

INTENSIFICATION AND THE DEVELOPMENT OF CULTURAL COMPLEXITY:  
THE NORTHWEST VERSUS THE NORTHEAST COAST

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INTRODUCTION

The relationship between the development of social complexity and intensification of resource use is the subject of this paper. I examine aspects of both the general case and two specific examples -- one in which intensification and cultural complexity developed, and one in which they did not, although the resources were similar in both areas. First I will describe what I mean by "cultural complexity" and "intensification." The process of intensification will be discussed in the abstract and two brief examples illustrating some of the key points will be given, one of intensification and the other of non-intensification. The main substantive portion of the paper, which follows, gives my views on why salmon fishing was intensified on the Northwest Coast and how this was related to the development of cultural complexity. Finally, the question of why intensification and complexity did not develop in the Northeast, at least not to the extent they occurred in the Northwest will be examined.

CULTURAL COMPLEXITY

Given that the two areas that are under examination both have hunting and gathering economies, cultural complexity is used here as simply indicating social organizations that are more complex than the

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basal hunting and gathering egalitarian pattern. Fried has called this basal level of complexity the egalitarian society (1967:27-107) and has defined it as "... one in which there are as many positions of prestige in any given age-sex grade as there are persons capable of filling them" (1967:33). Egalitarian societies include most "typical" hunting and gathering band societies. Complex societies, on the other hand, are those which have limitations on positions of prestige or, as Athens states (1977:361) "A cultural system having a social hierarchy as a permanent institutional feature." Such societies are labelled by Fried (1967) as rank or stratified societies.

While in both the Northeast and Northwest coasts ethnographically we find foraging modes of subsistence, we find substantial differences in cultural complexity. If we look at typical hunting and gathering societies, whether the !Kung of Southern Africa, the Shoshone of the Great Basin or the Athapaskans of the Subarctic, we find a number of traits in common. The largest effective social unit is the band and the band size is usually small, 30-40 individuals (Martin 1973). Typically the band resides as a unit during only a small part of the year with families or small numbers of families being the face-to-face group during other times. The primary, and often only, economic unit is the nuclear family, the length of time spent at any single location is usually short, seasonal movements are the rule, habitations are usually flimsy and division of labor limited to age and sex. Ownership of property and ascribed status are weakly developed and many societies are aggressively egalitarian.

The formal definition of a foraging egalitarian society, then, just hints at a variety of shared traits and institutions. The general rule is, if social ranking is absent, the rest of the features listed above are present. But the Northwest Coast groups do have ascribed social statuses, and differ in most other features as well, from the picture presented above.

The Northwest Coast maximum social unit was the village, which often, if not usually, consisted of several hundred individuals. Further, this unit stayed together much of the year. While other seasonal settlements were present, much of the time these were short term work camps and, at other times, the groups involved consisted of a number of families. For most of the year, the usual social group was several times larger than that of egalitarian hunters and gatherers.

The primary economic unit on the Northwest Coast was usually the household which was probably about the size of an egalitarian band. These household units are most easily recognized on the north

coast where they are basically equivalent with the inhabitants of a gable roofed house, and hardest to see in the south where they may inhabit either separate shed roofed houses or compartments within them. While the organization within a household varied widely, the basic theme remained the same along the coast. Much of the year was spent at the winter village house site; in some cases these were occupied all the year around, while in others, the entire village moved as a unit to summer locations. Other situations of greater mobility and smaller units occurred, but the amount of movement and the size of the average social group differed greatly from that found in egalitarian foragers. Habitations, particularly during the winter, included truly large, well built structures. Division of labor included a fair degree of specialization, and ownership of property went to some lengths, including many resource locations as discussed below. While the amount and nature of social ranking varied widely, even among the Coast Salish, competition for prestige was important, and the amount of status positions and of the ascribed component differed greatly from that seen in the egalitarian foragers.

Many of these differences are more quantitative than qualitative; they can be seen as more complex variations on a theme. Having a larger social group at least allowed for more complex social interactions (Blau 1977); the complicated ownership patterns seen on the Northwest Coast can be derived from simpler patterns elsewhere; large substantial dwellings developed from small simple ones, rigid status hierarchies grew from less rigid ones, and so forth. The combined effects of these differences, however, result in a qualitative transformation in cultural complexity, from an egalitarian to a ranked society in Fried's terms. Just as in the egalitarian case, the formal definition only hints at a complex web of interacting institutions and effects.

Accepting that the Northwest Coast situation is one of cultural complexity does not mean that this sort of society is a necessary stage in cultural evolution from the egalitarian level. I think it is a common development, as archaeological examples such as the Natufan in late Pre-Neolithic times in Palestine indicate, but I do not claim it is the only route to cultural complexity. A possible alternative route is suggested by V. Miller's paper on the Micmac (this volume), via political rather than social organizational developments.

Explaining the development of the ranked society from an egalitarian one is the goal of this paper. How did this development take place? Why did it occur? What society would willingly go from a situation where everyone is considered in some way to be equal and

thus worthwhile, to one in which only some could have high status, where a large part of the society is placed beyond the pale, and where much of these distinctions are made on the basis of birth? The answer to this last question is that there was not much "choice" in the matter contrary to what workers such as Diener (1980) would argue. A rank society is not only abhorrent to modern ethics but is also economically (or biologically -- or ecologically) inefficient. Thus many traditional prime movers cannot be the main "causes" of this transformation, at least not on a gross level. The notion of intensification, however, combined with the nature of resource location can be used to describe a setting where this transformation would be all but inevitable.

#### INTENSIFICATION

Intensification is a word which means different things to different people, but is one that, like "function" or "adaptation" stands for a crucial concept, though one difficult to define unambiguously. Intensification is frequently used in the sense of "relating to a method designed to increase productivity by the expenditure of more capital and labor rather than by increase in scope" (Webster 1974:601). Intensification is also used, I think, to include increase in scope as well. While this definition would include my idea of intensification, a better description of the process I envisage is:

A process where at time  $T_0$ , an amount of time (or capita)  $X$  is spent on an activity to give a production or result of  $Z$ . The rate of return  $R$  (productivity or efficiency) is  $X$  divided by  $Z$ . At time  $T_1$  the amount of time spent is now  $X + \text{something}$  and the return is also  $Z + \text{something}$  but the rate of return is now  $R + \text{something}$ . Thus an intensification process is one in which as more time is spent on an activity, not only is the amount of return or production increased but so is its efficiency.

This view of intensification might be conceived as a two way positive feedback loop. The first loop is one where more time is being spent and thus a greater return is occurring on successive cycles. The second loop is one where through time successive changes in the organization of resource exploitation increase the rate of return making the overall process more efficient through time. So intensification, as used here, means increasing investment, production and efficiency.

A now classic example of this kind of model is that of Flannery (1968) on the origin of maize agriculture in Meso-America. Here, as

more time is spent planting and harvesting the precursor of maize (apparently teosinte), progressively more efficient forms are developed, which leads to spending more time developing better forms until the amount of time, the amount of return, and the efficiency are all great. Thus maize became a staple of the diet of Meso-Americans through intensification. Clearly this is only part, but an important part, of the explanation of the origins of maize agriculture.

This same general "intensification process" has been suggested as a major mechanism of culture change by Buckley (1967). Wood and Matson (1973) have presented it as a mechanism of change when one is dealing with internally initiated change. In this more general form the second positive loop is preceded by some sort of mechanism creating varieties of organization and some of these varieties are selected by the culture system. In the specific intensification case these varieties will vary in efficiency and the more efficient varieties will be selected for "reproduction," everything else being equal.

It is in this last statement that we can see how the intensification process leads to greater efficiency. This point of including efficiency within the definition of intensification has been a bone of contention to others, who argue, like Boserup (1965), that through time, intensification can lead to decreased productivity or efficiency. Efficiency here increases in the short run or at a given level of production. If increased levels of production develop, the proper comparison for efficiency is with an equivalent level of production of one or a group of subsistence activities.

Boserup (1965) uses intensification to refer to increased cropping of a set piece of land and thus a more "efficient" use of land (more return per unit of land). Boserup suggests that in terms of output per labor unit, this process is one that goes towards efficiency, or lower rates, although this point is disputed. Whether Boserup's version of intensification would fit the present model would depend on the price given to land, if, in fact, output per labor hour does decrease. If it does not, then it does fit nicely.

The notion of efficiency also is called into question on another front, that of the definition offered by Earle (1980) and Christenson (1981). They define efficiency as marginal costs, that is, the addition to total cost caused by the addition of one unit of production (Earle 1980:8). This definition of efficiency is justified by its being theoretically the optimal evaluative cost unit when there is no major initial cost. The cost measure can be very different from the average unit cost measure used here. I doubt that intensification occurs without extensive initial costs.

I expect that through time one would progress from procurement technologies with low initial costs, like those modelled by Earle and Christenson, to one with high initial costs, as seen in intensified technologies.

Efficiency, then, is subject to a number of definitions which have greater or lesser utility depending on the situation. Problems with efficiency are not eliminated by clearly defining it, as here, by cost per unit, as then what are the appropriate costs becomes the question. Further, the question of what is the appropriate unit of comparison is also present.

In what way can intensification processes be said to become more efficient? As argued above, for any given level of output, an intensified procurement process will increase in efficiency over time. This should be true if only the most obvious cost in hunting and gathering societies, time, is included. It has been suggested that if this is so, then we could visualize a system in which the output remained the same but the labor costs decrease. I think this situation is possible, but it is not one that leads to intensification as the returns remain constant, so that the importance of that activity remains relatively constant. So, given a set level of output, which appears to be the proper means of comparison, intensification results in gains in efficiency or productivity.

The other part of our definition of intensification is the increase in scale. Here gains in efficiency can again be found by comparing cost per unit at a set level, but at the level found at the larger scale. Thus at the time  $T_1$ ,  $Z +$  return is found; if we pushed the technology at time  $T_0$  to  $Z +$  return we would find the cost at time  $T_0$  to be higher. In this sense, also, efficiency must clearly increase, everything else being equal.

Actually this last case would probably not occur, as the system at  $T_0$  could not be pushed to the higher level of outputs. The real comparison would be with other alternative procurement schemes, and as intensification occurs, its relative efficiency must increase compared to the alternatives or intensification would not continue. Instead, the other alternatives would be followed.

These arguments are beside the point in that they implicitly assume that the cost per unit will actually increase through time. There is little evidence to suggest that this does occur in intensification processes, but then there is little evidence either way as discussion of Boserup's work has shown.

A fundamental problem with using economic models is that it is

difficult to incorporate changes in processes as well as in choice. Thus it is relatively easy to maximize some variable in a static situation, as one does with linear programming, and it is also relatively easy to discuss changes in processes, such as the "learning curve" but difficult to deal with both kinds of events in an inter-related model. Intensification is a process which includes both sorts of events, increasing efficiency and a selection for increasing scope (and a selection against other subsistence activities) by maximizing costs in a more synchronic fashion.

One Northwest Coast subsistence activity that appears to fit this model is pelagic sealing on the west coast of Vancouver Island. Gay Calvert has recently completed a dissertation concerning this area (Calvert 1980). Ethnographically pelagic, or deep sea, hunting of fur seals was an important part of the subsistence pattern. Today fur seals are migratory and stay well off the coast. One can imagine a process in which at first only a few fur seals wandering near the coast are taken with primitive water craft and equipment. As time goes on and more experience is obtained, so are better water craft, more specialized tools and more open ocean seals. At this point a more specialized technology is developed, one with greater initial costs, but one much more efficient at obtaining fur seals. Now that hunting fur seals in the open ocean has become an extensive activity other resource procurement activities must have been cut back (the scheduling conflict of Flannery (1968)). As pelagic fur seal hunting becomes more intensive, possibly other sea mammals are taken ("embedded" in Binford's (1979) terminology). This intensification of fur seal mammal hunting has taken place in the last 1000 years according to Calvert (1980).

A different situation occurred at the Chatham Islands off New Zealand where similar seals were hunted (Sutton and Marshall 1980; Sutton 1982). Here, the only rookeries were on rocks immediately off shore, unlike the situation on the Northwest Coast, where the fur seal rookeries, at least today, are far off in the Bering Sea on the Pribilofs. While the limitations on Vancouver Island were technological, at least in the short run, as at that procurement level the inhabitants could not make serious inroads into the fur seal population, on the Chatham Islands the situation was otherwise. Over-hunting is almost immediately a real threat to continuing production. Moreover, technology is not a limitation, as only a low level is needed to get to the off shore islands and harvest the seals.

Sutton (1982) does refer to an intensification of seal hunting on the Chatham Islands. Here he is describing settlement pattern

changes where the settlements become located near seal rookeries and how seals become a more important part of the diet. While this amount of "intensification" occurs, intensification does not continue because of the easily reached limits of production of the local rookeries. In this situation continued intensification leads, in the long run, to less return and to lower efficiency. The long term return is governed by the production of the rookeries and not the technology or organization of the hunters. Even though the resources, the environments and the technologies were similar on the Chatham Islands and the West Coast of Vancouver Island, in one case continued intensification is possible, in the other, it is not. As the Chatham Islands are some 1000 km from New Zealand, the earliest inhabitants had an impressive seagoing technology. Perhaps because high technology is not necessary to hunt seals on the Chatham Islands, Sutton found that devolution occurred, at least in technology.

These two brief sketches present a key idea about intensification; it can only occur in certain circumstances where the nature of the resource allows it. If a society were to vote on intensifying the use of a set resource (and I doubt that this sort of choice ever occurred), unless the nature of the resource was such that, given the appropriate technology, more returns for less costs per units could occur, intensification would not take place. The nature of the resource exploited limits the amount of intensification that can take place.

#### INTENSIFICATION ON THE NORTHWEST COAST

Beyond doubt the key resource in the Northwest was salmon. This is not only attested to by the ethnographies, but also by demonstrations of strong relationships between amount of salmon and ethnographic population estimates by Sneed (1971) for the interior and by Donald and Mitchell (1975) for the central coast. Salmon were exploited, both extensively and intensively, on the Northwest Coast.

Salmon have been exploited in the Pacific Northwest since Old Cordilleran Culture times (6000-8000 B.P.) with remains being found both at The Dalles on the Columbia River (Cressman *et al.* 1960) and at the Glenrose Cannery Site on the Fraser River (Matson 1976) during this time. Other attributes of the ethnographic Northwest Coast pattern are much later, however, ca. 2500 B.P. (Matson 1981a) and there is little evidence of the intensive exploitation seen ethnographically extending back to Old Cordilleran times.



I have argued that for the coast, the drying and storage technology may have been a more important prerequisite for large scale use of salmon than the procuring technology (Matson 1976, 1981a). Schalk (1977:230-231) has argued that a storage strategy is more important to the north. Since Schalk's argument is based on the shorter period of availability to the north, Burley (1979b) has extended it to upstream portions of major rivers, where availability would be similar to further north and where diverse coastal resources are unavailable. In this situation with abundant but temporally limited salmon resources, the addition of storage is seen as promoting sedentism and specialization (1979b:138). Intensification of salmon procurement along the coast would then follow only later. These ideas will be discussed in more detail below.

The basic model for salmon intensification is very simple. As more experience is gained with using salmon, and as salmon getting and storing technology becomes more developed, salmon fishing becomes both more efficient and more important. What is not so simple is under what conditions this situation is allowed to continue. In addition the sources of salmon getting and storage technology and the interaction of salmon resource exploitation and other subsistence activities, or seasonality and scheduling in Flannery's terms (1968), must be examined.

Turning to these additional factors, salmon producing and storing technology has been thought by some to develop first in interior situations. In this view necessity is the mother of invention. As ably pointed out by Schalk (1977), where runs are short, if one is to use salmon resources extensively, one must have an elaborate technology to catch the salmon and dry them before they spoil. In interior, northern areas, this is the situation, as documented for recent times by Hudson (1980).

As Schalk has pointed out, in the far north and in the interior in the middle north (45°-55°N) in the upstream portions runs are not long enough or reliable enough to serve as a foundation for a complex, semi-sedentary society (1977:242).

Burley's scheme has the locus for development of intensification occurring 100 miles upstream on the Fraser River. Here, at the first constriction of the river, numerous kinds of salmon would be available, without the greatly restricted availability and reliability found further upstream (1979b:138). Further, the fish could be obtained by minimal technology, that of the dip net. The well known canyon winds and less clouded skies would make drying the catch a less difficult proposition than at the river mouth.

While I have no doubt that salmon were first exploited in small streams, I have doubts that either scenario is at all correct. The technology for dealing with small interior streams cannot be easily transferred to the coast. Ethnographically, and, as far as we can tell, archaeologically, the technology is quite different, with storage pits ("cache pits") and dip nets found along interior streams of moderate size but not on the coast. Not only is the technology different, but so are the conditions. These include not only the larger, slower moving streams, but also the length of the runs, the makeup of the fish, and the weather conditions. The combination of a cooler, moister climate and fish with a much higher oil content means that the drying process is much more difficult along the coast. So the problems and solutions differ between coastal and interior regions, notwithstanding which ones were solved first.

The results of salmon intensification on the coast and interior differ as well. While intensification works for awhile in the interior, blocking streams with weirs or other "efficient" fishing techniques can cause a reduction in production, and the cyclic fluctuations make heavy reliance impossible for all years. The much greater numbers and kinds of anadromous fish in the lower reaches of the major streams and the absence of river blocking fishing techniques meant that neither of these problems were important on the coast.

In Burley's suggested Fraser Canyon scheme, the problems of year to year fluctuations in fish and over-fishing would not exist. But as Burley (1979b:138) notes the canyon is essentially an "interior locale" and the dip net (and interior style processing techniques) are used. Thus if salmon intensification occurred first at this location we would expect a significant time lag before the technological transformations needed to transport it to the coast could be developed. The mechanisms for such transfer to the coast are not developed by Burley, but I think some credible ones could be easily developed.

Burley (1979b:139) argues that ground slate knives may be correlated with intensive salmon processing (for drying) and that their presence in the Eayem Phase in the Fraser Canyon is evidence for early intensification of salmon in the canyon area. I find the widely used argument of ground slate knives and extensive use of fish worthy of serious consideration but the archaeological presence of it at earlier times unconvincing. The ground slate knife fragments found in Eayem Phase do not have clearly documented provenience in print (Borden 1968b:14-15) and are from poorly documented layers adjacent to a large pithouse of the multicomponent

Esilao site. The actual pieces informally attributed to the Eayem phase are small, further suggesting the possibilities of mixing. More importantly, the much less confused Eayem component of the Mauer site, also in the same general area, lacks any such ground slate knives, and is much better documented (Le Clair 1976). Until ground slate knives are unequivocally found in Eayem context, this part of Burley's argument is invalid. In short, Burley's interesting "hybrid" scheme with interior technology but coastal abundance at this point fails to have archaeological support.

In sum then, the coastal technology cannot be imported directly from elsewhere and there does not seem to be any reason to believe salmon intensification took place earlier in the interior. While there is a long history of salmon use on the coast, crucial aspects of the ethnographic pattern were missing until the last 3000 years -- whether or not the storage aspects are as important as I have suggested (Matson 1976, 1981a). What exactly were the developments on the coast cannot be currently determined with precision, but the following model is offered as a reasonable possibility.

The first inhabitants of the southern B.C. coast were clearly oriented to large mammal hunting and belonged to that widespread tradition which has been called Old Cordilleran Culture (Matson 1976, 1981a; C. Carlson 1979). The Old Cordilleran subsistence pattern clearly included salmon fishing. This is verified by locational and seasonal information (late summer-early fall) at the Milliken site (Borden 1975) and by fish remains along the Snake River (Bense 1972), along the Columbia (Cressman 1960), and at the mouth of the Fraser River (Matson 1976, 1981a).

At the mouth of the Fraser, the Glenrose site reveals a spring and early summer occupation with the excellent seasonal markers of eulachon and sticklebacks both being present (Casteel 1976b, Matson 1976). While fish (and a few shellfish) remains were present in this component, deer and elk (wapiti) faunal remains were definitely dominant.

For Old Cordilleran groups living close to the coast we can suggest the following seasonal round. From non-coastal locations they would move to the coast in late spring to harvest eulachon, sticklebacks and other fish, as well as some shellfish. Elk, deer and seals would also be sought. In summer salmon could be obtained in local small streams with a simple technology. It is possible that trips would be made in late summer into the interior where salmon is more accessible with a low level of technology. In the fall, hunting of large mammals would be important and winter sites would probably occur inland in the vicinity of large wintering

ungulates. In late spring the cycle would be again. A family-band dichotomy probably existed with a low population density and little status differentiation.

How did this basal use of salmon with little or no storage develop into the ethnographic situation? The next stage, as seen in the St. Mungo phase component at the Glenrose site (4500-3300 B.P.) (Matson 1976, 1981a) is one of more extensive use of coastal resources, particularly of shellfish and salmon. The previously used resources were all still being exploited but the seasonal evidence suggests that the coast was exploited at various times of the year, rather than spring and early summer. Since shellfish are available during the winter with a low level of technology (no storage needed) I would expect that they would attract people to the coast during this most difficult season, and we do have evidence of use of shellfish during this season in this component (Ham 1976; Matson 1981a). Extensive remains of shell are found during this time, creating a shell midden, although the lack of ground slate knives would seem to indicate an absence of an intensive storage technology for salmon.

Concurrent with this change would be a relative reduction of large land mammals, at least during the winters. One would expect the generalized fishing technology to become more efficient as more experience accumulated. The greater amounts of time spent near good fishing areas would encourage the development of more specialized and higher initial cost technologies. It may be that gill net fishing (Suttles 1951) or drag (bag) net fishing (J. Kew 1976) was invented at this time. There is no evidence for extensively occupied winter villages, large habitation structures, or non-egalitarian society during the St. Mungo phase. From this broad scale hunting, gathering, and fishing subsistence base, emphasizing coastal resources, the ethnographic subsistence pattern developed through focussing on salmon.

The switch from large land mammals to other small and more numerous resources is, of course, not unique to the Northwest Coast. The development of the archaic in the New World and the mesolithic in the Old show this trend to be near worldwide in extent. The reasons for this trend are detailed in Hayden (1981) which is partly revealed below and partly extended by Matson (1981b). This pervasive development is a precondition to intensification but obviously is not in any way an explanation of it.

Since the carrying capacity for large land mammals is low in this area, and since shellfish can be overcollected and difficult to obtain in dark, stormy winters, it is no surprise that salmon became

the resource that was emphasized. Even before an efficient storage technology was developed salmon could be an important resource in an area such as the Gulf of Georgia where they are available for a large part of the year, as suggested by Schalk (1977:229). It was not, however until efficient ways of getting large numbers during the peaks of the runs and storing them were developed that large, dense populations and extensive winter villages could develop.

The curing and storing technology consists of important but unspectacular ways of butchering, cutting, spreading, smoking and storing fish under conditions which were often adverse. The procuring technology included reef net fishing in which a large, semi-fixed net was suspended in front of a reef between two canoes. This method, as J. Kew (1976) points out, has obvious similarities with the more primitive drag net, which was suspended from two canoes in a river. A single reef net position could involve over a dozen individuals to obtain the fish while others processed them on shore (Suttles 1951).

The reasons for successful intensification of salmon fishing on the coastal rivers are clear. The numbers of fish were too large to be seriously interfered with at this level of technology and the runs were long and reliable enough so that large numbers could be processed once the curing and storage technology was developed. The large numbers of fish existed because the fish had to swim through the lower reaches of the river to get to their upstream spawning grounds, and the length and reliability of the runs a result of different races and species going through the lower reaches of the river at slightly different times and having different peak years. The intensification process allowed denser, and probably more sedentary populations. As put so ably by Hayden (1981) increasing population density is essentially a one way gate.

In Hayden's model population density is determined by a trade off between "*the cost of physical suffering every so many years and the cost of maintaining population controls*" (1981:522). The trend is to minimize the effects of resource stress whenever possible, which has the effect of increasing population density. Population density can only be decreased by high costs in either (or both) directions. In Hayden's view (and mine) population densities are within sight of the "carrying capacity" on bad years and maintain themselves there *even though the limiting density is subject to change as the carrying capacity changes through technological innovation* (or environmental changes). (Environmental changes could be caused by climatic changes or be the result of human activities, such as over-fishing.) Hayden terms this the "resource-stress model" and would argue that what is being maximized is resource

reliability and that increasing population density is only a consequence of this maximization, or so I infer. Thus increasing population density would result from these changes in subsistence and settlement patterns which coincided with changes in social organization.

#### SOCIAL ORGANIZATIONAL IMPLICATIONS

Schalk (1977:236-237) argues that the amount of control in social organization where anadromous fish resources are important should increase where availability is limited and year to year fluctuations are great. He quotes Suttles (1968) to the effect that formal social organization is more developed towards the north as support of his argument. The situation is reversed from what he expects, however, when one compares coastal and interior groups in the Northwest. Why is it along the coast that the more complex, more rigid social organization occurs, along with relatively less fluctuation and greater availability of salmon resources?

I think the answer has to do with ownership of resources. In the interior ownership is weakly developed and access to most resources is freely available. Along the coast we find ownership of most important resources and even stretches of beaches. Ownership arises when a resource is important, reliable, and localized and when the society is relatively sedentary.

If a resource is not reliable and fluctuates, control will not usually be important. Since such a resource is not predictable, it is not efficient for the local group to exercise control over it, since much or most of the time sufficient return would not occur. This would be particularly so if access to other such resources occurs in other areas.

On the other hand, if a resource is reliable, control over it is made economic by the consistent return and since it is predictable, technology can be developed to fully utilize it.

Looking at these aspects of resource natures from a slightly different but complementary perspective, for an unreliable resource the most important aspect is whether or not it will occur in abundant amounts. For a reliable resource this is not important, but access to it is. If a resource is not localized, access is assured, but if it is localized, access may not be certain. Access to a reliable resource is only important if it is abundant. Therefore efforts at controlling access would be expected if the resource is abundant, reliable and localized, but not otherwise.

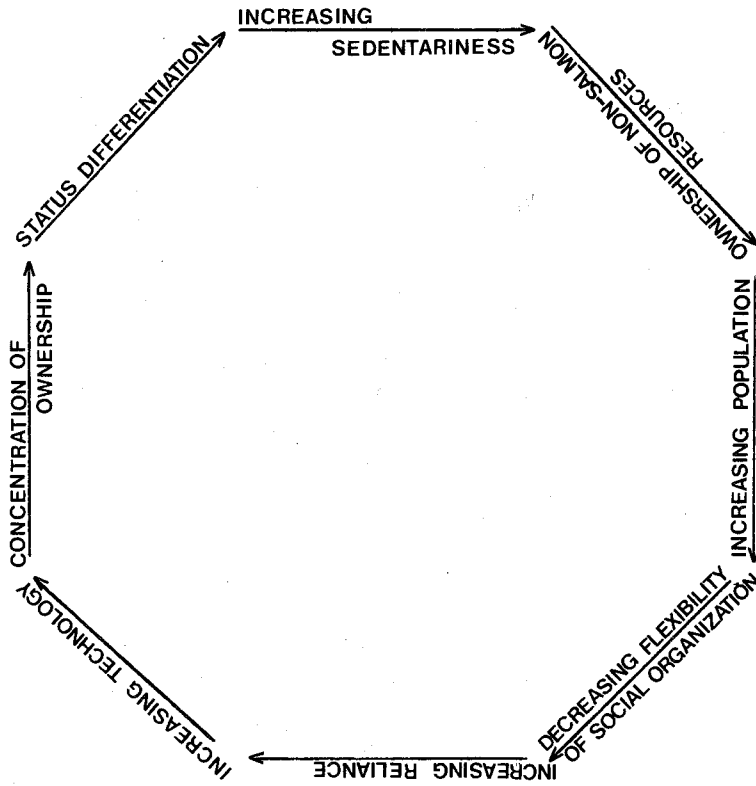


Figure 1. Situation in Interior Salmon Streams.

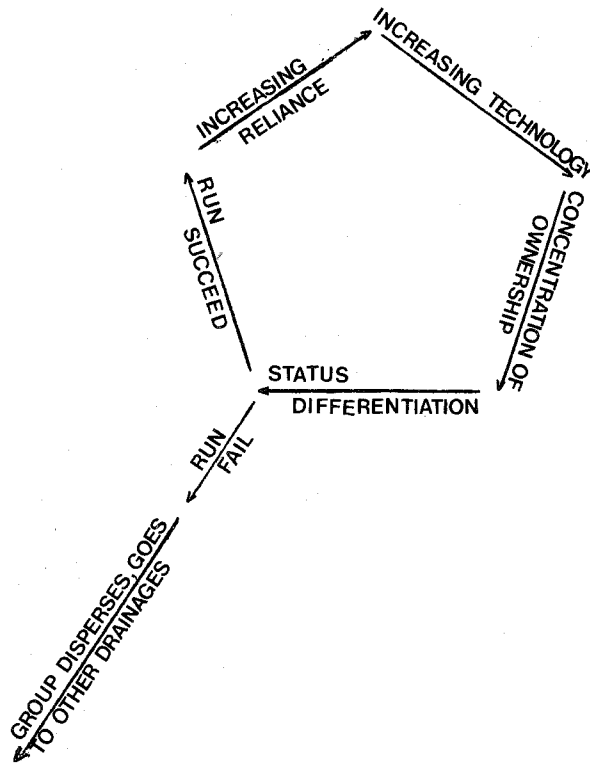


Figure 2. Situation on Coastal Portions of Large Salmon Streams.

Effective control can only be exercised if the local group is relatively sedentary near the resource. Otherwise another group could appear at the location earlier in season, if it is seasonal, or just use the resource sometime while the original group was not present, if it is not seasonal.

In a situation where resources do fluctuate so that they cannot be depended on, the centrifugal cycle of more dependence and ownership is broken each time the resource fails, no matter how localized and abundant the resource is when it does occur. Thus in Hudson's (1980) example, when the run failed, the Carrier groups broke up and went as families to visit groups having access to other river systems (Figure 1) which had different runs. If this is apt to happen every few years, we can see how society would be flexible and ownership would not be important in spite of an impressive technology and reliance on salmon.

Schalk (1977:237) argues that as seasonality in productivity increases, periods of resource availability decrease, and year to year fluctuations increase, specialization upon anadromous fish becomes more difficult and, eventually, an impossibility. The Carrier described by Hudson may be close to this limit. Elsewhere Schalk (1977:230) suggests that upstream groups should have more generalized forms of subsistence. He does not, as far as I can see, explain how groups become more and more rigid as the resource becomes available during smaller parts of the year and, then, suddenly, become more generalized and less rigid. Hudson's example suggests how rigidity was not possible in such conditions, in spite of specialization.

In contrast, along the coast, where failures such as this were much less frequent, dependence and ownership would increase without any levelling mechanisms. A resource location such as a reef net site is too small to be shared by a large group, and too few existed to allow free access, so ownership by a smaller group (household?) was inevitable. In contrast with the interior, where almost all other resources beside salmon are widely scattered, other resources along the coast are typically located at specific places along the shore. With the higher population density and shorter seasonal rounds allowed by the salmon intensification, control of these resources by members of local groups was both possible and feasible. Once the most important resource locations are "owned" it is easy to see how all localized resource locations would soon be controlled (Figure 2).

In contrast with the interior situation, where few resources were owned, the coastal social organization became much less



flexible. First, flexibility on the same scale was not needed (i.e., local salmon resources could not fail and so the option of joining groups with different salmon resources would be unnecessary) and secondly, most of the other important resources would be owned and thus could not be used by someone who was not well integrated into the local group. Once resources were owned, inequities relating to access and inheritance would occur as well as changes in technology which would affect the relative worth of the resource locations. The most extreme case may be reef net locations, where the owners hired captains and crews for a part of the catch, with the owners not participating in the actual exploitation of the fish (Suttles 1951:161-162). Specialization here occurred at several levels, reef net fisherman (crew), reef net captain and reef net owner. The end result of such inequities would be a ranked society such as seen ethnographically.

While it is relatively straightforward to explain why the upstream interior groups did not develop culturally complex societies, it is more difficult to deal with groups along the main streams but downstream enough so that long, large and reliable runs occurred, such as the Fraser Canyon area. Here the resource is surely reliable enough and relatively unaffected by fishing, so why not a complex ranked society? I think the answer has to do with a lack of localization of resources or a need for high technology. If a complex system of weirs is used and can be used only at certain parts of the river, as reported by Hudson, resource and/or technological control will develop if the reliability and importance is there.

Along the downstream parts of the Fraser River the technology used was the simple dip net, which does not require a complex social organization, as one might argue something like a reef net does (Schalk 1977). But more importantly, dip net locations are not localized but extend up and down the river banks. Further, other important resources such as deer, elk, berries and root crops are also widely dispersed. In such a situation if social inequities develop over access to the best dip netting stations, the solution for a family that does not have good access to the best stations is simple, move upstream or down and use the best unused one. In a sense one trades poor access to the best locations for good access to not-so-good locations.

Along some rivers, such as the Skeena, culturally complex groups did inhabit the lower reaches. It would be interesting to examine these rivers and compare them with other rivers where this did not occur. It may well be that this was not a primary development but occurred secondly to developments along the coast.

Intensification of salmon fishing on the Northwest Coast can be seen to have several different important aspects. It was stable, allowing feedback trends to continue. These included increasing technology, specialization of labor force, increasing importance, and increasing ownership. Salmon resources were also inexhaustible so that increasing production did not have an important effect on run size (survival rates from egg to fingerlings are thought to be the most important factor). The trends of increasing ownership and increasing importance of salmon in a large part brought about the inegalitarian aspects of society so noted on the Northwest Coast. The increasing importance, or increasing production, also allowed the high population density and large settlements seen ethnographically on the Northwest Coast.

Several aspects should be pointed out here. The first is that not all groups had access to the same resources or to the same reliability of resources. The complex situation pointed out by Suttles (1968) for the Salish is probably functionally equivalent to the interior flexibility. So trade, potlatches and widespread kin networks evened out the fluctuations on the coast instead of the wholesale splitting up and moving of groups as in the interior where the fluctuations were greater.

This view about the linked nature of sedentariness, ranked society and important, reliable resources is not unique to me. Others have pointed out that, in general, hunters and gatherers need to have a reliable, large scale resource to become sedentary and that the ownership or control of such resources, if inherited below the level of the community, would create inequalities in status differentiation of kin groups. The more detailed description above of the Northwest Coast case can be thought of as an example of this general process. A similar view of Northwest Coast developments has been expressed by Sutton (1982).

In any disinterested inquiry it is important that ideas about the nature of things be evaluated in a non-tautological fashion. What evidence is now available that bears on these ideas? What observations might be made in the future to confirm or falsify this model?

The core of the model is that ranked society, sedentariness and large scale use of salmon resources should all be tied tightly together and that, initially, one should not occur without the other two. It is important to note that once such a system is in existence, successful variants that no longer have all the attributes of the original will become established. For example, we can see areas on the fringe of really successful salmon producing

areas, whether acculturated to a sedentary, ranked society, or offshoots of it, finding ways of making up salmon shortfalls through some other process. In time this new variant would spread through the area in which it is a potentially successful adaptation and variants of it also would develop. Hayden's "Resource Stress" model explains why the new variant would spread. The general mechanism is that suggested by Wood and Matson (1973). So the crucial point is that the *initial* occurrence has all three factors.

In the Gulf of Georgia area, the Marpole culture is widely thought to be the first archaeological manifestation of a sedentary, ranked society. Although the evidence for this is indirect there are a number of lines of evidence, and those who have investigated this question are in agreement (Borden 1970; Mitchell 1971:54; Matson 1976:304, 1981:85; Burley 1979b:134, 1980b:60). So the Marpole culture ought to show evidence of being dependent on salmon, at least in its initial stages, to a greater extent than earlier or later cultures.

A number of lines of evidence suggest that this is the case. Mitchell (1971:52) states that "From the distribution of the Marpole sites it seems the subsistence of the type was closely identified with the major fish runs of the Fraser River, and it is probable that a mainstay of the economy was the salmon runs, perhaps even to a greater extent than was true of the Gulf of Georgia type." Burley (1980b:43, 45) shows that the mean distribution of the Marpole sites with early radiocarbon dates is in the Fraser Delta, suggesting that the culture originated there. Matson, Ludowicz and Boyd (1980) have shown that all typologically early Marpole sites are clustered in the Fraser Delta. So it does appear that the Marpole culture developed adjacent to the lower Fraser River, one of the most important salmon sources in the Pacific.

Ham in his dissertation (1982) has reviewed Gulf of Georgia archaeology and concluded that salmon were most important in the Marpole culture with earlier and later periods showing less emphasis on salmon. His evidence is admittedly not as good as one would like, but is at least partially independent of, and a confirmation of, the above distributional evidence.

The present archaeological evidence, then, is in accord with the model, but by no means can be said to have confirmed it. Falsification is much easier to do in a definite manner, and findings of sedentariness, with or without ranking, in the little-understood Locarno Beach culture which immediately precedes Marpole, would certainly do so. Other findings in Locarno, such as ranking with sedentariness, or ranking with sedentariness but

without an emphasis on salmon would also do. In fact findings of any one of sedentariness, ranking or large scale use of salmon, or any combination, except for the joint occurrence of all three together, would falsify this model. The presently known distribution of Locarno Beach sites, however, is not centered on the Fraser Delta, which is mildly supportive of this model.

The more general model might be examined by careful cross-cultural comparison of hunters and gatherers which have ranked societies, or by archaeological investigations elsewhere of such groups. Since I have argued that the nature of the resource that is intensified is all important, one might look at an area that has resources that are apparently similar to those found on the Northwest Coast but that does not have comparable cultural complexity, and ask why not. Such a case, appears, at least initially, to be the Micmac on the east coast.

#### THE NORTHEAST COAST, THE MICMAC

In contrast to the Northwest Coast, cultural complexity in the Northeast was relatively low. Why did the situation occur? The Micmac were too far north to grow maize, but had access to resources broadly similar to those available on the Northwest Coast. The Micmac were contacted very early and were greatly influenced by this contact so that the ethnographic records are much less reliable than those for the Northwest. Hoffman (1955) has made an attempt to gather such information as exists together, and the following account relies heavily on his material.

Many questions remain about the basic attributes of the Micmac that make comparisons difficult. For instance according to some the population density was much lower, possibly one tenth, than that on the Northwest Coast (Hoffman 1955:230) while others (Miller 1976, 1980a) suggest comparable densities. The size of local communities is likewise contentious. The seasonal dispersion of the population is reversed from that of the Northwest Coast, with summertime villages and winter dispersion. The summer aggregations might average around 60 persons (Hoffman, population size after contact, 3000; 45 known villages) or have 200 or more individuals (Bock 1978:109) according to different workers. For the purposes of this paper I will assume that the estimates that are most like those for the Northwest Coast are correct. In this way we may be certain such differences as remain did exist in precontact times. So the population density and maximum community size appear to be similar, although the seasons of aggregation are reversed.

Many of the important resources were similar in both areas. Sea mammals, fish and shellfish were all important to the Micmac. During the spring, smelt, herring, flounder, sturgeon and salmon were all taken, along with shellfish. In the summer, a number of sea fish were obtained; in fall, salmon, herring and brook trout were taken. In the winter smelt, tom cod, seals, eels, and walrus were obtained along the coast; beaver, moose and caribou, inland (Hoffman 1955:153). The period of maximum dispersion was during winter when small groups were inland hunting, but Hoffman suggests that this winter inland pattern may have developed in response to the fur trade (1955:233-236). Even if this was so, the summer villages still dispersed in the fall to smaller settlements in areas along the coast and small rivers. Burley (1981a) suggests that riverine locations near the coast may have been occupied during fall and winter while a wide variety of resources were exploited.

Other aspects of the Micmac culture also differ from the Northwest Coast. While there does appear to be some complexity in terms of political organization, the highly ranked society with ownership of resources found on the Northwest Coast is absent. There is little evidence of sedentariness. The summertime villages were not occupied for long and differ greatly from the Northwest Coast winter villages. The only status position that appears to have an ascribed component is that of chief. I think this is due to warfare and a reflection of a more widespread Woodland pattern (see Miller, this symposium), and not an important part of everyday life in Micmac society. In most other aspects, except for elaborate feasts and the summertime aggregations, the Micmac are close to the basal pattern of hunters and gatherers, discussed earlier. If Miller is correct, they did have a high population density, but this does not by itself lead to a ranked or sedentary society. Following Martin (1973), areas with rich resources can be expected to have more hunting and gathering bands rather than larger or more sedentary bands, although one would also expect the total distance travelled in the seasonal round to be less. In general, then, the Micmac contrast strongly with the Northwest Coast.

The explanation for this similarity of resources and differences in cultural complexity lies in the Micmac lack of intensification of resource utilization. As described, the Micmac show similarities with the St. Mungo archaeological phase described previously; intensive use of coastal resources during a variety of seasons but lacking intensive use of a single resource. When an intensification process occurs, the time allotted to processing the intensified resources interferes with processing other resources available only at that time. The switch from one resource to the other will only occur if the first resource is giving more return

than the second (leaving aside such obvious exceptions as nutrients, important ceremonial purposes, etc.). So after intensification occurs there will be a reduction in range of activities (again leaving aside specialization which can increase the range of activities by having different people do different things). The decrease in range of activities and increase in yield leads to increased sedentarism and to the possibility of increased complexity.

Why did this intensification not occur in the Micmac? I think the most obvious answer is that the salmon in the east is not as abundant as the Pacific salmon. The Atlantic salmon (*Salmo salar*) is a member of the same genus as the western steelhead and has a life history which more closely approaches that of the steelhead than the generically different Pacific salmon (Scott and Crossman 1973:192-197). The numbers involved, while greater than those for steelhead, are but a small fraction of those for the Pacific salmon (compare for instance, Dymond 1963:389 to Scott and Crossman 1973:171 for the sockeye). The absolute abundance of the Atlantic salmon appears to be somewhere between one hundredth and one tenth of the Pacific salmon, and in spite of Rostlund's statement to the contrary (1952:26), there is little doubt that it always has been so. Further, the river systems in the east that have salmon runs are small, making the east-west differences greater. While the major streams in the west gain reliability of runs through having different species and races of salmon, in the east there is only one species and the small size of the streams makes the probability of different races existing remote.

To sum up, as it was put to me by one familiar with both types of salmon, but professionally involved with Pacific salmonids, "There are no Fraser Rivers in the east." To which I might add, no Marpole-like cultures, either.

Rostlund also makes a claim for more fish per square mile of land in the east than in the west (1952:52) but this is spread out over a variety of types of fish. If so, this density of fish might help to explain the density of Micmac as argued by Miller but does not give the preconditions of a single, large, reliable resource which I have argued is necessary for the development of a sedentary, ranked society on a foraging base. In the Micmac territory there appears to have been no single resource that was significantly more important than the Atlantic salmon.

## CONCLUSIONS

It has long been held that the developments seen in the Northwest Coast culture area have been related to the resources available, but the exact relationship has not been spelled out nor tested in detail. The model presented here is a special case of both a more general model of culture change and a more general model of the relationships between sedentarism, ranking and resource base for hunters and gatherers. The evidence that we have today is in line with expectations generated from the intensification model. Further, the model appears to be successful in explaining the lack of Northwest Coast-like developments in the Northeast coast.

I do not think that the resource intensification route is the only one possible to cultural complexity. As suggested earlier, I think it is a common one, but there are other routes and other forms of complexity, such as seen in the development of political complexity seen in the Micmac. The intensification model needs further development; there are a number of features left blank at this time. Clearly, for ownership to be successful, sedentarism, as argued above, allows one to look after the resource, but only if it is localized. If the resource is diffuse, it would be difficult to control. What kind of limits are needed for control in terms of geographical or seasonal spread are not stated. Further, the mechanisms of ownership or control are not specified. Yet even in this initial formulation the model is sufficiently complete to enable us to generate a series of expectations, and the examination of this certainly supports further efforts to develop and test these ideas.

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