TECHNOLOGY ON THE NORTHWEST COAST: A SMALLEST SPACE ANALYSIS OF THE TECHNOLOGICAL RELATIONSHIPS OF 31 TRIBAL UNITS

by

JACQUELYN FARNDEN

B.A., University of Victoria, 1971

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Anthropology and Sociology

ACCEPTED
FACULTY OF GRADUATE STUDIES

[redacted]

DEAN

DATE 5 Oct/72

We accept this thesis as conforming
to the required standard

[redacted]

UNIVERSITY OF VICTORIA

September 1972

Supervisor: Assistant Professor Leland H. Donald

ABSTACT

The pre-contact technologies of 31 Northwest Coast tribal units are examined. The focus is on groups covered in the University of California Culture Element Lists (Barnett 1939 and Drucker 1950), but where possible groups have been added.

The technological similarity between paired groups is measured using Driver's G coefficient of similarity. Smallest space analysis, based on this measure, is used to discover the inter-relationships of groups.

Overall technological relationships are investigated using a sample of 31 groups and a reduced sample of 28 groups (three groups had very small variable sample sizes). Three major divisions of groups are established: Salish, Nootka, and Central-Northern. A south to north geographic pattern is observed in the diagram. Alternate classifications of the Salish (Barnett 1939, Jorgensen 1969, and Mitchell 1971) and of the entire Northwest Coast (Kroeber 1963 and Drucker 1965) are examined. Concordances are found between the present scheme and all alternate classifications (especially for the Salish). No scheme, however, is a perfect reflection of the present results. Of course, most of these schemes were developed to apply to total cultures, and some of the alternate interpretations may be the result of differences between

technological and non-technological relationships. Linguistic relationships are also compared to the relationships developed, and considerable similarity is found between the two patterns of relationship. A biotic zone scheme (Chapman and Turner 1956) of environmental relationships is examined and found lacking in explanatory power. An environmental classification based on a group's position with reference to the coast and coastal type is developed and found to have some relevance to the pattern of observed relationships. A single factor explanation of group relationships is found to be inadequate.

Technology is divided into four major categories: subsistence; dress, ornament, and textiles; travel and transport; and structures and furnishings--with a residual miscellaneous category. Subsistence is further divided into food preparation, water resources, and land resources. On the basis of a 28 tribal unit sample, group relationships are examined for the four major categories and for the sub-categories of subsistence. The geographic south-north pattern is still evident. The three part division into the Nootka, Salish, and Central-Northern clusters has some importance for most categories, especially for subsistence. The pattern of groups is never identical for any two categories.

Environmental factors and linguistic-ethnic affiliations are considered in relation to the sub-categories of technology. Linguistic-ethnic divisions are found to be of importance in understanding group relationships, especially in non-subsistence categories. Environmental factors, including access to the coast and mainland-island distinctions, are also found to be of

aid in understanding these relationships, especially in subsistence categories.

Mean G coefficients of similarity are used to examine the consistency of linguistic-ethnic units and access to the coast environmental types. Using these means and the patterns of relationships in the SSA diagrams, some inferences are made on the temporal stability and sensitivity to environment of the technological categories. In subsistence categories, linguistic-ethnic units are generally less homogeneous than in non-subsistence categories; assuming that more homogeneity is indicative of less change from a common ancestor, then subsistence categories are less stable than non-subsistence categories. This is analogous to the typical picture of technology as less stable than social organization, which is in turn less stable than ideology. Structures and furnishings is the least consistent non-subsistence category. Use of mean G coefficients for access to the coast categories suggests that subsistence categories, especially food preparation and water resources, are more sensitive to at least this one environmental factor. No category of technology is found to be more homogeneous for the entire area of the Northwest Coast.

[redacted]

TABLE OF CONTENTS

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

Many thanks to my committee members-- Dr. L.H. Donald, Dr. R. Hall, Dr. D.H. Mitchell and Dr. T. Hess--for their advice, their invaluable aid in the research, and their careful suggestions for revisions. Also to Dr. L.H. Donald, a special thanks for his encouragement in every phase of this study.

CHAPTER I

INTRODUCTION

Focusing on the technological relationships among tribal units[1], the pre-contact technologies (represented by 172 technological variables) of 31 Indian groups on the Northwest Coast of North America are examined. The method of analysis is statistical in nature, utilizing techniques designed to explore the internal relationships of a set.[2] While the question of technological relationships on the Northwest Coast is interesting in and of itself, the analytical approach is also important as a model on which to base further studies in other areas or through time.

Attention is focused on the 28 Northwest Coast groups covered in the University of California Culture Element Lists, that is, the lists prepared by Barnett (1939) and Drucker (1950). Where practicable, other groups located within the Northwest Coast boundaries, as proposed by Murdock (1960), have been added to these lists: Twana (Elmendorf 1960), Quinault (Olson 1936), and Puyallup-Nisqually (Haeberlin and Gunther 1967, and Smith 1940).

In addition to describing the intergroup relationships in Northwest Coast technology, earlier classifications developed for Salish units and the entire area are examined. These include the intuitive classifications of Drucker (1970) and Kroeber (1963) for the entire area and Mitchell (1971) for the Salish, and the

statistically derived arrangements of the Salish by Barnett (1939) and Jorgensen (1969).

The technological relationships are also considered with reference to linguistic-ethnic affiliations between groups. Natural environmental differences are considered using a biotic zone scheme (Chapman and Turner 1956: 23-24, modified from Munro and Cowan 1947). An environmental scheme based on a group's positioning with reference to the coast and the coastal type is evolved and investigated.

Technology, in addition to being considered as a whole, is subdivided, and the relationships between groups are examined briefly for each subdivision. The sample of groups is reduced for this purpose as three groups (East Sanetch, Puyallup-Nisqually, and Quinault) are omitted due to inadequate variable samples. Environmental factors and linguistic affiliations are discussed in relation to the sub-categories of technology.

THE VARIABLE SAMPLE

Before a list of variables could be compiled, it was necessary to develop a list of comparable trait entries in the two available culture element lists (Barnett 1939 and Drucker 1950). Some difficulty was encountered in this process as the two lists were not uniform, despite an espoused desire for uniformity among culture element lists. Each ethnographer covered subjects in varying degrees of depth. Variation in wording and a lack of clear descriptions often made it impossible to establish comparability. It is possible that some trait entries common to both lists have

been omitted simply because I was unable to discern their similarity.

Biased sampling is an ever present problem that should be briefly mentioned. The culture element lists and ethnographies from which I have drawn data are undoubtedly biased in some fashion beyond my control. The largest possible list of technological traits (within the given confines of the trait lists) was required so random sampling techniques were out of the question. In a conscious attempt to avoid bias in this study, the only criterion for the initial selection of technological traits was the existence of comparable trait entries.

Once the basic list of traits was developed, reduction began. First, non-technological traits mistakenly included were omitted. Also excluded were those traits for which less than two-thirds of the groups could be rated. The remaining traits were arranged into variable-attribute sets.

The arrangement of attributes was accomplished by examining the trait list to find sets of traits that were variations of one particular object or technique. For example, stone, bone, and mussel shell fish cutting knives (variable 6 in Appendix A) were found and a variable, fish cutting knives—material, was established. Mutually inclusive and exclusive attributes of the variable were then developed by examining the combinations of related traits (for example, materials for fish cutting knives) which were present in the tribal sample. The examination produced seven variations, or attributes, of fish cutting knives—material: (1) mussel shell, (2) stone, (3) bone, (4) bone and stone, (5) bone and mussel shell, (6) stone and mussel shell, and (7) all of

the above materials. This basic process was followed for each set of traits. In some cases, it was necessary to set up a variable based on a single trait with the only attributes being presence or absence, for example, pitfalls (variable 48 in Appendix A). Where fewer than one-half of the total number of groups could be rated for all attributes of a variable, the variable was omitted.

Ratings of variables for additional groups were developed from the appropriate ethnographies (Olson 1936, Smith 1940, Elmendorf 1960, and Haeberlin and Gunther 1967). (See section entitled Tribal Sample for details on the inclusion of groups).

Next, traits present or absent for all tribal units (except for cases of unknown ratings) were considered. Such traits will not aid in differentiating among tribal units, and in the case of common absences would be omitted from all calculations, so these non-differentiating traits were excluded from the variable-attribute sample. (See Appendix B).

The resultant variable-attribute list was then arranged into sub-categories of technology. (See Appendix A for the list of variables and Appendix C for the rating of each tribal unit for each variable). Five major categories were developed: (1) subsistence; (2) dress, ornament, and "textiles"; (3) structures and "furnishings"; (4) travel and transportation; and (5) a miscellaneous category. The sub-category subsistence was further broken into food preparation, land resources, and water resources.

1. Subsistence includes those tools and techniques concerned with hunting; fishing; gathering; and the preparation, consumption, and storage of foods

along with the materials and techniques of subsistence tool production. Also included are implements used in warfare, except armor, as most of these are also used in hunting.

(a) The food preparation category of subsistence contains those of the above utensils and techniques which are involved in the preparation (including fire making), consumption, and storage of food items.

(b) The water resources category includes those subsistence techniques necessary for sea mammal hunting, fishing, and the gathering of shellfish and fish eggs.

(c) The land resources category includes those subsistence tools and techniques dealing with land mammal and bird hunting, plant gathering, and warfare.

2. Dress, ornament, and textiles includes: (a) materials and forms of wearing apparel—includes armor, major body coverings, headgear, footgear, and loggings; (b) material and forms of ornaments—necklaces, bracelets, anklets, pierced ear and nose ornaments, labrets, and combs; (c) tools and techniques of face, head, and hair care—face painting, hair washing and oiling, beard plucking, and head deformation; (d) tools of skin preparation; (e) tools, techniques, and materials of fiber shredding, matting, yarn making, weaving,

basketry, and decoration of textiles.

3. The structures and furnishings category includes techniques of production, forms, and materials of the: (a) constituents of rectangular plank houses; (b) semi-subterranean structures, summer camp houses, and stockades; and (c) furnishings—cradles, seating, storage, and cedar boxes.

4. The travel and transport category includes: (a) wood-working tools; (b) techniques, tools, materials, forms, and decorations of canoes; (c) forms and materials of paddles, sails, and bailers; (d) other techniques of transportation—tobaggans and snowshoes; (e) techniques, forms, and materials for packing.

5. The miscellaneous category contains musical instruments, tobacco, games, and toys.

The final inventory totals 570 attributes arranged in 172 variables. See Table I for the variable distribution by category.

TABLE I VARIABLES BY SUB-CATEGORY

Variable Category		Number of Variables
Subsistence		68
Food Preparation	16	
Water Resources	23	
Land Resources	29	
Dress, Ornament, Textiles		33
Structures and Furnishings		27
Travel and Transport		29
Miscellaneous		10
Total		172

THE TRIBAL SAMPLE

All tribal units represented in Barnett's (1939) and Drucker's (1950) culture element lists have been included despite variation in the adequacy of coverage. Barnett (1939) treats eleven Gulf of Georgia Salish groups: East Sanetch, West Sanetch, Cowichan, Nanaimo, Pentlatch, Comox, Slaiamun, Klahuse, Homalco, Sechelt, and Squamish. Drucker (1950) considers three Nootkan groups—Hupachisat, Tsishaat, and Clayoquot (two lists are presented for the Clayoquot)—six Kwakiutl groups—Koskimo, Kwexa, Wikeno, Bella Bella, Xaihais, and Xaisla—one Salish group—Bella Coola—three Tsimshian groups—Hartley Bay, Tsimshian Proper, and Gitksan—two Haida groups—Massett and Skedans—and two Tlingit groups—Sanyakwan and Chilkat. (See Figure I for the approximate positions of groups and Table II for a list of groups and abbreviations).

The culture element lists give reasonably wide coverage of the groups within Murdock's (1960) Northwest Coast area. Some important areas, however, are not included. Among the excluded groups are a number of Salish speaking groups, by linguistic affiliation,—the mainland Halkomelem, most Straits Salish, Puget Sound Salish, Nooksack, Chehalis, and Twana—and the Chemakuan speakers and the Makah (Nootka speakers). It is necessary to include as many groups as possible to understand the relationships among groups. A missing area or group may provide the key to a set of group relationships, for example, by taking an intermediary position between groups, and their absence may complicate or confuse the interpretation of group relationships. Also the omission of a

group from the study is unfortunate as it signifies one more area where nothing can be added to our knowledge of technological relationships. The most serious omissions from the trait list are the Puget Sound and mainland Halkomelem groups which are completely unrepresented; these include large geographical areas involving numerous groups which are in an important position with regard to the Northwest Coast boundaries and in relation to the Vancouver Island Salish. Coverage of non-Salish could be wider but it is reasonably adequate and will not be extended here as ethnographies do not make fine distinctions between the smaller groups of these units. Any attempt to include groups not included in the trait lists had to be focused on the southern groups.

TABLE II. NUMBER OF VARIABLES FOR EACH TRIBAL UNIT AND THE ABBREVIATIONS USED FOR THE TRIBAL UNITS*

Tribal Units	Number of Variables
Salish	
East Sanetch (ES)	66
West Sanetch (WS)	150
Cowichan (CW)	139
Nanaimo (NA)	141
Pentlatch (PE)	157
Comox (CX)	154
Slaiamun (SL)	124
Klahuse (KL)	165
Homalco (HO)	140
Sechelt (SE)	161
Squamish (SQ)	166
Twana (TW)	137
Puyallup-Nisqually (PN)	67
Quinault (QU)	85
Bella Coola (BC)	159
Nootka	
Hupachisat (NH)	133
Tsishaat (NT)	139
Clayoquot (NC)	138
(N2)	139
Kwakiutl	
Koskimo (KK)	156
Kwexa (KR)	163
Wikeno (KW)	164
Bella Bella (KO)	171
Xaihais (KC)	165
Xaisla (KX)	155
Tsimshian	
Hartley Bay (TH)	162
Proper (TG)	164
Gitksan (GK)	160
Haida	
Massett (HM)	166
Skedans (HS)	168
Tlingit	
Sanyakwan (LS)	161
Chilkat (LC)	170

* Abbreviations after Barnett (1939) and Drucker (1950)

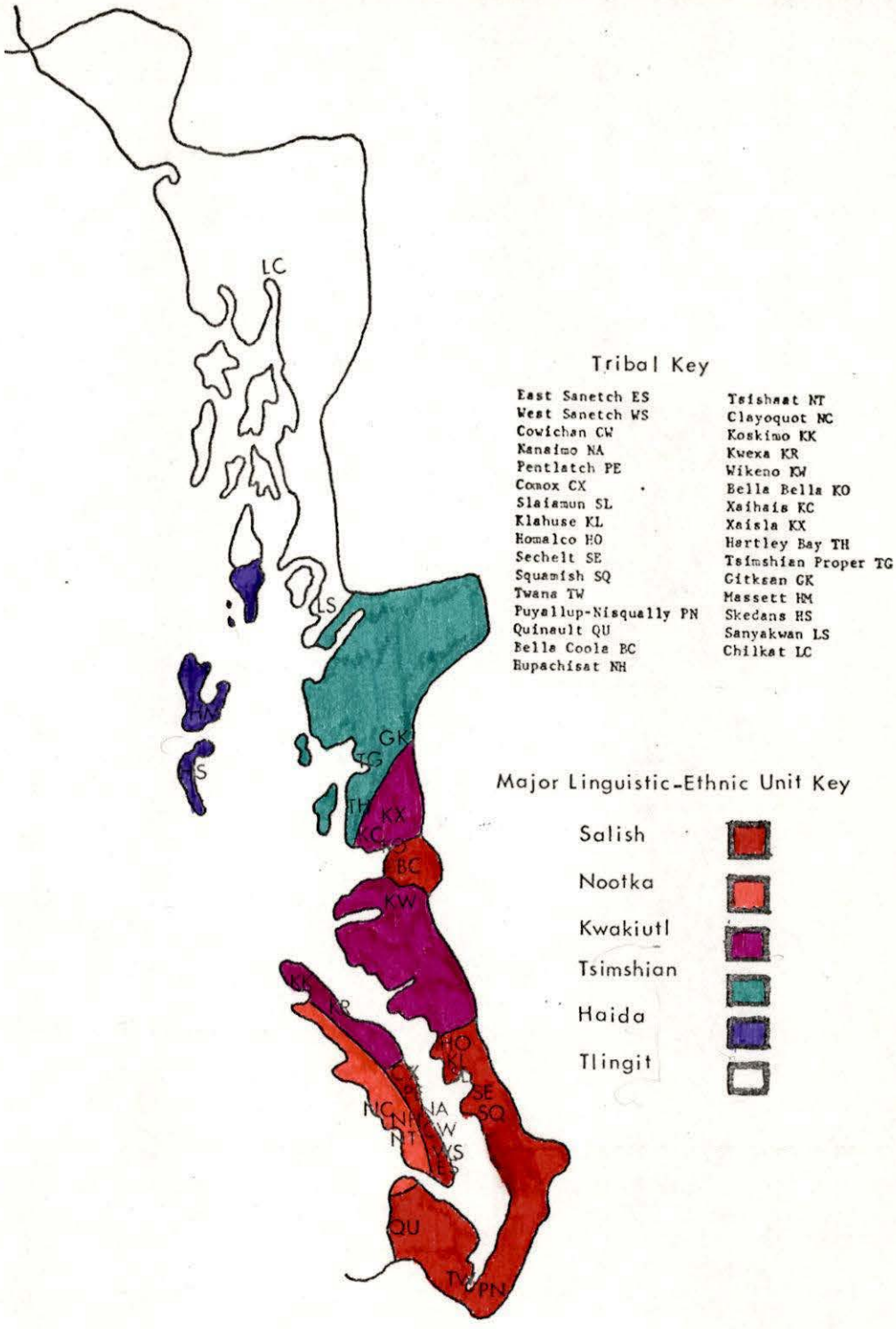


Figure 1. Approximate Locations of Sample Northwest Coast Tribal Units (after Drucker 1950 and 1965, Barnett 1955, Elmendorf 1960, Murdock 1960, Duff 1964, Boas 1966, and Krause 1970)

Given the limits of time and resources it was necessary to set up a rigid procedure to determine which additional groups, from other ethnographies, to include in this study. Once a preliminary list of variables was developed (see Variable Sample), a sample of thirty-five variables was selected using every fifth variable in the list. Using this sample list and the available major ethnography, it was determined how many variables could be rated for a particular group. Where it was possible to rate 50 per cent of the sample variables, the group was included. The major problem was the lack of "absence" recording by most ethnographers. Even where an ethnographer includes detailed information on technology, the tendency is to avoid mentioning the absence of technological traits in comparison to surrounding tribes. If no mention of absence or presence is found, absence cannot be assumed so the variable must be rated as unknown. The non-reporting of only one attribute prevents use of the entire variable.

The groups examined but not included are mainland Halkomelem groups (Barnett 1955, Boas 1894, Duff 1952, Hill-Tout 1902, Jenness 1955, and Suttles 1955); Straits Salish groups--the Klallam (Gunther 1927) and the Lummi (Suttles 1954 and Stern 1934); Puget Sound Salish groups except the Puyallup-Nisqually (Haeberlin and Gunther 1967); and the Makah (Colson 1953). The groups included as a result of using the outlined technique are the Twana (Elmendorf 1960), the Quinault (Olson 1936), and the Puyallup-Nisqually (Smith 1940, and Haeberlin and Gunther 1967).

The final sample includes thirty-one groups (with two lists for one group, the Clayoquot). All names used here are those used

in the primary sources. (See Table III for linguistic affiliations. Figure 2 gives further explanation of Coast Salish language relations). The major weakness of the sample remains the omission of the mainland Halkomelem or Fraser Valley groups, unavoidable due to lack of data.

METHODS OF ANALYSIS

The methodological problems of this study are the same as those encountered in culture area studies, namely: (1) how to measure similarity between any two groups, and (2) how to determine the similarity relationships among a number of groups.

In this study similarity between groups is measured by Driver's G coefficient of similarity. G coefficients, based on a series of attributes rated present or absent, are calculated for total technology and for each sub-category of technology for all cultural pairs. G can vary from 0.00 to 1.00, with zero meaning no similarity and unity meaning complete similarity. If two groups have a G equal to 0.00, it would mean that they share none of the technological attributes treated in this study. If two groups have a G coefficient equal to 1.00, it would mean that all their technological attributes are identical. (See Appendix D for details on calculation of G).

Initially it was intended to use G matrix ordering and dendrograms (of the type developed by Jorgensen [1969]) to show clusters of relationships by branch linkages, with Ellegard's (1959) test used to establish significance of differences between branches; and the data were analyzed with those techniques. (See Jorgensen

TABLE III. LINGUISTIC AFFILIATIONS OF SAMPLE TRIBAL UNITS

I. Na-Dene Phylum (after De La Grasserie 1902, Driver 1961b, and Drucker 1965)

A. Tlingit-Eyak-Athapaskan Family

(1) Tlingit

(a) Chilkat

(b) Sanyakwan

B. Haida Isolate

1. Haida

(a) Masset

(b) Skidegate (includes Skedans)

II. Penutian Phylum (after Driver 1961b and Drucker 1950 and 1965)

A. Chinook-Tsimshian Family

(Tsimshian)

(1) Coast Tsimshian

(a) Hartley Bay

(b) Tsimshian Proper

(2) Gitksan

III. Families With Undetermined Phylum Affiliations

A. Wakashan Family (after Duff 1964 and Boas 1966)

(1) Nootka

(a) Clayoquot

(b) Hupachisat

(c) Tsishaat

TABLE III (continued)

(Kwakiutl)

(1) Xaisla

(2) Heiltsuk

(a) Bella Bella

(b) Wikeno

(c) Xaihais

(3) Kwakiutl Proper

(a) Koskimo

(b) Kwexa

B. Salish Family (after Duff 1964, Boas 1966, Hess 1972)

(Coast)

(1) Bella Coola

(2) Comox

(a) Comox

(b) Homalco

(c) Klahuse

(d) Sliammun

(3) Pentlatch

(4) Sechelt

(5) Squamish

(6) Halkomelem

(a) Nanaimo

(b) Cowichan

(7) Straits

(a) Sanetch (includes East and West)

(8) Puget (Puyallup-Nisqually)

(9) Twana

(10) Quinault

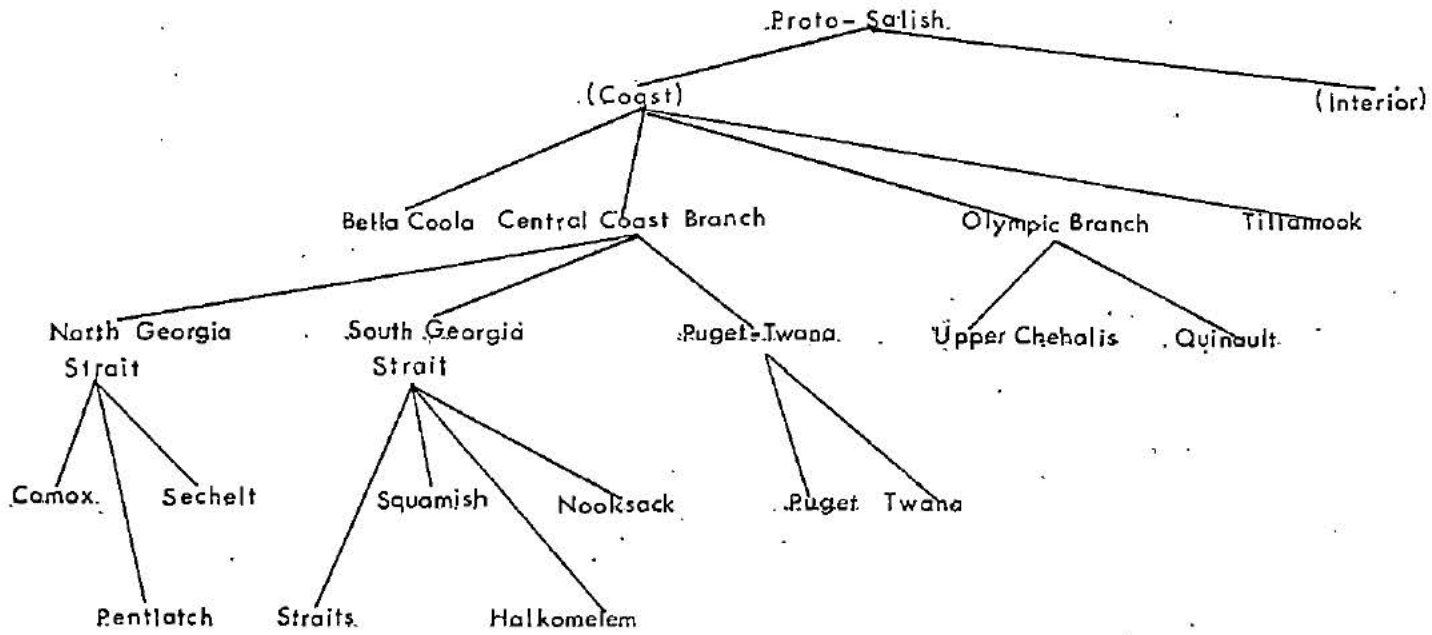


Figure 2 · Coast Salish Linguistic Relationships (after Hess 1972)

1969 for examples of this technique of data analysis and presentation). However, the opportunity to submit the data to smallest space analysis (SSA) arose, and it was found that this technique presented a much clearer picture of the relationships even though the question of statistical significance is not treated in SSA.

Smallest space analysis refers to a set of computer programs designed to produce a multivariate non-metric analysis making no special assumptions. Here we are dealing only with SSA I designed for symmetric matrices (Kloombaum 1970:409).

The first step in performing smallest space analysis is selection of a measure of relationships between paired groups. For this purpose, I have used G coefficients of similarity.

> The basic question addressed by SSA is "What is the smallest space in which a body of data may be adequately represented?" The notion of "smallest space" refers to the fewest number of dimensions . . . "Data" for SSA are what appears in the cells of the matrix [here G coefficient of similarity matrices] . . . The adjective "adequately" refers to how well these data can be reconstructed from a configuration of points which is a solution, and the idea of "representative" is to be approached in geometric terms where visuability is the key to comprehending a set of structured interrelationships." (Kloombaum 1970: 409).

In a space of specified dimensions, each group is represented by a single point with the coefficients of similarity related to Euclidian distances among points. Thus SSA is basically a systematic method of determining the geometric representation of the relationships among a group of items (here tribal units).

To determine the number of dimensions sufficient to represent the data, Guttman-Lingoes' coefficient of alienation is used. This is "a function of the differences between the distance as

calculated from the coordinate system and the same distances permuted to maintain the rank order of the original coefficients" (Bloombaum 1970:411). The better the fit, the smaller the coefficient, but there are no formal criteria for rejecting or accepting the fit. Generally, however, the differences between coefficients of alienation, for various numbers of dimensions, are observed and the fit is considered adequate when the change in the coefficient of alienation between two numbers of dimensions noticeably decreases in magnitude. Of course, ease of conceptualization may enter into the number of dimensions selected. Using both of these criteria, a two dimensional representation is required for overall technology, while three dimensions are necessary for the sub-categories.

In SSA there are no formal criteria for establishing clusters of similar groups. Where the tribal units of the present study are divided into clusters of groups, it is based on an impressionistic overview of the appropriate SSA diagram. Alternate renderings of the patterns of relationship could be equally credible.

G coefficients and the SSA ordering of the matrices are both presented as each has its own particular advantages. A G coefficient matrix allows a quick check of particular scores of similarity but does not permit a grasp of the whole picture. The SSA diagram presents a clear indication of total relationships but determining individual scores is more difficult. Since SSA allows a visual representation of the relationships among the groups in three dimensions or less, this makes it very useful for comparing the clusters that emerge with those proposed by intuitive schemes.

When the significance of differences between G coefficients of similarity is discussed, Ellegard's test is used. (See Appendix D for details of calculation).

The development and application of the techniques used have been traced elsewhere (Driver 1961a and 1964, Johnson 1968, Hofmeister 1969, Jorgensen 1969, and Bloombaum 1970).

CHAPTER II

TECHNOLOGY ON THE NORTHWEST COAST

INTRODUCTION

In this chapter the technological inventory is considered for the 31 groups[3] of the tribal sample and for a reduced list of 28 groups excluding the East Sanetch, Puyallup-Nisqually, and Quinault. The three groups are excluded as the variable sample sizes are rather small (66, 67, and 85 variables, respectively) and it is felt that their inclusion might distort the relationships among groups. Figures 3 and 4 present, respectively, the internal ordering of groups in smallest space analysis of 31 and 28 groups. Appendix E presents all the G coefficients of similarity for total and sub-categories of technology.

A two dimensional smallest space solution is sufficient for both samples. Table IV presents the coefficients of alienation for one, two, three, and four dimensions for both samples. As the drop in magnitude of the coefficient of alienation is much less between two and three dimensions than between one and two dimensions, the two dimensional solution is selected. A two dimensional solution is desirable also because it is easier to conceptualize than a solution of greater dimensions. (Smallest space coordinates for all solutions used are presented in Appendix F).

The arrangements developed in the smallest space analysis will be discussed and compared. Following this preliminary

description of findings, the data will be considered in terms of earlier classifications of Northwest Coast groups. Questions of natural environment, the cultural environment in terms of contact relations, and linguistic affiliations will be examined.

TABLE IV. COEFFICIENTS OF ALIENATION FOR ONE, TWO, THREE, AND FOUR DIMENSIONS FOR THE 28 AND 31 GROUP SAMPLE

Number of Dimensions	Coefficients of Alienation	
	28 Groups	31 Groups
1	.30592	.30376
2	.15357	.16734
3	.11561	.11903
4	.06995	.08473

Similarities between trait lists can be attributed to common parent cultures, diffusion of traits; independent invention due to chance or to convergence based on similar environmental or historical influences; or, more probably, a combination of these. By examining linguistic affiliations a rough estimate of the importance of common ancestry can be developed. Schemes of natural environmental types can be considered as possible explanations of similarities. The possibility of diffusion, or borrowings, between groups can be estimated by examining the potential for contact relations between groups. Contact relations between tribal units would include various forms of social intercourse such as trade, joint exploitation of common resources, warfare, marriage,

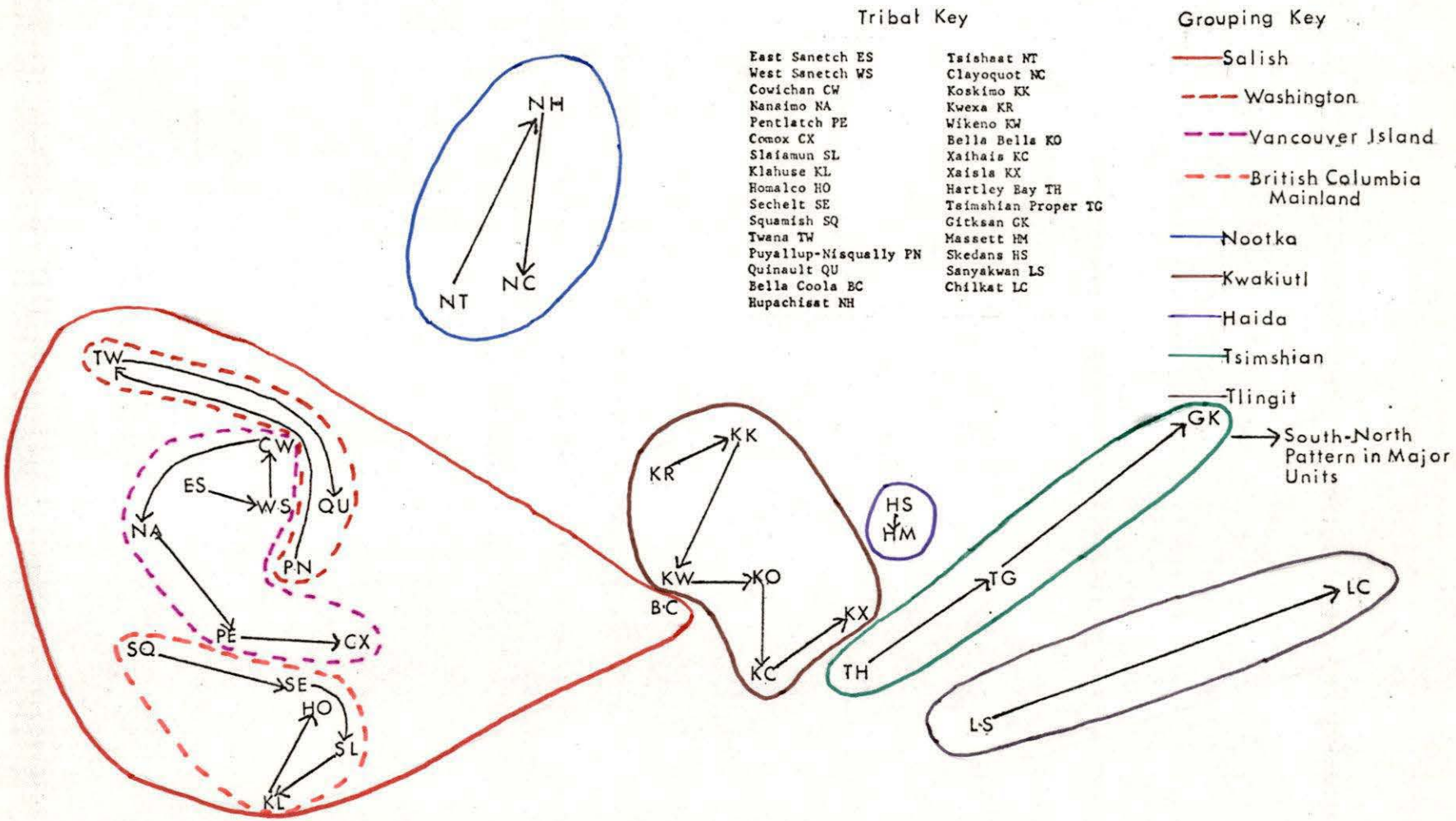


Figure 3· SSA of 31 Northwest Coast Groups for Total Technological Similarity, Major Linguistic-Ethnic Units Indicated (172 Variables)

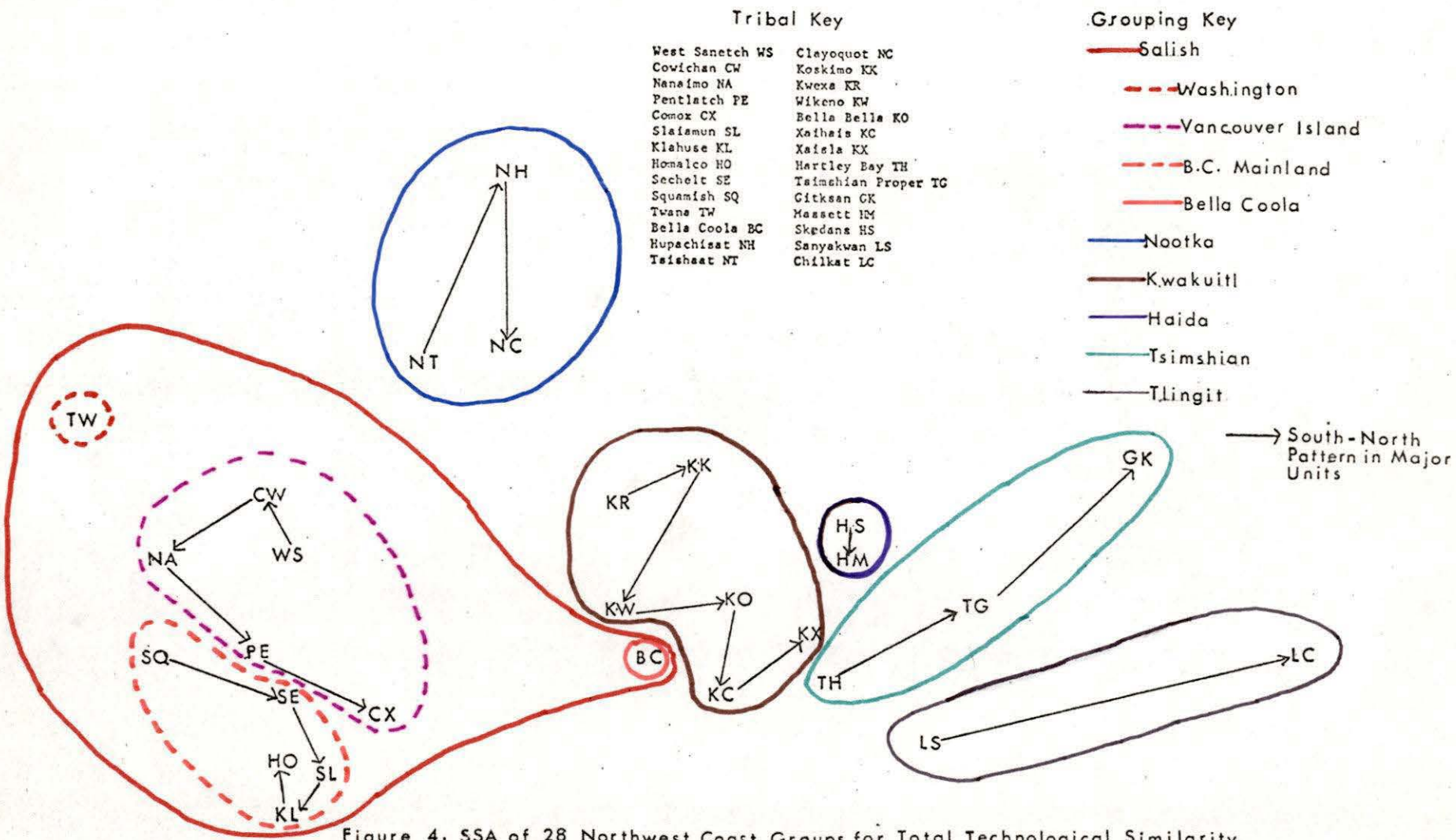


Figure 4. SSA of 28 Northwest Coast Groups for Total Technological Similarity, Major Linguistic-Ethnic Units Indicated (172 Variables)

and participation in joint ceremonies. Geographic proximity provides a rough index of contact between groups although the presence of natural barriers, or intervening groups, can disrupt potential contact between relatively close groups. Historical information on contact relations would also be helpful but within the scope of this study it can only be used to a limited extent.

THE GEOGRAPHIC PATTERN OF THE 31 TRIBAL UNIT SSA DIAGRAM

The Order of Major Linguistic-Ethnic Units

It is now appropriate to discuss intergroup relationships beginning with the 31 group sample. The ordering of major linguistic-ethnic units in Figure 3, roughly, but not completely, follows a geographic pattern from south to north moving across the page. The Salish, except the Bella Coola, appear as a unit in the most "southerly" position appropriately followed by the Nootka. There is some overlap of groups amongst the Bella Coola, Kwakiutl, Tsimshian, Haida, and Tlingit, but the general positioning of the units remains south to north.

The Order of Individual Tribal Units

Within the major ethnic-linguistic units the south-north patterning of individual tribal units is also evident. Directional arrows in the diagram indicate the geographical positioning of groups from south to north within the major units. There is a perfect reflection of geographical positioning within the Tlingit and Tsimshian units, although there is overlap when one considers the major units together as the Sanyakwan Tlingit are placed

further "south" than the Hartley Bay and Tsimshian Proper. Also the Tsimshian Proper are positioned approximately level with, but below, the Xaisla, their relatively close Kwakiutl neighbours to the south. The Haida are slightly "south" of their expected position but do appear in close conjunction with neighbouring groups. The internal pattern of the Haida is vertical rather than horizontal, moving from the south down to the north. Within the Kwakiutl, the pattern can be regarded as directional in either of two ways, vertically, moving from the south down to the north, or horizontally. (Within Salish, Kwakiutl, and Haida units any vertical positioning is a move from the south down to the north while for the Tlingit and Tsimshian, the vertical element is from the north to the south.) Taken vertically, the Koskimo, Xaisla, and, very slightly, the Bella Bella are out of position while horizontal movement puts both island Kwakiutl groups, the Xaihais, and the Bella Bella out of position but the divergences are not large. The position of the Bella Coola is appropriate with regard to other Salish groups but in relation to the Kwakiutl is slightly misplaced to the "south", moving vertically or horizontally, approaching the other Salish groups more than geography alone would indicate. With the exception of the Hupachisat, who are divergent from the bulk of groups, the Nootka are appropriately placed. The Salish, in Figure 3, have been divided into Washington, British Columbia mainland, and Vancouver Island groups. The positioning of groups within these divisions demonstrates directional correspondence both vertically and horizontally. The West and East Sanetch and, perhaps, the Cowichan are somewhat out of position within the

Vancouver Island groups as are the Homalco and Klahuse within the British Columbia mainland division. No clear directional pattern is evident within the Washington division. In relation to each other, these divisions also display correspondences to a directional pattern with only the Quinault, Puyallup-Nisqually, and Squamish clearly out of position. With the noted divergences, the SSA diagram replicates the geographical pattern of groups on the Northwest Coast.

A three part division of groups is readily apparent: the Salish (excluding the Bella Coola); the Nootka; and the Central-Northern groups, including the Kwakiutl, Bella Coola, Haida, Tlingit, and Tsimshian. The Nootka are placed in an intermediate position between the southern and central-northern groups. Most divergent from the majority are the two inland groups, the Gitksan and the Hupachisat, and the most northerly group, the Chilkat.

CORRESPONDENCE OF MAJOR LINGUISTIC-ETHNIC UNITS WITH THE PATTERN OF THE 31 TRIBAL UNIT SSA DIAGRAM

The major linguistic-ethnic unit divisions fit reasonably well with the pattern of clustering. The Salish groups, excluding the Bella Coola, are more closely related to each other than to any other groups. The same situation holds for the Nootka. The situation is more clouded for the Central-Northern groups but the pattern becomes clearer when possible contact relations due to geographical proximity are also considered. The Haida do form a tight geographical cluster showing approximately equal relationships to neighboring Kwakiutl and Tsimshian groups, except the Gitksan. Possibly this is because the Gitksan are an inland group so contact

may not have been as frequent and, of course, the environment is different. The Tsimshian display a scattered pattern between Kwakiutl, Haida, and Tlingit groups. The Hartley Bay Tsimshian are actually closer to the Xaihais and Xaisla than to other Tsimshian groups, but this is expectable when one considers the geographic proximity of the Hartley Bay and Kwakiutl groups. The Hartley Bay similarity to the Sanyakwan Tlingit is more surprising given the considerable separation in space. The Tsimshian Proper are approximately equidistant from, and mediating between, the Gitksan and Hartley Bay Tsimshian, much as they are geographically. They also display relatively close relationships to the Haida, Sanyakwan, and northern Kwakiutl groups; all but the Sanyakwan being relatively close neighbours. The Gitksan are separated from all groups, showing their closest relationships to the Tsimshian Proper and the Chilkat. The Chilkat relationship to these groups is unexpected as they are geographically distant. Drucker (1965:110) indicates that both the Tlingit and Gitksan had frequent contacts with interior groups. This could have had some influence on the Gitksan-Chilkat relationship but it would not explain the relatively distant relationship between the Gitksan and the Sanyakwan Tlingit. The Tlingit tribal units are separated widely, showing closer relationships to other groups than to each other. Of course, the Tlingit groups are also widely separated geographically.

The Kwakiutl form a rough unit, but the Xaisla and Xaihais are closer to the Hartley Bay Tsimshian than to other Kwakiutl groups. The Wikeno are also divergent as they exhibit closer ties to the Bella Coola, a neighbouring group separating the Wikeno from other

mainland Kwakiutl, than to other Kwakiutl. The Bella Coola do manifest close relationships to their Kwakiutl neighbours. However, the Bella Coola assume a position slightly nearer the Salish than are other members of the Central-Northern cluster. The mainland Kwakiutl form a cluster as do the island Kwakiutl.

INTERNAL DIVISIONS OF THE THREE MAJOR CLUSTERS OF 31 TRIBAL UNITS

We can now make a few comments about the internal relationships of the three major clusters to determine the possibility of subdividing these major divisions.

The Nootka

The Hupachisat are the most separated. Indeed more separated than might be expected given the geographical propinquity of the groups. This divergence may be a result of their inland environment. Also their "considerable contact with various Gulf of Georgia Salish" (Drucker 1951:5) may have had an effect, although the Hupachisat are diagrammed furthest from the Salish. All of the Nootka are closer to the Washington Salish groups than to any other Salish groups, surprising given the proximity of the Vancouver Island Salish and the Nootka. The island Kwakiutl are the only other groups diagrammed as similar to the Nootka. It is possible to divide the Nootka cluster into inland and coastal components and this difference should be borne in mind.

The Salish

Salish internal relationships are rather interesting. In Figure 3 the Washington, the mainland British Columbia Salish, and

the Vancouver Island Salish are outlined; and it is clear that this division does not reflect the actual clusterings of the groups.

The Puyallup-Nisqually and Quinault of the Washington Salish are closer to the Vancouver Island Salish than to the Twana who are the most isolated of the Salish. The Twana themselves are diagrammed closer to the Vancouver Island Salish than to the other Washington groups. Within the Washington Salish, linguistically and geographically we find the Puyallup-Nisqually closer to the Twana, yet the Puyallup-Nisqually and Quinault are clearly diagrammed as closer and using Ellegard's test are significantly closer at the .05 level. Actually the relationship of the Twana-Quinault versus the Quinault-Puyallup-Nisqually relationship is significantly different, as is the difference between the relationships Puyallup-Nisqually-Twana and Puyallup-Nisqually-Quinault. The Twana themselves are not significantly closer to either of the two groups. One is tempted to say that the difference is probably a result of small variable sample sizes but other explanations may be feasible. Possibly the Twana are divergent from a "typical" central Puget Sound culture owing to close relationships with the Klallam who the Twana held in high esteem (Elmendorf 1960:3, 278—279). Twana contact with the Puyallup-Nisqually and Quinault was apparently limited (Elmendorf 1960:286,291). The Puyallup-Nisqually seem to have had at least some contact with the Quinault (Smith 1940:19, Olson 1936:129). The extent of contact with each other and with other groups may be influencing the pattern of clustering. This further indicates that geographical proximity may not be a completely accurate reflection of contact relations.

Tentatively, it seems entirely reasonable to recognize two major divisions (outside of the division Bella Coola--other) within the Salish. The "Southern" division includes the southern Vancouver Island groups; Nanaimo, Cowichan, West Sanetch, and East Sanetch; and the Washington Salish; Puyallup-Nisqually, Quinault, and less clearly the Twana. A "Northern" division includes the Comox speakers, the Sechelt, and less clearly the Squamish of the southern mainland and the Pentlatch of Vancouver Island Salish; in other words, included are northern Vancouver Island and British Columbia mainland Salish. Within these divisions, an island-mainland distinction is apparent. For example, most mainland British Columbia groups cluster tightly, even cross-cutting the Comox linguistic division.

The Central-Northern Cluster

Relationships within the Central-Northern cluster have been briefly discussed above and it is difficult to sub-divide this cluster. With the exception of the Gitksan and Chilkat, who are quite detached, the cluster is a relatively undifferentiated unit allowing several alternate schemes of division. A core unit made up of the mainland Kwakiutl, Bella Coola, and Hartley Bay Tsimshian is apparent. The island Kwakiutl form a cluster fairly closely related to the core as do the Haida. The Tsimshian Proper and Sanyakwan Tlingit are more removed and the Gitksan and Chilkat are even more distant.

COMPARISON OF THE 28 AND 31 TRIBAL UNIT SSA DIAGRAMS

The Geographic Pattern

Turning now to the smallest space analysis for 28 groups (see Diagram 3), we again find the south to north pattern. The only changes in this geographic pattern are a slight move of the Bella Coola to a somewhat more appropriate directional position and a move of the Homalco even further from their correct position as "northerly" as the island Comox and Pentlatch.

Divisions of the Tribal Units

The Nootka and Central-Northern Clusters

Basically the pattern of relationships of the Central-Northern groups remains the same. The Nootka now appear more closely related to Vancouver Island Salish groups as the Washington groups which were diagrammed as closer to the Nootka are now removed. Thus, subtraction of Salish groups has generally affected only Salish relations.

The Salish

Again the Washington Salish, Vancouver Island Salish, and mainland B.C. Salish are outlined in the smallest space diagram and again this division is not satisfactory. The Twana, the only remaining Washington Salish group, are quite separated from the other Salish groups. Thus, the Twana can be established as a separate division. A "Southern" division, including the southern Vancouver Island Salish, is still evident. A "Northern" division

is formed by the northern Vancouver Island Salish, the Sechelt, and the mainland Comox. The position of the Squamish is even less clear than it was in the 31 group sample. The Squamish will be conditionally included in the "Northern" division following the pattern for 31 groups. This somewhat intermediate position of the Squamish may be the result of contact patterns. The Squamish are the most southerly B.C. mainland group considered; and contact with southern Vancouver Island groups, especially the island Halkomelem, would be important (possibly further evidence of the importance of island-mainland contact systems occurs with the Sechelt who display their closest tie to the island Pentlatch), as would contact with neighbouring mainland Halkomelem groups. Contact with the Sechelt of the "Northern" division would also be expected. An island-mainland distinction appears to be of lesser import in this sample. It is interesting to note that the mainland Comox form a relatively tight cluster in both samples.

Overall Change

Dropping the three Salish groups, East Sanetch, Puyallup-Nisqually, and Quinault, leads only to minor changes in the relationships evidenced between groups. The absence of the Quinault and Puyallup-Nisqually does make the isolation of the Twana clearer. The major divisions of the groups remain the same in the 28 group sample as do the sub-divisions of these units with the exception of the separation of the Twana, representing the Washington Salish, from the Southern Salish.

ALTERNATE CLASSIFICATIONS OF SALISH AND NORTHWEST COAST RELATIONSHIPS

Although it is desirable to include as many groups as possible in this analysis, it will be necessary to use the smaller sample for the sub-categories of technology. To be consistent, the 28 group arrangement will be used for comparison with other schemes of relationship.

The Alternate Classifications

Classifications of Northwest Coast relationships developed by Drucker (1965) and Kroeber (1963), and schemes of Salish relationships produced by Barnett (1939), Jorgensen (1969), and Mitchell (1971), will now be examined; linguistic and environmental taxonomies will also be surveyed. Before examining these alternate categorizations, we must consider the fact that we are dealing only with technology, while most of the alternate schemes deal with the cultural whole.

The Relationship of Technology to the Cultural Whole

Jorgensen's (1969) study of the Salish is one of the few to consider systematically the relationship of cultural categories, like technology, to the total of cultural categories. Technology-demography as a category of variables was found to present "the most diverse picture of relationships" among the three sets of variables--technology-demography, religion-ceremonial, and social organization (Jorgensen 1969:70).

> In review it is safe to assert that technological differences correlate with environmental differences and that both macro and microenvironmental differences are greater in the interior than on the coast. (Jorgensen 1969:79)

Hofmeister, in a similar study dealing with Southern Plateau and Northeastern California groups, inferred "that changes occur first in the technological realm" (1969:51). A close association between technology and environment is also observed in Hofmeister's study (1969:31). The results of Jorgensen's and Hofmeister's studies suggest that we may find more differentiation within the Northwest Coast, particularly associated with environmental differences, than we might have found had we examined a variable list representing all categories of culture. As will be noted when Jorgensen's results for technology and for overall culture are discussed, the pattern of clusters is different, although this may be due to the relatively small sample of technological variables used by Jorgensen. In both studies of the categories of culture, the patterns of group relationships were at least slightly different for each category. Thus some of the differences between the scheme of relationships developed from the SSA and the alternate classifications may be attributable to the fact that we are examining only a particular category of culture elements. We will not be able to evaluate the correctness of a typology but only that it does or does not reflect the technological differentiation found in using SSA.

Kroeber's Scheme of Northwest Coast Relationships

The first alternate system to be considered is the intuitive scheme developed by Kroeber (1963:29-30) to deal with total culture. This classification, with the groups of this study placed in context, is presented in Table V. To aid in visualizing this scheme in relation to the smallest space analysis, Figure 5 presents the SSA with Kroeber's groupings outlined. Initially we divided the Northwest Coast into three divisions: the Salish, the Nootka, and the Central-Northern division. Kroeber's major divisions separate the Kwakiutl, except the Xaisla, and the Bella Coola from our Central-Northern group and places them with the Nootka to form the Central Maritime division. Clearly the SSA does not support the combination of these Nootka, Kwakiutl, and Bella Coola groups. However, although not a major division according to our data, the division of all Kwakiutl, except the Xaisla, and the Bella Coola from other Central-Northern groups does not conflict with the present analysis though other divisions would be as satisfactory. The Xaisla do seem to be more like northern groups than are the other Kwakiutl groups. Kroeber's division of the Puget Sound and Gulf of Georgia Salish is borne out in the 28 group sample, but not as a major division. With regard to this division, the position of the Puyallup-Nisqually with the Gulf of Georgia groups should be noted. Also the position of the Quinault in the 31 group sample is not with the Nootka, Bella Coola, and most Kwakiutl groups, as Kroeber tentatively proposed, but with the Gulf of Georgia groups.

TABLE V. KROEBER'S INTUITIVE CLASSIFICATION OF NORTHWEST COAST GROUPS*

1. Northern Maritime
   a. Mainland
      Chilkat
   b. Archipelago
      Sanyakwan
      Massett
      Skedans
      Tsimshian Proper
      Hartley Bay
   c. River
      Gitksan
      Xaisla
2. Central Maritime
   a. Northern
      Kwexa
      Koskimo
      Wikeno
      Xaihais
      Bella Bella
      Bella Coola
   b. Southern
      Clayoquot
      Tsishaat
      Hupachisat
      (Quinault)
3. Gulf of Georgia Salish
      West Sanetch
      Nanaimo
      Cowichan
      Squamish
      Sechelt
      Homalco
      Klahuse
      Slaiamun
      Comox
      Pentlatch
      (East Sanetch)
4. Puget Sound Salish
      Twana
      (Puyallup-Nisqually)

* after Kroeber (1963:29—30)

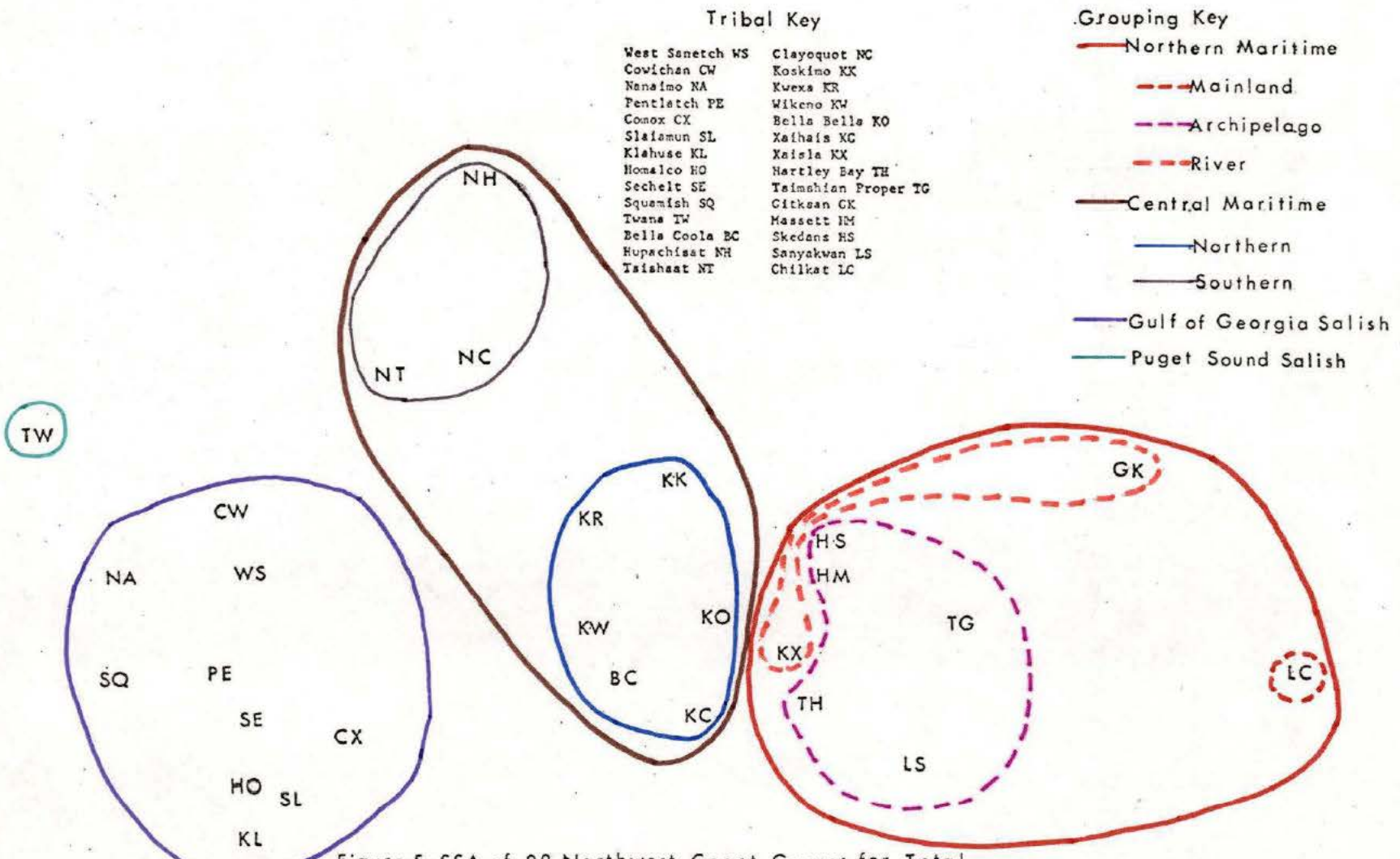
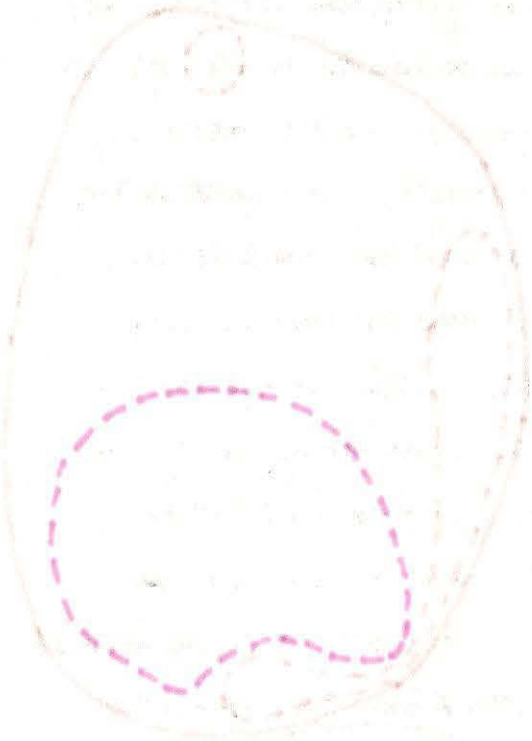


Figure 5. SSA of 28 Northwest Coast Groups for Total Technology, Kroeber's (1963) Classification Indicated



There are problems with Kroeber's initial pattern of division in terms of our initial divisions, but the smaller divisions may be more closely comparable, so we will examine them. The Northern Maritime-Mainland division includes only the Chilkat which are evidently quite separate from other groups in this analysis. The Northern Maritime-Archipelago division includes groups (from three ethnic units) that are fairly closely related; but other groups like the Xaisla, equally closely related, are not included. In the Northern Maritime-River division, the Gitksan and Xaisla are joined but these groups are widely separated in the SSA. The groups of the Central Maritime-Northern division are also relatively close but again some groups (the Bella Bella and Xaihais) show closer relationships to groups (the Xaisla and Hartley Bay Tsimshian) of a totally different division—the Northern Maritime. The Central Maritime-Southern division does make sense (when the Quinault are omitted), but the members of this division represented here are all neighbouring Nootkan groups. Given the pattern of clustering observed in the SSA diagram, Kroeber's divisions do have some validity but often other divisions are equally workable. Some of the differences between this study and Kroeber's are not so much a disagreement on which groups belong together but a disagreement as to the "taxonomic" level of division.

Drucker's Classification of Northwest Coast Groups

Drucker (1965:112-113) divides the Northwest Coast into three cultural provinces, based on data from all categories of culture, very similar to the major divisions of Kroeber. The divisions,

mentioning only the groups involved in this study, are:

1. Northern, including the Tlingit, Haida, Tsimshian, and marginally the Xaisla;
2. Wakashan, including all other Kwakiutl groups, the Nootka, the Bella Coola, and, provisionally, the Comox groups; and
3. Coast Salish-Chinook, including all other Salish groups.

Figure 6 presents these divisions on an SSA diagram.

Considering most of the Salish as a single major division is perhaps more consistent with present results but generally Drucker's divisions, being identical to Kroeber's except for the disposition of the Comox, have the same problems mentioned in previous paragraphs. The position of the Xaisla, also following Kroeber, with northern groups is interesting as the Xaisla appear to be at least a transitional group between northern and central groups.

Drucker's tentative positioning of the Comox with the Wakashan is not reflected in our analysis, although, of all the Salish except the Bella Coola, the Comox manifest the closest relationship to the Kwakiutl.

> Their inclusion or exclusion [in the Wakashan division] depends ultimately on whether or not the heavy overlay of Southern Kwakiutl traits that distinguished them from their linguistic cogeners was a prehistoric acquisition, or a post contact development. (Drucker 1965:112)

Technologically speaking, the Comox speakers exhibit a closer relationship to other Salish groups than to any other group. (Drucker [1965:113] includes the Quileute as a marginal member of the Wakashan province and it is possible that he is also including

the Quinault under this heading. This does not affect the 28 group sample but the inappropriateness of this inclusion was mentioned in dealing with Kroeber's divisions.)

Linguistic Classification

As noted previously, the major ethnic units, which are also linguistic units, display some consistency in clustering. It is interesting to note that although the Salish encompass greater linguistic diversity (in terms of more languages) than other groups, the spatial ordering of groups is no more scattered than among other groups like the Tlingit and Tsimshian when one takes the number of sample tribal units into account. Extent of distribution in space seems to be more important. As the larger linguistic units hang together to a certain extent, it will be instructive to examine how internal linguistic divisions compare to clusterings based on technology. Figure 7 presents the linguistic divisions on an SSA diagram (see Table III and Figure 2 for linguistic divisions and sources).

The Salish

All of the Salish display reasonably close relationships with most Salish appearing in a single unit. Hess (1972) divides the Coast Salish into the Bella Coola, Tillamook, and two branches: the Central Coast Branch and the Olympic Branch. The Tillamook are unrepresented in this study and the Olympic Branch finds representation only in the 31 group sample where we found the single member considered, the Quinault, not separated from the

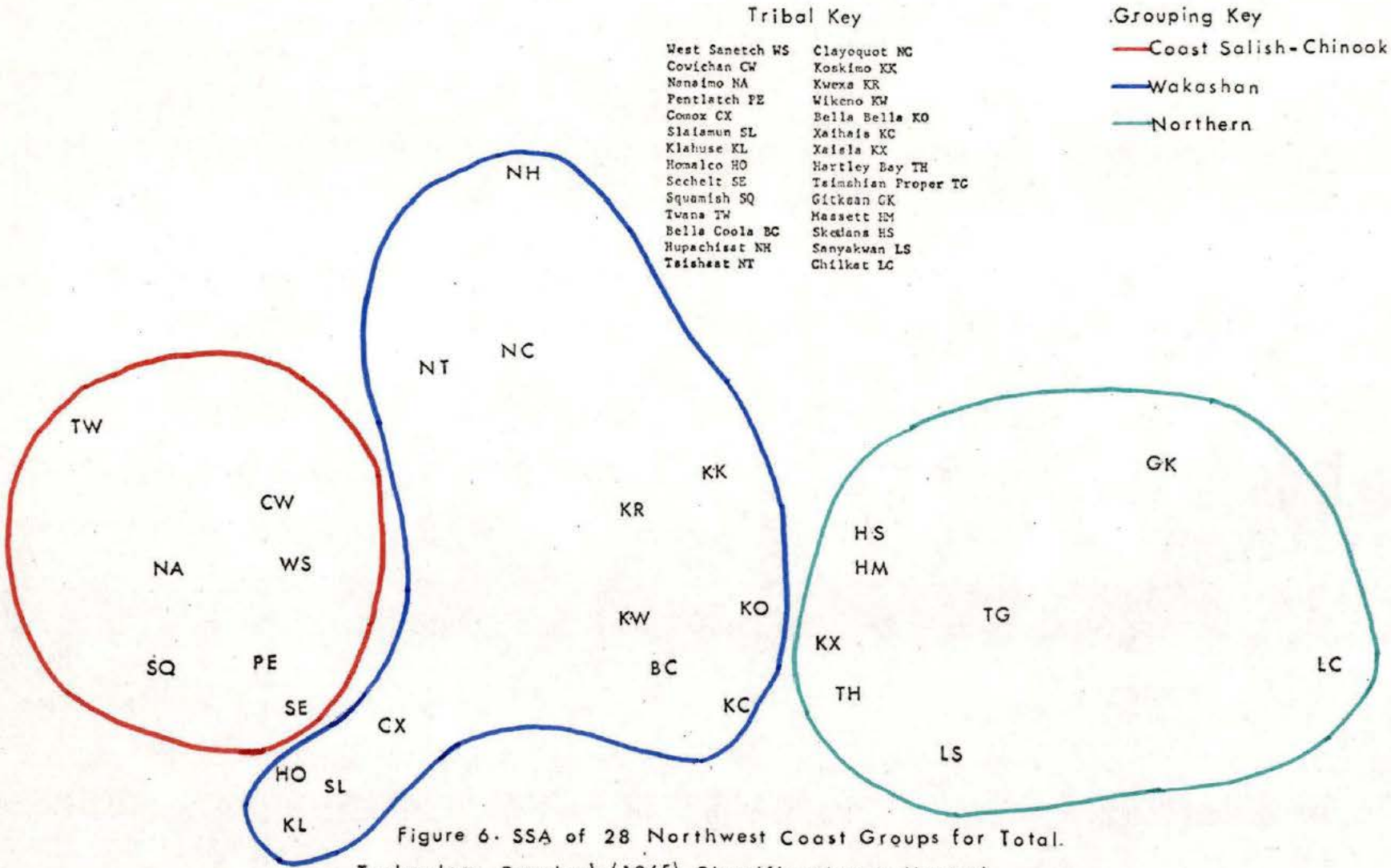


Figure 6. SSA of 28 Northwest Coast Groups for Total Technology, Drucker's (1965) Classification Indicated

Central Coast Branch. The Central Coast Branch is partitioned into three divisions: the North Georgia Strait, including the Comox, Pentlatch, and Sechelt; the South Georgia Strait, including the Sanetch, Squamish, and Halkomelem; and the Puget-Twana, represented by the Twana. (The Puyallup-Nisqually are also representative of this division and they display no special technological relationship to the Twana, as has already been noted, and indeed are closer to representatives of other divisions.) With the exception of the Squamish, our Northern and Southern divisions of the Salish perfectly reflect the North and South Georgia Strait linguistic divisions. Again we have another case of problems with the Squamish, possibly indicating that we have misplaced them or that they are in an intermediary position. The Comox speakers, especially the mainland groups, do display close relationships as do the Halkomelem speakers but some outside relationships are equally as close. Generally, for the Salish, linguistic and technological groupings are similar.

Non-Salish

It is not possible to make any important comments about internal linguistic units with the Haida, Tlingit, and Nootka as no internal groupings are linguistically more similar than others. The Haida and Tlingit are both members of the Na-Dene Phylum but they do not appear to have any close technological relationships beyond those which might be expected from their geographic positioning. Within the Tsimshian unit, there is a linguistic division between the Coast Tsimshian, including the Hartley Bay and Tsimshian Proper,

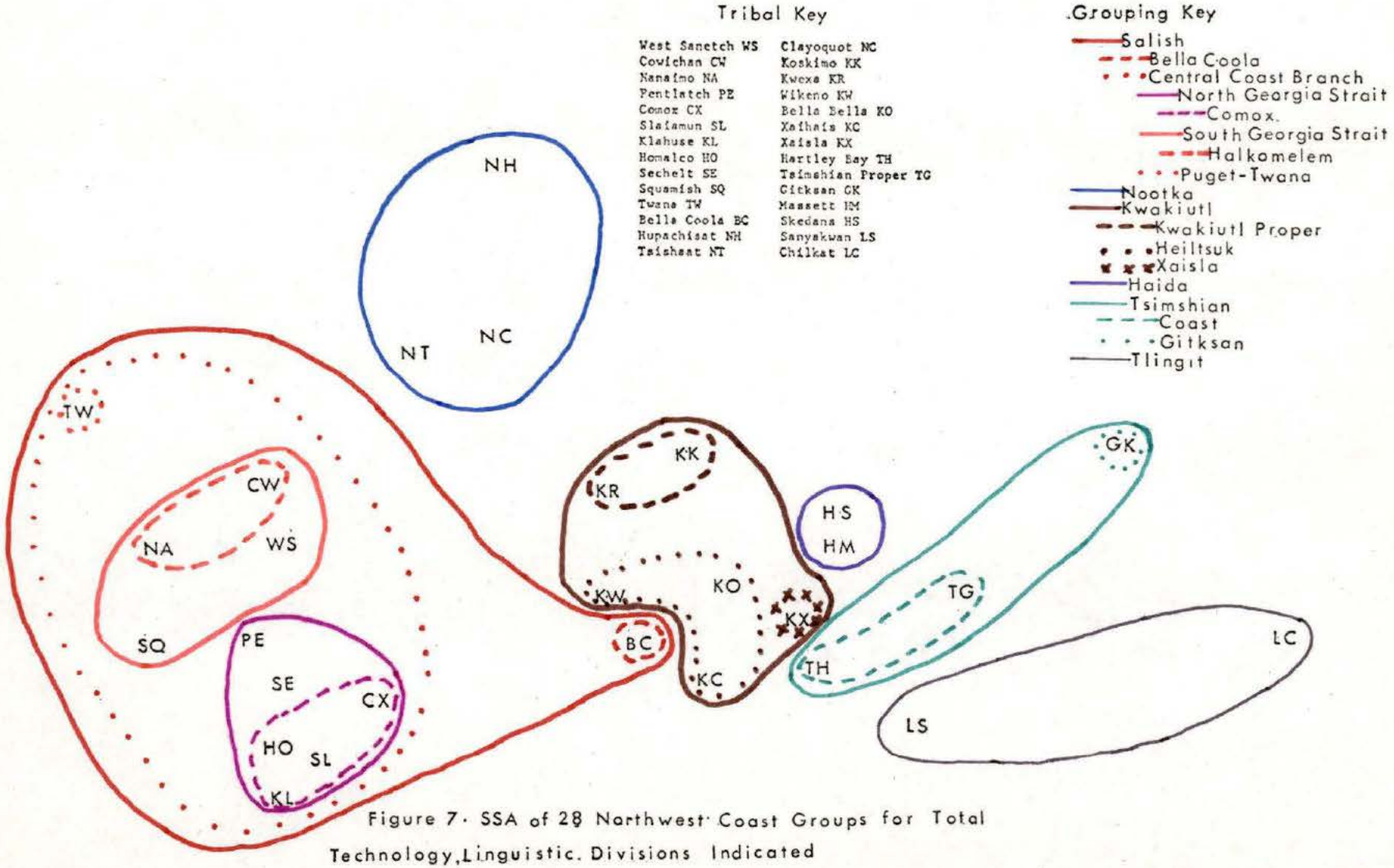


Figure 7. SSA of 28 Northwest Coast Groups for Total Technology, Linguistic Divisions Indicated

and the Gitksan. The relationship between the two Coast Tsimshian groups is slightly closer than the relationship of either to the Gitksan. The Kwakiutl are divided into three languages—the Xaisla, the Heiltsuk (including the Bella Bella, Wikeno, and Xaihais) and the Kwakiutl Proper (including the Koskimo and Kwexa). The Kwakiutl Proper display close relationships although the Kwexa are also close to the Wikeno. Actually a grouping of all the mainland groups of both dialects is as feasible as a dialectical division, as the Xaisla are closer to the Xaihais and Bella Bella than are the Wikeno, but they are also closer geographically so linguistics may play a part. Linguistics alone cannot explain the derived pattern of relationships, although its divisions are at least partially mirrored in the patterning. Of course, it is difficult to separate the effects of common or close ancestry, as reflected in linguistics, from factors such as geographical proximity and similar areal situations.

Environmental Schemes

Three environmental classifications—Shelford's (1963) ecological zone scheme, Krajina's (1965) biogeoclimatic zone scheme, and Chapman and Turner's (1956, after Munro and Cowan 1947) biotic region scheme—were considered for use in this study. Shelford's (1963) scheme was immediately rejected due to the poor mapping in that study. Both Krajina's (1965) and Chapman and Turner's (1956) schemes allow differentiation of the same groups despite a different basis for determination of environmental zones and different nomenclature for the zones. Chapman and Turner's scheme's (1956) is selected as, unlike Krajina's (1965) scheme,

it deals with the Alaskan portion of the Northwest Coast. Also Chapman and Turner's (1956) mapping of the environmental zones is especially clear due to the use of color and a large scale. Actually Chapman and Turner's (1956) treatment of the Alaskan area does not allow any additional differentiation of groups, but at least this can be noted in preference to leaving the area a blank.

Biotic Zone Divisions

Using the biotic region scheme presented in Chapman and Turner (1956:23—24; see Appendix G), a macroenvironmental division of most of the area under consideration can be derived.

> Briefly, we have regarded three criteria as evidence for identifying a biotic area, namely the presence of distinctive plant species, the presence of distinctive animal species and the absence of plant and animal species of other biotic areas.(Munro and Cowan 1947:13)

The boundaries are never sharp, as they are distinguished by plant and animal forms which are best suited to particular climatic conditions which themselves vary gradually rather than sharply (Chapman and Turner 1956:23). As this particular scheme was developed primarily for British Columbia, and there is nothing comparable for Washington, it is not possible to deal with the Twana(or Puyallup-Nisqually or Quinault).

Unfortunately, the relative environmental consistency of the Northwest Coast does not allow for extensive internal divisions on a gross scheme such as this. Most of the area is a mix of Coast Forest, Sub-Alpine, and Alpine-Arctic biotic zones with sufficient consistency of mix to prevent reasonable sub-typing on the basis of dominants or co-dominants. The only divergent

environment is found in the Gulf of Georgia area where the Gulf Island and Puget Sound Lowland biotic zones are encountered. Figure 8 presents the biotic scheme in relation to the SSA.

The Comox, Pentlatch, Nanaimo, Cowichan, Sanetch, Homalco, Klahuse, Squamish, Sechelt, and Slaiamun have within their territories areas designated as Gulf Island biotic type. The Squamish, in addition, have areas designated as the Puget Sound Lowland type. The groups are similar, as has already been pointed out, but as all are Salish groups it is difficult to say if environmental similarity is responsible for their similarity but it is quite probable that it plays a part. The Bella Coola are the only Salish group known not to be sharing in these environmental types. This is the most divergent Salish group but it is also the most separated geographically and is isolated by surrounding Kwakiutl groups. The Squamish, a problem group, have an environmental type a little different from the other Salish and this may contribute to their detached and unclear position.

"Access to the Coast"

As can be seen overall environmental classifications of the type examined above add little to our understanding, and detailed environmental information is not possible within the scope of this study. It is possible, however, to pick out a more narrowly defined environmental variable that may have impact on the arrangement of groups and test it for explanatory power. The variable selected here is what might be called "type of access to the coast". The groups are impressionistically placed in the scheme presented

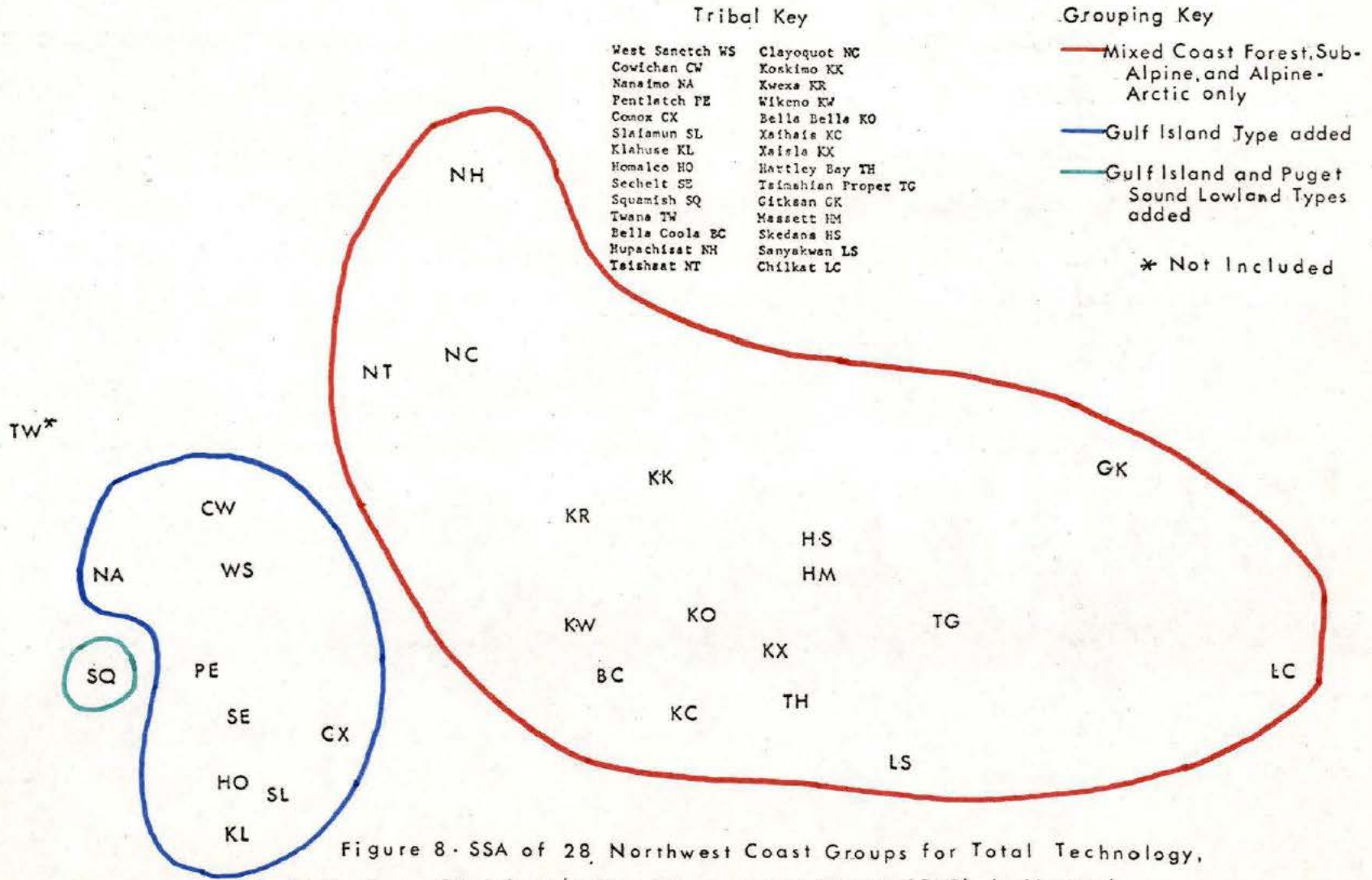


Figure 8 · SSA of 28 Northwest Coast Groups for Total Technology, Biotic Zone Divisions (after Chapman and Turner 1965). Indicated

in Table VI (the Quinault are the only Open Coast group so they will be mentioned). Figure 9 provides a pictoral representation of this scheme in relation to the SSA. This scheme involves a four part division: Inland River, Fiord Head, Archipelago, and Open Coast. Open Coast groups are those groups whose territory of exploitation and settlement is directly on the open Pacific coast. Fiord Head groups are those whose major area of exploitation and settlement is at the head of the deep fiords characteristic of this area, and, hence, not directly on the coast. The Archipelago groups situation is between that of the Open Coast and Fiord Head, involving island territories or island sheltered mainland territories where major orientation is not to the deep fiord head. Inland River groups have no direct access to the sea coast and are oriented to rivers and lakes for most water resources.

Obviously one cannot expect that all members of an environmental type will cluster tightly, completely outweighing factors such as geographic proximity or common ancestry. Given the assumption that, all things being equal, members of a linguistic group should cluster together, we can get some indication of the effects of this environmental variable by looking to see if those groups which have a different environment from their linguistic relatives are more divergent from the bulk of their relatives.

As most groups fall in the Archipelago environmental type, the easiest approach is to examine the position of those groups which are not members of this environmental type in relation to their linguistic cognates of the Archipelago type. It is interesting to note that several groups of divergent environmental types--the

TABLE VI. ENVIRONMENTAL TYPES DETERMINED ON THE BASIS OF THEIR POSITION IN RELATION TO THE COAST

Inland River	Fiord Head	Archipelago	Open Coast
Gitksan	Homalco	West Sanetch (Quinault)	
Hupachisat	Klahuse	Nanaimo	
	Twana	Cowichan	
	Bella Coola	Squamish	
	Xaisla	Sechelt	
	Xaihais	Slaismun	
	Wikeno	Comox	
	Koskimo	Pentlatch	
	Chilkat	Bella Bella	
	(Puyallup-Nisqually)	Kwexa	
		Massett	
		Skedans	
		Clayoquot	
		Tsishaat	
		Sanyakwan	
		Tsimshian Proper	
		Hartley Bay	
		(East Sanetch)	

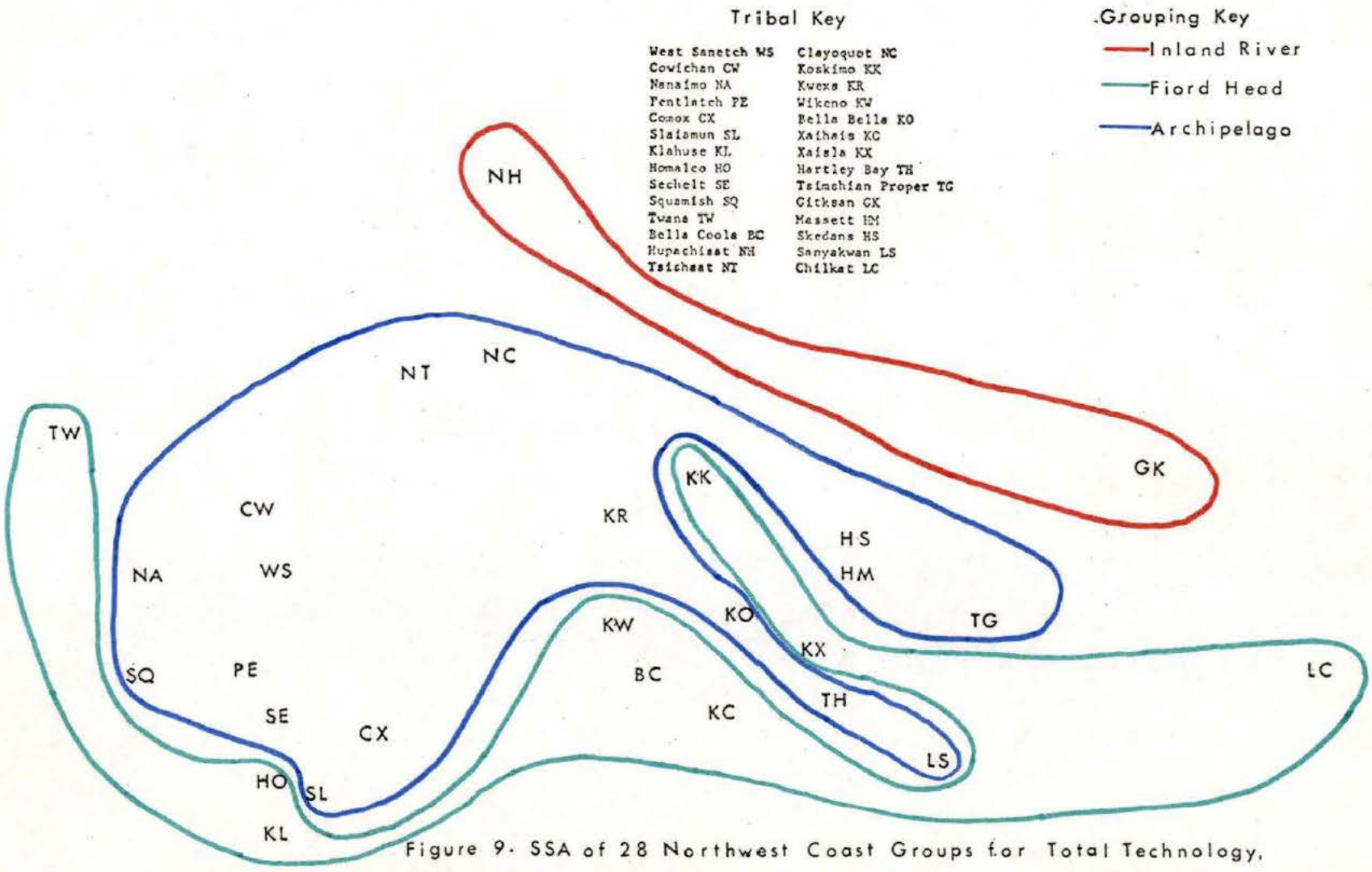


Figure 9. SSA of 28 Northwest Coast Groups for Total Technology, Divisions Based on Access to the Coast Indicated

Twana, Homalco, Klahuse, Chilkat, Hupachisat, and Gitksan--are on the periphery of the distribution of groups.

The Inland River environmental type includes the Hupachisat and Gitksan whose linguistic relatives are of the Archipelago type. The Gitksan are linguistically more differentiated from the other Tsimshian groups, so their slightly larger difference from the other Tsimshian can be attributed to either greater environmental or ancestral differences or more likely both. The Hupachisat are more divergent from their relatives but, of course, there is also the question of Salish contact.

The next environmental type is the Fiord Head which includes the Xaisla, Wikeno, Xaihais, Koskimo, Chilkat, Homalco, Klahuse, Twana, and Bella Coola (also the Puyallup-Niqually). The Fiord Head Xaisla are not extremely divergent from Kwakiutl of the Archipelago type and they show their closest relationship to the Hartley Bay Tsimshian of the Archipelago type. The Fiord Head Xaihais and Wikeno, along with the Fiord Head Bella Coola, do form a cluster but are not distinct from the Archipelago Kwakiutl. The Koskimo Fiord Head Kwakiutl are also not distinct from Archipelago groups. The Fiord Head Chilkat are divergent from the Archipelago Sanyakwan but the geographical distance between the two is also great. Homalco and Klahuse Comox speakers are both of the Fiord Head type but they are not notably different from the Archipelago Slaiamun. In fact, both are closer to the Slaiamun than they are to each other. The most divergent of the Salish, the Bella Coola, are Fiord Head while most Salish are of the Archipelago type; they are also most closely linked to the neighbouring Wikeno who are of

the Fiord Head type. No close relationship between all Fiord Head Salish is evident. In the larger sample, the puzzling case of the Twana and Puyallup-Nisqually, linguistically and environmentally similar and close neighbours yet with no special relationship, should be remembered. The Fiord Head Salish do occur at the extremes of the Salish distribution possibly indicating they are not as similar to other Salish, but also possibly a result of directional patterning.

The final environmental type is Open Coast which is represented only by the Quinault (not a part of the 28 group sample) who are closely linked to other Salish of both the Archipelago and Fiord Head types. Unfortunately close linguistic relatives of the Quinault are not included in this study.

This environmental division is helpful in dealing with a few groups; thus there is some indication that "inlandedness" may be one of the important variables to be considered although other factors appear equally as important. This subject will be returned to in the next chapter.

Barnett's Scheme of Salish Relationships

We will now examine schemes of relationship developed for the Salish. The first alternate classification of Salish relationships to be examined is that of Barnett (1939). Barnett's (1939) study is based on the Salish trait list utilized in the present study. For this reason, all Salish groups, with the exception of the Twana and Bella Coola, of the 28 group sample are represented. Yules Q was employed as the coefficient of similarity (Barnett 1939:225).

This measure is very similar to Driver's G but it takes cognizance of common absences. The derived scheme of relationships is presented in Figure 10 in relation to an SSA.

Three blocks of very similar groups are established: (1) the Comox-Pentlatch block, (2) the Nanaimo-Cowichan-Sanetch block, and (3) the Homalco-Klahuse-Slaismun block (Barnett 1939:224). The Sechelt grade into the latter block and are also similar to the Squamish who, in turn, grade into the Nanaimo-Cowichan-Sanetch block (Barnett 1939:225). The Nanaimo-Cowichan-Sanetch block is identical to the Southern division established in the present study. The division of the Comox-Pentlatch from the Homalco-Klahuse-Slaismun is not supported by the SSA diagram, especially when the intermediate position of the Sechelt is considered. In this study, the Sechelt are part of the Northern Salish division, much as in Barnett's study, and they do occupy a diagrammed position between the Squamish and the remaining Northern groups. The Squamish have been tentatively assigned to the Northern division but, as Barnett finds, they are in an intermediate position between the "north" and "south". Barnett's (1939) scheme of the southern Vancouver Island Salish and the unclear position of the Squamish fits well with the present study. Barnett's (1939) disposition of the Northern division units is not borne out.

Jorgensen's Scheme of Salish Technological Relationships

Jorgensen's (1969) study of Salish relationships is based on statistical techniques similar to those employed in this study. Figure 11 indicates Jorgensen's technology-demography divisions on

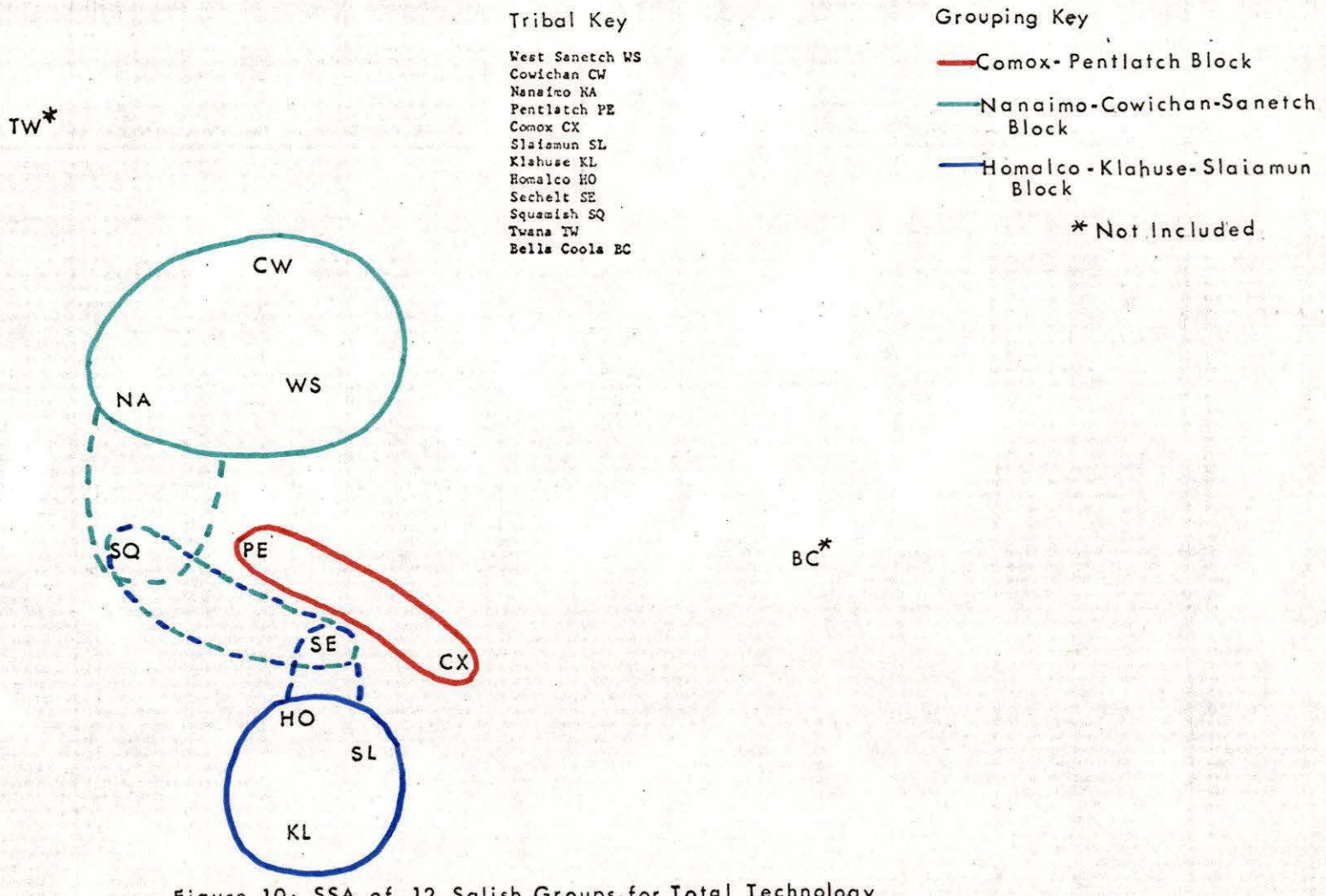


Figure 10: SSA of 12 Salish Groups for Total Technology, Barnett's (1939) Classification Indicated

an SSA diagram. Jorgensen (1969) finds there is a North Coast Culture Group, based on a technological sample of 23 variables, including all the Salish groups involved in this study, with the exception of the Washington Salish and the Slaiamun (the Slaiamun probably belong in this Culture Group but are not included in Jorgensen's study). Jorgensen does not present the internal subdivisions of the North Coast Culture Group as representing fact. The differences between groups were not significant, except the distinction Bella Coola—other North Coast groups, and he made no attempt to deal with them.

Of Jorgensen's North Coast Culture Group, the Bella Coola are the most divergent but not as divergent as the Washington Salish groups which form a different Culture Group—the Puget Sound Salish Culture Group. For the moment we will consider all 31 groups. In the present study we find the Bella Coola appearing as more divergent than these Washington Salish, probably as they are given the opportunity to show their relationship to the Central-Northern group, especially the Kwakiutl who are their immediate neighbours. The average G of the Bella Coola with all other Salish is .54 but with the mainland Kwakiutl the relationship rises to .66 (the average G coefficient of the other Salish with the mainland Kwakiutl is .49). This is still lower than the average Washington coefficient of .60 with all other Salish, excluding the Bella Coola, but not as different as first appears from an examination of the diagram. It is still suggestive of a difference between this study and that of Jorgensen. The additional Salish groups of Jorgensen's study may explain the differences, there is

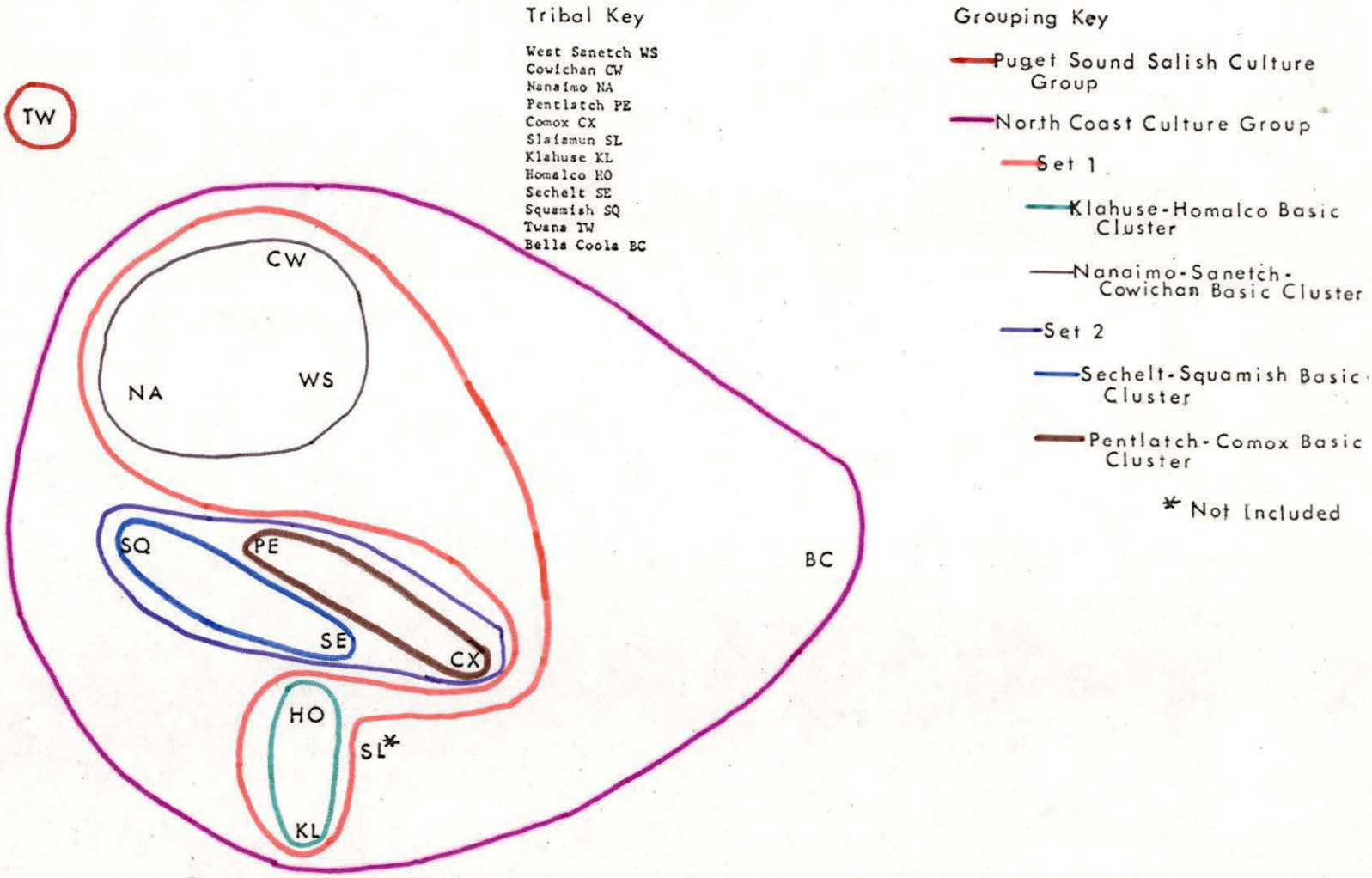
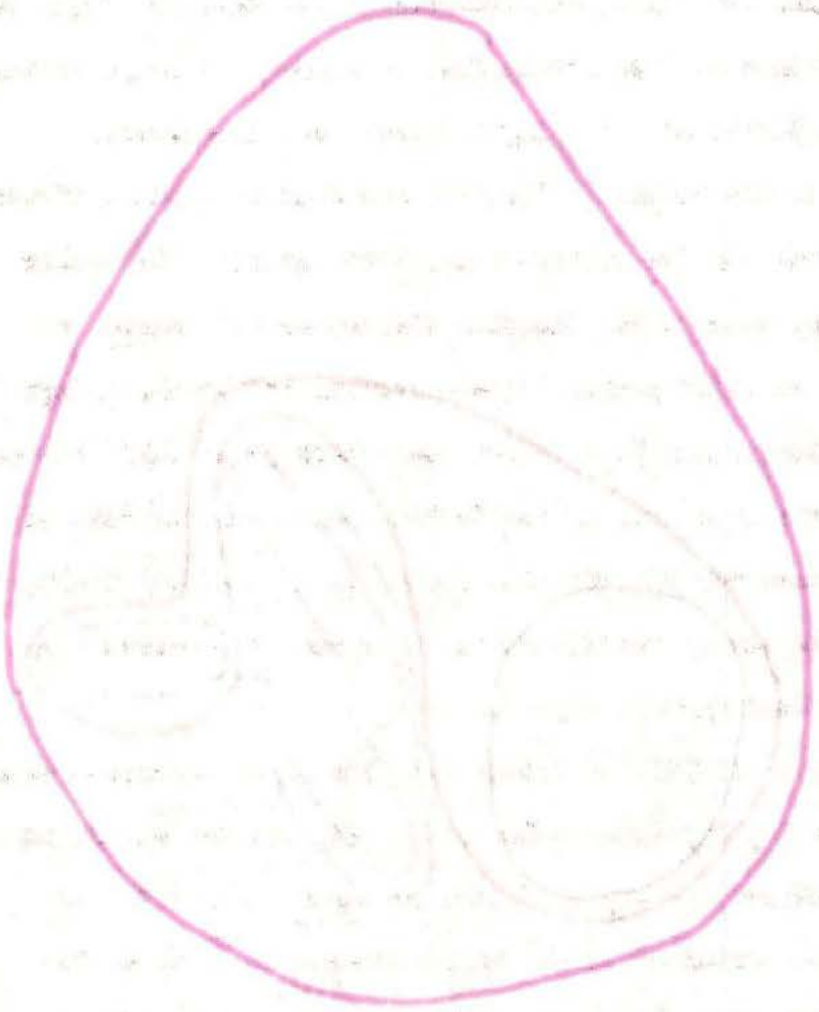


Figure 11· SSA of 12 Salish Groups for Total Technology, Jorgensen's (1969) Technology-Demography Dendrogram Linkages Indicated



also the possibility of sampling error. In the 31 group sample, the presence of an additional Sanetch group, reasonably close neighbours of the Washington groups, may be exerting an influence pulling the Washington groups in tighter. In the 31 group sample the Bella Coola are not as close, possibly indicating less of a relationship to the more southerly groups. Thus the addition or subtraction of groups can alter relationships.

Basic clusters of the Klahuse-Homalco, Pentlatch-Comox, Cowichan-Nanaimo-Sanetch, and the Squamish-Sechelt, are found in Jorgensen's study. The Klahuse and Homalco do form a cluster (although in the larger sample the Homalco display a closer, and unexpected, relationship to the Sechelt). The Cowichan-Nanaimo-Sanetch division is also workable for the present data. (But again in the larger sample the West Sanetch and Cowichan display equally close relationships to other groups.) The Comox and Pentlatch, though affiliated, clearly manifest closer relationships to other groups. The same situation is true of the Sechelt and Squamish. Some of these differences may be partially due to the use of different analytic techniques as results closer to those of Jorgensen were observed in a dendrogram analysis.

Jorgensen's (1969:71) findings join the basic Klahuse-Homalco cluster to the Nanaimo-Sanetch-Cowichan while the Sechelt-Squamish and Pentlatch-Comox are linked. These two sets join, then the Bella Coola are linked, followed by the Washington groups. The differences with the Bella Coola and Washington groups have already been mentioned. The patterning of groups in this study has already been described for both sample sizes and considerable variation

from Jorgensen's results is noted. In the 28 group sample, the Squamish, Sechelt, Pentlatch, and Comox do form a fairly close cluster, but the Klahuse-Homalco and Nanaimo-Sanetch-Cowichan are clearly divided by this cluster. (For the 31 group sample, the Squamish, Sechelt, Pentlatch, and Comox cluster is less obvious and the same problems ensue for the other groups.) The division of groups presented in Jorgensen seems less likely to fit the true situation given the geographical proximity and linguistic affiliation of groups.

Jorgensen's Scheme of Salish Relationships for the Total Cultural Inventory

Jorgensen does not place complete faith in the divisions based on his small sample (23 variables) of technological-demographic variables. For this reason, we will also compare the present results with Jorgensen's (1969:63) results for the total cultural inventory. These divisions are presented on the SSA diagram in Figure 12. The relationships of the Washington Salish and the Bella Coola remain the same. The basic clusters are also the same, with the exception of the Squamish and the Sechelt that are nevertheless closely linked. With the exception of the Bella Coola and the Washington Salish groups, those Salish groups present in both studies form part of the Gulf of Georgia Culture Cluster of the North Coast Salish Culture Group. Jorgensen (1969:63—65) develops southern and northern sub-sets of this Culture Group with the southern set including the Cowichan, Nanaimo, Sanetch, and Squamish, and the northern set including the Pentlatch, Comox, Klahuse, and Homalco.

The Sechelt are considered as intermediary. With the exception of the positioning of the Sechelt and Squamish, this division tallies well with the Northern and Southern divisions proposed for both samples in this study. The positioning of the Squamish is, of course, not clear in the present study, nor is the position of the Sechelt in Jorgensen's study.

Mitchell's Classification of Salish Relationships

Another scheme, dealing only with the Salish, is Mitchell's (1971) intuitive division based on fishing technology. The Bella Coola are the only Salish group of this study not included in the scheme (the Quinault are also absent but this does not affect our 28 group sample). Mitchell's four divisions are as follows: (1) Northern Gulf Diversified Fishermen, composed of the Comox, Pentlatch, Homalco, Klahuse, Sechelt, and Slaiamun; (2) Central and Southern Gulf River Fishermen, including the Nanaimo, Cowichan, West Sanetch, and Squamish; (3) Puget Sound Diversified Fishermen, including the Twana, (and in the larger sample, the Puyallup-Nisqually); and (4) Straits Reef Net Fishermen, represented by the East Sanetch only in the 31 group sample. (See Figure 13 for the SSA diagram of Mitchell's scheme).

Considering the 28 group sample, we are left with a three part division. The Northern Salish division of this study includes all of the Northern Gulf Diversified Fishermen and also tentatively includes the Squamish of the Central and Southern Gulf River Fishermen. The rest of the Central and Southern groups do form our Southern division. The Twana are sufficiently differentiated to

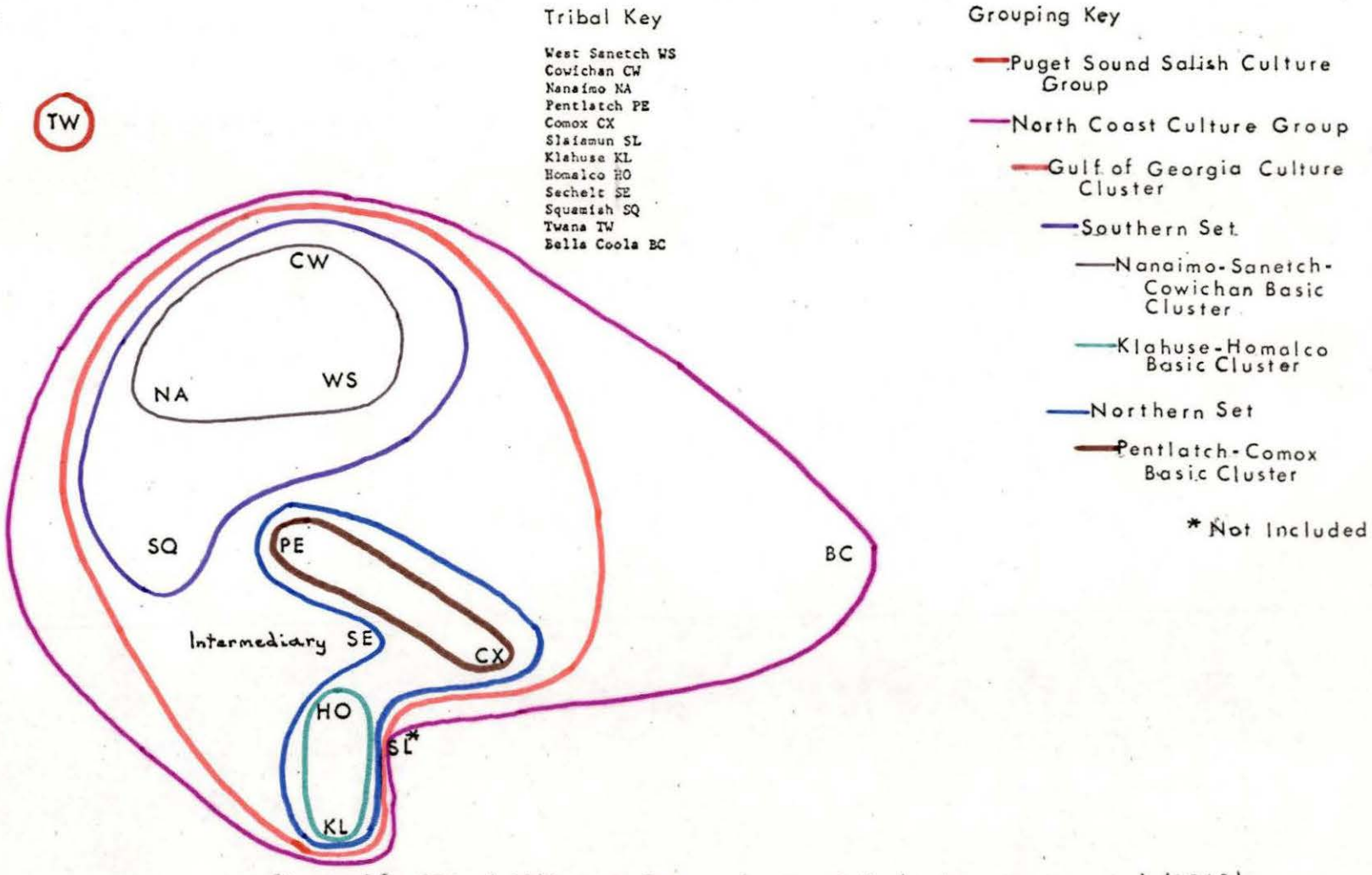


Figure 12. SSA of 12 Salish Groups for Total Technology, Jorgensen's (1969) Total Cultural Inventory Dendrogram Linkages Indicated

be considered as separate and represent a separate division for Mitchell--the Puget Sound Diversified Fishermen. In the larger sample, the East Sanetch, representing the Straits Reef Net Fishermen, are not clearly separated from the Central and Southern Gulf River Fishermen and the Puyallup-Nisqually also join this division rather than joining the Twana. Thus in the sample we are mainly considering, there is a perfect correspondence, with the exception of the Squamish, between the intuitive scheme and this statistically derived scheme.

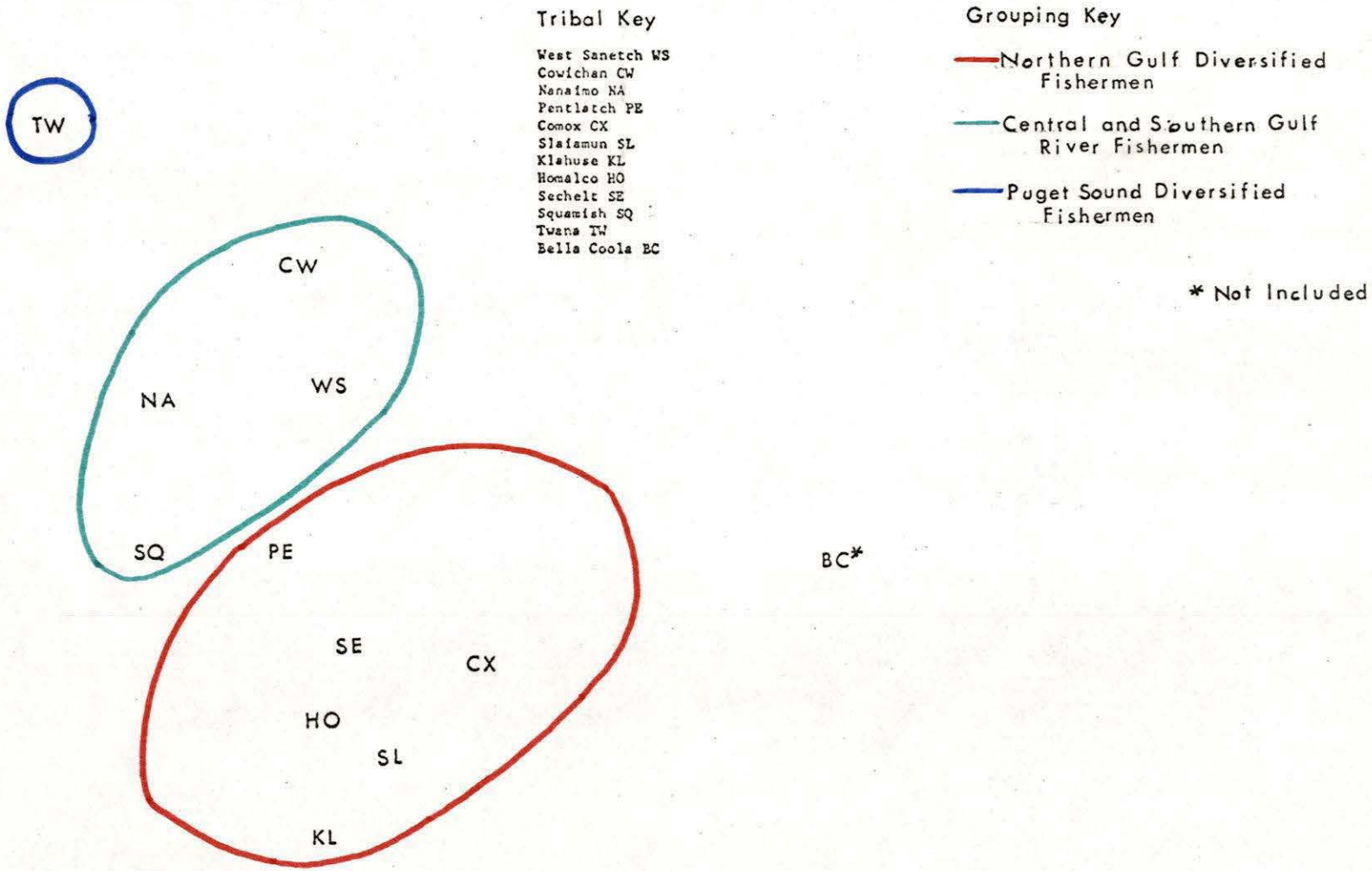


Figure 13. SSA of 12 Salish Groups for Total Technology, Mitchell's (1971) Classification Indicated

SUMMARY

This chapter shows that a single factor explanation of patterns of relationship is not adequate even when dealing with a limited portion of the cultural inventory—technology—in a delimited geographical area. Environment (not one single environmental factor but a set of environmental factors) probably does have a special relevance but commonality of ancestry; contact relations (cultural environment), whether roughly measured by geographical proximity or by specific records of contact; and historical influences also play their part. Looking at the components of technology in the following chapter may help to explicate the influence and importance of some of these factors.

Earlier typologies of the Salish and the entire Northwest Coast have been considered and all were found to have some elements concordant with results in this study but none was an exact reflection of the present results. Most of the schemes dealt with the totality of cultural elements and this difference in scope may have had its influence. If this is so, it suggests the danger of typing an area on the basis of a few obvious traits.

A south-north pattern of groups was observed suggesting differences in groups based on their geographical position, presumably tied to localization of ethnic groups, environmental differences of some kind between the north and south, and patterns of contact. A three part division of groups into Salish, Nootka, and Central-Northern units has been developed. The Salish unit

was sub-divided into Southern, Northern, and Washington sets (the Washington groups were not clearly divided from the Southern set in the 31 group sample). The Nootka unit was left undivided but coastal-inland distinctions were noted. The divisions of the Central-Northern unit were not clear, although a core unit of the mainland Kwakiutl, Bella Coola, and Hartley Bay Tsimshian is recognized. Clusters of the island Kwakiutl and the Haida are noted and the remaining groups are found to be somewhat detached.

After this brief review of our major findings, it is appropriate to begin consideration of the components of technology and their interrelationships.

CHAPTER III

THE SUB-CATEGORIES OF TECHNOLOGY AND THEIR RELATIONSHIPS

INTRODUCTION

As was noted in Chapter I, the cultural category of technology can be subdivided into coherent sub-categories. In this study, technology has been subdivided into (1) subsistence; (2) dress, ornament, and textiles; (3) structures and furnishings; (4) travel and transport; and (5) a residual miscellaneous category. Subsistence has been further divided into technology to deal with food preparation, water resources, and land resources. It was possible to categorize most of the variables as belonging to one of the four major categories leaving only ten variables to be placed in the fifth, or miscellaneous, category. The subdivisions of technology were suggested by the available data as an effort was made to place as much of the data as possible in as few categories as possible while retaining category coherence. Given different data, the pattern of sub-categorization would probably be different.

The initial purpose of this chapter is to describe the noteworthy features of group relationships determined for each sub-category of technology. Via these group relationships, the relationships among the different aspects of technology will be examined. Variables like linguistic affiliation and environment

will be considered to be determinate if there is a better fit of these variables with certain aspects of technology. From this examination, the question of comparative stability of these aspects of technology will be touched upon.

Smallest space diagrams, in Figures 14--20, present pictorial representations of the group similarities with major linguistic-ethnic units indicated.[4] The matrices of G coefficients of similarity are presented in Appendix E. Presentation of the matrix and smallest space diagram for the miscellaneous category would only be misleading as the variable sample is extremely small and the category has only limited internal uniformity. In addition, two groups--the Slaismun and Homalco--had to be dropped in considering the miscellaneous items as there was no information for the two groups. The information contained in the miscellaneous category was, of course, considered in the overall technological sample. All matrices and smallest space diagrams presented in this chapter are based on the 28 group sample.

The question of dimensionality for the smallest space analysis of sub-categories is more complicated than in dealing with overall technology. Table VII presents the coefficients of alienation for one, two, three, and four dimensions for the major sub-categories of technology and for the sub-categories of subsistence. For some categories, such as total subsistence, a four dimensional solution would be preferable but the difficulties of representing such a solution makes it necessary to use a three dimensional solution. (Indeed, using the same number of dimensions for each category facilitates comparison). A two dimensional

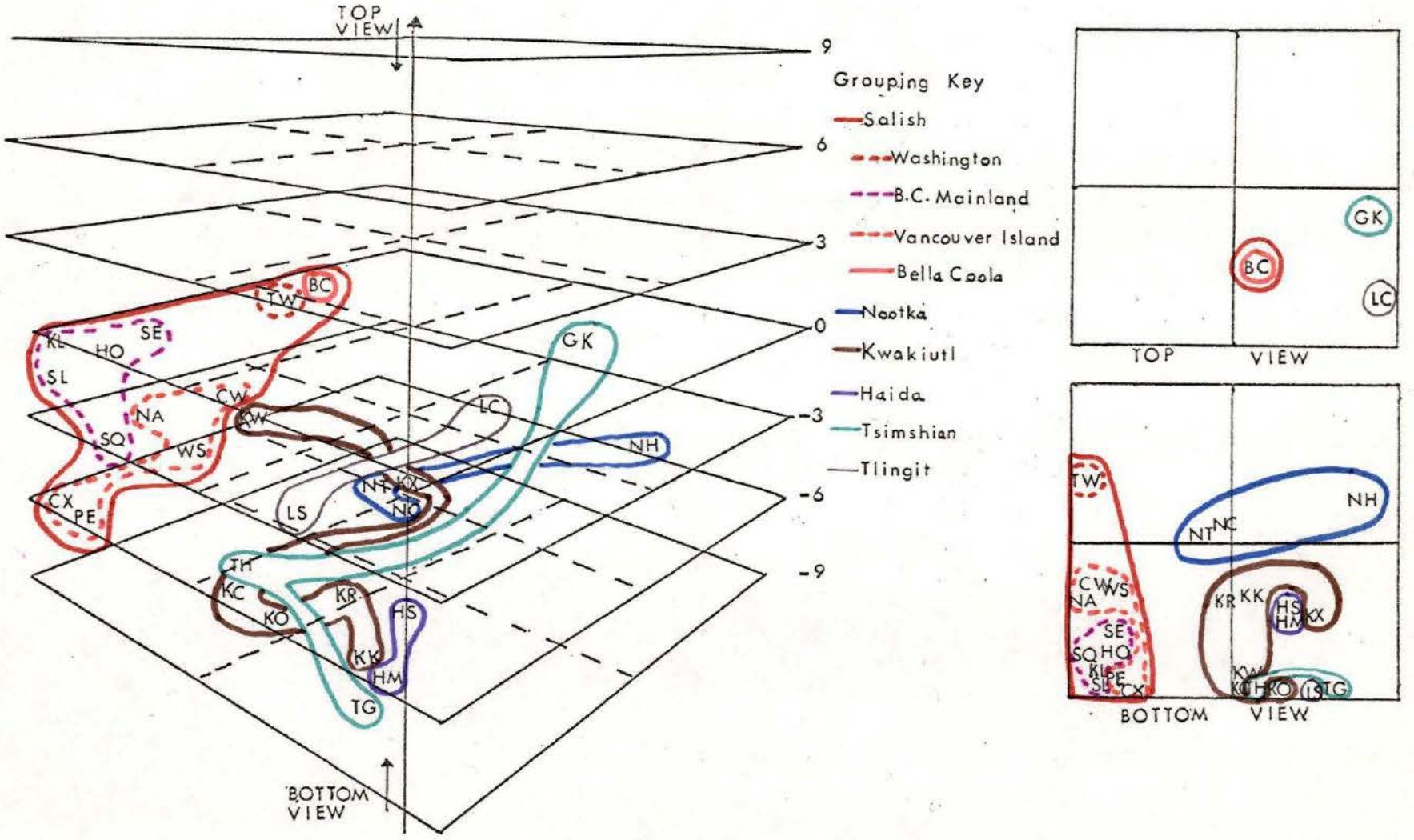


Figure 14· SSA of Technological Similarity: Total Subsistence, Major Linguistic-Ethnic Units Indicated (68 Variables)

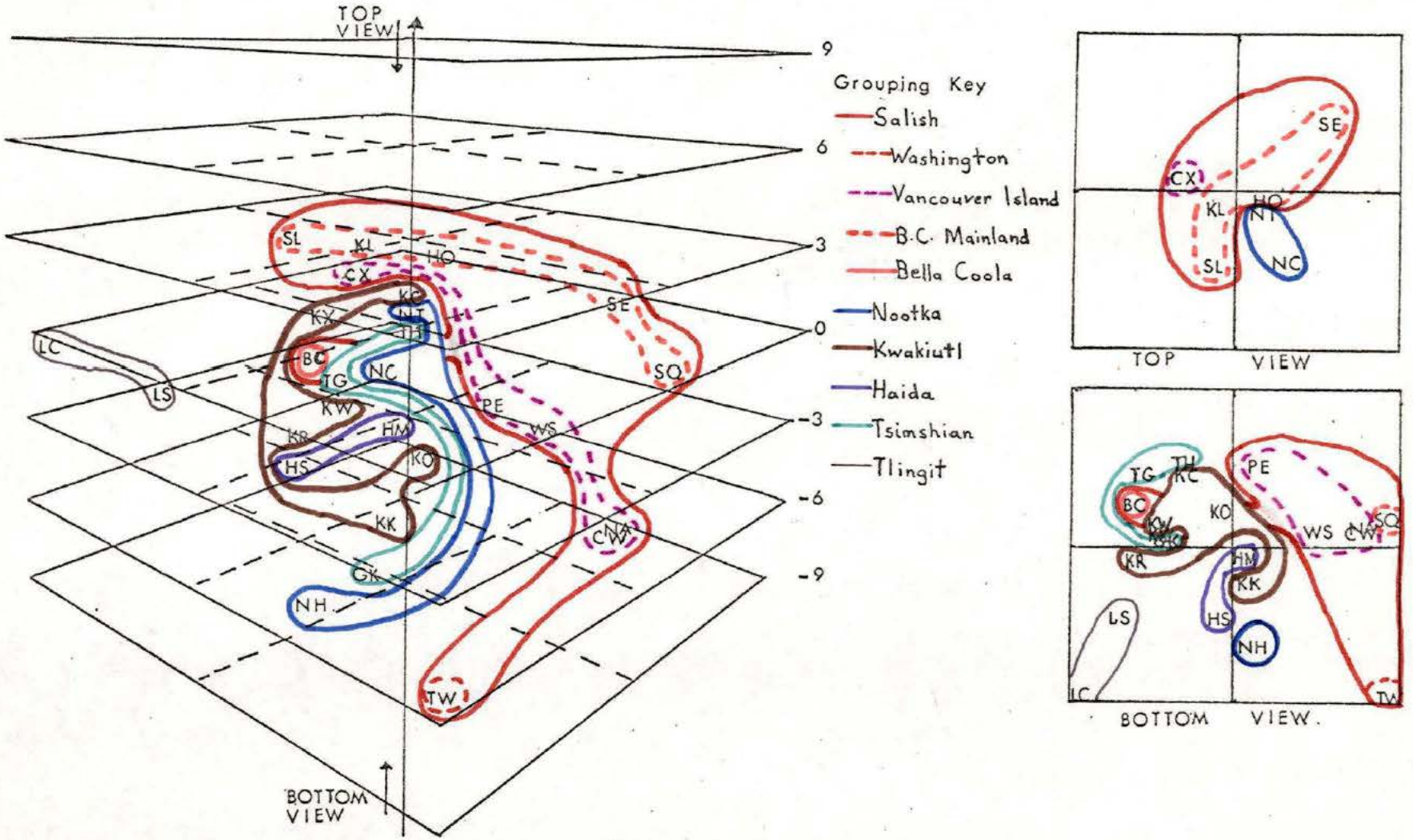


Figure 15. SSA of Technological Similarity: Subsistence-- Food Preparation, Major Linguistic - Ethnic Units Indicated (16 Variables)

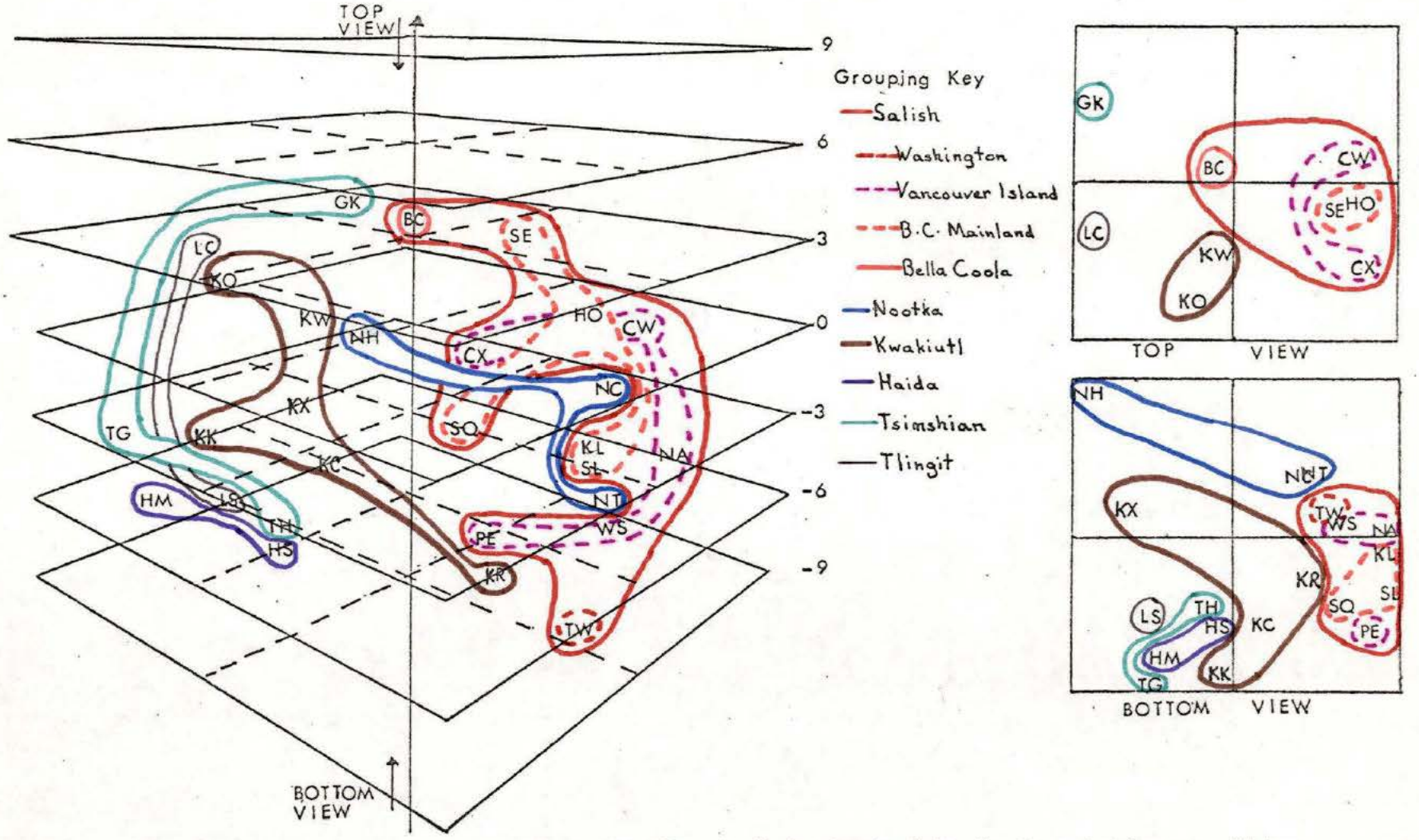


Figure 16. SSA of Technological Similarity: Subsistence-- Water Resources, Major Linguistic-Ethnic Units Indicated (23 Variables)

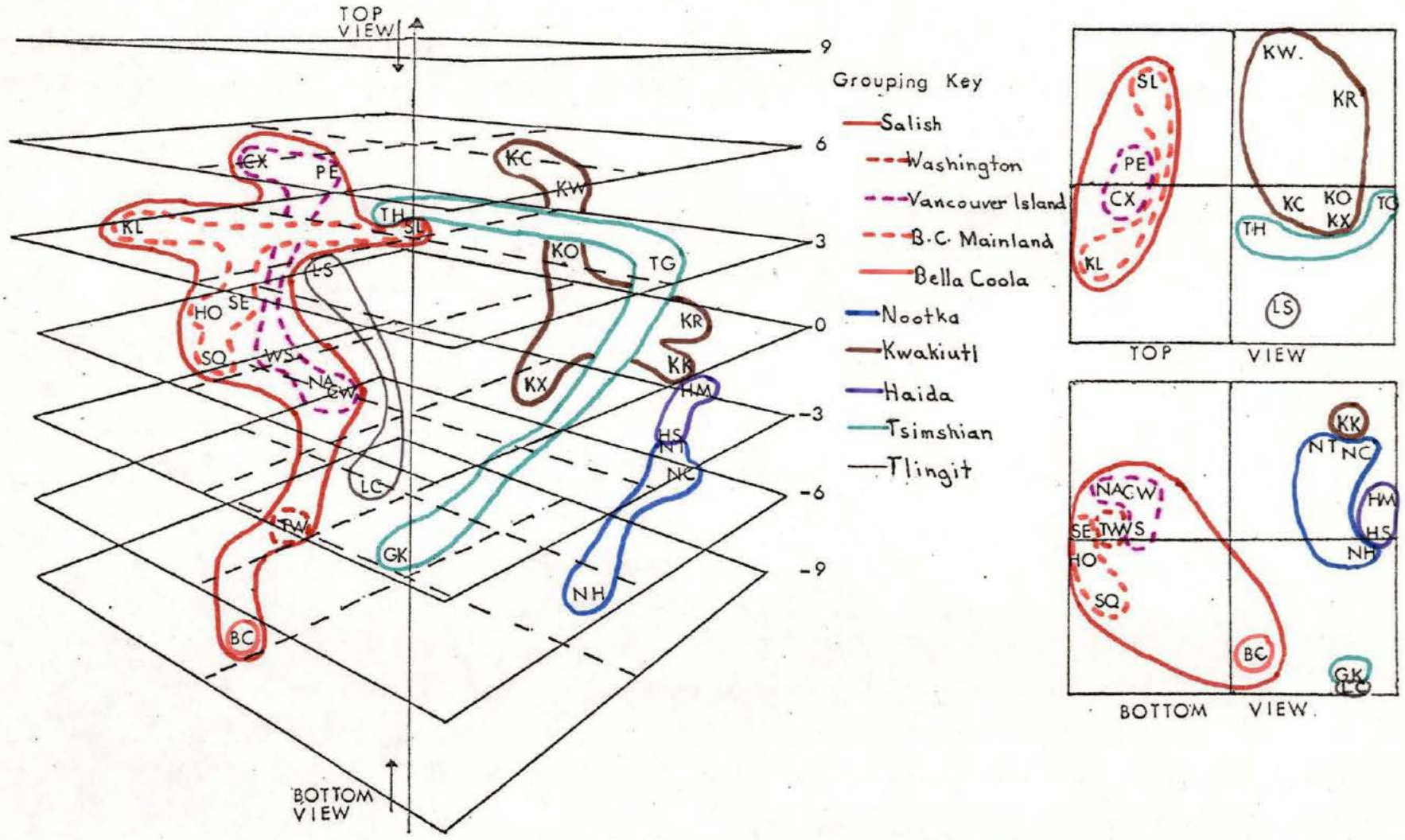


Figure 17. SSA of Technological Similarity: Subsistence--Land Resources, Major Linguistic-Ethnic Units Indicated (29 Variables)

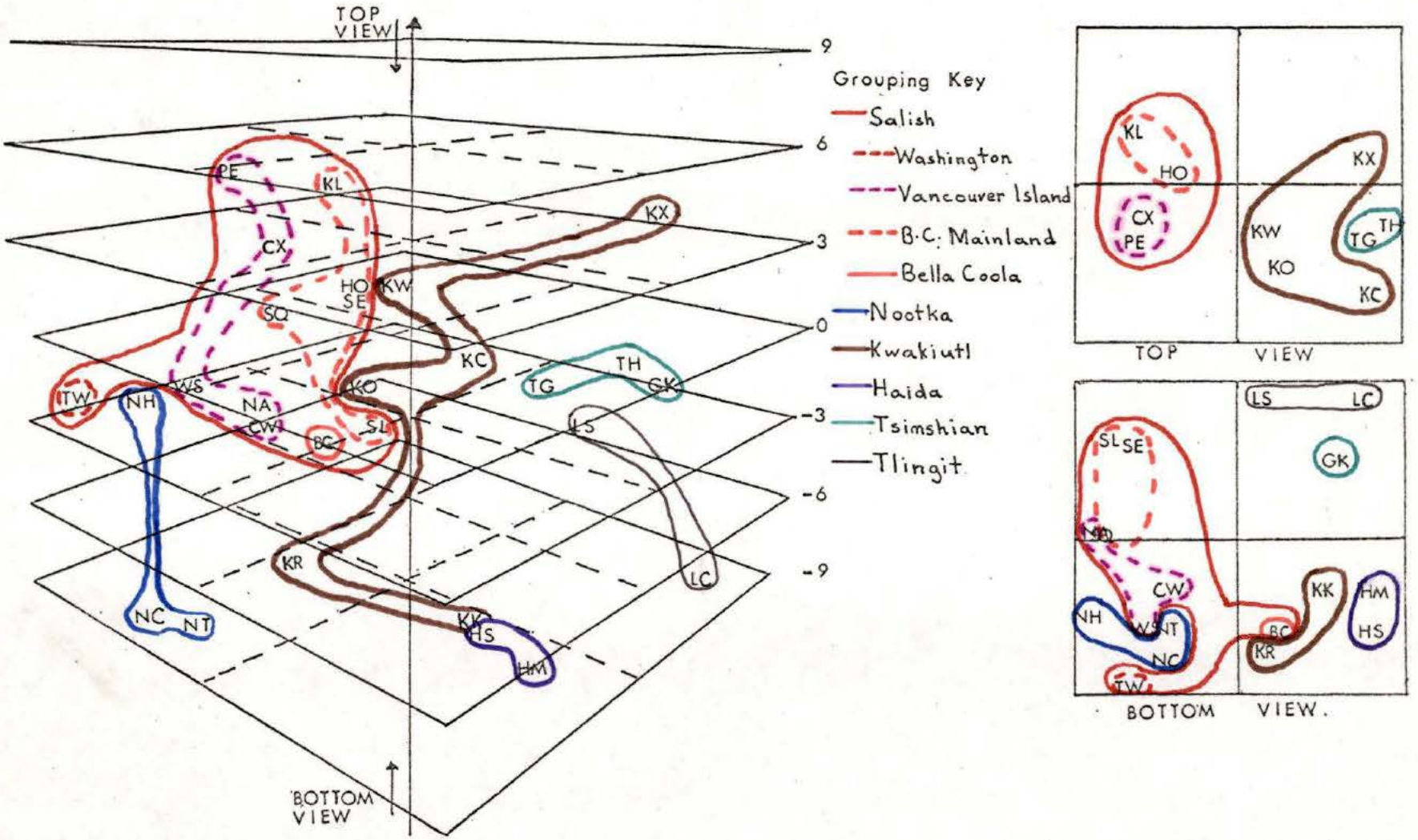


Figure 18 · SSA of Technological Similarity: Dress, Ornament, and Textiles, Major Linguistic-Ethnic Units Indicated (33 Variables)

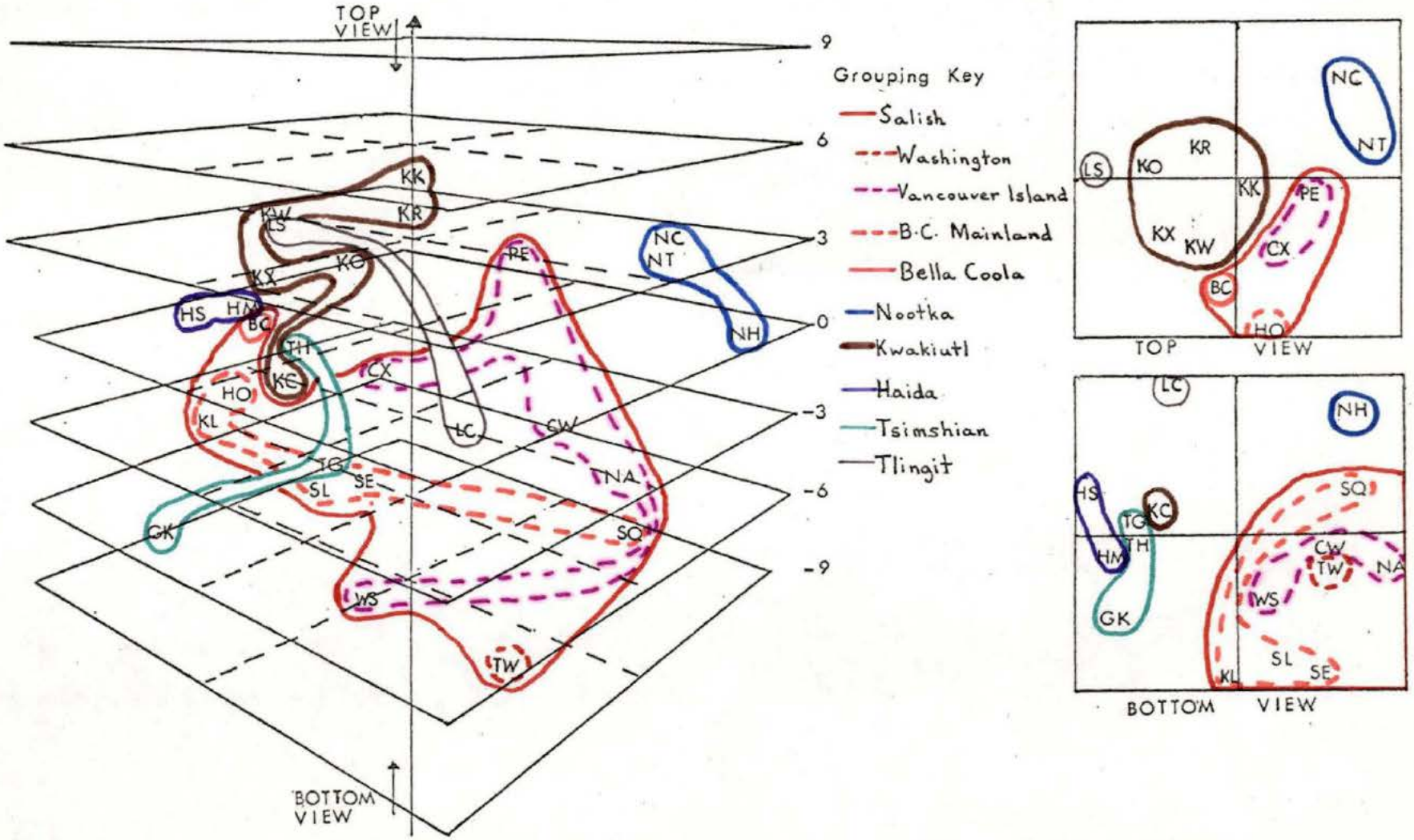


Figure 19. SSA of Technological Similarity: Structures and Furnishings, Major Linguistic-Ethnic Units Indicated (27 Variables)

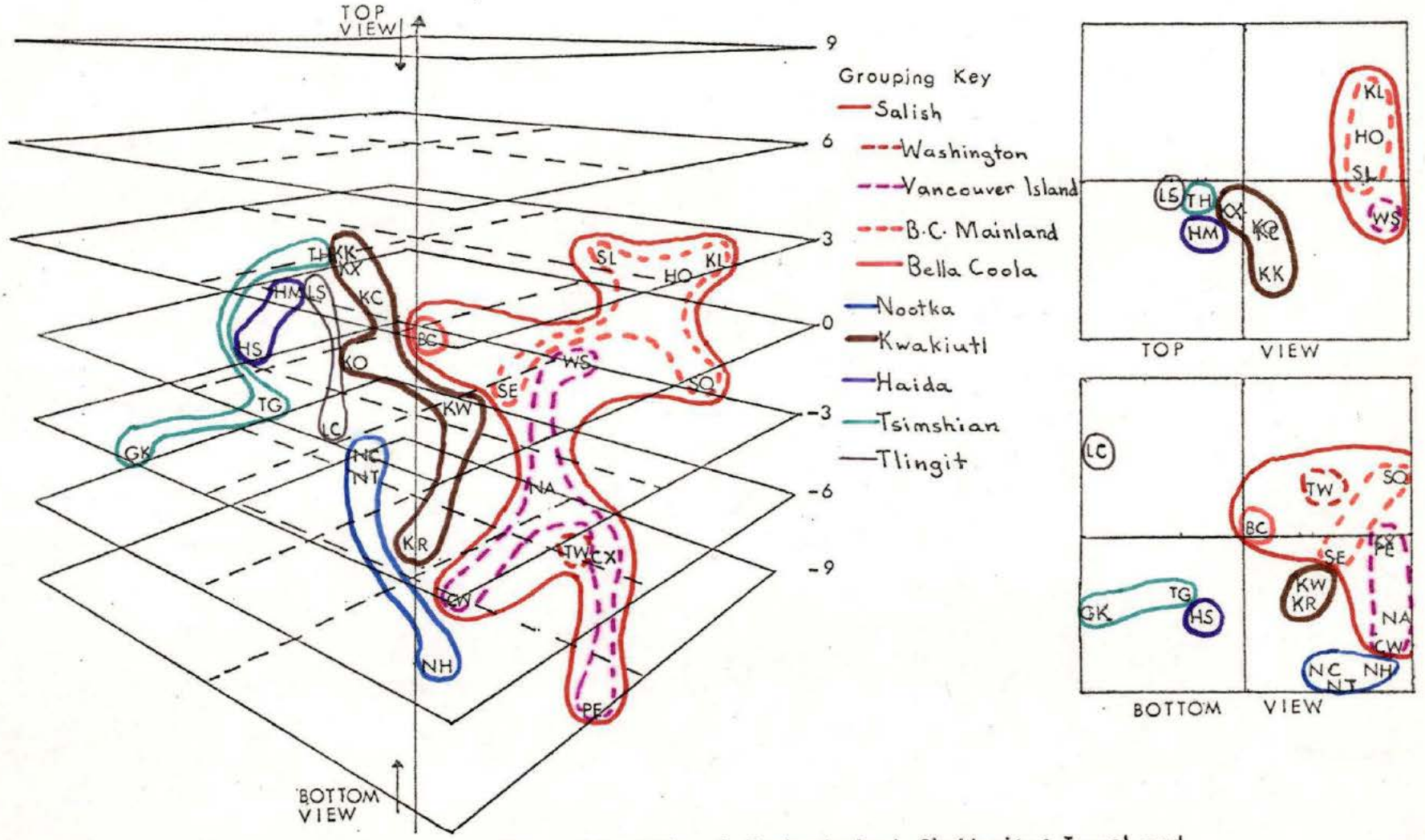


Figure 20 SSA of Technological Similarity: Travel and Transport, Major Linguistic-Ethnic Units Indicated (29 Variables)

solution would be reasonable for categories like dress, ornament, and textiles; but again a three dimensional solution, better but not completely necessary, is used to aid in comparison.

TABLE VII. COEFFICIENTS OF ALIENATION FOR ONE, TWO, THREE, AND FOUR DIMENSIONS FOR THE SUB-CATEGORIES OF TECHNOLOGY BASED ON 28 GROUPS

Sub-Categories of Technology	1 Dimension	2 Dimensions	3 Dimensions	4 Dimensions
Total Subsistence	.28932	.19349	.13255	.09028
Food Preparation	.32695	.19784	.12752	.08838
Water Resources	.31002	.21668	.14223	.11026
Land Resources	.34734	.18989	.12196	.08949
Dress, Ornament, and Textiles	.37748	.20260	.13857	.10409
Structures and Furnishings	.37166	.23667	.15636	.11586
Travel and Transport	.31437	.22007	.12575	.08644

As noted previously, the smallest space analyses utilize three dimensional representations of the positioning of 28 groups which presents some difficulty on a two dimensional surface. The solution adopted is that of Guttman (1966) which presents a series of planes along the vertical z axis. The planes are drawn to give the impression of perspective and the x and y axes are placed on the plane, also in a way which gives the impression of perspective. The position of a group is simply plotted from 3 coordinates

(the coordinates are presented in Appendix F); one coordinate determining the plane, or position relative to two planes, and the other two the position on that plane. As an SSA diagram can be rotated, the choice of which set of coordinates to use for a particular axis is unimportant.

To understand the smallest space diagram, it is also necessary to examine the bottom and top views, presented with each diagram, as a three dimensional diagram of the type utilized can only provide us with a very rough picture of relationships which tend to be distorted on the vertical dimension. The bottom and top views present the position of groups ignoring exact placement on the vertical dimension. The bottom view presents those groups whose vertical coordinates are less than zero, while the top view presents those groups whose vertical coordinates are greater than zero. The remaining two coordinates are used to plot the position of a group on the appropriate two dimensional top or bottom view graph.

LINGUISTIC-ETHNIC UNIT AND ENVIRONMENTAL CATEGORY CONSISTENCY

The Concept of Consistency

The concept of linguistic-ethnic unit and environmental category consistency is introduced as a means of examining the comparative impact of common ancestry and environment on the individual categories of technology. This also allows an assessment of the relative temporal stability of the individual categories of technology. The relative similarity of groups for the entire area for each category of technology can also be examined; as well

as the relative homogeneity of linguistic-ethnic units.

Consistency means the comparative group homogeneity of divisions, such as linguistic-ethnic or environmental categories, for the categories of technology. An assessment of areal consistency can be simply established by examining the spread of groups in the SSA diagrams. Using the original G coefficients of similarity, rather than examining the smallest space diagrams, presents a clearer idea of linguistic-ethnic or environmental unit homogeneity. A mean G coefficient of similarity is calculated for each linguistic-ethnic and each environmental unit for each sub-category of technology. The mean G for each linguistic-ethnic unit is also used as a means of appraising comparative internal consistency of the unit.

By comparing the mean G's for each category of technology for the linguistic-ethnic units, it is possible to examine the comparative stability of the categories over time—assuming that close linguistic similarity is equal to common ancestry. The higher the mean G for a category, relative to other categories of technology, then the less relative change in the category. The same technique is used to estimate the comparative impact of the access to the coast environmental variable. The mean G's are calculated for each environmental category for the technological categories. A relatively higher mean G is considered to indicate greater impact of the natural environment, as reflected in this one environmental factor.

The positioning of the groups in the individual diagrams will be examined later as there is not a one to one relationship

between the mean G coefficients, for either linguistic-ethnic or environmental category consistency, and the pattern of relationships observed in the SSA diagrams. In other words, a relatively high degree of similarity within a unit may not be reflected in the SSA diagram probably due to closer ties to tribal groups external to the unit. Cohesion is an appropriate term for linguistic-ethnic or environmental category homogeneity evidenced in the SSA diagrams.

Before going on to linguistic-ethnic unit consistency we consider briefly the similarity of tribal units of the entire Northwest Coast area for the various technological categories. This we can examine by considering the spread of groups in the SSA diagrams. We note no large differences between technological categories indicating that no one category is more diversified for the entire area.

Linguistic-Ethnic Unit Consistency

Closely related to the previous topic is the question of category consistency for the major linguistic-ethnic units. As noted earlier, mean G coefficients of similarity are used to assess unit homogeneity for a technological category. Table VIII presents the mean G coefficients of similarity within each major linguistic-ethnic unit for overall technology and for each category of technology. Table IX orders the categories of technology from least to most consistent for each major linguistic-ethnic unit.

Initially we can rate the linguistic-ethnic units in terms of intergroup similarity. The Haida are notably more consistent

for all categories except dress, ornament, and textiles. The Nootka, for most categories, rank as second highest in internal consistency. Both of these units inhabit small island territories, and in the case of the Nootka are representative of only one division of Nootka. The Kwakiutl are next in order for just over half of the categories but the differences for the remaining groups are not clear cut. Geographic spread, presumably concomitant with environmental (cultural and natural) differences, appears closely related to the degree of consistency within the major units.

Now we can examine the relative technological category consistency for major linguistic-ethnic units. If we continue to assume that close linguistic similarity indicates common ancestry, then, where less consistency is found within the linguistic-ethnic units, it would presumably indicate those areas of technology more subject to change or those that have been more intensively influenced to change. Although each linguistic-ethnic unit provides a slightly different arrangement of the components of technology in terms of linguistic-ethnic consistency, the general pattern is, from least to most consistent for linguistic-ethnic units:

1. water resources;
2. structures and furnishings;
3. dress, ornament, and textiles;
4. land resources;
5. food preparation;
6. travel and transport.

TABLE VIII. MEAN G OVERALL AND COMPONENT AGREEMENT FOR MAJOR LINGUISTIC-ETHNIC UNITS

Linguistic-Ethnic Unit	Overall Technology	Total Subsistence	Food Preparation	Water Resources	Land Resources	Dress, Ornaments and Textiles	Structures and Furnishings	Travel and Transport
Salish* (N=12)	.618(.635)	.612(.639)	.569(.585)	.629(.653)	.628(.663)	.631(.646)	.589(.589)	.625(.635)
Nootka (N=3)	.703	.650	.702	.530	.737	.735	.717	.771
Kwakiutl (N=6)	.674	.630	.697	.596	.626	.675	.675	.763
Tsimshian (N=3)	.626	.557	.670	.435	.619	.731	.593	.654
Haida (N=2)	.814	.823	.866	.791	.827	.709	.814	.961
Tlingit (N=2)	.626	.661	.666	.653	.666	.581	.576	.571
Mean of Means (Total N=28)	.677	.656	.695	.606	.684	.677	.661	.724

*Bracketed figure is Salish mean G score excluding the Bella Coola

TABLE IX. ORDERING OF COMPONENTS OF TECHNOLOGY FROM LEAST TO MOST CONSISTENCY OF MAJOR LINGUISTIC-ETHNIC UNITS FOR EACH LINGUISTIC-ETHNIC UNIT+

Linguistic-Ethnic Unit						
Salish (N=12)	Food Preparation	Structures and Furnishings	Travel and Transport	Land Resources	Water Resources	Dress, Ornament, and "Textiles"
Nootka (N=3)	Water Resources	Food Preparation	Structures and Furnishings	Dress, Ornament, and "Textiles	Land Resources	Travel and Transport
Kwakiutl (N=6)	Water Resources	Land Resources	Dress and Furnishings*		Food Preparation	Travel and Transport
Tsimshian (N=3)	Water Resources	Structures and Furnishings	Land Resources	Travel and Transport	Food Preparation	Dress, Ornament, and "Textiles"
Haida (N=2)	Dress, Ornament, and "Textiles"	Water Resources	Structures and Furnishings	Land Resources	Food Preparation	Travel and Transport
Tlingit (N=2)	Travel and Transport	Structures and Furnishings	Dress, Ornament, and "Textiles"	Water Resources	Food and Land*	
Mean of Means (Total N=28)	Water Resources	Structures and Furnishings	Dress, Ornament, and "Textiles"	Land Resources	Food Preparation	Travel and Transport

+ Subsistence category broken down

* Tied scores

The subsistence categories are rather spread out in this arrangement but if subsistence is considered as a whole it becomes the least consistent component. Unfortunately the differences are, in most cases, small.

One would expect that the natural environment would be a primary factor in influencing change in the components of technology, especially change in the subsistence categories. The pattern is not completely clear cut but it does seem that (although subsistence as a whole is the least consistent) at least two non-subsistence categories--structures and furnishings; and dress, ornament, and textiles--are less homogeneous that most subsistence categories. Perhaps the category of food preparation is less clearly a category to which environmental influence would be of prime import. This still leaves the unexpected position of the land resources category. Possibly the relative consistency of this category is related to the comparative uniformity of the land environment and the relative lack of importance of land resources for the Northwest Coast. Of course, the pattern does change for the different linguistic-ethnic units so one cannot establish a pattern of stability decisively.

Environmental Category Consistency

We can also examine the mean G coefficients of similarity for environmental categories to shed further light on this. Of course, similarities associated with the environment are not expected to override completely similarities associated with linguistic-ethnic affiliations. The biotic zone scheme, which

was examined in Chapter II, was found to be inadequate so the access to the coast or inlandedness scheme proposed in Chapter II will be used in this discussion. The mean G coefficients for the three environmental categories are presented in Table X.

It is first noted that the pattern of consistency for each technological category varies in each environmental category, so again the pattern is not clear cut. Considering subsistence as a whole relative to the non-subsistence categories is an appropriate place to begin. Generally the travel and transport category seems to be the most consistent (we must consider the Archipelago environmental category rather strongly as it contains so many groups) followed by total subsistence and dress, ornament, and textiles, with structures and furnishings being the least consistent. This greater consistency of travel and transport is rather unexpected for two reasons: (1) we expect subsistence categories to be more strongly affected by environmental considerations, and (2) travel and transport is also the most consistent in terms of linguistic-ethnic divisions which do not follow the present environmental divisions. The explanation possibly lies in the fact that the Archipelago and Fiord Head categories, where travel and transport shows the greatest consistency, contain a large number of groups in a few linguistic-ethnic categories, and linguistic-ethnic affiliation is picked up in this measure of similarity. Travel and transport was not found to be more consistent than other technological categories for the area as a whole. This finding prevents attributing the greater linguistic-ethnic unit and environmental category consistency of travel and

TABLE X. MEAN G TECHNOLOGICAL COMPONENT AGREEMENT FOR ENVIRONMENTAL CATEGORIES BASED ON ACCESS TO THE COAST

Environmental Category	Total Subsistence	Food Preparation	Water Resources	Land Resources	Dress, Ornament, Textiles	Structures and Furnishings	Travel and Transport
Inland River (N=2)	.660	.666	.727	.590	.500	.307	.461
Fiord Head (N=9)	.496	.550	.514	.454	.533	.532	.580
Archipelago (N=17)	.555	.590	.549	.545	.536	.512	.609
Mean of Means (Total N=28)	.570	.602	.597	.529	.523	.450	.550

transport to a general similarity for the whole area.

When considering linguistic-ethnic group consistency, we found subsistence as a whole to be the least consistent category. Here we find subsistence the second most consistent category, only less consistent than travel and transport whose position may be influenced by linguistic-ethnic consistency. The position of structures and furnishings and dress, ornament, and textiles relative to each other and to travel and transport, is the same as that noted for linguistic-ethnic consistency. Again this may partially be an artifact of the linguistic-ethnic consistency, especially in Archipelago and Fiord Head categories, but a glance at the G coefficient for the Inland River environmental type may dispel this; the groups involved are widely separated geographically and are not closely related linguistically. Unfortunately this figure is based on only two tribal units and it is perhaps the clearest environmental type. The Inland River figure (and the Archipelago and Fiord Head figures where the linguistic factor is present) support the ordering of "dress" and "structures".

Considering the components of subsistence we find that the subsistence categories individually, except land resources, are the most consistent in a general pattern. The land resources category is only slightly less consistent than travel and transport so we will only consider the subsistence categories in relation to each other. Within the subsistence category, the food preparation and water resources categories are very similar in consistency, with the land resources category the least consistent. One would not expect the food preparation category to be as clearly

tied to the environment as those categories directly utilizing the natural resources of an area, that is, land resources and water resources. As food preparation is the most consistent of the subsistence groups in the linguistic-ethnic ratings, this may be having an effect here, although food preparation is more consistent on the Inland River category than is the land resources category (although less consistent than water resources). As noted before, this Inland River category involves groups separated linguistically and geographically. These considerations will be dealt with further as the individual categories are discussed.

Before considering the individual SSA's, we will mention the geographic pattern. It is rather difficult to discuss geographic patterning for the three dimensional smallest space diagrams but a rough north-south directional pattern is maintained for all categories although some, such as structures and furnishings, conform to it less than others. The misplaced elements are different for the different categories.

SSA OF TOTAL SUBSISTENCE

The total subsistence category is the first to be considered in detail (Figure 14). A major linguistic-ethnic unit division, as in total technology, is not adequate to explain the distribution. It appears to reflect the positioning of groups most clearly in the case of the Haida. The division of groups suggested by the diagram is very similar to that for overall technology. This may be due to the fact that the subsistence variables make up a large proportion of overall variables.

The Division of Tribal Units

The Salish (except the Bella Coola, who despite the impression received from the three dimensional diagram, are closer to their Kwakiutl neighbours) still form a cluster although the Washington Salish, represented by the Twana, are considerably separated from the other Salish. The Northern and Southern divisions of the Salish proposed for overall technology are not adequate in this case. The Southern division is still relatively separated, but the Northern division has split into mainland and island segments, so we now find the Salish divided into "Southern", "Northern Mainland", and "Northern Vancouver Island". The Squamish still maintain their mediating position, and there is approximately equal separation among divisions. This division duplicates the classification proposed by Barnett (1939) discussed earlier in this paper.

A Central-Northern cluster is formed, although the Gitksan, Chilkat, and Bella Coola are now clearly separated and are perhaps best treated as isolates. The original proposed core unit (of the Hartley Bay Tsimshian, mainland Kwakiutl, and Bella Coola) is altered due to the isolation of the Bella Coola and the considerable separation of the Nikeno and, especially, the Xaisla. The residual cluster is reasonable given the relative closeness of the groups, but the Xaisla, also from the same general area, are not included. The island Kwakiutl groups are slightly differentiated, approaching the Nootka groups. The Haida groups form another sub-cluster showing relatively close relationships to Tsimshian and

their mainland Kwakiutl neighbours. The Haida also show relatively close relationships to the island Kwakiutl who, although more separated geographically, share island environments. The Sanyakwan Tlingit are slightly separated as are the Tsimshian proper but they still appear as members of this cluster.

The Nootka cluster now contains only the Tsishaat and Clayoquot as the Hupachisat appear as an isolate. The Nootka cluster mediates somewhat between the other two clusters.

Environment--Access to the Coast

As noted previously, one would expect environment to play a large part in the arrangement of subsistence similarities so environmental variables must be considered. The access to the coast scheme presented in Chapter II will be examined using the techniques presented in Chapter II. This procedure will be used for each technological category. Figure 21 presents the smallest space diagram with type of coastal access indicated.

The first environmental type is the Inland River type, represented by the Gitksan and Hupachisat. These two groups are not only the most divergent of their linguistic groupings (Archipelago environment) but they also exhibit a relationship much closer than might be anticipated from the evidence of linguistics and proximity.

The next environmental type is Fiord Head, including the Xaisla, Koskimo, Wikeno, Xaihais, Chilkat, Homalco, Klahuse, Bella Coola, and Twana (the Puyallup-Nisqually are not included in this sample). The Xaisla are differentiated from the other Kwakiutl

of the Archipelago type. The Wikeno, like the Xaisla, are separated from the Archipelago Kwakiutl but, also like the Xaisla, are found with non-Kwakiutl Archipelago groups and display no special relationships to other Fiord Head Kwakiutl groups. The Fiord Head Xaihais and Kockimo are not separated from Archipelago Kwakiutl groups. The Chilkat are separated from the Archipelago Sanyakwan but it is difficult to attribute this completely to environment due to wide geographical separation. However the Chilkat are positioned relatively near other Fiord Head groups, like the Bella Coola, and the Inland River groups. The Homalco and Klahuse are not differentiated from their linguistic relatives of the Archipelago type. The Bella Coola and Twana are both separated from all other Salish groups, and environment could be a contributing factor. The final environmental type, Open Coast, is unrepresented in the sub-categories of technology.

This environmental typology is useful in understanding group relationships for total subsistence on the Northwest Coast but it obviously does not explain all the results and is only one factor among many environmental factors while environment itself is only one factor among many. An examination of the components of technology may aid in our understanding of total subsistence and its relationships to the environment.

Environment--A Mainland-Island Distinction

Before discussing subsistence sub-categories, there is another environmental consideration to be briefly mentioned and that is an island-mainland division. That this factor may be of some influence is suggested by the relatively close relationships of

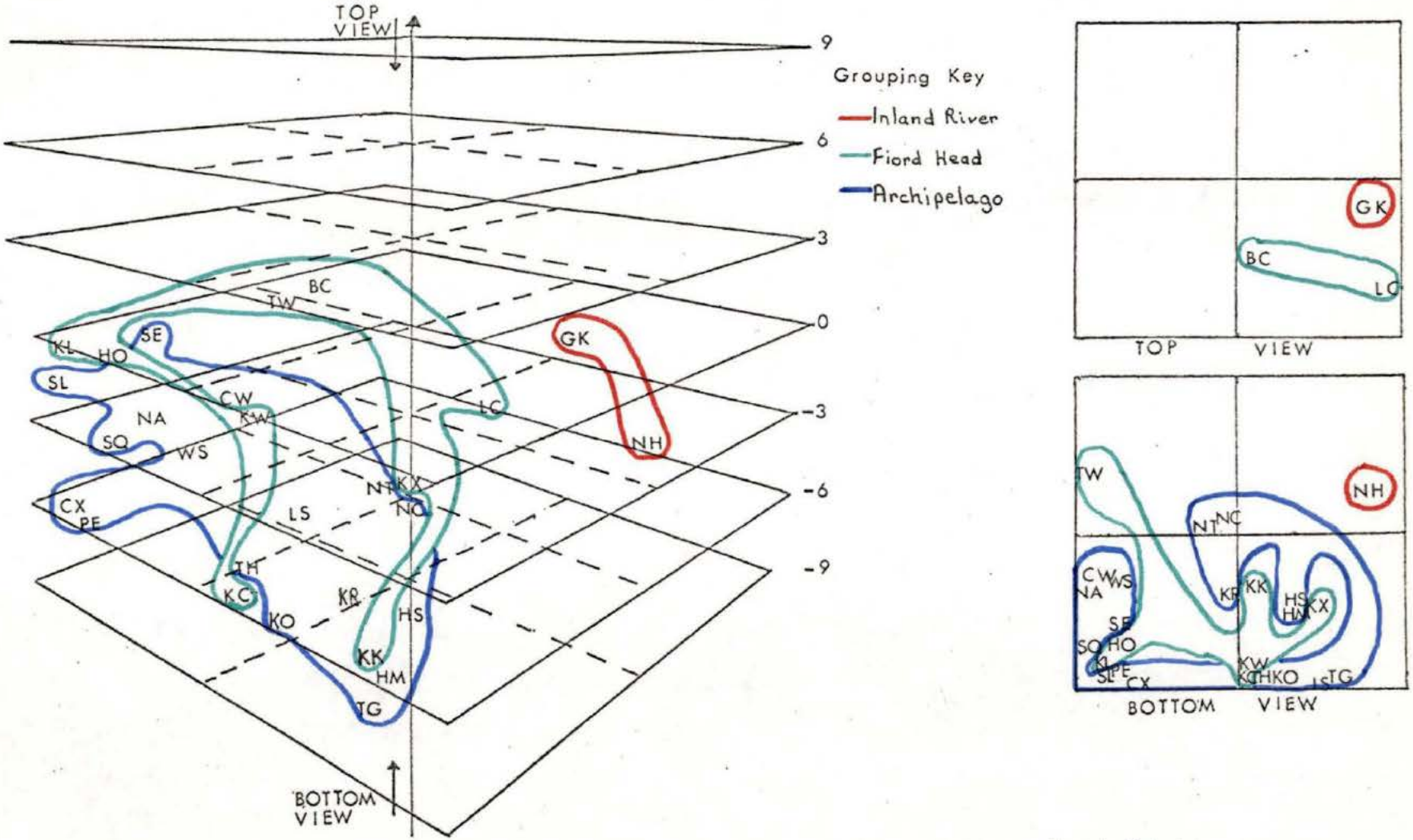


Figure 21· SSA of Technological Similarity: Total Subsistence, Divisions Based on Access to the Coast Indicated

the Haida to the island Kwakiutl. The Nootka are also relatively close to these other island groups although they are closer to mainland groups and their proximity to the island Kwakiutl may be a factor. Also for this category, the northern Vancouver Island Salish groups have split off from the northern mainland Salish groups. The island Salish, however, do not demonstrate any special relationship to the other island groups. These features suggest that an island-mainland distinction is of some impact in group relationships and again this will be examined further in the discussion of subsistence sub-categories.

SSA OF FOOD PREPARATION

The first sub-category to consider is food preparation (Figure 15). Linguistic-ethnic unit divisions are of limited explanatory power, despite the relatively high linguistic-ethnic consistency noted earlier, although the Tlingit and Haida display some cohesion. The Twana and the Tlingit, that is the most southerly and northerly groups, appear to be the most divergent, possibly indicating the influence of groups outside of the Northwest Coast.

The Division of Tribal Units

Actually the relationships observed in the diagram display no clear cut pattern, and it is possible that the scrambled affinities are partly a product of the limited number of variables involved in this category. It would not be worthwhile to spend much time establishing clusters of relationships due to the lack of patterning.

Environment—Access to the Coast

A few comments on the operation of the access to the coast environmental variable are warranted. Figure 22 presents the SSA diagram with environmental categories indicated. One would expect that the food preparation component of subsistence would be less clearly related to the natural environment than are the other components of subsistence. The Gitksan and Nupachisat of the Inland River environmental type are clearly separated from their Archipelago type linguistic affiliates and display much closer relationships than would be predicted from linguistics and proximity—indeed the relationship is even closer than in total subsistence which includes this category.

The Fiord Head Salish includes the Twana, Bella Coola, Klahuse, and Homalco. The Twana and Bella Coola are clearly separated from the Archipelago Salish but, as noted previously, other factors may be involved. Again the separation is clearer than for overall subsistence. The Klahuse and Homalco are slightly, but not notably, separated from most other Salish groups and are on the periphery of Salish Archipelago groups. The separation of the Chilkat is not as wide nor is the separation of the Xaisla, but the Xaisla are close to the Fiord Head Bella Coola. The Fiord Head Xaisla are also separated from the Archipelago Kwakiutl and are close to the Fiord Head Xaihais who, although neighbours, are of different languages. The Wikeno and Koskimo are not as detached from the Archipelago Kwakiutl. The environmental variable is found to be of some use, actually more than might be expected, in

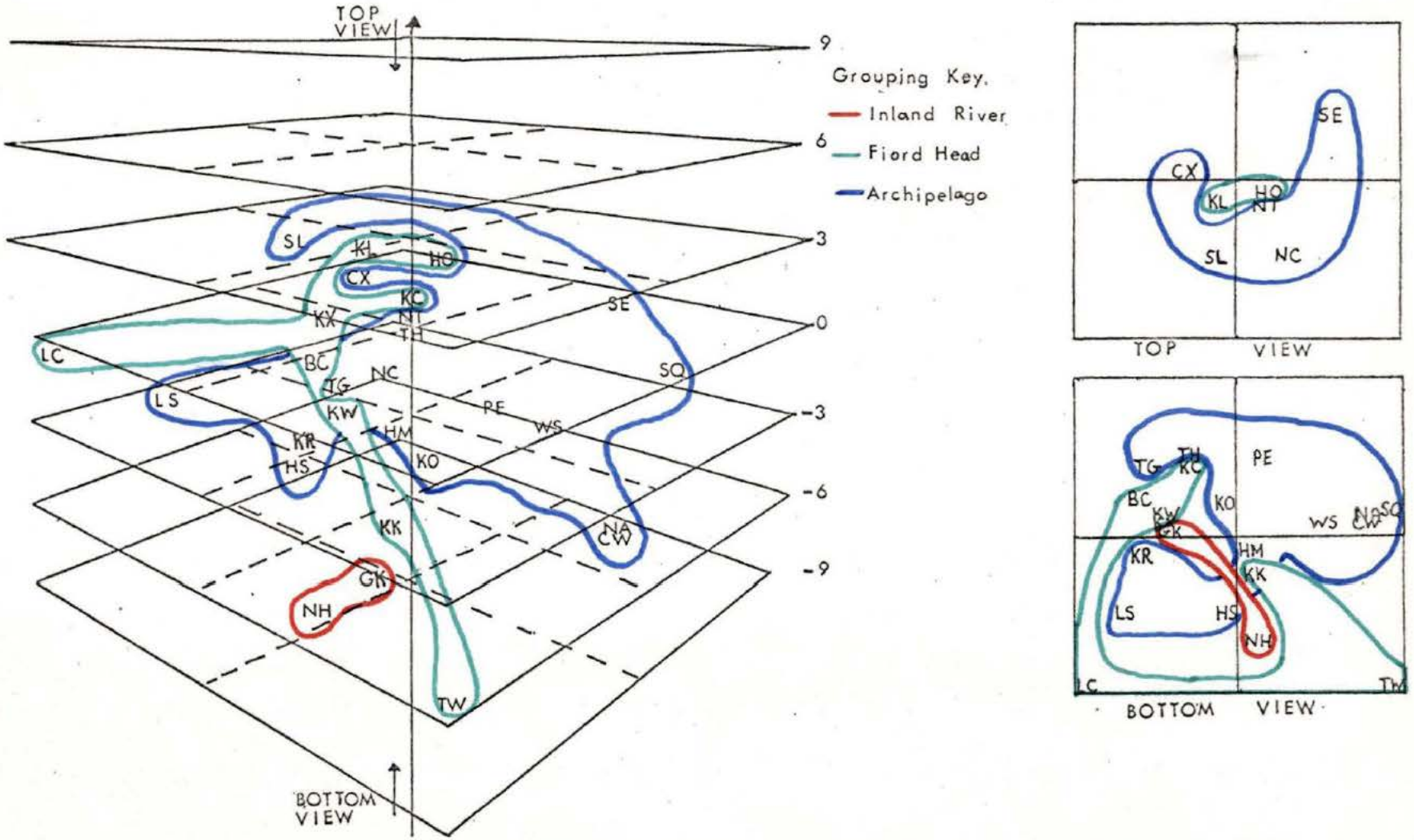


Figure 22. SSA of Technological Similarity: Subsistence-- Food Preparation, Divisions Based on Access to the Coast Indicated

understanding the relationships determined by food preparation techniques, but this must be compared to the other components of subsistence instead of to the total category of subsistence. Still the usefulness is limited to a few groups and it should not be overplayed as it is only one possible consideration among many.

Environment--A Mainland-Island Distinction

The island-mainland division is not as clear for this category. The island Kwakiutl, Haida, and Nootka are still relatively closely positioned but do not form a separate unit as plainly as they did in total subsistence. Salish island-mainland divisions are unclear especially as the Salish are so scattered.

SSA OF WATER RESOURCES

The Division of Tribal Units

A pattern is more evident for the water resources component (Figure 16), than for food preparation but again it is not distinct. Linguistic-ethnic unit divisions are not very useful as within each unit, with the possible exception of the Haida, there is a spread of all tribes. The Salish still form something of a unit as do the Nootka, except the Hupachisat who are best treated as an isolate. The coastal Nootka, despite proposed ease of contact between the Salish and the Hupachisat, are closer to the Salish than are the Hupachisat, probably due to a similarity of coastal environment. This situation also occurs in the food preparation and total subsistence categories but the difference is not as notable. It is reasonable to expect that similarity in coastal

environment would be expressed in a category dealing with water resources. Within the Salish, the Washington Salish, represented by the Twana, are separated from the other Salish groups but other internal patterns are not clear as the groups are rather spread out. The Bella Coola are best treated as an isolate mediating between the Salish and the Central-Northern groups.

The Central-Northern division still forms a cluster but the groups are not close. We can still recognize a few sub-clusters but they can only be roughly determined. The Chilkat, Bella Bella, and Wikeno form one cluster. The Bella Bella are environmentally (using the access to the coast scheme) different from the Chilkat and Wikeno, while the Chilkat are separated geographically from the other two groups. Linguistically, all are diverse although the Wikeno and Bella Bella speak different Kwakiutl languages. Another cluster is formed by the Tsimshian Proper, Haida, Hartley Bay Tsimshian, Sanyakwan, and Koskimo—a rather mixed group. The Gitksan are best treated as an isolate. Other groups of this division are related but do not form any noteworthy clusters.

Environment—Access to the Coast

It is in a category like water resources, which deals directly with the natural resources of an area, that one would expect our environmental variable to be relevant. Figure 23 presents the access to the coast divisions on the SSA diagram for water resources. The Inland River Gitksan and Hupachisat are not only divergent from their linguistic kinsmen of the Archipelago type but also show a close relationship, although not as close as occurred in the

food preparation category. Also of note is the fact that the Nootka, normally second in linguistic-ethnic consistency, drop to fifth place for this category and a similar situation occurs for the Tsimshian. This is notable as these two major units contain the Inland River groups which are the most divergent environmental type considered.

The case is not as clear for the Fiord Head groups, but the environmental divergence from the Archipelago type is not as great. The Chilkat are even more separated from the Archipelago Sanyakwan than they are for overall subsistence or food preparation. The Fiord Head Xaisla, Koskimo, and Xaihais form a cluster, while the Fiord Head Wikeno are more distinct and closer to the Archipelago Bella Bella. The Bella Coola are separate from the Archipelago Salish. The Homalco, Klahuse, and Twana are not separated beyond normal expectations. Another point of interest is the comparatively close positioning of groups from the Fiord Head and Inland River environmental types (both more inland than the Archipelago type), for example, the Chilkat-Gitksan-Bella Coola and the Xaisla-Nupachisat. This environmental variable is again of some importance but it does not explain all the variation, and other explanations would be as feasible.

As was indicated by the mean G coefficients, the environmental variable appears to operate almost equally on both food preparation and water resources despite our original expectations. This does not appear to be due to the influence of linguistic-ethnic relationships in food preparation.

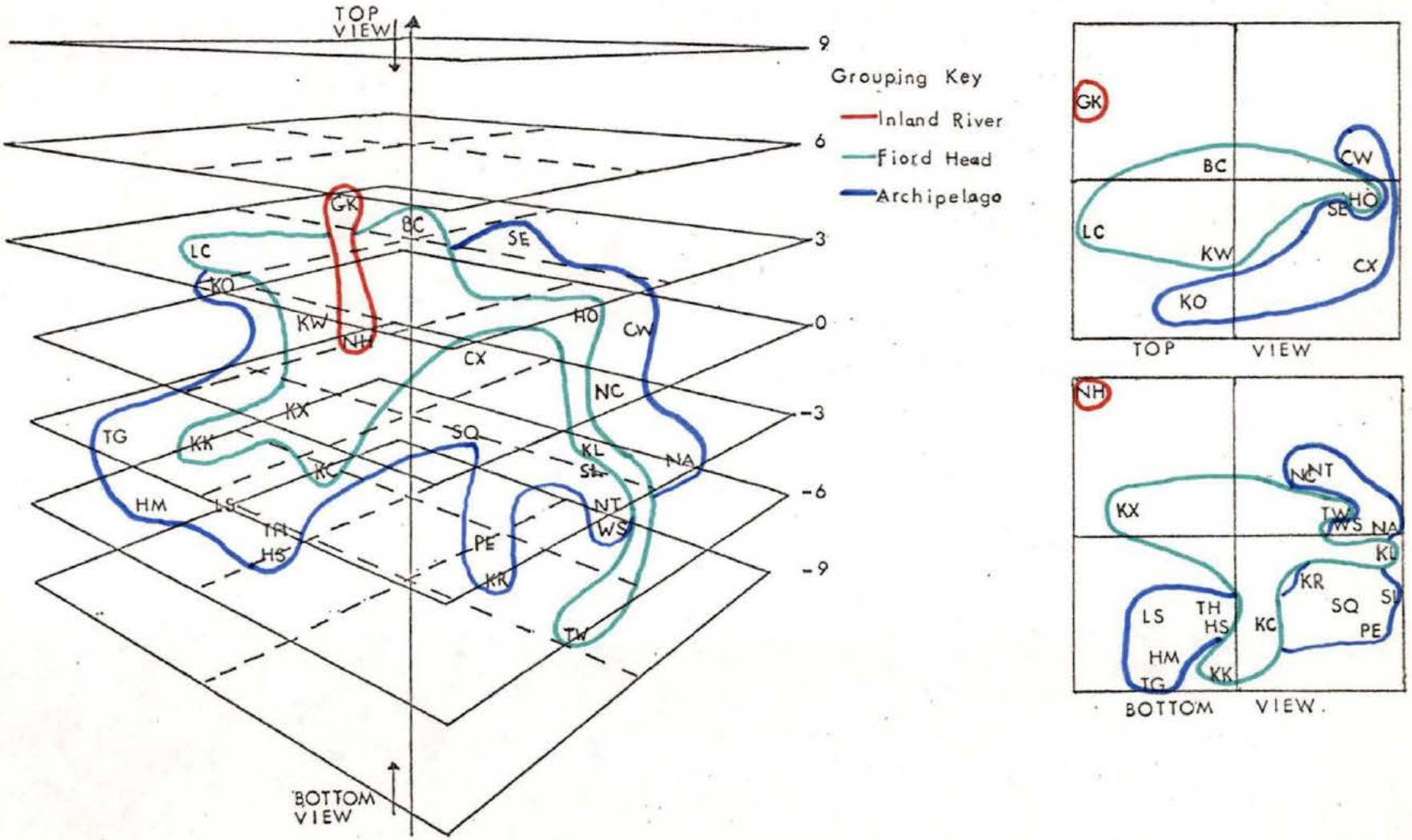


Figure 23. SSA of Technological Similarity: Subsistence--Water Resources, Divisions Based on Access to the Coast Indicated

Environment—A Mainland-Island Distinction

The influence of a postulated mainland-island distinction is not obvious. Various island groups from different linguistic units do cluster, for example, Kwexa-Pentlatch, Haida-Koskimo, Tsishaat-West Sanetch, and Clayoquot-Cowichan, but mainland units are included in most of the groupings. Also the clusters containing the island groups are widely separated, and the reasons for the individual linkages of particular island units are not readily apparent.

SSA OF LAND RESOURCES

The final component of subsistence is technology dealing with land resources (Figure 17). Some of the linguistic-ethnic units are relatively clearly demarcated but all contain tribal units showing closer relationships to groups of other ethnic units.

The Division of Tribal Units

The Salish cluster is still comparatively distinct, although quite diverse. A division of Northern and Southern Vancouver Island groups is clear as is the division of both from the mainland groups, although they themselves do not constitute a group. The Twana are quite differentiated as are the Bella Coola who again appear as an isolate. Possibly the frequent isolated position of the Bella Coola reflects their intermediate position with regard to affiliations, contact, and general environment.

The Nootka cluster is not clearly separated from the Central-Northern cluster as it has been in previous categories. The Hupachisat

are no longer widely separated from the other Nootkan groups.

The Central-Northern cluster is diversified and determining definite clusters within the Central-Northern division is again difficult. A grouping of the island Kwakiutl groups and the Haida is apparent. This cluster is close to the coastal Nootka suggesting some relation to environmental differences between the island and mainland, although contact would probably have its influence, especially between the Nootka and Kwakiutl. Another cluster seems to be formed of the Bella Bella, Xaihada, and Tsimshian Proper, with the possible inclusion of the Hartley Bay Tsimshian, all of which are relatively close neighbours. The Wikeno and Xaisla are relatively close to this cluster but are best regarded as separate. The Chilkat and Gitksan also cluster together. The Sanyakwan are separated and inexplicably close to the Salish.

Environment—Access to the Coast

Our environmental variable is not as useful in attempting to understand the distribution of land resource utilization patterns (see Figure 24). The Inland River Gitksan separation from the Archipelago Tsimshian is similar to the separation observed for the other subsistence categories, but the Inland River Hupachisat are not as separated from their Archipelago Nootka relatives, and the relationship between the two Inland River groups is not as close as for the two other subsistence categories (a G similarity coefficient of .590 versus .666 for food preparation and .727 for water resources). Also the Gitksan do cluster with a Fiord Head group, the Chilkat.

Of the Fiord Head groups, the clustering of the Chilkat with the Gitksan has been mentioned, and the Chilkat separation from the Archipelago Sanyakwan is approximately equal to the separation in other subsistence categories. The Fiord Head Xaisla are positioned approximately equidistant between Fiord Head and Archipelago Kwakiutl groups. The Fiord Head Wikeno and Xaihais are closely associated but are also close to the Archipelago Bella Bella. The Fiord Head Koskimo are diagrammed as closest to the Archipelago Kwexa but are perhaps closer to the Xaisla than might ordinarily be expected. The Fiord Head Twana and Bella Coola are apart from the other Salish, but factors of contact and geographical separation may be involved. Another point of note is the relatively close positioning of the Twana and Bella Coola and their peripheral position. The Fiord Head Klahuse are somewhat separated from the Archipelago Salish but the Fiord Head Homalco are not. The Klahuse are another peripheral group.

Access to the coast divisions do play a part, but this is not even as strong as its limited usefulness with the other subsistence categories.

Environment—A Mainland-Island Distinction

It is still suggested that environment plays a part but that variables, other than access to the coast, may be more important. It is further suggested that an island-mainland split may be one of the other important environmental variables—note the division of the Salish and the cluster of the coastal Nootka, island Kwakiutl, and Haida. The game available varies between the island and

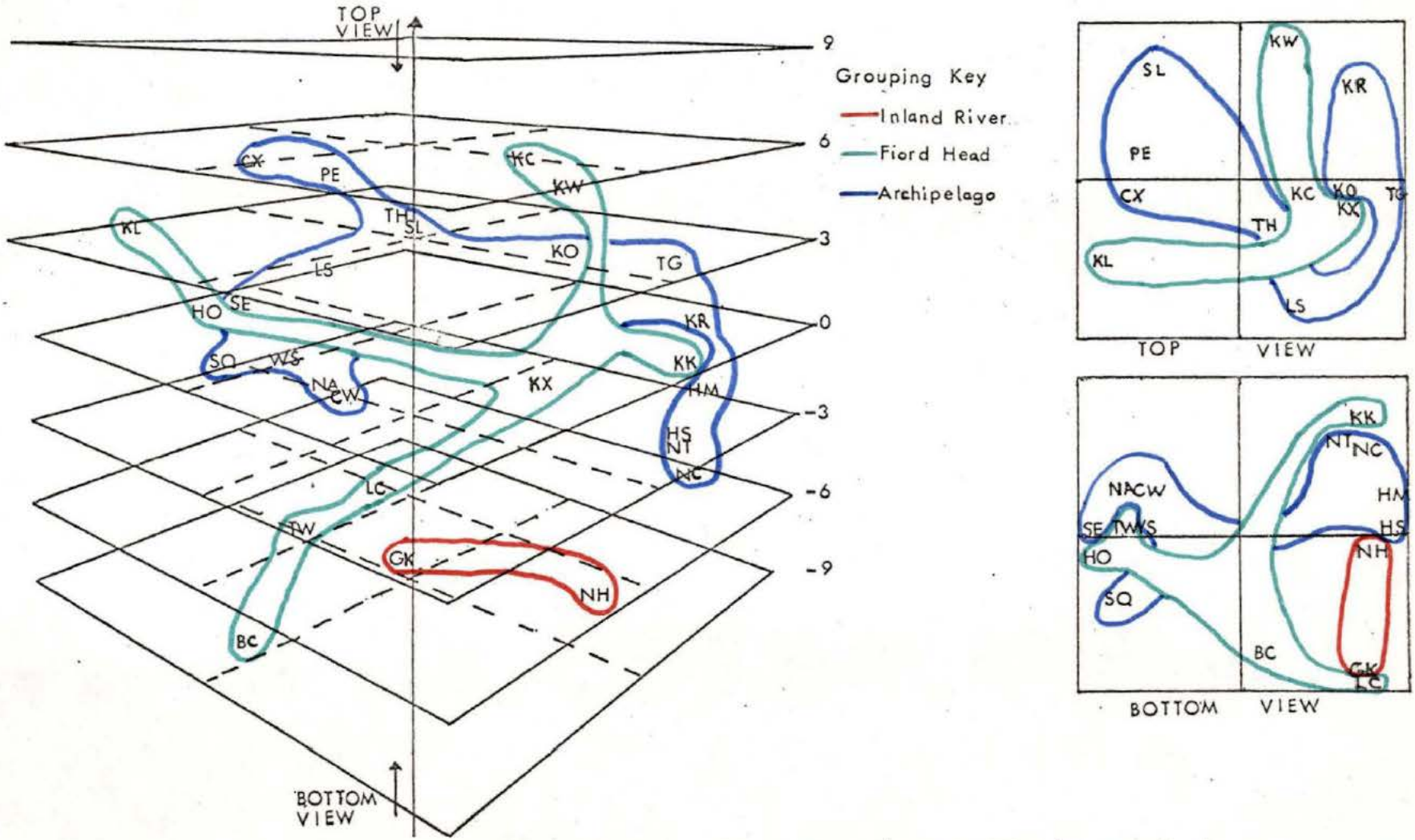


Figure 24· SSA of Technological Similarity: Subsistence-- Land Resources, Divisions Based on Access to the Coast Indicated

mainland and presumably this would play a part in the technology of resource utilization.

SUMMARY OF SUBSISTENCE

Thus within the general topic of subsistence we have found considerable variation in the pattern of similarity between groups. A selected environmental variable, access to the coast, is found to operate with greater strength on technology devoted to water resources and food preparation than upon technology devoted to land resource utilization. An island-mainland distinction is also found to have some importance, especially on techniques of land resource utilization.

SSA OF DRESS, ORNAMENT, AND TEXTILES

The next category to be considered is that of dress, ornament, and textiles (Figure 18). Linguistic-ethnic unit divisions appear to be of more importance than they have been up to this point. Most units, with the notable exception of the Kwakiutl, display relatively high cohesion and more separation from other linguistic-ethnic units (except for Kwakiutl intrusions). Thus the cohesion of a linguistic-ethnic unit displays a different pattern than the consistency scores indicated—they placed dress, ornament, and textiles as less consistent, within linguistic-ethnic units, than land resources and food preparation.

The Division of Tribal Units

We now continue the examination of patterns of group clusterings and comparison with the patterns established earlier. For overall subsistence we established a Salish division further divided into Washington, Southern, Northern Vancouver Island, and Northern Mainland with the Squamish mediating. The Bella Coola were recognized as members of a Central-Northern division although rather isolated. In this category, we find the Bella Coola, although close to groups of the original Central-Northern division, clearly associated with other Salish groups. The remaining divisions of the Salish proposed for subsistence are still reasonable, although the Klahuse and Homalco are somewhat separated. Thus we still establish a Salish cluster which now includes the Bella Coola. Linguistic-ethnic similarity, indicating similar ancestry, appears to be of more importance here than contact patterns established by geographical proximity.

For subsistence relationships a Nootka cluster, with the Hupachisat forming a separate isolate, was established. The Nootka still form a cluster with the Hupachisat separate, but now the Hupachisat should possibly be included in the Salish cluster. In all subsistence categories, especially the water resources category, the coastal Nootka were clearly closer to the Salish than were the Hupachisat, and it was suggested that this was due to similarity of environmental features. Now we have a reversal of this situation and we can probably find the solution in terms of cultural environment, that is contact relationships. It has been mentioned that the Hupachisat had the potential for extensive

contact relations with the Salish due to their geographic position near the center of Vancouver Island. Given these contact relationships, the position of the Nootka is explicable and perhaps gives further evidence that environmental differences are of lesser import for this category.

The Central-Northern division roughly established for subsistence no longer forms a unit. The Tsimshian form a separate unit although the Gitksan are differentiated. The Sanyakwan possibly also belong in this category or at least mediating between the Tsimshian and the Chilkat, much as they do geographically. The Haida and the Koskimo also form a unit, all of these are island groups possibly suggesting the influence of some undetermined environmental influences. The remaining island Kwakiutl group, the Kwexa, is positioned between the coastal Nootkan and the Haida-Koskimo clusters. This further suggests the possibility of environmental influences based on a distinction between the island and mainland, although contact relations may play a part. The mainland Kwakiutl groups, except the Xaisla, are dispersed between the Salish and Tsimshian. This mirrors, to some extent, geographic positions and is possibly indicative of contact patterns and environmental differences. The Wikeno and Bella Bella could be placed with the Salish and the Xaihais with either the Salish or Tsimshian. The Xaisla are at the end of the line of Kwakiutl groups, taking a peripheral position.

Environment--Access to the Coast

Although it is not expected that our environmental variable will be of prime importance in explaining the pattern of clustering for this category, it will nevertheless be briefly examined (see Figure 25). The Inland River Hupachisat and Gitksan are still separated from their Archipelago linguistic affiliates but they no longer display any specially close relationship. As the differences are relatively small, the Hupachisat separation can be at least partially explained by contact differences, and the Gitksan separation by their linguistic difference (indicative of wider separation) from the other Tsimshian.

Turning now to the Fiord Head groups, we find the Chilkat still separated from the Sanyakwan in about the same way as in subsistence categories. All Kwakiutl groups are scattered so it is difficult to make any points about relative separation. One point of note is the comparative proximity of the Fiord Head Wikeno and Homalco. The Fiord Head Bella Coola and Twana are now integrated into the Salish whole. As in land resources, the Klahuse are somewhat separated from the remaining Salish, beyond what might be expected given linguistic affiliations and geographic proximity, but this is not true of the Fiord Head Homalco.

Access to the coast is found to have limited explanatory power, but other factors seem to be of greater significance. This agrees with the general expectations as to the influence of environment on areas of culture and with the mean G coefficients of similarity for environmental variables.

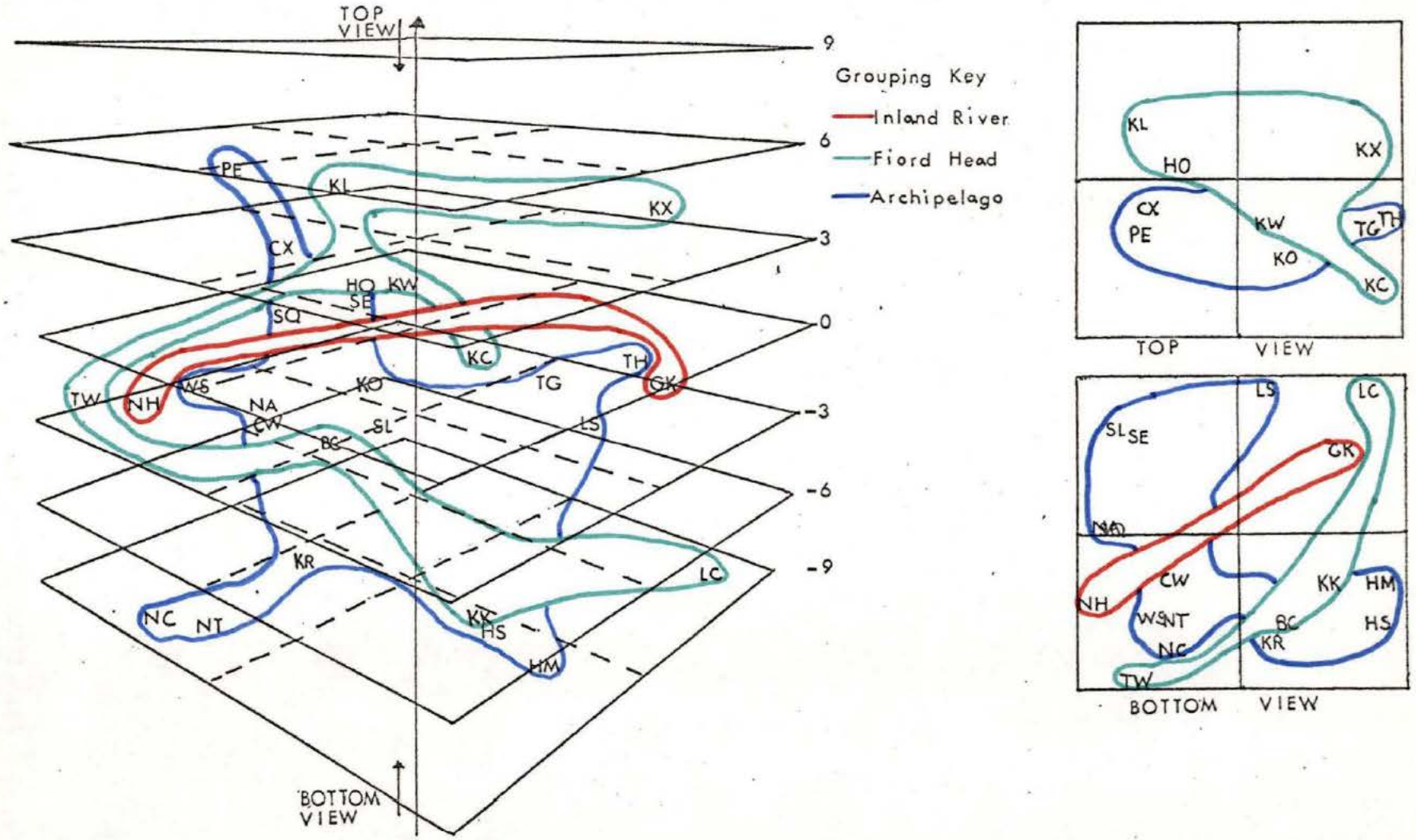


Figure 25. SSA of Technological Similarity: Dress, Ornament, and Textiles, Divisions Based on Access to the Coast Indicated

SSA OF STRUCTURES AND FURNISHINGS

The category of structures and furnishings (Figure 19) is another category where we might expect greater stability, especially with regard to environmental factors. We would expect to find cohesion with regard to linguistic-ethnic units much as we found in the dress, ornament, and textiles category, even though the consistency appeared low. This, however, is not the situation observed. The Nootka do display some cohesion as do the Haida although outside groups also display close relationships to the Haida. Now not only are the Kwakiutl scattered, but so are the Salish, Tlingit, and Tsimshian. No distinct pattern of groups is readily apparent.

The Division of Tribal Units

The Nootka are distinct from other groups and, unlike all prior categories, the Hupachisat are included in this grouping. Similar relationships to the Salish are found for all Nootka groups suggesting that neither environmental similarity between coastal Nootka and the Salish, nor contact between the Hupachisat and Salish are of overriding importance. We may suggest that similar development from a common source is the major concern here.

The pattern for the remaining groups is difficult to discern. There appears to be a cluster of the Haida, Bella Coola, Sanyakwan, Hartley Bay Tsimshian, mainland Kwakiutl, Klahuse, and Homalco with the Comox, Chilkat, Tsimshian Proper, Slaiamun, Sechelt, island

Kwakiutl, and Gitksan peripheral to these. Even more peripheral and scattered are the remaining Salish groups. The island Kwakiutl and several island Salish groups—the Comox, Pentlatch, and Nanaimo—mediate between the Nootka and other groups. These island groups and the West Sanetch and Haida are all peripheral groups. No ready explanation of the pattern, if it can be called a pattern, of groups readily arises and it appears to display no consistent relationship to the patterns of those categories already discussed.

Environment—Access to the Coast

The structures and furnishings category received the lowest consistency rating for access to the coast categories so an examination of the confused structures and furnishings category may reveal some features of note. Figure 26 presents these environmental categories on the SSA diagram. The Inland River Gitksan and Hupachisat are still separated from their Archipelago relatives, but the separation is not as noteworthy as that found in other categories, and the two groups display no special relationship to each other.

The Fiord Head Chilkat are separate from the Sanyakwan to a slightly larger degree than in any other category, except water resources. In relation to Salish Fiord Head groups we do find a separation of the Twana, Klahuse, Homalco, and Bella Coola from the Archipelago Salish, but indeed the Archipelago Salish are separated from each other. However, the Twana appear to be the most separate and peripheral Salish group. The remaining Fiord Head groups are relatively closely clustered and, in the case of the Bella Coola, beyond expectation. The Fiord Head Xaisla and Wikeno

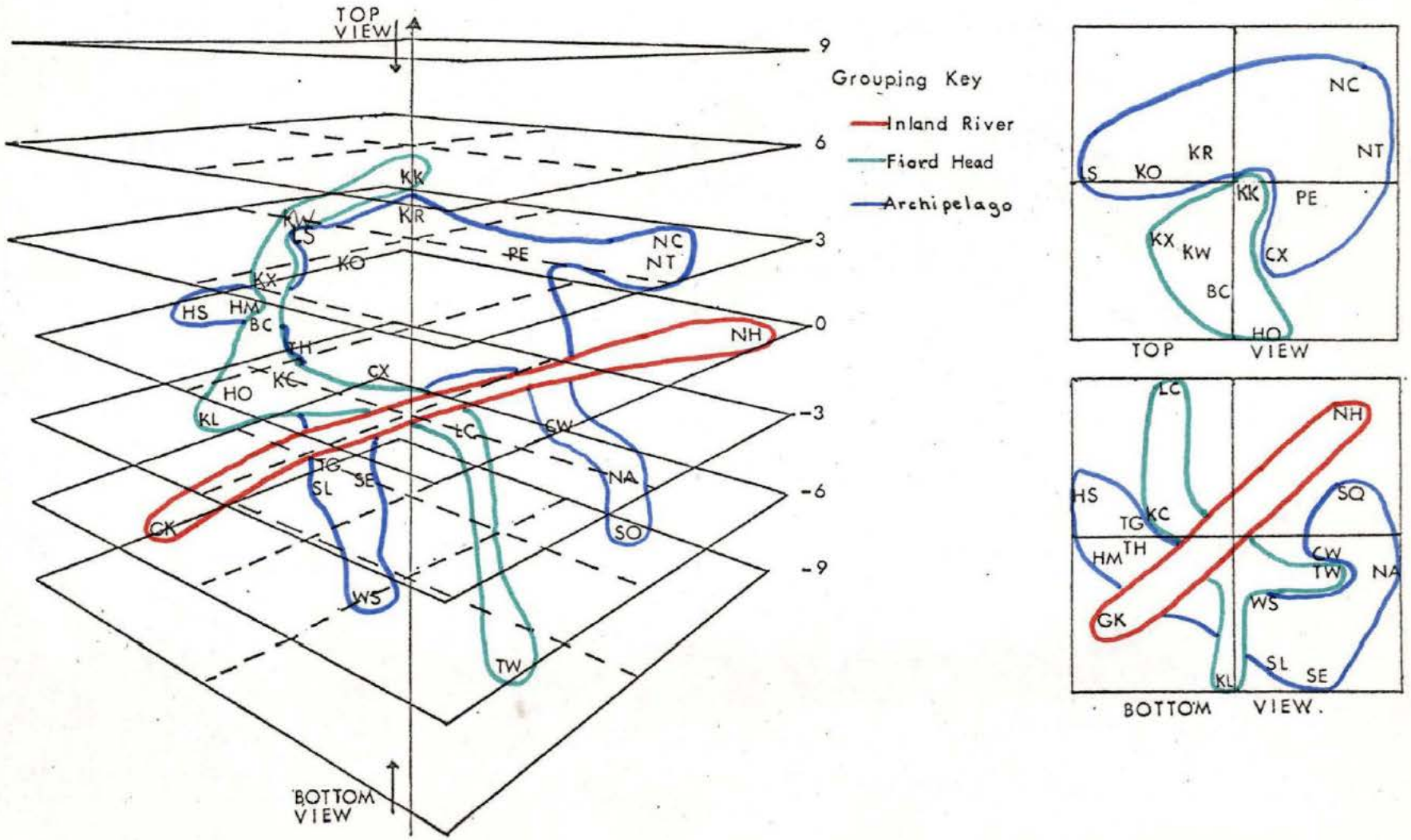


Figure 26. SSA of Technological Similarity: Structures and Furnishings, Divisions Based on Access to the Coast Indicated

are diagrammed close together near the Fiord Head Bella Coola. The Fiord Head Xaihais are more detached from the Xaisla and Wikeno with almost an equal relationship to the Archipelago Bella Bella. The Xaihais are also near to the Fiord Head Salish. The Fiord Head Koskimo are more similar to the Archipelago Kwexa than to any other group. Granted the spread of Archipelago (and indeed all environmental category) groups is great (as it is for all technological categories, despite relatively similar environments), nevertheless the environmental divisions suggested in this study do appear to have relevance for the structures and furnishings category--beyond that expected on the basis of mean G coefficients of similarity. The environmental categorization is mainly useful (as it has been for all categories of technology) in explaining divergences from linguistic-ethnic units or geographical units but is limited in establishing closely related clusters.

Perhaps the ambiguity of groupings observed in this category relates to the operation of a considerable number of factors, most of which are not recognized here, but at least including access to the coast and common ancestry.

SSA OF TRAVEL AND TRANSPORT

The final category of technology is travel and transport (Figure 20). The diagram for this category looks much more like that for dress, ornament, and textiles, in terms of linguistic-ethnic cohesion, than do the other categories. It does appear slightly less cohesive, especially in the case of the Salish, than the dress category despite the higher score in consistency.

The Division of Tribal Units

Now we turn to a discussion of the apparent clusters of groups and of the comparison with other categories. The Hupachisat separation from the coastal Nootka is similar to that observed in dress, ornament, and textiles category. Also, as in the dress, ornament, and textiles category, the Hupachisat display closer relationships to the Salish, especially the Vancouver Island Salish, than do the coastal Nootka and indeed should possibly be considered with the Salish. This Vancouver Island Salish-Hupachisat similarity was attributed to contact relations in the dress category and the same explanation is proposed here. It was also pointed out that, in the subsistence categories, the coastal Nootka were more similar to the Salish, and it is again suggested that the similarity was due to environmental similarities not operating strongly on the travel and transport (despite higher consistency ratings for the environmental variables, further evidence that this is an artifact of linguistic-ethnic similarity) and dress, ornament, and textiles techniques.

The Salish can be considered as a cluster, although they display considerable spread, and other groups tend to intrude. Within the Salish we have a division of the mainland Comox; a very rough mediating grouping of the Squamish, Sechelt, and West Sanetch; and a final grouping of the remaining island Salish and the Washington Salish, that is the Twana—a slightly scrambled mainland-island split only partially reflecting geographical proximity. Within the mainland groups, the Comox speakers are separated, probably at least partially due to development from

a common source or their proximity. The Bella Coola take a position intermediate to the Salish and Kwakiutl. Again this is very similar to the dress, ornament, and textiles category and quite different from subsistence. Two Kwakiutl groups, the island Kwexa and southerly mainland Wikeno, take up a position between the Salish, Nootka, and Kwakiutl groups. The Kwexa are especially close to the Nootka and island Salish. This is reasonable given their proximity, allowing contact and probably also furnishing similar environments. Actually the position of the Koskimo, separated from these island groups, is more of a puzzle. The Wikeno's mediation of the remaining Kwakiutl groups and the Salish is reasonable given the proximity of the Bella Coola. The remaining groups are members of what is left of the Central-Northern cluster. They form a relatively undifferentiated whole with all groups, except the Koskimo, in close proximity. The Gitksan, Chilkat, and possibly the Tsimshian Proper are peripheral to this cluster. The Chilkat, as well as being of the Fiord Head environmental type, are the most northerly group and the Gitksan are the most inland. These extreme positions may be associated with this difference.

Environment--Access to the Coast

Now we may discuss the access to the coast environment divisions in relation to the travel and transport category. Figure 27 presents the SSA with the environmental divisions indicated. Again the Inland River Gitksan and Hupachisat are separated from their affiliates; the Hupachisat about the same as in the dress

category, and the Gitksan somewhere between the dress and structures positioning. The two groups are not distinctly associated, even less so than in dress.

With the Fiord Head groups we find the Twana clearly with other Salish groups. The Homalco and Klahuse are separated from most other Salish but they are clustered with the Archipelago Slaiamun, their close linguistic and geographic relatives, who are even more separated from the majority of the Salish. The Bella Coola take an intermediary position between the Kwakiutl and Salish, which would be expected even if no environmental differences were present, but they are somewhat separated from the Archipelago Salish. The Fiord Head Xaisla, Koskimo, and Xaihais are in a tight cluster near the Bella Coola. The Fiord Head Wikeno are more divergent from these Fiord Head Kwakiutl groups than they are from the Archipelago Bella Bella. Actually the positioning of the mainland Kwakiutl and Bella Coola parallels geography. The Chilkat are separated from the Sanyakwan to about the same extent as that observed for other non-subsistence categories and this may reflect geographic separation rather than this particular environmental categorization. Thus we actually find the environmental categorization to be of minimal relevancy for this technological category despite the consistency indicated in the mean G coefficients of similarity. Although this result does contradict our expectations from these calculations, it follows our expectations as to the way environmental factors will affect the categories of technology.

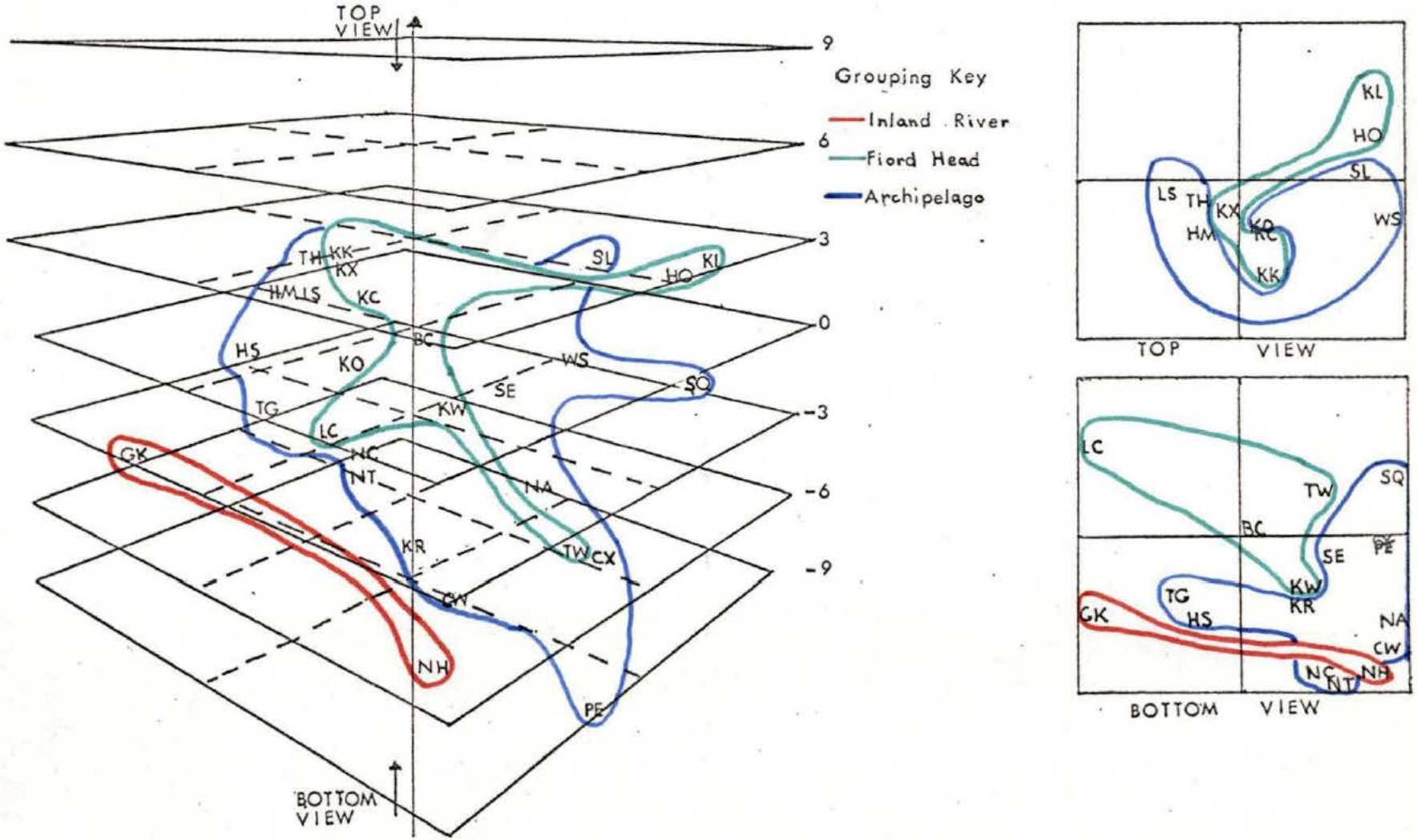


Figure 27. SSA of Technological Similarity: Travel and Transport, Divisions Based on Access to the Coast Indicated

THE PATTERN OF TRIBAL UNIT CLUSTERING

Total Subsistence

For total subsistence the pattern of tribal units is very similar to that observed for overall technology. Excepting the Bella Coola, the Salish form a cluster, with the Twana (representing the Washington Salish) being the most divergent. A four part division of the Salish, rather than the three part division of overall technology, was developed: Washington Salish, Southern, Northern Mainland, and Northern Vancouver Island, with the Squamish maintaining their mediating position. A Central-Northern cluster is formed, but the Gitksan, Chilkat, and Bella Coola are clearly separated and best treated as isolates. Within the Central-Northern cluster, subclusters are formed by (1) the Hartley Bay Tsimshian and the mainland Kwakiutl except the Xaisla and Wikeno, (2) the island Kwakiutl approaching the Nootka, and (3) the Haida. The remaining Tsimshian, Tlingit, and Kwakiutl are slightly separated but are related to the other clusters. The Nootka cluster mediates between the other two major clusters. This cluster contains only the Tsishaat and Clayoquot Nootka, as the Hupachisat are now an isolate. There are different patterns observed for the subcategories of subsistence.

Food Preparation

No clear cut pattern emerges for food preparation although the Tlingit and Twana are the most divergent groups—groups which in the case of the Twana and Chilkat Tlingit are divergent in the

total subsistence category. The Gitksan and Hupachisat are also divergent as was observed in the total subsistence pattern. The Nootka cluster is not separate from the Central-Northern cluster which forms a relatively undifferentiated whole. The Salish are not completely differentiated from this cluster, although peripheral, and do not form a distinct cluster.

Water Resources

In the water resources category the Salish, except the Bella Coola, do form a cluster, although it is not very distinct. Within the Salish, the Washington Salish are still separated but other clusters are not clear. The Nootka form something of a unit with the Hupachisat separate as an isolate. The Bella Coola are again an isolate mediating between the Salish and the Central-Northern cluster. The Central-Northern cluster is now spread out. The cluster is divided into several subclusters all of which are rather mixed and not comparable to units of other categories: (1) Chilkat, Bella Bella, and Wikeno, and (2) Tsimshian Proper, Haida, Hartley Bay Tsimshian, Sanyakwan, and Koskimo. The Gitksan are again an isolate. All remaining groups are related but do not form any additional clusters.

Land Resources

The final subsistence category, land resources, again produces a slightly different pattern. The Salish still form a diverse cluster. The pattern of division of the Salish is basically the same as for overall subsistence, but the mainland groups do not

form a cluster, although all other Salish groups are separated from them. The Bella Coola once again appear as an isolate. As occurred in the food preparation category, the Nootka cluster is not clearly separated from the Central-Northern cluster which is itself rather diversified. The Hupachisat are no longer widely separated from the other Nootka groups. Determining clusters within the old Central-Northern cluster is difficult. As in the total subsistence category, the island Kwakiutl and Haida each form separate clusters. These two clusters are rather close and are also close to the Nootka. Other clusters are formed of (1) the Bella Bella, Xaihais, and Tsimshian Proper and probably the Hartley Bay Tsimshian with the Wikeno and Xaisla relatively close, and (2) the Chilkat and Gitksan. The Sanyakwan are separated and are much closer to the Salish than might be expected. Again this pattern of division is slightly different from all other subsistence categories.

Dress, Ornament, and Textiles

For the first non-subsistence category, dress, ornament, and textiles, we find the Bella Coola clearly linked to the Salish although close to Central-Northern groups. The Salish cluster is still present and the internal divisions established for total subsistence are still reasonable, despite more internal separation of the mainland groups. The Nootka still form a cluster, but the Hupachisat are no longer an isolate as they can be included in the Salish cluster probably with the southern Vancouver Island Salish. The Central-Northern division, which has held together roughly for all subsistence categories, no longer forms a unit. The Tsimshian,

although the Gitksan are rather differentiated, form one cluster possibly also including the Sanyakwan, although the Sanyakwan can be treated as a mediating group between the Tsimshian or Chilkat. The Haida and Kuskino also form a cluster. The Kwexa mediate between the Haida-Koskimo and the coastal Nootka. The mainland Kwakiutl are strung out between the Salish and the Tsimshian.

Structures and Furnishings

The pattern, if it can even be called a pattern, of the structures and furnishings category is far from clear. The Nootka are separated from all other groups to a greater extent than that observed in any other category. Also the Hupachisat are clearly included in the Nootka category. Neither the Salish nor the Central-Northern cluster can be treated as distinct units. There appears to be a cluster of the Haida, Bella Coola, Sanyakwan, Hartley Bay Tsimshian, mainland Kwakiutl, Klahuse, and Homalco with the Comox, Chilkat, Tsimshian Proper, Slaiamun, Sechelt, island Kwakiutl, and Gitksan peripheral to these. Even more peripheral and scattered are the remaining Salish groups. This peripheral position of the Salish is not unusual, but the scatter is extreme. The island Kwakiutl and several island Salish groups—the Comox, Pentlatch, and Nanaimo—mediate between the Nootka and other groups. All island groups, except the Comox, are peripheral. This pattern is not clear cut and displays no consistent relationship to any other category.

Travel and Transport

The final non-subsistence category is travel and transport which displays many similarities to the pattern observed in dress, ornament, and textiles. Despite considerable spread, and the intrusion of other groups, the Salish can be considered a unit. The internal division of the Salish is a new one--a cluster of the mainland Comox, a mediating cluster of the Squamish, Sechelt, and West Sanetch, and a cluster of the island Salish and the Twana. The Bella Coola resume their intermediate position between the Salish and Kwakiutl. Again, the Clayoquot and Tsishaat form a Nootka cluster, but as in the food preparation and water resources categories this Nootka cluster is not clearly distinguished from groups of the original Central-Northern cluster. The Hupachisat take a position with the Salish much as they did in dress, ornament, and textiles. The island Kwakiutl and Wikeno take up an intermediate position between the Salish, Nootka, and Kwakiutl groups. These groups have taken somewhat similar positions before, but not as clearly. The remaining groups form a reduced Central-Northern cluster. The Gitksan, Chilkat, and possibly, the Tsimshian Proper are peripheral to most of the Central-Northern groups which form a relatively undifferentiated whole.

The Overall Picture

All categories display some similarities and differences in the patterning of group relationships. The structures and furnishings and food preparation categories display less clear cut patterns

than do the other categories. Even within the category of subsistence, the subcategories display quite different patterns. A division of the Salish, Nootka, and Central-Northern groups is common, especially in the subsistence categories, although this breaks down somewhat, especially in the case of the Central-Northern group, in non-subsistence categories. The dress, ornament, and textiles and the travel and transport categories display considerable similarity.

SUMMARY

We have now briefly described the patterning of groups for each of the components of technology. Each component has its own characteristic distribution of groups, the result of the operation of different sets of factors. Obviously the pattern of each of these components has an influence on the overall pattern observed in Chapter II, and it would be impossible to understand completely the pattern of overall technology without examining the pattern of its components. The anomalous placement of a group in the overall technological pattern can be the result of quite different associations for various components of technology. Also the placement of a group with, for example, its linguistic relatives for overall technology may mask considerable variation from that pattern in terms of the various components of technology.

In this chapter we have found a recurring south-north patterning of groups suggesting differences in groups based on their geographical pattern, presumably tied to localization of linguistic-ethnic groups, environmental differences of some kind moving northward,

and to patterns of contact. Generally the more northerly and, especially, the more southerly groups are more clearly differentiated from other groups.

Linguistic-ethnic units have been found to be especially cohesive in the non-subsistence categories of dress, ornament, and textiles and travel and transport, despite a low ranking of dress, ornament, and textiles for linguistic-ethnic consistency. The subsistence categories of land resources and food preparation had high rankings on linguistic-ethnic consistency but in these categories and in the water resources category, rated low on consistency, linguistic-ethnic units were found to have limited cohesion. The structures and furnishings category, which also rated low on consistency, was found to have little linguistic-ethnic group cohesiveness. Conforming to a linguistic-ethnic pattern suggests more stability as a unit and, in terms of consistency, subsistence as a whole was found to conform less to this pattern than did non-subsistence categories. This can be regarded as analogous to the typical picture of technology as less stable than social organization, which is in turn less stable than ideology (although Jorgensen's [1969] results suggest a possible reversal of the last two). However, when the subsistence categories were considered separately, land resources and food preparation were found to be more consistent than dress and structures, but the cohesion of linguistic-ethnic groups did not bear out this feature. It was further suggested that relative environmental consistency on land and a lesser emphasis on land resources may have been a factor in this.

In this chapter we have also examined a typology of environment based on access to the coast and we have found it to have some explanatory power, but obviously a finer division of environment would be necessary, and, also obviously, a single factor explanation of group relationships is not adequate. Using mean G coefficients of similarity (as was done with linguistic-ethnic consistency) to determine the consistency of groups within the environmental types, we found that travel and transport produced the most consistency in environmental types followed by subsistence, dress, ornament, and textiles, and structures and furnishings. It was suggested that the greater consistency of travel and transport was partially an artifact of linguistic-ethnic consistency, and this was born out by the greater lack of cohesion and the lesser divergence from the major environmental type of the members of the smaller environmental categories in the travel and transport SSA diagram. The impact of this environmental scheme upon structures and furnishings was found to be greater than expected from the mean G coefficients. It was in subsistence categories that we found the most cohesion and divergence on the basis of environmental groupings. Water resources and food preparation were found to be most sensitive to this environmental feature, although this was somewhat unexpected in the case of food preparation which is intuitively less clearly linked to the environment. The land resources category was found to be less clearly linked to this environmental factor, perhaps owing to a lack of emphasis on land resources or possibly because this particular division of the environment is not sensitive to factors influencing land resources. Also an island-mainland split,

of some importance for other categories, was found to be especially relevant for the land resources category.

Generally a basic division of groups into Salish, Nootka, and Central-Northern clusters, as in overall technology, was observed with shifts from this pattern and internal divisions distinctive for each category. The greatest divergence from this is found in the structures and furnishings category.

In conclusion, only a few factors out of many have been considered so that a complete explanation of each pattern is not possible. A major point that arises from this is the fact that a single factor explanation of group relationships is not adequate.

CHAPTER IV

RESULTS AND CONCLUSIONS

This chapter presents a few comments and conclusions designed to pull the discussion together. The present approach to technological relationships and to the relationships of the components of technology is fruitful. The patterns of group relationships can be easily diagrammed for each component and these patterns compared with the patterns that are expected to occur as a result of the operation of various explanatory factors. Although the desirability of further research is indicated, it may be hampered by a lack of information for many ethnic groups; a traditional ethnography is not presented in a way that allows one to gather sufficient information for most technological variables. Those groups covered by culture element lists have the most potential for further research. In addition, it should be possible to introduce archaeological evidence, in the form of artifact assemblages, extending the study in time as well as space. The smallest space analysis utilized in this study shows great potential for anthropological research particularly as it is easy to use and understand--even for those with limited statistical expertise.

Turning to the results of the study, a recurring south-north pattern of groups was observed. This suggests differences in groups based on their geographical position (presumably tied to the localization of ethnic groups, environmental differences, and patterns

REFERENCES CITED

Barnett, Homer G.

1939 Gulf of Georgia Salish. University of California Publications in Anthropology, Anthropological Records 1:221—296.

1955 The Coast Salish of British Columbia. University of Oregon Studies in Anthropology 4:1—333.

Bloombaum, Milton

1970 Doing Smallest Space Analysis. Journal of Conflict Resolution 14:409-416.

Boas, Franz

1894 The Indian Tribes of the Lower Fraser River. Reports of the British Association for the Advancement of Science 64:454—463.

1966 Kwakiutl Ethnography. Helen Codere, ed. Chicago: University of Chicago Press.

Chapman, J.D. and D.B. Turner, eds.

1956 British Columbia Atlas of Resources. Vancouver: British Columbia Natural Resources Conference.

Colson, Elizabeth

1953 The Makah Indians. Minneapolis: University of Minnesota Press.

Driver, Harold E.

1961a Introduction to Statistics for Comparative Research. In Readings in Cross-Cultural Methodology. Frank W. Moore, ed. New Haven: Human Relations Area Files Press.

1961b Indians of North America. Chicago: University of Chicago Press.

1964 Survey of Numerical Classification in Anthropology. In The Use of Computers in Anthropology. Dell Hymes, ed. The Hague: Mouton and Co.

Drucker, Philip

1950 Northwest Coast. University of California Publications in Anthropology, Anthropological Records 9:157—294.

1951 The Northern and Central Nootkan Tribes. Bulletins of the Bureau of American Ethnology 144:1—490.

1965 Cultures of the North Pacific Coast. San Francisco: Chandler Publishing Co.

Duff, Wilson
1952 The Upper Stalo Indians of the Fraser Valley, British Columbia. Anthropology in British Columbia Memoir 1. Victoria: British Columbia Provincial Museum.

1964 The Indian History of British Columbia, Volume 1, The Impact of the White Man. Anthropology in British Columbia Memoir 5. Victoria: British Columbia Provincial Museum.

Ellegard, Alvar
1959 Statistical Measurement of Linguistic Relationship. Language 35:131—156.

Elmendorf, W.W.
1960 The Structure of Twana Culture. Washington State University, Research Studies, Monographic Supplement 2:1-576.

Grasserie, Raoul de la
1902 Cinq Langues de la Colombe Britannique. Paris: J. Maisonneuve.

Guttman, Louis
1966 The Nonmetric Breakthrough for the Behavioral Sciences. Proceedings of the Second National Conference on Data Processing. Rehoroth.

Gunther, Erna
1927 Klallam Ethnography. University of Washington Publications in Anthropology 1:171—314.

Haeberlin, Hermann and Erna Gunther
1967 The Indians of Puget Sound. Seattle: University of Washington Press. (Originally published as University of Washington Publications in Anthropology Volume 4, 1930.)

Hess, T.
1972 Personal Communication.

Hill-Tout, C.
1902 Ethnological Studies of the Mainland Halkomelem. Reports of the British Association for the Advancement of Science 72:355—490.

Hofmeister, Jon F.
1969 A Statistical Analysis of Culture Change Among Fourteen Southern Plateau and Northeastern California Indian Groups. Northwest Anthropological Research Notes 3:1—67.

Jenness, Diamond
1955 The Faith of a Coast Salish Indian. Anthropology in British Columbia, Memoir 3. British Columbia Provincial Museum, Victoria.

of contact). The more northerly and southerly groups were generally the most clearly differentiated.

In dealing with technology as a whole, several intuitive and statistically derived schemes of Northwest Coast and Salish relationships were examined. These included the intuitive classifications of Drucker (1965) and Kroeber (1963) dealing with the entire Northwest Coast area and the intuitive classifications of Mitchell (1971) dealing only with the Salish. Jorgensen's (1969) statistically based arrangement of Salish relationships for technology and the totality of cultural elements was examined; as was Barnett's statistical arrangement of the Salish using the entire cultural inventory. All of these were found to have some elements concordant with results in this study but none was a perfect reflection. Actually the systems dealing with the Salish for the totality of cultural elements seemed to be the most successful in terms of agreement with the present study. Most of the classifications did deal with the whole of culture, and the difference in scope may have had an influence on the differences observed.

The extent to which the pattern of group relationships, for total technology, fit linguistic-ethnic ties was also examined. The derived pattern of relationships could not be completely explained by the pattern of linguistic-ethnic ties, but they do partially mirror the technological pattern, especially in the case of the Salish. It is difficult to separate the effects of common ancestry, as reflected in linguistics, from factors such as geographical proximity and similar areal situations.

The problem of using a gross biotic division of environment was encountered in dealing with overall technology. These

categorizations do not necessarily reflect the environmental differences important to technological differentiation. Also, being on a macroenvironmental level, the biotic zone division used in this study (Chapman and Turner 1956) does not give sufficient reflection of smaller environmental differences that might be significant. More success was encountered when a particular factor—access to the coast—was isolated, and the groups categorized on this basis. Access to the coast was found to have a certain amount of explanatory power, especially when dealing with subsistence, but it was obviously not the only factor in operation and was of limited usefulness. A related island-mainland distinction was also found to be relevant.

No category of technology was found to be notably more consistent for the entire area. It was established that differences in the consistency of linguistic-ethnic groups varied for the different categories of technology. This was initially measured by mean G coefficients of similarity for the individual linguistic-ethnic unit for each category of technology. On this basis, the general ranking of categories (from least to most consistent) for linguistic-ethnic homogeneity was established as follows: water resources; structures and furnishings; dress, ornament, and textiles; land resources; food preparation; and travel and transport. When subsistence was considered as a whole, it became the least consistent category, agreeing with an intuitive picture of which elements of culture are more likely to be stable. The relative consistency of food preparation and land resources was unexpected.

The cohesion of linguistic-ethnic units was also investigated by an appraisal of each SSA diagram. It was more difficult to

rank categories on this basis, but travel and transport and dress, ornament, and textiles were found to be the most cohesive for linguistic-ethnic units, especially the dress, ornament, and textiles category (not expected from the mean G coefficients).

The mean G technique was also used to examine consistency of access to the coast environmental categories for the individual technological categories which produced a ranking as follows (again from least to most consistent): structures and furnishings; dress, ornament, and textiles, subsistence; and travel and transport. Within subsistence the ranking (from least to most consistent) was land resources, food preparation, and water resources. This ranking was also found to be rather deceptive, partially because of the influence in the larger environmental categories of linguistic-ethnic consistency. An examination of the access to coast environmental categories in the individual SSA diagrams was performed. On this basis, the subsistence categories, especially water resources and food preparation, were the most cohesive for the environmental category. The cohesion of structures and furnishings was greater than expected for environmental categories. The cohesion of travel and transport categories was less than expected from the mean G coefficients.

From the patterns of consistency and cohesion observed for the various categories of technology, it is possible to make a few statements on the stability of the categories of technology. Linguistic-ethnic consistency or cohesion can be used as a rough measure of stability, and we do find that the subsistence categories are generally not as cohesive as the non-subsistence categories.

As noted earlier, this can be regarded as analogous to the typical picture of technology as less stable than social organization, which is in turn less stable than ideology. Structures and furnishings was the least consistent non-subsistence category. The proposed environmental scheme has very limited application, reflecting only one factor. The consistency ratings suggest that subsistence categories, especially food preparation and water resources, are more sensitive to environmental factors.

The measure of linguistic-ethnic consistency also established that the most homogeneous linguistic-ethnic units were the Haida followed by the Nootka. The Kwakiutl follow in the majority of categories, but the difference in homogeneity for the remaining units is not clear. Geographic spread seems to be a prime factor, combined with relative isolation.

For total subsistence, a clustering of groups into Salish, Nootka, and Central-Northern groups was established. This basic division was found to hold up reasonably well in the divisions of technology, especially in subsistence categories. Variations from this basic pattern were different for each category of technology, as were the internal divisions of the clusters. Food preparation and structures and furnishings were found to present the least clear pattern of relationships.

The most obvious conclusion drawn from this study is that a single factor explanation of patterns of relationships is not adequate even when dealing with a limited aspect of culture—technology—in a carefully delimited geographical area. The components of technology have their own combinations of sets of

influencing factors, including the sets of factors involved in the natural environment, contact (cultural environment), and history. Environmental factors do have a special relevance for technological patterns of relationship and this appears particularly with regard to the water resources and food preparation subsistence categories.

Further research extending this study in time and space is necessary and would be fruitful. A closer examination of the interrelationships of the components of technology is an area worthy of additional work. Studies such as this can add to our understanding of the mechanisms of culture change and internal culture cohesion; and appropriate techniques of analysis in this area are now readily available.

NOTES

1. The term "tribal unit" is used very loosely to refer to the localized units named in the relevant trait list or ethnography.
2. Rigorous comparative studies devoted to technology are rare or non-existent. Indeed systematic and comparative studies of any aspect of culture are relatively rare, Jorgensen's (1969) study of the Salish being a notable exception. My study is an initial attempt to fill this gap in the literature.

   Impressionistic intuitive schemes of tribal relationships are no longer adequate—they must be tested, using the numerous techniques of analysis now available, and challenged if necessary. The present study begins the process by establishing a statistically derived scheme of relationships. The final decision of what tribal units form a separate division remains, however, essentially impressionistic.
3. Originally, the data from two Clayoquot lists (Drucker 1950) was used as a test of the trait list technique and the methodology. Table XI presents the G coefficients of similarity between the two lists and indicates considerable consistency.

TABLE XI. G COEFFICIENTS OF SIMILARITY FOR TWO CLAYOQUOT TRAIT LISTS BY CATEGORY OF TECHNOLOGY

Technological Category	G Coefficient of Similarity
Total Technology	.918
Total Subsistence	.910
Food Preparation	.916
Water Resources	.857
Land Resources	.956
Dress, Ornament, and Textiles	1.000
Structures and Furnishings	.923
Travel and Transport	.833
Miscellaneous	1.000

4. The lines indicating, for example, major linguistic-ethnic units, drawn on the three dimensional SSA diagrams are intended to give an impression of the vertical dimension. The resultant figures have no reality of their own. They represent only one of the many possible ways to link the tribal units to display linguistic-ethnic units, environmental categories, and such divisions.

1965 Cultures of the North Pacific Coast. San Francisco: Chandler Publishing Co.

Duff, Wilson
1952 The Upper Stalo Indians of the Fraser Valley, British Columbia. Anthropology in British Columbia Memoir 1. Victoria: British Columbia Provincial Museum.

1964 The Indian History of British Columbia, Volume 1, The Impact of the White Man. Anthropology in British Columbia Memoir 5. Victoria: British Columbia Provincial Museum.

Ellegard, Alvar
1959 Statistical Measurement of Linguistic Relationship. Language 35:131—156.

Elmendorf, W.W.
1960 The Structure of Twana Culture. Washington State University, Research Studies, Monographic Supplement 2:1-576.

Grasserie, Raoul de la
1902 Cinq Langues de la Colombe Britannique. Paris: J. Maisonneuve.

Guttman, Louis
1966 The Nonmetric Breakthrough for the Behavioral Sciences. Proceedings of the Second National Conference on Data Processing. Rehoroth.

Gunther, Erna
1927 Klallam Ethnography. University of Washington Publications in Anthropology 1:171—314.

Haeberlin, Hermann and Erna Gunther
1967 The Indians of Puget Sound. Seattle: University of Washington Press. (Originally published as University of Washington Publications in Anthropology Volume 4, 1930.)

Hess, T.
1972 Personal Communication.

Hill-Tout, C.
1902 Ethnological Studies of the Mainland Halkomelem. Reports of the British Association for the Advancement of Science 72:355—490.

Hofmeister, Jon F.
1969 A Statistical Analysis of Culture Change Among Fourteen Southern Plateau and Northeastern California Indian Groups. Northwest Anthropological Research Notes 3:1—67.

Jenness, Diamond
1955 The Faith of a Coast Salish Indian. Anthropology in British Columbia, Memoir 3. British Columbia Provincial Museum, Victoria.

Johnson, Larry, Jr.
1966 Tool Technology in an Age of Economy: Stone and Glasser Analysis. University of Oregon, Museum of Natural History, Bulletin 13:1--44.

Jorgensen, Joseph G.
1969 Salish Language and Culture: A Statistical Analysis of Internal Relationships, History, and Prehistory. Indiana University Publications, Language Science Monographs 3:1--173.

Kroeber, A.L., ed.
1963 Biosocietal: Tones and Classification of Indian Culture. Ecology of Western Tribes 1:1--50.

Kroeber, Anral
1970 The Tlingit Indians. Jerrold Dunlop, Translator. Seattle: University of Washington Press. (Originally published as Die Tlinkit-Indianer, Jena, 1939).

Kroeber, Alfred L.
1963 Cultural and Natural Areas of Native North America. Berkeley and Los Angeles: University of California Press. (Originally published as University of California Publications in American Archaeology and Ethnology 38, 1939).

Mitchell, Donald H.
1971 Archaeology of the Gulf of Georgia Area. Natural History and the Culture Types. Vancouver: Supplement 1. Vancouver.

Munro, J.A. and L. Mc.Gowan
1947 A Survey of the Ethnic Arrangement of British Columbia. British Columbia Provincial Museum Special Publication 7. Victoria: British Columbia Provincial Museum.

Murdock, George Peter
1960 Ethnographic Bibliography of North America. New Haven: Human Relations Area Files Press.

Olson, Ronald L.
1936 The Quileute Indians. University of Washington Publications in Anthropology 6:1--190.

Schlosser, Walter E.
1963 The Ecology of North America. Toronto: Holt Rinehart of Illinois Press.

Suttles, Wayne
1960 The Coast Salish-Language. Salish Indian Sociolinguistics to Anthropology 32:1--320.

Stern, Bernhard J.
1934 The Lummi Indians of Northwest Washington. Columbia University Contributions to Anthropology 17:1—127.

Suttles, Wayne
1954 Post-Contact Culture Changes Among the Lummi Indians. British Columbia Historical Quarterly 18:29—102.

1955 Katzie Ethnographic Notes. Anthropology in British Columbia, Memoir 2, Victoria: British Columbia Provincial Museum.

APPENDIX A

VARIABLES AND ATTRIBUTES

A. Subsistence

1. Fire Making
   1. Slow match
   2. Percussion
   3. Both techniques
   4. Other techniques only

2. Stone Boiling—Containers
   5. Dugout trough
   6. Wooden boxes
   7. Wooden boxes and Bark containers
   8. Dugout troughs and Bark containers
   9. No stone boiling

3. Tongs
   10. Split stick tongs
   11. Other forms only

4. Fat Rendering—Containers
   12. Wooden boxes
   13. Canoe or canoe-like trough
   14. Both techniques
   15. Neither technique

5. Grease Storage—Containers
   16. Wooden boxes
   17. Sea mammal paunch/bladder
   18. Wooden boxes and Sea mammal paunch/bladder
   19. Wooden boxes and Kelp bulbs
   20. All of above containers
   21. None of above containers

6. Fish Cutting Knives—Material
   22. Mussel shell
   23. Stone
   24. Bone
   25. Bone and Stone
   26. Bone and Mussel shell
   27. Stone and Mussel shell
   28. All of above materials

7. Foods Dried
   29. Clam, cod, herring
   30. Clam, herring, halibut
   31. Clam, halibut, cod
   32. Clam, cod, herring, halibut
   33. Clam, cod, herring, pulverized meat and fish
   34. Other foods only

8. Storage of Dried Roe
   35. Wooden boxes
   36. Paunch/bladder
   37. Both forms of storage
   38. Other forms of storage only

9. Water Containers
   39. Wooden boxes
   40. Other containers only

10. Wooden Dishes—General Type
    41. Rectangular
    42. Rectangular and Large feast
    43. Other wooden types only

11. Wooden Dishes—Zoomorphology
    44. Zoomorphic
    45. Non-zoomorphic only

12. Bark, Stone, and Horn Dishes
    46. Bark
    47. Stone and Bark
    48. Horn
    49. None of above materials

13. Spoons—Material
    50. Clamshell
    51. Wood and Clamshell
    52. Mountain goat horn and Wood
    53. Mountain goat horn, Wood, and Clamshell
    54. Mountain goat horn, Wood, and Mountain sheep horn
    55. All of above materials

14. Paddle Food Stirrers
    56. Present
    57. Absent

15. Berry Eating Spatulas
    58. Present
    59. Absent

16. Shredded Bark Napkins
    60. Present
    61. Absent

A. 2 Water Resources

17. Fish Weirs—Stake Pattern
    62. Row of vertical stakes
    63. Row of oblique stakes
    64. Both forms
    65. Other forms only
    66. No weirs

18. Simple Wing Dam or Weir—Basket in Connection
    67. Present
    68. Absent

19. Scaffold on Dam or Weir
    69. Present
    70. Absent

20. Fish Traps
    71. Cylindrical river
    72. Grid
    73. Cylindrical river and Grid
    74. Cylindrical river, Grid, and Pothanger
    75. Grid and Open top basketry
    76. Cylindrical river and Open top basketry
    77. Cylindrical river, Open top basketry, and Grid
    78. Other forms only

21. Nets—Material
    79. Nettle twine
    80. Other materials only

22. Nets—Shuttles
    81. Wooden
    82. Non-wooden only
    83. No net shuttles

23. Nets—Wooden Guages
    84. Rectangular
    85. Non-rectangular and rectangular
    86. No wooden net guages

24. Nets Fish—Types
    87. Gill
    88. Gill and Reef
    89. Reef and Seine
    90. Gill, Reef, and Seine
    91. Other forms only

25. Nets Fish—Wooden Floats
    92. Present
    93. Absent

26. Herring Rakes
    94. Present
    95. Absent (as no herring)

27. Brush "Fences" for Herring Eggs
    96. Present
    97. Absent
    98. No herring eggs

28. Fish Clubs
    99. Present
    100. Absent

29. Fish Line Floats
    101. Carved wooden animal
    102. Seal bladder/paunch
    103. Both forms
    104. Neither form

30. Fish Line Sinkers
    105. Grooved stone
    106. Wrapped stone
    107. Both forms
    108. Neither form

31. Cod Spinner Lure
    109. Present
    110. Absent
    111. Cod not taken

32. Fish Hooks
    112. Sharp angled 2-piece
    113. Wooden U shaped (halibut)
    114. Carved V shaped (halibut)
    115. Bone gorge
    116. Sharp angled 2-piece and Wooden U shaped
    117. Sharp angled 2-piece and Bone gorge
    118. Wooden U shaped and Carved V shaped
    119. Sharp angled 2-piece, Wooden U shaped, and Bone gorge
    120. Other forms only

33. Salmon Gaff
    121. Present
    122. Absent

34. Fish Spears
    123. 2-Pronged gig
    124. 3-Pronged gig
    125. Both forms
    126. Other forms only

35. Fish Harpoon--Prong
    127. 2-Pronged
    128. Other forms only

36. Fish Harpoon--Butt
    129. Trident butt
    130. Other forms only

37. Sealing Harpoon--Foreshaft
    131. Double
    132. Single
    133. Both forms
    134. Neither form (no sea mammals hunted)

38. Sealing Harpoon--Head
    135. 1-Piece
    136. 3-Piece
    137. Both forms
    138. Neither form (no sea mammals hunted)

39. Sealing Harpoon--Line to Shaft
    139. Present
    140. Absent

40. Line Floats for Seals and Sea Lions
    141. On seal line
    142. On sea lion line
    143. On both
    144. On neither

41. Clubbing of Seals and Sea Lions
    145. Seals clubbed
    146. Sea Lions clubbed
    147. Both clubbed
    148. Neither clubbed

42. Attracting/Distracting Seals (i.e. Disguises, calls)
    149. Disguises or calls
    150. Neither

43. Shore Screens
    151. Present
    152. Absent

44. Seal Nets
    153. Present
    154. Absent

A. 3 Land Resources (includes weapons)

45. Nets—"Land"
    155. Deer
    156. Beaver
    157. Elk
    158. Deer and Elk
    159. No net hunting of land animals

46. Nets—Duck
    160. Permanent high net
    161. Net used in canoe
    162. Both techniques
    163. Neither technique

47. Bird Snares
    164. Loop
    165. Submerged
    166. Springpole
    167. Loop and Submerged
    168. Loop and Springpole
    169. All of above types
    170. None of above types

48. Pitfalls
    171. Present
    172. Absent

49. Multiple Pronged Bird Spears
    173. Present
    174. Absent

50. Special Harpoon for Beaver
    175. Present
    176. Absent

51. Techniques of Mountain Goat Hunting
    177. Bow and arrow
    178. Loop snare
    179. Bow and arrow and Loop snare
    180. Bow and arrow and Springpole snare
    181. All of above techniques
    182. None of above techniques
    183. Not hunted

52. Attracting/Distracting Deer
    184. Deer call
    185. Deer call and Deer head decoy
    186. Neither form

53. Waterfowl Hunting by Torchlight
    187. Present
    188. Absent

54. Bird Blinds
    189. Present
    190. Absent

55. Dogs Used for Hunting
    191. Present
    192. Absent (dogs are kept)

56. Digging Sticks
    193. Double pointed
    194. Straight handle
    195. Straight, crutch handle
    196. Ball handle
    197. Double pointed and Straight handle
    198. Straight handle and Straight, crutch handle
    199. Straight handle, Straight, crutch handle, and Double pointed

57. Bark Scrapers—Material
    200. Bone
    201. Shell
    202. Both materials
    203. Inner bark not eaten

58. Bow—Form and Construction
    204. Simple-broad, thin, tapered
    205. Sinew lined
    206. Both forms
    207. Other forms only

59. Bow-Tips
    208. Recurved
    209. Other forms only

60. Bow—Tipped with Sharp Point
    210. Present
    211. Absent

61. Bow—Painted
    212. Present
    213. Absent

62. Bowstrings—Material
    214. Fiber
    215. Sinew
    216. Gut
    217. Fiber and Sinew
    218. Gut and Sinew
    219. All above materials
    220. Other materials only

63. Arrow Straightening
    221. Hands used
    222. Hands not used

64. Arrow Feathering
    223. Double, tangential
    224. Radial
    225. Both techniques

65. Arrow Points—Material
    226. Stone
    227. Other materials only

66. Bone Arrow Points—Number of Barbs
    228. Multiple
    229. Other forms only

67. Arrow Points—Number
    230. Multiple
    231. Other forms only

68. Quivers—Material
    232. Sewn skin
    233. Sewn skin and Cedar bark
    234. Other materials only
    235. No quivers

69. War Clubs—Material and Form
    236. Wood
    237. Whalebone, 2-edged
    238. Both forms
    239. Neither form

70. Spear Point—Material
    240. Stone
    241. Bone
    242. Untipped wood
    243. Bone and Stone
    244. All of above forms

71. Spear Point—Permanence
    245. Detachable
    246. Non-detachable only

72. Bone Daggers
    247. Present
    248. Absent

73. Sling Used in War
    249. Present
    250. Absent

B. Dress, Ornament, and Textiles

74. Wooden Shields
    251. Present
    252. Absent

75. Helmet—Material
    253. Wooden
    254. Skin
    255. Neither material

76. Body Armor
    256. Hide cuirass
    257. Rod jacket
    258. Hide cuirass and Rod jacket
    259. Hide cuirass and Cedar bark jacket
    260. None of the above forms

77. Major Body Covering—Male
    261. Buckskin shirt
    262. Skin apron
    263. Other clothing only

78. Major Body Covering—Female
    264. Skin apron
    265. Bucksin gown
    266. Both forms
    267. Other clothing only

79. Fur Caps
    268. Present
    269. Absent

80. Basketry Hats
    270. Flaring brim
    271. Other forms only
    272. No basketry hats

81. Moccasins
    273. Present
    274. Absent

82. Leggings
    275. Present
    276. Absent

83. Necklaces—Material
    277. Dentalia
    278. Claw or teeth
    279. Both materials
    280. Other materials only
    281. No necklace

84. Bracelets
    282. Present
    283. Absent

85. Anklets
    284. Present
    285. Absent

86. Ornaments for Pierced Ears--Material
    286. Dentalia
    287. Other materials only

87. Ornaments for Pierced Nose--Material and Form
    288. Haliotis pendant
    289. Haliotis pendant and Bone pin
    290. Haliotis pendant and Dentalia pin
    291. All of above types
    292. Other materials only

88. Labrets
    293. Present
    294. Absent

89. Face Painting (Non-Ritual)
    295. Tallow
    296. Other substances only
    297. No face painting

90. Stone Paint Grinding Pan
    298. Present
    299. Absent

91. Head Deformation
    300. Cowichan type
    301. Koskimo type
    302. Other types only
    303. No head deformation

92. Hair combs
    304. Carved bone
    305. Other forms only

93. Urine Wash for Hair
    306. Present
    307. Absent

94. Hair Oiled/Greased
    308. Present
    309. Absent

95. Beard Plucking
    310. With fingers
    311. Other techniques only
    312. Beard not plucked

96. Scrapers for Skin Dressing—Material
    313. Mussel shell
    314. Other materials only

97. Bark Shredder—Form
    315. Crescentic hardwood
    316. Other forms only
    317. No bark shredders

98. Bark Shredder—Handhold Perforated
    318. Present
    319. Absent

99. Mats—Material and Technique
    320. Bark checkerwork
    321. Sewn rush (creaser and eyed needle used)
    322. Sewn rush and Bark checkerwork
    323. Sewn and Twined rush
    324. All of above types
    325. None of above types

100. Yarn/Twine Making Tools
    326. Disk whorl
    327. Disk whorl and Spindle
    328. Neither tool

101. Looms
    329. Roller
    330. Suspended warp
    331. Both types
    332. Neither type

102. Fabrics—Material
    333. Goat wool
    334. Goat wool and Dog wool
    335. Goat wool and Cedar bark warp-wool weft
    336. Goat wool, Cedar bark warp-wool weft, and Dog wool
    337. Woven animal skin
    338. Goat wool, Cedar bark warp-wool weft, and Woven animal skin
    339. None of above materials

103. Techniques of Basketry
    340. Twined
    341. Twined and Cedarbark checker
    342. Wrap twined and Cedar bark checker
    343. Wrap twined and Coiled
    344. Wrap twined, Coiled, and Twined
    345. Wrap twined, Twined and Cedar bark checker
    346. All of above techniques

104. Types of Wrap Twined Baskets
    347. Rectangular, convex sides
    348. Burden
    349. Both types
    350. Neither type

105. Decoration of Textiles—Mud Dye
    351. Present
    352. Absent

106. Decoration of Textiles—Quill
    353. Present
    354. Absent

C. Structures and Furnishings

107. Summer Camp Houses—Material
355. Mat covered
356. Bark covered
357. Both materials
358. Neither material

108. Earth Covered Semi-Subterranean Structure
359. Present
360. Absent

109. Stockades
361. Present
362. Absent

110. "Structures" for Sweat Bathing
363. Blanket covering over pit
364. Dome shaped sweathouse of poles
365. Plank sweathouse
366. Dome shaped sweathouse of poles and Plank sweathouse
367. Other structure types only
368. No sweat bathing

111. Rectangular Plank Houses—"Foundations"
369. Excavated central pit and Excavated series of steps
370. On pilings
371. All of above forms
372. Other forms only

112. Rectangular Plank Houses—Floor
373. Board
374. Other types only

113. Rectangular Plank House—Posts
375. Decorated by carving or painting
376. Undecorated

114. Rectangular Plank Houses—Sheathing
377. Horizontal
378. Other positioning only

115. Rectangular Plank Houses—Mat Lining of Walls
379. Present
380. Absent

116. Rectangular Plank Houses—Beams Projecting Through Facade
381. Present
382. Absent

117. Rectangular Plank Houses—House Front
383. Painted
384. Unpainted

118. Rectangular Plank Houses--Ridgepoles
    385. Single with long end posts
    386. Double
    387. Single with long end posts and Single with lintels
    388. All of above forms
    389. No ridgepole

119. Rectangular Plank Houses--Ridge Treatment
    390. Overlapping plates at ridge
    391. Separate ridge covers
    392. Neither treatment

120. Rectangular Plank Houses--Roofing Material
    393. Board
    394. Bark
    395. Both materials

121. Rectangular Plank Houses--Roof Pitch
    396. 1-Pitch
    397. 2-Pitch
    398. Both forms

122. Rectangular Plank Houses--Smokehole
    399. Adjustable smokehole shield
    400. Other types only

123. Rectangular Plank Houses--Doorway Placement
    401. Gable end
    402. Side and Gable end
    403. Other placement only

124. Rectangular Plank Houses--Door "Shape"
    404. Rectangular
    405. Rectangular and Oval
    406. Rectangular and Portal pole
    407. Oval and Portal pole
    408. All of above forms

125. Rectangular Plank Houses--Door "Operation"
    409. Swinging wooden
    410. Plug
    411. Both forms
    412. Other forms only

126. Rectangular Plank Houses--Internal Divisions
    413. Partitions between places
    414. Sleeping rooms
    415. Both forms
    416. Neither form

127. Rectangular Plank Houses--Sleeping Platforms
    417. All around walls
    418. Other forms only

128. Cradles
    419. Basketry
    420. Flat board
    421. Dugout box
    422. Basketry and Flat Board
    423. Flat board and Dugout box
    424. All of above forms
    425. Other forms only

129. Seating
    426. Back rests
    427. Back rests and Wooden stools
    428. Back rests and Whale vertebrae stools
    429. Other forms only

130. Interior Storage
    430. High shelves
    431. Storage pit
    432. Neither form
    433. Both forms

131. Exterior Storage--Elevated Platform
    434. Present
    435. Absent

132. Cedar Boxes--Bottom
    436. Mortised
    437. Other techniques only

133. Cedar Boxes--Lid
    438. Flanged
    439. Other forms only

D. Travel and Transport (includes woodworking)

134. Wedges--Material
    440. Horn or bone
    441. Other materials only

135. Stone Chisels
    442. Present
    443. Absent

136. Stone Mauls
    444. Present
    445. Absent

137. Adz Types
    446. Elbow
    447. D
    448. Elbow and D
    449. Elbow, D, and Straight

138. Adz Blades--Material
    450. Stone
    451. Shell and/or bone
    452. Both of above materials

139. Shafted Bone Drill
    453. Present
    454. Absent

140. Beaver Tooth Woodworking Knife
    455. Present
    456. Absent

141. Tree Felling
    457. By chisel
    458. By burning
    459. Both techniques used
    460. Other techniques only

142. Hollowing of Tree
    461. By burning
    462. Other techniques only

143. Hull Spread by Steaming
    463. Present
    464. Absent

144. Canoes--Material
    465. Cedar
    466. Bark
    467. Both materials
    468. Other materials only

145. Canoes--Types
    469. Northern
    470. Nootkan
    471. Yicelt
    472. Nukwil
    473. Northern and Nootkan
    474. Northern and Yicelt
    475. Nukwil and Nootkan
    476. Yicelt and Nootkan
    477. Yicelt, Nootkan, and Northern
    478. Spoon and Northern
    479. Nukwil and Spoon
    480. Nootkan and Shovel-nose
    481. Nootkan, Yicelt, and Shovel-nose
    482. Nootkan, Yicelt, Shovel-nose, and Spoon
    483. Other types only

146. Canoe Ends
    484. Separate
    485. Other arrangement only

147. Gunwale Strips Pegged On
    486. Present
    487. Absent

148. Floorboards in Canoe
    488. Present
    489. Absent

149. Hull Cleaning By Scorching
    490. Present
    491. Absent

150. Hull Decoration--Painting
    492. Present
    493. Absent

151. Sails--Material
    494. Cedar mat
    495. Cedar mat and Thin board
    496. Other materials only
    497. No sails

152. Sails--Rigging
    498. Square-sail
    499. Spritsail
    500. Both forms
    501. Neither form

153. Paddles--Types
    502. Special woman's paddle
    503. Other types only

154. Paddles--Decoration
    504. Blackened over
    505. Decorative designs
    506. Both forms

155. Bailers
    507. Cedarbark, cross handle
    508. Cedarbark, cross handle and Wooden triangular
    509. Wooden/bark ladle
    510. Wooden/bark ladle and Cedarbark, cross handle

156. Tobaggans
    511. Present
    512. Absent

157. Snowshoes--Types
    513. Oval
    514. Blunt toe, sharp heel
    515. Blunt toe, sharp heel and Sharp toe, raised
    516. Oval and Sharp toe, raised
    517. Oval and Blunt toe, sharp heel
    518. All of above types
    519. Other types only
    520. No snowshoes

158. Snowshoes--Cedar With Netting
    521. Present
    522. Absent

159. Dog Packing
    523. Present
    524. Absent

160. Packstrap--Material
    525. Fiber
    526. Skin
    527. Skin and Fiber
    528. Wool and Fiber
    529. Wool and Skin
    530. All of above materials

161. Packstrap--Type
    531. Head
    532. Chest
    533. Both types

162. "Containers" for Packing
    534. Basket
    535. Skin bag
    536. Both types
    537. Other types only

E. Miscellaneous

163. Single Head Skin Drums--Frame
538. Circular frame
539. Rectangular frame
540. Both types
541. No skin drums

164. Wooden Drums
542. Wooden box
543. Other types only

165. Rattles--Types
544. Globular-ovoid wooden and Hoof
545. Globular-ovoid wooden and Splitstick
546. Globular-ovoid wooden and Puffin beak hoop
547. Globular-ovoid wooden, Splitstick, and Puffin beak hoop
548. Globular-ovoid wooden, Splitstick, and Hoof
549. Other types only

166. Non-Percussion Instruments--Types
550. Bull-roarer
551. Bull-roarer and Wooden whistle
552. Bull-roarer, Wooden whistle, and Musical bow
553. None of above types

167. "Tobacco and Similar Products"--Use
554. Smoked
555. Chewed
556. Both uses
557. Neither use

168. Team Skill Games--Types
558. Men play shinny
559. Ring and pin game
560. Both types
561. Other types only

169. Guessing Games--Types
562. Stick game
563. Stick game and Disk lahal
564. Other types only

170. Dice Games
565. Present
566. Absent

171. Tops
567. Present
568. Absent

172. Cat's Cradle
569. Present
570. Absent

APPENDIX B

NON-DIFFERENTIATING TRAITS

If included certain traits would be coded all present or all absent, while others would be coded likewise with the exception of ratings of unknown for a few groups where information is missing on the trait or other traits forming part of the same attribute set. Including ratings on these traits would add nothing to the differentiation among groups, hence they were omitted.

A. All Present or Present and Unknown

1. Simple fire drill
2. Bark tinder
3. Earth oven
4. Roe dried
5. Wooden dishes
6. Wooden oil dishes
7. Wooden ladles
8. Dip nets
9. Deadfalls
10. Bone arrow point
11. Spear used in warfare
12. Robes worn--male and female
13. Haliotis pendant for pierced ears
14. Carved wood comb
15. Skin dressing
16. Cedar boxes to store valuables
17. Cedar boxes, sides of 1 piece kerfed
18. Wooden wedges
19. Crutch handled paddles
20. Pointed poling rod
21. Painted paddle
22. Plank drum
23. Hoop and pole game

B. Absent or Absent and Unknown

1. Stone rendering platters
2. Pounding slab and hopper
3. Meal brush
4. Stone "hammer" for killing fish
5. Fish poison

6. "Hair" hook
7. Bilaterally barbed hooks
8. Multiple pronged fish spear, prongs spread by ring
9. Sea lion disguise
10. Elk call
11. Sabre handled digging stick
12. Sinew backed bow
13. Compound bow
14. Arrow wrench
15. Arrow foreshafted
16. Spear thrower
17. Fabrics of down and fiber mixed
18. Fabrics of woven birdskin
19. Sliding door
20. Anterooms
21. Oars
22. Sleds
23. Foot drums
24. Roof or wall plank drums
25. Flute

APPENDIX C

VARIABLE RATINGS FOR THE TRIBAL UNITS

In Table XII, the rating of each variable for each tribal unit is presented. Variable numbers refer to the numbering system in Appendix A. The variable rating for each tribe is expressed by the appropriate attribute number of that variable (again following the numbering in Appendix A). A question mark indicates that it was not possible to rate the variable for the particular tribe.

TABLE XII. VARIABLE RATINGS FOR EACH TRIBE

Variable	ES	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	PN	QU	NH	NT
								Group								
1	?	1	1	1	2	4	1	1	1	1	1	3	3	3	?	?
2	5	9	9	9	6	6	6	6	7	5	?	5	?	8	6	6
3	?	10	10	10	10	10	10	10	10	10	10	10	?	10	10	10
4	?	15	15	15	14	?	14	14	15	15	15	15	?	13	13	14
5	?	?	?	20	20	17	18	17	17	17	17	17	?	?	21	17
6	?	?	?	25	?	?	28	28	25	25	28	?	?	?	?	?
7	?	29	29	32	32	29	29	29	32	29	32	33	?	?	34	32
8	?	?	?	?	?	37	37	37	37	38	36	36	?	?	?	?
9	?	39	39	39	39	40	39	39	39	39	39	39	39	?	40	39
10	?	43	43	42	42	42	42	?	41	41	?	?	?	?	42	42
11	45	45	45	44	44	44	44	44	45	45	45	44	?	?	45	45
12	?	49	49	47	47	46	46	?	46	49	?	46	?	?	?	?
13	?	51	51	55	55	53	53	53	53	53	55	51	?	55	?	53
14	57	57	57	57	57	57	57	57	57	57	57	56	?	?	57	57
15	?	58	58	58	58	58	58	58	58	58	58	59	?	?	?	?
16	?	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
17	66	62	62	66	66	64	66	62	62	64	62	63	?	?	?	?
18	68	?	68	68	68	68	68	67	68	68	68	67	?	?	67	67
19	70	69	69	70	70	70	70	70	70	70	69	69	69	70	?	?
20	?	?	?	72	72	73	73	73	73	72	78	71	?	?	?	?
21	79	79	79	79	79	79	79	79	80	79	79	79	79	79	79	79
22	81	81	81	81	?	?	81	81	?	81	81	?	?	81	?	83
23	84	84	84	84	?	86	84	84	84	84	84	85	?	84	?	84
24	90	90	89	89	89	91	?	91	91	89	?	91	90	?	87	87
25	92	92	93	93	93	93	93	93	93	93	92	92	92	?	92	92
26	94	94	94	94	94	94	94	94	94	94	94	94	94	94	95	94
27	?	96	96	96	96	96	96	96	96	96	96	96	?	97	98	96

TABLE XII. (continued)

Variable	Group															
	NC	N2	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS	LS	LC
1	?	?	1	1	1	1	1	1	?	1	1	1	1	?	2	2
2	6	6	6	6	6	6	7	7	6	7	7	6	6	6	6	6
3	10	10	10	10	10	10	10	10	10	10	10	11	10	10	10	10
4	12	14	15	12	12	12	13	12	12	12	12	15	15	15	12	13
5	17	17	21	19	19	16	21	16	16	16	16	21	21	21	16	16
6	?	?	26	22	22	27	22	28	24	27	22	?	28	22	22	23
7	32	32	32	30	32	30	32	32	32	32	32	34	32	32	?	34
8	36	36	36	36	35	35	35	35	35	35	35	35	37	37	37	37
9	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
10	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
11	45	45	44	44	44	44	44	44	44	44	44	44	44	44	44	44
12	?	?	?	?	?	47	46	47	?	?	?	46	49	49	49	48
13	50	50	51	52	52	52	53	53	53	53	52	52	53	53	52	54
14	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57
15	?	?	?	58	58	58	58	58	58	58	58	58	58	59	59	59
16	60	60	60	60	60	60	60	60	60	60	?	?	60	60	60	61
17	?	?	62	62	65	63	63	63	65	63	63	62	?	62	64	64
18	67	68	67	67	68	68	68	68	67	67	68	68	68	68	67	67
19	?	?	70	70	70	69	70	70	69	70	70	69	70	70	69	70
20	?	?	?	?	75	?	74	74	72	77	74	72	77	77	76	73
21	79	79	80	79	79	79	80	79	79	79	80	80	79	79	80	80
22	81	81	?	81	?	?	82	81	83	83	83	?	82	83	83	83
23	86	86	?	84	84	84	86	84	84	84	84	86	?	84	?	86
24	91	87	91	91	91	91	91	91	91	91	87	91	91	87	91	91
25	?	?	93	93	93	93	93	93	93	?	92	93	92	92	93	93
26	94	94	94	94	94	94	94	94	94	94	94	95	94	94	94	94
27	96	96	96	97	96	97	96	96	97	96	96	98	96	96	96	97

TABLE XII. (continued)

Variable	Group															
	ES	CW	NA	PE	CK	SL	KL	HO	SE	SQ	WS	TW	PN	QU	NH	NT
28	99	99	99	99	99	99	99	99	99	99	99	99	99	?	100	99
29	104	104	104	102	104	103	104	104	104	?	102	?	?	?	[illegible]	104
30	107	106	107	107	107	105	105	105	?	105	?	?	?	?	108	107
31	110	109	109	109	109	109	109	109	109	109	109	?	?	?	111	109
32	119	116	?	116	116	116	112	115	116	112	119	?	?	?	112	119
33	121	121	?	121	121	121	121	121	122	121	121	121	121	121	122	122
34	?	?	?	?	?	125	125	?	123	125	?	125	125	?	?	125
35	127	127	127	127	127	127	127	127	127	127	127	127	127	?	128	127
36	129	129	129	129	129	129	129	129	129	129	129	?	?	?	130	129
37	?	132	?	132	132	131	131	131	131	132	131	133	?	?	134	131
38	136	136	136	135	135	136	136	136	136	136	?	?	?	?	138	136
39	140	139	140	140	139	140	140	139	139	140	140	140	139	?	140	140
40	143	143	144	143	?	143	141	143	144	144	141	141	141	?	144	142
41	146	148	145	145	?	145	145	148	145	?	145	145	145	147	148	?
42	?	?	149	149	149	149	149	149	149	149	150	?	?	?	150	150
43	151	152	151	152	152	152	152	152	152	152	152	?	?	?	152	152
44	?	?	?	?	153	153	153	153	153	154	153	153	?	?	154	?
45	?	158	155	159	159	155	159	155	159	159	155	?	?	?	?	?
46	?	?	?	163	163	161	160	163	160	163	160	161	162	?	163	161
47	?	168	168	168	169	168	163	166	168	166	?	163	?	?	169	169
48	171	171	171	171	171	171	172	171	171	171	171	171	171	171	172	172
49	173	173	173	174	174	174	174	173	173	173	173	173	173	174	174	174
50	?	176	176	176	175	175	175	175	175	176	176	176	175	?	176	176
51	183	183	183	183	?	?	179	?	181	181	183	183	?	183	183	183
52	185	?	184	184	185	185	185	185	184	184	185	?	?	?	186	186
53	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187
54	189	?	189	189	189	189	189	189	189	189	189	189	?	189	189	189
55	191	191	?	191	191	191	191	191	191	191	191	191	191	191	?	?
56	197	197	197	197	?	194	199	199	194	194	194	193	?	?	?	?

TABLE XII. (continued)

Variable	Group NC	N2	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS	LS	LC
28	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
29	104	104	102	102	104	104	104	102	102	102	101	104	102	103	103	104
30	106	106	105	106	105	105	105	105	108	105	105	108	106	?	107	108
31	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
32	119	119	116	116	113	?	118	114	114	118	114	120	114	?	?	117
33	122	122	121	121	122	122	121	121	122	121	121	122	121	121	121	122
34	?	125	123	126	126	124	124	124	123	123	123	124	126	126	126	124
35	127	127	128	127	127	127	127	127	127	127	128	128	128	127	127	128
36	130	129	129	129	129	130	129	129	130	130	130	130	130	130	130	130
37	131	131	131	131	132	132	132	132	134	132	132	134	132	132	132	132
38	136	136	135	136	135	136	135	136	138	135	135	138	135	135	135	135
39	140	140	140	140	139	139	140	140	140	139	140	139	139	139	139	139
40	142	142	144	144	141	141	144	144	144	144	144	144	144	144	144	144
41	?	?	147	145	147	148	147	147	148	145	147	148	147	145	145	158
42	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
43	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
44	?	?	154	153	154	153	154	154	154	154	154	154	154	154	154	154
45	?	?	?	?	?	156	156	159	159	159	159	156	159	159	159	159
46	161	161	161	161	161	163	163	163	163	163	163	163	163	163	163	163
47	169	169	169	168	170	168	168	168	168	170	164	164	164	169	170	167
48	172	172	172	172	172	171	172	172	172	172	172	172	172	172	172	172
49	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174
50	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176
51	183	183	183	183	177	177	182	182	182	182	182	182	183	183	182	178
52	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186
53	187	187	187	187	187	188	188	187	188	187	187	187	187	187	187	187
54	189	189	189	189	189	189	189	189	189	189	189	190	189	189	190	190
55	?	?	?	?	191	191	191	191	191	191	191	191	192	192	191	191
56	?	?	197	194	196	196	195	195	195	195	194	194	194	196	198	194

TABLE XII. (continued)

Variable	Group ES	CS	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	PN	QU	NH	NT
57	?	?	?	202	?	201	201	201	201	?	203	?	203	?	?	203
58	?	204	204	204	204	?	204	204	204	204	204	206	206	206	205	206
59	?	208	208	208	208	?	208	208	208	208	208	208	?	208	?	?
60	?	211	?	211	211	?	210	211	211	211	211	211	?	?	211	211
61	?	213	?	212	212	?	213	213	213	212	?	212	?	212	213	213
62	?	?	216	217	217	?	220	218	218	217	216	219	?	?	215	216
63	?	221	221	221	221	?	221	221	221	221	221	221	?	221	222	222
64	?	223	223	223	223	?	223	223	223	223	223	223	?	225	?	?
65	?	?	226	226	226	?	226	226	226	226	226	226	226	?	227	227
66	?	229	229	228	228	?	229	229	229	229	229	?	?	?	229	229
67	?	230	230	230	230	?	230	230	230	230	230	230	?	230	230	230
68	?	?	?	233	233	?	232	232	232	232	232	232	?	?	232	234
69	?	238	?	238	236	?	236	236	239	236	?	237	238	?	239	237
70	?	?	243	244	244	?	244	244	?	244	244	?	?	?	242	241
71	246	246	246	246	246	246	246	246	246	246	246	245	?	?	246	246
72	?	?	247	247	247	?	247	247	?	247	247	248	247	247	?	?
73	?	?	?	249	249	?	?	?	249	250	249	250	?	250	250	249
74	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252
75	?	254	255	255	255	?	254	?	255	255	?	255	?	255	255	255
76	?	256	260	260	260	?	260	?	260	256	?	260	256	?	?	?
77	?	263	263	263	263	?	263	263	261	263	263	?	?	?	?	?
78	?	267	267	267	264	?	264	264	265	264	267	267	?	?	?	?
79	?	268	269	268	268	?	268	268	268	268	628	268	268	268	268	269
80	?	272	272	272	?	?	271	270	270	272	272	272	?	270	272	271
81	?	273	274	273	273	?	273	273	273	273	273	273	273	273	273	274
82	?	276	276	276	275	?	275	275	276	275	275	275	275	275	275	276
83	?	?	281	281	280	?	281	?	281	278	279	279	?	?	?	277
84	?	282	283	283	282	?	283	?	283	282	282	282	282	282	282	282
85	?	284	285	285	284	?	285	?	285	285	285	284	285	285	?	?

TABLE XII. (continued)

Variable	Group															
	NC	N2	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS	LS	LC
57	203	203	201	201	201	200	201	202	201	201	201	200	201	201	201	200
58	204	204	204	204	204	206	204	204	204	206	206	206	204	204	204	206
59	209	209	209	209	208	?	208	208	209	?	?	?	209	209	208	208
60	211	211	211	211	211	210	211	211	211	211	211	211	211	211	211	211
61	213	213	213	213	212	213	212	212	212	212	212	213	213	213	212	213
62	216	216	216	215	214	215	216	216	216	216	216	216	216	216	216	216
63	222	222	222	222	222	221	222	222	222	221	222	221	222	222	221	221
64	?	224	225	224	223	224	224	224	223	223	225	224	224	224	225	224
65	227	227	227	227	227	226	227	226	227	226	227	226	227	227	226	226
66	229	229	229	228	229	229	228	228	229	228	228	229	228	228	?	228
67	?	?	231	231	231	230	230	231	230	230	231	231	230	230	?	231
68	234	234	234	232	235	232	232	232	232	232	232	232	234	232	232	232
69	237	237	237	237	239	?	238	238	239	238	237	239	237	238	236	239
70	241	241	241	241	242	242	241	241	241	241	241	241	241	241	241	241
71	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246	246
72	?	?	247	247	248	?	247	247	248	247	248	247	247	247	247	248
73	249	250	249	249	249	250	249	249	250	249	249	250	249	250	250	250
74	252	252	252	252	252	252	252	252	251	252	252	252	252	252	252	251
75	255	255	253	255	255	255	255	253	254	254	254	254	253	254	253	253
76	?	259	256	256	260	258	260	258	256	256	258	256	258	256	260	257
77	?	?	263	263	263	263	263	262	263	262	261	261	263	263	261	261
78	?	?	267	267	267	267	267	267	264	?	266	265	267	267	265	265
79	?	?	268	268	268	268	268	268	268	268	268	268	268	268	268	268
80	271	271	270	270	270	270	270	270	270	270	270	270	270	270	270	270
81	274	274	274	274	273	273	273	273	273	273	273	273	273	274	274	273
82	276	276	276	276	275	275	275	275	275	275	275	275	276	276	276	276
83	277	277	277	277	277	277	277	?	277	277	277	277	277	277	280	277
84	282	282	282	282	283	282	282	282	283	282	282	282	282	282	282	282
85	?	?	284	284	284	284	284	284	285	284	284	285	284	284	285	284

TABLE XII. (continued)

Variable Number	Group ES	CS	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	PN	QU	NH	NT
86	287	287	287	287	?	287	287	287	287	286	286	286	286	?	?	286
87	?	289	289	289	289	?	289	289	288	288	291	?	?	?	292	?
88	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294
89	?	295	295	295	295	?	295	295	295	295	295	295	295	295	295	295
90	?	299	299	298	299	299	299	299	299	299	299	299	?	?	?	?
91	?	300	300	302	?	?	?	?	?	300	300	?	?	?	300	300
92	?	305	305	305	305	?	305	305	305	305	305	?	?	304	305	305
93	?	306	306	?	306	?	306	306	306	306	306	307	?	?	?	?
94	?	308	308	308	308	?	308	308	308	308	308	308	308	308	309	308
95	?	?	310	310	311	?	?	?	?	?	310	?	310	310	312	310
96	313	313	313	?	313	314	314	314	314	314	313	?	?	?	?	?
97	?	315	315	315	315	316	315	315	315	315	315	315	315	315	?	?
98	?	318	318	318	318	319	318	318	318	318	318	318	318	318	?	318
99	?	321	321	320	322	324	324	324	324	321	323	323	324	324	324	324
100	?	327	327	326	327	327	327	327	327	327	327	328	327	327	328	328
101	?	?	?	330	331	330	330	329	329	329	329	331	?	?	?	?
102	?	333	334	334	334	334	334	334	334	334	334	336	?	?	?	?
103	?	346	?	344	344	?	344	?	343	343	345	?	?	346	346	345
104	?	349	349	349	349	?	?	?	347	349	349	?	?	?	349	349
105	?	352	352	351	351	?	351	?	352	352	352	?	351	351	?	?
106	?	354	354	354	354	?	353	?	354	354	354	?	?	?	354	354
107	?	?	?	?	?	?	357	357	355	355	357	357	?	357	356	358
108	?	360	360	360	360	?	359	359	359	359	360	360	?	?	360	360
109	?	?	361	361	361	?	361	361	?	362	?	362	361	?	362	361
110	?	363	364	364	364	?	367	367	367	367	?	364	?	?	368	368
111	?	372	372	369	?	?	?	?	?	?	?	?	?	372	372	372
112	374	374	374	374	374	374	374	374	374	374	374	374	?	?	374	374
113	?	375	376	375	375	375	375	375	375	375	375	376	375	375	375	375
114	?	377	377	377	377	377	377	377	377	377	377	377	377	378	377	377

TABLE XII. (continued)

Variable Number	Group															
	NC	N2	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS	LS	LC
86	286	286	286	286	287	286	286	?	?	?	?	286	286	286	287	287
87	291	291	290	?	289	?	289	?	?	?	?	289	289	289	289	289
88	294	294	294	294	294	294	294	293	293	293	293	293	293	293	293	293
89	295	295	296	296	296	296	296	296	296	297	296	296	296	296	296	296
90	?	?	299	298	298	298	298	298	?	298	298	299	298	298	299	299
91	300	300	301	300	300	300	300	300	303	303	303	303	303	303	303	303
92	305	305	305	305	305	305	?	?	304	304	305	305	?	305	305	304
93	306	?	306	306	306	306	306	306	306	306	?	?	307	306	306	306
94	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308
95	310	310	312	310	312	310	312	311	312	312	310	312	310	311	311	312
96	?	?	?	313	314	314	313	?	313	313	313	314	313	314	313	314
97	?	?	316	315	315	315	315	315	?	315	315	?	316	315	?	317
98	318	318	318	318	318	318	318	318	?	318	318	?	318	318	?	319
99	322	?	320	320	320	320	320	320	320	320	320	?	320	320	?	325
100	328	328	327	327	327	327	327	327	327	327	327	327	327	328	328	328
101	?	?	330	330	330	300	330	330	?	?	330	332	332	330	332	330
102	?	?	339	335	335	338	335	335	339	?	335	337	339	339	339	333
103	346	346	345	345	345	?	345	345	345	345	345	?	342	341	?	340
104	349	349	348	349	348	348	348	348	348	348	348	?	?	350	?	350
105	?	?	351	352	352	351	352	351	?	351	351	?	352	351	352	352
106	354	354	354	354	354	354	354	354	354	354	354	354	354	354	354	353
107	358	358	358	356	358	358	356	356	356	356	356	358	356	356	358	358
108	360	360	360	360	360	359	360	360	360	360	360	359	360	360	360	360
109	361	361	362	361	362	361	361	362	361	361	362	361	361	361	361	362
110	368	368	?	?	?	368	363	363	363	365	365	366	365	366	366	365
111	372	372	369	369	371	371	369	369	371	370	371	372	369	369	369	369
112	374	374	374	374	374	374	374	374	374	374	374	374	373	373	373	373
113	375	375	375	375	375	375	375	375	375	375	375	375	375	376	375	376
114	377	377	377	377	377	377	378	378	378	378	378	378	378	378	378	377

TABLE XII. (continued)

Variable Number	Group															
	ED	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	PN	QU	NH	NT
115	?	379	379	380	379	379	379	379	379	379	379	379	379	379	380	380
116	?	?	?	381	381	?	381	381	381	381	382	?	?	?	?	?
117	?	383	384	383	383	?	383	384	383	384	384	384	384	383	383	383
118	?	?	?	388	387	387	385	388	385	?	385	?	?	?	389	389
119	?	390	390	390	390	?	390	390	390	392	390	?	?	?	392	390
120	?	393	393	393	393	395	395	395	395	393	395	?	?	395	393	393
121	?	398	398	398	398	398	398	398	398	396	398	398	398	397	396	398
122	?	399	399	?	399	?	399	?	399	399	399	?	?	?	400	400
123	?	402	402	401	401	?	401	401	402	401	401	?	402	402	403	403
124	?	?	?	406	408	?	406	406	404	404	405	?	?	?	404	404
125	?	409	410	411	411	?	410	410	410	409	409	409	410	?	412	410
126	?	416	416	415	415	415	415	415	413	416	413	?	?	?	416	416
127	?	417	417	417	417	?	418	417	417	417	417	?	417	417	417	417
128	?	420	420	420	420	?	420	?	422	423	?	424	?	?	419	419
129	?	428	429	429	426	?	426	426	426	429	426	429	?	?	429	429
130	?	430	430	430	430	?	432	432	430	430	?	?	?	?	430	430
131	?	435	435	435	434	?	435	?	435	435	435	434	?	435	435	435
132	437	437	437	?	?	436	436	436	436	437	?	?	?	?	437	437
133	?	438	439	438	438	?	438	?	438	438	438	438	?	438	438	438
134	440	440	440	440	440	441	441	441	441	441	440	441	440	440	440	440
135	442	442	442	?	442	442	442	442	442	442	442	442	?	442	442	443
136	444	444	444	444	444	444	444	444	444	444	444	444	444	444	444	444
137	447	447	447	448	448	449	449	447	447	448	448	448	?	?	447	447
138	452	450	450	450	450	450	450	450	450	450	450	?	452	452	450	451
139	?	453	453	453	453	?	453	453	453	454	453	453	453	453	453	453
140	?	456	?	?	455	456	455	?	456	456	?	456	?	455	456	456
141	457	459	457	?	458	458	458	458	458	458	458	459	?	459	459	459
142	461	461	461	461	461	461	461	461	461	461	461	?	461	461	461	461
143	463	464	464	463	463	463	463	463	463	463	463	463	463	463	?	?

TABLE XII. (continued)

Variable Number	Group NC	N2	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS	LS	LC
115	380	380	380	380	379	379	379	379	379	379	379	379	379	379	380	380
116	?	?	381	381	381	382	382	381	381	382	382	382	381	381	382	382
117	383	384	383	383	383	383	383	383	383	383	383	383	383	383	383	384
118	385	387	388	388	386	386	386	386	386	386	386	386	386	386	386	386
119	391	391	390	390	391	390	390	390	390	390	391	392	392	392	390	391
120	393	393	393	393	393	393	393	393	393	393	395	394	395	394	395	393
121	397	397	397	397	397	398	397	397	397	397	397	397	397	397	397	397
122	400	400	400	400	399	399	399	399	399	399	399	399	399	399	399	399
123	401	401	401	401	401	401	401	401	401	401	401	401	401	401	401	401
124	404	404	405	404	406	406	405	408	406	408	405	406	408	407	408	404
125	412	412	410	409	410	410	412	409	410	412	409	?	409	409	409	409
126	413	413	415	414	415	415	414	414	413	414	414	416	415	414	415	414
127	417	417	417	417	417	417	417	417	417	417	417	418	417	417	417	418
128	421	421	425	425	425	419	422	420	420	425	425	425	420	420	?	419
129	429	429	426	426	426	426	426	426	426	426	427	427	426	426	426	429
130	430	430	?	432	?	?	432	431	433	433	431	430	432	432	432	432
131	435	435	435	435	435	?	435	435	435	435	435	434	435	435	434	434
132	437	437	436	436	436	436	436	436	436	436	436	436	436	436	436	436
133	438	438	438	438	439	438	438	438	438	438	438	438	438	438	438	438
134	441	441	441	441	441	441	441	441	441	441	441	441	441	441	441	441
135	442	442	442	442	442	442	442	442	442	442	442	443	?	443	443	443
136	444	444	444	444	444	444	444	444	444	445	445	445	445	445	445	445
137	447	447	448	448	448	446	446	446	446	446	446	446	446	446	446	446
138	451	?	451	450	450	450	450	450	450	450	450	450	450	450	450	450
139	453	453	453	453	453	?	453	453	453	453	453	454	453	?	453	453
140	456	456	455	?	?	?	456	?	?	455	455	455	?	456	455	456
141	459	457	459	459	457	457	457	457	460	460	460	460	460	460	460	460
142	?	?	461	461	461	461	461	461	461	461	461	462	461	461	461	462
143	?	?	463	463	463	463	463	463	463	463	463	463	463	463	463	463

TABLE XII. (continued)

Variable Number	Group ES	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	PN	QU	NH	NT
144	465	465	465	465	465	467	467	467	465	465	465	465	465	465	465	465
145	471	471	471	474	477	475	472	479	?	472	476	482	481	480	470	470
146	485	484	485	484	484	484	485	485	484	485	485	484	484	484	484	484
147	486	486	486	486	486	486	486	486	486	487	486	?	?	486	486	486
148	?	?	?	?	488	488	488	488	488	488	488	489	?	?	488	488
149	490	490	490	491	490	490	490	490	490	490	490	490	490	490	?	?
150	492	?	?	?	?	492	492	492	492	492	492	492	492	492	493	492
151	494	?	494	496	496	497	495	495	494	494	494	?	?	495	497	494
152	501	499	?	501	501	501	498	498	498	498	499	498	?	?	501	500
153	503	503	503	502	502	503	502	503	503	502	503	502	502	?	503	503
154	?	?	?	506	506	504	504	504	504	504	504	506	?	?	504	504
155	?	510	507	507	507	507	507	507	?	507	508	?	?	509	?	?
156	?	512	512	512	512	512	511	512	512	512	512	512	?	?	512	512
157	?	517	520	514	520	514	514	515	514	515	514	513	?	?	519	520
158	?	?	522	521	522	522	522	522	522	522	522	522	?	?	522	522
159	524	524	524	524	524	524	524	524	524	524	524	524	?	523	524	524
160	?	?	?	?	?	528	527	525	525	525	?	530	?	?	526	525
161	?	533	533	533	533	533	533	533	533	533	533	533	?	?	533	533
162	?	537	537	537	537	537	537	535	537	537	535	536	?	?	534	534
163	?	538	538	541	541	?	539	?	538	540	538	540	538	540	538	538
164	?	543	543	543	542	?	543	?	542	543	543	543	?	?	543	542
165	?	544	544	545	?	?	544	?	544	544	544	?	?	?	?	?
166	?	?	?	552	552	?	?	?	?	?	?	551	?	550	551	551
167	?	554	557	554	554	?	557	?	554	557	557	554	?	?	557	557
168	?	560	?	?	558	?	561	?	561	561	558	?	?	560	?	558
169	?	563	563	562	562	?	562	?	562	562	563	563	564	563	564	564
170	?	565	565	565	565	?	565	?	565	565	565	565	565	565	565	565
171	?	568	568	567	567	?	567	?	568	568	567	567	?	567	568	567
172	?	569	569	569	569	?	569	?	569	569	569	569	569	569	570	569

TABLE XII. (continued)

Variable Number	Group NC	N2	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS	LS	LC
144	465	465	467	465	465	467	467	467	467	467	465	468	467	465	467	468
145	470	470	473	473	478	478	469	478	469	469	469	469	469	469	469	483
146	484	484	484	484	484	484	484	484	484	484	484	484	484	484	484	485
147	486	486	486	486	486	486	486	486	486	486	486	486	486	486	486	?
148	488	488	488	489	488	489	488	488	488	488	488	488	488	488	488	489
149	?	?	490	490	490	490	490	490	490	490	?	?	490	490	490	?
150	492	493	492	492	492	492	492	492	492	492	492	493	492	492	492	493
151	494	494	494	495	494	494	494	494	494	494	494	497	494	494	494	496
152	499	500	499	500	500	498	499	499	499	499	500	501	499	499	499	499
153	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503
154	506	504	506	506	?	506	506	506	505	506	506	505	506	506	505	506
155	?	?	510	510	507	509	509	510	509	509	509	509	509	509	509	509
156	512	512	512	512	512	512	512	512	512	512	512	512	512	512	512	511
157	520	520	520	520	516	515	520	520	516	516	515	518	520	520	515	515
158	522	522	522	522	522	522	522	522	522	522	521	521	522	522	522	522
159	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524	524
160	525	525	525	525	525	525	525	525	525	527	528	530	525	525	529	526
161	533	533	532	533	533	533	533	532	532	532	532	533	533	532	531	531
162	534	534	534	534	534	534	534	?	?	?	?	534	534	534	534	536
163	538	538	538	538	538	538	538	541	538	538	538	538	538	538	538	538
164	542	542	542	542	542	542	542	542	542	542	542	542	542	542	542	542
165	549	549	?	?	?	?	545	545	545	547	547	547	547	547	546	548
166	551	551	551	551	551	551	551	551	551	551	551	551	551	551	553	553
167	557	557	557	557	557	557	557	554	557	555	555	555	555	556	555	556
168	560	560	?	?	559	560	559	559	?	560	558	561	560	559	558	558
169	564	564	?	562	562	562	562	562	?	562	562	562	562	562	562	562
170	?	565	?	566	565	565	566	566	?	566	566	565	565	565	565	565
171	567	567	?	567	567	567	567	567	?	567	567	567	567	567	567	567
172	569	569	?	569	569	569	569	569	?	569	569	569	569	569	569	569

APPENDIX D

METHODOLOGY

G similarity coefficients, matrix ordering, and the smallest space analysis were all prepared using the University of Victoria IBM 360/50 computer.

A. Driver's G Coefficient

G was developed by Kroeber and Driver in 1932 and reinvented by Ellegard in 1959, along with a test of significance (Driver 1961: 320-321). G, like Phi and Q, is designed to analyze the relationships in a 2 x 2 table. Unlike Phi and Q, the G coefficient ignores the d or common absence cell by setting d at infinity. This feature prevents inflation of the correlation by common absences (see Driver 1961:321-322 for a fuller discussion of the common absence problem). "One can imagine that coefficients of similarity which include negative agreements will be inflated as the heterogeneous character of the sample and the size of the universe of items are increased" (Jorgensen 1969:120).

The G coefficient is calculated between each pair of tribal units for all technological variables and for all sets of sub-category variables.

TABLE XIII.

MODEL 2 x 2 TABLE

		Tribe A	
		+	-
Tribe B	+	a	b
	-	c	d

The formula for G is: $$G = \frac{a}{\sqrt{(a+b)\ (a+c)}}$$

B. Ellegard's Test of Significance

When Ellegard (1959) reinvented Driver's G coefficient, he also developed the test of significance of the difference between two scores (see Ellegard [1959:148-153] for a more complete discussion) used occasionally in this study. The test, based on chi-square, makes the assumption of randomness of sampling which is unfulfilled here but the test is still a valuable indication of the plausability of a relationship. If the "evidence turns out to be insufficient statistically it will be insufficient also for an intuitive judgement" (Ellegard 1959:151-152). Ellegard also points out that non-significant differences should not be dismissed immediately as "a positive difference in the sample is always more likely to arise from a real positive difference in the population, than from a negative one-other things being equal". Thus differences in the sample, especially significant differences, suggest areas where further investigation would be of interest.

The technique of calculating Ellegard's test is demonstrated in the following series of steps utilizing a concrete example.

1. Two paired groups are selected with one of the groups occurring in both pairs, for example, Twana-Hartley Bay Tsimshian and Xaisla-Hartley Bay Tsimshian.

Twana-Hartley Bay		Xaisla-Hartley Bay	
53	65	113	37
65		37	
G = .449		G = .753	

2. For each pair t is calculated:

$$t = 1.96 \sqrt{\frac{abc}{ab + ac + bc}}$$

where a, b, c, refer to cells of a 2 x 2 table

t = 8.8 t = 7.8

3. The maximum and minimum G coefficient is calculated for each pair:

$$G\ max = \frac{a + t}{V\ (Total\ Variables)}$$

$$G\ min\ 2 \frac{a - t}{V\ (Total\ Variables)}$$

As the total number of variables involved will vary for each case due to missing information, the number of variables involved is determined by the formula V = a + b or V = a + c.

$$G\ max = \frac{61.8}{118} = 52.4\% \qquad G\ max = \frac{120.8}{150} = 80.5\%$$

$$G\ min = \frac{44.2}{118} = 37.5\% \qquad G\ min = \frac{105.2}{150} = 70.1\%$$

4. The confidence interval is calculated by subtracting G max and G min from the true G, also expressed in percent.

G - G max = -7.5%	G - G max = - 5.2%
G - G min = 7.4%	G - G min = 5.2%
l = approximately ± 8 units of G expressed in percent	m = approximately ± 5 units of G expressed in percent

5. The necessary difference in G coefficients (k) for significance at the $p \leq .05$ is next determined:

$$k = \sqrt{l^2 + m^2}$$
$$= 9$$

A difference of 9 units of G, expressed in percent, is necessary for significance and the difference Twana-Hartley Bay Tsimshàan and Xaisla-Hartley Bay Tsimshian is found to be significant.

APPENDIX E

MATRICES OF G COEFFICIENTS OF SIMILARITY

TABLE XIV. UNORDERED G SCORE MATRIX OF TOTAL TECHNOLOGICAL SIMILARITY FOR 31 NORTHWEST COAST GROUPS (172 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT ES	CW	NA	DE	CX	SL	KL	HO	SE	SQ	WS	TW	PN
ES	1000	730	776	634	653	571	589	592	636	750	560	560	750
CW	730	1000	792	625	622	536	525	646	639	721	582	625	733
NA	776	792	1000	566	604	564	590	628	681	688	738	533	650
DE	634	625	656	1000	805	577	565	595	596	597	517	518	615
CX	653	622	604	805	1000	655	668	690	613	610	625	561	593
SL	563	536	564	577	655	1000	759	731	704	612	606	506	619
KL	571	525	590	599	668	759	1000	820	664	629	630	475	661
HO	589	625	628	565	690	731	820	1000	744	700	677	518	719
SE	592	646	681	595	613	704	664	744	1000	689	664	471	666
SQ	636	639	688	596	610	612	629	700	689	1000	664	551	530
WS	750	721	738	597	625	606	630	677	664	664	1000	657	774
TW	560	682	533	517	561	506	475	518	471	451	657	1000	754
PN	750	733	650	615	693	619	661	719	666	630	774	754	1000
QU	709	631	550	594	639	543	592	621	564	555	653	685	859
NH	479	568	493	414	414	435	365	385	439	503	478	448	403
NT	653	601	623	515	523	543	469	500	553	485	613	514	619
NC	673	562	585	472	491	551	431	463	500	492	593	495	533
KK	490	516	474	503	507	542	463	511	500	433	532	435	456
KR	553	572	514	566	537	562	493	540	532	484	583	482	526
KW	553	522	548	559	585	567	554	562	564	531	541	463	503
BC	509	539	496	510	556	530	552	603	456	496	535	491	651
KO	491	521	485	525	565	524	481	517	531	478	543	440	503
KC	535	511	450	565	582	510	593	511	506	496	534	430	484
KX	421	475	445	450	481	478	486	511	513	456	503	380	491
TH	446	469	401	500	545	468	477	488	476	448	517	449	553
TG	428	404	308	433	468	412	382	383	437	398	468	383	468
GK	254	382	343	358	391	385	396	381	419	389	384	333	413
HM	407	481	411	470	506	463	431	463	458	412	496	375	444
HS	346	481	420	477	493	428	434	441	449	432	469	399	503
LS	330	431	409	450	531	461	448	480	476	422	464	408	480

TABLE XIV (continued)

TRIBAL UNIT	TRIBAL UNIT												
	QU	NH	NT	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG
ES	709	479	653	673	490	553	553	509	491	535	421	446	428
CW	631	568	601	692	516	572	522	539	521	511	475	469	404
NA	550	493	623	585	474	514	548	496	485	450	445	401	308
PE	594	414	515	472	503	566	559	510	525	565	450	500	433
CX	639	414	523	491	507	537	585	556	565	582	481	545	468
SL	543	435	543	551	532	562	567	530	524	510	478	548	412
KL	592	365	469	431	463	493	554	552	481	493	487	477	382
HO	621	385	500	463	511	540	562	603	517	511	511	588	564
SE	564	439	553	500	500	532	564	546	531	506	513	476	437
SQ	555	503	485	492	433	484	531	496	478	496	456	448	398
WS	653	478	613	593	532	583	541	435	543	534	503	517	468
TW	685	448	514	495	435	583	463	591	440	430	380	449	468
PN	859	403	619	533	456	526	503	651	503	484	491	553	383
QU	1000	507	541	521	480	436	506	602	523	530	533	559	468
NH	507	1000	653	623	448	492	480	487	469	379	507	392	468
NT	541	653	1000	834	638	639	597	514	521	470	500	463	536
NC	521	623	834	1000	627	664	586	546	543	488	488	429	399
KK	480	488	638	627	1000	753	655	544	670	653	616	619	455
KR	536	592	639	664	753	1000	674	629	685	670	582	607	440
KW	507	480	567	586	655	674	1000	696	711	677	664	619	590
BC	602	487	541	546	544	629	696	1000	677	642	634	622	585
KO	523	469	521	543	670	685	711	677	1000	793	688	745	630
KC	530	379	470	488	653	670	677	674	793	1000	684	772	581
KX	533	507	500	588	616	582	664	634	688	684	1000	753	699
TH	559	392	463	429	619	606	619	622	745	772	753	1000	699
TG	536	399	455	440	590	585	630	581	699	699	635	756	1000
GK	407	515	393	424	462	437	477	566	534	450	568	549	567
HM	493	426	514	537	688	658	578	571	704	670	653	392	689
HS	457	461	536	536	625	641	574	560	682	639	631	670	649
LS	506	382	447	418	541	526	544	555	606	556	611	655	620
LC	277	400	353	389	414	427	430	482	471	446	456	479	495

TABLE XIV (continued)

TRIBAL UNIT	TRIBAL UNIT GK	HM	HS	LS	LC
ES	254	407	436	330	218
CW	382	481	481	431	327
NA	343	411	412	409	279
PE	358	470	477	450	321
CX	391	506	493	531	363
SL	385	463	428	465	331
KL	396	431	434	448	330
HO	381	463	441	480	353
SE	419	458	449	476	363
SQ	389	412	432	422	334
WS	384	496	469	464	316
TW	333	365	399	408	355
PN	413	444	503	480	257
QU	407	493	457	506	277
NH	515	426	461	382	400
NT	393	514	536	447	353
NC	424	537	536	418	389
KK	426	688	625	541	414
KR	437	658	641	526	427
KW	477	578	574	454	430
BC	566	571	560	555	482
KO	534	704	682	606	471
KC	450	670	639	556	446
KX	568	653	631	611	456
TH	549	692	670	655	479
TG	567	689	649	620	495
GK	1000	529	632	599	557
HM	529	1000	814	658	492
HS	532	814	1000	643	522
LS	599	658	643	1000	626
LC	557	492	522	626	1000

TABLE XV. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: TOTAL SUBSISTENCE (68 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	833	672	583	511	555	711	660	679	782	545	404	568
NA	833	1000	714	591	558	618	660	711	759	795	558	348	555
PE	672	714	1000	852	588	588	560	606	691	683	472	301	464
CX	583	591	852	1000	652	699	694	627	639	641	469	294	509
SL	511	558	588	652	1000	744	645	641	615	599	488	299	571
KL	555	618	588	699	754	1000	791	641	652	655	464	346	565
HO	711	660	560	694	745	791	1000	734	696	683	481	333	528
SE	660	711	606	627	641	641	734	1000	686	694	421	326	418
SQ	679	759	691	639	615	652	696	686	1000	683	508	384	464
WS	782	795	683	641	599	655	658	694	683	1000	639	391	659
TW	545	558	472	469	488	464	481	421	508	639	1000	333	522
NH	404	348	301	294	299	346	333	326	384	391	333	1000	557
NT	578	555	364	509	571	545	527	518	464	659	522	557	1000
NC	545	533	428	470	571	517	462	454	456	625	466	539	854
KK	489	490	407	473	520	453	467	476	421	535	396	500	643
KR	519	500	530	482	619	522	523	507	447	576	418	444	459
KW	480	471	522	549	519	514	469	477	485	500	385	444	571
BC	529	471	543	508	461	507	532	476	446	573	425	500	462
KO	472	446	524	564	500	464	470	507	492	467	362	444	491
KC	490	517	642	580	518	535	514	507	563	564	379	370	526
KX	415	425	447	433	432	426	439	454	455	449	399	629	561
TH	461	461	611	576	480	417	500	500	544	549	490	415	553
TG	346	283	432	457	365	352	333	499	411	399	327	433	500
GK	346	377	333	333	320	358	359	378	373	376	285	660	381
HM	471	407	500	508	442	434	439	432	449	500	321	537	571
HS	500	444	507	516	450	455	446	432	470	483	368	615	618
LS	419	423	461	532	431	439	460	406	484	421	418	419	442
LC	309	250	328	403	351	338	382	391	338	274	293	518	385

TABLE XV (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	545	489	519	480	529	472	490	415	461	346	346	471	500
NA	533	490	500	471	471	446	517	425	471	283	377	407	428
PE	428	507	530	522	453	542	642	447	611	432	333	500	507
CX	470	473	482	549	508	564	580	433	576	457	333	507	516
SL	571	520	619	519	461	500	518	431	480	365	320	442	250
KL	517	453	522	514	507	464	535	426	514	352	358	434	455
HO	462	467	523	469	532	470	514	439	500	333	359	439	446
SE	454	476	507	477	476	507	507	454	500	409	478	432	432
SQ	456	421	447	485	446	492	563	455	544	411	373	448	470
WS	625	535	576	500	473	467	564	449	549	399	396	500	483
TW	466	396	418	385	425	362	379	390	490	327	285	321	368
NH	539	500	444	444	500	444	370	629	415	433	660	537	615
NT	854	654	596	571	462	491	526	561	553	500	381	571	618
NC	1000	678	655	578	481	517	551	534	438	446	436	596	625
KK	678	1000	712	606	370	636	606	553	593	609	492	707	634
KR	655	712	1000	617	546	565	652	573	582	587	556	641	621
DW	578	606	617	1000	584	628	642	617	502	602	432	544	537
BC	481	370	546	484	1000	552	582	599	569	507	584	461	492
KO	417	636	565	628	522	1000	780	599	714	714	550	690	671
KC	551	606	652	642	582	780	1000	657	785	699	478	633	585
KX	534	553	573	617	599	599	657	1000	705	617	575	688	602
TH	438	593	582	602	569	514	785	705	1000	710	462	632	565
TG	446	609	537	602	507	714	699	617	710	1000	500	691	641
GK	436	492	446	432	584	550	478	575	462	500	1000	492	454
HM	596	707	641	544	461	590	633	588	632	691	492	1000	823
HS	625	634	621	537	492	671	585	602	565	641	454	823	1000
LS	425	532	532	538	823	602	573	630	676	630	531	567	681
LC	413	454	434	442	552	506	479	557	500	542	637	507	528

TABLE XV (continued)

TRIBAL UNIT	TRIBAL UNIT LS	TRIBAL UNIT LC
CW	429	309
NA	423	250
PE	461	328
CX	534	403
SL	431	351
KL	439	338
HO	460	382
SE	406	391
SQ	484	338
WS	421	274
TW	418	293
NH	419	618
NT	442	385
NC	425	413
KK	532	454
KR	532	434
KW	438	442
BC	523	552
KO	602	506
KC	573	497
KX	630	557
TH	676	500
TG	630	542
GK	531	637
HM	567	507
HS	681	528
LS	1000	661
LC	661	1000

TABLE XVI. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: SUBSISTENCE--FOOD PREPARATION (16 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	1000	615	416	416	538	636	615	769	799	416	555	500
NA	1000	1000	615	416	416	538	636	615	769	799	416	555	500
PE	615	615	1000	846	461	533	538	666	533	750	384	500	545
CX	416	416	846	1000	583	692	727	538	384	699	333	500	727
SL	416	416	461	483	1000	785	833	500	500	454	384	666	699
KL	538	538	533	692	785	1000	928	500	500	538	357	500	727
HO	636	636	538	727	833	928	1000	642	647	615	384	444	799
SE	615	615	666	538	500	500	642	1000	750	769	357	500	727
SQ	769	769	533	584	500	500	642	750	1000	692	428	500	636
WS	799	799	750	699	454	538	615	769	692	1000	500	625	777
TW	416	416	384	333	384	357	384	357	428	500	1000	333	399
NH	555	555	500	500	666	500	444	500	500	625	333	1000	599
NT	500	500	545	727	699	727	799	727	636	777	399	599	1000
NC	500	500	545	727	545	583	636	583	500	799	454	599	909
KK	636	636	692	727	500	571	538	500	528	666	583	699	636
KR	500	500	571	666	538	599	571	399	399	538	384	500	545
KW	500	500	642	750	538	599	571	466	399	538	307	500	636
BC	461	461	599	692	500	562	571	437	375	461	285	500	545
KO	538	538	666	615	571	635	571	625	500	615	428	599	636
KC	461	461	666	692	500	625	642	625	437	615	285	399	636
KX	454	454	615	750	666	642	615	500	428	500	333	500	727
TH	500	500	642	666	538	599	571	599	466	538	307	399	636
TG	454	454	615	636	416	500	461	500	357	500	350	333	500
GK	416	416	538	500	461	571	500	357	357	454	307	666	399
HM	615	615	666	692	642	750	785	625	562	692	357	699	737
HS	500	500	571	615	615	599	615	533	466	500	461	699	737
LS	416	416	428	583	538	533	538	333	333	333	384	555	599
LC	230	230	333	461	428	437	428	250	187	230	285	500	454

TABLE XVI (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	500	636	500	500	461	538	461	454	500	454	416	615	500
NA	500	636	500	500	461	538	461	454	500	454	416	615	500
PE	545	692	571	642	599	666	666	615	642	615	538	666	571
CX	727	727	666	750	692	615	692	750	666	636	500	692	615
SL	545	500	538	538	500	571	500	666	538	416	461	642	615
KL	583	571	599	599	562	625	625	642	599	500	571	750	599
HO	636	538	571	571	571	571	642	615	571	461	500	785	615
SE	583	500	399	466	437	625	625	500	599	500	357	625	533
SQ	500	428	399	399	375	500	437	428	466	357	357	562	466
WS	799	666	538	538	461	615	615	500	538	500	454	692	500
TW	454	583	384	307	285	428	285	333	307	250	307	357	461
NH	599	699	500	500	500	599	399	500	399	333	366	699	699
NT	909	636	545	636	545	636	636	727	636	500	399	737	737
NC	1000	666	583	583	500	500	500	583	500	454	363	583	583
KK	666	1000	642	642	571	714	571	615	571	538	666	785	769
KR	583	642	1000	866	799	599	599	642	599	714	615	599	571
DW	584	642	866	1000	799	733	733	785	733	857	692	666	642
BC	500	571	799	799	1000	562	750	785	799	785	642	562	466
KO	500	714	599	733	562	1000	750	714	799	785	714	750	733
KC	500	571	599	733	750	750	1000	857	933	857	500	688	533
KX	583	615	642	785	785	714	857	1000	857	769	583	714	642
TH	500	571	599	733	799	799	933	857	1000	857	538	666	571
TG	454	538	714	857	785	785	857	769	857	1000	615	571	538
GK	363	666	615	692	642	714	500	583	538	615	1000	642	538
HM	583	785	599	666	562	750	687	714	666	571	642	1000	866
HS	583	769	571	642	466	733	533	642	571	538	538	866	1000
LS	545	538	714	714	666	466	533	592	571	692	461	599	785
LC	416	428	399	399	437	312	375	500	399	428	428	437	533

TABLE XVI (continued)

TRIBAL UNIT	TRIBAL UNIT LS	LC
CW	416	230
NA	416	230
PE	428	333
CX	583	461
SL	538	428
KL	433	437
HO	538	428
SE	333	250
SQ	333	178
WS	333	230
TW	384	285
NH	555	500
NT	599	454
NC	545	416
KK	538	428
KR	714	399
KW	714	399
BC	666	437
KO	466	312
KC	533	375
KX	692	500
TH	571	399
TG	692	428
GK	461	428
HM	599	437
HS	785	533
LS	1000	666
LC	666	1000

TABLE XVII. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: SUBSISTENCE—WATER RESOURCES (23 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	649	608	684	545	590	739	619	619	699	533	263	599
NA	649	1000	727	722	619	761	636	750	799	736	571	222	631
PE	608	727	1000	909	679	719	576	583	791	652	470	142	500
CX	864	722	909	1000	652	737	652	681	727	549	466	149	526
SL	545	619	679	652	1000	807	730	692	719	608	758	136	545
KL	590	761	719	727	807	1000	769	719	799	708	611	238	636
HO	739	636	576	652	730	769	1000	759	639	583	500	227	590
SE	619	750	583	681	692	719	759	1000	583	565	368	190	571
SQ	619	799	791	727	719	799	639	583	1000	590	444	299	545
WS	699	736	652	549	608	708	583	565	509	1000	705	363	736
TW	533	571	470	466	578	611	500	368	444	705	1000	285	642
NH	263	222	142	419	136	238	227	190	299	263	285	1000	449
NT	599	631	500	526	545	636	590	571	545	736	642	449	1000
NC	578	611	476	500	619	666	523	549	571	722	538	368	772
KK	380	399	521	454	519	458	541	583	521	523	411	318	428
KR	565	590	599	500	615	615	653	639	559	695	555	372	521
KW	454	523	559	565	481	576	500	500	599	521	421	318	545
BC	571	476	391	523	439	541	583	541	478	523	500	333	476
KO	434	409	461	608	481	444	481	538	538	375	368	227	347
KC	521	590	615	512	555	592	555	500	730	583	473	272	478
KX	347	409	359	272	307	307	384	399	399	434	444	590	478
TH	409	428	559	454	461	461	439	559	521	611	380	500	461
TG	391	272	384	434	296	333	333	423	461	375	315	363	391
GK	272	380	239	260	259	230	269	384	319	304	214	727	272
HM	476	299	458	500	359	319	359	375	458	454	411	363	318
HS	571	476	541	571	439	439	439	479	541	565	421	399	523
LS	428	428	458	500	439	319	399	458	458	409	500	285	428
LC	304	227	269	391	333	259	407	461	346	166	210	500	347

TABLE XVII (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	578	380	565	454	571	434	521	347	409	391	272	476	571
NA	611	399	590	523	476	409	590	409	428	272	380	299	476
PE	476	521	599	559	391	461	615	359	559	384	238	458	451
CX	500	454	500	565	523	608	621	272	454	434	260	500	571
SL	619	519	615	481	439	481	555	207	461	296	259	359	439
KL	666	458	615	576	541	444	592	307	461	333	230	319	439
HO	523	541	653	500	583	481	555	384	461	333	269	359	439
SE	549	583	639	500	541	538	500	399	439	523	384	385	479
SQ	571	521	559	599	547	538	730	399	559	461	319	458	541
WS	722	523	695	521	523	375	583	434	521	375	304	454	565
TW	538	411	555	421	500	368	473	444	611	315	210	411	421
NH	368	318	272	318	333	227	272	590	380	363	627	363	399
NT	772	428	521	545	476	347	478	478	500	391	272	318	523
NC	1000	449	590	619	549	500	590	409	409	373	380	428	500
KK	449	1000	679	599	333	679	679	519	708	639	439	625	521
KR	590	679	1000	538	519	444	666	555	616	333	307	519	559
KW	619	599	538	1000	639	666	703	538	615	518	370	599	599
BC	549	333	519	639	1000	599	639	599	541	479	479	478	500
KO	500	679	444	666	599	1000	750	370	629	678	444	653	576
KC	590	679	666	703	639	750	1000	555	703	642	370	653	576
KX	409	519	555	538	599	370	555	1000	653	444	576	479	479
TH	409	708	615	615	541	629	603	653	1000	666	307	679	759
TG	363	639	333	518	479	678	643	444	666	1000	333	730	730
GK	380	439	307	370	479	444	360	576	307	333	1000	359	319
HM	428	625	519	399	478	653	653	479	679	730	359	1000	791
HS	500	521	559	599	500	576	576	479	759	730	319	791	1000
LS	349	583	519	519	500	615	500	559	679	576	399	599	719
LC	363	559	407	481	599	607	428	592	518	535	592	538	500

TABLE XVII (continued)

TRIBAL UNIT	TRIBAL UNIT LS	LC
CW	428	304
NA	428	227
PE	458	269
CX	500	391
SL	439	333
KL	319	259
HO	399	407
SE	458	461
SQ	458	346
WS	409	166
TW	500	210
NH	285	500
NT	428	347
NC	349	363
KK	583	555
KR	519	407
KW	519	481
BC	400	599
KO	615	607
KC	500	428
KX	559	592
TH	679	518
TG	576	535
GK	399	592
HM	599	538
HS	719	500
LS	1000	653
LC	653	1000

TABLE XVIII. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: SUBSISTENCE--LAND RESOURCES (29 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	933	789	588	555	526	722	736	684	875	647	500	571
NA	933	1000	761	578	599	523	699	736	614	849	674	375	500
PE	789	761	1000	807	538	500	555	592	689	679	519	363	391
CX	588	578	807	1000	727	679	719	625	692	695	545	333	380
SL	555	599	538	727	1000	615	592	692	538	727	454	333	500
KL	526	533	500	679	615	1000	740	653	607	666	416	380	363
HO	722	699	555	719	692	740	1000	759	777	826	521	399	333
SE	736	736	592	625	692	653	759	1000	740	782	500	380	363
SQ	682	714	689	692	538	607	777	740	1000	759	599	479	304
WS	875	849	679	695	727	666	826	782	759	1000	666	421	526
TW	647	647	519	545	454	416	521	500	599	666	1000	368	500
NH	500	375	363	333	333	380	399	380	409	321	468	1000	636
NT	571	500	391	380	500	363	333	363	304	526	500	636	1000
NC	533	470	333	318	500	347	318	304	333	449	428	666	909
KK	529	500	407	375	545	384	359	359	333	478	291	590	869
KR	470	399	444	375	727	384	359	439	370	478	333	590	695
KW	500	399	428	439	583	407	384	416	428	458	399	545	565
BC	529	473	423	391	461	439	458	439	461	434	454	666	409
KO	473	428	551	500	461	392	407	407	448	479	319	519	565
KC	473	476	655	576	461	428	407	444	482	519	349	454	521
KX	473	428	448	423	461	428	407	481	517	439	399	627	656
TH	500	500	642	639	461	518	500	500	571	583	500	454	565
TG	222	199	392	399	461	396	269	346	392	375	375	545	608
GK	388	349	321	319	307	370	384	384	428	458	333	590	478
HM	368	380	448	423	374	357	333	350	379	439	239	636	739
HS	421	380	448	423	307	392	370	333	413	399	279	772	652
LS	411	421	481	541	307	500	479	399	592	478	375	500	380
LC	368	285	379	384	307	357	333	407	413	399	359	545	391

TABLE XVIII (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	533	529	470	500	429	473	473	473	500	222	388	368	421
NA	470	500	399	399	473	428	476	428	500	199	349	380	380
PE	333	407	444	428	423	551	655	448	642	392	321	448	448
CX	318	375	375	439	391	500	576	423	639	399	319	423	423
SL	500	545	727	583	461	461	461	461	461	461	307	384	307
KL	347	384	384	307	439	392	428	428	518	296	370	375	392
HO	318	359	359	384	458	407	407	407	500	269	384	333	370
SE	304	359	439	461	439	407	444	481	500	346	384	370	333
SQ	333	333	370	428	461	448	482	517	571	392	428	379	413
WS	449	478	478	458	434	479	519	439	483	375	458	349	399
TW	428	291	333	399	454	319	359	399	500	375	333	239	279
NH	666	590	590	545	666	590	454	727	454	545	590	636	772
NT	909	869	695	565	409	565	521	565	565	608	487	439	652
NC	1000	875	750	541	409	541	541	625	434	521	521	750	750
KK	875	1000	777	592	291	555	555	555	500	615	461	740	666
KR	750	777	1000	555	416	666	666	555	538	653	500	777	703
KW	541	592	555	1000	399	535	535	607	518	555	370	428	428
BC	409	291	416	399	1000	500	423	500	461	384	653	384	500
KO	541	555	666	535	500	1000	827	758	750	714	571	689	723
KC	541	555	666	535	423	827	1000	655	785	678	571	586	620
KX	625	555	555	620	500	758	655	1000	678	714	571	620	689
TH	434	500	538	518	461	750	585	678	1000	678	571	571	707
TG	521	615	653	555	384	714	678	714	678	1000	607	714	607
GK	521	461	500	370	653	571	571	571	571	607	1000	535	535
HM	750	740	777	428	384	689	586	620	671	714	353	1000	827
HS	750	666	703	428	500	724	620	689	607	607	535	827	1000
LS	434	479	439	461	458	666	666	666	730	653	692	518	592
LC	458	370	481	428	576	517	586	551	535	607	785	517	551

TABLE XVIII (continued)

TRIBAL UNIT	TRIBAL UNIT LS	LC
CW	411	368
NA	421	285
PE	481	379
CX	501	384
SL	307	307
KL	500	357
HO	479	333
SE	399	407
SQ	592	413
WS	478	399
TW	399	375
NH	359	500
NT	545	380
NC	391	434
KK	458	479
KR	370	439
KW	481	461
BC	428	458
KO	576	666
KC	527	666
KX	586	666
TH	551	730
TG	535	653
GK	607	692
HM	785	518
HS	517	592
LS	1000	666
LC	666	1000

TABLE XIX. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: DRESS, ORNAMENT, AND TEXTILES (33 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	736	607	714	444	571	714	551	733	750	619	666	578
NA	736	1000	745	620	589	654	683	701	711	679	500	540	683
PE	607	745	1000	655	444	714	649	620	566	586	545	526	523
CX	714	620	655	1000	500	724	857	566	699	655	681	647	526
SL	444	589	444	500	1000	799	699	699	599	500	333	750	799
KL	571	654	714	724	799	1000	909	666	633	571	478	500	444
HO	714	683	649	857	699	909	1000	818	863	727	555	666	538
SE	551	701	620	566	699	666	818	1000	709	586	478	529	526
SQ	733	711	566	699	599	633	863	700	1000	766	565	722	549
WS	750	689	586	655	500	571	727	586	766	1000	761	666	649
TW	619	500	545	681	333	478	555	678	565	761	1000	833	599
NH	666	540	526	647	750	500	666	528	722	666	833	1000	611
NT	578	683	523	526	599	444	538	526	549	649	599	611	1000
NC	631	634	523	526	500	388	500	473	549	674	642	947	647
KK	551	459	419	466	666	413	523	388	419	500	434	368	571
KR	689	599	566	533	399	379	523	466	548	666	478	500	761
KW	599	612	612	580	500	599	727	580	562	548	521	526	476
BC	571	466	586	500	535	666	482	566	620	565	588	599	631
KO	620	533	533	599	399	482	619	466	516	633	608	555	549
KC	461	301	407	500	222	399	500	346	407	500	428	352	333
KX	479	230	346	479	125	375	500	319	384	439	444	333	299
TH	481	285	448	500	299	444	526	392	379	500	428	388	449
TG	500	346	319	439	571	479	578	519	500	479	449	500	411
GK	535	448	413	413	299	275	428	344	333	482	347	235	526
HM	533	387	483	451	399	433	500	345	375	387	434	315	522
HS	458	359	375	458	333	521	625	416	479	500	277	333	263
LS	500	490	423	509	500	408	514	612	431	431	410	437	352
LC	399	258	225	290	399	333	409	387	381	225	304	263	238

TABLE XIX (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	631	551	689	599	571	620	461	458	479	481	500	535	533
NA	634	459	599	612	466	533	301	359	230	285	346	448	387
PE	523	419	566	612	586	533	407	375	346	448	319	413	483
CX	526	466	533	580	586	599	500	458	479	500	439	413	451
SL	500	666	399	500	500	399	222	333	125	299	571	299	299
KL	388	413	379	535	482	399	521	375	444	479	275	599	433
HO	500	523	523	727	666	619	500	625	500	526	578	428	500
SE	473	399	466	580	482	466	346	416	319	392	519	344	354
SQ	549	419	548	562	566	516	407	479	384	379	500	333	375
WS	684	500	666	584	620	633	500	500	439	500	479	482	387
TW	642	434	478	521	565	608	428	277	444	428	449	347	434
NH	647	368	500	526	588	555	352	333	333	388	500	235	315
NT	947	571	761	476	599	549	333	363	299	449	411	526	423
NC	1000	523	750	428	631	500	294	222	263	421	388	526	523
KK	523	1000	741	625	699	677	607	599	615	586	538	699	687
KR	750	741	1000	750	774	838	642	500	592	666	461	733	687
KW	428	625	750	1000	806	906	714	615	629	666	518	548	575
BC	631	699	774	806	1000	833	777	519	653	578	538	655	677
KO	294	607	642	714	777	750	1000	521	833	777	454	592	593
KC	222	599	500	615	519	639	521	1000	782	639	654	583	607
KX	263	615	592	629	654	730	833	782	1000	814	714	599	538
TH	421	586	666	666	758	724	777	639	814	1000	666	642	629
TG	388	538	461	518	538	538	454	652	714	666	1000	538	633
GK	526	699	733	548	655	645	592	583	599	642	538	1000	592
HM	523	687	687	565	677	593	607	538	629	633	592	709	1000
HS	333	452	415	481	423	452	391	454	465	530	692	538	709
LS	299	677	838	906	833	751	750	639	730	724	538	645	415
LC	238	406	343	423	354	406	428	384	481	399	555	451	484

TABLE XIX (continued)

TRIBAL UNIT	TRIBAL UNIT LS	LC
CW	500	399
NA	490	258
PE	423	225
CX	509	290
SL	500	290
KL	500	399
HO	408	333
SE	415	409
SQ	612	387
WS	431	281
TW	431	225
NH	410	304
NT	437	263
NC	352	238
KK	333	238
KR	452	406
KW	415	343
BC	481	424
KO	423	354
KC	452	406
KX	391	428
TH	454	384
TG	465	481
GK	530	399
HM	692	555
HS	538	451
LS	1000	581
LC	581	1000

TABLE XX. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: STRUCTURES AND FURNISHINGS (27 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	727	649	699	625	523	411	619	619	647	583	590	681
NA	727	1000	619	619	500	454	500	523	545	647	538	478	652
PE	649	619	1000	782	625	608	599	500	500	473	538	521	652
CX	699	619	782	1000	875	625	599	665	478	549	615	391	521
SL	625	500	625	875	1000	888	888	777	500	625	1000	333	444
KL	523	454	608	625	888	1000	863	719	439	619	428	239	399
HO	411	500	599	599	888	863	1000	666	476	611	545	190	380
SE	619	523	500	565	777	719	666	1000	583	619	384	375	500
SQ	619	545	500	478	500	439	476	583	1000	500	571	625	500
WS	647	647	473	549	625	619	611	619	500	1000	727	299	399
TW	583	538	538	615	1000	428	545	384	571	727	1000	428	428
NH	590	478	521	391	333	239	190	375	625	299	428	1000	807
NT	681	652	652	521	444	399	380	500	500	399	428	807	1000
NC	500	521	565	478	444	279	333	375	541	449	428	653	692
KK	500	380	727	590	555	541	599	521	434	476	384	500	583
KR	523	363	695	565	444	519	571	500	458	476	384	519	559
KW	500	476	545	590	666	583	599	521	478	428	384	375	416
BC	549	476	590	681	777	708	714	608	434	549	384	375	583
KO	545	391	500	541	444	500	454	479	359	571	285	384	384
KC	636	391	541	625	444	500	409	479	479	523	428	384	346
KX	590	478	583	625	444	615	545	559	399	523	285	346	423
TH	500	391	458	583	444	461	409	439	359	523	285	384	384
TG	454	260	333	375	555	384	318	399	399	571	428	346	269
GK	428	318	347	434	444	479	380	375	416	299	307	319	359
HM	454	304	500	583	555	576	500	439	399	476	357	307	269
HS	409	347	416	458	222	461	363	359	476	476	285	269	230
LS	380	227	478	565	444	479	454	375	250	476	384	239	359
LC	272	304	333	291	222	269	227	199	399	428	571	246	346

TABLE XX (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	500	500	523	500	549	545	636	590	500	454	428	454	409
NA	521	380	373	476	476	391	391	478	391	260	318	304	416
PE	565	727	695	545	590	500	541	583	458	333	347	500	458
CX	478	590	565	490	681	541	625	625	583	357	434	583	222
SL	444	555	444	666	777	444	444	444	444	555	444	555	461
KL	279	541	519	583	708	500	500	615	461	384	497	576	461
HO	333	599	571	599	714	454	409	545	409	318	380	500	363
SE	375	521	500	521	608	479	479	559	439	399	375	439	359
SQ	541	434	458	478	434	359	479	399	359	399	416	399	359
WS	449	476	428	549	571	523	523	523	571	299	476	299	476
TW	428	384	384	384	384	285	428	285	285	428	307	357	285
NH	653	500	519	375	375	384	384	346	384	346	319	307	269
NT	692	583	559	416	583	384	346	423	384	269	359	269	230
NC	1000	541	559	458	416	423	346	423	423	346	359	307	269
KK	541	1000	799	719	583	599	639	599	559	519	375	519	439
KR	559	799	1000	559	500	692	692	615	653	538	359	615	615
KW	458	719	559	1000	708	559	639	719	599	639	500	559	479
BC	416	583	500	708	1000	599	519	679	599	479	583	469	399
KO	423	599	692	559	599	1000	777	740	814	666	500	666	666
KC	346	639	692	639	519	777	1000	777	740	703	423	740	703
KX	423	599	615	719	679	740	777	1000	740	592	500	666	629
TH	423	559	653	599	599	814	740	740	1000	703	538	666	592
TG	346	519	538	639	479	666	703	592	703	1000	538	629	555
GK	359	375	359	500	583	500	423	500	538	538	1000	461	500
HM	307	519	615	559	479	666	740	666	666	629	461	1000	814
HS	269	539	615	479	399	666	703	629	592	555	500	814	1000
LS	359	583	599	500	583	653	615	538	615	538	559	769	653
LC	461	439	500	439	399	444	444	296	407	481	384	444	481

TABLE XX (continued)

TRIBAL UNIT	TRIBAL UNIT LS	LC
CW	380	272
NA	227	304
PE	478	333
CX	565	291
SL	444	222
KL	479	269
HO	454	227
SE	375	199
SQ	250	399
WS	476	428
TW	384	571
NH	239	346
NT	359	346
NC	359	461
KK	583	439
KR	599	500
KW	500	439
BC	583	399
KO	653	444
KC	615	444
KX	538	296
TH	615	407
TG	538	481
GK	559	384
HM	769	444
HS	653	381
LS	1000	576
LC	576	1000

TABLE XXI. UNORDERED G SCORE MATRIX OF TECHNOLOGICAL SIMILARITY: TRAVEL AND TRANSPORT (29 VARIABLES)

TRIBAL UNIT	TRIBAL UNIT												
	CW	NA	PE	CX	SL	KL	HO	SE	SQ	WS	TW	NH	NT
CW	1000	809	599	608	590	434	500	761	478	636	578	799	699
NA	809	1000	571	695	590	565	608	761	608	695	500	699	699
PE	599	571	1000	826	590	521	478	619	521	565	611	599	500
CX	608	695	826	1000	653	629	615	679	629	653	636	625	541
SL	590	590	590	653	1000	714	666	807	642	653	521	639	519
KL	434	565	521	629	714	1000	785	723	689	629	500	423	384
HO	500	608	478	615	666	785	1000	769	750	666	565	519	519
SE	761	761	619	679	808	703	769	1000	777	799	652	679	719
SQ	478	608	521	629	642	689	750	777	1000	666	625	461	500
WS	636	695	565	653	653	629	666	799	666	1000	545	625	625
TW	578	500	611	636	521	500	565	652	625	545	1000	500	500
NH	799	699	599	625	639	421	519	679	461	625	500	1000	730
NT	699	699	500	541	519	384	519	719	500	625	500	730	1000
NC	666	777	444	545	565	416	651	782	541	590	500	750	833
KK	565	521	434	592	535	482	535	629	482	595	583	500	653
KR	681	608	565	653	555	500	571	692	535	592	739	599	679
KW	590	695	590	679	653	555	628	799	666	692	636	625	708
BC	523	590	454	519	592	518	629	719	592	538	636	500	541
KO	608	652	478	592	642	517	607	749	551	629	583	576	653
KC	619	636	454	599	615	518	592	719	518	615	454	500	583
KX	571	545	409	519	615	518	592	719	518	615	500	500	541
TH	500	500	409	538	555	535	518	615	428	576	478	439	439
TG	576	476	533	519	500	407	461	599	444	519	454	439	479
GK	318	272	409	384	444	285	296	384	285	307	394	471	346
HM	476	500	391	519	538	444	518	639	444	538	454	458	583
HS	500	500	409	500	500	357	444	653	500	538	478	479	639
LS	468	468	383	472	526	474	526	581	440	545	408	452	528
LC	325	352	325	313	301	327	339	353	327	353	425	353	374

TABLE XXI (continued)

TRIBAL UNIT	TRIBAL UNIT												
	NC	KK	KR	KW	BC	KO	KC	KX	TH	TG	GK	HM	HS
CW	666	565	681	590	523	608	619	571	500	476	318	476	500
NA	777	521	608	695	590	652	636	545	500	476	272	500	500
PE	444	434	565	590	454	478	454	409	409	523	409	391	409
CX	545	592	653	679	519	592	599	519	538	519	384	519	500
SL	565	535	555	653	592	642	615	615	555	500	444	538	500
KL	416	482	500	555	518	517	518	518	535	407	383	444	357
HO	565	535	571	629	629	607	592	592	518	461	296	518	444
SE	782	629	692	799	719	740	719	719	615	599	384	639	653
SQ	541	482	535	666	592	551	518	518	428	444	285	444	500
WS	590	592	592	692	538	692	615	615	576	619	307	538	538
TW	500	583	739	636	636	583	645	500	478	454	304	545	478
NH	750	500	599	625	500	576	500	500	439	439	461	458	479
NT	833	653	679	708	541	653	583	541	439	479	346	583	639
NC	1000	625	695	818	636	750	681	590	478	521	416	590	608
KK	625	1000	785	703	666	758	851	740	714	592	357	777	678
KR	695	785	1000	777	703	714	703	592	555	576	370	629	629
KW	818	703	777	1000	769	777	769	730	653	639	423	693	653
BC	636	666	703	769	1000	851	807	730	692	639	461	730	666
KO	750	758	714	777	851	1000	888	851	785	666	500	888	821
KC	681	851	703	769	807	888	1000	814	777	653	384	846	769
KX	590	740	592	730	730	851	814	1000	888	730	538	884	807
TH	478	714	555	653	592	785	777	888	1000	814	555	923	814
TG	521	592	576	639	639	666	653	730	814	1000	592	799	769
GK	516	357	370	423	461	500	384	338	555	592	1000	576	592
HM	590	777	629	653	730	888	847	884	933	799	576	1000	961
HS	608	678	629	653	666	821	769	807	814	769	592	961	1000
LS	489	610	526	618	691	745	654	800	807	727	666	836	772
LC	340	290	277	313	470	472	392	431	490	452	509	509	528

TABLE XXI (continued)

TRIBAL UNIT	TRIBAL UNIT LS	LC
CW	468	325
NA	468	325
PE	383	325
CX	472	313
SL	526	301
KL	474	327
HO	536	339
SE	581	353
SQ	440	327
WS	545	353
TW	408	425
NH	452	353
NT	538	374
NC	489	340
KK	610	290
KR	526	377
KW	618	313
BC	691	470
KO	745	472
KC	654	392
KX	800	431
TH	807	490
TG	727	452
GK	666	509
HM	836	509
HS	772	528
LS	1000	571
LC	571	1000

APPENDIX F

SMALLEST SPACE COORDINATES

TABLE XXII. SMALLEST SPACE COORDINATES FOR TOTAL TECHNOLOGY FOR 31 GROUPS USING TWO DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2
East Sanetch	-85.440	-21.761
Cowichan	-72.960	-30.513
Nanaimo	-93.976	-12.837
Pentlatch	-79.872	11.814
Comox	-54.267	10.405
Slaiamun	-60.712	31.799
Klahuse	-69.892	39.351
Homalco	-66.805	23.497
Sechelt	-68.110	19.593
Squamish	-93.239	10.250
West Sanetch	-70.416	-17.497
Twana	-100.000	-47.121
Puyallup-Nisqually	-69.562	- 7.002
Quinault	-63.297	-19.819
Hupachisat	-31.109	-100.000
Tsishaat	-45.160	-59.327
Clayoquot	-35.806	-64.355
Koskimo	-0.028	-35.084
Kwexa	-13.270	-24.958
Wikeno	-11.402	-4.118
Bella Coola	-13.200	1.023

TABLE XXII (continued)

GROUP	DIMENSION I	DIMENSION 2
Bella Bella	6.500	-6.093
Xaihais	3.552	14.149
Xaisla	18.076	3.171
Hartley Bay	18.224	14.186
Tsimshian Proper	42.138	-3.441
Gitksan	73.483	-35.479
Massett	27.984	-13.791
Skedans	25.205	-20.672
Sanyakwan	39.219	24.256
Chilkat	100.000	-1.314

TABLE XXIII. SMALLEST SPACE COORDINATES FOR TOTAL TECHNOLOGY FOR 28 GROUPS USING TWO DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2
Cowichan	-70.849	-32.017
Nanaimo	-87.035	-46.791
Pentlatch	-71.316	-66.003
Comox	-50.224	-79.746
Slaiamun	-60.898	-90.256
Klahuse	-66.793	-100.000
Homalco	-68.231	-86.111
Sechelt	-65.455	-76.837
Squamish	-88.110	-66.363
West Sanetch	-66.275	-45.774
Twana	-100.000	-15.423
Hupachisat	-30.541	36.061
Tsishaat	-42.431	-4.061
Clayoquot	-32.442	0.601
Koskimo	0.898	-24.603
Kwexa	-13.725	-35.720
Wikeno	-12.634	-56.112
Bella Coola	-8.278	-66.270
Bella Bella	7.488	-54.400
Xaihais	3.865	-73.073
Xaisla	18.613	-61.694
Hartley Bay	21.712	-72.282

TABLE XXIII (continued)

GROUP	DIMENSION I	DIMENSION 2
Tsimshian Proper	46.263	-55.556
Gitksan	72.134	-25.805
Massett	27.-34	-47.267
Skedans	27.671	-38.006
Sanyakwan	39.456	-84.134
Chilkat	100.000	-66.462

TABLE XXIV. SMALLEST SPACE COORDINATES FOR TOTAL SUBSISTENCE USING THREE DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Cowichan	-91.498	-24.047	-41.159
Nanaimo	-100.000	-38.031	-43.932
Pentlatch	-74.622	-87.669	-71.499
Comox	-65.432	-100.000	-49.721
Slaiamun	-82.078	-92.405	-18.233
Klahuse	-83.318	-85.091	-4.456
Homalco	-89.407	-67.533	-8.411
Sechelt	-86.995	-54.471	-5.845
Squamish	-98.205	-68.742	-45.072
West Sanetch	-81.018	-31.856	-48.949
Twana	-98.641	39.811	-12.388
Hupachisat	77.304	29.836	-25.774
Tsishaat	-24.912	3.127	-63.462
Clayoquot	-11.172	10.091	-68.787
Koskimo	10.776	-34.008	-100.000
Kwexa	-5.522	-38.101	-86.101
Wikeno	5.398	-85.667	-12.089
Bella Coola	10.628	-51.253	35.312
Bella Bella	25.634	-93.772	-63.875
Xaihais	0.063	-91.776	-63.082
Xaisla	45.440	-47.053	-24.291
Hartley Bay	12.539	-87.594	-55.660

TABLE XXIV (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Tsimshian Proper	65.981	-87.581	-75.691
Gitksan	86.777	-17.473	16.504
Massett	34.372	-49.525	-88.173
Skedans	36.781	-42.955	-73.594
Sanyakwan	53.155	-99.435	-23.075
Chilkat	100.000	-69.283	10.155

TABLE XXV. SMALLEST SPACE COORDINATES FOR FOOD PREPARATION USING THREE DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Cowichan	74.220	15.898	-54.179
Nanaimo	75.068	17.282	-53.858
Pentlatch	15.328	50.763	-37.342
Comox	-31.356	7.772	7.233
Slaiamun	-15.901	-48.875	33.300
Klahuse	-10.744	-10.668	28.994
Homalco	14.172	-1.606	25.928
Sechelt	54.660	41.748	10.228
Squamish	89.985	18.008	-0.435
West Sanetch	52.138	11.295	-22.894
Twana	100.000	-100.000	-48.013
Hupachisat	10.761	-63.040	-72.715
Tsishaat	12.796	-15.847	10.513
Clayoquot	29.773	-43.248	3.691
Koskimo	8.493	-21.520	-58.926
Kwexa	-59.543	-7.275	-51.649
Wikeno	-47.571	14.777	-42.133
Bella Coola	-67.785	28.374	-28.722
Bella Bella	-5.434	24.139	-53.891
Xaihais	-33.943	47.898	-7.191
Xaisla	-47.041	11.955	-5.596
Hartley Bay	-35.944	48.273	-15.912
Tsimshian Proper	-61.061	47.448	-39.633

TABLE XXV (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Gitksan	-43.213	6.248	-100.000
Massett	1.832	-7.790	-28.684
Skedans	-12.212	-47.643	-35.904
Sanyakwan	-71.613	-48.107	-27.381
Chilkat	-100.000	-98.359	-8.697

TABLE XXVI. SMALLEST SPACE COORDINATES FOR WATER RESOURCES USING THREE DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Cowichan	73.268	18.123	11.677
Nanaimo	94.713	0.977	-18.300
Pentlatch	84.427	-59.607	-27.503
Comox	77.480	-55.850	14.616
Slaiamun	100.000	-36.478	-18.689
Klahuse	92.078	-18.100	-15.341
Homalco	78.864	-11.127	23.869
Sechelt	61.050	-18.784	39.914
Squamish	64.075	-45.273	-12.189
West Sanetch	67.420	8.498	-55.623
Twana	58.798	16.953	-100.000
Hupachisat	-100.000	81.272	-33.080
Tsishaat	51.598	41.955	-46.497
Clayoquot	49.046	39.915	-31.480
Koskimo	-6.859	-89.501	-17.663
Kwexa	43.118	-27.644	-64.331
Nikeno	-2.825	-41.918	8.921
Bella Coola	-11.755	7.392	34.901
Bella Bella	-21.612	-77.927	23.939
Xaihais	15.681	-56.558	-19.238
Xaisla	-65.392	20.848	-46.873
Hartley Bay	-19.513	-47.117	-60.232

TABLE XXVI (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Tsimshian Proper	-53.691	-100.000	-22.116
Gitksan	-92.439	50.675	27.657
Massett	-42.826	-85.178	-46.058
Skedans	-12.490	-59.467	-68.332
Sanyakwan	-53.694	-51.307	-58.328
Chilkat	-89.508	-34.491	21.187

TABLE XXVII. SMALLEST SPACE COORDINATES FOR LAND RESOURCES USING THREE DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Cowichan	-61.208	28.257	-41.960
Nanaimo	-77.971	32.321	-36.232
Pentlatch	-62.052	11.831	45.430
Comox	-74.037	-10.444	50.943
Slaiamun	-55.506	68.115	19.950
Klahuse	-87.421	-52.391	32.954
Homalco	-100.000	-19.970	-9.057
Sechelt	-98.515	5.296	-4.024
Squamish	-75.989	-40.137	-12.610
West Sanetch	-67.683	10.535	-17.004
Twana	-73.792	10.506	-100.000
Hupachisat	83.494	-10.966	-64.004
Taishaat	60.806	62.549	-42.896
Clayoquot	79.797	54.191	-44.672
Koskimo	72.075	74.893	-13.414
Kwexa	70.551	54.085	7.517
Wikeno	30.173	87.189	45.533
Bella Coola	16.137	-75.548	-90.323
Bella Bella	64.158	-8.650	38.997
Xaihais	41.167	-11.838	54.539
Xaisla	65.747	-24.329	0.545
Hartley Bay	13.966	-28.154	44.476

TABLE XXVII (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Tsimshian Proper	100.000	-15.360	38.571
Gitksan	70.212	-85.584	-29.554
Massett	99.538	25.756	-6.600
Skedans	96.160	0.370	-18.765
Sanyakwan	33.955	-79.163	36.042
Chilkat	71.111	-100.000	-10.523

TABLE XXVIII. SMALLEST SPACE COORDINATES FOR DRESS, ORNAMENT, AND TEXTILES USING THREE DIMENSIONS

GROUP	DIMENSION 1	DIMENSION 2	DIMENSION 3
Cowichan	-43.406	-32.596	-37.671
Nanaimo	-90.753	2.945	-43.841
Pentlatch	-66.497	-37.141	50.831
Comox	-57.402	-20.620	26.992
Slaiamun	-80.423	62.616	-64.642
Klahuse	-64.734	34.962	38.167
Homalco	-41.577	7.492	8.313
Sechelt	-68.344	58.825	-5.519
Squamish	-85.483	1.618	-8.321
West Sanetch	-61.756	-55.975	-17.957
Twana	-71.754	-100.000	-18.387
Hupachisat	-100.000	-47.722	-35.889
Tsishaat	-49.099	-56.617	-100.000
Clayoquot	-52.775	-78.033	-94.512
Koskimo	51.250	-32.385	-73.326
Kwexa	17.107	-72.444	-49.264
Nikeno	16.386	-31.162	21.850
Bella Coola	24.734	-61.506	-13.246
Bella Bella	25.605	-55.505	0.951
Xaihais	83.212	-74.615	20.008
Xaisla	81.785	19.989	46.685
Hartley Bay	100.000	-25.884	13.274

TABLE XXVIII (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Tsimshian Proper	81.529	-37.526	4.404
Gitksan	59.799	-34.733	-74.266
Massett	63.234	50.608	-17.680
Skedans	82.567	-61.948	-54.509
Sanyakwan	18.518	91.810	-41.018
Chilkat	75.972	90.302	-95.927

TABLE XXIX. SMALLEST SPACE COORDINATES FOR STRUCTURES AND FURNISHINGS USING THREE DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Cowichan	53.721	-9.768	-23.978
Nanaimo	100.000	-21.268	-20.150
Pentlatch	44.651	-12.636	33.015
Comox	26.807	-43.914	0.187
Slaiamun	28.246	-81.401	-24.184
Klahuse	-2.660	-92.277	-9.680
Homalco	18.948	-100.000	5.348
Sechelt	50.509	-88.485	-13.644
Squamish	71.545	32.478	-60.854
West Sanetch	20.261	-40.805	-74.826
Twana	53.562	-21.129	-100.000
Hupachisat	80.124	84.060	-3.987
Tsishaat	87.261	23.129	30.180
Clayoquot	69.029	66.769	29.417
Koskimo	2.046	-3.131	54.425
Kwexa	-19.887	27.703	31.887
Wikeno	-22.336	-45.795	41.702
Bella Coola	-8.222	-69.527	15.992
Bella Bella	-56.785	9.029	10.743
Xaihais	-45.566	16.776	-11.752
Xaisla	-46.805	-36.787	12.662
Hartley Bay	-65.765	-1.943	-18.747

TABLE XXIX (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Tsimshian Proper	-66.799	10.512	-65.411
Gitksan	-79.624	-55.875	-73.927
Massett	-81.147	-14.380	-0.053
Skedans	-100.000	27.576	-6.614
Sanyakwan	-88.656	4.694	27.548
Chilkat	-41.541	96.131	-69.145

TABLE XXX. SMALLEST SPACE COORDINATES FOR TRAVEL AND TRANSPORT USING THREE DIMENSIONS

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Cowichan	91.310	-73.629	-40.424
Nanaimo	100.000	-56.061	-10.004
Pentlatch	89.898	-8.332	-100.000
Comox	89.932	-6.060	-49.307
Slaiamun	75.480	2.437	32.864
Klahuse	85.312	60.300	27.064
Homalco	78.143	33.147	24.064
Sechelt	61.420	-17.422	-5.462
Squamish	94.978	38.823	-8.508
West Sanetch	90.252	-21.415	11.416
Twana	49.684	31.326	-76.558
Hupachisat	80.166	-83.601	-58.403
Tsishaat	64.152	-100.000	-7.347
Clayoquot	52.475	-83.256	-8.654
Koskimo	18.253	-62.507	36.927
Kwexa	39.577	-43.224	-46.715
Wikeno	43.410	-33.599	-9.281
Bella Coola	3.810	1.998	-8.463
Bella Bella	9.844	-32.413	0.379
Xaihais	12.826	-36.219	19.283
Xaisla	-5.504	-24.564	23.740
Hartley Bay	-29.454	-14.595	22.208

TABLE XXX (continued)

GROUP	DIMENSION I	DIMENSION 2	DIMENSION 3
Tsimshian Proper	-39.931	-34.057	-23.077
Gitksan	-100.000	-53.958	-53.659
Massett	-23.183	-36.211	14.709
Skedans	-25.363	-54.211	-0.721
Sanyakwan	-45.584	-13.435	7.117
Chilkat	-91.057	53.449	-69.857

APPENDIX G

BIOTIC REGIONS OF BRITISH COLUMBIA

TABLE XXXI. CHARACTERISTICS OF THE BIOTIC REGIONS*

BIOTIC REGION	ANN. PRECIP. (INCHES)	TEMP. MEAN MIN.	TEMP. MEAN MAX.	FROST FREE DAYS	FLORA	CLIMAX VEGETATION	FAUNA
Coast Forest	50-150	30-35	60-70	200-250	Broad-leaved maple, vine maple, red alder, cascara salal, red huckleberry, devil's club, salmonberry, thimbleberry, sword fern, maiden hair fern.	Sitka spruce, western and mountain hemlock, western red cedar, yellow cypress, grand fir, western white pine.	Chestnut-backed chickade brown creeper, varied thrush, pileated woodpecker, sooty grouse, fox sparrow, coast deer, black bear.
Puget Sound Lowlands	35-60	20-30	70-75	200-250	Broad-leaved maple, flowering dogwood, vine maple, Nootka rose, mock orange, skunk cabbage.	Western hemlock, western red cedar, grand fir.	Black-capped chickadee, white crowned sparrow least bushtit, California purple finch, coast deer, red fox, coast bobcat, mountain beaver, coast mole, spotted skunk.
Gulf Islands	25-35	30-35	70-75	230-275	Garry oak, arbutus, flowering dogwood, mountain juniper, camas, shooting star, broom maiden's blush.	Douglas fir, Garry oak, arbutus, mountain juniper.	California quail European skylark, house finch wandering shrew, Townsend vole, coast deer. No one mammal restricted to this area.

BIOTIC REGION	ANN. PRECIP. (INCHES)	TEMP. MEAN MIN.	TEMP. MEAN MAX.	FROST FREE DAYS	FLORA	CLIMAX VEGETATION	FAUNA
Sub-Alpine Forest	40-50	-10to5	68-70	50-100	Engelmann spruce, alpine fir, white-barked pine, lodgepole pine, aspen, blue-berries, mountain axalea.	Engelmann spruce, alpine fir, mountain hem-lock.	Rusty black-bird, Canada jay, Fran klin grouse, three-toed woo pecker, brown headed chickade pine gro beak, mou tain car bou, moun tain goa lemming vole.
Alpine-Arctic Alpland	No climatic data available.				False heathers, avalanche lily, phlox, mountain avens, valerian, moss campion, anemones, saxi-frages, dwarf willows.	?	Golden-crowned sparrow, white-tailed ptarmiga rock ptarmiga willow ptarmiga horned lark, gol en eagle hoary marmot, Parry or Columbia ground-squirrel pika.

* after Chapman and Turner (1956:23)

DETAIL FROM VITA

SURNAME: FARNDEN GIVEN NAMES: JACQUELYN

PLACE OF BIRTH: TORONTO, ONTARIO

DATE OF BIRTH: FEBRUARY 22, 1949

EDUCATIONAL INSTITUTION: UNIVERSITY OF VICTORIA 1966 TO ____

DEGREES: B.A. 1971 UNIVERSITY OF VICTORIA, VICTORIA

THE UNIVERSITY OF VICTORIA LIBRARY

MANUSCRIPT THESIS

AUTHORITY TO DISTRIBUTE

AUTHOR: This thesis may be lent or microfilm copies made available:

(a) Without restriction [redacted]

(b) With the restriction that, for a period of five years (until .....) the written approval of the following is required:

(1) The Chairman, School of Graduate Studies .....

(2) The Author .....

(3) both the Chairman, School of Graduate Studies, and the Author .....

BORROWERS: The borrower undertakes, by signing below, to give proper credit for any use made of the thesis, and to obtain the consent of the author if it is proposed to make extensive quotations, or to reproduce the thesis in whole or in part.

Signature of Borrower	Address	Date