variant hunter-gatherer systems, it was favored by "just history" [GOULD 1989: 323]. The expansion of collector systems after 4000 b.p. came not entirely as a consequence of their greater adaptive efficiency. Prior to 4000 b.p., some other systems were probably equally efficient. Rather, their spread was dependent upon the temperature downturn of the Neoglacial and, in this sense, was a consequence of historical contingency. Without Neoglaciation and its associated ecological effects, perhaps there would have been no "Developed Northwest Coast Pattern" [MATSON and COUPLAND 1995] or interior winter village pattern [CHATTERS 1989, 1995] in the late prehistoric and contact periods. If cultural evolution is indeed a historically contingent process, then we must rethink many of our arguments favoring adaptive efficiency and "progress" as the explanatory *modus operandi*.

CONCLUSION

Much further research will be necessary to better understand the process of cultural evolution in the Pacific Northwest during the Middle Holocene. The tempo and mode of Middle Holocene cultural evolution in the Pacific Northwest appears to have been one of punctuated equilibrium facilitated by differential emergence and success of socio-economic systems. A wide range of systemic entities came about during a time of relaxed selection pressure, as groups

fissioned and successfully explored new forms of mobility, subsistence, and social organization. The ultimately successful variant, the collector system, originating perhaps in the Queen Charlotte Islands and/or possibly on the British Columbia central Coast, was at one time only one of many successful entities. Its survival and expansion after the full onset of Neoglaciation was a historically contingent event. This is an example of cultural diversification and decimation, a pattern that is actually common in many regional sequences, particularly associated with the evolution of major new cultural variants. Diversification and decimation can be recognized at the transition to agriculture in southwest Asia, in the rise and fall of horticultural and hunter-gatherer systems in the late prehistoric Great Plains and Great Basin of North America, and in the transition from Woodland to Mississippian societies in the North American Southeast. As in biology, cultural evolution is clearly a consequence of general processes and historical contingency.

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BIBLIOGRAPHY

ACKERMAN, Robert

1968 *The Archaeology of the Glacier Bay Region, Southeastern Alaska*. Pullman: Washington State University, Laboratory of Archaeology Report of Investigations 44: Pullman.

1992 Earliest stone industries on the North Pacific Coast of North America. *Arctic Anthropology* 29: 18-27.

ACKERMAN, Robert, Kenneth REID, James GALLISON, and Mark ROE

1985 *Archaeology of Heceta Island: A Survey of 16 Timber Harvest Units in the Tongass National Forest, Southeastern Alaska*. Pullman: Washington State University Center for Northwest Anthropology, Report No. 3.

ALEXANDER, Diana

1992 A reconstruction of prehistoric land use in the mid-Fraser River Area based on ethnographic data. In B. Hayden (ed.), *A Complex Culture of the British Columbia Plateau*. Vancouver: University of British Columbia Press. pp. 47-98.

AMES, Kenneth

1981 The evolution of social ranking on the Northwest Coast of North America. *American Antiquity* 46: 789-805.

1983 Towards a general model of the evolution of ranking among foragers. In R. Nash (ed.), *The Evolution of Maritime Cultures on the Northeast and Northwest Coasts of North America*.

- Burnaby: Simon Fraser University Department of Archaeology Publication No. 11. pp. 173-184.
- 1985 Hierarchies, stress and logistical strategies among hunter-gatherers in northwestern North America. In T. D. Price and J. A. Brown (eds.), *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity*. Orlando: Academic Press. pp. 155-180.
- 1994 The northwest coast: complex hunter-gatherers, ecology and social evolution. *Annual Review of Anthropology* 23: 209-229.
- 1995 Chiefly power and household production on the Northwest Coast. In T. D. Price and G. M. Feinman (eds.), *Foundations of Social Inequality*. New York: Plenum Press. pp. 155-188.
- 1998 Economic prehistory of the northern British Columbia coast. *Arctic Anthropology* 35(1): 68-87.
- AMES, Kenneth M. and Herbert D.G. MASCHNER
- 1999 *Peoples of the Northwest Coast: Their Archaeology and History*. London: Thames and Hudson.
- ANDREFSKY, William, Jr.
- 1995 Cascade Phase lithic technology: an example from the Lower Snake River. *North American Archaeologist* 16: 95-115.
- ARCAS CONSULTING ARCHEOLOGISTS, LTD.
- 1983 Bethlehem Copper Corporation Lake Zone Development Mitigation Study. Report on file British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.
- 1985 Excavations at the Rattlesnake Hill Site (EeRh61), Ashcroft, B.C. Report on file British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.
- 1986 Archaeological Excavations at the Valley Mine, Highland Valley, B.C. Report on file British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.
- 1991 Archaeological Investigations at Tsawwassen, B.C., Volume III. Osteology. Report on file British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.
- 1994 Archaeological Investigations at Tsawwassen, B.C., Volume II. Archaeology. Report on file British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.
- ARNOLD, Jeanne E.
- 1993 Labor and the rise of complex hunter-gatherers. *Journal of Anthropological Archaeology* 12: 75-119.
- BAMFORTH, Douglas B.
- 1991 Technological organization and hunter-gatherer land use: a California example. *American Antiquity* 56: 216-234.
- 1997 Adaptive change on the Great Plains at the Paleoindian/Archaic transition. In M. L. Larson and J. E. Francis (eds.), *Changing Perspectives of the Archaic on the Northwestern Plains and Rocky Mountains*. Vermillion: University of South Dakota Press. pp. 14-55.

- BARTON, C. Michael and Geoffrey A. CLARK (eds.)
1997 *Rediscovering Darwin: Evolutionary Theory and Archaeological Explanation*. Archeological Papers of the American Anthropological Association No. 7.
- BAR-YOSEF, Ofer and Richard MEADOW
1995 The origins of agriculture in the Near East. In T. D. Price and A. B. Gebauer (eds.), *Last Hunters-First Farmers*. Santa Fe: School of American Research Press. pp. 39-94.
- BEARDSLEY, Richard K., Betty J. MEGGARS, Preston HOLDER, Alex KREIGER and John B. RINALDO
1956 Functional and evolutionary implications of community patterning. In P. Wauchope (ed.), *Seminars in Archaeology*, Society for American Archaeology Memoir 11. pp. 129-157.
- BINFORD, Lewis R.
1968 Post-Pleistocene adaptation. In S. R. Binford and L. R. Binford (eds.), *New Perspectives in Archaeology*. Chicago: Aldine. pp. 313-341.
1978 *Nunamiut Ethnoarchaeology*. New York: Academic Press.
1980 Willow smoke and dogs' tails: hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* 45(1): 4-20.
1982 The archaeology of place. *Journal of Anthropological Archaeology* 1(1): 5-31.
1990 Mobility, housing, and environment: a comparative study. *Journal of Anthropological Research* 46(2): 119-152.
- BOSERUP, Esther
1965 *The Conditions of Agricultural Growth*. Chicago: Aldine.
- BOYD, Robert and Peter J. RICHERSON
1982 Cultural transmission and the evolution of cooperative behavior. *Human Ecology* 10: 325-351.
1985 *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.
1992 Cultural inheritance and evolutionary ecology. In E. A. Smith and B. Winterhalder (eds.), *Evolutionary Ecology and Human Behavior*. New York: Aldine De Gruyter. pp. 61-94.
- BURKE, R.M. and P.W. BIRKELAND
1983 Holocene glaciation in the Mountain Ranges of the Western United States. In H. E. Wright, Jr. (ed.), *Late Quaternary Environments of the United States, The Holocene*. Minneapolis: The University of Minnesota Press. pp. 3-11.
- BURLEY, David B. and Christopher KNUSEL
1989 Burial patterns and archaeological interpretation: problems in the recognition of ranked society in the Coast Salish Region. In B. Onat (ed.), *Development of Hunting-Fishing-Gathering Maritime Societies Along the West Coast of North America*. Proceedings of the Circum-Pacific Prehistory Conference, Seattle.
- BURLEY, David V.
1980 *Marpole: Anthropological Reconstructions of a Prehistoric Northwest Coast Culture Type*. Burnaby: Department of Archaeology Simon Fraser University, No. 8.
- CANNON, Aubrey
1991 *The Economic Prehistory of Namu*. Burnaby: Archaeology Press.
1995 The rattfish and marine resource deficiencies on the Northwest Coast. *Canadian Journal of Archaeology* 19: 59-60.
1998 Contingency and agency in the growth of Northwest Coast maritime economies. *Arctic*

- Anthropology* 35: 57-67.
- 2000 Settlement and sea levels on the central coast of British Columbia: Evidence from Shell Midden Cores. *American Antiquity* 65: 67-78.
- n.d. Was salmon important in Northwest Coast prehistory? In S. C. Gerlach and M. S. Murray (eds.), *Zooarchaeology in the North, The Festschrift for R. Dale Guthrie*. BAR International Series. (in press)
- CARLSON, Catherine
- 1979 The early component at Bear Cove. *Canadian Journal of Archaeology* 3: 177-194.
- CARLSON, Roy L.
- 1991 Namu periodization and C-14 chronology. Appendix B. In A. Cannon (ed.), *The Economic Prehistory of Namu*. Burnaby: Archaeology Press. pp. 85-95.
- 1998 Coastal British Columbia in the light of North Pacific maritime adaptations. *Arctic Anthropology* 35(1): 23-35.
- CARLSON, Roy L. and Philip M. HOBLER
- 1993 The Pender Canal excavations and the development of Coast Salish culture. *BC Studies* 99: 25-52.
- CARNEIRO, Robert L.
- 1970 A theory of the origin of the state. *Science* 169: 733-738.
- CARSON, H.L.
- 1968 The population flush and its genetic consequences. In R. C. Lewontin (ed.), *Population Biology and Evolution*. Syracuse: Syracuse University Press. pp. 123-137.
- CASHDAN, Elizabeth
- 1980 Egalitarianism among hunters and gatherers. *American Anthropologist* 82: 116-120.
- CASTEEL, Richard
- 1976 Fish remains from Glenrose. In R. G. Matson (ed.), *The Glenrose Cannery Site*. National Museum of Man, Archaeological Survey of Canada, Mercury Series No. 52. pp. 82-87.
- CAVALLI-SFORZA, Luca L. and Marcus W. FELDMAN
- 1981 *Cultural Transmission and Evolution: A Quantitative Approach*. Princeton: Princeton University Press.
- CHATTERS, James C.
- 1987 Hunter-gatherer adaptations and assemblage structure. *Journal of Anthropological Archaeology* 6: 336-375.
- 1989 Resource intensification and sedentism on the southern Plateau. *Archaeology in Washington* 1: 13-19.
- 1992 Freshwater biota as indicators of temperature and flow characteristics of ancient fluvial systems. Paper Presented at the International Union for Quaternary research, Symposium on Continental Paleohydrology, Krakow, Poland.
- 1995 Population growth, climatic cooling, and the development of collector strategies on the southern Plateau, western North America. *Journal of World Prehistory* 9: 341-400.
- 1998 Environment. In D. E. Walker (ed.), *Handbook of North American Indians, Volume 12, Plateau*. Washington: Smithsonian Institution Press. pp. 29-48.
- CHATTERS, James C., Virginia L. BUTLER, M.J. SCOTT, D.M. ANDERSON, and D.A. NEITZEL
- 1995 A paleoscience approach to estimating the effects of climatic warming on salmonid fisheries

- of the Columbia Basin. *Canadian Special Publication in Fisheries and Aquatic Sciences* 21: 489-496.
- CHATTERS, James C. and K.A. HOOVER
 1992 The response of the Columbia River fluvial system to Holocene climatic change. *Quaternary Research* 37: 42-59.
- CHATTERS, J.C. and D. LEAVELL
 1994 Smeads Bench Bog: A 1500-year history of fire and succession in the Hemlock Forest of the Lower Clark Fork Valley, northwestern Montana. Research Report P1, North American Paleoscience, Richland, WA.
- CHATTERS, James C. and David L. POKOTYLO
 1998 Prehistory: introduction. In D. E. Walker (ed.), *Handbook of North American Indians, Volume 12, Plateau*. Washington: Smithsonian Institution Press. pp. 73-80.
- COHEN, Mark Nathan
 1977 *The Food Crisis in Prehistory: Overpopulation and the Origins of Agriculture*. New Haven Conn.: Yale University Press.
 1981 Pacific Coast foragers: affluent or overcrowded? In Shuzo Koyama and David Hurst Thomas (eds.), *Affluent Foragers: Pacific Coasts East and West*. Senri Ethnological Studies 9. pp. 275-295.
- COUPLAND, Gary G.
 1985 Household variability and status differentiation at Kitselas Canyon. *Canadian Journal of Archaeology* 9: 39-56.
 1988 *Prehistoric Cultural Change at Kitselas Canyon*. Canadian Museum of Civilization, Mercury Series, Archaeological Survey of Canada Paper No. 138. Ottawa.
 1998 Maritime adaptation and evolution of the developed Northwest Coast pattern on the Central Northwest Coast. *Arctic Anthropology* 35: 35-56.
- CROES, Dale R. and Steven HACKENBERGER
 1988 Hoko River archaeological complex: modeling prehistoric Northwest Coast economic evolution. In B. L. Isaac (ed.), *Prehistoric Economies of the Pacific Northwest Coast*. Research in Economic Anthropology Supplement 3. Greenwich: JAI Press. pp. 19-85.
- CYBULSKI, Jerome S.
 1991 Observations on labret wear. Appendix 1. In R. G. Matson, H. Pratt and L. Rankin (eds.), 1989 and 1990 Crescent Beach Excavations, Final Report: The Origins of the Northwest Coast Ethnographic Pattern: The Place of the Locarno Beach Phase. Report on file, Archaeology Branch. Victoria, B.C.
- DAVIS, Philip T.
 1988 Holocene glacier fluctuations in the American Cordillera. *Quaternary Science Reviews* 7: 129-157.
- DAVIS, Stanley (ed.)
 1989 *The Hidden Falls Site, Baranof Island, Alaska*. Brockport: Alaska Anthropological Association Monograph Series.
- DEWHIRST, John
 1980 The indigenous archaeology of Yuquot, a Nootkan outside village. In W. J. Folan and J. Dewhirst (eds.), *The Yuquot Project Volume I*. Canada National Historic Parks and Sites

Branch, History and Archaeology 39.

DRAPER, John A.

- 1988 A Proposed Model of Late Prehistoric Settlement Systems on the Southern Northwest Coast, Coos and Curry Counties, Oregon. Ph.D. dissertation, Department of Anthropology, Washington State University: Pullman.

DRUCKER, Phillip

- 1955 *Indians of the Northwest Coast*. New York: The Natural History Press.

DUNNELL, Robert C.

- 1980 Evolutionary theory and archaeology. In M. B. Schiffer (ed.), *Advances in Archaeological Method and Theory*, Vol. 3. New York: Academic Press. pp. 35-99.

DYSON-HUDSON, R. and Eric A. SMITH

- 1978 Human territoriality: an ecological reassessment. *American Anthropologist* 80: 21-41.

EARLE, Timothy K.

- 1997 *How Chiefs Come to Power*. Stanford: Stanford University Press.

ELDREDGE, Niles

- 1985 *Unfinished Synthesis*. New York: Oxford University Press.

- 1989a Punctuated equilibria, rates of change, and large-scale entities in evolutionary systems. In A. Somit and S. A. Peterson (eds.), *The Dynamics of Evolution*. Ithaca: Cornell University Press. pp. 103-120.

- 1989b *Macroevolutionary Dynamics*. New York: McGraw Hill Publishing Company.

ELDREDGE, Niles and Stephen J. GOULD

- 1972 Punctuated equilibria: an alternative to phyletic gradualism. In T. J. M. Schopf (ed.), *Models in Paleobiology*. San Francisco: Freeman, Cooper, and Co. pp. 82-115.

ELDREDGE, Niles and Joel CRACRAFT

- 1980 *Phylogenetic Patterns and the Evolutionary Process*. New York: Columbia University Press.

ELDREDGE, Niles and Stanley SALTHER

- 1984 Hierarchy and evolution. In R. Dawkins and M. Ridley (eds.), *Oxford Surveys in Evolutionary Biology, Volume 1*. Oxford: Oxford University Press. pp. 184-206.

FEDJE, Daryl W. and Tina CHRISTENSEN

- 1999 Modelling paleoshorelines and locating Early Holocene coastal sites in Haida Gwaii. *American Antiquity* 64: 635-652.

FEDJE, Daryl W., A.P. MACKIE, J.B. McSPORRAN and B. WILSON

- 1996 Early period archaeology in Gwaii Haanas: results of the 1993 field program. In R. L. Carlson and L. D. Bona (eds.), *Early Human Occupation in British Columbia*. Vancouver: University of British Columbia Press. pp. 133-150.

FLADMARK, Knut R.

- 1975 *A Paleoeological Model for Northwest Coast Prehistory*. National Museum of Man, Mercury Series, Archaeological Survey of Canada Paper No. 43. Ottawa.

FLADMARK, Knut R., Kenneth AMES and Patricia SUTHERLAND

- 1990 Prehistory of the northern coast of British Columbia. In W. Suttles (ed.), *Handbook of North American Indians, Volume 7: Northwest Coast*. Washington: Smithsonian Institution. pp. 229-239.

- FLANNERY, Kent V.
1986 *Guila Naquitz*. Orlando: Academic Press.
- FOLAN, William J. and John DEWHIRST (eds.)
1980 *The Yuquot Project, Volume 2*. National Historic Parks and Sites Branch, Parks Canada, History and Archaeology 43.
- GHISELIN, Michael T.
1974 A radical solution to the species problem. *Systematic Zoology* 23: 536-544.
- GOULD, Stephen J.
1982 Darwinism and the expansion of evolutionary theory. *Science* 216: 380-387.
1989 *Wonderful Life*. New York: W.W. Norton and Company.
- GOULD, Stephen J. and Niles ELDRIDGE
1986 Punctuated equilibrium at the third stage. *Systematic Zoology* 35: 143-148.
- HARRIS, Marvin
1999 *Theories of Culture in Postmodern Times*. Walnut Creek: Altamira Press.
- HAYDEN, Brian
1981 Research and development in the Stone Age: technological transitions among hunter-gatherers. *Current Anthropology* 22: 519-548.
1990 Nimrods, piscators, pluckers, and planters: the emergence of food production. *Journal of Anthropological Archaeology* 9: 31-69.
1992 Introduction: ecology and culture. In B. Hayden (ed.), *A Complex Culture of the British Columbia Plateau*. Vancouver: University of British Columbia Press. pp. 3-46.
1995 Pathways to power: principles for creating socioeconomic inequalities. In T. D. Price and G. M. Feinman (eds.), *Foundations of Social Inequality*. New York: Plenum Press. pp. 15-78.
- HAYDEN, Brian and Audrey CANNON
1982 The corporate group as an archaeological unit. *Journal of Anthropological Archaeology* 1: 132-158.
- HAYDEN, Brian, Morley ELDRIDGE, and Ann ELDRIDGE
1985 Complex hunter-gatherers in interior British Columbia. In T. D. Price and J. A. Brown (eds.), *Prehistoric Hunter-Gatherers*. New York: Academic Press. pp. 181-199.
- HEBDA, Richard and Rolf MATHEWES
1984 Holocene history of Cedar and Native Indian Cultures of the North American Pacific Coast. *Science* 225: 711-713.
- HEUSSER, Calvin J.
1985 Quaternary pollen records from the Pacific Northwest Coast: Aleutians to the Oregon California boundary. In V. M. Bryant and R. G. Holloway (eds.), *Pollen Records of Late Quaternary Sediments*. AASP Foundation. pp. 167-189.
- HITCHCOCK, Robert K. and James I. EBERT
1984 Foraging and food production among Kalahari hunter/gatherers. In J. D. Clark and S. A. Brandt (eds.), *From Hunters to Farmers*. Berkeley: University of California Press. pp. 328-348.
- HULL, David L.
1976 Are species really individuals? *Systematic Zoology* 25: 174-191.

IMAMOTO, Shirley

- 1976 Analysis of the Glenrose faunal remains. In R. G. Matson (ed.), *The Glenrose Cannery Site*. National Museum of Man, Archaeological Survey of Canada, Mercury Series No. 52. pp. 21-41. Ottawa.

JOCHIM, Michael A., Cynthia HERHAHN, and Harry STARR

- 1999 The Magdalenian colonization of southern Germany. *American Anthropologist* 101(1): 129-142.

KELLY, Robert L.

- 1983 Hunter-gatherer mobility strategies. *Journal of Anthropological Research* 39: 277-306.
 1992 Mobility/sedentism: concepts, archaeological measures, and effects. *Annual Review of Anthropology* 21: 43-66.
 1995 *The Foraging Spectrum*. Washington D.C.: Smithsonian Institution Press.

KELLY, Robert L. and Lawrence C. TODD

- 1988 Coming into the country: early Paleoindian hunting and mobility. *American Antiquity* 53: 231-244.

KUJT, Ian

- 1989 Subsistence resource variability and culture change during the Middle-Late Prehistoric cultural transition on the Canadian Plateau. *Canadian Journal of Archaeology* 13: 97-118.

LIGHTFOOT, Kent G.

- 1993 Long-term developments in complex hunter-gatherer societies: recent perspectives from the Pacific Coast of North America. *Journal of Anthropological Research* 1(3): 167-201.

LIGHTFOOT, Ricky R.

- 1989 Cultural Component II. In S. Davis (ed.), *The Hidden Falls Site, Baranoff Island, Alaska*. Brockport: Alaska Anthropological Association Monograph Series. pp. 199-273.

LOHSE, Ernest and Dorothy SAMMONS-LOHSE

- 1986 Sedentism on the Columbia Plateau: a matter of degree related to the easy and efficient procurement of resources. *Northwest Anthropological Research Notes* 20(2): 115-136.

LYMAN, Lee R. and Ann C. BENNETT

- 1991 Discussion (Archaeology of Whale Cove). In R. L. Lyman (ed.), *Prehistory of the Oregon Coast: The Effects of Excavation Strategies and Assemblage Size on Archaeological Inquiry*. San Diego: Academic Press. pp. 276-277.

LYMAN, Lee R. and Michael J. O'BRIEN

- 1998 The goals of evolutionary archaeology: History and Explanation. *Current Anthropology* 39: 615-652.

MACDONALD, George and Richard INGLIS

- 1981 An overview of the North Coast Prehistory Project. *BC Studies* 48: 37-63.

MACFADDEN, B.J. and R. HULBERT, Jr.

- 1988 Explosive speciation at the base of the adaptive radiation of Miocene grazing horses. *Nature* 336: 466-468.

MACK, R.N., V.M. BRYANT, and S. VALASTRO

- 1978 Late Quaternary pollen record from Big Meadow, Pend Oreille County, Washington. *Ecology* 59: 956-966.

MACK, R.N., N.W. RUTTER, and S. VALASTRO

1978a Late Quaternary pollen records from the Sanpoil River Valley, Washington. *Canadian Journal of Botany* 56: 1642-1650.

MACK, R.N., N.W. RUTTER, S. VALASTRO, and V.M. BRYANT

1978b Late Quaternary vegetation history at Waits Lake, Colville River Valley, Washington. *Botanical Gazette* 139: 499-506.

MANN, Daniel H., Aron L. CROWELL, Thomas D. HAMILTON, and Bruce P. FINNEY

1998 Holocene geologic and climatic history around the Gulf of Alaska. *Arctic Anthropology* 35(1): 112-131.

MARKS, J. and E. STASKI

1988 Individuals and the evolution of biological and cultural systems. *Human Evolution* 3: 147-161.

MASCHNER, Herbert D.G.

1991 The emergence of cultural complexity on the Northern Northwest Coast. *Antiquity* 65: 924-934.

1992 The Origins of Hunter-Gatherer Sedentism and Political Complexity: A Case Study from the Northern Northwest Coast. Ph.D. dissertation. University of California, Santa Barbara.

MASCHNER, Herbert D.G. and John Q. PATTON

1996 Kin selection and the origins of hereditary social inequality: a case study from the northern Northwest Coast. In H. D. G. Maschner (ed.), *Darwinian Archaeologies*. New York: Plenum Press. pp. 89-108.

MASCHNER, Herbert D.G. and Katherine L. REEDY-MASCHNER

1998 Raid, retreat, defend (repeat): the archaeology and ethnohistory of warfare on the North Pacific Rim. *Journal of Anthropological Archaeology* 17: 19-51.

MASON, A.

1994 The Hatzick Rock Site: A Charles Culture Settlement. Unpublished M.A. Thesis. Department of Anthropology and Sociology, University of British Columbia,

MASON, Owen K.

1998 The contest between the Ipiutak, Old Bering Sea, and Birnirk polities and the origin of whaling during the first millenium A.D. along Bering Strait. *Journal of Anthropological Archaeology* 17: 240-325.

MATSON, R.G.

1976 *The Glenrose Cannery Site*. National Museum of Man, Mercury Series, Archaeological Survey of Canada, No. 52. Ottawa.

1983 Intensification and the development of cultural complexity: the Northwest versus Northeast Coast. In R. Nash (ed.), *The Evolution of Maritime Cultures on the Northeast and Northwest Coasts*. Burnaby: Simon Fraser University Department of Archaeology Publication No. 11. pp. 125-148.

1985 The relationship between sedentism and status inequalities among hunter-gatherers. In M. Thompson, M. T. Garcia, and F. J. Kense (eds.), *Status, Structure and Stratification: Current Archaeological Reconstructions*. Calgary: Archaeological Association of the University of Calgary. pp. 245-252.

1989 The Locarno Beach Phase and the origins of the Northwest Coast Pattern. In B. Onat (ed.),

- Development of Hunting-Fishing-Gathering Maritime Societies along the West Coast of North America (Reprint Proceedings Vol. IIIC)*. The Circum Pacific Prehistory Conference. Seattle, Washington. pp. 1-43.
- 1992 The evolution of Northwest Coast subsistence. In D. Croes, R. Hawkins, and B. L. Isaac (eds.), *Research in Economic Anthropology, Supplement 6, Long Term Subsistence Change in North America*. Greenwich: JAI Press. pp. 367-428.
- 1996 The Old Cordilleran Component at the Glenrose Cannery site. In R. L. Carlson and L. D. Bona (eds.), *Early Human Occupation in British Columbia*. Vancouver: University of British Columbia Press. pp. 111-122.
- MATSON, R.G. , Heather PRATT, and Lisa RANKIN
- 1991 1989 and 1990 Crescent Beach Excavations, Final Report: The Origins of the Northwest Coast Ethnographic Pattern: The Place of the Locarno Beach Phase. Report on file British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.
- MATSON, R.G. and Gary COUPLAND
- 1995 *The Prehistory of the Northwest Coast*. San Diego: Academic Press.
- MAYR, Ernst
- 1988 *Toward a New Philosophy of Biology*. Cambridge: Harvard University Press.
- McMILLAN, Alan D.
- 1998 Changing views of Nuu-Chah-Nulth culture history: evidence of population replacement in Barkley Sound. *Canadian Journal of Archaeology* 22: 5-18.
- MEHRINGER, Peter J.
- 1985 Late Quaternary pollen records from the Interior Pacific Northwest and Northern Great Basin of the United States. In V.A. Bryant Jr. and R.G. Holloway (eds.), *Pollen Records of late Quaternary North American Sediments*. AASP Foundation. pp. 167-189.
- MITCHELL, Donald H.
- 1988 Changing patterns of resource use in the Queen Charlotte Strait, British Columbia. In B. L. Isaac (ed.), *Prehistoric Economies of the Northwest Coast*. Greenwich: JAI Press. pp. 245-290.
- 1990 Prehistory of the coasts of southern British Columbia and northern Washington. In W. Suttles (ed.), *Handbook of North American Indians, Volume 7: Northwest Coast*. Washington: Smithsonian Institution. pp. 340-358.
- MONKS, Gregory
- 1987 Prey as bait: the Deep Bay example. *Canadian Journal of Archaeology* 11: 119-142.
- MOSS, Madonna L.
- 1998 Northern Northwest Coast regional overview. *Arctic Anthropology* 35: 88-111.
- MOSS, Madonna L. and Jon M. ERLANDSON
- 1995 Reflections on North American Pacific Coast prehistory. *Journal of World Prehistory* 9(1): 1-45.
- MOSS, Madonna L., Jon ERLANDSON, and Richard STUCKENRATH
- 1990 Wood stake weirs and salmon fishing on the Northwest Coast: evidence from Southeast Alaska. *Canadian Journal of Archaeology* 14: 143-158.
- O'BRIEN, Michael J. and Thomas D. HOLLAND
- 1990 Variation, selection, and the archaeological record. *Archaeological Method and Theory* 2:

31-79.

POKOTYLO, David L. and Donald MITCHELL

- 1989 Prehistory of the Northern Plateau. In D. E. Walker (ed.), *Handbook of North American Indians, Volume 12, Plateau*. Washington: Smithsonian Institution Press. pp. 81-102.

PRATT, Heather

- 1992 The Charles Culture of the Gulf of Georgia: A Reevaluation of the Charles Culture and its Three Phases. M.A. Thesis. Department of Sociology and Anthropology, University of British Columbia: Vancouver.

PRENTISS, William C. and James C. CHATTERS

- 2003 Cultural diversification and decimation in the prehistoric record. *Current Anthropology* 44. (In press)

RICHARDS, Thomas H.

- 1978 Excavations at EeR1171. Report on File, Resource Management Branch. Victoria.

ROSENBERG, Michael

- 1994 Pattern, process, and hierarchy in the evolution of culture. *Journal of Anthropological Archaeology* 13: 307-340.
- 1998 Comment on "The goals of evolutionary archaeology; history and explanation" by R.L. Lyman and M.J. O'Brien. *Current Anthropology* 39: 639-640.

RICHARDS, T.H. and M.K. ROUSSEAU

- 1987 *Late Prehistoric Cultural Horizons on the Canadian Plateau*. Department of Archaeology, Simon Fraser University Publication Number 16.

SANGER, David

- 1969 Cultural traditions in the Interior of British Columbia. *Syesis* 2: 189-200.
- 1970 The archaeology of the Lochnore-Nesikep Locality, British Columbia. *Syesis* 3(Supplement 1): 1-146.

SCHAEPE, D.

- 1998 Household interpretations from a 4,700-year-old Plankhouse in the Upper Fraser Valley, B.C. Paper presented at the 63rd Annual Meeting of the Society for American Archaeology.

SCHALK, Randall F.

- 1981 Land use and organizational complexity among foragers of northwestern North America. In Shuzo Koyama and David Hurst Thomas (eds.), *Affluent Foragers: Pacific Coasts East and West*. Senri Ethnological Studies 9. pp. 53-75.

SCHIFFER, Michael B.

- 1996 Some relationships between behavioral and evolutionary archaeologies. *American Antiquity* 61: 643-662.

SCHNIRELMAN, Victor A.

- 1992 Crises and economic dynamics in traditional societies. *Journal of Anthropological Archaeology* 11: 25-46.

SHOTT, Michael

- 1986 Technological organization and settlement mobility: an ethnographic examination. *Journal of Anthropological Research* 42: 1-15.

SMITH, C. S.

- 1983 A 4300-Year History of Vegetation, Climate and Fire from Blue Lake, Nez Perce County,

Idaho. M.A. thesis. Washington State University, Pullman.

SPENCER, Charles S.

1997 Evolutionary approaches in archaeology. *Journal of Anthropological Research* 5: 209-264.

STANLEY, Steven

1975 A theory of evolution above the species level. *Proceedings of the National Academy of Science* 72: 646-650.

1979 *Macroevolution*. First Edition. Baltimore: The Johns Hopkins University Press.

1992 An Ecological theory for the origin of Homo. *Paleobiology* 18: 237-257.

1998 *Macroevolution*. Second Edition. Baltimore: The Johns Hopkins University Press.

STRYD, Arnoud R. and Michael K. ROUSSEAU

1996 The early prehistory of the Mid Fraser-Thompson River area. In R. L. Carlson and L. D. Bona (eds.), *Early Human Occupation in British Columbia*. Vancouver: University of British Columbia Press. pp. 177-204.

TAINTER, Joseph A.

1988 *The Collapse of Complex Societies*. Cambridge: University of Cambridge Press.

THOMPSON, R.S.

1985 *Paleoenvironmental Investigations at Seed Cave (Windust Cave H-45FR46), Franklin County, Washington*. Eastern Washington University. Reports in Archaeology and History No. 100-41. Cheney, WA.

TORRENCE, Robin

1983 Time budgeting and hunter-gatherer technology. In G. Bailey (ed.), *Hunter-Gatherer Economy in Prehistory*. Cambridge: Cambridge University Press. pp. 11-22.

VRBA, Elizabeth S. and Stephen J. GOULD

1986 The hierarchical expansion of sorting and selection: sorting and selection cannot be equated. *Paleobiology* 12: 217-228.

WILSON I.R. CONSULTANTS, LTD.

1992 Excavations at the Baker Site EdQx 43, Monte Creek. Report on file, British Columbia Ministry of Small Business, Culture and Tourism, Archaeology Branch. Victoria.

WOODBURN, James

1982 Egalitarian societies. *Man* 17: 431-451.