

MODELS OF COASTAL ADAPTATION: THE NORTHWEST COAST  
AND MARITIMES

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INTRODUCTION

Modelling the character of regional hunter/gatherer patterns of resource exploitation and settlement distributions represents an important area of research in contemporary archaeology (cf. Butzer 1971; Binford 1964; Struever 1971; Parsons 1972; Jochim 1976, 1979a; Rice 1975; Roper 1979; Winters 1969; Yellen 1977). Identifying variability in patterns of scheduling behaviors (Binford 1978; Lee 1968; Thompson 1939), changes in group organization (Thomas 1972; Steward 1938), and the character of resource exploitation (Cleland 1966, 1976; Dunnell 1972) are seen as critical in understanding the nature of specific prehistoric adaptations. The resulting knowledge, besides facilitating comparative studies in prehistoric human ecology, may also substantially contribute to larger issues within archaeology, anthropology, and sociobiology. Archaeologists can contribute data, representing long time spans from a variety of extant and extinct environments, to research questions concerning the correlations between cultural forms and environmental characteristics, the nature of cultural change, and the adaptive significance of culture.

It is within this general perspective that I have developed a regional settlement-subsistence model to facilitate comparisons between aboriginal coastal adaptations along the Northwest Coast and in the Maritimes. It will also hopefully contribute both to our

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understanding of Canada's prehistory and aid in developing a more general understanding of and appreciation for the complexity of hunter/gatherer coastal ecology.

In constructing regional settlement-subsistence models two contrastive approaches may be employed. First, the archaeological record for specific coasts can be reviewed and attempts to identify specific adaptations can be made for each area for particular time periods. This approach has several disadvantages besides the major time/research expenditures that are involved. It necessitates the creation of a series of detailed and systemic models that would attend the interaction of specific environments and settlement-subsistence adaptations. Typically, this kind of approach requires both detailed knowledge about the precise relationships between a given set of environmental and cultural variables along with specific knowledge about the structure of the relevant paleoenvironments. The success of this kind of approach is heavily dependent upon making inferences about the specific composition, structure, and significance of both the cultural and environmental variables, besides placing a critical reliance upon the ability to make detailed palaeoenvironmental and subsistence resource reconstructions (cf. Butzer 1971; Davis 1963; Grayson 1973, 1978, 1979). Further, because of the detailed information requirements, this kind of strategy almost always requires concentration upon one or a few locations to be examined in great detail, making it difficult to distinguish purely local events and conditions from more general and important relationships until a large number of such studies have been completed.

An alternative strategy, and the one that is employed in this paper, is to construct a more general model by drawing upon principles in the ecological and anthropological literature and relying upon repetitive patterns in the archaeological record for larger areas to identify critical differences in the character of settlement-subsistence adaptations across space and through time. If such a model is conceived in terms of documenting a number of relatively easily measured parameters of the coastal archaeological record that are sufficient to differentiate between different forms of adaptation and allow correlation with broad environmental parameters, the likelihood of obtaining definitive conclusions about the general character of prehistoric settlement-subsistence adaptations on the Northwest Coast and in the Maritimes is enhanced.

While these two strategies are competitive, they are also complementary. Ultimately, detailed, systemic, functional studies will have to be conducted to allow the specifics of particular coastal adaptations to be identified and their relationships to

particular resource and palaeoecological configurations assessed; however, if a more general approach is taken initially, far more informed decisions can be made about where future detailed studies should be undertaken and specific objectives for testing can be clearly defined once the general structure has been identified. In the final analysis, the choice of a more general model is simply a matter of taking the most cost and information effective approach first and then using the information resulting from that research to guide subsequent detailed field investigations (Binford 1968b; Redman 1973). This situation is particularly relevant to the Northwest Coast and the Maritimes where there is still much basic research to be done.

#### THE VARIABLES

In creating a general model of aboriginal adaptation for the Northwest Coast and the Maritimes there are several variables that must be investigated and their inter-relationships discussed. The rationale for the selection of these variables is grounded in both ecological and anthropological theory. These variables also have direct entailments in the archaeological record that make clear determinations possible. Additionally, these entailments are not so subtle as to preclude identification with the types of data available for use in this paper: published archaeological site and regional reports.

There are two variables of the settlement system that are important in assessing how populations occupy an environment. The first critical variable of the settlement system is the scheduling behavior of the population. The scheduling behavior represents how a population is distributed across a landscape during the course of the annual cycle. An assessment of the state of this variable is important because it indicates the duration of utilization for particular locales and environments. The scheduling behavior reflects whether the population resides in the same place during the entire yearly cycle without regard to seasonal changes in the environment (termed Sedentary) or whether there is cyclical relocation of populations to differing locales during the course of the annual cycle (termed Mobile) (cf. Winters 1969; Parsons 1972; Lee 1968; Yellen 1977). To be sure, there is substantial variability subsumed by this definition of Mobility, but the distinction recognizes a major structural difference between all Mobile forms versus a Sedentary adaptation. It is assumed that a Sedentary strategy, others things being equal, maximizes cost/benefits to a population by allowing the full-time exploitation of a territory besides reducing relocation costs and enhancing

potential reproductive success (Binford 1968b; Brown and Orians 1970; Fretwell 1972; Emlen 1966; MacArthur and Pianka 1966; Moseley 1975). On the other hand, the archaeological record quite clearly indicates that sedentary settlements are the exception rather than the rule until relatively late when they are associated with a particular kind of subsistence practice: agriculture. All other things are not always equal. A basic assumption behind approaches like site-catchment analysis (Jarman, Vita-Finzi and Higgs 1972; Higgs and Vita-Finzi 1972; Roper 1979), and an assumption that is well founded in human anatomy, is that only a limited amount of space can be exploited from a single location. Mobility during the course of the year can increase the exploitable space although it does so at the expense of continual occupation of a given territory (Jochim 1976; Yellen 1977). Mobility as a strategy is also important as it interacts with changing seasonal resource availability. Seasonal changes affecting the occurrence, distribution, and productivity of subsistence resources can radically alter resource potentials available to populations in given areas. Changes in the productivity of particular resources and their locations during the course of the year may require population relocation for effective exploitation (Binford 1978, 1980; Schalk 1977; Winters 1969; Yellen 1977).

The second variable of the settlement system is the nature of the group structure. This variable reflects the degree to which the effective economic unit is also the cohesive residential unit (cf. Coe and Flannery 1964; Flannery 1976; Parsons 1972; Rice 1975). An assessment of the state of this variable is important because it indicates the nature of population distributions across a landscape and the density of occupations for differing environments. For the character of the group structure, two forms can be discriminated: nucleated and dispersed. For the nucleated form, the community is identical with the discrete settlement. For the dispersed form, the economic unit encompasses several distinct settlements distributed across a landscape at a given point in time.

The occurrence of particular forms of the group structure relates to environmental conditions in an important manner. The spatial distribution of exploitable resources can be important in understanding the nature of group structure. Where resources are of a low density and are randomly or uniformly distributed across an environment, dispersion of the population may be necessary for their effective procurement (cf. MacArthur and Pianka 1966; Harpending and Davis 1977; Pianka 1978). Dispersing the consumer population increases the search area covered per time expended thus increasing potential prey/resource contact (Schoener 1971; Harpending and Davis 1977; Pianka 1978). Conversely, when resources are of a high

density, tightly clustered and/or seasonally limited, nucleation of the consumer population may be required for effective acquisition and processing (Binford 1978; Schalk 1977; Thomas 1972).

The form of the group structure that is manifest in the settlement pattern data is also critical because it bears directly upon the relationship between the cultural system and the representation it leaves in the archaeological record. Different densities of populations and their variable distributions across an environment will produce different amounts and distributions of debris and hence produce different thresholds of archaeological visibility. Nucleation can produce relatively large, dense sites (Moseley 1975) while dispersion of the population into smaller units can produce diffuse distributions of archaeological materials across a landscape (Thomas 1972).

The differing states of these two settlement variables can interact in complex ways within a functioning adaptation. While individually, either dispersion or mobility can increase the total amount of exploitable space; taken in conjunction, a mobile strategy can further vary the space exploited at any given point in the seasonal cycle by population dispersion. Both dispersion and nucleation of the population at different times during the yearly cycle may be an important mechanism for regulating local population densities in relation to seasonal resource abundance and distributional changes (Lee 1968; Steward 1938; Thomas 1972). In a similar fashion, the mobility of special segments of a population may be incorporated into an adaptation that is essentially sedentary. For all cultures, the subsistence and raw material resources required for system survival and continuity are not found within the boundaries of the settlement. The temporary detachment of special labor forces appropriately partitioned by function is more efficient in the specialized short-term procurement of specific resources than moving the entire population between resource locales (Binford 1980; Jochim 1976). As can be envisioned, different combinations of the states of the group structure and the scheduling structure can entail very different requirements for space, resource distributions, and social interactions.

A consideration of the interaction of these two settlement variables introduces the matter of subsistence as critical in determining whether or not a particular kind of settlement adaptation is competitive or not at a particular time and place.

Subsistence activities are often simply detailed in terms of the presence/absence or relative abundance of recovered fauna (c.f. Willey 1949). As an alternative to this approach, subsistence systems can be conceived in terms of the organizational structure

and diversity of resources exploited apart from a listing of the specific resources. Cleland (1966, 1976) in developing his "focal-diffuse" model emphasized an evaluation of the diversity of resources exploited by a population during the course of the entire annual cycle. He noted his model may be conceived as a continuum in which two types of adaptations are polar opposites.

At one end, "focal" adaptations, alternatively termed "specialized" (Pianka 1978; MacArthur 1965) or "intensive" (Dunnell 1972; Whitlam 1980b) are based upon the exploitation of a single resource or a set of closely related resources that can be exploited and processed in a similar manner (Cleland 1966, 1976; Rice 1975). While intensive strategies may be based upon either naturally occurring resources (cf. Frison 1978) or domesticates (cf. Flannery 1973), all intensive adaptations, because of their reliance upon a restricted set of resources, require a high degree of reliability in the availability, abundance, and distribution of the exploited resource.

Conversely, "diffuse" adaptations, often termed "generalized" (Pianka 1978; MacArthur 1965) or "extensive" (Dunnell 1972; Whitlam 1980b) exploit a wide array of different kinds of resources. An extensive strategy is organized around the careful scheduling of exploitation timed to resource availability. The key to an extensive adaptation is the shifting resource base in time and space during the yearly cycle. Supporting a population with an extensive adaptation not only requires the careful scheduling of resource procurement keyed to natural availability, but also the ability to substitute alternative resources should a given resource be temporarily unavailable (Cleland 1976). The ability to substitute alternative resources and subsistence tactics also distinguishes extensive from intensive adaptations in an important respect. Because intensive adaptations rely upon a single or a few highly productive resources, alternatives, both in terms of subsistence resources and procurement tactics, may not be readily available (Cleland 1966, 1976; Pianka 1978).

There are both ecological and cultural factors to consider in assessing the potential occurrence and adaptive significance of these two kinds of subsistence strategies. Ecological theory on optimal foraging tactics relates extensive adaptations with decreasing resource abundance (Emlen 1966, 1968; MacArthur and Pianka 1966; Schoener 1971; Pianka 1978). For environments with a low abundance of resources, consumers cannot afford to bypass food items because search time is long and expectations of potential prey encounter is low; therefore, an extensive strategy emphasizing the exploitation of a variety of different resources is more competitive

since it will maximize resource return per unit time expended (Schoener 1971). Conversely, for environments with an abundance of resources, search time is low since consumers encounter numerous potential prey. Under these conditions, inferior resources can be bypassed since the expectations of encountering a superior prey item in the near future is high; thus food rich environments favor selective foraging and specialization in resource procurement over time (MacArthur and Pianka 1966; Pianka 1978; Schoener 1971; Brown 1964; Davies 1976).

There are, however, complex relationships between resource diversity, availability, spatial distributions, productivity, and a culture's technology to consider in assessing the potential occurrence of each of these subsistence adaptations. In environments where resource diversity is low, individual resource populations can be immense and highly productive, effectively creating a food dense environment of a single exploitable species. This factor, coupled with a subsistence technology that can efficiently procure and store the resource, would favor the occurrence of an intensive strategy (cf. Pianka 1978; Frison 1978; Dunnell 1972; Rice 1975). In contrast, for environments where resource diversity is high, but individual resource populations are small, unpredictable in occurrence, and mixed in distribution, and when a consumer population lacks efficient procurement and storage technologies, an extensive strategy that can exploit all available resources would be favored (MacArthur and Levins 1964, 1967; Pianka 1978; Caldwell 1958; Cleland 1966, 1976; Dunnell 1972).

The nature of diachronic change for these two kinds of adaptations differs substantially. Because extensive strategies can readily substitute alternative resources, they can, through time, diversify or "adaptively radiate" and incorporate more and more different kinds of resources into their diverse resource base (Pianka 1978; MacArthur and Pianka 1966; Dunnell 1972; Caldwell 1958; Rice 1975). Additionally, extensive strategies also have the potential for changing into intensive strategies under certain conditions. Under conditions of diverse resource exploitation, where consumer contact with prey resources is high, selective utilization on the part of the consumer in bypassing inferior for superior resources favors the development of specialization in resource acquisition and the development of intensive strategies through time (MacArthur and Levins 1964; MacArthur, MacArthur and Preer 1962; Dunnell 1972; Cleland 1966, 1976; Rice 1975). Intensive strategies, because of their restricted resource focus, lack the variability to readily substitute alternative resources and procurement strategies and tend to remain specialized. Through time, increased resource return is accomplished by increasing

efficiency in resource procurement, increasing resource productivity, or increasing storage and redistribution facilities (Frison 1978; Cleland 1966, 1976; Schalk 1977). In short, extensive adaptations may remain extensive or they can change into intensive adaptations through time; intensive adaptations remain intensive.

#### THE MODEL

The interaction of these differing variables states produces a number of different kinds of functioning systemic adaptations. However, in developing a general model applicable to both the Northwest Coast and the Maritimes let me discuss one kind of adaptation I will call the MNE type of adaptation. MNE stands for *Mobile/Nucleated/Extensive*, characteristics that distinguish this form of adaptation. Figure 1 illustrates the structure of this kind of adaptation and its potential relationship to resource seasonality and abundance changes in a schematic fashion. There are several points that deserve mention regarding this model. First, the mobile structure of the adaptation produces a situation where settlements and populations shift to different environments or microenvironments as resources change in seasonal availability or abundance. Secondly, the group structure can also change during the course of the annual cycle. The dispersion of the population into smaller units, the short-term detachment of specialized labor groups, and the movement of individuals across the landscape may all be effective mechanisms for increasing consumer/prey contact, for obtaining specialized raw materials, and for regulating local population densities in relation to resource spatial distributional and productivity shifts. Thirdly, the extensive nature of the subsistence orientation is reflected in the diversity of environments, microenvironments, and resources that are exploited.

The complexity of this kind of adaptation has a number of critical implications for the structure of the archaeological record and our perception of it. Most importantly, the mobile character of this kind of adaptation produces a situation where the complete adaptation is only represented on a regional level. No single site or environment will portray the entire systemic adaptation.

Changes in group structure will produce a situation where sites can vary greatly in size, density, duration of occupation, and ultimately archaeological visibility. The extensive character of the subsistence orientation assures us that sites will vary in the kinds and quantities of the flora and fauna exploited, along with the functional tools and facilities that are required for their procurement, processing, and potential storage. All these factors



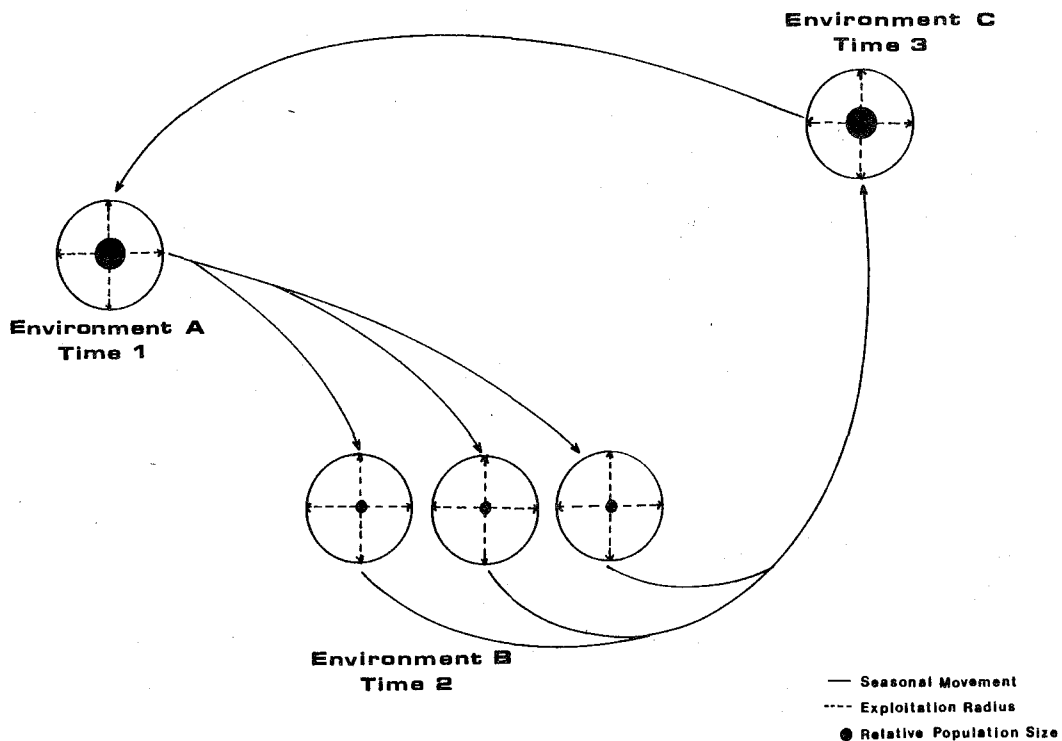


Figure 1. General model of a MNE adaptation

interact to produce a complex and heterogeneous pattern in the archaeological record on a regional level.

The character of diachronic change can be modelled in one of two general fashions. First, given the nature of a MNE adaptation with its extensive subsistence orientation, it can adaptively radiate or diversify over time. More and more different kinds of resources and environments may be incorporated into an increasingly complex, seasonally defined, and territorially differentiated exploitative pattern (Figure 2). Alternatively, it is also possible that, over time, specialization may occur. Given a resource and environment that is highly productive, reliable, and one that can support the subsistence requirements of the population through the entire cycle, an intensive adaptation can develop (Figure 2). Selective pressures may favor the concentration of a population's time and energy upon the exploitation of that resource/environment at the expense of other resources/environments.

Differences in resource productivity, and reliability along with potential scheduling conflicts, differences in transportation costs, risk minimization, capital investment costs in subsistence technologies, and cultural values may all interact to produce a situation where one or a set of closely related resources will become the focus of an intensive adaptation (Pianka 1978; Cleland 1966, 1976; Earle and Christenson 1980; Binford 1978, 1980; Jones 1976, 1977, 1978).

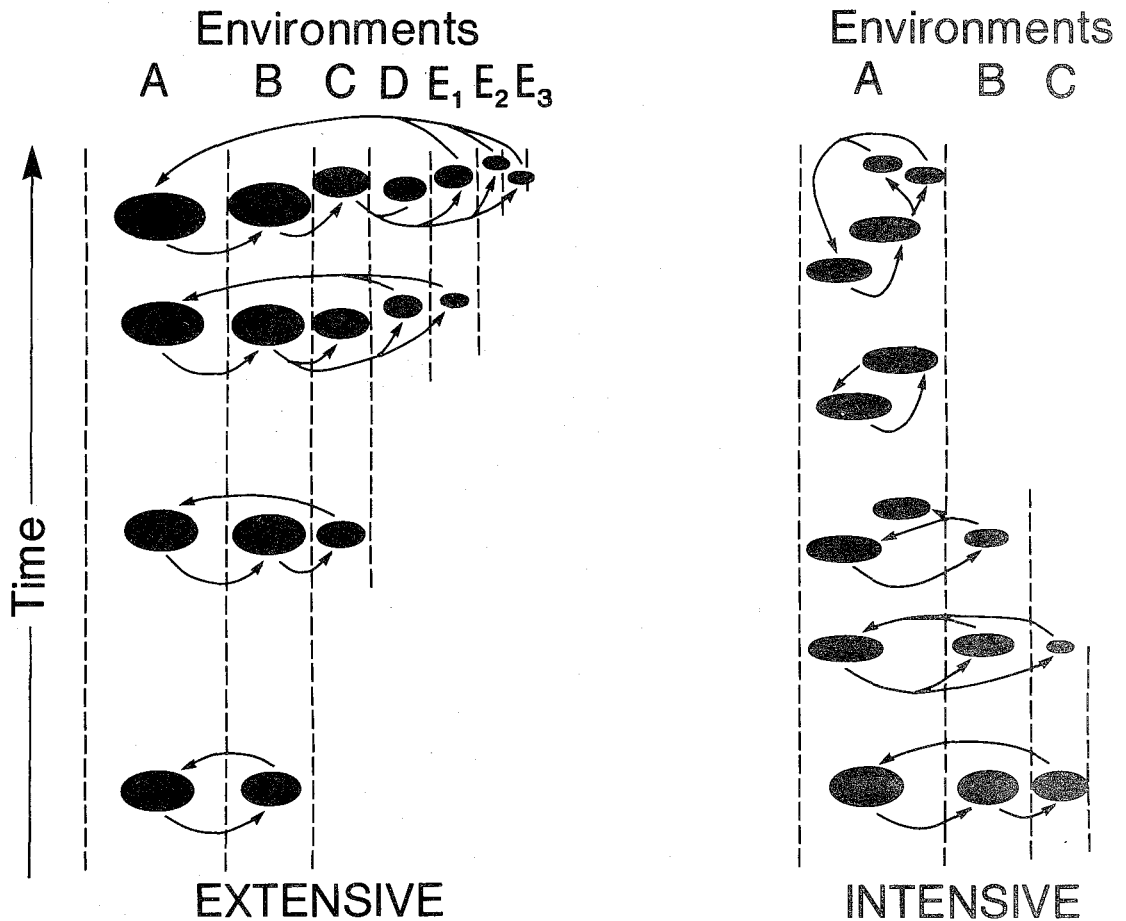


Figure 2. Trajectories of extensive and intensive adaptations through time.

Given these theoretical considerations and the constructed models, the substantive research problem becomes one of loading the models with empirical referents and assessing which model or models is most appropriate for the Northwest Coast and the Maritimes. Accomplishing this goal in a detailed and systematic fashion is obviously beyond the present scope of this paper, and is perhaps even beyond the capabilities of a single researcher. Nevertheless, let me present to you, in a summary fashion, what available conclusions and data I have been able to glean from the published literature. Hopefully, these data and conclusions will serve as a foundation for further research, stimulate discussion, and be amenable to future testing. In the final analysis, what follows represents a first approximation rather than a fully tested and accepted end-product.

#### THE NORTHWEST COAST: GULF OF GEORGIA

For the Gulf of Georgia and Puget Sound region, archaeological

research has been conducted since the turn of the century (cf. Deans 1891, 1892, 1900; Eells 1878; Thacker 1898a, 1898b; Hill-Tout 1902; Smith 1899, 1900, 1904a, 1904b, 1906, 1907, 1909; Smith and Fowke 1901). However, it was not until the 1950s that the first attempts to rigorously establish a cultural historical framework were undertaken through the pioneering research of Borden (1950a, 1950b, 1951b, 1954a, 1954b, 1962, 1968b, 1969, 1970, 1975, 1979) in the Fraser River/Vancouver area and King (1950) and Carlson (1954, 1960, 1970a) in the San Juan Islands. Their research and subsequent investigations during the 1960s to the present (cf. Mitchell 1968a, 1968b, 1969, 1971, 1973, 1979; Matson 1976; Haggarty and Sendey 1976; Thompson 1978a, 1978b) has produced a tentative culture history. Although there are still substantial questions and points of contention about the chronological sequence (Abbott 1971, 1972; Burley 1980b; Mitchell 1971; Matson 1974; Thompson 1978b) and the cultural affiliations of particular assemblages, it is apparent that humans have been in the general region since the Late Pleistocene (Gustafson, Daugherty and Gilbow 1979) and have exploited coastal resources from Early Holocene times (Borden 1975, 1979; Carlson 1979).

Thompson's research (1978a, 1978b) provides a regional overview and synthesis of many previous site specific investigations. Her examination of the region's sites and their microenvironmental location, functional tool types, and chronological placement provides a set of data that can be readily interfaced with the model of a MNE adaptation and its adaptive radiation through time (Figure 3). As is schematically illustrated in this figure, the nature and number of exploited environments changes through time. More and more environments are incorporated into a seasonally and environmentally differentiated territorial round. Despite the fact that particular suites of resources have yet to be systematically identified for many of the sites, and though there may be potential problems in sampling and quantification (cf. Casteel 1971, 1974, 1976a; Grayson 1973, 1978, 1979), it would appear that a variety of different kinds of resources, including numerous fish, bird, land and sea mammal and molluscan species were incorporated into an extensive pattern of exploitation.

While the general character of the site's differing environmental locations, variability in functional types, and reported fauna accord well with the general MNE model, there are several cautionary points that should be made. First is the question of how widely applicable this model is to other areas within the Northwest Coast. A general appreciation of the complexity and differential distribution of resources and environments within this region makes it quite likely that

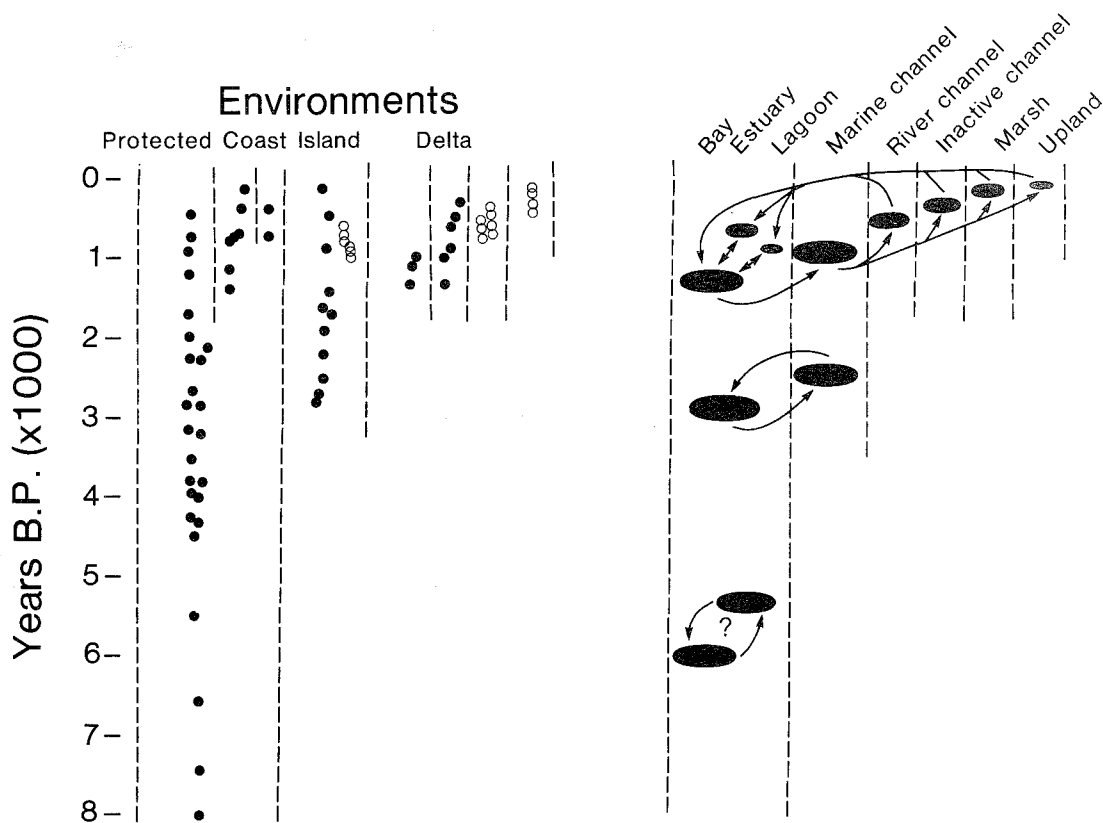


Figure 3. Model of Northwest Coast adaptations through time. Solid circles represent  $^{14}\text{C}$  dates, open circles represent estimated dates. Data from various sources.

substantial variability existed at given points in time between local populations in terms of their particular settlement and subsistence adaptations. There is some evidence to suggest sedentary adaptations in locales characterized by microenvironmental compaction and complexity (Kenady 1971). Also intensive adaptations focusing upon anadromous fish exploitation may characterize some populations (Schalk 1977). What will probably become clear in the future is the fact that Northwest Coast populations exhibited a mosaic of differing adaptations through time and across space. The challenge is to empirically document that variability, establish the boundaries for particular forms, assess their adaptive significance, and determine their relative competitive success.

Secondly, this model and the supporting data suggests the observed ethnographic pattern may not characterize all of the kinds of adaptations represented in the archaeological record. This evidence, coupled with our knowledge of the region's palaeoenvironments, especially the documented changes in the character of the vegetation (Hansen 1938, 1940, 1941, 1947, 1950; Hebda and Rouse 1979; Heusser 1955, 1960, 1973, 1974, 1977; Mathews 1979), sea levels (Andrews and Retherford 1978; Clague 1975; Dawson

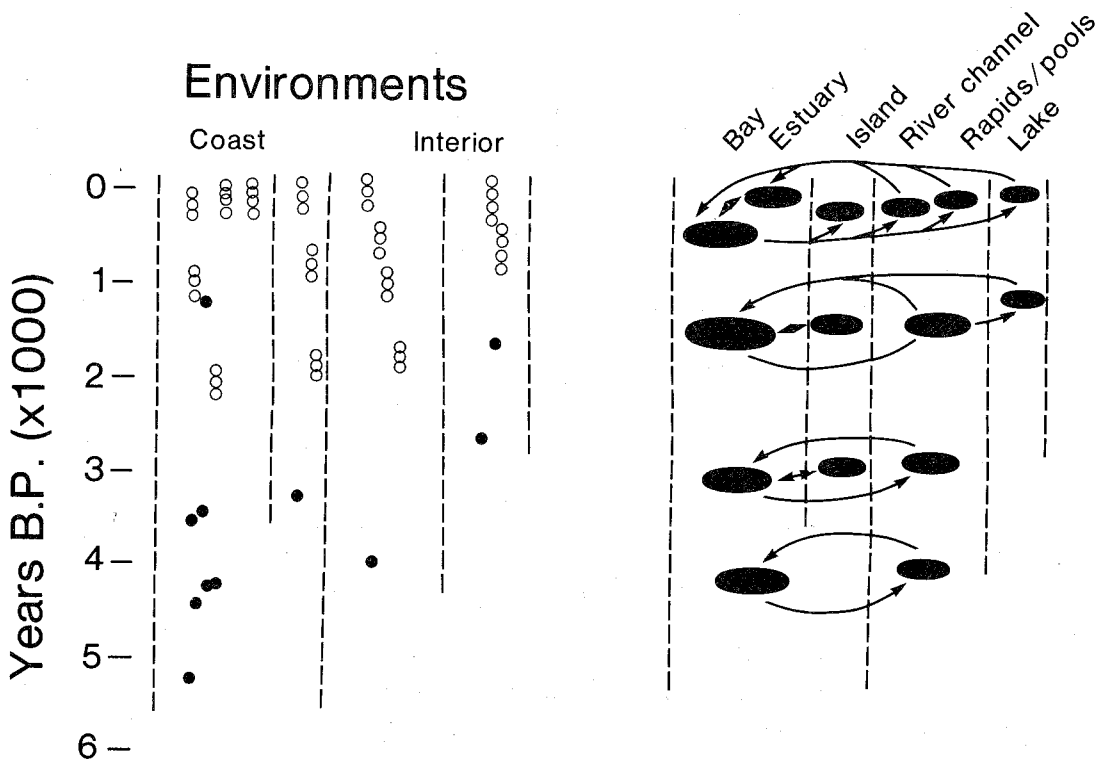


Figure 4. Model of maritime adaptations through time. Data from various sources.

1877; Easterbrook 1963; Grabert and Larsen 1973), geomorphology (Alley 1979; Alley and Chatwin 1979; Clague, Armstrong, and Mathews 1980; Kraft, pers. com.) along with changing species biogeography (cf. Fladmark 1974, 1975) make it reasonable to suppose there existed environments and adaptations to those environments for which no specific ethnographic analogues exist.

#### THE MARITIMES

For the Maritimes, archaeological investigations have been conducted since the mid-1800s (cf. Ambrose 1863; Bailey 1883, 1887; Baird 1881; DesBrisay 1879; Dixon 1914; Duns 1880; Fewkes 1896; Ganong 1898, 1899, 1905; Gilpin 1873; Goodwin 1892; Gossip 1864; Honeyman 1879; Jack 1883; Jones 1863; Kain 1901, 1902, 1904, 1905; McIntosh 1909, 1914; Matthew 1884, 1900; Matthew and Kain 1905; Miller 1887; Patterson 1881, 1888; Piers 1889, 1894, 1912; Smith 1914; Smith and Wintemberg 1929; Wintemberg 1929, 1937). More recent research has been able to identify Paleo-Indian occurrences (cf. Byers 1965; MacDonald 1966, 1968; Stuckenrath 1964; Turnbull 1974; Turnbull and Allen 1978) and obtain a broad outline of subsequent aboriginal occupancy (Burley 1974, 1976; Davis 1976; Erickson 1978; Harper 1957; Nash 1978; Sanger 1971a, 1971b, 1973).

However, modelling the variability of aboriginal Maritime coastal adaptations and their change through time is exacerbated by the fact that the Maritimes are experiencing rapid, though variable, rates of coastal submergence (cf. Bloom 1960; Clarke *et al.* 1967; Dawson 1866, 1856; Deevey 1948; Forward 1960; Frankel and Crowl 1961; Gesner 1861; Grant 1970, 1977b; Harrison and Lyon 1963; Johnson 1913 1925; Lyon and Goldthwait 1934; Lyon and Harrison 1960). The changing configurations of Holocene shorelines and the erosion of coastal sites poses serious problems in obtaining empirical evidence on the character of aboriginal coastal exploitation (Simonsen 1978, 1979).

From the available information contained in the published literature it appears that the general structure of aboriginal Maritime coastal utilization conforms well with the MNE model. The composite model (Figure 4) based upon data from the Maritimes (cf. Burley 1976; Nash 1978, n.d.; Sanger 1971a, 1971b, 1973; Smith and Wintemberg 1929; Turnbull 1975) and adjacent areas of Maine (cf. Bourque 1973, 1975, 1976; Sanger 1975, 1979e; Sanger and MacKay 1973; Yesner 1979) suggest a mobile scheduling organization with coastal resources and environments playing an important, though potentially seasonally differentiated, role in an extensive subsistence adaptation exploiting a wide array of different fish, bird, molluscan, land and sea mammal forms.

What is not evident from this figure, and a challenge facing Maritime archaeologists in the future, is establishing the duration, season, and relative importance of particular resources and environments exploited by local populations. A substantial research issue also involves systematically monitoring diachronic changes in coastal-use patterns. Did shifts occur in the nature of settlement and subsistence strategies for local areas as the Maritime environments changed during the Holocene? What impact did the documented changes in the nature of the vegetation (Bradstreet and Davis 1975; Livingstone and Estes 1967; Livingstone and Livingstone 1958; Mott 1975), coastal geomorphology (Grant 1970, 1977b), current patterns (Clark *et al.* 1967) and species biogeography (Clark *et al.* 1967; Loomis 1911; Morse 1882; Sanger 1975) have upon aboriginal adaptations? There is clearly much research to be done.

#### CONCLUSIONS

In concluding, there are several points that must be stressed. First, this model of a MNE adaptation and its potential change through time was developed so it could be applied to hunting and gathering systems regardless of particular historic and ecological

circumstances. The rationale for the model, and the selection of relevant dimensions to monitor, were derived from a body of ecological and subsistence theory that should be applicable to aboriginal systems regardless of their particular resource base or technological level (Cleland 1966, 1976; Dunnell 1972). Additionally, these dimensions are not so subtle so as to preclude identification with the kinds of data normally available to archaeologists; artifacts, fauna, and their variable distributions across environments. The challenge is to empirically load the model with archaeological entailments so as to identify the particular ecological adaptations and evolutionary history of specific populations.

Secondly, the variables of the model also interact with environmental characteristics in an important and direct manner. Differences in resource seasonality, spatial distributions and diversity will produce selective pressures for varying forms of scheduling behaviors, group structure, and subsistence orientation. What is significant about both the Northwest Coast and the Maritimes is the relatively well documented evidence for Holocene environmental and resource shifts. Most frequently, empirical studies on the relationships between environmental change and cultural change have been conducted in regions where changes in the climatic or resource regime would have pronounced and frequently detrimental effects upon prehistoric cultural systems. Field studies in the arid Southwest U.S. (Plog 1974), the U.S. Great Basin (Bettinger 1977), and the Canadian High Arctic (Barry *et al.* 1977) have documented both the adaptive success and failure of specific kinds of settlement-subsistence strategies in environments that today would be characterized as extremely rigorous to man. However, archaeological attention has yet to systematically assess the nature and impact of environmental and resource changes in more temperate and resource-diverse regions such as the Northwest Coast and the Maritimes. The models developed in this paper may effectively interface with such studies.

Finally, the models and theoretical foundations developed in this paper can be applied to the archaeological record independent of ethnographic analogues. While not denying the contribution that ethnographic data can potentially make to archaeological research (cf. Gould 1978, 1980b), the position taken in this paper is that archaeological data must be ultimately analyzed independent of ethnographic descriptions. There are both theoretical and pragmatic reasons for such a stance. Since the explicit focus of archaeological research is upon long time spans and the nature of diachronic change, the ethnographic record frequently cannot adequately address nor serve to model the nature of diachronic change.

Additionally, the archaeological record may contain the record of systems or modes of adaptation to particular ecological circumstances and environmental conditions that are no longer extant. Thus ethnographic data may have little relevance to modes of adaptation to extinct environments for which no analogs exist. This point may be especially relevant for the Northwest Coast and the Maritimes where dramatic and pronounced changes in the character of palaeoenvironments are clearly documented.

More importantly, and a point that may have great significance to the disciplines of archaeology and anthropology as a whole are the implications of the impact that European contact had upon aboriginal systems in these areas. The documented serious effects and epidemic diseases that followed European intrusion into these areas resulted in the rapid depopulation and collapse of aboriginal systems as independent cultural entities (Duff 1964; Miller 1976).

Thus, ethnographic generalizations may reflect statements about systems in collapse, successful and unsuccessful attempts at readaptation following European contact, and the incorporation of European technologies and behavior to varying degrees. The ethnographic data may more accurately represent Refugee systems rather than functioning independent cultural strategies that characterize successful adaptations to these regions' diverse environments.

In short, the ethnographic data from this perspective becomes a body of data that requires examination and analysis in terms of the characteristics that represent successful prehistoric strategies rather than being viewed as the structure to portray prehistoric aboriginal adaptations. The transition from prehistoric to historic times -- from the archaeological record to the historic record -- involved massive death, system collapse, settlement abandonment and relocation, the loss of environmental utilization, and in some cases, cultural extinction. Archaeology may be able to contribute information that will be useful in understanding the problems facing contemporary refugee populations.

In the final analysis, the archaeological resources of the Northwest Coast and the Maritimes can contribute critical data to a variety of contemporary research topics in archaeology, anthropology, and other disciplines concerned with man, his environments, and the past. A major challenge will be the construction of models that can be employed in comparative research. In this paper I hope I have raised a number of issues and provided a general model of settlement-subsistence adaptations that will facilitate future studies.