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Bristol Bay Subsistence Harvest and Sociocultural Systems Inventory

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Bristol Bay Subsistence Harvest and Sociocultural Systems Inventory

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NOTICE

ALASKA OCS SOCIAL AND ECONOMIC STUDIES PROGRAM
Bristol Bay Subsistence Harvest and Sociocultural Systems Inventory
Final Report

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We extend our deepest appreciation to the people of Bristol Bay for their contributions to this research project. Hundreds of people were interviewed to collect the data upon which this report is based, and we thank those people for their time, patience, generosity, and kindness. They expanded our understanding of subsistence lifestyles and deepened our respect and admiration for those who live off the land in Alaska's often harsh natural environment and in an often complex state and national political arena. In particular, we would like to acknowledge the residents and local officials from the study communities of Chignik Lake, Dillingham, Naknek, New Stuyahok, Nondalton, Port Heiden, and Togiak, as well as the community of Ekwok, where we pretested our interview protocols. People in these communities not only agreed to participate in the research and cooperated by sharing information with us, but they made our visits to their communities very enjoyable and memorable. Many representatives of regional and Native organizations and institutions and of state and federal agencies also agreed to be interviewed and we thank them as well for their time and insights. We are unable here to acknowledge each individual by name because so many people participated in this research project that we fear unintentionally omitting someone and because we assured most interviewees that their names would remain confidential.

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Draft versions of this report were critiqued by anonymous reviewers from the Minerals Management Service, the Subsistence Division of the Alaska Department of Fish and Game, the study communities, and Native and regional organizations serving Bristol Bay. We wish thank the reviewers for their attention to detail and for their valuable corrections and comments. Any errors that remain are the sole responsibility of the authors.

ABSTRACT

Background. In 1975, in response to a lack of published information on which to base environmental impact statements, the Minerals Management Service (MMS) began to sponsor a series of social and economic studies in a variety of offshore areas. The goal of these studies is to provide information necessary in the development of accurate and defensible environmental assessments and to make possible the monitoring of environmental effects from OCS development, should such effects occur. Because harvests of naturally-occurring, renewable (wild) resources are important to rural Alaskan communities, much work has focused on subsistence issues. The need for Bristol Bay subsistence-harvest and sociocultural information had been identified in several MMS Alaska Regional Studies Plans. The Alaska Department of Fish and Game (ADF&G), Division of Subsistence, as a result of an FY-1988 study, supplied MMS with a computerized data base and technical papers from baseline subsistence studies they had conducted in Bristol Bay communities beginning in 1980.

Objectives. The general purpose of this study was to describe and analyze the harvests and uses of wild resources for the Bristol Bay region. Specific study objectives were: 1) development of a typology of subregions within Bristol Bay based on multivariate analysis of subsistence harvesting and processing; 2) examination of the ethnographic meanings and context of subsistence; and, 3) analysis of the key political, economic, social, and cultural factors that affect subsistence pursuits.

Project Description. This project consisted of several tasks. The ADF&G data base was analyzed. Researchers compared protocols used to collect data in various communities and analyzed data that were present for most communities. Cluster analysis, Fourier plots, and Guttman-Lingoes multidimensional similarity structure analysis were used to compare communities and identify subregions within Bristol Bay. Based on this analysis and a review of secondary literature, seven communities were selected to represent the subregional variation in subsistence harvesting: Chignik Lake; Dillingham; Naknek; New Stuyahok; Nondalton; Port Heiden; and Togiak. Fieldwork was conducted in these communities during August and September 1990. Focused discussions were conducted with members of randomly selected households (212 households representing 778 total household members) and with institutional officials (98 people), and subsistence practices were observed. Cooperation and sharing networks based on geography and kinship were analyzed to illustrate the importance of subsistence activities to social structure. Models of individual and household participation in subsistence activities were constructed by regressing each of three, weighted involvement indices on a set of explanatory variables. Fourier plots and Guttman-Lingoes multidimensional similarity structure analysis were used to compare communities based on subsistence harvesting and processing patterns. The meanings of subsistence, changes in subsistence practices, and threats to subsistence were also analyzed.

Study Results. Bristol Bay communities were compared using ADF&G data on the percentages of households harvesting various types of resources (a rough indication of involvement in subsistence activities) and the average pounds per household harvested (a measure of nutritional dependence upon particular foods). Community comparisons indicated that there are three distinct subregions in Bristol Bay: the Pacific side of the Alaska Peninsula; coastal communities on the Bristol Bay side of the Alaska Peninsula; and, inland or "upriver" communities. Some comparisons produced finer distinctions within these subregions.

Fieldwork focused on documenting connections between households that cooperate in subsistence activities and share subsistence resources. The researchers calculated the percentages of households in each community that have harvesting and processing (cooperation) and giving and receiving (sharing) ties to households in various locations (geographic networks) and to households that are related to them in various ways (kinship networks). Sharing networks generally are more extensive and intricate than cooperation networks while harvesting networks are more extensive than processing networks. In terms of geography, cooperation and sharing networks are concentrated within communities but extend to other communities throughout the Bristol Bay region, to other areas of Alaska, to the lower 48 states, and, in a few instances, to foreign countries. Cooperation between households generally decreases as distance increases. While the most sharing occurs between households within the same community, Bristol Bay communities give more resources to people outside the region than they receive, suggesting that Bristol Bay is a net "exporter" of subsistence foods. Our data indicate that kinship is the primary basis for cooperating in subsistence pursuits and sharing subsistence resources. Subsistence resources are widely shared among family and friends, with need being a determining factor in their distribution. Variations in cooperation and sharing patterns were observed across sample communities and resource groups. The researchers concluded that study communities play different roles in regional subsistence networks and certain resources are more important to the maintenance of subsistence networks.

Interviewees stressed the meaning and importance of subsistence in their lives. Meanings of subsistence are based on cultural continuity (need and preference for naturally-occurring foods, sharing, relationship with place, family traditions and recollections), the social and recreational pleasures of subsistence activities, and the contribution that subsistence makes to economic security and psychological well-being. The threats to subsistence resources and activities most commonly mentioned were increases in government regulations, federal take-over of resource management in the wake of the McDowell decision, resource depletion, increased conflicts between user groups, and oil exploration and potential development.

Significant Conclusions. Harvests of naturally-occurring resources were generally high in all communities. Comparisons between sample communities indicate that geography as well as socioeconomic characteristics account for resource harvesting patterns. This study documented the existence and extent of networks between households for the harvesting, processing, and sharing of subsistence resources. Analysis of these networks suggests that subsistence is an important foundation of regional social structure, provides intra- and inter-community integration and cohesion, and helps to maintain Native cultural traditions. This study found that those individuals most likely to engage in subsistence activities are long-term residents, males, younger adults, Alaska Natives, and those from larger households, although there are variations in this pattern across resource categories. The researchers found a positive relationship between involvement in commercial fishing and involvement in subsistence, at both the individual and household levels, indicating that these two activities are integrated. Open-ended discussions with interviewees revealed that subsistence adds meaning to people's lives, people desire to maintain subsistence lifestyles, and people are concerned about various perceived threats to subsistence.

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CHAPTER I. INTRODUCTION

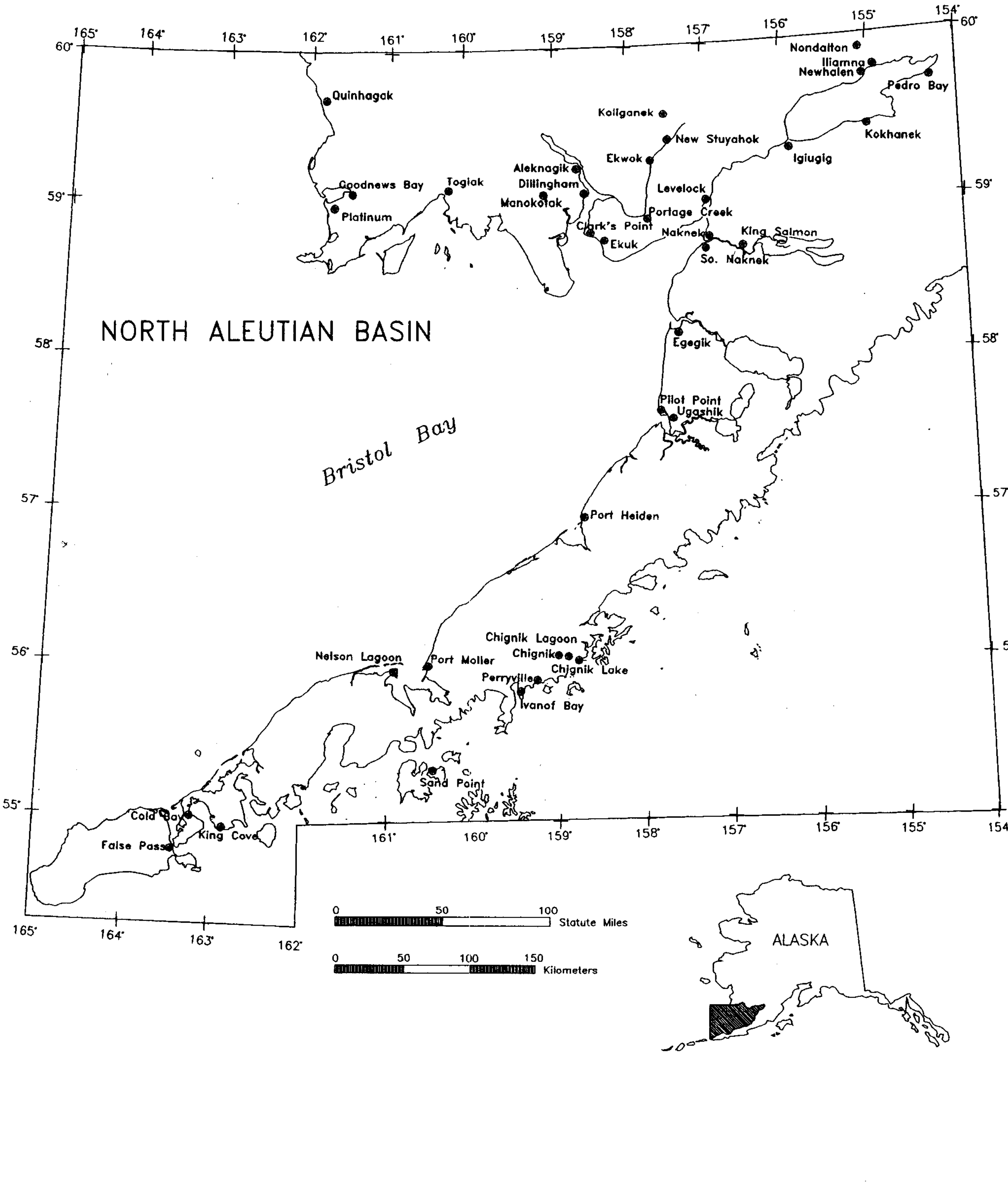
A. PURPOSE OF THE STUDY

The general purpose of the Bristol Bay Subsistence Study was to analyze subsistence activities in the Bristol Bay region and the significant factors affecting those activities. This was accomplished through review and analysis of several different bodies of data, including primary data gathered through intensive field work in a sample of seven Bristol Bay communities. Three more specific objectives of the study were: 1) development of a typology of subregions within Bristol Bay based on multivariate analysis of subsistence activities; 2) examination of the ethnographic meanings and context of subsistence; and, 3) analysis of the key political, economic, social, and cultural factors that affect subsistence pursuits.

B. DATA SETS

Several data sets were used in this research project. First, the Subsistence Division of the Alaska Department of Fish and Game (ADF&G) has had an active research program in Bristol Bay since 1980. The department has completed baseline studies for most communities in the region which document subsistence harvests and describe subsistence activities. A computerized data base and technical papers from these studies were provided under contract to the Minerals Management Service, which contracted with us to analyze this data. A more thorough discussion of the nature of the ADF&G data base and presentation of the results from our analysis of it can be found in Chapter VII.

The accompanying technical papers published by the Alaska Department of Fish and Game, Subsistence Division were important secondary sources of information and helped to inform our fieldwork (e.g. Anderson and Overturf 1986; Behnke 1980, 1982; Fall et al. 1986; Fall and Morris 1987; Morris 1985, 1986; Wolfe et al. 1984; Schichnes and Chythlook 1991; Wright and Chythlook 1985; Wright et al. 1985). Information and insights from these reports are included throughout this document.



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The second main source of data for this study was primary fieldwork data that we gathered in seven sample Bristol Bay communities during August and September 1990. The primary fieldwork data consists of historical information, ethnographic observations, and interviews (household and institutional). This data was used to supplement our earlier descriptive and analytic work, which was based upon analysis of the ADF&G data and a review of secondary literature review. We present the analysis of and findings from this primary data in two different chapters. In Chapter VI, we provide fieldwork descriptions, information, and insights in the form of community profiles for each of the seven communities selected for inclusion in this study. In Chapter VIII, we present findings from our statistical analysis of fieldwork data and compare these findings, as much as possible, with results from our analysis of the ADF&G data presented in Chapter VII.

A third set of data consisted of secondary sources of information, which included published information, government documents, industry reports, and local newspapers. Chapters II through V rely heavily upon these secondary sources of information, and some information from these sources was incorporated in the community profiles in Chapter VI. In Chapter II, we relied upon other research which has attempted to analyze the complexities of Alaskan subsistence economies and the current subsistence dilemma (Jorgensen 1990; Langdon 1986; Little & Robbins 1984; Luton 1985; Wolfe et al. 1984).

C. FIELDWORK PROCEDURES

The main purpose of conducting fieldwork was, generally, to collect information on subsistence activities in Bristol Bay. We were especially interested in a number of aspects of subsistence: the nature and composition of subsistence harvesting and processing groups; the sharing of subsistence resources between households in the same and different communities; variables influencing involvement in subsistence activities; beliefs, values, and meanings surrounding wild resource harvests; and, changes in and perceived threats to subsistence.

Fieldwork was conducted during summer 1990 in seven Bristol Bay communities, each representing a subregion identified through analysis of ADF&G data and review of secondary literature. The following Bristol Bay communities and the subregions they represent were included in our study:

Table 1
Communities Included in this Study

Community	Subregion
Togiak	Togiak
Dillingham	Nushagak Bay
New Stuyahok	Nushagak River
Nondalton	Iliamna Lake
Naknek	Bristol Bay Borough/ Upper Alaska Peninsula
Port Heiden	Upper Alaska Peninsula
Chignik Lake	Chignik

Within each community, we selected random samples of households to be interviewed. In order to do this, we mapped housing structures, assigned a number to each dwelling, and, using a table of random numbers, selected the houses to be interviewed along with replacements to compensate for households where residents were unavailable for interviews or declined to be interviewed. We used housing structures as our sampling frame instead of year-round households in order to include families which may only reside in the communities on a seasonal basis. Therefore, our number of houses may be larger than census figures. For example, according to the 1990 census, there were 57 households in Chignik Lake, 34 of which were occupied on April 1, 1990. Our sampling frame included 48 houses; we did include empty houses in our sample, some of which were seasonal and some which were empty most of the time.

Each household was contacted as many times as possible during our stay in the village, and at least five times. Inquiries into the whereabouts of persons not immediately available were made. We made every effort to interview the households randomly selected. Households were replaced only when they had been contacted five times and no information could be obtained on them, when we had determined that the residents would be gone from the community during our entire stay there, or when the residents refused to be interviewed.

We selected an adult to interview within each sampled household. Since most of our protocol pertained to the whole household, we tried to interview those who were most informed about the activities of all household members. Our strategy was to interview couples, where applicable, so that we could obtain information on both harvesting and processing of subsistence resources, since we thought there would be gender differences regarding these activities. However, one adult was designated as the primary interviewee for the household. In instances where couples were interviewed, we were careful to record any differences of opinion on affective questions. In instances where couples could not be interviewed together, we randomized the selection of either the man or the woman and coordinated this with the sampling of households headed by a single adult to ensure gender diversity in the sample.

We tried to ensure high response rates in the household interviews in several ways. First, visits were scheduled to each community after consulting with community leaders, who gave us recommendations on the best times to visit. Second, before we left to conduct the fieldwork, letters and announcements were prepared and sent to local community officials in order to notify community residents about the research project. Third, we obtained approval from all representative governments before entering communities. Fourth, in each community priority was given to the household interviews in order to contact as many identified interviewees as possible and to complete the scheduled work. Institutional interviews were conducted between household interviews and when convenient so they did not stand in the way of completing apportioned household samples. In several instances, we staggered our departures from communities so that one field researcher could remain to ensure completion of the work.

Refusal rates in the household sample did not exceed 10 percent of the sample size in any one of the study communities. We had a number of refusals in Dillingham and Naknek and several persons who were unavailable. There were no refusals in Chignik Lake, Nondalton, New Stuyahok, Togiak, and Port Heiden, although a few persons randomly selected were not at home during the study period and they were replaced. We have no reason to believe the samples were biased by gender, age, income, economic activity or other personal or social and economic characteristics.

The final number of household interviews conducted was 212. The total number of people residing in those 212 households, for which we have some information on subsistence activities, was 778. The following table shows, for each community, the population according to recently released federal census data, which was gathered in spring 1990, the number of households according to our mapping procedures, the number of interviews conducted, and the total number of residents in the sampled households.

Table 2
Household Sample Information

Community	1990 Population	# of HHs	# HHs Sampled	# Persons
Chignik Lake	133	48	20	75
Dillingham	2,017	840	76	242
Naknek	575	283	32	109
New Stuyahok	391	91	20	121
Nondalton	178	67	20	68
Port Heiden	119	45	20	63
Togiak	613	208	24	100
TOTALS	4,026	1,582	212	778

The communities were visited from early August, 1990, to late September 1990. Information on interviewees and their households covered the 12-month period prior to the interviews. There were two interviewers in each community most of the research period to hasten progress, to provide quality control in field techniques and recording information, and to exchange insights and observations. The three workers rotated in and out of Dillingham so that at least one was present for most of the fieldwork period. The three interviewers tested the protocol together in Dillingham to achieve consistency in lines of inquiry and recording before embarking on their visits to other communities. Smaller communities required about five days of field work time each (Chignik Lake, New Stuyahok, Nondalton, and Port Heiden), whereas Naknek and Togiak required several additional days, and Dillingham was sampled throughout the field work period. On several occasions, the three field researchers met to make validity checks on their research.

Household interviews were conducted using protocols, lists of topics that helped to guide but did not structure the interviews. These interviews were designed to be open-ended and to yield textual, descriptive, and ethnographic information about subsistence in Bristol Bay. The interviews were thorough discussions and yielded systematic data which could be compared across households. However, they were not systematic surveys in that questions were not asked in the same order and predetermined answers were not offered for interviewees to select. The responses they gave were recorded and a coding scheme to systematize the data was developed after the fieldwork session.

Several types of data were collected for each household. Data collected at the household level, that is for everyone residing in the household, included demography, involvement in subsistence activities, participation in commercial fishing and wage employment, and income. Other data was collected at the respondent level, that is, only for the person being interviewed. This data included responses to affective questions, additional detail about involvement in subsistence activities, and employment history.

In addition to the household interviews, we conducted interviews with institutional leaders in each community. The selection of these community leaders and officials was not random. We talked to leaders who were well-respected and knowledgeable about community affairs and who were in positions to provide us with the specific institutional information that we needed to collect. We routinely asked people that we met for recommendations on which community leaders to interview and were sure to interview those persons who were recommended most often.

Several officials were sought out for interviews in each community: the mayor, the head of the village council, the head of the Native village corporation, the city manager or administrator (if there was one), a local business person, and a local political representative or appointee (e.g. to the local Fish and Game Advisory Board).

We picked several other people in each community from the following list of potential institutional interviewees: city council members, village council members, the police chief or the Village Public Safety Officer, the clinic administrator or community health aide, heads of fishing organizations, officers at banks, members of the community school committee, the school superintendent or local principal, school teachers, the harbor master, a clergy person, head of the local Chamber of Commerce (where there was one), representatives of fish processing companies, operators of sports lodges, and postmasters. In many instances, people who were randomly selected for household interviews were also local community leaders, and oftentimes we asked these people questions from the household and institutional protocols.

Additional institutional interviews were done in the regional centers of Dillingham and the Bristol Bay Borough. Here we interviewed people who work with federal and state agencies, local school districts, and regional organizations. Several organizations have offices in Anchorage and two field researchers conducted some institutional interviews there also.

A comment should be made about the context in which fieldwork took place. Several important events which occurred prior to or during fieldwork had special relevance for the outcome of the research. First, in December 1989, the Alaska Supreme Court handed down the McDowell decision, which declared the state's rural preference in subsistence unconstitutional (a thorough discussion of this issue is included in Chapter II). Special sessions of the state legislature during the spring and early summer failed to produce a legislative response. At the time of fieldwork, the state and federal government were in the process of arranging the federal take-over of fish and game management on federal lands.

Second, attitudes about oil development were influenced by three factors. During August 1990, Iraq invaded Kuwait, heightening local fears that there would be increasing pressure for development of domestic oil reserves. Residents feared this might include Bristol Bay, which was excluded from President Bush's moratorium on oil and gas activities off several other coasts. Memories of the Exxon Valdez oil spill in March 1989 were still in people's minds and these certainly shaped or otherwise altered some persons' attitudes about potential oil and gas developments in Bristol Bay. Finally, proposed oil exploration in the Arctic National Wildlife Refuge gave some persons encouragement that new development in the far north might obviate development in Bristol Bay.

Third, climatic and biological factors had affected the abundance of various subsistence resources. A severe 1989-1990 winter in Alaska caused a higher-than-normal mortality among game (particularly moose), a late breakup, an altered timing of caribou and bird migrations, and an effect on beaver and porcupine. A red tide scare in the Upper Alaska Peninsula discouraged most Bristol Bay residents, particularly those in Chignik Lake and Port Heiden, from harvesting marine invertebrates in numbers common to most harvest seasons.

Fourth, increasing activity on the part of national animal-rights activists had accelerated a general decline in the price of furs, resulting in far less commercial trapping activity than was normal in upriver communities. The two upriver communities in our study are New Stuyahok and Nondalton.

Fifth, the second largest catch in the history of the Bristol Bay salmon fishery was recorded in 1990.

D. DATA CODING PROCEDURES

Household data was coded for purposes of statistical analysis. This was done in a two-step process. First, an initial coding of the data was done in the field. Soon after conducting household interviews, fieldworkers spent some time elaborating on their own interview notes, coding the more objective responses, and looking for patterns in interviewees' responses to the affective questions. Open-ended protocol interviews generally require additional time afterwards to fill in notes, to indicate the specific questions that prompted certain responses, and to organize and code information.

The second step in data coding occurred after fieldwork was complete and fieldworkers had returned to their homes. Household interviews were analyzed for common themes and a detailed master code sheet was prepared by our data consultants in consultation with the fieldworkers to code comparable information. Instructions to accompany this code sheet were also prepared. All fieldworkers along with one of the data consultants met in Bellingham, Washington for four days to discuss and standardize their coding procedures and to begin the process of coding raw field notes and data onto the master code sheets. This formal coding took several weeks, after which the code sheets were taken to a data entry firm for transfer to computer files.

The institutional interviews were also analyzed for common themes, but these interviews were not coded, primarily due to the fact that each of these interviews was tailored to the person being interviewed. Thus, the amount of comparable information is less than in the household interviews. The information obtained in the institutional interviews primarily was used to help write the community profiles and to confirm trends observed in the analysis of the household data, since institutional interviewees generally commented on overall trends that they had observed in their communities.

CHAPTER II. ANALYSIS AND DEFINITION OF KEY CONCEPTS

A. SUBSISTENCE AND MARKET ECONOMIES

There are many definitions of "subsistence economies" and the words have been used in many contexts to denote diverse meanings (see Luton 1985 and 1986 for an especially fruitful analyses of various meanings attached to subsistence economies). One approach separates hunting, fishing, collecting and all of the organization, processing, distribution, and customs surrounding these economic activities in Native American populations from economic functions and processes in market economies.

The market economy, based largely on what Marshall Sahlins (1972) described in general as "balanced reciprocity" (giving and receiving in kind and specified times of exchange) often has been seen as separate from Native American subsistence activities. The former is labeled "modern" or "Western," the latter "traditional." In some analyses of native economies the presence of the market economy (cash transactions, capital accumulation, for-profit economic exchanges) has been regarded as peripheral and secondary to the "normal," economically and culturally more consequential "subsistence economy." In these analyses, it seems that native peoples could take or leave the market economy.

This interpretation of Native American dependence on subsistence activities and resources was given a new treatment by Hickerson (1965). Hickerson, and others after him (e.g. Aberle 1967; Jorgensen 1971) averred that early in their contacts with whites, Native Americans were swept into the market economy and, because of this, subsistence pursuits could not be separated from market economies and treated as isolated phenomena. Native Americans had adopted Euro-American tools and weapons, extracted resources for these finished goods, reorganized themselves for these purposes, and were, on many occasions but certainly not all, eager participants in a quest for more efficient means of extracting and processing. Furthermore, much of the Native American integration into market economies was the result of exposure to smallpox and other diseases of white origin (Cronon 1983).

Coupled with the physical, economic and social effects of diseases - such as loss of population, reorganization of statuses, migrations, loss of lands, and formation of new alliances - Euro-American polities subdued Native Americans, usurped their lands, and destroyed their self-governance.

The second form of explanation and analysis of subsistence economies describes the role of fur trading and other biotic and abiotic extraction by Native Americans and agents of empires and newly-formed Euro-American nations as integral parts of native economies and their direct reflection of white intrusion into native life. Native quests for Euro-American goods became as much a part of native economies as harvests of naturally-occurring foods. Moral and ideological political-economic arguments aside, native subsistence pursuits and resource extraction for the market became a single, integrated economic system. With some further definition and analysis, our use of the term "subsistence economy" will conform to the latter interpretation.

In western Alaska there has been a long history of various forms of resource extraction and use of Indian, Eskimo and Aleut labor in white-native economic relations. Among the most precise and useful definitions of subsistence economy, in our opinion, are the ones offered by Jorgensen (1990) and Lonner (1986). These make the most sense for a study of subsistence in Bristol Bay communities.

For some other regions of Alaska, Jorgensen demonstrated that subsistence pursuits are presently conducted in a modern context and are inextricably tied to the market economy. Subsistence economies have characteristics common to market economies - barter, selling, middlemen, credit, debt, etc. However, these features do not undermine the essential character of subsistence economies. They allow entry into the periphery of the market economy which allows subsistence communities to engage in some kinds of specialization to sell and obtain desired goods. This enhances the ability of subsistence producers to provide for the unskilled, the aged, the luckless, and other members of their communities.

One can define the subsistence economy empirically as a system of ". . . production, exchange, distribution and consumption" (Jorgensen 1990:75). Jorgensen goes on to describe what he labels the "subsistence economy" as a mode of production ". . . comprised of the organization of labor . . . required to extract, process, and store naturally occurring resources; the organization of distribution required to share, gift, or reciprocate those resources; and the patterns of consumption of those resources that can be observed" (ibid.).

Subsistence economies are also characterized by economic activities (hunting, fishing, gathering, farming, herding, crafting, trading, tool-making, transportation, skill training, storage and other activities) which are ". . . relatively self-contained within a community or region, which are not conducted primarily for profit-maximization, which aim primarily for present consumption, and which are governed by traditional patterns rather than market conditions or immediate needs" (Lonner 1986:15). Resources are renewable and production intermittent in scheduling and lacking in intensive production so that labor is in surplus and there is time to socialize, conduct rituals and engage in various forms of recreation. Efforts are centered on establishing material and psychological security and communities with subsistence economies possess a customary, essentially homogenous culture marked by socially cohesive symbols and extensive and intensive reciprocal economic exchanges.

Subsistence is a community rather than individual or household enterprise, as many studies have demonstrated (Little and Robbins 1984, Anderson et al. 1976, Sahlins 1972, among many others).

Labor in subsistence economies is based on division of work between men, women, and children and is determined by age, gender, task, skill, training, equipment, kinship, social organization, capital, time, season, location, reciprocity and distribution systems. Important tasks cannot be removed without altering the efficiency and productivity of the group (Lonner 1986).

It is misleading and, indeed, impossible, to reduce the worth of subsistence goods and services to standardized market values. Subsistence market exchanges (one-way and reciprocal) are replete with emotional, psychological and ritual meanings, to which monetary values cannot be assigned in a meaningful way. Moreover, goods, services and labor are extremely variable, depending on availability and desirability of resources, season and consumption.

Jorgensen gives further substance to his definitions by stating that the naturally-occurring resources are not manipulated by humans in a subsistence economy. Before Euro-American peoples entered Native American lands there were trade networks among native people based on bartering and gifting. These were not extensive, they did not include any kind of currency transactions, and capital was not accumulated.

Contemporary subsistence economies are systems which integrate modern machines and devices and the sources of cash required to maintain them. The modern forms of subsistence economies in Bristol Bay are certainly different from what subsistence economies were 30 or so years ago. There has been increasing adoption of more powerful motorized equipment for extraction and transport and changes in regulations governing periods and quantities of harvests. Despite these important changes, the facts on hand clearly show that many characteristics of traditional aspects of subsistence economies in production, ownership, distribution, control, labor and consumption remain.

Jorgensen identifies subsistence activities which form the modern subsistence economy. They are as follows:

1) there is no developed market system in the mode of production (the producer consumes his own product, and distributes what he or she does not consume);

2) resources are rarely exchanged for services;

3) labor is not a commodity that can be bought and sold (Jorgensen 1990:80);

4) extracted resources and labor are not converted to capital (resources are preserved and stored for human consumption, however); capital formation is not an incentive for extraction;

5) distribution of resources is based, in most instances, on kinship, friendship, and village networks (in Bristol Bay and many other parts of Alaska);

6) there is little specialization in labor, and an individual's productive activity is built on a broad spectrum of skills which are directed toward a wide range of products and species (Jorgensen 1990:81).

These features of subsistence activities are also recognized by the Alaska Department of Fish and Game social scientists as comprising a single complex one can legitimately claim on empirical grounds as a subsistence economy (e.g. Wolfe and Walker

1987). Wolfe and Walker also emphasize the enormous contribution the subsistence economy makes to the nutritional and cultural well-being of Alaskans, especially those residing in rural areas.

None of the six characteristics of subsistence economies given above suggests that there is no specialization in the Bristol Bay villages. Indeed, there is some specialization of government functionaries, modern technical crafts, light industries and other occupations. But these do not preclude involvement in subsistence activities and are often a means for subsidizing those activities. It is clear that in Bristol Bay, village subsistence economies are present even though they are imbedded in larger regional, state, national and international economies. As Jorgensen and Lonner have defined subsistence economies, one can validate such a realm (as many have) in Alaskan communities through observation and recording events. This realm has its norms, nuances, and personnel, and is a coherent system passed from one generation to the next with subsequent modifications caused by technical changes, government policies and regulations, corporate practices and policies, and personal and cultural preferences, among other things.

A crucial point about subsistence, one often overlooked, is well stated by Lonner: "Subsistence is one way of protecting local areas from cash inflation, erosion of purchasing power, boom-bust cycles of development and employment, maldistribution of employment and income, and unsuccessful ventures in local commercial development" (Lonner 1986:17).

As mentioned, rural Alaskan villages have been integrated into the global economy and the United States nation-state. However, they have not been completely transformed. They have provided raw materials for large and small non-Native corporations during their history yet involvement in subsistence activities remains high, traditional resources and techniques are used, sharing is widespread, and those involved attest to its importance in their lives.

Most of the research conducted on Native villages has centered on internal structures and norms that constitute subsistence traditions in an effort to account for reasons why subsistence persists. According to Langdon, "Subsistence activities of Alaska Natives have undergone continuous modification due to a variety of natural, social and cultural pressures; but they have persisted because they play a crucial role in sustaining and nurturing valued ways of life for rural Alaskan Natives" (Langdon ed. 1986:31).

A second, complementary part of explaining why subsistence persists is a focus on external forces of change, which are often given emphasis by modernization theorists. One cannot account for the continuation of traditional subsistence communities in Alaska simply by citing the desirable traits of such communities. (This is not a criticism of the quote from Langdon; Langdon also analyzes external forces in his research on Alaskan villages). Countless subsistence cultures have been thoroughly transformed or destroyed despite value placed upon traditions because external forces overwhelmed them.

There are certain social, geographic, political and economic forces which help account for the persistence and modification of Alaskan subsistence economies. Alaskan villagers have not been alienated from the forces and the means of production or from the product of their labor. They have not become entirely dependent on selling their labor to survive. Subsistence technology has remained small in scale, affordable, and labor-intensive and is owned and controlled by households or kin groups. Equipment is pooled in kin networks so that non-owners can participate in subsistence activities. Producers still have access to land (corporate or government-controlled land) and to fish and game, and have control over the distribution of the product of their labor. These circumstances allow most of the residents of Alaskan villages to integrate subsistence with ritual, feasting, recreation, visiting and other aspects of lives that are cohesive and whole. Market exchanges are largely accommodated to the subsistence way of life as described above.

One of the main reasons the United States and other capitalist systems have not converted arctic hunters, fishers and collectors into workers dependent on the market economy is because it is not profitable to do so. The costs of reproducing labor in Alaskan villages is too high to bring it entirely within the orbit of the market economy. Cost-of-living surveys and studies that estimate the dollar value of subsistence harvests give some indication of how costly it would be to maintain Alaskan village labor. This is the reason most fish-processing and packaging is done in the Lower 48 states and most full-time wage labor in bush Alaska either produces very high-priced commodities (such as oil), provides high-priced professional services, or is supported by the federal or state government in health, education, and other services.

Government aids private enterprise by underwriting the infrastructure to make bush Alaska accessible and its products affordable, but it also has helped provide for a labor force that is largely maintained by government rather than by the private sector. These circumstances and relationships place Alaska in a position peripheral to the centers of political power and corporate wealth. Providing greater access to various parts of Alaska through transportation, communications and support services reduces the full costs of that labor and brings in new cultural forces. There is also enough labor from outside Alaska to serve short-term resource extraction endeavors. This further keeps a majority of Native people from participating in private enterprises whose headquarters are outside of Alaska. Workers from the Lower 48 states usually do not remain in Alaska and therefore there is no commitment needed from companies or the state to provide these people with needed goods and services for long-term residency. The Alaskan villagers know this and they usually regard full-time employment as temporary, realizing also that subsistence pursuits form the real foundation of their economic and cultural lives.

Research on connections between commercial fishing and subsistence activities notes that accommodations have been made in traditional subsistence patterns to permit participation in cash-generating endeavors (Wright et al. 1985:23). For example, men participate in commercial fishing and women play a greater role in subsistence fishing, some subsistence activities are rescheduled, and fish is retained for home use from commercial catches. Commercial fishing is a preferred occupation because it is better adapted to and poses less conflicts for a subsistence culture than other types of work. Commercial fishing is seasonal, fishers have more control over their time, similar equipment and skills are used in both endeavors, individuals are in control of the factors of production, and the nature of the activity is the same. Both activities rely on kin-based harvesting groups, and both provide an opportunity for children to learn from their parents or other kin.

There is another aspect of subsistence economies apart from the analytic and empirical taxonomies which must be considered. The legislative, legal and regulatory definitions of subsistence are currently in flux because of the Alaska Supreme Court's ruling on December 22, 1989 in *McDowell vs. State of Alaska*, which declared that the Alaska State subsistence law was unconstitutional. The ruling caused considerable consternation and various segments of Alaskan society worked to change the state constitution, to appeal the decision, or to work out an agreement with the federal government for dual management of fish and game resources. The controversies surrounding the court's decision played a significant role in the research undertaken as part of this study, requiring us to take into account local interpretations of the ruling and attitudes on what course of action should be followed to protect the interests of various segments of the Bristol Bay population.

B. THE SUBSISTENCE DILEMMA IN ALASKA

1. Background: Fish and Game Management in Alaska

The "subsistence dilemma" in Alaska, which in simplest terms pits federal law against state law and the state constitution regarding rights to subsistence resource harvests in Alaska, evolved over several stages even before court decisions and challenges of the last few years. As such this historical and political context must be illustrated first in order to understand how this dilemma is being played out today.

The federal government and the state of Alaska have attempted to maintain a single system for the management of fish and game. Subsequent to statehood, the federal government transferred authority for fish and game management to the state government in Alaska. Although the federal government has the right to manage wildlife on public lands, its policy has been to delegate to the states responsibility for regulating hunting and fishing within their borders. Since 1960, hunting and fishing in Alaska have been regulated by the Alaska Department of Fish and Game according to the policies set by the Board of Fish and the Board of Game. The exceptions are that the federal government, not the state, regulates migratory bird hunting and marine mammal hunting.

The state of Alaska's legal power and responsibility for fish and game management is subject to the state's compliance with federal preemptive laws. State management of Native subsistence is subject to federal oversight, and the state fish and wildlife management system must be in compliance with the federally-approved subsistence protection. Federal legislation has recognized that subsistence is important in terms of people's economic or physical reliance upon it, the cultural and social values attached to subsistence activities, and the traditional and customary uses of resources (Case 1984:276). As part of its trust responsibility toward Native Americans, the federal government has passed legislation protecting subsistence in order to preserve Native cultures in Alaska. Since Alaska Natives do not have a traditional reservation system and no off-reservation, treaty-protected hunting, fishing, and gathering rights, this federal legislation has been the main avenue for protecting their subsistence rights (Case 1984:278).

Federal legislation affecting subsistence, the need for the state to comply with federal law in order to maintain the right to manage fish and wildlife on federal lands, and legal and political attacks on subsistence rights have been at the heart of controversy over subsistence in Alaska. Subsistence has been caught in the middle of jurisdictional disputes between the federal and state governments and has been the focus of policy debates over setting priorities for using public lands and for managing fish and game. Even though legal priorities have been established for subsistence uses of fish and game, defining subsistence users and interpreting and implementing the subsistence priority have proved to be more difficult problems.

After assuming authority for managing fish and game in 1960, the state of Alaska allowed all Alaskan residents equal access to fish and game resources instead of allocating the resources among defined groups of users based upon certain priorities. This situation seriously affected Native villages, which were impacted by competition from urban, non-Native fishers and hunters, particularly during the oil pipeline boom of the late 1970s (AFN 1990b:2). The federal government was made aware of the fact that the state of Alaska was not protecting Native village hunters and fishers during the debates over the Alaska Native Claims Settlement Act. Although ANCSA extinguished aboriginal hunting and fishing rights in section 4(b), the ANCSA Conference Report, which accompanied the final bill to the floor and interpreted its meanings, stated that Alaska Native subsistence rights would be protected. Congress made it clear in the Conference Report that both the Department of the Interior and the state of Alaska were expected to protect those rights. Most of the impetus for the Title VIII provisions of the Alaska National Interest Lands Conservation

Act (ANILCA, passed in 1980), which concern subsistence, can be traced to ANCSA, particularly the Conference Report.

Toward the end of the 1970s, it became clear that neither the state nor the Secretary of the Interior was protecting subsistence in the manner that Congress had intended. Neither had withdrawn lands specifically for subsistence purposes or established any preferences to limit non-subsistence users' access to fish and game (Case 1984:295). In the absence of an overriding federal subsistence law, Alaska did not have the legal authority under the state constitution to discriminate between various users (Case 1984:296). Furthermore, the state's Department of Fish and Game and the Boards of Fish and Game were dominated by non-Native, urban sports and commercial fishing interests. Under the federal grant scheme that provided matching funds for the state's fish and game management program, urban Alaskan's accounted for most of the Department of Fish and Game revenue and their concerns received the department's attention (Case 1984:296-298).

In 1978, the state of Alaska passed a subsistence statute (chapter 151, section 4 SLA 1978) which established a subsistence hunting and fishing priority over other uses (commercial and sport) and provided for two "tiers" of users: those (in tier one) who could take subsistence resources when fish and game stocks were not threatened by any use pressures, and those (in tier two) who could take subsistence resources when use pressures were sufficiently high to constrain harvests by tier one users. Tier two was distinguished from tier one on the basis of local residency, customary and direct or immediate use, and the lack of availability of alternative resources. The 1978 statute did not require rural residency or Native tradition in order to become a tier one user.

Major federal protection for subsistence was incorporated into ANILCA (Alaska National Interest Lands Conservation Act). Title VIII of ANILCA guarantees subsistence rights to rural residents (not Alaska Natives *per se*, in contrast to the focus of ANCSA)[1]

[1]Subsistence was defined as "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal family consumption; and for customary trade." The federal government's subsistence definition differed from the state's in two respects: 1) the federal government restricted subsistence to "rural Alaska residents" while the state did not; 2) under the state's

and requires the federal government to oversee activity of the State Boards of Fisheries and Game so that subsistence uses are not restricted. Furthermore, Title VIII requires that the Secretaries of Interior and Agriculture advise the state as to those boards' effectiveness in doing their job under Title VIII.

ANILCA established a subsistence priority on federal public lands, and required the state to comply with federal subsistence requirements in order to continue managing fish and game on federal lands. ANILCA also required that local advisory committees and regional advisory councils have more influence over policies affecting subsistence, provided federal funding for those committees and councils, and provided for federal oversight and judicial enforcement of state and federal compliance with its provisions. Finally, ANILCA allowed for subsistence use of public land restrictively classified and for consideration of the impact that future disposition of public lands might have on subsistence (Case 1984:298-306).

In order to conform with the federal law and continue managing fish and wildlife on public lands, the Alaska Boards of Fish and Game adopted regulations and interpretations of state subsistence statutes in 1982 which incorporated the federal subsistence definition and preference. The state's regulations established specific criteria for identifying traditional and customary subsistence uses by rural Alaskans. Once subsistence uses of resources for particular areas have been identified and the approximate amounts of fish and game necessary to supply those uses have been determined, the regulations require that the boards adopt regulations providing for adequate subsistence use of the resource (Case 1984:307). The state has applied these same regulations to state and private lands in the interest of maintaining uniform management. The state revised the committee/council advisory system and clarified procedures whereby local advisory committees and councils are to have input into the policy and regulatory decisions made by the state Board of Fish and the Board of Game. The role of the Subsistence Division of the Alaska Department of Fish and Game, established in 1978, has been expanded to

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subsistence definition, customary trade had to be for personal or family consumption while the federal government's definition did not link customary trade to any particular purpose (Case 1984:301).

provide a wide variety of information necessary for implementing the subsistence priority in Alaska.

2. The McDowell Decision

The passage of ANILCA and state efforts to comply with its mandated rural subsistence priority brought anti-subsistence interests together in the early 1980s (AFN 1990b:3). A coalition of groups calling themselves Alaskans for Equal Fish and Game Management succeeded in placing an initiative, Ballot Proposition 7, before voters in November 1982. This proposition would have repealed the state subsistence preference and would have required that fish and wildlife resources be "equally available to personal consumption users" (AFN 1990b:3; Case 1984:314). The measure would have prohibited subsistence distinctions based upon various criteria used since statehood: economic status, land ownership, local residency, past or present dependence on the resource, or lack of alternative resources (Case 1984:314). The proposition was defeated, but if it had passed, state law would have been out of compliance with ANILCA's rural subsistence preference.

Since 1982, there have been several court challenges to the subsistence priority that required further state action to remain compliant with ANILCA. A number of parties,[2] including Sam McDowell, Dale Bondurant and others, challenged the state's 1978 subsistence statute and other subsistence provisions, and their challenges have been modified and re-written as new court decisions arose. Their 1983 complaint challenged tier two requirements of the statute, which created the most restrictive conditions for resource use (i.e., access to resources for some persons even when other subsistence users are prohibited from access). Before a ruling on this complaint could be rendered, the Alaska Supreme Court ruled on *Madison v. Alaska Department of Fish and Game* (1985), saying that the regulations adopted by the Board of Fish in 1982 limiting subsistence to rural Alaska residents were not specifically allowed under the 1978 state subsistence law. The regulations that required rural residency for tier one users were declared illegal, which put the state out of compliance with ANILCA. In some respects this made the complaint

[2] Much of this discussion involves appeals of superior court rulings, so these parties are generally called appellants in the text.

moot, but it impelled the state to amend the subsistence statute in 1986 (chapter 52 SLA 1986) which explicitly required rural residency for both tier one and tier two subsistence users. This event may be seen as a tactic to bolster the subsistence preference in response to challenges and a specific court decision. The 1986 statute was also consistent with ANILCA inasmuch as both focused on rural residency as a precondition of subsistence use.

It is important to return to ANILCA in this chronology since ANILCA requires federal management of resources on public land in order to protect the subsistence priority, but *also* allows for the state to assume that management if and when the state establishes laws that ". . . are consistent with, and which provide for the definition, preference, and participation specified in. . ." ANILCA (16 USCR 3115(d)).[3] After the *Madison* decision, the Secretary of the Interior found that the state was not in compliance with ANILCA; after the passage of the 1986 statute with the rural residency requirement, the state was again in compliance. The specific definitions of "rural" in ANILCA and the state statute were inconsistent and the state definition underwent amendment.

Before moving on to the final and successful challenge, this capsule summary of the events to date is provided:

1. Prior to 1978 there were no comprehensive statutory rights for subsistence hunting and fishing (but subsistence statutes were enacted in 1975 and 1976 that are not pertinent to this discussion); urban and rural residents could be subsistence users. Subsistence uses were not given a priority above sport or commercial uses.

2. In 1978, subsistence uses were given a higher priority, but this state statute did not prohibit tier one subsistence uses by urban residents. However, a Board of Fisheries regulation asserted a rural residency requirement. (A Joint Board Regulation asserting a rural residency requirement was also established, but *Madison* addressed only the Board of Fisheries regulation.)

3. The *Madison* decision found that this regulation violated the 1978 statute.

[3] The situation, however, is not as straightforward as it may sound. In fact, the Federal government can assume management authority on Federal public land regardless of ANILCA. This is a matter of policy rather than law, and the Federal government usually lets state governments administer state regulations on Federal land so long as the state regulations are not more lenient than a parallel Federal regulation. Furthermore, ANILCA nowhere states that the State of Alaska *will* regulate resources on Federal public land; it is merely permitted (see section 805(d) of ANILCA).

4. The 1986 statute was established, including a residency requirement, which mooted the ramifications of the *Madison* decision and brought the state into explicit compliance with ANILCA according to the Department of the Interior. Hence, the 1986 statute accomplished two logically unrelated things: it protected subsistence uses, and it preserved state management of resources on federal lands in Alaska.

The 1986 amendment to the state subsistence law contained the seeds of another controversy. That amendment defined rural as "a community or area of the state in which the non-commercial, customary, and traditional use of fish and game for personal or family consumption is a significant characteristic of the economy of the community or area" (AFN 1990b:4) In the case *Kenaitze Indian Tribe v. Alaska,* the 9th Circuit Court of Appeals ruled in 1989 that the state's definition of rural, which was based upon the economic nature of the community, was not consistent with the definition of rural in ANILCA Section 803, which was based upon the density of a community's population. This inconsistency had been used to deny subsistence rights to the Kenaitze Tribe of the Kenai Peninsula. The court ordered the state to either write a new definition of "rural" consistent with ANILCA or relinquish management of fish and wildlife on federal lands within the state (AFN 1990b:4; RurAL CAP 1989a).

The 1986 amendment to Alaska's subsistence statute was then challenged by the appellants on the grounds that it violated several provisions of the Alaska Constitution, principally the common use and related uniform rights clauses.[4] In fact the challenge was two-pronged: it argued that the Alaska Constitution prohibited "special privileges" for some and not others; and it argued that the rural residency requirement was biased inasmuch as it is both under-inclusive (it excludes some deserving urban residents who should merit subsistence rights) and over-inclusive (it includes some rural residents who should not merit subsistence rights). The superior court, to which the appellants first presented their case, ruled against the challenge, at which time the judgment was appealed to the Alaska Supreme Court. On December 22, 1989, the Supreme Court reversed the ruling of the lower court and remanded the case to that court, instructing it to declare that the rural

[4] In blunt terms, these clauses state that State resources must be allocated in a uniform manner and that "special classes" of users cannot be distinguished.

preference is unconstitutional (Alaska Supreme Court 1989). At this point, Alaska law no longer complied with ANILCA, yielding the current "subsistence dilemma."

Before considering actions by Alaska Natives, the Alaska legislature, the Alaska governor, and federal agencies in response to the Supreme Court ruling, it will be useful to briefly summarize the key factors underlying the Supreme Court decision as well as potential flaws in that decision as revealed in Justice Rabinowitz's dissenting opinion, on the grounds that future remedies to the dilemma will undoubtedly relate to those factors or potential flaws.

First, the majority opinion agreed more or less with the under-inclusive argument raised by the appellants. Citing research by the Alaska Department of Fish and Game, Division of Subsistence, the opinion pointed out that urban residents may in fact exhibit qualities associated with traditional subsistence use and might otherwise qualify as subsistence users were it not for their residence. The cities of Fairbanks and Homer were specifically identified in the opinion, since research has shown that some residents of those communities appear to be subsistence users in everything but mailing address. The over-inclusive argument of the appellants was also validated inasmuch as the majority opinion noted that some residents of "rural" communities, such as Nome and Sitka, do not engage in subsistence harvests.

Second, the majority opinion ruled that Article VIII of the Alaska Constitution prohibits exclusive rights or special privileges and requires that wherever fish and game resources exist in a wild state (i.e., farms, aquaculture and other similar resource practices are excluded) those resources are to be disposed or allocated uniformly to all persons. The exclusive rights and privileges ruling seems simple, but it is actually part of a complex body of decisions involving resource allocations and involves tortuous legal reasoning. Article VIII, section 4 of the Alaska Constitution states that "...replenishable resources belonging to the state shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses." The state may not create a "closed class" of users but it may enact different rules to administer or regulate uses. Article VIII has been interpreted such that user *monopolies* cannot be established, but uses can be regulated by means such as limited entry permits and quotas and seasons that vary between subsistence, sport, and commercial uses. Much hangs on the difference, then, between a class of persons defined by residence (which is deemed unconstitutional) and a class of persons defined by possession of, for instance, a limited entry permit (which is deemed constitutional). The state argued that a person could attain subsistence rights by moving his or her residence, but the Supreme Court found this argument "unpersuasive" and a poor basis for allocation of resource rights. Allocation of rights by permits and willingness or ability to pay, however, is considered compatible with state law.

The Supreme Court ruling (now often termed the "McDowell Decision" in journalistic and legal vernacular) does not mean that anyone is permitted to be a subsistence user, and in fact the ruling specifically says that this interpretation is unwarranted (Alaska Supreme Court 1989:24). It says that a residency rule is unconstitutional and, furthermore, that the Supreme Court is not required to specify which selection criteria would be constitutional. The ruling elaborates on the ambiguity between the open-access clauses of Article VIII and special-access provisions of the Limited Entry Act, explaining that any limitation on access must impinge *minimally* on the open-access provisions of Article VIII and hints that a limitation must imply some mechanism by which that impingement is minimized. In the case of the Limited Entry Act, the logic of "optimum numbers" of permits (in order to protect the resource and promote sustained yield) provides such a mechanism. The urban-rural distinction is considered a "crude" criterion and the majority opinion suggests that a classification of users based on individual characteristics might be more likely to achieve the purposes of a subsistence statute and less likely to impinge on the open-access provisions of Article VIII (but it does not conclude that such a classification would in fact meet the constitutional test).

Justice Rabinowitz's dissenting opinion asserts that the majority opinion takes an overly strict and narrow interpretation of open-access provisions (which imply almost global uniformity in allocations) and their relation to a variety of preferences among beneficial uses (which permit impingements on the open-access provisions). He argues that subsistence laws do not *exclude* any residents from using any wildlife resources, hence a special class or monopoly is not established. Rather, those resources are allocated on a preferential basis and all residents are potential candidates for use of those resources.

Rabinowitz's opinion seems to draw a closer parallel between subsistence uses and limited entry uses, inasmuch as both could be construed as acceptable deviations from the more general rule of open-access. In line with his position that some deviations from the open-access provisions are warranted and even constitutionally required in order to protect the species and promote sustained yield, he draws attention to section 4 of Article VIII, which was already cited in part: ". . . replenishable resources belonging to the state shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses." He concludes that "preferences among beneficial uses" include subsistence preferences, just as they may be interpreted to apply to limited entry and other forms of special administration or regulation.

3. The Aftermath: 1990 to the Present

The immediate aftermath of the Supreme Court decision moved policy-makers, advocates and special-interest groups in two directions simultaneously: one, federal agencies (in particular the U.S. Fish and Wildlife Service, Department of the Interior) were forced to begin planning for an assumption of management of federal public lands in Alaska, since the state was no longer in compliance with ANILCA; and two, Alaskan legislators and interest groups examined means to bring Alaska back into compliance with ANILCA and re-establish a state subsistence preference.

Most concerned parties wished to know how the Superior Court would interpret the Supreme Court's ruling. Did the ruling strike out a subsistence priority entirely, or did it merely invalidate the rural residence requirement? Meanwhile, four courses of action were possible. First, the Supreme Court could reverse its decision upon re-hearing the case, based on new materials and arguments presented by the state of Alaska. Both the state and the Alaska Federation of Natives filed petitions for re-hearing the case. Second, legislative action could amend the Alaska Constitution so as to permit a rural preference; third, Congress could amend Title VIII of ANILCA to conform to the Alaska Constitution <u>or</u> to prohibit state jurisdiction; or fourth, the federal government could be permitted to assume all resource management on public lands in Alaska.

Several legislative solutions were swiftly proposed. House Resolution No. 74 (introduced by George Jacko, Pedro Bay) sought to amend the Alaska Constitution and insert a rural subsistence preference. Senate Concurrent Resolution No. 39 (by Jay Kertulla, Palmer) called for a commission to examine legislative options. House Bill No. 415 (Ramona Barnes, Anchorage) modified the Alaska subsistence statute, eliminated the "rural" definition, and substituted a "subsistence user" definition based on local residence and individual characteristics of users (i.e., level of dependence on subsistence resources and income). Kay Wallis (Fort Yukon) introduced a bill which sought to amend the Alaska Constitution and insert an Alaska Native subsistence preference, and Lyman Hoffman (Bethel) offered a constitutional amendment that would permit Alaska to enact a subsistence law that is in compliance with ANILCA (see Alaska Federation of Natives 1990).

By May 8, 1990 House Democrats and Republicans divided almost perfectly along party lines as the last vote for a constitutional amendment was taken, with Democrats generally voting for an amendment and Republicans against (Tundra Times 1990). After enough votes to change the state constitution were not obtained during the regular session, the Governor Cowper called a special session to address subsistence, but was still unable to obtain the votes needed to put a constitutional amendment on the ballot. By June, a new federal Subsistence Board had been formed and had reviewed and then adopted the state's definitions of "customary and traditional" subsistence uses. On July 1, 1990, the federal government assumed control over wildlife resources and subsistence on federal land. The state continued to manage subsistence hunting on state, private, and Native corporation lands. Subsistence fishing is regulated by the state because the federal government does not consider coastal waters and rivers to be federal public lands. The Superior Court interpreted the Supreme Court ruling to prohibit rural preferences, opening all state lands and waters to subsistence uses by all residents, but emergency regulations then halted fishing and hunting free-for-alls.

The federal government initially adopted state regulations, not only the state definition of subsistence. This meant that the two-tier system of users was adopted in its entirety, as well as season and bag limit regulations. An Office of Subsistence Management was established within the U.S. Fish and Wildlife Service and set out to review, refine, and correct the regulations that had been adopted. The Office of Subsistence Management also began to solicit public comments on the adopted regulations, with a view toward revision and correction.

The state was now limited to managing subsistence only outside federal lands. During the transition immediately after federal assumption of management, federal and state regulations were quite similar insofar as the state regulations were imported wholesale into the federal plan. State and federal agencies tended to work together closely over this interval, as cooperation was in everyone's best interest, but it must be understood that the interim regulations borrowed by the federal agencies were *only temporary*. It was clear to all parties that federal officials would eventually draft permanent regulations that would not necessarily match closely with the state system.

The federal government adopted what are referred to as "temporary" subsistence regulations for the 1991-2 hunting season. These are to be developed as "permanent" regulations which are expected to go into effect in July 1992. Federal officials held meetings on subsistence regulations and more are expected before regulations are completed. When this occurs, there will be a Federal Subsistence Board which will consider future changes. The board will be made up of representatives from the Fish and Wildlife Service, the National Park Service, the Bureau of Land Management, the Bureau of Indian Affairs and the Forest Service. The board will be advised by regional committees in each of the six regions set up by ANILCA. The committees will represent villages and will be selected by village votes. A regional council will be created made up of chairpersons of each advisory committee. The advisory committees will convey local recommendations and attitudes to the regional councils. The councils can make formal recommendations to the state and federal governments on subsistence fishing and hunting. These recommendations must be accepted unless there is a very good reason for rejecting them.

Federal regulations specify certain eligibility requirements: rural residency (all villages meet this requirement); customary and traditional uses of each game population and fish stock, and identification of where these uses take place (thus resource and location of use would qualify persons in each village); seasons of harvest and bag limits; and, methods and means of harvesting (type of equipment and uses of harvested game and fish).

These requirements are written to maintain federal responsibility to Native populations under ANILCA. For example, designated seasons of harvests and bag limits include provisions for village customs and traditions, human needs and protection of naturally-occurring species. Subsistence activities are governed by a permit system under the rules described above.

The political arena in Alaska changed substantially during 1990 when Wally Hickel, running on the Independent ticket, became governor. Hickel, in contrast to his Democratic and Republican adversaries, had not indicated any willingness during his campaign to devise a remedy to this dilemma that would protect rural or Native subsistence preferences.

Governor Hickel established the Advisory Commission on Subsistence in January, 1991. The purpose of this body is to recommend legislative and regulatory actions to bridge the federal and state subsistence policies (Alaska Federation of Natives 1991). The governor's office, acting through the Commission, has proposed several plans, such as the creation of subsistence use areas and multiple levels of restriction. For example, if species were threatened commercial uses would be restricted, followed by bans on removal of the harvested resources from the use area, followed finally by restrictions among users based on a variety of eligibility factors. The Commission has also investigated the possibility of a subsistence license system.

The actions and proposals of the Commission have so far met with very little support, due to the charge that the Commission's work does nothing to resolve the fundamental conflict between state and federal law. The Commission is also viewed with some fear by Alaska Natives inasmuch as it is self-evident that state law (without a constitutional amendment) and ANILCA are irreconcilable. Since the governor does not favor a constitutional amendment, the Commission could merely serve as a vehicle to (1) allow dual management to continue perpetually, or (2) eventually advocate for changes to federal law, specifically ANILCA.

The old state subsistence regulatory scheme, though adopted as a transition measure by the federal government, is likely to be discarded by federal agencies early in 1992. By March 9, 1992, residents had opportunities to issue recommendations and proposals for subsistence on federal land. The federal Subsistence Board and U.S. Fish and Wildlife

Service are now apt to change regulations, including season and bag limits as well as the definition of customary and traditional use (adopted from the state). Those decisions are slated to be made early in April (Arctic Sounder 1992).

According to a representative of an Alaska Native organization, one of the governor's staff working with the Advisory Commission on Subsistence first floated a proposal to consider amending ANILCA early in 1992. This proposal has little support in the Native community since it would throw ANILCA open to any and all changes that the Congress might wish to consider, jeopardizing far more than might possibly be saved. Hickel's current (March 1992) proposal calls for a subsistence preference for residents of communities with populations under 2000, but requires a determination of eligibility based on personal characteristics (including proof of consumption of more than 150 pounds of harvested fish and game each year) for residents of towns that exceed that population limit. The state Boards of Fisheries and Game would have substantial authority to grant those privileges under Hickel's legislative proposal. At a Subsistence Summit organized by the Alaska Federation of Natives and RurAL CAP in March 1992, most Alaska Natives opposed that proposal, chiefly because it grants extraordinary power to Boards that many Alaska Natives feel are dominated by sport and commercial interests. At the close of the Subsistence Summit, Native delegates from across Alaska voted unanimously in favor of amending the constitution and voted unanimously against Hickel's subsistence bill. Another resolution called for examination of alternative approaches to political action, including economic boycotts and civil disobedience.

The Subsistence Summit was a political event designed to show Hickel and state agencies how sweeping Alaska Native opposition to subsistence compromises was. Hickel and his appointees and aides reportedly feel that Alaska Native opposition rested in the hands of elite Native leaders who are out of touch with their constituents. The Summit was designed to bring "common folks" from the villages to the Anchorage meeting in order to clearly and unambiguously reveal the level of opposition that really exists.

Some rural and Alaska Native organizations began to examine innovative strategies to protect subsistence privileges and subsistence resources in this climate of uncertainty even before the Subsistence Summit. The Northwest Arctic Borough, based on Kotzebue, now plans to use conventional zoning regulations to prohibit any kind of development in borough areas that are used for subsistence. Such an approach places control of development, and to some extent protection of subsistence resources and lands, with local institutions. Tanana Chiefs Conference, based in Fairbanks and serving Interior Athabascan villages, is organizing an economic boycott of Alaska Outdoor Council membership businesses. The Alaska Outdoor Council, which represents sport-oriented and generally non-Native fishing and hunting groups, opposes subsistence preferences (Anchorage Daily News 1992). Tanana Chiefs Conference also resolved to propose a new Advisory Commission on Subsistence and to oppose Hickel's legislative proposals on subsistence management.

One proposal to change subsistence regulations comes from Mary Kancewick, legal consultant and writer who resides in Anchorage, Alaska, and Eric Smith, a lawyer with a private practice in Anchorage, Alaska. This proposal was published in a law journal in spring of 1991 and it follows considerable analysis and history of subsistence laws and regulations in Alaska (Kancewick and Smith 1991). The authors recommend that ANILCA be amended to create a Native-community subsistence priority. This would be a tribal, not an individual preference. Qualified persons would be members of a Native community practicing Native subsistence as a part of that community. According to this recommendation, tribal membership would be determined by tribal government rolls "and/or encoded membership definitions and requirements" (Kancewick and Smith 1991:674). Preference would also include urban Natives who were members of Native villages. Village membership would mean continued inclusion on tribal rolls and voting in village government elections. This definition could also include non-Natives, depending on tribal definitions of membership. Most, if not all, of Alaska's villages have constitutions which define their membership, and therefore, the task of establishing membership criteria is essentially complete. The authors suggest that villages that do not have membership criteria could be required to develop them, and some of them might wish to alter their criteria in light of the subsistence preference plan given above.

This proposed plan recognizes a "cultural-community" aspect of subsistence practices, something that is not included in the recommendations favored by Governor Hickel and which has not been part of federal and state regulations and statutes. The notion of "cultural-community" has been at the heart of debates over subsistence rights. Federal and State laws and regulations recognize individual subsistence rights, to the exclusive of group (tribal or cultural-community) rights, and Native peoples have had no success in shifting emphasis from the individual to the group. Kancewick and Smith define what they refer to as the "Native tribal community" in the following way: ". . . be understood to include the Native villages recognized by ANCSA and/or having tribal governments certified by the Indian Reorganization Act" (Kancewick and Smith 1991:675). The State of Alaska could establish regulations for non-Natives as it sees fit so long as Native subsistence uses are met before any others. This plan would guarantee the federal government's fiduciary responsibility to Natives under ANILCA. The Supreme Court of the United States has ruled that Natives have first-preference subsistence rights in their government-to-government relations with the U.S. States cannot abrogate this right. States are allowed to limit Native rights to subsistence are specified as, "only to the extent necessary to prevent the exercise of that right in a manner that will imperil the continued existence of the...resource" (Kancewick and Smith 1991:676). The subsistence regulations proposed by the State of Alaska's Governor's Subsistence Advisory Council, and which are strongly supported by Governor Hickel, do not take into account the "cultural-community".

4. Implementing the Subsistence Priority

The legal wrestling over defining the subsistence priority has been accompanied by problems in interpreting and implementing that priority. These problems have impacted subsistence users. Restrictions have been placed on subsistence in instances where the Boards of Fish and Game have ruled that certain uses did not qualify as "customary and traditional," that certain sales of incidental by-product did not constitute "customary trade," or that certain subsistence harvests violated the sustained yield principle. These restrictions have been the cause of several lawsuits (AFN 1990a:12-13). In one case, the Tlingit and Haida Central Council have challenged the state's management of sea cucumbers, claiming that allowing commercial harvests has violated the sustained yield principle to the detriment of long-established subsistence uses of sea cucumbers in the region (AFN 1990a:13).

Even though ANILCA establishes a legal subsistence priority for rural Alaskan residents, that priority contains some important qualifications. The major qualification is that considerations concerning the biological management of fish and game resources take precedence over subsistence needs, and those biological considerations are subject to interpretation. Assuring the continued viability of fish and wildlife populations is to be taken into account in the provisions for implementing the subsistence priority, in the basis upon which recommendations from the advisory committees and councils must be accepted, in considerations for allowing hunting and fishing in national parks or monuments, and in the conditions for emergency closures of federal lands. Assuring the continued viability of subsistence is not given the same weight in those decisions. Limitations on subsistence because of biological considerations concerning resources are more common than limitations on non-subsistence uses because of detriments to subsistence. Under federal and state law, the subsistence priority is to be effected only when all uses cannot be accommodated (Case 1984:302).

Another major qualification is that under title VIII of ANILCA, subsistence uses were given priority on all federal lands in times of diminished resources, but all uses on these lands are subject to "reasonable regulation" by the Secretary of Interior or the Secretary of Agriculture. As Case has pointed out (1984:293), the federal trust responsibility to protect subsistence has its greatest force in preempting state attempts to regulate subsistence activities. That responsibility has less force when it conflicts with other federal domestic policies, such as off-shore oil and gas leasing. Furthermore, the responsibility is insufficient to warrant direct judicial interference with federal foreign policy interests or international treaties.

Within Bristol Bay, subsistence users have faced increasing competition over fish and game resources. Increased management of the timing, location, and amount of fish and game harvested for biological reasons has affected subsistence activities. Not only have subsistence users faced economic and regulatory competition for the actual resources, but they have had to compete politically for the advisory committee and council positions that make decisions about allocating those resources between various users.

Within this context of increased competition over resources, there has been a general bias in resource management in Bristol Bay. Many of the people that we interviewed were of the opinion that fish and game have been managed more for the benefit of commercial and sports interests than subsistence interests. There may be several reasons for this. The economic value of commercial and sports uses are more easily determined and are often calculated into analyses of the regional economy. Since subsistence use of resources does not involve commercial exchange, its importance to the regional economy is less readily recognized. Furthermore, commercial uses of fish and game account for nearly 95% of resource harvests in Alaska compared to the 4% of harvests for subsistence uses and the 1% of harvests for sport uses (ADF&G Subsistence Division 1990b). Despite the legal priority given to subsistence use of resources, commercial uses appear to receive more attention because of their overwhelming dominance of harvesting activities.

This bias of managing resources in Bristol Bay for commercial use is evidenced in several ways. Representation on the various fish and game councils favors commercial and sports fishing interests (RurAL CAP 1989b). The internal workings of the Alaska Department of Fish and Game's three divisions (commercial, sport, subsistence) and the attitude of many employees of the commercial and sports divisions are biased against subsistence. Even though ANILCA requires that specific consideration be given to subsistence on an on-going basis even when no priority need be invoked (Case 1984:303), proposals emanating from the commercial and sports divisions are rarely given to the subsistence division for review of potential implications for subsistence. The commercial division of the Alaska Department of Fish and Game has assumed broad discretionary powers in managing Bristol Bay's fisheries, without considering subsistence interests, because of their attitude that subsistence is not as important as commercial use of resources.

CHAPTER III. OVERVIEW OF THE BRISTOL BAY REGION

A. DESCRIPTION OF THE AREA

The Bristol Bay region consists of 31 million acres in Southwest Alaska. The boundaries of the Bristol Bay region were defined in Section 1203 of the Alaska National Interest Lands Conservation Act (ANILCA).

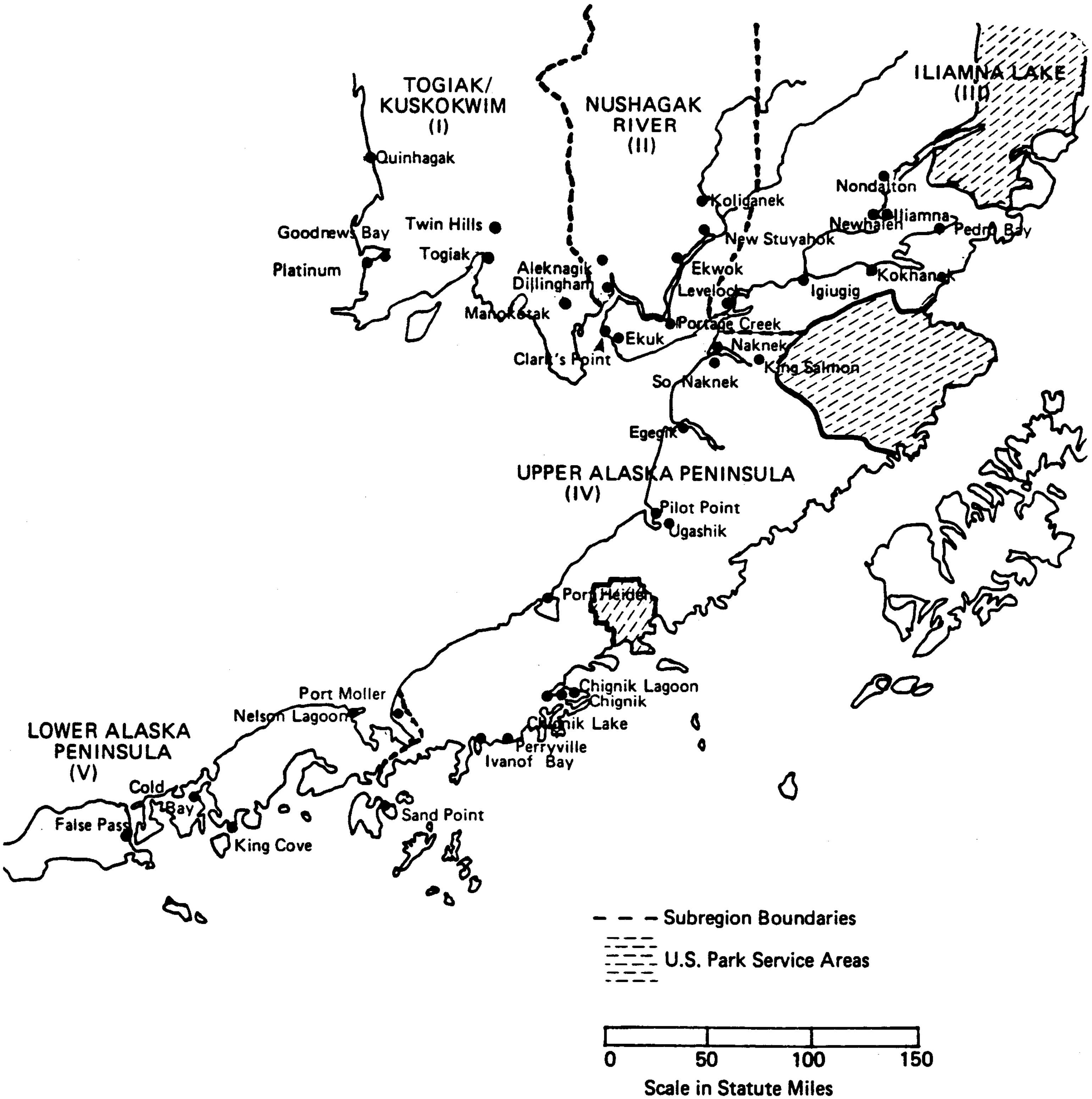
This large, diverse region extends from the southeast shoreline of the Kuskokwim Delta as far east as the headwaters of the Mulchatna River and Lake Clark National Park and Preserve. The region includes Iliamna Lake and its watershed and all of the Alaska Peninsula and Unimak Island, except for Katmai National Park and Preserve and Aniakchak National Monument and Preserve. On the Pacific shore of the Alaska Peninsula, mean high tide defines the boundary of the region, except for those bays that are within the Alaska Peninsula National Wildlife Refuge. In Bristol Bay, the three-mile limit defines the seaward boundary of the region (U. S. Department of the Interior 1984:1-1; Alaska Department of Natural Resources 1984:1-1). The map on the following page shows the Bristol Bay region.

B. THE PHYSICAL ENVIRONMENT

The physical environment of the Bristol Bay region varies greatly. Bristol Bay contains three different climatic zones. The continental climatic zone, in the interior of the region, is characterized by temperature extremes that produce warm summers and cold winters with less than 20 inches of precipitation per year. The maritime climatic zone on the Pacific Ocean side of the Alaska Peninsula produces moderate temperatures with precipitation that can exceed one hundred inches per year. The rest of Bristol Bay is in a transitional climatic zone and has weather conditions that vary between the other two zones. Bristol Bay is subject to several natural hazards, including earthquakes, volcanoes, tsunamis, sea ice, storm surges, slope failure, and flooding.

Bristol Bay's terrain includes expansive lowlands, rolling hills, and mountains on the north side of Bristol Bay; treeless coastal lowlands that rise toward the Aleutian Range on

Map 2
Map of Bristol Bay Communities



Source: Will Nebesky, Steve Langdon, Teresa Hull. Economic, Subsistence, and Sociocultural Projections in the Bristol Bay Region. Vol. II. Bristol Bay Cooperative Management Plan and Refuge Comprehensive Plans. University of Alaska: ISER, 1982.

the north side of the Alaska Peninsula; and, rugged shoreline where the Aleutian Mountains meet the sea on the Pacific Ocean side of the Alaska Peninsula. Several major rivers drain into Bristol Bay, including the Togiak, Nushagak, Kvichak, Naknek, King Salmon, Egegik, Cinder, Ugashik, and Meshik rivers.

The rivers that drain into Bristol Bay meander through lowlands, forming extensive estuaries, while the rivers that drain into the Pacific Ocean on the south side of the Alaska Peninsula are generally short with steep gradients. The major lakes in the region include the Wood-Tikchik lakes, Iliamna Lake (the largest lake in the state), Lake Clark, Naknek Lake, Becharof Lake, and the Ugashik Lakes (BBCRSAB 1984:13).

The coastal and upland habitat of Bristol Bay supports an abundance of marine and wildlife resources. Coastal habitats are provided with nutrients by upwelling marine currents and discharge from the region's rivers. The region's extensive shoreline contains estuaries, salt marshes, tide flats, rocky islands, sea cliffs, offshore rocks, capes, barrier islands, and lagoons which are vital breeding, nesting, rearing, feeding, staging, and/or haul-out areas for fish, waterfowl, seabirds, marine mammals, shellfish, or other marine life. The region contains thousands of rivers, streams, lakes, and tundra ponds which support huge runs of salmon and resident char, rainbow trout, grayling, and other fish. Beavers, muskrat, otters and other small mammals also depend on these water bodies, as do the region's brown bears and eagles that feed on salmon. Upland and tundra habitat supports a variety of game populations, native plants, and berries (BBCRSAB 1984:14-15).

C. NATURAL RESOURCES

Bristol Bay has abundant fish and wildlife resources. The Bristol Bay region is famous for its huge salmon runs. The region boasts the largest red (sockeye) salmon runs in the world, which are the most important subsistence food and are the cornerstone of the region's commercial fishery. Some years, more than half the world's harvest of red salmon are taken in Bristol Bay. More red salmon return to Bristol Bay than all of the other salmon species combined. The number of lakes in Bristol Bay make the large red salmon runs possible because, unlike other salmon, reds depend almost entirely on lakes for rearing. The largest runs of red salmon occur in the Naknek and Kvichak rivers, with large runs also returning to the Togiak, Nushagak, Egegik, Wood, and Ugashik river drainages, and to the Chignik River on the south side of the Alaska Peninsula. Red salmon generally run in late June and early July.

Bristol Bay also receives runs of the other four species of salmon. King salmon (chinook) run in June in many of the region's drainages, with the largest runs in the Nushagak drainage, major runs in the Togiak, Naknek, Kvichak, Alagnak, and Egegik rivers, and smaller runs in the Meshik, Ugashik, Chignik, and Cinder rivers. King salmon are the largest of the Pacific salmon, have high commercial value, and are preferred by sport fishers and subsistence users. Arriving first, king salmon provide the first fresh salmon of the season and they smoke particularly well.

Silver, pink, and chum salmon generally are used less for subsistence and commercial purposes. Silver salmon (coho) are the last salmon to return to Bristol Bay each year, entering streams of origin between mid-July through the end of October, depending on the area. The major silver runs occur in the Nushagak and Togiak rivers, with smaller runs in the Meshik, Ugashik, Egegik, and Naknek river systems. Pink salmon (humpy) are the smallest of the Pacific salmon and return to Bristol Bay in even numbered years, generally running in July and August. Chum salmon ("dog") are common in many of the region's rivers and are the second most abundant species of salmon (after reds). Chums return from mid-June to mid-July, with the largest runs in the Sapsuck and Cinder rivers and the Port Heiden drainages, major runs in the Nushagak and Togiak rivers, and smaller runs in the Kvichak River and tributaries of major bays west of False Pass on the Pacific side of the Alaska Peninsula (BBCRSAB 1984:16; Schroeder et al. 1987).

In addition to its salmon, Bristol Bay is known for the trout, char, and grayling that abound in its marine waters, lakes, and streams. Rainbow trout inhabit every major drainage of Bristol Bay north of Becharof Lake and occasionally can be found in the glacial headwaters of lakes on the Alaska Peninsula. Anglers from around the world are attracted to Bristol Bay by the large rainbow trout in the Iliamna Lake and Wood-Tikchik drainages. Lake trout can be found in many of the region's cold, clear, deep lakes and in some clear rivers and tundra ponds, but not in the Wood-Tikchik drainages or in the Alaska Peninsula drainages south of Mother Goose Lake. Grayling inhabit all drainages at least as far south as Port Heiden on the Alaska Peninsula. Dolly Varden and arctic char occur throughout the region, occupying nearly every watershed. Other anadromous and freshwater fish in Bristol Bay include northern pike, whitefish, burbot, and Boreal smelt. Smelt are popular with recreational and subsistence fishers, but primarily provide food for marine mammals, birds, and other fish (BBCRSAB 1984:17).

Bristol Bay supports vast quantities of saltwater fish and shellfish. Bristol Bay is an eastern extension of the Bering Sea, which sustains lucrative fisheries in yellowfin sole, pollock, herring, cod, and halibut. Bristol Bay serves as an important rearing area for several species, particularly halibut, while other fish spawn along the region's shoreline, such as herring and capelin. Shellfish present in Bristol Bay include cockles; softshell, butter, surf, and razor clams; king, tanner, dungeness, and hair crabs; and shrimp. The north shore of the Alaska Peninsula between Ugashik Bay and Port Moller has the highest concentrations of clams, with smaller clam beds on the Pacific side of the Peninsula and scattered throughout the region. Crabs inhabit the continental shelf, with substantial numbers occurring along the Alaska Peninsula, particularly the Pacific side. Shrimp are distributed throughout the continental shelf but tend to congregate in bays along the South Alaska Peninsula (ibid.:18).

Millions of seabirds, waterfowl, shorebirds, raptors, and other birds are supported by the rich coastal habitats of Bristol Bay. The rugged cliffs of northwestern Bristol Bay and the Pacific side of the Alaska Peninsula provide excellent nesting habitat for seabirds such as common murres, black-legged kittiwakes, tufted and horned puffins, pelagic, red-faced, and double-crested cormorants, glaucous-winged gulls, pigeon guillemots, parakeet auklets, and Aleutian terns. Millions of waterfowl and shorebirds migrate through Bristol Bay twice each year on their way to and from wintering areas all over the Pacific, North America, and Asia, including various species of ducks, geese, swans, brants, eiders, loons, grebes, cranes, and the greater yellowlegs, northern phalarope, common snipe, short-billed dowitcher, western, least, and rock sandpipers, and dunlin. Bald eagles, hawks, falcons, upland birds (ptarmigan, spruce grouse), and passerines (sparrows, finches, warblers, wrens, swallows) also inhabit or migrate through Bristol Bay (ibid.18-19).

The marine waters of Bristol Bay host a wide variety of sea mammals, including beluga whales, four endangered whale species (gray, fin, humpback, and bowhead), millions of seals (harbor, ringed, bearded, and ribbon), and thousands of sea lions and walruses. Whales are primarily present along the Alaskan Peninsula and at the western end of Bristol Bay during migration, but beluga and gray whales migrate through eastern and northern parts of the bay, feeding on salmon at the mouths of rivers. Seals are common throughout the region. Sea lions are concentrated on the Pacific side of the Alaska Peninsula, but some groups of sea lions regularly haul-out in the northern Bristol Bay area on rocky islands off the coast between Togiak Bay and Kulukak Bay. One of these islands, Round Island, has the largest concentration of walrus in the world (ibid.:20).

Bristol Bay supports roaming herds of caribou, some of the largest brown bears in the world, moose in the river valleys, Dall sheep in some of the rugged mountains to the north, and a wide range of small furbearers. Moose are distributed throughout most of the Bristol Bay region but prefer willow and alder-lined stream banks. The Alaska Peninsula, Iliamna Lake, and Wood River-Tikchik Lakes moose populations have declined, primarily due to brown bear predation and hunting. Two major herds of caribou presently inhabit the Bristol Bay region: the Mulchatna herd, which ranges north of Iliamna Lake and west of the Alaska Range; and, the Alaska Peninsula herd, which consists of three sub-herds and is distributed from King Salmon to Unimak Island. Caribou have recently been planted in the northwest portion of the region near Togiak, where they used to be abundant but had disappeared during this century. Bristol Bay's large number of brown bears are particularly abundant in the northern part of the Alaska Peninsula, the Iliamna Lake drainage, Becharof Lake area, and the Meshik and Chignik river areas. A wide variety of other land mammals inhabit the region, including wolverines, lynx, marten, river otter, beaver, mink, short-tailed and least weasel, red and arctic fox, snowshoe and Alaskan hares, hoary marmots, and arctic ground squirrels (ibid.:19-20).

In addition to fish and wildlife resources, Bristol Bay has a variety of other natural resources. The diverse geology of the region has made it interesting to the oil and mining industries. Bristol Bay has been the site of oil and gas exploration since the late 1800s (ibid.:8). Onshore oil and gas potential is greatest in the coastal lowlands along the Bristol

Bay side of the Alaska Peninsula south of the Naknek River and on the Pacific side of the Alaska Peninsula, from Katmai National Park to Aniakchak National Monument. Onshore oil and gas of medium potential exists throughout the lower Nushagak and Kvichak River drainages (ibid.:Map 5). Oil and gas basins extend offshore beneath the state-owned tide and submerged areas and the federal Outer Continental Shelf (OCS) on the Bristol Bay side of the Alaska Peninsula (BBCRSAB 1987:2-3 to 2-4).

There are known areas of mineral deposits throughout the Bristol Bay region that contain copper, zinc, gold, silver, molybdenum, lead, coal, and uranium. The high cost of operation in this remote region has thus far precluded large-scale mineral development, although some smaller placer operations are active. Sand and gravel, generally located along river drainages and around Lake Iliamna, are also important geologic resources in the region (BBCRSAB 1987:2-4; BBCRSAB 1984:8).

D. HUMAN ACTIVITY

Bristol Bay is one of the most culturally diverse areas of Alaska. The regional population is predominantly Native, consisting of Yupik Eskimos, Athapaskans, and Aleuts whose ancestors have inhabited the region for centuries (Damas ed. 1984). The region has been influenced by the religion and cultural heritage brought by Russian missionaries, traders, and trappers. Scandinavians, and to a lesser extent Italians, who came to Bristol Bay as fishers and trappers often stayed, married local people, raised families, and left their cultural mark on the area. In recent decades, commercial fishing, the expansion of government services, and improved transportation and communications have broadened the region's cultural composition and experience (BBCRSAB 1984; Impact Assessment 1984; Langdon 1982; Nebesky et al. 1983b).

The population of Bristol Bay is distributed in 38 communities throughout the region. These communities are located on the coast of Bristol Bay, along the rivers, or on the shores of lakes. Some of these villages are at the sites of traditional Native summer fish camps or winter villages and have been occupied seasonally or intermittently for thousands of years. Others have evolved as permanent villages over the past century or the past few decades. Some communities developed around canneries that first located in the area in the 1800s. Over the years, the population of Bristol Bay has been consolidated following major epidemics (smallpox, influenza, measles) or disasters (e.g. the 1912 eruption of Mt. Katmai). Villages have become more permanent habitations in response to the establishment of schools, churches, and government services (BBCRSAB 1984; Nebesky et al. 1983).

Communities in Bristol Bay are only accessible by air or water transportation. Passengers, mail, and small freight are transported by airplane. Regional airports at King Salmon and Dillingham connect the region with the rest of the state. Barges transport fuel, large freight, and other bulk items throughout the region. Skiffs, fishing boats, and snow machines are used for local travel between villages. Roads generally do not extend beyond the immediate vicinity of villages. There are only three roads between communities: the 22-mile "Lake Road" connecting Dillingham and Aleknagik; the 15-mile paved road from King Salmon to Naknek; and the 8-mile road connecting Iliamna and Newhalen. The majority of gravel and dirt roads within the communities were built by the state to support local airports. The airstrips in King Salmon and Port Heiden were built by the federal government during World War II for military purposes (BBCRSAB 1984:10; Impact Assessment 1984).

People who reside in the Bristol Bay region are dependent upon the land and natural resource base described previously for their economic as well as socio-cultural well-being. Subsistence plays a vital role in the life of all villages and of most residents, with subsistence harvests in this region being among the highest in the state (ADF&G Subsistence Division 1989). A patterned seasonal round focuses on subsistence and commercial salmon fishing, big game hunting (moose, caribou), non-salmon fishing (principally whitefish, northern pike, grayling, rainbow trout, lake trout, arctic char, Dolly Varden, herring, and smelt), and trapping.

The seasonal round and complex regional resource sharing and exchange networks continue to pattern the economic life of Bristol Bay communities. Subsistence activities provide an essential and preferred source of food, important links to Native cultural tradition and way of life, economic security and stability, and social cohesion through sharing and distribution. Subsistence activities vary between communities and from year to year, depending upon resource distribution and abundance, personal preferences, cultural values, household income, and alternative food costs (ADF&G Subsistence Division 1989; BBCRSAB 1984; Behnke 1982; Feldman 1979; Fall et al. 1986; Fall 1989; Kresge et al. 1974; Morris 1985, 1986, 1987; Schichnes & Chythlook 1988; Schichnes & Fall 1989; Wolfe et al. 1984; Wright et al. 1985).

Salmon, moose, and caribou are the region's most important subsistence resources in terms of quantities eaten and all villages use these resources to varying degrees. Salmon is taken in all communities on the Bristol Bay side of the Alaska Peninsula and primarily in Chignik Lagoon on the Pacific side of the peninsula. Moose harvests occur primarily in the Nushagak drainage, in the Iliamna Lake subregion, and on the Alaska Peninsula. Marine mammals are of particular importance to people in the Togiak subregion because of the scarcity of moose and caribou and the availability of walrus, seals, and sea lions. Residents of coastal communities along the south side of the peninsula and in the northwestern part of Bristol Bay obtain more marine invertebrates. People throughout the region gather wild plants and bird eggs in spring, berries in the late summer and early fall, and wood intermittently to fire stoves and steams. Some residents of each village trap furbearers, eat some of the meat, and sell most of the furs (BBCRSAB 1984:5). Overall, subsistence activities are highest in the Nushagak River and Iliamna Lake villages (Fall 1989; Wright et al. 1985; Schroeder et al. 1987).

Commercial fish harvesting and processing dominate the regional economy, providing most of the jobs and income. Commercial salmon fishing has been the mainstay of Bristol Bay's economy since the late 1800s. Over the past decade, Togiak has become the site of the largest commercial harvest of herring in the state (Devalpine 1989). Until recently, the bottomfish and shellfish of the Bering Sea and Pacific Ocean have been of limited economic importance, except on the Pacific side and lower end of the Alaska Peninsula. A halibut fishery was tried in Bristol Bay in 1990. Commercial trapping is still an important occupation and source of income, particularly for residents of inland (upriver) communities (Behnke 1982; Morris 1986).

Commercial fishing and processing influences the nature of Bristol Bay communities. In summer, many residents of upriver communities migrate to fishing districts, fish camps, and processing centers. The populations of Dillingham, Naknek, Chignik, Togiak, Egegik and other processing sites swell with thousands of fishermen and workers, primarily from outside the region. The Bristol Bay fishery has long been controlled by interests from outside the state and outside the region. Only since World War II have many local people participated in commercial fishing, but their participation has declined since implementation of Limited Entry in 1973 and the subsequent alienation of many Limited Entry fishing permits (Impact Assessment 1984; Koslow 1982; Langdon 1980).

Sport fishing and hunting and recreational use of land in Bristol Bay have increased dramatically in recent years. Bristol Bay is world renowned for its recreational opportunities, which include sport fishing and hunting, river-rafting, kayaking, wildlife observation, sightseeing, and hiking. Bristol Bay contains the 1.4 million-acre Wood-Tikchik State park (the largest state park in Alaska) and three national parks and monuments: Katmai National Park and Preserve, Lake Clark National Park and Preserve, and Aniakchak National Monument and Preserve. Most of the fishing and hunting lodges and private cabins are located along the Kvichak, Nushagak, and Wood River drainages and near Lake Iliamna and Katmai National Park. This recreational activity has increased pressure on local fish and game resources but has made minor contributions to the local economy, because most businesses which service these activities are owned and operated by people from outside the region or state (BBCRSAB 1984:8-10; McNabb et al. 1990).

Regional employment can be divided into three main categories: commercial fishing and processing; government; and service and support businesses. Most fishermen and generally all of the fish processing workers come from outside the state. Commercial fishing provides most of the employment in the Togiak, Alaska Peninsula, and Bristol Bay Borough subregions, and a smaller percentage in the Nushagak and Iliamna subregions, except for Dillingham. Government employment is with federal agencies (Federal Aviation Administration, Air Force, Coast Guard, Weather Service, Fish and Wildlife, National Park Service, Bureau of Land Management, Post Office, Army Corps of Engineers) or state and local entities (Alaska Department of Fish and Game, health and social service agencies, school districts, transportation and public facilities agencies). Most of the government jobs are located in Dillingham, Naknek, and King Salmon, while government employment provides most of the relatively few jobs in the Iliamna Lake subregion. Employment in the service and support sector are with businesses such as hotels, lodges and guides, restaurants, stores, banks, and communication, transportation, and utility firms. The Nushagak subregion, which contains the regional hub of Dillingham, is the most dependent upon service-related employment. Economic variation between the communities of Bristol Bay primarily is due to the level of involvement in commercial fishing, development of government services, and occupational diversity (BBCRSAB 1984; Impact Assessment 1984; Langdon 1982; Nebesky et al 1983a, 1983b).

CHAPTER IV. HISTORICAL CHANGE IN THE BRISTOL BAY REGION

In this chapter on the ethnohistory of Bristol Bay, we discuss the Native cultures of the region, their traditional use of various resources, and early commercial activities. We also give a brief historical overview of various subregions within Bristol Bay, focusing on the kinship ties and historic connections among communities in Bristol Bay to account for present-day resource distribution patterns. The subregional overviews will also discuss the effects of trade, population dynamics, community consolidation, and the development of commercial fisheries on resource use and community sources of cash income.

Other important historical changes discussed in this chapter include demographic trends, alterations in regional land ownership patterns, and the role of government in providing employment, services and infrastructure. Major institutional changes have been related to Alaska statehood, enactment of the Alaska Native Claims Settlement Act and the Alaska National Interest Lands Conservation Act, and the relatively rapid oil-driven development of the state. These institutional changes have been accompanied by increased competition over Alaska's land and natural resources. These changes have affected people's ownership of, control over, and access to fish and game resources as well as the timing, location, and organization of subsistence activities.

A. ARCHEOLOGY AND ETHNOHISTORY

Human occupation of Bristol Bay dates back about 9,000 years ago to the Paleo-Arctic period (Dumond 1984a, 1984b). Two distinct cultures developed on either side of the Alaska Peninsula from about 4,000 B.C. to the beginning of the Christian era. The peoples on the Bristol Bay side of the peninsula, influenced by the Northern Archaic tradition, were primarily terrestrial hunters and river fishermen. On the Pacific Ocean side, people were confined to the coasts because of the rugged, mountainous terrain and depended more upon fish and marine mammals, both of which were abundant. The latter was part of the Ocean Bay cultural tradition, which was developing at the same time on Kodiak Island and in Prince William Sound (Clark 1984a; Dumond 1984a). Archeological and linguistic evidence suggests a relationship between these early Pacific Eskimos and Aleuts, but there is much debate over the nature of that relationship and over when these groups may have diverged (Dumond 1984a:78-79).

From about 1200 B.C. to 600 A.D., most of Bristol Bay was influenced by the Norton tradition, a cultural complex with a unique tool tradition and ecological orientation which spread throughout the Alaska Peninsula and beyond. This period was marked by an increased interest in the use of marine resources, the development of more permanent coastal villages, and the use of properly maritime techniques in the taking of sea mammals. By 1100 A.D., the Thule tradition, or the true Eskimo culture, was fully developed and present on both sides of the Alaska Peninsula. This cultural tradition was distinguished by an ability to deal with ocean hunting and with subsistence hunting up rivers or in the tundra-covered interior (Dumond 1984a:76-77).

At the time of European contact, four major groups of Native people inhabited the Bristol Bay region: Central Yupik Eskimos, Pacific Eskimos, Dena'ina (Tanaina) Athabaskan Indians, and Aleuts.

Yupik Eskimos inhabited the northern part of Bristol Bay. There were three major sub-groups: the Tuyuryarmiut, who lived in the vicinity of the Togiak River, its tributaries, and the adjacent coast; the Kiatagmiut, who were located along the Nushagak, lower Mulchatna, and upper Kvichak rivers and in the Wood River Lakes area; and the Aglurmiut, who inhabited coastal areas from Nushagak Bay to the Upper Alaska Peninsula south of the Kvichak River (VanStone 1967; 1971; 1984c).

Pacific Eskimos occupied most of the Alaska Peninsula and spoke Sugpiaq, also called Alutiiq, which was a Yupik dialect spoken by people from Kodiak Island, the Kenai Peninsula, and Prince William Sound. The Pacific Eskimos were displaced or absorbed by the Aglurmiut Eskimos soon after the arrival of the Russians. The Aglurmiut had been driven from Nunivak Island by the Kiatagmiut and Kuskowagamiut and retreated to the Alaska Peninsula. When Russians arrived in Bristol Bay, they found about 2,000 Aglurmiut residing there (VanStone 1971). Pressured by the Tuyuryarmiut from the north and the Aleuts from the south, the Aglurmiut later sought refuge in the early Russian settlements (BBCRSAB 1984:1).

Dena'ina (Tanaina) Athabaskans lived to the east in the interior around Lake Iliamna, having moved there before Europeans made their first contacts with Native Americans in Bristol Bay (Townsend 1970). By the 1800s when Russians first penetrated the Iliamna Lake area, both Athabaskans and Eskimos were living there. Presently, the communities of Nondalton, Pedro Bay and Iliamna are occupied by persons of Athabaskan descent while the people occupying the communities of Newhalen, Igiugig and Kokhanok have Eskimo ancestors (BBCRSAB 1984:1).

The Aleuts formed another cultural boundary with the Eskimos on the upper end of the Alaska Peninsula. Aleuts inhabited the Aleutians and the lower Alaska Peninsula. Even though the Thule tradition was spreading down the Aleutian chain at the time of Russian exploration, the Aleuts remained distinct from other Native people of the area, with their own language, material culture and ecological adaptations (Dumond 1977).

1. Eskimos

The abundance of natural resources in the Bristol Bay region gave rise to some of the largest and most stable concentrations of Eskimos to be found anywhere in the arctic regions, except on Kodiak Island. These Eskimos lived in large, permanent villages as well as small hunting, trapping, and fishing camps. The predictable and large supplies of salmon which returned each year made this stable population possible (VanStone 1984b:206-207). The rivers that flow into Bristol Bay and the varied habitats that they support gave local inhabitants access to both coastal and inland food resources.

The Yupik Eskimos of Bristol Bay were maritime and riverine in their ecological orientation. Residents of coastal villages concentrated on fishing and sea mammal hunting, but ventured inland to hunt caribou and fish in inland lakes. Riverine communities depended upon salmon and lake fish which was supplemented with caribou and moose, but they occasionally visited the coast to hunt sea mammals. In their adaptation to a riverine environment and to northern forests, these Eskimos were distinct from other inland Eskimos and were, in this respect, like the Athabaskans who were their neighbors throughout much of the area (VanStone 1984b:207). There was considerable mobility between coastal and riverine areas, which made ritualized trade between inhabitants of the two ecological areas less significant. However, important patterns of reciprocities developed, based upon peoples' desires for each others products (ibid.).

Pacific Eskimo subsistence patterns were heavily marine-oriented. Whales, seals, salmon, halibut, cod and rockfish, sea lions, sea otters, porpoises, shellfish, sea urchins, clams, chitons, mussels, and seaweed all contributed to the diet. Deer from Kodiak Island and moose and caribou from the Alaska Peninsula were also important sources of food. A variety of greens and berries were taken too (Clark 1984a; Langdon 1987).

Southwest Alaska occupies an important position in the total configuration of Eskimo culture. More complex forms of social and ceremonial life were found here than in any other region occupied by Eskimos, due to the area's abundant natural resources, a large and stable population, and geographical proximity to other cultures with highly developed social and ceremonial systems (VanStone 1984b:208). In the permanent settlements, the men and older boys lived in the *kashim*, apart from the women and children, but nuclear and extended families formed households at hunting and fishing camps. Much of village life centered around the *kashim*, where decisions were made, ceremonies took place, males steamed, and young men were instructed in religion, myths and legends, and subsistence techniques (VanStone 1984c:233). An elaborate seasonal cycle of ceremonies was conducted in the winter and early spring, in which villages took turns hosting celebrations of feasting, dancing, and distribution of gifts.

The nuclear and extended families with bilateral descent formed the central social organizational and economic units, similar to contemporary Bristol Bay Eskimo communities. There were no territorial associations with these kin units and resources were available through usufruct rights. Band inter-marriages and alliances were common and generalized reciprocity was universal. Elder persons were treated deferentially. Shamanism was a customary practice and these ritual leaders enjoyed certain privilege and special status. They also ran high risks in their competition with other shaman and penalties for failure to bring about desired results. Distinctions in social status were greater among the Pacific Eskimo, with whom there were village leaders, inherited positions, and slavery.

2. Athabaskans

Some Dena'ina (Tanaina) Athabaskans occupied inland areas around Iliamna Lake and Lake Clark. There were greater concentrations of Dena'ina in this area due to abundant runs of red salmon (which spawned in the lakes) and herds of moose and caribou, which provided a stable food supply. The Dena'ina were one of the more sedentary groups of Athabaskans, occupying villages with recognized territories and chiefs, although they did travel seasonally to hunt, trap, or fish. Good hunters, organizers, and traders became leaders and attracted followers; their authority was based on proven desirable traits.

Athabaskans were flexible and incorporated technologies, social principles, and ceremonial practices used by neighboring groups. The Dena'ina adopted kayaks and *baidarkas* from the Koniag and Chugach and were influenced by Eskimos in their use of ulus, pottery, and ground slate tools. They constructed relatively large, semisubterranean lodges with a tunnel entry for housing in the more permanent villages, similar in construction to the Eskimo *kashim*. They used a variety of tents, lean-tos, and other temporary constructions in hunting and fishing camps. They were distinctive among Alaskan Natives in their use of tree bark for bowls and containers (Langdon 1987).

In terms of social organization, kinship was based on matrilineal descent and the Dena'ina were organized into matrilineal moieties (probably the result of contact with Tlingits). The Dena'ina were among the wealthier groups of Athabaskans and were noted for engaging in warfare with the Koniag, Chugach, and occasionally the Ingalik. They also facilitated trade between interior groups and Eskimos and Koniags while marriages and trading partnerships existed between Athabaskans and Eskimos. The major ceremonial event in Athabaskan society was the potlatch, and shamanism was prevalent.

3. Aleuts

The Aleut culture is of Eskimo origin in all likelihood. It is characterized by dependence chiefly on sea mammals, sea birds, fish, and marine invertebrates and is distinctive for its exceptionally successful adaptation to the cold environment of the Aleutian Islands. Aleuts were especially skillful open-ocean hunters and unsurpassed in their mastery at handling *baidarkas*, or kayaks. Aleuts who lived farther down the Aleutian Chain hunted whales and seals while the more central and eastern Aleuts also had access to salmon and caribou. Aleut communities claimed and protected certain areas as their resource territories (Lantis 1984; Laughlin 1980).

Aleut settlements included more permanent winter villages along the coast and seasonal camps which were used when procuring certain types of food. The more permanent Aleut housing structure was called a *barabara*, which was an oblong pit dwelling with wooden or whale bone frames overlain with grass or sod. Each house was residence for several nuclear families, usually related by kinship through males. Aleut villages did not have large community houses or steambaths, which were typical in Eskimo villages (ibid.).

The major difference in social organization between Aleuts and Eskimos was the occurrence in Aleut society of wealth and status differentials similar to those found in the Northwest Coast cultures which occupied richer environments and were especially ingenious at exploiting resources. There were wealthy people, common people, and captured slaves in Aleut society. Village chiefs were the heads of demes or of the strongest extended family in a village if there was more than one, and privileged positions were often inherited. Special rights, powers, and status were associated with whale hunting, which was usually confined to a few families. Aleuts possessed some incipient forms of matrilineal descent and inheritance, an indication of the development of status distinctions and concentrations of wealth. The avunculate was practiced, where males lived with their natural parents during childhood and later with their mother's brother, who became their primary teacher and trainer.

There were several distinctive features of Aleut culture, such as Aleut whaling ritual and technology, knowledge of anatomy, treatment of the dead and mummification, and bloodletting. The beautiful visors and elongated hats worn by Aleut men were unique and Aleut women were known for their particularly fine basketry. But Aleuts shared other cultural aspects with Eskimos, including bride service, distinction between older and younger siblings, positive value of suicide, shamanism, and many other details of technology (Lantis 1984). Intervillage festivals of dancing and feasting were common.

4. Agents of Change

Aleuts were the first Alaskan Natives to be effected by Russian expansion into North America, which began in the mid-18th century and pushed its way eastward along the

Aleutian chain to the mainland of Alaska. Aleuts fought against Russian incursions into their territory, winning some battles, but by the late 1780s they had been subjugated. The Russians had a devastating impacted on Aleut society. During the first two generations of Russian domination, from approximately 1750 to 1800, the Russian American Company gained control. Aleuts died from introduced diseases, punishment for resistance, malnutrition, suicide, and forced sea mammal hunting that transported hunters away from their homes and left dependents without adequate protection (Lantis 1984:163). The Aleut population was reduced by about 80% to 90% from an estimated population of about 12,000 to 15,000 when the Russians first arrived (Lantis 1984:163).

As Russians acquired new hunting territories, they consolidated the Aleut population and forcibly relocated Aleut hunters to the Pribilof Islands and to areas east and south of the Alaska Peninsula. Aleuts were relocated as far away as present-day California (Lantis 1984:165; Langdon 1987:21). Aleuts became integral to the Russian-American Company's trapping and trading activities because of their abilities to hunt sea otters and fur seals.

The Russian-American Company did not turn its attention to areas of southwestern Alaska north of the Alaska Peninsula until the nineteenth century. In 1819, a small post was established at the mouth of the Nushagak River, called Aleksandrovskiy Redoubt, which served as a point of departure for explorations and trading parties into the interior and northward along the coasts. Russian interest in Bristol Bay was directly related to expansion of the fur trade and trading stations later were established in the interior. One major trade route ran up the Nushagak River to its headwaters near the Kuskokwim River. Russian Orthodox missionaries followed closely on the heels of the trade-oriented explorers (VanStone 1984a) and schools were established at some of the trading posts.

Within thirty years, most of the Bristol Bay region had been opened up to the fur trade. Russian-American Company traders did not oppress Native people like earlier Russians had been able to do in the Aleutians and throughout southeastern Alaska (VanStone 1984a:154), but Natives suffered similarly from diseases and epidemics and populations were subsequently consolidated. Subsistence patterns were altered somewhat as Eskimos were drawn into the fur trade and began to rely upon goods obtained from the trading posts. Since transportation between the coast and inland communities was relatively easy, and since game and furbearing animals continued to be plentiful, interior communities were never depopulated like they were in the arctic slope region of northwest Alaska. Inland communities remained distinct from coastal communities (VanStone 1984a:159).

One of the major sources of cultural change in Bristol Bay were the commercial fisheries that developed after 1880, subsequent to Alaska's purchase by the United States. The commercial fisheries rapidly replaced the fur industry as the dominant economic activity in the region. Even though Natives obtained little employment during the early years of the fishing industry, the canneries and the large number of outsiders that they employed influenced population shifts, subsistence activities, and marriage patterns. The commercial fisheries introduced Natives to true wage employment and to a greater number of trade goods (VanStone 1967, 1971, 1984a). The economic history of Bristol Bay since the late nineteenth century largely has been influenced by the commercial fisheries, which is the focus of the next chapter.

B. SUBREGIONAL OVERVIEWS

This section provides some historical and current information on the subregions within Bristol Bay and the communities located within those subregions which were included in the ADF&G data base. The subregions are the ones recognized and described in most of the secondary and government literature on Bristol Bay as distinct geographical areas, each with its own array of marine and terrestrial resources and corresponding human orientations to these (Kresge et. al. 1974; Schroeder et al. 1987). These subregions correspond, in large part, to those identified through our statistical analysis of the ADF&G data set (see Chapter VI). The subregions that will be described are the following: the Alaska Peninsula, Pacific Side; the Alaska Peninsula, Bristol Bay side; the Iliamna Lake area; the Nushagak River drainage; and the Togiak area.

1. The Alaska Peninsula, Pacific Side Subregion

Human occupation in the Chignik area on the Pacific side of the Alaska Peninsula began about 6,000 years ago (Dumond 1977). There were two linguistic groups represented in the early Native American populations, Eskimo and Aleut. Most current residents regard themselves as Aleuts, despite linguistic differences between themselves and people further to the south, but many also have Russian or Scandinavian ancestors. Early occupants of the subregion depended mainly on marine resources, chiefly sea mammals, and the early human population was one of the largest in Bristol Bay. At present, there are five villages located in this mountainous Pacific side of the Alaska Peninsula: Chignik (known as Chignik Bay), Chignik Lagoon, Chignik Lake, Perryville, and Ivanof Bay.

Chignik Bay is the oldest village in the region. A Kaniagmuit Eskimo village called Kalwak occupied the site until the late 1700s when the Russians destroyed it during a bloody rampage along the peninsula. In the late 1800s, a cannery was built there, which established Chignik Bay as a fishing village (BBCRSAB 1984:2). Chignik Bay is presently the largest community in the area and the only incorporated city; it became a second class city in 1983. Chignik Bay is the site of two fish processing operations, since its sheltered harbor offers year-round use, and the center of commercial activity for the subregion. Most of the workers in the fish processing plants are imported from outside the region on a seasonal basis. There has been more infrastructural development in this community than in the other communities within the subregion.

Chignik Lagoon, which is about five miles from Chignik Bay, developed as a fishing village over the past several decades because of the huge red salmon runs in the lagoon. The community has a small year-round population which swells in the summer with fishermen from nearby villages and from outside the area who live in cabins or on their boats during the red salmon season. Columbia Wards operates a fish camp across the lagoon from the village during fishing season.

Chignik Lake originally was established in the 1920s as the location of a trapping cabin but grew into a village after a school was built in the 1950s. Chignik Lagoon families began moving to the site in winters because weather is milder there than in Chignik Lagoon. Present residents trace their roots to families from the villages of Ilnik on the Bristol Bay side of the Peninsula and Kanataq, near Becharof Lake. Chignik Lake is closely tied with Perryville and Ivanof Bay in kin relations and subsistence exchanges and is more dependent on subsistence resources than either Chignik Bay or Chignik Lagoon (Morris 1987).

Perryville was established by Eskimos moving southwest into Aleut territory following the great Katmai eruption in 1912 (Lantis 1984:165). The people from the villages of Douglas and Katmai survived the disaster because they were out fishing at the time. They were taken to Ivanof Bay by Captain Perry and later to the present location of this village, which was named in the captain's honor (Nebesky 1983b:196). Perryville is the only community in the Bristol Bay region chartered under the Indian Reorganization Act (IRA) of 1934 as an IRA corporation (ibid.:198).

The small village of Ivanof Bay was established in 1965 by former residents of Perryville who sought a more peaceful lifestyle, religious freedom, and linguistic homogeneity. They located the village on the site of a former salmon cannery which operated from the 1930s to the early 1950s (ibid.: 203).

The communities of this subregion tend to interact among themselves and have fishing grounds, fishing permits, and fishing gear that is completely distinct from villages on the other side of the Alaska Peninsula. They are oriented economically toward Kodiak Island, yet they have some social and religious ties to the communities of Port Heiden and Pilot Point on the Bristol Bay side of the peninsula (Nebesky et al. 1983b:175; Cultural Dynamics 1986).

Residents of all five of these communities are highly dependent upon commercial fishing and subsistence harvesting. There are few occupational alternatives in most of the villages aside from a few government, school, or health jobs. The commercial fishery in this area is more diversified and more lucrative, on the whole, than on the Bristol Bay side of the Alaska Peninsula. Salmon fishing is done mostly with seine gear and some people also fish for halibut, herring, crab, and, more recently, bottomfish. Most of the residents of Chignik Lake, Perryville, and Ivanof Bay relocate to Chignik Bay or Chignik Lagoon during fishing season. Many former residents of the area who now live in Kodiak, Anchorage, other parts of Alaska, or the Pacific Northwest return for the summer fishing season (ibid.).

People who live on the Pacific side of the Alaska Peninsula continue to take subsistence resources from large areas of water and there is considerable sharing and exchange of renewable resources, which increases interaction among residents. Harvesting groups tend to consist of nuclear families and extended families related through males, with hunting and fishing parties often composed of fathers and sons, brothers, and cousins. The major species harvested in this subregion are salmon, moose, and caribou. Residents of these communities also harvest other species of fish, ducks, teals, geese and ptarmigan, small mammals (porcupine, hares), sea mammals (sea lions, walrus and seals), fox, lynx, mink and wolverine, and marine invertebrates (crabs, shrimp, octopus and mussels) as well as wild plants (berries and vegetables) and seagull eggs. Alders and cottonwoods are collected and used in smokehouses (Morris 1987; Schroeder et al. 1987).

2. The Alaska Peninsula, Bristol Bay Side Subregion

Communities on the Bristol Bay side of the Alaska Peninsula can be separated into three distinct groups: small fishing villages along the Upper Alaska Peninsula, which include Egegik, Pilot Point, Port Heiden, Ugashik, Nelson Lagoon; False Pass from the Lower Alaska Peninsula; and, the three communities of the Bristol Bay Borough, which are Naknek, South Naknek, and King Salmon. Communities within each of these groups share some common characteristics and their residents interact most with people in other communities within their grouping. Almost all of these communities are located on former sites of Native villages or fish camps.

This part of Alaska was settled about 6,000 years ago. Captain Cook made contact with some of the people living there on his third voyage in 1778, the first recorded contact between the indigenous people and Anglo-Europeans. By the early 1800s, Eskimo people speaking Sugpiaq (also known as Alutiiq) of the Eskimo-Aleut language family were in the upper Naknek drainage (Dumond 1981). At the same time, Yupik Eskimos of the Aglurmiut subgroup lived adjacent to the coastal area along the lower drainage area.

It was not until the middle of the 1800s that frequent contact between Native and non-Native peoples began. At that time the Russians were engaged in intensive efforts to convert Natives to the Russian Orthodox religion and to bring Native peoples into the fur trade (Feldman 1979; VanStone 1967). The subregion initially was not considered important to the Russians or the Americans when Alaska was purchased in 1867.

American interests were reflected in scattered salmon salteries built and operated in the 1800s and early 1900s. In 1890, the first salmon cannery was started on the Naknek River and by the 1920s, other subregional villages also had canneries (Nebesky et. al. 1983).

Initially, owners of canneries and fishing crews were from outside Alaska, but labor shortages during World War II brought local people into the canneries as employees and as fishermen. As in other subregions of Bristol Bay, commercial fishing became the dominant force of social change and the demography and economies of these subregional communities have become inextricably linked to the cycles of commercial fishing.

Upper Alaska Peninsula Communities. The small villages along the Upper Alaska Peninsula are highly dependent upon commercial fishing for income and upon subsistence resources for food. They focus their harvesting activities on nearby rivers. There is little occupational diversity within these communities and the few jobs besides commercial fishing are related to providing community services. All of these communities remain unincorporated except for Port Heiden, which became a second class city in 1972. The Native population of these communities is mostly Aleut, although parts of the region were inhabited historically by Eskimo, Aleut, and Athabaskan peoples (Impact Assessment 1984; Nebesky et al. 1983b; Schroeder et al. 1987).

Egegik is located on the south bank of the Egegik River, 38 miles southwest of Naknek. It is the largest village on the Upper Alaska Peninsula with 122 residents in 1990. The area had long been used for Native fish camps before the Alaska Packers Association established a salmon saltery there in the late 1800s. The community developed around a cannery located at the river's mouth and has become a major fishing community (Nebesky et al. 1983b). Egegik swells in the summer with people who work for several fish processors and with commercial fishermen. Many residents from outside the area fish Egegik because of the huge salmon runs that feed into nearby rivers and that pass by this area on their way to other major salmon spawning streams farther north in Bristol Bay.

The other four Upper Alaska Peninsula communities of Pilot Point, Ugashik, Port Heiden, and Nelson Lagoon share several characteristics. All of them except Ugashik, which is nine miles inland on the Ugashik River, are located on the coast or near the mouths of rivers where Natives had traditional fish camps and where salmon salteries or canneries located in the late nineteenth and early twentieth centuries. However, none of these communities currently has a major local fish processor. The populations Pilot Point, Ugashik (which was once one of the region's largest villages), and Port Heiden were decimated by the flu epidemic of 1918-1919 and they have remained small since that time. Most of these communities have had trouble maintaining their port facilities because their harbors have suffered from erosion and silting. Port Heiden is unique in that during World War II an army and airbase was located eight miles north of the village and the community has an unusually large landing strip.

False Pass, which is further down the Alaska Peninsula, is not on the Pacific side or the Bristol Bay side of the peninsula but sits on the eastern side of Unimak Island, on the most eastern strait separating the Bering Sea and the Gulf of Alaska. False Pass was the only Lower Alaska Peninsula community included in the ADF&G data base and is described here before we move farther north in covering subregions and communities. Like the other communities of the Upper Alaska Peninsula, False Pass originated with the establishment of a cannery at the site in 1918 and, like Egegik, one remains in operation today. The community has not incorporated. The number of permanent residents is small and most of them depend upon commercial fishing and processing and engage in subsistence activities. In recent years, False Pass has seen an increase in fish processing associated with the bottomfishing boom that has affected much of southwest Alaska.

Bristol Bay Borough Communities. The communities of the Bristol Bay Borough, namely King Salmon, Naknek, and South Naknek, are quite distinct from the smaller fishing villages of the upper Alaska Peninsula. These three communities, which are geographically close to one another, form a major population, commercial, and administrative center within Bristol Bay. These communities are organized into the only borough within the Bristol Bay region and the very first borough to be organized in the state, which was established October 2, 1962. There is more infrastructural development in Bristol Bay Borough communities than in most other communities in the region except for Dillingham. Kinship and friendship ties link some members of these communities to people living along the Kvichak River and Lake Iliamna.

Naknek is located on the north bank of the Naknek River and not very far south from the Kvichak River. Since the beginning of the twentieth century, Naknek has evolved into a major fisheries center. Presently, about ten large, red salmon processing operations are located there. Thousands of people swell the community in June and July to commercial fish and to work for the fish processors. Housing for these seasonal residents is extremely limited. Naknek is also the seat of borough government and the location of the Bristol Bay Borough School District offices. Government, the school district, and support and service industries for the fisheries provide occupational and economic diversification for the local population.

South Naknek is located across the Naknek River from Naknek. South Naknek grew since the turn of the century after cannery operations were located there and population began to concentrate on the river front. At present, there are several large fish processors located on the south side of the river. Most of the employment in South Naknek is related to commercial fishing or community services and a few residents trap furbearing animals in the winter. South Naknek has a much higher percentage of Native residents than either Naknek or King Salmon.

King Salmon is located on the north bank of the Naknek River about fifteen miles up the river from Naknek. Beginning in the 1930s, the federal government has used King Salmon as a center for air navigation and weather monitoring. The King Salmon Air Force Base, built during World War II, serves as the major military installation in western Alaska. More recently, offices for various federal land and resource management agencies have been built in King Salmon. King Salmon also serves as a center for several fishing lodge and guide operations which utilize the outstanding recreational opportunities of nearby areas. The community has continued to develop as a transportation, government, and service center (Nebesky et al. 1983b:218)

Subsistence. The three most important wild foods in this subregion as measured by degrees of total human use are salmon, caribou, and moose. All five salmon species are important to the people in this area. The Upper Alaska communities are distinct in that land mammals, primarily caribou, add more to the local diet than salmon and the harvest of migratory waterfowl makes a notable contribution to peoples diets (Morris 1987). Nuclear and extended families harvest resources, with much of the hunting and fishing done by fathers and sons, brothers, and cousins. Residents of the Bristol Bay Borough depend primarily upon salmon and caribou but their overall harvests are low compared to those of other Bristol Bay communities. Within the borough communities, most subsistence activities are done by nuclear and extended families and groups of friends. The resource harvesting and distribution practices of long-term residents are quite different than that of newcomers to the area (Morris 1985).

The tundra of the Bristol Bay side of the Alaska Peninsula lacks both trees (except for the area immediately around King Salmon) and permafrost. Shrubs, alder, and willow are found along the protected banks of some of the larger drainages, providing good habitat for caribou and moose. The subregion is the home of one portion of the Northern Alaska Peninsula caribou herd, numbering about 18,000 animals, that winters between the Naknek River and Becharof Lake and bears calves between the Bear and the Meshik rivers. Moose are also common to the subregion with about 2,000 animals but the population appears to be declining. Key moose habitats are located along the upper Meshik and Naknek rivers, Mother Goose Lake, Cinder River, and the King Salmon River. Brown bears are very common in the subregion but are not used for food and are considered a nuisance.

Many other resources are used as well. These include Arctic and snowshoe hare, porcupine, beaver, land otter, squirrel, muskrat, lynx, wolverine, wolf, red fox, belukha whales and harbor seals. Freshwater fish such as Dolly Varden, grayling, blackfish, rainbow trout, pike, and smelt are also taken. Clams and other marine invertebrates are used most extensively by residents of Port Heiden, Egegik, Pilot Point, and False Pass. Migratory waterfowl are prevalent in the area and ducks, geese, ptarmigan, grouse, sandhill cranes and snipe are used frequently. Several species of berries are collected, including blueberries, crowberries, salmonberries, high-bush and low-bush cranberries, and currants in some localized areas. Some residents use wild celery, greens, grass roots, wild rhubarb, wild corn and seagull eggs (Morris 1987; Schroeder et al. 1987).

3. The Iliamna Lake Subregion

The communities located in the Iliamna Lake subregion which are included in the ADF&G data base are Iliamna, Newhalen, Igiugig, Kokhanok, Pedro Bay, Nondalton, and Port Alsworth. Levelock was not included in the data base although a community survey for Levelock has now been completed. All of these communities are located inland along Iliamna Lake, Lake Clark, or the rivers draining those lakes.

Little is known about the ethnohistory of the Iliamna Lake subregion. The prehistory of the Native residents of the area is clouded by the fact that the Athabaskans were in a state of flux with considerable migration under way at the time of Russian contact. It is likely that various groups of Native Americans had lived in this resource-rich area for thousands of years. Partly because the subregion is so rich in resources, it was a point of contact between the Dena'ina Athabaskans and various Eskimo-Aleut groups.

The Lake Iliamna subregion remains an area marked by linguistic and cultural diversity. Dena'ina populations reside in the communities of Nondalton, Pedro Bay and Iliamna. Native residents of Igiugig, Levelock and Newhalen consider themselves Aleut and are descendants of the Aleut-speaking Peninsula Eskimos. Kokhanok residents are Yupik-speaking Eskimos as are some residents of Iliamna and Newhalen (Nebesky et al. 1983b:123). The communities of Iliamna and Port Alsworth have the smallest percentages of Native inhabitants in the subregion (less than 50%).

The different Native groups maintain ethnic integrity through intermarriage, exchanges of goods, frequent visits (the concomitant of exchanges) and persistence of languages and customs. For instance, Nondalton residents receive caribou and moose meat from relatives in Lime Village located one-hundred miles to the north. Winter is when the most visiting occurs. Russian Christmas is a particularly important occasion marked by many celebrations and traveling between communities; all homes are visited and special foods are made available to guests.

Most villages in this subregion were originally Native communities. The community of Iliamna began during the late 1800s and moved to its present site on the north side of Iliamna Lake in 1935, which is about 40 miles from the old site. Iliamna is connected by road to nearby Newhalen, which lies to the southwest and was established in the 1800s. Igiugig is an Eskimo village that was originally located further down the Kvichak River, below the outlet of Lake Iliamna. The present site on the south shore of the Kvichak River near the outlet of Lake Iliamna was traditionally a fish camp but has been inhabited since the turn of this century. Kokhanok, on the south shore of Lake Iliamna, is also an Eskimo fishing village which was first listed by the U. S. Census in 1890. The Dena'ina village of Pedro Bay was once located at the west entrance of Pedro Bay but has been in its present location at the northeast end of Iliamna Lake at least since the 1930s. Nondalton, another Dena'ina Athabaskan community, was moved in 1940 to its present location up the Newhalen River from Lake Iliamna along Six Mile Lake (Nebesky et al. 1983b). Port Alsworth, which lies north of Nondalton on Lake Clark, is a small community with mixed Anglo-Native residents which grew on land homesteaded by Leon Alsworth in the 1930s (BBCRSAB 1984).

Many residents of Iliamna Lake villages depend upon commercial fishing for red salmon in Bristol Bay and spend most of June and part of July fishing or working for the processors. Sport fishing and hunting lodges are also important sources of income in Iliamna and Port Alsworth and several Native village corporations have opened lodges in recent years. The community of Iliamna has emerged as the transportation and recreational center for the Iliamna Lake/Lake Clark area. The huge runs of red salmon, some of the best trophy rainbow trout fishing in the world, and big game hunting make the Iliamna Lake subregion a sports paradise. Other forms of employment and income include fur trapping, limited public and service employment, Bureau of Land Management fire fighting crews, and temporary construction work.

Nondalton and Newhalen are the only incorporated cities in the Iliamna Lake subregion; both became second class cities in 1971. Political and administrative functions are performed in the other communities by traditional village councils. Almost all of these communities have a Russian Orthodox Church; there is also an Arctic Mission Church in Nondalton and a Baptist Church in Pedro Bay. Nondalton is presently the largest community in the subregion, followed by Newhalen, Kokhanok, and Iliamna.

Most residents of Iliamna Lake subregion communities continue to rely heavily upon subsistence activities (BBCRSAB 1984; Morris 1986; Nebesky et al. 1983b). Several communities in this subregion have resource harvests which are among the highest in the state (ADF&G Subsistence Division 1989). Nondalton residents show the greatest intensity of subsistence use as measured by the number of households involved and the amount of resources harvested per capita. Harvesting groups are generally composed of members of extended families (Morris 1986:35,50).

The seasonal round generally begins with people traveling to spring harvest sites by snow machine, and, after breakup on the rivers and lakes, in small skiffs to take freshwater fish, waterfowl, beaver, and muskrat. Whitefish are harvested in large numbers because this is the season of their migration to tundra lakes. In early and mid-summer, most people travel to the Naknek areas to engage in the short sockeye salmon season, which lasts until about mid-July. Belukha whales are harvested from coastal areas at this time. Some people put up salmon at fish camps where many families may share a camp and where set gill nets are the common means of harvesting salmon.

Late summer and early fall are the major periods of harvest. Spawned out salmon are harvested farther up the Kvichak River and its tributaries and in Iliamna Lake and Lake Clark. Trout, grayling and other freshwater fish also are taken from the lakes. Porcupine are hunted and edible plants are gathered. Hunters seek moose along lake shores and river banks and berry-collectors travel throughout the subregion for different species of berries. The most common water craft used are 16 to 18-foot wooden homemade skiffs.

In winter, moose and caribou are hunted intermittently up to 150 miles from home communities, with hunters often using cabins located in remote locations. Hares, ptarmigan, spruce grouse and porcupine are also taken. Freshwater fish are caught by jigging through ice. Occasionally, fox, wolf, lynx, otter and wolverine are trapped along with beaver (Morris 1986; Schroeder et al. 1987).

4. The Nushagak River Subregion

The Nushagak River subregion is located in the northern part of Bristol Bay. The communities of this subregion are divided into those oriented toward Nushagak Bay (Dillingham, Aleknagik, Clark's Point, and Ekuk) and those oriented toward the Nushagak River (Portage Creek, Ekwok, New Stuyahok, and Koliganek). Dillingham, Ekwok, New Stuyahok, and Koliganek were the only Nushagak River subregion communities included in the ADF&G data base.

Prior to the historic period, the Nushagak River area was inhabited by various groups of Eskimos and Indians. The earliest Russian trading, missionary, and settlement activities in Bristol Bay focused on the Nushagak River after Aleksandrovskiy Redoubt was established near the mouth of the river (VanStone 1967). After Alaska was purchased by the United States, numerous canneries were located on Nushagak Bay and the community of Dillingham later developed there. In 1903, U. S. Senator William Paul Dillingham conducted an extensive tour of Alaska and the town was named in his honor.

A hospital and orphanage were established in Dillingham after the influenza epidemic of 1918-1919 and people from throughout Bristol Bay relocated to this community, adding to the mix of Native peoples residing there. While the majority of Native residents of the Nushagak River subregion are descended from the Kiatagmiut and the Aglurmiut, two of the Yupik-speaking Eskimo groups which inhabited the region prior to contact, there are also descendants of Native peoples from the Alaska Peninsula, the Aleutian Islands, and the Kuskokwim region.

Dillingham. Over the years, Dillingham has developed as the population, commercial, transportation, service, governmental and social center of the Bristol Bay region (BBCRSAB 1984; Impact Assessment 1984; Nebesky et al. 1983b). Dillingham is the largest community in Bristol Bay with 2,017 residents in 1990 and continues to gain population from smaller communities, although its rate of growth slowed in the late 1980s. The community swells in the summertime with fishers and fish processing workers. Seafood processors, service and support businesses, government facilities (federal, state, and local), health services (including the only hospital in Bristol Bay), utility companies, regional air carriers, and the regional Native non-profit corporation (the Bristol Bay Native Association) are all located in Dillingham. Dillingham has a diversified employment base and the highest ratio of full-time wage positions per population of any community in the subregion (Schroeder et al. 1987:344). Dillingham also serves as a center for visiting, shopping, religious ceremonies, and festivals. Dillingham is the only first class city in Bristol Bay, having incorporated in 1963. The population is religiously diverse.

Dillingham has distinct sub-communities with different patterns of subsistence resource use. Native households and commercial fishing households generally have higher household harvests and per capita harvests than non-Native households or non-commercial fishing families. Length of residency is also an important factor influencing subsistence activities, with longer residency corresponding to higher harvests levels. Persons from outside the region tend to have different conceptions of subsistence harvests than those born in the area. In-migrants harvest for the pleasure of getting out-of-doors and to add to their larder but they are not part of extended family networks. People born locally, who are often Native Alaskans, are tied into extended family networks in which resources are harvested for survival and support of kin and in which sharing of resources is routine. Many Dillingham residents engage in non-commercial distribution and exchange, both with other residents of Dillingham and with villagers. People from Dillingham often provide housing, transportation, and assistance to villagers coming to Dillingham for medical services, shopping, or business. They are usually given fish or game in return (Fall et al. 1986).

The general subsistence harvesting pattern of Nushagak Bay communities consists of the following. In spring, waterfowl are hunted (particularly eider ducks and emperor geese) at Nushagak Bay and along the rivers and Natives hunt seals along the coast. In the Wood River Lakes area, brown bears and squirrels are hunted. Some families go to the Togiak and Kulukak coastal region to harvest sea mammals, herring, herring roe-on-kelp, and clams.

Salmon are taken from subsistence nets along Nushagak Bay or from commercial catches during May through August. Chinook (kings) are especially important for subsistence because they are eaten fresh, smoked, salted or frozen. Sockeye, coho, chum and pink salmon are harvested as well. Char, grayling and trout are caught with rod and reel during summer months. Salmonberries are collected mainly from Nushagak Bay and blueberries, blackberries, huckleberries and lowbush cranberries are also gathered. Berries are especially important for the traditional *aqutaq*, or "Eskimo ice cream," a mixture of berries, sugar, and fat.

Caribou and moose are hunted in late summer and early fall. As in the traditional seasonal round, hunters travel inland up the Mulchatna and Nushagak rivers. Some even go to the Alaska Peninsula to hunt. Moose hunters also go to the Wood River lakes, a practice that was common even before the Russians arrived. Hunters use skiffs and fishing boats for these trips, although more and more Dillingham residents fly to hunting locations.

Winter is also a busy harvesting time. Smelt, whitefish, char, lake trout, pike, burbot, and blackfish are caught through the ice. Ptarmigan are hunted close to the villages. Some people still utilize porcupine, which are taken when available. Many people still trap beaver, land otter, fox, mink, and other furbearers. Trapping season culminates in the early spring and is marked by Beaver Round-up held in Dillingham, when fur buyers and villagers are in town and when numerous activities, contests, and celebrations are held.

The Nushagak River Communities. Ekwok, New Stuyahok, and Koliganek lie north and east of Dillingham along the banks of the Nushagak River. Ekwok, the first village up the river, is the oldest, continuously inhabited village on the Nushagak River and was once the largest river settlement, although it has declined in recent years. The village was first used over 100 years ago as a fish camp and base for berry picking. New Stuyahok, the second village, is 52 miles from Dillingham and has been relocated twice in the past. It is now the largest and fastest growing Nushagak River community and appears to be emerging as a subregional hub. Koliganek, which means "last" or "upper village," is located 63 air miles north of Dillingham and 19 miles from New Stuyahok. This community was also relocated twice, once because of a shortage of fire wood and once due to flooding (Nebesky et al. 1983b).

The three Nushagak River villages are similar in many respects. There are close and extensive historical and kinship ties between them. Commercial fishing, fur trapping, limited government employment (mostly with the schools), occasional construction jobs, and a few positions in local stores or as resident agents for the airlines are the main sources of income in all three communities. Ekwok and New Stuyahok both incorporated as second class cities (in 1974 and 1972 respectively) and all three communities have traditional village councils. Most residents practice the Russian Orthodox religion but there is also a small Baptist Church in Ekwok and an Assembly of God church in Koliganek which claims members in other Nushagak River communities as well.

Residents of all three Nushagak River communities remain highly dependent upon subsistence resources. People from Ekwok generally do not leave to set up fish camps elsewhere but fish from the river banks near the village. Many people from New Stuyahok and Koliganek set up fish camps along the lower reaches of the Nushagak River or at Nushagak Bay, with most people from New Stuyahok going to Lewis Point. They return upriver in fall and winter. Winter is an important season marked by frequent visiting, particularly during Russian Orthodox Christmas in January and winter carnivals in March. This present seasonal round is similar to the aboriginal yearly activities and movement, although the people now inhabit permanent villages. Traditional subsistence fishing has been altered, however, to coordinate it with commercial fishing. Commercial fishing is often conducted by men who travel to the bay to drift net fish while women conduct subsistence fishing along the river with set nets.

Hunting and trapping are particularly important in Nushagak River communities. Residents from each of these villages go moose and caribou hunting up the Nushagak and Mulchatna Rivers and travel extensively to go berry picking. These communities are very involved in regional resource distribution networks and many people from other parts of Bristol Bay visit them on their way to go hunting up the Mulchatna River. Harvesting and processing parties consist primarily of close relatives. The following scheme shows the subsistence activities and the kin who generally make up the groups (Wolfe et al. 1984):

Activity	Relationship or Other Association
Hunting	Brother / brother; brother / brother-in-law; son-in-law / father-in-law; father / son; other groups include consanguines, affines and friends
Fishing (Freshwater)	Grandfather / grandson (patrilineal emphasis)
Salmon (Subsistence)	Women related by blood or marriage
Berry-picking	Mothers / daughters; Women / daughters-in-law and offspring
Processing (Subsistence)	Women closely related by blood and marriage and closely related men when available

Foods often are shared among patrilineal extended families and held by the eldest person in the kin group. For example, seal meat and oil, herring eggs, smelt, walrus and other marine products come into New Stuyahok when relatives and friends come from coastal settlements, while these visitors hunt for and receive moose and caribou. New Stuyahok residents travel to Nushagak Bay and the Togiak area to fish commercially, pick berries and socialize. In winter, Christmas gatherings, dog racing and other activities are occasions for socializing between residents from coastal and upriver communities. The activities of harvesting, processing and distributing, which bring many people together, kin and friends, helps to sustain a sense of a communal past, present and future.

5. The Togiak Subregion

The Togiak subregion is located on the western end of Bristol Bay and consists of the following communities: Quinhagak, Goodnews Bay, Platinum, Togiak, Twin Hills, and Manokotak (Nebesky et al. 1983b:13). Of these communities, only Quinhagak and Manokotak are included in the ADF&G data base. However, ADF&G personnel have conducted ethnographic research in Togiak and it has been included in one of their major technical reports (Wolfe et al. 1984).

Quinhagak, Goodnews Bay, and Platinum are actually located on the Lower Kuskokwim Bay and have different regional orientations from Togiak, Twin Hills, and Manokotak. The former villages concentrate their commercial fishing and subsistence activities north of Cape Newenham. Bethel serves as their transportation, service, social and political center. Residents of these villages are part of the Kuskokwim Native regional profit corporation (Calista Corporation) and non-profit corporations (Association of Village Council Presidents and Nunam Kitlusisti). The latter three villages focus their commercial and subsistence activities within Bristol Bay and are oriented toward Dillingham as a regional center. Residents are represented by the Bristol Bay Native regional profit (Bristol Bay Native Corporation) and non-profit (Bristol Bay Native Association) corporations.

The communities of the Togiak subregion share certain characteristics. They were relatively isolated from Russian entry into Bristol Bay during the early 1800s. Commercial fishing during the early American period occurred in Kvichak and Nushagak Bays, which left this area more or less unaffected. The Russian Orthodox Church never gained a solid foothold in the area and most people in these villages are presently Moravian. All of these communities except for Platinum (which developed during the 1930s in response to mining activities) have a high percentage of Native residents. The Yupik language is still spoken by most Natives, even young people. Dependence on subsistence resources remains high. There are extensive historic and kinship networks between these villages which continue to influence the distribution and sharing of resources. All of these villages except for the small community of Twin Hills incorporated as second class cities in the late 1960s or early 1970s and each has an active traditional village council as well.

The village of Quinhagak is about 200 years old and was originally located at another site which eventually eroded into the Kanektok River. The village of Togiak used to be located across the bay from its present location. A cannery was constructed at the old village site in the 1950s, which drew the Yupik-speaking bands in that area into the cash economy. A second cannery was built in the same area in the 1970s which helped establish commercial fishing as the largest single source of income for area residents. Manokotak is one of the newest settlements in Bristol Bay. It became a permanent settlement in the late 1940s with the establishment of a church and school, with the consolidation of several older villages, and with migration from other communities (Nebesky et al. 1983b).

Togiak has emerged as the major community in the Togiak subregion. Togiak's population increased 39 percent from 1980 (470) to 1988 (654), a trend that underscores the community's rising importance. Residents are highly dependent upon commercial fishing for their livelihoods. By 1982, 78 percent of gross income came from commercial fishing; there was about one fishing permit for every five residents and it was not uncommon for one household to hold both a set and drift net permit (Wolfe et al. 1984). Next to commercial fishing, the most common source of wage income in Togiak is in government employment (state and federal). The most common jobs are as school workers, health aides, postal employees, airport maintenance personnel, police officers, and utilities maintenance people.

One of the important features of the Togiak subregion is the extent of the land and water surfaces used by Native residents during the course of a year. Persons from Togiak, Twin Hills and Manokotak jointly use a considerable area for subsistence activities which extend from their communities to the Upper Alaskan Peninsula. This range on subsistence activities is related, in part, to the relative sparseness of certain land mammals in the immediate area and the high utilization of marine mammals. Some residents of Togiak, Twin Hills and Manokotak used to fly to the Upper Alaska Peninsula to hunt moose and caribou. Since the Mulchatna caribou herd has grown to about 100,000 animals, residents of the Togiak subregion now travel up the Nushagak River to hunt caribou when the snow cover is good. Togiak subregion residents share resources frequently with residents of Dillingham, Aleknagik, and other Nushagak River communities (Schichnes & Chythlook 1988; Schroeder et al. 1987; Wolfe et al. 1984).

The people of the Togiak subregion take resources from greatly diverse habitats: forest, tundra, river, shoreline and marine. They harvest seals, walruses, sea lions, many types of salmon and other fish, furbearers, waterfowl, herring spawn-on-kelp, seabird eggs, clams and other invertebrates, basket grass, brown bear, tundra hare, ptarmigan, berries. They harvest moose and caribou from other subregions.

Togiak has been well studied on the subjects of subsistence and commercial harvests, sharing patterns, inter-household and intervillage distribution of resources and the role of kin and friends in these interrelations (Wolfe et. al. 1984). ADF&G researchers report that households do not stand alone in the round of subsistence and commercial activities. Each household in Togiak is a part of a deeply embedded family-based (patrilineal emphasis) network of pooled equipment, labor, subsistence and commercial fish (salmon chiefly). Harvesting groups generally are composed of extended families; men generally hunt but women are also engaged in salmon fishing. Drift net fishing is done by family crews most often consisting of men and their sons or persons linked agnatically (through male lineages). Set net fishing is done most often by women and their daughters and matrilineal kin. Many women own set net fishing permits.

Household sharing and pooling in Togiak are distinct forms of resource extraction, processing, distribution and consumption. These involve families traced through the male line to include second cousins and three generations in depth. These people make up units of seldom more than a dozen or two; they share resources and equipment generally without asking permission and they share these items as common property. These small, crucial, and, in all probability, ancient forms of resource pooling are extremely adaptable to the conditions of the subregion and to the market economy (Wolfe et al. 1984). Membership is somewhat fluid as divorces and resettlements and deaths occur, yet a central core of individuals remains upon whom members of the group can depend for assistance and to whom one gives without expectation of return in kind or specified time. Marshall Sahlins (1972) referred to this common practice in non-literate societies as "generalized reciprocity."

A second type of sharing that occurs in Togiak involves giving (gifting) subsistence resources and lending equipment but without regarding equipment and resources as common property. This sharing relationship is conducted largely with kin (consanguines and affines) and friends and is one of the notably pleasant and convivial characteristics of Native communities. Giving of both types imposes no direct and immediate obligation to return; people are not expected to return goods, labor or time. One returns what one is able to return. This life-long system of giving and receiving protects the incapacitated and in many communities one finds resources distributed to elders and the infirm.

C. SUBREGIONAL COMPARISON OF RECENT DEMOGRAPHIC TRENDS

The preceding pages have summarized some of the ethnohistory, linguistic features, economy, social structures, and commercial and subsistence uses of naturally-occurring resources in communities of the Bristol Bay subregions. This section briefly reviews population trends of the past thirty years for all Bristol Bay communities and compares them with trends for the state as a whole.

As Table 3 shows, the population trend for the 1960s and 1970s varied by subregion and by community. The Nushagak River and Togiak subregions exhibited fairly steady growth from 1960 to 1980. The Iliamna Lake subregion grew in the 1960s and declined slightly in the 1970s. The Alaska Peninsula subregions declined in the 1960s but grew significantly during the 1970s. However, there were variations within subregions. Some communities declined and others grew, in large part due to internal migration and population consolidation. Smaller communities lost residents to larger ones that offered more services and educational opportunities.

The decade of the 1980s was been a period of growth for most Bristol Bay communities. The Bristol Bay side of the Alaska Peninsula experienced the greatest rate of increase from 1980-1990, largely due to the growth of fish processing in the Bristol Bay Borough and intercept fisheries along the upper Alaska Peninsula. The next highest growth rate occurred in the Iliamna Lake subregion as a result of natural increase in the Native

Table 3
Population Trends in Bristol Bay Communities, 1960-1990

	1960	1970	1980	1990	% Change 1980-1990
Alaska Peninsula, Pacific Side:					
Chignik Bay	99	83	178	188	+ 6
Chignik Lagoon	108	NA	48	53	+10
Chignik Lake	107	117	138	133	- 4
Ivanof Bay	NA	48	40	35	-13
Perryville	111	94	111	108	- 3
Subtotals	*425*	*342*	*515*	*517*	*+0.4*
Alaska Peninsula, Bristol Bay Side:					
Egegik	150	148	75	122	+63
False Pass	41	62	70	68	- 3
Nelson Lagoon	NA	43	59	83	+41
Pilot Point	61	68	66	53	-20
Port Heiden	74	66	92	119	+29
Ugashik	36	NA	13	NA	---
Subtotals	*362*	*387*	*375*	*455*	*+19*
King Salmon	227	202	545	696	+28
Naknek	249	178	318	575	+81
South Naknek	142	154	145	136	+ 6
Subtotals	*618*	*534*	*1,008*	*1,407*	*+40*
Iliamna Lake Subregion:					
Igiugig	0	35	33	33	0
Iliamna	47	58	94	94	0
Kokhanok	57	88	83	152	+83
Levelock	88	74	79	105	+33
Newhalen	63	88	87	160	+84
Nondalton	205	184	173	178	+03
Pedro Bay	53	65	33	42	+27
Subtotals	*513*	*592*	*582*	*764*	*+31*

Table 3 (Continued)
Population Trends in Bristol Bay Communities, 1960-1990

	1960	1970	1980	1990	% Change 1980-1990
Nushagak Drainage Subregion:					
Aleknagik	231	128	154	185	+20
Clark's Point	138	95	79	60	-24
Dillingham	424	914	1,563	2,017	+29
Portage Creek	0	0	48	NA	---
Subtotals	*793*	*1,137*	*1,844*	*2,262*	*+23*
Ekwok	106	103	77	77	0
Koliganek	100	142	117	181	+55
New Stuyahok	145	216	331	391	+18
Subtotals	*351*	*461*	*525*	*649*	*+24*
Togiak Subregion:					
Goodnews Bay	154	218	168	241	+43
Manokotak	149	214	294	385	+31
Platinum	43	55	55	64	+16
Quinhagak	228	340	412	501	+22
Togiak	220	383	470	613	+30
Twin Hills	NA	67	70	66	-06
Subtotals	*794*	*1,277*	*1,469*	*1,870*	*+27*
BRISTOL BAY TOTAL			6,318	7,469	+18
STATE OF ALASKA			401,851	531,000	+32

Sources: U. S. Department of Commerce, Bureau of the Census, 1960, 1970, 1980, 1990.

communities and growth related to the recreation industry. All of the other subregions grew by about 25%, except for communities on the Pacific side of the Alaska Peninsula (the Chignik grouping), which remained constant overall. This growth comes from natural increase as well as from people returning to their home villages now that better education and more services are available and now that Native corporation stockholders are confronted with important decisions regarding their land. Some of the growth is related to good fishing seasons during the latter part of the 1980s. The overall decrease in population in the Chignik communities is due to a decline in year-round residents. Many residents from this subregion have established permanent residence outside the region in order to have better access to schools and medical care, but they continue to return to their home communities for fishing season.

Collectively, the Bristol Bay communities grew 18% in population from 1980 to 1990. During the same period, the State of Alaska increased 32%. Thus, the demographic trend in Bristol Bay shows lower growth than in the state of Alaska as a whole.

D. CHANGING LAND OWNERSHIP PATTERNS

Alaska statehood initiated alterations in land ownership patterns not only in Bristol Bay but throughout Alaska. The Alaskan statehood act in 1958 granted the new state the right to select more than 103 million acres from the public domain which were "vacant, unappropriated, and unreserved." The state's land selection process increased attempts to settle Native land claims. In 1966, the Alaska Federation of Natives (AFN), a state-wide organization representing Native people, got the Department of Interior to halt the conveyance of federal land pending a land claims settlement. AFN began to look at legal and legislative alternatives to a land settlement. When oil was discovered in Prudhoe Bay in 1968, oil companies aligned themselves with proponents of a legislated settlement of Native land claims (Berger 1985:22-23) and succeeded in getting an act passed by Congress.

Federal legislation has had the most dramatic effect on land ownership in Alaska. The 1971 Alaska Native Claims Settlement Act (ANCSA) extinguished aboriginal title that Natives held to land throughout Alaska. Under ANCSA, Natives were to receive roughly 44 million acres (10% of the state) while the federal government was to receive 197 million acres (60% of the state) and the state of Alaska 124 million acres (30% of the state). Native land was to be held by regional and village corporations and, in exchange for relinquishment of aboriginal title, Natives received $962.5 million. ANCSA provided no guarantee in perpetuity of Native land ownership.

The Alaska National Interest Lands Conservation Act of 1980 further defined the legal structure of public land allocations, purposes, and uses in Alaska. ANILCA implemented section 17(d)(1) and (2) of ANCSA which required the Secretary of the Interior to recommend to Congress up to 80 million acres of land in Alaska for dedication under one of the four federal conservation systems: Park, Refuge, Forest, Wild and Scenic Rivers. One of the main purposes of ANILCA was to ensure the well-being of fish, wildlife, and habitats on Alaska's federal lands.

Table 4 shows land ownership in the Bristol Bay region as of December 1983. Land ownership has changed since then as the Bureau of Land Management (BLM) continues to convey title to Native corporations and the state and to adjudicate conflicting land claims.

The majority of federal land in Bristol Bay is in national wildlife refuges, parks, preserves, and monuments. These classifications of land are more restrictive than other federal land classifications and do not allow as great a range of uses. Most of this land is concentrated along the south side of the Alaska Peninsula, south and north of Lake Iliamna, and on the western end of Bristol Bay in the Togiak subregion. The United States Fish and Wildlife Service (USFWS), the National Park Service (NPS), and the Bureau of Land Management (BLM) manage federal land in Bristol Bay. USFWS manages the national wildlife refuges, which include all of the Togiak, Alaska Peninsula, Becharof, and Izembek refuges and parts of the Yukon Delta and Alaska Maritime refuges. Land within Bristol Bay as defined under ANILCA does not include but adjoins three national preserves or monuments (a very restrictive land classification): Lake Clark, Katmai, and Aniakchak. NPS land in these preserves or monuments is not included in the above table even though it is within the Bristol Bay geographic region. If NPS land was included in the table, it' would be clear that the federal government is the major land holder in Bristol Bay. Other land held by the federal government is located south and west of Lake Iliamna, is managed by the BLM, and is eligible for selection by the state.

Most of the state-owned and selected lands are in the Wood-Tikchik Lakes area, the Nushagak-Mulchatna River and Iliamna Lake drainages, and along the Bristol Bay side of the Alaska Peninsula. In addition to the land listed in the above table, the state claims all

Table 4
Bristol Bay Landownership in Acres, 1983

Owner or Land Manager	Approx. No. Acres	% of Total
Federal Government:		
a. FWS (Fish & Wildlife)	10,780,000	35.0 %
b. BLM (no selections)	1,940,000	6.3 %
Total Federal	*12,720,000*	*41.3 %*
State of Alaska:		
a. Patented or tentatively approved	9,209,000	29.9 %
b. Selected	3,740,000	12.1 %
Total State	*12,949,000*	*42.0 %*
Native:		
a. Patented or interim conveyed	3,810,000	12.4 %
b. Selected	760,000	2.5 %
Total Native	*4,570,000*	*14.9 %*
State and Native Conflicting Selections	240,000	.8 %
11(a)(3) State Selections on Alaska Peninsula	348,680	1.1 %

Source: Bristol Bay Area Plan for State Lands, by Alaska Department of Natural Resources, Alaska Department of Fish and Game, and Alaska Department of Environmental Conservation, September 1984, page 1-5.

tide and submerged lands offshore to three miles and the beds of all navigable water bodies. State land is managed by the Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Natural Resources (ADNR). The ADF&G manages the state's two game refuges (Izembek and Cape Newenham), five state critical habitat areas (Port Moller, Port Heiden, Cinder River, Egegik, and Pilot Point), and Walrus Island Game Sanctuary in Bristol Bay. The ADNR Division of Parks manages the 1,428,000-acre Wood-Tikchik State Park, which is the largest state park in the nation. Other state-owned land in Bristol Bay is managed by the ADNR under a multiple-use concept which allows mining, land settlement, and other economic development.

Native corporations created under ANCSA are the region's major private landowners. ANCSA recognized 39 Native villages or groups in the Bristol Bay region that were entitled to receive land. Several of the Aleut village corporations and the Bristol Bay, Aleut, Calista, Koniag, and Cook Inlet regional Native corporations also have selected land in Bristol Bay. Bristol Bay village corporations have received interim conveyance to most of their land entitlement and final patents to some of that land. For the most part, Native groups have selected lands in close proximity to their villages and along the shores of bays or rivers in areas where they traditionally lived, fished and hunted.

These changes in land ownership have affected subsistence activities in several ways. Native corporations were put in an untenable position. Native Alaskans chose the lands that were most valuable for subsistence uses, but once these lands were transferred to the corporations they became capital assets that needed to turn a profit.

ANCSA and ANILCA increased the amount of government-controlled and private property, which has diminished Natives' access to some traditional areas where they fished, picked berries, set trap lines, or hunted game. The land set aside in national wildlife refuges, parks, preserves, and monuments and in state parks, game sanctuaries, and critical habitat areas are managed primarily for the preservation of wildlife species and habitats, unusual and scenic and geographic features (e.g. the Valley of Ten Thousand Smokes), and recreational opportunities. Subsistence use is allowed in some of these areas, but subsistence activities must be consistent with the purposes for which the land was set aside and must not threaten the conservation of fish and wildlife. Subsistence activities have been increasingly regulated under a variety of federal and state land management plans implemented in Bristol Bay. For example, management of subsistence resources may be complicated by having land managed by the Alaska Department of Natural Resources and the animals and fish managed by the Alaska Department of Fish and Game. No government-controlled land has been set aside specifically for subsistence purposes, since it was envisaged that subsistence would be the primary use for private Native corporation lands.[5] Access to private lands for subsistence purposes has also decreased. There has been an increase in recent years of "Private Property" signs in the vicinity of larger communities warning berry pickers and wood gatherers to keep off.

The land ownership situation in Bristol Bay has been plagued with difficulties that have made it harder to conduct subsistence activities. Lands held or claimed by the federal government, the state of Alaska, Native corporations, and private individuals are interspersed with one another. Transfer of land titles on Native allotments and corporate land has been slow due to conflicting claims, to mistakes and delays in completing surveys and legal descriptions, and to questions involving heirship and probates. Titles to land and easements are still being determined throughout Bristol Bay and, until these are finalized, Native corporations will have difficulty managing land for subsistence, residential, and/or economic development purposes.

Finally, the overall purpose of land planning and management in Bristol Bay has been to provide direction for development activities occurring on federal and state land in the region. Land management has focused on encouraging the conservation of fish, wildlife, and cultural resources while allowing economic development to proceed if done in a rational and environmentally sound manner (BBCRSAB 1984:12). Conflicts between these two purposes are inevitable. To date, the greatest conflicts have occurred over federal plans to lease off-shore tracts for oil and gas development, over state plans for land disposals, and over federal and state plans to increase recreational opportunities in Bristol Bay. These issues have been controversial precisely because they pose the greatest threats to subsistence activities.

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[5]Subsistence use of lands withdrawn by the federal government under ANILCA was obtained through political compromise: Alaska Natives and other subsistence advocates traded their support for ANILCA's environmentally-oriented land classifications for environmentalist support of ANILCA's Title VIII subsistence provisions (Case 1984:299).

E. THE EXPANDING ROLE OF GOVERNMENT

Major institutional changes have occurred with the new and greater roles that federal and state government and Native organizations have come to play in the Bristol Bay region. Changes in the formal structure of state and local government and of Native organizations were brought about by Alaskan statehood and the Alaska Native Claims Settlement Act. The presence of federal and state governments has increased along with their roles in managing lands and regulating the use of natural resources under their control. The mere implementation of ANCSA and ANILCA has increased the role of government agencies throughout Alaska. These changes have affected subsistence activities in a variety of ways.

In addition to managing lands and resources as discussed previously, federal and state governments have provided employment, services, and infrastructure in Bristol Bay. Government now accounts for a significant proportion of the regional employment. This employment has brought in greater numbers of people from outside Bristol Bay and has diversified the regional population. Many government employees who have moved to Bristol Bay come from other parts of the United States, were not raised with subsistence lifestyles, engage in sports hunting and/or fishing, and appreciate the Bristol Bay environment for its scenery and recreational opportunities. They bring with them different cultural and environmental views about the use of natural resources. Their presence has not only added to the competition between subsistence and sports users over fish and game, but has added another dimension to debates over land use and management plans.

Increased government employment has not only diversified the population, but it has diversified the economic base of Bristol Bay and altered the nature of communities, particularly the regional centers in which this employment is centered. This diversification has affected subsistence activities. In the past when most people were engaged in commercial and subsistence harvesting of resources, even government employment was often part-time or seasonal, in recognition of the fact that people devoted the summer months to commercial fishing or subsistence activities. Now that government employment has increased, more of the positions are year-round. Full-time government employees require community services on a full-time basis, tying a greater segment of the total work force to steady, year-round employment. People with full-time occupations are often hindered from engaging in subsistence activities other than on weekends or during their vacation time, and often unemployed relatives do subsistence for them. Yet full-time occupations have also provided options and choices for some people and made them less dependent upon subsistence.

Capital spending and government-funded services for rural communities expanded dramatically in the 1970s after revenues began flowing into the state treasury from oil development in Prudhoe Bay. Government funding has supported the building or provision of public water, sewer, electrical and telephone systems; community schools, clinics, roads, docks, harbors, and airports; and television and other communications networks. These infrastructural improvements have been accompanied by expanded services which have made the region more accessible and marketable to outsiders. These improvements have promoted the expansion of the commercial fishing industry and the increase in recreational activity in Bristol Bay.

Expanded infrastructure and services and greater accessibility have increased the competition for Bristol Bay's fish and wildlife resources, creating conflicts between subsistence, commercial, and recreational users of those resources. There has been a dramatic increase in the number of commercial and recreational users from outside the region which has coincided with an increase in the populations of villages that depend on fish and wildlife resources for subsistence. This has resulted in increased human presence and harvesting pressure, which has at times displaced subsistence users, requiring them to travel further from their usual harvesting areas. Increased competition in the commercial fishery has resulted in escalating prices for Limited Entry permits and in alienation of many of those permits from local residents (Langdon 1980; Koslow 1982), which diminishes people's capacity to engage in harvesting activities generally.

There have been other impacts to subsistence from the increased accessibility of the region and competition for local fish and wildlife resources. These impacts include public access to subsistence use areas, increased trespass on private Native corporation land, increases in litter and other waste, disturbance of fish and wildlife habitats, invasion of the privacy of those conducting subsistence activities, unfavorable allocation and regulatory decisions, and increased settlement and coastal development in areas that impact subsistence activities. These impacts have been exacerbated by differences in cultural values. For instance, local Natives often view the practices of sportsmen as wasteful and do not agree with their recreational aims or catch-and-release fishing methods (Wolfe 1989). Sportsmen, on the other hand, minimize the importance of Natives' preferences for certain fish and perceive as wasteful the Native practice of feeding dried salmon to dogs.

Increased recreational activity is generally viewed as negatively impacting local residents' use of natural resources, without providing much economic benefit. Visits by sportsmen from outside the area adds to the seasonal population influx that Bristol Bay communities experience due to the commercial fisheries. Most recreational outfitters and guides are headquartered in urban Alaska and siphon potential income from Bristol Bay. Village corporations want a greater ability to engage in recreational enterprises, which could provide local benefits and give them greater control over recreational activity. Some guides from outside the area have moved their operations onto state lands as those become available in order to avoid paying fees to Native corporations. Some people feel that the state has unfairly granted a small number of individuals proprietary interest to public fish and wildlife resources by leasing them land for lodges and camps, with the potential for these leases to turn into land ownership through a land disposal (McNabb et al. 1990).

People in Bristol Bay are most concerned about maintenance of the subsistence way of life. They want the fisheries and game protected and generally do not want dams, roads, oil development, or people to interfere with those. Local residents strongly oppose a road connection to the other regions of the state (e.g. to Anchorage) because they are concerned this would increase the access outsiders have to the area and would negatively impact their communities, although they want better air traffic and ferry service for their own needs (BBCRSAB 1987:4-4; McNabb et al. 1990). They are also concerned about the potential impact of roads on the terrain and land mammals. They want the conveyance of land to native corporations accelerated. They believe that sufficient private property already exists in the area for commercial recreation facilities and that additional lands should not be removed from the public domain.

CHAPTER V. HISTORY OF COMMERCIAL FISHING IN BRISTOL BAY

This section traces the history of the Bristol Bay commercial salmon fishery, focusing on the commercialization of the fisheries resource, major regulatory issues, technological development in the industry, and the relationship of the commercial fishery to subsistence activities. The chapter will be divided into four historical periods. The four historical periods are easily defined by major legislative acts that had a direct bearing on the Bristol Bay fishery. These periods are from the earliest commercial activities in the Bristol Bay fishery, beginning in the early 1880s, to the Organic Act of 1912; from the Organic Act to the White Act of 1924; from the White Act to statehood in 1959; and from statehood to the present.

A. COMMERCIALIZATION OF THE FISHERY: 1880-1912

Commercialization of the Bristol Bay salmon fishery began in 1884 with the establishment of a cannery on the east side of Nushagak Bay (Kresge et al. 1974:1-1), although salteries had operated there at least as early as 1880 (Cobb 1921:60). In the 1880s, commercial salting of salmon was rapidly replaced by canning. From one cannery in 1884 the number steadily increased. Some of the earliest southwest Alaskan operations began on the Naknek and Ugashik Rivers in 1890, the Kvichak River in 1894, and the Ugaguk River in 1895 (Cobb 1921:60-64). On the Pacific Ocean side of the Alaskan Peninsula, canning operations began at Chignik in 1889 (Cobb 1921:56). From 1889 to 1893, five canneries operated in the Bristol Bay area, in some years accounting for nearly 20 percent of the total Alaskan catch (Murray 1896:18).

The canneries established in western Alaska were operated generally by large companies because of the greater costs of transportation (Mohr 1979:68). In 1893, twenty-two west coast canneries consolidated to form the Alaska Packers Association (Greenberg 1983:2) and this corporation dominated the fishery for the next decade, in some years canning as much as 80 percent of the total pack from Alaskan waters. The Alaska Packers Association was primarily responsible for the rapid development of the Bristol Bay fishery around the turn of the century, especially the production of red salmon (Gregory and Barnes 1939:93-94).

During the early development of the commercial fishery, the primary concern was that the commercial operations were causing irreparable harm to the resource. At that time there were "few limitations on supply, the technology of the canning industry was simple, and, with free entry, competition was intense" (Crutchfield and Pontecorvo 1969:74). The unrestrained use of the salmon resource during the late 1880s and early 1890s caused some government officials to suggest regulatory control (Bean 1889; McDonald 1894; Murray 1896). Since the earliest canneries depended upon traps and barricades built directly in the rivers, the earliest regulatory action was taken to prohibit the construction of dams or other obstructions in salmon spawning streams (Pennoyer 1979:20). This, the Alaska Salmon Fisheries Act of 1889, had little effect on the noticeable damage being caused to salmon spawning populations. In 1896, 1900 and 1906, the Alaska Salmon Fisheries Act was amended to further restrict the harvest of salmon and to allow for spawning escapement. Although even further restrictions were recommended by federal investigators (e.g., Kutchin 1898, 1899; Moser 1899; Jordan and Evermann 1906; Marsh and Cobb 1909, 1910; Cobb 1911), the ability of regulatory agencies to enforce the laws was hampered by the remoteness and inaccessibility of the Bristol Bay area.

As a customs district, Alaska was under the jurisdiction of the U.S. Treasury Department and the Alaska fisheries were under the control of the U.S. Fish Commission. In 1903, the Department of Commerce and Labor was created and the Alaska fisheries were placed under the control of the Bureau of Fisheries. The Bureau of Fisheries maintained control until 1938 (Pennoyer 1979:21).

B. INCREASING REGULATION: 1912-1924

With the passage of the Organic Act of 1912 which created Alaska Territory, the regulatory control of the Alaska fisheries stayed with the federal government, unlike any other state or territory.

Traps and weirs had been outlawed in certain Alaska salmon streams as early as 1889. Traps had never been particularly productive in the Bristol Bay salt water areas and there were never many traps in use. By 1923, traps had disappeared from Bristol Bay entirely (Rich and Ball 1928). The dominant gear type in Bristol Bay was and continues to be the gill net. Both set and drift gill nets are used in the fishery. A particular form of gill net boat developed in the Bristol Bay salmon fishery which was designed after the Columbia River gill net boat. Some power boats appeared in the 1922 season but in 1923 power boats were restricted from operating in Bristol Bay (VanStone 1967:64). From 1923 to 1951, the boats were restricted to sail or oar power and therefore the vessels have remained fairly small, still restricted to a maximum of thirty-two feet in length (National Fisherman 1967:67). The residents of Bristol Bay were primarily responsible for the ban on power boats long after other fisheries had converted to them, reasoning that if "power is permitted, boats will come from other areas . . . and strip the bay of fish" (*National Fisherman* 1982:67). The exception to this pattern is that purse seine vessels are the principal mode of fishing technology in False Pass and the Chignik communities.

During the early 1900s, the commercial fishery in Alaska continued to grow, reaching a total pack of 1.6 million cases for the Bristol Bay area in 1917 (*Pacific Fisherman* 1918:64). (In the fishing industry a "case," as a unit of measurement, is the equivalent of forty-eight one-pound cans.) The catch would not reach this number again until 1965 (National Fisherman 1966). Increasing regulations were designed to preserve the Bristol Bay salmon fishery. For example, in 1908 the Wood and Nushagak Rivers were closed to all commercial fishing (Cobb 1921:60) and in 1922 fisheries reserves were created in Southwest Alaska (Pennoyer 1979:21). The federal government increasingly financed investigations of the industry (e.g., Gilbert and O'Malley 1920; Rich and Ball 1928) which continued to predict the inevitable demise of the Alaska fishery.

Nonetheless, the salmon industry expanded dramatically during World War I as production increased to meet the demands of a European market. After the war, the industry experienced a slump with a concomitant drop in both demand and price (*Pacific Fisherman* 1920). Crutchfield and Pontecorvo believe the weak position of the industry was as much the impetus for legislative action in the 1920s as the biological concerns.

The legislation that emerged in 1924 was a compromise between economic interests and biological necessity. With two major exceptions, the White Act represented an extension of the existing pattern of regulation (Crutchfield and Pontecorvo 1969:96).

C. CONTROL BY OUTSIDE INTERESTS: 1924-1959

The White Act of 1924 gave the Bureau of Fisheries the right to impose heavy penalties against violators, including the power to arrest and seize gear. In addition, the White Act provided that 50 percent escapement must be assured for all salmon streams. According to Mathison (1979), however, the goal of 50 percent escapement "never materialized, since the spawning stock could not be measured," and as a result no "substantial progress" was made for another twenty-four years (1979:429).

The period leading to World War II was one in which the Bristol Bay fishing industry continued under the control of outside interests. Catch statistics show dramatic fluctuations from year to year but with a general downward trend (*Pacific Fisherman* 1942:76; 1960:61). By 1935, the return was so poor that the fishery was voluntarily closed. However, three years later the largest pack in history produced 1.9 million cases (*Pacific Fisherman* 1942:76).

An indication of the degree to which non-Alaskans were involved in the fishery is evident by the number of cannery employees and fishers recruited from the Lower 48 states. Of the 8,227 Bristol Bay employees in 1939, only 496 (6%) were Alaska Natives and 1,387 (17%) were non-Native Alaskans (Kresge, et al. 1974:1-3). As early as 1898, residents were reacting to the fact that so few local Native and non-Native workers were employed in the commercial fishery (VanStone 1967:74). The canning interests contended that they would hire Natives but that Natives were unreliable. The following quote illustrates the canning industry's public statement on this subject.

> "The canneries gladly employ every native who is willing to work; nay, more, they seek for this labor in the villages and offer every inducement for them to work, and would employ many more if they could be obtained and were reliable. This is not done for charity's sake -- the canneries are not in the field for that purpose, though they are far from being uncharitable -- but because the labor is needed, particularly when the rush is on, and for which profitable provision can not otherwise be made (Moser 1902:185-186)."

In 1937, the Bering Sea Fisherman's Union was formed to increase the number of Alaskan residents involved in the Bristol Bay fishery. The penetration of residents into the commercial fishery, however, did not achieve significant proportions until World War II (Wolfe et al. 1984:438).

During the late 1930s, encroachment of foreign vessels into Bristol Bay, especially Japanese, caused concern in the industry (*Pacific Fisherman* 1938:55). At the request of the United States government, the Japanese withdrew in 1938 (*Pacific Fisherman* 1939:55).

In 1939, the management of the Alaskan fishery passed from the Bureau of Fisheries to the Fish and Wildlife Service within the Department of the Interior (Pennoyer 1979:22). World War II was beginning and because of wartime needs and restrictions the fishery experienced a decline. Reduced fishing capacity during the war years resulted in relaxed regulatory activity (Crutchfield and Pontecorvo 1969:120). Furthermore, the need for local labor allowed for the penetration of Bristol Bay residents into the fishing and processing sectors of the industry.

After the war, the Territory began to push for local control of its fishery. In 1949, the Alaska Fisheries Board and Department was formed. Although the Board had no regulatory authority, it set the groundwork for local fisheries management when authority passed to the state in 1960 (Pennoyer 1979:22).

As residents began to participate in the Bristol Bay fishery in greater numbers, the attempt by cannery owners and managers to depend upon outside labor was met with considerable resistance. Many Alaska residents were extremely hostile toward absentee labor, absentee capital, and absentee government (Cooley 1963:149). Labor union problems were common in the Alaska fishing industry in the post-war period. Especially active were those unions which represented resident labor, the Bering Sea Fisherman's Union and the Resident Cannery Workers Union (*Pacific Fisherman* 1949:101; 1952:103).

When unprecedented growth of the salmon fishing industry in the 1950s was coupled with declining numbers of fish (*Pacific Fisherman* 1954:87), it became increasingly clear that stricter regulatory control was necessary to preserve the viability of the industry (Cooley 1963:165-166). The belief among many Alaskans that outside interests were ruining the resource was a major impetus in the push for local control of fishing and was an important force in the drive for statehood.

D. Statehood, Local Control, and Changes in the Industry: 1959-1990

In 1960, the regulatory responsibility for Alaska's fisheries was transferred from the federal government to the Alaska Department of Fish and Game (Pennoyer 1979:23). Initially the Alaska Department of Fish and Game followed the method of federal control (*Pacific Fisherman* 1960:61), with an important exception being the elimination of salmon traps. However, since traps were not being used in Bristol Bay by that time, the regulation had no effect in that area.

1. The Struggle for Local Control

Throughout the 1960s, the pressure on the fishery continued with increasing participation and decreasing numbers of fish. Many Bristol Bay locals who had participated in the processing sector in the 1950s left in the 1960s to become fishers (Wolfe et al. 1984:174). However, the fishery was still dominated by non-residents who not only outnumbered residents but also took larger harvests than locals. A study conducted by ADF&G in 1970 attempted to discover why. The study found that the non-resident fishers consistently made large catches and were able to do so because of more effective gear and boats than those possessed by most of the resident fishermen. Many of these non-resident fishers had fished Bristol Bay for years and they had a great deal at stake financially in their enterprises. This 1970 ADF&G study attempts to apologize for the fact that residents harvest fewer fish than some non-residents. A more adequate explanation may be the attitude that residents have compared with non-resident fishers concerning capital investment in fishing and the value they place on other activities, particularly subsistence.

There were about three major groups of resident fishermen: (1) the highliners -- who consistently make good catches and can and do compete with the non-residents; (2) the part-time or weekend fishers who use either skiffs and/or older gear and vessels which cannot compete with the larger, more mobile highliner fleet; (3) and finally, the upriver Native fishers who also cannot compete because of labor intensive, small operations and whose motives combine modest commercial and subsistence harvest from season-to-season (Rogers 1972:375).

In the search for more fish, the canning operations expanded northward (*Pacific Fisherman* 1963:33). Alaska's salmon fishery became a system of beleaguered resources and, increasingly, fisheries experts pushed for more restrictions on the industry. These latter efforts culminated in 1973 with the passage of the nation's first limited entry law (*National Fisherman* 1975:74; Pennoyer 1979:24).

Limited entry had two profound effects on the Bristol Bay salmon fishery. First, the value of a limited entry permit dramatically increased, from an average of $3,557 in 1976 to over $240,000 in 1990 (*Pacific Fishing* 1990:58). The unforeseen effect, however, has been for some resident permits to pass to non-residents (Langdon 1980), especially during the winter or in times of need after poor salmon years (Koslow 1982:423). One of the most significant effects of the Alaska Limited Entry program on local fishing communities may prove to be, however, the severe limitation it places upon entry into the fishery for the burgeoning population of rural youth (ibid.:60).

The second effect of Limited Entry in salmon was to spur the development of other fisheries. The harvests of previously unutilized or underutilized species has become commonplace creating "booms and busts" within the total Bering Sea fishery. Before the 1970s, salmon dominated the Bristol Bay fishery. Since Limited Entry, that has changed. For example, the major fisheries trade journal, the *National Fisherman*, noted that pollock was an untapped resource (1973:56), that a major new fishery for Alaska groundfish was waiting to be developed (1975:34), and that herring and groundfish were picking up the slack during poor salmon runs (1984:9). Of course, the "boom and bust" story of the king crab fishery of the late 1970s and early 1980s is well known. The Bristol Bay king crab fishery has been closed since 1983 (*Pacific Fishing* 1990:62).

The search for new fisheries continues. The Togiak herring fishery, for example, developed in the late 1970s (Olson 1986), becoming the largest commercial herring fishery in Alaska. Other new fisheries, such as sole (Fisher 1980) and capelin (Warner 1981), have been established. Bristol Bay was opened for commercial halibut fishing in 1990 for the first time in years.

Throughout the 1970s and 1980s, increasing regulation on the state and federal levels became the rule. With the passage of the Fisheries Conservation and Management (Magnuson) Act in 1976, which established the 200-mile limit, and with the creation of the National Marine Fisheries Service, the North Pacific Fishery Management Council and other regulatory bodies, the number of agencies at the various levels of government has increased dramatically (*National Fisherman* 1978).

Since the early 1970s, resident Natives and non-Natives, who make up 36 percent of the fishing fleet, have struggled to retain their role in the commercial fishing industry. Local residents are 80 percent Native (Koslow 1982:417). There is disparity between the actual realized income of resident and non-resident fishers as well. Bristol Bay resident fishers earn between 23 to 37 percent below what non-residents earn (Larson 1980:16).

The passage of the Alaska Native Claims Settlement Act in 1971 (ANCSA) created opportunities for new wealth and helped Native people overcome some frustrations concerning low fishery incomes (*National Fisherman* 1983:14). Some Native corporations began investing in commercial fishing operations. Native fishers viewed processing and marketing as the most lucrative part of adding value to fisheries. Therefore, they put pressure on their corporations to invest in these economic activities. In the 1970s, the Bristol Bay Native Corporation purchased the Peter Pan Seafood plant in King Cove for $9 million and sold it in 1979 for $23.5 million. The Corporation also entered into the crab industry while it was still strong and got out before it crashed (*National Fisherman* 1983:14). Other regional corporations have not been as successful in the fishing business.

Today the commercial fisheries provides the primary source of cash for residents in the Bristol Bay area, although the fishery remains dominated by non-residents (Van Maanen et al. 1982; Miller and Johnson 1981). This is often a point of conflict. Although the Limited Entry Act was designed to promote the interests of local, predominately Native, commercial fishers in the region, the result was to give certain advantages to non-Native fishers from other parts of the United States. Because of this, non-resident, non-Native fishers are perceived as threatening the interests of Native and resident commercial fishers (Palinkas 1987:302).

2. The Bristol Bay Fisheries

Residents of the Bristol Bay area who fish commercially are primarily involved in the salmon and herring fisheries, although there are some jobs in the processing sector and in other fisheries (Wright et al. 1985:26). Fishers generally sell to the canneries or to cash buyers on the fishing grounds. Some years the fishers who do not have a cannery contract are unable to sell their catch because the canneries are filled to capacity (*Pacific Fishing* 1982).

Commercial fishing in Bristol Bay is overwhelmingly focused on salmon. Of the five species of salmon, red salmon alone accounts for 70 to 90 percent of the commercial harvest. Red salmon also comprises the majority of the subsistence harvest of salmon (Wright et al. 1985:98). For commercial purposes, salmon fishing is limited to the period between June 1 and September 30 and only during specified openings.

The salmon fishery is intense. The red salmon runs last only about three weeks, although other species of salmon are caught both before and after the red runs. Some fishers fish the entire season, while others only fish the peaks of the runs. Variables such as price, run size, other openings, other fisheries, subsistence needs and other employment determine the amount of effort an individual will expend in a given season.

The herring fishery of Bristol Bay is also an important source of income for residents, particularly in the Togiak subregion (Wolfe et al. 1984:304; Devalpine 1989). This fishery consists of sac roe and roe-on-kelp harvests. The herring fishery takes place in May, well before the red salmon runs appear (*National Fisherman* 1984:34). Bristol Bay was opened for halibut fishing in 1990, although it had been closed for years to this commercial fishery. Fisheries experts believe that Bristol Bay is a nursing area for juvenile halibut and, therefore, Bristol Bay has been protected by a general closure. However, pressure from commercial fishing interests spurred the Halibut Commission to allow a commercial harvest of halibut in 1990 (*Alaska Fisherman's Journal* 1990:32).

Bottomfish are not restricted as to commercial fishing season. Most bottomfish are taken commercially with trawls although other types of gear are also permitted, e.g. longlines, seines and pots. Most bottomfish are taken by non-residents. At this time, the ADF&G recognizes that insufficient data exist to manage the bottomfish fishery in a manner consistent with the other commercial fisheries. Of particular concern is the incidental harvest of already over-harvested or restricted species such as halibut and crab. The bottomfish fishery in Bristol Bay is in its formative stages and, like other bottomfish fisheries in the state, it operates under the provisions of the Bottom Trawl Fisheries Management Plan. As bottomfish are of minor concern to the subsistence fishery, and since few residents participate in the commercial harvest of bottomfish, it need not be discussed further.

In the past few years, the Bristol Bay fishery has been relatively productive and earnings have generally been good. In 1987, drift and set nets in Bristol Bay earned over $142 million, a record amount that was surpassed in 1988 by a catch bringing in $179 million for fishers (*National Fisherman* 1989). The 1988 Togiak herring fishery yielded 10,371 tons of fish by seine, generating $10.7 million, and 3,545 tons of fish by gill net, worth $3.7 million. Other areas have not fared as well. The 1988 fishery at Chignik had the worst catch since 1975. False Pass, an interception fishery that is closed after 500,000 chum are caught, was shut down after only 800,000 red salmon were taken.

In the past five years, the price of red salmon has varied from as low as $0.85 per pound to has high as $2.25 in 1988. The price of herring in the Togiak area has varied from $450 to $1,030 per ton. The proposed allocation of herring for 1990 was set at 11,204 tons, the lowest in recent years. In 1989, the Bristol Bay fishery recorded the second best red salmon catch in history after more than 165 million fish were landed. According to the March issue of the *Alaska Fisherman's Journal* (1990:7), the processors, in anticipation of a large catch, only offered $1 per pound in 1989, so the income the fishery generated fell short of the 1988 totals. Some fishers believe that prices were low in 1989 in reaction to the Exxon Valdez oil spill, and that fish buyers and processors took advantage of the situation.

In terms of technology, salmon fishing in the Bristol Bay area is by drift gill net and set gill net. A different permit is required for each. Salmon fishing vessels are limited to 32 feet or less although there have been attempts to alter this regulation (*National Fisherman* 1981:52). Other vessel types in the Bristol Bay area are the "Togiak skiff," a 26-foot, shallow-draft, plywood vessel generally powered by an outboard motor in which the net is hauled in by hand (this is best suited to the characteristics of Togiak Bay) (Wolfe et al. 1984:268), and a small, 16- to 20-foot open boat used in the Quinhagak area. Herring is taken both with gill nets and with purse seines. The fisheries on the Pacific side of the Alaska Peninsula are conducted with purse seine boats and larger trawl vessels.

Many local fishers have purchased new boats through state financed loans programs. Canneries also provide loans and start-up costs for fishers who have a contract to sell to them. A cursory review of classified advertisements in a regional commercial fishing magazine showed the price of used Bristol Bay gill net boats ranging from $40,000 to $60,000 and new boats as high as $150,000. Since 1973, salmon permits have been regulated by the Commercial Fishing Entry Commission and the number has been limited. As a result of Limited Entry, salmon permits have become one of the most important forms of capital investment in the fishery. The present value of Bristol Bay permits is estimated at $240,000 for a Bristol Bay drift gill net permit and $70,000 for a Bristol Bay set gill net permit (*Pacific Fishing* 1990:43). The purchase of a boat, gear and a limited entry permit for Bristol Bay may require a capital investment of $300,000 to $400,000. With the rising costs of Limited Entry permits and the continued pressure to upgrade fishing gear, the capital necessary to remain viable in the Bristol Bay fishery is considerable and often beyond the means of local residents. Therefore it is usually capital from outside the Bristol Bay area that invests in boats and permits as they go on the market.

Technology and capitalization in the Bristol Bay fishery has increased in recent years, in part a reaction to the way the fishery has been managed. Different districts and different sections may be open during different days of the week. As a result, there has been a tendency among the drift net fishers to acquire faster vessels to move among districts and to get in the maximum fishing time as one section closes and another opens. The holder of a Bristol Bay salmon permit must register to fish in a specific district, but may transfer to another district after giving 48 hours notice. The permit holder is not allowed to fish during the 48-hour waiting period. The more productive districts potentially can be over-run by fishers from other areas. This is perceived as a problem by residents who tend to fish in their home areas (Wolfe et al. 1984:252).

Another reason for technological intensification is that the Bristol Bay salmon fishery depends upon a common property resource. Ownership of the resource is undefined until such time as the resource is harvested. Unlike other producers of primary products, fishers do not invest in property rights other than the instruments of production. As a result, the common tendency, as in all commercial fisheries, is to invest in more technologically sophisticated gear within the limits imposed by regulations. For example, Bristol Bay gill net boats are restricted to 32 feet in length, but in order to make bigger hauls the beam (width) of the vessels has continually increased.

There is also pressure to increase harvests through increased time spent fishing and many fishers tend to fish continually during an opening. Unlike other natural resources such as timberland or agricultural land which are governed by property rights, no one "owns" the salmon resource until it is harvested. Consequently, the development of gear to get at the fish first leaves those "at the end of the line" with restricted access. On occasion, the Alaska Department of Fish and Game has attempted to compensate for this by redrawing district boundaries, but still a common property resource tends to select for intensification of fishing effort, either through increase in technology or increase in fishing time. Where farmers or timberland owners might take a portion of their profits to reinvest in the resource (e.g., by replanting or fertilizing), in the case of a common property resource, there is no incentive to reinvest economic surplus in the resource as no one fisher can be assured of harvesting a particular portion of the catch. In a commercial fishery, there are no guarantees that investment in the resource will be returned, therefore the means to higher productivity is better and faster boats and more efficient nets and gear. When limited entry is imposed, the permit too becomes an important part of the capital investment, the value of which may fluctuate but which generally tends to increase.

In 1989, approximately 1,860 drift gill net permits and 973 setnet permits were used in Bristol Bay. Setnets are limited to 50 fathoms in length, drift nets to 150 fathoms (for special harvest areas other restrictions may apply). Setnets are staked in a straight line out from the shore and depend upon the runs of salmon following known paths of migration. Although setnetters may place their gear anywhere, so long as it is placed at least 300 feet away from another setnet and within 1,000 feet from the 18-foot high tide mark, the actual locations tend to be stationary (*Pacific Fishing* 1990:60). Practical reasons, such as placing setnets where the fish runs have historically been most reliable and proximity to camps and cabins, are factors determining where a setnet is placed.

The more mobile drift gillnetters are capable of taking a larger share of the harvest since they are not confined to particular locations. They can find the fish instead of waiting for the fish to come to them. Drift gill nets are fished from boats limited to 32 feet in length. The nets are let out and allowed to drift for a time then brought in on a large hydraulic reel which pulls the net over rollers on the stern. The tendency in recent years, as in most intercept fisheries, has been to develop boats capable of moving quickly from one opening to another.

Since the ADF&G does not allocate the commercial harvest according to gear type, the more mobile drift gill nets have tended to dominate the fishery. Although setnets compose one-third of all commercial salmon permits in Bristol Bay, they take just 13 percent of the harvest. In some districts the setnet share of the harvest may be even lower. For example, in the Egegik and Ugashik districts, the harvest share obtained by setnetters has dropped from 14-16 percent to 9 percent in recent years.

An example of this discrepancy between drift and setnet fishers was discussed in the May 1990 issue of *Pacific Fishing*. In 1988, the Board of Fisheries redrew the boundaries of the Egegik district because it was believed that 40 percent of the catch in that district consisted of fish destined for other areas of Bristol Bay. The boundaries were redrawn primarily to protect Ugashik-bound fish but setnetters in the Kvichak area claim the Egegik fishers are still intercepting fish destined for their area. This may be because of the increased efficiency of the harvest capability of drift gill vessels. The setnets have reached the maximum efficiency that state regulations will allow but mobile gear can become more efficient within those regulatory limitations by installing more powerful engines or increasing the technological efficiency of other aspects of their gear.

The Bristol Bay fishery has been marked by several major changes in recent years. There has been a shift from marketing primarily canned salmon to frozen, fresh, and cured salmon. This has increased the need for better transportation to facilitate decreased time frames on shipping seafood. Increasing numbers of floating processors compete with shore-based processors, which has severed former ties between many fishermen and the canneries. Fishermen have given up some security but gained independence and better prices in the process. The major threats to the fisheries at the present time are high seas interception of salmon bound for Bristol Bay, the intensified utilization of fishery resources which is threatening various stocks, and the growing competition in international markets from aquaculture, or fish farming.

3. Fisheries Management in Bristol Bay

Bristol Bay has two distinct fishing areas: Bristol Bay proper, which is the area that consists of all waters of Bristol Bay including drainages enclosed by a line from Cape Newenham to Cape Menshikof; and, the Alaska Peninsula fishing districts, located on the Pacific side of the peninsula. The Bristol Bay Management Area has five designated fishing districts that correspond to river systems of the same names: Togiak; Nushagak; Naknek-Kvichak; Egegik; and Ugashik. Each of these districts is managed separately by the Alaska Department of Fish and Game (ADF&G). The Alaska Peninsula fishery is divided into three Alaska Department of Fish and Game Management Areas: the Alaska Peninsula/Aleutian Island Management Area on the north side of the peninsula; the Chignik Management Area (consisting of the Eastern District, the Chignik Bay district, the Western District, and the Perryville District); and the Kodiak Management Area (the Mainland District affects the peninsula). ADF&G further divides each of these management districts into sections. The division of the areas into smaller districts and sections allows for the closure of all or part of the fishing areas as deemed necessary for the resource. For most areas, the commercial and subsistence areas are similar for ease of regulation (State of Alaska 1989a).

The Alaska Department of Fish and Game is required to manage the fishery resources consistent with certain management principles. These resources must be managed within the limits of "sustained yield." The "maximum sustained yield" refers to the use of biological data to determine the spawning escapement needs and the expected return. The excess is the amount that can be harvested without depleting the resource beyond its ability to reproduce.

Another regulatory management principle provides "a fair and reasonable opportunity for the taking of fishery resources by personal use, sport and commercial fishermen." Many conflicts surround this principle. Regulations are established by the Alaska Board of Fisheries, a seven-member board which establishes openings, closures, and other regulations in accordance with information supplied by ADF&G staff. The Board of Fisheries also relies on the data supplied by 74 fish and game advisory committees and six regional councils. A separate Board of Game establishes game regulations.

In addition to establishing commercial fishing regulations on a regular basis, the Board of Fisheries also meets twice a year to hear proposals from the public for regulatory changes. It is the policy of the Board of Fisheries to only hear petitions that result in the "finding of emergency" but, nevertheless, it is not uncommon for as many as 600 proposals to be submitted to the meetings. Although openings are established well in advance of the fishing season, the commissioner of the ADF&G may still close seasons or areas by means of emergency orders.

The Board of Fisheries follows seven criteria in making allocation decisions:

1) the history of each fishery;
2) the number of residents and non-residents who have participated in the fishery in the past and are likely to participate in the future;
3) the importance of each fishery to subsistence;
4) the availability of alternate fisheries resources;
5) the importance of the fishery to the economy of the state;
6) the importance of the fishery to the economy of the region and local area;
7) the importance in providing recreational opportunities.

The balancing of all of these criteria is an onerous task and, as is common in most commercial fisheries, the decisions are often criticized as favoring one interest over another. Generally, commercial interests are seen as taking precedence in management decisions.

E. CONNECTIONS BETWEEN COMMERCIAL AND SUBSISTENCE FISHERIES

The commercial and subsistence fisheries are inextricably linked. With so many rural residents of Alaska dependent on subsistence activities for survival, management of subsistence fishing has long been an important responsibility of the regulatory agencies. As early as 1949, the Fish and Wildlife Service recognized a "personal use" fishery (Morris 1985:121). After statehood, regulating a "subsistence fishery" became the responsibility of the state. Since the responsibility of any regulatory agency is to maintain the biological viability of a fishery, it stands to reason that tight control of subsistence fishing must be carried out in conjunction with the regulation of commercial fishing. Since most subsistence fishing takes place in the terminal areas of the fishing grounds, some means of judging adequate numbers is essential.

Subsistence fishing is crucial in the lives of resident Alaskans. Since the commercial fisheries have historically been dominated by non-residents, the attempt to allocate for subsistence use is often seen as a resident vs. non-resident issue. Most communities in Bristol Bay depend upon the commercial fishery as primary sources of cash (Impact Assessment 1984; Nebesky et al. 1983b; Wolfe et al. 1984:244) and local residents depend upon subsistence fishing as a primary source of protein. The situation has been further exacerbated by the attempt on the part of the regulatory agencies to limit subsistence to "rural" residents, ruled unconstitutional by the Alaska State Supreme Court in December 1989. The entire issue is currently under scrutiny.

It has been estimated that, statewide, subsistence fishing takes just 4 percent of the total harvest of salmon compared with 1 percent sports harvest and 95 percent commercial harvest (Alaska Department of Fish and Game 1990b). In Bristol Bay, the subsistence harvest is even lower, accounting for approximately 1 percent of the total. Nevertheless, the issue is often portrayed as subsistence taking precedence over other user groups and posing a threat to them. Legally it does take precedence, but it is not a threat to the viability of fishery resources or to other user groups. The legislature determines that it is in the public interest to clearly establish subsistence use as a priority use of Alaska's fish and game resources and to recognize the "needs, customs and traditions of Alaska residents" (ADF&G 1989:1). If it is necessary to restrict subsistence harvest for conservation, the State legislature has mandated that the following criteria must be followed in deciding who is eligible to harvest:

1) customary or direct dependence on the fish stock or game population as the mainstay of livelihood
2) local residency
3) availability of alternative resources.

Subsistence salmon permits are required by the Alaska Department of Fish and Game (ADF&G), which issues them free of charge. Designated persons in each village distribute the subsistence permits, oftentimes a postal employee. People are asked to estimate their need for the coming season and then to keep track of and to report the number of fish that they take each year. This assists the ADF&G in monitoring and documenting the subsistence catch. Subsistence fishers must post signs at their set net sites when those sites are in use and remove those signs when the sites are not in use. There is no limit on the number of permits issued but there is a limitation on the number of good subsistence set net sites, especially within the commercial fishing districts.

In some areas, subsistence fishing has been limited to as little as one day per week in some years. Some regulations governing the use of subsistence permits are: that a commercial net and a subsistence net may not be fished at the same time; only one subsistence permit is allowed per household; and permit holders must be residents of Alaska. Since some of the regulations may be too prohibitive, some of those who fish commercially take personal use fish from their commercial catch (Morris 1985:128-129).

As with the commercial salmon fishery, subsistence fish may be taken with set or drift gill nets. However, the gear restrictions differ. In some areas and during some openings setnets are limited to 10 fathoms in length. In other waters and at other times, setnets may not be longer than 25 fathoms. Subsistence fishing may take place during commercial fishing openings but no one may fish commercially and for subsistence simultaneously. In other words, if an individual holds both a commercial and subsistence permit, then she or he must choose to fish for cash or household use or get someone to fish for him or her. One might assume that because of the limited periods of commercial fishing time, it would not likely be spent fishing for subsistence, however, that is not necessarily true. Some runs of salmon in Bristol Bay are of short duration. Red salmon, for example, may be available for only two weeks. Some subsistence fishing takes place in the terminal areas after the commercial fishers have had their chance at harvesting the quota. Some resident fishers, e.g., from Nushagak River and Iliamna Lake communities, must travel considerable distance to fish commercially and therefore may only fish during the peaks of the runs or for subsistence during the same trip.

Despite the apparent conflicts, Wolfe et al. (1984:492) found at Togiak and New Stuyahok that commercial fishing, wage labor and subsistence activities were compatible. Simple commodity production provided the greatest flexibility, but even wage employment schedules were adjusted to fit seasonal subsistence and commercial fishing time demands. Complementary work roles were created between domestic group members, such as between women and men (women holding the wage positions while men fished and hunted.) Non-local employment which separated workers from subsistence opportunities was avoided, especially when local employment options were available.

In the past and at the time this research was conducted, subsistence permits for fish restricted holders to their domicile (see "Temporary Federal Subsistence Regulations for Game, Fish, and Shellfish, Effective July 1, 1990 through June 30, 1991," page 24). For example, "only those residents domiciled in the Togiak district, freshwater drainages flowing into the district, and the community of Manokotak may take salmon and freshwater fish species in the district and those drainages" (State of Alaska 1989b:14). Therefore, if a permit-holder is fishing commercially in another district, it may restrict his/her ability to fish for subsistence. Conversely, the fisher may forgo commercial opportunity to harvest for subsistence. As a result, many residents tend to fish in or near their home area for both commercial and subsistence needs.

The commercial and subsistence fisheries conflict in numerous ways, the most basic of which is the general principle of fisheries management which sets quotas but does not allocate as to gear type or user group. This conflict is most obvious in the discrepancy between the proportional shares of the commercial salmon harvest obtained by the stationary setnets and the mobile drift nets. Although the conflicts are less obvious between subsistence and commercial uses, they still exist. Alaska statutes state that if a particular stock is insufficient to accommodate all uses, then subsistence uses take priority, that is, within the limits of sustainable yield. However, if both commercial and subsistence harvests are allowed, many more factors might come into play. The individual has to choose between commercial and subsistence harvesting. Different gear restrictions apply and often commercial gear cannot be used for subsistence or must be adapted for subsistence use. By the time the commercial harvest is finished, the runs may have diminished to the point at which subsistence fishing is ineffective.

Subsistence salmon fishing is open year-round in Bristol Bay, although some streams are closed and others are restricted as to time. Salmon, however, are a migratory species and therefore only available in or near the terminal areas during certain times of the year. Commercial seasons are established with this knowledge and generally the seasons coincide with the peaks of the runs or, often, for the duration of the runs. Salmon may pass through a subsistence area very quickly, which can create difficulty for an individual to pursue both commercial and subsistence harvests.

CHAPTER VI. COMMUNITY PROFILES

In this chapter, we provide profiles for each of the communities selected for inclusion in this study. The profiles are based primarily upon ethnographic field data, but also rely upon secondary sources of information and some of the household interview data. Each profile contains a brief overview and history of the community, a characterization of the population, and information about the local economy, institutions, organizations, and community activities. The final section in each profile discusses the subsistence activities of community residents. Section H of this chapter contains data tables comparing the seven communities on distributions of household type (Table 5), gender (Table 6), age (Table 7), ethnicity (Table 8), education (Table 9 and Table 10), villages where residents were raised (Table 11), years of residency in the community (Table 12), employer (Table 13), years of involvement in commercial fishing (Table 14), and location of residents' jobs (Table 15). The reader is encouraged to refer to these tables, particularly when reading section 2 (Characteristics of the Population) in each profile, for comparisons with the other communities.

A. CHIGNIK LAKE

1. Introduction

The village of Chignik Lake is located on Chignik Lake near its outlet, the Chignik River. Chignik Lake is approximately 15 miles from the village of Chignik on the Pacific Ocean side of the Alaska Peninsula, and approximately 475 miles southwest of Anchorage. Chignik Lake is accessible by air or by boat from Chignik. Chignik Lake is part of the Lake and Peninsula Borough, established as a home rule borough in 1989 with offices in King Salmon.

Although Chignik Lake was not included in the original proposal for this study, after a review of secondary literature and an analysis of Alaska Department of Fish and Game (ADF&G) data (e.g., see Morris 1987), we chose Chignik Lake as representative of the Alaska Peninsula communities that are oriented towards the Pacific side of the Alaska

Peninsula. Chignik Lake was selected after exploring the possibilities of including one of the three Chignik communities and after consultation with village officials. Chignik Lake offers some interesting comparisons with the other Bristol Bay communities as it represents a unique resource harvesting area and is primarily an Aleut village. Additionally, the primary occupation of Chignik Lake residents is the commercial fishery of the Chignik district which, unlike the salmon fishery within Bristol Bay, is a purse seine fishery.

2. Ethnohistory

Chignik Lake is a relatively new community. Prior to the 1950s, Chignik Lake was a temporary fishing and hunting camp that people from the villages of Ilnik (on the Bristol Bay side of the Peninsula) and Kanataq (near Becharof Lake) utilized. In the early 1950s, the village began to grow around a school established there. One version of the origin of this village was a split over religious doctrine in Chignik Lagoon. However, most of the early settlers came from other communities, especially Ilnik. Some later settlers came from Ivanof Bay and Perryville and, as a result, kinship ties are strong to these two villages and much interaction takes place (Ilnik and Kanataq are now abandoned).

A majority of Chignik Bay residents are involved in commercial fishing and many families move to Chignik Lagoon during the fishing season. The processing plants and the center of fishing activity are near the villages of Chignik (sometimes called Chignik Bay) and Chignik Lagoon. Collectively, these three communities are referred to as the "Chigniks." Chignik Lake residents frequently visit Chignik Bay for shopping as there is only a small store in Chignik Lake.

3. Characteristics of the Population

A total of twenty household interviews of one adult member in each household were conducted in Chignik Lake in September of 1990. The total sample included 75 individuals living in the twenty selected households. There were forty-eight households in Chignik Lake at the time fieldwork was conducted. The 1990 federal census reports the population of Chignik Lake at 133 persons. However, this figure varies considerably during the year as some people spend the winter in "town" (Anchorage) if they can afford to and many people move to fish camp at Chignik Lagoon during fishing season, from roughly June through August. The season is officially "open" from June 1st to October 31st but fishing is effectively over by the end of August.

The vast majority of households in Chignik Lake appear to be made up of nuclear families. Of the twenty households interviewed, eleven (55%) are composed of nuclear families, three (15%) are single persons, three (15%) are single parents, one (5%) is a conjugal pair and two (10%) are grandparent/grandchild households (after Jorgensen 1990:217).

Several characteristics of the sample population of Chignik Lake are worth noting in comparison with other study communities. Chignik Lake has more males (41 people or 54.7%) than females (34 people or 45.3%), with only Port Heiden and New Stuyahok having a greater preponderance of males over females. The sample populations of Chignik Lake and New Stuyahok are the youngest of the study communities. Nearly 50% of the total Chignik Lake sample is of school age, while over 70% of the sample population is under 30 years of age. Only two people in the total sample were 65 years of age or older.

Chignik Lake is a predominantly Native community. Of the total sample, almost 79% claim Aleut ethnicity, while one individual, the Russian Orthodox Priest, is Yupik Eskimo. The remaining Natives are mixed Alaska Native (2.7%) and mixed Native/non-Native (8%). Seven individuals, or 9.3% of the sample population, are non-Alaska Natives, and all of these people are school teachers or their families.

Chignik Lake residents appear to be about average in formal, Western-based school education, and the populations of Dillingham, Naknek, and Port Heiden have, on average, more of this kind of schooling. Togiak residents have about the same educational level as Chignik Lake. The populations of New Stuyahok and Nondalton have less formal education. One-third of the total Chignik Lake sample reports an educational level of high school completion or higher.

The permanent population of Chignik Lake is generally very stable, although during fishing season the town may seem "deserted" and in good fishing years some families choose to spend the winter in Anchorage. Many residents have lived there all of their lives. The year-round population of Chignik Lake consists of a few families, mostly descended from the pioneer families who first settled Chignik Lake in the 1950s. Of the total sample, 68%

were raised in Chignik Lake and another 8% in the proximal area (Pacific side of Alaska Peninsula, Chignik Bay, Chignik Lagoon, and Perryville). The remainder are from scattered parts of Southwestern, Western, and Central Coast Alaska, with the exception of the school teachers in our sample, all of whom were raised outside of Alaska.

Chignik Lake is an isolated, homogenous village that openly expresses its hostility to outsiders who would interfere with the business of running the community. During fieldwork, our researchers were treated cordially and extended every hospitality, but it was made clear that residents like Chignik Lake the way it is and are resistent to changes brought from outside the community. School teachers expressed the feeling that they had to establish themselves in the village before they could partake of local resources, especially subsistence resources. Repeatedly we were told the story of a former school teacher who had been seen wasting game and was forced to leave the community. The insular qualities of Chignik Lake are reflected in various ways, for example, Chignik Lake residents believe that factionalism is less common in Chignik Lake than in other Native communities and the importance of sharing with other members of the community was the most highly valued of any community in the study.

4. Economy and Infrastructure

The economy of Chignik Lake is almost totally dependent upon the commercial fishing industry. Other forms of economic opportunity are virtually nil. Private business in the community is limited to a small store one family runs out of their home, selling mostly pop and snacks; a private consulting business, which one person operates; and a video rental. Groceries and other items must be purchased in Chignik Bay or Chignik Lagoon, about 15 miles by boat or aircraft, ordered through the mail, or purchased in bulk once or twice a year.

Unlike the other communities in this study, the people of Chignik Lake participate in the commercial fishery of the Chignik District. Only one Chignik Lake resident in our sample fished in Bristol Bay and that was in the Togiak herring fishery. The Chignik Salmon Fishing District extends from Kilokak Rocks on the east to Kupreanof Point, just south of Ivanof Bay. Unlike the Bristol Bay fishing, the Chignik fishing is a purse seine fishery.

The majority of the fishing activity of Chignik Lake residents takes place in Chignik Lagoon. In a normal year, about half of the 101 permit owners in the Chignik District fishery fish inside the Lagoon. However, in 1989, when oil from the Exxon Valdez oil spill was present in waters outside the Lagoon, the Lagoon remained open for fishing while the outside waters were closed. This made the fishery much more competitive as all Chignik District fishers were in the Lagoon that year. Chignik Lake residents believe that their catch was smaller as a result and thereby they are deserving of compensation. Chignik Lake residents claim to have seen oil slicks inside the Lagoon during the aftermath of the spill but were unable to convince the authorities that oil had reached their preferred fishing grounds. Chignik residents are currently involved in litigation for compensation income lost during the oil spill but do not have much hope of receiving adequate compensation.

Of the 101 salmon seine permits in the Chignik District, eight permits are owned by Chignik Lake residents. While data from the Alaska Commercial Fisheries Entry Commission (Snow 1990) show an increase in the number of resident-owned permits in the Chignik fishery (from initial issuance to 1989, local resident-owned permits increased from 29 to 41), residents of Chignik Lake have not gained permits. In the past year, one permit was "lost to the IRS." According to the March 1991 issue of *Pacific Fishing*, the average gross over the past ten years for Chignik vessels has been $171,000. The Chignik fishery is highly capitalized, so the average gross income is not necessarily reflected in the net income of Chignik Lake fishers. One fisher reported no net income after boat payments, variable costs and crew shares. The average household income from the survey sample was reported as $27,084, the second lowest of the seven communities.

A Chignik purse seine crew usually consists of four or five crew members in addition to the skipper and some crews were reportedly as large as eight. Some Chignik Lake school boys reported that they started fishing as crew for part shares as young as six years of age and most high school boys in the village were earning a full share. At least one high school girl also crewed but most villagers expressed the opinion that women should not work on the boats.

The importance of the Chignik fishery to the economy of Chignik Lake cannot be overstated. The loss of one permit over the past year was a serious economic blow to the community, representing a loss of income not only to the permit holder but also to the crew he normally would have hired. In addition to dependence on the commercial fishery as a source of income, some Chignik Lake residents utilize their commercial vessels to carry out subsistence activities.

Current permit prices reported in the March 1991 issue of *Pacific Fishing* list Chignik permits as the most expensive permits in the entire West Coast salmon fishery. Current market value is estimated as high as $500,000. The vessels used in the Chignik fishery are not the typical "Alaska limit" seiners which by state law cannot exceed 58 feet, but most Chignik fishers use small vessels ranging from 32 to 42 feet in length. The shallow waters of Chignik Lagoon especially necessitate the use of the smaller boats. About half of the Chignik Lake permit owners lease their boats from the cannery at Chignik Bay. Although the bulk of the fishing activity centers around the red salmon fishery, other species of salmon are also fished and some Chignik Lake residents additionally fish herring and crab.

Most other employment for Chignik Lake residents is in the public sector. The Lake and Peninsula School District hires a secretary, librarian, janitors and cooks to work at the school. A public health aid is hired by the Bristol Bay Area Health Corporation. Local government hires village employees, such as the village administrator and maintenance people to run the telephone and electricity generator. Some part-time employment is also available through short-term government projects. For example, sixteen homes recently were built in the community under the federal HUD program (Housing and Urban Development) using some local labor. In the fall of 1990, some men in the community were employed in a home weatherization program. The city manager believes that decline in revenue sharing in recent years has caused an increase in subsistence because there are fewer jobs. She also noted, however, that when families have a drop in income it is tough to do subsistence but that is when they need it the most.

The prospects for long-term economic development independent of the fishing industry are not good. The high costs of entering the Chignik fishery are prohibitive, especially for young people. Other sources of employment simply do not exist in the village. The village corporation has considered the idea of starting a lodge/guide service for sports hunting and fishing but many village residents are openly opposed to encouraging for sports hunting and fishing but many village residents are openly opposed to encouraging outsiders to hunt or fish in the area. Chignik Lake is well known for trophy size brown bears but the village has attempted to limit bear hunts to one or two expeditions per year. Bear hunters are charged a users fee and they must hire villagers as guides. The village charges outside hunters a "land use permit" and by restricting the number of permits per year, they effectively limit the number of hunters. The area is also known for excellent sports fishing opportunity but that, too, the residents would rather not share with outsiders. As one person stated, "we would be happy to remain undiscovered."

5. Institutions, Organizations, and Community Activities

Chignik Lake is unincorporated but the Native population is represented by a village council and the total village population is part of the Lake and Peninsula Borough. The village council is organized under the Bureau of Indian Affairs. Village government is responsible for providing most of the services in the community, such as water, electricity and telephone. The village council works closely with the village corporation, which is Chignik River, Ltd.

The Lake and Peninsula Borough was organized in April 1989 and has a total population of 1,844. Chignik Lake now receives revenue sharing from the borough where as in the past this revenue came directly from the state. Because of a general decline in oil revenues, the amount the village has received has decreased in recent years. In the 1990 fiscal year, revenue sharing totaled $12,000, down from yearly amounts of approximately $25,000 during the 1980s.

The school and a church are the only two institutions through which social activities are organized in the community. The village school offers programs for pre-school through grade 12 and the school gym is usually the central focus of recreational activity on most evenings. There is a Russian Orthodox church in the village with a full-time priest. The priest estimates that about one-fourth of the village is active in the church. The priest is Yupik Eskimo and participates in local subsistence activities to help provide for his own sustenance.

Land ownership is particularly complicated in the area but, because few people other than the villagers utilize local resources, competition over land use has not necessarily been a problem. Much of the land in the vicinity of Chignik Lake is part of the Alaska Peninsula National Wildlife Refuge. There are other federal lands (e.g., Aniachak National Monument), some state lands, four different village corporation lands (Chignik Lake, Chignik Lagoon, Chignik Bay, and Port Heiden), and Native allotments. Access to subsistence resources has not been a problem and, some residents believe, may be less of a problem in the area because the state has so little land in the proximity. The village corporation seems to have more control over land and land issues than any of the other villages visited in this study. Under the Alaska Native Claims Settlement Act, the village corporation can select certain land but so far has not selected the entirety of their entitlement. There is only one lodge in the area that is on lands the village would like to control. The lodge owner claims his rights are pre-ANCSA but the people of Chignik Lake disagree. The matter is now in litigation. A number of the older residents of Chignik Lake have Native allotments. The allotments are scattered around Chignik Lake and Black Lake. Therefore most of the land Chignik Lake residents utilize is under federal or Native control.

6. Subsistence Activities

Nearly everyone in Chignik Lake takes part in subsistence activities; of the twenty households interviewed, nineteen (95%) reported engaging in subsistence activities and giving subsistence foods to others, mostly in the community, and eighteen households (90%) received subsistence foods from others. Two young men reported that they did not receive subsistence foods because they were capable of getting all that their families needed and they generally harvested a surplus to share with others. Two elderly men who lived alone did not share resources because they were incapable of getting their own and others gave to them just what they needed. There is a concerted effort in the community to assure that everyone receives enough subsistence food and those who are particularly skilled hunters often provide for those who are unable to hunt and obtain their own subsistence food.

The sharing networks in which people from Chignik Lake are involved are concentrated within the Chignik subregion, but extend to communities on the other side of the Alaska Peninsula, to the regional center of Dillingham, to other rural regions of

Alaska, to the urban centers of Alaska, and to the Lower 48 states. The most sharing (giving and receiving) occurs with other households in Chignik Lake; 19 households (95%) are involved in this type of distribution. Subsistence resources are shared with all the other communities in the Chignik subregion; 6 households (30%) share with Perryville households, 4 households (20%) share with Chignik Bay households, 3 households (15%) share with Ivanof Bay households, and 1 household (5%) shares with Chignik Lagoon households. Two households (10%) share subsistence resources with Pilot Point and Port Heiden, both located on the other side of the Alaska Peninsula, and 1 household (5%) shares with Dillingham.

Next to sharing within the community of Chignik Lake, the most sharing occurs with urban centers of Alaska, which involves 11 sample households (55%) This urban connection is important not only for Chignik Lake, but for all the communities included in this study. Two Chignik Lake households (10%) share subsistence resources with communities of the Aleutian region, and 1 household shares with communities in the Western Coast and Central Coast regions of Alaska and with the Lower 49 states.

People of Chignik Lake realize that subsistence is tied to the cash economy, but they report that in poor fishing years people do more subsistence. Subsistence is more important in years of poor fishing but it is also harder to do, especially in recent years with the increased cost of fuel. One interviewee stressed that she was putting up more fish and meat than usual because 1990 was a poor fishing season.

A list of subsistence resources which Chignik Lake households use revealed at least thirty-one different species of plants and animals. Caribou provide the bulk of red meat in the diet and, although moose was also hunted, village residents voiced a strong preference for caribou. Subsistence regulations limit the annual per person subsistence harvest of caribou to four and of moose to one bull. Berries and greens are also harvested by most households in the sample, as are ducks and ptarmigan. Marine resources, especially clams and crabs, are commonly used, but people also eat chitons, sea urchins, halibut, sea gull eggs, seal, and other marine mammals. As is typical of all communities in the study, fish, especially salmon and several varieties of freshwater fish, are integral to the subsistence lifestyle. Subsistence fishing takes place in the village outside of the commercial fishing season. Subsistence regulations for the Chignik District restrict commercial permit holders from fishing for subsistence while the commercial season is open.

To the residents of Chignik Lake, participation in subsistence activity is a necessary part of their existence. Of the twenty respondents, 85% identified subsistence as a way of life and an essential source of food. Respondents could not imagine life without subsistence. As noted, food must be obtained outside the community or from subsistence. Subsistence activities provide a significant proportion of food for the people of Chignik Lake, and some former residents and kin come to Chignik Lake for the purpose of putting up subsistence food. The inaccessibility of stores and the expense of most manufactured items makes dependence upon subsistence foods essential. In discussing what would happen if they could not engage in subsistence activities, 30% of the interviewees said they felt they would face serious economic hardship, 40% said it would affect their budget, and 55% believed they would have less social and recreational activity in their lives. Several interviewees also mentioned that they would be forced to relocate, their diets would be altered, they would be dispirited, and/or they would have to find other means of support.

Subsistence is seen as a communal activity both in terms of gathering and sharing of the harvest. With so few other social activities available for residents of Chignik Lake, the very act of engaging in subsistence is especially important. Former residents and kin who return to put up subsistence food do so not just to acquire these foods, but to maintain ties and spend time with relatives and friends. As one respondent said, "we do not have all the things urban dwellers have, we have the communal activity of doing subsistence; it's more than just food gathering."

In addition to the day-to-day sharing of subsistence foods to ensure that everyone's needs are met, sharing of subsistence food is an important part of community activity in Chignik Lake. Nearly 80% of respondents mentioned that their household shared subsistence foods at community potlucks, 75% mentioned sharing these foods in connection with birthdays, weddings and funerals, and 70% mentioned sharing subsistence foods on other religious occasions. The celebration of birthdays is a unique activity in Chignik Lake. Most members of the community take part in this festivity. When a family member has a birthday, the entire community is invited to come by and take turns eating at the table. Subsistence foods are especially shared at these community events.

The people of Chignik Lake believe that one of the most important lessons associated with subsistence use is to not waste the resource (65% of interviewees mentioned this) and to share what you have harvested (mentioned by 85% of interviewees). This corresponds with anecdotal information gathered by field researchers, specifically the story of the school teacher who was forced to leave after seen wasting game, and the importance of sharing that most interviewees stressed throughout the discussions. The other lessons that people felt were important to teach to their children were subsistence skills and learning to survive outdoors and in the rather harsh environment of Chignik Lake.

The people of Chignik Lake have had limited experience with competition over subsistence resources, such as the conflicts with sports users mentioned by respondents in several other communities. Residents of Chignik Lake made it clear that they would prefer that it stay that way, and, in fact, they speak of the local fish and game resources in the possessive form. However, in discussing changes that have occurred in subsistence activities, nearly 30% of interviewees mentioned that they think there has been a decrease in access, an increase in pressure from other people, and an overall decrease in residents' dependence upon subsistence resources. Residents of Chignik Lake must travel a considerable distance to harvest caribou. The herds that the Chignik Lake people hunt migrate near Port Heiden, on the Bristol Bay side of the peninsula. There are at least two private planes in Chignik Lake and these are sometimes used to transport hunters to that hunting area.

B. DILLINGHAM

1. Introduction

Dillingham is located 350 air miles southwest of Anchorage and 175 air miles southeast of Bethel. It sits at the confluence of the Wood and Nushagak Rivers. Dillingham is accessible by air daily and by sea during the four or five months of the year when Bristol Bay and the Nushagak River are not ice bound. Dillingham is connected by road only to the small community of Aleknagik.

Dillingham is regarded by most of those we contacted in the community as an extremely pleasant and challenging place to live for persons of different ages, ethnic origins, and with varieties of skills. It combines the amenities of a modern community - communications, college training, public and private services, frequent and rapid air travel, retail and wholesale businesses, postal and freight services, hospital and other health-care services, restaurants, motels, and government facilities and services (Native, state, federal, and others), among others. It is, for example, a highly desired location for public school teachers because it affords the conveniences of a modern community with the ease and friendliness of a small town. The surroundings are scenic, the air clean, the ambiance restful and quiet, the recreational and subsistence opportunities plentiful, and the people friendly and decent. Throughout their history, the residents of Dillingham have worked together in most instances cooperatively, accepted the challenges posed by the environment and harvested naturally-occurring resources for commercial purposes.

Dillingham was selected for inclusion in this study because it is the largest community in Bristol Bay and serves as the regional government and economic center. Nearly 27% of Bristol Bay's total population in 1988 resided in Dillingham. The population of Dillingham has a higher ethnic mix, a higher participation in the commercial fishery, and a different pattern of participation in subsistence activities than most communities in Bristol Bay (Fall et al. 1986). Dillingham's role as a regional center makes it unique, yet it often clustered together in the multidimensional similarity structure analyses with Nushagak River communities and with coastal communities on the Bristol Bay side of the Alaska Peninsula. Since these clusterings were based upon percentages of households harvesting various resources and amounts harvested, the resource mix utilized by Dillingham residents appears to be similar to that of other communities in the same geographical and ecological area. It is in this sense that Dillingham was selected to represent Nushagak area communities.

2. Ethnohistory

The area which is now Dillingham has always been important for human habitation and commerce because of the abundance of naturally-occurring resources. The Dillingham site was first used by Aglegmiut, a group of Yupik-speaking Eskimos that developed a way of life dependent upon the huge salmon runs in the Nushagak River and upon big game hunting. An Eskimo village recorded as "Ah-lek-nug-uk" in the 1880 United States census was located within the present boundaries of Dillingham City. The village was also known as Choggiung.

Russians were the first to explore the Nushagak region. In 1818, they built a fort, called Alexandrovski Redoubt, on the east side of the Nushagak River, across from Dillingham's present location. This redoubt served as a supply depot and base of operations for Russian explorations of the Kuskokwim River and other parts of Southwestern Alaska. Alexandrovski Redoubt was an important center for the Russian fur trade, but declined after forts were built at the mouth of the Yukon River and on Cook Inlet, near what is today Kenai. A Russian Orthodox Chapel was built at Nushagak in 1832 and a mission was officially established there in 1841. New church buildings were built in 1845 and 1860. The presence of the Russian Orthodox religion has continued until the present time.

The Russian influence modified traditional subsistence practices. Eskimos began placing greater emphasis on fur trapping activities in order to obtain trade goods and became increasingly dependent upon the trading posts. The establishment of Russian Orthodox chapels at various villages altered settlement patterns.

After Alaska was sold to the United States in 1867, the Alaska Commercial Company took over operation of the Russian American Company buildings at Nushagak. The Alaska Commercial Company dominated the trade of Southwestern Alaska into the early 1900s. Whereas the Russians were mostly interested in furs, the Americans were more interested in fish. The first fish cannery was built on the eastern side of Nushagak Bay in 1884 and another cannery was built on the western side of the bay near the present site of Dillingham in 1885. By 1908, there were ten canneries and numerous salteries operating in Nushagak Bay. Most of the population and economic activity shifted from the east to the west side of Nushagak Bay between 1890 and 1910.

A number of small villages grew around the cannery sites located on Nushagak Bay. Stores, schools, churches, and post offices were built at several of these sites. In 1903, United States Senator William Paul Dillingham toured Alaska and the community which became Dillingham was named in his honor the following year. In 1918, the Alaska Native Health Service expanded and remodeled the Kanakanak school facility into a hospital. An orphanage was established there after the 1918-1919 influenza epidemic and orphans from throughout the Bristol Bay region were relocated to Kanakanak. The orphanage is partially responsible for the mixed Native background of many contemporary residents.

Eventually, most of the businesses and services located at Snag Point, which is presently the downtown area of Dillingham. Hotels, restaurants, and a theater later were built there. A new high school was completed in 1961 and a boat harbor was finished in 1962. Dillingham incorporated as a first class city in 1963 and municipal boundaries were drawn to include Snag Point, Kanakanak, Olsonville, Squaw Creek, and the Wood River area.

Because Dillingham includes areas that were once separate cannery and village sites, Dillingham has several sections. All of the industrial complexes, most of the commercial and public facilities, and the higher density residential development is in the downtown area, on the original townsite, also known as Snag Point. Additional commercial, public, and residential use occurs in the Windmill Hill area (where the second cannery was built in 1885) and the airport area. Kanakanak Hospital, its associated facilities, and hospital employee housing are located a little over six miles from the downtown area. Most of the residential development in recent years has been dispersed along the Wood River Road and the road to Aleknagik (the "Lake Road"). Residential land has been made available through the subdivision of Native allotments, Native corporation lands, and other private lands. There is a Housing and Urban Development (HUD) housing project located north of the downtown area and separated from it by about a mile stretch of road.

Several changes over the years enabled local residents to become more involved in the commercial fisheries. During World War II, serious labor shortages enabled local residents to obtain jobs in the canneries where previously the canneries had imported their own laborers in the summertime. In 1951, restrictions on the use of power boats were lifted and power boats soon replaced sail boats. Independent fishers were able to purchase their own boats and gained greater independence from the canneries. The Bering Sea

Fishermen's Union was formed in 1951 from the Snag Point Fishermen's Association, and this union fought for the hiring of local people and for a uniform fish price.

Dillingham's role as the regional center for Bristol Bay was solidified as government facilities and services became concentrated there. Social, educational, and health services expanded rapidly during the 1960s as a consequence of huge federal transfers which were part of President Johnson's "War on Poverty". During the 1970s through the mid-1980s, Dillingham grew as a result of state spending in rural Alaska and was selected as the headquarters for the Southwest Region School REAA (Rural Education Attendance Area), which is funded by the state. Since the passage of the Alaska Native Claims Settlement Act in 1971, offices of the Native regional corporations and several Native village corporations have been centered in Dillingham.

3. Characteristics of the Population

Seventy-six household interviews were conducted in Dillingham which yielded a total sample of 242 individuals. The sample was randomly selected from a total of 840 housing units, not all of which were occupied when the research was conducted in August and September 1991. Some of those housing units, primarily apartments, are only occupied during the summer fishing season.

According to the 1990 federal census, Dillingham had a year-round population of 2,017, although 1990 population estimates by the Department of Community and Regional Affairs put the population at closer to 2,232. The community's population fluctuates seasonally, however, due to Dillingham's role as the service center for the northern Bristol Bay area salmon fishery and the Togiak/Kulukak herring fishery and as the gateway to the Wood-Tikchik State Park (Alaska's largest state park). Dillingham swells by several thousand additional people in the summer, mostly commercial fishers, fish processors, cannery worker, sports fishers and hunters, guides, pilots, and other people who service the commercial fishery and recreation/tourist industry.

The City of Dillingham has had greater growth in permanent residents since 1960 than any other community in the Bristol Bay Region. The annual rate of growth since 1970 has averaged between 5% and 7%, and has resulted from natural increase and a net positive migration rate. The population grew in response to Dillingham's expansion as a regional service center and to record salmon harvests in the late 1970s and early 1980s. Native Alaskans from smaller villages in Bristol Bay have moved to Dillingham seeking jobs, better educational opportunities for their children, and access to government services. People who have moved to Dillingham from the Lower 48 are primarily non-Native professionals who have obtained employment with government, the schools, health services, or Native corporations.

According to our sample, there are a variety of household types in Dillingham. The most households are nuclear families (28 households or 36.8%), followed by conjugal pairs (18 households or 23.7%), single persons (12 households or 15.8%), single parents (8 households or 10.5%), extended families (4 households or 5.3%), other types (4 households or 5.3%), composite families (1 household or 1.3%), and siblings (1 household or 1.3%).

Several characteristics of the Dillingham sample population are worth noting compared with other communities included in the study. Dillingham's sample population is the most evenly divided between male and female, with 50.4% male and 49.6% female. While overall quite young, Dillingham's sample population is the oldest of the seven study communities, with a mean age of 28.7 years. It has the lowest percentage of population under the age of 20, and one of the highest percentages of population over 40 years of age.

Dillingham has the most mixed ethnic population. The sample population is approximately 35% Alaskan Native, 40% non-Alaskan Native, and 25% mixed Native and non-Native. The Alaskan Native population contains primarily Eskimos, but Aleuts and Athapaskans are also represented. Dillingham's non-Native population is second only to Naknek's, where nearly 57% of the sample population is non-Alaskan Native. Only Port Heiden with 39.7% has a higher proportion of sample population which is mixed Native/non-Native.

The sample population of Dillingham is clearly the most educated of all the study communities. Nearly 30% of the population has had some education beyond high school and over 13% of the population has received a bachelor's or master's degree from college. The next most educated community is Naknek, followed by Port Heiden and Togiak.

The population of Dillingham is perhaps the most transient of the study communities, as revealed by comparing the tables on age and years of residency. Nearly half of the sample population (47%) has lived in Dillingham less than 10 years, while only 22% of the sample is under 10 years of age. While 25% of the sample population is over 40 years of age, only 8% of the sample population has lived in Dillingham for more than 40 years. Less than half of the sample population (about 46%) was raised in Dillingham. Nearly 30% of the sample population was raised outside Alaska. Of the remaining 24% of the sample population, about 13% was raised in other Bristol Bay communities, primarily in the north part of Bristol Bay, and 11% comes from other parts of Alaska. Dillingham's sample residents come from the greatest variety of places of any study community.

4. Economy and Infrastructure

Dillingham's economy is based upon the fisheries and upon the public, commercial, and transportation services that Dillingham provides for the region. The fishing industry is the mainstay of Dillingham's economy but only provides short-term employment during the summer herring and salmon seasons. The seasonal nature of the fishing industry is partially offset by Dillingham's role as Bristol Bay's regional center. The government and service sectors help to stabilize the economy and provide Dillingham residents with more full-time, year-round employment than is found in other communities in the region except those of the Bristol Bay Borough.

The private sector of the economy is well developed in Dillingham compared to other communities in Bristol Bay. The commercial salmon fishery employs the greatest number of people and generates the largest amount of income. Fish processors and packers that operate locally during the salmon season include Peter Pan Sea Foods, Icicle Seafoods, All Alaskan Seafoods, and Trident Seafoods Corporation. A variety of other businesses provide support services for the fishing industry, such as cold storage, fuel supply, cargo service, boat and motor repair, net hanging, and boat servicing, launching, and storage. A large number of local residents fish commercially in the summer, either as captains or as crew for individual drift net and set net fishing operations. Very few local residents work in the canneries. Most of them would prefer and have the opportunity to work as fishers, which provides greater financial returns. Of the people included in our sample of Dillingham residents, nearly 43% worked in commercial fishing or were self-employed fishers.

The rest of the private sector is made up primarily of services, retail trade, transportation, communications, and utilities. Businesses offering services include two hotels, a "bed and breakfast" establishment, four restaurants, three cocktail lounges, several contractors (general, electrical, plumbing), two travel agencies, two video rental shops, five gas and automotive service stations, several laundromats, two beauty salons, a bank, some law offices, a fuel deliverer, and a one-person United Parcel Service operation. Several health professionals, accountants, tax preparers, insurance brokers, land surveyors, welders, and photographers also provide private services. Guides and lodges that cater to the rapidly growing recreation and tourist industry are a small but growing part of the service sector. Approximately 8% of our sample was employed in service occupations and 1% with lodges or as guides.

Retail trade is comprised of two major grocery stores, a liquor store, several gift and variety shops, a large hardware store, an electronics store, several sporting goods stores, one bookstore, a computer dealer, and other miscellaneous businesses. Many people from smaller Bristol Bay villages shop in Dillingham, but there is significant spending by residents outside the region. People shop in Anchorage and order from Seattle barge companies and mail order houses. Of our sample of residents, nearly 7% were employed in retail or wholesale trade.

Transportation jobs are provided by several airlines, freight businesses, and three taxi cab companies. The airport in Dillingham serves as the hub for the western part of Bristol Bay. The Nushagak Telephone Cooperative, Inc., Dillingham Cablevision, two local newspapers (Bristol BayTimes and Bristol Bay News), and public radio station KDLG provide communications jobs. Nushagak Electric Cooperative, Inc. is a private cooperative providing electric service and a number of jobs in the Dillingham area. Almost 8% of our sample worked in transportation, communications, or utilities.

ANCSA Native corporations are an important part of the economy in Dillingham. Bristol Bay Native Association is the regional non-profit corporation and administers a variety of government programs to aid Native residents. The Bristol Bay Area Health Corporation (BBAHC) is a nonprofit corporation administering health services and programs for the Native residents of the Bristol Bay Region which are funded by the Indian

Health Service, other federal agencies, and the state of Alaska. BBAHC operates the 15-bed Kanakanak Hospital located in Dillingham, which employs over 100 people, and manages Community Health Service programs for 32 villages throughout the region. Choggiung Ltd. (the village corporation for Dillingham) and Aleknagik Natives Ltd. (the village corporation for Aleknagik) both have offices in Dillingham.

Most of the remainder of Dillingham's employment is in the government or public sector, accounting for nearly 17% of our sample of residents. Local government and school districts are the city's leading public sector employers, with 11% of the sample employed by them. The City of Dillingham employs people in the Dillingham City School District, in City Hall, and in public works and service jobs (city dock, fire department, harbor master, library, maintenance, museum, parks and recreation, planning, police department, senior center, youth center). Offices of the Southwest Region School District, the Rural Education Attendance Area which serves villages throughout the western end of Bristol Bay, is headquartered in Dillingham. Another local governmental entity is the Bristol Bay Coastal Resource Service Area Board, which has developed and oversees a regional coastal management program and has an office in Dillingham.

The state and federal governments are also major employers in Dillingham. The state of Alaska hires people to staff regional offices of: the Departments of Community and Regional Affairs, Fish and Game, Health and Human Services, Labor, Natural Resources, Public Safety (State Troopers), and Transportation and Public Facilities; the Court System and District Attorney's Office; and, an extension facility of the University of Alaska. Almost 3% of our sample was employed by state government.

The federal government employs people year-round with the United States Fish and Wildlife Service, which oversees the Togiak National Wildlife Refuge, with the Postal Service, and with the Federal Aviation Administration. Additional seasonal employment is provided by the U. S. Fish and Wildlife Service and with the Army Corps of Engineers, which dredges the harbor. Of our sample, 3.3% was employed by the federal government.

Increasing state revenues in the early 1980s resulted in some capital improvement projects. But because Dillingham has a strong private sector and its economy is more diversified, the community has not become dependent upon revenues from the state and federal government. Dillingham has been affected by the downturn in the state economy, but not as severely as areas without strong commercial fisheries.

Dillingham has engaged in economic planning for many years. The city has developed and adopted several comprehensive plans: the City of Dillingham Comprehensive Plan (1971); City of Dillingham Comprehensive Plan Update, Phase 1 (1981); City of Dillingham Comprehensive Plan Update, Phase 2 (1982); City of Dillingham Comprehensive Plan 1985. They have also engaged in planning concerning specific development projects, such as airport improvements, a new small boat harbor, and a new water and sewer system.

Dillingham residents believe the community's future will continue to be tied to the fishing industry. A major goal stated in these various comprehensive plans is to enhance marine and fisheries-related developments and the infrastructure necessary to support the fishing industry. Increased competition from farmed salmon on the international market has made local processing and transportation techniques for Bristol Bay salmon a detriment. Residents want to improve the operational efficiency of the local fishing industry and the quality of the local product. Toward that end, they have studied proposals for cold storage facilities, for a regional seafood industrial park, and for secondary processing facilities. One of the goals stated in the more recent plans is to retain a greater share of the benefits from the fishing industry locally.

Other goals of Dillingham residents are to expand the local economic base to reduce seasonal fluctuations in employment opportunities and to improve commercial services such as shops and stores. However, the local population has had mixed or negative reactions to certain potential developments. Dillingham residents have tried to limit and control the growth of recreation and tourism and have opposed oil and gas development. The more recent comprehensive plans reveal greater concern about preserving the quality of Dillingham's physical and social environment and managing growth. Some of the stated goals are to improve Dillingham's infrastructure (such as the water and sewer system, law enforcement, and fire protection), to acquire more educational, recreational and cultural facilities, and to promote social programs.

The comprehensive planning documents have noted that residents wish to encourage economic productivity and diversity in the region in ways that minimize conflicts with the fishing industry and with subsistence lifestyles. They want economic development that will avoid adverse impacts to fish and wildlife populations and habitats, since these are the basis of Dillingham's economy and many residents' subsistence activities. Locals are particularly concerned about oil and gas development and mineral development, and have fought federal oil and gas lease sales on the North Aleutian Shelf.

5. Institutions, Organizations, and Community Activities

Dillingham has several local political institutions. Dillingham is a first class city with a council-manager form of government. The six-member city council and mayor who are elected at large set policy and make decisions, with day-to-day operations of the city handled by the city manager. The city maintains the water and sewer systems, a landfill, municipal dock, Sam Fox Museum, public library, and senior center.

Native residents of Dillingham are represented politically by a six-member traditional council which is recognized by the Bureau of Indian Affairs as the official traditional governing body of Dillingham. The Bristol Bay Native Association, the ANCSA regional non-profit organization, is a semi-political institution which administers a variety of federal and state programs for Natives in the region.

The City of Dillingham operates its own school district with an elementary, middle, and high school. The city helps to support the cost of education and the district receives some federal funds, but the state contributes the greatest share of revenue to operate the city's schools (around 80%). The school district offers regular, vocational, and special education programs, and has bilingual/bicultural and community education programs. Dillingham has an elected Board of Education and local residents also sit on committees which oversee Native education and the bilingual/bicultural program. Community residents also are involved in the schools through a Parent Teacher Association (PTA) and Booster Club.

Other educational opportunities are offered through the Bristol Bay Rural Education Center, a division of the University of Alaska, which is located in Dillingham. The center offers Bachelor of Arts degrees in cross cultural education and rural development, Associate of Arts and Associate of Applied Sciences degrees, and adult basic education and GED programs. The University of Alaska-Cooperative Extension Service also has a Marine Advisory Program office in Dillingham, which coordinates workshops, technical assistance, and educational materials to the commercial fishing industry.

The greatest variety of churches and religious faiths of the study communities is found in Dillingham. The Assembly of God, Baha'i, Baptist, Roman Catholic, Latter Day Saints, Lutheran, Moravian, Russian Orthodox, and Seventh-Day Adventist are all active in Dillingham. There are a variety of community activities and social functions associated with these churches, such as potlucks, fund raisers, and other get-togethers.

A number of civic organizations in Dillingham also provide activities in which residents can become involved. Dillingham has a Volunteer Fire Department and Rescue Squad, founded in 1947, which, in addition to providing fire and rescue services, sponsors public benefit dinners and social activities for its members. The Dillingham Arts Council sponsors a wide range of cultural activities, including concerts, art exhibits and shows, chili cook- offs, and Christmas bazaar. The Dillingham Chamber of Commerce, organized in 1985, co-sponsors the Fall Fair with the city's Parks and Recreation Department and staffs a Visitor's Center in the summer. One of the biggest community events every year is the Annual Beaver Roundup, generally held in March at the end of trapping season. A special Beaver Roundup Festival Association plans the week-long event, which includes tournaments, contests, exhibits, craft shows, dances, dinners, and the like. Another civic organizations is the Dillingham Historic Preservation Commission.

Dillingham has several service organizations which are staffed with local volunteers. S.A.F.E. (Safe and Fear-Free Environment, Inc.) is an organization which promotes the welfare of victims of domestic violence, sexual assault, and other physical and emotional abuse. Other organizations serve the needs of people with alcohol and drug related problems, such as Alcoholics Anonymous, the Alano Club, and Alanon, or are dedicated to addressing certain community problems, such as Crime Stoppers.

Organized recreational activities are provided for Dillingham residents through the city's Parks and Recreation Department, the Senior Center, the local school district, and private groups such as the Dillingham Sportsman Club, the Tundra Patchwork Quilters

Guild, and the Dog Mushers Association. Sports activities include a summer co-ed softball league, little league baseball, co-ed winter volleyball and basketball, and winter ice-skating and ice hockey in an outdoor rink. Bingo is regularly sponsored by a variety of local organizations and is generally well-attended, indicating this is a favorite pastime for many residents.

The other major organizations in Dillingham are fishers associations which are headquartered there. The primary purpose of these organizations is to fight for the economic and political interests of their members, but they also serve as a social network for people involved in the commercial fisheries. These fishers organizations include the Western Alaska Cooperative Marketing Association, the Bristol Bay Herring Marketing Co-Op, and the Bristol Bay Longline Gillnet Cooperative.

The fact that the private sector of Dillingham's economy and the local infrastructure are well-developed makes the nature of social activity in this community somewhat different in comparison to the smaller villages included in this study. Dillingham residents have more commercial entertainment available to them and more public places in which to gather and interact, such as cafes, stores, the Senior Center, the fire hall (where Bingo is held every Tuesday night), the public library and museum, and other community facilities.

6. Subsistence Activities

Dillingham is located on Bristol Bay, near the mouths of two major rivers (the Nushagak and the Wood), and in close proximity to Aleknagik Lake and the chain of lakes north of it which extend into the Wood-Tikchik State Park. This situates Dillingham near a great diversity of naturally-occurring resources. The subsistence activities of Dillingham residents are focused on the bay, rivers, and lakes. At the community level, Dillingham shows the greatest variety of resources harvested of the seven study communities. This may in part be attributable to the larger sample size and the large network of connections between Dillingham and other coastal and riverine communities. The population of Dillingham also has a greater mix of various ethnic groups, whose ancestors and living kin have a wide variety of food preferences.

Respondents from the 76 households sampled in Dillingham mentioned 64 different species of animals and plants which they use for subsistence. The most commonly harvested resources are various species of berries (by 84.2% of sampled households) and these are also the most common items given in subsistence exchanges. King, red and silver salmon are the next most frequently harvested subsistence resources, with nearly 65% of households harvesting kings and reds and over 50% of households harvesting silvers. Between 20% and 50% of the households also harvest grouse, trout, caribou, chum salmon, smelt, ptarmigan, duck, green plants, pink salmon, moose, Dolly varden, pike, porcupine, grayling, and herring roe. A variety of other subsistence resources are harvested by smaller percentages of households. The frequencies of households harvesting various subsistence resources, however, does not indicate the degree of dependence upon these resources, since certain resources, such as moose, provide greater quantities of food.

The sample of 76 Dillingham households indicates that giving and receiving of subsistence resources are extensive and intensive with kinsmen and with friends and acquaintances. Of the 76 households, 73 households (96%) gave or received subsistence resources, and they did that with households throughout the United States, other parts of Alaska, other parts of Bristol Bay, and in one foreign nation (Germany). Next to sharing within the community, Dillingham households gave or received most often with households in the Lower 48 states; 28 households (37%) shared subsistence foods with households in 29 different states and the District of Columbia. Most of the subsistence goods sent outside the state were various species of berries (often made into jam) and salmon (usually canned or smoked).

In terms of other parts of Alaska, twenty-five of Dillingham's sample households (33%) shared with people in the three urban centers (primarily Anchorage). Five other regions of Alaska were involved in sharing relationships with Dillingham households. Twelve Dillingham households (16%) were involved in giving or receiving subsistence resources with people in Central Coast communities (the Chugach, Cook Inlet, and Koniag regions); eight households (11%) with Western Coast communities (Bering Straits and Calista regions); and a few households with people in the Interior (Ahtna and Doyon regions), North Slope (Arctic Slope and NANA regions), and Aleutians (Aleut region).

The most sharing took place with other households in the same community; 70 households (92%) share with other households in Dillingham. The Togiak and Nushagak

River areas are the other major areas of subsistence sharing within Bristol Bay, along with Naknek, a subregional hub. Fifteen Dillingham households (20%) had sharing relationships with Togiak; 12 households (16%) with New Stuyahok; 11 households (15%) with Ekwok; 8 households (11%) with Aleknagik; 7 households (9%) with Naknek; and, 5 households (7%) with the communities of Manokotak, Clarks Point, and Koliganek. Sharing with people in the following places involved one or two households: Chignik Bay, Chignik Lake, Goodnews Bay, Iliamna, Ivanof Bay, King Salmon, Levelock, Perryville, Port Heiden, Quinhagak, South Naknek, and other locations not within community boundaries.

Aside from the sharing of subsistence resources that takes place between particular households, Dillingham interviewees identified several other occasions on which subsistence resources were generally shared with many households. Fifty of the respondents (65.8%) said their households contribute subsistence foods to potlucks and other community events. Thirty-eight respondents (50%) mentioned they share subsistence foods at birthday, wedding and funeral feasts. Thirty-two respondents (42.1%) indicated their household takes subsistence foods to meals given by kin and friends. And twenty-seven respondents (35.5%) said they share subsistence foods in connection with religious activities and holidays.

In terms of the meaning that subsistence has for residents of Dillingham, the two main responses were that subsistence is important as a source of food (mentioned by 57 or 75% of the respondents) and subsistence is important as a treasured way of life (40 persons or about 53% mentioned this). For Native respondents, there is generally a cultural element to these meanings. Even though store-bought foods are readily available in Dillingham, Native respondents often mentioned that these foods do not satisfy them and they crave certain wild foods. Some of these wild foods were attributed with keeping them in good health, particularly seal oil and berries (which are rich in vitamin C and are stored for the winter when other fruits are less available). Native respondents often mentioned that subsistence is something they have done all of their lives, something which sustained their ancestors, and something they want to pass on to their children. Their descriptions of the yearly round of activities, of the excitement they felt as various seasons approached, and of the satisfaction they received from doing subsistence activities and providing for their own and others' needs indicated that subsistence added a great deal of meaning to their lives.

Subsistence has other meanings as well for the Dillingham sample of respondents. Close to 20% of the respondents said subsistence provides them with economic security, recreation, and the right to provide for their family's needs. A few respondents talked about how engaging in subsistence gives them a relationship to nature which they treasure. One respondent made the following comment about the meaning of subsistence: "There is no way to do without it [subsistence]. I would go berserk without it. It is relaxing and rewarding."

If subsistence activities were prohibited (a hypothetical subject of discussion), all but eight respondents, or in other words 89.5% of those interviewed, felt that their lives would be affected. Of the 76 Dillingham interviewees, 43 (56.6%) said they would lose important recreational opportunities, 16 (21.1%) thought they would experience serious economic hardships, 15 (19.7%) felt they would suffer economically, 12 (15.8%) stated that they would have to make substantial alterations in their diet, 11 (14.5%) feared it would affect their emotional well being and they would become very dispirited, and 8 (10.5%) declared that they would relocate to a place where they could continue to engage in subsistence pursuits. Another 14 persons (18.4%) identified a variety of other impacts that the loss of subsistence would have on their lives.

Regarding the possible loss of subsistence activities, one person said:

> "I'd break the law and do it anyway. It's something that is inside of us. I could not live without fish. I could not last three weeks on restaurant food. Too much of it is fried."

Another person said:

> "I would suffer emotionally and psychologically from not being able to eat subsistence foods. People would be more angry because they couldn't afford store foods. They would have a deep scar inside . . . they would feel punished for something they didn't do . . . they would be forced to do illegal hunting."

A third person gave the following comment:

> "If Eskimos lose subsistence they will lose their culture - it [subsistence] is of great importance to them."

According to Dillingham interviewees, the central and primary rule regarding subsistence is to avoid waste (62 persons or 81.6% discussed this). Belief in this rule obviously crosses cultural boundaries. Interviewees often discussed the many uses for different parts of animals, and some occasionally became angry when relating stories of people who had wasted subsistence resources. Sports hunters and fishers were usually the target of their ire, but they became particularly upset at instances in which a local person, who supposedly should have known better, wasted resources. Waste of subsistence resources was not easily forgotten or forgiven, and some interviewees indicated that they would not hesitate to report other people to fish and game officials in instances involving the waste of subsistence resources.

Several other rules or lessons regarding subsistence were discussed by Dillingham interviewees. Twenty-eight of the respondents (36.8%) specifically mentioned the importance of sharing subsistence resources, but the reported acts of sharing indicate that many more probably adhere to this principle as well. Mastering the skills required to perform subsistence tasks competently and safely and learning to survive in the wild were mentioned by 24 (31.6%) and 18 (23.7%) of the interviewees respectively. Other comments that interviewees made related to showing respect for nature (19 respondents or 25%), conserving and managing resources wisely (15 persons or 19.7% mentioned this), and complying with fish and game regulations and laws (6 persons or 7.9%).

Taken together, the comments concerning rules and lessons pertaining to subsistence made by respondents emphasize conservation, the sparing and wise use of resources, and respect for the land and resources upon which most Dillingham residents depend for food and for their way of life. As one man said,

> "Respect the land and wildlife. Harvest when resources are plentiful and conserve them when they are in short supply. Do not mistreat the land with machines. Do not leave trash. Respect animals. Do not leave litter. Always take a trash bag along when you are outdoors. Learn from animals about how to live."

Dillingham residents perceive several threats to their ability to continue doing subsistence in the future. The threat mentioned most often comes from the abuse and waste of resources (according to 39.5% of respondents). Interviewees were critical of anyone they perceived as wasting resources, such as sport hunters who only take "trophies," catch and release fishermen, and fellow set net subsistence fishers who fail to pick their nets regularly. People fear that waste of resources will not only lead to a declining resource base, but could result in tighter regulations which would limit their access to those resources. One local resident said in reference to the need to acquire money to conduct subsistence activities, "Subsistence is a form of conservation. Look how hard it is to get money? One would not waste moose meat, and hence one would not waste money."

The other main threats which interviewees mentioned concern increased pressure and development impacts on limited resources. These threats include the increased competition between different user groups (mentioned by 35.5% of the interviewees), a decline in resources (mentioned by 31.6%), potential off-shore oil and gas developments (mentioned by 31.6%), general increase in human population within the area (mentioned by 30.3%), reduced access to subsistence resources (mentioned by 17.1%), and other economic developments which could increase outsiders access to Bristol Bay (mentioned by 14.5%). As one person said,

> "I am very angry about whites coming in and transgressing on our lands. I hate tourists who do what they want because they are spending so much money. They are wasting our resources . . . It's getting to the point where Natives are ready to close lands to outsiders."

Another person commented:

> "I do not like sports fishermen all up and down the [Nushagak] river. When sports hunters fly over you when you are hunting, it scares the game."

Another group of identified threats relate to government control over and regulation of subsistence resources. In particular, interviewees were reacting to the recent McDowell decision (mentioned by 18.4% of the respondents) and the federal assumption of power over regulating subsistence resources (mentioned by 25% of the respondents). Several interviewees (11.8%) felt those events might result in racial restrictions on access to subsistence resources, particularly if Native ANCSA corporations ended up restricting access to lands under their control. In general, interviewees were reacting to perceived interference on the part of the federal government, which many consider too remote and unresponsive to Alaskan concerns, and on the part of the state, which many believe is more responsive to the commercial and sports industries.

The threats to subsistence that Dillingham interviewees perceive are largely related to changes that they have observed in the past. The change most noted by interviewees (mentioned by 48.7%) is an increase in regulations governing subsistence activities. Many interviewees registered displeasure about this change, but some were pleased to see more regulations and thought these were necessary. Close to 40% of interviewees talked about improvement in the equipment and technology used to conduct subsistence activities, and some interviewees related the resulting increased efficiency of hunters and fishers to the need for greater regulation.

Several other changes that were frequently mentioned refer to the increased competition over resources which has occurred in Bristol Bay over the past decade. About 34% of interviewees talked about the increased pressure on subsistence resources from more people, primarily from outside the region but also due to regional population growth. Access to subsistence resources has declined, according to 25% of interviewees, because of this increased pressure and because of changes in land tenure, laws governing the use of resources, and regulations of various kinds. Some bitterness was expressed on this point. Approximately 22% of the interviewees mentioned that resource conflicts have increased, and these conflicts tend to be most acrimonious between subsistence and sports users.

The other change which about 20% of interviewees discussed was a general decline in people's involvement in and dependence upon subsistence activities. They primarily attributed this to the greater availability and ease of store-bought food, and to changing lifestyles which for many include full-time employment. However, some interviewees emphasized that people have not abandoned subsistence pursuits altogether, but have become more selective about which resources they obtain. People will not go out of their way to acquire the less desirable resources, but will take them when the opportunity arises. Instead, they concentrate on obtaining the most desirable resources (e.g. berries) and the resources which have the greatest return for the time invested (e.g. fish and game).

Some of the respondents were asked what they believed subsistence would be like in twenty years. Their observations were rather pessimistic. Respondents essentially summarized the threats cited above: increasing numbers of people; increasing resource conflicts; preference given to sport hunters, fishers, and guides over local residents (Alaskan Natives and non-Native Alaskans); more developments that would increase outsiders' accessibility to the Bristol Bay area; and, the possibility of federal management of subsistence resources. None of these anticipated changes were perceived to bode well for local residents who engage in subsistence activities. A few persons thought well-conceived regulations and fairness could keep subsistence alive for a long time to come. Interviewees emphasized the importance of subsistence activities to the way of life of Alaskan Natives and other rural residents regardless of racial ancestry. Some persons observed that any future decline in the national and state economies would result in greater local need for and dependence upon wild foods.

C. NAKNEK

1. Introduction

Naknek is located on Kvichak Bay in the northeast part of Bristol Bay at the mouth of the Naknek River and just south of the Kvichak River, approximately 300 miles southwest of Anchorage. Along with South Naknek and King Salmon, Naknek is part of the Bristol Bay Borough. Of the total borough population, approximately one-third lives in Naknek.

Naknek was chosen for inclusion in this study to represent the communities of the Bristol Bay Borough, which clustered together in some of the analyses of the Alaska Department of Fish and Game data (see, e.g., Morris 1985). It was also selected because of the characteristics of the population, especially residents' involvement in commercial fishing and subsistence activities and the ethnic mix of residents. The economic and cultural diversity in Naknek as well as the community's role as an administrative center enabled important comparisons to be made with the smaller, more homogenous villages. Since the Bristol Bay Borough is a center for transportation, governmental activities, and sports hunting and fishing, Naknek residents have more direct experience with resource managers and other resource user groups. This experience is reflected in the attitudes of Naknek residents concerning subsistence use and control. Naknek's role in the Bristol Bay salmon fishery, one of the most lucrative fisheries in the world, added important insights into the relationship between commercial fishing and subsistence use of natural resources.

2. Ethnohistory

Naknek (Paugvik) was originally the location of a Yup'ik Eskimo village. Russian fur trading posts established in Bristol Bay in the early 1800s sent periodic visitors to the Naknek area to trade for furs. Additionally, Moravian and Russian Orthodox missionaries visited the Naknek area throughout the 1800s. The latter were especially influential in the Naknek-Kvichak area after the establishment of Russian-American missions in the 1820s, although prior to 1900 their visits were sporadic (Van Stone 1967:21,36).

Of all of the agents of social change, however, none had a greater or more lasting impact on the Naknek area than the commercial salmon fishing industry. Commercialization of the salmon resource in this part of Bristol Bay began in 1890 with the establishment of canneries at the mouths of the Naknek and Ugashik Rivers. A third cannery was built on the Kvichak River in 1894 (Cobb 1921:60-64). A small community began to grow around the Naknek cannery and, in 1907, a U.S. Post Office was established there. The growth and development of Naknek as a community corresponded with the growth and development of the commercial fishing industry.

Although the early cannery operators made little or no effort to incorporate Native labor into the work force, local people were nonetheless attracted to the canneries as a means of obtaining manufactured goods and some cash from part-time labor (Moser 1902:185-187). The community of Naknek developed as a major center for commercial fishing and processing because it lies between two of the most productive salmon producing rivers in Bristol Bay. These activities still form the basis of the local economy. Presently, there are ten fish processing plants located in Naknek which not only employ local residents but also several thousand workers who migrate to Naknek during the summer fishing season. Naknek also evolved to become the seat of Bristol Bay Borough government and the major commercial center for the area. Bristol Bay Borough was the first borough established in the State of Alaska, incorporating as a second class borough in 1962. Additionally, school and medical facilities for the borough are located in Naknek, as are numerous businesses.

3. Characteristics of the Population

According to the 1990 federal census, Naknek has a year-round population of approximately 575 people. In the summer months, especially during the height of the fishing and tourist seasons, the population swells by an estimated 4,000 people, which adds stress to various agencies. The borough's permanent population increased by 32.5% from 1980 to 1990 and the long term trend appears to be a continued increase. The rapid population growth is primarily due to in-migration, about half of which is from outside the State of Alaska. Of the total sample, 31.2% of the people were raised outside Alaska and 39.5% were raised elsewhere in the state. Certainly, economic opportunities have played a major role in attracting new residents to the area.

Thirty-two household interviews were conducted in Naknek which included 109 individuals in the total sample. The sample was randomly selected from a total of 283 housing units located in the community. Field researchers worked in Naknek during the first part of September, at which time most of the fish processing plants already were closed for the winter and many housing units which are occupied on a seasonal basis were vacated.

Of the 32 households interviewed, 19 households (59.4%) were composed of nuclear families, five households (15.6%) were conjugal pairs, three households (12.5%) were extended families, three households (9.4%) were single persons, and two households (6.2%) were single parents. Nuclear family households, then, are the norm with extended household types uncommon. Part of the reason for this tendency towards single family households may be because nearly 57% of the population of Naknek is non-Alaskan Native, predominantly Euro-American, and over two-thirds of the total sample were raised outside of Naknek. Recent arrivals to Naknek would not likely have the extensive kin ties that long-term residents, especially Alaskan Natives, would have. Further, three-fourths of the Native population were recorded as "Mixed-Native" or "Mixed Native/Non-Native," which probably further reduces the number of kin ties within the community. Additionally, Naknek has the highest per capita income of all the communities sampled and, generally, economically healthy communities have fewer co-residential or multiple-family households. The small number of co-residential units does not preclude the interactive networks of kin ties. Related families, particularly among the Alaskan Native population, usually live in close proximity to one another and the sharing of resources continues among kin folk.

The sample population for Naknek is fairly evenly split between males and females, with more females (53.2%) than males (46.8%). Overall, the population is young and well-educated. The mean age is approximately 27 years of age. About 40% of the total sample is of school age. Of the 109 individuals in the sample, only three (about 3%) were above the age of 65, but 42 (38.5%) were 16 years old or younger. Nearly 50% of the population has a high school degree or higher, with 10% having completed college degrees. The superintendent of the borough schools reported that the drop-out rate was less than 1%.

The sample population of Naknek is predominantly non-Alaska Native and mixed Alaska Native/non-Native. Naknek has, by far, the most non-Alaska Natives (56.9%) of any sample community, and one of the largest mixed Native/non-Native populations (22%), with only Port Heiden and Dillingham having more people of mixed background (39.7% and 24.8% respectively). Only 18.3% of the Naknek sample population is full Alaska Native, of which most have a mixed Native background (8.3%) or claim Aleut ancestry (7.3%), with only a few Eskimos (1.8%) or Athapaskans (.9%).

The population of Naknek has grown rapidly in recent years and also appears to be highly mobile. About 40% of the sample has lived in the community less than five years (including 18% of the total that are less than five years of age), and less than 20% have lived there more than 20 years. This in-migration is probably due to the fact that Naknek, a major Bristol Bay fishing community, attracts a large transient labor force from a wide variety of places, some of whom remain in the area and become permanent residents. Institutional interviews suggest that there is plenty of work in the area, even in the off-season for fishing. In fact, Bristol Bay Borough has the second lowest unemployment rate in the State of Alaska.

4. Economy and Infrastructure

Naknek is an economically prosperous community. Of the seven communities studied, Naknek was found to have the highest average household income at $74,411, nearly $20,000 higher then the next closest community, Dillingham. Per capita income is also high because households are relatively small in size and dependency ratios are lower than in the other six Bristol Bay communities studied. Naknek's prosperity is reflected in the fact that Naknek reports the third highest per capita income in the State of Alaska.

Situated in the heart of the Bristol Bay fishing industry and being the seat of borough government, Naknek has considerable economic input from both the public and private sector. Borough government and the local schools are the major employers in the public sector. Public sector jobs also exist in the health care field and in state and federal offices, many of which are located in nearby King Salmon. State offices for the Alaska Court System, Department of Environmental Conservation, Department of Labor, Division of Family and Youth Services, and Public Health are located in Naknek, while the Alaska Departments of Fish and Game, Public Safety, and Transportation have offices in King Salmon. Except for United States post offices located in Naknek and South Naknek, all of the federal offices in the area are located in King Salmon. The federal government maintains an Air Force Base and Federal Aviation Administration, National Weather Service, Fish and Wildlife Service, and National Park Service offices in King Salmon. In addition to local, state and federal governments, ANCSA Native corporations, which can be considered semi-public entities, employ a few people in Naknek. Many of the public sector jobs are administrative, either managerial or clerical, but some positions are in maintenance, for example, of the road system and the airport.

A major difference between Naknek and some of the smaller communities studied is that as an administrative center and "hub" of transportation for the Alaska Peninsula and Aleutian areas, there is more full-time and permanent employment available in the Bristol Bay Borough. This helps to stabilize the highly seasonal commercial fishing industry. The Naknek sample had the highest level in the category "number of months worked." Nevertheless, most institutional interviewees stressed that the economic well-being of the community is tied to the fishing industry. "When the fishery is healthy, the economy is healthy," was a sentiment commonly expressed.

The borough government's strategies for economic development center around the fishing industry. The borough's main source of income is a 3% raw fish tax that last year contributed over $2 million to borough revenues. The borough operates a public shipping dock, built just east of Naknek, that has become a major shipping port for the Bristol Bay area. One concern, however, is the historic reality that the commercial fishery and the fish processing sector are controlled by outside interests. Over 90% of the permits are owned by outsiders and most of the processing is carried on by outside capital using non-local labor. Borough managers believe that if the borough would provide the infrastructure, borough residents could penetrate the fishing industry further. This would further strengthen Naknek's potential for long-term economic development.

Naknek's private sector is not as well developed as Dillingham's, but is more developed than that which exists in the smaller communities studied. For the most part, private sector businesses serve the needs of Naknek's year-round population and support the commercial fishing industry. Naknek has two grocery stores, two general merchandise/hardware stores, three restaurants, two hotels, four bars, two automotive service stations, an auto parts store, two gift shops, a beauty shop, two seasonal taxi services, air haulers, aircraft repair, and some small construction, electrical, welding, glass, and upholstery and leatherworks businesses. Quite a number of businesses are associated with the fishing industry, including boat storage, boat repair, marine equipment and supplies, engine sales and service, marine surveyors, net hangers, fuel supply, and fish brokers.

Despite outside control of the fishing industry, participation in the fishing industry is the major economic activity at the household level. Over 25% of the sample reported the commercial fishing industry as their household's main source of employment, and almost 40% were self-employed or independent fishers, almost all in the Naknek-Kvichak area. A few people fish outside the local area, mostly for herring in the Togiak district. Commercial fishing in Bristol Bay is an economic activity that individuals can engage in and still hold a year-round job because the commercial fishery is so intense. The commercial fishing season is short, in some years as little as two weeks. Some residents take personal leave or vacation time from their regular jobs in order to commercial fish.

While the importance of commercial fishing to the population of Naknek cannot be over stressed, fishing is a means of livelihood that may be decreasing for Bristol Bay residents in coming years. Over one-third of the sample is involved in commercial fishing as permit holders and two-thirds of those have been involved in the industry for twenty or more years. This suggests an aging population of local permit owners at a time when the growing younger population is experiencing difficulties entering the fishery. Several respondents voiced concern over the fact that young people may only be able to enter the fishery as crew members since permits and the capital investment necessary to become independent fishers on a competitive basis have become too prohibitive. The market value of Bristol Bay Limited Entry salmon permits reported in the February 1991 issue of Pacific Fishing were as high as $280,000 for a drift gill net permit and $70,000 for a set gill net permit. A Bristol Bay drift gill net vessel ranges in price from $65,000 for a used boat to $250,000 for a new vessel.

Interviewees repeatedly suggested that the inability of local residents to enter and remain viable in the fishing industry will be the major problem facing the community in the future. It is the general consensus of local residents that fishing permits are going to "outsiders," usually identified as "rich doctors and lawyers from Seattle." Evidence does show a slow, but steady, permit drain throughout the Bristol Bay area (Langdon 1980; Snow 1990).

In general, local residents think the economy of Naknek and the Bristol Bay Borough will remain healthy into the foreseeable future. The 1990 fishing season recorded the second largest catch in the 107-year history of the fishery. The productive commercial fisheries have enriched the Bristol Bay Borough, enabling it to finance major capital improvements without acquiring a large debt burden, increasing its operating budget, or becoming dependent upon state revenues. The borough has been managed conservatively in the past, largely because of the potential for variability in revenues from the commercial fishery, and presently has an estimated $16 million dollars in capital reserves.

All indications are that the fishery will remain viable if managed properly. A common concern expressed, though, is that the prospect of oil development in Bristol Bay would endanger the fishery, which is considered far more valuable to the local economy in the long run than any potential benefits that could be gained from oil extraction. Further, oil development is seen as an activity that would not bring economic stability to the Naknek area but rather result in a short-term boom with gain mostly going to outsiders.

Interviewees generally thought that the salmon fishery should not be endangered for the short-term gain from oil extraction.

5. Institutions, Organizations, and Community Activities

Residents of Naknek are served by several levels of government: Bristol Bay Borough government; state and federal governments; and, ANCSA Native Corporations, which include Paug-Vik, the village corporation, Bristol Bay Native Corporation, the regional for-profit corporation, and Bristol Bay Native Association, the regional non-profit corporation.

In addition to administering the infrastructure necessary to support economic well-being in the Naknek area, Bristol Bay Borough government is involved in coastal management, land use planning, and the provision of social services for area residents. The borough provides law enforcement, road maintenance within communities (the state maintains the 15.5 miles of paved road connecting Naknek and King Salmon), water and sewer services, and public education (pre-school through 12). The borough also operates health care, mental health care, and community outreach programs and maintains library and park facilities. Bristol Bay Borough is governed by an elected mayor and five member assembly, and has a number of standing committees. Several full-time employees are hired by the borough, including a city manager, planning director, director of public works, police chief and officers, and fire chief (the fire and emergency response teams are volunteer). Clerical and maintenance staff are also employed by the borough.

The state and federal governments are primarily involved in providing services, administering public programs, and managing land and natural resources in the Naknek area. Of the state departments present in the area which were mentioned in the previous section, the Alaska Department of Fish and Game is the largest. Its various divisions manage the commercial fishery and sports hunting and fishing, and prior to the McDowell decision regulated subsistence activities. The U. S. Air Force, Federal Aviation Administration, and National Weather Service have maintained a presence in the area since the air base was built in King Salmon to provide support for the nation's defense efforts in the Aleutian Islands during World War II. The National Park Service and Fish and

Wildlife Service help manage the Katmai National Park, the Becharof National Wildlife Refuge, and the Alaska Peninsula Wildlife Refuge.

The village corporation, Paug-Vik, is comprised of ANCSA shareholders from the Naknek area. There is no village corporation in King Salmon and shareholders from South Naknek belong to the Alaska Peninsula Corporation along with shareholders from Ugashik, Port Heiden, Newhalen, and Kokhanok. Paug-Vik owns a significant portion of the land within the Bristol Bay Borough, particularly within the vicinity of Naknek and King Salmon. The corporation distributed some of this land to individual shareholders, and has subdivided and developed other portions of its land. The land has been developed primarily for housing, and Paug-Vik owns and manages some as rental units. Paug-Vik has also sought to raise funds for social programs through bingo and other social events, such as a community halloween party.

The Bristol Bay Native Corporation and the Bristol Bay Native Association represent Native residents of the Bristol Bay Borough and many local residents are active in these organizations which have offices in Dillingham and Anchorage. Most of the investments of the Bristol Bay Native Corporation have been outside the region. The Bristol Bay Native Association administers a variety of programs which serve Naknek Natives, including the Community Health Aid Program which has an employee in Naknek. For the past several years, the Bristol Bay Native Association has sponsored an annual Tribal Government Conference in Dillingham where representatives of all of the village councils meet to discuss political issues affecting Alaska Natives. This conference includes a feast featuring traditional Native subsistence foods.

Bristol Bay Borough encompasses approximately 1200 square miles, of which 531 square miles are land and 669 square miles are water. The primary land owners are the borough, the federal government, and the Native corporations. Very little of the land is in private ownership. Regulation of land use is definitely a problem. Land regulations adopted by the borough only apply to private lands and access to and control over the majority of land is divided among other entities, oftentimes making it an issue. Under ANCSA, 14 (c) 3 lands could be transferred by the Native corporations to the borough for public use, but these lands have yet to be conveyed. The relationship between borough government and Paug-Vik, the village corporation, was described by some institutional interviewees as "not that bad," but land owned by ANCSA corporations and individual Native allottees were considered, by borough officials, to present a problem in maintaining control over potential development. Native lands, both corporation lands and individual allotments, are restricted access but permits can be obtained from the corporation. Because boundaries are not well known, Native lands are often trespassed.

The biggest concern of many interviewees was not the actions of state or local government, but of the federal government, especially concerning Katmai National Park and Preserve. The Bristol Bay Borough is considered the "Gateway to Katmai National Park," which is located less than 30 miles from King Salmon. Katmai is accessible by road or boat in the summer and snow machine in the winter. Due to its status as a national park, however, subsistence activities in Katmai are prohibited. The federal government has taken several actions that have affected the subsistence activities of Naknek residents. For example, the taking of red fish (spawned out red salmon) in the park, an activity that used to provide a large bulk of subsistence fish for drying, is prohibited. Now this source of food must be made up with fresh fish or with fish dried earlier in the season, which conflicts with the commercial fishing season. Naknek residents believe that the taking of red fish is conservationally sound as the fish carcasses are gathered after they have spawned. Hunting in Katmai is also prohibited and, as the area used to provide moose hunting habitat for the people of Naknek, they must now go further afield to obtain moose.

There are several educational institutions in Naknek. The Bristol Bay Borough School District is presently serving 310 students from pre-school through grade twelve. About 40% of the youth are bused into Naknek from King Salmon and several sixth to twelfth graders are flown in daily from South Naknek by air taxi. The Bristol Bay Borough School District has suffered a 30% to 35% reduction in state revenues since July of 1986. Local government has had to make up the difference. No school programs or extra-curricular activities have been cut, but funding for these programs is a concern. School administrators hope funding at least remains at the present level since the schools have developed bilingual and multi-cultural programs for the 43% Native student body and the school provides services that parents have come to expect, such as after-school programs and recreational activities. A Parent Teacher Association is affiliated with the local schools.

Several opportunities for adult education are available in Naknek. The Bristol Bay Borough School District administers an adult learning program. The University of Alaska Bristol Bay Campus is an extension facility of the Bristol Bay Rural Education Center, which is located in Dillingham. Through this extension program, students can pursue Bachelor of Arts degrees in cross cultural education and rural development, Associate of Arts and Associate of Applied Sciences degrees, and adult basic education and GED programs.

Naknek residents can participate in one of several churches which are located in the Bristol Bay Borough. The Russian Orthodox, Lutheran, Catholic, and Church of Jesus Christ of Latter-Day Saints denominations have congregations in Naknek, while there are community chapels in both Naknek and King Salmon.

Like Dillingham, Naknek has more civic, fraternal, service, industry, recreational organizations than the smaller study communities. Each of these organizations provide a variety of activities for members and community residents. Examples of such organizations are the Naknek-King Salmon Chamber of Commerce, the Bristol Bay Historical Society, local chapters of the Elks and Lions Clubs, a Volunteer Fire and Rescue Squad, Alcoholics Anonymous, the Bristol Bay Family Resources and Crisis Center, the Alaska Independent Fisherman's Marketing Institute, and community recreation leagues. The Bristol Bay Borough Parks and Recreation Department organizes a variety of community events and programs. These various organizations sponsor bazaars, dinners, benefits, bingo and Monte Carlo nights, workshops, programs, and the like.

Residents of the Bristol Bay Borough celebrate two major community festivals each year. "Fishtival" is held near the end of July and celebrates the area's major industry, the salmon fishery. The two-day event includes a parade, salmon barbecue, salmon-fileting contest, dance, tournaments, contests, raffles, races, displays, and open house at the air force base. Winterfest takes place in February and its activities and contests, such as dog-sled races and ice fishing, are geared toward celebrating winter.

6. Subsistence Activities

Of the thirty-two households interviewed in Naknek, all participated in some form of subsistence activity and all but two (94%) were the recipients or distributors of subsistence food. For the most part, Naknek residents are less involved in subsistence activities than members of other communities when measured by a combination of the mean amounts of species harvested and the percentage of households harvesting. However, we found that residents of Naknek harvest a wide range of resources, some in relatively large amounts, and that they depend on subsistence food as an important part of their diet.

An inventory of subsistence resources used by the people of Naknek revealed that forty-two types of plants and animals are utilized. Some resources, such as moose, caribou, salmon and various types of berries, form the bulk of the subsistence diet. Other, less-used species, are also considered important for adding variety to that diet. Caribou and moose are both hunted in the local area. (Subsistence regulations in Unit 9 (C), the Naknek area, limit the annual harvest of caribou to four and of moose to one. The taking of subsistence salmon is limited to ten kings per household per year.) Nearly every household interviewed reported gathering berries. Blackberries, blueberries, cranberries and salmonberries were most common. Other subsistence foods include ducks, ptarmigan, hare, porcupine, beaver and seal. Seals are sometimes caught in fishing nets and used as food, but few people reported hunting seal.

The people of Naknek reported less use of marine mammals and marine invertebrates than other coastal communities. Eskimos are the Native group with a strong tradition of and preference for using marine mammal foods, and there are few people of Eskimo heritage in Naknek; 1.8% of our sample identified as Eskimo. According to the 1990 census, 41% (236 persons) of Naknek's population in 1990 was American Indian, Eskimo, and Aleut. Of this, 61% were Aleut, 25% Eskimo, and 14% Indian. The use of shellfish was especially uncommon, particularly for a community so heavily involved in commercial fishing. Part of the reason for the small amounts of shellfish used for subsistence is because there were several reported cases of shellfish poisoning in the Alaska Peninsula area during the previous year. Many Naknek residents stated that they normally would have gathered and eaten clams but now are afraid to do so. This likely resulted in modest harvests of clams during the fieldwork period.

Since the population of Naknek is made of up many non-Natives, people who have recently arrived, and short-term residents, sharing networks are not as intensive as in the smaller, more homogeneous communities. However, 30 of the 32 households (about 94%) in Naknek reported receiving some subsistence food and distributing some to others. The non-Natives in the sample tended to share with friends or, in some cases, affines more often than consanguines. One individual is a case in point. Married to a Native woman, this man provides food for many of his wife's kin. There are fifteen households with whom he regularly shares meat and fish, and numerous friends and other non-kin receive food from him on occasion. He also sends wild food to his own relatives in Washington State. Most households would not be so heavily involved in subsistence exchanges, but the majority of households in Naknek, Native and non-Native, do share some of what they harvest.

The sharing connections that Naknek households have with other places are similar to those of Dillingham in that they are fairly extensive; that is, people share with households in widely dispersed locations. This is not surprising given that Naknek is a subregional center and plays a role similar to Dillingham, the regional center of Bristol Bay. As with all of the study communities, the most sharing occurs within the community, with 28 households (88%) sharing with other households in Naknek. Like in the case of Dillingham, the next strongest sharing connections are with the rest of the United States (17 households or 53%) and with urban areas of Alaska (13 households or 41%).

Naknek households also share subsistence resources with households in other rural communities outside the Bristol Bay region. Three households (9%) share with people in the Interior, Central Coast, and Aleutian regions. Two households (6%) share with people in the North Slope region and one household (3%) shares with people on the Western Coast of Alaska.

Within Bristol Bay, Naknek households primarily share with other communities on the Bristol Bay side of the Alaska Peninsula (which includes the Bristol Bay Borough) and in the Iliamna Lake subregion. Alaska Peninsula communities with which Naknek households share include King Salmon (3 households or 9%), Egegik (2 households or 6%), Pilot Point (1 household or 3%), and South Naknek (1 households or 3%). Iliamna Lake communities with which Naknek households share include Igiugig and Iliamna (each 3 households or 9%), Kokhanok (2 households or 6%), Nondalton (1 household or 3%), and Levelock (2 household or 3%). The sharing in which Naknek households engage also extends to the Nushagak subregion, (3 households or 9% share with Dillingham and 2 households or 6% share with Clark's Point), and to the other side of the Alaska Peninsula (1 household or 3% shares with households in Chignik Lake and Ivanof Bay).

The highest value placed on the meaning of subsistence in Naknek was as a source of food. This was mentioned by nearly 59.4% of the respondents, the smallest percentage of all communities studied. Few Naknek respondents said they would starve without subsistence food. In general, subsistence food was considered an important supplement to the diet, especially in supplying fish and animal protein which is the most expensive and most perishable of store-bought foods. Concern over the freshness of store foods and the chemical and fat content of beef and pork was voiced, as was the common feeling that wild food is "better for you." Subsistence food is important to people living in Naknek because subsistence foods are perceived to be of better quality and because of the high price of store foods.

Subsistence is also valued as a "way of life," mentioned by 37.5% of Naknek interviewees, which again represents the smallest percentage of all study communities. It appears that subsistence is generally part of Naknek residents' lives, but not necessarily *a way of life*, which usually has many traditions and Native cultural meanings attached to it. Interestingly, the highest percentage of interviewees, about 31%, said that one of the meanings of subsistence is to provide "economic security." This seems to be incongruous with the fact that Naknek residents generally are not dependent upon subsistence food. However, it is understandable in terms of the fact that subsistence clearly is viewed as an economic alternative to store-bought foods and as a way to stretch household budgets.

Naknek also had the highest percentage of interviewees (25%) mention that they think subsistence is a right. This is probably because Naknek residents generally were quite aware of the political debates over the subsistence issue and of proposals to base harvesting priorities on need. Many respondents felt they would not be considered, and did not consider themselves, in *need* of subsistence, but felt they had a *right* to do subsistence. A number of interviewees explained that they think they have a right to harvest local resources over people from outside the area because they choose to live in a rural area, which has its disadvantages (higher cost of living, less conveniences, limited availability of fresh foods), and therefore should be able to benefit from its advantages (availability of naturally-occurring resources). For some of the interviewees, subsistence is valued as a form of recreation (12.5% of interviewees). Hunting and fishing tend to be major recreational activities in the Naknek area.

Naknek residents were concerned about the conservation of fish and game and stressed the importance of using resources wisely and not wasting the harvest. The highest percentage of respondents (87.5%) of any community discussed this as an important lesson of subsistence. Interviewees most often complained about the wasting of game by transients, military personnel and sports users. Military personnel from the base at King Salmon were said to shoot game for "the fun of it" and just take the choice parts or waste the entire animal. A recent incident in which some air force men shot a large number of caribou and left them was cited often. Interviewees also claimed that much big game meat is wasted because outsiders do not know how to properly dress a carcass and "head hunters" or sports trophy hunters are only interested in the racks. Residents feel that Fish and Game personnel spend far too much of their effort regulating subsistence users when they should be cracking down on those who waste and abuse the resources.

One resident noted that once on an unsuccessful hunt, she and others happened upon the carcass of a moose that other hunters had just finished butchering. They were able to get nearly 100 pounds of meat from the remains. She and other interviewees often commented that they wished hunters from outside the area would give the meat that they were not going to use to local people so that it would not go to waste. Perhaps because the Naknek area has more sports activity than other communities and because residents perceive that there is more resource abuse, Naknek had the highest percentage of respondents (62.5%), nearly double that of the next community, that said they thought people should learn to respect nature.

The importance of sharing subsistence resources was less stressed in Naknek and Dillingham than in the other five communities. This may have to do with the mixed ethnic and transient nature of these larger communities. Sharing in the smaller communities most commonly takes place between kin. Among those respondents with few or no kin in the Naknek area, sharing would be less likely and less valued. Those with kin outside the area occasionally send them subsistence foods, but these foods must be well preserved and able to be shipped, which limits the amount of sharing that is feasible. This is not to say that residents of Naknek do not share their subsistence harvest; they do, but generally with a smaller and more dispersed network of recipients. In Naknek, sharing often takes place, however, among non-kin at community gatherings and potlucks where subsistence food is a welcome contribution. Other social events, such as weddings, funerals and religious gatherings, are occasions for the sharing of subsistence foods.

The importance of learning subsistence skills (15.6% of interviewees) and of learning how to survive from the land (3.1% of interviewees) were two other lessons that Naknek interviewees mentioned far less than respondents in all other study communities. This supports the previous comments about Naknek residents being less dependent upon subsistence for their basic survival and being less involved in subsistence as a way of life.

The people of Naknek expressed a great deal of concern over the present (1990) state of flux in subsistence regulation. Many believe that if subsistence is more tightly regulated, or eliminated altogether, there would be economic impacts of varying degrees on their household (ranging from serious hardship to limiting their discretionary spending). The most respondents (43.8%) mentioned that if they did not engage in subsistence activities, they would have less recreation and exercise, but this percentage was smaller than in all the other communities, indicating that Naknek residents have more recreational alternatives. Most interesting was the fact that a greater proportion of Naknek respondents reported they would be very dispirited (37.5%) or they would relocate (34.4%) if they were prohibited from engaging in subsistence than in any of the other sampled communities. Taken together, these responses seem to indicate, in general, that subsistence is an activity which Naknek residents choose to do and which they enjoy, that the ability to hunt and fish is one of the reasons they live in Naknek, and that subsistence resources make an economic contribution to their households.

Competition with sports hunters and fishers has dramatically increased in the Naknek area in recent years. The over crowding of the Kenai River area, the proximity of the Bristol Bay Borough to Anchorage and its accessibility through the King Salmon airport, and the increasing numbers of lodges and guides operating in the area have certainly contributed to this increase in sports users. This worries some Naknek residents who see no end in sight to the increase in sports pressure on resources they consider necessary for subsistence. Increased competition was the most commonly perceived threat to subsistence (mentioned by 50% of interviewees), followed by resource abuse/waste (43.8% of interviewees) and resource decline (31.3% of interviewees). Naknek interviewees seemed worried that sports enthusiasts have more political clout in the State of Alaska and that the local harvest of resources for subsistence may be altered to accommodate outside interest groups.

While most Naknek residents believe that regulation is a necessary part of resource management, they expressed the opinion that local people are often in a better position to know how the resources should be managed. They resent regulations which impose what to them are unnecessary restrictions on traditional subsistence activities and believe some provision should be made for subsistence use in Katmai National Park and Preserve. Interviewees perceive general government interference, the federal take-over of subsistence management, the McDowell decision, and ADF&G management as threats to subsistence activities (mentioned by 21.9%, 25%, 15.6%, and 15.6% of interviewees respectively). Oil development also was seen as a potential threat by 28.1% of the respondents and, as mentioned above, many people feel that the potential revenue from oil development is not worth putting the fishery at risk.

The most common change noted in subsistence activity was an increase in regulatory activity (25% of the respondents), probably referring to restricted access to Katmai National Park. Other changes were commented on by some individuals. For example, several people noted that sea mammals, especially seal, are not hunted as much as they used to be and that because of a recent outbreak of shellfish poisoning, fewer people use marine invertebrates. Very few people noted changes in involvement in subsistence activities, in the skills and equipment associated with subsistence procurement, or in patterns of resource harvesting and sharing. This is probably due to the fact that average term of residence in Naknek is only about eleven years, thus many people have not been around long enough to observe changes in subsistence practices.

D. NEW STUYAHOK

1. Introduction

New Stuyahok is located on the Nushagak River, approximately 52 air miles and 85 river miles northeast of Dillingham and 275 air miles southwest of Anchorage. This inland community is situated between Nuyakuk Lake in Wood-Tikchik State Park and the mouth of the Nushagak River at Nushagak Bay. New Stuyahok is the middle of three communities which are located northeast of Dillingham on the Nushagak River; it lies about twelve miles upriver from Ekwok and about forty miles downriver from Koliganek.

New Stuyahok is located on a steep, ancient riverbank. On the riverbank one can see as many as 60 aluminum, motorized boats parked side-by-side in long rows. These machines are used for trips up and down the river for hunting, fishing, collecting, and visiting. The river is the transportation artery, especially when its surface waters run free. When snows are deep, snow machine trails on rivers, lands, and lakes become the routes of travel. All the while, air travel is the crucial transportation link to the world. Radio and satellite television bring much of the outside world to the village.

The largely Central Yupik Eskimo residents are extremely cordial, and a visitor is immediately greeted warmly and treated respectfully. It is common to be invited to take steam baths with those of one's gender, and it is in the baths that one learns about the community and the people's feelings about their lands, politics, subsistence, history, ethnic relations, economics, and countless other subjects.

The two centers of community activity are the combined high school and elementary school and the Russian Orthodox Church. During our stay in August, the Archbishop of Alaska conducted church services to a large congregation of persons from New Stuyahok and neighboring communities. The Archbishop had spent the previous night in the home of one of the respected members of the community, and there was great excitement about his important event, as well as an atmosphere of solemnity and respect. The local store owned by the village corporation is near the riverbank and it serves as an informal meeting place for casual talk and story-telling.

Villagers are quick to tell visitors who the elders are in the community. They are greatly respected for their knowledge of places to hunt, fish, and collect and of the precautions and signs one looks for to have success in the wild and to avoid dangers. These persons also know about food preparation, storage, and distribution. New Stuyahok people are also deeply conscious of their history and their place in the land, and the elders represent a strong link to the rivers, lakes, land, and living beings.

New Stuyahok was included in this study generally to represent inland or upriver communities and, in particular, to represent the three inland Nushagak River communities. Our analyses of the Alaska Department of Fish and Game data, as well as ADF&G's technical papers, indicated that inland communities differed significantly from coastal communities in terms of their resource harvesting patterns (Wolfe et al. 1984; Schichnes and Chythlook 1991). In general, they were more involved in harvesting small game and more dependent upon subsistence foods. New Stuyahok, Ekwok, and Koliganek clustered with the Iliamna Lake communities in a few of the multidimensional similarity structure analyses, while in other analyses they formed their own cluster.

There were several other reasons for selecting New Stuyahok. This community is the largest of the three Nushagak River communities, is growing rapidly, and is emerging as a subregional center. It appears to play a key role in regional and inter-regional subsistence distribution networks. New Stuyahok is fairly homogenous and predominantly Eskimo, which contrasts with the larger, more ethnically diverse communities included in this study.

2. Ethnohistory

The community of New Stuyahok was located at two different sites historically, as far as local residents can recall. The original, "Old Village" was located near the present site but was moved upriver in 1918 to the Mulchatna area. It was at this second village site, referred to as Old Stuyahok, that its Native residents herded reindeer in the 1920s and

1930s for the United States government. By the 1940s, however, the reindeer herd had diminished to a few animals. Old Stuyahok was subject to repeated flooding and was unable to receive bulk shipments because sail boats of that day had too deep a draft to go that far upriver.

New Stuyahok was moved in 1942 to its present location to give residents easier access to Nushagak Bay. "Stuyahok" is an Eskimo word which translates in English as "going downriver place". The community soon grew with the addition of people from the village of Nunachuak. New Stuyahok was included in the federal census for the first time in 1950 when the population was 88 (VanStone 1967:147). In the early 1950s, people from New Stuyahok built their own school, which was then staffed and supplied by the Bureau of Indian Affairs (BIA). A Russian Orthodox Church was built in 1958. Once it became clear to BIA officials that the people intended to remain permanently settled in New Stuyahok, a new school building was constructed for the community, which was in 1961 (VanStone 1967:99).

New Stuyahok grew rapidly after the church and new school were built, drawing upon the entire Nushagak region and the western part of Bristol Bay for its population. VanStone's 1962 list of the communities in which New Stuyahok household heads and their spouses had been born included the following communities (in descending order of numbers from each village): Nunachuak, Old Stuyahok, Wood River Village, Ekwok, Dillingham, Kanakanak, Nushagak, Igushik, Mulchatna River, Koliganek, Togiak, Platinum, Kokwok, Snake River, and Angle Bay (VanStone 1967:147).

In addition to the school, a United States post office was built in New Stuyahok in 1961. An airstrip and roads were constructed by the state in the 1960s. The store, which is now operated by the village ANCSA corporation, was built in 1970. In 1971, the Alaska State Housing Authority constructed a major housing project in the lower part of the village, the Public Health Service installed a water and sewer system, and the Alaska Village Electric Cooperative built an electrical power plant.

New Stuyahok incorporated as a second class city in 1972 and assumed municipal powers over sewers, health services, cemeteries, police protection, light, power, and heat, and community centers. A clinic, city council building, recreation hall, and storage buildings have since been added to the community's facilities. New Stuyahok has grown steadily since the 1960s because of natural increase and in-migration of people from smaller villages who seek improved education, health, and community services. In order to accommodate New Stuyahok's growing population, a second housing project, referred to as the "HUD housing," was built in 1985 by the Bristol Bay Housing Authority with federal funding from the Department of Housing and Urban Development (HUD).

3. Characteristics of the Population

A total of twenty households in New Stuyahok were selected in a random sample of 91 households, and an adult head of each of those households was interviewed. The twenty households had 121 persons living in them, making the average household size for the sample about six persons.

The population of New Stuyahok has increased dramatically since the community moved to its present location. New Stuyahok grew from the 88 persons recorded in the 1950 federal census to 145 persons in 1960 (a 64% increase in ten years), to 216 persons in 1970 (a 49% increase over 1960), and to 331 persons in 1980 (a 53% gain from 1970). According to the 1990 United States census, the population of New Stuyahok is 391 people, representing an 18% increase over 1980.

Of the twenty sample households, nuclear households predominate, representing 55% of the total. Another 30% of households are extended or composite, 10% are single parents, and 5% are conjugal pairs. Extended family households are large in New Stuyahok, averaging over nine persons and the household heads are relatively elderly (64 years). Nuclear family households are also large with nearly six persons on average; the age of nuclear household heads is nearly 39 years.

There are two characteristics of the sample households in New Stuyahok which distinguish this community from the other communities. First, New Stuyahok sample households are the largest of the seven study communities, averaging six persons per household. Secondly, New Stuyahok has a relatively high proportion of multiple-family and composite-family households. Generally, lack of housing and low incomes account for such characteristics, but New Stuyahok is not in serious shortage of housing and the community has an average mean household income. The explanation for these household characteristics appears to be that employment levels are relatively low and the community has a relatively high birth rate. New Stuyahok had, by far, the smallest percentage of jobs for the sample population of all study communities (46 jobs for the 121 persons in the sample or 38%). Also, the sample population of New Stuyahok worked, on average, just under five months out of the year, next to the lowest number of months out of the year. Only Nondalton was lower with people working, on average, less than four months out of the year.

Another distinguishing characteristic of New Stuyahok is its pattern of sub-regional and village endogamy. With one exception among the Alaskans in the sample population, women marry into the village, probably because of the preponderance of males, as will be described below. Fourteen of the respondents were married at the time of the protocol discussions. Four couples were endogamous within the village; that is, men and women in these unions were full-blood Eskimos born and raised in New Stuyahok. All of them are under 50 years of age since New Stuyahok was not settled until 1942. Four other couples were comprised of Eskimo men born and raised in New Stuyahok married to women (three Eskimos and one Tlingit) from Koliganek (two women), Southeastern Alaska (one woman), and Platinum (one woman). There was one full-blood Aleut man born and raised in New Stuyahok married to an Eskimo woman from Koliganek. Two elders (84 and 77 years of age) who were raised in the upper Nushagak/Mulchatna area made up another couple. Two other couples were native, one an Eskimo man from the Kuskokwim region married to an Aleut woman from Sand Point, and another an Eskimo man from Togiak married to an Eskimo woman from New Stuyahok. Two non-Native couples were from the lower 48 states, one of which had lived in the village five years.

Gender ratios in New Stuyahok varied significantly from those in the other study communities. Our sample population consisted of 74 males (about 61%) and 47 females (about 39%), with a gender ratio of 1.58 (the number of males for each female). Most of the gender differences are among persons 10 years of age and younger, where there were 33 males and 9 females, yielding a gender ratio of 3.7 for this age group. We are not sure how to explain this imbalance between males and females. A similar preponderance of males has been noted in the past. A community census done by the Bureau of Indian

Affairs in 1966 showed a notable disparity between the genders in the 45 to 65 age group, with 19 males to 7 females, or a ratio of 2.71 (DOWL Engineers and Bristol Bay Native Association 1982). A community profile prepared by the Small Business Class from New Stuyahok High School in 1988 showed 204 males to 171 females in the community (a ratio of 1.19), with a notable disparity in the 15 to 65 age group (129 males to 99 females or a ratio of 1.3).

New Stuyahok has one of the youngest sample populations of the seven communities, along with Chignik Lake, with average ages of 22.7 and 22.8 years respectively. For comparison, the average age in Nondalton is 26.0 years, in Naknek 27.2 years, in Togiak 27.6 years, in Port Heiden 28.4 years, and in Dillingham 28.7 years. New Stuyahok has the greatest proportion of children of any of the study communities.

Predominantly an Alaska Native community, New Stuyahok has the smallest percentages of non-Alaska Natives (5.8%) and people of mixed Native/non-Native parentage (3.3%) of all study communities. Eskimos comprise 73.6% of the sample population. Aleuts are 5.8% of the sample population. Another 10.8% of the sample population comes from a mixed Native background. And, .8% of the sample population is other Alaska Native (a Tlingit).

Compared with the other study communities, people in New Stuyahok have next to the lowest level of education (Nondalton is the lowest), with an average of 6.4 years in school. A little over half (53%) of the household sample population n=121 completed sixth grade, another 39% completed high school, and about 8% have had some college education. Only 2.5% of the sample population has earned a degree beyond high school (these were school teachers born and raised outside the region).

The population of New Stuyahok is very stable. The 121 persons sampled in New Stuyahok averaged 18.2 years of residence in their community, the third longest among the seven study communities. Nondalton's sample population had the longest term of residence, 20.4 years, followed by Togiak, with an average of 20.1 years of residence. The average length of residence in Chignik Lake was 16.7 years, in Dillingham and Port Heiden was about 15.6 years, and in Naknek was only 11.1 years.

New Stuyahok had, by far, the highest percentage of the sample population that was raised within the village, which was 82.6%. Of those who were not raised in New Stuyahok, 10.8% were raised in the northern part of Bristol Bay (Dillingham, Koliganek, Portage Creek, Platinum, Togiak, and other "Upper Bristol Bay area" villages which no longer exist). The remaining 6.6% of the sample population was raised in other parts of Alaska (3.3%) and in other parts of the United States (3.3%).

4. Economy and Infrastructure

Of the seven communities included in this study, New Stuyahok is sixth in economic well-being as measured by the availability of full and part-time jobs and at the mid-point for all the communities in terms of average total household income. The community has a high birth rate and a high ratio of dependents to persons in the work force (persons under 16 and over 64 years of age, in proportion to those between 16 and 64 years of age). The dependency ratio for New Stuyahok is 1.05, with 51% of the population too young or too old to be officially in the labor force. Nondalton is another example of a community with a high dependency ratio, which is 1.12. By comparison, the other communities have dependency ratios of .83 for Chignik Lake, .70 for Naknek, .69 for Togiak, .54 for Dillingham, and .50 for Port Heiden.

The economic base of the upriver community of New Stuyahok is comprised of a mixture of commercial fishing, government employment, and subsistence fishing and hunting. Close to half of the people in New Stuyahok who work are self-employed fishers, crew members, or processing workers. They primarily participate in the commercial salmon fishery, but some also fish commercially for herring in Togiak Bay. Most of the salmon drift-netters work in the Nushagak Fishing District, and most of the commercial set-netters work in the vicinity of Lewis Point on the lower end of the Nushagak River.

Commercial fishing is a crucial source of livelihood for residents of New Stuyahok, who have retained many Limited Entry permits. This is in contrast to the other inland community of Nondalton, where most Limited Entry permits have been alienated. For New Stuyahok residents, commercial fishing tempers what could be a near-poverty standard of living, one similar, unfortunately, to Nondalton where other forms of employment are scarce and instances of public support are relatively high. Aside from commercial fishing, there is very little private sector employment in New Stuyahok, except family-operated videotape rentals, baby sitting, and selling crafts or berries. A few people are competitive dog mushers.

Close to 80% of the men in New Stuyahok participated in fur trapping as recently as three years ago. Beaver, lynx, fox, and mink were the primary species trapped for fur, although muskrat, otter, wolverine, marten, and weasel were also taken (New Stuyahok Enterprises 1988:16-17). In 1990, many trappers were not marketing their furs because prices had dropped dramatically. However, ADF&G officials reported that 24 New Stuyahok trappers took 302 beavers' pelts into Dillingham during the annual Beaver Round-up celebration in the 1989-90 season. During our fieldwork, we talked with the manager of a store in Dillingham that purchases pelts from trappers in many Bristol Bay communities. He reported that in 1986, 4,000 beaver pelts were purchased at $50 each. By August 1990, only 900 pelts had been purchased, each for $35.

The state of Alaska is the second largest source of employment in New Stuyahok. The Southwest Region School District, which is funded by the state and serves the Southwest Region Rural Education Attendance Area, hires local people as teaching aides, cooks, custodians, secretaries, and activities supervisors. Most of these positions are part-time. The Alaska Village Electric Co-op (AVEC) employs a few operators and seasonal help to run and service the village generator.

Other public sector employment is provided by the local and federal governments. Paid positions through the city of New Stuyahok include the mayor, water and sewer maintenance person, elder van driver, dog catcher, and some seasonal clean-up help. The federal government hires one full-time and two part-time people to staff the post office.

Alaska Native corporations also hire New Stuyahok residents. The City Administrator and the Village Public Safety Officer are employed by the Bristol Bay Native Association. The village corporation, Stuyahok, Ltd., operates Panarqukuk, Inc., a co-op store, which hires a full-time manager, a freight hauler, and several clerks. Bristol Bay Native Health Corporation staffs the local clinic with several health aids.

The community infrastructure of New Stuyahok consists of a number of public and private facilities, much of it developed with state oil monies or with federal assistance. The community has water and sewer facilities, an electrical power plant, telephone service, dump site, dirt roads, and a gravel airstrip. Public structures include the schools (serving kindergarten through twelfth grades), Russian Orthodox Church and Sunday school, store, City Hall, city shop, clinic, fire hall, and two youth center buildings. Housing is a mixture of older cabins and structures built under two different government projects.

The economic future of New Stuyahok is not particularly promising, according to observations made by community leaders in summer of 1990. State funds are declining and capital improvement projects, which were abundant in the heyday of high oil prices, are not being funded as readily as during the 1970s and early 1980s. The local tax base is very small and city government officials are averse to levying taxes on the local population.

5. Institutions and Organizations

New Stuyahok was incorporated as a second-class city in 1972. The village is governed by a seven-member city council from which a mayor is elected. Elections are held each October and city council members are elected to staggered terms. The city council meetings are held every second Tuesday of the month. City revenues come primarily from the State of Alaska revenue-sharing program, municipal aid and grants, and sales of electrical power from the city plant.

Native residents of New Stuyahok also are represented by a Traditional Council, which is recognized by the Bureau of Indian Affairs as the official traditional governing body of the village. The Traditional Council is composed of seven members who are elected at the same time as city government officials. The traditional council is empowered to administer federal programs such as social services, employment assistance, local health care, and college assistance. The regional non-profit corporation, Bristol Bay Native Association, administers many of these programs for New Stuyahok and for most of the other villages as well.

Stuyahok, Ltd. is New Stuyahok's village corporation organized under the Alaska Native Claims Settlement Act. The nine-member board of directors is elected annually by the shareholders. Major assets of Stuyahok, Ltd. are the land it was entitled to select under ANCSA and a village co-op store which it owns and operates. The co-op store earns a modest profit from year-to-year and is used by village residents for the purchase of day-today grocery items. Most residents, however, purchase much of their store food supplies in bulk from Dillingham or Anchorage, or shop for fresh foods when they go to Dillingham.

The three local government entities, city government, the Traditional Council, and the village corporation operate in harmony, according to the community leaders who were interviewed. Much of the community activities in New Stuyahok revolve around the schools, which offer recreation programs, dances, and carnivals. New Stuyahok has a preschool funded by the federal Johnson-O'Malley program. The elementary grades are housed in the facility built in 1961 and the high school is in a newer building which was constructed in 1979. Together they have about 100 students. The high school has a gym that is used for sports activities and community gatherings. The high school began a career and personal counseling program in 1987 which serves not only students but all residents of New Stuyahok. There is concern about cuts in the state budget, which resulted in a $93,000 reduction in the schools' budget for 1990-1991, a difficult reduction to manage considering the rising population of school-age youngsters. The University of Alaska's Bristol Bay Rural Education Center located in Dillingham offers higher education to New Stuyahok residents through on-campus courses, courses offered by instructors who visit periodically, and correspondence and teleconference courses.

Other organized community activities revolve around the Russian Orthodox Church and the Youth Center. The Russian Orthodox Church is the only church in New Stuyahok and virtually all of the residents are members. The Russian Orthodox holiday of Slavi is a week-long celebration in which there is much visiting between communities and feasting, particularly with subsistence foods. The youth center is operated by Stuyaram Ikaiurugaaci (New Stuyahok Wants to Help You). The center is a meeting place for various service organizations (A.A., Alanon, and Ala-teen) and the place where young people hold dances, movies, potlucks, cakewalks, and the like.

Several other activities are popular in New Stuyahok. The community hosts winter carnivals which feature dog mushing, turkey shoots, broom-ball, various contests and races, and basketball tournaments. Throughout the year, bingos and cakewalks are held to raise money for the carnival committee and for charity purposes. There are many informal activities which residents enjoy doing, such as taking steams, visiting and playing poker.

Favorite outdoor activities include hunting, fishing, hiking, camping, riding skiffs or three-wheelers, snowmachine riding, ice fishing, trapping, and dog mushing.

6. Subsistence Activities

New Stuyahok residents are very involved in subsistence harvesting and processing, as well as in the sharing of subsistence foods. New Stuyahok interviewees reported using a large variety of subsistence resources. Forty-seven different kinds of resources were mentioned. Residents of this community are particularly high harvesters of caribou, moose, various types of berries, pike, grayling, whitefish, king salmon, red salmon, chum salmon, ducks, geese, beaver, hare, and porcupine compared to residents of other communities studied. The ADF&G subsistence survey in New Stuyahok showed that sockeye (red) salmon were second only to king salmon in the total edible pounds contributed to the mean harvest (higher than caribou or moose). The same survey revealed that in number of fish harvested, sockeye were highest (ADF&G memorandum, 10-14-91). In addition to the resources already listed, of which they harvest relatively high amounts, New Stuyahok interviewees use for food red salmon, ptarmigan, silver salmon, wild spinach, pink salmon, fiddle fern, rabbits, (snowshoe and tundra hares), rainbow trout, lake trout, Dolly varden, smelt, flounder, black bear, herring, roe on kelp, clams, tom cod, crab, yellowfin sole, sea lion, seal, and a variety of green plants. Non-food animals taken for pelts include fox, otter, mink, marten, wolverine, and wolf.

New Stuyahok residents engage in extensive and intensive sharing of subsistence resources with kin, friends, and acquaintances. All of New Stuyahok's sample households (20 or 100%) share with other households in the same community. The next strongest sharing connections are to other communities that are also along the Nushagak River and to Togiak. Sharing occurs with the downriver communities of Dillingham (9 households or 45%) and Ekwok (4 households or 20%), the upriver community of Koliganek (8 households or 40%), and Togiak (8 households or 40%). Sharing also connects New Stuyahok to other villages in the Bristol Bay region (2 households or 10% share with Aleknagik while 1 household or 5% shares with Clark's Point, Iliamna, Levelock, Manokotak, and Newhalen); to other rural regions (2 households or 10% share with communities on the Western Coast and in Southeast Alaska and 1 household or 5% shares with communities in the Aleutian Islands); to urban Alaska (3 households or 15%); and, to the rest of the United States (2 households or 10%).

In addition to the giving and receiving that particular households engage in with one another, people in New Stuyahok share in more general ways. The highest reported instance of general sharing in all the communities occurs among New Stuyahok residents as part of religious ceremonies (90%), chiefly during the January Slavi gatherings. Most of the respondents (65%) said they contribute subsistence resources to birthday, wedding, and funeral meals and feasts (65%) and to other community events and potlucks (55%). Six persons (30%) said they share subsistence foods at meals with extended family members and friends, which is probably an under-count since this practice is so widespread that most interviewees did not think to mention it unless the interviewer probed. Four of the respondents (20%) said they give subsistence foods to others to celebrate a young hunter's first kill.

The primary meanings that subsistence has for interviewees from New Stuyahok are as a source of food and as a way of life. Statements that could be classified into these categories were made by 70% of those interviewed. Statements indicating subsistence is a way of life were difficult for some persons to express, and several respondents said they could not find English words to convey what subsistence means to them. The following quotes illustrate expressions of the importance of subsistence. The first three statements were made by full-blooded Eskimos who were born and raised in New Stuyahok and the last was made by an Anglo public school teacher who has lived in New Stuyahok for five years.

> "If they take away subsistence, a whole lot of Alaskan Natives would go on welfare."

> "It is a way of life. It means lots. We couldn't live without it. If it goes down, everything would go down. It is a tradition we were taught and are trying to pass on to our kids. It is lots of work, but when you are done, you are proud and glad you could do it for your family. It provides for the whole winter."

> "I give subsistence foods to people because I care for them. I give so I can receive more. I could not afford not to do subsistence."

> "It means feeding my family, ties to the land. Subsistence activities draw me to this place; it's part of what makes living here special. I grew up in a place where I could not do these things. Other than this, you can't put it (the importance or meanings of subsistence) in words."

The lessons and rules that one must learn as part of subsistence pursuits were discussed by the respondents, and the largest percentage said that sharing (65%) and learning the skills necessary to do subsistence (also 65%) are crucial lessons. New Stuyahok, Nondalton, and Chignik Lake respondents emphasized sharing more than the other communities, and this cultural value seems to correspond with the high proportion of Native persons in those communities' samples. New Stuyahok and Nondalton respondents mentioned the need to learn subsistence skills the most (65% in both villages), revealing both their dependence upon subsistence and their desire to see the tradition continue.

Twelve New Stuyahok respondents (60%) scorned waste, and they stated that frugal use of naturally-occurring resources is essential in the culture of subsistence. Learning survival techniques is also part of the subsistence complex, as cited by ten persons or 50% of the respondents, the highest percentage of all the communities. Residents of New Stuyahok travel far up the Mulchatna River to hunt caribou and moose and to trap, which may account for their emphasis on learning how to survive.

Eleven interviewees (55%) said the greatest threat to subsistence is increased competition over resources, particularly from sport hunters and fishers. This threat is based, in part, on an increase in the number of sport hunters and fishers on the Nushagak River over the past five years. Nine persons (45%) said the Alaska Department of Fish and Game (ADF&G) regulations pose a serious threat, mainly because they believe ADF&G favors recreational hunters and fishers over local subsistence users of the resources. The same number of interviewees (45%) perceive state management as a threat, probably because this community is located in the drainage with the largest proportion of state-owned land in Bristol Bay. Several community leaders voice similar displeasure with ADF&G.

A fair amount of concern also was registered over the prospect of federal management of game and fish on federal lands in the wake of the McDowell decision. As one local leader said,

> "They (the federal government) give us no choice but to run game management by ourselves. We do not mind having sport hunters and fishers if they would not waste, but they do waste. The area is too large to police. Stiff fines should be imposed."

Reduced access to resources, potential oil development, increases in population, resource decline, and environmentalists were other threats mentioned by interviewees. A grievance registered by one New Stuyahok interviewee was about people who support animal rights and who lobby against anyone taking animal pelts. This person said such actions have caused the beaver pelt market to decline to the point that it is no longer worth one's time to trap beaver. This economic condition has caused a rise in the beaver population along the Nushagak River and in the Mulchatna area, so much so that beaver ponds are threatening salmon spawning grounds. This person argued for a steady, profitable harvest of beavers to keep a balance between salmon and beaver and to allow local people to earn additional cash. Beaver pelts were very important to the local economy just a few short years ago.

Land control is crucial in the New Stuyahok area, and some of the members of the village corporation hold allotments along the Nushagak River and some of its tributaries. Some of these allottees are displeased about sport hunters and fishers using their land. The village police officers, under an inter-village cooperative agreement, conduct summer patrols to protect Native land. Local guides are encouraged to inform their clients of land ownership and to encourage them to respect allottee land.

According to interviewees, there have been some changes in subsistence, yet it remains a vital part of life in the community. The changes mentioned most often were more and better equipment (resulting in greater efficiency), an increase in subsistence regulations, and some decline in people's involvement and dependence upon subsistence. An Eskimo man who is about 35 years old and who was born in the village provided some especially succinct statements on changes in subsistence:

"When I was a kid in the 1960s hunters used to give some part of an animal (especially a moose) to everyone in the village. This is rarely done now. Sharing is done within immediate families or with elders. People spend shorter time in the field, and there is less time spent on camping because machines allow people to travel faster. Store foods have not replaced subsistence foods. Subsistence organization is very efficient. When I see a moose, for example, I try to find someone to hunt with me. I tell one person, the request spreads and I end up with four snowmachines. There are so many game and fish rules nobody gives a shit anymore. When game is available, the season is open. Someone who decides on subsistence (a legislator, for example) should spend one year or more in a small community without a job and be expected to live off the land."

E. NONDALTON

1. Introduction

Nondalton is located 15 miles north of the community of Iliamna on the west shore of Six Mile Lake and 200 miles southwest of Anchorage. It was selected for inclusion in this study to represent communities of the Iliamna Lake subregion, which often clustered together in the multidimensional similarity structure analysis. Nondalton represents an inland Athabaskan community dependent on a wide range of lake and terrestrial resources, upon which Native peoples in the Bristol Bay region have long been dependent. Furthermore, it has served as an important cross-roads for the Iliamna Lake subregion. Subsistence exchanges between Nondalton residents and their kin and friends throughout the subregion are commonplace. Newhalen, Pedro Bay and Iliamna are especially important in these networks of reciprocity (Behnke 1982; Morris 1986).

2. Ethnohistory

The predecessor of the present village was located on the north shore of Six Mile Lake. The old village was abandoned in 1940 because firewood fell in short supply and the surrounding area became a large mud flat. The occupants of the village settled at a new location, the present site of Nondalton. A post office established in 1938 in the old village was also moved to the new site. The first census of Nondalton was conducted in 1920 when 69 persons were recorded. The population declined to 24 persons in 1929, after which it steadily rose.

3. Characteristics of the Population

The current population of Nondalton is 178 persons according to the 1990 federal census, but Alaska Department of Community and Regional Affairs figured the 1990 population at 229 persons. There were 67 occupied households in September of 1990, of which 20 were randomly selected for inclusion in this study. A total of sixty-eight people resided in those twenty households, yielding an average of 3.4 persons per household.

Nondalton has the greatest diversity of household types, a circumstance that might be a reflection of poor economic conditions. The relatively high percentage of multiple-family households (25%) and single-parent households (25%), and the low percentage of nuclear family households (30%), suggest that the composition and organization of households are related to sparse economic opportunities.

Household heads (so designated by household members) average 47.7 years of age. Nuclear family household heads average only 28.5 years, a rather young age. This low average age might be accounted for by the presence of some older, less prosperous nuclear families in multiple-family households headed by elders. It appears that as household heads age, they are likely to host other, closely-related families, or grandchildren, or, if divorces or other kinds of separations occur, single-parent households form.

One-fourth of Nondalton sample households are headed by single parents (three women, two men). Thus the evolution or life cycle of households in Nondalton is complicated by the instability of unions, the need for families to join under one roof for mutual support, and grandparents hosting grandchildren to form grandparent-grandchild households or composite households.

The Nondalton population is fairly evenly split along gender lines. There were 36 males and 32 females in the 20 households sampled, yielding a small gender ratio of about 1.1. The population is relatively young, with an average age of 26 years. Only Chignik Lake and New Stuyahok have populations with younger average ages. However, Nondalton has the widest distribution of ages of all seven communities.

In terms of ethnic composition, Athabaskan persons make up the largest portion (65% or 44 persons) of the population. The Non-Natives who make up 15% of the sample (ten persons), are whites who work for the school district. The eight mixed Native/Non-

Natives (12%) and six mixed Natives (9%) are Aleut and Eskimo and some mixed-blood persons with Aleut, Eskimo and white ancestry.

Nondalton's population is the least educated of the seven communities, with an average of six years of formal education. Twenty persons (29%) reported never attending school, another twenty-two (32%) completing up to eight grades, and twenty-six persons (37%) completing some high school education. Only 3% of the population had attended any college, and only 1.5% had received a college degree.

The population of Nondalton consists primarily of long-term residents. Of the sixty-eight persons in the sampled households, seventeen (25%) had lived in Nondalton for more than 30 years, eleven (16%) had been in the community from twenty to thirty years, and eight (12%) had lived in the community between ten and nineteen years. Thus, over 50% of the population had lived in Nondalton for ten years or more while only 65% of the population was ten years of age or older.

Most of the residents of Nondalton (nearly 84%) were raised in the village or in nearby communities. Forty-nine persons (72.1%) were raised in Nondalton, six in Lime Village (8.8%), and two (2.9%) in Igiugig. Only two persons (2.9%) were raised in other parts of Alaska and eight persons were raised outside of Alaska (11.7%).

The marriage pattern in Nondalton shows a high percentage of couples comprised of persons from Nondalton. Fourteen of the 20 respondents (70%) were married at the time of the protocol discussions in summer of 1990. Three of these unions (21%) were couples who were from outside of Alaska and were teachers. Seven of these unions (50%) were full-blood Athabaskan couples ranging in age from the early twenties to the mid-sixties, composed of persons born in Nondalton married to other persons also born in that community. This is highest level of endogamy of the seven study communities. Other unions are small in number and both male and female had married outside the village. In two of the fourteen unions (14%), males from Nondalton had brought Athabaskan spouses to the village from Lime Village, not many miles from Nondalton. One Athabaskan male from Eagle (Interior Alaska) married an Athabaskan woman born in Nondalton. A man from New Stuyahok, who is half Eskimo and half white, had married a woman born and raised in Nondalton.

4. Economy and Infrastructure

Nondalton is an economically poor community. The sample of twenty households had the lowest average household income of all seven communities, which was $21,298. The gap between Nondalton and the community with the next lowest average household income (Chignik Lake at $27,084) is significant. In comparison with Togiak, the community with the third lowest household income ($38,198), the difference is considerable. Nondalton residents are very dependent on public transfer funds. Sample households averaged $549 in public assistance (highest of the seven communities), $1,031 in Aid to Families with Dependent Children (AFDC) and Women, Infants, and Children (WIC) payments (second highest next to New Stuyahok), and $1,027 in food stamps (highest of the seven communities). Despite their low incomes, many families have been provided with single-family houses by Housing and Urban Development (HUD) projects of the 1970s and 1980s, and seven houses were built in 1983 under a Bureau of Indian Affairs contract with the Traditional Native Council.

Nondalton has a very small number of wage jobs and most of the residents have resigned themselves to the futility of seeking employment. Nondalton residents are oriented toward Anchorage for employment, and many make job-seeking trips there. Some remain in Anchorage for a while and return in frustration for various reasons while others stay a long time or permanently.

There are forty-seven jobs held by members of the twenty sample households, most of which are in the public sector. Public sector employment includes jobs with local government and the Lake and Peninsula Borough School District (23.4%), with the federal government (21.3%, primarily with the National Park Service), with state government (6.4%), and Native corporations (6.4%). Commercial fishing accounted for almost a third of the jobs (17% as crew or cannery workers and 10.6% as self-employed captains). Construction provided two jobs (4.3%). One person (2.1%) was a lodge employee serving as a guide. The remaining 4 jobs were not determined as to employment sector. Some of the residents (7 persons in the sample) fight fires on federal lands each summer, and although this employment is important, it contributes only a small portion of total household income.

The Kijik Corporation and the Traditional Native Council entered into an agreement with a private corporation several years ago to produce dolls. Kijik held 49% and the Council 51% control of the enterprise. A small factory was constructed and eventually twenty local persons, men and women, were employed. After several years of operation, the factory closed in 1988 because of generally poor economic conditions in Alaska following the 1986 drop in world oil prices. This closure was very disappointing to local government representatives and many Nondalton residents. This enterprise had offered hope of a local, long-term source of employment on a comparatively large scale.

5. Institutions, Organizations, and Community Activities

In 1971 Nondalton was incorporated as a second-class city in the State of Alaska. The city council has seven members and from these are selected a major, vice mayor and a secretary/treasurer. Elections are held in October and the council meets on the second Tuesday of each month. There are several city employees and the city is one of the important sources of employment in a community where jobs are scarce.

Nondalton's city finances are meager, as state matching funds have declined in recent years, especially since the down-turn in oil prices. The local tax base is very small and city government officials seem to be averse to levying taxes on the local and growing sport hunting and fishing industry. There is a small store operated by a private company which is one of the few sources of local municipal taxes.

In 1971 the Nondalton Native Corporation (Kijik), one of thirty-nine village corporations chartered in the Bristol Bay Native Corporation (BBNC), was entitled to select 123,558 acres of federal land. It received 108,395 acres of unsurveyed land from the Bureau of Land Management under interim conveyance (working title). A patent was issued after the boundaries were confirmed by surveys. The corporation has title to the surface of lands and the BBNC owns sub-surface rights.

The Kijik Corporation has established a housing subdivision on the shores of Lake Clark. About 200 lots have been sold mainly to non-Native Alaskans in Anchorage, and about 100 remain. As of September 1990, this project was running in the black, although sales had slowed because of the downturn in the state's economy.

Another source of income for the Kijik Corporation is the sale of easements to the National Park Service along the Tazimina Lake across from Nondalton. The corporation has no intention of developing important subsistence areas and subsistence rights will be retained on easement land. The easements will allow public use in the area. About 700 persons go through the area each year and the corporation could not afford to police it. The title and use rights to the land remain in the hands of Kijik Corporation. The corporation and its members want to preserve the fragile ecosystem of the Tazimina Lake as well as Six Mile Lake, which form an important part of the sockeye salmon habitat of Bristol Bay. In reference to the Lake and Peninsula Borough (newly-formed), the corporate stockholders seem to be averse to efforts by the borough to tax people in its jurisdiction.

Sports hunters and fishermen have unfettered access to the Long Lake area north of Nondalton, an area now under state control but which was once part of the Athabaskan traditional area. The lake cuts off local access to an area north of the lake which is important to Nondalton residents for hunting, and this situation is aggravating to the local people. Stockholders in the corporation were to discuss limiting access to corporation land to stockholders in a forthcoming meeting. Officers of the Kijik Corporation, other village leaders, and most of the residents oppose oil development in Bristol Bay. Many persons said the Exxon Valdez oil spill caused them to reverse their positions on exploration, from support to opposition.

The Kijik Corporation borrowed $6,800,000 which is collateralized and will be paid off in a few years. The loan was taken out to pay debts and to help underwrite development of recreational properties at Lake Clark. Kijik has a fuel company which has performed well, although it recently experienced a fuel-spill of 2,000 gallons and had to spend $40,000 for a clean up.

It was not until about 1985 that the corporation was managed by Native, rather than non-Native persons. Since that time it has shown a steady improvement in financial performance over the dismal record established in the early years of operation. Apart from its profit-making and land management functions, the corporation provides burial service benefits for shareholders.

The Traditional Native Council of Nondalton is chartered under the Indian Reorganization Act. It is greatly valued as a voice of the community on important subjects such as subsistence, land use, economic enterprises, and intergovernmental cooperation in the region. The Council has attempted some business ventures, such as a doll factory, but without success because of declining markets. The Council has considered operating guide services in the National Park Service area across from Lake Clark, but this idea has been abandoned because of high insurance premiums needed for such an operation. Meanwhile, the Council has no income to underwrite enterprises with its own cash.

Council leaders stated that the Alaska Native Claims Settlement Act imposed administrative, management, legal, economic, and other difficult and wholly unfamiliar burdens and responsibilities on Nondalton's institutional leaders. These new roles and tasks came too quickly for the village residents to handle without considerable miscalculation, confusion, and expense. These leaders also made it clear that initial errors and misunderstandings they experienced in the first two decades of ANCSA are largely over, and there was a local re-assessment of institutions, culture, and strategies. The leaders on the Traditional Council were getting their second wind, so to speak. They are collecting data on subsistence uses of National Park Service lands to work out a cooperative management plan with National Park Service officials.

Many persons from Nondalton who now live in Anchorage, camp on the far shore of Lake Clark throughout the summer. These relatives or friends of permanent village residents are called the "Geese people" by locals because of their migratory habits. Their uses of National Park Service lands make it all the more important for the Traditional Council to establish joint subsistence management with the National Park Service.

Nondalton is served in public education by the Lake and Peninsula School District headquartered in King Salmon. The single school, constructed in 1978, serves pre-school through grade twelve. There are about sixty students, six teachers, a principal and several maintenance and office staff and other personnel. The school offers many special activities (Native olympics, gymnastics, classes for gifted children, athletic programs) and is the site of many civic activities.

The dominant sect in Nondalton is Russian Orthodox, and there are only a few residents who belong to other Christian sects. There is a Russian Orthodox Church in Nondalton.

Residents of Nondalton enjoy many community activities. People like visiting and traveling to neighboring communities in the Iliamna Lake subregion for square dancing (some Nondalton residents are award-winning fiddlers) or for Slavi (the Russian Orthodox Christmas celebration). Feasting, hunting, fishing, bingo and card games, athletic events at the high school, riding 3- and 4-wheel all-terrain cycles and snow machines, are among the other activities enjoyed by residents.

6. Subsistence Activities

The Nondalton sample of households showed the highest percentage of involvement in various kinds of subsistence activities of all seven communities in the study. This generalization does not discount in any sense the very high degree of participation in subsistence activities in all of the communities. There are several mammalian, fish, bird and plant resources of particular importance to residents of Nondalton: berries (various types), red salmon, porcupine, beaver, caribou, grayling, moose, whitefish, grouse, ptarmigan, ducks, and rabbits. Residents also harvest wild celery, firewood, geese, Dolly varden, black bear, wild onion, pike, wild rhubarb, wild spinach, cod, otters (pelts), silver salmon, candlefish, pink salmon, sea gull eggs, fox (pelts), freshwater seal, mink (pelts), and char. From outside the region come abalone, clams, halibut and sheep.

Nondalton is an important community for subsistence sharing in the Iliamna Lake subregion. Nineteen sample households (95%) share with other households in Nondalton and sharing connects Nondalton to Iliamna (4 households or 20%), Newhalen (3 households or 15%), and Igiugig (1 household or 5%). Nondalton households also share with other communities in Bristol Bay, namely Dillingham, Naknek, and New Stuyahok (1 household each or 5%), and with nearby Lime Village (also 1 household or 5%). Sharing connections with urban areas of Alaska are second only to intravillage sharing (9 households or 45%). Other areas connected to Nondalton through subsistence sharing are the United Kingdom, the rest of the United States, and the Western Coast, Interior, and Central Coast regions of Alaska (each with connections to 1 household or 5%).

The twenty respondents in the Nondalton sample commented on what subsistence means to them. Fifteen (75%) said it has a special meaning as a source of food, eight (40%) were emphatic that it is a way of life, and four (20%) stated that subsistence activities provide economic security. One person said subsistence allows him to do some things very well. It gives him a sense of self-sufficiency that he cannot get in any other way. Another said he loves to be outdoors and he loves wild animals. A 28-year-old man said, "I was raised to be a hunter. I cannot do otherwise."

Seventeen (85%) persons said that avoidance of waste is a central rule of behavior in conducting subsistence activities. Fifteen (75%) cited sharing as another crucial ethical lesson embedded in subsistence customs and practices. Thirteen people (65%) said learning the skills of hunting, fishing, butchering, and storage are common lessons of subsistence. Six people (30%) also stated that respect for nature is important. Eleven people (55%) people contribute subsistence foods to weddings, funerals, religious occasions and community events and potluck meals. Six people (30%) routinely take foods to gatherings of friends and kinsmen.

One respondent gave special emphasis to his beliefs about the lessons to be learned as a hunter and fisherman. He said, "The major thing about subsistence is to kill only what you need, and to share with people who need the foods, especially elders." Another person said, simply and directly, "I like to go out and get some food for myself from the land. And sharing is an automatic part of it." An elderly woman said, "We learned from them old guys . . . to share and to keep some for yourself."

Respondents discussed what actions they might take if subsistence foods were not available to them. Nearly all of them (95%) said they would be without opportunities for recreation and exercise, ten (50%) said they would experience economic hardships, nine (45%) would have difficulties making ends meet in their family budgeting and seven (35%) believed they would have to alter their diets. One person said he or she would leave the community if subsistence activities were no longer possible. One person said about the possible loss of subsistence foods,

> "It would be miserable. There are not enough jobs to provide for the people. If you don't have a job and can't do subsistence, what can you do to support your family?"

A second person stated,

> "I couldn't imagine it. If I had to sit around the village without hunting and fishing, I'd go crazy. We would do subsistence anyway (if prohibited)."

The interviewees spoke about what they believed subsistence activities would be like twenty years in the future. Most of the respondents, including officials, are apprehensive about the future. They have seen enormous changes come to their community - snow machines, television, more powerful weapons, motorized boats, and more effective fishing gear. They have also seen increases in local populations and a recent, dramatic increase in the numbers of sport hunters and fishers in the Lake Clark region, as well as an ever-growing number of complex game regulations. The Alaska Native Claims Settlement Act (ANCSA) of 1971 and the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 have brought profound changes to local people's relationship with the land, with each other, and with outside institutions. The McDowell Decision added to misgivings about future prospects for subsistence (see section II.B.). Most of the persons who engaged in protocol discussions with fieldworkers believed that there will very likely be more regulations and more unwelcome restrictions, and that unless local residents take strong measures through lobbying and local government action, subsistence, as it is now practiced, will be seriously threatened.

In terms of threats to subsistence, the McDowell decision was mentioned by household and institutional leaders alike. Nearly half of the interviewees said increased competition (mainly from sports hunters) is the main threat to subsistence. Six (30%) said increases in regulations pose threats.

There are some other crucial changes that have taken place and which people think will continue. These bear significantly on subsistence as a complex of technical, social and cultural practices. One of the major changes in subsistence mentioned by interviewees is acquisition and use of modern equipment such as snowmachines, all-terrain cycles, motorized boats, and CB radios. This was mentioned by five persons, or 25% of the household interviewees.

Since the late 1960s, social, cultural and technical aspects of local life in Nondalton have undergone major alterations. (The same observations could apply, with varying degrees, to the other six communities included in). Some of the traditional role expectations have been shattered. For example, people used to have life-or-death responsibilities. They had to feed their families, fight off or negotiate with bordering peoples, engage in an elaborate and meaningful ritual life, among other tasks. Many of these activities are no longer necessary.

Another major change relates to wage employment. Wage jobs are sit-down tasks and they are largely anathema to men; yet, they are rapidly becoming the central means of earning a living, despite the continuing importance of subsistence pursuits. Women hold most of the wage jobs in Nondalton, a condition which undermines male pride. Men are confronted with a conflict between the need to prove themselves as hunters and fishers and the realization of the need for cash income. Similarly, women have lost some aspects of the traditional female role that gave their lives richness, pleasure, and meaning, such as making crafts, preparing foods and attending to other duties in ways now gone. This is not to say women do not enjoy their present jobs or the new-found independence that comes from wage employment and their contemporary roles. Most of them do. According to several officials, only a concerted and persistent effort can re-kindle the core of Native Athabaskan culture, whose decline seems to be looked upon with nostalgia and a sense of loss. Meanwhile, the people of Nondalton are attempting to accommodate themselves to the modern world.

One of the fieldworkers and Mineral Management Service COTR (Contracting Officer's Technical Representative) Karen Gibson visited two classes in the Nondalton public school. The students were asked to discuss their interest in subsistence activities and foods. Ten young persons in grades 9 through 12 were in one class. All of them had been raised in Nondalton and all had gone hunting with male family members, have the skills to conduct this activity, and expect to be hunting when they "are old." All are learning to fish, and to collect berries. They said they are learning the skills necessary to conduct subsistence activities.

Discussions with these students also indicated that preferences for most "Native foods" are being acquired by the younger generation. Seven of the ten students in this class said they prefer wild to store foods. All enjoy dried fish, boiled salmon eggs, and "agutuk" or Eskimo ice cream (berries mixed with combinations of lard, sugar, Wesson oil, milk, whitefish, caribou tongue, stomach, intestines, tongue, ribs and bone marrow). All eat spruce hens, ptarmigan, geese, and some kinds of ducks. Most of them did not like to eat caribou brains, "stinky heads" (salmon heads well-ripened), caribou snouts, or fish eyes.

When asked what they would do if there were no wild foods available, five students gave the following replies:

> "We would get very fat on store foods."
>
> "I would die."
>
> "There would be nothing good left."
>
> "I would move to another place where there is wild food"
>
> "I would move to Anchorage and stay."

Several students said they eat caribou more often than hamburger, pork chops, or chicken, which are some of their favorite store foods. Some of the students commented that they enjoy eating pizza (laughter followed this statement), french fries, tater tots and potato chips (more laughter). The students thought it was amusing that they would like these foods - a kind of a joke about what they referred to as "junk foods."

In terms of their future plans, six of the ten students said they planned to stay in Nondalton when they finish school. Four expected to leave because they want to go to college. Five of these young persons had close kinspersons who are commercial fishermen.

COTR Gibson and researcher Robbins visited a second class on the same day, a class of nine sixth and seventh graders (six girls and three boys). Eight of them had hunted. One boy said he had been taught by his father to skin moose while the other two boys said they had not yet learned to do this. Four of these students, all of the boys and one girl, expected to be hunting when they are adults. All of them engage in subsistence fishing. In the previous two or three days all nine had eaten caribou, fish and moose in the village. All nine of the students (boys and girls) eat caribou regularly, seven eat fish often, and six said they consume moose frequently.

Seven of the nine students said they prefer Native foods to store-bought foods. Six of the nine had eaten and enjoyed porcupine. The boys and girls said their grandparents, in contrast to themselves, enjoy eating rotten eggs (wild birds), whale blubber, and seal oil, along with the foods all villagers enjoy (for example, moose, caribou, fish, and berries).

The class was asked where they expected to be living twenty years in the future. All said they would not be in Nondalton if they could avoid staying there. They were asked why. Some said they want to attend college and others want to get jobs and live in Anchorage or the Lower 48 states. Some said the village is too boring, although four students said they would return regularly to the village to hunt when they are adults. One student said, "Too many people die here (in the village)." Another said, "There are too many bad memories here." A third student said, "You can do different things (in cities)." And a fourth stated, "You can see things you never saw before." Five of the youngsters had been raised in Nondalton.

The observations and comments of the public school students reveal that subsistence skills, the desire to engage in subsistence activities, and preferences for Native foods are present and pronounced in at least some members of the younger generation in Nondalton. However, it is also important to note that most of the students in the sixth and seventh grades expect to leave the community when they are older. Their comments suggest that the poor economic conditions in Nondalton do not offer young people much hope, and that they perceive more opportunities and more things to do exist outside the village.

F. PORT HEIDEN

1. Introduction

Port Heiden is located 430 airline miles southwest of Anchorage on the Bristol Bay side of the Alaska Peninsula. The community sits on a small bay where the Meshik River drains into Bristol Bay (see Fall and Morris 1987).

The residents of Port Heiden are energetic and hard-working. The majority of the residents are an ethnic mix of Scandinavian and Aleut, and most are Protestants. The community has seized initiatives in running small businesses and retaining and purchasing commercial fishing permits. Port Heiden is also a small transportation hub in air service, and this activity brings many outsiders who add to the knowledge and skills of community residents. For these reasons, and because of the distinctive history of the community, there is considerable variety in interests, experiences, skills, and ambitions. Despite this diversity, however, there is a keen interest in subsistence activities and in land management in the surrounding areas.

Port Heiden residents are cordial and generous, and they assist newcomers with information and other help with ease and spontaneity. For example, the local store owner, an Anglo-European, intentionally runs his retail and fast-food operation on a small margin of profit so that local consumers can more readily afford the goods he sells. This store the schools, two Protestant churches, the airstrip and its small inn, and the city government building serve as the main gathering places.

The community is spread out over a 6-mile area, with an old section on the south end consisting of several houses, all still in use, and some out-buildings. These older wooden buildings were subject to occasional damage by flooding form the bay, and because of this danger a HUD housing project was built inland three miles north and east of the early town-site. This consists of about twenty dwellings constructed in the 1970s and 1980s. A city council building, two churches, a fire station, post office, and store are located near these houses. The elementary and high school and teacher housing are located between the old section of the community and the first HUD housing project. In the 1980s a second HUD housing project of about 20 units was completed about 2 miles northeast of the first HUD project. Beyond this project another 2 miles is the airstrip which serves as a cross-roads for many villages in the upper Alaska Peninsula.

Since the community is scattered, most of the residents purchase pickup trucks or automobiles to get around. Many of them also use snowmachines and all-terrain cycles for off-road travel. The two major transportation links to other communities are by air (flights in and out of Port Heiden are frequent), water, and to a lesser extent, on land chiefly during months when there is a snow pack.

Port Heiden was selected for inclusion in this study to represent the communities on the Bristol Bay side of the Alaska Peninsula. Port Heiden most often clustered with Egegik, Nelson Lagoon, Pilot Point, South Naknek, and Ugashik in the multidimensional scale analysis, and it was chosen to represent this cluster of communities. Port Heiden has a diversity of cultural heritages, is a minor but important transportation hub for Upper Alaska Peninsula communities and for the Chignik subregion, has thriving local commercial fisheries, and offers interesting perspectives on subsistence resource use. Furthermore, there is a tradition in the community of entrepreneurial initiative which is a productive and enterprising mixture of Scandinavian and Aleutian cultures.

2. Ethnohistory

For many years the site of Port Heiden was referred to by the Eskimo name "Meshik." Although the Port Heiden locale is not well known archaeologically, it seems probable that Southern Eskimos first inhabited the small bay where the community is located. These early residents were later absorbed by other Eskimo bands collectively named the Aglegmiut.

By the latter part of the nineteenth century, a cod fishery was established in Port Heiden by persons of Scandinavian origin, many of whom married local Native women and settled in the community. Epidemics ravaged many of these people and by the turn of the century, after the diseases had subsided, people of Aleut and Scandinavian cultural and racial heritage from scattered nearby settlements replaced the earlier settlers.

By the early part of the twentieth century, a salmon saltery was established and operated in the community by the Port Heiden Packing Company. The plant offered casual employment to some of the local residents, but it closed in the 1930s. Residents of Port Heiden later worked in the salmon canneries on the Ugashik River to the north, and some eventually fished on the boats. Residents have remained involved in the commercial fisheries (Combs 1982:272).

An army and air base was constructed and operated eight miles north of Port Heiden during World War II. Following the war, the airstrip remained in operation and the community has since served as an air service hub for many communities of the Alaska Peninsula.

3. Characteristics of the Population

There were 45 households in Port Heiden in September, 1990. Twenty of these households were randomly selected for protocol discussions, and ten men and ten women were interviewed. The total Port Heiden sample consisted of sixty-three persons living in those twenty sample households.

The 1990 federal census reported a population of 119 in Port Heiden. The population declined from 74 to 66 between 1960 and 1970, according to census figures, in large part due to outmigration to urban areas. The population has grown since that time and in 1980, the federal census counted a population of 92. Most of the residents remain in the village year-round, resulting in a stable population with little seasonal fluctuation, unlike many other communities in Bristol Bay.

The distribution of household types, sizes of households, and ages of household heads shows that households in Port Heiden are relatively small and nuclearized, and household heads are comparatively young. Ninety percent of the households are either nuclear (55%), single persons (25%) or conjugal pairs (10%). There were no multiple-family households in the sample. Average age of household heads (designated by household members who are the major decision-makers) was 37.5 years.

There are twenty-eight females and thirty-five males in the twenty sample households. The gender ratio of males to females is 1.25. The preponderance of males over females is common to most Alaskan villages and is accounted for in Port Heiden by a higher proportion of females than males who migrate out of the community to seek further education, gain employment, and leave the restrictions of village life.

The average age of the Port Heiden sample population is slightly over 28.4 years. Only Dillingham, with an average age of 28.7 years, has a higher average age than Port Heiden. Nearly 29% of the Port Heiden sample population is under 15 years of age, and 1.6% is over 64 years of age. These two age groups comprise about one-third of the population. People in these age groups are referred to by demographers and economists as "dependents" since they are usually out of the labor market. The percentage of dependents in the population is referred to as the "age dependency ratio." The Port Heiden population has a higher ratio of people under age fifteen than the United States national average of about 22%, and a smaller proportion of people over age 64 (the United States average is 12%). However, compared to the other seven Bristol Bay study communities, Port Heiden has the smallest age dependency ratio at 30.2%. For comparison, the age dependency ratios for the other communities are as follows: Dillingham 35.1%; Togiak 39%; Naknek 41.3%; Chignik Lake 42.7%; New Stuyahok 48.8%; and Nondalton 52.9%.

Along with Naknek and Dillingham, Port Heiden has one of the smallest percentages of residents who are Alaska Natives. Persons of full-blood Aleut heritage comprise about one-fifth of the sixty-three persons sampled. Over three-fourths of the persons in the sample have either a mixture of Native/Non-Native parentage (largely Scandinavian-Aleut) or are Non-Natives.

The population of Port Heiden is also one of the more educated of the study communities, with the populations of Dillingham and Naknek having higher average years of education. Port Heiden's sample averaged 8.5 years of formal schooling. Nearly 40% of the persons in the twenty sample households had completed tenth grade, 25% had completed high school, and nearly 10% had attended some college. Almost 5% had received bachelor's or master's degrees.

The sample population of Port Heiden is more transient than the sample populations of Togiak, Chignik Lake, Nondalton, and New Stuyahok, but there is a core of long-term residents in Port Heiden. Slightly less than half of the sample population was raised in the community, with a fourth of the population raised in other parts of Alaska and the remaining fourth raised outside of Alaska. About a third of the sample population had lived in Port Heiden for more than twenty years, and nearly half had been there for over ten years. Nearly one-fifth of the sample population had been there for less than one year.

There were thirteen married couples recorded in the sample. Three of these were from the Lower 48 states. Of the other ten couples, six consisted of men who were at least half Aleut who had brought their spouses to Port Heiden from outside of the community. Their wives came from Anchorage, Ilnik, Palmer, Chignik Bay, Kalskag and Wisconsin. The four remaining couples consisted of full-blood Aleut or mixed Aleut-white women from Port Heiden who were married to men from outside the community. Their husbands came from Ilnik, King Salmon, Oklahoma, and Wisconsin. There were no unions in our sample in which both partners were from Port Heiden. Exogamy for resident males and females is 100 percent for our sample, with male and female rates of out- and in-marriage nearly equal.

4. Economy and Infrastructure

Port Heiden residents are fairly well off economically compared to other sample communities. This community has the third highest average household income ($45,598) of the seven study communities, with Naknek being the highest ($74,411) and Dillingham second highest ($57,063). No Port Heiden households reported receiving public assistance or unemployment benefits. These households were third lowest (next to Naknek and Dillingham) in receipt of income from AFDC (Aid to Families with Dependent Children) and WIC (Women, Infants, and Children).

Based on employment data recorded for sample households, there were more jobs per household in Port Heiden than in most other communities in the Bristol Bay Subsistence study. Port Heiden averaged 2.95 jobs per household compared with 3.0 in Togiak, 2.88 in Naknek, 2.75 in Dillingham, 2.35 in Nondalton, 2.3 in New Stuyahok, and 2.25 in Chignik Lake. Port Heiden employment is characterized by persons who frequently hold more than one job, and there is a labor shortage in view of the multiplicity of essential jobs that must be carried in the village. However, this fairly high ratio of jobs to households in Port Heiden is accounted for, in part, by the one-time operations of Underwater Construction, Inc. which was contracted by the State of Alaska Department of Environmental Conservation with Environmental Protection Agency funds to remove toxic wastes from the community left behind by United States military forces during World War II. About twenty Port Heiden residents were employed at union wages for several months in 1990 by Underwater Construction, Inc.

Commercial fishing and public sector employment constitute the chief sources of earned income, which is true for most of the communities in , and account for over half of all employment in Port Heiden. According to the employment data gathered from the sample households, self-employment, which includes commercial fishing boat captains and permit-holders, is the leading source of jobs in Port Heiden, comprising 32.2% of employment. A lodge owner, some sport hunting and fishing guides, several fish freezing plant employees, the owner of a retail store, a person who sells guns and hunting supplies, a pastor, a carpenter, and a few baby sitters are the other self-employed persons.

There are two successful, privately-owned, local businesses. One of the businesses is a retail store owned and operated by a resident of about ten years who hires several clerks. Prices at the store are regarded as lower than prices in stores of comparable inventories in other communities, which is an intentional policy on the part of the owner. The other successful, locally-owned business is Christensen and Sons Fish Company, which operates a fish-buying operation for the frozen food market. The company hires several local residents part-time each year and offers, without charge, meat-cutting services (for big game, mostly caribou) to residents of Port Heiden. This service is given to foster goodwill, to help those who would otherwise have difficulty handling caribou carcasses, and often hunters do their own cutting, using the equipment provided by the owner of the business. The business person is also a fish buyer, and meat-cutting service fosters loyalty from fishers who sell to him.

Public sector employment consists largely of jobs with the local school district and local government. The Lake and Peninsula School District hires teachers (mostly non-locals), teachers' aides, a librarian, janitors, a cook, a secretary, and a bus driver. City government hires people to fill several positions: clerk, secretary, fuel hauler, janitor, mechanic, and people to do power maintenance, road grading and snow removal, and trash removal. The state of Alaska hires a person to manage the local airport. The federal government hires a postmistress and a substitute, a weather observer (through the National Weather Service), and an occasional person to install septic tanks (through the Public Health Service).

During 1990, construction was the next largest employer, an anomaly, as indicated previously, due to the operations of Underwater Construction, Inc. Commercial fishing, which refers specially to persons who are commercial fishing crew or to people who work for processors, was the fourth largest sector of the economy. Several people work in transportation as agents or cargo handlers for Mark Air and Reeves Aleutian Airways. The local health aid is employed by Bristol Bay Area Health Corporation and the Bristol Bay Native Association hires a Senior Services Coordinator and Village Public Safety Officer.

As in most Bristol Bay communities, the economy of Port Heiden is very dependent upon commercial fishing. Nineteen persons in the twenty sample households reported self-employment in various enterprises, chiefly commercial fishing, and five persons stated that they were members of commercial fishing crews but did not own fishing permits. Most of the fishing activity takes place between May and September on the Meshik River and in Ugashik Bay near Pilot Point, although some local fishers also fish in other Bristol Bay fishing districts north of Port Heiden.

A community leader estimated that in 1990, residents of Port Heiden owned a total of twenty commercial driftnet fishing permits, four setnet commercial fishing permits, and fifteen commercial fishing boats. This gave Port Heiden a high ratio of commercial fishing permits to population. The driftnet permits were valued at about $200,000 each and the setnet permits at about $70,000 each, bringing the total estimated face value of fishing permits in the community to $4,280,000.

Local people are proud of the fact that Port Heiden is one of the few communities in the Upper Alaska Peninsula that has acquired rather than lost commercial fishing permits, and some young men have entered into a fish-landing business at the community waterfront. Retention of permits is high and several young men, offspring of seasoned, middle-age permit-holders, have secured their own commercial permits. Only one person in the community lost a commercial fishing permit in recent years and, according to local reports, the person was soon to repurchase the permit. This net gain in locally-owned fishing permits in Port Heiden contrasts with the other six communities included in this study.

Examples of wage rates in Port Heiden are: $2.50 per hour per child for baby sitters (a sum generally considered scarcely worth the effort), $5.00 per hour for some of the lower paying jobs, such as work as store clerks, to $20.00 per hour plus over-time with Underwater Construction (a rare and anomalously high-paying wage). The local store owner uses one to two helpers at any given time, and he "goes through" twelve to fifteen persons in an average year. Local people seem reticent to stay with these lower-paying jobs, probably because commercial fishing is the big money-maker in Port Heiden.

One major obstacle to economic development is land control. Business persons experience great difficulty in purchasing, leasing or renting land from the City of Port Heiden. The city generally does not wish to alienate land even to local residents and prefers instead to hold lands for future earnings. There is one person who leases five acres from the city for future development, but this instance is an exception to the rule. The city land policy seems to be to retain land without alienating or renting it. However, some residents would like to see the private business tax base improved and think more public land should be leased for such purposes.

Local government officials registered dissatisfaction with prospective oil development in Bristol Bay. Port Heiden is the study community located closest to the prospective oil and gas development sites off the North Aleutian Shelf. Some persons envision possible local economic gains in employment and perhaps increases in fuel supplies if oil development takes place, although the risks to fisheries are perceived as too great to make any anticipated gains worth the effort. "Draffers" (trawl-fishers), who drag the sea-bottom for various fish species, are considered another serious threat to fisheries because of the disruption caused by this technique to natural systems and fish stocks.

Port Heiden does not have personnel well trained in the acquisition of federal grants and does not have the knowledge, information and equipment necessary for obtaining such grants. This contrasts with other communities in Alaska, like the resource-scarce Yukon-Kuskokwim River delta communities, which prepare for and are dependent upon federal grants to a much greater degree than Port Heiden.

Community residents are considering new ways to improve economic development projects. Leaders of Port Heiden want to cultivate knowledge and skills among residents so the community can obtain more and larger state and federal grants. Presently, they are coping with meager and declining state and federal funding. The village's capital facilities need to be improved or expanded, such as the library, an activity center, the roads, and housing facilities. Operating, capital, and maintenance budgets for city facilities are small and there is scarcely enough public money to maintain the relatively extensive twenty-seven miles of roads which link several dispersed clusters of housing and the airport. This road system necessitates that residents own private autos and pickup trucks, a financial burden uncommon in most villages of this size population.

5. Institutions, Organizations, and Community Activities

The people of Port Heiden are governed by the United States government and its various agencies, the state of Alaska and its branches, the recently-formed Lake and Peninsula Borough, the Alaska Peninsula Corporation and the regional Native corporations for Bristol Bay which were established under provisions of the Alaska Native Claims Settlement Act (ANCSA), a city government chartered under the state of Alaska, and a Village Native Council which is recognized by the federal government.

The United States government's most obvious presence is in managing land and natural resources, taxing residents, and providing some services. The federal government manages the fisheries outside the limits of state authority three miles offshore and manages the Aniakchak National Monument and Preserve. Federal management of the refuge has had an important effect on local subsistence practices because of limits imposed on access to game, principally caribou. The people of Port Heiden call the refuge "Carter Country", referring to the administration of President Jimmy Carter under which the land was withdrawn from the public domain and the preserve was established. The preserve's western-most border is 640 feet above sea level and about two miles east of the community. This border was closed to local subsistence hunters to conserve caribou herds. This closure cut off community access to important game areas, and it was lifted after local residents registered many complaints.

Port Heiden was incorporated as a second-class city in 1972. Elections are held the first Tuesday of each November and the city council meets on the first Tuesday of each month. City services include provision of basic utilities, fuel oil, electrical power, road maintenance, and fire protection. The city has a multi-purpose fire hall and fire truck, and volunteers serve as fire fighters. The city jointly owns and maintains an office building with the village council which also serves as a community center and houses a library and health clinic. The city fuel sales are between $200,000 and $300,000 a year. In spring 1991, a local co-op will take over operation of the fuel enterprise. Most of the city's operating revenues come from state revenue sharing and municipal assistance. The city levies no taxes and does not collect any special service or license fees.

The Port Heiden Village Council represents the Native Americans in the community and has worked with the federal Bureau of Indian Affairs, but only infrequently and without significant community benefits. There are five councilors and voters qualify on the basis of Native blood quantum of at least one quarter. The council was dormant at the time of this study because of lack of operating funds. However, there was interest in reviving the council which was expressed with considerable emphasis by the Chairman. The principal purpose of the council is to promote the interests of Native peoples in Port Heiden. The council used to administer more public services, but its role has diminished since the city incorporated.

The Port Heiden Village Corporation, formed under the Alaska Land Claims Settlement Act of 1971, was merged with the village corporations of Newhalen, Kokhanok, South Naknek and Ugashik to form the Alaska Peninsula Native Corporation (APNC). As with the city, this corporation has been reluctant to alienate land. However, a few persons in Port Heiden lease land from the APNC and this opportunity is seen as a benefit.

There is one public school in Port Heiden which offers grades one through twelve. The school is part of the Lake and Peninsula School District, which is now operated by the Lake and Peninsula Borough but is still largely funded by the state. Prior to the borough's formation, the Lake and Peninsula schools were part of a Regional Educational Attendance Area (REAA) and were administered by the state. The school facility is located equidistant from three clusters of housing and serves as a makeshift and poorly-located community and recreational center.

There are two religious faiths represented in Port Heiden, Russian Orthodox and a non-denominational fundamentalist faith. Most residents claim to be Russian Orthodox, but there is no church building and no resident priest in the community. The non-denominational sect has a local pastor and a chapel.

There are no formal civic groups in the community. In terms of community activities, Port Heiden residents enjoy visiting, socializing, attending church, birthday feasts, family reunions, basketball games, high school wrestling matches, get-togethers celebrating the return of students from schools in other parts of Alaska, and holiday festivities. One of the great sources of delight are subsistence activities, the subject of the following section.

The community has undergone substantial changes in recent years with the increasing use of private vehicles, a practice which has apparently altered socializing. When there were only a few automobiles in the community, people hitched rides and traveled in fives and sixes or more to wherever they were going. Now, nearly every household has an automobile and this limits the extensiveness and intensiveness of interaction between residents. Some people regret this change while others believe the convenience in travel is worth the sacrifice of reduced neighborliness.

6. Subsistence Activities

In comparison with the other communities, Port Heiden residents were less involved in subsistence activities in 1990, both in percentages of households involved in the harvest of various resources and the amounts harvested. Port Heiden's harvest pattern appears to be relatively specialized and residents harvested the smallest variety of resources of the seven study communities. This was due to the fact that certain active households harvested the bulk of subsistence game. These generalizations represent only one sampling year. It is important to note that in its 1986-1987 subsistence survey of all households, the Subsistence Division of ADF&G found that every household used subsistence resources and engaged in subsistence activities. All but one harvested wild foods, and the per capita harvest was 407.6 pounds. About 60% of the harvest at that time was caribou, and certain households harvested the bulk of the animals and shared it with other households.

Our sample in 1990, which covered the 12-month period from September 1989 to September 1990, revealed that there are several resources which more than half of the households procure for subsistence purposes: berries, ptarmigan, caribou, and silver salmon. Interviewees mentioned using twenty-two different types of subsistence resources which, in addition to berries, ptarmigan, caribou, and silver salmon, include clams, red salmon, ducks, other marine invertebrates, king salmon, sea gull and tern eggs, beach greens, geese, pink salmon, Dolly varden, chum salmon, porcupine, halibut, flounder, trout, wild peas, and rabbits.

Port Heiden sample households engage in subsistence activities (either harvesting, processing, giving, or receiving) with other households within the community and with households in at least twelve other communities in Alaska (including Port Heiden) and five Lower 48 states. These other Alaskan communities include Anchorage, Perryville, Dillingham, Fairbanks, Kodiak, Pilot Point, Chignik Lake, Ugashik, Naknek, Kalskag, Ivanof Bay, Chignik Bay, Chignik Lagoon and False Pass. The Lower 48 states where Port Heiden residents have subsistence connections are Washington, Wisconsin, Michigan, Oregon, and Alabama. These harvesting, processing, and distribution networks are most intensive within the village but also extend quite far beyond the village.

Port Heiden's subsistence sharing networks, in particular, are strongest within the community (19 households or 95%) and then connect the community to the rest of the United States (6 households or 30%) and to urban areas of the state (5 households or 25%). Port Heiden, which is on the Bristol Bay side of the Alaska Peninsula, appears to play an important role in terms of the distribution of subsistence resources to the other side of the Alaska Peninsula, since it is connected to all five communities in the Chignik subregion. Four Port Heiden households (20%) have sharing connections with Perryville, 2 households (10%) with each of Chignik Lake and Ivanof Bay, and 1 household (5%) with each of Chignik Bay and Chignik Lagoon. Port Heiden households also share with other communities on the Bristol Bay side of the Alaska Peninsula; 3 households (15%) with Pilot Point, 2 households (10%) with False Pass and Naknek, and 1 household (5%) with Ugashik. Other reported sharing connections are with Dillingham (3 households or 15%), Central Coast Alaskan communities (3 households or 15%), and the Interior region of Alaska (1 household or 5%).

In discussing the meaning of subsistence, nineteen of the twenty interviewees (95%) cited food as the most important meaning of subsistence pursuits. Nine of the twenty (45%) regarded subsistence activities and all that is associated with them as comprising a treasured way of life. Six persons (30%) cited economic security as the central meaning and purpose of subsistence activities. Five persons (25%) also stated that subsistence activities are crucial as a source of certain rights and freedoms, which applied to full-blood Aleuts as well as persons of mixed white and Aleut heritage.

There are meanings attached to subsistence activities that are expressed in ways other than those described in the preceding paragraph. For example, to quote some of the respondents, one person said that "subsistence means common respect." Another person said it is a good feeling when one "sends the word out that someone needs food and people help out right away."

The normal pattern of redistribution of subsistence resources is for a man to bring foods home and his spouse or his mother, grandmother, or sister insures that those in need receive some. This custom is so commonplace for the residents of the community, and it is taken for granted to such a degree that replies to the fieldworkers' probes about the meanings of subsistence seemed ludicrously obvious. Many persons said "It is our life," or "It's what we do to get our food," without elaborating on the subtle meanings and pleasures embedded in harvesting, giving and receiving. There were deep emotional feelings expressed in many comments, indicating the joys and pleasures of engaging in subsistence activities.

In addition to the sharing that goes on between individual households, many households share subsistence resources at community events. Twelve of the 20 interviewees (60%) mentioned that they contribute subsistence resources to community feasts and potluck dinners. Five interviewees (25%) mentioned giving wild foods to meals prepared for religious occasions and three interviewees (15%) reported sharing subsistence foods at feasts held for family gatherings. There are also people who send wild foods to persons in hospitals or prisons who crave the local, naturally-occurring foods on which they were raised. And there are many people who return to the village to eat foods familiar to them.

If they were unable to engage in subsistence, 50% of the interviewees mentioned most often a loss of recreational opportunities and exercise. Obviously, people value being outdoors and enjoy the thrill of hunting and fishing, and subsistence activities provide an important recreational outlet for a community which has no formal civic groups and few other forms of recreation. Other major impacts that interviewees anticipated would occur were serious economic hardship (35%), becoming dispirited (30%), relocating to a place where they could do subsistence (25%), having their household budget affected (20%), and having to find other means of support (15%). There were several respondents who said that living in Port Heiden would be prohibitively expensive for many people if subsistence were no longer possible.

As for the rules and lessons governing subsistence, seventeen of twenty interviewees (85%) cited avoidance of waste as central to the rules. Twelve others (60%) mentioned sharing as an integral part of subsistence. Nine interviewees (45%) thought an important lesson was learning the skills required to engage in subsistence, while six interviewees (30%) mentioned learning to survive is an important lesson. Five interviewees (25%) thought people should learn to comply with game laws and regulations. Another five (25%) said conservation and management of resources must be learned as part of a subsistence way of life.

A few quotes on rules, customs and ethical behavior in relation to subsistence pursuits are noteworthy here. One respondent stated, "People do not like waste. They are disturbed when they see abandoned, dead animals. They respect animals. They kill them and eat them or leave them alone." Another said, "We ask for some of the first kill to make a successful hunter or fisherman feel proud."

The change in subsistence most commonly mentioned by interviewees (50%) was an increase in government regulations, and this was also perceived as one of the major threats to subsistence. The most common complaint about ADF&G regulations is the closing of the caribou hunting season in April when the herds are in the area. The caribou hunting season is open from August through March, and many persons stated that they would like to be allowed to hunt the animals when they are closest to the community.

Many interviewees said present game regulations overlook the important local subsistence custom of sharing by imposing bag limits on individual hunters. According to these interviewees, hunters who take more than their own households need usually give away their surplus. Indeed, many hunters give the greater share of their bags to relatives, friends, elders and others in need, taking only enough for a few meals for their immediate families. Another reason for doing this, as cited by many residents, is that it takes a great deal of time and effort to prepare a season's bag for storage. It is easier to give a relatively large share of the harvest to others and doing so serves a crucial function for the well-being of the community.

These interviewees think that it is absurd to impose fixed, uniform harvest limits on all persons when clearly some persons are superb hunters from whom many members of the village, and on occasion, persons outside the village, receive subsistence foods. Therefore, they argue that allowances should be made for this local custom and game managers should trust local people to use game wisely and not waste it, which they believe will ensure a sustainable supply. Villagers could decide on allocation of harvests within their communities, a practice they have followed for many, many generations. This suggestion was made by some persons in all seven of the study communities, and it was a common suggestion made in Port Heiden.

In a larger sense, some persons believe game regulations are needlessly imposed on local people. One respondent said, "We don't need people to come here and tell us what to do. Local people know animals well enough." Another said, "When (ADF&G) managers and other outsiders impose game limits, they put nature out of balance. They do not live here." Each hunter is allowed to take four caribou, and this has been the limit for several years.

Another major threat locals perceive to subsistence is increased competition from sports hunters and fishers. However, sports hunting is generally tolerated because it provides some local employment and because several households receive regular supplies of meat from a local guide whose clients give their bags to him for distribution to elders and others in need. Meat is often distributed at the community airstrip, and ducks are given to thirty-five of the community's forty-five households. And yet, there are some hunters of considerable experience, men in their forties and older, who resent the presence of sport hunters in the area and would prefer that outsiders (non-locals) be prohibited from hunting on Native village corporation land. There are others who would prohibit outsiders from hunting and fishing in the village area.

Interviewees also cited changes in the quantities and uses of local wild resources. Some people said the numbers of brown bears and moose in the vicinity of Port Heiden had declined from 1975 to 1990, although they reported no appreciable reduction in the number of other natural resources. Apparently brown bears and beavers were once eaten by residents of Port Heiden but this no longer occurs.

The social organization of hunting also has changed. In earlier days, there were more persons in each hunting party and they stayed out together longer, often several days. These changes have been recent, following the acquisition of fast water and land machines by most households.

G. TOGIAK

1. Introduction

The community of Togiak is located at the head of Togiak Bay and two miles west of the Togiak River. Togiak is about 380 air miles southwest of Anchorage and 67 miles due west of Dillingham. It is one of the most western villages in Bristol Bay. Togiak is connected to other parts of Alaska only by air and boat.

The ADF&G has not collected systematic household harvest data for Togiak, thus Togiak was not included in the ADF&G data set, so we did not know how it compared with other communities in Bristol Bay and how it clustered in the multidimensional similarity structure analyses. Togiak was selected as a study community for several other reasons. Our review of the secondary literature and other research on Togiak by ADF&G indicated that the Togiak subregion represents a unique resource harvesting subregion, and Togiak is the main community in this area (e.g. Wolfe et al. 1984). Previous research work in Togiak connected with the Social Indicators Project suggested that Togiak is important in terms of subsistence resource distribution networks which extend throughout and beyond Bristol Bay. Finally, Togiak has not been studied very much and we thought ADF&G would benefit from having some subsistence data on Togiak.

2. Ethnohistory

The Togiak subregion was relatively isolated from Russian entry into Bristol Bay during the early 1800s. Commercial fishing during the early American period occurred in Kvichak and Nushagak bays, which left this area more or less unaffected. The Russian Orthodox Church never gained a solid foothold in the area and most people in villages of this subregion are presently Moravian.

Many Togiak residents trace their roots or ancestry to the Yukon-Kuskokwim region. Migrations of population south to the Togiak area occurred after a devastating influenza epidemic in 1918-1919. Thus, many Togiak residents have ancestral, kinship, and subsistence network ties to the Yukon-Kuskokwim region.

The village of Togiak used to be located across the bay from its present location, at a site now called Old Togiak. People moved across the bay because wood gathering at the old site was made difficult by deep snowdrifts and the new site offered better living conditions, including a protected slough behind the village for boats.

The Bureau of Indian Affairs operated a school in Togiak which was closed in 1938. Not until 1950 did the community get another school when a teacher arrived and school was set up in the old church. A cannery was constructed at the old village site in the 1950s, which attracted the Yupik-speaking bands in that area for trade and jobs. A second cannery was built in the same area in the 1970s. These canneries, along with the development of the herring and roe fisheries over the past fifteen years, helped establish commercial fishing as the largest single source of income for area residents.

3. Characteristics of the Population

The population of Togiak in 1990 was 613, according to the federal census. However, the Alaska Department of Community and Regional Affairs population figures for 1990 list Togiak as having 713 people. A sample of twenty-four households out of a total of 208 households were selected for household interviews, and there were 100 people residing in those sample households.

The population of Togiak has grown steadily since the 1940s due to several factors. The number of births has been generally higher than the number of deaths. Young people tend to remain in the village and bring spouses to reside there. Also, Togiak experiences in-migration from the Yukon-Kuskokwim area.

Togiak's resident population tends to be fairly stable year-round and does not fluctuate seasonally like many other communities in Bristol Bay. Most commercial fishers from Togiak fish in Togiak Bay and locals do subsistence fishing in front of the village. Togiak does experience some seasonal influx from commercial herring and roe fishers and cannery workers, but most of the fishers live on their boats and most of the cannery workers are located across the bay.

Nuclear households predominate in the Togiak sample, comprising 58.3% of all sample households. Housing stock is generally quite good and has expanded and improved in recent years due to housing assistance programs and successful fishing seasons, thus allowing this nuclear family independence. The next most common households are composed of composite or extended families (25%), followed by conjugal pairs (12.5%) and a single person household (4.2%).

Togiak's sample population is one of the most evenly split between the genders. It has the third oldest average age (27.6 years, which is lower than Dillingham and Port Heiden). Overall, however, the population is quite young, with almost 75% of the population 40 years old or younger. The sample population consists primarily of people with Eskimo (72%) and mixed Native/non-Native (14%) heritage, with the third lowest percentage of non-Natives (12%, with New Stuyahok and Chignik Lake having lower percentages of non-natives) and a small percentage of mixed Native (2%). The Yupik language is still spoken by most Natives, even young people.

In average years of education for all residents of sample households, Togiak (7.1 years) is in the middle behind Dillingham, Naknek, and Port Heiden, about equal to Chignik Lake, and ahead of New Stuyahok, and Nondalton. About 6% of the sample population have college degrees (B.A./B.S. or M.A./M.S.).

Information on length of residency and where people were raised supports the reasons given earlier for why Togiak has grown. Next to Nondalton, Togiak's sample population has lived in their community the largest average number of years. Togiak's ability to attract people from other areas is evident in information on where residents were raised. Togiak is the mid-community of the seven in terms of the number of people raised within the village (60%). Dillingham, Naknek, and Port Heiden have less percentages of their populations raised locally while Chignik Lake, Nondalton, and New Stuyahok have more. Togiak residents not raised locally come from other communities in Upper Bristol Bay (18%), Western Alaska (9%), outside Alaska (12%), and urban areas of Alaska (1%).

In terms of intermarriage patterns, there were 18 unions recorded in the 23 Togiak households samples. The male spouse in seven unions (38.9%) had married into the community. Six unions (33.3%) were made up of men and women raised in or very near

Togiak. The endogamous pattern is less than in Nondalton, New Stuyahok and Chignik Lake, but higher than in Port Heiden, Dillingham and Naknek. Persons in five of the six unions were in their forties or older, and one couple was in their middle-thirties. Two women had married into Togiak, and they and their spouses make up 11% of the unions.

4. Economy and Infrastructure

Togiak has emerged as the largest community and in the Togiak sub-region and serves as a commercial center for the northwestern part of Bristol Bay. Togiak's population increased 52 percent from 1980 (470) to 1990 (713), a trend that underscores the community's rising importance. Togiak residents are highly dependent upon commercial fishing for their livelihoods. Of the total sample population, 42% reported being self-employed, largely as commercial fishers, and 18.8% are employed in commercial fishing as crew or cannery workers. Salmon is still the major commercial fishery for the area, although a large scale commercial herring industry and a smaller commercial roe-on-kelp industry have existed in the Togiak and nearby Kulukak Bays for over a decade. The herring fisheries have grown in recent years, in response to favorable market conditions and to concerns that these fisheries may become subject to Limited Entry in the future (thus fishers want to establish their historic participation). In addition, Togiak's Native corporation operates its own sport fishing camp.

Next to commercial fishing, the most common source of wage income in Togiak is with the schools or with local or federal government. About 17% of the sample population works for the Southwest Region Schools or for the City of Togiak. Another 4.3% works for the federal government. The most common government jobs are as secretaries, maintenance staff, cooks, postal employees, airport maintenance personnel, police officers, and utilities maintenance people.

Native corporations hire 5.8 percent of the sample population. Employment with native corporations generally consists of health aid positions with the Bristol Bay Area Health Corporation and manager and clerk positions in a local grocery store which is owned and operated by the village corporation.

Aside from these major sources of employment, members of the Togiak sample population worked in retail trade (4.3%), transportation and utilities, and for religious organizations. Togiak has a more developed private sector of the economy than smaller villages included in this study, such as New Stuyahok, Nondalton, Port Heiden, or Chignik Lake. Togiak has one large and three small grocery stores, a hardware store in connection with the large grocery store (both owned by the village corporation), another lumber/hardware/hunting store, a small cafe, and a local fish processing plant which leases buildings owned by the village corporation (this plant had just closed prior to our conducting fieldwork).

In terms of community infrastructure, Togiak has several facilities in addition to the ones mentioned as part of the private sector of the economy. Other structures include the school buildings, community hall, city office building, health clinic, youth center, post office, National Guard armory, Moravian Church, Seventh-Day Adventist Church, elder's council meeting hall, fire hall (the rooms of which are rented to guests from outside the community), a generator building/metal shop, pump house, city storage buildings, and numerous steam baths.

5. Institutions, Organizations, and Community Activities

Togiak residents are represented locally by several political organizations. Togiak was incorporated as a second class city in 1969 and has a six-member city council from which a mayor is selected and a city manager. The Traditional Council, which is recognized by the Bureau of Indian Affairs, is very active in Togiak and has an office in the city hall. The city and the Traditional Council each oversee various state and federal programs which they are eligible to administer, although many of the federal programs serving Native residents are administered by the Bristol Bay Native Association. In addition to these two representative bodies, Togiak has the Nasaurlurmiut Traditional Elders Council, which is affiliated somewhat loosely with the Yupik Nation Movement.

The school, the two local churches, the village corporation, a National Guard unit, and sports leagues (which play nearby communities in basketball) are other institutions through which community activities are organized in Togiak. The city operates a youth program and is planning for the construction of a senior center which will offer programs for seniors. Residents also engage in numerous informal social activities. Primary among these informal activities are subsistence activities and steam baths.

6. Subsistence Activities

One of the important features of the Togiak subregion is the extent of the land and water surfaces used by Native residents during the course of a year. Persons from Togiak, Twin Hills and Manokotak jointly use a considerable area for subsistence activities which extend from their communities to the Upper Alaskan Peninsula. This range on subsistence activities is related, in part, to the relative sparseness of certain land mammals in the immediate area and the high utilization of marine mammals. Some of the residents of Togiak, Twin Hills and Manokotak fly or ride snowmachines to the Nushagak/Mulchatna area to hunt moose and caribou, and these communities share resources frequently with residents of Dillingham, Aleknagik, and other Nushagak River communities (Schichnes & Chythlook 1988; Schroeder et al. 1987; Wolfe et al. 1984).

The people of the Togiak subregion take resources from greatly diverse habitats: forest, tundra, river, shoreline and marine. They harvest seals, walruses, sea lions, many types of salmon and other fish, furbearers, waterfowl, herring spawn-on-kelp, seabird eggs, clams and other invertebrates, basket grass, brown bear, beaver, porcupine, eggs (murre, sea gull, tern), tundra hare, ptarmigan, berries, reindeer, seaweed. They harvest moose and caribou from other subregions. At least 50 naturally-occurring common resources (not specific species) are harvested by the sample households in Togiak.

A large percentage of the households sampled in Togiak mentioned sharing subsistence resources with other households in the community and with households in seventeen other communities in Alaska, five other states, and one foreign nation (Norway). Sharing was most frequent with other households in Togiak (23 households or 96%). The Bethel area in Western Alaska, the area with the greatest kin and historical connections for the majority of Togiak residents, is involved in subsistence sharing with Togiak more than any other area. Almost half of the Togiak sample households (11 households or 46%) shared wild foods with persons in the Bethel area. Togiak households also are connected through sharing to the Interior and Central Coast regions of Alaska (2 households or 8% in each), to the rest of the United States (5 households or 21%), and to urban areas of Alaska (4 households or 17%).

Togiak's sharing connections also extend to other communities of the Bristol Bay region and are based upon interactions and intermarriages with people from these communities. Togiak residents have strong intermarriage and sharing connections with people in nearby Manokotak (6 households or 25%). Some Togiak youth used to attend a Seventh Day Adventist School in Aleknagik, Togiak residents frequent the regional center of Dillingham, and many Togiak hunters stay in New Stuyahok on their way to areas up the Mulchatna River. Through these and other means, they have become connected to people in the Nushagak River subregion. Five households (21%) share with people in Dillingham and three households (13%) share with people in Aleknagik and New Stuyahok. In addition, one Togiak household (4%) shares with each of the following communities: Platinum and Goodnews Bay (both in the Togiak subregion); Ekwok (in the Nushagak subregion); Pilot Point (on the Upper Alaska Peninsula); and two other Bristol Bay locations not within recognized communities.

In terms of the meanings of subsistence, close to 80% of the respondents regarded food as one major importance of subsistence and 54% expressed their interest in it as part of a way of life. These were the only meanings of subsistence mentioned in any substantial frequency. However, it is significant to cite some of the heart-felt comments on the meanings of subsistence made by some of the people of Togiak. One person said:

> "Subsistence means the ability of local people to feed themselves and make it through the year. Without subsistence the diet would be inadequate; it is an important source of food."

To further illustrate some of the feelings of people in Togiak on subsistence we provide the following quote:

> "Old people said if you waste food it will be gone for good. Use it wisely. Don't waste it; use all you get, even scraps."

The most often-cited lesson associated with subsistence is to not waste wild foods; 83% of the persons interviewed mentioned this. Twelve interviewees (50%) said sharing is one of the most important rules of subsistence activities, eight (33%) mentioned respect for nature, seven (29%) talked about the skills required for success and safety in conducting subsistence, and four (17%) cited learning to survive.

Sharing subsistence resources with others is done in many ways and special meals is one of these ways. Eighteen interviewees (75%) said they give wild foods for birthday, wedding and funeral feasts, fifteen (63%) for community events and potlucks, ten (42%) for exclusively religious occasions (Christian). Nine interviewees (38%) reported contributing naturally-occurring foods to family meals, four (17%) provide subsistence foods for meals celebrating a young hunters' first kill, and two (8%) for meals marking the first kill of the season.

Togiak interviewees perceive several threats to subsistence. The major threat to subsistence, mentioned by 33% of the interviewees, is the Alaska Department of Fish and Game. This was the most often cited source of threat. Increased competition was mentioned by 21% of interviewees, and this referred to sports hunters and fishers who come to the Togiak River annually and are quite visible and troublesome to the residents of the community. The same number of persons (21%) said increases in population was a serious threat to subsistence. Four persons (17%) cited "government interference" as a threat. Three persons (13%) said potential oil development in the region poses a serious threat to subsistence. Only two persons (8%) mentioned reduced access, the federal takeover of game and fish management on federal lands, and waste of resources as threats. One person (4%) specifically mentioned the McDowell decision as another threat. Togiak residents seem to be anxious about the future of their subsistence pursuits, as evidenced by the issues raised in connection with the Togiak National Wildlife Refuge Public Use Management Plan (PUMP) and Board of Fisheries issues involving sport and subsistence fishing conflicts.

If subsistence pursuits were disallowed for one reason or another, twelve interviewees (60%) said they would have less exercise and recreation, eight persons (33%) said they would have to alter their diets substantially, three (12.5%) said there would be no effect on their lives, three (12.5%) said they would experience a serious effect on their budget, two (8%) said they would be met with economic hardships, and one person (4%) said he would break the law if necessary and continue with subsistence pursuits.

Few persons cited specific changes, or lack thereof, in subsistence activities. Those who did mention changes talked about the greater complexity of equipment, changes in regulations, changes in the expenses associated with subsistence, and a decline in involvement in subsistence. Some people said subsistence pretty much had stayed the same. Six interviewees (25%) said there had been no change in sharing of subsistence resources or in peoples' subsistence skills. Overall, interviewees emphasized the importance of subsistence in their lives and their desire to see it remain unchanged in the future.

H. DATA TABLES FOR COMMUNITY PROFILES

The following pages contain data tables which compare the communities on a number of different variables which characterize the population: nature of households; gender profiles; age distribution; ethnic composition; years of education; college degrees obtained; villages where residents were raised; years of residency in the community; employers; years of involvement in commercial fishing; and place of employment. For most of these tables, we use all persons in the sample households (n = 778 for all communities) since the variables apply to individuals. The exceptions are table 5, where we use sample households (n = 212) because the variable concerns the nature of households, and tables 13 and 15, where we only use employed members of sample households since the variables refer to jobs. The sample size is given for each community in the bottom row of each table.

Readers may want to refer to these tables when reading the community profile sections. These tables are presented at the end of this chapter instead of being repeated in each community profile section.

Table 5

Household Type by Community, 1990
(Percent of sampled households in each category)

Community> Household	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
Nuclear	55.0	36.8	59.4	55.0	30.0	55.0	58.3
Single Person	15.0	15.8	9.4	0.0	15.0	25.0	4.2
Extended Family	0.0	5.3	9.4	10.0	5.0	0.0	4.2
Composite Family	0.0	1.3	0.0	10.0	0.0	0.0	12.5
Extended or Composite	0.0	0.0	0.0	10.0	5.0	0.0	8.3
Single Parent	15.0	10.5	6.2	10.0	25.0	10.0	0.0
Conjugal Pair	5.0	23.7	15.6	5.0	5.0	10.0	12.5
Grandparent/ Grandchild	10.0	0.0	0.0	0.0	10.0	0.0	0.0
Joint (Siblings)	0.0	1.3	0.0	0.0	5.0	0.0	0.0
Other	0.0	5.3	0.0	0.0	0.0	0.0	0.0
n =	*20*	*76*	*32*	*20*	*20*	*20*	*24*

n = number of households

Table 6

Gender by Community, 1990
(Percent of sample in each category)

Community> Gender	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
Female	45.3	50.4	53.2	38.8	47.1	44.4	50.0
Male	54.7	49.6	46.8	61.2	52.9	55.6	49.0
Unknown	0.0	0.0	0.0	0.0	0.0	0.0	1.0
n =	*75*	*242*	*109*	*121*	*68*	*63*	*100*

n = total persons in sampled households for whom data is available

Table 7

Age Distribution and Mean Age by Community, 1990
(Percent of sample in each community)

Community==> Years of Age	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
0 to 10 years	33.3	22.3	26.6	34.7	36.8	14.3	26.0
11 to 20 years	16.0	16.1	15.6	19.0	8.8	27.0	16.0
21 to 30 years	22.7	14.5	13.8	14.1	19.1	17.4	14.0
31 to 40 years	12.0	22.3	19.2	14.8	14.7	17.5	19.0
41 to 50 years	6.7	10.8	11.0	5.8	4.4	11.1	8.0
51 to 60 years	6.6	9.0	8.3	5.8	5.9	6.4	8.0
61 to 70 years	1.4	2.5	2.7	3.3	4.4	6.3	8.0
71 + years	1.3	2.5	2.8	2.5	5.9	0.0	0.0
Mean Age =	22.8	28.7	27.2	22.7	26.0	28.4	27.6
n =	*75*	*242*	*109*	*121*	*68*	*63*	*100*

n= total persons in sample households for whom data is available

Table 8

Ethnicity by Community, 1990
(Percent of sample in each category)

Community> Ethnicity	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
Eskimo	1.3	19.8	1.8	73.6	0.0	0.0	72.0
Aleut	78.7	9.5	7.3	5.8	0.0	22.2	0.0
Athabascan	0.0	0.8	0.9	0.0	64.7	1.6	0.0
Other AK Native	0.0	0.0	0.0	0.8	0.0	0.0	0.0
Mixed Native	2.7	4.5	1.8	5.8	8.8	0.0	0.0
Non-Native	9.3	40.5	56.9	5.8	14.7	36.5	12.0
Mixed Native Non-Native	8.0	24.8	22.0	3.3	11.8	39.7	14.0
Mixed Native Unknown	0.0	0.0	8.3	5.0	0.0	0.0	2.0
Unknown	0.0	0.0	0.9	0.0	0.0	0.0	0.0
n =	*75*	*242*	*109*	*121*	*68*	*63*	*100*

n = total persons in sampled households for which data is available

Note: Non-Native refers to all persons who are not Alaska Natives; this includes persons of Caucasian background as well as other ethnic groups. Mixed Native refers to persons with mixed Alaska Native heritage, for instance, persons who are part Aleut and part Eskimo, or persons who are part Eskimo and part Athabaskan.

Table 9

Distribution of Residents' Years of Education by Community, 1990
(Percent of sample in each category)

Community==> Years of Education	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
0 to 5 years	40.0	28.9	34.8	47.9	54.4	28.6	46.0
6 to 10 years	22.7	13.3	8.3	11.6	7.4	31.7	12.0
11 to 12 years	25.3	27.6	23.8	29.7	35.3	30.2	26.0
13 + years	12.0	29.8	29.4	8.3	2.9	9.5	14.0
Unknown	0.0	0.4	3.7	2.5	0.0	0.0	2.0
Mean Years of Education	7.0	9.5	8.6	6.4	6.1	8.5	7.1
n =	*75*	*242*	*109*	*121*	*68*	*63*	*100*

n = total persons in sampled households for which data is available

Table 10

College Degree Obtained by Community, 1990
(Percent of sample in each category)

Community> Degree	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
None	92.0	85.5	89.9	97.5	98.5	95.2	90.0
AA	0.0	0.8	0.0	0.0	0.0	0.0	0.0
BA/BS	2.7	11.6	8.3	0.8	1.5	3.2	2.0
MA/MS	1.3	1.7	0.9	1.7	0.0	1.6	4.0
PHD	0.0	0.0	0.9	0.0	0.0	0.0	0.0
Unknown	4.0	0.4	0.0	0.0	0.0	0.0	4.0
n =	*72*	*242*	*109*	*121*	*68*	*63*	*97*

n = total persons in sampled households for whom data is available

Table 11

Village Where Persons Were Raised by Community, 1990
(Percent of sample in each category)

Community> Location	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Foreign	0.0	1.7	3.7	0.0	2.9	1.6	1.0
U.S (Not AK)	9.3	28.5	28.4	3.3	8.8	23.8	11.0
Anchorage, Fairbanks, Juneau	0.0	1.2	3.7	0.0	1.5	4.8	1.0
Migratory in AK	0.0	5.0	8.3	0.0	0.0	0.0	0.0
Upper BB Area	0.0	1.7	7.3	5.0	0.0	0.0	14.0
BB side of Peninsula	2.7	0.0	0.0	0.0	0.0	1.6	0.0
Pacific side of Peninsula	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Aleknagik	0.0	1.7	0.0	0.0	0.0	0.0	1.0
Western AK	4.0	0.8	0.9	1.7	0.0	0.0	9.0
Interior of AK	0.0	1.7	1.8	0.0	1.5	1.6	0.0
So. Eastern AK	0.0	0.8	0.0	0.8	0.0	0.0	0.0
Central Coast of AK	4.0	1.2	0.9	0.8	0.0	11.1	0.0
North Slope of AK	0.0	0.0	1.8	0.0	0.0	0.0	0.0
Aleutian Islands	4.0	0.0	0.9	0.0	0.0	1.6	0.0
Chignik Bay	1.3	0.0	0.0	0.0	0.0	1.6	0.0
Chignik Lagoon	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Chignik Lake	68.0	0.0	0.0	0.0	0.0	0.0	0.0
Clarks Point	0.0	0.4	0.9	0.0	0.0	0.0	0.0
Dillingham	0.0	45.9	2.8	1.7	0.0	0.0	2.0
Egegik	0.0	0.4	0.0	0.0	0.0	1.6	0.0
Ekwok	0.0	2.9	0.0	0.0	0.0	0.0	0.0
Goodnews	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Igiugig	0.0	0.0	0.0	0.0	2.9	0.0	0.0
Iliamna	0.0	0.0	1.8	0.0	0.0	0.0	0.0

Table 11
(Continued)

Village Where Persons Were Raised by Community, 1990
(Percent of sample in each category)

Community> Location	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
King Salmon	0.0	0.0	0.9	0.0	0.0	1.6	0.0
Kokhanok	0.0	0.0	0.9	0.0	0.0	0.0	0.0
Koliganek	0.0	1.7	0.0	1.7	0.0	0.0	0.0
Levelock	0.0	1.2	0.9	0.0	0.0	0.0	0.0
Lime Village	0.0	0.0	0.0	0.0	8.8	0.0	0.0
Manokotak	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Naknek	0.0	0.4	32.1	0.0	0.0	0.0	0.0
New Stuyahok	0.0	0.8	0.0	82.6	1.5	0.0	0.0
Nondalton	0.0	0.0	0.0	0.0	72.1	0.0	0.0
Perryville	4.0	0.0	0.0	0.0	0.0	0.0	0.0
Pilot Point	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Platinum	0.0	0.0	0.0	0.8	0.0	0.0	0.0
Port Heiden	0.0	0.0	0.0	0.0	0.0	49.2	0.0
Portage Creek	0.0	0.4	0.0	0.8	0.0	0.0	0.0
South Naknek	0.0	0.4	0.9	0.0	0.0	0.0	0.0
Togiak	0.0	0.0	0.0	0.8	0.0	0.0	60.0
Unknown	0.0	0.0	1.1	0.0	0.0	0.0	0.0
n =	*75*	*238*	*107*	*121*	*67*	*62*	*99*

n = total persons in sampled households for whom data is available

Table 12

Years of Residency by Community, 1990
(Percent of sample in each category)

Community==> Years of Residency	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
0 to 5 years	36.0	31.0	40.4	26.4	32.4	34.9	23.0
6 to 10 years	9.3	16.1	22.9	12.4	16.1	19.1	21.0
11 to 15 years	12.0	14.9	9.2	13.3	8.9	9.5	8.0
16 to 20 years	8.0	7.8	9.2	10.7	2.9	6.3	7.0
21 + years	34.7	30.2	17.4	37.2	39.7	30.2	39.0
Unknown	0.0	0.0	0.9	0.0	0.0	0.0	2.0
Mean Length of Residency =	16.7	15.6	11.1	18.2	20.4	15.6	20.1
n =	*75*	*242*	*109*	*121*	*68*	*63*	*100*

n = total persons in sampled households for whom data is available

Table 13

Employer by Community, 1990
(Percent of sample in each category)

Community==> Employer	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
Agriculture/Forestry	0.0	0.5	2.2	0.0	0.0	0.0	0.0
Commercial Fishing	33.3	10.0	12.0	30.4	17.0	8.5	18.8
Construction	2.2	0.5	0.0	0.0	4.3	16.9	0.0
Manufacturing	0.0	0.0	1.1	0.0	0.0	0.0	0.0
Transportation/ Commun./Utilities	0.0	7.7	4.3	0.0	0.0	8.5	1.4
Retail Trade	0.0	6.2	0.0	0.0	0.0	0.0	4.3
Wholesale Trade	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Finance/Insurance Real Estate	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Services	0.0	8.1	8.7	0.0	0.0	0.0	0.0
Federal Government	2.2	3.3	1.1	6.5	21.3	5.1	4.3
State Government	0.0	2.9	4.3	0.0	6.4	1.7	0.0
School District/Local Government	33.3	11.0	17.4	32.6	23.4	22.0	17.4
Self Employed	15.6	33.0	39.1	17.4	10.6	32.2	42.0
Lodge/Guide	0.0	1.0	0.0	0.0	2.1	0.0	0.0
Religious Organization	2.2	0.0	0.0	0.0	0.0	0.0	1.4
Native Corporation	2.2	11.0	7.6	8.7	6.4	3.4	5.8
Other	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Not Available	8.9	3.8	2.2	4.3	8.5	0.0	4.3
n =	*45*	*209*	*92*	*46*	*47*	*59*	*69*

n = total employed persons in sample households for whom data is available

Table 14

Years Commercial Fishing by Community, 1990
(Percent of sample in each category)

Community> Yrs Commer. Fishing	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
0	65.3	64.0	64.2	63.6	75.0	52.4	51.0
>0 to 5 yrs.	9.3	9.1	4.6	4.1	8.8	9.5	4.0
6 to 10 yrs.	1.3	6.2	7.3	7.4	0.0	4.8	11.0
11 to 15 yrs.	2.7	4.1	6.4	5.0	4.4	6.3	6.0
16 to 20 yrs.	6.7	1.7	1.8	5.0	2.9	4.8	8.0
21+ yrs.	14.7	14.9	14.7	8.3	5.9	17.5	14.0
Don't Know	0.0	0.0	0.9	0.8	2.9	0.0	5.0
Not Asked	0.0	0.0	0.0	5.8	0.0	4.8	1.0
n =	*75*	*242*	*109*	*119*	*68*	*60*	*99*

n = total persons in sample households for whom data is available

Table 15

Location of Residents' Jobs by Community, 1990
(Percent of sample in each category, base is all workers)

Community==> Location	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
U.S. Not AK	0.0	0.5	1.1	0.0	2.1	0.0	0.0
Anchorage, Fairbanks, Juneau	0.0	2.4	0.0	0.0	2.1	0.0	0.0
Upper BB Community	0.0	1.0	0.0	0.0	2.1	0.0	0.0
BB side of Peninsula	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Aleknagik	0.0	1.4	0.0	0.0	0.0	0.0	0.0
Western AK	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Interior of AK	0.0	0.0	0.0	0.0	14.9	0.0	2.9
So. Eastern AK	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Central Coast of AK	0.0	0.5	1.1	0.0	0.0	1.7	0.0
North Slope of AK	0.0	0.5	0.0	0.0	2.1	0.0	0.0
Aleutian Islands	0.0	1.9	0.0	0.0	0.0	0.0	0.0
Nushagak Fishing District	0.0	9.1	2.2	26.1	0.0	0.0	1.4
Togiak Fishing District	2.2	0.0	0.0	2.2	0.0	0.0	34.8
Naknek/Kvichak Fishing District	0.0	1.0	18.5	2.2	4.3	0.0	1.4
Egegik Fishing District	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Ugashik Fishing District	0.0	0.0	0.0	0.0	0.0	23.7	0.0
AK Peninsula Fishing District	0.0	0.0	1.1	0.0	0.0	0.0	0.0
Chignik Fishing District	44.4	0.0	0.0	0.0	0.0	0.0	0.0

Table 15
(Continued)

Location of Residents' Jobs by Community, 1990
(Percent of sample in each category, base is all workers)

Community==> Location	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Non-dalton	Port Heiden	Togiak
Fish Several BB Districts	0.0	5.3	2.2	4.3	0.0	0.0	1.4
Fish Outside BB	0.0	0.0	1.1	0.0	0.0	0.0	0.0
Fish BB generally	0.0	7.7	1.1	4.3	23.4	1.7	2.9
Chignik Lake	44.4	0.0	0.0	0.0	0.0	0.0	0.0
Dillingham	0.0	61.8	0.0	0.0	0.0	0.0	1.4
Ekwok	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Iliamna	0.0	0.0	0.0	0.0	2.1	0.0	0.0
King Salmon	0.0	0.0	7.6	0.0	0.0	0.0	0.0
Naknek	0.0	0.5	63.0	0.0	0.0	0.0	0.0
New Stuyahok	0.0	0.0	0.0	52.2	0.0	0.0	0.0
Nondalton	0.0	0.0	0.0	0.0	38.3	0.0	0.0
Perryville	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Port Heiden	0.0	0.0	0.0	0.0	0.0	71.2	0.0
Quinhagak	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Togiak	0.0	0.0	0.0	0.0	0.0	0.0	49.3
Ekuk	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Unknown	8.9	2.4	1.0	8.6	8.5	0.0	2.9
n =	*45*	*209*	*92*	*46*	*47*	*59*	*69*

n = total employed persons in sample households for whom data is available

CHAPTER VII. STATISTICAL ANALYSIS OF ADF&G DATA

This chapter summarizes our findings from analysis of the ADF&G data set. We begin with a discussion of the protocols used by ADF&G to gather subsistence data, the structure of the ADF&G data set, conversion factors, and patterns of missing data. This discussion is included as background information for interpreting tables of resource harvesting data. One purpose of this discussion is to alert readers to the fact that "NA" (not available) or "0" (zero) in subsistence harvesting tables does not necessarily mean that a community did not harvest that resource, but probably means that interviewees were not asked about that resource or the data is missing for some other reason.

Discussion of the protocols is also important for understanding community comparisons. Communities in the same subregion tended to be studied in the same year using the same protocol. This methodology may be artificially inflating real or observed similarities between communities. After discussing the nature of the ADF&G data, we present tables of resource harvesting data. Then, using various graphical techniques, we compare Bristol Bay communities based upon their resource harvesting patterns. The purpose of comparing communities is to provide a community typology and subregional analysis.

A. COMPARISON OF THE ADF&G PROTOCOLS

Examining the ADF&G protocols is important for combining data for analysis and for understanding the history and instrumentation threats to internal validity that may exist within the data sets. The fact that the ADF&G data was collected over seven years using nine different protocols poses some problems for the data analysis. Since the protocols changed over time, with more recent protocols being more comprehensive, there is not always comparable information for all of the communities. Questions that did not appear on older protocols which were used in several communities have resulted in considerable amounts of missing information. For instance, questions not contained in the protocol used

Table 16
Communities Studied in the Same Year Using the Same Protocol

Year	Communities	Subregion
1982	Quinhagak	Togiak
1982-1983	Igiugig	Iliamna Lake
	Iliamna	" "
	Kokhanok	" "
	Newhalen	" "
	Nondalton	" "
	Pedro Bay	" "
	Port Alsworth	" "
1983	Naknek	Bristol Bay Borough
	South Naknek	" " "
	King Salmon	" " "
1984	Egegik	Upper Alaska Peninsula
	Chignik	Chignik Subregion
	Chignik Lake	" "
	Chignik Lagoon	" "
	Ivanof Bay	" "
	Perryville	" "
1984	Dillingham	Nushagak Bay Subregion
1985	Manokotak	Togiak Subregion
1986-1987	Pilot Point	Upper Alaska Peninsula
	Port Heiden	" " "
	Ugashik	" " "
	Nelson Lagoon *(different protocol)*	" " "
1987-1988	Ekwok	Nushagak River Subregion
	Koliganek	" " "
	New Stuyahok	" " "
1988-1989	False Pass	Lower Alaska Peninsula

in the Iliamna Lake region eliminates information for 7 of the 27 communities (26%) contained in the ADF&G data set. Table 16 on the previous page groups the communities studied in the same year using the same protocol. This table will be an important reference for understanding patterns of missing data in the resource tables.

The ADF&G data are broken into two major categories: demographic/income and resource data. The demographic/income data are separated into five files, demographic data, household data, job data, expense data, and other income data. There are eight categories of resource data. These data are stored in files related to birds, commercial fishing catch used for subsistence purposes, fur bearers, large game, invertebrates, marine mammals, noncommercial fishing, and plants.

1. Demographic/Income Data Sets

This section presents the variables that were available for analysis of the demographic/income variables.

The demographic data are arranged as one record for each person in the household

Table 17
Variables in the Demographic Data File

- Community
- Household ID
- Person (interviewees status in household)
- Year of the study
- Sex
- Month of birth
- Day of birth
- Year of birth
- Age
- Residence of parents at birth
- Year they moved to the community
- Where they moved from
- Ethnicity
- Whether or not they spent any months away from the community (specific months)
- Where they spent the time away
- Total number of months absent from the community
- Whether they hunted, fished, trapped, or gathered plants that year
- Disposition (student, unemployed, homemaker etc.)

Table 18
Comparisons of Protocols by Community on Demographic Data Collected

	SEX	AGE	WHERE BORN	YR MOVE TO CITY	ETHNIC	JAN-DEC ELSE	WHERE ELSE	NUM MO. ELSE	HUNT	FISH	GATHER	TRAP	DISPOSE
CHIGNIK BAY	Y	Y	Y	NO	Y	NO	NO	NO	Y	Y	NO	Y	Y
CHIGNIK LAGOON	Y	Y	Y	NO	Y	NO	NO	NO	Y	Y	NO	Y	Y
CHIGNIK LAKE	Y	Y	Y	NO	Y	NO	NO	NO	Y	Y	NO	Y	Y
DILLINGHAM	Y	Y	Y	Y	Y	NO	NO	NO	Y	Y	NO	Y	NO
EGEGIK	Y	Y	Y	Y	Y	NO	NO	NO	Y	Y	NO	Y	Y
EKWOK	Y	Y	Y	Y	Y	NO	NO	NO	Y	Y	Y	Y	NO
FALSE PASS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NO	Y
IGIUGIG	Y	Y	Y	Y	NO	NO	NO	NO	NO	NO	NO	NO	NO
ILIAMNA	Y	Y	Y	Y	NO	NO	NO	NO	NO	NO	NO	NO	NO
IVANOF BAY	Y	Y	Y	NO	Y	NO	NO	NO	Y	Y	NO	Y	Y
KING SALMON	Y	Y	NO	Y	NO	NO	NO	NO	NO	NO	NO	Y	Y
KOKHANOK	Y	Y	Y	Y	NO	NO	NO	NO	Y	Y	NO	NO	NO
KOLIGANEK	Y	Y	Y	Y	Y	NO	NO	NO	Y	Y	Y	Y	NO
MANOKOTAK	Y	Y	Y	Y	Y	NO	NO	NO	Y	Y	Y	NO	Y
NAKNEK	Y	Y	NO	Y	NO	NO	NO	NO	Y	Y	NO	NO	Y
NELSON LAGOON	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NO	Y
NEW STUYAHOK	Y	Y	Y	Y	Y	NO	NO	NO	Y	Y	Y	Y	NO
NEWHALEN	Y	Y	Y	Y	NO	NO	NO	NO	NO	NO	NO	NO	NO
NONDALTON	Y	Y	Y	Y	NO	NO	NO	NO	NO	NO	NO	NO	NO
PEDRO BAY	Y	Y	Y	Y	NO	NO	NO	NO	NO	NO	NO	NO	NO
PERRYVILLE	Y	Y	Y	NO	Y	NO	NO	NO	Y	Y	NO	Y	Y
PILOT POINT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NO	Y
PORT ALSWORTH	Y	Y	Y	Y	NO	NO	NO	NO	NO	NO	NO	NO	NO
PORT HEIDEN	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NO	Y
QUINHAGAK	Y	Y	NO	NO	Y	NO	NO	NO	NO	NO	NO	Y	NO
SOUTH NAKNEK	Y	Y	NO	Y	NO	NO	NO	NO	Y	Y	NO	Y	Y
UGASHIK	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NO	Y

interviewed. The variables available for analysis in the demographic data are presented in Table 17. Ethnicity was missing for 10 communities, as were many of the other variables for at least some of the communities. This is due to differences between the protocols used for the different studies. As noted in Table 18, gender and age were the only questions asked on all of the protocols. Several questions were asked in many of the communities, such as parents' residence at birth (indicated in Table 18 as "where born"), year the interviewee moved to the community, employer, and job title. The rest of the questions either were not asked in most of the communities or most of the information is missing from the data files. For example, in only 5 communities (18%) were interviewees queried about which months (January - December) they spent away from the community, where they spent the time away, and the total number of months spent elsewhere.

There was one record per household for the household data file. The variables contained in this file are shown in Table 19. As can be seen in Table 20, data on size of

Table 19
Variables in the Household Data File

- Community
- Household ID
- Card number
- Interview month, day, and year
- Interview person
- Whether or not the HH had a subsistence salmon permit
- Household size.

household was available for all communities. On the other hand, there is no information on whether the household has a subsistence salmon permit for 18 of the 27 communities.

The job data file does not contain records for every household, or within a household, for every person listed under the demographic data. Information included in the job data file is shown in Table 21. Not every household is represented in the data set and, as shown in Table 22, data on income earned from jobs are missing for 11 (42%) entire communities, with certain other variables missing for the remaining communities. There is also a disappointing lack of information on the seasonal nature of employment and

Table 20
Comparisons of Protocols by Community on Household Data Collected

	Salmon Permit	HH Size	MEAN HH SIZE
CHIGNIK BAY	N	Y	4.3
CHIGNIK LAGOON	N	Y	3.4
CHIGNIK LAKE	N	Y	5
DILLINGHAM	Y	Y	3
EGEGIK	N	Y	2.3
EKWOK	Y	Y	3.4
FALSE PASS	Y	Y	3.2
IGIUGIG	N	Y	6.3
ILIAMNA	N	Y	3.9
IVANOF BAY	N	Y	3.7
KING SALMON	Y	Y	3
KOKHANOK	N	Y	5.3
KOLIGANEK	Y	Y	3.9
MANOKOTAK	N	Y	5.2
NAKNEK	Y	Y	3.1
NELSON LAGOON	Y	Y	3.8
NEW STUYAHOK	Y	Y	4.8
NEWHALEN	N	Y	4.8
NONDALTON	N	Y	5.2
PEDRO BAY	N	Y	2.9
PERRYVILLE	N	Y	4.3
PILOT POINT	N	Y	3.6
PORT ALSWORTH	N	Y	3.6
PORT HEIDEN	N	Y	2.8
QUINHAGAK	N	Y	4.8
SOUTH NAKNEK	Y	Y	2.8
UGASHIK	N	Y	2

on work outside the community. The protocols in only seven communities (26%) asked which months the person worked from January to December.

The expense data file is structured with one record per household. The variables contained in the data set are shown in Table 23. This data set is not very useful as nineteen communities are missing data on all variables. In only eight communities (30%), the ones studied since 1986, were people asked about household expenses (see Table 24).

Table 21
Variables in the Jobs Data File

- Community
- Household ID
- Person (ID number)
- Job Number (no description in SPSS input file)
- Job Title
- Employer (trade)
- Location of job
- Which months they worked from January to December
- Unit of measure for work period (days, years, weeks, months, etc.)
- Full or part-time job
- Amount of time spent working
- Income from job (either a dollar amount or in a category)

Table 23
Variables in the Expense Data File

- Community
- Household ID
- Monthly expenses for:
    - heating fuel
    - transportation fuel
    - water
    - housing
    - food
    - electricity
    - telephone
    - propane
- Total monthly expenses
- Total monthly expenses for all fuel types
- Total monthly household expenses

The other income data file is organized as one record per household. The variables contained in the file are presented in Table 25. As with the expense data, these data are also not very useful due to the large amounts of missing data. Again, the data are missing

Table 22
Comparisons of Protocols by Community on Job Data Collected

	JOB TITLE	EMPLOYER	Jan-Dec Work	AMOUNT EARNED	EARNINGS CATEGORY
CHIGNIK BAY	Y	Y	N	MOST MISSING	N
CHIGNIK LAGOON	Y	Y	N	MOST MISSING	N
CHIGNIK LAKE	Y	Y	N	MOST MISSING	N
DILLINGHAM	Y	Y	N	N	Y
EGEGIK	Y	Y	N	MOST MISSING	N
EKWOK	Y	Y	Y	Y	N
FALSE PASS	Y	Y	Y	Y	N
IGIUGIG	Y	Y	N	Y	N
ILIAMNA	Y	Y	N	Y	N
IVANOF BAY	Y	Y	N	MOST MISSING	N
KING SALMON	N	N	N	N	N
KOKHANOK	Y	Y	N	Y	N
KOLIGANEK	Y	Y	Y	Y	N
MANOKOTAK	Y	Y	N	Y	N
NAKNEK	N	N	N	N	N
NELSON LAGOON	Y	Y	Y	Y	N
NEW STUYAHOK	Y	Y	Y	Y	N
NEWHALEN	Y	Y	N	Y	N
NONDALTON	Y	Y	N	Y	N
PEDRO BAY	Y	Y	N	Y	N
PERRYVILLE	Y	Y	N	MOST MISSING	N
PILOT POINT	Y	Y	Y	Y	N
PORT ALSWORTH	Y	Y	N	Y	N
PORT HEIDEN	Y	Y	Y	Y	N
QUINHAGAK	Y	Y	N	N	N
SOUTH NAKNEK	N	N	N	N	N
UGASHIK	Y	Y	N	Y	N

Table 24
Comparisons of Protocols by Community on Expense Data Collected

	Heat $	Transport Fuel $	Water $	Housing $	Food $	Electric $	Phone $	Propane $	Total $	Tot Fuel $	Tot HH $
CHIGNIK BAY	N	N	N	N	N	N	N	N	N	N	N
CHIGNIK LAGOON	N	N	N	N	N	N	N	N	N	N	N
CHIGNIK LAKE	N	N	N	N	N	N	N	N	N	N	N
DILLINGHAM	N	N	N	N	N	N	N	N	N	N	N
EGEGIK	N	N	N	N	N	N	N	N	N	N	N
EKWOK	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
FALSE PASS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
IGIUGIG	N	N	N	N	N	N	N	N	N	N	N
ILIAMNA	N	N	N	N	N	N	N	N	N	N	N
IVANOF BAY	N	N	N	N	N	N	N	N	N	N	N
KING SALMON	N	N	N	N	N	N	N	N	N	N	N
KOKHANOK	N	N	N	N	N	N	N	N	N	N	N
KOLIGANEK	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
MANOKOTAK	N	N	N	N	N	N	N	N	N	N	N
NAKNEK	N	N	N	N	N	N	N	N	N	N	N
NELSON LAGOON	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NEW STUYAHOK	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NEWHALEN	N	N	N	N	N	N	N	N	N	N	N
NONDALTON	N	N	N	N	N	N	N	N	N	N	N
PEDRO BAY	N	N	N	N	N	N	N	N	N	N	N
PERRYVILLE	N	N	N	N	N	N	N	N	N	N	N
PILOT POINT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
PORT ALSWORTH	N	N	N	N	N	N	N	N	N	N	N
PORT HEIDEN	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
QUINHAGAK	N	N	N	N	N	N	N	N	N	N	N
SOUTH NAKNEK	N	N	N	N	N	N	N	N	N	N	N
UGASHIK	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

for the nineteen communities studied before 1986. For the eight communities studied in the years after 1985, not all variables (other sources of income) were included in each of the protocols (see Table 26).

Table 25
Variables in the Other Income Data File

- o Community
- o Household ID
- o Annual income from
  - social security
  - public assistance
  - families with dependent children
  - corporation dividends
  - pension
  - disability
  - food stamps
  - longevity bonus
  - energy assistance
  - permanent fund dividends
  - unemployment
  - child support

Table 27
Variables in the Bird, Invertebrate and Plant Data Files

- o Community
- o Household ID
- o Resource
- o Units of measure
- o Conversion factor
- o Use (did HH use resource)
- o Attempt (did HH attempt to harvest resource)
- o Harvest (did HH harvest resource)
- o Pounds (pounds of resource harvested)
- o Receive (did HH receive the resource)
- o Give (did HH give away the resource)

Table 26
Comparisons of Protocols by Community on Other Income Data Collected

	SOCIAL SEC.	PUBLIC ASST.	FDC	CORPORATE DIVIDENDS	PENSION	DIS-ABILITY	FOOD STAMPS	LONGEV-ITY	ENERGY ASST.	PERMANENT FUND	UNEMPL.	CHILD SUPPORT	OTHER SOURCES
CHIGNIK BAY	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CHIGNIK LAGOON	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CHIGNIK LAKE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
DILLINGHAM	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
EGEGIK	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
EKWOK	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	YES
FALSE PASS	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO	YES
IGIUGIG	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
ILIAMNA	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
IVANOF BAY	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
KING SALMON	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
KOKHANOK	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
KOLIGANEK	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	YES
MANOKOTAK	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NAKNEK	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NELSON LAGOON	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO	NO	NO
NEW STUYAHOK	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	YES
NEWHALEN	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NONDALTON	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
PEDRO BAY	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
PERRYVILLE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
PILOT POINT	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO
PORT ALSWORTH	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
PORT HEIDEN	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO
QUINHAGAK	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	YES
SOUTH NAKNEK	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
UGASHIK	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO

2. Resource Data Sets

The bird data file consists of one record per resource per household. For this file, there are 113 resources and 754 households. Each record contains 11 variables, which are shown in Table 27. During preliminary data analysis it was found that only 61 of the 113 listed resources were ever actually harvested by any household. Of the 61 resources harvested, ptarmigan was harvested the most, by 29% of the households. Grouse was the second most commonly harvested resource, with 20% of the households having reported taking grouse.

Of the 61 resources actually harvested, many were listed as specific types of a species. As an example, duck was listed under 24 resource numbers which were:

> Teal-fall, teal-spring, pintail-fall, ducks-spring unknown, pintail-spring, eider, eider-spring, ducks-fall, sea ducks, mallard-spring, mallard-fall, ducks, ducks unknown, freshwater ducks, gadwall-fall, gadwall-spring, goldeneye-fall, goldeneye-spring, scoter-spring, scoter-whitewing fall, scaup-spring, scaup-fall, wigeon-fall, wigeon-spring.

The reason for ducks (and other resources) being listed by so many types under so many different categories is that different protocols were used, each designed with a different purpose. Most communities only have data on several of the duck categories, never on all.

Table 28
Variables in the Commercial Fishing Data File

- Community
- Household ID
- Resource
- Units of measure
- Conversion factor
- Use (did HH use resource)
- Attempt (did HH attempt to harvest resource)
- Locations (where did harvest take place)
- Gear type (what type of gear was used)
- Removed (amount of harvest used for own use)
- Gave away (amount of harvest given away)
- Pounds (pounds of resource removed from commercial catch)
- Information on the ID's of up to 4 permit holders and 4 crew members.
- Give (did HH give away the resource)

The same format used for the bird data was used for the commercial fishing data. Of the 28 resources that were listed, only 23 were actually harvested. The variables contained in each record are shown in Table 28. Salmon was the most common resource taken from a commercial catch for subsistence purposes, followed by herring and halibut.

The data on furbearers were arranged as one record per resource per household. The variables in this data file are shown in Table 29. There are 17 listed resources (11 only

Table 29
Variables in the Furbearer Data File

- Community
- Household ID
- Resource
- Units of measure
- Conversion factor
- Use (did HH use resource)
- Attempt (did HH attempt to harvest resource)
- Harvest (did HH harvest resource)
- Pounds (pounds of resource harvested)
- Receive (did HH receive the resource)
- Give (did HH give away the resource)
- Used food (number harvested and used for food)
- Number used for fur
- Number sold (number harvested and sold)
- Price (the price the resource was sold for)

being harvested for food), the most commonly harvested furbearer, porcupine, was harvested by 22% of the households. Beaver was harvested by 20% of the sampled households.

The game data file also contained one record per resource per household. Of the 8 listed resources, only 6 were actually harvested. These resources are:

> Black bear, brown bear, caribou, moose, sheep (1 HH harvested), and wild cow (1 HH harvested).

The variables contained in the file are presented in Table 30. Of the households, 43.2% reported harvesting caribou, 20.7% reported harvesting moose, 1.5% reported harvesting black bear, and 2.1% reported harvesting brown bear.

The same structure outlined above for the other data files was used for the

Table 30
Variables in the Game Data File

- Community
- Household ID
- Resource
- Units of measure
- Conversion factor
- Use (did HH use resource)
- Attempt (did HH attempt to harvest resource)
- Harvest (did HH harvest resource)
- Pounds (pounds of resource harvested)
- Receive (did HH receive the resource)
- Give (did HH give away the resource)
- Used food (number harvested and used for food)
- Number used for fur

invertebrate data structure. The same variables used for the bird data were used for the invertebrate data (see Table 27). The number of resources listed was 19 with 17 actually being harvested. Clams were the most commonly harvested resource for subsistence, followed by sea urchins and chitons.

The same data structure as described above was used for the marine mammals. The

Table 31
Variables in the Marine Mammal Data File

- Community
- Household ID
- Resource
- Units of measure
- Conversion factor
- Use (did HH use resource)
- Attempt (did HH attempt to harvest resource)
- Harvest (did HH harvest resource)
- Pounds (pounds of resource harvested)
- Receive (did HH receive the resource)
- Give (did HH give away the resource)
- The portion of resource used first, second, third, and fourth.

variables in this data file are shown in Table 31. Of the 12 listed resources, 9 were harvested by people in the communities. Seals were the most commonly harvested resource, followed by sea lions and then whales.

The same data structure used in the other harvest files was used for the noncommercial fishing data file. For noncommercial fish, 39 resources were listed, all of which were harvested by residents of at least one community. Salmon was the most commonly harvested resource, followed by a variety of freshwater fish. The variables in the file are given in Table 32.

Table 32
Variables in the Noncommercial Data File

- Community
- Household ID
- Resource
- Units of measure
- Conversion factor
- Use (did HH use resource)
- Attempt (did HH attempt to harvest resource)
- Harvest (did HH harvest resource)
- Pounds (pounds of resource harvested)
- Receive (did HH receive the resource)
- Give (did HH give away the resource)
- Amounts harvested by subsistence net, rod and reel, ice fishing, and by other methods.

Plant data was structured the same as the above data files. The variables used are the same as in the bird data file (see Table 27). Four resources were listed, of these wood was missing for everyone on pounds harvested because no conversion factor was specified. Approximately 66% of the total households harvested plants/berries, 78% harvested berries, 23% harvested plants/greens/mushrooms, and only one household harvested seaweed/kelp.

3. Resource Harvest Data Results

Information has been compiled from the resource data files: bird data; data on commercial fish used for subsistence; furbearer (small game) data; game data; invertebrate data; marine mammal data; non-commercial fishing data; and plant data. Several tables are presented for each resource category, which show the percentages of households in each community that attempted to harvest, that harvested, and the average pounds harvested per household by community (Tables 42 to 46). "Percentages of households" is used as a measure of a community's involvement in harvesting and distributing the resource. Comparison of the average pounds harvested per household for the various resources indicates which resources communities depend upon the most.

The variables attempting, harvesting, and number of pounds contain the least amounts of missing data. Other variables in the data set (such as giving or receiving) contained many zeros as values and are not presented here. Caution needs to be used in interpreting zero values in these tables. A zero can either indicate that the resource was not used (or attempted or harvested) by any household in that community, or that the question concerning whether households used (or attempted or harvested) the resource was not asked. If zeros occur in the same cells for communities studied using the same protocol, the zero most likely means the question was not posed. In the tables that follow, we have attempted to distinguish between "true zeros" (e.g., no harvest) and missing data. Where all the data for a community are missing, then a "NA" was placed in the cell *regardless of whether or not the protocol indicated the data had been gathered*. In cases where most of the data for a community was missing, but where there were some cases coded as zero, the value for the community was left as a zero. Thus, the zero values should still be regarded with caution.

Several comments need to be made on attempting (Table 42), harvesting (Table 43 and Table 44), and average pounds harvested (Table 45 and Table 46) for commercial fishing, noncommercial fishing, plants, invertebrates, game, furbearers, marine mammals, and birds. First, there is considerably more missing information on pounds harvested than for either the percent attempting or the percent harvesting variables. This missing data is protocol related; that is, questions about amount harvested were not included in the protocols used in certain communities. The result is a pattern of missing data that is not randomly distributed across the Bristol Bay region. Second, ADF&G does not compute pounds for species that are caught for fur and not eaten. For other species, ADF&G computes total pounds harvested by multiplying the number of animals harvested by a conversion factor (i.e., an estimate of the utilizable weight per unit). For furbearers caught for their fur and not for their food value, ADF&G sets the conversion factor to zero thereby resulting in a total pounds harvested value of zero.

For the purposes of studying harvesting patterns throughout Bristol Bay we decided to include furbearers since trapping is an important subsistence activity (ADF&G does not convert them to pounds since they are not eaten). In order to include them it was necessary to compute total pounds harvested. To compute this value, however, it was necessary to have a conversion factor for the species. As shown in Table 34, for those species where ADF&G set the conversion factor to zero, there were five species of furbearers (snowshoe hare, land otter, lynx, muskrat, and parka squirrel) for which there was a non-zero conversion factor in the database so there was a conversion factor that could be used for these species. It is not uncommon for species to have more than one conversion factor (see Table 35 to Table 41 for conversion factors for the other resources [6]), although there was only one conversion factor used within a community. For the occasions when a species was assigned a zero conversion factor, we computed total pounds harvested by multiplying the number of units harvested by the *modal* conversion factor value for that species. For example, snowshoe hare was assigned a conversion factor of 2, and land otter was assigned a conversion factor of 3. The values for the other furbearing species are as follows: lynx (12), muskrat (0.75), and parka squirrel (0.50). When no conversion factor was available, a conversion factor was created by multiplying the average weights for Alaska for each species (obtained from the Division of Wildlife Conservation, ADF&G) by .3 (a rough estimate of the usable weight of the pelt). The conversion factors computed in this way are: marten (.9), mink (1.2), redfox (1.8), wolf (30), and wolverine (6.6). These procedures allowed us to include the furbearers in the analysis of pounds per household harvested.

Sea otter and walrus also had conversion factors of zero when only the pelt or tusks (respectively) were used (see Table 35). The procedure described above was used to compute the conversion factor for sea otter (conversion factor = 20). For walrus, however, despite the conversion factor being set to zero in one instance, the pounds were set at

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[6] These tables show the number of times a conversion factor was used for each resource. These frequencies only include cases in which the resource was harvested (the ADF&G databases also include conversion factors for cases that were not harvested).

175.00 by ADF&G. For the two cases in which walrus was assigned a conversion factor of 1 (meaning an individual species), the pounds were set at 600 by ADF&G. In these cases, we left the pounds as set by ADF&G. There were other instances in which ADF&G used different conversion factors. For example, we were told by ADF&G that conversion factors were not used when more reliable indicators were available (such as someone knowing exactly how many pounds of a species they obtained). The data did not include a code indicating when the pounds were calculated by means other than the standard conversion factors. For example, ADF&G indicated that for False Pass and Nelson Lagoon a conversion of 1.4 was used for Dolly Varden if harvested from commercial net, hook, line or ice fishing. A conversion factor of .3 was used for those harvested with subsistence net. As shown in Table 40, however, a "conversion factor" used in False Pass and Nelson Lagoon was "-11111." This conversion factor means "Gear specific conversion factor" and implies that pounds were calculated by a method other than multiplying the conversion factor in the database (i.e., -11111) by the number of units harvested. According to the material sent to us by ADF&G, and as mentioned above, only two conversion factors were supposed to be used for Dolly Varden in False Pass and Nelson Lagoon (i.e., 1.4 and 0.3). Yet if we divide the pounds by the number harvested we obtain several "conversion factors" as shown below:

	Conversion Factor					
	0	0.3	0.33	1.0	1.3	1.4
False Pass	1	2	1	1		2
Nelson Lagoon	1	2			1	3

As can be seen, the conversion factors mentioned above (1.4 and .3) do occur most often (9 out of 14 cases), but other conversion factors were also used. In addition, the data indicate that there are occasionally fractional units coded when a surveyed household harvested a single animal with another household (e.g., half a walrus). These fractions, however, appear infrequently and it is not clear whether sharing of harvested resources is infrequent, or only some of these occurrences are being coded as fractional harvests.

Table 33
Listing of Grouped Resource Categories with Subcategories

COMMERCIAL FISH
- Salmon
- Herring
- Halibut
- Crab
- Saltwater fish
- Freshwater fish

NONCOMMERCIAL FISH
- Salmon
- Herring and Roe
- Saltwater fish
- Freshwater fish

PLANTS
- Berries
- Plants
- Seaweed and Kelp

INVERTEBRATES
- Clams
- Crabs
- Other

GAME
- Caribou
- Moose
- Bear
- Other

FURBEARERS
- Beaver
- Hare
- Porcupine
- Other

MARINE MAMMALS
- Whale
- Seal and Sealion
- Walrus

BIRDS
- Ducks
- Geese
- Grouse and Ptarmigan
- Eggs
- Other birds

Table 34
Conversion Factors for Furbearers

		CONVERSION FACTORS														
RESOURCE NAME	RESOURCE NUMBER	0	0.41	0.5	0.75	2	2.5	3	4	5	5.6	8	8.75	10	12	20
BEAVER	24100												9	2		150
HARE	24200					8										
ARCTIC HARE	24210									3	32					
SNOWSHOE HARE	24220	1				63	5									
HARE, UNKNOWN	24230							4								
LAND OTTER	24250	37						57								
LYNX	24300	8		1					2						10	
MARTEN	24400	22														
MINK	24450	54														
MUSKRAT	24500	5			15											
PORCUPINE	24550											162		1		
RED FOX	24600	125														
WOLF	24700	13														
WOLVERINE	24750	23														
PARKA SQUIRREL	24810	3		13	1											
TREE SQUIRREL	24820		3													

Table 35
Conversion Factors for Marine Mammals

		CONVERSION FACTORS											
RESOURCE NAME	RESOURCE NUMBER	0	1	45	50	56	60	100	140	200	480	560	750
BELUKHA	35050												12
GRAY WHALE	35150				1								
SEA LION	35300							11	2	8			
SEA OTTER	35350	5											
BEARDED SEAL	35410								3				
HARBOR SEAL	35430			18	5	43							
RINGED SEAL	35450						6						
SPOTTED SEAL	35460						6						
SEAL, UNKNOWN	35470					2							
WALRUS	35500	1	2								2	2	

Table 36
Conversion Factors for Plants

		CONVERSION FACTORS				
RESOURCE NAME	RESOURCE NUMBER	-66666	0	1	4	20
BERRIES	48050	76		121	268	3
PLANTS/GREENS/MUSHROOMS	48100	37	16	53	51	
SEAWEED/KELP	48150				1	
WOOD	48250		35			

Table 37
Conversion Factors for Game

		CONVERSION FACTORS							
		58	80	100	150	300	350	450	540
RESOURCE NAME	RESOURCE NUMBER								
BLACK BEAR	23100	6		5					
BROWN BEAR	23150			15		1			
CARIBOU	23200				325				
MOOSE	23400							2	154
SHEEP	23550		1						
WILD COW	23700						1		

Table 38
Conversion Factors for Invertebrates

		CONVERSION FACTORS										
RESOURCE NAME	RESOURCE NUMBER	0.07	0.23	0.7	1	1.5	1.6	2.3	3	4	15	17.3
CLAMS	47150											7
BUTTER CLAMS	47162		45						5		46	
RAZOR CLAMS	47172		19						9		19	
STEAMER CLAMS	47182								1			
LITTLE NECK CLAMS	47192								2			
DUNGENESS	47212			2			2					
KING CRAB	47222							9				
TANNER CRAB	47232			4								
SOFTSHELL CRABS	47262								2			
HAIR CRAB	47272			1								
COCKLES	47302	23							46			
GUMBOOTS	47402				33				1	15		
MUSSELS	47452				4	3						
OCTOPUS	47502									23		
SEA URCHIN	47652				22					6		
SNAILS	47802					1						
LIMPETS	47902								1			

Table 39
Conversion Factors for Commercial Fishing

RESOURCE NAME	RESOURCE NUMBER	CONVERSION FACTORS (FREQUENCY)								
CHUM SALMON	11101	4.3 (3)	4.47 (1)	4.6 (7)	4.63 (3)	4.69 (8)	4.9 (3)	5 (3)	6 (5)	
COHO SALMON	11401	4.1 (13)	4.59 (1)	4.8 (15)	4.94 (37)	5.2 (14)	5.5 (9)	5.6 (15)	5.95 (15)	
KING SALMON	11501	11.76 (13)	12.3 (21)	13.02 (38)	13.6 (12)	13.81 (9)	14.6 (36)	15 (10)	15.2 (26)	16.9 (10)
PINK SALMON	11601	2.52 (7)	2.7 (2)	3.1 (3)	3.2 (2)	4.5 (5)				
SOCKEYE SALMON	11701	3.9 (26)	3.92 (17)	4.22 (2)	4.3 (22)	4.5 (15)	4.6 (15)	4.8 (17)	5.5 (23)	
COD	12251	1 (17)								
BLACK COD	12261	3.5 (1)								
GRAY COD	12271	3.5 (3)								
FLOUNDER	12311	1 (13)								
HALIBUT	12401	16.2 (10)	32 (31)							
HERRING	12451	0.5 (4)	30 (36)							
HERRING ROE	12501	4.94 (8)								
ROE ON KELP	12511	25 (25)								
SALMON ROE	12531	40 (3)								
DOLLY VARDEN	12831	1.4 (8)								
LAKE TROUT	12851	1.4 (1)								
RAINBOW TROUT	12861	1.4 (1)								
STEELHEAD	12871	1.4 (2)								
DUNGENESS	47211	1.6 (17)								
KING CRAB	47221	2.3 (6)								
TANNER CRAB	47231	0.7 (5)	1 (1)							
OCTOPUS	47501	4 (4)								

Table 40
Conversion Factors for Noncommercial Fishing

RESOURCE NAME	RESOURCE NUMBER	CONVERSION FACTORS (FREQUENCY)									
CHUM SALMON	11102	4.3 (8)	4.6 (12)	4.63 (3)	4.69 (10)	4.9 (25)	5 (1)	5.4 (6)	6 (14)		
COHO SALMON	11402	4.1 (48)	4.59 (47)	4.8 (59)	4.94 (24)	5.2 (4)	5.4 (8)	5.5 (26)	5.6 (39)	5.95 (16)	
KING SALMON	11500	15 (3)									
KING SALMON	11502	11.76 (5)	12.3 (29)	13.02 (9)	13.6 (4)	13.81 (58)	14.3 (10)	14.6 (68)	15.2 (69)	16.9 (13)	
PINK SALMON	11602	2.29 (7)	2.39 (2)	2.5 (4)	2.52 (6)	2.7 (29)	3.1 (24)	4.5 (7)			
SOCKEYE SALMON	11702	3.9 (45)	3.92 (14)	4 (68)	4.22 (57)	4.3 (9)	4.5 (3)	4.6 (38)	4.8 (63)	5.4 (7)	5.5 (41)
SALMON	11802	4.3 (1)	4.8 (11)	5.5 (3)							
SPAWNOUTS,SALMON	11902	2 (31)	2.52 (2)	4 (41)							
BLACKFISH	12052	0.25 (1)	1 (1)	30 (9)							
BURBOT	12102	1 (50)									
CISCO	12202	0.4 (1)	0.75 (6)								
COD	12252	1 (11)									
BLACK COD	12262	3.5 (1)									
GRAY COD	12272	3.5 (6)									
TOM COD	12292	5 (1)									
FLOUNDER	12312	1 (16)	5 (3)								
SOLE	12322	3 (3)									
GRAYLING	12352	0.7 (163)	0.75 (1)	1 (42)							
HALIBUT	12402	1 (1)	16.2 (10)	32 (17)							
HERRING	12452	30 (34)									
HERRING ROE	12502	40 (29)									
ROE ON KELP	12512	25 (33)									
PIKE	12602	2.8 (191)									
ROCKFISH	12612	1.5 (1)									
SCULPIN	12652	0.5 (5)									
GREENLING	12662	1 (1)									
SMELT	12752	0.13 (29)	0.2 (9)	0.25 (76)	6 (8)	30 (60)					
SUCKER	12762	1.5 (37)									
TROUT	12802	2.3 (12)									
DOLLY VARDEN	12832	-11111 (14)	1.4 (210)	1.8 (34)							
LAKE TROUT	12852	1.4 (2)	2.7 (83)								
RAINBOW TROUT	12862	1.4 (228)									
STEELHEAD	12872	1.4 (16)									
TROUT	12882	1.8 (6)									
WHITEFISH	12902	1 (96)									
WHITEFISH, LARGE	12912	1 (25)									
WHITEFISH, SMALL	12922	1 (23)									
LANDLOCKED SALMON	49450	1.5 (13)									

Table 41

Conversion Factors for Birds

RESOURCE NAME	RESOURCE NUMBER	CONVERSION FACTOR (FREQUENCY)			
SHOREBIRDS-SPRING	46135	0.1 (4)			
DUCKS	46150	1.5 (43)			
SEA DUCKS	46160	1.4 (48)	1.5 (22)		
DUCKS,UNKNOWN	46170	1.4 (36)	1.5 (7)		
DUCKS-SPRING	46175	0.97 (9)			
DUCKS-FALL	46176	0.72 (2)	0.97 (1)		
SANDHILL CRANE	46190	6 (25)	9 (1)	10 (1)	
SANDHILL CRANE-Spring	46195	6 (12)			
SANDHILL CRANE-Fall	46196	6 (6)			
MURRE EGGS	46240	0.05 (2)	4 (5)		
GULL EGGS	46250	0.05 (14)	0.15 (58)	2 (9)	6.8 (35)
GULL EGGS-SPRING	46255	0.15 (44)			
SWAN EGGS-SPRING	46275	0.3 (1)			
DUCK EGGS	46280	0.15 (8)	1.3 (2)		
DUCK EGGS-SPRING	46285	0.15 (11)			
GEESE EGGS	46290	0.15 (1)	2.6 (1)	7 (5)	
GEESE	46300	3 (18)	4 (28)	5 (9)	
BRANT	46310	3 (3)			
CANADA GEESE	46320	3 (2)	4 (10)		
CANADA GEESE-SPRING	46325	1.2 (1)			
CANADA GEESE-FALL	46326	1.2 (16)			
EMPEROR GEESE	46330	3 (16)	4 (3)		
EMPEROR GEESE-SPRING	46335	2.5 (11)			
EMPEROR GEESE-FALL	46336	2.5 (23)			
SNOW GEESE	46340	3 (1)	4 (3)		
SNOW GEESE-FALL	46346	2.3 (1)			
WHITEFRONT GEESE	46355	2.4 (12)			
WHITEFRONT GEESE	46356	2.4 (3)			
GEESE,UNKNOWN	46360	3 (3)	4 (1)		
GEESE-SPRING	46365	1.7 (8)			
GEESE-FALL	46366	1.7 (1)	1.8 (2)		
BLACKBRANT-SPRING	46375	1.2 (2)			
BLACKBRANT-FALL	46376	1.2 (10)			
BIG CANADA GEESE	46385	2.1 (16)			

Conversion Factors for Birds

RESOURCE NAME	RESOURCE NUMBER	CONVERSION FACTOR (FREQUENCY)			
BIG CANADA GEESE	46386	2.1 (1)			
SMALL CANADA GEESE	46395	1.2 (22)			
SMALL CANADA GEESE	46396	1.2 (1)			
GROUSE	46400	0.5 (44)	1 (105)		
PTARMIGAN	46450	0.5 (24)	0.7 (187)	1 (7)	
	46455	0.7 (38)			
	46505	8 (10)			
	46506	8 (3)			
TUNDRA SWAN	46510	10 (19)	18 (4)		
TUNDRA SWAN-SPRING	46515	6 (2)			
TUNDRA SWAN-FALL	46516	6 (2)			
EIDER	49120	1.6 (2)			
EIDER-SPRING	49125	1.6 (3)			
GADWALL-SPRING	49135	0.8 (2)			
GADWALL-FALL	49136	0.8 (6)			
GOLDENEYE-SPRING	49145	0.9 (1)			
GOLDENEYE-FALL	49146	0.9 (5)			
MALLARD-SPRING	49165	1 (61)			
MALLARD-FALL	49166	1 (41)			
PINTAIL-SPRING	49195	0.8 (51)			
PINTAIL-FALL	49196	0.8 (26)			
SCOTER-SPRING	49205	0.9 (4)			
TEAL-SPRING	49265	0.3 (10)			
TEAL-FALL	49266	0.3 (32)			
WIGEON-SPRING	49275	0.7 (2)			
WIGEON-FALL	49276	0.7 (5)			
SCAUP-SPRING	49285	0.7 (2)			
SCAUP-FALL	49286	0.7 (2)			
SCOTER, WHITE WIN	49336	0.9 (1)			
TERN EGGS	49390	0.15 (5)			
TERN EGGS-SPRING	49395	0.1 (13)			
SNIPE	49400	0.2 (2)			
CORMORANT EGGS	49410	0.15 (2)			
FRESH WATER DUCKS	49440	1.5 (39)			

Table 42

Proportion of Households Attempting to Harvest (Percent / 100)
(Part 1 of 5)

ATTEMPTS			COMMERCIAL FISHING					
VILLAGE	NAME	N	SALM	HERRING	HALIBUT	CRAB	SALT	FRESH
86	CHIGNIK BAY	19	0.474	0.105	0.526	0.158	0.158	0
87	CHIGNIK LAGOON	17	0.471	0.059	0.412	0.176	0.176	0.059
88	CHIGNIK LAKE	23	0.304	0.043	0.522	0.087	0.304	0
113	DILLINGHAM	153	0.19	0.092	0	0.013	0	0
122	EGEGIK	25	0.8	0	0	0.04	0.2	0.08
124	EKWOK	29	0.103	0	NA	NA	NA	NA
132	FALSE PASS	20	0.5	0.05	0.2	0.15	0.15	0.05
168	IGIUGIG	3	0	0	0	NA	0	NA
170	ILIAMNA	20	0.05	0	0	NA	0	NA
172	IVANOF	6	0.333	0	0.167	0	0.167	0
189	KING SALMON	43	0.093	0	NA	NA	NA	NA
198	KOKHANOK	19	0.105	0	0	NA	0	NA
200	KOLIGANEK	42	0.095	0	NA	NA	NA	NA
217	MANOKOTAK	54	0.463	0.5	0	0	0	0
236	NAKNEK	52	0.442	0.077	NA	NA	NA	NA
240	NELSON LAGOON	13	0.692	0	0	0	0	0
242	NEW STUYAHOK	40	0.075	0.1	NA	NA	NA	NA
243	NEWHALEN	11	0.091	0	0	NA	0	NA
252	NONDALTON	21	0.238	0	0	NA	0	NA
266	PEDRO BAY	17	0.059	0	0	NA	0	NA
269	PERRYVILLE	20	0.3	0	0.05	0.3	0.1	0
272	PILOT POINT	17	0.824	0.059	0.176	0.059	0.176	0.235
280	PORT ALSWORTH	13	0	0	0	NA	0	NA
283	PORT HEIDEN	37	0.622	0.027	0.081	0	0.108	0
290	QUINHAGAK	12	NA	NA	NA	NA	NA	NA
320	SOUTH NAKNEK	21	0.429	0.143	NA	NA	NA	NA
356	UGASHIK	5	1	0	0	0	0.2	0.4

Table 42 (continued)

Proportion of Households Attempting to Harvest (Percent / 100)
(Part 2 of 5)

ATTEMPTS		NONCOMMERCIAL FISHING				PLANTS		
	VILLAGE	SALMNC	ROE_HERNC	SALTnc	FRESHnc	BERRIES	PLANTS	SEAWEED
86	CHIGNIK BAY	0.789	0.105	0.737	0.053	0.684	0.368	0
87	CHIGNIK LAGOON	0.706	0.118	0.529	0.059	0.647	0.412	0
88	CHIGNIK LAKE	1	0.043	0.652	0.217	0.739	0.261	0
113	DILLINGHAM	0.588	0.105	0	0.516	0.634	0.124	0
122	EGEGIK	0.92	0	0.24	0.6	0.52	0.12	0
124	EKWOK	0.621	0.138	0	0.69	0.897	0.31	0
132	FALSE PASS	0.5	0	0.65	0.35	0.9	0.9	0.05
168	IGIUGIG	0.333	0	0	1	1	0	0
170	ILIAMNA	0.65	0	0	0.6	0.75	0.05	0
172	IVANOF	0.833	0	0.5	0.667	1	0.667	0
189	KING SALMON	0.744	NA	NA	0.767	NA	NA	NA
198	KOKHANOK	0.895	0	0	0.789	0.737	0.105	0
200	KOLIGANEK	0.69	0.071	0.095	0.81	0.81	0.286	0
217	MANOKOTAK	0.926	0.704	0.333	1	0.889	0.667	0
236	NAKNEK	0.712	NA	NA	0.75	NA	NA	NA
240	NELSON LAGOON	0.692	0	0.077	0.538	0.769	0.462	0
242	NEW STUYAHOK	0.75	0.125	0	0.85	0.925	0.475	0
243	NEWHALEN	0.455	0	0	0.455	0.727	0.091	0
252	NONDALTON	0.905	0	0	0.905	0.857	0.571	0
266	PEDRO BAY	0.824	0	0.059	0.765	0.882	0.706	0
269	PERRYVILLE	0.95	0	0.5	0.9	0.8	0.5	0
272	PILOT POINT	0.471	0	0.059	0.882	0.765	0.235	0
280	PORT ALSWORTH	0.615	0	0	0.615	0.538	0.308	0
283	PORT HEIDEN	0.514	0	0	0.595	0.703	0.243	0
290	QUINHAGAK	0.833	0	0	1	0.25	0	0
320	SOUTH NAKNEK	0.571	NA	NA	0.905	NA	NA	NA
356	UGASHIK	0.8	0	0	0.6	0.4	0.2	0

Table 42 (continued)

Proportion of Households Attempting to Harvest (Percent / 100)
(Part 3 of 5)

ATTEMPTS		INVERTEBRATES			GAME			
	VILLAGE	CLAMS	CRABS	OTHER	CARIBOU	MOOSE	BEAR	OTHERGME
86	CHIGNIK BAY	0.789	0.158	0.579	0.316	0.211	0	0
87	CHIGNIK LAGOON	0.647	0.235	0.059	0.294	0.294	0	0
88	CHIGNIK LAKE	0.565	0.087	0.174	0.739	0.261	0.174	0
113	DILLINGHAM	0.092	0	0	0.268	0.32	0	0
122	EGEGIK	0.28	0.04	0.12	0.8	0.16	0	0
124	EKWOK	NA	NA	NA	0.724	0.759	0	0
132	FALSE PASS	0.3	0.15	0.8	0.5	0.05	0	0.05
168	IGIUGIG	NA	NA	NA	0.333	0.333	0.333	0
170	ILIAMNA	0.05	0	0	0.2	0.1	0	0
172	IVANOF	0.833	0.167	0.833	0.667	0.167	0.333	0
189	KING SALMON	NA	NA	NA	0.535	0.372	0	0
198	KOKHANOK	NA	NA	NA	0.053	0.316	0	0
200	KOLIGANEK	0.095	0	0	0.738	0.571	0.119	0
217	MANOKOTAK	0.667	0	0	0.426	0.667	0.056	0
236	NAKNEK	NA	NA	NA	0.481	0.212	0	0
240	NELSON LAGOON	0.769	0.462	0.077	0.692	0.154	0	0
242	NEW STUYAHOK	0.075	0	0	0.825	0.6	0.05	0
243	NEWHALEN	NA	NA	NA	0.364	0	0.091	0
252	NONDALTON	NA	NA	NA	0.857	0.381	0.238	0
266	PEDRO BAY	0.235	0	0	0.059	0.176	0.059	0
269	PERRYVILLE	0.6	0.3	0.9	0.4	0.5	0.2	0
272	PILOT POINT	0.588	0	0	0.824	0.059	0	0
280	PORT ALSWORTH	0.154	0	0	0.231	0.385	0	0.077
283	PORT HEIDEN	0.838	0	0	0.703	0.054	0	0
290	QUINHAGAK	NA	NA	NA	0.25	0.167	0.083	0
320	SOUTH NAKNEK	NA	NA	NA	0.714	0.429	0	0
356	UGASHIK	0	0	0	0.8	0.2	0	0

Table 42 (continued)

Proportion of Households Attempting to Harvest (Percent / 100)
(Part 4 of 5)

ATTEMPTS		FUR BEARERS				MARINE MAMMALS		
	VILLAGE	BEAVER	HARE	PORCUPINE	OTHER	WHALE	SEAL	WALRUS
86	CHIGNIK BAY	0	0.053	0	0.105	0	0.105	0
87	CHIGNIK LAGOON	0.059	0	0	0.118	0	0.118	0
88	CHIGNIK LAKE	0	0	0.087	0.261	0	0.261	0
113	DILLINGHAM	0.065	0.065	0.124	0.078	0	0.039	0.013
122	EGEGIK	0	0.04	0.32	0.16	0	0	0
124	EKWOK	0.517	0.276	0.517	0.414	0	0	0
132	FALSE PASS	0	0	0	0.15	0.05	0.3	0
168	IGIUGIG	0.667	0.667	1	0.667	0	0.333	0
170	ILIAMNA	0.15	0.1	0.15	0.2	0	0.1	0
172	IVANOF	0	0.167	0	0.167	0	0.667	0
189	KING SALMON	0.14	0.07	0	0.209	0	0	0.023
198	KOKHANOK	0.316	0.474	0.684	0.421	0	0	0
200	KOLIGANEK	0.643	0.19	0.357	0.476	0	0.024	0
217	MANOKOTAK	0.778	0.444	0.667	0.648	0.259	0.519	0.093
236	NAKNEK	0.019	0.096	0.038	0.058	0	0.058	0
240	NELSON LAGOON	0	0.077	0	0	0	0.077	0
242	NEW STUYAHOK	0.625	0.175	0.45	0.425	0.025	0.05	0
243	NEWHALEN	0.364	0.091	0.455	0.273	0	0.182	0
252	NONDALTON	0.381	0.143	0.762	0.19	0	0	0
266	PEDRO BAY	0.235	0.118	0.118	0	0	0	0
269	PERRYVILLE	0	0.25	0.1	0.15	0	0.5	0
272	PILOT POINT	0.353	0.294	0.294	0.882	0	0.235	0
280	PORT ALSWORTH	0.077	0.077	0.077	0.308	0	0	0
283	PORT HEIDEN	0.054	0	0.108	0.27	0	0.135	0.054
290	QUINHAGAK	0.167	0.417	0.083	0.25	0	0.583	0.167
320	SOUTH NAKNEK	0	0.143	0.143	0.048	0	0	0
356	UGASHIK	0.4	0.4	0.2	0.8	0	0	0

Table 42 (continued)

Proportion of Households Attempting to Harvest (Percent / 100)
(Part 5 of 5)

ATTEMPTS				BIRDS/EGGS			ETHNICITY
VILLAGE	NAME	DUCKS	GEESE	GROUSE	EGGS	OTHERBRD	(Percent)
86	CHIGNIK BAY	0.316	0.316	0.105	0	0	0.877
87	CHIGNIK LAGOON	0.471	0.353	0.059	0	0	0.754
88	CHIGNIK LAKE	0.609	0.261	0.13	0.217	0.043	0.991
113	DILLINGHAM	0.216	0.105	0.431	0.098	0.02	0.509
122	EGEGIK	0.52	0.08	0.72	0.32	0.04	0.776
124	EKWOK	0.414	0.172	0.517	0	0.069	0.948
132	FALSE PASS	0.6	0.35	0.65	0.25	0	0.841
168	IGIUGIG	0.667	0.667	0.333	0.667	0	0.760
170	ILIAMNA	0.1	0.05	0.5	0.15	0	0.400
172	IVANOF	0.667	0.667	0.5	0.333	0	1.000
189	KING SALMON	0.372	0.186	0.349	NA	0.581	0.293
198	KOKHANOK	0.474	0.105	0.474	0.368	0.053	0.960
200	KOLIGANEK	0.619	0.429	0.548	0.167	0.238	0.963
217	MANOKOTAK	0.722	0.593	0.759	0.667	0.556	1.000
236	NAKNEK	0.212	0.135	0.269	NA	0.404	0.506
240	NELSON LAGOON	0.769	0.308	0.846	0.385	0	0.939
242	NEW STUYAHOK	0.625	0.45	0.3	0.05	0.05	1.000
243	NEWHALEN	0.182	0.091	0.455	0.636	0.182	0.940
252	NONDALTON	0.571	0.381	0.762	0.286	0.095	0.930
266	PEDRO BAY	0.353	0.059	0.412	0.647	0	0.940
269	PERRYVILLE	0.55	0.05	0.6	0.45	0	1.000
272	PILOT POINT	0.765	0.706	0.706	0.471	0.471	0.885
280	PORT ALSWORTH	0.231	0.231	0.538	0	0	0.400
283	PORT HEIDEN	0.432	0.351	0.595	0.622	0.135	0.728
290	QUINHAGAK	0.583	0.75	0.583	0	0.167	1.000
320	SOUTH NAKNEK	0.429	0.381	0.571	NA	0.571	0.855
356	UGASHIK	0.8	0.6	0.8	0.8	0.8	0.800

Table 43

Proportion of Households Harvesting (Percent / 100) (Grouped Categories)

VILLAGE NAME		COM FISH	NC FISH	PLANTS	INVT	GAME	FURBR	MARM	BIRDS
86	CHIGNIK BAY	0.737	0.632	0.789	0.789	0.211	0.105	0.105	0.526
87	CHIGNIK LAGOON	0.588	0.412	0.647	0.647	0.294	0.118	0.118	0.529
88	CHIGNIK LAKE	0.696	1	0.783	0.522	0.739	0.304	0.13	0.652
113	DILLINGHAM	0.209	0.719	0.621	0.092	0.281	0.196	0.039	0.484
122	EGEGIK	0.8	0.72	0.52	0.36	0.72	0.4	0	0.76
124	EKWOK	0.103	0.724	0.897	NA	0.655	0.586	0	0.517
132	FALSE PASS	0.5	0.7	1	0.8	0.35	0.15	0.3	0.7
168	IGIUGIG	0.00	1	1	NA	1	1	0.333	1
170	ILIAMNA	0.05	0.8	0.75	0.05	0.25	0.25	0.1	0.5
172	IVANOF	0.333	0.667	1	0.833	0.667	0.167	0.667	0.833
189	KING SALMON	0.093	0.884	NA	NA	0.442	0.256	0.023	NA
198	KOKHANOK	0.105	0.947	0.737	NA	0.316	0.789	0	0.579
200	KOLIGANEK	0.095	0.881	0.81	0.095	0.762	0.714	0	0.786
217	MANOKOTAK	0.722	0.944	0.926	0.648	0.481	0.87	0.5	0.944
236	NAKNEK	0.442	0.885	NA	NA	0.385	0.154	0.058	NA
240	NELSON LAGOON	0.692	0.846	0.846	0.923	0.615	0.077	0.077	0.846
242	NEW STUYAHOK	0.175	0.95	0.925	0.075	0.825	0.725	0.025	0.725
243	NEWHALEN	0.091	0.545	0.727	NA	0.455	0.636	0.182	0.636
252	NONDALTON	0.238	0.952	0.857	NA	0.857	0.762	0	0.81
266	PEDRO BAY	0.059	0.882	0.941	0.235	0.235	0.294	0	0.765
269	PERRYVILLE	0.55	1	0.8	0.9	0.55	0.25	0.5	0.75
272	PILOT POINT	0.824	0.941	0.765	0.588	0.765	0.882	0.235	0.882
280	PORT ALSWORTH	0.00	0.846	0.538	0.154	0.462	0.462	0	0.538
283	PORT HEIDEN	0.649	0.622	0.703	0.811	0.676	0.27	0.135	0.757
290	QUINHAGAK	NA	1	0.25	NA	0.25	0.5	0.583	0.833
320	SOUTH NAKNEK	0.429	0.905	NA	NA	0.571	0.238	0	NA
356	UGASHIK	1	1	0.4	0	0.8	0.8	0	0.8

Table 44

Proportion of Households Harvesting (Percent / 100)
(Part 1 of 5)

PERCENT HOUSEHOLD HARVESTING			COMMERCIAL FISHING					
VILLAGE	NAME	N	SALM	HERRING	HALIBUT	CRAB	SALT	FRESH
86	CHIGNIK BAY	19	0.474	0.105	0.526	0.158	0.158	0
87	CHIGNIK LAGOON	17	0.471	0.059	0.412	0.176	0.176	0.059
88	CHIGNIK LAKE	23	0.304	0.043	0.522	0.087	0.304	0
113	DILLINGHAM	153	0.19	0.092	0	0.013	0	0
122	EGEGIK	25	0.8	0	0	0.04	0.2	0.08
124	EKWOK	29	0.103	0	NA	NA	NA	NA
132	FALSE PASS	20	0.5	0.05	0.2	0.15	0.15	0.05
168	IGIUGIG	3	0	0	0	NA	0	NA
170	ILIAMNA	20	0.05	0	0	NA	0	NA
172	IVANOF	6	0.333	0	0.167	0	0.167	0
189	KING SALMON	43	0.093	0	NA	NA	NA	NA
198	KOKHANOK	19	0.105	0	0	NA	0	NA
200	KOLIGANEK	42	0.095	0	NA	NA	NA	NA
217	MANOKOTAK	54	0.463	0.5	0	0	0	0
236	NAKNEK	52	0.442	0	NA	NA	NA	NA
240	NELSON LAGOON	13	0.692	0	0	0	0	0
242	NEW STUYAHOK	40	0.075	0.1	NA	NA	NA	NA
243	NEWHALEN	11	0.091	0	0	NA	0	NA
252	NONDALTON	21	0.238	0	0	NA	0	NA
266	PEDRO BAY	17	0.059	0	0	NA	0	NA
269	PERRYVILLE	20	0.3	0	0.05	0.3	0.1	0
272	PILOT POINT	17	0.824	0.059	0.176	0.059	0.176	0.235
280	PORT ALSWORTH	13	0	0	0	NA	0	NA
283	PORT HEIDEN	37	0.622	0.027	0.081	0	0.108	0
290	QUINHAGAK	12	NA	NA	NA	NA	NA	NA
320	SOUTH NAKNEK	21	0.429	0	NA	NA	NA	NA
356	UGASHIK	5	1	0	0	0	0.2	0.4

Table 44 (continued)

Proportion of Households Harvesting (Percent / 100)
(Part 2 of 5)

	HARVEST	NONCOMMERCIAL FISHING				PLANTS		
	VILLAGE	SALMNC	ROE_HERNC	SALTnc	FRESHnc	BERRIES	PLANTS	SEAWEED
86	CHIGNIK BAY	0.526	0	0.211	0.053	0.684	0.368	0
87	CHIGNIK LAGOON	0.353	0	0.118	0	0.647	0.412	0
88	CHIGNIK LAKE	1	0	0.087	0.13	0.739	0.261	0
113	DILLINGHAM	0.569	0.098	0	0.503	0.621	0	0
122	EGEGIK	0.24	0	0.04	0.6	0.52	0.12	0
124	EKWOK	0.621	0.103	0	0.621	0.897	0.276	0
132	FALSE PASS	0.5	0	0.65	0.35	0.9	0.9	0.05
168	IGIUGIG	0.333	0	0	1	1	0	0
170	ILIAMNA	0.65	0	0	0.6	0.75	0.05	0
172	IVANOF	0.667	0	0.333	0.667	1	0.667	0
189	KING SALMON	0.744	NA	NA	0.767	NA	NA	NA
198	KOKHANOK	0.895	0	0	0.789	0.737	0.105	0
200	KOLIGANEK	0.667	0.071	0.095	0.81	0.81	0.286	0
217	MANOKOTAK	0.741	0.593	0.204	0.907	0.889	0.611	0
236	NAKNEK	0.712	NA	NA	0.75	NA	NA	NA
240	NELSON LAGOON	0.615	0	0.077	0.462	0.769	0.462	0
242	NEW STUYAHOK	0.675	0.1	0	0.825	0.925	0.475	0
243	NEWHALEN	0.455	0	0	0.455	0.727	0.091	0
252	NONDALTON	0.905	0	0	0.905	0.857	0.571	0
266	PEDRO BAY	0.824	0	0.059	0.765	0.882	0.706	0
269	PERRYVILLE	0.9	0	0.45	0.9	0.8	0.5	0
272	PILOT POINT	0.471	0	0.059	0.882	0.765	0.235	0
	PORT ALSWORTH	0.615	0	0	0.615	0.538	0.308	0
283	PORT HEIDEN	0.486	0	0	0.568	0.703	0.243	0
	QUINHAGAK	0.833	0	0	1	0.25	0	0
320	SOUTH NAKNEK	0.571	NA	NA	0.905	NA	NA	NA
356	UGASHIK	0.8	0	0	0.6	0.4	0.2	0

Table 44 (continued)

Proportion of Households Harvesting (Percent / 100)
(Part 3 of 5)

	HARVEST	INVERTEBRATES			GAME			
	VILLAGE	CLAMS	CRABS	OTHER	CARIBOU	MOOSE	BEAR	OTHERGME
86	CHIGNIK BAY	0.789	0.053	0.526	0.211	0.053	0	0
87	CHIGNIK LAGOON	0.647	0.059	0.059	0.176	0.176	0	0
88	CHIGNIK LAKE	0.522	0	0.13	0.739	0.261	0.087	0
113	DILLINGHAM	0.092	0	0	0.222	0.163	0	0
122	EGEGIK	0.28	0	0.12	0.72	0.04	0	0
124	EKWOK	NA	NA	NA	0.621	0.517	0	0
132	FALSE PASS	0.25	0.15	0.8	0.35	0	0	0.05
168	IGIUGIG	NA	NA	NA	0.333	0.333	0.333	0
170	ILIAMNA	0.05	0	0	0.2	0.1	0	0
172	IVANOF	0.833	0.167	0.833	0.667	0	0.333	0
189	KING SALMON	NA	NA	NA	0.442	0.093	0	0
198	KOKHANOK	NA	NA	NA	0.053	0.316	0	0
200	KOLIGANEK	0.095	0	0	0.738	0.524	0.119	0
217	MANOKOTAK	0.648	0	0	0.315	0.333	0.019	0
236	NAKNEK	NA	NA	NA	0.365	0.058	0	0
240	NELSON LAGOON	0.769	0.462	0.077	0.615	0.077	0	0
242	NEW STUYAHOK	0.075	0	0	0.825	0.55	0.025	0
243	NEWHALEN	NA	NA	NA	0.364	0	0.091	0
252	NONDALTON	NA	NA	NA	0.857	0.381	0.238	0
266	PEDRO BAY	0.235	0	0	0.059	0.176	0.059	0
269	PERRYVILLE	0.6	0.05	0.9	0.35	0.3	0.2	0
272	PILOT POINT	0.588	0	0	0.765	0.059	0	0
280	PORT ALSWORTH	0.154	0	0	0.231	0.385	0	0.077
283	PORT HEIDEN	0.811	0	0	0.676	0.027	0	0
290	QUINHAGAK	NA	NA	NA	0.25	0.167	0.083	0
320	SOUTH NAKNEK	NA	NA	NA	0.571	0.095	0	0
356	UGASHIK	0	0	0	0.8	0.2	0	0

Table 44 (continued)

Proportion of Households Harvesting (Percent / 100)
(Part 4 of 5)

HARVEST		FUR BEARERS				MARINE MAMMALS		
	VILLAGE	BEAVER	HARE	PORCUPINE	OTHER	WHALE	SEAL	WALRUS
86	CHIGNIK BAY	0	0.053	0	0.105	0	0.105	0
87	CHIGNIK LAGOON	0.059	0	0	0.118	0	0.118	0
88	CHIGNIK LAKE	0	0	0.043	0.261	0	0.13	0
113	DILLINGHAM	0.059	0.052	0.111	0.065	0	0.039	0.007
122	EGEGIK	0	0.04	0.32	0.16	0	0	0
124	EKWOK	0.517	0.207	0.414	0.414	0	0	0
132	FALSE PASS	0	0	0	0.15	0.05	0.3	0
168	IGIUGIG	0.667	0.667	1	0.667	0	0.333	0
170	ILIAMNA	0.15	0.1	0.15	0.2	0	0.1	0
172	IVANOF	0	0.167	0	0.167	0	0.667	0
189	KING SALMON	0.14	0.07	0	0.209	0	0	0.023
198	KOKHANOK	0.316	0.474	0.684	0.421	0	0	0
200	KOLIGANEK	0.643	0.167	0.357	0.476	0	0	0
217	MANOKOTAK	0.722	0.37	0.63	0.593	0.222	0.444	0.019
236	NAKNEK	0.019	0.096	0.038	0.058	0	0.058	0
240	NELSON LAGOON	0	0.077	0	0	0	0.077	0
242	NEW STUYAHOK	0.625	0.175	0.45	0.425	0	0.025	0
243	NEWHALEN	0.364	0.091	0.455	0.273	0	0.182	0
252	NONDALTON	0.381	0.143	0.762	0.19	0	0	0
266	PEDRO BAY	0.235	0.118	0.118	0	0	0	0
269	PERRYVILLE	0	0.25	0.05	0.05	0	0.5	0
272	PILOT POINT	0.353	0.294	0.294	0.824	0	0.235	0
280	PORT ALSWORTH	0.077	0.077	0.077	0.308	0	0	0
283	PORT HEIDEN	0.027	0	0.108	0.216	0	0.135	0.054
290	QUINHAGAK	0.167	0.417	0.083	0.25	0	0.583	0.167
320	SOUTH NAKNEK	0	0.143	0.143	0.048	0	0	0
356	UGASHIK	0.4	0.4	0.2	0.8	0	0	0

Table 44 (continued)

Proportion of Households Harvesting (Percent / 100)
(Part 5 of 5)

	HARVEST			BIRDS/EGGS			ETHNICITY
	VILLAGE	DUCKS	GEESE	GROUSE	EGGS	OTHERBRD	(Percent)
86	CHIGNIK BAY	0.316	0.316	0.105	0	0	0.877
87	CHIGNIK LAGOON	0.471	0.353	0.059	0	0	0.754
88	CHIGNIK LAKE	0.609	0.261	0.13	0.217	0.043	0.991
113	DILLINGHAM	0.216	0.098	0.418	0.092	0.013	0.509
122	EGEGIK	0.52	0.04	0.72	0.32	0.04	0.776
124	EKWOK	0.379	0.138	0.483	0	0.034	0.948
132	FALSE PASS	0.4	0.35	0.65	0.25	0	0.841
168	IGIUGIG	0.667	0.667	0.333	0.667	0	0.760
170	ILIAMNA	0.1	0.05	0.5	0.15	0	0.400
172	IVANOF	0.667	0.667	0.5	0.333	0	1.000
189	KING SALMON	NA	NA	NA	NA	NA	0.293
198	KOKHANOK	0.474	0.105	0.474	0.368	0.053	0.960
200	KOLIGANEK	0.619	0.429	0.548	0.167	0.238	0.963
217	MANOKOTAK	0.685	0.519	0.704	0.648	0.5	1.000
236	NAKNEK	NA	NA	NA	NA	NA	0.506
240	NELSON LAGOON	0.692	0.308	0.846	0.385	0	0.939
242	NEW STUYAHOK	0.6	0.45	0.3	0.05	0.05	1.000
243	NEWHALEN	0.182	0.091	0.455	0.636	0.182	0.940
252	NONDALTON	0.571	0.381	0.762	0.286	0.095	0.930
266	PEDRO BAY	0.353	0.059	0.412	0.647	0	0.940
269	PERRYVILLE	0.55	0.05	0.6	0.45	0	1.000
272	PILOT POINT	0.706	0.588	0.706	0.471	0.412	0.885
280	PORT ALSWORTH	0.231	0.231	0.538	0	0	0.400
283	PORT HEIDEN	0.432	0.243	0.595	0.595	0.108	0.728
290	QUINHAGAK	0.583	0.75	0.583	0	0.167	1.000
320	SOUTH NAKNEK	NA	NA	NA	NA	NA	0.855
356	UGASHIK	0.8	0.6	0.8	0.8	0.6	0.800

Table 45

Pounds per Household Harvested (Grouped Categories)

	VILLAGE NAME	COM FISH	NC FISH	PLANTS	INVT	GAME	FURBR	MARM	BIRDS
86	CHIGNIK BAY	226.84	490.42	NA	28.11	60.00	2.47	22.37	11.58
87	CHIGNIK LAGOON	301.65	191.71	NA	43.59	194.12	10.82	7.94	24.53
88	CHIGNIK LAKE	141.52	674.43	NA	15.52	551.74	6.04	14.57	25.00
113	DILLINGHAM	72.45	397.34	23.63	3.24	170.59	26.54	8.78	15.65
122	EGEGIK	160.92	95.36	NA	31.56	561.60	9.60	0.00	37.60
124	EKWOK	10.45	1744.86	63.28	NA	641.38	202.59	0.00	12.21
132	FALSE PASS	456.05	412.80	40.20	55.20	250.00	11.70	202.20	57.60
168	IGIUGIG	0.00	3309.00	148.00	NA	313.33	101.00	16.67	44.67
170	ILIAMNA	4.50	1407.35	63.15	0.85	121.50	10.70	7.50	10.25
172	IVANOF	262.17	817.67	NA	97.00	350.00	3.67	78.33	44.33
189	KING SALMON	34.93	322.35	NA	NA	298.60	16.53	13.02	NA
198	KOKHANOK	8.68	3213.58	90.05	NA	292.11	86.16	0.00	29.16
200	KOLIGANEK	74.69	1892.48	80.86	5.00	1139.57	248.02	0.00	44.88
217	MANOKOTAK	203.33	950.85	73.74	23.65	315.43	191.31	170.74	88.22
236	NAKNEK	81.71	294.63	NA	NA	201.35	4.69	3.23	NA
240	NELSON LAGOON	147.62	200.08	16.62	58.92	480.00	0.31	4.31	45.15
242	NEW STUYAHOK	14.68	2108.53	65.43	1.88	906.70	238.35	2.80	18.75
243	NEWHALEN	13.64	3391.00	47.00	NA	145.45	58.73	27.27	26.09
252	NONDALTON	9.29	4887.05	122.62	NA	931.90	118.48	0.00	45.38
266	PEDRO BAY	26.47	2298.18	36.65	10.12	145.29	14.24	0.00	13.76
269	PERRYVILLE	128.65	1036.45	NA	44.25	357.00	7.05	77.00	27.40
272	PILOT POINT	254.65	143.65	20.24	20.94	852.35	73.18	24.71	61.29
280	PORT ALSWORTH	0.00	909.08	26.85	4.00	343.08	16.08	0.00	15.92
283	PORT HEIDEN	137.59	131.95	38.62	49.35	695.68	8.46	43.32	37.46
290	QUINHAGAK	NA	2383.08	21.67	NA	400.00	48.42	561.67	141.58
320	SOUTH NAKNEK	105.00	177.86	NA	NA	465.71	4.29	0.00	NA
356	UGASHIK	353.80	359.40	37.80	0.00	816.00	101.80	0.00	51.20

Table 46

Pounds per Household Harvested
(Part 1 of 5)

POUNDS PER HOUSEHOLD HARVESTED				COMMERCIAL FISHING				
VILLAGE	NAME	N	SALM	HERRING	HALIBUT	CRAB	SALT	FRESH
86	CHIGNIK BAY	19	168.74	2.00	50.53	3.84	1.74	0.00
87	CHIGNIK LAGOON	17	238.41	2.94	52.71	5.88	1.65	0.06
88	CHIGNIK LAKE	23	83.13	0.78	52.87	0.65	4.09	0.00
113	DILLINGHAM	153	60.06	12.03	0.00	0.37	0.00	0.00
122	EGEGIK	25	155.08	0.00	0.00	0.04	5.16	0.64
124	EKWOK	29	10.45	0.00	NA	NA	NA	NA
132	FALSE PASS	20	364.05	3.00	67.35	7.15	14.30	0.20
168	IGIUGIG	3	0.00	0.00	0.00	NA	0.00	NA
170	ILIAMNA	20	4.50	0.00	0.00	0.00	0.00	0.00
172	IVANOF	6	249.83	0.00	10.67	NA	1.67	NA
189	KING SALMON	43	34.93	0.00	NA	NA	NA	NA
198	KOKHANOK	19	8.68	0.00	0.00	NA	0.00	NA
200	KOLIGANEK	42	74.69	0.00	NA	NA	NA	NA
217	MANOKOTAK	54	130.87	72.46	0.00	0.00	0.00	0.00
236	NAKNEK	52	81.71	0.00	NA	NA	NA	NA
240	NELSON LAGOON	13	147.62	0.00	0.00	0.00	0.00	0.00
242	NEW STUYAHOK	40	5.18	9.50	NA	NA	NA	NA
243	NEWHALEN	11	13.64	0.00	0.00	NA	0.00	NA
252	NONDALTON	21	9.29	0.00	0.00	NA	0.00	NA
266	PEDRO BAY	17	26.47	0.00	0.00	NA	0.00	NA
269	PERRYVILLE	20	109.15	0.00	16.00	2.20	1.30	0.00
272	PILOT POINT	17	236.94	2.94	9.47	1.47	0.94	2.88
280	PORT ALSWORTH	13	0.00	0.00	0.00	NA	0.00	NA
283	PORT HEIDEN	37	131.43	1.35	4.00	0.00	0.81	0.00
290	QUINHAGAK	12	NA	NA	NA	NA	NA	NA
320	SOUTH NAKNEK	21	105.00	0.00	NA	NA	NA	NA
356	UGASHIK	5	352.40	0.00	0.00	0.00	0.20	1.20

Table 46 (continued)

Pounds per Household Harvested
(Part 2 of 5)

POUNDS HARVESTED		NONCOMMERCIAL FISHING				PLANTS		
	VILLAGE	SALMNC	ROE_HERNC	SALTnc	FRESHnc	BERRIES	PLANTS	SEAWEED
86	CHIGNIK BAY	455.95	0.00	31.16	3.31579	NA	NA	NA
87	CHIGNIK LAGOON	186.06	0.00	5.65	0	NA	NA	NA
88	CHIGNIK LAKE	659.30	0.00	7.83	7.30435	NA	NA	NA
113	DILLINGHAM	357.74	11.11	0.00	28.4902	23.63	0.00	0.00
122	EGEGIK	62.28	0.00	5.12	27.96	NA	NA	NA
124	EKWOK	1515.38	4.31	0.00	225.172	60.97	2.31	0.00
132	FALSE PASS	244.65	0.00	124.85	43.3	28.90	11.10	0.20
168	IGIUGIG	2814.67	0.00	0.00	494.333	148.00	0.00	0.00
170	ILIAMNA	1305.20	0.00	0.00	102.15	63.05	0.10	0.00
172	IVANOF	757.00	0.00	24.67	36	NA	NA	NA
189	KING SALMON	275.47	NA	NA	46.8837	NA	NA	NA
198	KOKHANOK	2695.68	0.00	0.00	517.895	89.89	0.16	0.00
200	KOLIGANEK	1522.79	7.50	1.55	360.643	80.57	0.29	0.00
217	MANOKOTAK	578.59	103.20	2.69	266.37	64.89	8.85	0.00
236	NAKNEK	237.63	NA	NA	57	NA	NA	NA
240	NELSON LAGOON	169.92	0.00	1.92	28.2308	16.62	0.00	0.00
242	NEW STUYAHOK	1946.08	4.88	0.00	157.575	63.95	1.48	0.00
243	NEWHALEN	3260.36	0.00	0.00	130.636	47.00	0.00	0.00
252	NONDALTON	3980.48	0.00	0.00	906.571	122.19	0.43	0.00
266	PEDRO BAY	2094.12	0.00	1.88	202.176	35.53	1.12	0.00
269	PERRYVILLE	861.90	0.00	68.85	105.7	NA	NA	NA
272	PILOT POINT	88.82	0.00	2.94	51.8824	19.76	0.47	0.00
280	PORT ALSWORTH	867.08	0.00	0.00	42	26.85	0.00	0.00
283	PORT HEIDEN	105.35	0.00	0.00	26.5946	38.05	0.57	0.00
290	QUINHAGAK	1654.50	0.00	0.00	728.583	21.67	0.00	0.00
320	SOUTH NAKNEK	130.10	NA	NA	47.7619	NA	NA	NA
356	UGASHIK	285.60	0.00	0.00	73.8	37.60	0.20	0.00

Table 46 (continued)

Pounds per Household Harvested
(Part 3 of 5)

	POUNDS HARVESTED	INVERTEBRATES			GAME			
	VILLAGE	CLAMS	CRABS	OTHER	CARIBOU	MOOSE	BEAR	OTHERGME
86	CHIGNIK BAY	21.37	0.74	6.00	31.58	28.42	0.00	0.00
87	CHIGNIK LAGOON	22.65	20.88	0.06	35.29	158.82	0.00	0.00
88	CHIGNIK LAKE	14.61	0.00	0.91	397.83	140.87	13.04	0.00
113	DILLINGHAM	3.24	0.00	0.00	82.35	88.24	0.00	0.00
122	EGEGIK	31.04	0.00	0.52	540.00	21.60	0.00	0.00
124	EKWOK	NA	NA	NA	268.97	372.41	0.00	0.00
132	FALSE PASS	5.85	7.80	41.55	232.50	0.00	0.00	17.50
168	IGIUGIG	0.00	0.00	0.00	100.00	180.00	33.33	0.00
170	ILIAMNA	0.85	0.00	0.00	67.50	54.00	0.00	0.00
172	IVANOF	67.50	10.00	19.50	300.00	0.00	50.00	0.00
189	KING SALMON	NA	NA	NA	223.26	75.35	0.00	0.00
198	KOKHANOK	NA	NA	NA	7.89	284.21	0.00	0.00
200	KOLIGANEK	5.00	0.00	0.00	582.14	540.00	17.43	0.00
217	MANOKOTAK	23.65	0.00	0.00	112.50	200.00	2.93	0.00
236	NAKNEK	NA	NA	NA	170.19	31.15	0.00	0.00
240	NELSON LAGOON	35.77	22.00	1.15	438.46	41.54	0.00	0.00
242	NEW STUYAHOK	1.88	0.00	0.00	513.75	391.50	1.45	0.00
243	NEWHALEN	NA	NA	NA	136.36	0.00	9.09	0.00
252	NONDALTON	NA	NA	NA	564.29	334.29	33.33	0.00
266	PEDRO BAY	10.12	0.00	0.00	44.12	95.29	5.88	0.00
269	PERRYVILLE	14.50	0.25	29.50	165.00	162.00	30.00	0.00
272	PILOT POINT	20.94	0.00	0.00	820.59	31.76	0.00	0.00
280	PORT ALSWORTH	4.00	0.00	0.00	46.15	290.77	0.00	6.15
283	PORT HEIDEN	49.35	0.00	0.00	681.08	14.59	0.00	0.00
290	QUINHAGAK	NA	NA	NA	300.00	75.00	25.00	0.00
320	SOUTH NAKNEK	NA	NA	NA	414.29	51.43	0.00	0.00
356	UGASHIK	0.00	0.00	0.00	600.00	216.00	0.00	0.00

Table 46 (continued)

Pounds per Household Harvested
(Part 4 of 5)

POUNDS HARVESTED		FUR BEARERS				MARINE MAMMALS		
	VILLAGE	BEAVER	HARE	PORCUPINE	OTHER	WHALE	SEAL	WALRUS
86	CHIGNIK BAY	0.00	0.89	0.00	1.58	0.00	22.37	0.00
87	CHIGNIK LAGOON	4.71	0.00	0.00	6.12	0.00	7.94	0.00
88	CHIGNIK LAKE	0.00	0.00	0.35	5.70	0.00	14.57	0.00
113	DILLINGHAM	20.52	0.75	2.77	2.50	0.00	5.12	3.66
122	EGEGIK	0.00	0.44	6.72	2.44	0.00	0.00	0.00
124	EKWOK	187.59	3.31	8.28	3.41	0.00	0.00	0.00
132	FALSE PASS	0.00	0.00	0.00	11.70	125.00	77.20	0.00
168	IGIUGIG	20.00	7.00	53.33	20.67	0.00	16.67	0.00
170	ILIAMNA	3.00	0.25	4.40	3.05	0.00	7.50	0.00
172	IVANOF	0.00	1.83	0.00	1.83	0.00	78.33	0.00
189	KING SALMON	7.44	1.60	0.00	7.49	0.00	0.00	13.02
198	KOKHANOK	30.53	13.95	22.32	19.37	0.00	0.00	0.00
200	KOLIGANEK	191.43	2.57	13.71	40.31	0.00	0.00	0.00
217	MANOKOTAK	151.48	6.56	20.15	13.13	90.74	74.81	5.19
236	NAKNEK	1.92	2.12	0.46	0.19	0.00	3.23	0.00
240	NELSON LAGOON	0.00	0.31	0.00	0.00	0.00	4.31	0.00
242	NEW STUYAHOK	220.00	2.15	13.00	3.20	0.00	2.80	0.00
243	NEWHALEN	27.27	3.27	24.00	4.18	0.00	27.27	0.00
252	NONDALTON	76.19	1.05	38.86	2.38	0.00	0.00	0.00
266	PEDRO BAY	9.41	1.53	3.29	0.00	0.00	0.00	0.00
269	PERRYVILLE	0.00	1.65	0.40	5.00	0.00	77.00	0.00
272	PILOT POINT	11.88	3.29	4.71	53.29	0.00	24.71	0.00
280	PORT ALSWORTH	1.54	0.92	4.31	9.31	0.00	0.00	0.00
283	PORT HEIDEN	0.49	0.00	2.38	5.59	0.00	6.16	37.16
290	QUINHAGAK	24.17	8.83	1.67	13.75	0.00	361.67	200.00
320	SOUTH NAKNEK	0.00	1.38	2.67	0.24	0.00	0.00	0.00
356	UGASHIK	8.80	6.40	1.60	85.00	0.00	0.00	0.00

Table 46 (continued)

Pounds per Household Harvested
(Part 5 of 5)

	POUNDS HARVESTED			BIRDS/EGGS			Ethnicity
	VILLAGE	DUCKS	GEESE	GROUSE	EGGS	OTHERBRD	(Percent)
86	CHIGNIK BAY	5.26	4.74	1.58	0.00	0.00	0.877
87	CHIGNIK LAGOON	17.65	6.71	0.18	0.00	0.00	0.754
88	CHIGNIK LAKE	19.61	2.09	1.00	2.17	0.13	0.991
113	DILLINGHAM	5.31	2.01	8.20	0.01	0.12	0.509
122	EGEGIK	20.52	0.12	13.76	3.04	0.16	0.776
124	EKWOK	6.17	1.69	4.07	0.00	0.28	0.948
132	FALSE PASS	13.70	10.65	27.80	5.45	0.00	0.841
168	IGIUGIG	30.00	9.00	1.00	4.67	0.00	0.760
170	ILIAMNA	1.95	2.25	4.30	1.75	0.00	0.400
172	IVANOF	18.83	19.50	5.00	1.00	0.00	1.000
189	KING SALMON	NA	NA	NA	NA	NA	0.293
198	KOKHANOK	13.37	3.16	9.68	2.00	0.95	0.960
200	KOLIGANEK	19.12	9.29	12.36	0.74	3.38	0.963
217	MANOKOTAK	18.30	24.22	21.04	7.43	17.24	1.000
236	NAKNEK	NA	NA	NA	NA	NA	0.506
240	NELSON LAGOON	19.54	8.77	14.62	2.23	0.00	0.939
242	NEW STUYAHOK	10.63	4.33	2.50	0.65	0.65	1.000
243	NEWHALEN	6.45	1.36	10.64	4.36	3.27	0.940
252	NONDALTON	17.05	5.14	20.52	0.95	1.71	0.930
266	PEDRO BAY	8.06	0.71	1.76	3.24	0.00	0.940
269	PERRYVILLE	8.40	0.15	14.15	4.70	0.00	1.000
272	PILOT POINT	13.06	15.76	5.53	8.35	18.59	0.885
280	PORT ALSWORTH	7.15	3.46	5.31	0.00	0.00	0.400
283	PORT HEIDEN	8.54	11.38	7.05	9.46	1.03	0.728
290	QUINHAGAK	15.25	105.00	18.83	0.00	2.50	1.000
320	SOUTH NAKNEK	NA	NA	NA	NA	NA	0.855
356	UGASHIK	13.80	8.80	9.20	7.20	12.20	0.800

B. ANALYSES OF REGIONAL RELATIONS AMONG COMMUNITIES ON RESOURCE DATA

Our first step in analyzing the ADF&G data was to do a preliminary cluster analysis of Bristol Bay communities using the BAVERAGE method, which looks at the average linkage between groups using squared Euclidean measures of distance. Thirty-three variables were used in this cluster analysis; thirty-two were percentages of households in each community that harvest in the various categories of resources and the thirty-third was the percentage of Native residents of each community. The results of this preliminary cluster analysis were not altogether surprising. Communities appeared to cluster according to real differences in harvesting patterns (no doubt influenced by subregional differences in resource availability) and according to differences resulting from the various protocols administered at different points in time. We have no way of determining the degree to which each of these factors influences the clustering. Native composition of the communities influenced the clustering according to its proportion of the total number of variables used (one thirty-third), but this factor doubt influences the percentages of households harvesting various types of resources.

The results of this preliminary analysis indicated that the communities on the north side of Bristol Bay and the communities on the Alaska Peninsula were distinct from each other. On the north side of Bristol Bay, the upriver Nushagak communities of Koliganek, New Stuyahok, and Ekwok cluster together and then combine with four inland communities from the Iliamna Lake subregion (Nondalton, Kokhanok, Pedro Bay, and Newhalen). Interestingly enough, the Nushagak River communities first clustered with Nondalton, the Iliamna Lake community with the greatest involvement in subsistence activities. Dillingham clustered with two of the other Iliamna Lake communities (Iliamna and Port Alsworth) and then combined with a cluster containing the Bristol Bay Borough communities (King Salmon, Naknek, South Naknek).

On the Alaska Peninsula, those communities on the Bristol Bay side cluster together (Nelson Lagoon, Port Heiden, Pilot Point, Egegik, and Ugashik) while those on the Pacific Ocean side cluster together (Ivanof Bay, Perryville, Chignik Bay, Chignik Lagoon, Chignik Lake). Chignik Bay and Chignik Lake are the most alike, with Ivanof Bay and Perryville being more similar to each other than to the three Chigniks. False Pass was most unlike the other communities on the Alaska Peninsula and it is the only community from the Lower Alaska Peninsula included in the ADF&G Bristol Bay data set.

The three communities of Quinhagak, Igiugig, and Manokotak did not group with each other or with any other community. It should be noted that Quinhagak and Manokotak were each studied using a protocol unique to that village. This suggests some possibility of an instrumentation or history effect. The peculiar results from Igiugig, on the other hand, are probably due to the very small number of households in the sample (only 3 households were sampled).

The results that follow represent further multivariate analyses conducted on the resource data. It is interesting that the results are, for the most part, quite consistent with our preliminary analyses.

1. Multivariate Graphical Representation of Bristol Bay Communities

The large amount of data presented in the preceding tables is difficult to assimilate. The purpose of this section is to make use of a graphical techniques, Fourier plots, to make the similarities among communities more apparent. (For discussion of this method see Everitt, 1978; Flury & Reidwyl, 1988; Tufte, 1983; or Wang, 1978). The purpose of this technique is to represent high dimensional data in all of its dimensionality. That is, two variables are easily graphed in a traditional two dimensional Cartesian coordinate plot, and similarly, three variables are simply graphed in three dimensions. Graphing higher dimensions becomes increasingly less feasible and a graph of 20 variables in 20 dimensions, for example, is unthinkable. The technique used in this section, on the other hand, attempts to represent these higher order dimensions. Multidimensional data is represented as a Fourier function and results in a Fourier plot or a Fourier "blob".[7] Each blob

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[7] These plots are also called Polar Fourier representations because they are plots of the Fourier functions in polar coordinates. This method is a derivative of Andrews' (1972) Linear Fourier plots in which each of the r-dimensional observations, x_i, defines a function:

$$f(t) = x_1/\sqrt{2} + x_2 sin(t) + x_3 cos(t) + x_4 sin(2t) + x_5 cos(2t) + \dots$$

This function is then plotted over the range $-\pi \leq t \leq \pi$. Andrews showed that this function has many desirable properties including the fact that it preserves Euclidian distances. Thus, points that are close in the original r-dimensional space remain close together in the linear Fourier, or Andrews plot. The Polar Fourier plots presented in this report are simply the Andrews plots transformed into polar coordinates.

represents one community. Communities with similar values on all variables will have similarly shaped blobs. The factors influencing the shapes of the Fourier blobs are not readily apparent. The blobs may, however, facilitate identifying similarities among objects. No restriction in the number of variables used is imposed on a Fourier blob.

Representations of Percentage of Households Harvesting. Figure 1 through Figure 4 present the Fourier plots for percent of households harvesting for the variables presented in Table 33. Figure 1 shows the plots for the 27 communities that have nonmissing values for the variables associated with game, furbearers, marine mammals, birds (not eggs), noncommercial salmon, and noncommercial other fresh water fish. In addition, the percent of the community that is native was included in these analyses. Figure 2 shows the plots for the 24 communities that have nonmissing values on the resource variables shown in Figure 1 with the addition of eggs, plants, and the remaining noncommercial fish. Figure 3 gives the plots for the 18 communities with nonmissing data on all of the variables listed above with the addition of invertebrates. Finally, Figure 4 presents the plots for the 13 of the 27 communities with nonmissing data on ethnicity and all the variables presented in Table 33.

Figure 4 is best representative of the similarities and differences between communities because it compares them on all resource variables. However, missing data prevents all communities from being included. Figure 1 has the advantage of including all communities, but these communities are not compared on their harvesting of plants, marine invertebrates, eggs, noncommercial herring and roe, noncommercial saltwater fish and subsistence fish taken from commercial catches, again due to holes in the data. These variables, however, are important distinguishing features of Bristol Bay communities. Consequently, the four figures (1-4) should be used together, comparing specific pairs or sets of communities in the later figures when possible, then comparing all communities in the first figure.

Examining all four figures reveals that Chignik Bay and Chignik Lagoon are more similar to one another than to Chignik Lake. Ivanof and Perryville are also similar to one another (Figure 3 compares these last two communities on the most variables). False Pass is most different from the other five Pacific side communities (see Figure 3 and Figure 4), though it is most similar to Perryville and Ivanof. False Pass also contains features similar

Figure 1
Fourier Plots for Percent of Households Harvesting for Communities with Values on Game, Furbearers, Marine Mammals, Birds (no Eggs), Ethnicity, Noncommercial Salmon & Fresh Fish

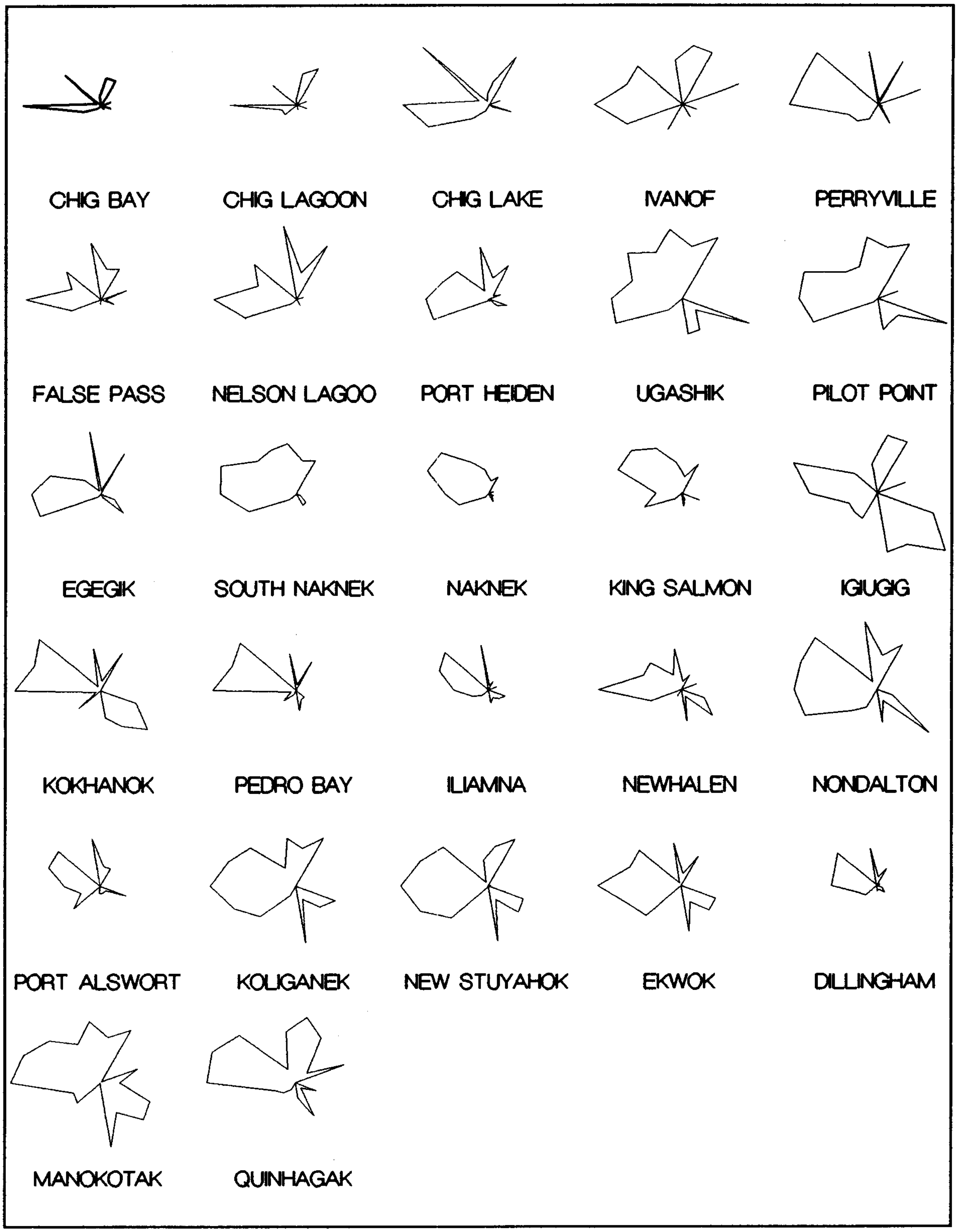


Figure 2
Fourier Plots for Percent of Households Harvesting for Communities with Values on Game, Furbearers, Marine Mammals, Birds, Eggs, Ethnicity, Plants & Noncommercial Fish

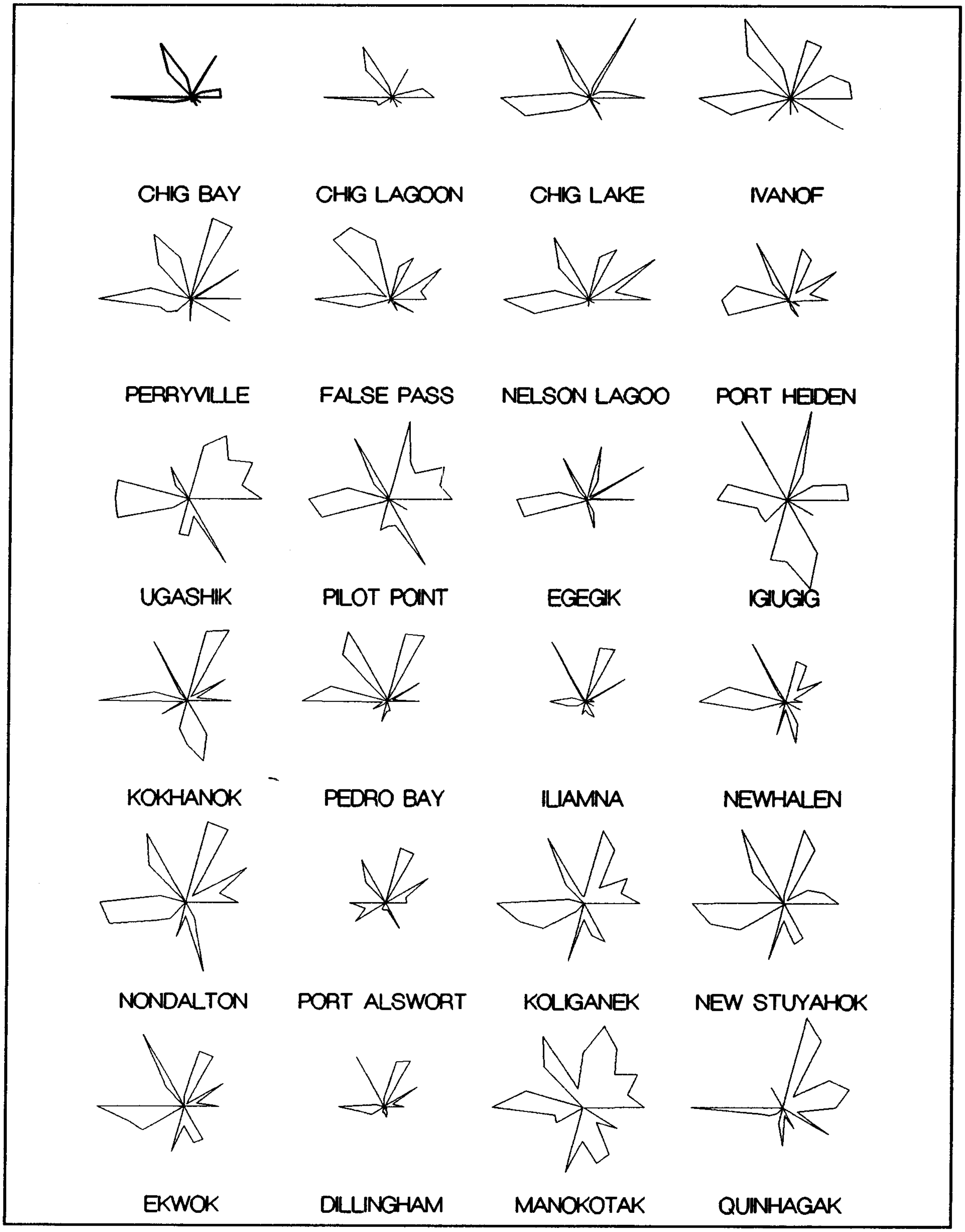


Figure 3
Fourier Plots for Percent of Households Harvesting for Communities with Values on Game, Birds, Eggs, Furbearers, Marine Mammals, Ethnicity, Plants, Noncommercial Fish & Invertebrates

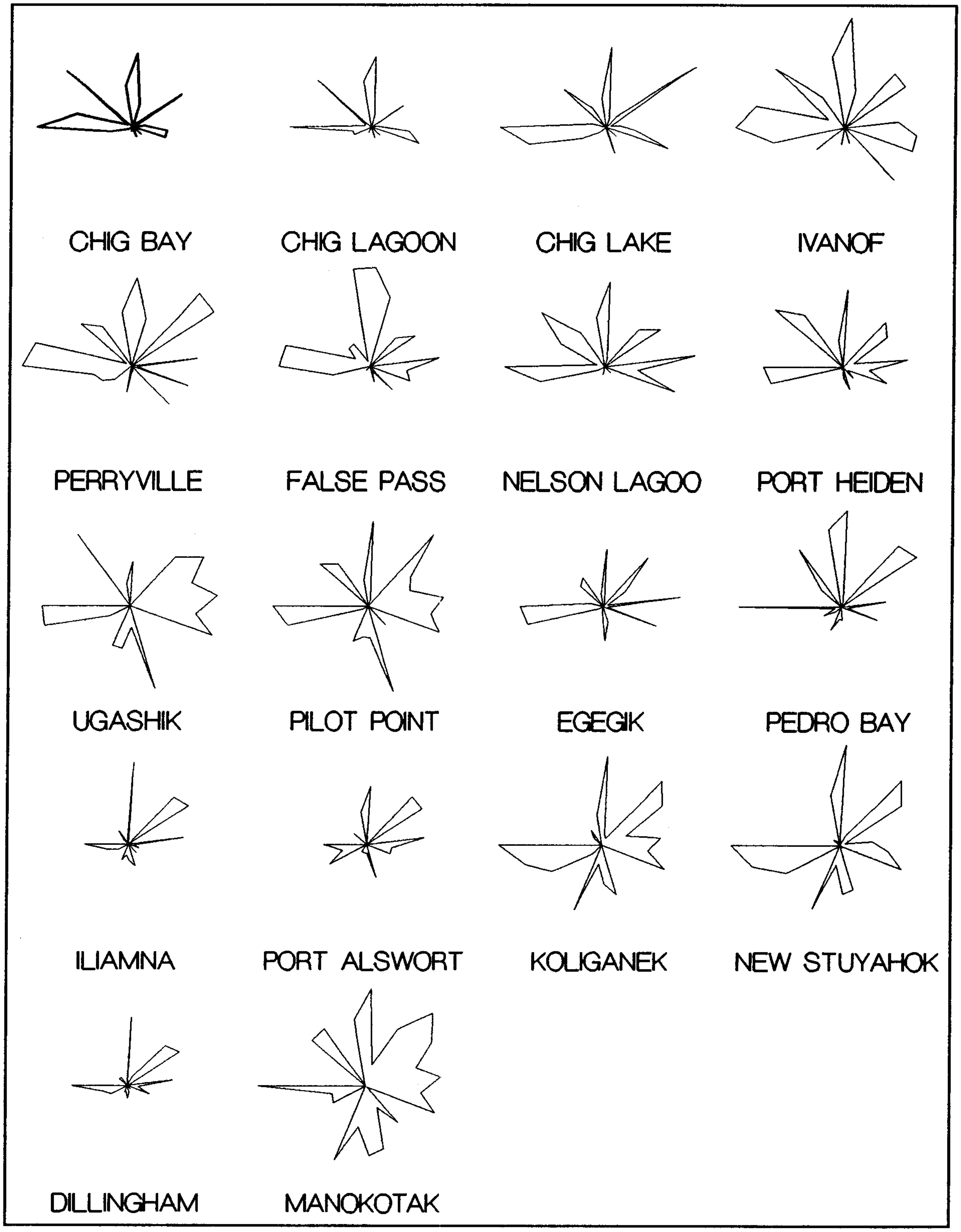
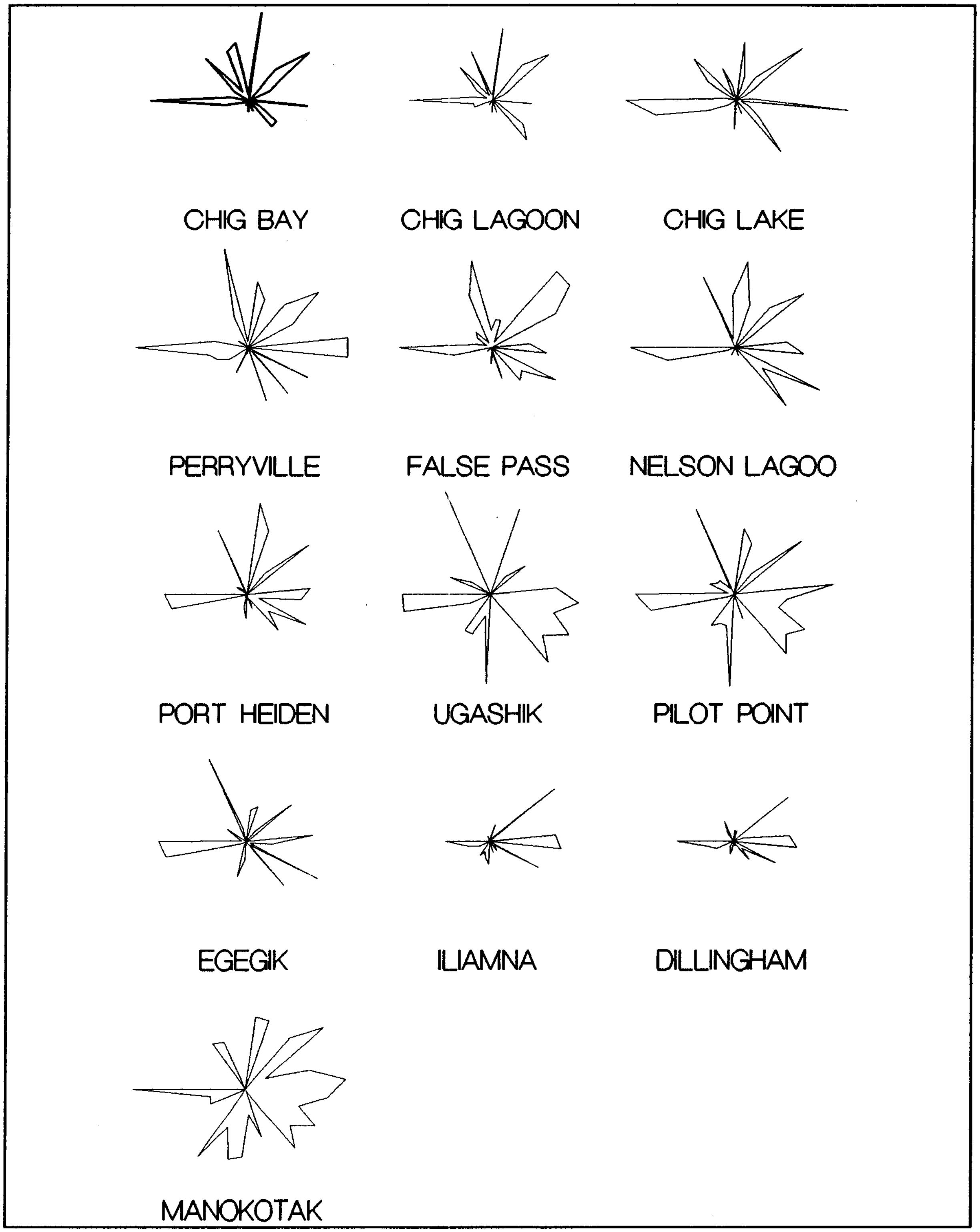


Figure 4
Fourier Plots for Percent of Households Harvesting for Communities with Values on All Variables (Game, Furbearers, Marine Mammals, Invertebrates, Plants, Birds, Commercial & Noncommercial Fish)



to Nelson Lagoon. Despite their differences, these six communities (Chignik Bay, Chignik Lagoon, Chignik Lake, Ivanof, Perryville and False Pass) all share similar characteristics and could be grouped into a cluster representing the Pacific side of the Alaska Peninsula.

Nelson Lagoon and Port Heiden share similar characteristics with False Pass and with Egegik, Ugashik, and Pilot Point. The latter two are quite similar to one another (best seen in Figure 4), which we would expect since they are located only seven miles apart on the same river drainage (the Ugashik River). Nelson Lagoon and Port Heiden seem to fit, both geographically and analytically, between the lower and the upper Alaska Peninsula. For parsimony sake, however, a cluster of communities on the Bristol Bay side of the Alaska Peninsula could be formed from Nelson Lagoon, Port Heiden, Egegik, Pilot Point, and Ugashik. The position of False Pass between the communities of the Pacific and the Bristol Bay side of the Alaska Peninsula makes sense in terms of its geographic location on a strait between the Bering Sea and the Pacific Ocean. The ecological niche from which its residents harvest resources shares certain characteristics with each side of the Alaska Peninsula, and residents have easy access to harvesting areas on both sides of the peninsula.

Naknek, South Naknek, and King Salmon are all quite similar to one another. King Salmon, as previously described, is somewhat unique in terms of its function as a military and government center and its high proportion of non-local residents. Yet clearly, in terms of percent of households harvesting various resources, these three Bristol Bay Borough communities form a cluster. The clustering of these three communities is most likely being influenced by protocol differences and missing data. These communities only appear in Figure 1 because of missing data on most commercial fish species, some noncommercial fish species, plants and berries, marine invertebrates, and birds.

Koliganek, New Stuyahok, Ekwok, and Nondalton share similar characteristics. Nondalton is the most different community among this grouping, perhaps reflective of the fact that it is the only Athapaskan community, with the other three being Yupik Eskimo communities. All of these communities are located inland or upriver, there is a high percentage of Alaskan Natives residing in them, and residents have high harvest levels relative to other communities throughout the state (ADF&G Subsistence Division 1989:14-15). These communities appear to retain certain subsistence orientations going back to aboriginal times that distinguished inland from coastal peoples. Presently, these communities are notable for the relatively high number of households that harvests non-commercial fish, game, and furbearers, and the relatively low number that harvest sea mammals and marine invertebrates or take subsistence fish from commercial catches. This group forms a "traditional, upriver" cluster of communities from the Nushagak River drainage and the Iliamna Lake subregion.

Iliamna, Newhalen, Port Alsworth, and Dillingham form an imperfect Iliamna Lake cluster (imperfect because Dillingham is located in the Nushagak River drainage). Of these communities, Dillingham, Iliamna, and Port Alsworth are the most alike (the similarity between Dillingham and Iliamna is evident in all four figures. The similarity between these three communities on percent of households harvesting various resources is probably mostly due to the fact that only 40% to 50% of their residents are Alaskan Natives, the lowest in Bristol Bay except for the Bristol Bay Borough communities of King Salmon and Naknek. Their harvesting activities may also be similar because these communities offer residents occupational alternatives to commercial fishing and people are less dependent upon subsistence resources. Newhalen is most different from the other communities in this cluster and shares many characteristics with the Nondalton-Koliganek-New Stuyahok-Ekwok cluster.

The plots for Kokhanok and Pedro Bay share many similarities which is perhaps not too surprising given their geographic proximity. Both are predominately Native although Kokhanok is primarily Aleut and Eskimo while Pedro Bay is predominantly Athapaskan.

Igiugig, Manokotak, and Quinhagak appear to be distinct from each other and from all other communities. The differences between Igiugig and other communities is greater in terms of percent of households harvesting than it is in terms of pounds per household harvested, reflecting the influence of the small sample size on all of the percentages (e.g., if one of the three households harvests a resource, 33% of Igiugig has harvested the resource). Manokotak and Quinhagak are both located within the greater Togiak subregion, but Quinhagak is on the far western end of that subregion and Manokotak on the far eastern end. Quinhagak is actually in the lower Kuskokwim River area and is a coastal community of the Bering Sea, not of Bristol Bay. Manokotak lies a short distance inland from Bristol Bay in an area dividing the Nushagak River drainage from the Togiak River drainage. Residents of Manokotak are unique in the fairly high participation of residents in a variety of harvesting activities; they take advantage of their unique position and avail themselves of the marine mammals and herring available in the Togiak subregion and of the game, furbearers, and fresh water fish available in areas north of their village and on the upper Nushagak River drainage. Given that Quinhagak and Manokotak occupy somewhat different ecological niches, it is not surprising that their resource harvesting patterns are distinct from one another.[8]

It should be noted that in using the harvest tables as an aid for comparing communities, King Salmon, Naknek, and South Naknek have "NA"s for ducks, geese, grouse, and other birds. These communities are, however, included in the Fourier plots. All analyses involving the bird (not eggs) variables and the communities of King Salmon, Naknek, and South Naknek used the percentages of households *attempting*. These numbers were used to reduce the amount of missing data. This substitution should not be a bad estimate for percentage harvesting birds given how closely the percentages in the attempting and harvesting tables generally coincide.

Representations of Pounds per Household Harvested. Figure 5 to Figure 9 present the plots for the pounds per household harvested for the variables in Table 33. For all of these plots, each variable was standardized before computing the Fourier function. Figure 5 shows the plots for the game, furbearers, marine mammals, noncommercial salmon, and noncommercial fresh water fish resource variables, on which all 27 communities have nonmissing values. Figure 6 presents the plots for the 24 communities that have nonmissing values on the bird, the remaining noncommercial fish (herring & roe, other saltwater fish), and the resource variables used in the previous figure. Figure 7 presents the plots for the 19 communities with data on all but the plant and commercial fish variables. Figure 8 shows the Fourier plots for the 13 communities with nonmissing data on all but the

[8] Other factors that may be influencing the research results are 1) differences in sampling procedures; 2) differences in the years studied (Quinhagak was studied in 1982 and Manokotak in 1985); and, 3) different research goals and protocols used.

commercial fishing variables. Finally, Figure 9 shows the Fourier blobs for the eight communities with nonmissing data on all variables. As with the previous set of figures containing Fourier blobs, Figure 5 to Figure 9 should be used in conjunction with one another in order to take into consideration the most variables and the most communities.

Examining all five figures reveals that the pounds per household data do not reproduce exactly the results of the percent of households harvesting data presented in Figure 1 through Figure 4. The Chigniks, in the case of pounds harvested per household, all seem distinct from one another (Figure 7). Chignik Bay harvests fewer pounds of moose. Chignik Lake takes more pounds of caribou than the other two Chigniks and more bear per household. Of the remaining Pacific side communities, the Fourier plots show that Ivanof and Perryville do not resemble the three Chigniks or False Pass (Figure 7). False Pass is different from all the other communities.

The communities on the Bristol Bay side of the Alaska Peninsula do not appear to cluster well using pounds per household harvested. In Figure 5, Nelson Lagoon, Port Heiden, and Egegik do appear similar to one another. Similarly, Ugashik and Pilot Point share similar characteristics. These similarities diminish, however, as more variables are added. The relationships between Nelson Lagoon, Port Heiden, Ugashik, Pilot Point, and Egegik are best seen in Figure 7, which shows the Fourier plots based on the most variables for these communities. In this figure, Nelson Lagoon and Egegik share many features. Nelson Lagoon also resembles Chignik Lagoon. Ugashik and Pilot Point begin to look quite different in this figure. In Figure 9, which shows the communities with nonmissing data on all variables, Nelson Lagoon and Port Heiden do have some similar characteristics, but Ugashik and Pilot Point are not really very similar in appearance. The Bristol Bay Borough communities of South Naknek, Naknek and King Salmon, are not especially similar in shape. South Naknek shares similar features with Egegik and Nelson Lagoon. Naknek and King Salmon are more similar to each other than to other communities.

For the communities on the north side of Bristol Bay, the Nushagak River drainage forms the clearest cluster. This cluster consists of Koliganek, New Stuyahok, and Ekwok (Figure 5 and Figure 6). Port Alsworth shares some characteristics with members of this cluster but is also similar to Dillingham (Figure 9). Of the remaining communities, Kokhanok and Nondalton are most different (Figure 5), while Pedro Bay, Iliamna, and

Figure 5
Fourier Plots for Pounds per Household Harvested for Communities with Values on Game, Furbearers, Marine Mammals, Noncommercial Fish & Birds

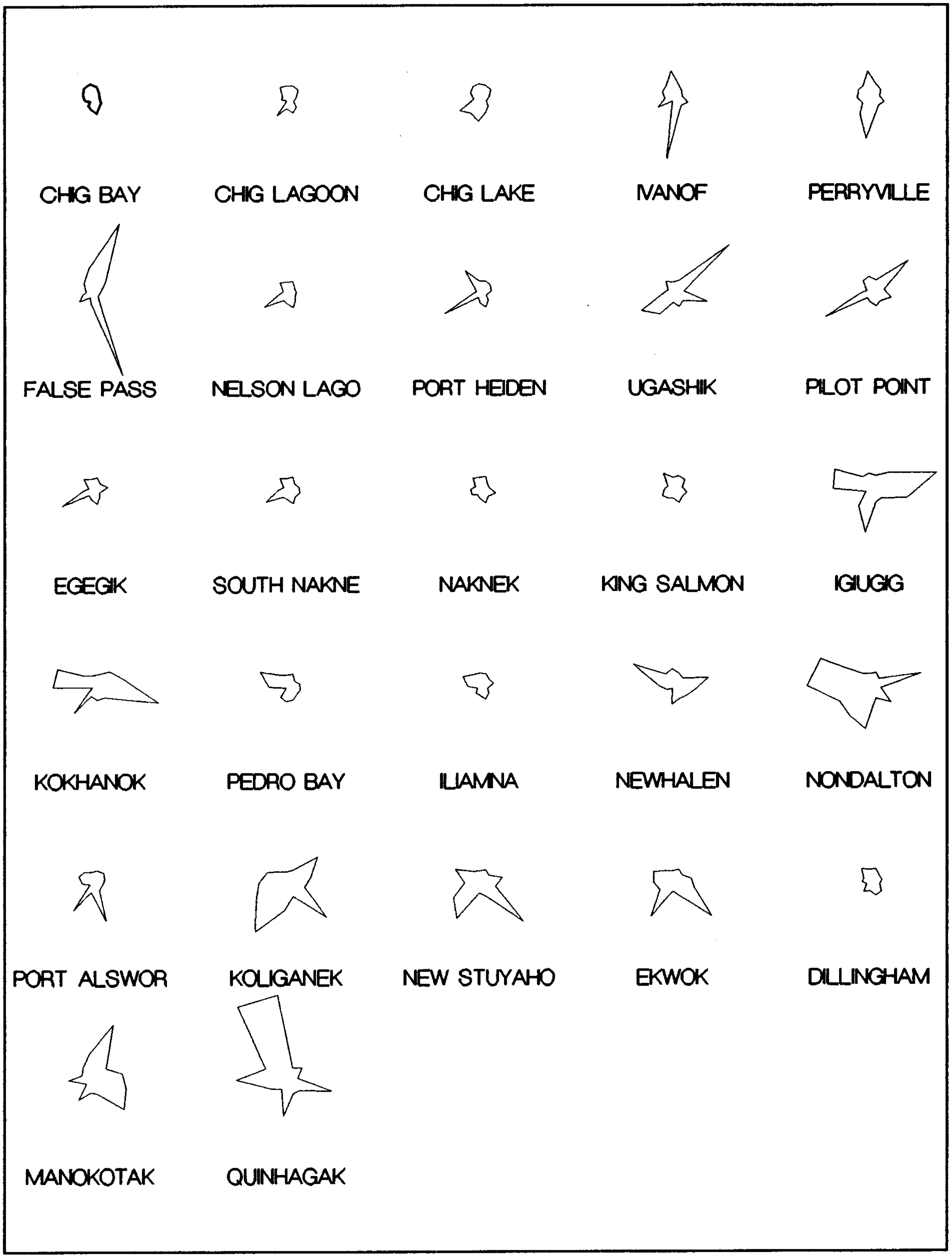


Figure 6
Fourier Plots for Pounds per Household Harvested for Communities with Values on Game, Furbearers, Marine Mammals, Noncommercial Fish, Birds & Invertebrates

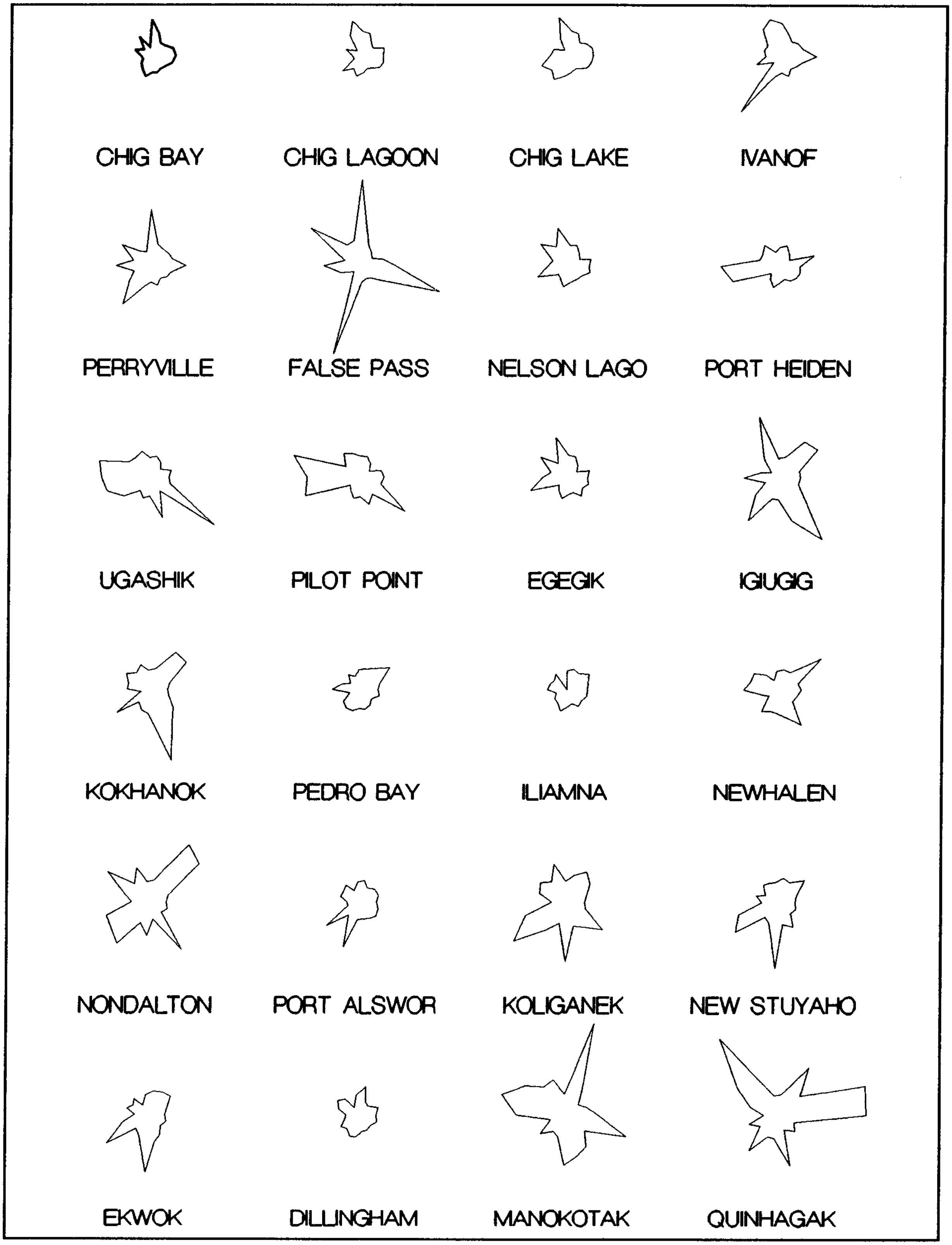


Figure 7
Fourier Plots for Pounds per Household Harvested for Communities with Values on Game, Furbearers, Marine Mammals, Noncommercial Fish, Birds, Invertebrates & Plants

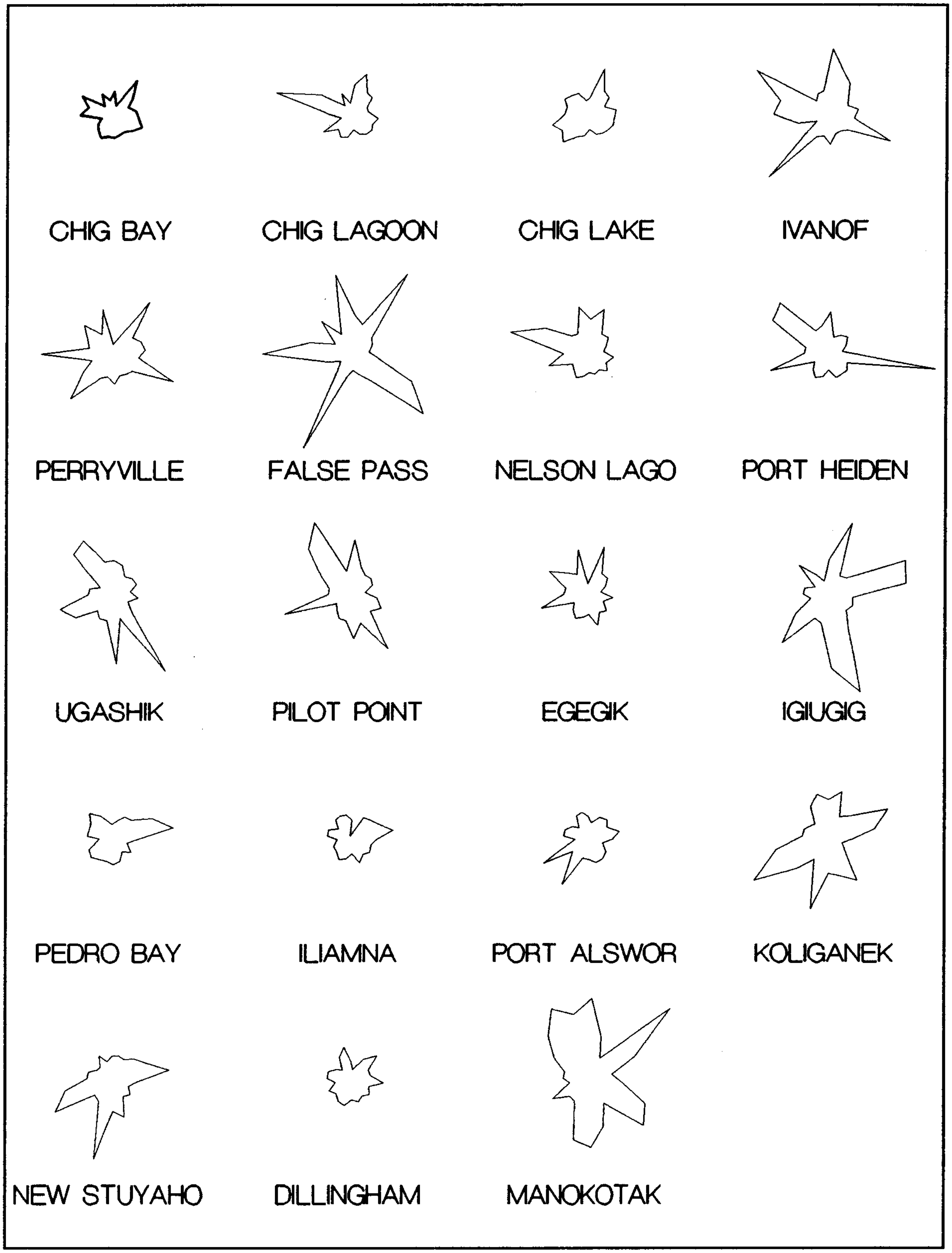
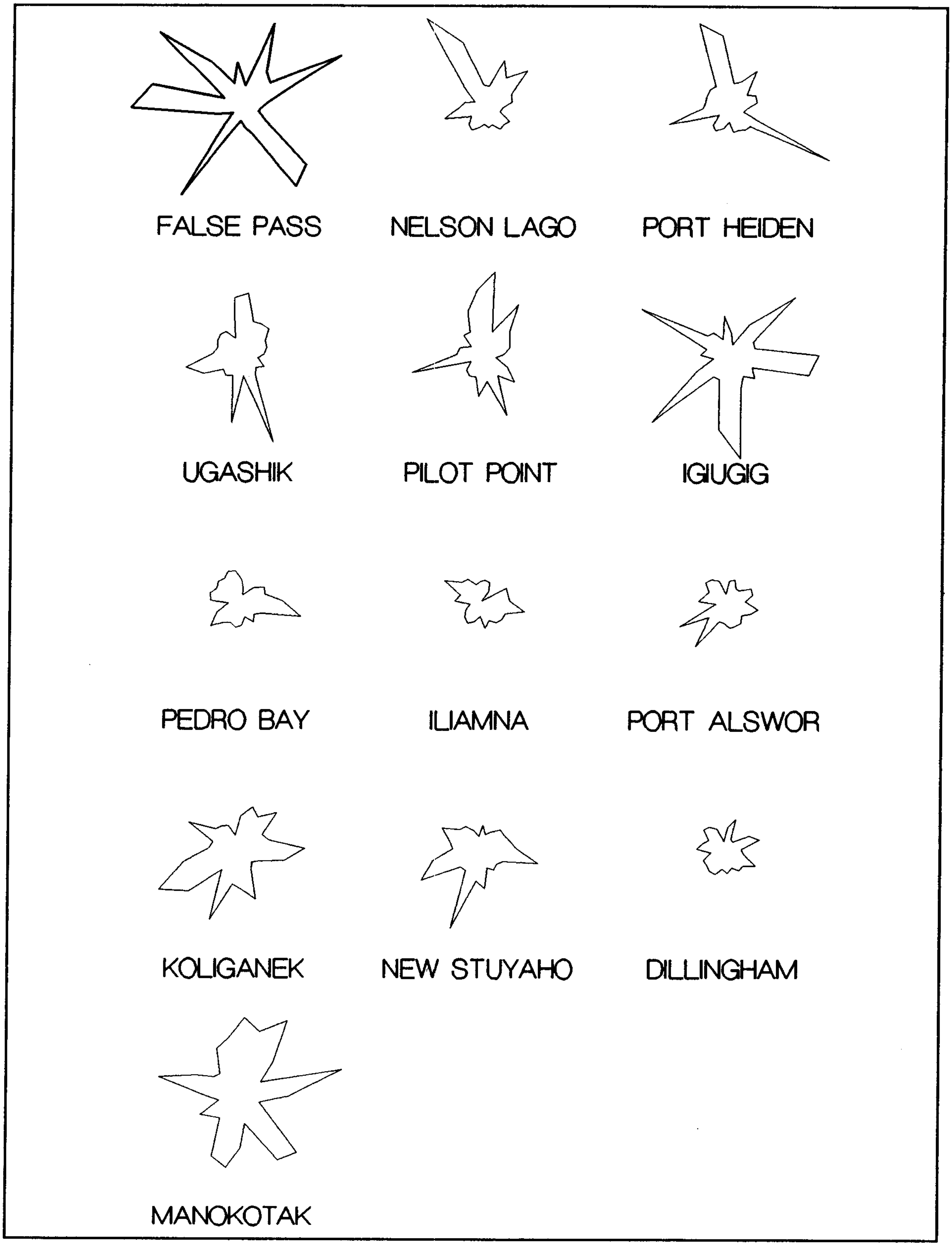


Figure 8

Fourier Plots for Pounds per Household Harvested for Communities with Values on Game, Birds Furbearers, Marine Mammals, Invertebrates, Plants, Noncommercial & Commercial Fish



Dillingham resemble each other. False Pass, Igiugig, Manokotak, and Quinhagak are not similar to each other or to any other community.

After examining the Fourier plots, it appears that using pounds per household results in graphical representations that do not lend themselves to categorization as readily as the percentage of households harvesting data. It may be that the percentage of households harvesting is a better measure than actual pounds per household harvested. The term "better" may mean that this measure more accurately reflects the construct of "involvement in subsistence activities." For the smaller communities, participation in the harvesting <u>is</u> probably a better measure than pounds per household harvested because a few big harvesters can easily throw off the average per household even if most households did not harvest a resource at all. Percentage of households harvesting may also be more reliable because the respondent's recall of the actual harvested amounts for each resource is probably less reliable than simply recalling if a resource was harvested. Consequently, measurement error could be making it difficult to cluster the communities on pounds harvested.

2. Multidimensional Similarity Structure Analyses of Resource Data

The third method we used for comparing communities was multidimensional similarity structure analyses (SSA). The purpose of SSA is to represent the similarity of a set of objects by distances in a multidimensional space. In general, the higher the correlation between objects, the closer together they are in the multidimensional space. For a very small number of objects, relationships can easily be discerned simply by examining the correlation matrix (or other similarity/dissimilarity matrix). When examining anything other than a small number of relationships, however, it is necessary to handle the quickly expanding number of relationships in a way that makes the task of understanding relations manageable. For instance, with only six objects there are 15 two-way relationships (e.g., a with b, a with c, a with d, a with e, a with f, and so on), 20 three-way relationships (e.g., a with b and c), 15 four-way relationships, and 6 five-way relationships. In the present analyses there are 27 communities in the Q mode. Clearly, then, some method is needed to make manageable the task of understanding the complex interrelationships. The method used here is the multidimensional similarity structure analysis (Borg & Lingoes 1987).

Because of the large amounts of missing data in the nonresource data files, it was decided that the analyses would focus on the two variables with the least amount of missing data: percent of households harvesting and the number of pounds per household harvested for the commercial fishing, noncommercial fishing, plants, invertebrates, game, furbearers, marine mammals, and birds resources. Percent of households harvesting a resource was computed by calculating the number of households within a community that harvested a resource and dividing by the total number of households surveyed in that community. Pounds per household harvested were calculated similarly. When harvesting information was missing for a resource, but pounds were available for that resource, the missing information was coded as harvested if pounds were greater than zero. When both pounds and harvest information were missing, then the data was left as missing (these are the cells in the previous tables marked "NA").

In order to analyze the data using SSA, it is necessary to construct a similarity matrix. Given that the data to be analyzed were percentages harvested and pounds harvested, the Pearson product-moment correlation was judged an appropriate similarity coefficient. Because of missing data problems, creation of a correlation matrix is not a simple matter. That is, a decision must be made as to whether the correlation matrix should be computed based on a *listwise* or *pairwise* computation of correlation coefficients. Correlations based on a listwise deletion are computed only for those cases that have complete information for all variables. Using this technique all coefficients in the correlation matrix are based on the same number of cases. This technique is generally preferred, when possible, because the pairwise method can lead to problems including inconsistency in the results. Unfortunately, using listwise deletion has its own tradeoffs, most notably the reduction in the number of cases to be analyzed. In the present study such a tradeoff is unacceptable. As seen in the Fourier plots, using listwise deletion can leave only eight communities available for analysis. Furthermore, the communities that would be dropped are by no means randomly distributed across the regions. The missing data is obviously related to the protocols used, and the same protocol tended to be used in all the communities in a subregion. Thus, eliminating communities means eliminating subregions. For example, in using listwise deletion the entire Bristol Bay Borough (communities of King Salmon, Naknek, South Naknek) would be eliminated.

Pairwise computation of correlation coefficients means that coefficients are computed based on the number of cases available for that particular relation. For example, all communities have a score for caribou and moose so the correlation between caribou and moose is based on all 27 cases. On the other hand, there are only 24 communities that have data on herring and halibut and so the correlation between these two resources is based on 24 cases. Use of this pairwise procedure results in a matrix in which all of the coefficients are *not* based on the same number of cases. As noted above this can lead to inconsistency problems. The SPSS manual gives a simple but instructive example: if a sample is taken in which age and weight have a high positive correlation and age and height have a high positive correlation, then it is impossible for height and weight to have a high negative correlation in this sample. This can, however, occur if the same individuals were not used to calculate all three coefficients. Thus, although we consider the consequences of listwise deletion unacceptable in the present circumstances, there are definite problems with the pairwise procedure. These problems are related to the nonrandom nature of the distribution of missing data; in short, the inadvertent confounding of protocol differences with subregional differences.

Percent of Households Harvesting (Q Mode). All the similarity structure analysis (or smallest space analysis, as they are also known) were conducted using Guttman-Lingoes' package. Table 47 presents the centrality and the scores for the two and three dimensional SSA-I solutions for the analyses of percent of households harvesting.[9] Following this table are the two (Figure 9) and three (Figure 10) dimensional plots of the SSA solution. As can be seen, the coefficient of alienation for the two dimensional solution indicates that 23 percent of the variation is unexplained by this solution, whereas 14 percent of the variation is left unexplained by the three dimensional solution. Examining the figures shows that there is a split between the communities on the Alaska Peninsula and the communities on the North Side of the Bay. Specifically, communities on the Alaska Peninsula tend to have scores that are less than zero on Dimension A in 2-D plot (less than 0 on Dimension C in 3-D plot) and the scores for the communities on the North Side of the Bay are greater than zero on Dimension A in the 2-D plot (greater than 0 on Dimension C in 3-D plot). Note that this result is similar to that found previously using the hierarchical cluster analysis. Within the Alaska Peninsula, a Pacific Side of the Alaska Peninsula cluster is made up of the Chigniks, False Pass, Ivanof, and Perryville. As with the cluster analysis, the three Chigniks were most alike, with the Bay and the Lagoon being the closest. Ivanof Bay and Perryville were more similar to each other than to the three Chigniks and were closer to False Pass than to the Chigniks. It should be noted that Chignik Bay, Chignik Lagoon, False Pass and Igiugig all had fairly high centralities and could be considered outliers.

The Bristol Bay side of the Alaska Peninsula forms another cluster made up of Egegik, Pilot Point, Ugashik, Port Heiden, Nelson Lagoon, King Salmon, Naknek, and South Naknek. These last three communities make up the Bristol Bay Borough, which is not distinguishable as a separate cluster in these analyses. Examining Figure 10 reveals that

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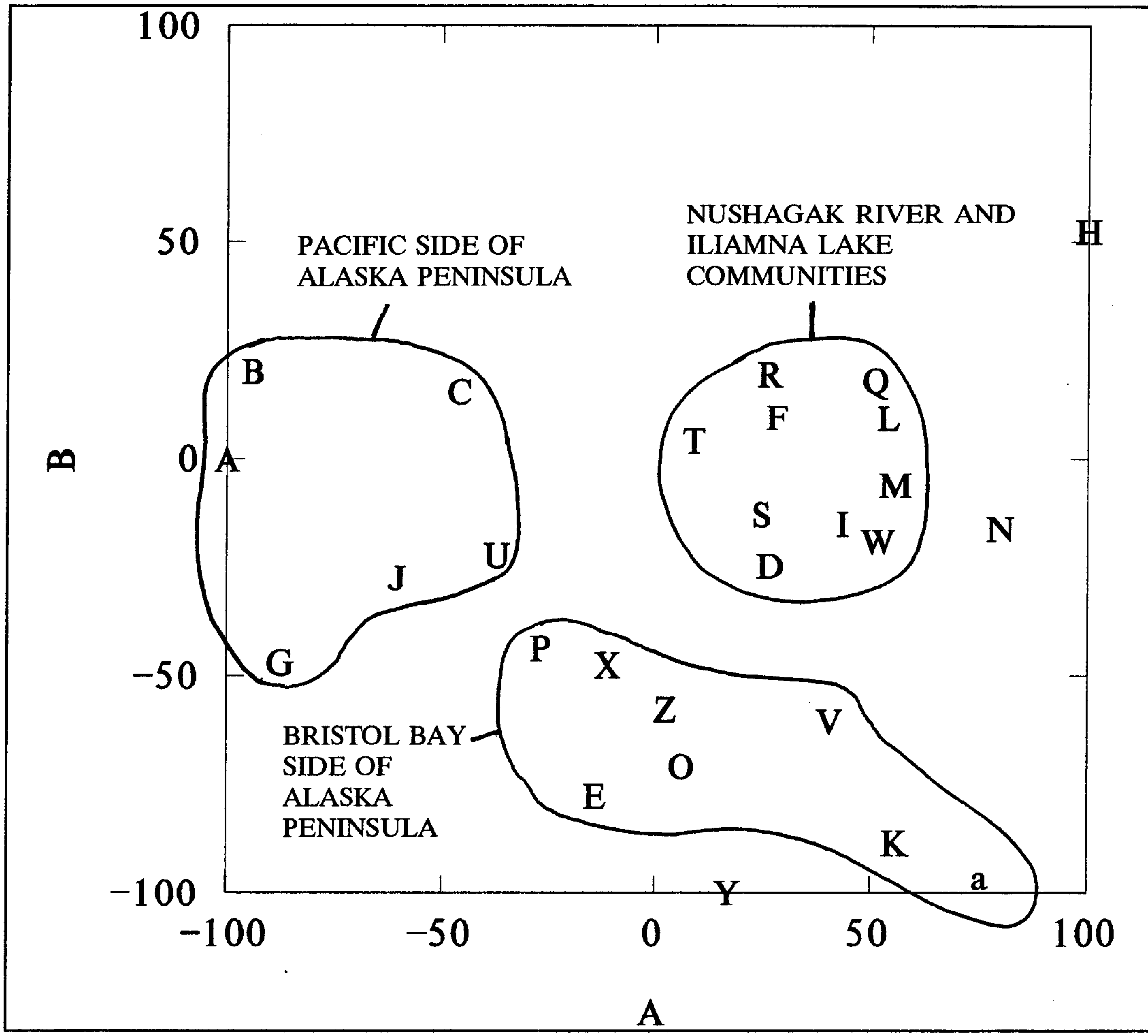
9 The centrality indicates how central a point is in the multidimensional space. Objects that are similar to one another tend to be closer together than the remaining objects and will tend to appear more centrally located in multidimensional space (Lingoes & Roskam, 1973). A high centrality indicates a weak relationship with the remaining objects (i.e., they are outliers).

Table 47
Guttman-Lingoes' Smallest Space Analysis (SSA-I)
Two and Three Dimensional Solutions
For Percent of Households Harvesting (Q Mode)

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
CHIGNIK BAY	A	112.899	-100.000	-0.248	112.143	-100.000	-56.926	-42.846
CHIGNIK LAGOON	B	113.834	-94.272	20.072	112.666	-87.771	-71.4	-75.111
CHIGNIK LAKE	C	69.42	-46.024	15.428	72.666	-44.642	-67.366	-65.109
DILLINGHAM	D	16.694	26.72	-24.995	25.572	26.435	-18.113	-20.291
EGEGIK	E	57.394	-13.956	-77.659	69.211	-3.124	-3.912	-100.000
EKWOK	F	39.358	28.231	9.379	44.426	25.393	-66.668	-42.851
FALSE PASS	G	99.962	-87.563	-47.134	102.63	-83.103	-19.026	11.701
IGIUGIG	H	118.924	100.000	52.257	117.958	100.000	-100.000	-37.962
ILIAMNA	I	35.056	43.53	-15.178	52.142	45.694	-27.877	0.188
IVANOF	J	70.581	-60.51	-27.816	73.779	-61.469	-33.806	-10.903
KING SALMON	K	77.86	55.739	-88.553	85.998	36.009	41.834	8.244
KOKHANOK	L	56.048	54.042	9.189	62.881	57.397	-56.041	-10.668
KOLIGANEK	M	49.505	55.62	-6.216	51.819	53.988	-45.469	-49.175
MANOKOTAK	N	70.367	79.808	-16.398	73.015	78.76	-22.466	-51.824
NAKNEK	O	45.556	6.215	-70.915	56.264	-4.846	23.356	-12.827
NELSON LAGOON	P	41.255	-26.865	-43.971	48.945	-33.903	-13.296	-57.59
NEW STUYAHOK	Q	59.765	51.004	17.993	61.464	51.004	-65.574	-55.076
NEWHALEN	R	47.9	26.754	19.368	54.524	28.437	-73.849	-17.936
NONDALTON	S	19.307	24.83	-13.117	22.103	25.567	-39.584	-34.796
PEDRO BAY	T	29.605	9.033	4.068	52.152	14.153	-43.425	13.424
PERRYVILLE	U	47.288	-37.161	-22.559	64.917	-31.284	-23.297	16.287
PILOT POINT	V	46.607	40.573	-60.727	58.873	27.603	-4.469	-86.317
PORT ALSWORTH	W	42.126	51.704	-19.339	59.478	52.641	-15.164	1.752
PORT HEIDEN	X	30.641	-11.09	-47.715	42.499	-15.448	-10.883	-67.502
QUINHAGAK	Y	74.8	16.943	-100.000	80.075	8.516	53.482	-36.743
SOUTH NAKNEK	Z	33.183	2.326	-57.795	39.757	-7.331	10.222	-35.64
UGASHIK	a	96.376	75.288	-96.444	96.131	49.482	32.07	-99.201

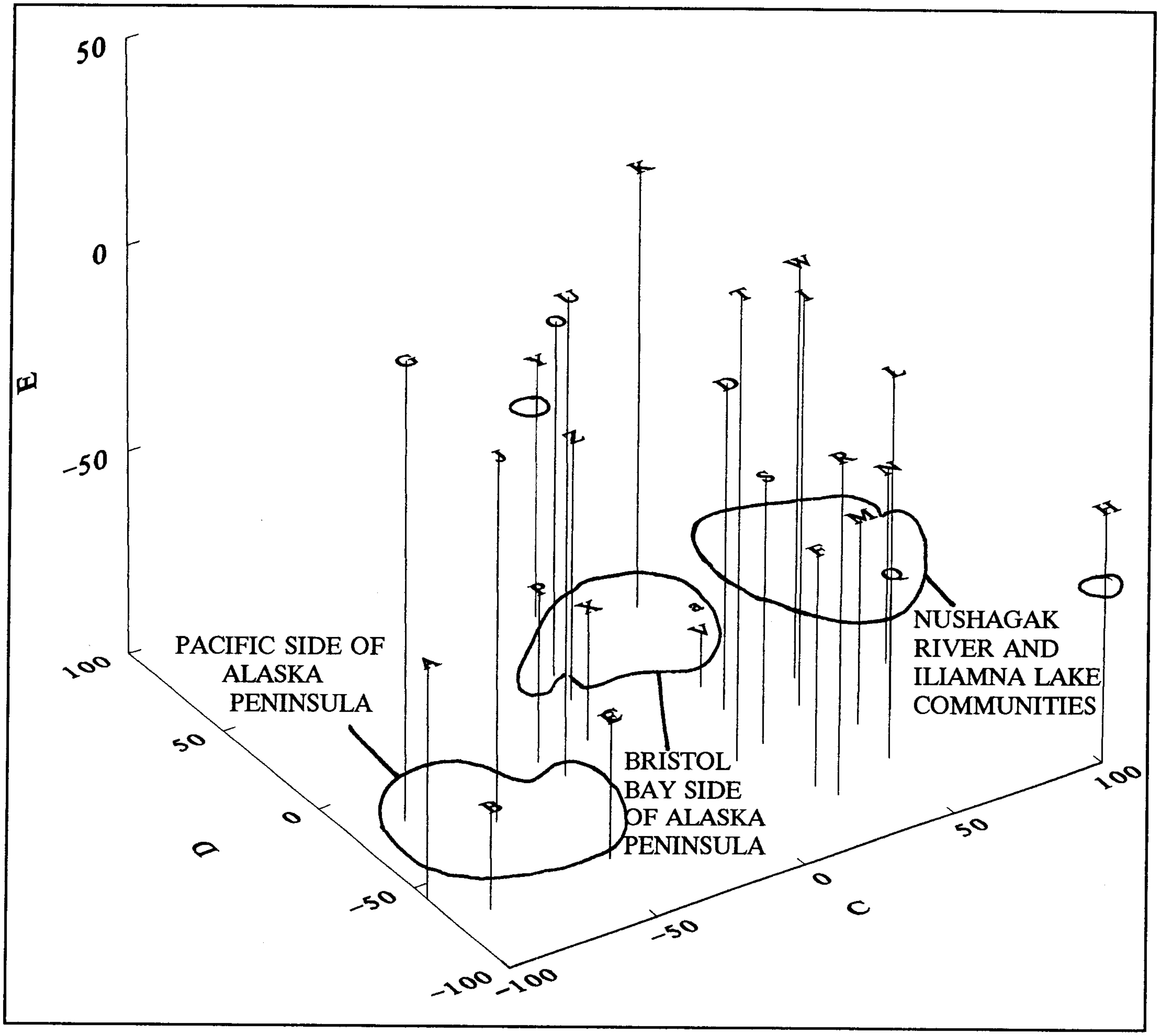
Figure 9
Percent of Households Harvesting
(Q Mode)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .22576, KRUSKAL'S STRESS = .20682.

CHIGNIK BAY	A	KOKHANOK	L	PORT ALSWORTH	W
CHIGNIK LAGOON	B	KOLIGANEK	M	PORT HEIDEN	X
CHIGNIK LAKE	C	MANOKOTAK	N	QUINHAGAK	Y
DILLINGHAM	D	NAKNEK	O	SOUTH NAKNEK	Z
EGEGIK	E	NELSON LAGOON	P	UGASHIK	a
EKWOK	F	NEW STUYAHOK	Q		
FALSE PASS	G	NEWHALEN	R		
IGIUGIG	H	NONDALTON	S		
ILIAMNA	I	PEDRO BAY	T		
IVANOF	J	PERRYVILLE	U		
KING SALMON	K	PILOT POINT	V		

Figure 10
Percent of Households Harvesting
(Q Mode)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .14057, KRUSKAL'S STRESS = .12880.

CHIGNIK BAY	A	KOKHANOK	L	PORT ALSWORTH	W
CHIGNIK LAGOON	B	KOLIGANEK	M	PORT HEIDEN	X
CHIGNIK LAKE	C	MANOKOTAK	N	QUINHAGAK	Y
DILLINGHAM	D	NAKNEK	O	SOUTH NAKNEK	Z
EGEGIK	E	NELSON LAGOON	P	UGASHIK	a
EKWOK	F	NEW STUYAHOK	Q		
FALSE PASS	G	NEWHALEN	R		
IGIUGIG	H	NONDALTON	S		
ILIAMNA	I	PEDRO BAY	T		
IVANOF	J	PERRYVILLE	U		
KING SALMON	K	PILOT POINT	V		

there is a considerable amount of variation in this Bristol Bay side of the Alaska Peninsula "cluster", King Salmon, Ugashik, and Pilot Point are all especially different. The north side of Bristol Bay forms a separate cluster. This cluster is made up of Dillingham, Ekwok, New Stuyahok, Koliganek, Nondalton, Newhalen, Iliamna, Port Alsworth, Pedro Bay, and Kokhanok. (Igiugig is an outlier and did not fall within this cluster.) Although the correlations are fairly high between all these communities, Ekwok, New Stuyahok, Koliganek, and Nondalton are highly correlated. It should be noted that the first three of these (and the most highly correlated) were all gathered using the same protocol. Similarly, Dillingham, Iliamna, and Port Alsworth are closely related. As a whole, however, it would be difficult to identify clusters within these eleven communities that are distinct enough to warrant defining them as separate.

Three communities do not fall into any cluster, and are not similar to one another: Manokotak, Quinhagak, and Igiugig. As noted previously, the results for Igiugig are probably due to the small sample size. The results for Manokotak and Quinhagak are more surprising. Given that they fall in the same subregion one might expect to see more similarity. The differences could represent actual differences (e.g., Quinhagak is a coastal community and Manokotak is not) or could be due to protocol differences. That is, Quinhagak, being one of the earliest communities studied, is missing quite a bit of data on important variables (especially commercial fishing). The observed differences could be a reflection of the missing data. In Figure 10 Manokotak appears similar to Koliganek, but examining its position using the numbers in Table 47 reveals that it is close only in height (dimension E). Koliganek and Kokhanok, which appear dissimilar in this figure, are actually really different only in height. Thus, despite the apparent similarity, Manokotak is not considered to fall in the same cluster as the upriver communities.

In sum, the results using percent of households harvesting data indicate three distinct regions: the Pacific side of the Alaska Peninsula, the Bristol Bay side of the Alaska Peninsula, and the north side of Bristol Bay.

Pounds per Household Harvested (Q Mode). Table 48 presents the two and three dimensional solutions for the similarity structure analysis of the pounds per household harvested. Plots of these solutions are shown in Figure 11 and Figure 12. The coefficient of alienation for the two solutions indicates that seven percent of the variation remains unexplained in the two dimensional solution, while only 3.7 percent remains unexplained in the three dimensional solution. Both the two and three dimensional plots reveal that the Bristol Bay side of the Alaska Peninsula forms a clear cluster made up of Nelson Lagoon, Port Heiden, Pilot Point, Ugashik, Egegik, and South Naknek. This cluster is comprised of the same communities that appeared in the analysis of percent of households harvesting, minus Naknek and King Salmon. These latter two communities are spaced near one another, but are separated from the other Bristol Bay side of the Alaska Peninsula communities.

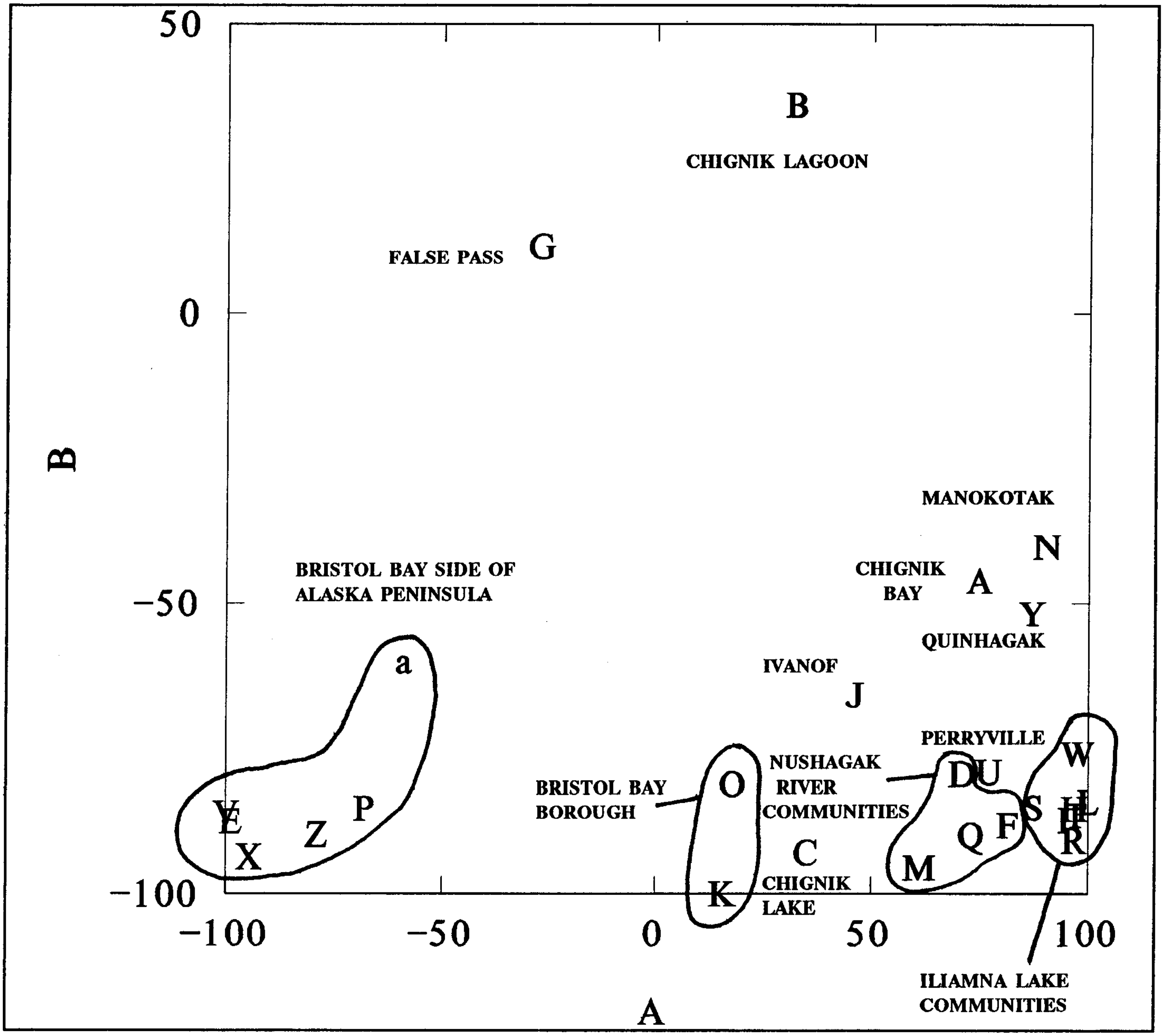
The degree to which the communities of the Iliamna Lake region are closely spaced (i.e., Pedro Bay, Newhalen, Iliamna, Igiugig, Kokhanok, Nondalton, and Port Alsworth) is striking. This degree of similarity among these communities was not apparent in the iconic representations presented in Figures 5 to 8. The communities of the Nushagak River drainage subregion are also closely spaced and the ordering follows their geographic location along the river (i.e., in Figure 11 the order is Koliganek, New Stuyahok, Ekwok, and Dillingham).

The communities of the Pacific side of the Alaska Peninsula do not seem to cluster together well. In particular, False Pass and Chignik Lagoon are particularly separated from the other communities.

Finally the communities of Quinhagak and Manokotak are different from each other and from all other communities (see Figure 12).

Figure 11 and Figure 12 are somewhat difficult to read because the solution forces most of the communities into a relatively small space. This is especially true of the communities north of Bristol Bay. To better see the relationships among these latter communities the smallest space analyses were repeated after removing False Pass, Chignik Lake and the communities of the Bristol Bay side of the Alaska Peninsula (Pilot Point, Egegik, Port Heiden, South Naknek, Nelson Lagoon, and Ugashik). All of these communities had fairly high centrality values. Removing these communities does not change the relationship between the remaining communities, but it does allow them to better fill the space and makes the plots easier to read.

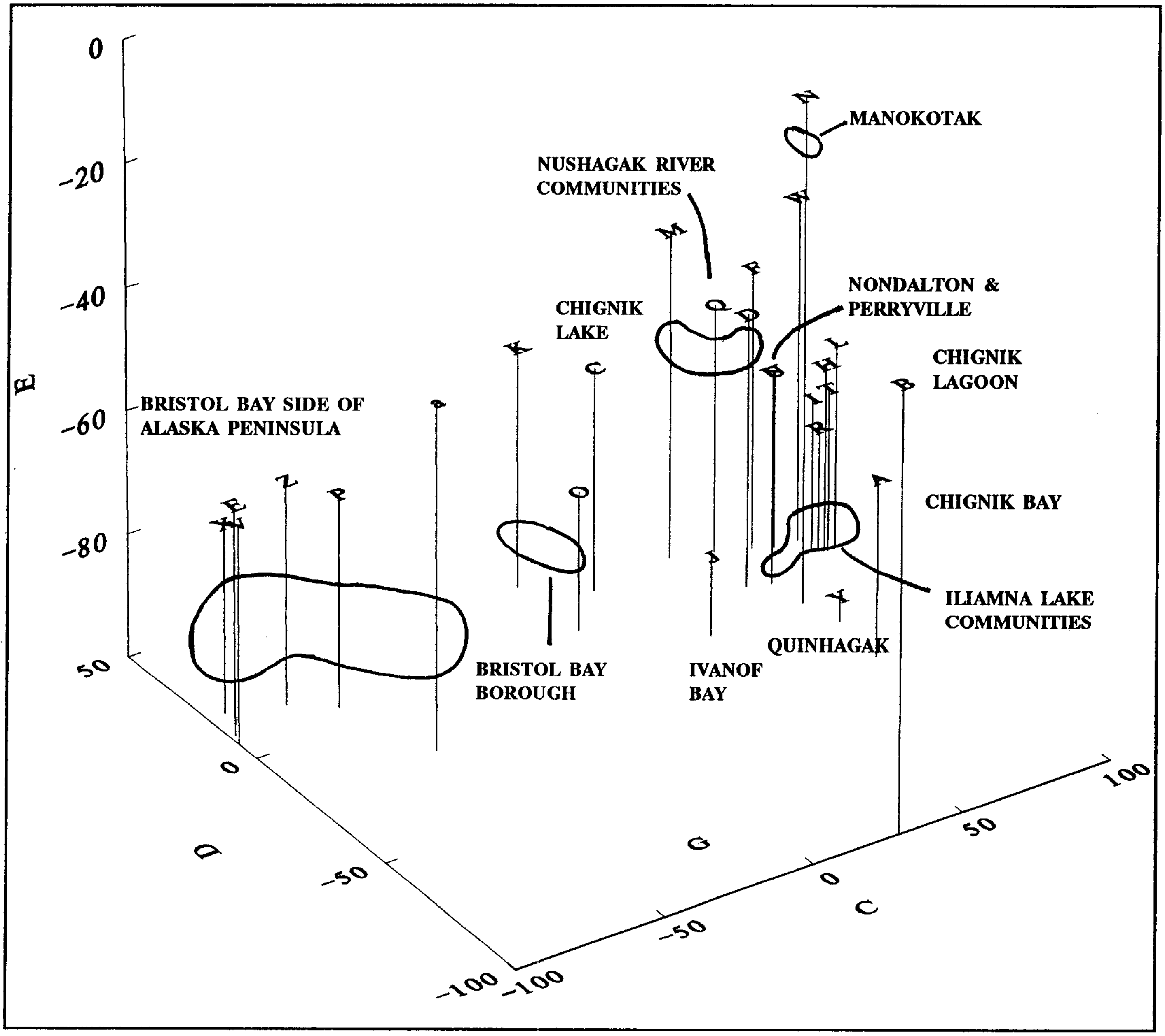
Figure 11
Pounds per Household Harvested
(Q Mode)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .07147, KRUSKAL'S STRESS = .06126.

CHIGNIK BAY	A	KOKHANOK	L	PORT ALSWORTH	W
CHIGNIK LAGOON	B	KOLIGANEK	M	PORT HEIDEN	X
CHIGNIK LAKE	C	MANOKOTAK	N	QUINHAGAK	Y
DILLINGHAM	D	NAKNEK	O	SOUTH NAKNEK	Z
EGEGIK	E	NELSON LAGOON	P	UGASHIK	a
EKWOK	F	NEW STUYAHOK	Q		
FALSE PASS	G	NEWHALEN	R		
IGIUGIG	H	NONDALTON	S		
ILIAMNA	I	PEDRO BAY	T		
IVANOF	J	PERRYVILLE	U		
KING SALMON	K	PILOT POINT	V		

Figure 12
Pounds per Household Harvested
(Q Mode)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .03740, KRUSKAL'S STRESS = .03175.

CHIGNIK BAY	A	KOKHANOK	L	PORT ALSWORTH	W
CHIGNIK LAGOON	B	KOLIGANEK	M	PORT HEIDEN	X
CHIGNIK LAKE	C	MANOKOTAK	N	QUINHAGAK	Y
DILLINGHAM	D	NAKNEK	O	SOUTH NAKNEK	Z
EGEGIK	E	NELSON LAGOON	P	UGASHIK	a
EKWOK	F	NEW STUYAHOK	Q		
FALSE PASS	G	NEWHALEN	R		
IGIUGIG	H	NONDALTON	S		
ILIAMNA	I	PEDRO BAY	T		
IVANOF	J	PERRYVILLE	U		
KING SALMON	K	PILOT POINT	V		

Table 48
Guttman-Lingoes' Smallest Space Analysis (SSA-I)
Two and Three Dimensional Solutions
For Pounds per Household Harvested (Q Mode)

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
CHIGNIK BAY	A	49.092	74.708	-46.015	57.563	76.964	-37.467	-71.175
CHIGNIK LAGOON	B	108.682	32.108	35.981	104.188	28.596	-100.000	-27.531
CHIGNIK LAKE	C	20.289	34.972	-92.927	20.624	29.359	17.997	-63.475
DILLINGHAM	D	37.925	70.792	-79.574	36.756	67.351	1.44	-55.481
EGEGIK	E	133.297	-98.96	-87.634	130.899	-98.456	10.181	-62.431
EKWOK	F	50.294	81.285	-88.367	52.007	80.153	13.921	-54.04
FALSE PASS	G	103.731	-26.936	11.617	100.347	-20.964	-79.868	-100.000
IGIUGIG	H	64.53	96.744	-85.496	66.415	97.534	5.299	-69.727
ILIAMNA	I	62.609	94.339	-87.457	63.739	93.964	6.31	-75.16
IVANOF	J	14.429	46.266	-65.972	27.43	43.616	-11.488	-87.104
KING SALMON	K	32.632	15.633	-100.000	36.85	12.15	28.522	-60.805
KOKHANOK	L	67.515	100.000	-84.337	68.526	100.000	4.109	-66.038
KOLIGANEK	M	35.788	61.062	-95.516	38.671	57.519	20.492	-46.498
MANOKOTAK	N	65.341	90.245	-40.303	64.344	75.638	-10.806	-17.665
NAKNEK	O	17.74	17.975	-81.283	24.037	13.681	6.053	-77.31
NELSON LAGOON	P	102.511	-68.221	-85.421	98.313	-65.959	7.696	-65.212
NEW STUYAHOK	Q	42.978	72.841	-89.988	43.121	69.923	17.19	-59.461
NEWHALEN	R	65.834	96.757	-90.921	66.873	96.122	6.166	-80.248
NONDALTON	S	55.407	87.433	-85.372	56.146	85.715	11.644	-71.007
PEDRO BAY	T	65.051	97.047	-86.582	66.8	97.632	4.17	-73.361
PERRYVILLE	U	43.963	76.963	-79.277	42.289	74.059	-0.709	-65.109
PILOT POINT	V	134.181	-100.000	-86.226	132.153	-100.000	6.897	-64.226
PORT ALSWORTH	W	64.103	97.507	-76.128	66.441	93.565	11.43	-43.82
PORT HEIDEN	X	129.906	-94.708	-93.65	128.143	-94.407	19.023	-69.081
QUINHAGAK	Y	57.291	86.864	-51.854	59.862	78.725	-21.513	-95.99
SOUTH NAKNEK	Z	114.151	-79.35	-89.897	110.791	-77.621	14.763	-63.562
UGASHIK	a	93.311	-58.958	-60.083	91.261	-55.716	-18.174	-43.56

The solutions fitted by removing the above mentioned communities are given in Table 49. The two and three dimensional solutions are presented in Figure 13 and Figure 14. The coefficient of alienation for the two dimension solution indicates that 13 percent of the variation was unexplained, while the three dimensional solution leaves 5 percent unexplained.

As before, Quinhagak and Manokotak are not similar to any other communities. The Pacific side communities are again not highly similar, with little similarity between the Chigniks. The communities of King Salmon and Naknek are still close to one another.

The communities north of Bristol Bay still cluster, though the Nushagak and Iliamna subregions are fairly distinct. The two dimensional plot (Figure 13) makes Koliganek appear farther from the other Nushagak communities. This apparent difference is not evident in the three dimensional solution (Figure 14). Similarly, the two dimensional solution makes Port Alsworth appear more similar to the Nushagak communities than to the Iliamna communities. While Port Alsworth *is* somewhat removed from the other Iliamna communities, the three dimensional solution indicates that it is not that similar to the Nushagak communities in terms of pounds per household harvested (notice the height of Port Alsworth in Figure 14). Port Alsworth not withstanding, these analyses show less overlap among the Nushagak and Iliamna communities than was apparent in the analyses of percent of households harvesting.

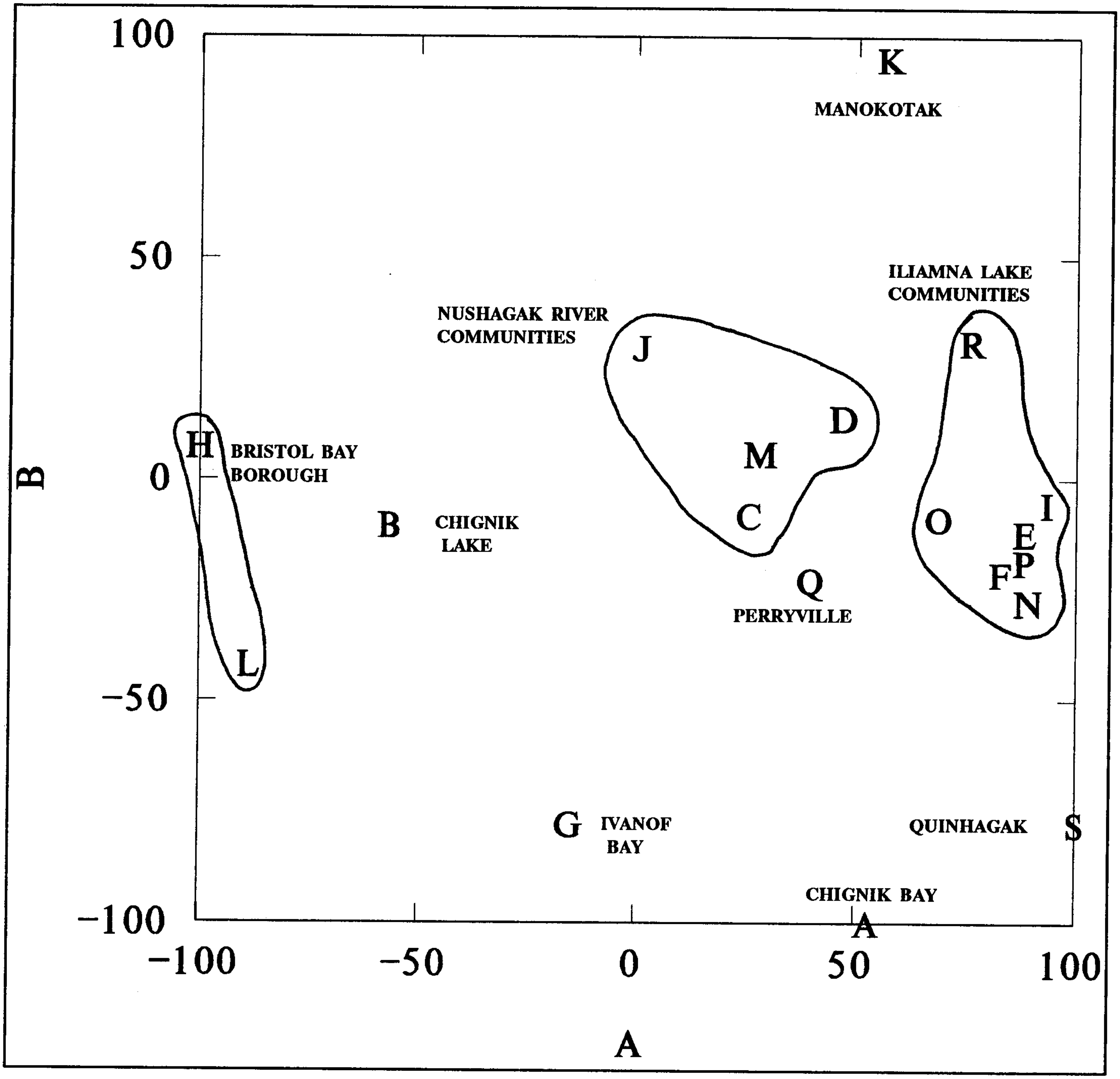
In sum, the results based upon data for pounds per household harvested indicate five subregions: the lower Alaska Peninsula (but note this region is not as well defined as it was for percent of households harvested), the Bristol Bay side of the Alaska Peninsula, the Bristol Bay Borough (minus South Naknek), the Nushagak subregion, and the Iliamna subregion. Once again, the communities of Quinhagak and Manokotak did not cluster with other communities.

Joint Analysis of Communities and Resources (SSAP). This section presents the results of the smallest space analysis of partitioned matrices (SSAP). This technique allows an analysis of communities and resources in a common space (Lingoes, 1970). To perform this analysis, it was necessary to create new resource variables. These new variables were simple binary (i.e., scored 0 or 1) indicator variables which indicated the presence or absence of the resource category for a community. The resource categories were created from the eight grouped resource categories as shown in Table 33. Two new sets of resource

Table 49
Pounds per Household Harvested (SSA-I, Q Mode)
Chignik Lagoon, Egegik, False Pass, Nelson Lagoon, Pilot Point, Pt. Heiden, S. Naknek, & Ugashik Removed

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
CHIGNIK BAY	A	88.409	52.94	-99.999	98.138	58.04	90.831	-31.269
CHIGNIK LAKE	B	92.535	-56.91	-10.444	99.732	-58.195	-0.164	-68.323
DILLINGHAM	C	11.049	25.745	-8.281	26.114	27.456	-2.716	-63.929
EKWOK	D	29.368	46.974	13.756	39.832	53.005	-36.113	-58.577
IGIUGIG	E	52.431	88	-12.185	58.687	95.877	-1.769	-39.293
ILIAMNA	F	47.585	82.45	-21.537	56.714	91.277	9.236	-50.057
IVANOF	G	82.082	-14.937	-78.007	89.868	-15.55	64.015	-16.045
KING SALMON	H	137.147	-99.999	7.35	139.305	-99.999	-23.488	-54.34
KOKHANOK	I	57.956	93.036	-5.712	63.203	99.999	-12.351	-39.04
KOLIGANEK	J	55.027	1.062	29.541	64.181	3.024	-57.498	-52.429
MANOKOTAK	K	110.213	57.053	94.789	114.413	55.082	-99.999	20.946
NAKNEK	L	127.533	-88.669	-42.06	131.182	-88.698	10.788	-6.615
NEW STUYAHOK	M	20.371	28.278	5.705	34.177	31.701	-26.492	-65.544
NEWHALEN	N	55.211	88.84	-27.863	67.025	96.185	23.267	-55.258
NONDALTON	O	33.256	68.559	-9.023	40.256	74.375	-15.803	-28.847
PEDRO BAY	P	52.505	87.802	-18.764	61.487	96.346	9.296	-49.517
PERRYVILLE	Q	10.504	39.747	-22.954	16.64	41.556	9.511	-47.325
PORT ALSWORTH	R	59.843	76.071	30.753	76.062	76.681	-29.38	-99.999
QUINHAGAK	S	91.288	99.999	-77.994	94.782	69.891	-0.507	49.082

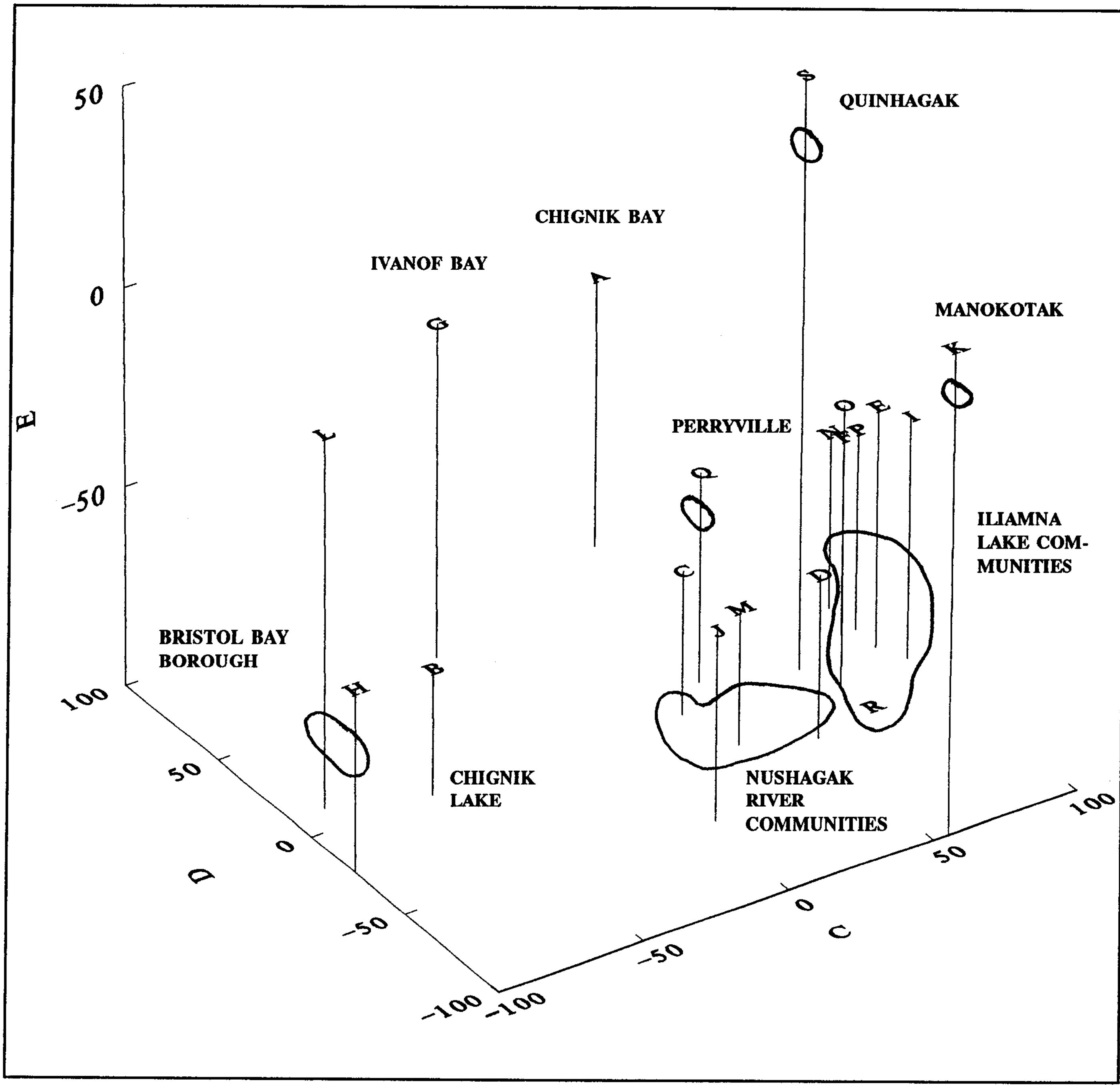
Figure 13
Pounds per Household Harvested (Q Mode)
(Chignik Lagoon, Egegik, False Pass, Nelson Lagoon, Pilot Point, Port Heiden, South Naknek, and Ugashik Removed)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .13062, KRUSKAL'S STRESS = .11423

CHIGNIK BAY	A	KING SALMON	H	NONDALTON	O
CHIGNIK LAKE	B	KOKHANOK	I	PEDRO BAY	P
DILLINGHAM	C	KOLIGANEK	J	PERRYVILLE	Q
EKWOK	D	MANOKOTAK	K	PORT ALSWORTH	R
IGIUGIG	E	NAKNEK	L	QUINHAGAK	S
ILIAMNA	F	NEW STUYAHOK	M		
IVANOF	G	NEWHALEN	N		

Figure 14
Pounds per Household Harvested (Q Mode)
(Chignik Lagoon, Egegik, False Pass, Nelson Lagoon, Pilot Point, Port Heiden, S. Naknek, and Ugashik Removed)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .04732, KRUSKAL'S STRESS = .03816.

CHIGNIK BAY	A	KING SALMON	H	NONDALTON	O
CHIGNIK LAKE	B	KOKHANOK	I	PEDRO BAY	P
DILLINGHAM	C	KOLIGANEK	J	PERRYVILLE	Q
EKWOK	D	MANOKOTAK	K	PORT ALSWORTH	R
IGIUGIG	E	NAKNEK	L	QUINHAGAK	S
ILIAMNA	F	NEW STUYAHOK	M		
IVANOF	G	NEWHALEN	N		

indicator variables were created, one for the percent of households harvesting (see Table 50) and the other for pounds per household harvested (see Table 51). To clarify how these variables were created consider an example using Chignik Bay. The table presented previously (Table 43) showing percent of households harvesting for grouped resource categories shows that 21 percent of the households sampled from Chignik Bay participated in the harvest of game. Table 50 shows the cutpoints for the indicator variables for percent of households harvesting. The breakpoints for each category were decided upon by examining the natural breakpoints in the frequency distribution for each variable. From Table 50 we see that communities with Chignik Bay's level of participation receive a score of "1" on variable "Game 1" and scores of zero on the other three game indicator variables. Similarly, 74% of the household sample from Chignik Bay took fish for subsistence use from their commercial catch. Table 50 shows that communities with this level of participation receive a score of "1" on the variable "Commercial 4" and scores of zero on the other four commercial fish indicator variables. The table showing pounds per household harvested for grouped resource categories (Table 45) shows that households sampled from Chignik Bay took, on the average, 60 pounds of game. Table 51 indicates that communities with this amount of game harvest receive a score of "1" on variable "Game 1" and scores of zero on the other three game indicator variables. The remaining variables, for both percent of households harvesting and pounds per household harvesting, were coded similarly.

The results for both the two and three dimensional SSAP solutions are presented in Table 52. The SSAP-1 program computes four alienation coefficients. The coefficients for the two dimensional solution are: $K_{(\text{global})} = .178$, $K_{(\text{within-communities})} = .253$, $K_{(\text{within-resources})} = .230$, $K_{(\text{between communities and resources})} = .100$. The first coefficient is the overall measure of fit. The last three partial coefficients indicate how well the solution represents the data for the communities, the resources, and between the communities and resources, respectively. The coefficients from the three dimensional solution are $K_{(\text{overall})} = .111$, $K_{(\text{communities})} = .151$, $K_{(\text{resources})} = .159$, $K_{(\text{between communities and resources})} = .065$. The plots of these solutions are shown in Figure 15 through Figure 17.

Table 50
Cutpoints used for Resource Categories in Guttman-Lingoes' Smallest Space Analysis (SSAP) For Percent of Households Harvesting (Grouped Resource Categories)

Game 1	0 ≤ percent harvesting < .40
Game 2	.40 ≤ percent harvesting < .65
Game 3	.65 ≤ percent harvesting < .85
Game 4	.85 ≤ percent harvesting ≤ 1.00
Birds 1	0 ≤ percent harvesting < .60
Birds 2	.60 ≤ percent harvesting < .80
Birds 3	.80 ≤ percent harvesting ≤ 1.00
NonComm Fish 1	0 ≤ percent harvesting < .65
NonComm Fish 2	.65 ≤ percent harvesting < .80
NonComm Fish 3	.80 ≤ percent harvesting < .90
NonComm Fish 4	.90 ≤ percent harvesting < 1.00
NonComm Fish 5	100 percent harvesting
Comm Fish 1	Missing
Comm Fish 2	0 ≤ percent harvesting < .15
Comm Fish 3	.15 ≤ percent harvesting < .50
Comm Fish 4	.50 ≤ percent harvesting < .75
Comm Fish 5	.75 ≤ percent harvesting ≤ 1.00
Fur bearer 1	0 ≤ percent harvesting < .20
Fur bearer 2	.20 ≤ percent harvesting < .40
Fur bearer 3	.40 ≤ percent harvesting < .70
Fur bearer 4	.70 ≤ percent harvesting < .85
Fur bearer 5	.85 ≤ percent harvesting ≤ 1.00
Plants 1	Missing
Plants 2	0 ≤ percent harvesting < .40
Plants 3	.40 ≤ percent harvesting < .70
Plants 4	.70 ≤ percent harvesting < .80
Plants 5	.80 ≤ percent harvesting < .90
Plants 6	.90 ≤ percent harvesting ≤ 1.00
Invertebrates 1	Missing
Invertebrates 2	0 ≤ percent harvesting < .10
Invertebrates 3	.10 ≤ percent harvesting < .40
Invertebrates 4	.40 ≤ percent harvesting < .79
Invertebrates 5	.79 ≤ percent harvesting < .90
Invertebrates 6	.90 ≤ percent harvesting ≤ 1.00
Mar Mammal 1	0 percent harvesting
Mar Mammal 2	0 < percent harvesting < .10
Mar Mammal 3	.10 ≤ percent harvesting < .20
Mar Mammal 4	.20 ≤ percent harvesting < .50
Mar Mammal 5	.50 ≤ percent harvesting ≤ 1.00
Ethnicity 1	0 ≤ percent harvesting < .52
Ethnicity 2	.52 ≤ percent harvesting < .90
Ethnicity 3	.90 ≤ percent harvesting ≤ 1.00

Table 51
Cutpoints used for Resource Categories in Guttman-Lingoes' Smallest Space Analysis (SSAP) For Pounds per Household Harvested (Grouped Resource Categories)

Game 1	0 ≤ pounds harvested < 200
Game 2	200 ≤ pounds harvested < 400
Game 3	400 ≤ pounds harvested < 700
Game 4	700 ≤ pounds harvested < 1140
Birds 1	Missing
Birds 2	0 ≤ pounds harvested < 20
Birds 3	20 ≤ pounds harvested < 40
Birds 4	40 ≤ pounds harvested < 65
Birds 5	65 ≤ pounds harvested < 150
NonComm Fish 1	0 ≤ pounds harvested < 500
NonComm Fish 2	500 ≤ pounds harvested < 1000
NonComm Fish 3	1000 ≤ pounds harvested < 2000
NonComm Fish 4	2000 ≤ pounds harvested < 3000
NonComm Fish 5	3000 ≤ pounds harvested < 5000
Comm Fish 1	Missing
Comm Fish 2	0 ≤ pounds harvested < 100
Comm Fish 3	100 ≤ pounds harvested < 200
Comm Fish 4	200 ≤ pounds harvested < 300
Comm Fish 5	300 ≤ pounds harvested < 460
Fur bearer 1	0 ≤ pounds harvested < 48
Fur bearer 2	48 ≤ pounds harvested < 100
Fur bearer 3	100 ≤ pounds harvested < 250
Plants 1	Missing
Plants 2	0 ≤ pounds harvested < 50
Plants 3	50 ≤ pounds harvested < 100
Plants 4	100 ≤ pounds harvested < 150
Invertebrates 1	Missing
Invertebrates 2	0 ≤ pounds harvested < 10
Invertebrates 3	10 ≤ pounds harvested < 32
Invertebrates 4	32 ≤ pounds harvested < 100
Mar Mammal 1	0 ≤ pounds harvested < 50
Mar Mammal 2	50 ≤ pounds harvested < 100
Mar Mammal 3	100 ≤ pounds harvested < 565

One of the most striking features of Figure 15 is that the communities form an apparent circumplex. This is somewhat difficult to see, however, because the resources obscure the distribution of the communities in the solution space. By removing the resources from the plot (Figure 16) we can not only see the apparent circumplex, but also can note that the communities are not particularly well organized by their geographical location. Instead, the communities appear to be spaced according to their ethnic makeup.

The communities on the left side of Figure 16 (Dillingham, Iliamna, Naknek, King Salmon, Port Alsworth, and South Naknek), with the exception of South Naknek, all have relatively small percentages of Native Alaskans. Communities on the top portion of this figure have medium levels of Native peoples, with the exception of Chignik Lake which is highly Native. Most of the communities in this section of the figure are from the Alaskan Peninsula (Chignik Bay, Chignik Lagoon, Chignik Lake, False Pass, Port Heiden, Egegik, Pilot Point, and Ugashik). Igiugig is the only community not from the Alaskan Peninsula in this group, but it too has a medium level of Native population. The communities at the bottom of the figure are all highly Native and come from each of the subregions shown in Map 1 at the beginning of the report. Most of the communities from the subregions on the north side of the Bay are in this group (Kokhanok, Pedro Bay, Newhalen, Ekwok, Koliganek, Nondalton, New Stuyahok, Manokotak, and Quinhagak). Ivanof Bay and Perryville represent the Upper Alaska Peninsula and Nelson Lagoon represents the Lower Alaska Peninsula.

Besides the common ethnicity communities which are close together tend to have other commonalities. The communities on the left side of Figure 16 (Dillingham, Iliamna, Naknek, King Salmon, Port Alsworth, and South Naknek) tend to have low participation in the harvesting of most resources. All have low participation in harvesting birds (Bird 1).[10] These communities are also low (Game 1) or low-medium (Game 2) participation in hunting game. Of these communities the three top-most communities (Dillingham, Iliamna, and Naknek) have the lowest participation in game harvesting, while the bottom three (King Salmon, Port Alsworth, and South Naknek) have somewhat more participation. Not surprisingly, there is a similar split in harvesting of furbearers. The former group of three communities has low participation in harvesting of furbearers (Furbearer 1), while the latter group of three communities has medium level of furbearer harvesting (Furbearer 3). The communities are also low in participation of harvesting marine mammals, with South Naknek and Port Alsworth collecting none (Mar Mammal 1), with Dillingham, King Salmon

[10] Remember that although the table of percent of households harvesting shows that King Salmon, Naknek, and South Naknek are missing information on birds, these analyses were performed using the percent of households *attempting*.

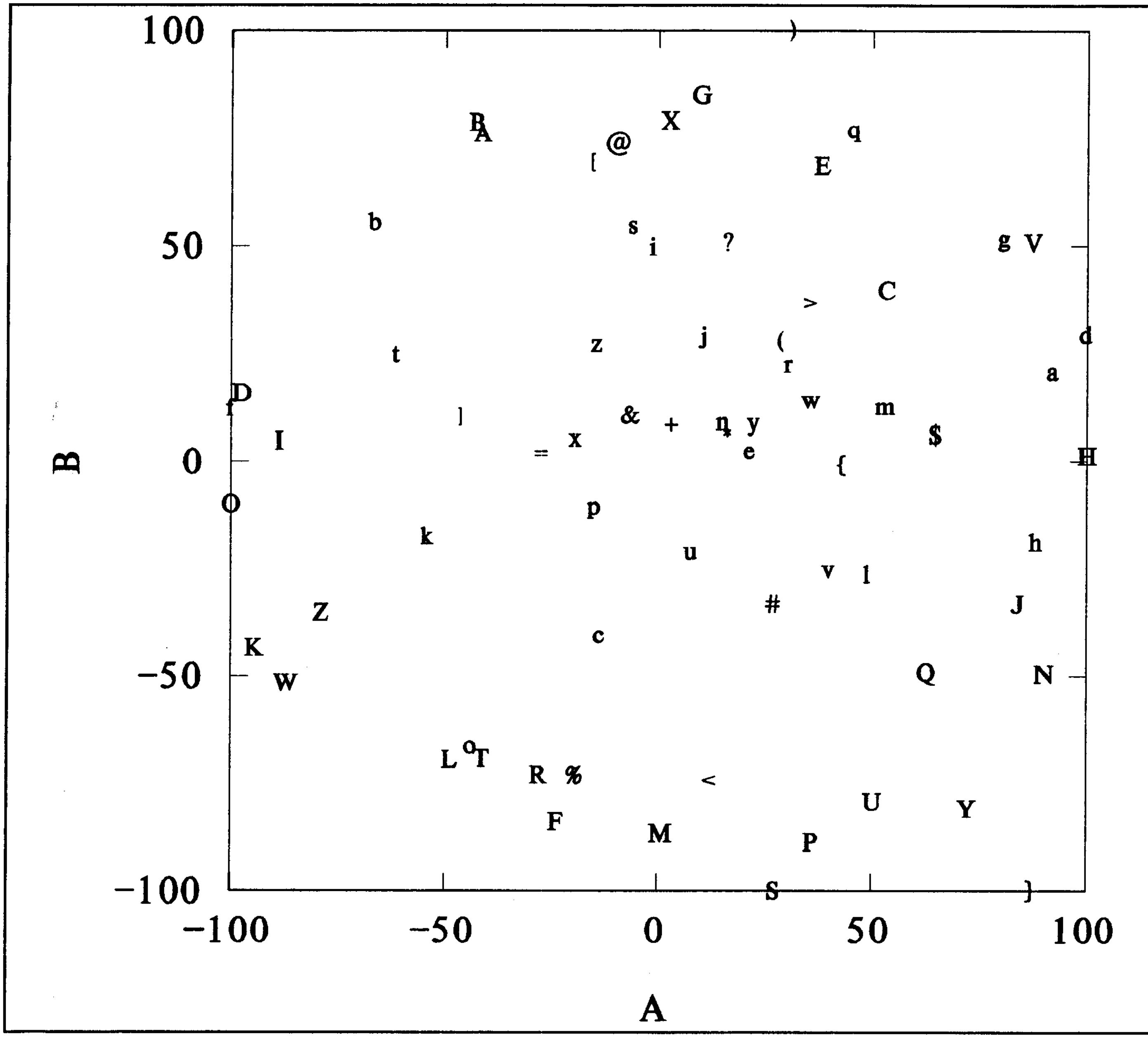
Table 52

Guttman-Lingoes' Smallest Space Analysis (SSAP - Villages & Resources)
Two and Three Dimensional Solutions
For Percent of Households Harvesting (Grouped Resource Categories)

Community	Label	Two Dimensional Solution		Three Dimensional Solution		
		A	B	C	D	E
CHIGNIK BAY	A	-41.413	76.26	-18.405	-98.693	15.073
CHIGNIK LAGOON	B	-42.844	78.792	-26.684	-100.000	-6.808
CHIGNIK LAKE	C	53.266	39.736	37.506	-49.491	67.106
DILLINGHAM	D	-97.596	15.902	-89.726	-27.213	-43.677
EGEGIK	E	38.217	68.593	7.5	-5.375	-100.000
EKWOK	F	-23.855	-83.89	-29.652	83.16	-9.078
FALSE PASS	G	10.166	84.995	42.029	-92.692	-16.7
IGIUGIG	H	100.000	1.337	90.566	21.305	-57.559
ILIAMNA	I	-88.846	4.848	-88.769	-23.942	28.444
IVANOF	J	83.86	-33.158	100.000	7.616	8.531
KING SALMON	K	-94.59	-43.438	-99.962	22.79	16.214
KOKHANOK	L	-48.875	-69.309	-45.637	71.536	6.557
KOLIGANEK	M	0.813	-86.565	-2.507	91.745	18.711
MANOKOTAK	N	90.03	-49.581	97.62	10.184	43.661
NAKNEK	O	-100.000	-9.899	-100.000	-9.432	-13.528
NELSON LAGOON	P	35.888	-88.632	29.484	21.067	93.329
NEW STUYAHOK	Q	62.657	-49.135	52.239	82.081	-14.638
NEWHALEN	R	-27.882	-72.941	-28.181	10.965	82.358
NONDALTON	S	27.319	-100.000	28.693	99.994	-17.787
PEDRO BAY	T	-41.355	-69.066	-42.491	51.814	52.259
PERRYVILLE	U	50.192	-79.257	40.529	2.073	96.031
PILOT POINT	V	87.235	50.653	84.069	-30.054	-67.393
PORT ALSWORTH	W	-87.147	-51.621	-96.319	41.718	-8
PORT HEIDEN	X	2.73	79.188	19.215	-91.276	29.503
QUINHAGAK	Y	72.169	-80.904	67.657	60.053	54.488
SOUTH NAKNEK	Z	-79.127	-35.085	-63.444	35.391	-58.099
UGASHIK	a	91.845	20.911	54.24	42.821	-85.592

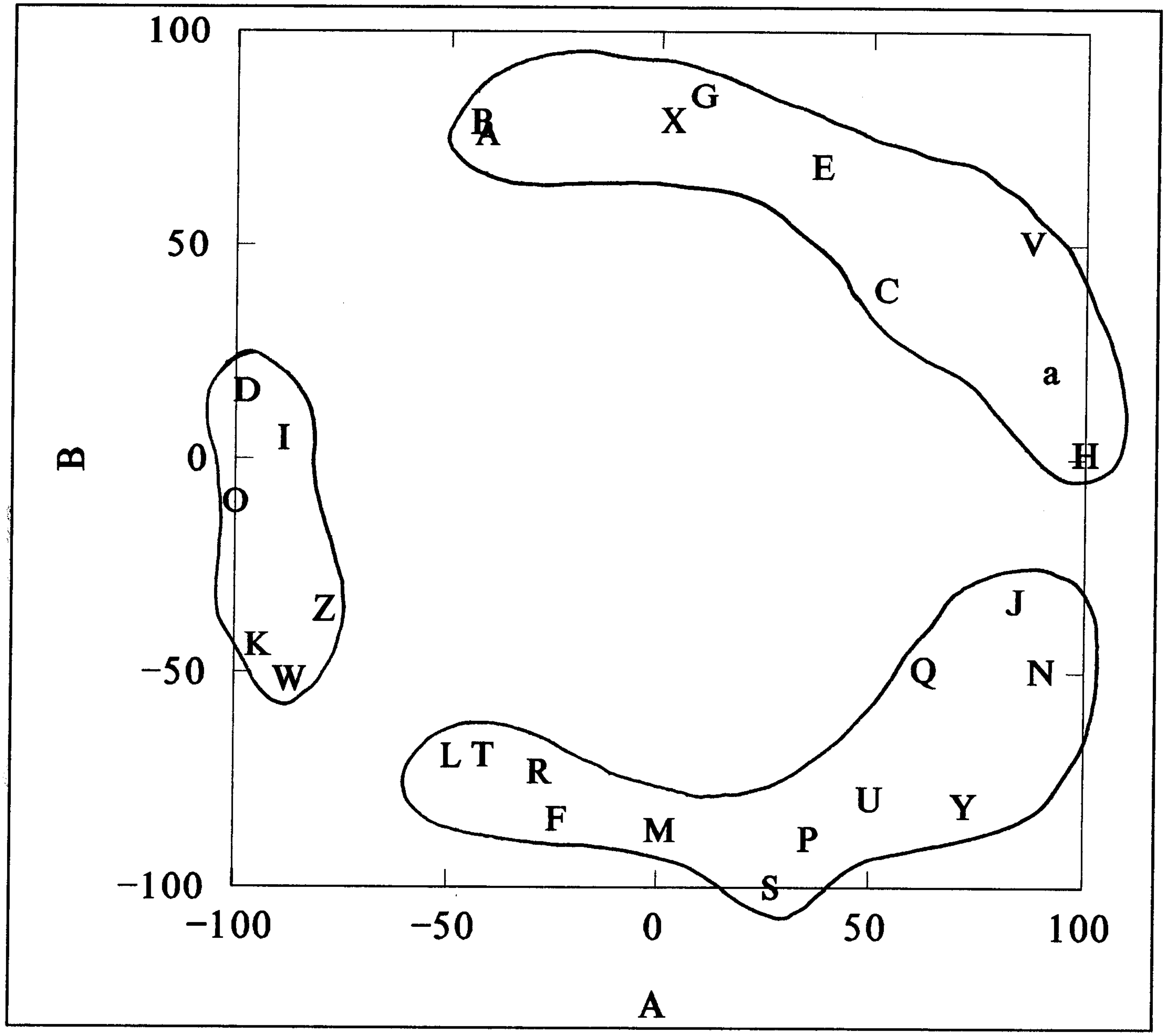
		Two Dimensional Solution		Three Dimensional Solution		
Resource	Label	A	B	C	D	E
GAME 1	b	-66.819	55.638	-63.225	-86	-39.183
GAME 2	c	-13.782	-40.358	-6.686	-0.912	27.997
GAME 3	d	99.602	29.396	92.922	-25.491	-95.531
GAME 4	e	21.424	2.704	26.378	-13.749	-48.473
BIRDS 1	f	-100.000	12.441	-100.000	-38.331	-58.223
BIRDS 2	g	80.375	51.731	61.536	-47.642	41.279
BIRDS 3	h	88.009	-18.872	100.000	9.118	-50.234
NONCOMM FISH 1	i	-1.479	49.921	9.013	-72.562	-25.651
NONCOMM FISH 2	j	10.346	29.148	14.731	-45.485	-90.462
NONCOMM FISH 3	k	-54.306	-17.434	-57.362	-8.422	-5.081
NONCOMM FISH 4	l	48.811	-26.34	48.181	24.104	-68.92
NONCOMM FISH 5	m	52.94	12.823	59.115	-20.178	-15.881
COMM FISH 1	n	15.144	9.291	19.284	-24.645	-37.43
COMM FISH 2	o	-44.014	-65.962	-47.919	46.166	0.043
COMM FISH 3	p	-15.068	-10.344	-5.483	-2.668	-98.141
COMM FISH 4	k	45.524	77.231	53.67	-98.617	10.1
COMM FISH 5	r	30.443	22.679	34.445	-30.549	-70.998
FURBEARERS 1	s	-6.003	54.891	9.528	-90.458	-55.174
FURBEARERS 2	t	-61.712	24.943	-45.055	-53.441	23.4
FURBEARERS 3	u	7.713	-20.995	0.585	11.085	-26.78
FURBEARERS 4	v	39.777	-25.31	32.333	24.074	-67.192
FURBEARERS 5	w	35.672	14.281	46.22	-29.808	-49.389
PLANTS 1	x	-19.585	5.617	-18.555	-23.596	-46.06
PLANTS 2	y	22.355	9.024	26.009	-21.093	-46.738
PLANTS 3	z	-14.535	27.426	-13.349	-47.435	-67.849
PLANTS 4	@	-9.539	74.452	6.878	-85.282	9.461
PLANTS 5	#	27.051	-33.056	29.983	19.531	-12.262
PLANTS 6	$	64.738	6.179	81.055	-24.983	-38.082
INVERTEBRATES 1	%	-19.51	-73.036	-30.38	62.889	-46.844
INVERTEBRATES 2	&	-6.536	10.668	-3.017	-14.428	-80.952
INVERTEBRATES 3	+	3.157	8.41	1.026	-22.113	-44.13
INVERTEBRATES 4	>	35.512	36.859	47.346	-54.461	-35.253
INVERTEBRATES 5	?	16.388	50.869	31.668	-74.989	-46.849
INVERTEBRATES 6	*	16.283	6.078	21.434	-26.248	-20.533
MARINE MAMMAL 1	<	12.203	-74.27	-9.979	63.681	-89.406
MARINE MAMMAL 2	=	-27.484	2.084	-31.98	-23.672	-43.454
MARINE MAMMAL 3	[	-15.351	69.409	-0.158	-90.212	-4.165
MARINE MAMMAL 4	(	28.625	27.796	39.22	-43.284	-56.66
MARINE MAMMAL 5	{	42.792	-0.932	50.164	-16.005	-17.117
ETHNICITY 1	]	-46.63	10.234	-49.128	-32.185	-43.925
ETHNICITY 2	)	31.177	100.000	51.657	-100.000	-100.000
ETHNICITY 3	}	86.951	-100.000	74.13	70.743	45.977

Figure 15
Joint Analysis of Communities and Resources (SSAP)
Using Percent of Households Harvesting Grouped Resources



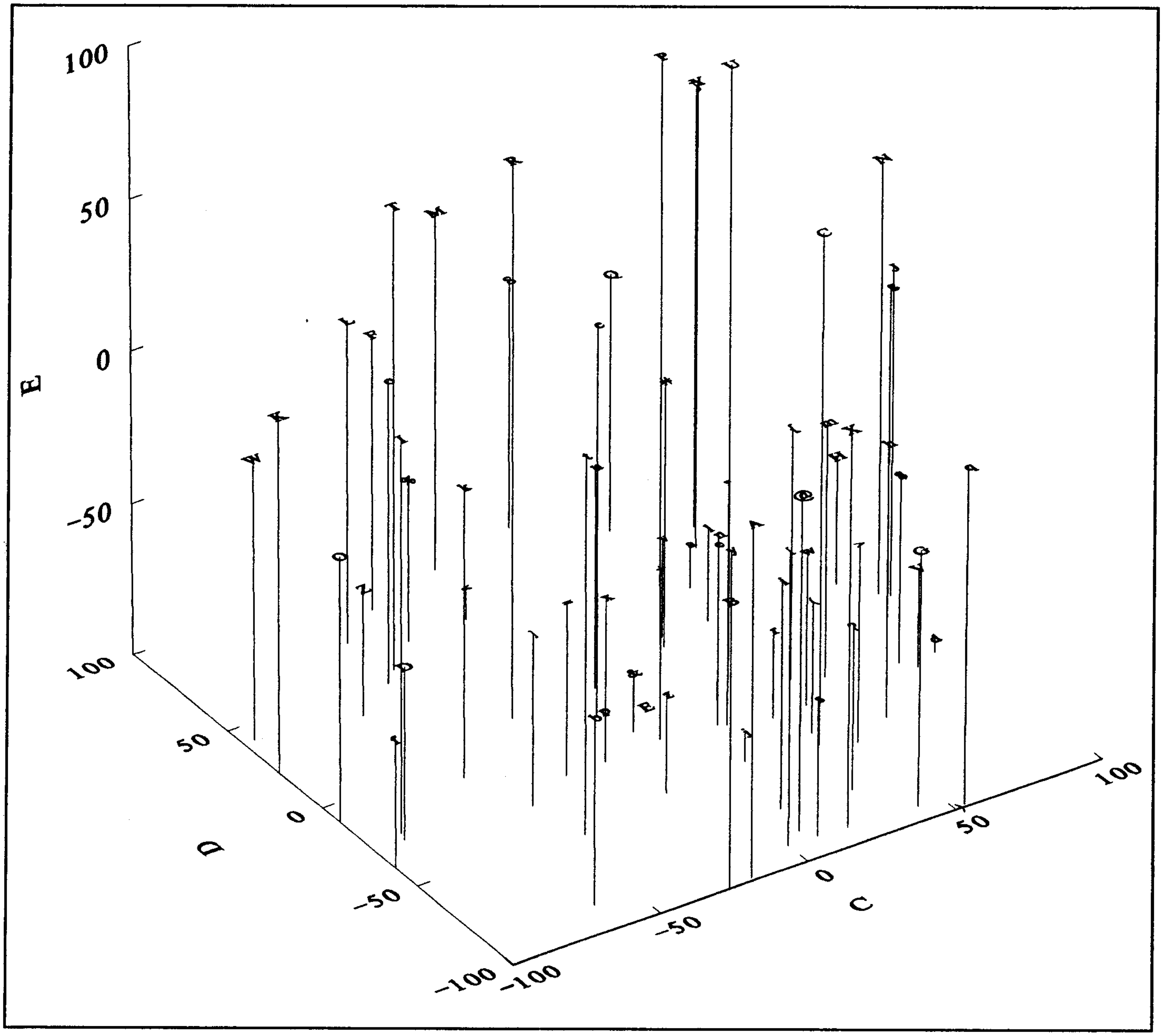
CHIGNIK BAY	A	PORT HEIDEN	X	Fur bearer 3	u
CHIGNIK LAGOON	B	QUINHAGAK	Y	Fur bearer 4	v
CHIGNIK LAKE	C	SOUTH NAKNEK	Z	Fur bearer 5	w
DILLINGHAM	D	UGASHIK	a	Plants 1	x
EGEGIK	E	Game 1	b	Plants 2	y
EKWOK	F	Game 2	c	Plants 3	z
FALSE PASS	G	Game 3	d	Plants 4	@
IGIUGIG	H	Game 4	e	Plants 5	#
ILIAMNA	I	Birds 1	f	Plants 6	$
IVANOF	J	Birds 2	g	Invertebrates 1	%
KING SALMON	K	Birds 3	h	Invertebrates 2	&
KOKHANOK	L	NonComm Fish 1	i	Invertebrates 3	+
KOLIGANEK	M	NonComm Fish 2	j	Invertebrates 4	>
MANOKOTAK	N	NonComm Fish 3	k	Invertebrates 5	?
NAKNEK	O	NonComm Fish 4	l	Invertebrates 6	*
NELSON LAGOON	P	NonComm Fish 5	m	Mar Mammal 1	<
NEW STUYAHOK	Q	Comm Fish 1	n	Mar Mammal 2	=
NEWHALEN	R	Comm Fish 2	o	Mar Mammal 3	[
NONDALTON	S	Comm Fish 3	p	Mar Mammal 4	(
PEDRO BAY	T	Comm Fish 4	q	Mar Mammal 5	{
PERRYVILLE	U	Comm Fish 5	r	Ethnicity 1	]
PILOT POINT	V	Fur bearer 1	s	Ethnicity 2	)
PORT ALSWORTH	W	Fur bearer 2	t	Ethnicity 3	}

Figure 16
Joint Analysis of Communities and Resources (SSAP)
Using Percent of Households Harvesting Grouped Resources
(Plot of Communities Only)



CHIGNIK BAY	A	KOKHANOK	L	PORT ALSWORTH	W
CHIGNIK LAGOON	B	KOLIGANEK	M	PORT HEIDEN	X
CHIGNIK LAKE	C	MANOKOTAK	N	QUINHAGAK	Y
DILLINGHAM	D	NAKNEK	O	SOUTH NAKNEK	Z
EGEGIK	E	NELSON LAGOON	P	UGASHIK	a
EKWOK	F	NEW STUYAHOK	Q		
FALSE PASS	G	NEWHALEN	R		
IGIUGIG	H	NONDALTON	S		
ILIAMNA	I	PEDRO BAY	T		
IVANOF	J	PERRYVILLE	U		
KING SALMON	K	PILOT POINT	V		

Figure 17
Joint Analysis of Communities and Resources (SSAP)
Using Percent of Households Harvesting Grouped Resources



CHIGNIK BAY	A	PORT HEIDEN	X	Fur bearer 3	u
CHIGNIK LAGOON	B	QUINHAGAK	Y	Fur bearer 4	v
CHIGNIK LAKE	C	SOUTH NAKNEK	Z	Fur bearer 5	w
DILLINGHAM	D	UGASHIK	a	Plants 1	x
EGEGIK	E	Game 1	b	Plants 2	y
EKWOK	F	Game 2	c	Plants 3	z
FALSE PASS	G	Game 3	d	Plants 4	@
IGIUGIG	H	Game 4	e	Plants 5	#
ILIAMNA	I	Birds 1	f	Plants 6	$
IVANOF	J	Birds 2	g	Invertebrates 1	%
KING SALMON	K	Birds 3	h	Invertebrates 2	&
KOKHANOK	L	NonComm Fish 1	i	Invertebrates 3	+
KOLIGANEK	M	NonComm Fish 2	j	Invertebrates 4	>
MANOKOTAK	N	NonComm Fish 3	k	Invertebrates 5	?
NAKNEK	O	NonComm Fish 4	l	Invertebrates 6	*
NELSON LAGOON	P	NonComm Fish 5	m	Mar Mammal 1	<
NEW STUYAHOK	Q	Comm Fish 1	n	Mar Mammal 2	=
NEWHALEN	R	Comm Fish 2	o	Mar Mammal 3	[
NONDALTON	S	Comm Fish 3	p	Mar Mammal 4	(
PEDRO BAY	T	Comm Fish 4	q	Mar Mammal 5	{
PERRYVILLE	U	Comm Fish 5	r	Ethnicity 1	]
PILOT POINT	V	Fur bearer 1	s	Ethnicity 2	)
PORT ALSWORTH	W	Fur bearer 2	t	Ethnicity 3	}

and Naknek having very little participation (Mar Mammal 2), and with Iliamna having slightly more participation (Mar Mammal 3). On harvesting invertebrates, Dillingham and Iliamna are low (Invertebrates 2), while Port Alsworth has a medium amount of participation (Invertebrates 3). The communities of the Bristol Bay Borough are missing information on this variable (Invertebrates 1). It is only on the harvesting of plants and fish that these communities reach medium levels of participation. On plants, Dillingham and Port Alsworth are low-medium (Plants 3) and Iliamna is medium (Plants 4). The communities of the Bristol Bay Borough are missing information on this variable (Plants 1). These communities are also medium participants in noncommercial fishing, with Dillingham being lowest (Noncommercial 2) and South Naknek being highest (Noncommercial 4). The remainder of the communities are in between (Noncommercial 3). For commercial fishing, Iliamna, Port Alsworth, and King Salmon are low (Comm Fish 2), while Dillingham, Naknek, and South Naknek are low-medium (Comm Fish 3).

The communities at the top of Figure 16 can be separated into two clusters. The top-most of these consists of Chignik Bay, Chignik Lagoon, False Pass, Port Heiden, and Egegik. These communities tend to have medium to high participation in commercial fishing, marine mammals, invertebrates and plants, while being low on everything else. Specifically, Chignik Bay, Chignik Lagoon, False Pass, and Port Heiden all have medium-high levels of participation in commercial fishing (Comm Fish 4). Egegik has high levels of participation in commercial fishing (Comm Fish 5). For marine mammals, Egegik has zero participation, Chignik Bay, Chignik Lagoon, and Port Heiden have low-medium participation (Mar Mammal 3), and False Pass has medium-high participation (Mar Mammal 4). Egegik is also lowest of this cluster in participation in harvesting invertebrates, with low-medium participation (Invertebrates 3). Chignik Lagoon has medium participation (Invertebrates 4), while the remaining communities have medium-high levels of participation (Invertebrates 5). False Pass has the highest level of participation in the harvesting of plants and berries (Plants 6). The remaining communities have only a medium level of participation (Plants 4 - Chignik Bay and Port Heiden) or a low-medium level of participation (Plants 3 - Chignik Lagoon and Egegik). On the remaining resources this cluster tends to have low participation. For hunting, Chignik Bay, Chignik Lake, and False

Pass have the lowest levels of participation (Game 1), while Port Heiden and Egegik have medium-high levels of participation (Game 3). A similar pattern is evident for harvesting of furbearers; Chignik Bay, Chignik Lake, and False Pass have the lowest levels of participation (Furbearer 1), while Port Heiden has low-medium participation (Furbearer 2), and Egegik has a medium level of participation (Furbearer 3). On harvesting of birds the results are again similar with Chignik Bay and Chignik Lake having the lowest levels of participation (Birds 1) and the remaining communities having medium participation (Birds 2). Finally on noncommercial fishing, Chignik Bay and Chignik Lake are joined in having the lowest participation by Port Heiden (Noncomm Fish 1), while False Pass and Egegik are low-medium (Noncomm Fish 2).

The top right cluster is made up of Chignik Lake, Pilot Point, Ugashik, and Igiugig. This cluster tends to be medium to high on harvesting most resources, but there is considerable variation within this group. More specifically, this cluster has high levels of participation in <u>noncommercial</u> fishing. Residents of Chignik Lake, Igiugig, and Ugashik are all highly engaged in noncommercial fishing (Noncomm 5). Pilot Point has a medium-high level of participation (Noncomm 4). Participation in <u>commercial</u> fishing is high in most of these communities (pilot Point and Ugashik - Comm Fish 5; Chignik Lake - Comm Fish 4), but, not surprisingly, it is low in Igiugig (Comm Fish 2). Both Chignik Lake and Pilot Point have medium levels of participation in the harvest of <u>invertebrates</u> (Invertebrates 4), while Ugashik has a low level of participation in (Invertebrates 2). Igiugig is missing information on this variable (Invertebrates 1). Participation in harvesting of <u>marine mammals</u> is medium-high for Igiugig and Pilot Point (Mar Mammal 4). This result may seem surprising for Igiugig, but it must be remembered that there were only three households surveyed in this community and this result indicates that one household engaged in harvesting marine mammals. Chignik Lake has a medium level of participation (Mar Mammal 3), while no households participated in the harvest of marine mammals in Ugashik (Mar Mammal 1). On participation in the harvest of <u>game</u>, these communities, these communities range from low (Chignik Lake - Game 1) to high (Igiugig - Game 4). Ugashik and Pilot Point have medium-high participation levels (Game 3). There is a wide range on the harvesting of <u>furbearers</u> as well. Chignik Lake has a low-medium level of participation in the harvest of furbearers (Furbearer 2), Ugashik has a medium-high level of participation (Furbearer 4), and Igiugig and Pilot Point have high levels of participation (Furbearer 5). Levels of participation in the harvest of plants are also quite varied in this cluster. Ugashik's participation level is the lowest (Plants 2), while Igiugig's is the highest (Plant 6). Chignik Lake and Pilot Point have medium levels of participation (Plants 4). All the communities except Chignik Lake (Birds 2) have high participation in harvesting of birds (Birds 3). It should be noted that if a line is drawn on Figure 16 from Pilot Point to Nondalton, every community to the right of this line, with the exception of New Stuyahok and Perryville, has a high level of participation in the harvest of birds.

The communities at the bottom of Figure 16 can also be separated into two clusters. The right-most of these is made up of Ivanof Bay, Manokotak, New Stuyahok, Perryville, Quinhagak, Nelson Lagoon, and Nondalton. These communities are comprised mostly of Native Alaskans (Ethnicity 3) and then to have high levels of participation in the harvest of birds, noncommercial fish, and plants. There is less consistency on the other variables. Specifically, there is a wide variation in the levels of participation in the harvest of marine mammals. In Nondalton, none of the sampled households harvested marine mammals. (Mar Mammal 1). Low levels of participation were also observed in Nelson Lagoon and New Stuyahok (Mar Mammal 2). Ivanof Bay, Manokotak, Perryville, and Quinhagak, on the other hand, had high levels of participation (Mar Mammal 5). Low to medium levels of participation in the harvest of invertebrates were observed in this cluster. In Ivanof Bay, New Stuyahok, and Nondalton, low-medium levels of participation were observed (Invertebrates 3), while medium levels of participation in invertebrate harvest were seen in Manokotak, Perryville, and Nelson Lagoon (Invertebrates 4). Quinhagak was missing information on this variable (Invertebrates 1). Low to medium levels of participation is also seen in the harvesting of commercial fish. Ivanof Bay, New Stuyahok, and Nondalton had low-medium levels of participation (Comm Fish 3), while Manokotak, Perryville, and Nelson lagoon all had medium-high levels of participation (Comm Fish 4). Quinhagak was missing information on this variable (Comm Fish 1). There is a wide range of participation in the harvest of both game and furbearers. For game, Quinhagak had the lowest level of participation (Game 1), followed by Manokotak, Perryville, and Nelson Lagoon (Game 2).

Ivanof Bay and New Stuyahok had medium-high levels of participation in harvesting game (Game 3) and Nondalton had the highest level of participation (Game 4). The variation evident in the harvesting of furbearers was similar to that observed in the harvesting of game, but the ordering of the communities is somewhat different. Ivanof and Nelson Lagoon have low levels of participation in harvesting furbearers (Furbearer 1), Perryville has low-medium levels of participation (Furbearer 2), and Quinhagak has a medium level of participation (Furbearer 3). New Stuyahok and Nondalton have medium-high levels of participation (Furbearer 4) and Manokotak has high levels of participation (Furbearer 5). As noted above, all these communities, with the exception of Perryville and Nelson Lagoon have high participation in the harvest of birds (Birds 3); these latter two communities have medium levels of participation (Birds 2). Harvesting of plants was highest in Ivanof Bay, Manokotak, and New Stuyahok (Plants 6), medium-high levels of participation were observed in Perryville, Nelson Lagoon, and Nondalton (Plants 5). Only Quinhagak had low levels of participation in harvesting plants (Plants 2). Participation in the harvest of noncommercial fish was generally high in this cluster. Quinhagak and Perryville had the highest level of participation (Noncomm Fish 5), followed by New Stuyahok, Manokotak, and Nondalton (Noncomm Fish 4). Lower levels were observed in Nelson Lagoon (Noncomm Fish 3) and Ivanof Bay (Noncomm Fish 2).

The last cluster consists of Kokhanok, Pedro Bay, Newhalen, Ekwok, and Koliganek. In general, most of these communities have low participation in the harvesting of commercial fish, marine mammals, and invertebrates (though most of the communities are missing information on this last variable). They also have low to medium participation in the harvesting of noncommercial fish, game, furbearers, and medium to high participation in the harvesting of plants. For commercial fishing, all the communities have low participation (Comm Fish 2). Similarly, only residents from Newhalen participate in harvesting marine mammals (Mar Mammals 3). Koliganek has a low level of participation in the harvesting of invertebrates (Invertebrates 2) and Pedro Bay has a low-medium level of participation (Invertebrate 3). The remaining communities are missing data on this variable (Invertebrate 1). Kokhanok and Pedro Bay have the lowest levels of participation in harvesting game (Game 1), while Newhalen has a low-medium level of participation

(Game 2). Both Ekwok and Koliganek have medium-high levels of participation in harvesting game (Game 3). Koliganek and Kokhanok have medium-high levels of participation in harvesting furbearers (Furbearer 4), while Ekwok and Newhalen have medium levels of participation (Furbearer 3). Pedro Bay has a low-medium level of participation (Furbearer 2). There was considerable variation in participation in noncommercial fishing. Newhalen has the lowest levels (Noncomm Fish 1), followed by Ekwok (Noncomm Fish 2), Koliganek, and Pedro Bay (Noncomm Fish 3). Kokhanok has a medium-high level of participation in noncommercial fishing (Noncomm Fish 4).

The results for both the two and three dimensional SSAP solutions for pounds per household harvested are presented in Table 53. The coefficients for the two dimensional solution are: $K_{(\text{global})} = .143$, $K_{(\text{within-communities})} = .217$, $K_{(\text{within-resources})} = .225$, $K_{(\text{between communities and resources})} = .076$. The coefficients from the three dimensional solution are $K_{(\text{overall})} = .090$, $K_{(\text{communities})} = .132$, $K_{(\text{resources})} = .157$, $K_{(\text{between communities and resources})} = .042$. The plots of these solutions are shown in Figure 18 and Figure 19.

The results of this SSAP duplicate the geographical spacing of the communities more closely than the SSAP for the percentage of households harvesting. Examining Figure 18, we see that the communities can be grouped into four clusters. The top most cluster is comprised of some of the communities from the Pacific side of the Alaska Peninsula (False Pass, Ivanof Bay, and Perryville). This group is characterized by medium to high pounds per household harvested of marine mammals, medium to high pounds per household taken from commercial fish for subsistence purposes, low to medium pounds of noncommercial fish harvested, high amounts of invertebrates, medium amounts of birds, low to medium pounds of game, low pounds per household of furbearers, and low amounts of plants (though only False Pass has nonmissing data on this variable).

The second cluster is made up of Chignik Bay, Chignik Lake, Chignik Lagoon, Egegik, Nelson Lagoon, Port Heiden, Pilot Point, King Salmon, Naknek, South Naknek. This cluster is characterized by low pounds of marine mammals harvested, low pounds of noncommercial fish, and low pounds harvested of furbearers. The communities have low to low-medium harvests of birds (though the communities of the Bristol Bay Borough are missing on this variable), and low to medium-high harvests of game. There is considerable variation on commercial fishing and invertebrates (the communities of the Bristol Bay Borough are missing on this variable). All communities are missing data on plants.

The third cluster is comprised of Dillingham, Iliamna, Newhalen, Pedro Bay, Port Alsworth, and Ugashik. This cluster is generally low in pounds per household harvested of marine mammals, low harvest of commercial fish, low pounds harvested of birds, low pounds of plants, low game and furbearers, and low-medium invertebrates. There is considerable variation in pounds per household harvested of noncommercial fish.

The last cluster is made up of Igiugig, Kokhanok, Nondalton, Koliganek, New Stuyahok, and Ekwok. This cluster is characterized by low harvest of commercial fish, low pounds of marine mammals, low amount of invertebrates (but Igiugig, Kokhanok, and Nondalton are missing data on this variable), high pounds harvested of noncommercial fish, high pounds of furbearers and medium pounds of plants. There is considerable variation on game and birds.

As with many of the analyses presented so far, Manokotak and Quinhagak did not cluster with the other communities. Manokotak is high on pounds harvested of birds, marine mammals, and furbearers; medium-high on commercial fishing; medium on plants and invertebrates; and low-medium on noncommercial fish and game. Quinhagak is high on pounds harvested of birds and marine mammals; medium-high on game and noncommercial fish; medium on furbearers; low on plants; and has missing data on commercial fish and invertebrates.

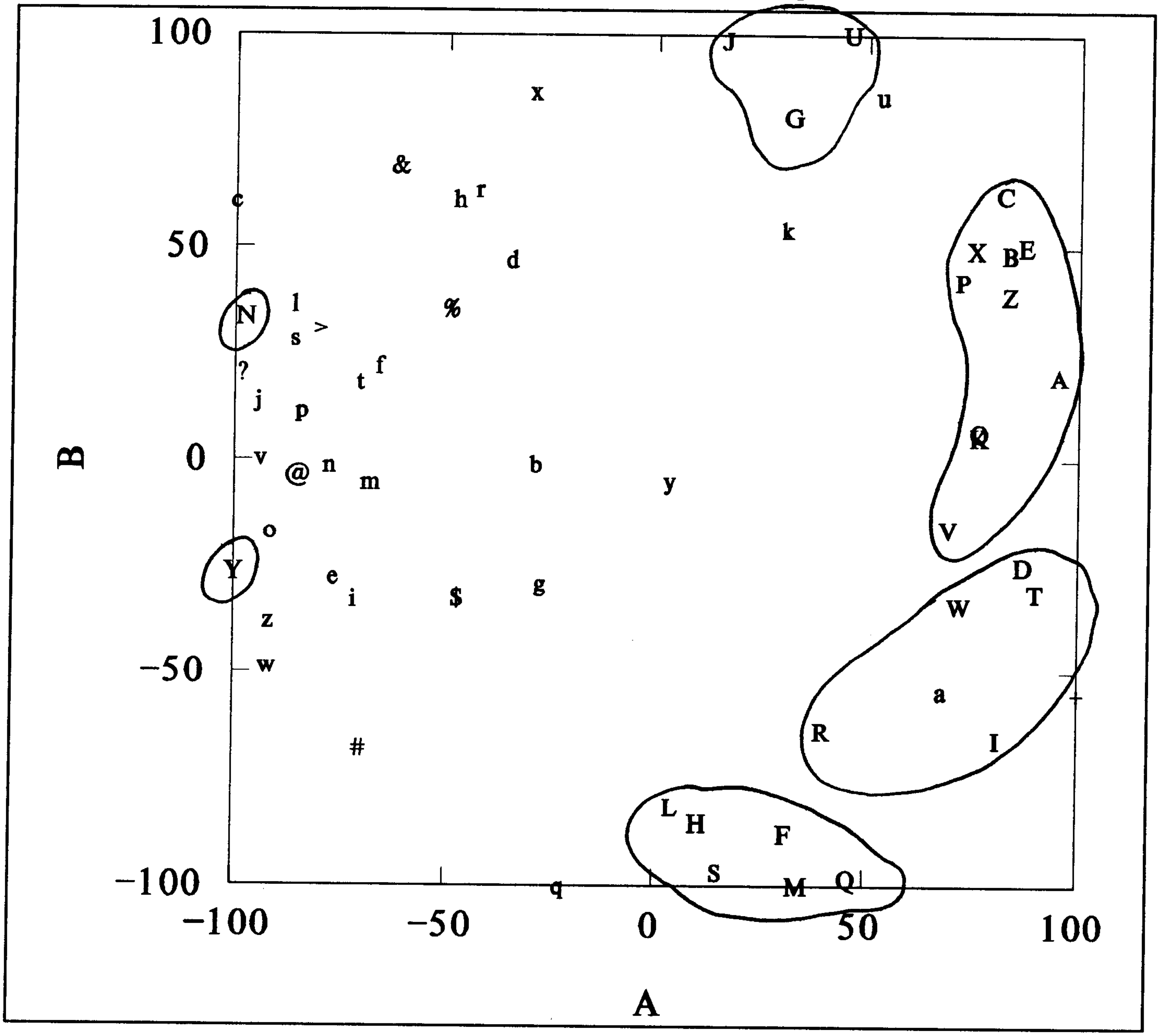
Summary. In general, the analyses presented here show that there are at least three different subregions in Bristol Bay: the Pacific side of the Alaska Peninsula, the Bristol Bay side of the Alaska Peninsula, and the "Upriver" communities. Manokotak and Quinhagak consistently failed to cluster with other communities. Of the cluster that did form, the Pacific side of the Alaska Peninsula is the least coherent. That is, communities in this "cluster" are quite varied, even among the Chigniks. Depending on the analyses, the other two clusters were broken into finer groupings. In some analyses, the Bristol Bay Borough communities clustered separately from the other Bristol Bay side of the Alaska Peninsula communities. Similarly, in some analyses the "Upriver" communities could be broken into a Nushagak River cluster and an Iliamna Lake cluster.

Table 53
Guttman-Lingoes' Smallest Space Analysis (SSAP - Villages & Resources)
Two and Three Dimensional Solutions
For Pounds per Household Harvested (Grouped Resource Categories)

Community	Label	Two Dimensional Solution		Three Dimensional Solution		
		A	B	C	D	E
CHIGNIK BAY	A	95.166	19.785	-55.007	63.25	23.974
CHIGNIK LAGOON	B	83.204	48.535	-79.759	37.714	-21.141
CHIGNIK LAKE	C	82.027	62.763	-86.627	25.596	28.864
DILLINGHAM	D	86.863	-25.038	2.721	82.846	-11.698
EGEGIK	E	87.091	50.331	-84.197	39.842	-4.275
EKWOK	F	31.293	-87.728	78.04	42.202	39.43
FALSE PASS	G	32.273	80.881	-66.36	-18.868	-79.797
IGIUGIG	H	10.64	-85.236	93.547	30.609	-28.52
ILIAMNA	I	80.851	-65.779	39.901	73.043	45.673
IVANOF	J	16.285	98.607	-81.504	-52.891	39.078
KING SALMON	K	76.451	5.572	-27.318	64.292	8.589
KOKHANOK	L	4.265	-81.514	97.438	18.244	-8.91
KOLIGANEK	M	34.35	-100.000	97.997	48.424	12.784
MANOKOTAK	N	-97.581	33.484	37.97	-100.000	65.993
NAKNEK	O	76.476	6.516	-26.582	63.93	11.56
NELSON LAGOON	P	72.231	42.024	-62.128	31.409	-59.06
NEW STUYAHOK	Q	46.194	-98.287	88.482	60.75	30.856
NEWHALEN	R	40.039	-63.685	63.865	49.624	-56.993
NONDALTON	S	15.259	-96.936	100.000	36.68	-40.029
PEDRO BAY	T	89.843	-31.215	13.898	90.028	-0.967
PERRYVILLE	U	45.835	100.000	-100.000	-27.98	30.794
PILOT POINT	V	69.319	-16.231	1.645	24.361	-100.000
PORT ALSWORTH	W	71.963	-34.389	15.046	70.083	28.044
PORT HEIDEN	X	75.388	49.527	-74.395	33.099	-43.825
QUINHAGAK	Y	-100.000	-26.521	37.881	-93.902	-93.227
SOUTH NAKNEK	Z	83.246	38.702	-69.058	51.954	-6.11
UGASHIK	a	68.011	-54.478	21.233	48.055	-89.715

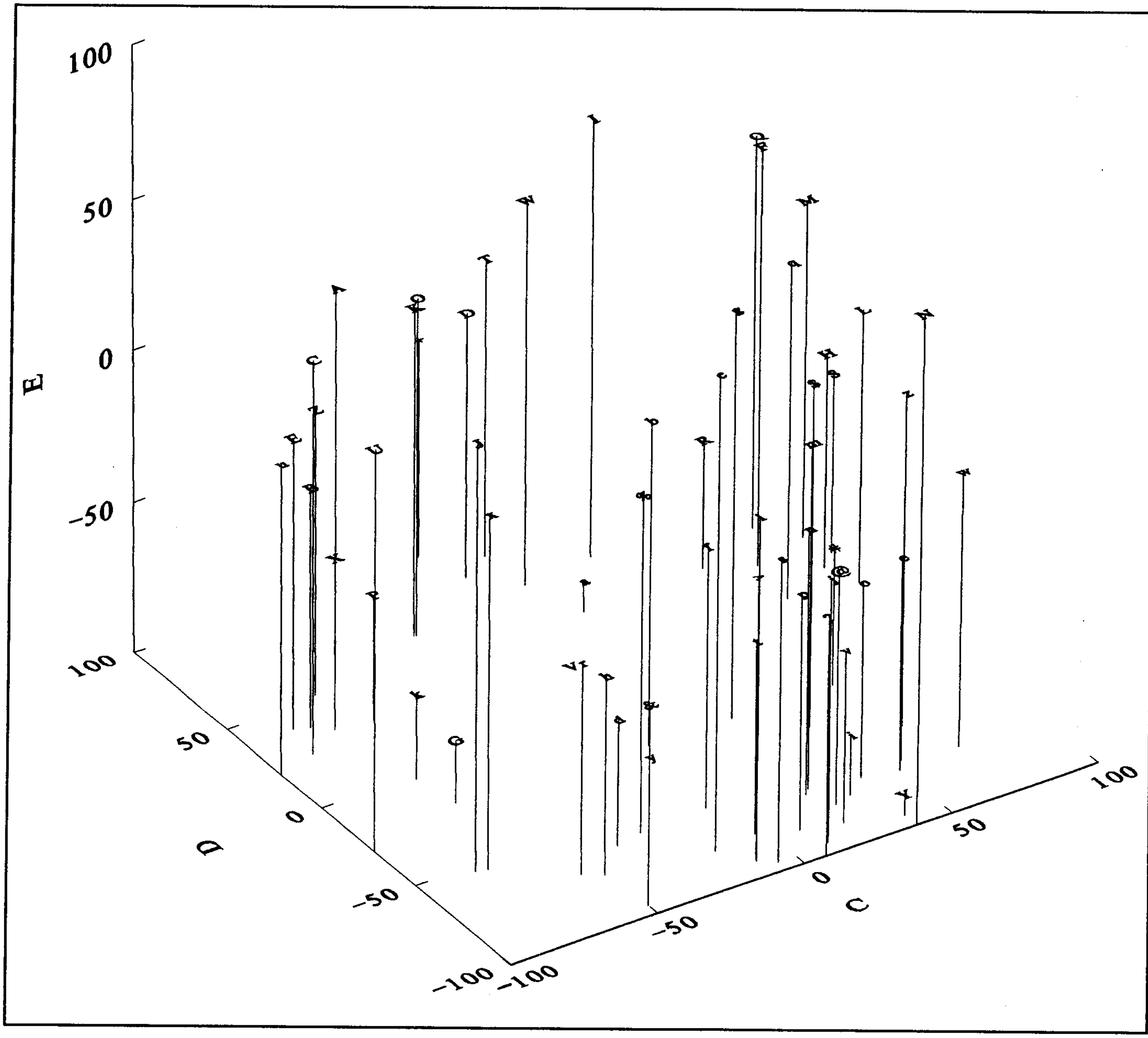
Resource	Label	Two Dimensional Solution		Three Dimensional Solution		
		A	B	C	D	E
GAME 1	b	-28.791	-0.9	-2.74	-23.384	6.446
GAME 2	c	-100.000	61.183	-17.85	-81.059	54.917
GAME 3	d	-34.724	47.137	-39.832	-63.47	-58.956
GAME 4	e	-76.729	-27.537	50.359	-72.866	-30.724
BIRDS 1	f	-65.756	22.041	-7.229	-60.091	-15.13
BIRDS 2	g	-27.574	-29.095	25.371	-23.88	34.263
BIRDS 3	h	-47.405	61.535	-51.538	-74.58	-35.604
BIRDS 4	i	-72.173	-32.712	31.089	-76.477	-80.875
BIRDS 5	j	-94.853	13.644	11.662	-94.336	-14.805
BIRDS 3	k	31.072	54.313	-68.6	-1.493	-72.759
NONCOMM FISH 1	l	-86.079	36.398	-10.87	-91.585	11.824
NONCOMM FISH 2	m	-68.086	-5.159	22.839	-67.231	13.057
NONCOMM FISH 3	n	-77.828	-1.085	20.629	-69.628	-13.404
NONCOMM FISH 4	o	-91.547	-16.697	38.972	-70.221	-36.647
NONCOMM FISH 5	p	-84.371	11.432	8.349	-84.691	-23.175
COMM FISH 1	k	-22.394	-100.000	75.074	21.999	11.872
COMM FISH 2	r	-42.654	63.945	-56.928	-70.481	-31.557
COMM FISH 3	s	-86.001	28.483	-6.196	-95.722	-1.499
COMM FISH 4	t	-70.498	18.234	-3.222	-79.198	-37.528
COMM FISH 5	u	53.14	85.68	-100.000	21.285	1.467
FURBEARERS 1	v	-93.946	0.443	21.22	-88.02	-44.04
FURBEARERS 2	w	-92.038	-48.488	71.093	-71.818	-9.697
FURBEARERS 3	x	-29.557	86.651	-77.907	-53.843	15.278
PLANTS 1	y	3.404	-4.916	-5.6	-28.703	-100.000
PLANTS 2	z	-91.881	-38.035	53.443	-68.882	20.26
PLANTS 3	@	-85.241	-3.167	25.021	-78.479	-24.087
INVERTEBRATES 1	#	-70.333	-68.001	59.437	-24.896	-54.758
INVERTEBRATES 2	$	-47.326	-32.532	41.542	-39.897	12.909
INVERTEBRATES 3	%	-49.144	35.46	-30.323	-61.028	9.617
INVERTEBRATES 4	&	-61.584	69.292	-50.144	-95.294	-34.57
MARINE MAMMAL 1	+	100.000	-55.389	-2.782	100.000	-27.44
MARINE MAMMAL 2	>	-80.106	30.727	-9.041	-88.65	-10.143
MARINE MAMMAL 3	?	-98.174	20.17	7.336	-100.000	-22.975

Figure 18
Joint Analysis of Communities and Resources (SSAP)
Using Pounds per Household Harvested Grouped Resources



CHIGNIK BAY	A	PORT ALSWORTH	W	Comm Fish 4	s
CHIGNIK LAGOON	B	PORT HEIDEN	X	Comm Fish 5	t
CHIGNIK LAKE	C	QUINHAGAK	Y	Fur bearer 1	u
DILLINGHAM	D	SOUTH NAKNEK	Z	Fur bearer 2	v
EGEGIK	E	UGASHIK	a	Fur bearer 3	w
EKWOK	F	Game 1	b	Plants 1	x
FALSE PASS	G	Game 2	c	Plants 2	y
IGIUGIG	H	Game 3	d	Plants 3	z
ILIAMNA	I	Game 4	e	Plants 4	@
IVANOF	J	Birds 1	f	Invertebrates 1	#
KING SALMON	K	Birds 2	g	Invertebrates 2	$
KOKHANOK	L	Birds 3	h	Invertebrates 3	%
KOLIGANEK	M	Birds 4	i	Invertebrates 4	&
MANOKOTAK	N	Birds 5	j	Mar Mammal 1	+
NAKNEK	O	NonComm Fish 1	k	Mar Mammal 2	>
NELSON LAGOON	P	NonComm Fish 2	l	Mar Mammal 3	?
NEW STUYAHOK	Q	NonComm Fish 3	m		
NEWHALEN	R	NonComm Fish 4	n		
NONDALTON	S	NonComm Fish 5	o		
PEDRO BAY	T	Comm Fish 1	p		
PERRYVILLE	U	Comm Fish 2	q		
PILOT POINT	V	Comm Fish 3	r		

Figure 19
Joint Analysis of Communities and Resources (SSAP) Using Pounds per Household Harvested Grouped Resources



CHIGNIK BAY	A	PORT ALSWORTH	W	Comm Fish 4	s
CHIGNIK LAGOON	B	PORT HEIDEN	X	Comm Fish 5	t
CHIGNIK LAKE	C	QUINHAGAK	Y	Fur bearer 1	u
DILLINGHAM	D	SOUTH NAKNEK	Z	Fur bearer 2	v
EGEGIK	E	UGASHIK	a	Fur bearer 3	w
EKWOK	F	Game 1	b	Plants 1	x
FALSE PASS	G	Game 2	c	Plants 2	y
IGIUGIG	H	Game 3	d	Plants 3	z
ILIAMNA	I	Game 4	e	Plants 4	@
IVANOF	J	Birds 1	f	Invertebrates 1	#
KING SALMON	K	Birds 2	g	Invertebrates 2	$
KOKHANOK	L	Birds 3	h	Invertebrates 3	%
KOLIGANEK	M	Birds 4	i	Invertebrates 4	&
MANOKOTAK	N	Birds 5	j	Mar Mammal 1	+
NAKNEK	O	NonComm Fish 1	k	Mar Mammal 2	>
NELSON LAGOON	P	NonComm Fish 2	l	Mar Mammal 3	?
NEW STUYAHOK	Q	NonComm Fish 3	m		
NEWHALEN	R	NonComm Fish 4	n		
NONDALTON	S	NonComm Fish 5	o		
PEDRO BAY	T	Comm Fish 1	p		
PERRYVILLE	U	Comm Fish 2	q		
PILOT POINT	V	Comm Fish 3	r		

CHAPTER VIII. STATISTICAL ANALYSIS OF FIELDWORK DATA

This chapter presents the findings from the analysis of data collected by Social Science Research Associates in the summer of 1990. The analyses conducted on these data were intended to be as similar as possible to those conducted on the ADF&G data presented in the previous chapter. Because of differences in the types of data collected, however, it was not always possible to keep the analyses presented here parallel with those presented previously.

The first two parts of this chapter present the analyses that were *not* possible to conduct using the ADF&G data. In the first part, we present data on harvesting and processing networks within and between communities and on giving and receiving networks. We look at the geography (i.e. the connections between households in different villages) and kinship (i.e. the nature of the relationship between the households) of these networks. In the second part, we discuss the variables which influence involvement in subsistence activities.

In the third part of this chapter, we present analyses that more or less parallel the analyses presented in our previous report. These are analyses of the harvesting and processing of subsistence resources, which include the mean amounts of resources harvested per household by community, percentages of households harvesting and processing various resources by community, the multivariate graphical representations (Fourier plots) of the resources, and the multidimensional similarity structure analyses of the resource data. The subsistence resources used in these analyses were either analyzed separately or were grouped into resource categories. The resources and the grouped categories were shown in Table 33.

A. COOPERATION AND SHARING NETWORKS FOR SUBSISTENCE

The data collected in this study differed from data collected in previous Alaskan subsistence studies in that it attempted to find networks within and between communities that connect households for the harvesting, processing, giving, and receiving of subsistence resources. Interviewees were asked to discuss with whom their household members harvested and processed subsistence resources, to whom their household gave subsistence resources and from whom their household received subsistence resources, how they were related to the people with whom they did subsistence activities and shared subsistence resources, and where the people they cooperated and shared with lived. Previous subsistence studies have documented the dependence of Alaskan villages on subsistence resources based on the contribution these resources make to the local diet. The main purpose of our inquiry was to document the role that subsistence activities and the sharing of subsistence resources play in the social and cultural structure of Alaskan villages.

Our research was guided by several expectations based upon previous research (Fall et al. 1986; Jorgensen 1990; Morris 1986; Schichnes and Chythlook 1988; Morris 1986). We anticipated that households within Bristol Bay cooperate in subsistence activities and share subsistence resources with other households both within and outside their own village. We thought that the strongest ties would exist between households within the same community. This would be followed by ties to households in surrounding communities, with the percent of households harvesting, processing, giving, or receiving with a household from another village decreasing as distance increased. We also expected that the cooperation and sharing networks would extend beyond Bristol Bay to other regions of Alaska, to Alaska's urban centers (Anchorage, Fairbanks, Juneau), and to areas outside the state.

We had several other expectations. We thought that villages with higher percentages of Native inhabitants would have the most intensive cooperation and sharing networks since the values of cooperation and sharing are deeply ingrained in Alaskan Native culture. According to the 1990 Census, the sample communities are ranked as follows: New Stuyahok (96%), Chignik Lake (92%), Nondalton (89%), Togiak (87%), Port Heiden (72%), Dillingham (56%), and Naknek (41%).

We anticipated that Dillingham, and to a lesser extent Naknek, would exhibit slightly different networks due to their roles as regional and subregional hubs respectively. We expected the intercommunity networks for these communities would be somewhat more extensive than for the other communities in the study. The populations of these two communities are the most migratory and residents often maintain ties with people in natal communities. Also, ADF&G's report on Dillingham (Fall et al. 1986) indicated that visitors from smaller villages often give subsistence foods to friends and relatives living in Dillingham in exchange for housing and transportation during their stay in the city.

Our literature review and pretest suggested that the subsistence activities which would draw people together the most would be the harvesting and processing of big game, non-commercial fish, and plants (primarily berries). We anticipated that households and villages would be most likely to share the particular resources which they have in abundance, and to receive resources which they lack and desire. Yet, we also expected to find sharing of the resources which most households harvest, such as non-commercial fish.

Another main expectation was that kinship plays a major role in the formation of groups for the harvesting, processing, giving, and receiving of subsistence resources. The literature on subsistence indicates that this is the case throughout Alaska and in other parts of the world. We expected that people would engage in subsistence activities most frequently with members of their same household, but would also cooperate with kin living in other households. Since households have become more nuclearized in recent years with improvements in the housing stock and increased prosperity, we expected that cooperation and sharing in regards to subsistence would connect related households that previously may have comprised a single, extended-family household. In particular, we expected to find inter-generational harvesting networks, which we believed would indicate that subsistence skills were being taught to younger generations.

We anticipated that cooperation and sharing patterns among kin would correspond in some degree to the historic kinship systems of Native groups. For instance, we thought there would be more ties with matrilineal kin in Nondalton, since it is predominantly Athabaskan and historically this native group practiced matrilineal descent. We expected to find matrilineal and patrilineal ties in Chignik Lake, Port Heiden, Togiak, and New Stuyahok, whose residents have Eskimo and Aleut ancestry. Historically Eskimos practiced bilateral descent and Aleuts were and continue to be bilateral. We thought that ties to extended kin would be much weaker in Dillingham and Naknek, since a large percentage of the population in these communities is non-Native, is originally from outside of Bristol Bay, and has few extended kin in the region.

We did not anticipate, however, that kinship relations would be the sole basis for cooperation and sharing between households. As Jorgensen (1990) found, availability, skill, and reliability were major considerations in choosing hunting partners, and need is a major factor in determining sharing patterns. In addition, because of improvements in subsistence harvesting technology, we also anticipated that many households would be self-sufficient and able to obtain enough of particular subsistence resources on their own, thus limiting their need to cooperate with other households in procuring these resources.

Before some of the empirical generalizations are presented, a word of explanation is needed about the way we use the term network and about how to interpret the tables which will be presented in this section. It was impossible to do a formal analysis of the structure of the networks connecting the 212 households included in this study to all of the households with which they cooperate and share for subsistence purposes. It would have been impossible for interviewees to recall all of the details of their cooperation and sharing networks, and the amount of data that would have been generated would have been unwieldy. We were primarily interested in documenting the existence of these networks, and we have done so by calculating the percentages of sample households in each community that have harvesting, processing, giving and receiving ties to households in various locations (the geographic networks) and to households that are related to them in various ways (the kinship networks).

The data from which the percentages were calculated is structured in the following manner. As for the geographic networks, if any member of a sample household harvested or processed a particular resource with someone from another village, the household was coded as having a tie to that other village. Similarly, if a household gave a particular resource to or received it from someone in another village, the household was coded as having a tie to that other village. The coded data thus documents the presence of ties, but does not indicate the strength of those ties. For instance, we do not know whether a household member harvested or processed a particular resource with ten people from the other village, or whether three members of the household harvested or processed with someone from the other village. Also, for instance, we do not know how many households in another village a sample household shares with or the amounts of a particular subsistence resource that it shares.

Our field notes contain more specific details about the connections between households and about the types and amounts of resources shared. Some networks were described in detail, but these were recorded to provide some illustrative cases rather than for purposes of conducting formal quantitative analysis. We were unable systematically to obtain and code these details for all households given the open-ended nature of the interview process which we used, as required by the Minerals Management Service. Additional detail on the networks between communities was presented previously in the community profiles but for this section, once relationships between households in various villages were coded, the villages were then grouped into larger geographic areas to present the information in table form.

As for the kinship networks, each individual harvester or processor was the ego for coding kinship relations pertaining to cooperation in subsistence activities. For instance, if any member of a sample household harvested or processed with someone in a particular category of kin relations, the household was coded as having that kinship tie. However, when it came to coding kinship relations in giving and receiving subsistence foods, the interviewee and their closest relative in the other household were the referents for determining the nature of the relationship between the giving and receiving households.

As with the geographic networks, the kinship data thus documents the presence of ties, but does not indicate the strength of those ties. For instance, we do not know whether both the male and female head of a household harvests or processes with siblings, just that someone in the household does these activities with siblings. Also, for instance, we do not know how many households in a specific kin group the sample household shares with or the amounts of a particular subsistence resource that it shares with that kin group. This and other limitations in the data are due, in part, to data gathering restrictions imposed on this research by the Minerals Management Service.

Given this explanation, it should be apparent that the tables presented in this section give an indication of the most basic structure of the networks connecting households for subsistence activities and the sharing of subsistence resources. The percentages contained in these tables represent a very conservative estimate of the strength of geographic and kinship ties between households in Bristol Bay.

1. Geographic Networks in Subsistence Harvesting and Processing

Table 54 through Table 60 show the harvesting networks for each grouped resource category. As we had anticipated, the within community ties are the strongest in almost every case. For the most part, households tend to harvest with other households in the same community. The next strongest ties tend to be with households in other communities located within the same or a nearby subregion of Bristol Bay. Some households harvest with people from other areas of Alaska, including urban areas of the state. Fewer harvesting ties exist with areas outside of Alaska, and these ties are only from the communities of Dillingham, Naknek, Chignik Lake, and New Stuyahok.

The communities of New Stuyahok, Nondalton, Togiak, and Chignik Lake have the largest percentage of Natives and tend to exhibit the highest levels of intracommunity cooperation in the harvesting of subsistence resources, as we had anticipated. For instance, 75% or more of the households in New Stuyahok harvest big game, plants, and non-commercial fish with other households within the village. In Nondalton, 85% of the households harvest plants with other households from the village while over half (50%) of the households harvest big game and non-commercial fish with other Nondalton households. In Togiak, over half of the households harvest birds with other households in the community while between one quarter and one half of the households harvest non-commercial fish, marine invertebrates, plants, and marine mammals with other Togiak households. Close to half of the households in Chignik Lake harvest birds, non-commercial fish, big game, and plants with other households in that community.

In intercommunity harvesting networks, of special interest is the relatively high level of cooperation between households in New Stuyahok and households in other Upper Bristol Bay communities for all resource categories except marine mammals. We found that people in New Stuyahok often harvest resources with people from the nearby communities of Ekwok and Koliganek. Because of its inland and upriver location, New Stuyahok is a stopping-off point for people from coastal communities in Upper Bristol Bay on their way to hunting areas up the Mulchatna River, where they form harvesting groups with New Stuyahok residents.

As we had anticipated, Dillingham and Naknek appear to have the most extensive intercommunity harvesting networks. That is, households from Dillingham and Naknek harvest subsistence resources with people from a wider variety of places. Port Heiden generally tends to have low levels of intracommunity and intercommunity cooperation in harvesting subsistence resources except for high intracommunity cooperation in harvesting big game.

The data indicate that the greatest harvesting networks generally exist for birds, big game, plants, and non-commercial fish. The harvesting tables for these resource categories show relatively high percentages of households harvesting with other households from their same community as well as from other communities. The high level of cooperation in harvesting plants indicates that, even though plants add a small amount of edible pounds to local subsistence diets, the gathering of this resource is an important subsistence activity.

Harvesting ties to households outside of Bristol Bay and outside of Alaska are greatest for non-commercial fish and plants. Our research indicates that harvesting these resources is an important activity which brings family and friends together. Many people who were raised in Bristol Bay but live elsewhere return to do subsistence fishing and generally pick berries at the same time. The harvesting networks for big game also extend to other parts of Alaska and outside of Alaska. This probably reflects the fact that hunting big game draws people to Bristol Bay for recreational (sporting) activity as well as subsistence activity.[11] The harvesting networks for birds only extend to other parts of the state, and primarily to urban areas.

The harvesting networks for small game, marine invertebrates, and marine mammals are much less extensive. Most of the ties between households for harvesting small game and marine mammals are within communities. Cooperation in the harvesting of marine mammals is strongest in Togiak, the community which harvests the most of these resources. The only intercommunity harvesting ties for small game are to Dillingham, New Stuyahok,

[11]When people harvested naturally-occurring resources as part of a sports activity but used the resources for subsistence purposes, we counted their harvest of that resource as a subsistence activity. That is, we counted all of their harvests that they ate or used for subsistence purposes (i.e. gave to other people; used for traditional crafts, etc.).

and Nondalton, the communities where people are the most involved in commercial fur trapping. The only intercommunity ties for harvesting marine mammals are between communities in Upper Bristol Bay, the area with the strongest Eskimo heritage and hence preference for these resources. The harvesting network for marine invertebrates is somewhat more extensive, but this is probably due to the fact that subsistence harvesting of marine invertebrates is generally done by groups of commercial fishers while they wait for openings or before they return to their homes.

The processing networks for each grouped resource category are shown in Table 61 through Table 67. As with the harvesting networks, the strongest ties in the processing networks are within communities, with the strength of ties decreasing as distance between communities increases. The communities of New Stuyahok, Nondalton, and Togiak tend to exhibit the highest levels of intracommunity cooperation in the processing of subsistence resources. The intercommunity processing networks are strongest for Dillingham.

Comparison of Table 54 through Table 60 (the harvesting networks tables) with Table 61 through Table 67 (the processing networks tables) indicates that the processing networks are much less extensive than the harvesting networks. In practically every instance, the percentage of households processing a given resource with other households is lower than the percentage of households harvesting with another household. Often cells that contained percentages in a harvesting table are empty in the corresponding processing table. This indicates that, in general, there is much less cooperation between households in the processing of subsistence resources than in the harvesting of subsistence resources. Subsistence resource processing is generally done alone or with other members of the same household.

However, there are differences in the level of cooperation between households in processing across resource groups. Not surprisingly, processing cooperation between households is greatest for big game and non-commercial fish. Harvests of these resources generally yield large amounts of food which must be preserved quickly before spoilage. These two resource groups comprise the bulk of the subsistence diet in Bristol Bay. People preserve large amounts of game and fish for winter, which require more processing activity. A similar situation exists with marine mammals in that a single harvest will yield a large amount of food, which often requires cooperation in processing. People cooperate in processing marine mammals to about the same degree that they cooperate in harvesting them, as indicated by the fact that similar percentages are contained in Table 58 and Table 65.

The least amount of cooperation takes place in processing marine invertebrates and small game, which are generally harvested in small quantities at any one time. Marine invertebrates are usually consumed fresh and rarely preserved, thus reducing the amount of processing which is necessary. Small game is generally processed by individual trappers, by another member of their family, or by the person to whom it may be given.

Table 54
Percent of Households Harvesting Birds with Another Household
By Village of Other Household

From==> To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	55.0	35.5	37.5	70.0	40.0	20.0	54.2
Pacific Side of AK Peninsula	5.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Penin.	0.0	3.9	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	9.2	3.1	20.0	5.0	0.0	0.0
Fairbanks, Juneau, Anchorage	5.0	2.6	3.1	0.0	5.0	5.0	4.2
Rest of AK	0.0	0.0	6.3	0.0	0.0	0.0	4.2
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 55
Percent of Households Harvesting Small Game with Another Household
by Village of Other Household

From==> To:	Chignik Lake	Dillingham	Nak-nek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	5.0	13.2	0.0	40.0	20.0	0.0	12.5
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bristol Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	1.3	0.0	5.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	0.0	5.0	0.0	0.0
Rest of Alaska	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 56
Percent of Households Harvesting Big Game
With Another Household by Village of Other Household

From==> To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	45.0	28.9	50.0	80.0	55.0	50.0	20.8
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	2.6	3.1	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	7.9	6.3	20.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	2.6	3.1	0.0	5.0	5.0	0.0
Rest of Alaska	0.0	0.0	3.1	0.0	0.0	5.0	0.0
Outside of Alaska	5.0	3.9	0.0	0.0	0.0	0.0	0.0

Table 57
Percent of Households Harvesting Invertebrates
With Another Household by Village of Other Household

From==> To	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	15.0	10.5	3.1	15.0	5.0	10.0	33.3
Pacific Side of AK Peninsula	10.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	3.9	0.0	15.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	10.0	1.3	0.0	0.0	0.0	0.0	0.0

Table 58
Percent of Households Harvesting Marine Mammals
With Another Household by Village of Other Household

From==> To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	5.0	3.9	3.1	5.0	0.0	0.0	25.0
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	1.3	0.0	0.0	5.0	0.0	4.2
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 59
Percent of Households Harvesting Plants
With Another Household by Village of Other Household

From==> To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	45.0	55.3	46.9	85.0	85.0	20.0	29.2
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	10.0	0.0
Bay side of AK Peninsula	0.0	1.3	3.1	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	7.9	9.4	25.0	5.0	0.0	4.2
Fairbanks, Juneau, Anchorage	0.0	6.6	6.3	0.0	0.0	5.0	4.2
Rest of Alaska	0.0	0.0	3.1	0.0	0.0	5.0	4.2
Outside of Alaska	0.0	5.3	12.5	0.0	0.0	0.0	0.0

Table 60
Percent of Households Harvesting Non-commercial Fish
With Another Household by Village of Other Household

From==> / To	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	60.0	61.8	53.1	75.0	60.0	15.0	41.7
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	10.0	0.0
Bay side of AK Peninsula	0.0	0.0	6.3	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	7.9	0.0	10.0	5.0	0.0	8.3
Fairbanks, Juneau, Anchorage	0.0	10.5	6.3	0.0	15.0	0.0	4.2
Rest of Alaska	0.0	9.2	12.5	0.0	0.0	5.0	0.0
Outside of Alaska	0.0	9.2	9.4	0.0	0.0	0.0	0.0

Table 61
Percent of Households Processing Birds
With Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	5.0	13.2	3.1	40.0	15.0	5.0	20.8
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	2.6	0.0	0.0	5.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	0.0	5.0	0.0	0.0
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 62
Percent of Households Processing Small Game
With Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	0.0	3.9	0.0	15.0	10.0	0.0	8.3
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest of Alaska	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 63
Percent of Households Processing Big Game
With Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondal-ton	Port Heiden	Togiak
Same Village	20.0	19.7	9.4	65.0	55.0	25.0	20.8
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	7.9	3.1	0.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	2.6	0.0	0.0	5.0	0.0	0.0
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	5.0	0.0	0.0	0.0	0.0	0.0	4.2

Table 64
Percent of Households Processing Invertebrates
With Another Household by Village of Other Household

From==> To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondal-ton	Port Heiden	Togiak
Same Village	5.0	5.3	3.1	0.0	5.0	10.0	8.3
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 65
Percent of Households Processing Marine Mammals
With Another Household by Village of Other Household

From==> To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	5.0	2.6	0.0	10.0	0.0	0.0	25.0
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 66
Percent of Households Processing Plants With Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondal-ton	Port Heiden	Togiak
Same Village	10.0	13.2	6.3	20.0	25.0	0.0	12.5
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	2.6	0.0	5.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	3.9	0.0	0.0	0.0	0.0	4.2
Rest of Alaska	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Outside of Alaska	0.0	2.6	0.0	0.0	0.0	0.0	0.0

Table 67
Percent of Households Processing Non-commercial Fish With Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	10.0	36.8	18.8	50.0	45.0	5.0	16.7
Pacific Side of AK Peninsula	0.0	1.3	0.0	0.0	0.0	10.0	0.0
Bay side of AK Peninsula	0.0	0.0	3.1	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	7.9	0.0	10.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	6.6	0.0	0.0	10.0	0.0	0.0
Rest of Alaska	0.0	5.3	3.1	0.0	5.0	0.0	0.0
Outside of Alaska	5.0	3.9	6.3	0.0	0.0	0.0	0.0

2. Geographic Networks in Giving and Receiving Subsistence Foods

The networks for sharing subsistence resources within and between communities are shown in Table 68 through Table 81. The percentages of households *giving* grouped subsistence resources to other households are shown in Table 68 through Table 74. The percentages of households *receiving* grouped subsistence resources from other households are shown in Table 75 through Table 81.

Overall, the networks observed for the giving and receiving of subsistence resources are more extensive and intricate than the networks observed for the harvesting or the processing of subsistence resources. In general, more households give resources to and receive resources from other households, both within and outside their own community, than harvest and process with other households. Stronger giving and receiving ties are especially noted between the seven Bristol Bay communities surveyed and communities outside the region. It is clear that subsistence resources flow between Bristol Bay and the three urban areas of Alaska (namely Anchorage, Fairbanks, and Juneau), other parts of Alaska, and outside of Alaska.

As was the case with harvesting and processing, the strongest ties for giving and receiving subsistence resources are between households *within* the same community. However, the next strongest ties for sharing subsistence resources are *not* necessarily with households in nearby communities, as was the case with harvesting and processing and as we had anticipated. In the *receiving* of subsistence resources, the next strongest ties are generally between the sample communities and other communities within Bristol Bay. This means that the subsistence needs of Bristol Bay communities are generally provided for from within the region. For birds, plants, and non-commercial fish, which are generally available throughout the region, the receiving ties tend to be to nearby communities. But for small game, big game, marine invertebrates, and marine mammals, the receiving ties tend to be to areas where these resources are in abundance.

In *giving* subsistence resources, the next strongest ties are to communities outside Bristol Bay. In particular, note the large percentages of households in every sample community that send big game, plants, and non-commercial fish outside the region. These percentages are generally greater than the percentages of households which send these same resources to communities other than their own within Bristol Bay. Households in the sample communities generally give more birds, small game, big game, plants, and non-commercial fish to households outside the region than they receive from households outside the region. Sample communities receive more marine invertebrates and marine mammals from outside the region than they give, except for Chignik Lake and Togiak which have these resources in abundance. Apparently, then, the resources which are in abundance in Bristol Bay provide for the subsistence needs of people in other areas as well as the needs of the Bristol Bay population.

Several communities occupy interesting positions in regional sharing networks. A relatively large percentage of households in New Stuyahok gives resources of all kinds to other households in Upper Bristol Bay communities. This indicates that New Stuyahok may be a subregional center in subsistence sharing networks.

Togiak has the highest percentage of households giving birds, marine mammals, and plants to communities in the rest of Alaska (non-urban areas) and receiving plants and non-commercial fish from communities in the rest of Alaska. Our ethnographic work indicates that this sharing extends primarily to the Kuskokwim region, where people have extensive historic and kinship ties. Togiak thus appears to occupy a key position in connecting the sharing networks of Bristol Bay to those of the Kuskokwim region.

Port Heiden is important in that it has the most sharing connections to all three subregions of Bristol Bay (the Pacific side of the Alaska Peninsula, the Bristol Bay side of the Alaska Peninsula, and Upper Bristol Bay communities). Given the location of this community on the Bristol Bay side of the Alaska Peninsula and the fact that it has a large airport runway, Port Heiden serves as a crossroads between various subregions of Bristol Bay.

The data appear to support our expectation that communities would be most likely to share the particular resources which they have in abundance and to receive resources which they lack, need, and desire.[12] Several examples illustrate this tendency. Togiak,

[12]The data on giving includes subsistence resources that households share but which they did not harvest themselves. That is, if households shared subsistence resources which

New Stuyahok, Port Heiden, and Chignik Lake harvest and also share the most birds, while Naknek and Dillingham harvest the least amount of birds and receive the most from other communities. New Stuyahok, Nondalton, and Togiak harvest the most small game and also give the most small game, while Dillingham and Naknek harvest less but receive the most. Marine invertebrates are harvested and shared the most by residents of Port Heiden, Togiak, and Chignik Lake. Togiak harvests by far the most marine mammals and also shares the most marine mammals, while New Stuyahok and Dillingham, the other two sample communities with a significant Eskimo population which desires marine mammals, receive the most of this resource.

The tendency to share what one has and to receive what one does not have is much harder to discern in the case of big game, plants, and non-commercial fish because these resources are harvested by the highest percentages of households in all of the sample communities and because these resource categories contain the largest number of species. The giving and receiving tables for these resources indicate that these resources are widely shared within and between communities and have the most intricate giving and receiving networks. What the tables cannot reveal, but what was apparent from the interviews, is that people will share the particular species available to them and receive other species which are not available to them. People will share different types of game, different types of berries and plants, and different types of fresh and saltwater fish according to availability and need.

Dillingham and Naknek exhibit slightly different sharing networks than the other communities. A greater percentage of households in these communities receives resources from other communities in Bristol Bay than gives resources to these other communities. This lends support to our expectation that Dillingham residents often receive food or other resources when visitors stay in the city and reinforces the findings of ADF&G (Fall et al. 1986:84-87).

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they received from others, this was counted in our percentages on giving. Thus, the percentages in the giving tables are not an exact indication of the particular resources a community has in abundance and shares.

Table 68
Percent of Households Giving Birds to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	55.0	38.2	21.9	65.0	40.0	45.0	65.2
Pacific Side of AK Peninsula	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	2.6	3.1	35.0	5.0	5.0	4.2
Fairbanks, Juneau, Anchorage	5.0	3.9	3.1	0.0	15.0	10.0	4.2
Rest of Alaska	5.0	1.3	0.0	0.0	0.0	0.0	8.3
Outside of Alaska	0.0	5.3	0.0	0.0	0.0	5.0	0.0

Table 69
Percent of Households Giving Small Game to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	0.0	22.4	9.4	40.0	40.0	0.0	45.8
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	1.3	0.0	25.0	5.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	0.0	3.1	5.0	5.0	0.0	8.3
Rest of Alaska	0.0	1.3	0.0	0.0	0.0	0.0	12.5
Outside of Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 70
Percent of Households Giving Big Game to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	50.0	46.1	43.8	75.0	70.0	70.0	45.8
Pacific Side of AK Peninsula	5.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	0.0	3.1	0.0	5.0	5.0	0.0
Upper Bristol Bay	0.0	6.6	3.1	50.0	0.0	5.0	0.0
Fairbanks, Juneau, Anchorage	20.0	6.6	18.8	15.0	25.0	5.0	8.3
Rest of Alaska	5.0	5.3	12.5	5.0	0.0	5.0	4.2
Outside of Alaska	5.0	1.3	12.5	0.0	0.0	0.0	4.2

Table 71
Percent of Households Giving Invertebrates to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondal-ton	Port Heiden	Togiak
Same Village	45.0	21.1	3.1	20.0	20.0	25.0	29.2
Pacific Side of AK Peninsula	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	1.3	0.0	10.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	10.0	0.0	0.0	0.0	5.0	0.0	0.0
Rest of Alaska	0.0	0.0	3.1	0.0	0.0	0.0	0.0
Outside of Alaska	5.0	0.0	0.0	0.0	0.0	5.0	0.0

Table 72
Percent of Households Giving Marine Mammals to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	20.0	9.2	3.1	45.0	5.0	0.0	58.3
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	2.6	0.0	5.0	5.0	0.0	20.8
Fairbanks, Juneau, Anchorage	0.0	2.6	0.0	0.0	0.0	0.0	4.2
Rest of Alaska	5.0	2.6	0.0	0.0	0.0	0.0	12.5
Outside of Alaska	0.0	1.3	0.0	0.0	0.0	0.0	0.0

Table 73
Percent of Households Giving Plants to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondal-ton	Port Heiden	Togiak
Same Village	45.0	40.8	34.4	50.0	50.0	25.0	62.5
Pacific Side of AK Peninsula	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	6.3	0.0	5.0	0.0	0.0
Upper Bristol Bay	0.0	6.6	6.3	20.0	5.0	10.0	8.3
Fairbanks, Juneau, Anchorage	20.0	9.2	15.6	0.0	10.0	10.0	4.2
Rest of Alaska	5.0	3.9	6.3	5.0	5.0	5.0	12.5
Outside of Alaska	5.0	13.2	25.0	5.0	5.0	20.0	8.3

Table 74
Percent of Households Giving Non-commercial Fish to Another Household by Village of Other Household

From==> / To:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	50.0	64.5	40.6	75.0	60.0	40.0	79.2
Pacific Side of AK Peninsula	20.0	0.0	0.0	0.0	0.0	10.0	0.0
Bay side of AK Peninsula	5.0	1.3	6.3	0.0	5.0	5.0	0.0
Upper Bristol Bay	0.0	13.2	6.3	40.0	10.0	10.0	12.5
Fairbanks, Juneau, Anchorage	45.0	22.4	31.3	10.0	25.0	10.0	12.5
Rest of Alaska	10.0	6.6	15.6	5.0	5.0	0.0	4.2
Outside of Alaska	5.0	26.3	43.8	0.0	10.0	10.0	16.7

Table 75
Percent of Households Receiving Birds from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	60.0	47.4	25.0	50.0	40.0	75.0	66.7
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	3.9	3.1	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	13.2	12.5	10.0	5.0	0.0	4.2
Fairbanks, Juneau, Anchorage	5.0	0.0	3.1	0.0	0.0	0.0	0.0
Rest of Alaska	0.0	2.6	3.1	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	5.3	0.0	0.0	0.0	0.0	0.0

Table 76
Percent of Households Receiving Small Game from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	20.0	22.4	9.4	40.0	45.0	0.0	58.3
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	14.5	0.0	5.0	5.0	0.0	8.3
Fairbanks, Juneau, Anchorage	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest of Alaska	0.0	1.3	6.3	0.0	0.0	0.0	0.0
Outside of Alaska	0.0	1.3	0.0	0.0	0.0	0.0	0.0

Table 77
Percent of Households Receiving Big Game from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	80.0	60.5	68.8	75.0	80.0	90.0	75.0
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	10.0	1.3	12.5	0.0	0.0	5.0	0.0
Upper Bristol Bay	5.0	26.3	6.3	20.0	15.0	0.0	20.8
Fairbanks, Juneau, Anchorage	0.0	1.3	6.3	0.0	10.0	0.0	4.2
Rest of Alaska	0.0	0.0	3.1	0.0	5.0	5.0	0.0
Outside of Alaska	10.0	2.6	3.1	0.0	0.0	0.0	0.0

Table 78
Percent of Households Receiving Invertebrates from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	50.0	18.4	18.8	20.0	15.0	35.0	37.5
Pacific Side of AK Peninsula	20.0	2.6	3.1	0.0	0.0	10.0	0.0
Bay side of AK Peninsula	0.0	5.3	0.0	0.0	0.0	10.0	4.2
Upper Bristol Bay	0.0	3.9	3.1	5.0	15.0	0.0	4.2
Fairbanks, Juneau, Anchorage	0.0	1.3	0.0	0.0	5.0	0.0	0.0
Rest of Alaska	0.0	7.9	12.5	10.0	0.0	0.0	4.2
Outside of Alaska	10.0	2.6	0.0	0.0	0.0	5.0	4.2

Table 79
Percent of Households Receiving Marine Mammals from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	30.0	22.4	6.3	35.0	5.0	10.0	58.3
Pacific Side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Bay side of AK Peninsula	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Bristol Bay	0.0	22.4	9.4	45.0	0.0	0.0	0.0
Fairbanks, Juneau, Anchorage	0.0	2.6	0.0	0.0	0.0	0.0	0.0
Rest of Alaska	0.0	9.2	6.3	5.0	5.0	0.0	0.0
Outside of Alaska	0.0	1.3	3.1	0.0	0.0	5.0	0.0

Table 80
Percent of Households Receiving Plants from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	45.0	52.6	43.8	45.0	45.0	25.0	25.0
Pacific Side of AK Peninsula	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay side of AK Peninsula	0.0	1.3	0.0	0.0	0.0	10.0	0.0
Upper Bristol Bay	0.0	14.5	25.0	35.0	5.0	0.0	8.3
Fairbanks, Juneau, Anchorage	0.0	3.9	9.4	0.0	5.0	0.0	0.0
Rest of Alaska	0.0	5.3	12.5	5.0	0.0	10.0	25.0
Outside of Alaska	5.0	2.6	6.3	0.0	0.0	5.0	0.0

Table 81
Percent of Households Receiving Non-commercial Fish from Another Household by Village of Other Household

To ==> / From:	Chignik Lake	Dilling-ham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Same Village	75.0	63.2	62.5	75.0	85.0	70.0	79.2
Pacific Side of AK Peninsula	10.0	1.3	3.1	0.0	0.0	15.0	0.0
Bay side of AK Peninsula	0.0	2.6	9.4	0.0	0.0	5.0	0.0
Upper Bristol Bay	0.0	25.0	18.8	45.0	5.0	5.0	29.2
Fairbanks, Juneau, Anchorage	0.0	5.3	3.1	0.0	5.0	0.0	0.0
Rest of Alaska	5.0	6.6	9.4	15.0	5.0	10.0	20.8
Outside of Alaska	5.0	6.6	3.1	5.0	5.0	10.0	0.0

3. Kinship Networks in Subsistence Harvesting and Processing

Table 82 through Table 88 give the percentages of households in each study community harvesting various resources by kinship group. Overall, the three most common harvesting groups are harvesting alone, harvesting with other household members, and harvesting with friends not from the same household. Harvesting with a sibling, matrilineal kin, patrilineal kin, and affines not from the same household are the next most frequently cited kinship groups. Harvesting groups consisting of affines and siblings not in the same household tend to be cited more frequently than groups composed of more distant matrilineal and patrilineal kin. More harvesting activity generally is done with matrilineal kin than with patrilineal kin.

Fewer harvesting groups are formed with offspring, grandchildren, and parents not in the same household. We had anticipated finding more of these types of inter-generational harvesting networks. Given the high level of harvesting with other household members, it appears that most of these types of inter-generational harvesting networks are formed within households. The data indicate that the inter-household, inter-generational networks are mostly composed of affinal and extended kin. Given the high level of ties between friends and siblings, harvesting seems to be an activity which is mostly done with contemporaries. In the smaller villages where there are few other social activities available, subsistence harvesting is a form of recreation often done with people one's own age.

The data indicate that kinship is the basis for the formation of harvesting groups. Harvesting with friends was the most common harvesting group next to harvesting with other household members only because we separated the various types of kin for analytic purposes. If the data had been coded as kin or non-kin, the most common harvesting connections would have been with kin. However, the high percentages of households harvesting with friends does support our hypothesis that kinship is not the sole organizing principle for the formation of harvesting groups, but that availability, skill, and reliability are probably also factors influencing the selection of harvesting partners.

The tendency for people to harvest more with matrilineal kin than patrilineal kin in the Athabaskan community of Nondalton fits our expectations. This tendency was not evident in the Aleut community of Chignik Lake and much less pronounced in the mixed

Aleut/non-Native community of Port Heiden, where we thought people would do more with matrilineal kin. We had anticipated finding harvesting groups fairly equally distributed between matrilineal and patrilineal kin in the Eskimo communities of New Stuyahok and Togiak, but were surprised to find a very strong tendency to harvest with matrilineal kin in New Stuyahok.

There is a good deal of variation in harvesting groups across resource categories. For example, the tables for birds, big game, plants, and non-commercial fish have very few empty cells. This indicates that harvesting these resources tends to be a group activity and that there are a wide variety of harvesting group compositions. Harvesting plants and non-commercial fish are the two subsistence harvesting activities that bring the most families together, as evidenced by the highest percentages of those who harvest with other household members and with offspring, grandchildren, and parents who reside in other households.

In contrast, there are many missing cells in the tables for small game, marine mammals, and marine invertebrates. This reflects, of course, not only the fact that fewer combinations of kin groups harvest these resources but also the fact that there is greater variation in the distribution of these resources across communities. Small game, marine mammals, and marine invertebrates generally are less available, fewer people harvest them, and thus, there are fewer combinations of kin involved in their harvest.

Harvesting small game, which consists mostly of trapping furbearing animals and catching an occasional porcupine, is the most solitary harvesting activity. In every community except New Stuyahok, greater percentages of household members harvest small game alone than harvest with any other group of relations or friends. In New Stuyahok, the greatest percentage of households harvest small game with friends and larger percentages of households harvest with groups of kin than in the other communities. Many residents of New Stuyahok are serious trappers, trap for days or weeks at a time during the winter, and have established trapping partners. In Togiak, there is a strong tendency for people to trap with siblings residing in another household and, to a lesser extent, with friends outside the household.

Table 89 through Table 95 show the percentages of households in each study community processing the major resources by kinship group. The data indicate that processing is primarily a solitary activity or done with other household members. A strong tendency exists for people to process birds, small game, and plants alone, except in New Stuyahok where other household members offer significant help. There is much less cooperation in processing plants than in harvesting them, largely because plants are more difficult and time consuming to gather than to process. Plant processing largely consists of washing, cooking, and/or freezing them, or making jams, jellies, or sauces in the case of berries.

Processing big game, marine mammals, and non-commercial fish tend to be more group activities and various types of kin cooperate with one another in processing these resources. However, the majority of processing even of these resources is still done with other household members. Processing non-commercial fish is the activity which involves the most inter-generational kin groups and the widest variety of collateral and affinal kin. There is a slight tendency to do more processing with matrilineal kin for all resource categories and all communities.

Table 82
Percent of Households Harvesting Birds With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	45.0	22.4	31.3	40.0	55.0	55.0	62.5
Other HH Member	20.0	22.4	21.9	45.0	20.0	50.0	29.2
Sibling not in HH	20.0	10.5	12.5	30.0	15.0	0.0	20.8
Offspring not in HH	5.0	3.9	6.3	0.0	0.0	5.0	4.2
Patrilineal kin not in HH	15.0	9.2	9.4	15.0	10.0	0.0	4.2
Matrilineal kin not in HH	20.0	10.5	3.1	30.0	25.0	5.0	8.3
Affines not in HH	20.0	10.5	9.4	5.0	5.0	0.0	20.8
Friend not in HH	35.0	28.9	34.4	50.0	30.0	25.0	16.7
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	5.0	2.6	3.1	0.0	0.0	0.0	4.2
Other group	5.0	2.6	0.0	5.0	0.0	0.0	12.5

Table 83
Percent of Households Harvesting Small Game With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	10.0	19.7	18.8	30.0	55.0	10.0	58.3
Other HH Member	0.0	5.3	3.1	25.0	10.0	0.0	4.2
Sibling not in HH	5.0	1.3	0.0	20.0	10.0	0.0	0.0
Offspring not in HH	0.0	1.3	0.0	5.0	0.0	0.0	0.0
Patrilineal kin not in HH	5.0	1.3	0.0	0.0	0.0	0.0	4.2
Matrilineal kin not in HH	0.0	1.3	0.0	15.0	5.0	0.0	0.0
Affines not in HH	5.0	3.9	0.0	20.0	0.0	0.0	0.0
Friend not in HH	5.0	9.2	3.1	35.0	10.0	0.0	12.5
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	0.0	0.0	5.0	5.0	0.0	0.0
Other group	0.0	1.3	0.0	0.0	5.0	0.0	4.2

Table 84
Percent of Households Harvesting Big Game With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	10.0	7.9	12.5	15.0	35.0	30.0	4.2
Other HH Member	20.0	11.8	18.8	40.0	20.0	15.0	8.3
Sibling not in HH	20.0	7.9	12.5	35.0	20.0	5.0	4.2
Offspring not in HH	10.0	2.6	6.3	5.0	5.0	10.0	0.0
Patrilineal kin not in HH	20.0	3.9	3.1	10.0	15.0	5.0	8.3
Matrilineal kin not in HH	15.0	3.9	3.1	35.0	25.0	10.0	8.3
Affines not in HH	10.0	10.5	18.8	20.0	30.0	5.0	4.2
Friend not in HH	25.0	23.7	46.9	55.0	30.0	30.0	8.3
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	15.0	1.3	3.1	5.0	10.0	0.0	4.2
Other group	0.0	1.3	0.0	0.0	5.0	10.0	4.2

Table 85
Percent of Households Harvesting Marine Mammals With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	5.0	1.3	0.0	0.0	0.0	0.0	20.8
Other HH Member	10.0	1.3	0.0	0.0	0.0	0.0	16.7
Sibling not in HH	0.0	1.3	0.0	0.0	0.0	0.0	4.2
Offspring not in HH	0.0	0.0	0.0	0.0	0.0	0.0	4.2
Patrilineal kin not in HH	0.0	1.3	0.0	0.0	0.0	0.0	4.2
Matrilineal kin not in HH	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Affines not in HH	0.0	0.0	3.1	0.0	0.0	0.0	4.2
Friend not in HH	5.0	0.0	3.1	5.0	5.0	0.0	12.5
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other group	0.0	2.6	0.0	0.0	0.0	0.0	8.3

Table 86
Percent of Households Harvesting Invertebrates With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	20.0	2.6	0.0	0.0	5.0	20.0	12.5
Other HH Member	15.0	9.2	9.4	10.0	0.0	40.0	25.0
Sibling not in HH	5.0	5.3	0.0	15.0	0.0	0.0	4.2
Offspring not in HH	5.0	1.3	0.0	0.0	0.0	0.0	0.0
Patrilineal kin not in HH	0.0	0.0	0.0	10.0	0.0	0.0	8.3
Matrilineal kin not in HH	0.0	0.0	3.1	5.0	0.0	0.0	8.3
Affines not in HH	10.0	2.6	0.0	5.0	5.0	0.0	8.3
Friend not in HH	20.0	10.5	0.0	25.0	0.0	15.0	8.3
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	5.0	0.0	3.1	0.0	0.0	5.0	4.2
Other group	5.0	0.0	0.0	5.0	0.0	0.0	8.3

Table 87
Percent of Households Harvesting Plants With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	20.0	30.3	31.3	40.0	40.0	20.0	33.3
Other HH Member	55.0	43.4	68.8	65.0	45.0	60.0	70.8
Sibling not in HH	15.0	10.5	15.6	35.0	40.0	10.0	20.8
Offspring not in HH	10.0	5.3	3.1	15.0	15.0	0.0	4.2
Patrilineal kin not in HH	5.0	5.3	0.0	10.0	15.0	5.0	4.2
Matrilineal kin not in HH	10.0	9.2	12.5	30.0	30.0	10.0	16.7
Affines not in HH	20.0	19.7	15.6	20.0	35.0	10.0	4.2
Friend not in HH	15.0	43.4	34.4	60.0	50.0	15.0	16.7
Grandchild not in HH	5.0	6.6	6.3	0.0	0.0	5.0	0.0
Parent not in HH	10.0	17.1	15.6	25.0	15.0	5.0	8.3
Other group	5.0	7.9	9.4	0.0	5.0	5.0	8.3

Table 88
Percent of Households Harvesting Non-commercial Fish With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	45.0	28.9	37.5	40.0	55.0	45.0	54.2
Other HH Member	55.0	52.6	78.1	70.0	50.0	35.0	75.0
Sibling not in HH	25.0	21.1	12.5	15.0	30.0	0.0	37.5
Offspring not in HH	15.0	14.5	12.5	15.0	20.0	5.0	4.2
Patrilineal kin not in HH	15.0	10.5	6.3	15.0	5.0	0.0	4.2
Matrilineal kin not in HH	5.0	14.5	9.4	25.0	30.0	0.0	12.5
Affines not in HH	20.0	23.7	18.8	35.0	25.0	5.0	12.5
Friend not in HH	45.0	39.5	50.0	45.0	40.0	10.0	16.7
Grandchild not in HH	0.0	2.6	3.1	0.0	0.0	0.0	0.0
Parent not in HH	5.0	23.7	12.5	15.0	15.0	5.0	8.3
Other group	5.0	10.5	3.1	10.0	0.0	0.0	8.3

Table 89
Percent of Households Processing Birds With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	70.0	43.4	46.9	55.0	70.0	80.0	58.3
Other HH Member	25.0	21.1	25.0	65.0	25.0	40.0	37.5
Sibling not in HH	0.0	2.6	0.0	20.0	10.0	0.0	16.7
Offspring not in HH	0.0	0.0	3.1	10.0	0.0	5.0	4.2
Patrilineal kin not in HH	0.0	1.3	0.0	0.0	5.0	0.0	0.0
Matrilineal kin not in HH	0.0	1.3	0.0	5.0	5.0	0.0	0.0
Affines not in HH	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Friend not in HH	0.0	6.6	0.0	5.0	5.0	5.0	0.0
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	3.9	0.0	0.0	0.0	0.0	8.3
Other group	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 90
Percent of Households Processing Small Game With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	20.0	26.3	15.6	50.0	65.0	10.0	50.0
Other HH Member	5.0	5.3	3.1	40.0	15.0	0.0	20.8
Sibling not in HH	0.0	0.0	0.0	5.0	0.0	0.0	4.2
Offspring not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Patrilineal kin not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Matrilineal kin not in HH	0.0	0.0	0.0	5.0	5.0	0.0	0.0
Affines not in HH	0.0	1.3	0.0	5.0	0.0	0.0	0.0
Friend not in HH	0.0	2.6	0.0	10.0	0.0	0.0	0.0
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	0.0	0.0	0.0	0.0	0.0	4.2
Other group	0.0	0.0	0.0	0.0	5.0	0.0	0.0

Table 91
Percent of Households Processing Big Game With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	45.0	19.7	25.0	20.0	75.0	60.0	33.3
Other HH Member	55.0	31.6	59.4	70.0	35.0	35.0	45.8
Sibling not in HH	5.0	3.9	3.1	35.0	20.0	0.0	8.3
Offspring not in HH	5.0	3.9	3.1	25.0	5.0	0.0	0.0
Patrilineal kin not in HH	0.0	1.3	0.0	0.0	10.0	5.0	4.2
Matrilineal kin not in HH	0.0	3.9	0.0	25.0	25.0	10.0	4.2
Affines not in HH	15.0	9.2	6.3	25.0	15.0	5.0	4.2
Friend not in HH	10.0	14.5	6.3	20.0	35.0	15.0	4.2
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	10.0	6.6	0.0	0.0	10.0	0.0	8.3
Other group	0.0	1.3	0.0	0.0	5.0	0.0	4.2

Table 92
Percent of Households Processing Marine Mammals With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	15.0	0.0	0.0	5.0	5.0	0.0	25.0
Other HH Member	15.0	5.3	3.1	15.0	0.0	0.0	33.3
Sibling not in HH	5.0	0.0	0.0	0.0	0.0	0.0	20.8
Offspring not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Patrilineal kin not in HH	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Matrilineal kin not in HH	0.0	0.0	0.0	0.0	0.0	0.0	8.3
Affines not in HH	5.0	1.3	0.0	0.0	0.0	0.0	4.2
Friend not in HH	0.0	0.0	0.0	0.0	0.0	0.0	4.2
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	5.0	0.0	0.0	5.0	0.0	0.0	4.2
Other group	0.0	0.0	0.0	0.0	0.0	0.0	8.3

Table 93
Percent of Households Processing Invertebrates With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	50.0	13.2	0.0	5.0	10.0	25.0	20.8
Other HH Member	30.0	6.6	6.3	5.0	0.0	35.0	4.2
Sibling not in HH	0.0	2.6	0.0	0.0	0.0	5.0	0.0
Offspring not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Patrilineal kin not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Matrilineal kin not in HH	0.0	0.0	3.1	0.0	0.0	0.0	0.0
Affines not in HH	5.0	0.0	0.0	0.0	5.0	0.0	4.2
Friend not in HH	0.0	5.3	0.0	5.0	0.0	10.0	0.0
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	5.0	1.3	3.1	0.0	0.0	0.0	4.2
Other group	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 94
Percent of Households Processing Plants With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	55.0	56.6	53.1	45.0	55.0	55.0	58.3
Other HH Member	25.0	18.4	43.8	60.0	20.0	25.0	37.5
Sibling not in HH	0.0	0.0	3.1	5.0	0.0	5.0	8.3
Offspring not in HH	10.0	3.9	3.1	5.0	5.0	0.0	4.2
Patrilineal kin not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Matrilineal kin not in HH	0.0	1.3	3.1	5.0	0.0	0.0	0.0
Affines not in HH	5.0	5.3	0.0	10.0	10.0	5.0	0.0
Friend not in HH	5.0	7.9	0.0	5.0	5.0	5.0	0.0
Grandchild not in HH	0.0	3.9	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	6.6	3.1	10.0	5.0	0.0	4.2
Other group	5.0	1.3	0.0	0.0	0.0	0.0	0.0

Table 95
Percent of Households Processing Non-commercial Fish With a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Alone	55.0	42.1	53.1	50.0	70.0	55.0	50.0
Other HH Member	45.0	48.7	65.6	55.0	35.0	35.0	50.0
Sibling not in HH	5.0	13.2	12.5	20.0	15.0	0.0	16.7
Offspring not in HH	0.0	9.2	3.1	35.0	10.0	0.0	0.0
Patrilineal kin not in HH	0.0	3.9	3.1	5.0	5.0	0.0	4.2
Matrilineal kin not in HH	0.0	9.2	6.3	10.0	15.0	0.0	8.3
Affines not in HH	10.0	18.4	12.5	25.0	15.0	0.0	8.3
Friend not in HH	5.0	18.4	15.6	10.0	15.0	10.0	0.0
Grandchild not in HH	5.0	1.3	0.0	5.0	0.0	0.0	0.0
Parent not in HH	5.0	14.5	9.4	15.0	5.0	5.0	8.3
Other group	0.0	6.6	3.1	5.0	0.0	0.0	0.0

4. Kinship Networks in Giving and Receiving Subsistence Foods

Table 96 through Table 109 give an indication of the kinship networks between households which share subsistence resources. The percent of households *giving* a major resource group to a specific kin group are shown in Table 96 through Table 102. The results for *receiving* a major resource group from various types of kin are shown in Table 103 through Table 109. In general, the kinship networks for sharing subsistence resources are more extensive than the kinship networks for harvesting and processing subsistence resources. These tables indicate that subsistence resources are widely distributed among family and friends, and that the sharing of subsistence resources connects more households than the harvesting of those resources.

The giving of resources is directly related to their availability and harvest. In general, the higher the percentage of households in a community that harvests a particular resource, the lower the percentage of households that do not give that resource to other households. For example, in most communities, the highest percentages of households harvest big game, plants, and non-commercial fish, and the majority of households give that resource to other households (i.e. less than 50% report no giving). For another example, Togiak is the community with the highest percentage of households harvesting marine mammals, and it is the community with the lowest percentage of households that do not give this resource to other households.

Interestingly, few households in New Stuyahok harvest marine mammals, yet New Stuyahok has a relatively high percentage of households that share marine mammals (Table 99). Table 106 shows that a relatively low percentage of households in New Stuyahok do not receive marine mammals and that a large percentage of households receive marine mammals from friends and affines. Previously we saw that many households in New Stuyahok receive marine mammal products from other communities in Upper Bristol Bay, and our interviews indicated that most of this comes from Togiak. Thus, the high percentage of households in New Stuyahok that shares marine mammals is an indication of the *redistribution* of this resource. That is, people share not only what they harvest themselves but they also share what they receive. Marine mammal products (primarily seal oil) are particularly desired among these Eskimos and widely shared.

An interesting finding is that more households give subsistence resources to parents and offspring than harvest those resources with them. This tendency is more pronounced in the case of birds, small game, big game, and marine mammals than in the case of plants or non-commercial fish. This finding suggests that inter-household, inter-generational groups (parents, offspring, grandchildren) may be more connected in the distribution and consumption of subsistence foods than in the harvest of those resources.

Parents tend to receive more birds, small game, big game, and marine mammals since they are harder to harvest and elderly people are less able to participate. Since these resources provide more traditional foods which older Native Alaskans crave, younger people harvest them, oftentimes even though they do not care to eat them, and give them to older people. Parents tend to give more plants and non-commercial fish because they are able to continue harvesting these resources, which usually requires less travel and less strenuous effort.

Another reason that there tends to be more giving of subsistence resources to parents is that they are often the ones who know best how to prepare traditional foods and the giver is usually then invited to eat some of the food. Also, parents' houses tend to be gathering places for offspring and other extended kin. Giving subsistence resources to parents usually ensures the widest distribution among these relatives.

Table 96
Percent of Households Giving Birds to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	40.0	60.5	75.0	30.0	60.0	50.0	33.3
Siblings not in HH	20.0	11.8	0.0	30.0	10.0	15.0	12.5
Offspring not in HH	10.0	5.3	3.1	15.0	10.0	15.0	0.0
Patrilineal kin not in HH	10.0	2.6	3.1	15.0	20.0	0.0	12.5
Matrilineal kin not in HH	15.0	5.3	6.3	15.0	30.0	10.0	16.7
Affines not in HH	25.0	18.4	0.0	35.0	5.0	25.0	12.5
Friend not in HH	30.0	18.4	18.8	10.0	30.0	15.0	33.3
Grandchild not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Parent not in HH	25.0	13.2	6.3	40.0	15.0	5.0	12.5
Other group	20.0	10.5	3.1	30.0	20.0	5.0	20.8

Table 97
Percent of Households Giving Small Game to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	100.0	77.6	90.6	55.0	55.0	100.0	37.5
Siblings not in HH	0.0	2.6	3.1	25.0	0.0	0.0	8.3
Offspring not in HH	0.0	1.3	3.1	10.0	15.0	0.0	0.0
Patrilineal kin not in HH	0.0	1.3	0.0	5.0	15.0	0.0	8.3
Matrilineal kin not in HH	0.0	1.3	0.0	20.0	20.0	0.0	12.5
Affines not in HH	0.0	6.6	3.1	30.0	0.0	0.0	8.3
Friend not in HH	0.0	13.2	3.1	25.0	20.0	0.0	29.2
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	3.9	0.0	30.0	15.0	0.0	8.3
Other group	0.0	3.9	3.1	20.0	25.0	0.0	16.7

Table 98
Percent of Households Giving Big Game to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	45.0	51.3	46.9	15.0	25.0	30.0	45.8
Siblings not in HH	20.0	18.4	12.5	45.0	25.0	15.0	20.8
Offspring not in HH	10.0	3.9	9.4	30.0	25.0	10.0	4.2
Patrilineal kin not in HH	5.0	0.0	6.3	20.0	35.0	0.0	4.2
Matrilineal kin not in HH	5.0	3.9	12.5	20.0	35.0	20.0	16.7
Affines not in HH	35.0	15.8	12.5	55.0	15.0	20.0	4.2
Friend not in HH	30.0	36.8	37.5	40.0	40.0	30.0	12.5
Grandchild not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Parent not in HH	15.0	11.8	12.5	30.0	15.0	20.0	12.5
Other group	20.0	7.9	9.4	60.0	35.0	10.0	16.7

Table 99
Percent of Households Giving Marine Mammals to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	80.0	85.5	96.9	55.0	90.0	100.0	41.7
Siblings not in HH	5.0	6.6	0.0	15.0	0.0	0.0	12.5
Offspring not in HH	0.0	1.3	0.0	20.0	0.0	0.0	4.2
Patrilineal kin not in HH	5.0	0.0	0.0	5.0	0.0	0.0	16.7
Matrilineal kin not in HH	0.0	3.9	0.0	5.0	5.0	0.0	12.5
Affines not in HH	10.0	2.6	0.0	15.0	0.0	0.0	12.5
Friend not in HH	15.0	3.9	3.1	10.0	5.0	0.0	37.5
Grandchild not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Parent not in HH	5.0	3.9	0.0	25.0	0.0	0.0	12.5
Other group	5.0	1.3	3.1	10.0	0.0	0.0	12.5

Table 100
Percent of Households Giving Invertebrates to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	55.0	78.9	93.8	80.0	80.0	70.0	70.8
Siblings not in HH	15.0	3.9	0.0	15.0	5.0	10.0	0.0
Offspring not in HH	10.0	0.0	0.0	10.0	0.0	5.0	0.0
Patrilineal kin not in HH	10.0	0.0	0.0	10.0	10.0	0.0	0.0
Matrilineal kin not in HH	10.0	1.3	0.0	5.0	10.0	5.0	8.3
Affines not in HH	20.0	7.9	0.0	5.0	0.0	10.0	4.2
Friend not in HH	40.0	10.5	6.3	5.0	5.0	10.0	12.5
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	10.0	3.9	0.0	10.0	5.0	5.0	4.2
Other group	10.0	5.3	0.0	10.0	5.0	5.0	4.2

Table 101
Percent of Households Giving Plants to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	45.0	51.3	46.9	40.0	45.0	55.0	33.3
Siblings not in HH	10.0	14.5	9.4	10.0	20.0	15.0	20.8
Offspring not in HH	10.0	10.5	9.4	10.0	30.0	15.0	8.3
Patrilineal kin not in HH	5.0	1.3	3.1	5.0	20.0	0.0	8.3
Matrilineal kin not in HH	0.0	2.6	3.1	10.0	20.0	5.0	16.7
Affines not in HH	10.0	15.8	31.3	15.0	20.0	10.0	8.3
Friend not in HH	40.0	32.9	31.3	20.0	25.0	15.0	33.3
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	5.0	0.0
Parent not in HH	10.0	17.1	15.6	20.0	15.0	10.0	16.7
Other group	10.0	9.2	9.4	10.0	10.0	5.0	12.5

Table 102
Percent of Households Giving Non-commercial Fish to a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	40.0	31.6	25.0	15.0	30.0	55.0	16.7
Siblings not in HH	15.0	30.3	31.3	45.0	35.0	10.0	41.7
Offspring not in HH	15.0	11.8	12.5	25.0	25.0	25.0	16.7
Patrilineal kin not in HH	10.0	11.8	12.5	20.0	20.0	0.0	20.8
Matrilineal kin not in HH	5.0	14.5	9.4	10.0	30.0	5.0	20.8
Affines not in HH	30.0	26.3	31.3	45.0	30.0	20.0	16.7
Friend not in HH	40.0	53.9	40.6	30.0	45.0	20.0	58.3
Grandchild not in HH	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Parent not in HH	20.0	28.9	34.4	30.0	25.0	5.0	29.2
Other group	20.0	14.5	12.5	25.0	20.0	10.0	37.5

Table 103
Percent of Households Receiving Birds From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No receiving	45.0	48.7	62.5	50.0	60.0	25.0	29.2
Siblings not in HH	20.0	9.2	6.3	5.0	0.0	10.0	29.2
Offspring not in HH	15.0	6.6	9.4	25.0	25.0	15.0	12.5
Patrilineal kin not in HH	15.0	5.3	0.0	0.0	5.0	0.0	8.3
Matrilineal kin not in HH	5.0	3.9	0.0	10.0	15.0	5.0	16.7
Affines not in HH	25.0	11.8	6.3	25.0	5.0	10.0	16.7
Friend not in HH	35.0	32.9	25.0	30.0	10.0	50.0	45.8
Grandchild not in HH	5.0	1.3	3.1	5.0	15.0	0.0	0.0
Parent not in HH	10.0	2.6	3.1	0.0	0.0	10.0	8.3
Other group	10.0	6.6	3.1	0.0	5.0	0.0	8.3

Table 104
Percent of Households Receiving Small Game From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No giving	75.0	65.8	84.4	60.0	55.0	100.0	41.7
Siblings not in HH	0.0	6.6	0.0	10.0	0.0	0.0	12.5
Offspring not in HH	5.0	2.6	0.0	20.0	25.0	0.0	8.3
Patrilineal kin not in HH	0.0	0.0	0.0	0.0	5.0	0.0	0.0
Matrilineal kin not in HH	0.0	2.6	0.0	5.0	15.0	0.0	12.5
Affines not in HH	0.0	10.5	0.0	20.0	10.0	0.0	8.3
Friend not in HH	10.0	17.1	12.5	20.0	25.0	0.0	29.2
Grandchild not in HH	0.0	1.3	0.0	5.0	15.0	0.0	4.2
Parent not in HH	0.0	3.9	0.0	0.0	10.0	0.0	8.3
Other group	5.0	2.6	3.1	15.0	10.0	0.0	4.2

Table 105
Percent of Households Receiving Big Game From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No receiving	15.0	23.7	31.3	25.0	10.0	10.0	16.7
Siblings not in HH	25.0	18.4	6.3	30.0	15.0	25.0	12.5
Offspring not in HH	20.0	10.5	6.3	20.0	35.0	15.0	8.3
Patrilineal kin not in HH	15.0	0.0	0.0	10.0	20.0	5.0	8.3
Matrilineal kin not in HH	15.0	6.6	0.0	20.0	35.0	5.0	8.3
Affines not in HH	30.0	21.1	12.5	40.0	15.0	30.0	16.7
Friend not in HH	60.0	42.1	56.3	45.0	55.0	40.0	37.5
Grandchild not in HH	5.0	1.3	3.1	5.0	10.0	0.0	0.0
Parent not in HH	5.0	9.2	3.1	0.0	15.0	5.0	8.3
Other group	15.0	3.9	12.5	5.0	25.0	35.0	16.7

Table 106
Percent of Households Receiving Marine Mammals From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No receiving	70.0	56.6	87.5	35.0	90.0	85.0	41.7
Siblings not in HH	0.0	6.6	3.1	5.0	0.0	5.0	20.8
Offspring not in HH	0.0	0.0	0.0	5.0	0.0	0.0	8.3
Patrilineal kin not in HH	5.0	2.6	0.0	10.0	0.0	0.0	0.0
Matrilineal kin not in HH	0.0	7.9	3.1	10.0	0.0	0.0	12.5
Affines not in HH	0.0	13.2	9.4	25.0	0.0	5.0	4.2
Friend not in HH	25.0	25.0	9.4	45.0	10.0	5.0	29.2
Grandchild not in HH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parent not in HH	0.0	7.9	3.1	5.0	0.0	0.0	12.5
Other group	5.0	2.6	0.0	0.0	0.0	0.0	8.3

Table 107
Percent of Households Receiving Invertebrates From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No receiving	40.0	65.8	65.6	70.0	70.0	50.0	45.8
Siblings not in HH	10.0	6.6	3.1	10.0	10.0	5.0	20.8
Offspring not in HH	5.0	1.3	0.0	0.0	0.0	0.0	4.2
Patrilineal kin not in HH	15.0	0.0	0.0	5.0	5.0	0.0	4.2
Matrilineal kin not in HH	5.0	0.0	0.0	10.0	10.0	0.0	8.3
Affines not in HH	25.0	6.6	3.1	10.0	0.0	15.0	0.0
Friend not in HH	40.0	19.7	21.9	15.0	30.0	25.0	20.8
Grandchild not in HH	0.0	1.3	3.1	0.0	0.0	5.0	0.0
Parent not in HH	5.0	2.6	0.0	0.0	0.0	0.0	4.2
Other group	15.0	1.3	3.1	0.0	0.0	5.0	4.2

Table 108
Percent of Households Receiving Plants From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No receiving	50.0	36.8	37.5	35.0	50.0	60.0	54.2
Siblings not in HH	10.0	9.2	3.1	30.0	10.0	0.0	4.2
Offspring not in HH	15.0	1.3	6.3	10.0	15.0	0.0	4.2
Patrilineal kin not in HH	0.0	1.3	0.0	15.0	10.0	5.0	4.2
Matrilineal kin not in HH	10.0	5.3	0.0	10.0	30.0	5.0	4.2
Affines not in HH	10.0	14.5	21.9	25.0	10.0	10.0	4.2
Friend not in HH	35.0	39.5	46.9	20.0	20.0	15.0	29.2
Grandchild not in HH	0.0	0.0	3.1	0.0	5.0	0.0	0.0
Parent not in HH	0.0	10.5	12.5	20.0	15.0	10.0	12.5
Other group	5.0	3.9	3.1	5.0	5.0	5.0	0.0

Table 109
Percent of Households Receiving Non-commercial Fish From a Specific Kin Group

Community=> Kin Group	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
No receiving	25.0	25.0	15.6	15.0	10.0	10.0	16.7
Siblings not in HH	25.0	13.2	6.3	45.0	20.0	10.0	25.0
Offspring not in HH	20.0	7.9	15.6	15.0	30.0	15.0	12.5
Patrilineal kin not in HH	10.0	6.6	0.0	20.0	20.0	5.0	16.7
Matrilineal kin not in HH	5.0	6.6	0.0	20.0	30.0	5.0	8.3
Affines not in HH	25.0	17.1	21.9	40.0	15.0	15.0	12.5
Friend not in HH	45.0	52.6	62.5	40.0	60.0	50.0	54.2
Grandchild not in HH	5.0	1.3	3.1	0.0	10.0	0.0	0.0
Parent not in HH	10.0	14.5	3.1	15.0	15.0	15.0	12.5
Other group	25.0	3.9	18.8	20.0	35.0	15.0	4.2

B. FACTORS AFFECTING SUBSISTENCE

In this part of the chapter, we discuss various factors which affect involvement in subsistence activities. In the first section, we analyze the effects of gender, length of residency, ethnicity and age on individual involvement in subsistence based on information provided by respondents for all members of their households. We present tables of bivariate relationships between the harvesting and processing of specific resource categories and each of these four variables (e.g., harvesting birds by age of respondent). Although these specific relationships are of interest, we are also interested in the more generic notion of involvement in subsistence. In the next two sections, we construct measures of subsistence involvement using more detailed information on the respondents' activities and information on the households as a whole.

1. Profile of Individual Involvement in Subsistence Activities

In this section, we provide a profile of the individuals who are most involved in the harvesting and processing of subsistence resources. The total sample is all individuals (n=778) residing in the 212 households included in the study for which data is available. Table 110 through Table 121 show various breakdowns of harvesting and processing by some of the personal characteristics of the participants. The factors analyzed here are gender, length of residency, ethnicity, and age.

Involvement in subsistence harvesting by gender is shown in Table 110 and Table 116. While, overall, as many women as men harvest at least one subsistence resource, (over 75% of each gender as shown in Table 116), there appears to be a division of harvesting chores between genders when we look at particular resource categories (see Table 110). A greater percentage of men harvest in each resource category except for plants and berries, where 70.9% of women harvest, compared to 45.8% of men. Women are much less involved than men in hunting and trapping (harvesting birds, small game, big game, marine mammals) but only slightly less involved in harvesting non-commercial fish and marine invertebrates. The highest percentages of women and men are involved in harvesting plants and berries and non-commercial fish, while significant proportions of men also are involved in hunting birds, big game, and small game.

Involvement in subsistence processing by gender is shown in Table 113 and Table 121. Clearly, females process subsistence resources much more than they harvest them. As with harvesting, about equal numbers of women and men process at least one subsistence resource, but the percentages for both genders are somewhat less than the percentages which harvest at least one subsistence resource. However, interestingly, there is much less of a distinction between genders in terms of processing activities by resource category. Women are much more likely to process plants and berries, but greater percentages of men process small game and big game. Women are only slightly more likely to process non-commercial fish and marine invertebrates than men, while roughly equal percentages of men and women process birds and marine mammals. This indicates that men, in general, are more involved in all aspects of subsistence activities (harvesting *and* processing) than women. Our ethnographic research suggests that more women are wage earners and many work full-time, thus limiting their ability to engage in subsistence activities, while more men are seasonal commercial fishers and have the rest of the year available to hunt, trap, and fish, and to process what they harvest.

The influence of length of residency on involvement in subsistence activities is demonstrated in Table 111 and Table 114. These two tables show that as years of residency increase, the likelihood of engaging in subsistence harvesting and processing consistently increases. This generalization is true for every single resource category and is true for both harvesting and processing, indicating that length of residency is a very important factor for predicting individual involvement in subsistence. The total sample used for calculating these percentages consists of all members of the 212 households (n=778) included in the study and thus includes both in-migrants to the region and people born and raised in Bristol Bay. In general, then, residents of Bristol Bay (both "locals" and "non-locals") become involved in subsistence activities the longer they live in the area, suggesting that this is a regional way of life influencing everyone to some degree.

There are several possible explanations for why people become more involved in subsistence activities the longer they live in the Bristol Bay region. First, engaging in subsistence activities requires a good deal of knowledge, and it takes time for both in-migrants and youth to become familiar with the local geography and biota. Second, many in-migrants to the region married people from the local area and thus were drawn into subsistence harvesting and processing networks, which are based largely upon kinship. Third, in-migrants to Bristol Bay tend to come from rural areas and family backgrounds in which there is a tradition of hunting and fishing. Indeed, the ability to hunt and fish is often what attracts them to Bristol Bay in the first place. They come predisposed to engaging in hunting and fishing and become more involved over time as they learn the best areas in which to do these activities.

Table 112, Table 115, Table 117, and Table 120 show the effect of ethnicity on involvement in subsistence activities. Table 112 and Table 115 reveal that there are some significant differences in subsistence activities based upon ethnicity, with ethnicity categorized as full Native, part Native, or non-Native. In terms of harvesting, statistically significant ($p<.05$) differences were found for birds, small game, marine invertebrates, and marine mammals. Full Natives are more likely to harvest small game and, to a lesser extent, birds than either part-Natives or non-Natives, while Natives and part-Natives are more likely to harvest marine mammals (restricted to Natives) and marine invertebrates than non-Natives. There are no significant differences based on ethnicity for harvesting big game, non-commercial fish, or plants and berries, the three main subsistence resource categories. Non-Natives are more likely to harvest non-commercial fish than full-Natives or part-Natives ($p<.06$).

In terms of processing, differences based upon ethnicity are statistically significant ($p<.05$) for birds, small game, big game, marine mammals, and non-commercial fish. Full Natives are more likely to process birds, small game, big game, and marine mammals than either part-Natives or non-Natives. Non-Natives are more likely to process big game than part-Natives and more likely to process non-commercial fish than either part-Natives or full-Natives. In sum, the findings concerning ethnic involvement in subsistence activities indicate that Natives are involved in harvesting and processing a wider range of subsistence resources. Non-Natives are most heavily involved in harvesting and processing resources for consumption that are generally pursued for sport.

Significant differences were found for harvesting and processing by age group. In Table 118 and Table 119, it is interesting to see that over 90% of individuals between the ages of 21 and 60 harvest or process at least one subsistence resource. The percent of participation remains high (over 80%) for those over the age of 60. Youth under the age of 20 are much less likely to be involved in harvesting and especially in processing.

2. Respondent Level Involvement in Subsistence

The simplest measure of involvement is, for each grouped resource listed in Table 33, a sum of the number of species harvested and processed by the respondent. To these sums can be added the number of days the respondent engaged in the following subsistence activities during the previous year: hunt, fish, trap, gather, process subsistence foods, camp as part of subsistence, gather firewood/haul water, build and repair equipment, do crafts (sew skins, blankets), and engage in other subsistence activities. When these activities are combined in this way to form an involvement index, each element of the index (e.g. hunt big game or gather plants) is given equal weight. All of these elements may not, however, be equally important. Thus, it is desirable to weight each element of the index as to its importance in involvement with subsistence.

Two weighting schemes were used. The first was to factor analyze the harvesting, processing and number of days variables. Factor analysis is often used in reducing high dimensional data (see Tabachnick & Fidell, 1989 or Tatsuoka, 1988, for discussions of factor analysis and related techniques). Using this approach, the weights are the factor loadings associated with the first orthogonally rotated factor. That is, the weights represent the correlation of the variable and the first factor. This first factor explains the most variance and we assume that it represents an "involvement in subsistence" factor. Thus, this involvement scale is the sum of each variable multiplied by its correlation with the latent involvement factor.

In the second weighting scheme, the weights are measures of how well each variable discriminates those with high involvement in subsistence from those with low involvement in subsistence. If, for example, every respondent harvested a particular resource, this resource would have a *low* weight because it provides no information that distinguishes high involvement from low involvement. The weights are obtained using the principal

Table 110
Percent of Sample Harvesting a Resource Group by Gender

Gender ==> Major Resource Group	Female	Male
Birds	11.6	44.8
Small Game	2.7	21.2
Big Game	4.9	36.2
Invertebrates	10.5	16.5
Marine Mammals	1.9	7.1
Plants and Berries	70.9	45.8
Non-commercial Fish	48.5	63.8

Table 111
Percent of Sample Harvesting a Resource Group by Years of Residency

Years of Residency ==> Major Resource Group	0 to 10 years	11 to 20 years	21+ years
Birds	15.3	37.5	44.4
Small Game	6.6	11.2	21.8
Big Game	11.9	28.3	31.0
Invertebrates	7.4	13.2	23.4
Marine Mammals	2.6	4.6	7.7
Plants and Berries	47.4	61.2	71.4
Non-commercial Fish	42.6	64.5	72.6

Table 112
Percent of Sample Harvesting a Resource Group by Ethnicity

Ethnicity==> Major Resource Group	Full Native	Part Native	Non-Native
Birds	33.3	26.4	22.8
Small Game	16.5	7.5	8.2
Big Game	23.8	17.6	19.2
Invertebrates	15.3	18.2	7.3
Marine Mammals	5.8	6.9	0.9
Plants and Berries	57.3	63.5	54.3
Non-commercial Fish	53.8	54.1	63.0

Table 113
Percent of Sample Processing a Resource Group by Gender

Gender ==> Major Resource Group	Female	Male
Birds	31.8	29.3
Small Game	12.9	17.0
Big Game	37.2	40.1
Invertebrates	12.4	9.4
Marine Mammals	7.3	6.7
Plants and Berries	58.0	17.2
Non-commercial Fish	52.6	45.3

Table 114
Percent of Sample Processing a Resource Group by Years of Residency

Years of Residency ==> Major Resource Group	0 to 10 years	11 to 20 years	21+ years
Birds	13.0	34.2	54.8
Small Game	4.2	11.8	33.5
Big Game	20.1	36.8	68.1
Invertebrates	4.8	7.9	21.8
Marine Mammals	2.1	7.2	14.1
Plants and Berries	24.6	40.1	52.8
Non-commercial Fish	32.3	49.3	73.4

Table 115
Percent of Sample Processing a Resource Group by Ethnicity

Ethnicity==> Major Resource Group	Full Native	Part Native	Non-Native
Birds	34.5	25.8	26.5
Small Game	22.3	6.9	7.8
Big Game	43.5	28.9	37.0
Invertebrates	11.5	13.2	7.8
Marine Mammals	11.0	4.4	1.4
Plants and Berries	37.8	33.3	37.0
Non-commercial Fish	45.5	45.3	57.1

Table 116
Crosstab of Harvest Any Resource by Gender

Gender===>	Female	Male
No Harvesting	83 (22.4%)	91 (22.4%)
Harvest at least one subsistence resource	288 (77.6%)	315 (77.6)

t = 1.00, Not significant at the .05 level

Table 117
Crosstab of Harvest Any Resource by Ethnicity

Ethnicity===>	Full Native	Part Native	Non AK Native
No Harvesting	96 (24.0%)	34 (21.5%)	45 (20.5%)
Harvest at least one subsistence resource	304 (76.0%)	124 (78.5%)	175 (79.5%)

t = .5680, Not significant at the .05 level

Table 118
Crosstab of Harvest Any Resource by Age Group

Age Group ===>	0 to 20 years	21 to 40 years	41 to 60 years	61+ years
No Harvesting	138 (40.5%)	20 (7.6%)	9 (7.1%)	8 (17.4%)
Harvest at least one subsistence resource	203 (59.5%)	244 (92.4%)	118 (92.9%)	38 (82.6%)

t = .0000, Significant at the .05 level

Table 119
Crosstab of Process Any Resource by Age Group

Age Group ===>	0 to 20 years	21 to 40 years	41 to 60 years	61+ years
No Processing	222 (65.1%)	26 (9.8%)	10 (7.9%)	7 (15.2%)
Process at least one subsistence resource	119 (34.9%)	238 (90.2%)	117 (92.1%)	39 (84.8%)

t = .0000, Significant at the .05 level

Table 120
Crosstab of Process Any Resource by Ethnicity

Ethnicity===>	Full Native	Part Native	Non AK Native
No Processing	146 (36.5%)	59 (37.3%)	60 (27.3%)
Process at least one subsistence resource	254 (63.5%)	99 (62.7%)	160 (72.7%)

t = .0422, Significant at the .05 level

Table 121
Crosstab of Process Any Resource by Gender

Gender===>	Female	Male
No Processing	112 (30.2%)	152 (37.4%)
Process at least one subsistence resource	259 (69.8%)	254 (62.6%)

t = .0398, Significant at the .05 level components analysis of ridits (PRIDITS) methodology (Bertrand, Brockett, & Levine, 1979; Levine, 1991).

Although each of these three weighting schemes are different, they also are similar in that they are just different linear combinations of the variables. In the first method, which may be viewed as "unweighted" or equally weighted, the weights are really each "1", while the weights in the other methods are either the factor loadings or the PRIDITS weights. Using three weighting schemes allows us to determine the sensitivity of our results to the weighting methodology. If there is a great deal of difference in the models resulting from each weighting scheme, then little confidence can be placed in the stability of the models.

Models of involvement in subsistence were constructed by regressing each of the three subsistence indices on a set of explanatory variables. To keep the discussion relatively simple, only the results for regressions involving the subsistence index created using the factor loadings will be presented. When these results are at variance with the results obtained using one of the other indices, the discrepancies will be noted. As will be seen, however, the results are quite similar across indices.

Several regression models were investigated and regression diagnostics were also conducted to investigate the effect of possible outliers, influential data points, and so on. Although there were a few cases with large studentized residuals, these cases did not exert undue influence on the regression coefficients (i.e., they did not have high leverage, Belsley, Kuh, & Welsch, 1980, Cook;, 1977). Thus no cases were deleted for any reason except when data were missing altogether (i.e., listwise deletion).

The first set of analyses consisted of regressing the involvement indices on a set of respondent variables. This set consisted of years of education, years lived in village, years commercial fishing experience, age, salary, and dummy codes for ethnicity (Native, part-Native, non-Native), village of residence, and gender. For the factor loading index, the final model consisted of gender (b = -1.482), age (b = -.028), years commercial fishing (b = 0.292), and dummy code for Nondalton (b = 1.88). This model explains 42.7 percent of the variance as indicated by the R^2 (F (4, 207) = 38.34, p = .000). The regression coefficients for each of these variables was significantly different from zero and the intercept was equal to 3.82.

This model produced several findings. Males participate in subsistence more than females. Involvement in subsistence activity increases as the years of commercial fishing increase. Younger persons engage in more subsistence activity (but note that this means young adults, the youngest respondent was 19 years old). Finally, respondents from Nondalton were more involved in subsistence activities than residents of the other villages. The regressions using the PRIDITS weighted index yielded the same significant predictor variables, while the equally weighted index yielded a model that was the same except that gender was no longer a significant predictor of subsistence activity. In addition, no other variables were found to significantly predict subsistence using either of these other indices. Thus, these models are very consistent in the variables found to be related to respondent involvement in subsistence.

The second set of analyses consisted of regressing the involvement indices on the set of respondent variables listed above along with a set of household variables. This latter set consisted of household size, household income, and dummy codes for household ethnicity, household involvement in commercial fishing and household type (e.g. nuclear, single person, extended, composite, conjugal pair, and so on). For the factor loading index, the final model consisted of gender (b = -1.58), years commercial fishing (b = 0.043), household involvement in commercial fishing (b = 0.826), years education (b = 0.096), and a dummy code for Nondalton (b = 2.10). This model explains 45.2 percent of the variance as indicated by the R^2 (F (5, 202) = 33.38, p = .000). The regression coefficients for each of these variables was significantly different from zero and the intercept was equal to 1.27.

This model yielded the following results. Males participate in subsistence more than females. Subsistence activity increases as the years of commercial fishing increase and with household involvement in commercial fishing. Persons with more education have increased involvement in subsistence. Respondents from Nondalton were more involved in subsistence than residents of other communities. The regressions using the PRIDITS weighted index yielded the same significant predictor variables. The equally weighted index yielded a model that was the same except that gender was no longer a significant predictor of subsistence activity but the dummy code for non-Native was significant, indicating that non-Natives are less involved in subsistence than Natives and part-Natives. The result for the non-Native ethnicity dummy variable is in line with the other analyses. For both of the other analyses, the *t*-tests indicating whether the regression coefficient for this variable was significantly different from zero was just short of conventional levels of significance. That is, for the factor loading index the *p* value was .06, while for the PRIDITS index the *p* value was .051. Thus, these models are still relatively consistent with each other.

The models with the household variables are fairly consistent with the models without the household variables with the exception of the age and years of education variables. This result may be initially surprising, especially as one might guess that subsistence involvement would be greater for people with less education. It should be recalled, however, that the sample consists of adults and that younger adults are more involved in subsistence activities than older adults. The education result should not be surprising if one considers that education is *negatively* correlated with age in this sample of respondents (r = -.626).

3. Household Level Involvement in Subsistence

Following the methodology used for the respondent level involvement, two household involvement indices were developed. The first was a simple sum of the number of grouped resources harvested and processed by the household, plus the percentage of each resource category harvested by a household. To clarify this last element of the sum, suppose a household harvested berries and greens, then this household would have collected fifty percent of the plants in this resource group. The second index was computed by weighting each of the above listed variables by the factor loadings associated with the first orthogonally rotated factor.

The household analyses were conducted in a fashion similar to that of the respondent analyses. That is, the involvement indices were regressed on a set of household variables. This set of variables consisted of household size, household income, and dummy codes for household ethnicity, household involvement in commercial fishing, village of residence, and household type (e.g. nuclear, single person, extended, composite, conjugal pair, and so on). For the factor loading index, the final model consisted of household size

(b = 1.43), household involvement in commercial fishing (b = 2.08), and the dummy code for single parent households (b = -1.698). This model explains 51.9 percent of the variance as indicated by the R^2 (F (3, 208) = 75.02, p = .000). The regression coefficients for each of these variables was significantly different from zero and the intercept was equal to 1.46. The regressions using the equally weighted index yielded the same significant predictor variables (and no additional variables). This model controls for household size and shows that larger households harvest and process more resources, household involvement in commercial fishing is associated with higher subsistence involvement, and, finally, single parent households are associated with less subsistence involvement even when controlling for household size.

C. HARVESTING AND PROCESSING OF SUBSISTENCE RESOURCES

This section presents the results of analyses which more or less parallel the analyses presented in the previous chapter where we analyzed the ADF&G data. We look at the harvesting and processing of particular resources by households in our sample. It should be recalled that the purpose of our research was not to conduct a species by species analysis of the pounds harvested by households (as done by ADF&G). In this investigation, households were asked about their harvesting of general types of resources and not about specific species (e.g., geese vs. snow geese). Thus, we did not convert our data on harvested resources to pounds. While we cannot directly compare our data to ADF&G data based on pounds, some rank order comparisons between the data collected in this study on amounts harvested with those collected by ADF&G are possible. In the previous chapter, we also presented tables of the percentage of households harvesting certain resources. To the extent possible, similar tables are presented here.

1. Mean Amounts of Subsistence Resources Harvested

Table 122 through Table 130 show the mean amounts of subsistence resources harvested by community. The units used in these analyses were the units most frequently used by respondents when reporting amounts harvested. No conversion factors were used to convert other units to the most frequently given unit or to one common unit such as pounds. This was done because of the difficulty in a) obtaining a correct conversion factor for each species, as described in the previous chapter, and b) the categories of species were sometimes so broad that one conversion factor could not be created. For example, for the duck category, no one conversion factor could accurately be applied as there are many different species of ducks with different weights. This methodology did not affect the analyses since most respondents used the same units when reporting amounts harvested. The only exception is for eggs, where several units predominated. These units were individual eggs, grocery store boxes of eggs, and gallons of eggs harvested.

Because of the methodology employed, we did not attempt to directly compare our data with data previously collected by ADF&G for pounds harvested. The large number of differences (including differences in protocols, methodology, the years of data collection, regulatory climate, and ADF&G's lack of data on Togiak) prevented a direct comparison of the two data sets. Furthermore, a direct comparison was never intended as Minerals Management Service was not interested in having Social Science Research Associates collect detailed species by species data on the amounts of resources harvested. Although we could not compare actual amounts, we took the relative rankings of communities based on our mean amounts harvested and compared this with the rankings based upon ADF&G's pounds per household harvested. That is, we compared the order of villages to determine if the same relative ordering of communities obtained in the ADF&G data set was observed in this data set for each grouped resource. Overall, our data shows a similar pattern to that found in ADF&G's prior studies.

Table 122 shows the mean amounts of particular types of birds harvested by household for each village. We see that duck and ptarmigan are the two most frequently harvested birds. All seven communities harvest relatively the same number of *total* birds, with differences in the particular species that they harvest the most due to the distribution and availability of various types of birds in each community. These data indicate that bird harvesting is not an activity specific to any particular subregion of Bristol Bay. A very similar harvesting order was found in the ADF&G data on birds (Table 46, Part 5).

Table 123 shows mean amounts of small game harvested by community. Unlike birds, we see distinct differences in amounts harvested by village. Nondalton and New Stuyahok, the upriver communities, harvested the most small game. Togiak also harvested quite a bit of small game, especially beaver and "other" small game. The other four communities harvested much less small game. The relatively large amounts of small game gathered in New Stuyahok, Nondalton, and Togiak are due to their residents' greater access to and preference for these specific resources. The relative order of mean amounts found here corresponds reasonably well with the order found in the ADF&G data.

Mean amounts per household of big game harvested by community are shown in Table 124. Households in New Stuyahok harvest the most caribou and moose while households in Togiak harvest the least amount. The other five communities harvest relatively the same amounts of caribou and moose. Our rankings match almost exactly ADF&G's rankings for moose and bear, but are different for caribou. According to our data, New Stuyahok and Naknek harvested the most caribou, while ADF&G's data indicates that Port Heiden and Nondalton harvested the most caribou. A striking difference is the low amount of caribou which our data indicates Nondalton takes relative to the other communities. The ADF&G data showed that Nondalton and New Stuyahok harvested approximately the same amount of caribou. Both data sets indicate that Dillingham and Chignik Lake harvested lower amounts of caribou than most other communities. It is difficult to interpret the divergent results given the number of methodological differences noted above. What is striking about most of the results is that, *in spite* of the many methodological differences, there were so many convergent findings.

Table 125 shows mean amounts of marine invertebrates harvested by community. Comparison of the two data sets was made difficult by the lack of ADF&G data on invertebrates for several communities. However, the relative ranking of communities by amount harvested is similar for the data which does exist. Due to the red tide scare in parts of Bristol Bay in 1991, invertebrate harvesting was lower than normal in most communities. Our data indicates the two up-river communities, New Stuyahok and Nondalton, along with Dillingham, harvested the least amounts of total invertebrates per household. These three communities have the least access of our sample communities to invertebrates due to location. Chignik Lake harvests much more crab than other communities because of the existence of a crab industry in local fishing districts.

Table 126 shows the mean amounts of marine mammals harvested per household. No whales were harvested by any community, which is exactly what was found in the ADF&G studies. Not surprisingly, Togiak was found to harvest the greatest amounts of marine mammals, which is consistent with ADF&G's background technical reports on Togiak, even though there is no harvesting data for comparison.

Table 127 shows the mean amounts of plant species harvested. Again, comparisons are difficult to make due to the lack of ADF&G data on plants for several communities. For the comparisons which are possible, our data show Nondalton to be harvesting relatively fewer berries now than previously shown. The ADF&G data showed Nondalton harvesting twice as many berries as New Stuyahok, and three to four times the amounts harvested by the other communities. This difference is probably due to the fact that berries are highly variable by season, and 1990 may have been a low year for berries in the Iliamna Lake Region.

The mean amounts of subsistence salmon harvested by community are shown in Table 128. Comparisons of our mean amount of *total* salmon harvested (the sum of the rows) with ADF&G's mean number of pounds of non-commercial salmon harvested yield virtually the same ranking of communities. Both data sets show Nondalton harvested the most subsistence salmon, followed by New Stuyahok and Chignik Lake. Our data show Togiak harvested more subsistence salmon than Chignik Lake, but we do not have ADF&G data for this rank comparison. Our data ranked Naknek next followed by Dillingham, while the rank order of these two communities was reversed in the ADF&G ordering. However, relative amounts harvested by these two communities was very similar. Both data sets rank Port Heiden last in subsistence salmon harvesting. Nondalton stands out in salmon harvesting from the other six communities in that it harvests reds almost exclusively, while the other communities tend to harvest some of each type of salmon. Sockeye (red) salmon is the only type of salmon available in Nondalton's harvest area. All communities show significant salmon harvesting.

Table 129 reports the mean number of other salt water fish harvested for subsistence by community. Few comparisons can be made in this category because of lack of ADF&G data for some communities. In terms of herring and roe, our data indicates the only harvesting communities are Togiak, Dillingham, New Stuyahok and Naknek, and they are ranked in that order. These communities are closest in proximity to the herring and roe fisheries of Togiak and Kulukak Bays. ADF&G data is not available for Togiak or Naknek, but Dillingham harvested more than New Stuyahok according to the ADF&G data. The ADF&G data concurs that Chignik Lake, Nondalton, and Port Heiden do not harvest herring or roe. ADF&G data shows only Chignik Lake taking other salt water fish for subsistence, but no data is reported for Naknek or Togiak. Our data shows Chignik Lake was ranked second, with New Stuyahok ranked first, in harvesting of other salt water fish. All of the other communities harvested some small amounts of salt water fish. Our data shows halibut is harvested most by Chignik Lake and Naknek.

Mean amounts per household of fresh water fish harvested by community is shown in Table 130. Comparison of our total amounts of freshwater fish harvested with the ADF&G data for fresh water, non-commercial fish shows a similar community ranking, except that our research ranked Chignik Lake quite a bit higher than ADF&G. Dolly Varden and trout are the two fresh water species harvested the most. New Stuyahok, Togiak, and Nondalton harvest the greatest variety and most amounts of fresh water fish.

An overall analysis of the community rankings for mean amounts of various subsistence resources harvested per household in 1990 reveals that New Stuyahok and Togiak generally harvested the most subsistence foods. These two communities most often ranked first, second, or third. Nondalton was the third largest harvesting community, generally ranking second, third, or fourth relative to other communities. Chignik Lake, Dillingham, and Naknek occupied the intermediate ranks. Chignik Lake ranked relatively high (either first, second, or third) on harvesting some resources (birds, marine invertebrates, marine mammals, some salt water fish) but ranked relatively low (fifth or sixth) on harvesting other resources (small game, big game, plants, salmon except for pinks, and most fresh water fish except Dolly Varden and trout). Dillingham almost always ranked second, third, fourth, or fifth. Naknek most often ranked fourth, fifth, or sixth, but ranked first or second for a few resources (eggs, other birds, other big game, clams, cod, caribou, and halibut). Port Heiden harvested the least amount of subsistence foods, generally ranking fifth, sixth, or seventh.

Table 122
Mean Household Amounts of Specific Birds Harvested by Community

Resource ==> (Units) Community:	Ducks (# of Birds)	Geese (# of Birds)	Eggs (# of Eggs)	Ptarmigan (# of Birds)	Grouse (# of Birds)	Other (# of Birds)
Chignik Lake	11.05	1.70	5.10	13.60	0.00	0.00
Dillingham	5.70	1.29	6.06	12.08	10.17	0.03
Naknek	3.77	0.72	7.19	10.13	.36	0.06
New Stuyahok	10.60	4.65	1.89	8.90	2.11	0.00
Nondalton	7.65	0.90	0.00	16.20	8.50	0.00
Port Heiden	6.05	0.30	4.32	22.30	0.00	0.00
Togiak	11.42	1.96	0.00	21.17	0.95	0.00

Table 123
Mean Household Amounts of Small Game Species Harvested by Community

Resource ==> (Units) Community:	Beaver (# of Beaver)	Hare (# of Hare)	Porcupine (# of Porcupine)	Other (# of game)
Chignik Lake	0.15	0.20	0.15	0.00
Dillingham	0.53	1.17	0.85	0.36
Naknek	0.19	0.75	0.16	1.22
New Stuyahok	4.40	2.00	8.05	2.30
Nondalton	2.20	1.58	2.45	0.35
Port Heiden	0.00	0.05	0.05	0.00
Togiak	3.21	0.63	1.00	6.83

Table 124
Mean Household Amounts of Big Game Species Harvested by Community

Resource ==> (Units) Community:	Caribou (# of Caribou)	Moose (# of Moose)	Bear (# of Bear)	Other (# of Game)
Chignik Lake	1.33	0.16	0.05	0.00
Dillingham	1.16	0.37	0.03	0.03
Naknek	1.72	0.14	0.00	0.16
New Stuyahok	5.05	1.21	0.05	0.00
Nondalton	1.53	0.56	0.17	0.10
Port Heiden	1.55	0.00	0.00	0.00
Togiak	0.38	0.13	0.13	0.13

Table 125
Mean Household Amounts of Invertebrate Species Harvested by Community

Resource ==> (Units) Community:	Clams (Gallons)	Crabs (# of Crab)	Other (Gallons)
Chignik Lake	5.85	2.65	0.50
Dillingham	1.36	0.08	0.20
Naknek	6.38	0.00	0.00
New Stuyahok	1.95	0.00	0.00
Nondalton	0.50	0.00	0.60
Port Heiden	4.25	0.00	2.50
Togiak	2.41	0.00	0.00

Table 126
Mean Household Amounts of Marine Mammal Species Harvested by Community

Resource ==> (Units) Community:	Whales (N/A)	Seals (# of Seals)	Walrus (# of Walrus)	Other (# of Mammals)
Chignik Lake	0.00	0.30	0.00	0.05
Dillingham	0.00	0.05	0.00	0.00
Naknek	0.00	0.06	0.00	0.00
New Stuyahok	0.00	0.10	0.00	0.00
Nondalton	0.00	0.00	0.00	0.00
Port Heiden	0.00	0.00	0.00	0.00
Togiak	0.00	1.39	0.17	0.00

Table 127
Mean Household Amounts of Plant Species Harvested by Community

Resource ==> (Units) Community:	Berries (Gallons)	Greens (Gallons)	Kelp (Gallons)	Other (cords of wood)
Chignik Lake	8.35	0.13	0.00	0.10
Dillingham	11.65	4.00	0.19	0.09
Naknek	9.36	0.08	0.00	0.79
New Stuyahok	24.37	1.07	0.00	0.00
Nondalton	11.13	0.97	0.00	2.00
Port Heiden	10.53	0.90	0.00	0.00
Togiak	17.87	7.69	0.42	0.90

Table 128
Mean Household Amounts of Salmon Species Harvested By Community

Resource ==> (Units) Community:	Kings (# of Fish)	Reds (# of Fish)	Silvers (# of Fish)	Pinks (# of Fish)	Chum (# of Fish)
Chignik Lake	1.25	61.15	16.65	17.20	0.00
Dillingham	12.77	35.46	11.65	4.16	5.29
Naknek	4.00	70.75	10.19	4.22	1.68
New Stuyahok	39.11	75.72	19.79	8.74	11.21
Nondalton	0.00	319.06	0.74	0.00	0.00
Port Heiden	3.10	12.10	21.25	2.15	7.00
Togiak	9.83	75.86	26.14	3.04	16.30

Table 129
Mean Household Amount of Specific Salt Water Fish Harvested by Community

Resource ==> (Units) Community:	Herring & Roe (# of Buckets)	Halibut (# of Fish)	Flounder (# of Fish)	Cod (# of Fish)	Other (# of Fish)
Chignik Lake	0.00	1.50	0.00	0.15	0.40
Dillingham	1.42	0.35	0.25	0.03	0.00
Naknek	0.31	0.98	0.00	0.19	0.00
New Stuyahok	0.83	0.00	1.85	0.00	1.00
Nondalton	0.00	0.05	0.00	0.00	0.00
Port Heiden	0.00	0.05	1.00	0.00	0.00
Togiak	2.50	0.50	0.63	0.00	0.00

Table 130
Mean Household Amounts of Fresh Water Fish Species Harvested by Community

Resource ==> (Units) Community:	Dolly Varden (# of Fish)	Trout (# of Fish)	Pike (# of Fish)	Grayling (# of Fish)	Smelt (Gallons)	Whitefish (# of Fish)	Other (# of Fish)
Chignik Lake	12.95	12.37	0.00	0.00	0.00	0.00	0.00
Dillingham	4.80	5.26	3.93	3.51	1.94	3.57	0.49
Naknek	1.63	1.72	0.19	1.50	5.54	0.03	0.00
New Stuyahok	1.90	5.85	19.37	26.26	0.05	13.26	6.10
Nondalton	3.26	10.28	0.94	8.94	0.00	7.06	0.28
Port Heiden	3.30	0.30	0.00	0.00	0.00	0.00	0.00
Togiak	19.09	58.88	3.17	1.13	2.31	0.00	43.48

2. Percentages of Households Harvesting and Processing

Table 132 to Table 140 present the results for percentage of households harvesting birds (Table 132), small game (Table 133), big game (Table 134), marine invertebrates (Table 135), plants and berries (Table 137), salmon (Table 138), salt water fish (Table 139) and fresh water fish (Table 140). To ease comparisons across these different resources, all of these data are compressed into one very full table (Table 141). The results for the households *harvesting* the grouped resource categories are shown in Table 142, while the results for the households *processing* the grouped resources are shown in Table 143.

Because of the differences in sampling methodology, data collection methodology, and time frame, it is not reasonable to assume that the absolute percentages of households harvesting a resource within a community in the present data set can be compared with the ADF&G data set. Instead of comparing the absolute percentages, we examined the rank ordering of the communities in terms of percentage of households harvesting a resource. Comparing the data presented here with those shown in the previous chapter reveals that the ordering of the communities is not maintained across the two data sets. What is usually maintained, however, is the top position. Also, the bottom position often is held by the same community across data sets. For example, the ADF&G data set and the current data set are fairly consistent in indicating the community with the largest percentage of households harvesting specific bird species. Table 131 illustrates that the top position (i.e., the community with the largest percentage of households harvesting a particular bird species) was consistent across the data sets for all bird categories except ducks. Even this category is fairly consistent as New Stuyahok held the second position in the ADF&G data set while Chignik Lake held the second position in the current data set. In other words, the top two positions are held by the same communities in both data sets.

This same pattern is similar across most of the tables. In Table 133, the greatest percentage of households harvesting small game is in Nondalton, followed by New Stuyahok. In the ADF&G data set these communities were reversed, the greatest percentage of households harvesting small game is in New Stuyahok, followed by Nondalton. The results are less consistent for harvesting of big game. In particular, a much larger percentage of households reports harvesting caribou and moose in Naknek in

Table 131
Comparison of ADF&G Data with Current Study on Communities with Greatest Percentage of Households Harvesting Specific Bird Species

Resource --> / Data Set	Ducks	Geese	Eggs	Ptarmigan	Grouse
ADF&G	Chignik Lake	New Stuyahok	Port Heiden	NA *	Nondalton
Current Study	New Stuyahok	New Stuyahok	Port Heiden	Port Heiden	Nondalton

* In the ADF&G data base, ptarmigan was combined with grouse.

the current study than in the ADF&G study, while a lower percentage reports harvesting caribou in Nondalton in the current study. For percentage of households harvesting clams (Table 135), the top two positions are again held by the same communities in the two data sets. In the current data set, the top position is held by Chignik Lake, while the second position is held by Port Heiden. The ordering was reversed in the ADF&G data set. The reported percentage of Port Heiden households harvesting clams dropped dramatically from the ADF&G study to this study, undoubtedly due to the red tide scare along the lower Alaska Peninsula in 1990. The percentage of households harvesting plants and berries (Table 137) is relatively high in all the communities and the absolute percentages are comparable across the two data sets.

No direct comparison is possible between the two data sets on the harvest of salmon. In this study salmon species are not combined into one category (Table 138), while salmon is grouped into one category by ADF&G. If salmon were grouped into one category here, the two data sets would look very similar. Although participation in salmon fishing is pervasive, Table 138 reveals some interesting differences in the species of salmon harvested across communities. Most noteworthy is the reliance that residents Nondalton have on reds to the exclusion of all other species, due to the fact that this is the only salmon species available in their harvesting area. The tables for salt water fish (Table 139) and fresh water fish (Table 140) are not directly comparable with the ADF&G data presented in the previous chapter.

In general then the ADF&G data set and the current data are reassuringly consistent when used to estimate the communities with the greatest percentage of households harvesting particular resources.

Table 132
Percent of Households Harvesting Specific Bird Species

Resource => Community:	Ducks	Geese	Eggs	Ptarmigan	Grouse	Other
Chignik Lake	50.0	15.0	20.0	60.0	0.0	0.0
Dillingham	32.9	18.4	17.1	34.2	43.4	2.6
Naknek	37.5	21.9	18.8	50.0	15.6	3.1
New Stuyahok	70.0	60.0	15.0	60.0	25.0	0.0
Nondalton	40.0	20.0	5.0	65.0	65.0	0.0
Port Heiden	25.0	10.0	30.0	70.0	0.0	0.0
Togiak	54.2	16.7	33.3	54.2	16.7	0.0

Table 133
Percent of Households Harvesting Specific Small Game Species

Resource=> Community:	Beaver	Hare	Porcupine	Other
Chignik Lake	5.0	5.0	10.0	0.0
Dillingham	9.2	15.8	26.3	5.3
Naknek	6.3	12.5	9.4	3.1
New Stuyahok	35.0	25.0	55.0	25.0
Nondalton	50.0	35.0	60.0	15.0
Port Heiden	0.0	5.0	5.0	0.0
Togiak	29.2	25.0	37.5	29.2

Table 134
Percent of Households Harvesting Specific Big Game Species

Resource ==> Community:	Caribou	Moose	Bear	Other
Chignik Lake	50.0	20.0	5.0	0.0
Dillingham	39.5	30.3	1.3	1.3
Naknek	59.4	21.9	0.0	3.1
New Stuyahok	80.0	75.0	5.0	0.0
Nondalton	60.0	50.0	25.0	10.0
Port Heiden	60.0	0.0	0.0	0.0
Togiak	8.3	12.5	8.3	8.3

Table 135
Percent of Households Harvesting Specific Invertebrate Species

Resource ==> Community:	Clams	Crabs	Other
Chignik Lake	45.0	25.0	10.0
Dillingham	18.4	3.9	2.6
Naknek	9.4	0.0	0.0
New Stuyahok	20.0	10.0	0.0
Nondalton	5.0	0.0	5.0
Port Heiden	35.0	0.0	25.0
Togiak	50.0	0.0	0.0

Table 136
Percent of Households Harvesting Specific Marine Mammal Species

Resource ==> Community:	Whale	Seal	Walrus	Other
Chignik Lake	0.0	20.0	0.0	5.0
Dillingham	0.0	5.3	0.0	0.0
Naknek	0.0	6.3	0.0	0.0
New Stuyahok	0.0	5.0	0.0	0.0
Nondalton	0.0	5.0	0.0	0.0
Port Heiden	0.0	0.0	0.0	0.0
Togiak	0.0	50.0	12.5	0.0

Table 137
Percent of Households Harvesting Specific Plant Species

Resource ==> Community:	Berries	Greens	Kelp	Other
Chignik Lake	80.0	25.0	0.0	5.0
Dillingham	84.2	31.6	6.6	5.3
Naknek	87.5	21.9	3.1	18.8
New Stuyahok	100.0	45.0	0.0	5.0
Nondalton	95.0	40.0	0.0	25.0
Port Heiden	75.0	20.0	0.0	0.0
Togiak	83.3	58.3	8.3	25.0

Table 138
Percent of Households Harvesting Specific Types of Salmon

Resource ==> Community:	Kings	Reds	Silvers	Pinks	Chum
Chignik Lake	25.0	85.0	50.0	20.0	0.0
Dillingham	64.5	64.5	53.9	31.6	39.5
Naknek	68.8	84.4	59.4	37.5	25.0
New Stuyahok	75.0	80.0	75.0	40.0	40.0
Nondalton	0.0	80.0	15.0	0.0	0.0
Port Heiden	30.0	35.0	60.0	10.0	15.0
Togiak	66.7	70.8	66.7	20.8	54.2

Table 139
Percent of Households Harvesting Specific Saltwater Fish Species

Resource ==> Community:	Herring & Roe	Halibut	Flounder	Cod	Other
Chignik Lake	0.0	40.0	0.0	10.0	5.0
Dillingham	23.7	10.5	5.3	1.3	1.3
Naknek	3.1	21.9	0.0	3.1	0.0
New Stuyahok	20.0	0.0	5.0	5.0	5.0
Nondalton	0.0	5.0	0.0	0.0	0.0
Port Heiden	0.0	5.0	5.0	0.0	0.0
Togiak	41.7	25.0	4.2	0.0	4.2

Table 140
Percent of Households Harvesting Specific Fresh Water Fish Species

Resource ==> Community:	Dolly Varden	Trout	Pike	Grayling	Smelt	White Fish	Other
Chignik Lake	25.0	25.0	0.0	0.0	0.0	0.0	5.0
Dillingham	27.6	43.4	26.3	23.7	34.2	13.2	3.9
Naknek	37.5	21.9	6.3	15.6	50.0	6.3	0.0
New Stuyahok	15.0	35.0	60.0	65.0	10.0	45.0	10.0
Nondalton	25.0	60.0	25.0	55.0	0.0	50.0	20.0
Port Heiden	20.0	5.0	0.0	0.0	0.0	0.0	0.0
Togiak	45.8	50.0	29.2	12.5	58.3	0.0	8.3

Table 141
Percent of Households Harvesting by Community and Resource

Resource	Community						
	Chignik Lake	Dillingham	Naknek	New Stuyahok	Nondalton	Port Heiden	Togiak
Berries	80.0	84.2	87.5	100.0	95.0	75.0	83.3
Greens	25.0	31.6	21.9	45.0	40.0	20.0	58.3
Kelp	0.0	6.6	3.1	0.0	0.0	0.0	8.3
Other plants	5.0	5.3	18.8	5.0	25.0	0.0	25.0
King Salmon	25.0	64.5	68.8	75.0	0.0	30.0	66.7
Red Salmon	85.0	64.5	84.4	80.0	80.0	35.0	70.8
Silver Salmon	50.0	53.9	59.4	75.0	15.0	60.0	66.7
Pink Salmon	20.0	31.6	37.5	40.0	0.0	10.0	20.8
Chum Salmon	0.0	39.5	25.0	40.0	0.0	15.0	54.2
Herring Roe	0.0	23.7	3.1	20.0	0.0	0.0	41.7
Halibut	40.0	10.5	21.9	0.0	5.0	5.0	25.0
Flounder	0.0	5.3	0.0	5.0	0.0	5.0	4.2
Cod	10.0	1.3	3.1	5.0	0.0	0.0	0.0
Saltwater fish	5.0	1.3	0.0	5.0	0.0	0.0	4.2
Dolly Varden	25.0	27.6	37.5	15.0	25.0	20.0	45.8
Trout	25.0	43.4	21.9	35.0	60.0	5.0	50.0
Pike	0.0	26.3	6.3	60.0	25.0	0.0	29.2
Grayling	0.0	23.7	15.6	65.0	55.0	0.0	12.5
Smelt	0.0	34.2	50.0	10.0	0.0	0.0	58.3
Whitefish	0.0	13.2	6.3	45.0	50.0	0.0	0.0
Other unknown fish	0.0	0.0	0.0	0.0	10.0	0.0	0.0
Freshwater fish	5.0	3.9	0.0	10.0	20.0	0.0	8.3
Ducks	50.0	32.9	37.5	70.0	40.0	25.0	54.2
Geese	15.0	18.4	21.9	60.0	20.0	10.0	16.7
Eggs	20.0	17.1	18.8	15.0	5.0	30.0	33.3
Ptarmigan	60.0	34.2	50.0	60.0	65.0	70.0	54.2
Grouse	0.0	43.4	15.6	25.0	65.0	0.0	16.7
Other birds	0.0	2.6	3.1	0.0	0.0	0.0	0.0
Beaver	5.0	9.2	6.3	35.0	50.0	0.0	29.2
Hare	5.0	15.8	12.5	25.0	35.0	5.0	25.0
Porcupine	10.0	26.3	9.4	55.0	60.0	5.0	37.5
Other Small Game	0.0	5.3	3.1	25.0	15.0	0.0	29.2
Caribou	50.0	39.5	59.4	80.0	60.0	60.0	8.3
Moose	20.0	30.3	21.9	75.0	50.0	0.0	12.5
Bear	5.0	1.3	0.0	5.0	25.0	0.0	8.3
Other Big Game	0.0	1.3	3.1	0.0	10.0	0.0	8.3
Clams	45.0	18.4	9.4	20.0	5.0	35.0	50.0
Crabs	25.0	3.9	0.0	10.0	0.0	0.0	0.0
Other Invertebrates	10.0	2.6	0.0	0.0	5.0	25.0	0.0
Whale	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seal	20.0	5.3	6.3	5.0	5.0	0.0	50.0
Walrus	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Sea Mammals	5.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 142
Percent of Households Harvesting Resources by Community
(Grouped Resource Categories)

Community	Birds	Small Game	Big Game	Marine Inverte-brates	Marine Mammal s	Plants & Berries	NC Fish
Chignik Lake	70.0	10.0	45.0	45.0	20.0	80.0	85.0
Dillingham	51.3	30.3	40.8	19.7	5.3	88.2	85.5
Naknek	56.3	18.8	62.5	9.4	6.3	87.5	100.0
New Stuyahok	75.0	60.0	80.0	25.0	5.0	100.0	95.0
Nondalton	65.0	70.0	65.0	10.0	5.0	95.0	95.0
Port Heiden	75.0	10.0	60.0	60.0	0.0	75.0	75.0
Togiak	79.2	62.5	25.0	50.0	45.8	87.5	91.7

Table 143
Percent of Households Processing Resources by Community
(Grouped Resource Categories)

Community	Birds	Small Game	Big Game	Marine Inverte-brates	Marine Mammal s	Plants & Berries	NC Fish
Chignik Lake	75.0	20.0	70.0	70.0	30.0	75.0	95.0
Dillingham	59.2	32.9	55.3	21.1	6.6	78.9	88.2
Naknek	59.4	21.9	71.9	6.3	3.1	84.4	100.0
New Stuyahok	90.0	70.0	90.0	15.0	20.0	100.0	95.0
Nondalton	75.0	75.0	95.0	10.0	5.0	95.0	95.0
Port Heiden	95.0	10.0	80.0	70.0	0.0	80.0	85.0
Togiak	75.0	58.3	62.5	33.3	50.0	87.5	87.5

3. Multivariate Graphical Representation of Bristol Bay Communities

This section makes use of the graphical technique which was used in the previous chapter. This technique is intended to facilitate the interpretation of the large amount of data presented in the preceding harvesting tables. The graphical technique used in this section, Fourier plots, should make the similarities among communities more apparent. (For discussion of this method see Everitt, 1978; Flury & Reidwyl, 1988; Tufte, 1983; or Wang, 1978). As noted in the previous chapter, the purpose of this method is to represent high dimensional data in all of its dimensionality. That is, two variables are easily graphed in a traditional two dimensional Cartesian coordinate plot, and similarly, three variables are simply graphed in three dimensions. Graphing higher dimensions becomes increasingly less feasible and a graph of 20 variables in 20 dimensions, for example, is unthinkable. The technique used in this section, on the other hand, attempts to represent these higher order dimensions. This method represents the multidimensional data as a Fourier function and the results are presented in a Fourier plot or a Fourier "blob".[13] Each blob represents one community. Communities with similar values on all variables will have similarly shaped blobs.

Figure 20 shows the Fourier plots for the percent of households harvesting each of the resources listed in Table 33. Comparing the community plots reveals that each community plot is fairly unique. Of all the plots, however, the Togiak plot seems to be most distinct. Although there are similarities between the other community plots, they are better seen in the remaining Fourier plots (Figure 21 to Figure 23). Figure 21 shows the percent of households *harvesting* grouped resources and Figure 22 shows the percent of households

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[13] These plots are also called Polar Fourier representations because they are plots of the Fourier functions in polar coordinates. This method is a derivative of Andrews' (1972) Linear Fourier plots in which each of the r-dimensional observations, x_i, defines a function:

$$f(t) = x_1/\sqrt{2} + x_2 sin(t) + x_3 cos(t) + x_4 sin(2t) + x_5 cos(2t) + ...$$

This function is then plotted over the range $-\pi \leq t \leq \pi$. Andrews showed that this function has many desirable properties including the fact that it preserves Euclidian distances. Thus, points that are close in the original r-dimensional space remain close together in the linear Fourier, or Andrews plot. The Polar Fourier plots presented in this report are simply the Andrews plots transformed into polar coordinates.

processing grouped resources. The harvesting (Figure 21) and processing (Figure 22) Fourier plots are very similar to one another. In these plots, Chignik Lake and Port Heiden have a similar shape and these two community plots are not especially similar to the other community plots. The plots for Naknek and Dillingham share similar characteristics, although Dillingham is also similar to New Stuyahok and Nondalton. In a sense Dillingham appears to fall between Naknek and New Stuyahok or Nondalton. Togiak, again, is fairly distinct from the other communities. Figure 23 presents the Fourier plots for the percent of households harvesting *and* processing grouped resources. These plots show the same similarities as noted above. That is, Chignik Lake and Port Heiden have similar characteristics, as do New Stuyahok and Nondalton. Dillingham is similar to Naknek and New Stuyahok. Togiak clearly is not similar to the other communities.

Examining the data tables in the previous section reveals that Chignik Lake and Port Heiden both have large involvement in the harvesting of invertebrates. In contrast, Naknek and Nondalton have much lower involvement. Chignik Lake and Port Heiden also have low small game harvesting and low small game processing. Note the changes for communities further up the peninsula. The percentage of households harvesting and processing small game increases steadily from Chignik Lake to Nondalton and New Stuyahok.

The trend for big game harvesting and processing is not as clear as for small game. Dillingham and Togiak have the lowest participation. New Stuyahok, Nondalton, Naknek and Port Heiden have more big game involvement.

It is interesting to note the similarities among communities, as well as the differences. All of the communities have a fairly large percentage of households involved in the harvesting and processing of plants. Similarly, most of the communities have low involvement in harvesting and processing marine mammals, with the two exceptions to this being Chignik Lake and Togiak. Togiak, in particular, has greater involvement in both harvesting and processing of marine mammals than the other communities.

Figure 20
Fourier Plots for Percent of Households Harvesting
(All Resources)

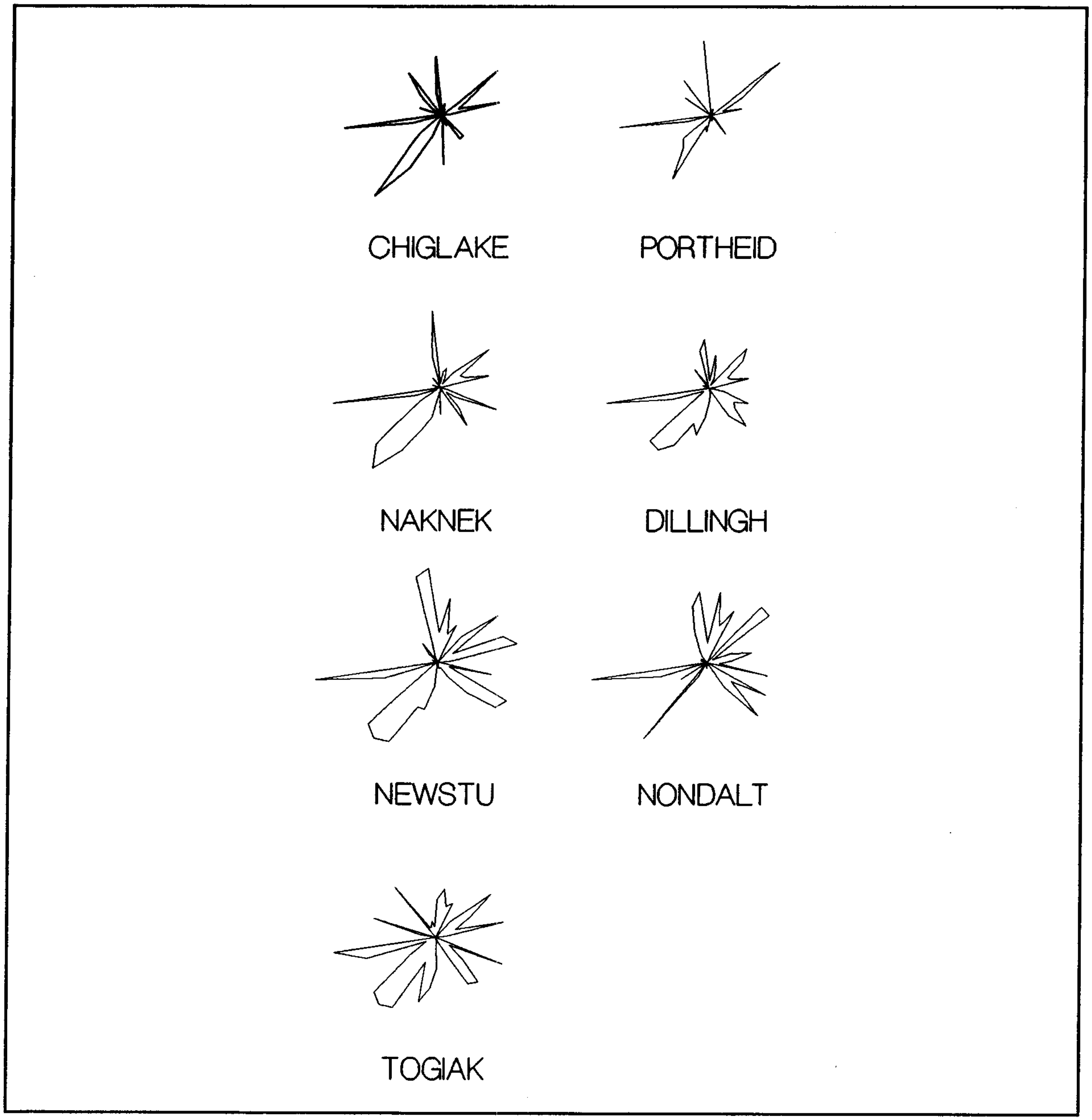


Figure 21
Fourier Plots for Percent of Households Harvesting
(Grouped Resources)

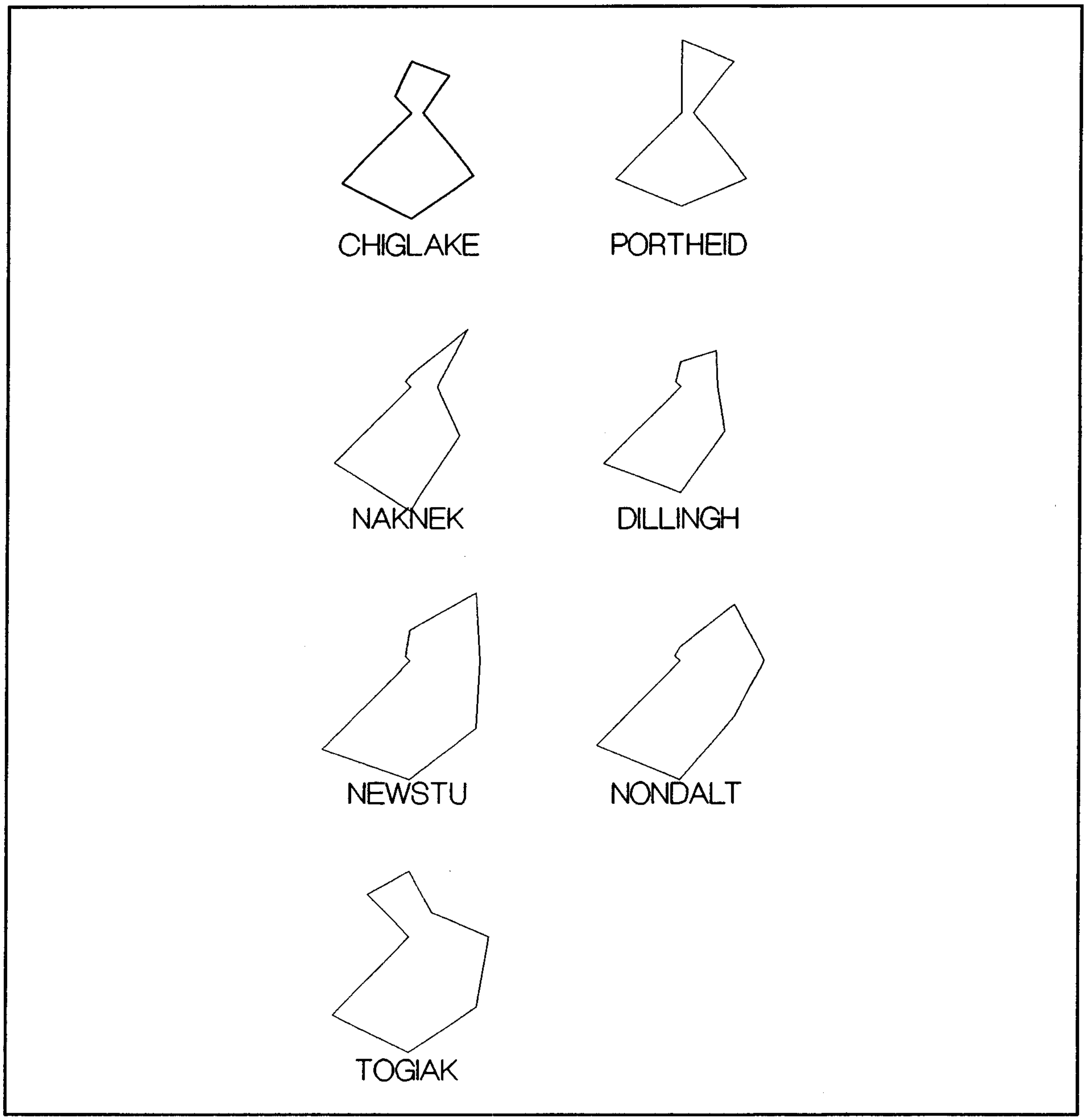


Figure 22
Fourier Plots for Percent of Households Processing
(Grouped Resources)

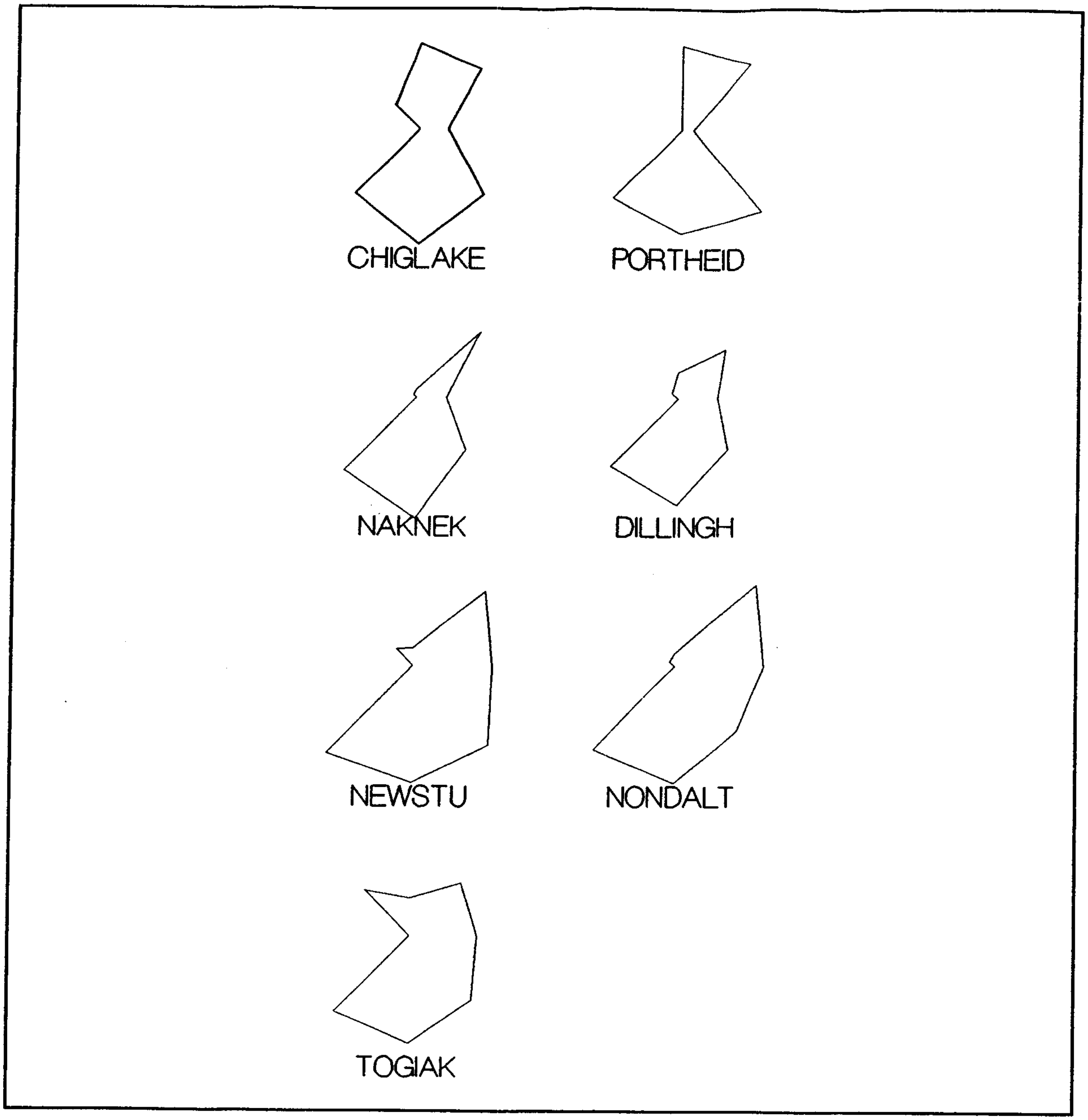
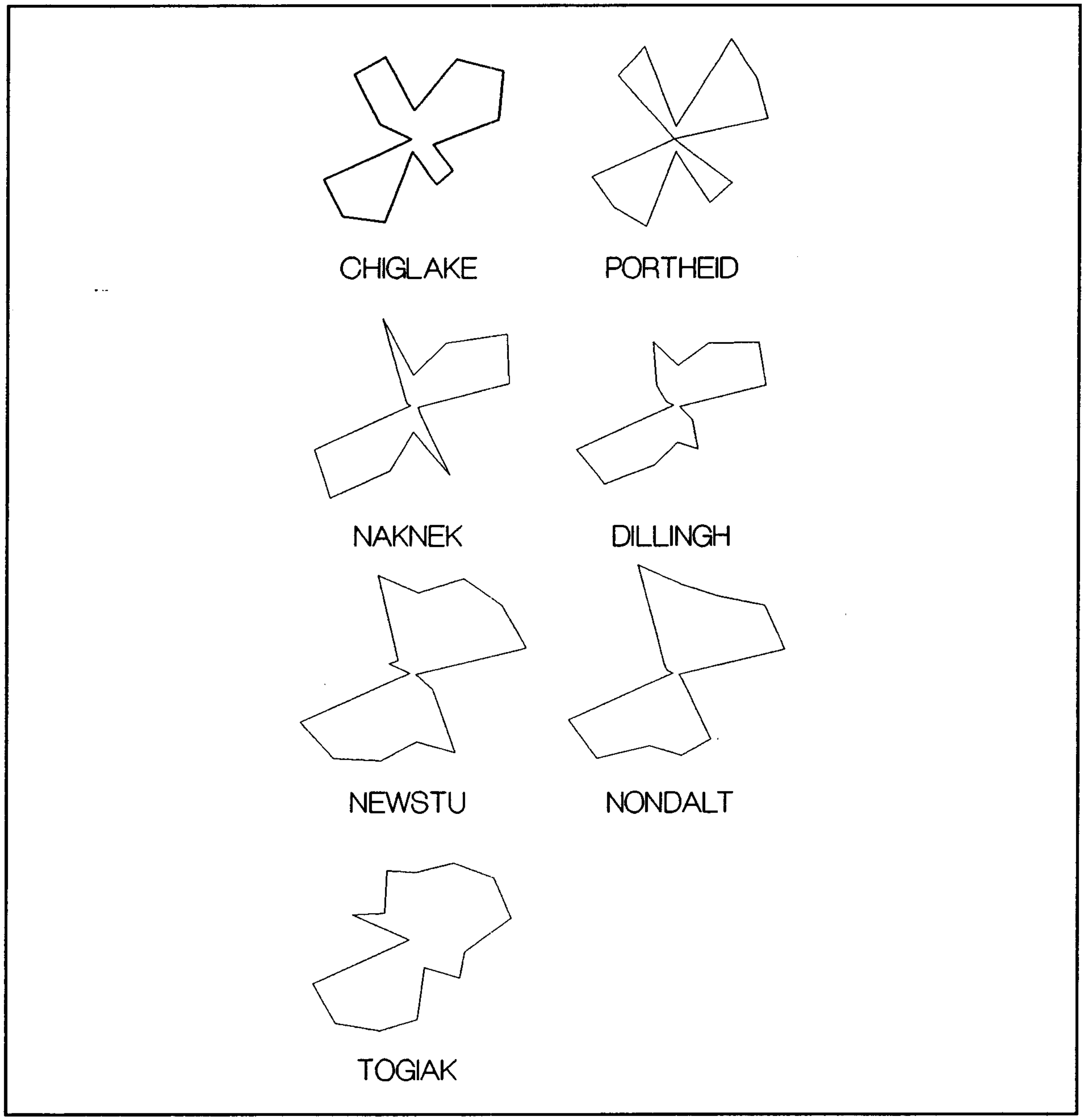


Figure 23
Fourier Plots for Percent of Households Harvesting and Processing
(Grouped Resources)



4. Multidimensional Similarity Structure Analyses of Resource Data

In the last chapter, we analyzed the ADF&G data using the multidimensional similarity structure analyses (SSA). To be consistent with the previous analyses, and because of the appropriateness of the procedure, we again make use of SSA in analyzing these data. The purpose of SSA is to represent the similarity of a set of objects by distances in a multidimensional space. In general, the higher the correlation between objects, the closer together they are in the multidimensional space. For a very small number of objects, relationships can easily be discerned simply by examining the correlation matrix (or other similarity/dissimilarity matrix). When examining anything other than a small number of relationships, however, it is necessary to handle the quickly expanding number of relationships in way that makes the task of understanding relations manageable. In the present analyses seven communities are analyzed in the Q mode and hence there are 120 possible relationships among the seven communities, as explained in the previous chapter (e.g., 21 two-way relationships -- a with b, a with c, a with d, a with e, a with f, and so on; 35 three-way relationships, a with b and c, etc.). Clearly, then, some method is needed to make manageable the task of understanding the complex interrelationships. The method used here is the multidimensional similarity structure analysis (Borg & Lingoes,1987).

In the previous chapter, the SSA analyses focused on percent of households harvesting subsistence resources and the number of pounds of each resource harvested per household. In our pre-fieldwork discussions with MMS, the decision was made not to collect data on the number of pounds harvested for each resource. Thus, the current analyses can only focus on percent of households harvesting and processing different resources. Information on processing was not available in the ADF&G data sets but was collected in our fieldwork. The resources used in these analyses were listed in Table 33.

Four sets of SSA analyses are presented: (a) analysis of percent of households harvesting using all variables listed in the table; (b) analysis of percent of households harvesting, using the grouped resource categories (e.g., Fish, Plants, and so on) listed in the table; (c) analysis of percent of households processing, using the grouped resource categories; and (d) an analysis combining the percent of households harvesting *and* processing, using the grouped resource categories. Percent of households harvesting (or processing) a resource was computed by calculating the number of households within a community that harvested (or processed) a resource and dividing by the total number of households surveyed in that community. The grouped resource categories were computed, for example, by indicating that a household had harvested (or processed) big game if they harvested (or processed) caribou *or* moose *or* bear *or* other big game.

Percent of Households Harvesting (Q Mode). All the similarity structure analysis (or smallest space analysis, as they also are known) were conducted using Guttman-Lingoes' package. Table 144 presents the centrality and the scores for the two and three dimensional SSA-I solutions for the analyses of percent of households harvesting all resources.[14] Corresponding to this table are the two (Figure 24) and three (Figure 25) dimensional plots of the SSA solution. Although the coefficients of alienation indicate that the three-dimensional model fits much better than the two-dimensional model (the two dimensional solution leaves approximately 15 percent of the variation unaccounted for, while the three dimensional solution leaves approximately .1 percent of the variation unexplained), the analysis of all resources does not present striking clusters. It may be recalled that this was also the case with the Fourier plots. The 3-D plot (Figure 25) shows that Nondalton and New Stuyahok cluster together, and Dillingham and Naknek are not far apart. Because of the viewing angle, Port Heiden and Togiak seem to be much closer than they actually are. Chignik Lake is, nonetheless, far from Port Heiden, as well as any of the other communities.

Table 145 presents the centrality and the scores for the two and three dimensional SSA-I solutions for the analyses of percent of households harvesting, using the grouped resource categories. In this analysis both the two and three dimensional solutions fit quite well, with the coefficients of alienation indicating that both solutions leave less than one percent of the variation unexplained. This analysis yielded clear clusters that are consistent with the results of the analysis of ADF&G data as well as with the Fourier plots presented above. As seen in Figure 26 and Figure 27, Chignik Lake and Port Heiden are close to one

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[14] The centrality indicates how central a point is in the multidimensional space. Objects that are similar to one another tend to be closer together than the remaining objects and will tend to appear more centrally located in multidimensional space (Lingoes & Roskam, 1973). A high centrality indicates a weak relationship with the remaining objects (i.e., they are outliers).

Table 144
Guttman-Lingoes' Smallest Space Analysis (SSA-I)
Two and Three Dimensional Solutions
For Percent of Households Harvesting All Resources

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
Chignik Lake	A	141.673	100.000	-63.795	139.994	100.000	-53.252	-23.918
Dillingham	B	78.592	13.817	38.555	79.088	3.623	5.212	-100.000
Naknek	C	5.727	-31.161	-18.918	19.312	-31.836	-61.616	-56.127
New Stuyahok	D	37.333	-52.594	10.619	60.8	-79.67	-9.116	-78.452
Nondalton	E	97.081	-94.147	-100.000	97.445	-100.000	2.925	5.566
Port Heiden	F	49.616	-84.771	-28.853	58.001	-68.979	-87.391	-32.81
Togiak	G	69.804	-100.000	4.215	76.813	-80.176	-100.000	-80.604

another; Nondalton, New Stuyahok, Naknek and Dillingham form a cluster; and Togiak is not close to the other communities.

The results for the analyses of the percent of households processing, using the grouped resource categories, were very similar to those of the percent of households harvesting. These results are shown in Table 146. In this analysis both the two and three dimensional solutions fit equally well, with the coefficients of alienation indicating that both solutions leave less than one percent of the variation unexplained. This analysis also yielded clear clusters that are almost identical to those of the previous analysis. The only exception is that the three-dimensional solution shows greater separation between Nondalton/New Stuyahok and Naknek/Dillingham. The two and three dimensional plots are shown in Figure 28 and Figure 29.

The final SSA analysis consisted of analyzing the percent of households harvesting and processing the grouped resource categories. The results of this analysis are very similar to those of the previous two analyses and they are shown in Table 147. Once again the model fits very well as both the two and three dimensional solutions leave less than one percent of the variation unexplained. The clusters formed are similar to those of the previous analyses so that Chignik Lake and Port Heiden (both on the Alaska Peninsula) form a cluster; Nondalton, New Stuyahok, Naknek and Dillingham are close to one another (all are located in the northern part of Bristol Bay); and Togiak again is unique and not close to the other communities. These results are not surprising and are consistent with the analysis conducted on the ADF&G data.

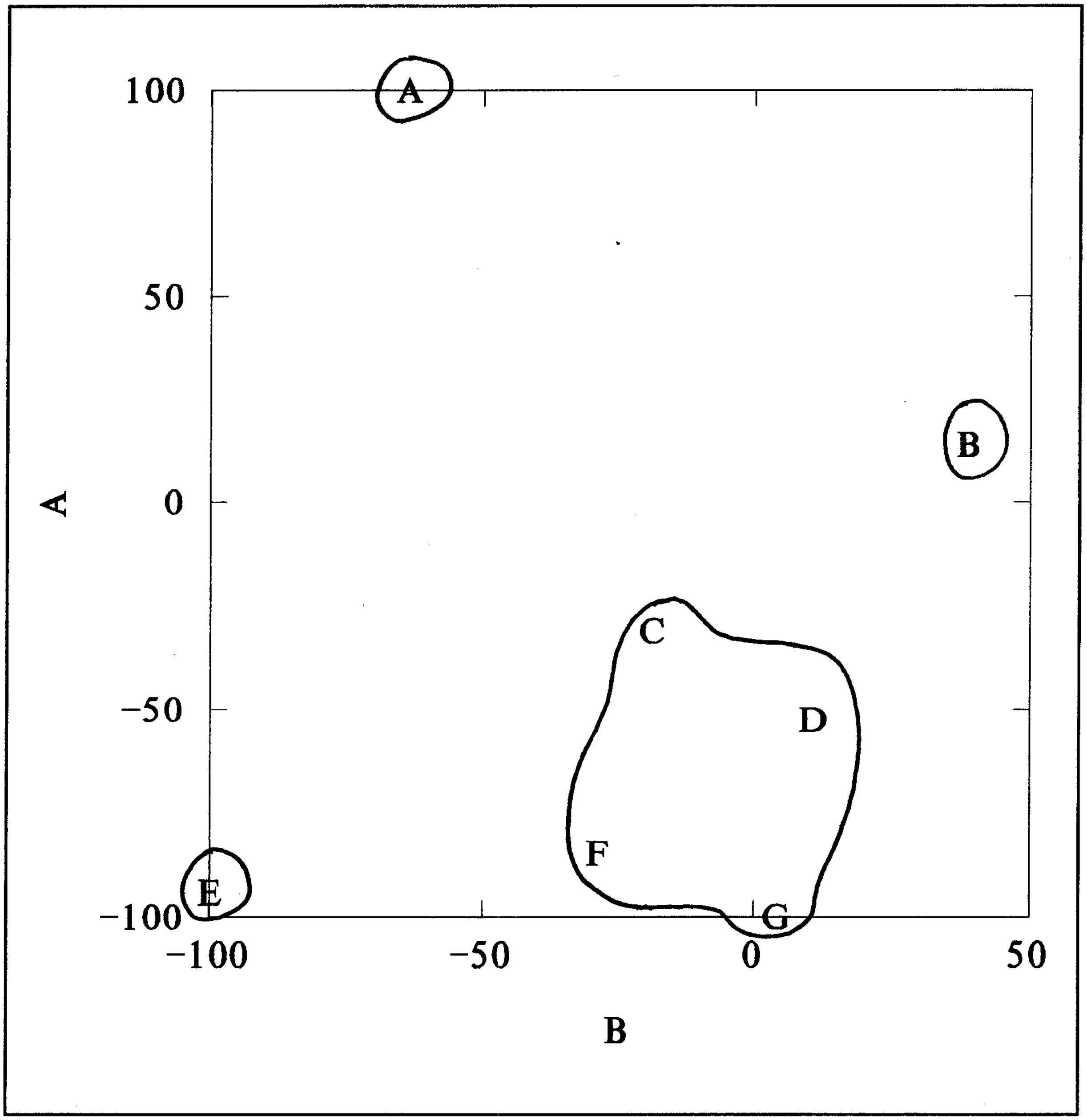
Table 145
Guttman-Lingoes' Smallest Space Analysis (SSA-I)
Two and Three Dimensional Solutions
For Percent of Households Harvesting Grouped Resources Categories

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
Chignik Lake	A	70.242	-47.808	18.408	77.358	-49.15	-67.145	-100.000
Dillingham	B	16.145	12.463	-42.273	8.3	0.605	-5.206	-68.846
Naknek	C	41.968	-14.365	-65.268	46.401	-27.895	25.021	-82.538
New Stuyahok	D	63.813	25.287	-88.472	59.416	7.276	46.04	-68.013
Nondalton	E	89.984	58.892	-100.000	87.964	45.805	60.49	-66.634
Port Heiden	F	109.312	-100.000	2.665	105.89	-100.000	-45.843	-42.865
Togiak	G	143.113	100.000	78.972	135.692	100.000	-100.000	-62.746

Table 146
Guttman-Lingoes' Smallest Space Analysis (SSA-I)
Two and Three Dimensional Solutions
For Percent of Households Processing Grouped Resources

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
Chignik Lake	A	126.022	99.02	-25.388	125.514	100.000	-32.173	-100.000
Dillingham	B	22.724	-45.881	-37.014	16.268	-34.477	-37.89	-93.009
Naknek	C	25.992	-50.888	-50.598	24.735	-40.058	-12.725	-96.194
New Stuyahok	D	65.932	-89.74	-60.075	76.969	-100.000	-13.783	-80.243
Nondalton	E	83.316	-89.08	-100.000	90.616	-98.58	23.897	-80.319
Port Heiden	F	126.646	100.000	-65.409	123.514	97.017	-24.148	-62.94
Togiak	G	95.61	-100.000	13.096	101.107	-95.45	-100.000	-79.908

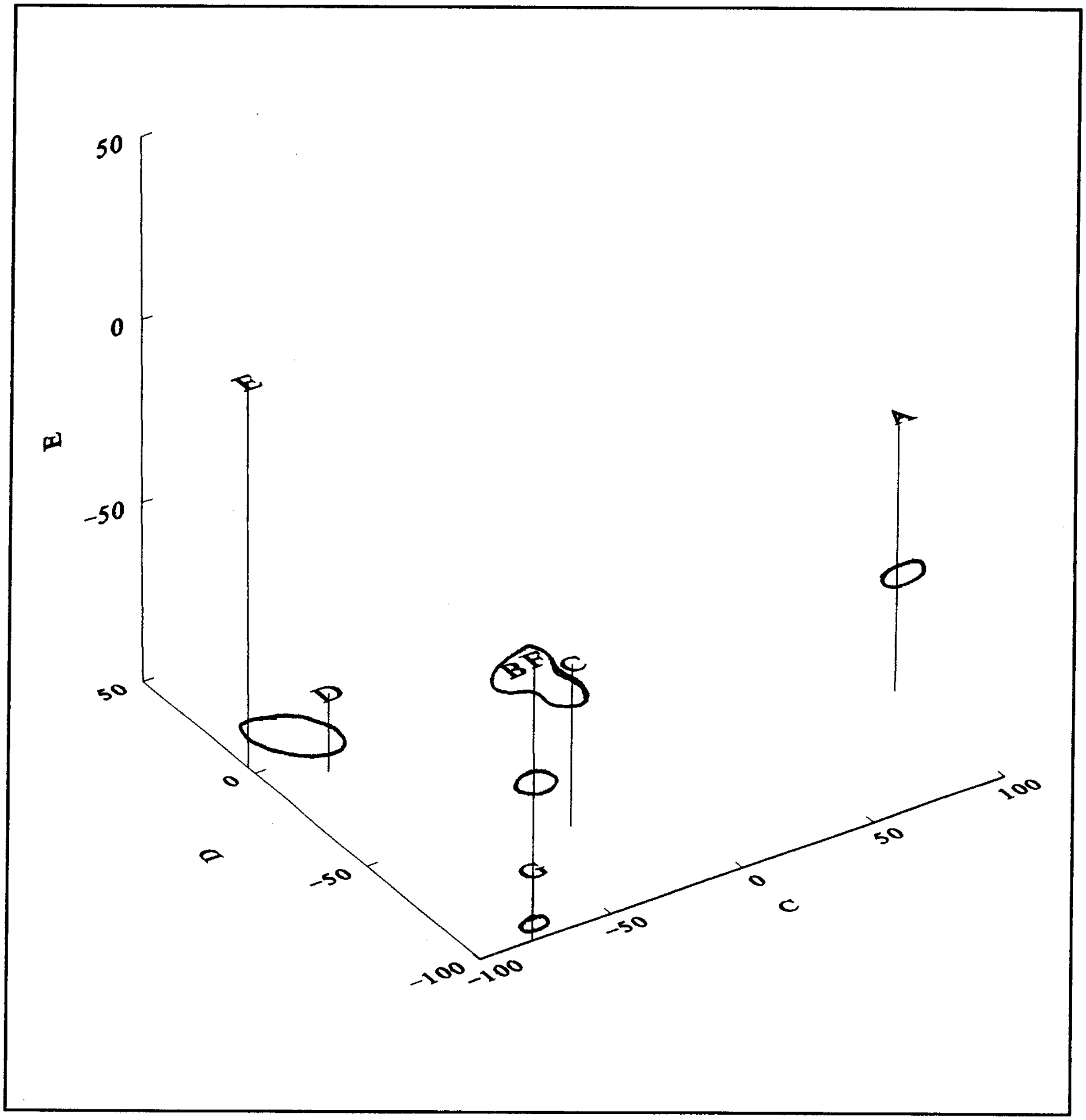
Figure 24
Percent of Households Harvesting
(All Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .15489, KRUSKAL'S STRESS = .11945.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

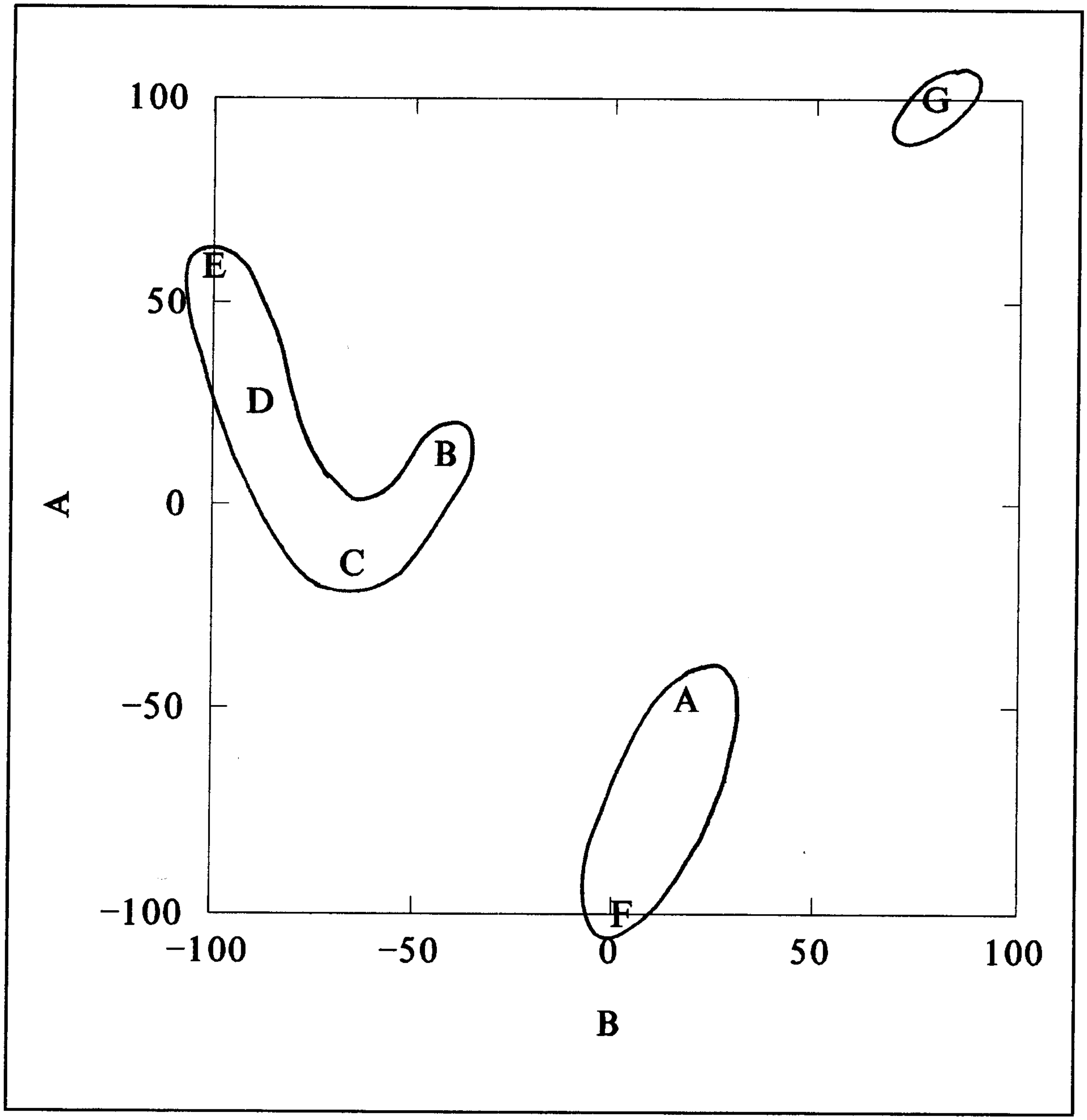
Figure 25
Percent of Households Harvesting
(All Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00128, KRUSKAL'S STRESS = .00083.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

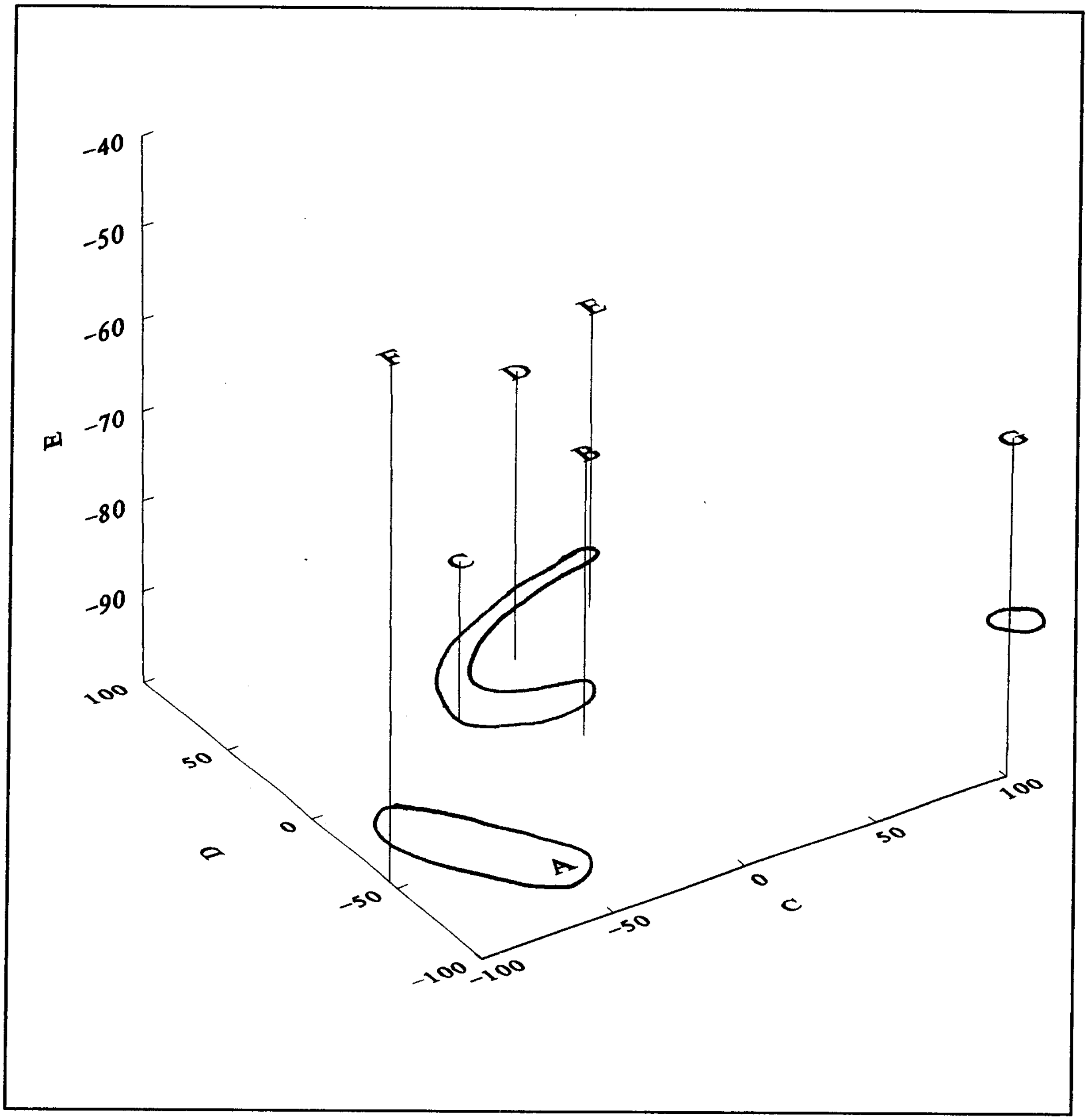
Figure 26
Percent of Households Harvesting
(Grouped Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00117, KRUSKAL'S STRESS = .00058.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

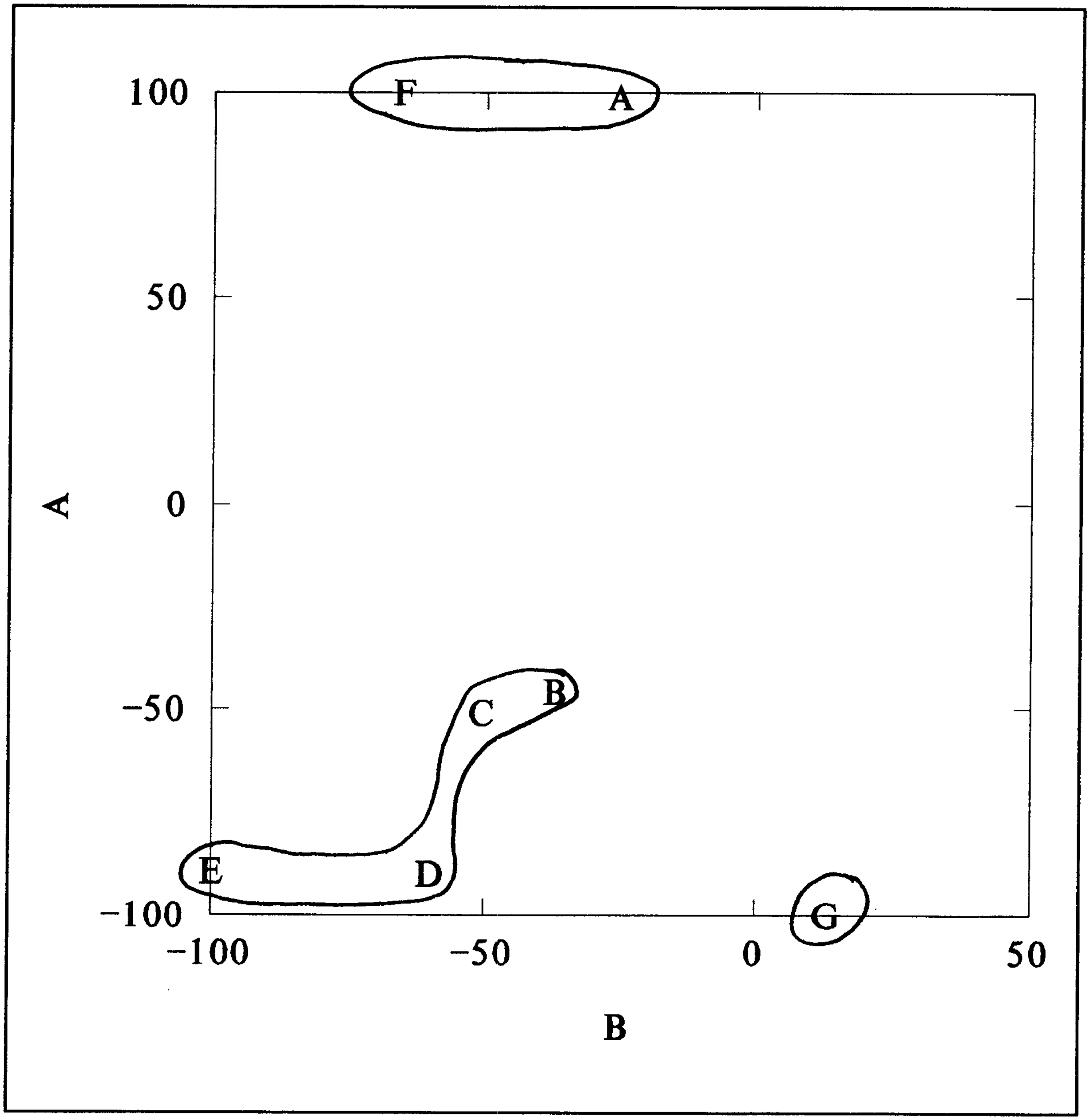
Figure 27
Percent of Households Harvesting
(Grouped Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00064, KRUSKAL'S STRESS = .00037.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

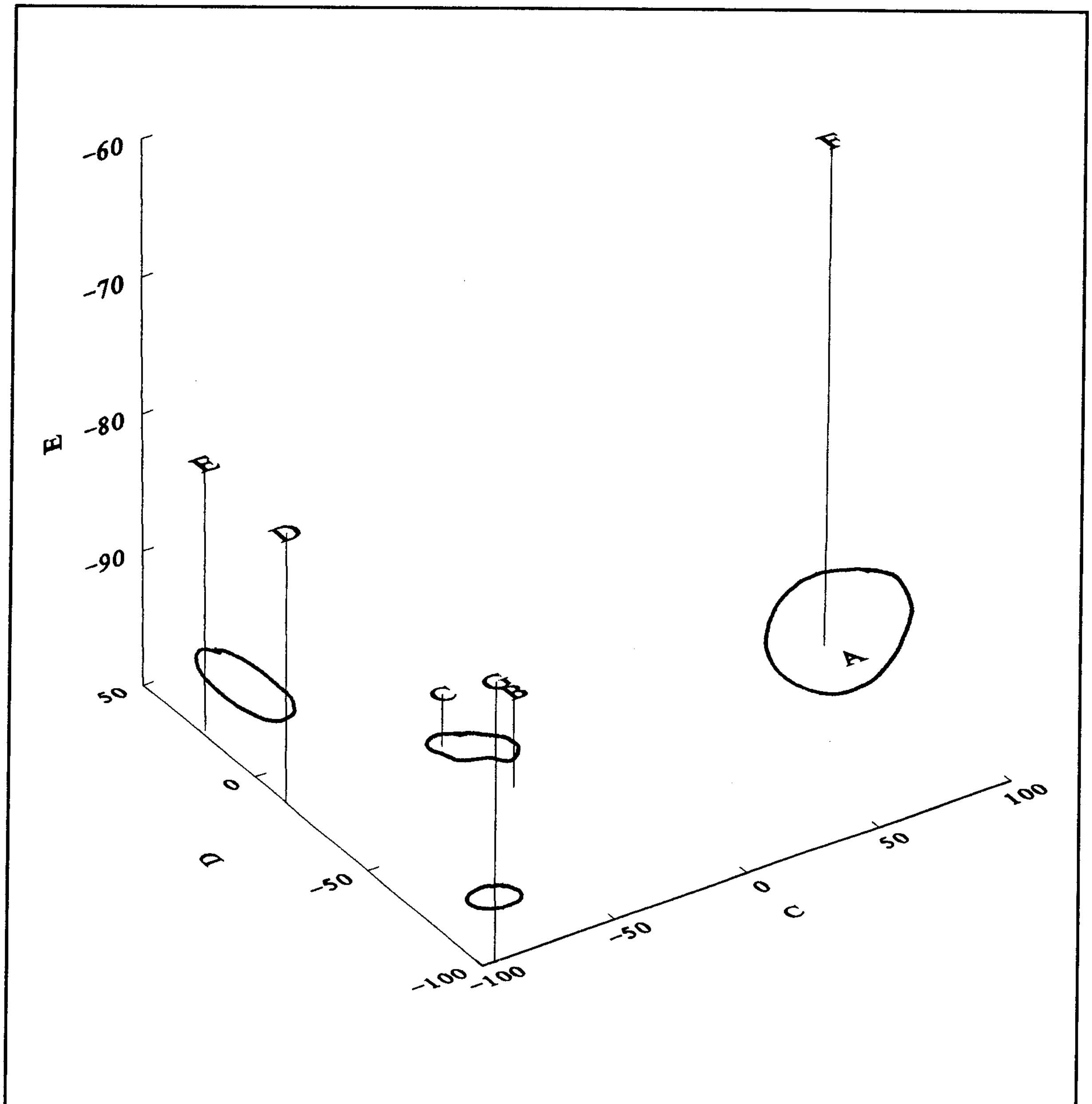
Figure 28
Percent of Households Processing
(Grouped Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00138, KRUSKAL'S STRESS = .00069.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

Figure 29
Percent of Households Processing
(Grouped Resources)



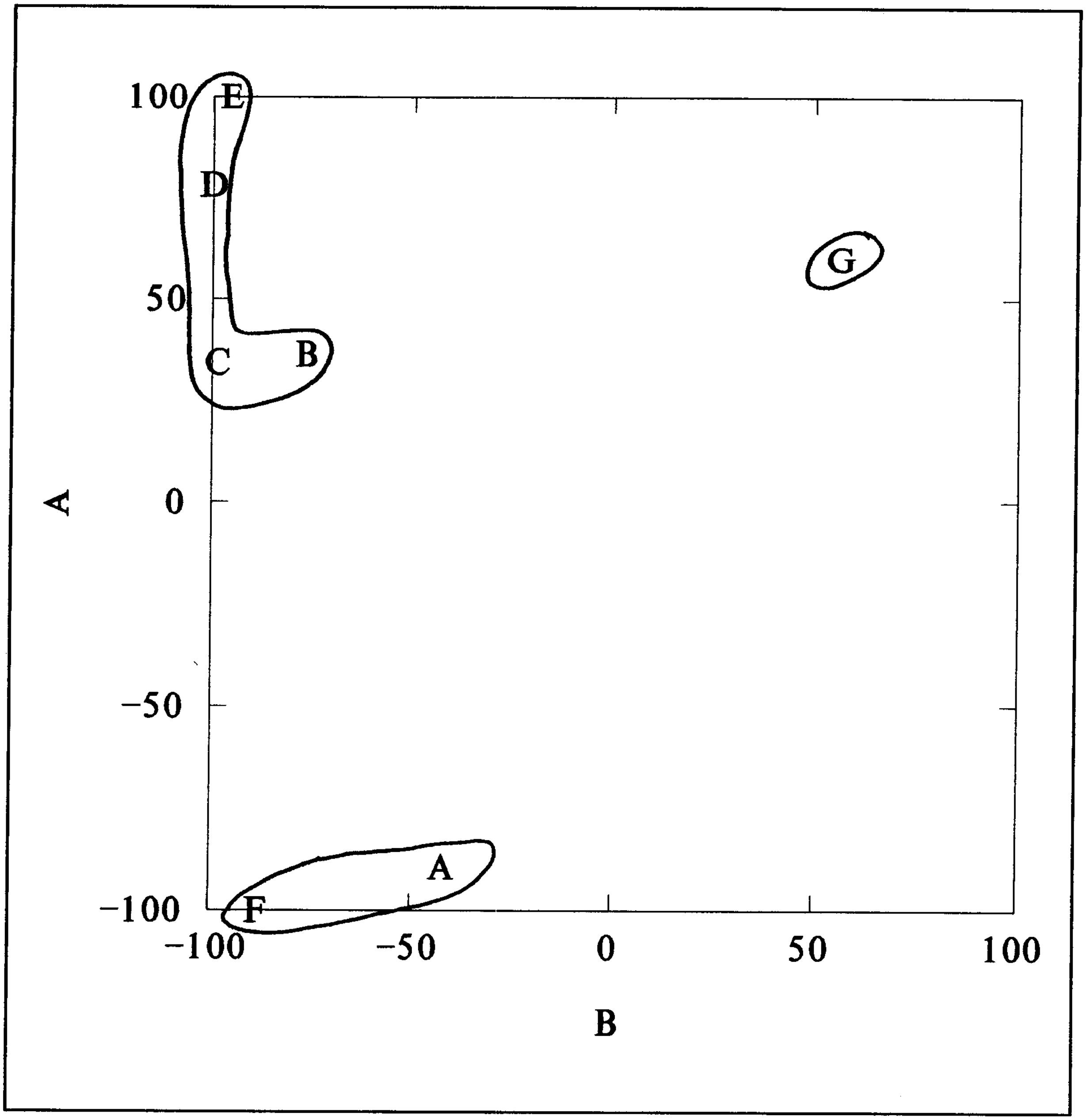
GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00138, KRUSKAL'S STRESS = .00074.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

Table 147
Guttman-Lingoes' Smallest Space Analysis (SSA-I)
Two and Three Dimensional Solutions
For Percent of Households Harvesting and Processing Grouped Resources

Community	Label	Two Dimensional Solution			Three Dimensional Solution			
		Centrality	A	B	Centrality	C	D	E
Chignik Lake	A	108.602	-89.354	-42.104	108.199	-78.476	-35.211	-38.788
Dillingham	B	23.421	36.537	-76.669	18.595	34.793	2.332	-53.409
Naknek	C	39.252	34.605	-98.738	42.691	27.859	28.564	-30.521
New Stuyahok	D	70.989	78.047	-100.000	62.938	61.064	50.087	-70.4
Nondalton	E	88.877	100.000	-95.641	92.064	91.048	60.12	-75.036
Port Heiden	F	119.696	-100.000	-88.414	125.579	-100.000	17.224	-100.000
Togiak	G	127.32	59.847	56.323	131.866	100.000	-100.000	-79.132

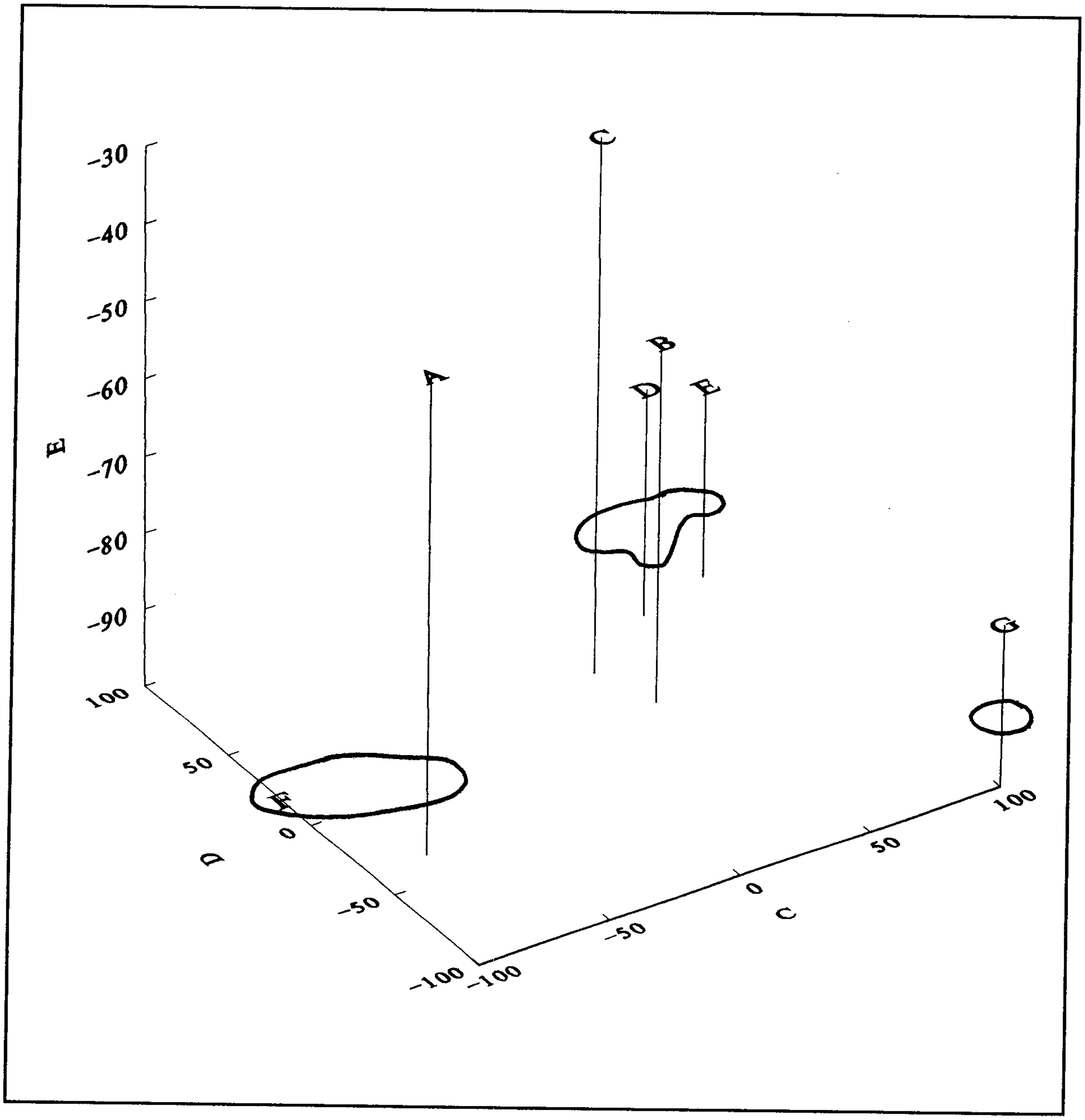
Figure 30
Percent of Households Harvesting & Processing
(Grouped Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00527, KRUSKAL'S STRESS = .00288.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

Figure 31
Percent of Households Harvesting & Processing
(Grouped Resources)



GUTTMAN-LINGOES' COEFFICIENT OF ALIENATION = .00133, KRUSKAL'S STRESS = .00069.

CHIGNIK LAKE	A
DILLINGHAM	B
NAKNEK	C
NEW STUYAHOK	D
NONDALTON	E
PORT HEIDEN	F
TOGIAK	G

CHAPTER IX. CONCLUSIONS

Our objective on this project was to compare Bristol Bay communities for subregional variations in resource use patterns and to analyze the role that subsistence plays in the lives of people in Bristol Bay. This report is based upon a review of secondary literature, an analysis of data gathered by the Subsistence Division of the Alaska Department of Fish and Game, and analysis of primary interview and ethnographic data collected in Bristol Bay in 1990. Our findings largely corroborated findings made by the Alaska Department of Fish and Game concerning harvesting data and the importance of subsistence in Bristol Bay communities.

1. Background

Bristol Bay is a culturally diverse region of Alaska which has been influenced by a long history of contact between indigenous peoples, Russians, Europeans, and Americans. Since the late 1800s, the region has been the site of one of the largest commercial salmon fisheries in the world. The region has undergone dramatic changes in recent decades as a result of federal legislative actions, changing land ownership patterns, increased management and regulation of natural resources, development of infrastructure, growth in availability of goods and services, increased accessibility of the region to people from outside, and growth in conflicts over resources that involve commercial, subsistence, and sports interests. Yet, despite these changes, subsistence continues to play an important role in the economic, social, and cultural systems of Bristol Bay communities.

The Bristol Bay Region of Alaska is rich in naturally-occurring resources, which many residents continue to rely upon heavily for subsistence purposes. Those resources utilized for subsistence comprised well over eighteen fish species (mainly salmon), dozens of plants species (especially various kinds of wild berries), three major species of land mammals (caribou, moose and bear), several small land mammal species (chiefly beaver, hare, porcupine), various clam and crab species, several species of marine mammals (seals, and occasionally walrus), and several species of ducks and geese, as well as grouse, ptarmigan, an incidental number of other birds species, and bird eggs.

The approximately 7,500 people that resided in Bristol Bay in 1990 were distributed among 35 different communities, ranging in size from about 30 people (Igiugig, Ivanof Bay) to 2,260 people in Dillingham, the regional center. For the most part, the people in these communities rely upon commercial fishing, government employment, and service and support industries for jobs and income. Most of the employment opportunities and services are located in Dillingham, the regional center, or in the Bristol Bay Borough. A few of the villages have more businesses and services than others and act as subregional centers, for example Togiak, New Stuyahok, or Chignik Bay. The rest of the communities are very small and have few, if any, businesses. A state-supported school, a church, and city and tribal government are generally the only formal institutions.

2. Analysis of Data from Alaska Department of Fish and Game, Subsistence Division

One of our primary tasks was to analyze data gathered by the Subsistence Division of the Alaska Department of Fish and Game (ADF&G) over the previous eight years. ADF&G collected detailed data on types and amounts of species harvested for most Bristol Bay communities in order to document dependence upon subsistence resources and to address regulatory questions. Two variables were fairly consistent across all communities in ADF&G's Bristol Bay data set: 1) the percentages of households harvesting various types of resources (a rough indication of involvement in subsistence activities and of the relative mix of resources harvested); and, 2) the average pounds per household harvested (a measure of nutritional dependence upon particular foods). We used cluster analysis, Fourier plots, and Guttman-Lingoes multidimensional similarity structure analysis to compare communities based on these two variables.

In general, community comparisons based on percentages of households that harvest particular resources indicated that there are three distinct subregions (e.g. see Figure 10): the Pacific side of the Alaska Peninsula (Chignik Bay, Chignik Lagoon, Chignik Lake, Ivanof, Perryville, False Pass); coastal communities on the Bristol Bay side of the Alaska Peninsula (Egegik, King Salmon, Naknek, Nelson Lagoon, Pilot Point, Port Heiden, South Naknek, Ugashik); and inland or "river" communities (Dillingham, Ekwok, Iliamna, Kokhanok, Koliganek, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth). Comparisons based on the amounts of various resources harvested (pounds per household) often produced finer distinctions within those subregions. For example, in some analyses, the Bristol Bay Borough communities clustered separately from other communities on the Bristol Bay side of the Alaska Peninsula. Similarly, in some analyses, the inland ("upriver") communities could be broken into a Nushagak River cluster and an Iliamna Lake cluster. The clusterings are largely geographical, which suggests that people generally harvest the resources available in their local environment.

Based on this analysis of ADF&G data and a review of secondary literature, we selected seven communities to represent the identified subregions: Chignik Lake, Dillingham, Naknek, New Stuyahok, Nondalton, Port Heiden, and Togiak. The populations of these communities ranged from 2,017 for Dillingham, the regional center, to 119 in Port Heiden, a small community on the Alaskan Peninsula. Ethnic compositions included various mixes of Eskimos, Athapaskans, Aleuts, and non-Natives. Fieldwork was conducted in these communities during August and September 1990 in which primary interview and ethnographic data was collected. Focused discussions were conducted with members of randomly selected households (212 households representing 778 total household members) and with institutional officials (98 people), and subsistence practices were observed.

3. Analysis of Fieldwork Data

Cooperation and sharing networks based on geography and kinship are analyzed to illustrate the importance of subsistence activities to social structure. Models of individual and household participation in subsistence activities were constructed by regressing each of three, weighted involvement indices on a set of explanatory variables. Fourier plots and Guttman-Lingoes multidimensional similarity structure analysis were used to compare communities based on subsistence harvesting and processing patterns. The meanings of subsistence, changes in subsistence practices, and threats to subsistence were also analyzed.

Subsistence Cooperation and Sharing Networks. The data collected in this study differed from data collected in most previous Alaskan subsistence studies in that we documented connections between households that cooperate in subsistence activities and share subsistence resources. We did so by calculating the percentages of households in each community that have harvesting, processing, giving and receiving ties to households in various locations (geographic networks) and to households that are related to them in various ways (kinship networks). Cooperation and sharing networks based on geography and kinship were analyzed to illustrate the importance of subsistence activities to community, subregional, and regional social and cultural structures.

In terms of geography, cooperation and sharing networks are most concentrated within communities but extend to other communities throughout the Bristol Bay region, to other areas of Alaska, to the lower 48 states, and, in a few instances, to foreign countries. Households tend to engage in subsistence harvesting and processing activities with people that live in the same or nearby villages, with cooperation generally decreasing as the distance between communities increases. Harvesting networks are more extensive than processing networks, that is, people from different villages get together more often to harvest resources than to process them.

Sharing networks are more extensive and intricate than cooperation networks and exhibit a somewhat different geographic pattern. While the strongest ties for giving and receiving subsistence resources are between households within the same community, the strength of sharing ties does not decrease with distance outside communities. The next strongest *receiving* ties are generally between the sample communities and other communities within Bristol Bay (not necessarily neighboring ones), indicating that the subsistence needs of Bristol Bay residents are generally provided for from within the region. However, the next strongest *giving* ties are to communities outside Bristol Bay, especially in the case of non-commercial fish, big game, and plants, and to a lesser extent with small game and birds. This indicates that Bristol Bay is a net "exporter" of subsistence foods and that resources which are abundant in Bristol Bay provide for the subsistence needs of people in other areas as well.

Differences in geographic patterns for cooperation and sharing were observed across sample communities. Communities with the highest percentages of Alaskan Native inhabitants (Chignik Lake, New Stuyahok, Nondalton, and Togiak) generally exhibited the greatest intra-community cooperation in subsistence activities and sharing of subsistence resources. Dillingham (the regional center) and Naknek (a subregional center) have more extensive inter-community harvesting and processing networks, probably due to connections maintained by people who have moved from villages to those centers. Several communities occupy important positions in terms of regional sharing networks: New Stuyahok shares resources of all kinds with other Upper Bristol Bay communities; Togiak has extensive sharing connections with the Kuskokwim region; Port Heiden has the most sharing connections with the three major subregions of Bristol Bay and serves as a crossroads between them; and, Dillingham and Naknek generally receive more subsistence resources from other communities in Bristol Bay than they give.

Differences in cooperation and sharing patterns also were observed across resource groups. People most often cooperate to harvest non-commercial fish, plants, big game, and birds. The harvesting networks for these resources extend beyond the region and, except for birds, outside of the state. Processing cooperation between households is greatest for big game and non-commercial fish, the two most important subsistence foods by bulk in Bristol Bay. Communities generally share the particular resources which they have in abundance and receive resources which they lack, need, and desire. Big game, plants, and non-commercial fish are widely shared within and between communities even though these resources are harvested by the highest percentages of households in all sample communities. This is because people share to even out temporary scarcities and share different species and resources preserved or prepared in different ways in order to increase the overall variety in their diet. Even though plants and birds generally add a small amount of edible pounds to local diets, the high level of cooperation in their harvest and of sharing in the case of plants indicates that these resources are more important in terms of the overall subsistence economy than their mere bulk would indicate.

Our data indicate that kinship is the primary basis for cooperating in subsistence pursuits and sharing subsistence resources. Harvesting is most often conducted alone, with other household members, and with friends, affines, and siblings from different households. More harvesting is done among persons related matrilineally than through the male lines of descent. Most of the inter-generational harvesting networks are found within households while inter-household, inter-generational networks are most often composed of affinal and extended kin. The large percentage of harvesting among friends and siblings indicates that harvesting often is done with contemporaries and is a form of recreation and social activity. It also suggests that availability, skill, and reliability, in addition to kinship, are factors determining the formation of harvesting groups. Harvesting birds, big game, plants, and non-commercial fish is more of a group activity with a wider variety of harvesting group compositions than is the case with harvesting small game, marine mammals, or marine invertebrates.

Subsistence processing is generally done alone or with other members of the same household. Inter-household processing networks are fewer and smaller than harvesting networks. Processing non-commercial fish is the activity which involves the most inter-generational kin groups and the widest variety of collateral and affinal kin.

The kinship networks for sharing subsistence resources are more extensive than the kinship networks for harvesting and processing subsistence resources. Subsistence resources are widely distributed among family and friends, and the sharing of subsistence resources connects more households than the harvesting or processing of those resources. More households give subsistence resources to parents and offspring than harvest those resources with them, which suggests that inter-household, inter-generational groups (parents, offspring, grandchildren) are more connected in the distribution and consumption of subsistence foods than in the harvesting and processing of them. Parents and grandparents tend to receive resources that are harder for older people to harvest (birds, small game, big game, and marine mammals) and to give resources that they are able to continue harvesting (plants, non-commercial fish). Parents and grandparents generally receive more subsistence foods because of need, because they usually know best how to prepare subsistence foods, and because their houses tend to be gathering places which ensures the widest distribution of the food among relatives.

Factors Affecting Participation in Subsistence Activities. Data gathered on participation in subsistence activities was more detailed for the respondents (n=212) than for other members of their households (n=778). Analyses of factors affecting participation in subsistence were conducted for all household members (n=778), for respondents (n=212), and for sampled households as a whole (n=212).

The factors analyzed using data on all household members (n=778) were gender, ethnicity, length of residency, and age. The strongest predictor of involvement in subsistence activities was length of residency. The likelihood of engaging in subsistence activities increased consistently with length of residency across all seven of the major resource categories for both harvesting and processing. This indicates that subsistence is a regional way of life influencing all residents to some degree.

In general, men are more involved in all aspects of subsistence activities (harvesting *and* processing) than women, although there are some differences across resource categories. The only resources that women harvest more than men are plants and berries, and women are much less involved than men in hunting and trapping (or harvesting birds, small game, big game, marine mammals). While females process subsistence resources much more than they harvest them, the distinctions between genders in terms of processing are slight. Women are much more likely than men to process plants and berries, but only slightly more likely to process non-commercial fish and marine invertebrates, about equally likely to process birds and marine mammals, and less likely to process small game and big game. Our ethnographic research suggests that more women are wage earners and work full-time, thus limiting their ability to engage in subsistence activities, while more men are seasonal commercial fishers, which leaves the rest of the year free to hunt, trap, and fish *and* to process what they harvest.

Significant differences based on ethnicity (coded as full Native, part-Native, or non-Native) were found for some resource categories and some subsistence activities. Natives and part-Natives are more likely to harvest and process marine mammals (restricted to Natives) and to harvest marine invertebrates than non-Natives, while full Natives are more likely to harvest and process small game and birds than either part-Natives or non-Natives. The only resource category in which non-Natives are more likely to harvest and process than either Natives or part-Natives is non-commercial fish. There are no significant differences based on ethnicity for harvesting big game, non-commercial fish, or plants and berries, the three main subsistence resource categories. In general, ethnic differences are significant for subsistence activities which are not normally undertaken for sport and Natives harvest a wider range of subsistence resources.

Significant differences were found for harvesting and processing by age group. Over 90% of individuals between the ages of 21 and 60 harvest or process at least one subsistence resource. Participation remains high (over 80%) for those over the age of 60. Youth under the age of 20 are much less likely to be involved in harvesting (60%), and especially in processing (35%).

Regression models were used to analyze data for respondents and sampled households. Involvement indices were created, elements of the indices were weighted according to importance for involvement in subsistence, and indices were regressed on a set of explanatory variables. The model for respondents indicated that males participate in subsistence more than females; involvement in subsistence activity increases as the years in commercial fishing increases; young adults engage in more subsistence activity (the youngest respondent was 19 years old); persons with more education have increased involvement in subsistence (not surprising since education is negatively correlated with age); and, respondents from Nondalton tended to be more engaged in subsistence activities than residents of the other villages. The model for sampled households indicated that larger households harvest and process more resources, household involvement in commercial fishing is associated with higher subsistence involvement, and single parent households were less involved in subsistence even when controlling for household size.

Community Comparisons. Part of our task was to integrate our findings with our previous analysis of the ADF&G data in which communities were compared based upon percentages of households harvesting various subsistence resources and the average pounds per household harvested. Differences in the years of data collection, protocols, and methodologies prevented a direct comparison of data sets. Instead of comparing absolute percentages or amounts, we compared the rank ordering of communities. Overall, our data shows a similar pattern to ADF&G's in terms of amounts harvested. For percentages of households harvesting, the top and bottom ranks were usually the same with some reversals occurring in the middle ranks on some resources.

Amounts of resources harvested varied by community, with each community focusing on the resources in abundance in their locale. Harvests of subsistence foods were generally high in all communities. In comparison, however, New Stuyahok and Togiak most often rank highest, followed by Nondalton. Chignik Lake, Dillingham, and Naknek generally occupy the intermediate ranks. Port Heiden usually ranked fifth, sixth, or seventh.

Comparisons between communities based upon percentages of households harvesting were made using several of the same multivariate graphical techniques employed to analyze the ADF&G data (Fourier plots and Guttman-Lingoes' multidimensional similarity structure analyses). In general, Chignik Lake and Port Heiden have similar characteristics as do New Stuyahok and Nondalton. Dillingham and Naknek are most similar to one another, but were also close to New Stuyahok and Nondalton. Togiak is not similar to the other communities. These subregional clusterings generally fall out geographically, but clearly the nature of the communities also influences the comparisons, as evidenced by the fact that the regional "centers" cluster (Dillingham and Naknek).

Meanings of Subsistence and Perceived Threats to Subsistence Activities. Much of the data collected through the focused interviews was descriptive and not easily subjected to statistical analyses. Interviewees stressed the meaning and importance of subsistence in their lives. Meanings of subsistence are based on cultural continuity (need and preference for naturally-occurring foods, sharing, relationship with place, family traditions and recollections). The social and recreational pleasures of subsistence activities are important, as is the contribution that subsistence makes to economic security and stability and psychological well-being. Subsistence foods are widely shared at community events, religious occasions, celebrations, and gatherings of family and friends, and the consumption of subsistence foods often provides the main reason for people to get together. For some, subsistence is important as an expression of aboriginal rights.

The threats to subsistence resources and activities most commonly mentioned were increases in government regulations, federal take-over of resource management in the wake of the McDowell decision, resource depletion due to increased human population, increased competition from sport hunters and fishers, and oil exploration. Changes in subsistence practices overlapped threats, but many persons mentioned new devices and machines, some changes in diet and food preferences, changes in the composition of harvesting groups, and the shortened duration of hunting and fishing excursions. Most of the residents contacted for this study believe subsistence activities will persist indefinitely despite perceived threats, and discussion with school children suggested a strong desire to continue subsistence pursuits and to favor subsistence foods.

4. Significance of the Research

This research produced several significant findings. We found that subsistence is not an individual enterprise; subsistence binds families and extended kin groups and connects households and communities to each other and to other areas beyond the Bristol Bay region. Documentation of subsistence cooperation and sharing networks suggests that subsistence is an important foundation of regional social structure, provides intra- and inter-community integration and cohesion, and helps to maintain Native cultural traditions. Subsistence entails a web of connections between smaller villages, the regional centers of Dillingham and Naknek, and urban centers of the state. To eliminate the residents of some communities from being eligible to engage in subsistence based upon the size of their community could sever some of the most important connections maintaining these subsistence networks.

We found that those most likely to engage in subsistence activities are long-term residents, males, younger adults, and Natives, although there are variations in this pattern across resource categories. Our finding that involvement in subsistence harvesting and processing increases with years of residency across all resource categories suggests that subsistence tends to be a regional, or, in the case of Bristol Bay, a rural way of life. The findings concerning other variables in this profile (that young adults, males, and Natives are more involved in subsistence) are significant given that young, Native males generally have been identified as a very high risk group in Alaska. This suggests that the ability to continue doing subsistence may be an important factor in addressing the particular needs of this segment of the population. The fact that income, one of the primary social indicators of "need", is not a significant predictor of subsistence activities indicates that subsistence is not merely an economic undertaking, but has other dimensions to it as well.

Our finding that there is a positive relationship between involvement in commercial fishing and involvement in subsistence, at both the individual and household levels, indicates that these two activities are integrated. This finding shows that involvement in commercial activities does not necessarily lead to decreased involvement in subsistence activities and suggests that commercial activities are being used to underwrite subsistence endeavors. This finding also suggests that changes in the commercial fisheries could impact subsistence activities.

Finally, our research indicates that subsistence adds meaning to people's lives, that people desire to maintain subsistence lifestyles, and people are concerned about various perceived threats to subsistence. Subsistence resources are obtained not only to fulfill economic needs, but to satisfy dietary preferences, maintain cultural traditions, and provide greater security for people living in Bristol Bay, Alaska.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.