An investigation of interassemblage variability within the Gulf of Georgia phase

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1992

AN INVESTIGATION OF INTERASSEMBLAGE VARIABILITY WITHIN THE GULF OF GEORGIA PHASE

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Abstract

This paper is an examination of diversity in archaeological assemblages within a culture type. The Gulf of Georgia Phase of the Northwest Coast provides an interesting, previously uninvestigated area to examine such diversity. It is propo here that such diversity is limited by the environment that the assemblage occurs in. The artifact assemblages from 18 Gulf of Georgia components are summarized in a common typology and then put through a clustering routine in an attempt to clearly show the relationship between culture and environment.

Résumé

Cet article examine la diversité dans les assemblages archéologiques à l'intérier d'un même groupe culturel. La phase "Gulf of Georgia" de la Côte Nord-Ouest, n'ayant pas encore fait l'objet d'une telle étude de la diversité, semble être un terrain propice. Je crois que la diversité est limitée par le type d'environnement dans lequel les assemblages archéologiques se retrouvent. Les assemblages artéfactuels de 18 composantes de la phase "Gulf of Georgia" ont été compilés à l'aide d'une typologie commune, puis analysés selon une méthode de regroupement dans le but de montrer un relation entre la culture et l'environnement.

INTRODUCTION

The Late Developmental Phase of the Northwest Coast, as defined by Fladmark (1982), or the Gulf of Georgia Culture Type as defined by Mitchell (1971a, 1990), provides an interesting, previously uninvestigated area in which to examine diversity of archaeological assemblages within a cultural phase. The idea that interassemblage variability occurs in the Gulf of Georgia phase is clearly stated by Mitchell:

> There are noticeable differences among the assemblages attributed to this [the Gulf of Georgia] culture type. It seems likely that many are the result of seasonal differences in site use..."(1990: 348).

Mitchell noted a relatively higher proportion of flaked stone artifacts from Gulf Island and Vancouver Island components,while ground slate knives occur in relatively higher proportions along the Fraser River mainland (Mitchell 1990:348).

Burley (1980:10) noted that interassemblage variability occurs between Marpole phase sites that are located on the Gulf Islands and those located by the Fraser River. He saw the differences as cultural; the Fraser River components being influenced by people from the interior, and the Gulf Island components influenced by the adjacent coastal peoples. He observed, for example, that there is a greater frequency of herring rake barbs and small bone points from the islands, distinguishing them from the mainland in the Marpole Phase.

It is clear that some variability in assemblages occurs between the islands and the mainland and that this could be attributed to a number of factors. Abbott was one of the first to point out the archaeological implications of Suttles' ethnographic observations of seasonal land use patterns (Abbott 1972). Abbott recounted Suttles' model that "the Coast Salish cultural system encouraged both short and long-term major fluctuations and redistributions of population" and that "the ecological factors which governed the specific uses of sites must have demanded a degree of technological diversity between them." (Abbott 1972:276-277). Mitchell (1990) concurred with Abbott suggesting that the difference could be due to seasonal movements of some individuals, families and communities between mainland and island sites. People would, therefore, set up camps or villages at different times of the year to utilize different resources. The varying ecologies of the sites should provide different artifact assemblages, and thus the interassemblage variability.

Burley (1980) suggested that there were actual cultural differences in sites occupied on the islands and those on the mainland. Such cultural differences could be connected to different origins of mainland and island people, and perpetuated by continual contact with people from different areas, specifically, the mainland with the interior and the islands with the coast.

The model proposed here is one of environmental adaptation. The differences that are found in the assemblages should reflect the environmental conditions that are present in that area. Seasonal variation in the use of sites is, in part, dependant upon available resources in the area, but season alone does not dictate what sort of materials would be found at a site. Two summer camps, one located on the mainland and one located on one of the Gulf Islands, would not necessarily have the same artifact assemblages. There will be differences because of varying resources that are utilized in the distinct environmental zones.

This model shows that interassemblage variability does not necessarily reflect a cultural difference, because people of the same culture could use different things given different environmental circumstances. Conversely, people of different cultures could use the same items in similar environmental circumstances. The model considers what resources are available in a given area at a

given time, and what items are needed to procure and process these resources. These factors should limit the interassemblage variability in an area having some diversity in environment, such as the Gulf of Georgia.

The goal of this paper is to establish the type of variability which occurs between the assemblages and to suggest possible reasons for such variability. It is hoped that this will provide further insight into the development of the ethnographic Coast Salish culture. Both Burley (1980) and Matson (1974; Matson, Ludowicz and Boyd 1980) have investigated variability using the method of multi-dimensional scaling. Their methodology is being followed in this investigation.

THE MODEL AND THE ANALYSIS

Eighteen Gulf of Georgia components were selected to look at interassemblage variability in the Gulf of Georgia phase: on Vancouver Island, Sandwick (Capes 1964), Deep Bay III (Monks 1977), Little Qualicum River (Bernick 1983), False Narrows III (Burley 1988), Fort Rodd Hill (Mitchell 1981), Shoal Bay (Mitchell 1980);on the Gulf Islands, Rebecca Spit (Mitchell 1968), Montague Harbour III (Mitchell 1971a), Dionisio Point IIb (Mitchell 1971b), Helen Point III (McMurdo 1974), Fossil Bay II (Kidd 1969);and on the mainland Saltery Bay I (Monks 1980), Stselax (Matson 1973), Belcarra Park II (Charlton 1980), Pitt River III (Patenaude 1985), Crescent Beach (Ham 1983), Tsawwassen Transition (Stryd 1991,pers comm.), Tsawwassen Stselax (Stryd 1991,pers. comm.). Figure 1 shows the location of each site in the Gulf of Georgia area. Although this sample gives a broad geographic range of sites and is fairly extensive, it is not exhaustive of all the Gulf of Georgia phase sites that have been excavated in this area. Rather, it represents the sites where frequency data were available for the artifacts in published and unpublished reports.

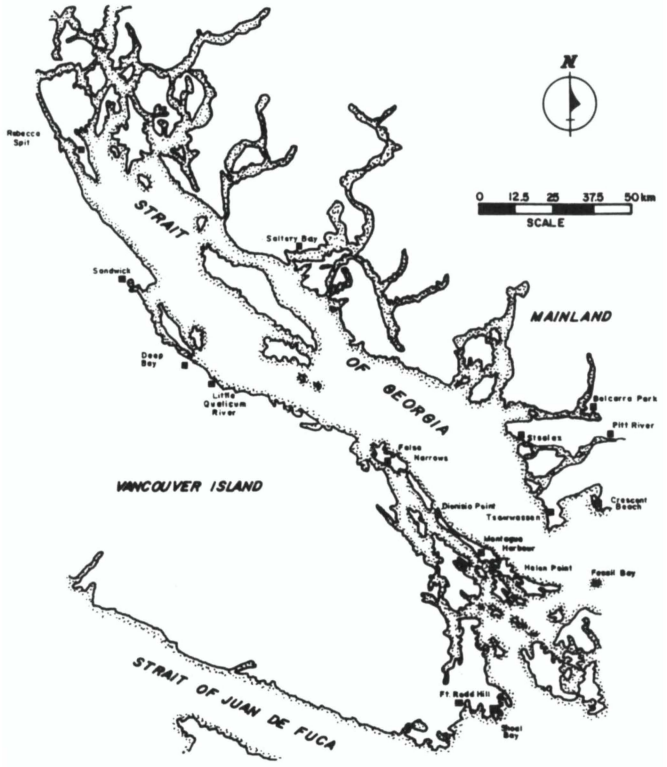

FIGURE 1: Gulf of Georgia sites investigated in this paper.

The artifacts from the various components were classified into a standard typology of seventy-two different artifacts. This typology is based on the one used by Matson (1974), which is in turn based on one used by Mitchell (1971a). These two sources can be consulted for a description of the artifacts in the typology used here. Table 1 shows the frequency data of each artifact type for all the components investigated in this paper.

	SBY1	BPK2	PTR3	STSX	MTH3	HPT3	DP2b	FBY2	FLN3	SAND	FTRH	LTQR	SHBY	DBY3	CRBH	RESP	TSNT	TSNS
CHIPPED STONE																		
narrow-angle retouched flakes	0	0	18	5	0	10	0	0	0	0	0	1	0	1	0	0	0	11
flake scrapers	0	30	5	1	0	0	2	0	0	0	0	0	0	0	1	0	6	0
notched tools	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
heavy-duty cutting-scraping tools	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	2	0
utilized flakes	0	64	8	1	2	0	0	0	6	0	8	2	0	0	0	0	0	5
miscellaneous chipped slate	0	0	0	20	1	0	0	0	0	0	0	0	0	2	2	0	0	1
chipped slate, sandstone bifaces	0	6	2	9	1	1	0	0	0	0	1	4	0	0	7	0	0	0
cores	1	8	45	3	1	1	0	0	4	0	2	2	0	2	17	0	0	46
stone wedges	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2
microblades and cores	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
quartz-flaked tools	0	0	5	0	0	1	0	0	0	0	0	0	0	1	6	0	0	0
pebble tools	1	0	9	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0
split-cobble tools	0	0	4	3	0	2	0	0	1	0	2	2	0	0	1	2	0	0
well-made large bifaces	0	24	12	0	3	0	0	0	0	0	8	0	1	0	0	0	0	0
contracting-stem points	0	16	17	0	0	1	0	0	3	0	0	1	0	0	1	0	0	0
leaf-shaped points	1	5	0	1	0	1	0	0	1	0	1	0	0	0	0	1	2	0
weakly shouldered contracting-stem points	1	0	0	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0
small triangular points	1	80	0	0	5	0	0	0	4	0	5	0	0	0	0	0	0	1
point fragments	4	0	24	0	2	4	1	0	12	0	2	0	0	0	0	0	0	0
large triangular points	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0
drills	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUB-TOTAL	10	235	160	43	19	21	3	0	31	0	30	12	1	9	36	4	19	66
GROUND STONE																		
triangular points	2	51	0	22	18	5	0	0	2	1	1	6	1	0	0	1	0	0
non-faceted stemless points	2	0	1	0	0	3	0	0	5	0	0	0	0	3	0	0	0	0
stemmed sloping-shoulder points	8	0	1	0	0	0	0	0	1	0	0	0	0	5	0	0	0	0
faceted large points	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
thin ground knives	7	61	0	99	9	5	2	0	31	8	3	8	5	6	2	1	0	52
thick ground knives	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	5
small celts	0	0	8	4	0	0	0	0	2	1	2	1	0	0	2	0	2	2
large celts	7	15	0	2	2	0	0	0	2	0	0	0	0	1	0	0	0	2
decorative objects	0	0	0	0	0	0	0	1	0	0	1	0	0	0	5	0	2	0
labrets	0	0	8	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0
saws	0	12	2	0	3	1	0	1	1	1	0	0	0	3	1	0	0	0
SUB-TOTAL	36	139	20	128	32	14	2	3	44	11	8	15	6	21	11	2	4	61
PECKED AND GROUND STONE																		
mauls	0	2	0	7	1	0	0	1	1	1	1	2	0	0	1	0	0	2
perforated stones	0	1	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	0
hammerstones	1	4	12	3	4	0	0	1	0	1	1	0	0	0	0	0	0	0
shaped abrasives	0	54	5	10	6	0	1	5	8	0	2	0	4	0	0	0	4	1
irregular abrasives	7	44	14	26	56	43	7	25	32	61	7	8	13	6	9	6	3	17
mortars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
grooved stones	0	1	0	0	0	0	1	0	3	0	0	1	0	0	0	0	0	0
handstones	0	3	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
SUB-TOTAL	8	106	34	49	67	45	9	32	47	63	11	13	17	6	10	7	7	20

TABLE 1. TABLE OF ARTIFACT COUNTS FOR EIGHTEEN GULF OF GEORGIA SITES: Sandwick [SAND] (Capes 1964), Deep Bay III [DBY3] (Monks 1977), Little Qualicum River [LTQR] (Bernick 1983), False Narrows III [FLN3] (Burley 1988), Fort Rodd Hill [FTRH] (Mitchell 1981), Shoal Bay [SHBY] (Mitchell 1980) on Vancouver Island; Rebecca Spit [RESP] (Mitchell 1968), Montague Harbour III [MTH3] (Mitchell 1971a), Dionisio Point IIb [DP2b] (Mitchell 1971b), Helen Point III [HPT3] (McMurdo 1974), Fossil Bay II [FBY2] (Kidd 1969) on the Gulf Islands; and Saltery Bay I [SBY1] (Monks 1980), Stselax [STSX] (Matson 1973), Belcarra Park II [BPK2] (Charlton 1980), Pitt River III [PTR3] (Patenaude 1985), Crescent Beach [CRBH] (Ham 1983), Tswwassen Transition [TSNT] (Stryd 1991:personal communication), Tswwassen Stselax [TSNS] (Stryd 1991:personal communication) from the mainland.

Using Table 1 alone it is difficult to establish the degree of difference or similarity between each component. To make this comparison a multi-dimensional scaling routine was used. The theory behind this routine is that it shows how similar, or different, collections of artifacts are by comparing the relative frequencies of individual artifact classes from each site. To provide such analysis the data have been run through a program developed by Matson (n.d.) which uses Torgerson's metric multi-dimensional scaling technique (Matson and True 1974). This program calculated city-block distance measures (Sneath and Sokal 1973 pp. 122-126) based on the frequency data, transformed into percentages. The distances measured come out in factors, which are then plotted on a graph, and interpreted for their similarity or difference.

By converting the raw frequency counts into percentages, the problem encountered by Burley (1980), of a large component out-weighing a smaller component was eliminated, making all the components equally significant. But the data were not further standardized, as Matson (1974) did, following Sokal and Sneath. By not further standardizing the data the problem of each artifact from one of the less frequent types being made more important than each artifact from the more common types is eliminated. Using further standardized data was one of the problems in Matson (1974), where artifact types were emphasized because of their frequency.

The first four vectors are plotted in Figures 2 and 3. Vector 1 accounts for 22.6 percent of the variance, vector 2, accounts for 13.9 percent, vector 3 accounts for 10.1 percent and vector 4 accounts for 11.1 percent, for a total of 57.7 percent variance explained. Five other vectors were also generated, but each accounted for less than 10 percent of the variance, so they were not considered.

By looking at the plots of vectors 1 and 2, (Figure 2), a fairly clear difference between Gulf Island and other components can be seen. All of the Gulf Island components form a cluster in the upper-right portion of the graph, while almost all of the components from Vancouver Island, and all the components from the mainland form a cluster in the lower-left portion. The exceptions to the clusters are the Shoal Bay and the Sandwick components, which are from Vancouver Island, but for reasons discussed below, are clustered with the Gulf Island components.

	SBY1	BPK2	PTR3	STSX	MTH3	HPT3	DP2b	FBY2	FLN3	SAND	FTRH	LTQR	SHBY	DBY3	CRBH	RESP	TSNT	TSNS
BONE																		
barbed bone points	0	31	0	6	6	3	1	0	7	2	7	0	0	1	0	2	5	5
faceted bone points	3	42	0	0	0	1	0	0	1	0	0	0	0	11	0	1	0	0
wedge-based bone points	3	122	0	7	6	1	0	0	7	30	2	8	0	1	0	2	0	0
bone bipoints	12	9	0	24	38	64	2	0	1	38	10	16	14	7	9	15	1	3
mammal-bone awls	1	47	0	27	23	2	5	3	10	16	10	5	1	5	13	11	1	0
bird-bone awls	0	19	0	7	1	0	0	0	1	0	0	0	0	0	0	0	1	1
incised eye needles	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0	0	3
drilled eye needles	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0
bone chisels	0	2	0	1	7	0	0	0	1	0	1	2	1	1	2	3	4	5
bone wedges	0	3	0	1	2	1	0	0	0	0	0	0	3	0	3	0	0	0
ulna tools	0	14	0	1	8	3	1	0	3	1	8	0	1	2	2	1	0	1
decorative objects	1	3	0	5	0	0	0	0	0	1	0	0	0	0	4	0	1	2
incisor tools	0	23	0	5	2	1	0	0	0	0	0	1	0	0	0	1	0	5
ground canines	0	4	0	0	0	0	0	0	0	0	2	0	0	1	0	1	0	0
bird-bone tubes	0	4	0	19	6	0	0	0	0	1	0	0	0	0	0	0	1	2
bird-bone points	0	1	0	0	18	0	0	0	0	0	2	0	0	0	0	0	0	0
unipoints	3	110	0	0	0	4	9	0	7	0	5	7	6	0	0	0	0	3
bone harpoon	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUB-TOTAL	28	432	0	103	117	80	20	3	40	89	47	39	27	29	35	37	14	30
ANTLER																		
composite toggle harpoon valves	3	93	0	29	11	6	3	7	5	16	2	2	1	2	3	3	1	11
harpoon foreshafts	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
wedges	0	12	0	34	18	9	9	5	9	2	9	1	23	2	25	2	2	32
marpole style harpoons	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
sleeve hafts	0	4	0	0	3	0	0	1	0	0	0	0	1	0	1	0	2	2
barbed points	0	13	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	1
SUB-TOTAL	3	126	0	63	32	15	13	13	17	18	11	3	25	5	30	5	5	46
SHELL AND FISH																		
adze blades (*mytilus californianus*)	0	0	0	0	0	0	0	0	9	0	0	0	0	1	2	0	0	0
knives (*mytilus californianus*)	0	0	0	10	2	6	0	0	0	0	2	0	2	0	0	2	0	0
beads	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
dentalia	0	0	0	1	4	0	0	0	20	0	0	0	0	1	1	0	48	48
dogfish spines	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rattles	0	0	0	4	0	0	0	0	5	0	0	0	0	0	1	0	0	1
SUB-TOTAL	0	0	0	35	7	6	0	0	34	0	2	0	2	2	4	2	48	49
TOTAL NUMBER OF ARTIFACTS	85	1038	164	272	274	181	47	51	213	182	109	82	78	72	126	57	97	272

TABLE 1. (cont...) TABLE OF ARTIFACT COUNTS FOR EIGHTEEN GULF OF GEORGIA SITES: Sandwick [SAND] (Capes 1964), Deep Bay III [DBY3] (Monks 1977), Little Qualicum River [LTQR] (Bernick 1983), False Narrows III [FLN3] (Burley 1988), Fort Rodd Hill [FTRH] (Mitchell 1981), Shoal Bay [SHBY] (Mitchell 1980) on Vancouver Island; Rebecca Spit [RESP] (Mitchell 1968), Montague Harbour III [MTH3] (Mitchell 1971a), Dionisio Point IIb [DP2b] (Mitchell 1971b), Helen Point III [HPT3] (McMurdo 1974), Fossil Bay II [FBY2] (Kidd 1969) on the Gulf Islands; and Saltery Bay I [SBY1] (Monks 1980), Stselax [STSX] (Matson 1973), Belcarra Park II [BPK2] (Charlton 1980), Pitt River III [PTR3] (Patenaude 1985), Crescent Beach [CRBH] (Ham 1983), Tswwassen Transition [TSNT] (Stryd 1991:personal communication), Tswwassen Stselax [TSNS] (Stryd 1991:personal communication) from the mainland.

Vector 1 is correlated with differences in chipped stone abundance: where the components plotted on the left have relatively large amounts of chipped stone, the components plotted on the right have very little, if any, chipped stone. The Gulf Island sites tend to cluster on the right side of the graph because of their relative lack of chipped stone. Sandwick and Shoal Bay fit into the Gulf Island cluster because they also have relatively little chipped stone in their assemblages; the Sandwick component containing no chipped stone, and the Shoal Bay component containing 1 percent chipped stone. This contrasts with the Pitt River III component on the other side of vector 1, in which 68 percent of the assemblage is chipped stone. The average percent of chipped stone artifacts for the Gulf Island cluster is compared with the average percent of chipped stone artifacts for the mainland/Vancouver Island cluster in Figure 4. A distinct difference can be seen between these two averages.

Vector 2 is related to differences in frequency of the bone and antler industry. The components at the top of Figure 2 have relatively large numbers of abrasive stones, and bone and antler objects. Those found at the bottom of Figure 2 have fewer objects of bone and antler in their assemblages. Sandwick and Shoal Bay fit into the Gulf Island cluster for this vector because of their abundance of abrasive stones (33 percent and 21 percent respectively) and bone (45 percent and 31 percent respectively). Figure 4 shows the average percentage of bone, antler and abrasive stones for both the Gulf Island and the mainland/Vancouver Island clusters.

These traits of relatively high frequencies of bone, antler and abrasive stones and relatively low frequencies of chipped stone distinguish the Gulf Island from the mainland and Vancouver Island sites, which exhibit more chipped stone and less bone (Figure 4). Sandwick and Shoal Bay are anomalies to this pattern, since they are sites located on Vancouver Island which have very similar assemblages to those of the Gulf Island.

Figure 3 shows vector 3 plotted against vector 4. Given that the percent variance explained for these two vectors added together is less than that for vector 1 alone, it should be expected that these two vectors are more difficult to explain. A trend can be seen in vector 3 for ground stone tools being more abundant on the right, generally decreasing in abundance as one moves to the left. This is particularly noticeable in the thin ground slate knife category, which is absent in the Pitt River III and the Fossil

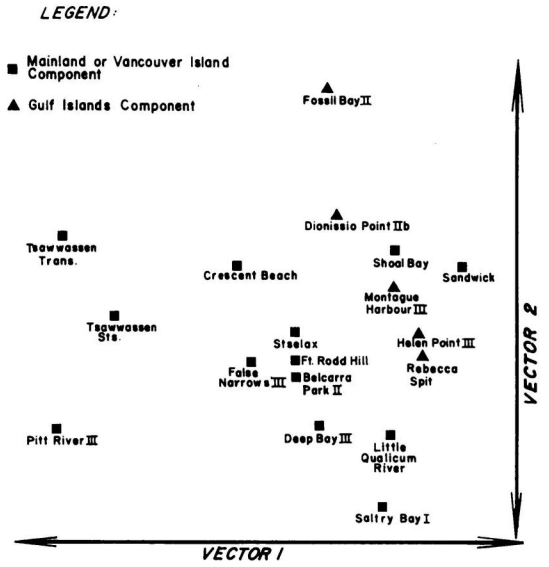

FIGURE 2: Multidimensional scaling of vectors 1 & 2.

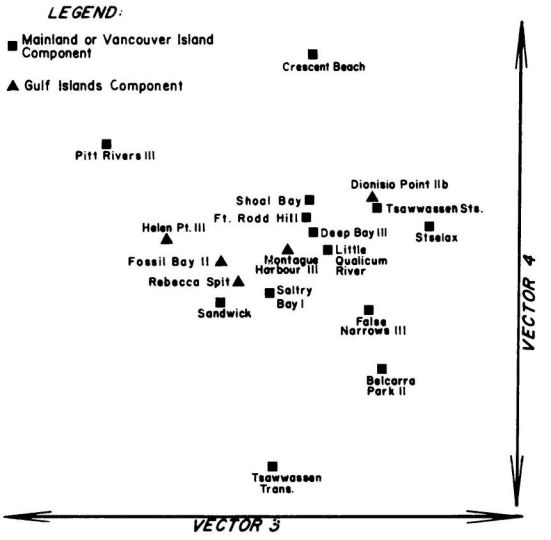

FIGURE 3: Mutidimensional scaling of vectors 3 & 4.

Bay II components, yet makes up 23 percent of the Stselax component, 19 percent of the Tsawwassen Stselax component, 14 percent of the False Narrows III component, 9 percent of the Little Qualicum River component and so on.

The components which contain a lot of ground slate knives are all interpreted as salmon processing centres, making this vector a likely product of site function, plotting salmon processing centres against non-salmon processing centres. The Pitt River III component seems to be the exception to this, for it is thought to have been a salmon processing centre, given its location on the Fraser River (Patenaude 1985). The site occupies this position on the diagram primarily because there are only lithics present in the assemblage, which distinguishes it from the others which have bone, antler and shell objects in their assemblages.

Vector 4 is the most difficult of all factors to interpret, as no cultural attributes can be attached to this vector. Individual traits of particular components distinguish them as anomalies. This explains the extreme positions of the Tsawwassen Transition, in which 50 percent of the assemblage is dentalium shell, and the Pitt River III, where no bone, antler or shell material is present; but does little to explain the position of the Crescent Beach component, or the components clustering near the centre of the graph. This vector may simply represent the distance of such unusual components as the Tsawwassen Transition or the Pitt River III from the majority of other components.

INTERPRETATIONS

The multi-dimensional scaling of the sites investigated in this paper established that there is an important difference between assemblages from the mainland and Vancouver Island, and those from the Gulf Islands. The general differences of greater frequency of chipped stone in the mainland and Vancouver Island sites, and greater frequency of bone and antler industries in the Gulf Islands have been made clear by the data presented here. Mitchell also noticed that chipped stone was generally less frequent in the Gulf Island sites, and bone was somewhat more frequent (1988: 269, Table 8). It must now considered why these differences are present.

Looking at the scaling results in terms of seasonal site use,it can be seen that the data do not fit into a model which has seasonality as the sole variable of interest. It is true that every component that is located on the Gulf Islands is a seasonal habitation or camp, and that all the winter village sites are found in the mainland/Vancouver Island cluster. However, there are seasonal camps, in particular Saltery Bay I, Fort Rodd Hill, Tsawwassen Transition, Crescent Beach, and False Narrows III,that

cluster with the mainland /Vancouver Island assemblage. The Gulf Island cluster also contains two components which are not located on the Gulf Islands. The Shoal Bay and Sandwick components are seasonal camps on Vancouver Island which cluster with the seasonal camps of the Gulf Island components. From this it is clear that there is no simple correlation between seasonality and artifact assemblage. Different seasonal uses of the components are found over both clusters and in the islands and on the mainland.

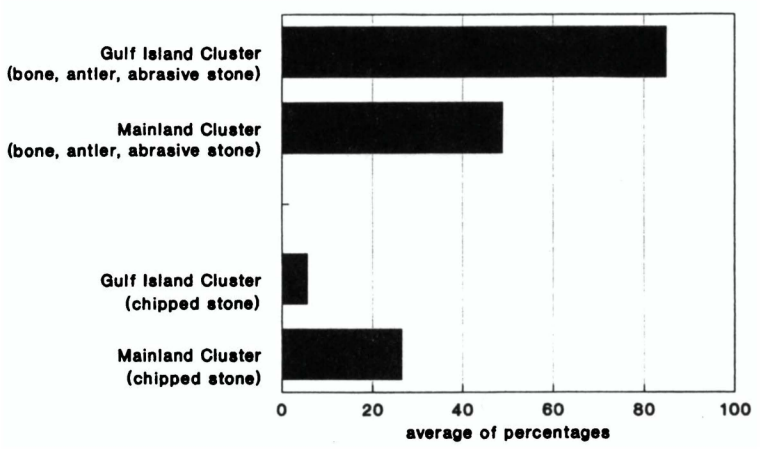

FIGURE 4: Average of percentages of chipped stone and bone, antler and abrasive stone for Gulf Island and Mainland/ Vancouver Island clusters.

Close analysis of the data also refutes the idea that the islands and the mainland have different cultural identities. Indeed, the mainland assemblages are clustered with Vancouver Island assemblages, and two Vancouver Island assemblages are found in the Gulf Islands cluster. If there had been different cultural connections with coastal and interior people, as suggested at the beginning of this paper, Vancouver Island and Gulf Island assemblages should have clustered distinctly from those of the mainland. Looking at the site distribution in Figure 2, quite the opposite is seen. False Narrows III and Fort Rodd Hill, which are very much coastal sites, are clustered very closely with Stselax and Belcarra Park II, which are on the Fraser Delta and are located closer to the interior. Such cultural distinctions do not seem to be features of the interassemblage variability in the Gulf of Georgia phase.

The final model against which the analysis of the data can be tested is that of environmental adaptation. It seems that the data fit this model more closely than the others previously presented. Mainland and Vancouver Island sites are clustered together, showing their relative similarity in available resources. Vancouver Island and the mainland have rivers and streams where the salmon spawn, and land mammals which can be obtained in some abundance. The Gulf Islands have different resources available, including camas and other bulbs, sea lions, seals and bird eggs (Mitchell pers.comm.1991). Land mammals also contribute to the resources of the Gulf Islands. Shellfish are a resource that is abundant at all coastal sites on the mainland, Vancouver Island, and the Gulf Islands. A detailed examination of the faunal assemblages from Gulf of Georgia sites, which looked for variability of resource availability and use in different ecological areas (i.e., Mainland/Vancouver Island and the Gulf Islands), would be a useful study in conjunction with the kind of analysis presented here.

The clusters present in Figure 2 reflect variability in environment. The mainland and Vancouver Island, which have similar environments, have components that cluster together. The components located on the Gulf Islands also cluster together. These two clusters seem to define the utilization of differing environmental resources. The anomalies of Shoal Bay and Sandwick, which are Vancouver Island components that cluster with the Gulf Island components, must also be considered. These two components show how environment is a limiting and not a determining factor in how a site is utilized. Their clustering with the Gulf Island components are indicative of how locations on Vancouver Island could be used in the same manner as those on the Gulf Islands, given that there were at least as many equivalent resources available at the Vancouver Island sites as there were at the Gulf Islands sites. Because the Shoal Bay and Sandwick sites, like the Gulf Island sites, were used as seasonal camps and had similar resource availability, their assemblages are similar to the Gulf Island sites.

Other seasonal camps were occupied on the mainland and Vancouver Island, but do not cluster with the Gulf Island seasonal camps. This is because different economic activities took place at these sites during seasonal occupation activities such as land mammal hunting, extensive shellfish gathering or large-scale salmon processing.

The interassemblage variability found in the Gulf of Georgia phase of the Northwest coast can be attributed to differing adaptations to the varying environmental circumstances present in this part of the coast.

CONCLUSIONS

It has been shown by multi-dimensional scaling that interassemblage variability does occur in the Gulf of Georgia Phase, between sites located on the Gulf Islands and those located on the mainland and Vancouver Island. The Gulf Islands components show a greater frequency of bone and antler industries. The mainland/Vancouver Island components exhibit higher frequencies of chipped and ground stone. These differences were attributed to varying adaptations to the different environments of the mainland and the islands.

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ACKNOWLEDGEMENTS

I would like to thank Dr. R. G. Matson of the University of British Columbia for giving me guidance in running the statistical software used for the analysis presented in this paper. I would also like to acknowledge ARCAS consulting Archaeologists Ltd, in particular A. Stryd for providing me with unpublished data from the Tsawwassen site. Dr. D. Mitchell of the University of Victoria provided valuable comments, suggestions and additional information in editing the paper. Finally, I would like to thank the Canadian Archaeological Association for awarding this paper first place in the 1991 Weetaluktuk student paper competition.

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