Environment, Food Availability, and Nutrition in the Northwest Coast: Hazards in Native Traditional Subsistence [1]

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RESUMEN

La Costa Noroeste norteamericana ha sido tan trillada como cubierta de tópicos por parte de las ciencias sociales. Uno de los más generalizados y básicos, pues afecta a todas las teorías que tratan de interpretar estas culturas, es el de la inagotable generosidad del medio ambiente, aunque los recursos estén disponibles de modo variable. Lo que este artículo aborda es una revisión de tales supuestos, enfocada desde la nutrición. Se expone que los recursos sí son agotables; que por diversos factores no sólo se distribuyen variablemente, sino estaban escasamente disponibles de forma bastante generalizada; y que incluso cuando su disponibilidad fuera óptima, existía una fuerte tendencia a padecer serios riesgos nutritivos en las culturas nativas tradicionales. Todo ello pone de relieve que las presiones medioambientales y culturales sobre la subsistencia eran más importantes de lo que se ha venido aceptando generalmente.

Palabras clave: Costa Noroeste norteamericana, culturas nativas, medio ambiente, disponibilidad de recursos, nutrición, riesgos.

Key Words: Northwest Coast of North America, native cultures, environment, resource availability, nutrition, hazards.

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INTRODUCTION [2]

The Northwest Coast of North America has certainly been one of the most studied culture areas in the world, and, as has been pointed out, it also served as a testing ground for most of the theories in the social sciences. But, in spite of exceptions having proved to be the rule (Boxberger 1990:387), it is likely to be, furthermore, a domain of clichés.

For more than three decades most theories on the NW Coast culture area had focused on the variability of the environment (Suttles 1960), and on the development of social ranking attached to it. In both cases they almost always assumed the endless richness of the enviroment, despite its variability. Lastly, failure or success was always a matter of social organization, not of environmental structure or whatever.

Regarding native traditional nutrition, the platitud of an inexhaustible supply of food is still generally believed (Smith in Rivera 1949:19). And once this premise is assumed, one is easily led to the assumption that getting both a suitable amount of food and a balanced diet was dead easy. However, it is put forward here that those arguments are far from being accurate, for different reasons. So, the aim of this paper is to point out that resources are exhaustible, that they are not and were not easily available, and that even when they were available, they could happen to be hazardously unbalanced from a nutritional point of view.

GENERAL TOPICS

There are a number of facts that could be settled even from the pure common sense of ordinary people. For instance, nowadays, though counting on the impressive actual technology, only 3.2 million people are living in the entire Province of British Columbia, whose size is roughly twice that of Spain -more than a half of them concentrated around the Greater Vancouver area. Such a figure is smaller than the one corresponding to a city like Madrid. Furthermore, from Oregon to Alaska the struggles for fishing rights and quotas between native and non-native, Canadian and American fishermen, are now as typical and traditional as the totem poles (Meggs, 1991). These are only primary indications of a suspiciously inexhaustible and pleasant environment. And we presume this to be the likely outcome of the latter at the same time.

[2] A draft of this paper was presented at «Mesa A: Alimentación. VI Congreso Internacional de Historia de América», Vitoria-San Sebastián, May 23-27, 1994.

From an ethnohistorical point of view, any random selection of the generous resources from contact times, repeatedly raises the same conclusion: shortage and famine raged among these peoples (e.g. Jewitt 1990; Alcalá 1991:129). These constraints ranged widely: from temporary shortage in most groups by late winter, to severe relapsing famines in a few groups that were faced with extinction or merging (Ruyle 1973).

Looking at the anthropological bibliography, one finds that any random selection of the ethnographical reports brings out another repeated feature: all over the NW Coast, every family owned a similar myth, in which one of their ancestors released his people from starvation by dreaming up the way to achieve a new food resource in desperate times (Cove 1978; Bruggmann & Gerber 1989:41).

These arguments, alone, bring forward enough traces to suspect that shortages and famine stretches were as frequent in the reality as in the myths and oral traditions. Furthermore, archaeological evidence shows that there was not only shortage of food resources, but, whether the shortages were present or not, there was also malnutrition. This affected the children mainly (Cybulski 1973), though many diseases couldn't be detected in the skeletal remains (Cybulski 1990).

Regarding this, in contact times the following more significant deficiencies had been detected: lack of fibre, vitamin E, folic acid (vitamin B_9), vitamin D, vitamin C, calcium, iron and copper (Kuhnlein 1984:804-806; Kuhnlein et al. 1982:159). Scurvy, rickets, and kwashiorkor, at least, had proved to be traditionally chronic diseases of these peoples (Lazenby & McCormack 1985:383). And iron-deficency anemia, arthritis, several cancers, and bone tuberculosis must also be added to the list (Cybulsky 1990).

Consequently, it is no longer time to continue arguing whether or not famine and malnutrition existed. We would better apply to quest about why, its range, outcome, and so on. This can be raised by approaching the two basic questions: why it was so difficult to secure an accurate amount food? and, which constraints prevented these peoples from achieving a balanced nutrition?

ENVIRONMENT AND FOOD AVAILABILITY

The aboriginal native groups of the Northwest Coast of North America did not rely on agriculture as a means to supplying food. Neither had they livestock to feed on [3]. Their subsistence relied on a hunters-gatherers economy, but not

[3] Dogs were the only domesticated animals they had, but these animals were special wool-

due to endless or inexhaustible environmental resources -as many students still keep on dreaming, but within a remarkably variable environment (Suttles 1990), with an unsteady equilibrium.

On that score, it is generally assumed that fish, and particularly salmonids, were the primary foodstuff all along the Northwest Coast. It has been pointed out also how its availability affected both the demographic incidence and the ranking of individuals within their groups (Donald & Mitchell 1975). But only Lazenby and MacCormack (1985) realized that such a heavy dependence on salmonids also led to a general trend characterized by severe seasonal hazards of malnutrition.

A gender based division of roles prevailed throughout the area: men went fishing and hunting; women went shellfishing, picked veggies and berries, and did the cooking. Nevertheless, such a division of labor was not very rigidly separated, especially shellfishing (Moss 1993:632). Food supplying roles turned, unfortunatly, more seasonally equalitarian: along the winter months they could hardly obtain any food. So they were compelled to previously gather a good supply. And, furthermore, they had to preserve this food in a very humid environment.

The problems come up when we try to determine what the food resources were that they really obtained. A detailed list of the many animal and vegetable species in the environment of the NW Coast would give the false impression of an easy supply, and endless possibilities (Suttles 1990; Turner 1987; Kuhnlein & Turner 1991). The temptation to fall prey to fantasies of the mythical jungle paradise is evident. And the Whites had taken a lot of trouble to invent this fantasy throughout the history of the conquest of the West, for two reasons. Firstly, the more lavish the environment, the more reason they had to take this environment away from the few savage hands that held it, there being enough resources for all. Secondly, the more abundant the West in gold and resources, the more attractive the arrival of more Whites who could take over these territories from the Natives. Most remarkably, the majority of anthropologists had traditionally fed the same myth, actively or passively.

Nevertheless, the reality is and was that not every species was available everywhere, at anytime, and in significant quantities. Here begin the limits in the real availability of resources, and the ratio between energy expended in work, size of benefits and efficiency. The resources available in each geographical unit were not so numerous, and were subject to great local, seasonal, and annual variations (Suttles 1990).

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bearing dogs, whose hair was used in weaving, but their meat was never included in the native foodstuffs (Smith in Rivera 1949:19).

We should keep in mind, in the first place, that due to the extremely rough geography, the distances between different resources -like salmon rivers, herring or halibut runs, shellfish grounds, and berryfields, were so big that a human group which was entirely sedentary couldn't use them effectively (Drucker 1951:59). Secondly, such an extension of land, rivers, and sea, along with the scattered resources, demanded more numerous and complex social units than at the band level, to be able to defend and ensure control over these territories. At the same time, resources must not only be obtained and processed (to be preserved) at the moment, but, in many cases, their availability is limited to a few weeks a year.

It should be noted now that the resources' nature demands both a specialization in the anadromous species and the presence of relatively numerous social units, with a complex organization. The reason is as follows: as aforementioned, resources are always scattered throughout a large and rough extension. Most resources are seasonal, the coast being the temporary home for migratory species (mainly fishes and fowl). And only these seasonal species happen to occur in vast quantities, for a short period. Ideally, these conditions allow subsistence of only small isolated nuclear families (almost at a level similar to the Arctic), whose storage needs are quite small, and who are under no pressures to defend territories, resources and storage. But, under favourable conditions, a general trend in population growth exists that doubles demographic rates from generation to generation. And then pressures arise.

Apart from insects and timber, the only food resources actually occurring in the NW Coast in vast quantities are and were the species associated with the marine biomass. But native traditional technology didn't allow regular fishing on the high seas. Resources had to be obtained from land or coastal grounds. The sole vast food resources related to the marine biomass were anadromous fish species, salmonids particularly. But they are not available everywhere, at anytime and in vast quantities. Every salmon species has its preferences for different rivers; salmon runs have different sizes from year to year; and they are usually available for a few –two or three– weeks a year (Suttles 1990; Groot & Margolis 1991).

Such a resource character demands high workforce concentration for only a few short periods a year. During such intensive seasons food had to be obtained to allow subsistence for the entire group in the present season; and, furthermore, for the long regular seasons of scarcity, primarily winter, when hardly any foodstuff can be gained. But the job is not yet done. Unlike agricultural products such as wheat or maize, which are stored away right after harvesting, and ready for consumption, fish has to be processed immediately

after fishing, so that it could be preserved for as long as possible (gutting, cutting, drying or smoking them).

It is likely, moreover, that other food resources are ripe at the same time, mainly in summer, demanding additional workforce. These other resources, though smaller in amount, were basic from a nutritional point of view. On the other hand, these favourable conditions supported the population growth, which brought up pressure over fishing grounds, storage, and population. So, a significant part of the workforce had to be ready anytime to defend all that. And all these factors gave rise to very showy cultures, with a high social-cultural complexity despite its hunting-gathering economy.

Under these conditions, the natural trend to population growth was the major inducement that led these peoples to specialization in salmonids and other anadromous fishes. Thanks only to this they could survive in such numbers, with such a complex social organization, and with such a lavish culture. This specialization began some 5,000 years ago, though fully steadied 2,000 years ago (Fladmark 1986). No drastic shifts in demographic rates and economic structure had been reported, since then, in the archaeological records, apart from the contact period. Bearing in mind the natural trend to population growth, we have to assume that certain environmental, cultural, or nutritional constraints restrained that.

NATURAL CONSTRAINTS

Apart from the significant spatial, seasonal and annual variability of the resources, there are and were a large series of natural factors that prevented, limited or affected the availability and use of natural resources. They could affect the resources directly or indirectly, through other elements of the environment, or the human populations and their technological means. Among them, the following variables, at least, are involved:

All the NW Coast, but particularly the St. Elias Mountains and the Cascade Range, is an occasional volcanic and seismically active area, with earthquakes being relatively frequent. Volcano activity has a devastating result on the food plants affected by lava and ashes. The latter, when given off in large quantities, can spoil the quality of water in the neighbouring rivers, heavily lessening the anadromous fish runs (Salo 1991:248-251; Healey 1991:326-330). Moreover, both volcano and human activity (the latter used to set fire to areas of the Southern Province to allow an easy growth to certain food plants) may cause wild fires, which affect the houses, stores, vegetable resources, game, or fishing (when ashes reach spawning and hatching grounds).

Occasional earthquakes provoke mudslides, with the aforementioned consequences. Furthermore, they can destroy houses, food storages, etc., and also cause destructive tsunami with similar outcome.

Severe winds, frequent from November to February, would damage houses, storages, canoes, implements, etc. (Alcalá 1991:119-120).

Regular storms and heavy rainfall can cause mudslides that could cover entire villages, as the reknowned prehistoric Ozette (Samuels, ed., 1991), with the aforementioned effects on plants and anadromous fish runs. The separate or joint action of heavy rainfall and severe winds prevented the natives from going hunting, gathering or fishing. So the resource availability was seriously lessened.

Excess of rainfall also causes floods that drag down fish eggs, hatchlings, and alevins, spoiling their growth or severely depleting it (Healey 1991:328). But droughts, also not infrequent (Minister of Supply and Services 1993), reduce the water level of rivers to such an extent as to prevent fish runs from reaching the spawning grounds, or hatchlings from growing up. In fall 1993, for instance, the chum salmon run failed along the British Columbia shores.

Decrease of water level in rivers, and deforestation due to wild fires, bring along a rise in water temperature that spoils the conditions for good growth of salmon runs (Healey 1991:328).

Exceptionally long and cold winters affect the growth of anadromous species alevins in the same way (Salo 1991:247-248). Temperature shifts below 4.4.°C and over 16.°C cause the death of fertilized eggs and hatchlings (Healey 1991:328).

We have to keep in mind that significant temperature and rainfall shifts happen to be daily, seasonal, annual, and local. And all these are really far from being unusual; rather they are the rule (Minister of Supply and Services 1993).

Large predators were a rare danger, but they seldom damaged storages, resources or people. Anyway, their sole incidental presence means a hazard.

Some invertebrates were at least a nuisance. Fleas and lice were common in houses, to the extent that it has been suggested that they contributed to the pattern of seasonal movement. And mosquitoes are vectors for diseases (Suttles 1990:29).

Along the year, but particularly in summer, the coastal waters are cyclically preyed on by the red tide, making fish, algae and shellfish poisonous. The spring of 1994, for instance, brought a big spring salmon slump that raged mainly along the Southern Province.

Persistence of the California Current, besides bringing red tides, causes a rise of coastal water temperatures over 20.°C, with salinity rates over 3.4%,

which salmon avoid (Clemens & Wilby 1961:106), depleting present and future anadromous runs because of lack of spawning.

Unknown, but not less actually dangerous factors, cause the disappearance of entire fish runs. In the spring of 1994, for instance, herring runs unaccountably failed to come to British Columbia spawning grounds.

These more significant negative natural factors are not unique. A large number of hazards that affect mainly human beings (diseases, accidents, etc.) work as a constraint at an individual or familiar level, making resources less available.

CULTURAL CONSTRAINTS

But human beings were not merely patient subjects of the natural handicaps that lessened the availability of resources. There were also a series of social-cultural constraints that hindered them more. Among those, the following should be kept in mind:

Every natural disaster that damaged houses, storage, and people, demanded, for a long or short time, a more or less significant workforce to make repairs, which was time discounted from directly exploiting the resources. But every individual has to be fed daily, whether they produce or not.

Though most social ceremonies were usually scheduled to be held in winter, to avoid lessening the productivity, others did not allow delay. So, a chiefs death, for instance, required immediate obsequies that temporarily lowered the available workforce and productivity (Drucker 1951:147-150).

In war times, or even fearing the possibility of a raid, a substantial part of the workforce was partly or fully detached from exploiting the resources. And we have to take into account that, for different reasons and with diverse intensity, warlike incidents or expectations were almost endemic throughout the NW Coast in precontact times (Ferguson 1984).

Resources and food are not merely a mixture of chemical elements. Social and symbolic values are attached to them, which limit their use to some or a great extent. The Tlingit, for example, related shellfish to «poverty, laziness, and ritual impurity, and those who sought to be *ideal* persons avoided shellfish» (Moss 1993:631). These cultural restrictions became more significant as supplies were shortened or exhausted.

Fortunatly, not all these hazards happened everywhere and all the time, so that this environment was not as catastrophic as it may appear, at first glance, only adding one constraint after another. However, they were so many, so assorted, and frequently acting jointly, that a few of them, at least,

were actually or expected to be threatening the availability of the resources everywhere at anytime. So then, unlike generally assumed in the traditional anthropological bibliography, resources behaved not only variably, but with scarcity rather than lavishly. Only these environmental pressures and resource scarcity could demand such a complex social organization that allowed subsistance to a relatively dense population.

TRENDS TO A HAZARDOUS DIET

Unbalanced or inaccurate nutrition is due to both a lack of some elements and an excess of others. All over the NW Coast a larger occurrence, availability and predictability of marine than terrestrial resources, led to the economic specialization in salmonids and other anadromous fishes (Chisholm, Nelson & Schwarcz 1983). This brought along a diet made up of a notably outstanding high quality of proteins, containing plenty of all the essential amino-acids, along with a remarkable rate of fats that probably exceded the advisable (Pennington 1989:227). On the other hand, such a diet was characterized by an almost total lack of carbohydrates, a significant shortage of vitamin C (Rivera 1949:22-23), and a dangerous excess of vitamin D (Lazenby & McCormack 1985).

Lack of carbohydrates is inadvisable, since it deprives the organism from a balanced nutrition. and basic elements of diet. However, this deficiency –shared with the Inuit and other marine hunting and gathering peoples– does not seem to cause severe consequences, when it is compensated for by an adequate intake of fats, proteins, vitamins and minerals.

Vitamin C deficiency is as much traditional as actual (Lee et al. 1971:1809-183). It increases depending on the troubles involved in obtaining, regularly, and steadily, enough supply of proper vegetable foods for all, and to their dramatic scarcity, particularly between November and March (Lepofsky, Turner & Kuhnlein 1985; Turner 1987).

When possible, the main source of carbohydrates and vitamin C was the camas bulb (*camassia quamass* and relatives of the lily family). But it only grows in swampy areas of the Southern Province; it was extremely rare in the Central Province; and was absent in the Northern Province. Moreover, it is easily mistaken for the poisonous death camas (Turner 1987:79-90). Anyway, for the most part of the NW Coast culture area, neither the camas bulb nor any other carbohydrate source was ever remarkable in the traditional native diet (Rivera 1949:22; Folan 1984).

Vitamin C was seasonally obtained from different berries, roots, shoots,

ferns, etc., and even raw meat and fish contain quantities that could be significant. During winter, however, it can hardly be secured. Moreover, the various food transforming processes, such as storage, drying, smoking, and cooking, which involved heating and dehydration, destroyed most of the vitamin C that food resources would contain. This led to the paradox that, within an impressively green forest and landscape, there was a notable vitamin C deficiency. This lack was greater than among the Inuit, as this people suffered much less from pathogen microbes, and they ate most fish and meat in a raw state (Rivera 1949:22-23).

Persistent vitamin C deficiency brings along with it a general weakness of the immune system, scurvy, inability to assimilate iron (a mineral extremely difficult for the body to use), great proneness to allergies, difficulties to evacuate toxins and heavy metals (such as lead, copper or mercury), and prevents the organism from opposing the effects derived from nitrates and nitrites, which combine with other elements in the body to yield the carcinogenic nitrosamins (Hunter 1990:59-60).

On the other hand, regarding malnutrition, as detrimental as vitamin C deficiency is to the organism, so is an overintake of vitamin D. Being one of the fat-soluble vitamins, its excess is not released from the body. Instead, it is stored within the liver and kidney, to the point of becoming deadly.

The recommended daily allowance of vitamin D in the USA ranges from 400 IU for children to 200 IU for adults (Pennington 1989:xvii-xx). But it should be noted that daily dosages over 42.5 mg (17,000 IU) for adults, and 10 mg (4,000 IU) for children, provoke intoxication (Pennington 1989:xvii), which, if persistent, may cause death. And the toxic level rises when hypervitaminosis D combines with diets richer in calcium, e.g. shellfish (Lazenby & McCormack 1985:381).

Among the salmon species, the vitamin D rate ranges from 863 IU per 100 gr of chum to 3,632 IU per 100 gr of sockeye. Of this, little is lost through the usual processing for preservation and cooking, even kept almost untouched after one year of storage, once dried or smoked (Rivera 1949:34-35). But salmon meat is not the only source of vitamin D in the traditional native diet. So, for instance, salmon oil is twice as potent as cod liver oil and herring, whose vitamin D rate is 3,300 IU per 100 gr (Lazenby & McCormack 1985:381).

Traditional native intake of salmon has been estimated from 1.5 to 3 kg a day for adults, and from 0.75 to 1.5 kg a day for children. This was particularly accurate in the summer and fall months (Lazenby & McCormack 1985:380). Moreover, among the Tlingit, for example, «a pint [0.473 litres] of oil a day is not considered overmuch for a hard working Indian» (Oberg 1973:115).

Assuming these estimates, it follows that children had a daily vitamin D dosage ranging from 6,472 IU (0.75 kg of chum) to 12,945 IU (1.5 kg of sockeye). This means an hypervitaminosis D which exceeds the margin of safety by between 62% and 223%. In the case of adults, the outcome is that their daily dosage ranged from 12,945 IU (1.5 kg of chum) to 108,960 IU (3 kg of sockeye). These figures range from 31% below to 541% over the margin of safety. Taking into account that the overdose is accumulated in the liver and kidney, the harmful toxicity of hypervitamonosis D was a real and permanent hazard, particularly between late summer and early winter, and mainly in the peak fishing and feasting seasons.

The immediate effect of excess vitamin D is hypercalcemia. But prolonged exposure to hypervitaminosis D, on the order of two weeks or a few months, produce severe harm. Once renal damage becomes irreversible, death eventually occurs (Lazenby & McCormack 1985:381).

Vitamin D intoxication is characterized by the following symptoms:

Renal symptoms:
polyuria (excessive urine secretion); hyposthenuria (inability to form urine of high specific gravity); hyperkaliuria (abnormally high urine potassium levels); *hypokalemia (abnormally low plasma potassium levels)*; exsiccosis (dehydration produced by a negative water balance).

Intestinal symptoms:
vomiting[4]; *abdominal pains; constipation.*

Cardiac symptoms:
Q-T shortening (reduced interval between ventricle activity); tachycardia; hypersentitivity to digitalis.

Neural symptoms:
weakness; hyporeflexia; EEG changes; *nausea.*

Psychic symptoms:
discord; mental disturbances; confusion; disorientation (Zeigler & Delling, in Lazenby & McCormack 1985:382).

A detailed description of all these symptoms requires highly specialized and modern medical knowledge. But several symptoms can be easily observed by an attentive witness, who could roughly make descriptions of them. A long stay and close contact make it easier. So, generally speaking, ethnohistoric resources of contact times do not render profitable accounts related to

[4] The symptoms considered highly visible in an aboriginal situation are in italics.

that. Furthermore, the character of these symptoms also makes them difficult to trace with archaeological methods. This notwithstanding, there is one source at least that accurately reports all the more easily observed symptoms. It is the description that Jewitt made (1990:241-249) of the disease, agony and death of Mowachaht chief Tootoosch, which matches them point by point.

Obviously, the native peoples of the NW Coast also had a variety of other marine, terrestrial, animal and vegetal sources that completed their diet. And it is now clear that among some outer coast peoples halibut was as important as salmon (Suttles 1990:25). But these were eaten only seasonally, incidentally, and in small amounts .There is no doubt that throughout the coast salmonids, along with other plentiful sources of vitamin D, were the bulk of these peoples nutrition. And this brought along the nutritional trend already detailed.

CONCLUSION

Recent history has proved since the 1940s that the NW Coast environment and food resorces are more easily exhaustible than expected. As generally assumed, environment and resources are notably variable in time and space, with an unsteady equilibrium. What is pointed out here is that, counting on the more recent available environmental data, such an unsteadiness frequently became real or expected shortages and starvation. And this environmental pressure affected all the peoples of the NW Coast on a permanent basis, whether by real or expected menace. So resources behaved with scarcity most or all the time. Shortages affected all the peoples seasonally and annually. But starvation raged cyclically among a significant number of groups, which faced decimation, slavery, merging or extinction. And this, in itself, continually worked as a vivid threat to other peoples.

As has been repeatedly argued in recent years, the seasonally great amount of anadromous fish resources, along with its predictability, made these peoples specialized in them and caused them to develop a complex social organization and culture. But, as is pointed out here, such resources were scarcely available due to a lot of constraints, which were as numerous and predictable as resources. Furthermore, and most remarkably, when resources happened to be sustainably plentiful, a trend to severe nutritional hazard threatened the people. It was malnutrition, characterized by deficiency in vitamin C and carbohydrates, along with an excessive intake of vitamin D that was eventually deadly. So, the environmental character itself, along with vari-

ous cultural factors, tended to generate a highly unsteady equilibrium within the native nutrition as well. And all this puts forward that environmental pressures and food availability constraints were much more significant than previously assumed.

This opens new theoretical and methodological perspectives in the study of these societies. The constraints pointed out here may be taken as impediments that restrained a greater and sustained population growth. This, at the same time, regulated the promotion of specialized roles, which allowed new technological developments and new management of the workforce, so that these societies could reach the level of pure states, in the most traditional acceptance of social sciences.

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