PATTERNS OF WILD RESOURCE USE IN DILLINGHAM: HUNTING AND FISHING IN AN ALASKAN REGIONAL CENTER

by

James A. Fall, Janet C. Schichnes,
Molly Chythlook, and Robert J. Walker

Technical Paper No. 135

This research was partially supported by ANILCA Federal Aid Funds, administered through the U.S. Fish and Wildlife Service, Anchorage, Alaska.

Alaska Department of Fish and Game
Division of Subsistence
Juneau, Alaska

December 1986

ABSTRACT

This report describes the contemporary patterns of wild resource use in Dillingham, a community of 2,004 people in southwest Alaska that serves as a regional center for other Bristol Bay communities. The report is based on data collected during a survey of 153 randomly selected Dillingham households (22 percent) and nine key respondent households in March through May 1985. The resource harvest and use data pertain to 1984.

In 1980, about 57 percent of Dillingham's population was Alaska Native, most of whom were from the Bristol Bay region. About half the sampled household heads in 1984 had been born in southwest Alaska. The other half had arrived in the community from outside the region, primarily to accept jobs available in the regional center.

The cash economy of Dillingham, like the rest of the Bristol Bay region, is inextricably linked to the commercial salmon fishing industry. About 44 percent of the sampled households in 1984 were involved in commercial fishing. A smaller percent found employment in fish processing or in businesses that provide services to commercial fishermen. Commercial fishing in Bristol Bay is a highly seasonal industry, and local incomes from the fishery vary from year to year depending on run strength and market conditions. In addition, most of the jobs in the fishery and income earned by the fishery go to non-Bristol Bay residents who seasonally migrate to the region. As a result, most of the income generated by the commercial fishing industry leaves the region at the end of the fishing season.

Dillingham's role as a regional center supports a substantial service and transportation sector which moderates the seasonal characteristics of a cash economy dominated by commercial salmon fishing. Jobs in federal, state,

and local government are an important part of Dillingham's economy. Retail trades, transportation, and health and social services also provide employment opportunities for residents of the community.

Monetary incomes of Dillingham residents vary substantially from year to year because of the role of the commercial fishery in the community's economy. Cash incomes in Dillingham tend to be higher than those of the region's smaller communities, though somewhat lower than larger cities in Alaska. As an example, in 1982, average taxable incomes in Dillingham were lower than those of any other Alaskan community with a population over 2,000. Also, costs of living are high. The costs of food, for example, averaged 172 percent of that of Anchorage from 1981 through 1985.

The research found high levels of use and harvest of wild resources in the randomly sampled households in 1984. Eighty eight percent used salmon, 79 percent used wild plants, 78 percent used game, 75 percent used other fish, 63 used birds, and 27 percent used marine mammals. The most commonly used species were king salmon, berries, caribou, red salmon, and moose. On average, sampled households used 11 kinds of wild foods in 1984.

In addition, most sampled households harvested fish, game, or wild plants during the study year. For example, 65 percent harvested salmon, 62 percent gathered plants, and 56 percent harvested fish other than salmon. Thirty two percent of the sample harvested game, most commonly caribou, spruce grouse, and moose. Salmon comprised 58.4 percent of the total edible weight of the sample's harvest, followed by game (27.2 percent), other fish (7.7 percent), plants (3.3 percent), birds (2.2 percent), and marine mammals (1.2 percent).

Dillingham households followed a patterned seasonal round of harvest activities, conditioned by resource availability and hunting and fishing

regulations. Almost all the harvesting took place in the Bristol Bay region. The report contains a series-of maps showing areas used for harvesting wild foods over a 20 year period from 1963 to 1983. There is also information on the intensity of use of these areas as well as data on the location of moose and caribou hunting and trapping in 1984.

The mean household harvest of wild foods during the'study year was 715 pounds edible weight, and the per capita harvest was 242 pounds, 234 pounds of which was fish and game, and the rest plants. The 1984 harvest compares to a per capita take of 259 pounds of fish and game by a sample of Dillingham households in 1973, suggesting little change in per capita non-commercial harvests in Dillingham over an 11 year period. Per capita harvests in Dillingham are generally lower than those of smaller Bristol Bay communities, but are much higher than those of larger communities along Alaska's road system such as Kenai (37 pounds per capita harvest in 1982) and Homer (104 pounds in 1982).

The survey findings and key respondent interviews also documented that non-commercial distribution of fish and game is very common between households in Dillingham, and between Dillingham residents and people living in other Bristol Bay communities. For example, 55 percent of the sampled households received caribou from harvesters outside their households, 49 percent received moose, and 23 percent received seal meat or oil. Dillingham households often were involved in reciprocal relationships with village households. The Dillingham households received gifts of fish and game in exchange of providing services to visiting households, such as lodging and transportation.

Also, it was common for key respondent households to describe cooperating with relatives, friends, or work associates in harvesting fish and game. Extended families worked together to harvest and process salmon at

several fishing sites in Dillingham or in camps on Nushagak Bay. Most salmon were taken with subsistence set nets. Traditional salmon products included dried and smoked "strips," partially dried and smoked fillets, salt fish, and fermented salmon heads. Newcomers to the community learned set netting techniques from long term residents.

The research found evidence of sub-communities within Dillingham with different patterns of resource uses. Evidence for such sub-communities also exists for other Alaska regional centers. For example, Alaska Native households in Dillingham had higher household harvests and per capita harvests, and reported a wider range of species used and harvested than did non-Native households, as did commercial fishing households compared to non-commercial fishing families. The research also showed that as length of‘ residency in Dillingham increased, so too did fish and game harvests. This suggests that residents who move to the community and stay become socialized into hunting and fishing patterns.

The research concluded that Dillingham is a good example of a type of community in Alaska called a regional center, with a distinctive socioeconomic system. Residents of regional centers like Dillingham participate in a mixed economy. They earn cash through commercial fishing and employment in government, service, and trades, but they also harvest substantial quantities of wild foods, and share these foods with other households. This balance of commercial and subsistence activities makes Dillingham distinctive (along with Naknek and King Salmon) among communities of southwest Alaska, but Dillingham residents share in the overall pattern of resource harvesting activities that is part of the economic system of the Bristol Bay region.

TABLE OF CONTENTS

	Page
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF FIGURES	vi
ACKNOWLEDGEMENTS	viii
CHAPTER 1: INTRODUCTION	1
Study Background	1
Research Hypotheses	6
Purposes and Objectives	8
Methodology	8
CHAPTER 2: HISTORICAL AND SOCIOECONOMIC BACKGROUND	13
Natural Environment	13
Traditional Ethnography and History	14
Demography	22
Employment	24
The Commercial Salmon Fishery	25
Other Commercial Fisheries	30
Other Employment	30
Monetary Income and Cost of Living	37
Government and Services	44
Dillingham City Government	44
State and Federal Agencies and Services	45
Education, Schools, and Churches	47
Health and Human Services	49
Transportation	50
Utilities, Telephone, and Electricity	51
Housing	51
Summary	53
CHAPTER 3: CHARACTERISTICS OF RESOURCE USE	54
Seasonal Round	54
Resource Harvest Areas	56
Species Used and Levels of Participation in Harvest	66
Harvest Quantities	72
Resource Sharing and Receiving	78
Comparison of 1973 and 1984 Harvests	79
Regional Distribution and Exchange	84
Harvest and Use Patterns by Resource Category	87
Salmon	87
Salmon Harvest Methods	88
Subsistence Salmon Fishing Regulations	90
Subsistence Fishing Locations	93
Preferred Species, Processing, and Preservation Methods	96
Marine Fish: Herring and Spawn-on-kelp	98
Smelt	100
Shellfish	100
Freshwater Fish	101
Moose	102

Page

Caribou 107
Furbearers 110
Other Small Mammals 113
Birds 113
Marine Mammals 116
Plants and Berries 118
Case Households 119
Case 1 119
Case 2 120
Case 3 122
Case 4 123
Discussion 125

CHAPTER 4: SUBPOPULATIONS 128
Introduction 128
Household Economic Factors and Resource Use 129
Length of Residency 130
Cultural Factors: Ethnicity 133
Discussion: Subpopulations 137

CHAPTER 5: DISCUSSION AND CONCLUSIONS 138

REFERENCES CITED 148
APPENDIX A: SURVEY INSTRUMENT 151
APPENDIX B: CONVERSION FACTORS 166
APPENDIX C: KEY RESPONDENT INTERVIEW GUIDE 167

LIST OF TABLES

		Page
Table 1.	Population of Bristol Bay Region Communities, 1960-1984	3
Table 2.	Sample Selection, Dillingham Resource Use Survey, 1985	10
Table 3.	Significant Historical Events, Bristol Bay Region	16
Table 4.	Population, Nushagak Bay and Nushagak River Communities, 1880-1986	21
Table 5.	Characteristics of Dillingham Sample, 1984	23
Table 6.	Total Salmon Commercial Catch by District, Bristol Bay, 1965-1986	26
Table 7.	Resident and Nonresident Total Wages by Industry, Dillingham Census Area, 1984	28
Table 8.	Dillingham Employment by Industry, 1980	32
Table 9.	Local, State, Federal Government and Public Sector Employment in Dillingham, 1986	35
Table 10.	Commercial Salmon Fishing Incomes, Dillingham Permit Holders, 1975-1982	38
Table 11.	Per Capita Incomes, 1970 and 1980, Southwest Alaska Communities in 1980 Dollars	39
Table 12.	1982 Average Taxable Incomes for Selected Alaska Communities	41
Table 13.	1983 Per Capita Income Estimates for Selected Alaska Communities	42
Table 14.	Cost of Food in Alaska Communities: Consumer Price Index	43
Table 15.	Frequency of Use of Areas for Moose Hunting	63
Table 16.	Frequency of Use of Areas for Caribou Hunting	63

Page

Table 17. Frequency of Use of Areas for Trapping 65

Table 18. Frequency Of Use of Areas For Moose Hunting, Caribou Hunting, or Trapping 65

Table 19. Levels of Harvest and Use of Fish, Game and Plant Resources, Dillingham, 1984 68

Table 20. Resource Harvests, Dillingham, 1973 80

Table 21. Comparison of Fish and Game Harvests of Dillingham Residents, 1973 and 1984 81

Table 22. Percentage of Sampled Dillingham Households Engaged in Sharing Selected Wild Resources with Other Communities 85

Table 23. Salmon Harvests by Geartype, Dillingham Sample, 1984 89

Table 24. Sport Fishing Regulations for the Nushagak and Wood-Tikchik Drainages 91

Table 25. Subsistence Salmon Harvests, Nushagak District, 1965-1986 95

Table 26. Freshwater Fish Harvests by Sampled Dillingham Households, 1984 103

Table 27. Moose Hunting Regulations, 1984 Regulatory Year, GMU 17 105

Table 28. Moose Harvest by Area of Residence of Hunters, GMU 17, 1984 106

Table 29. Caribou Hunting Regulations, 1984 Regulatory Year, GMUs 9 and 17 109

Table 30. Furbearer Trapping Regulations, GMU 17, 1984 112

Table 31. Hunting Regulations for Furbearer Species, GMU 17, 1984 112

Table 32. Hunting Regulations for Selected Species of Birds, GMUs 9 and 17, 1984 115

Page

Table 33. Demographic, Economic, and Per Capita Harvest Data for Selected Bristol Bay Communities 1800s 141

Table 34. Demographic, Economic, and Per Capita Harvest Data for Selected Alaska Communities . . . . . * 142

LIST OF FIGURES

		Page
Figure 1.	The Bristol Bay Region, Southwest Alaska	2
Figure 2.	Residential Areas of Dillingham Used for Selecting Random Sample, 1985	11
Figure 3.	Dillingham Census Area Wage Earnings by Industry, 1984	33
Figure 4.	Seasonal Round of Resource Harvests, Nushagak Bay Subregion	55
Figure 5.	Areas Used by Dillingham Residents to Hunt Caribou and Marine Mammals, 1963-1983	57
Figure 6.	Areas Used by Dillingham Residents to Hunt Moose and to Fish for Salmon, 1963-1983	58
Figure 7.	Areas Used by Dillingham Residents to Trap Furbearers and Gather Marine Invertebrates, 1963-1983	59
Figure 8.	Areas Used by Dillingham Residents to Hunt Waterfowl and Harvest Freshwater Fish, 1963-1983	60
Figure 9.	Areas Used by Dillingham Residents to Harvest Marine Fish and Gather Plants and Berries, 1963-1983	61
Figure 10.	Map of Resource Use Areas, Showing Percentage of Dillingham Hunters and Trappers Ever Using Each Area	67
Figure 11.	Percent of Sampled Dillingham Households Using, Attempting to Harvest, and Harvesting Six Categories of Wild Resources, 1984	70
Figure 12.	Composition of Wild Resource Harvest By Resource Category, Dillingham, 1984	73
Figure 13.	Household Harvests of Wild Resources, in Pounds Edible Weight, Dillingham, 1984	74
Figure 14.	Proportion of Salmon Harvest Taken by Cumulative Percentage of the Sample	75

Page

Figure 15. Proportion of Game Harvest Taken by Cumulative Percentage of the Sample..... 76

Figure 16. Proportion of Total Harvest Taken by Cumulative Percentage of the Sample..... 77

Figure 17. Comparison of Composition of Dillingham Non-commercial Fish and Game Harvests in 1973 and 1984..... 82

Figure 18. Subsistence Fishing Locations, Dillingham Area..... 92

Figure 19. Comparison of Mean Household Non-commercial Harvests and Per Capita Harvests of Commercial Fishing and Non-commercial Fishing Households..... 131

Figure 20. Comparison of Number of Resources Used and Harvested, Commercial Fishing and Non-commercial Fishing Households..... 131

Figure 21. Resource Harvest Quantities by Length of Residency, Dillingham, 1984..... 132

Figure 22. Number of Resources Harvested and Used by Length of Residency..... 134

Figure 23. Mean Household Harvest and Per Capita Harvests, Pounds Dressed Weight, by Ethnic Category, Dillingham, 1984..... 135

Figure 24. Mean Number of Resources Harvested and Used per Household, by Ethnic Category, Dillingham, 1984..... 135

ACKNOWLEDGEMENTS

The authors wish to thank John Wright, former Subsistence Resource Specialist in Dillingham, for his important contributions during the design of the Dillingham Resource Study. Much of the credit for the successful completion of 153 household interviews in just a few weeks time belongs to Dan Salmon, who was an indispensable part of the research team. His enthusiasm, energy, and attention to detail were much appreciated by everyone involved in the study. Nancy Wickstrom also helped with the interviews, as well as providing other logistical support for the project. Dan Foster, Division of Subsistence, skillfully prepared the maps and figures that appear in this report. We also thank Dillingham Department of Fish and Game employees Jeff Skrade, Ken Taylor, and Dorothy Wilson for providing information about resources and resource uses.

Most of all, the authors thank the many residents in Dillingham who took the time to answer our many questions'with care and accuracy. Especially, we thank our "key respondents," whose information about their lives and work was essential to the understanding of the importance of hunting and fishing in Dillingham today.

CHAPTER 1

INTRODUCTION

STUDY BACKGROUND: SUBSISTENCE USES IN REGIONAL CENTERS

This report describes the contemporary patterns of wild resource use in Dillingham, a community of 2,004 people in southwestern Alaska (Fig. 1). Dillingham serves as a regional center for approximately 18 smaller Bristol Bay communities in the Togiak Bay, Nushagak River, Nushagak Bay and Iliamna Lake areas with an additional population in 1984 of 2,428 (Table 1). The Bristol Bay Borough (Naknek and King Salmon) is the regional center for the upper Alaska Peninsula and provides some services to the Iliamna Lake communities as well.

Alaskan communities range in size from large urban centers such as Anchorage (243,829 in 1984) and Fairbanks (64,184) to small, isolated villages. Recent studies of the role of hunting and fishing in modern Alaska have focused on the smaller, predominately Native communities. Research in the villages of the Bristol Bay region, for example, has documented large subsistence harvests of fish and game, stable seasonal rounds of resource use, and productive, subsistence-based mixed economies (e.g. Behnke 1982; Wright, Morris, and Schroeder 1985; Wolfe et al. 1984; cf. Wolfe 1983:252-257). But in contrast to most other Bristol Bay communities, Dillingham has a moderately sized population of relatively diverse origin. For example, the non-Native proportion of the permanent population increased from 36 percent in 1970 to 42.5 percent in 1980 (Nebesky et al. 1983b:7). Although Dillingham's important commercial fishing and processing industry is highly seasonal, the community's role as a service and transportation center has brought more year-

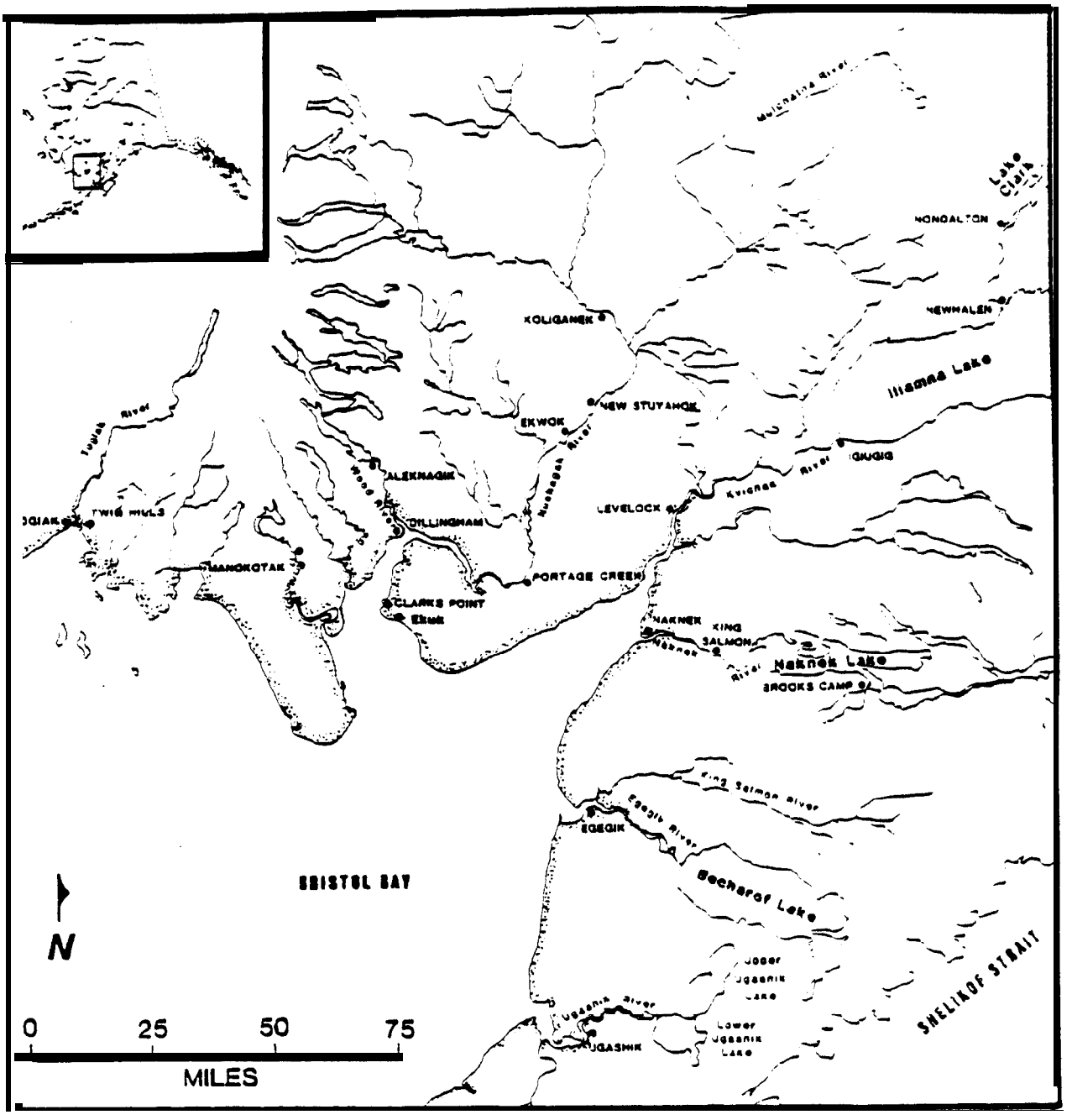


Figure 1. The Bristol Bay Region, Southwest Alaska.

TABLE 1. POPULATION OF BRISTOL BAY REGION COMMUNITIES, 1960 - 1984

Community	1960	1970	1980	1984
Togiak Subregion:				
Manokotak	149	214	294	302
Togiak	220	383	470	5.54
Twin Hills	NA	67	70	67
Nushagak Bay and River:				
Aleknagig	231	128	154	201
Clark's Point	138	95	79	75
Dillingham	424	914	1,563	2,004
Ekuk	40	51	7	NA
Ekwok	106	103	77	80
Koliganek	100	142	117	112
New Stuyahok	145	216	331	246
Portage Creek	NA	60	48	46
Iliamna Lake:				
Igiugig	36	36	33	32
Iliamna	47	58	94	90
Kokhanok	57	88	83	80
Levelock	88	74	79	76
Newhalen	110	88	a7	157
Nondalton	205	184	173	231
Pedro Bay	53	65	33	32
Port Alsworth	NA	NA	NA	40
Upper Alaska Peninsula:				
Bristol Bay Borough	618	534	1,094	1,134
Naknek	249	178	318	405
South Naknek	142	154	145	185
King Salmon	227	202	545	434
Remainder	NA	NA	86	110
Egegik	150	148	75	72
Pilot Point	61	68	66	63
Port Heiden	74	66	92	87
Ugashik	36	NA	13	NA

Source: Alaska Department of Fish and Game 1985a, Alaska Department of Labor 1985, Wright et al. 1985

round employment opportunities than are found elsewhere in the region (Nebesky et al. 1983b:67). These characteristics raise important questions about the continued significance of non-commercial hunting and fishing in Bristol Bay's regional center.

Limited research in other Alaskan regional centers has suggested that the socioeconomic systems of these mid-sized communities are a special type, differing from both village economic systems and urban economies (Wolfe 1983:268-271). A primary contrast with urban economies is that hunting and fishing activities in regional centers are integrated with wage employment for a substantial portion of the population. Participation in these activities is high, and subsistence production is an important component of households' economic strategies. Thus, regional centers have mixed economies, with cash and subsistence sectors. But, in contrast to rural villages, the population of regional centers is heterogeneous in terms of cultural and educational background as well as work experience. Accordingly, regional centers are composed of identifiable subcommunities, and each may display different patterns of wild resource use.

At present, the only detailed data available for a regional center are for the northwest Alaska community of Nome (Ellanna 1983; Magdanz and Olanna 1984). A survey of a random sample of 104 households (about 10 percent) conducted in 1982 found high levels of participation in a variety of resource harvest activities among all segments of Nome's population. However, differences in resource use patterns occurred among subpopulations based on community of origin, length of residency in Nome, and occupation. Former residents of King Island form one such subcommunity (Ellanna 1983:112), as do former residents of Wales, Brevig Mission, Shishmaref, and Teller who use fish camps at Fort Davis on the Nome River (Magdanz and Olanna 1984). In addition,

Nome residents from northwest Alaskan villages maintain relationships with their kin in their former homes through distribution networks and shared harvest areas (Ellanna 1983:112).

Previous research on fish and game harvests in Dillingham suggests the presence of the characteristics of subsistence use documented in Nome. For example, for 1973 a sample of 32 households (14 percent of the community) reported a mean annual harvest 1,110.6 pounds of wild foods and a per capita harvest of 259.2 pounds (Gasbarro and Utermohle 1974; Wright et al. 1985). This harvest far exceeds those of such urbanized areas as Kenai, which had a per capita harvest of 37 pounds in 1982 (Reed 1985:35). Also, Division of Subsistence research has documented traditional resource use areas for Dillingham residents and a common pattern of seasonal resource harvests (Wright et al. 1985), features which occur in smaller communities with subsistence-based economies but not in urban areas. On the other hand, Dillingham's harvest volume in 1973 was lower than that reported for some of the smaller communities of the region. For example, the per capita harvest of fish and game for Nondalton in 1981 was 738 pounds (Behnke 1982:47); in New Stuyahok in 1983 the per capita output was 896 pounds (Wolfe et al. 1984:352). Manokotak's reported per capita harvest of 396 pounds in 1973 (Gasbarro and Utermohle 1974), while lower than the production of New Stuyahok and Nondalton, also exceeded Dillingham's per capita output. Thus, prior to this study, the available data suggested that the patterns of subsistence hunting and fishing in Dillingham, as in other Alaska regional centers, differ from those of the subsistence-based systems of Bristol Bay villages but also contrast greatly with urban patterns of resource use. It was therefore the goal of research conducted in 1985 to further explore these similarities and differences.

RESEARCH HYPOTHESES

Several hypotheses about the patterns of wild resource use in Alaskan regional centers guided data collection and analysis. These were:

Hypothesis One. Subsistence production in Dillingham in 1984, as measured in pounds edible weight per household and per capita, will be lower than reported quantities for Bristol Bay region villages, but higher than those of Alaskan urban areas and most road-connected communities. This level of production reflects, on the one hand, the availability of alternatives to subsistence hunting and fishing and the varied cultural background of Dillingham's population, but is also influenced by the large percentage of lifelong Bristol Bay residents in the population and the proximity of fish and wildlife populations to the community.

Hypothesis Two. There will be multiple patterns of wild resource use in Dillingham, as evidenced by a wide range of household harvest quantities, number of resources harvested and used, and involvement in sharing and receiving resources. This diversity is a consequence of the heterogeneity of Dillingham's population.

Hypothesis Three. Subcommunities displaying different fish and game use patterns in Dillingham can be defined using demographic, Sociocultural, and socioeconomic criteria, such as region of origin, length of residency, ethnicity, and type of wage employment or cash income. Households originating in Bristol Bay will harvest more resources than those which have moved to Dillingham from other areas of the state. These households of non-local

origin increase their participation in resource harvesting as their length of residency in Dillingham grows. This is a result of growing knowledge of local fish and game populations and socialization into established resource use patterns and exchange networks.

Hypothesis Four. Fish and game exchange networks link Dillingham with other Bristol Bay communities. Households which move to Dillingham from the region's villages or have kinship ties with these villages share fish and game resources with them. Because of the higher subsistence production of villages, these exchanges will be imbalanced with regard to fish and game; Dillingham residents will reciprocate in such ways as providing services, housing, and transportation in the regional center.

hypothesis Five. Dillingham residents' resource harvesting areas will be influenced by distance from the community, accessibility, and community of origin. Overall, density of use will decrease with distance from Dillingham, and Dillingham residents with kin in Bristol Bay villages will use areas near the villages for harvest activities.

Hypothesis Six. Involvement in certain kinds of cash employment activities in Dillingham will be associated with resource harvest levels. Households with commercial fishermen will be high harvesters because of their familiarity with resources, ownership of equipment, and seasonal employment patterns. Households with adult members employed in wage labor full time, year-round will exhibit lower harvest levels due to time constraints.

PURPOSES AND OBJECTIVES

Given these hypotheses about fishing and hunting in regional centers, the research in Dillingham had three purposes. The first was to document contemporary hunting, fishing, and gathering of wild renewable resources by the residents of Dillingham. The second purpose was to describe non-commercial distribution and exchange of wild resources between Dillingham and other communities of the Bristol Bay region. Finally, the project sought to contribute to an understanding of the regional center as a type of socioeconomic system in Alaska distinct from villages and urban areas.

The major objectives of the study were: 1) to document the variety and quantities of wild resources used in 1984; 2) to describe the annual seasonal round of resource harvest and other economic activities; 3) to document the ways in which wild resources are utilized, including the methods of preservation and preparation, and patterns of sharing and exchange among community members; 4) to identify areas used for hunting caribou and moose as well as trapping activities; 5) to describe subpopulations within Dillingham and the variety of patterns of resource use and socioeconomic characteristics associated with each; and 6) to describe networks of distribution and exchange both within Dillingham and between Dillingham and other communities.

METHODOLOGY

Research in Dillingham was conducted in two phases. During the first phase, from March 1985 through May 1985, Division of Subsistence personnel conducted a household survey. A random sample of 155 households was selected for interviewing. The sample was stratified by ten residential areas (Table

2, Figure 2). Lists of occupied residential units by area were compiled from maps prepared by the City of Dillingham's volunteer fire department and updated by the researchers. Each residence was assigned a number, and a table of random numbers was used to draw the 22 percent sample for each area. Surveys were administered in person by Division of Subsistence staff, usually in the respondent's home.

The survey collected data on household harvest and use of all locally available fish and wildlife species during 1984, as well as other socioeconomic and demographic information (Appendix A). Surveys were completed for 153 households. The results were entered onto a computer file and analyzed with the Statistical Package for the Social Sciences (SPSS) program. Harvests of fish, game, and berries reported in numbers of animals or buckets were converted to pounds usable weight using standard conversion factors (Appendix B). Data were analyzed on a community-wide basis as well as by subcommunities to determine household harvests in numbers of animals and in pounds usable weight, per capita harvests in pounds, number of types of resources given to other households, and number of types of resources received from other households. Analysis of differences between the ten geographically discrete residential areas did not prove particularly significant and this line of analysis was not pursued further. Data were also examined in order to explore the patterns of resource use within subpopulations defined by several social and economic variables, such as ethnicity, length of residency in southwest Alaska, income, and type of wage employment.

In addition, during the survey active trappers, moose hunters, and caribou hunters were asked to identify areas used by their households for these activities. Community resource use area maps for Dillingham had already been identified as part of an earlier research effort connected with the

TABLE 2. SAMPLE SELECTION, DILLINGHAM RESOURCE USE SURVEY, 1985.

Area	Total No. of residences	Target sample size	No. of interviews completed	Percent of total hhs interviewed
HUD Housing	51	12	12	22.6
Downtown Dillingham	133	30	30	22.6
Windmill Hill	115	25	25	21.7
Wood River Road	a2	18	18	22.0
Airport Road	27	6	6	22.2
Kanakanak	54	12	12	22.2
Hospital Compound	26	6	6	23.1
Squaw Creek[1]	46	10	9	19.6
Aleknagik Road	114	26	25	21.9
Nerka Subdivision	43	10	10	23.3
TOTAL	691	155	153	22.1%

[1] Includes Scandinavia Flats

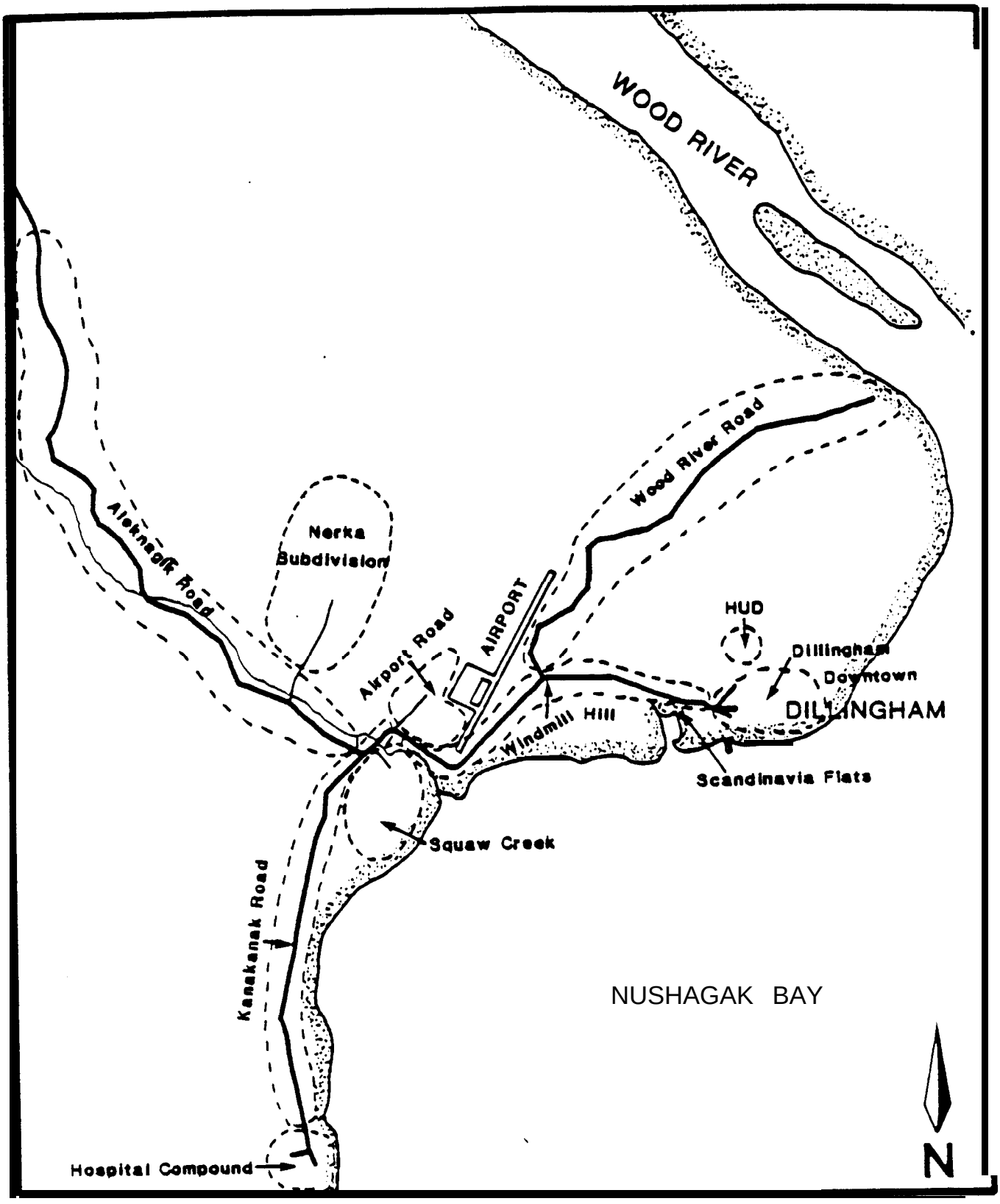


Figure 2. Residential Areas of Dillingham Used for Selecting Random Sample, 1985.

Bristol Bay Cooperative Management Plan and the Department of Fish and Game's Southwest Alaska Regional Management Guide (Alaska Department of Fish and Game 1985a; Wright et al. 1985). The community's resource use area was divided into ten discrete areas with the assistance of several knowledgeable residents and local Department of Fish and Game personnel. For each activity, respondents were asked whether they had ever used each area while living in Dillingham, how frequently they had used it, and whether they had used it in 1984. This series of questions was included to provide information on intensity of use of trapping and hunting areas.

The purpose of Phase Two of the project was to elicit information on the distribution and exchange patterns of various resource users in Dillingham. The survey results were examined to determine which resources were shared and among which communities. Also, information was obtained about social relationships, such as visiting patterns between Dillingham and the villages. Then, the researchers prepared a key respondent interview guide (Appendix C). Nine key respondent households were selected who represented a variety of resource use and sharing patterns. Interviews with these households were conducted in January 1986. Questions for respondents who had been born outside of southwest Alaska focused on socialization to local hunting and fishing patterns. Questions for those born locally focused on resource use patterns as well as distribution and exchange networks with area villages.

CHAPTER 2

HISTORICAL AND SOCIOECONOMIC BACKGROUND

NATURAL ENVIRONMENT

The community of Dillingham is located at the confluence of the Wood and Nushagak rivers in the Bristol Bay region of southwest Alaska (Fig. 1). It is 350 air miles from Anchorage. The topography of the region includes low coastal plains, rolling hills, and rugged mountains. From its origin in the Nushagak Hills, the Nushagak River flows 242 miles to empty into Nushagak Bay. Its main tributaries are the Nuyakuk River, which drains the Tikchik Lakes, and the Mulchatna River. The Wood River is the outlet of the Wood River lakes, and is 20 miles long.

The climate of the Bristol Bay region is influenced by both maritime and continental factors. Summers are cool and relatively wet, while winters are cold and dry. Precipitation is generally greater than in interior Alaska, and temperatures are less extreme (VanStone 1967:xix; Wright et al. 1985:13,15).

Within the Wood and Nushagak river drainages, spruce-deciduous forests occur along the shores of lakes and in bottomlands along rivers. The coastal plains and the upland areas of the river basins support tundra vegetation.

The Bristol Bay drainage area is the world's largest producer of sockeye (red) salmon. In addition, the Nushagak drainage supports strong runs of chinook (king), pink (humpy), chum (dog), and coho (silver) salmon. Other species of fish available in the area's fresh waters include Dolly Varden, Arctic grayling, rainbow trout, lake trout, whitefish, and northern pike. Marine fish in Bristol Bay include smelt, herring, and halibut. Tanner and king crab and several species of clams inhabit Bristol Bay as well.

The most common marine mammals of the region include harbor (spotted) seal, sea lion, belukha, and walrus. The most abundant large land mammals are caribou, brown bear, and moose. Two major caribou herds inhabit the upper Bristol Bay region. The growing Mulchatna herd, with 42,900 animals in 1985, ranges mostly east of the Nushagak River in the Mulchatna drainage. The Northern Alaska Peninsula herd (20,000 animals in 1983) ranges between the Naknek River and Port Moller. Brown bears are relatively abundant in the area, while moose are also common. Important small game in the region includes snowshoe and arctic hare, porcupine, beaver, and other furbearers. Sea birds and migratory water-fowl are seasonally abundant.

TRADITIONAL ETHNOGRAPHY AND HISTORY

At the time of the fist European explorations of western Alaska, three regional groups- of Yup'ik Eskimos occupied the western Bristol Bay area (VanStone 1967, 1984:224). The Tuyuryarmiut lived along the Togiak River, and their descendents live in Togiak today. The territory of the second group, the Aglurmiut, stretched along the coast from Nushagak Bay to the upper portion of the Alaska Peninsula. The third group, the Kiatagmiut, were an inland people, living along the Nushagak and lower Mulchatna rivers, Wood River Lakes, the Kvichak River, and lower Iliamna Lake. Thus a distinction existed in the Dillingham area in pre-contact times between coastal and interior peoples. However, population movements began very early after the arrival of Europeans as a result of disease, trade, and other commercial developments. These shifts have blurred the differences between the Aglurmiut and the Kiatagmiut in the Nushagak Bay area.

Pre-contact subsistence activities in the Nushagak River area focused on salmon and other fishing, and on big game hunting. The Nushagak Bay Aglurmiut also hunted marine mammals, but as with the more inland Kiatagmiut, salmon fishing was the single most important source of food (VanStone 1984:228-233). The seasonal round began in late March and early April when people left their winter villages for spring camps. The river dwellers hunted in the mountains for furbearers, migratory waterfowl, and caribou. They also gillnetted whitefish. The people of the bay took seals in spring from kayaks and dipnetted smelt. Both regional groups returned to villages in June to prepare for salmon fishing. Beginning with the arrival of king salmon in mid-June, the people caught salmon with set gillnets, basket traps, and fish spears with detachable heads. Large supplies of dried salmon, especially kings, reds, and silvers, were cached for winter use (VanStone 1984:228-30).

Although silver salmon were taken through September along the rivers, by mid August men began traveling inland to hunt caribou and beaver. The hunters returned to their winter villages with freeze-up in October. In November, traps were set under the ice for whitefish, and grayling were taken through the ice with hooks. Also, caribou hunting continued into December, when extreme cold curtailed most subsistence activities. December through February were a time for dance festivals, which had both secular and religious purposes. The seasonal round of resource harvests resumed again with the movement to spring camps in March (VanStone 1984:231-232).

The recorded history of the Bristol Bay region begins with Captain James Cook's explorations in July 1778 (Table 3). Russian fur traders penetrated the area by crossing the Alaska Peninsula or traveling from Iliamna Lake and Cook Inlet in the 1790s. In 1818, the Russian-American Company founded the first trading station on Bristol Bay, called the Aleksandrovskiy Redoubt

TABLE 3. SIGNIFICANT HISTORICAL EVENTS, BRISTOL BAY REGION

1778	Captain James Cook leads first European exploration of Bristol Bay area.
1818	The Russian-American Company founds its first trading station on Bristol Bay, Aleksandrovskiy Redoubt (Nushagak) near the mouth of the Nushagak River.
1841	The Russian Orthodox Church establishes a mission at Alexandrovskiy Redoubt.
1867	The United States purchases Alaska from Russia; Hutchfson, Kohl and Company, later reorganized as the Alaska Commercial Company, assumes operation of the Alexandrovskiy Redoubt, renamed Nushagak.
1883	Commercial salmon fishing begins in Bristol Bay as the schooner Neptune visits Nushagak Bay, and salts salmon for commercial sale.
1884	The first year of operation of the Arctic Packing Company's salmon cannery at Kanulik, Nushagak Bay.
1885	The Alaska Packing Company erects the first cannery on the western shore of Nushagak Bay, near the present site of Dillingham.
1918	Kanakanak hospital founded.
1918-19	An influenza epidemic severly reduces the Native population of the Nushagak River region. The population of the Wood River area is virtually eliminated.
1920	The number of salmon canneries in operation in Bristol Bay peaks at 25; this is followed by consolidation of operations.
1930s	The Bristol Bay fishery is periodically closed for conservation reasons.
1940-45	A scarcity of labor caused by the Second World Way results in more opportunities for participation in the commercial salmon fishery by Bristol Bay residents.
1959	Alaska becomes the 49th state.
1971	Alaska Native Claims Settlement Act; Bristol Bay Native Corporation formed.
1975	Limited entry to Alaska's commercial salmon fishery is established.

TABLE 3. SIGNIFICANT HISTORICAL EVENTS, BRISTOL BAY REGION, continued

1980	Alaska National Interest Lands Conservation Act; rural subsistence hunting fishing established as the priority use of fish and wildlife resources on federal lands.
1984	Bristol Bay Area Plan adopted by the state, with a primary goal being the protection of the salmon resource.

Sources: VanStone 1967, 1984

(Nushagak), on the east side of Nushagak Bay. As a result, the Eskimos of this region became more involved in the European fur trade. Consequences included an increased effort to trap beaver, more use of imported goods, and a growth of the population of the Nushagak Bay settlements at the expense of the upriver villages (VanStone 1984:235; 1967:115-116). At this earliest stage of contact, there were four major native settlements on Nushagak Bay. Three were on the east side of the bay: Ekuk, Nushagak, and Kanulik. The fourth, Kanakanak, was on the western shore. There were also a number of smaller settlements, both on the bay and along Wood River (VanStone 1967:115-117). This population grew as the redoubt became a source of trade goods. Further growth occurred with the founding of a Russian Orthodox mission at Aleksandrovskiy Redoubt in 1841 (VanStone 1967:11).

Except for the transfer of Russian-American Company holdings to the Alaska Commercial Company, no abrupt changes occurred in the Bristol Bay area when the United States purchased Alaska from Russia in 1867 (VanStone 1984:238). With the beginnings of commercial salmon fishing and processing in the 1880s, however, came important economic changes which continue to shape the region today. The Arctic Packing Company built the first Bristol Bay salmon cannery at Kanulik, on the east shore of Nushagak Bay near the river' mouth, in 1884. In the following year, the Alaska Packing Company began the first cannery on the western shore, one half mile below the mouth of the Wood River near the village of Kanakanak. The industry grew rapidly. By 1908, ten canneries were in operation. The peak was reached with 25 active canneries on Nushagak Bay in 1920. But as a result of overfishing, commercial fishing was restricted in the 1930s and the number of processors declined. Only six were in operation in 1939 (VanStone 1967:63-72).

Alaska Native residents of the Bristol Bay region found few employment opportunities in the commercial fishery until after World War II. Cannery operators brought in Chinese laborers, whom they believed were better, more reliable workers than the local population. *Nor* were many local people involved in commercial salmon fishing itself. The vast majority of the fishermen came seasonally from outside the region and outside Alaska. This situation began to change when the Second World War created a labor shortage in the fishery. Consequently, more employment opportunities for local residents in the salmon processors appeared. It was not until the 1960s, however, that Nushagak Eskimo fishermen comprised a substantial portion of the commercial fishermen of Bristol Bay (VanStone 1967:73-81).

In summary, since the 1880s, commercial fishing has dominated the economic development of the entire Bristol Bay region, including Nushagak Bay. This industry has been the principal source of income and employment since 1900. For example, while fur trapping remains a source of cash for some people in the area today, its economic role diminished greatly as commercial fishing developed. In assessing the history and contemporary role of the commercial salmon fishing industry, however, it must be noted that from its inception until the present, the fishery has been highly seasonal, controlled by non-local interests, and employed mostly a non-resident labor force (VanStone 1967:61-62, 81; Petterson et al. 1984:86-92).

The origins of Dillingham itself can be traced to the Nushagak Eskimo settlements on the west side of Nushagak Bay which were present when the first Russian traders arrived in 1818. Dillingham's growth as the dominant commercial center in the region began, however, with the advent of the commercial fishing industry in Bristol Bay. Petroff in 1880 reported a village called Ah-lek-nug-uk in the present-day Dillingham area, and a village

called Kanakanak appears in the 1890 census (Orth 1967:272). VanStone (1967:11) reports that the settlements of New Kanakanak and Chogiung, "later called Dillingham," were founded about 1890 as salmon processors built canneries on western Nushagak Bay. According to Orth (1967:272), the community of Dillingham was named in 1904 for William Paul Dillingham, United States senator from Vermont, who led a senate subcommittee tour of Alaska in 1903. A "Dillingham" post office was established at Snag Point in 1904, although at that time the town called Dillingham was located at what is now known as "Nelsonville," three miles to the southwest. About 1944, the Dillingham name was transferred to the post office site.

In addition to the presence of salmon processing facilities, several other factors contributed to Dillingham's emergence as a regional center for Bristol Bay. A school was founded at "Dillingham," probably the Kanakanak cannery, in 1904. There was a school at Chogiung by 1909, and a new territorial school was established at Dillingham in 1920-21 (VanStone 1967:96). The Alaska Native Health Service hospital at Kanakanak, serving the entire Nushagak region, dates to 1918. An orphanage began at the hospital in 1919 following the disastrous influenza epidemic of 1918-19. This orphanage later became an industrial school (VanStone 1967:104). Further impetus to growth came with the development of Dillingham as the air transportation hub of the area, and the location of offices of government agencies, and later native corporations, in the town. This importance is reflected in the steady growth of Dillingham's population throughout this century (Table 4). The 26.5 percent decline in population between 1950 and 1960 was probably related to the poor salmon harvests during that decade. The large increase in population between 1960 and 1970 was due to the incorporation of Kanakanak, Nelsonville, and Wood River Village into Dillingham in 1963. Since the 1970s there has

TABLE 4. POPULATION, NUSHAGAK BAY AND NUSHAGAK RIVER COMMUNITIES, 1880-1984

Community	YEAR 1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1984
Agivivak	52	30										
Akakhpuk	9											
Akooyukhpak	83											
(Agulukpukmiut)		22										
Akulwikchuk	72	61										
Aleknagik							78	153	231	128	154	201
(Alaknak)			114									
Clark's Point						25	22	128	138	95	79	75
(Stugarok)	7											
Dillingham						85	278	577	424	914	1,563	2,004
(Kanakanak)	53	145										
(Bradford)	167											
(Chogiung)				165	182							
Ekuk	112					37			40	51	7	NA
(Yekuk)		65										
Ekwok			79					131	106	103	77	80
(Ekwak)						40	68					
Kanulik	142	54										
(Carmel)		187	151									
Kokwok		45	106									
(Kakuak)	104											
Koliganek			114					90	100	142	117	112
(Kalignak)			91									
Moltchatna			180									
New Stuyahok								88	145	216	331	246
Nunachuak							SO	32				
Nushagak	178	268	324	74	16	43						
Portage Creek										60	48	46
Tikchik	38											
Wood River Village			196			55						
(Anagnak)	87											
TOTAL									1,116	1,184	1,709	2,376	2,764

Source: Alaska Department of Fish and Game 1985a:384,402, from U.S. Census information.

Alaska Department of Labor 1985:53-54. These represent minimum population estimates.

been a steady growth rate partly due to Dillingham's expansion as a regional center and the apparent recovery of the sockeye salmon fishery (Nebesky et al. 1983b:66). Most of this population increase was due to migration to Dillingham from other Bristol Bay communities, other Alaska communities, or from outside of the state (Petterson et al. 1984:67).

DEMOGRAPHY

According to State of Alaska estimates (Alaska Department of Labor 1985), Dillingham's population in 1984 was 2,004. This represents an increase of 28 percent over the 1,563 reported for the community by the U.S. Census in 1980. In 1980, Alaska Natives made up 57 percent of the city's population. This percentage was down from 1970, when 64 percent of Dillingham's population of 914 was Native.

In March 1985, the Division of Subsistence identified approximately 700 households in Dillingham. A sample of 153 of these households (22 percent) had an average size of 2.95 members (Table 5). About 49.7 percent of the sampled household heads were Alaska Native, and 47.1 percent had been born in the Bristol Bay region, 20.3 percent in other parts of the state, and the remaining 32.7 percent outside the state. Relative newcomers to the region, those who had resided in southwest Alaska for two years or less, comprised 19.6 percent of the sample, while 13.7 percent had been in the region for three to five years. The remaining 19.6 percent had lived in the local area for six years or more, but had not been born there.

Sampled household heads had a range of educational backgrounds. About seven percent had received less than a high school education, 28.8 percent had earned a high school diploma, an additional 30.7 percent had attended some

TABLE 5. CHARACTERISTICS OF DILLINGHAM SAMPLE, 1984 (n=153 households)

Demographic data

Average household size	2.95
Percent with Alaska Native household heads	49.7%
Percent with household heads born in Bristol Bay region	47.1%
Percent of household heads living in Bristol Bay region 1 - 2 years	19.6%
Percent of household heads living in Bristol Bay region 3 - 5 years	13.7%
Percent of household heads living in Bristol Bay region 6 or more years (not born locally)	19.6%
Percent of household heads born in other Alaska regions	20.3%
Percent of household heads born outside Alaska	32.7%

Economic data

Average number of months employed, all adults (over 18 yrs.)	7.4
Percent of households engaged in commercial fishing	44.4%

Education

Percent of household heads without high school education	7.2%
Percent of household heads with high school diploma, no college	28.8%
Percent of household heads with some college	30.7%
Percent of household heads with college degree	32.7%

Equipment Ownership

Percent of households owning any kind of boat	54.9%
Percent of households owning just a commercial boat	3.9%
Percent of households owning just a skiff	31.4%
Percent of households owning commercial boat and skiff	19.6%
Percent of households owning a smoke house	47.1%
Percent of households owning any highway vehicle	86.0%
Percent of households owning snow machines	52.0%
Percent of households owning all-terrain vehicles	28.0%
Percent of households owning airplanes	14.0%
Percent of households owning dog teams	3.0%

college, and the remaining 32.7 percent were college graduates. The length of educational experience of these household heads was greater that that reported for persons 25 years or older in the 1980 U.S. Census. In that sample, 24 percent had not completed high school, 34 percent had finished high school, 18 percent had some college, and 24 percent were college graduates (Petterson et al. 1984:466).

EMPLOYMENT

The economy of Dillingham, like the rest of the Bristol Bay region, is inextricably linked to the commercial salmon industry (Petterson et al. 1984: 85). For an 11 year period from 1970 through 1980, 65 percent of the personal income earned in the Bristol Bay region was generated by this industry, compared to 17 percent from government employment, 12 percent from support industries, and 6 percent from transfer payments (Petterson et al. 1984:75-77). However, as discussed below, historically, commercial fishing incomes have varied greatly along with the size of the salmon runs. Also, because commercial salmon fishing and processing is a seasonal industry, there are major seasonal fluctuations in Bristol Bay's and Dillingham's economy. Dillingham's role as a regional center, however, also supports a substantial service and transportation sector which moderates the seasonal characteristics of an economy dominated by commercial salmon fishing. Finally, tourism, especially in the form of recreational hunting and fishing, plays a small but growing role in the community's economy. Adults in the sampled households (individuals over 18 years of age) were employed for an average of 7.4 months in 1984 (Table 5).

The Commercial Salmon Fishery

Bristol Bay supports the largest sockeye salmon industry in the world. Five species spawn in the local drainages, including kings, sockeyes, chums, pinks, and silvers. Because of its abundance, the sockeye salmon is the most valuable species. In 1984, more than 30 million salmon were caught commercially in all Bristol Bay districts (Table 6). Sockeyes made up 80 percent of the harvest. Although the Bristol Bay watershed is a prolific producer of salmon, salmon runs, and hence commercial catches, have been variable over the history of the fishery. As reported in Table 6, harvests were especially low in the early and mid 1970s. In fact, in 1974, the Bristol Bay area was declared a federal economic disaster area because of the poor 1973 commercial fishing season.

As noted above, the first salmon cannery was established along Nushagak Bay, southeast of Dillingham, in 1884. Two years later another cannery was built at the site of present-day Dillingham. Canneries continued to be the major processors in the salmon industry until fairly recently, but the industry has been changing from shore-based canneries to floating processors. The marketing emphasis has changed to frozen fish (Petterson et al. 94-102). In fact, none of the five shore-based or the approximately one dozen floating processors in the Nushagak district canned fish in 1986.

Historically, local fishermen were closely tied to the canneries and were dependent on them to provide most of their support services, such as boat storage and maintanance, temporary housing and eating facilities, and an annual "grubstake" of food and fuel. Due to changing conditions in the industry, fishermen are now more independent from the canneries and fish processors.

TABLE 6. TOTAL SALMON COMMERCIAL CATCH BY DISTRICT, BRISTOL BAY, 1965-86

Year	Number of Fish					
	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1965	19,197,357	3,194,005	945,416	1,059,613	340,142	24,737,533
66	5,606,584	2,137,148	477,018	3,706,382	334,585	12,261,717
67	2,391,732	1,085,310	181,331	1,124,019	196,798	4,979,190
68	1,492,532	697,937	108,005	2,760,285	230,814	5,289,573
69	4,716,845	905,511	183,240	1,106,307	250,938	7,162,841
1970	17,971,475	1,458,196	192,703	2,132,636	295,514	22,050,524
71	6,019,188	1,336,865	969,822	1,707,656	363,298	10,396,829
72	1,277,840	884,350	27,295	809,125	284,758	3,283,368
73	293,174	248,547	12,612	667,664	325,296	1,547,293
74	1,089,440	182,969	10,080	1,126,747	268,984	2,678,220
1975	3,166,169	969,315	20,900	827,715	316,827	5,300,926
76	3,134,716	1,384,323	188,862	2,873,538	526,062	8,107,501
77	2,514,717	1,870,067	103,144	1,659,379	570,995	6,718,302
78	6,051,842	1,268,586	17,933	8,300,533	885,845	16,524,739
79	15,211,128	2,316,037	430,755	4,056,340	832,264	22,846,524
1980	15,628,654	2,732,245	946,588	7,594,946	1,167,819	28,070,252
81	11,361,223	4,487,436	2,186,006	8,702,332	929,201	27,666,198
82	5,354,392	2,613,663	1,250,539	8,235,232	937,664	18,391,490
83	21,650,250	6,890,598	3,466,757	6,102,866	951,058	39,061,529
84	14,883,327	5,561,080	2,946,466	6,331,545	871,345	30,593,763
1985	8,325,032	7,603,710	6,532,567	1,664,202	493,712	24,619,223
86	3,190,000	5,142,000	5,056,000	3,637,000	666,000	17,691,000
22 Year Total	170,528,617	54,969,828	26,254,039	76,186,062	12,039,919	322,287,535
1965-74 Total	60,057,167	12,130,838	3,107,522	16,200,434	2,891,127	94,387,088
1975-86 Total	110,471,450	42,839,060	23,146,517	59,985,628	9,148,792	245,591,447
22 Year Average	7,751,300	2,498,628	1,193,365	3,463,002	547,269	14,649,433
1965-74 Average	6,005,717	1,213,084	310,752	1,620,043	289,113	9,438,709
1975-86 Average	9,205,954	3,569,921	1,928,876	4,998,802	762,399	20,465,953

Sources: ADF&G 1985b, 1986b, 1986c.

Another important change in the fishery was the advent of a limited entry permit system in 1974 (Petterson et al 1984:131). In the study year of 1984, there were 2,804 limited entry salmon permits for the Bristol Bay district, of which 343 (12.2 percent) were held by persons with Dillingham addresses (Limited Entry Commission). This is an increase- from the 229 permits owned by Dillingham residents in 1979, and the 310 owned in 1983 (Petterson et al. 1984:119). In 1984, 224 permits were for drift gill nets and the remaining 119 for setnetting. In addition, Dillingham residents held two set net permits for the lower Yukon River and one for Norton Sound (LEC, pers. comm. 1986). About 44 percent of the households interviewed by the Division of Subsistence had members involved in commercial fishing in 1984.

In the 1980s, a large percentage of the employment in Dillingham was related to commercial fishing, processing, and fishing-related trade, transportation, and communication. Nebesky et al. (1983b:67) estimated in 1983 that one third of all the jobs in Dillingham were fishery-related. Also, approximately 400 commercial fishermen work in the Dillingham area each year for up to three months (Nebesky et al. 1983b:67). However, non-Alaska residents hold a very large portion of the jobs and earn most of the income generated by the commerical fishing industry in Dillingham and southwest Alaska. For example, in 1982 non-state residents owned 35.6 percent of all Bristol Bay limited entry salmon permits, including 42.5 percent of the drift net permits and 22.4 percent of the set net permits (Petterson et al. 1984:120). From 1970 through 1980, non-Alaska residents earned 57 percent of all the income earned in the Bristol Bay region, the majority from fishery-related employment (Petterson et al. 1984:77-79). As shown in Table 7, in 1984, 73.8 percent of the employees in the manufacturing sector of the economy in the Dillingham Census District (this includes the entire Bristol Bay

TABLE 7. RESIDENT AND NONRESIDENT TOTAL WAGES AND EMPLOYEES BY INDUSTRY, DILLINGHAM CENSUS DISTRICT, 1984[a]

Industry	Nonresident[b] Wages		Nonresident[b] Employees		Resident[c] Wages		Resident[c] Employees	
Government	$ 694,610	(7.0%)	67	(9.2%)	$ 9,195,092	(93.0%)	664	(90.8%)
Agriculture	b	(6.0%)	b	(16.7%)	b	(94.0%)	b	(83.3%)
Milling	b	(47.4%)	b	(48.5%)	b	(52.6%)	b	(51.5%)
Construction	317,811	(21.2%)	43	(23.1%)	1,184,118	(78.8%)	143	(76.9%)
Manufacturing	7,454,365	(73.2%)	1,430	(73.8%)	2,727,874	(26.8%)	508	(26.2%)
Transportation	368,664	(15.0%)	38	(19.9%)	2,095,213	(85.0%)	153	(80.1%)
Wholesale Trade	11,350	(3.3%)	4	(20.0%)	329,394	(96.7%)	16	(80.0%)
Retail Trade	144,613	(17.5%)	28	(18.5%)	681,237	(82.5%)	123	(81.5%)
Finance, Insurance Real Estate	19,951	(3.1%)	8	(13.6%)	628,261	(96.9%)	51	(86.4%)
Services	950,893	(15.5%)	188	(27.5%)	5,168,291	(84.5%)	495	(72.5%)
Nonclassified	0	0	0	0	10,209	(100.0%)	2	(100.5%)
PRIVATE BUSINESS TOTAL	$9,499,511	(42.0%)	1,756	(53.7%)	$131135,837	(58.0%)	1,513	(46.3%)
LOCAL GOVERNMENT AND PRIVATE TOTAL	$10,194,121	(31.3%)	1,823	(45.6%)	$22,330,930	(68.7%)	2,177	(54.4%)

[a] Does not include income generated from self-employment, such as commercial fishing.

[b] Nondisclosable

[c] "Resident" means "Alaska resident" and "non-resident" means "non-state resident."

Source: Alaska Department of Labor 1986:A18

watershed except the Bristol Bay Borough communities of King Salmon, Naknek, and South Naknek) were non-Alaska residents The vast majority of these jobs were in commercial fish processing. These non-resident workers earned 73.2 percent of the wages paid to employees in the manufacturing industries in this region. Excluding local government, non-residents comprised 53.7 percent of the work force in the Dillingham Census area in 1984 (Alaska Department of Labor 1986:A18). In fact, in 1984 the Dillingham Census Area had the third largest percentage of non-resident wage earnings (31.3 percent) in the state (Table 7), exceeded only by the Bristol Bay Borough (42.7 percent) and the Aleutian Islands (42.2 percent) (Alaska Department of Labor 1986:20).

Furthermore, limited entry permit data suggest that participation by local (Bristol Bay) residents in commercial fishing is declining, although, as noted above, the number of permits held by Dillingham residents increased between 1979 and 1984. Nevertheless, between 1975 and 1983, Bristol Bay residents lost 220 permits, 8.5 percent of the permits originally issued. Of the Bristol Bay natives who were issued permits, 21.3 percent no longer held them in 1983 (Tryck et al. 1985:32). As the value of Bristol Bay salmon drift permits has increased dramatically to over $100,000 while the cost of buying competitive boats has also grown, some local fishermen have decided to sell their permits. Fishing is a highly unstable industry with success varying from year to year. Several bad years can make it impossible for fishermen to meet boat payments and is one reason for the sale of permits. The data also show substantial differences in earnings between local and non-local fishermen. For example, non-local residents fishing with drift gear in Bristol Bay in 1982 had an average gross income of $42,956 as compared to $32,124 for local fishermen. This is probably a result of the superior gear

and vessels owned by fishermen from outside Alaska (Petterson et al. 1984:110).

Other Commercial Fisheries: Herring and Herring Spawn-on-Kelp

The Bristol Bay sac roe herring fishery began in 1967, followed by the spawn-on-kelp fishery in 1968. Both fisheries take place in the Togiak District. For the first ten years, level of effort and the number of processors remained small because of poor market conditions. These fisheries did not operate at all in 1971 and 1976. However, in 1977, favorable market conditions and additional incentives provided by the adoption of the 200 mile limit resulted in a major expansion of the Togiak herring fishery (Petterson et al. 1984:143).

In 1984, Dillingham residents held 176 Bristol Bay herring permits. The vast majority, 151, fished with drift gill nets; 25 others used purse seines. Nearly all adapted their salmon fishing boats by equipping them with herring gear. Thirteen other Dillingham residents held herring permits for the Norton Sound or the Kuskokwim districts in 1984.

Other Employment

As noted above, Dillingham's role as Bristol Bay's regional center creates many job opportunities. The significance of the support and government sectors of the economy of the Bristol Bay region, especially Dillingham, has increased in the 1970s and 1980s, in part as a result of a shift from provision of services by the canneries to the private sector, and the growing significance of the recreation industry (Petterson et al.

1984: 84). Petterson et al. (1984:76, 79) also found that during an 11 year period from 1970 through 1980, income earned in the government and service industries by Bristol Bay residents was far more stable than that earned by commercial fishing.

Current employment statistics are not available specifically for the City of Dillingham; these are collected on a region-wide basis by the Alaska Department of Labor. However, data specifically for Dillingham are available for 1980, based on United States Census returns (Table 8). These data do not include self-employment, such as commercial fishing. In 1980, services and government accounted for 56 percent of all people employed in Dillingham, with trade and transportation/communication accounting for an additional 12 percent and 12.5 percent respectively. Thus, in 1980, 80.5 percent of reported wage employment by Dillingham residents was in services, government, commerce, and transportation. This illustrates that most wage employment held by Dillingham residents is not directly linked to the seafood industry, but instead derives from the community's role as a regional center.

A more recent picture for the entire Dillingham census area illustrates the same configuration in 1984 (Table 7, Fig. 3). In descending order, the largest sources of wages for state residents employed in Dillingham were government (41.2 percent), services (23.1 percent), manufacturing (12.2 percent), transportation (9.4 percent), and trade (4.6 percent).

In 1986, the Division of Subsistence updated employment figures for the government, service, and education sectors of the community. There was a total of 413 government and other public sector positions. The city employed 45 persons (30 full time, 10 part time, and 5 seasonals), and there were 16 full time jobs and six seasonal positions with federal agencies. The largest government employer was the state, with 42 year-round and 60 seasonal

TABLE 8. DILLINGHAM EMPLOYMENT BY INDUSTRY, 1980

Industry	Number of Persons	Percent of Total
Agriculture, Fishing, Forestry, Mining	30	4.6
Construction	44	6.7
Manufacturing-Nondurables	8	1.2
Manufacturing-Durables	7	1.1
Transportation	56	8.5
Communications and other Public Facilities	26	4.0
Trade-Wholesale	4	.6
Trade-Retail	75	11.4
Finance, Insurance, Real Estate	39	5.9
Business and Repair Services	12	1.8
Personal, Entertainment, and Recreational Services	16	2.4
Health Services	79	12.0
Educational Services	I.37	20.8
Other Professional Services	28	4.3
Public Administration	97	14.7
TOTAL	658	100.0

Source: United States Bureau of the Census 1980: Summary Tape File 3A.

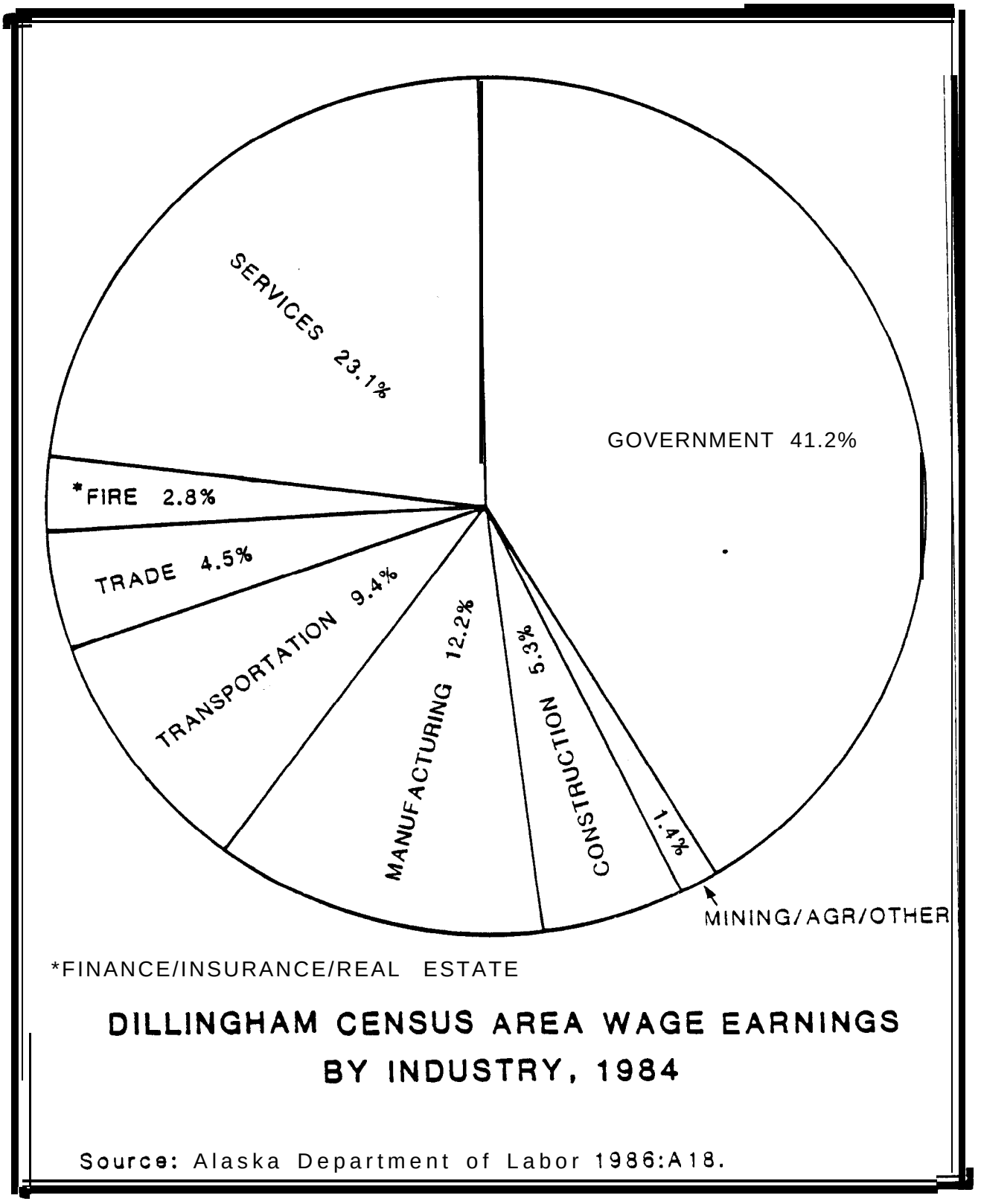


Figure 3. Dillingham Census Area **Wage** Earnings by Industry, 1984.

positions (Table 9). In addition, Dillingham City schools had a staff of 80. Southwest Region Schools, the Rural Education Attendance Area for the northwest portion of Bristol Bay, employed a staff of 18 in its central Dillingham office.

With the passage of the Alaska Native Claims Settlement Act (ANCSA), a number of Native organizations,. both profit-oriented and service-oriented, have played increasingly important roles in Dillingham's economy. The Bristol Bay Area Health Corporation is the largest service provider in the region; 100 of its 176 staff members in 1986 were located in Dillingham. The Bristol Bay Native Association (BBNA) employed 25 people in its Dillingham office. The Dillingham Traditional Council employed a staff of ten in its day care center, many on a part time basis. (For a description of these agencies, see the section on Health and Human Services, below.)

In addition, two private non-profit organizations had their offices in Dillingham in 1986. The Alaska Legal Services Corporation had a staff of two and the Bristol Bay Housing Authority had a staff of seven. Finally, two planners worked for the Bristol Bay Coastal Resource Agency, a state-funded planning board.

Choggiung, Ltd., the village corporation of Dillingham, had a number of thriving projects during the study period. It provided consulting services to several smaller village corporations, ran a lumber yard and hardware supply company, and had the cable television franchise. Choggiung also owned a hotel and restaurant, to which it was constructing an addition in 1986, and leased office space to various organizations, including the Alaska Court System. In 1985, Choggiung was awarded a $14 million construction contract for a new hospital. The corporation has also become involved with real estate development by selling some of its lands for subdivisions. Choggiung's staff

TABLE 9. CITY, STATE AND FEDERAL GOVERNMENT AND OTHER PUBLIC SECTOR EMPLOYMENT IN DILLINGHAM, 1986

	Number of Employees	
Federal Agencies	Fulltime	Seasonal
U.S. Army Corps of Engineers	0	5
U.S. Fish and Wildlife Service	6	1
Postal Service	5	0
Federal Aviation Administration	5	0
State Agencies		
Alaska Court System	3	0
Dept. of Commerce and Economic Development	1	0
Dept. of Community and Regional Affairs	3	0
Dept. of Fish and Game	9	50
Dept. of Health and Social Services	7	0
Dept. of Labor (Employment Center)	1	1
Dept. of Law (District Attorney's Office)	3	0
Dept. of Natural Resources, Div. of Parks	0	3
Dept. of Public Safety		
Alaska State Troopers	1	0
Div. of Fish and Wildlife Protection	1	2
Div. of Motor Vehicles (contracted to city)		
Dept. of Transportation and Public Facilities	6	0
Legislative Affairs Office	0	2
University of Alaska		
Cross-Cultural Education Development	2	0
Marine Advisory Program	2	0
Rural Development Program	2	0
Rural Education Center	1	2
Local Political Subdivisions		
Bristol Bay Coastal Resource Area Program	2	0
City of Dilligham	40*	5
Dillingham City Schools	80	0
Southwest Region Schools	18**	0
Private Non-Profit Organizations		
Alaska Legal Services	2	0
Bristol Bay Area Health Corps.	100***	0
Bristol Bay Area Housing Authority	6	1
Bristol Bay Native Association	25	0
Naanquaq Day Care Center	2	8
TOTAL	333	80

* Includes 10 part-time positions.

** Dillingham office only; includes one part-time position.

*** Includes 5 part-time staff.

in 1986 was approximately 70 year-round employees and an additional 45 seasonal workers, most of whom were employed in the hospital construction project. The offices of the Bristol Bay Native Corporation, the regional Native profit organization, are in Anchorage.

In the private sector excluding Choggiung, in 1986 there were two banks, another hotel, three other restaurants, two supermarkets and general merchandise stores, a liquor store, two bars, two laundromats, three auto service stations, another lumber yard, two fuel companies, and several snowmachine and outboard motor dealers. Four local air taxi services also employed local residents, as did one major airline.

Numerous small businesses are established on a frequent basis in Dillingham; some have short lifespans and others survive. In 1986, most of these employed small numbers of people, often on a part-time basis. Some of the smaller businesses in mid-1986 included a travel agency, three gift shops, a beauty shop, a janitorial service, two video rental stores, an alterations and fabric sales shop, an electronic5 store, a trash collection service, and several local taxi companies. There was also a weekly newspaper and printing press. Skilled laborers and tradesmen such as builders were often self-employed. A small number of businessmen have recently organized a fledgling Chamber of Commerce to promote private enterprise.

Bristol Bay's abundant fish and wildlife combined with pristine scenery attracts visitors from around the world for fishing, hunting, photography, boating, and other recreational pursuits. No information has been collected on the contribution of the recreation industry to Dillingham's economy specifically, but information from the Bristol Bay area overall (Petterson et al. 1984:251-259), indicates that this industry's role is substantial and growing. For example, in 1979 earnings in the recreational fishing industry

in Bristol Bay totaled $25 million, about 20 percent of the size of the 1979 commercial salmon fishing earnings. About 65 percent of these receipts went to Alaska residents living outside Bristol Bay, however.

Monetary Income and Cost of Living

For the 11 year period from 1970 through 1980, commercial fishing contributed 31 percent of the total income earned by Bristol Bay residents. Government and support industries provided 54 percent, and transfer payments comprised 15 percent (Petterson et al. 1984:79).

Historically, monetary incomes of Dillingham residents have varied significantly from year to year because of the role of the commercial salmon fishery in the community's economy. As shown in Table 10, the gross incomes of Dillingham's commercial drift net fishermen ranged from $4,219 per fisherman in 1975 to a high of $65,301 in 1981. Set net fishermen generally earned less than those using drift net gear, with a low average gross earning of $2,095 in 1975 and a high of $28,373 in 1981. Counting all permits used in 1984, Dillingham residents harvested 15.8 million pounds of fish, sold at an ex-vessel value of $7.4 million, or $20,876 gross sales per fished permit (Limited Entry Commission).

Data on per capita incomes from all sources in Dillingham and other Bristol Bay communities for 1970 and 1980 (Table 11), show an increase over the ten year period. Except for the Bristol Bay Borough, Dillingham residents had the highest cash incomes in the region in both years, exceeding the average per capita income for the region in 1980 by 81 percent. The average household income in Dillingham in 1980 was $32,203 (Nebesky 1983b:9). In 1982, the average taxable income reported on federal income tax returns of

TABLE 10. COMMERCIAL SALMON FISHING INCOMES, DILLINGHAM PERMIT HOLDERS, 1975 - 1982

Year	Drift gill netting # of permits	Drift gill netting Mean income	Set gill netting # of permits	Set gill netting Mean income
1975	106	$ 4,219	70	$ 2,095
1976	118	14,751	86	$ 5,419
1977	122	14,301	69	$ 3,574
1978	163	36,844	90	$10,962
1979	178	51,767	96	$19,580
1980	181	35,806	95	$12,164
1981	195	65,301	109	$28,373
1982	191	39,302	96	$10,219

Source: Petterson et al. 1984:112-113

TABLE 11. PER CAPITA INCOMES, 1970 AND 1980, SOUTHWEST ALASKA COMMUNITIES, IN 1980 DOLLARS

Subregion [a]	Per capita income 1970 Adjusted [b]	1980 [c]
Lower Kuskowim	$2,262	$ 5,302
Western	1,662	6,409
Dillingham	5,005	13,156
Nushagak	3,222	4,524
Iliamna/Kvichak	3,146	6,204
Bristol Bay Borough	5,225	15,542
All communities	$3,141	$ 7,277

[a] Lower Kuskokwim includes Quinhagak, Platinum, and Goodnews. Western includes Twin Hills, Manokotak, Togiak, and Aleknagik. Nushagak includes Koliganek, Ekwok, Clark's Point, Portage Creek, and New Stuyahok.

Iliamna/Kvichak includes Newhalen, Iliamna, Nondalton, Pedro Bay, Igiugig, Levelock, and Kokhanok

Bristol Bay Borough includes South Naknek, Naknek, and King Salmon.

[b] Adjusted = converted to 1980 dollars

[c] Based on 1979 earnings

Source: Petterson et al. 1984:449, based on U.S. Bureau of Census data.

Dillingham residents was $16,213. As shown in Table 12, this was higher than all other Bristol Bay communities except Pilot Point, Naknek, and King Salmon. On the other hand, the average taxable income in Dillingham in 1982 was lower than that of any other regional center or Alaskan community with more than 2000 people that year. In 1978, the average taxable income on federal tax returns for Dillingham was $16,870, and in 1981 it was $19,609. In comparison, Anchorage residents reported incomes of $18,255 per return in 1978 and $23,043 in 1981 (Alaska Department of Revenue 1985).

As shown in Table 13, the estimated per capita income for Dillingham residents in 1983 was $11,144, second only to the Bristol Bay Borough in southwest Alaska, and higher than all the smaller communities in the area. This estimated income was lower than all moderately-sized and larger Alaska communities except the rural regional centers of Nome, Kotzebue, and Bethel, and the road-connected cities of Seward, Wasilla, and Palmer.

In addition, in the 1980s the cost of living in Dillingham was considerably higher than urbanized parts of the state such as Anchorage. Table 14 compares the average quarterly consumer price index from June 1981 through December 1985 for Dillingham and selected other Alaskan communities. This index is based on the cost of food for a week, using Anchorage costs as a base for comparisons. These data demonstrate that for that five year period, foods costing $100 in Anchorage cost $172 in Dillingham. The cost of food in Dillingham exceeded that of all Alaskan communities with more than 2000 people except the regional centers of Barrow, Nome, and Kotzebue.

TABLE 12. 1982 AVERAGE TAXABLE INCOMES PER RETURN FOR SELECTED ALASKA COMMUNITIES

Bristol Bay Region	Average Taxable Income
King Salmon	$22,032
Pilot Point	17,865
Naknek	17,920
DILLINGHAM	16,213
Port Heiden	15,830
Iliamna	13,453
Aleknagik	12,118
South Naknek	11,747
Egegik	10,780
Levelock	9,413
Kokhanok	8,644
Newhalen	8,644
Nondalton	8,560
Ekwok	7,837
Togiak	7,579
Clark's Point	7,540
Manokotak	6,435
New Stuyahok	5,882
Portage Creek	4,559

Larger Alaska Communities [a]	Average Taxable Income
Valdez	$27,587
Fairbanks	24,178
Anchorage	23,590
Kenai	23,405
Wasilla	23,198
Juneau	22,968
Soldotna	22,251
Palmer	21,879
Ketchikan	21,693
Wrangell	21,301
Sitka	20,392
Petersburg	19,743
Cordova	19,296
Kodiak	19,259
Seward	18,524
Homer	17,295

Regional Centers	
Barrow	$29,406
Nome	19,745
Bethel	18,796
Kotzebue	18,566
Unalaska	17,532

[a] All incorporated communities with populations exceeding 2,000 in 1984, excluding regional centers.

Source: Alaska Department of Revenue 1985.

TABLE 13. 1983 PER CAPITA INCOME ESTIMATES FOR SELECTED ALASKA COMMUNITIES

Bristol Bay Region [a]	Per Capita Income
Bristol Bay Borough [b]	$17,917
Dillingham	11,144
Aleknagik	10,348
Clark's Point	8,287
Ekwok	8,287
Newhalen	8,287
Port Heiden	8,287
Manokotak	6,181
Nondalton	5,418
New Stuyahok	4,687
Togiak	4,422
Regional Centers	
Barrow	17,609
Unalaska	13,709
Nome	11,180
Kotzebue	11,170
Bethel	10,660

Larger Alaska Communities [c]	Per Capita Income
Juneau	$16,027
Cordova	14,740
Anchorage	14,561
Valdez	13,737
Kodiak	13,445
Kenai	13,390
Sitka	13,323
Petersburg	13,281
Ketchikan	13,164
Fairbanks	12,698
Homer	11,943
Wrangell	11,511
Soldotna	11,244
Seward	10,958
Wasilla	10,385
Palmer	9,785

[a] Data available for incorporated communities only.

[b] Includes King Salmon, Naknek, and South Naknek.

[c] All incorporated communities with population exceeding 2,000 in 1984, excluding regional centers.

Source: Alaska Department of Labor n.d.:17-20.

TABLE 14. COST OF FOOD IN ALASKA COMMUNITIES: CONSUMER PRICE INDEX [a]

Bristol Bay	
King Salmon	209
Naknek	206
Dillingham	172
Regional Centers	
Barrow	195
Nome	181
Kotzebue	176
Bethel	166
Dutch Harbor	155
Selected Smaller Communities [c]	
Tanana	248
Kaktovik	228
Fort Yukon	226
Unalakleet	200
Hoonah	185
Yakutat	182
McGrath	179
Northway	163
Larsen Bay	160
Tok	145
Glennallen	140

Larger Alaska Communities [b]	
Cordova	164
Kodiak	135
Petersburg	128
Homer	127
Valdez	122
Wrangell	119
Juneau	115
Ketchikan	114
Sitka	114
Fairbanks	110
Kenai - Soldotna	110
Palmer - Wasilla	109
Anchorage	100

[a] These numbers represent the average of quarterly consumer price index information from June 1981 through December 1985, based on the cost of food at home for one week. Anchorage is the base adjusted at 100.

[b] Communities with populations exceeding 2,000, excluding regional centers

[c] Communities with population below 1,000.

Source: Alaska Department of Fish and Game 1986:575-576, based on data from the Cooperative Extension Service, University of Alaska.

GOVERNMENT AND SERVICES

Dillingham City Government

Incorporated in 1963, Dillingham is the only first class city in the Bristol Bay region. In 1986, the city encompassed about 25 square miles. Dillingham had petitioned the Local Boundary Commission to annex additional territory, but the size of this addition was under negotiation. The city has a council-manager form of government; six council members and a mayor are elected at large. They provide policy direction to a city manager who handles day to day operations. As a first class city, Dillingham can assume diverse powers, including establishing its own school district. The city levies two taxes: a three percent sales tax and a three mill real and property tax. Major sources of funding include state and federal revenue sharing (federal revenue sharing funds will be phased out in fiscal year 1988), a state-funded municipal assistance grant, a federally funded community development block grant, and income generated from water, sewer, and dock fees, Special legislative appropriations and federal grants sometimes fund special projects (Nebesky 1983b:68).

In 1986, the city employed 45 people who performed jobs in the public works, police, and finance departments, and in the library, museum, dock, and harbor. The city also administered a senior center which provided hot lunches, a ride service, and information and referral to Dillingham's senior citizens, as well as to village residents when they visited Dillingham.

For non-city programs and services, Dillingham's Native population is represented by a five member traditional council. After adopting a

constitution and by-laws, the traditional council became eligible to administer a variety of federal programs, including local health care, employment assistance, college assistance, and social services. To date, the council has chosen to let the Bristol Bay Native Association, the regional non-profit organization, provide these services. The traditional council has, however, received state funds to build and administer a local day care center which currently serves 50 children.

State and Federal Agencies and Services

A number of state and federal agencies had offices in Dillingham during the study period (Table 9). Federal agencies included the Army Corps of Engineers, which is responsible for dredging the boat harbor; the U.S. Fish and Wildlife Service, which supervises the Togiak National Wildlife Refuge; and the Federal Aviation Administration (FAA). The FAA is responsible for air traffic control; this is particularly important during the summer months when Dillingham has one of the three busiest non-metropolitan airports in Alaska (FAA pers. comm. 1986). Dillingham also has a post office which manages the distribution of mail to neighboring villages as well. The current post office building has exceeded its capacity and construction of a new building will be completed in 1986. A representative of the federal Social Security Administration visits Dillingham on a monthly basis.

The state had a significant presence in Dillingham with a number of agencies operating offices to provide accessible services to the region. Applications for state loans, particularly fisheries loans, are facilitated by the Division of Investments, Department of Commerce and Economic Development. A magistrate is located in Dillingham who assumes a variety of judicial

functions including presiding at trails, pre-trial hearings, and coroner investigations. Judges dispatched from Anchorage handle about half the trials. The Alaska Department of Fish and Game (ADF&G) has representatives of five of its divisions based in Dillingham. The largest number of ADF&G employees manage the commercial fisheries, including-45 seasonal technicians stationed in the field during the peak of the sockeye salmon run. There are two biologists who have responsibility for game management and sport fishing. Public input from the Bristol Bay region into the fish and game regulatory process is coordinated by a staff member of the Division of Boards. The Division of Subsistence employs two people who conduct research on subsistence uses in the Bristol Bay region and provides information to the public. Another state agency, the Alaska Department of Health and Social Services, sponsors a clinic with two nurses who provide screening and assessment services, health education, and inoculations to Dillingham and village residents. Applications for a variety of public assistance programs are also coordinated through this department. Additionally, a social worker is employed who works with all aspects of family problems, including foster care and child abuse.

Additional state services are provided by the Alaska Department of Labor, which runs an employment center, staffed by one person, who assists residents seeking work in the local area and state wide. The Department of Law established a district attorney's office several years ago and a legislative information office operates during the state legislative session. The Alaska Department of Natural Resources stations a park ranger in Dillingham for six months to supervise the Wood-Tikchik State Park. The Department of Public Safety provides a state trooper and fish and wildlife protection officers who have law enforcement responsibilities for the western Bristol Bay region. The

Department of Transportation and Public Facilities maintains state roads and airport facilities. Finally, an employee of the Department of Community and Regional Affairs, Division of Municipal and Regional Assistance, offers technical assistance to municipal governments throughout the region, and two employees of the Division of Housing Assistance facilitate low interest housing loans and provide information on other state loan programs.

The Bristol Bay Coastal Resources Agency is responsible for developing a local district management program which is in compliance with state and federal standards. It operates as a political subdivision of the state and is managed by a locally elected board.

Education. Schools, and Churches

As a first class city, Dillingham is empowered to operate its own school district, which runs an elementary school, a middle school, and a high school. A new elementary school was completed in the summer of 1981, and seven new rooms and a kitchen were added in the summer of 1986. The high school building was originally constructed in 1960, and additions and renovations have been undertaken four times since then. In light of Dillingham's growing population, four more classrooms will be added to the middle school section of the high school building in 1987.

In October 1986, the elementary school enrolled 245 students, while the combined middle and high schools enrolled 208 students. The school district had a six person administrative staff, including a superintendent, 49 certified teachers, and 25 classified staff. Dillingham city schools sponsors an Indian Education Program, a Bilingual-Bicultural Program, and a Community

Education Program. The school district also owns and operates the local radio station.

Pre-school and day care services are provided to 50 children by the Naanguaq Center, which is operated by the Dillingham Traditional Council. Children from ages six months to ten years are enrolled. Monthly tuition for full-time care is $425, with some state funds available to assist low income families. The center was constructed in 1985 through a state funded grant.

Several programs of the University of Alaska have offices in Dillingham and offer limited higher education opportunities to residents of the Bristol Bay region. The Rural Education Program offered a variety of courses and workshops with an emphasis on vocational and technical subjects. Fifty two courses were offered in the fall semester, 1985. Also, there were two "distance education programs" which lead to baccalaureate degrees. The XCED *(Cross* Cultural Development) Program trains students who are seeking teaching careers in rural Alaska. The Rural Development Program emphasizes skills for careers in Native corporations or village governments. The combined enrollment in these programs was 35 students in 1986, seven of whom resided in Dillingham. Finally, the Marine Advisory Program is designed to provide technical assistance to local fishermen through courses and workshops.

Southwest Regional Schools, the Rural Education Attendance Area (REAA) which administers elementary and secondary schools in nine villages maintains its administrative offices in Dillingham. In 1986, eighteen people were employed in the central office, and there were 57 certified and 80 classified positions in the village schools.

There were eight churches in Dillingham in 1986. The denominations represented included Baptist, Bahai, Russian Orthodox, Roman Catholic, Moravian, Latter Day Saints, Seventh Day Adventist, and Assembly of God. The

Seventh Day Adventist Church sponsored an elementary school with an enrollment of ten children.

Health and Human Services

The largest service providers in Dillingham are two Native organizations, the Bristol Bay Native Association (BBNA) and the Bristol Bay Area Health Corporation (BBAHC). BBNA was organized as the nonprofit regional service provider to administer a number of federal and state programs. In 1986 BBNA had a staff of 25 in its regional office and 31 additional part and full time positions in the villages. Programs included social services, education and training assistance, tribal government operations, a village public safety officer program, elderly services, respite care to families with handicapped children, Indian Child Welfare, low income energy assistance, fisheries assistance, and services to handicapped infants.

A new hospital facility at Kanakanak provides primary health care for Dillingham residents. Kanakanak is located six miles from the Dillingham city center. The U.S. Public Health Service owns the hospital but the facility is operated by the BBAHC, a nonprofit Native corporation. The hospital is able to serve Native and non-Native clients, the latter on a fee for services basis. The new hospital has 16 beds and 3 bassinets. Routine care as well as dental and optometry services are offered. Specialty clinics are held frequently by visiting physicians. BBAHC also provides alcoholism and mental health counseling, and supervises and trains at least one health aide in all Bristol Bay villages. For serious illnesses, injuries or surgery, people are transferred to Anchorage hospitals. In 1986, BBAHC employed 176 people, 100 of whom were located in Dillingham and the remainder in the villages.

In 1986, two physicians operated limited private practices. A private dentist visited Dillingham about every six weeks. Volunteers staffed the fire and crash rescue squads. Alaska Legal Services maintained an office in Dillingham but funding cuts in 1986 seriously jeopardized its continued ability to do so. Two private attorneys had a law practice in 1986.

Also, the Bristol Bay Area Housing Authority had its offices in Dillingham in 1986. They are responsible for construction and management of low income housing throughout the region. This is a private, non-profit organization.

Transportation

With Dillingham serving as the Bristol Bay region's center, there are transportation ties within and outside the region. Dillingham is connected to Anchorage by scheduled daily jet service and, less frequently by two other carriers. Additional cargo flights are made regularly. Four air charter companies are based in Dillingham and they serve surrounding villages with many flights each day in single engine aircraft. Charter flights frequently occur to the Bethel area. Barge services link Dillingham with Seattle during the ice-free period from May to October. Local residents commonly order food, vehicles, and other large, bulky items for delivery by barge.

Local travel is by personal aircraft, boat, snowmachine, all-terrain vehicles (ATVs), and automobiles. Dillingham is connected to Aleknagik by a 20 mile gravel road that is serviceable year round except for the spring. The only other roads connect various parts of the town. A two mile stretch from Squaw Creek to the city center is paved. The remaining roads, notably Kanakanak, Lake, and Wood River roads, are gravel. Due to extreme weather

conditions, roads are difficult to maintain in good repair. Sidewalks were constructed in the shopping center area downtown in 1985, but other than those few blocks there are no pedestrian walkways. Four service stations sell gas as well as repair cars and trucks.

In the sampled population, 86 percent of the households reported owning at least one highway vehicle in 1984, 52 percent owned snowmachines, 28 had all-terrain vehicles, 14 percent owned their own airplanes, and three percent maintained dog teams (Table 5).

Utilities, Telephone, and Electricity

In 1986, municipal water and sewer collection were available to fewer than half the households, primarily residents of the townsite, Windmill Hill, and HUD (see Fig. 2). Other residents and industrial users have had to develop their own water sources, generally by drilling wells. The city had no sewage treatment facility but funds had been obtained for construction in 1987. Solid waste was disposed at a land disposal site outside the city limits. The was no municipal trash collection but residents could contract a private collection service (Nebesky et al. 1983b:79).

A locally-run cooperative provided electric power and telephone services throughout the developed portions of Dillingham. The primary method of home heating was oil but some residents used wood. Two private fuel delivery services were available.

Housing

Most housing is located within the townsite at Snag Point, Windmill Hill, along the Wood River, and Kanakanak Road. An increasing number of

subdivisions are being developed for single family units by Choggiung and by subdivision of some Native allotments. The majority of homes in Dillingham are single family units. In 1981, there were 345 single family houses in Dillingham. In addition, there were 15 buildings which contained 3 to 16 living units a piece for a total of 98 apartments. A HUD subdivision northeast of the town center comprised of 50 houses and 19 apartments are available to low income residents. In addition, privately built homes are under construction. In 1986, 15 units of housing for senior citizens were constructed next to the Senior Center.

Dillingham has a low housing vacancy rate with no housing available during the summer fishing season. Often people from other villages who go to Dillingham to fish stay with friends and relatives. During the salmon season, five local fish processors have bunkhouses with dining room facilities. During the salmon season, all 60 rooms in the two local hotels are filled. In addition, approximately 550 people live offshore on floating processors at the peak of the salmon season (Nebesky et al. 1983b:66).

No recent studies have been done to evaluate the quality of Dillingham's housing stock. A study conducted by BBNA in 1975 determined that a high proportion of the housing stock was substandard and most of the deteriorated units were concentrated in the townsite area. Of the 47 homes in the sample, 28 needed to be replaced, 17 needed improvement, and only two were considered satisfactory. BBNA reported that the average age of houses in Dillingham was 35 years (Nebesky et al. 1983b:69-70).

SUMMARY

In summary, during the study period commercial fishing continued to dominate the cash sector of Dillingham's economy, as well as that of the Bristol Bay region overall. For the economy of Bristol Bay, however, the abundance of salmon for commercial harvest has been tempered by year to year variability in run strength and the major role of non-local and non-Alaskan residents in the commercial salmon industry. Cash incomes vary from year to year, and most of the earnings in the fishery go to non-residents. This results in a great deal of "income leakage," income earned in Bristol Bay but spent elsewhere. For example, of the $147.7 million earned by all people employed in the Bristol Bay region in 1980, $113.2 million (77 percent) was spent outside the region, with non-residents spending 95.6 percent of their earnings of $78.2 million (53 percent of all income earned in the region that year) after leaving the area (Petterson et al. 1984:273).

Dillingham's role as Bristol Bay's major regional center has created jobs outside the commercial salmon industry, thus adding diversity to the community's economy and providing a wider range of services and facilities than are available in the smaller communities in southwest Alaska. Consequently, despite considerable variation from year to year, cash incomes in Dillingham are higher than those of the smaller Bristol Bay communities. On the other hand, 1982 data demonstrate that cash incomes in Dillingham are in some years substantially lower than those of many other mid-sized and larger Alaska communities. In addition, costs of living in Dillingham exceed those of more accessible and densely populated parts of the state.

CHAPTER3

CHARACTERISTICS OF RESOURCE USE

SEASONAL ROUND

During the early and mid 1980s, the hunting, fishing, and gathering activities of Dillingham residents followed a seasonal round as depicted in Figure 4. The timing of harvests was generally conditioned by resource availability, resource abundance, and hunting and fishing regulations. Most of the following information about seasonal activities in Dillingham is from Wright et al. (1985:42-45).

The annual cycle began with break-up in late April and May as a few hunters took waterfowl around Nushagak Bay and along the rivers and lakes. Also, a few seal were taken in spring by Dillingham residents. Some families traveled to the Kulukak and Togiak areas to harvest herring, herring roe-on-kelp, clams, marine mammals, and bird eggs, often in conjunction with commercial herring fishing.

The arrival of king salmon in Nushagak Bay in late May marked the beginning of subsistence gill net fishing. Kings were available through June and July, with reds running from late June through late July. Chum and pink salmon were also taken in the summer months, while silvers were present in August and September. Trout, Dolly Varden, and grayling were harvested in lakes and rivers with rod and reel throughout the summer. Late summer and early fall were the major berry harvesting periods.

Caribou and moose hunting were the dominant resource activities in late August and September. Waterfowl hunting and marine mammal hunting also

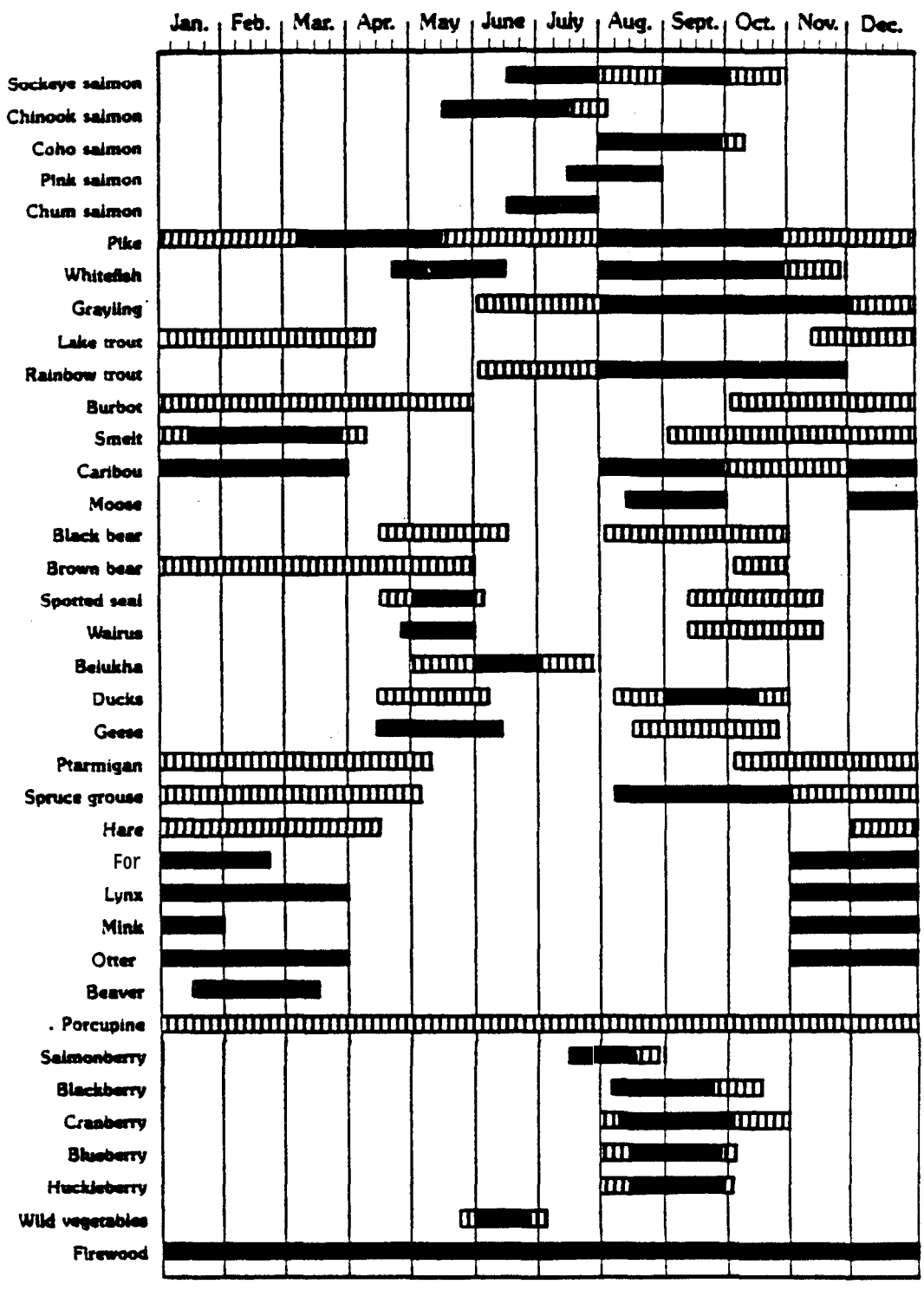


Figure 4. Seasonal Round of Resource Harvests, Nushagak Bay Subregion. (Solid line indicates time when harvest usually takes place. Broken line indicates occasional harvest effort. Source: ADF&G, Division of Subsistence, field interviews 1982-1983).

occurred in the fall. In addition, some families harvested spawned-out salmon from the Wood River Lakes and Snake Lake.

When ice formed in rivers and lakes, Dillingham residents set nets for whitefish. Smelt were taken with dip nets and by jigging in Nushagak Bay. After freeze-up, residents jigged for Dolly Varden, lake trout, and pike in the Wood River Lakes area.

Caribou hunting was a major resource activity during the winter months of December, January, February, and March. A second moose hunting season occurred in December as well. In addition, people trapped furbearers, especially beaver, land otter, and red fox. Ptarmigan were another important resource as they formed large flocks in late winter and early spring.

Some resources were harvested throughout much of the year, especially small game such as porcupine and hares, as well as spruce grouse. Firewood for heating homes and steam baths was also gathered year round.

RESOURCE HARVEST AREAS

Figures 5 through 9 depict areas used by Dillingham residents to harvest ten categories of wild resources in the period 1963 to 1983. These have been adapted from the large scale (1:250,000) community harvest area maps appearing in the Department of Fish and Game's Habitat Management Guide reference map series (ADF&G 1985a). Seven local experts provided information about all the areas used by the community. As shown in Figure 5, the largest use area was for caribou, including most of the Nushagak River drainage as well as the western Alaska Peninsula. Dillingham residents hunted moose in the Snake River, Wood River, and lower, middle, and upper Nushagak River drainages (Fig. 6), while furbearer trapping occurred within the lower and middle Nushagak

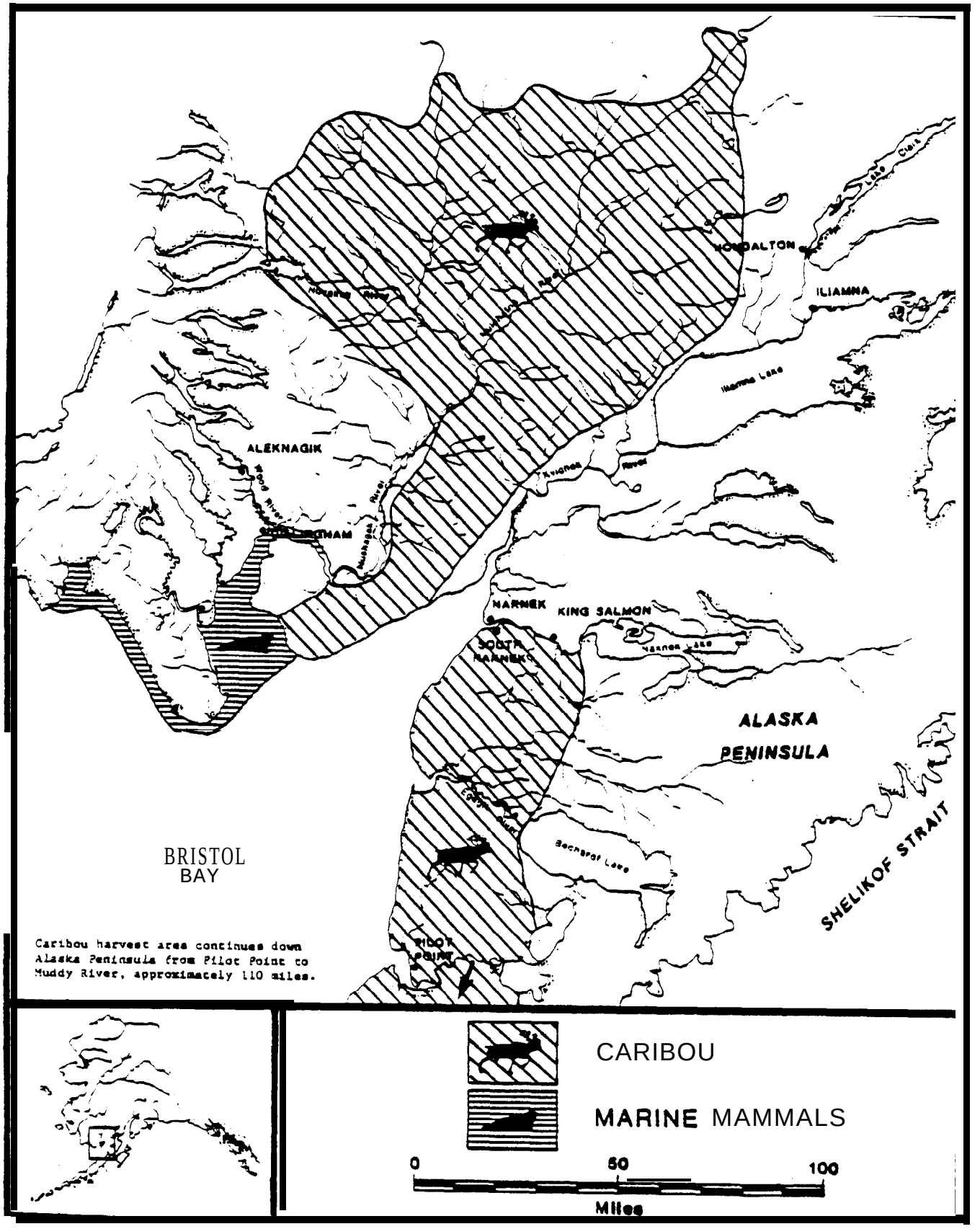


Figure 5. Areas Used by Dillingham Residents to Hunt Caribou and Marine Mammals, 1963-1983.

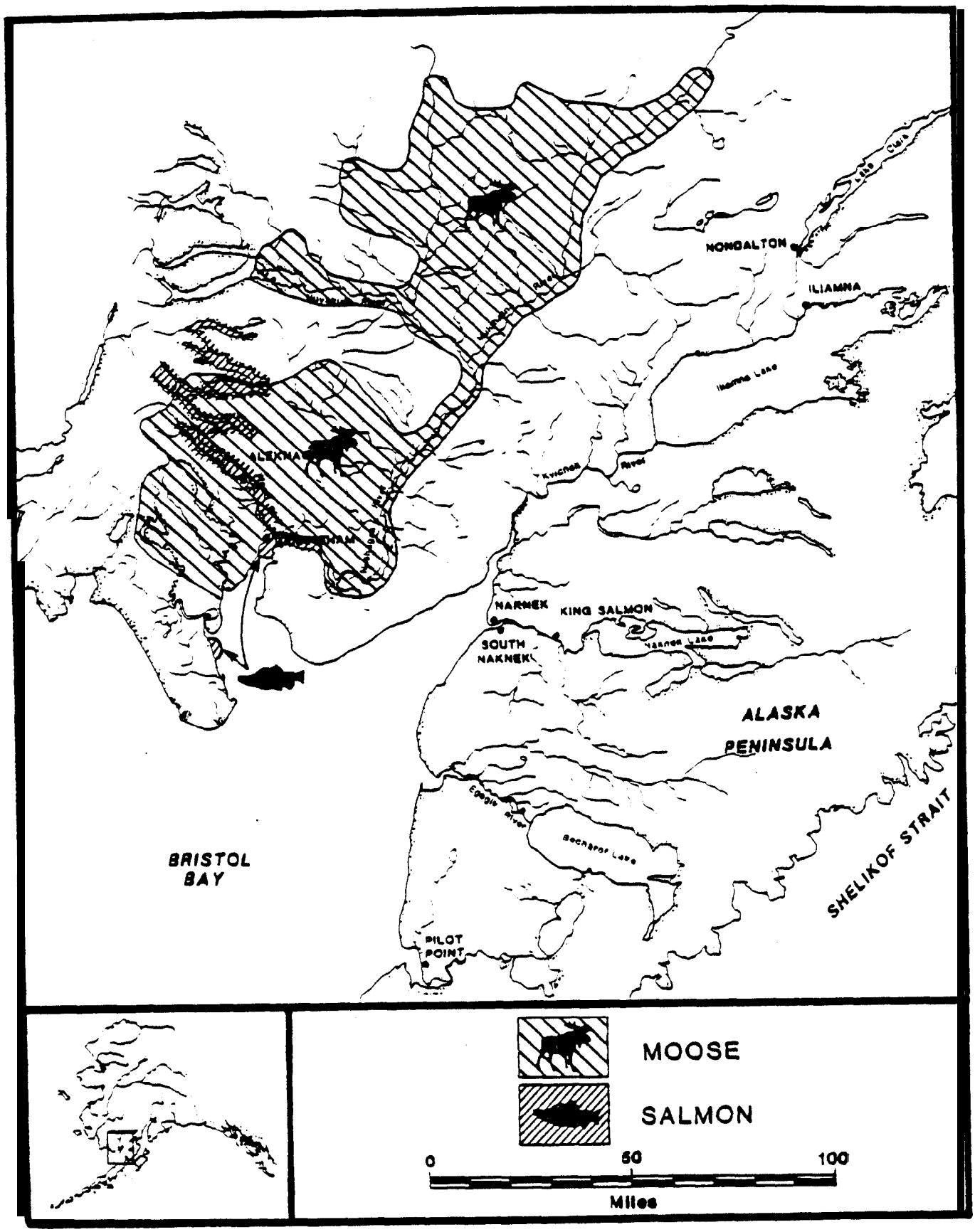


Figure 6. Areas Used by Dillingham Residents to Hunt Moose and to Fish for Salmon, 1963-1983.

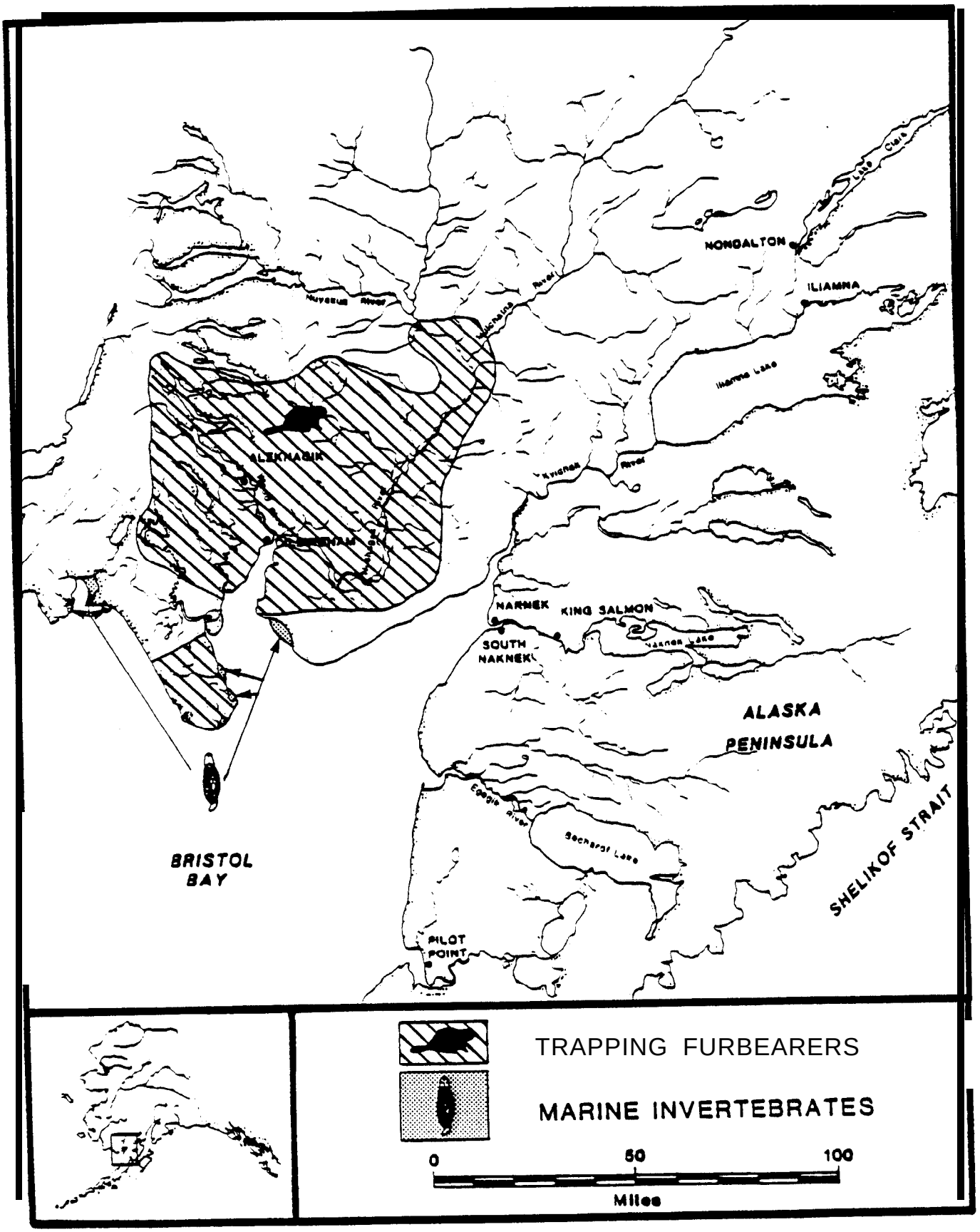


Figure 7. Areas Used by Dillingham Residents to Trap Furbearers and Gather Marine Invertebrates, 1963-1983.

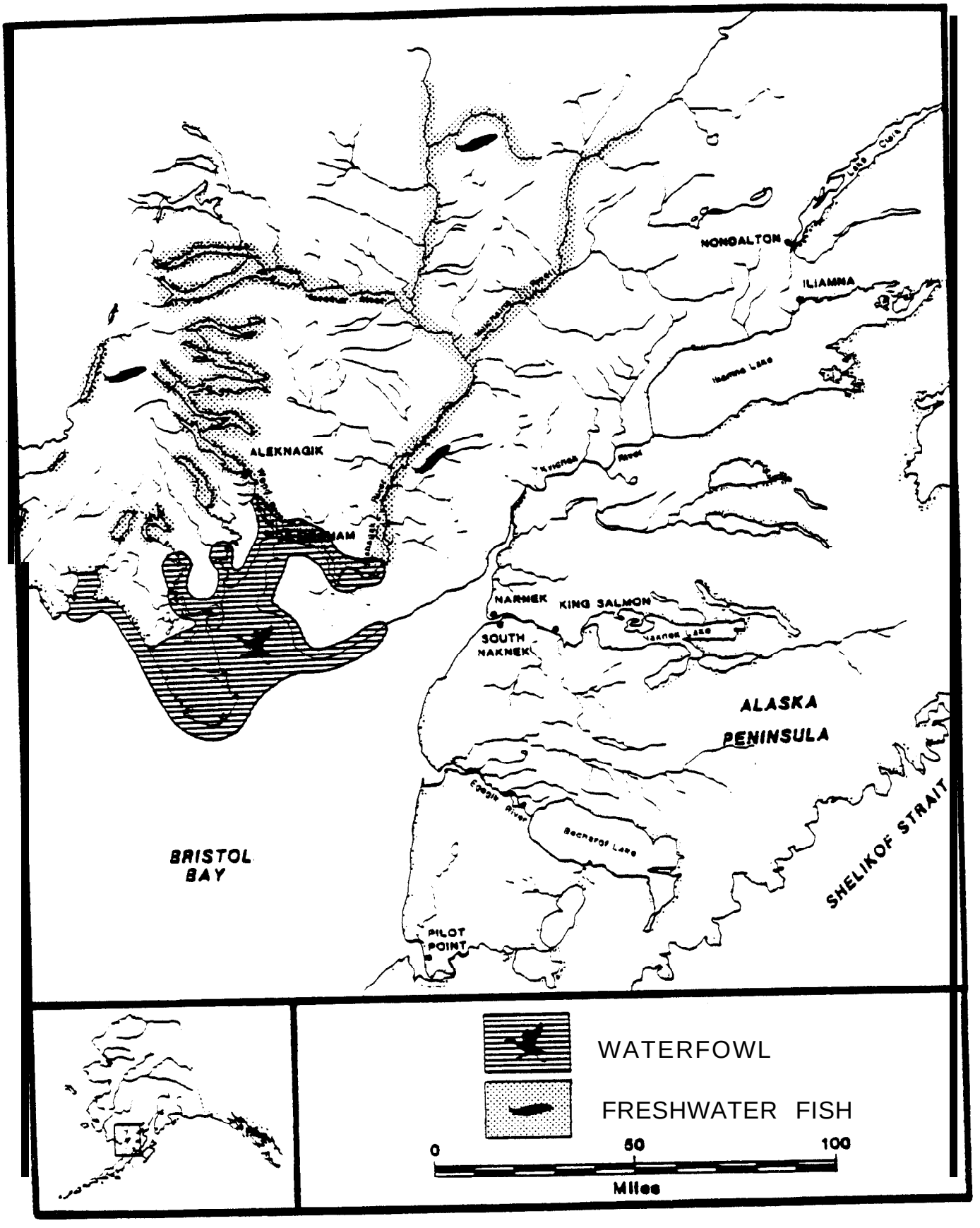


Figure 8. Areas Used by Dillingham Residents to Hunt Waterfowl and Harvest Freshwater Fish, 1963-1983.

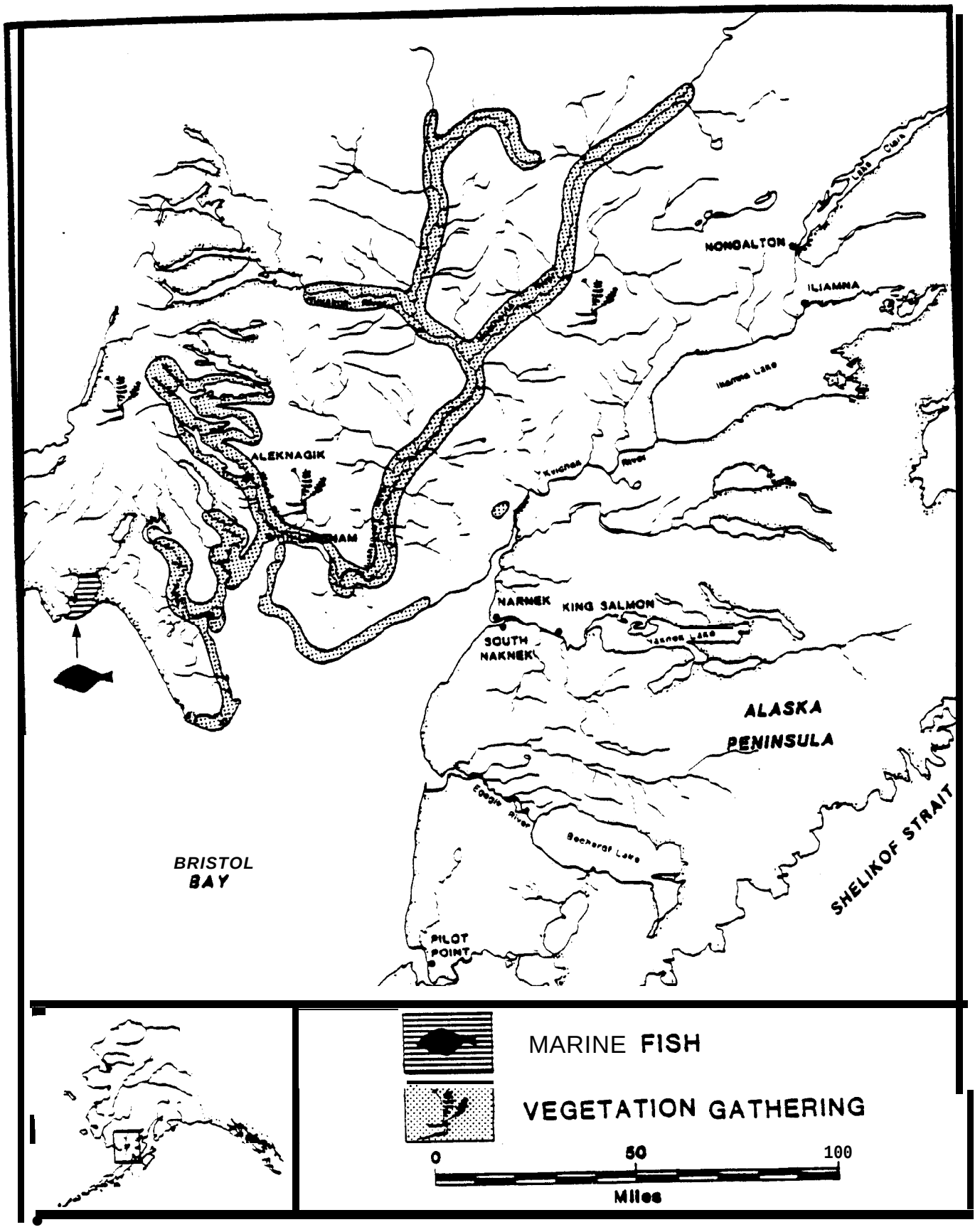


Figure 9. Areas Used by Dillingham Residents to Harvest Marine Fish and Gather Plants, 1963-1983.

River drainage, as well as the Wood River and Wood River Lakes and Snake River areas (Fig. 7). The lower Nushagak River, Nushagak Bay, the Nushagak Peninsula, and Kulukak Bay were the important waterfowl harvest areas (Fig. 8). Marine mammals were hunted in the lower Nushagak and lower Wood rivers, Nushagak Bay, and along the Nushagak Peninsula to Kulukak Bay (Fig. 5).

The maps also show fishing and gathering areas. During the 20 year period, Dillingham residents harvested salmon in the lower Nushagak River, the Wood River -- Wood River Lakes system, and Nushagak Bay (Fig. 6). Freshwater fish were taken in most of the area's rivers and lakes, including Nunavaugaluk Lake (Snake Lake; Yup'ik Nunvaurluk), the Wood River Lakes, Wood River, Nushagak River, Mulchatna River, Nuyakuk River, and the Tikchik Lakes (Fig. 8). Marine fishing occurred in Kulukak Bay (Fig. 9), and marine invertebrates were collected in Kulukak and Nushagak bays (Fig. 7). Dillingham residents gathered plants in a large area from Nushagak Bay to the upper reaches of the Nushagak and Mulchatna rivers and the Wood River Lakes (Fig. 9).

As part of the 1985 resource use survey, respondents answered questions about their use areas for moose hunting, caribou hunting, and furbearer trapping. The researchers asked each respondent to assess the frequency of their use of ten areas within the overall range of Dillingham hunters and trappers as reported in the 1983 mapping project (see Chapter 1 and Fig. 10).

As shown in Table 15, three areas were used by over 40 percent of the moose hunters in the sample. These were the lower Nushagak River and Iowithla drainage, Wood River and Lakes, and the middle Nushagak and Kokwok river drainages. In addition, over 20 percent of all the moose hunters reported using these areas regularly. In contrast, more distant areas such as the upper Nushagak drainage, the Tikchik Lakes, the Nunachuak drainage, the Alaska

TABLE 15. FREQUENCY OF USE OF AREAS FOR MOOSE HUNTING [a]

Area	Ever Use?	Regularly Use?	Seldom Use?	Use in 1984?
A. Kuklukak/Togiak	1%	0	1%	0
B. Wood River & Lakes	46%	22%	24%	25%
C. Tikchik Lakes and Nuyakuk River	14%	6%	8%	8%
D. Upper Nushagak	23%	8%	15%	9%
E. Mulchatna River	29%	11%	18%	11%
F. Nunachuak Drainage	19%	5%	14%	5%
G. Middle Nushagak & Kokwok Drainage	44%	22%	23%	20%
H. Lower Nushagak and Iowithla Drainage	49%	24%	25%	30%
I. Kvichak/Iliamna/ Lake Clark	8%	4%	4%	3%
J. Alaska Peninsula	15%	6%	9%	1%
Other	0	0	0	0

[a] N = 79 respondents who have hunted moose while living in Dillingham (52 percent of the sample of 153 households).

TABLE 16. FREQUENCY OF USE OF AREAS FOR CARIBOU HUNTING [a]

Area	Ever Use?	Regularly Use?	Seldom Use?	Use in 1984?
A. Kuklukak/Togiak	3%	0	3%	0
B. Wood River & Lakes	8%	3%	5%	6%
C. Tikchik Lakes and Nuyakuk River	9%	3%	6%	4%
D. Upper Nushagak	22%	9%	13%	6%
E. Mulchatna River	38%	22%	16%	18%
F. Nunachuak Drainage	19%	10%	9%	5%
G. Middle Nushagak & Kokwok Drainage	34%	18%	16%	18%
H. Lower Nushagak and Iowithla Drainage	37%	20%	17%	22%
I. Kvichak/Iliamna/ Lake Clark	12%	8%	4%	5%
J. Alaska Peninsula	36%	18%	18%	10%
Other	0	0	0	0

[a] N = 79 respondents who have hunted caribou while living in Dillingham (50 percent of the sample of 153 households).

Peninsula, and the Kvichak -- Iliamna Lake drainage, were regular moose hunting areas for less than 10 percent of the hunters. Survey results reveal that the lower Nushagak River was the most popular moose hunting area for Dillingham residents. Almost half of the moose hunters had used this area, 24 percent said they regularly hunted moose there, and 30 percent had used the area in 1984. Another important finding was that no Dillingham moose hunters used areas outside the Bristol Bay area for moose hunting.

Table 16 reports the frequency of use of specific areas for caribou hunting by interviewed Dillingham residents who had hunted caribou while living in the community. Four areas stand out as especially significant, with use by over 30 percent of the sampled caribou hunters. Two of these, the lower Nushagak drainage and the middle Nushagak drainage, were also among the most important moose hunting areas. However, two other areas -- the Mulchatna River and the Alaska Peninsula -- are notable as areas where Dillingham hunters especially traveled for caribou, although moose were hunted in these areas as well. The prominence of these two areas is clearly related to the relative abundance of caribou and liberal hunting regulations. In a pattern similar to moose hunting, no Dillingham hunters traveled outside the Bristol Bay region for caribou.

As demonstrated in Table 17, furbearer trapping by Dillingham residents has been concentrated in three subareas within the entire 20 year harvest area. These are Wood River and Lakes (48 percent of the trappers have used this area), the lower Nushagak drainage (42 percent), and the middle Nushagak drainage (29 percent). Very few trappers traveled to more distant locations like the Tikchik Lakes (six percent), Mulchatna River (13 percent), Kvichak system (0), or the Alaska Peninsula (six percent).

TABLE 17. FREQUENCY OF USE OF AREAS FOR TRAPPING [a]

Area	Ever Use?	Regularly Use?	Seldom Use?	Use in 1984?
A. Kuklukak/Togiak	3%	0	3%	0
B. Wood River & Lakes	48%	16%	32%	29%
C. Tikchik Lakes and Nuyakuk River	6%	6%	0	3%
D. Upper Nushagak	10%	0	10%	0
E. Mulchatna River	13%	3%	10%	6%
F. Nunachuak Drainage	6%	0	6%	3%
G. Middle Nushagak & Kokwok Drainage	29%	16%	13%	13%
H. Lower Nushagak and Iowithla Drainage	42%	19%	23%	13%
I. Kvichak/Iliamna/ Lake Clark	0	0	0	0
J. Alaska Peninsula	6%	3%	3%	0
Other [b]	3%	0	3%	0

[a] N = 31 respondents who have trapped furbearers while living in Dillingham (20 percent of the sample of 153 households).

[b] "Homer"

TABLE 18. FREQUENCY OF-USE OF AREAS FOR MOOSE HUNTING, CARIBOU HUNTING, OR TRAPPING [a]

Area	Ever Use?	Regularly Use?	Seldom Use?	Use in 1984?
A. Kuklukak/Togiak	4%	0	4%	0
B. Wood River & Lakes	46%	21%	25%	28%
C. Tikchik Lakes and Nuyakuk River	14%	5%	9%	8%
D. Upper Nushagak	27%	12%	15%	11%
E. Mulchatna River	39%	23%	16%	18%
F. Nunachuak Drainage	24%	10%	14%	8%
G. Middle Nushagak & Kokwok Drainage	49%	25%	24%	26%
H. Lower Nushagak and Iowithla Drainage	52%	26%	26%	30%
I. Kvichak/Iliamna/ Lake Clark	12%	8%	4%	5%
J. Alaska Peninsula	34%	16%	17%	10%
Other	1%	0	1%	0

[a] N = 92 respondents who have hunted moose or caribou, or trapped furbearers while living in Dillingham (60 percent of the sample of 153 households).

Table 18 reports the percentage of the moose hunters, caribou hunters, and trappers in the Dillingham sample who had ever used each of the subareas for these three activities. This information is also depicted in Figure 10. The results illustrate that Dillingham resource harvesters tended to hunt and trap in a localized area, with frequency of use decreasing with distance from the community. The availability of caribou along the Mulchatna River and the Alaska Peninsula accounts for the relatively high use of these more distant areas. Few activities took place in the Kulukak-Togiak area or the Kvichak-Iliamna-Lake Clark area. This reflects the relative scarcity of moose and caribou in the former area, and the availability of these resources in areas closer to Dillingham than the Iliamna area. This pattern probably also reflects the origins of Dillingham residents in the Nushagak-Mulchatna system rather than the villages of the Iliamna drainage.

SPECIES USED AND LEVELS OF PARTICIPATION IN HARVESTS

According to the results of the survey of 153 households, Dillingham residents used 48 kinds of fish, game, and plant resources in 1984 (Table 19). The ten most commonly used resources were king salmon (83.7 percent), berries (79.1 percent), caribou (69.9 percent), red salmon (67.3 percent), moose (61.4 percent), silver salmon (61.4 percent), spruce grouse (49 percent), rainbow trout (39.2 percent), smelt (37.3 percent), and Dolly Varden (37.3 percent). The mean number of resources used per household was 11, with a minimum of zero (one percent), and a maximum of 34.

Figure 11 reports the levels of use and harvest of six resource categories in Dillingham in 1984. As illustrated, salmon was the category most widely used (88 percent), followed by plants (79 percent), game (78

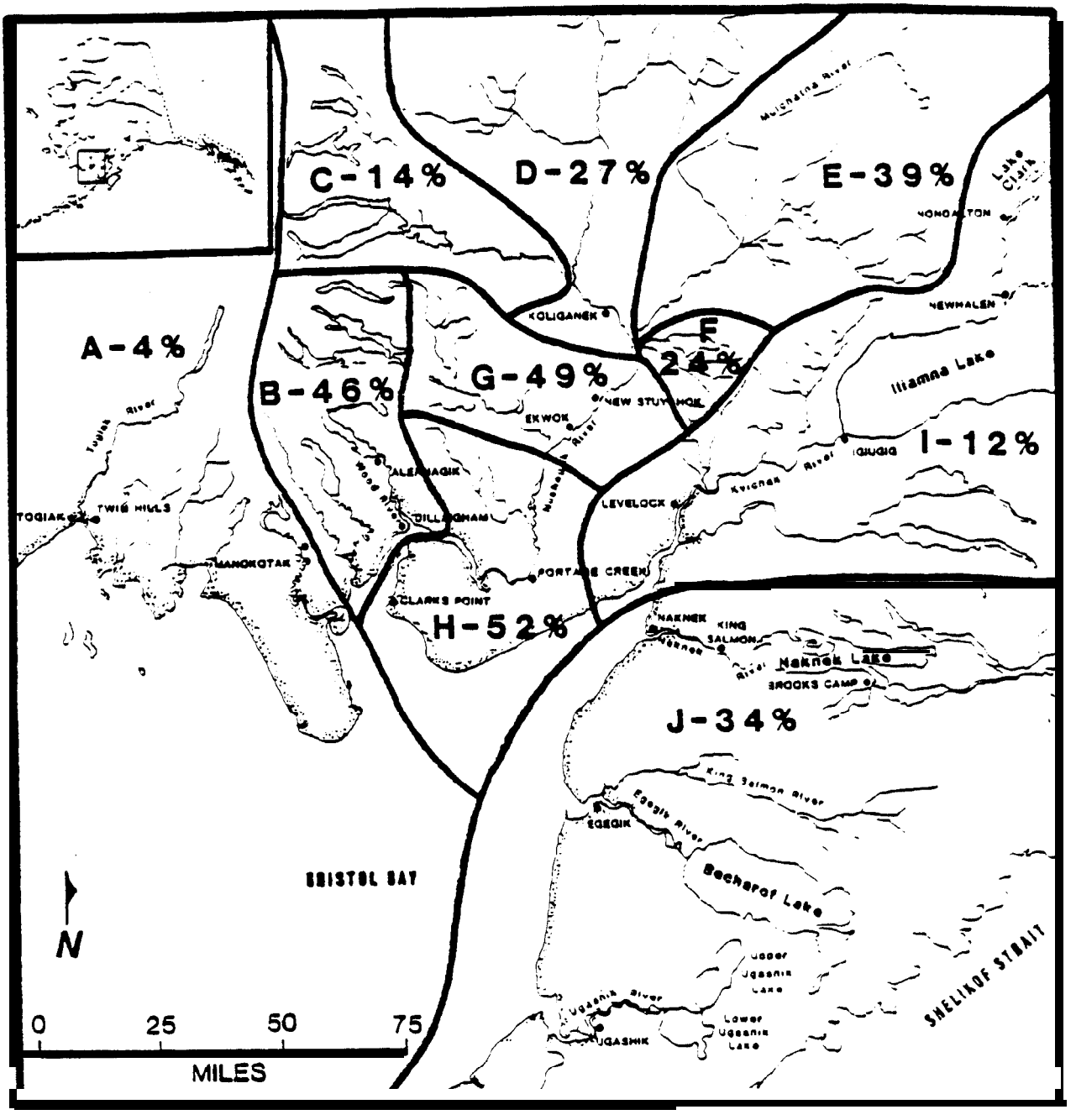


Figure 10. Map of Resource Use Areas Showing Percentage of Dillingham Hunters and Trappers Ever Using Each Area.

TABLE 19. LEVELS OF HOUSEHOLD HARVEST AND USE OF FISH, GAME, AND PLANT RESOURCES, DILLINGHAM, 1984. N = 153

Resource	% used	% attempt harvest	% harvested	% gave away	% received	mean hh harvest, lbs	total sample harvest, numbers*
King Salmon	83.7	57.5	56.9	27.5	36.6	156.1	1,571
Red Salmon	67.3	50.3	49.7	23.5	26.1	113.7	3,625
Chum Salmon	23.5	18.3	18.3	7.2	8.5	13.3	415
Pink Salmon	29.4	20.3	20.3	8.5	11.1	12.3	698
Silver Salmon	61.4	47.1	45.8	17.0	25.5	60.4	1,926
Salmon, Unknown	9.8	7.2	7.2	2.6	4.6	61.9	1,973
Smelt	37.3	22.2	21.6	12.4	22.2	12.0	61b
Herring	15.7	11.8	11.8	2.6	9.2	9.0	46b
Herring Roe	22.2	10.5	10.5	5.9	13.1	14.1	54b
Whitefish	13.7	7.8	5.9	2.0	8.5	.9	132
Rainbow Trout	39.2	29.4	27.5	5.2	9.8	3.8	420
Lake/Togiak Trout	11.8	7.2	5.9	.7	4.6	1.1	61
Grayling	28.8	20.3	19.6	2.6	9.2	1.2	269
Dolly Varden	37.3	31.4	29.4	6.5	9.8	6.0	661
Burbot	2.0	2.0	2.0	1.3	2.0	.2	26
Pike	25.5	19.0	17.0	5.9	7.8	3.2	177
Blackfish	3.9	.7	.7	0	2.6	.03	4
Butter Clam	9.8	8.5	8.5	3.3	3.9	2.1	21b
Razor Clam	5.2	2.6	2.6	.7	3.3	1.2	12b
Dungeness Crab	.7	.7	.7	NA	NA	.07	7
Other Fish	1.3	0	0	0	1.3	0	0
Caribou	69.9	26.8	22.2	15.0	54.9	82.4	84
Moose	61.4	32.0	16.3	12.4	49.0	88.2	25
Brown Bear	2.0	0	0	0	2.0	0	0
Porcupine	19.0	12.4	11.1	3.3	10.5	2.8	53
Hare	11.1	6.5	5.2	1.3	7.2	.7	57
Harbor Seal	26.1	3.9	3.9	5.9	22.9	5.1	14
Other Seal	0	0	0	0	0	0	0
Walrus	3.9	1.3	.7	1.3	3.3	3.7	1
Sea Lion	.7	0	0	.7	.7	0	0
Belukha	4.6	0	0	.7	4.6	0	0
Beaver	22.9	6.5	5.9	4.6	17.6	20.5	157
Mink	2.6	2.6	2.6	0	0	NA	25
Fox	5.2	5.2	3.9	0	.7	NA	24
Wolf	2.6	2.6	2.0	0	0	NA	5
Wolverine	1.3	1.3	.7	0	0	NA	3
Land Otter	3.9	3.9	3.3	0	0	NA	19
Muskrat	2.0	2.0	2.0	0	0	NA	9
Lynx	0	0	0	0	0	0	0
Arctic Squirrel	0	0	0	0	0	0	0
Marten	2.0	2.0	2.0	0	.7	NA	82

TABLE 19. (Continued) LEVELS OF HOUSEHOLD HARVEST AND USE OF FISH, GAME, AND PLANT RESOURCES, DILLINGHAM, 1984. N = 153

Resource	% used	% attempt harvest	% harvested	% gave away	% received	mean hh harvest, lbs	total sample harvest, numbers
Spruce Grouse	49.0	40.5	39.2	15.0	17.6	5.7	871
Ptarmigan	31.4	19.6	19.0	7.2	19.6	2.5	546
Sea Ducks	15.7	11.8	11.1	5.9	8.5	5.3**	280
Other Ducks	15.0	12.4	12.4	3.9	5.2	NA	299
Geese #1	17.6	10.5	9.8	4.6	9.2	NA	73
Geese #2	.7	.7	.7	0	0	NA	2
Geese #3	.7	.7	.7	0	0	NA	2
Total Geese			-			2.0	77
Cranes	2.0	2.0	1.3	.7	1.3	.1	3
Swans	0	0	0	0	0	0	0
Seagull Eggs	13.7	9.8	9.2	5.2	9.8	NA	62
Murre Eggs	1.3	1.3	1.3	.7	.7	NA	4
Total Eggs			-			.02	66
Plants	15.0	12.4	NA	4.6	3.9	NA	NA
Berries	79.1	63.4	62.1	22.2	34.0	23.6	904 g

* Harvests are reported in numbers of fish or animals, except resources marked by "b" (five gallon buckets) or "g" (gallons).

** Includes all ducks.

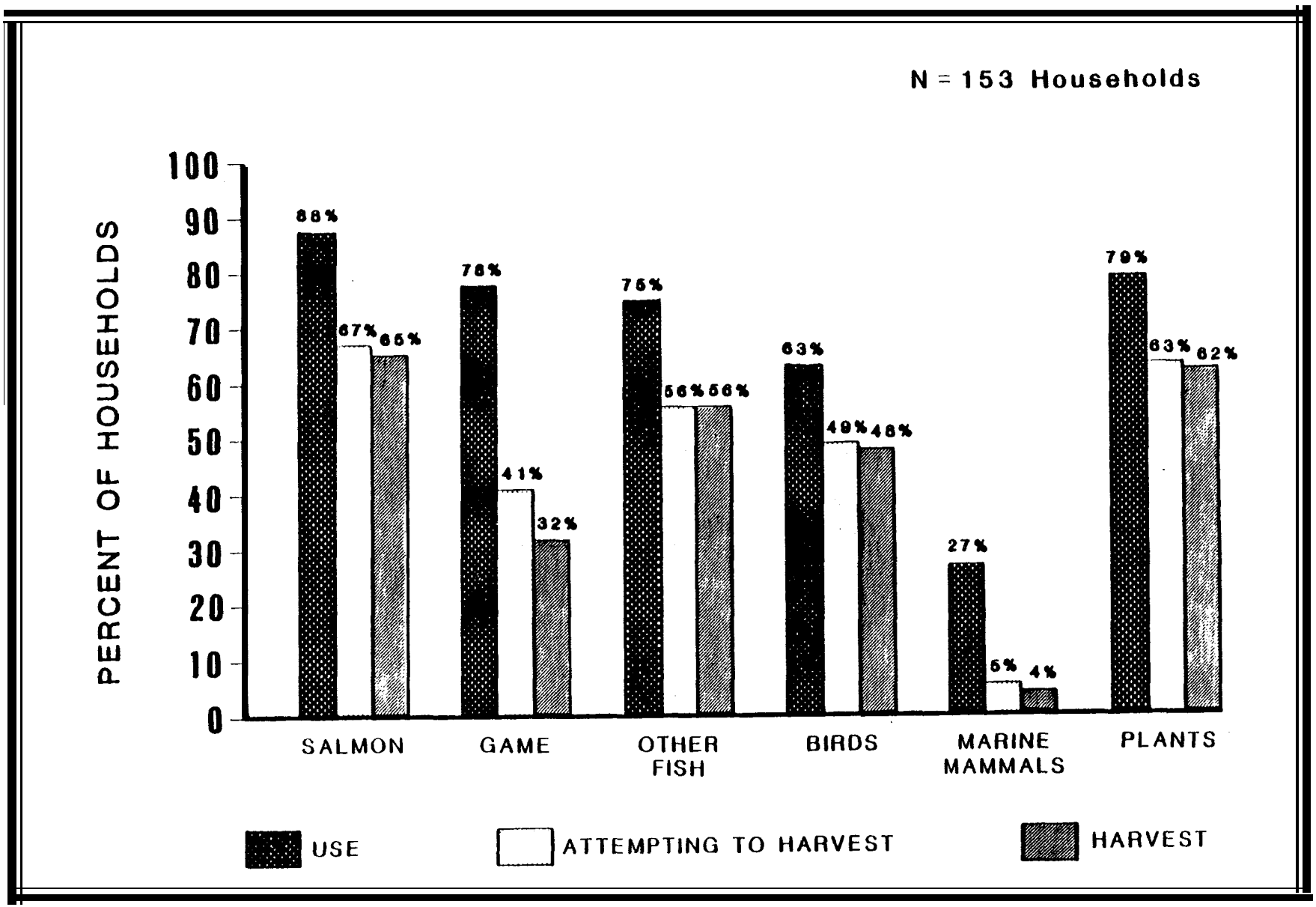


Figure 11. Percent of Sampled Households Using, Attempting to Harvest, and Harvesting Six Categories of Wild Resources, 1984.

percent), other fish (75 per cent), birds (63 percent), and marine mammals (27 percent).

Table 19 also reports the percentage of the sample that attempted to harvest each resource during 1984. In total, respondents attempted to harvest 46 resources. The most commonly sought resources were berries (63.4 percent), king salmon (57.5 percent), red salmon (50.3 percent), silver salmon (47.1 percent), spruce grouse (40.5 percent), moose (32 percent), Dolly Varden (31.4 percent), rainbow trout (29.4 percent), caribou (26.8 percent), and smelt (22.2 percent). Plants and salmon were the most widely sought resource categories (63 percent), followed by other fish (56 percent), birds (49 percent), game (41 per cent), and marine mammals (5 percent) (Fig. 11).

With a few exceptions, the most commonly harvested species were those most commonly sought (Table 19). In descending order, the resources taken by the most sampled households in 1984 were berries (62.1 percent), king salmon (56.9 percent), red salmon (49.7 percent), silver salmon (45.8 percent), spruce grouse (39.2 percent), Dolly Varden (29.4 percent), rainbow trout (27.5 percent), caribou (22.2 percent), smelt (21.6 percent), and pink salmon (20.3 percent). Notably, most households which attempted to harvest various species of fish, and caribou, were successful, but for moose, effort far exceeded success: 16.3 percent of the sample harvested moose, but twice as many, 32 percent, hunted moose. These findings are further illustrated in Figure 10, showing that 65 percent of the households harvested any salmon species, 62 percent harvested plants, 56 percent took other fish, 48 percent harvested birds, 32 percent took game, and four percent harvested marine mammals.

The average number of resources harvested by the sampled households was six. Twenty households (13 percent) harvested no fish, game, or plant species, 61 (40 percent) took one to five, 44 (29 percent) took six to ten,

and 28 (18 percent) took more than ten kinds of resources. The maximum number of resources harvested by any sampled household was 26.

HARVEST QUANTITIES

The mean household harvest of wild resources in 1984 for the 153 sampled households was 715 pounds usable weight. The per capita harvest was 242 pounds. Seven resources contributed 76 percent of the mean household harvest by weight. These were king salmon (156 pounds, 21.8 percent), red salmon (113.7 pounds, 15.9 percent), moose (88.2 pounds, 12.3 percent), caribou (82.4 pounds, 11.5 percent), silver salmon (60.4 pounds, 8.4 percent), berries (23.6 pounds, 3.3 percent), and beaver (20.5 pounds, 2.9 percent) (Table 19).

Figure 12 shows the portion of the total resource harvest contributed by six resource categories. With 58.4 percent of the total weight, salmon supplied most of the sample's harvest, followed by game (27.2 percent), other fish (7.7 percent), plants (3.3 percent), birds (2.2 percent), and marine mammals (1.2 percent).

As noted above, 13 percent of the sample did not participate in harvest activities. The range of participation and success in resource harvests is further illustrated by Figure 13. Forty six percent of the sampled households harvested 250 pounds or less of wild food. Relatively high harvests of over 1000 pounds were reported by 24 percent of the households. Six households (3.9 percent) took more than 3000 pounds of fish, game, and plants in 1984.

Figures 14, 15, and 16 illustrate further that most of the resource harvests in Dillingham were taken by a relatively small percentage of the sample. For example, while 65 percent of the 153 households harvested salmon, about 72 percent of the total salmon harvest was taken by 20 percent of the

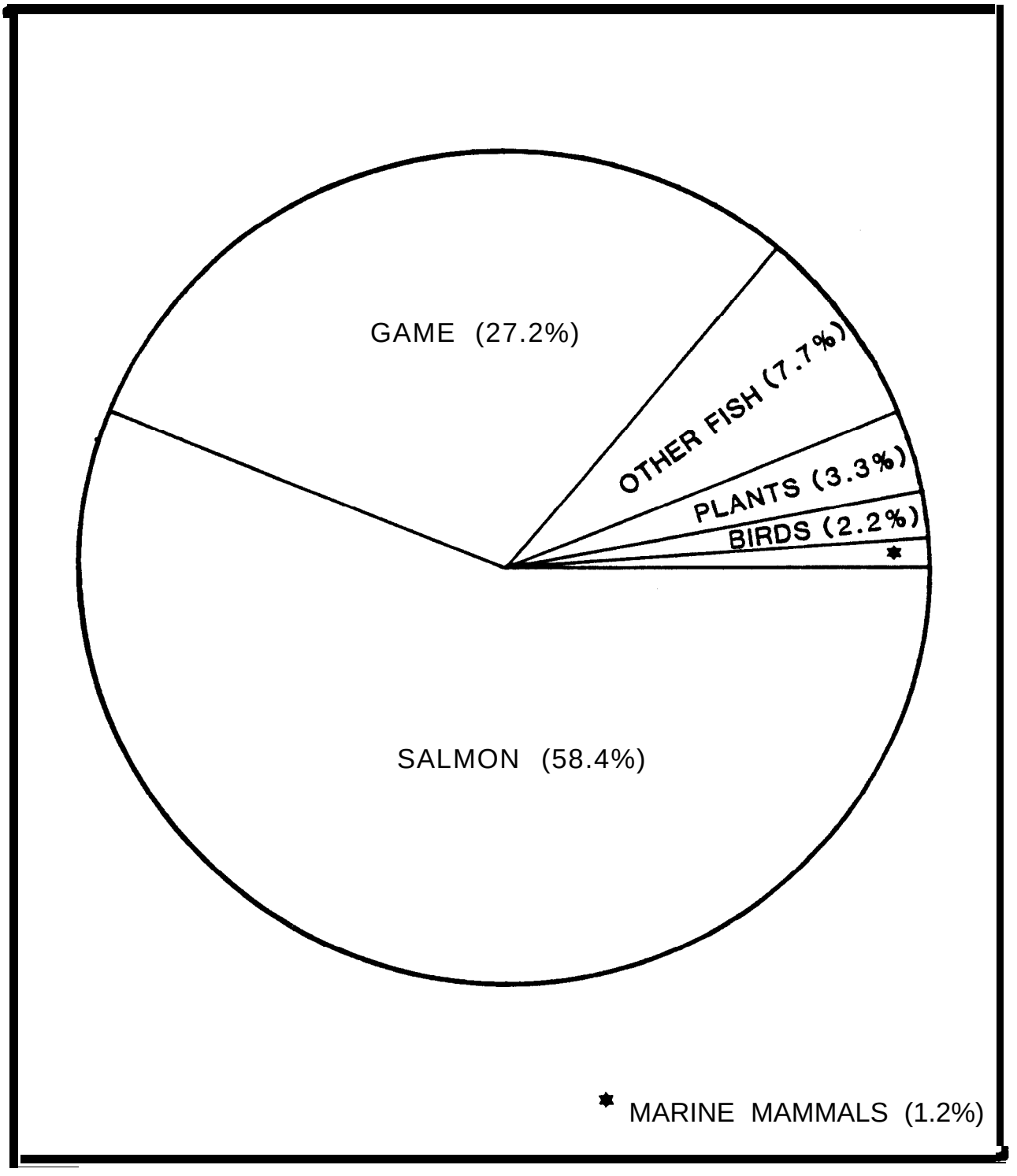


Figure 12. Composition of Wild Resource Harvest by Resource Category, Dillingham, 1984.

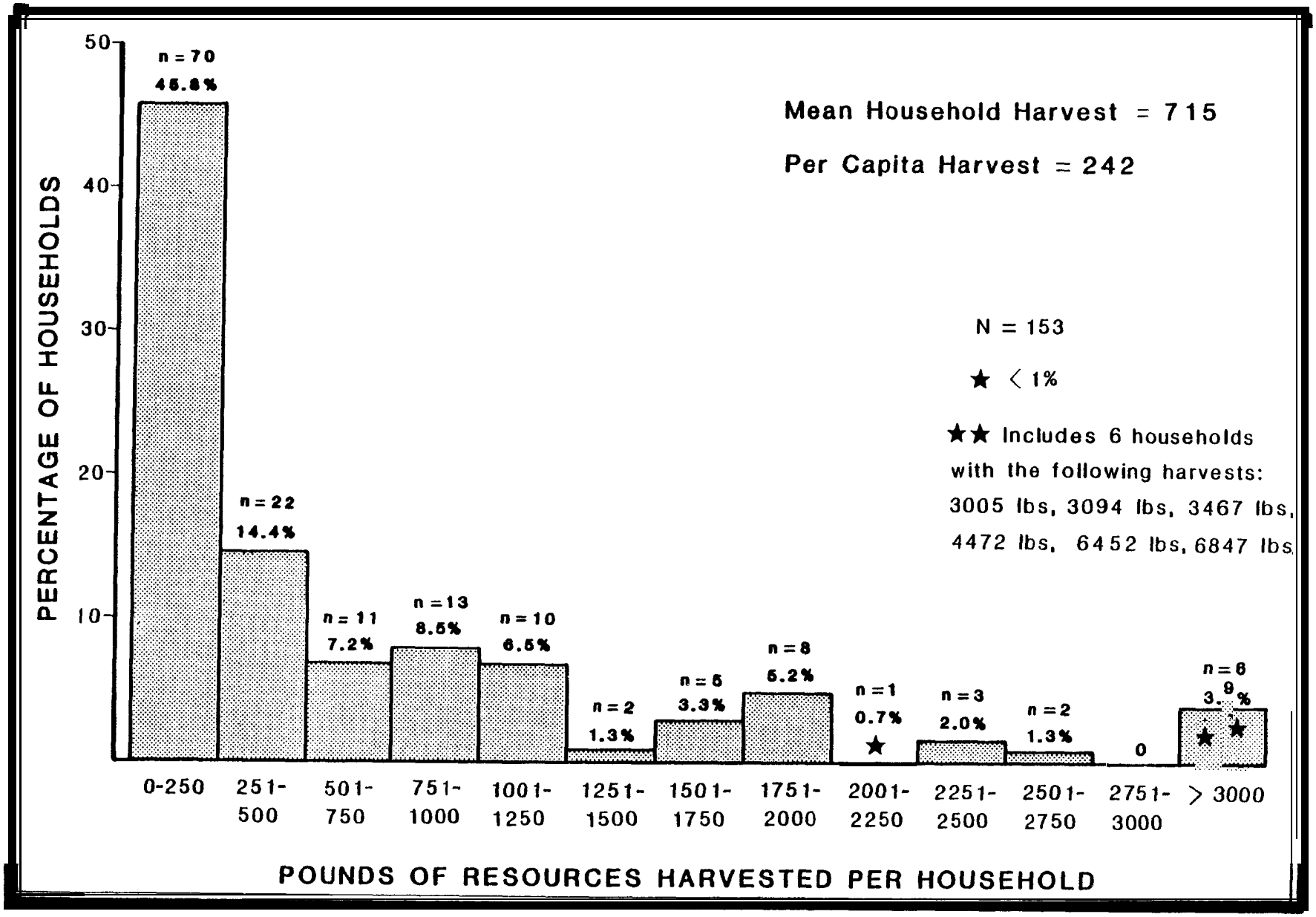


Figure 13. Household Harvests of Wild Resources, in Pounds Edible Weight, Dillingham, 1984.

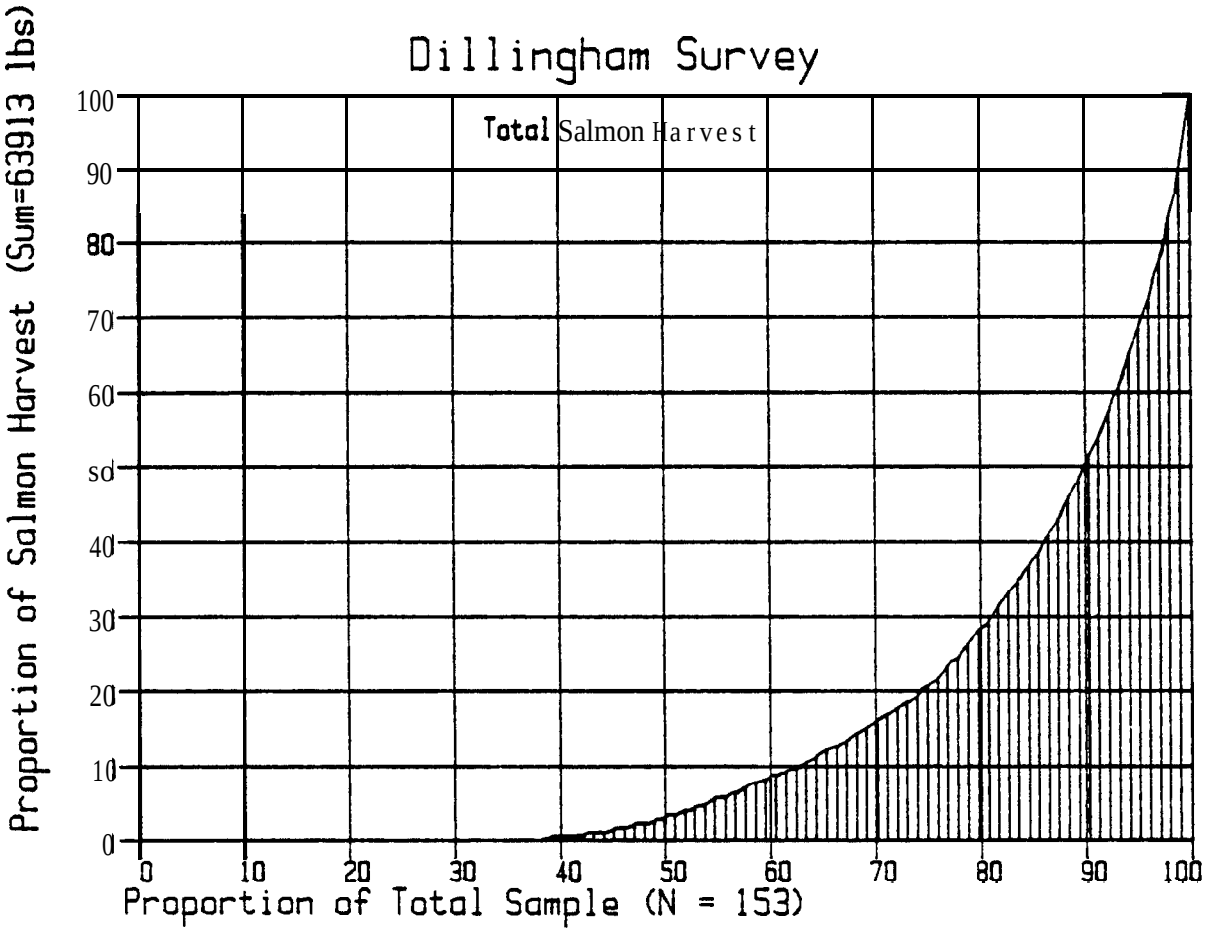


Figure 14. Proportion of Salmon Harvest Taken by Cumulative Percentage of the Sample.

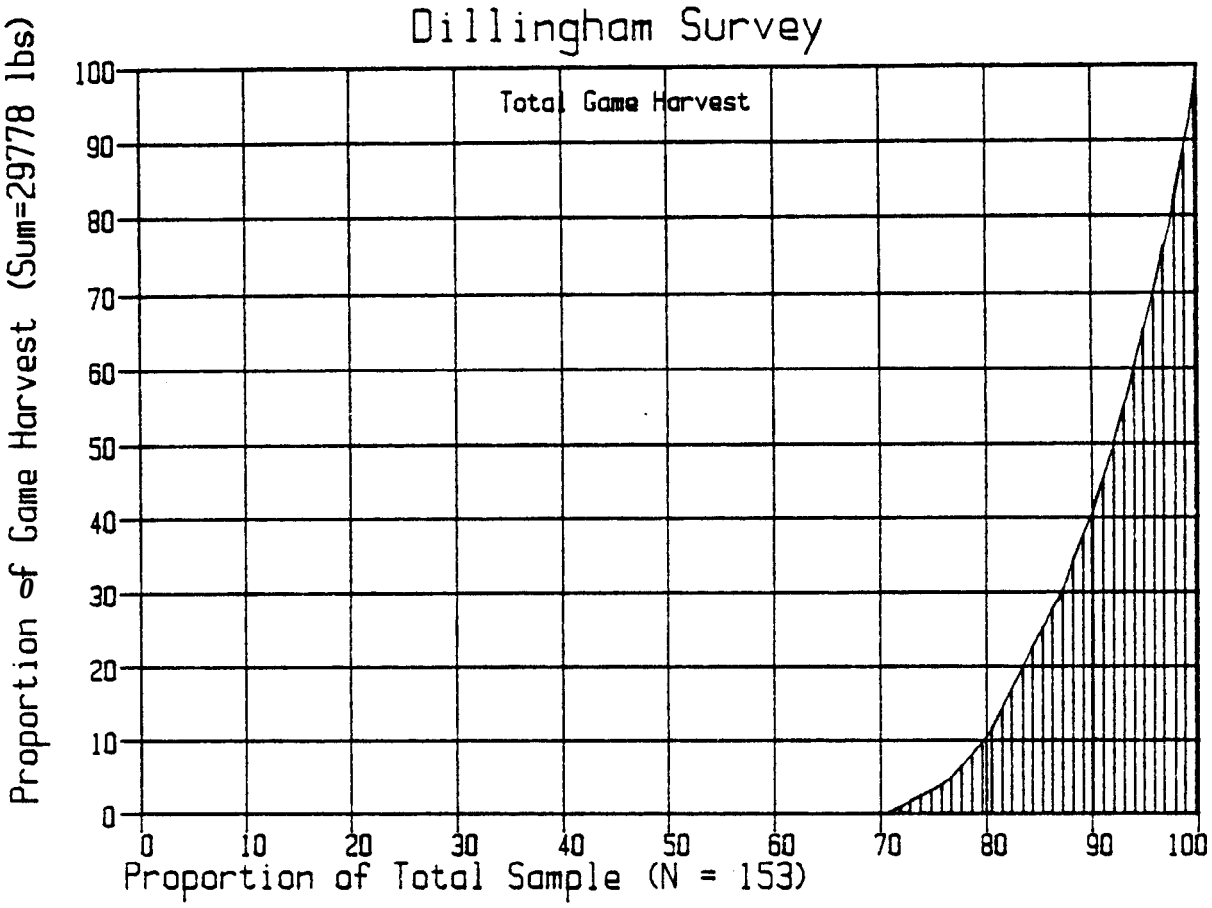


Figure 15. Proportion of Game Harvest Taken by Cumulative Percentage of the Sample.

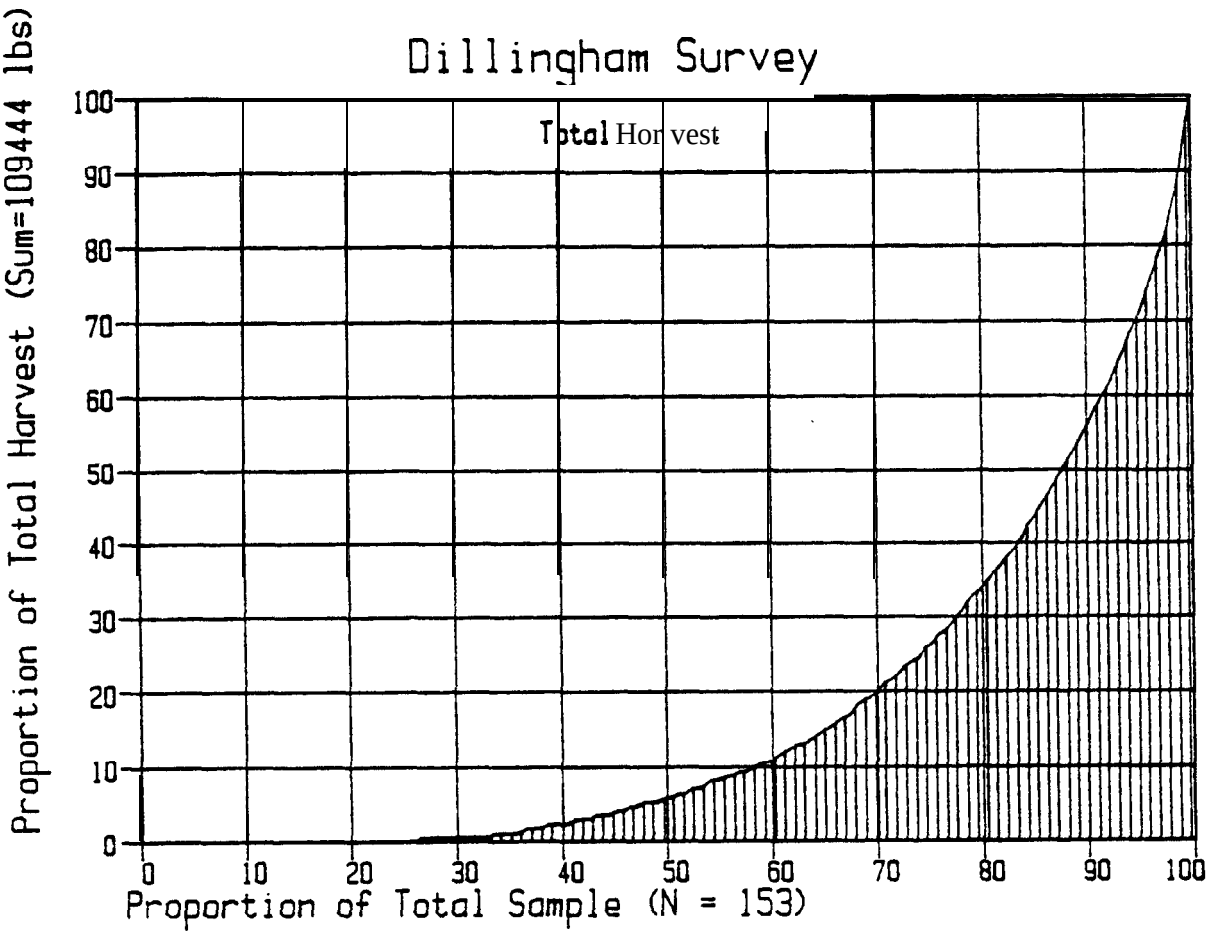


Figure 16. Proportion of Total Harvest Taken by Cumulative Percentage of the Sample.

households (Fig. 14). Specialization was even more evident for game, in that 10 percent of the sample took about 60 percent of the harvest as measured in pounds edible weight (Fig 15). Overall, 75 percent of Dillingham's non-*commercial* harvest in 1984 was taken by 25 percent of the households (Fig. 16). Thus, while a large majority of Dillingham's population used locally harvested fish and game in 1984, the harvest was accomplished by a much smaller segment of the population. This suggests that harvesting households share resources with non-harvesters (see next section). This also raises questions about the characteristics of harvesting and non-harvesting households which are addressed in Chapter 4.

RESOURCE SHARING AND RECEIVING

Table 19 provides evidence of active resource sharing networks in Dillingham. For example, 69.9 percent of the sampled households used caribou, but only 22.2 percent harvested this resource. Accordingly, 54.9 percent of the respondents said they received caribou from harvesters outside their household. Moose provides another example: 61.4 percent of the sample used moose, 16.3 percent harvested it, and 49 percent received moose meat from other households. A third example is harbor seal. While only 3.9 percent of the sampled households harvested seal, 22.9 percent received seal oil or meat. Thus, over one quarter of the sample, 26.1 percent, used this resource in 1984.

According to the survey results, the most commonly shared resources were, in descending order, caribou (54.9 percent), moose (49 percent), king salmon (36.6 percent), berries (34 percent), red salmon (26.1 percent), silver salmon (25.5 percent), harbor seal (22.9 percent), and smelt (22.2 percent).

Evidently, resources that could be harvested in large quantities (e.g. salmon) or provided a large quantity of meat or oil (e.g. caribou, moose, seal), were most likely to be shared. On the other hand, commonly harvested resources with relatively low bag limits or small sizes, such as rainbow trout, were shared much less frequently.

During the study period, resource distribution and exchange occurred among households in Dillingham, and between Dillingham households and residents of other Bristol Bay communities. This is the subject of a later section of the report.

COMPARISON OF 1973 AND 1984 HARVESTS

Table 20 presents the results of a resource harvest survey of 32 Dillingham households conducted in 1974 (Gasbarro and Utermohle 1974). The data refer to 1973 harvests. In that year, the sampled households took an average of 1,110.6 pounds of fish and game. The per capita harvest was 259.2 pounds. The resources which contributed the most to the household harvest in 1973 were king salmon (239.4 pounds), red salmon (198.2 pounds), moose (185.6 pounds), and caribou (168.8 pounds). As noted above, king salmon, red salmon, moose, and caribou were, by weight, the four major resources in 1984 as well.

Table 21 and Figure 17 further compare the 1973 and 1984 data. For comparative purposes, plants and berries have been deleted from the 1984 harvest totals, since quantitative information on these resources was not collected in 1973. In 1984, the harvest of fish, game, birds, and marine mammals in Dillingham was 691.7 pounds per household, and 234.1 pounds per capita. Thus, while household harvests between 1973 and 1984 evidently decreased, this is mostly a result of the larger household size of the 1973

TABLE 20. RESOURCE HARVESTS, DILLINGHAM, 1973

Resource	percent harvesting	total harvest	mean hh harvest lbs.	per capita harvest lbs.
Salmon[1]	75	3,039		
King	NA	453	198.2	46.3
Red	NA	1,915	239.4	55.9
Chum	NA	520	71.5	16.7
Pink	NA	0	0	0
Silver	NA	152	23.8	5.5
Smelt	NA	7,620	71.4	16.7
Herring	NA	900	11.3	2.6
Whitefish	62[2]	195	6.1	1.4
Rainbow trout	NA	1.57	6.9	1.6
Lake trout	NA	62	5.2	1.2
Grayling	NA	392	8.6	2.0
Char, Dolly Varden	NA	454	19.9	4.6
Pike	NA	187	16.4	3.8
Clams	22	NA	NA	NA
Caribou	34	36	168.8	39.4
Moose	34	11	185.6	43.4
Brown bear	NA	2	6.3	1.5
Porcupine	NA	18	4.5	1.1
Hare[3]	NA	122	7.6	1.8
Seals	3	3	5.3	1.2
Walrus	0	0	0	0
Sea Lion	0	0	0	0
Belukha	0	0	0	0
Beaver	9	21	13.1	3.1
Fox	NA	37		
Ptarmigan & Grouse	NA[4]	457	14.3	3.3
Ducks	41	286	12.5	2.9
Geese	NA	106	13.3	3.1
Swans	NA	2	.6	.1
Berries	62	NA	NA	NA
TOTAL			1,110.6	259.2

N = 32 households (14 percent) with 137 people

Source: Gasbarro and Utermohle 1974; Wright et al. 1985

[1] Reported as "salmon". Catch broken down by species proportional to the reported 1973 subsistence catch for the Nushagak district: red 63 percent; king, 14.9 percent; chum, 17.1 percent; pink, 0 percent; and coho, 5 percent (Wright et al. 1984:95).
[2] Percent of sample harvesting any freshwater fish.
[3] Assumed to be snowshoe hare.
[4] Percent of sample harvesting any waterfowl.

TABLE 21. COMPARISON OF FISH AND GAME HARVESTS OF DILLINGHAM RESIDENTS, 1973 and 1984

	1973			1984		
	% of sample harvesting	Per capita harvest, pounds	% of total harvest	% of sample harvesting	Per capita harvest, pounds	% of total harvest
Salmon	75	124.4	48.0%	65	141.4	60.4%
Other fish	62[a]	33.7	13.0%	56	18.6	7.9%
Game	34[b]	90.7	35.0%	32	65.9	28.1%
Birds [c]	41	9.1	3.5%	48	5.3	2.3%
Marine mammals	3	1.3	.5%	4	3.0	1.3%
Plants	62 [d]	NA	NA	62	e	e
Total	--	259.2	--	--	234.1	--

a Percentage of households harvesting freshvater fish; participation data for marine fish not available.

b Caribou and moose, each 34 percent

c For 1973, only includes waterfowl

d Berries only

e Harvest total for plants deleted for comparative purposes

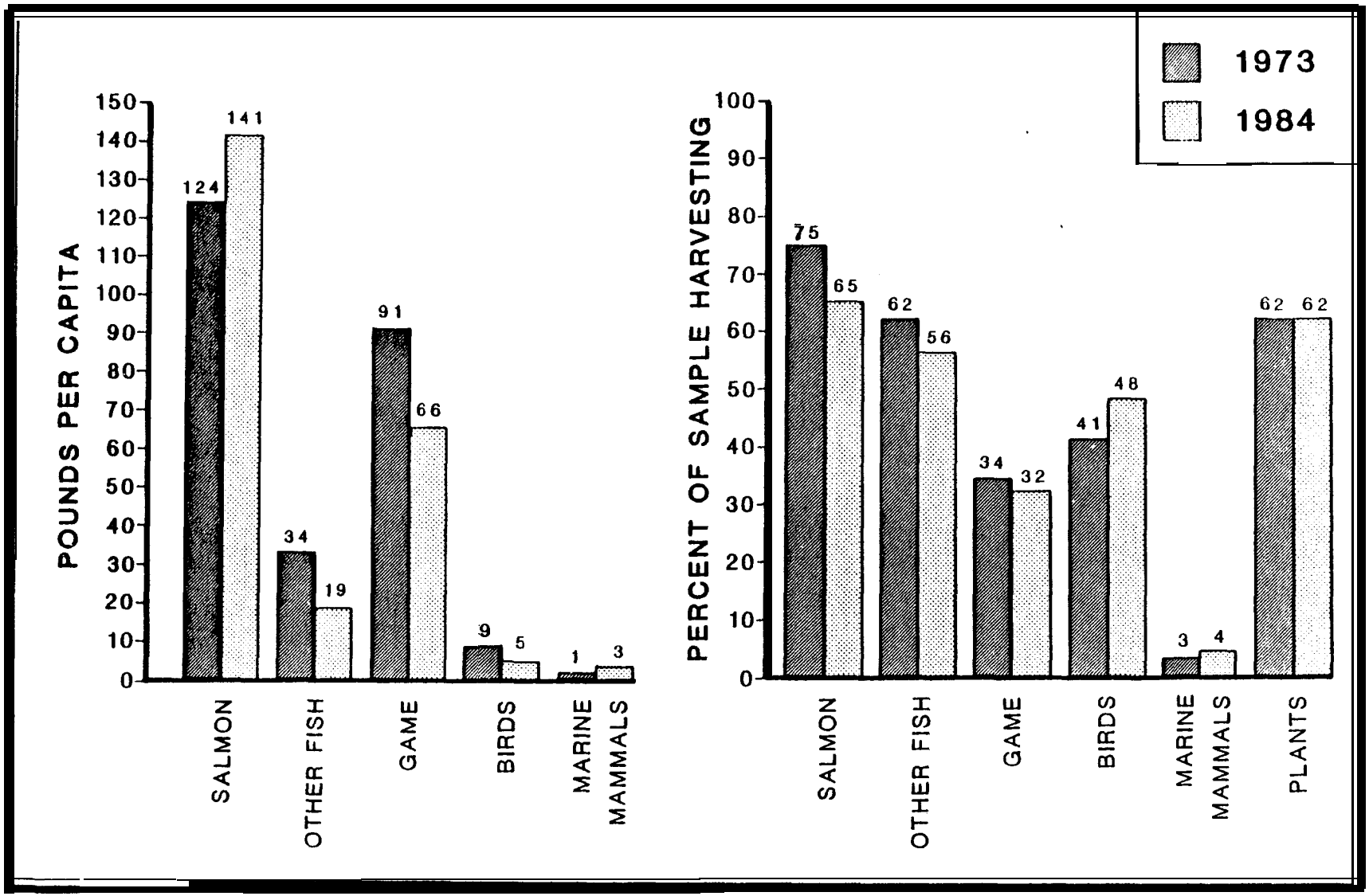


Figure 17 Comparison of Composition of Dillingham Non-Commercial Fish and Game Harvests in 1973 and 1984.

sample. The per capita production for the two samples was very similar (259.2 pounds in 1973; 234.1 pounds in 1984), suggesting little change in per capita harvest levels over the 11 year period. This also suggests that the total community harvest since 1973 has increased along with the city's population.

As shown in Table 21, levels of participation in six harvest activities -- salmon fishing, other fishing, game hunting, bird hunting, marine mammal hunting, and plant gathering -- were also quite similar in the two years. For example, 75 percent of the sample in 1973 harvested salmon, while in 1984, 65 percent did so; in 1973, 62 percent of the sampled households took other fish, and 56 percent did so in 1984; 34 percent harvested game in 1973, 32 percent in 1984.

Table 21 also shows, however, that the composition of the non-commercial fish and game harvest in Dillingham changed slightly over the 11 year period. In 1973, salmon composed 48 percent of the harvest by weight, while in 1984 this share increased to 60.4 percent. Conversely, the proportion of game dropped from 35 to 28.1 percent, other fish dropped from 13 percent to 7.9 percent, and birds dropped from 3.5 to 2.3 percent of the harvest. Marine mammals increased slightly, from .5 percent to 1.3 percent.

As noted in Chapter 2, the population of Dillingham has changed since the early 1970s; a larger group of people who were not born in the Bristol Bay region now live in the community. That the level of harvest in Dillingham has not declined greatly suggests that newcomers have been socialized into resource use activities. Another possibility, not contradicting the first, is that some immigrants to Dillingham were pre-adapted to the sociocultural conditions there through their involvement in hunting and fishing activities elsewhere. Those people who do not participate in hunting and fishing do not

choose to remain in the area for more than a few years. (This topic is discussed further in Chapter 4.)

REGIONAL DISTRIBUTION AND EXCHANGE

Table 19 demonstrated that in 1984 Dillingham households received many fish and wildlife resources from other harvesters. While much of this sharing occurred between Dillingham households, resource distribution and exchange also occurred between Dillingham households and those of other Bristol Bay communities. During the 1985 research, interviewed households were asked about their sharing of 16 kinds of resources from other communities. The results, presented in Table 22, show an imbalance in the exchange of resources between Dillingham, the regional center, and other communities. For all resources, the percentage of the sample receiving the resource from other communities was at least double the percentage that sent resources to other communities. The difference was especially high for two big game species, caribou and moose, which were the resources most commonly received from other communities. Only six percent of the sampled Dillingham households sent caribou meat to friends and relatives living outside Dillingham, but 25 percent received caribou meat from other communities. The pattern was similar for moose: five percent sent moose meat outside Dillingham, and 21 percent received moose meat from households living in other communities. Seal oil is a third example of this apparent imbalance. Only three percent of the Dillingham households sent this resource outside the community, but 18 percent received seal oil from non-Dillingham households.

Dillingham households which received resources from friends and relatives

TABLE 22. PERCENTAGE OF SAMPLED DILLINGHAM HOUSEHOLDS ENGAGED IN SHARING SELECTED WILD RESOURCES WITH OTHER COMMUNITIES.
N= 153

Resource	% of. Dillingham sample sending resource to other communities	% of Dillingham sample receiving resource from other communities	% sending or receiving resource from other communities
Beaver	4	11	13
Belukha	1	6	6
Berries	6	12	14
Caribou	6	25	27
Clams	3	6	8
Freshwater Fish	3	a	8
Herring	3	8	9
Moose	5	21	23
Ptarmigan	3	7	a
Salmon	8	17	20
Salted Salmon Heads	3	7	8
Seal Lion	0	4	4
Seal Meat	3	10	10
Seal Oil	3	18	18
Smelt	5	10	12
Walrus	0	5	5
Any Resource	14	33	33

reciprocated in several ways. Residents of other villages regularly visit the regional center for a variety of reasons, including shopping, medical care, and attending festivals such as Beaver Round-Up and the BBNA convention. During these visits, they usually find lodging with friends and relatives in Dillingham. For example, 54 percent of the interviewed Dillingham households reported that they had house guests from other Bristol Bay communities either "regularly" or "sometimes" during the year. Gifts of.resources from villages occurred during these visits. Reciprocity could also take the form of providing transportation to village visitors, cash loans, or running errands in Dillingham for people living elsewhere.

Survey respondents were also asked to name the villages with which they shared four resources: moose, caribou, salmon, and marine mammals. The results show that exchange occurred most frequently with Nushagak River villages, and secondarily with Togiak and Manokotak. For example, of the 75 cases of receiving either moose or caribou, 50 (67 percent) involved the Nushagak River villages of Portage Creek, Ekwok, New Stuyahok, or Koliganek. Eight (11 percent) involved Aleknagik, and 7 (9 percent) involved Togiak or Manokotak. Other communities mentioned were Levelock (four cases), Pilot Point (two cases), Kenai Peninsula (two cases), Ekuk (one case), and Clark's Point (one case).

Not surprisingly, coastal villages played a prominent role as a source of marine mammal products for Dillingham residents. Of 24 cases of receiving marine mammal products from outside Dillingham, 17 involved Togiak, Clark's Point, Manokotak, or Twin Hills.

The sample reported 49 cases of sharing salmon with households from other communities. Unlike big game and marine mammals, the majority (51 percent) of these involved Dillingham households sending the resource outside

the community. The most common recipients of salmon from Dillingham were people living "outside" (40 percent) and in Anchorage (36 percent).

HARVEST AND USE PATTERNS BY RESOURCE CATEGORY

This section provides more detailed information about harvest and use of each category of wild resources by Dillingham residents in 1984. Included are the results of key respondent interviews and case examples of households' hunting and fishing activities.

Salmon

Five species of salmon enter the Nushagak River drainage, each arriving at a different time and in different run strengths. Runs of king salmon appear first, beginning in late May, and usually peak by the end of June. Kings are highly prized by commercial, subsistence, and sport fishermen. Sockeye (red) salmon are the most abundant species and the next to arrive after the kings. The peak of the sockeye run usually occurs in early July. Sockeyes are important to commercial and subsistence users. Chums, locally known as dog salmon, begin returning to the Nushagak River in late June along with the sockeyes. They are usually caught incidentally with the targeted kings and sockeyes. Pink salmon return strongly to the Nushagak River in even-numbered years in the latter part of July. Due to their soft flesh they are not targeted by subsistence fishermen, nor are pinks a prized commercial species, but they are harvested by some when an acceptable price is offered. The last salmon to arrive are the cohos, or silver salmon, in early August. This species is sought by all user groups.

Salmon Harvest Methods

As noted previously, salmon were harvested by 65 percent of the sample in 1984. Salmon comprised 58.4 percent of the resource harvest, by far the largest proportion of any resource category. Table 23 demonstrates that the vast majority of salmon for home use were harvested in subsistence nets (82.9 percent). Over 11 percent of the salmon harvest was obtained from families' commercial catches, but only 3.2 percent of the catch was taken with rod and reel. "Other methods" contributed 2.4 percent of the catch.

As detailed in Chapter 2, the commercial salmon industry is the mainstay of the Bristol Bay economy. The commercial season runs from June through September, with the major effort taking place from mid-June to Mid-July during the king and sockeye runs. Coho salmon are fished in August and into September. About 44 percent of the sampled households fished commercially in 1984.

Rod and reel ("sport") fishing provided 3.2 percent of Dillingham residents salmon catch for home use in 1984. Silvers, pinks, and kings were the species most frequently harvested by this method, but for no species did rod and reel fishing account for more than 10 percent of the harvest. In interviews with key respondents about their harvest methods, all the residents who had not been born in the Bristol Bay region spoke about rod and reel fishing. Most of these people had fished with rod and reel before moving to Dillingham, and had looked forward to good sport fishing when relocating there. One respondent, when asked how frequently he fished with rod and reel, answered enthusiastically, "Every available weekend from break-up to November." Another couple said they preferred to fish with rod and reel

TABLE 23. SALMON HARVEST BY GEAR TYPE, DILLINGHAM SAMPLE, 1984[a]

	Number removed from commercial catch	Number, subsistence set net	Number, rod and reel	Number, other	Total
King	345 (22%)	1,122 (71%)	48 (3%)	56 (4%)	1,571 (15.4%)
Sockeye	527 (15%)	2,939 (81%)	39 (1%)	120 (3%)	3,625 (35.5%)
Chum	27 (6%)	380 (92%)	8 (2%)	0	415 (4.1%)
Pink	35 (5%)	615 (88%)	48 (7%)	0	698 (6.8%)
Silver	247 (13%)	1,432 (75%)	179 (9%)	68 (4%)	1,926 (19.3%)
Unknown	0	1,973 (100%)	0	0	1,973 (19.3%)
TOTAL	1,181 (11.6%)	8,461 (82.9%)	322 (3.2%)	244 (2.4%)	10,208

[a] N= 153 households included in 1984 Division of Subsistence survey.

because they enjoyed the trips involved. They also believed they could regulate the amount of their harvest more easily than with a set net. Although locally born respondents also did some rod and reel fishing, none of them mentioned it as an important source of salmon. All of these key respondents preferred the efficiency of set nets.

Rod and reel fishing for salmon required a ***sport*** fishing license. Seasons, catch, and possession limits are summarized in Table 24. No other fishing methods were specifically reported by suweyed households, but the "other methods" category (Table 23) included dipnetting or fishing with hook and line for spawned-out fish.

Subsistence Salmon Fishing Regulations

During 1984, any state resident was allowed to obtain salmon for subsistence purposes in the Nushagak District (Fig. 18) provided they obtained a permit, without charge, from the Alaska Department of Fish and Game. Each household was issued only one permit and was required to report their daily harvests at the end of the season. In the Nushagak District, no harvest limits were imposed on any species. Forty percent of the households in the sample obtained subsistence fishing permits in 1984. The Department of Fish and Game issued 261 subsistence fishing permits to Dillingham households that year.

In the Nushagak commercial fishing district, salmon could only be taken during open weekly commercial salmon fishing periods. In most areas of Bristol Bay outside of the commercial fishing districts, subsistence salmon fishing was open all year in 1984. However, during the period from June 16 to July 17, special regulations were in effect in the portion of the Nushagak

TABLE 24. SPORT FISHING REGULATIONS FOR THE NUSHAGAK AND WOOD-TIKCHIK DRAINAGES

	Catch Limit [a]			
	King Salmon	Other Salmon	Rainbow Trout	Other
All areas except the Agulapak	5 per day 5 in possession, only 2 over 28"	5 per day 5 in poss. no size limit	6/8 - 10/30 2 per day 2 in poss. only 1 over 20" 11/1 - 6/17 5 per day 5 in poss. only 1 over 20"	Char - 10 per day, 10 in poss. no size limit Grayling - 5 per day 5 in poss. no size limit Other no bag, no poss., or size limit
Agulapak River	same as above	same as above	may not be in possession; all must be released immediately	same as above

[a] Notwithstanding the bag and possession limits set out for each species, the total aggregate bag and possession limit may not exceed ten fish per person.

Source: Alaska Department of Fish and Game 1984b.

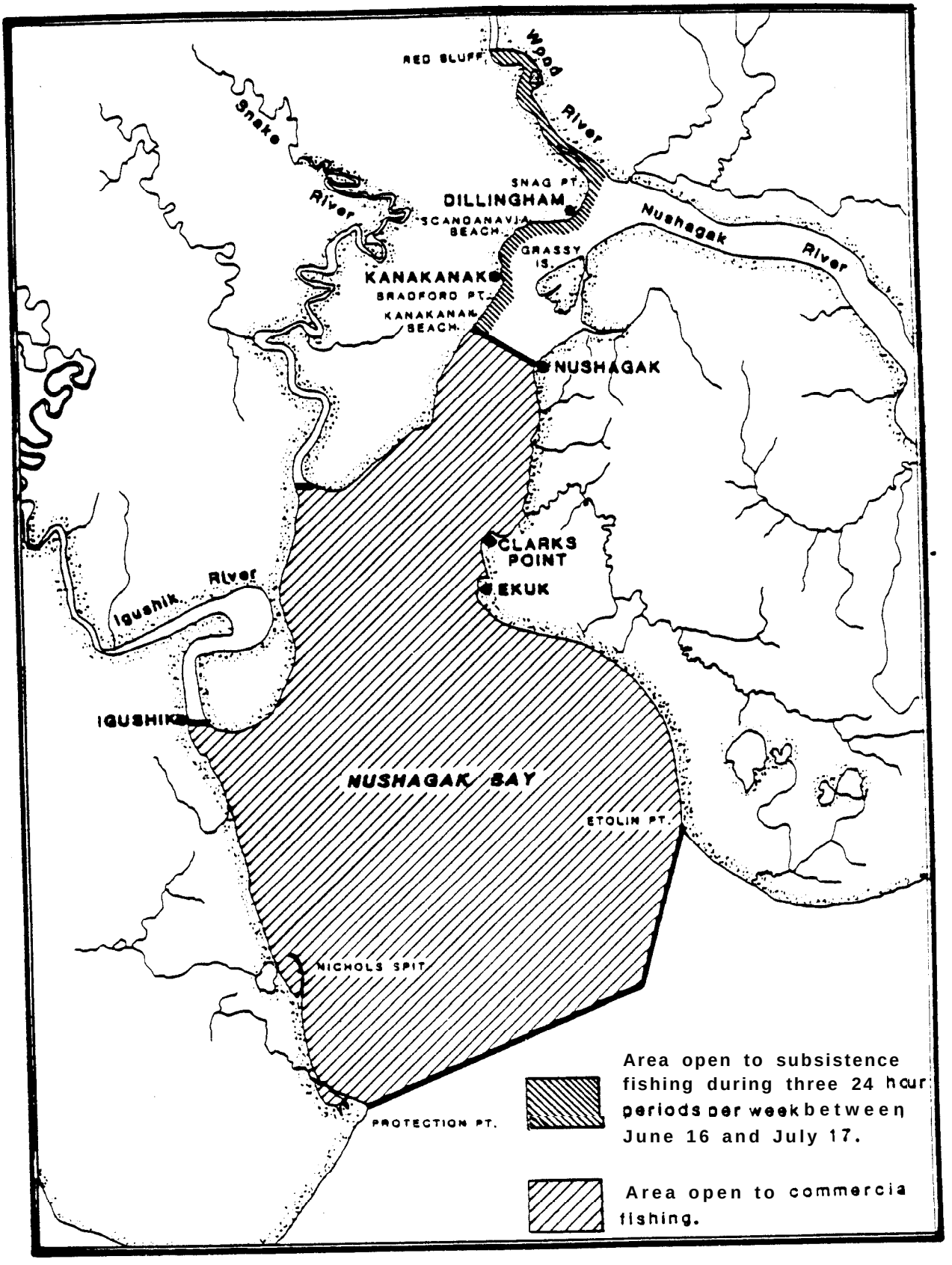


Figure 18. Subsistence Fishing Locations, Dillingham Area.

River drainage between the regulatory marker two miles below Bradford Point to a marker at Red Bluff on the west shore of Wood River. In this area, subsistence salmon fishing was open only from 9:00 a.m. Monday to 9:00 a.m. Tuesday, 9:00 a.m. Wednesday to 9:00 a.m. Thursday and 9:00 a.m. Friday to 9:00 p.m. Saturday during that period (Alaska Department of Fish and Game 1984d:13). All the beaches within the Dillingham city limits fall within this area.

Within the Nushagak District, subsistence salmon could only be taken by drift and set gill nets. In most of the district, up to 25 fathoms of gillnet was allowed with at least 300 yards required between sites. Between the regulatory markers described above, the maximum was 10 fathoms of net with a minimum spacing of 100 yards between sites. Outside of the commercial fishing districts, gillnets were the only permissible subsistence gear for salmon. The nets had to be staked and buoyed and no net was permitted to obstruct more than one half the width of a stream. No person was permitted to operate subsistence gear and commercial gear simultaneously.

Subsistence Fishing Locations

Subsistence gill nets most frequently had mesh which measured 8 1/4 inches (king gear) or 5 1/4 inches (red gear). Most people, especially those not involved in commercial fishing, set subsistence gill nets at three primary locations within the city limits of Dillingham. The largest and most popular was Kanakanak Beach, approximately six miles south of the city center. "Never a summer passes that we don't put up salmon and other fish...We set out our nets at Kanakanak or wherever we can find a place...," a long term Dillingham resident told the researchers. It was relatively easy to set and

pick nets at Kanakanak since a road provided good access and the sloping gravel beach enabled fishermen to drive vehicles to the sites. Another important fishing site was Scandinavia Beach, about 1/4 mile south of the city center. A local cannery road provided access for setnetters. Snag Point, just north of the city's center, was the third major fishing location within the city limits. Unlike the other two, its beach was only accessible by all terrain vehicles. A few families also set nets at various points along the Wood River or near the city dock. Occasional use was also made of areas north and east of Dillingham, including Grassy Island, where subsistence fishing was allowed seven days per week (Fig. 18).

In recent years, competition for sites within Dillingham has become more common as the community's population has grown. Table 25 shows that the number of subsistence permit holders in the Nushagak District increased from 121 in 1965 to 438 in 1984. One respondent who began fishing at Kanakanak in 1977 told the researchers, "(It) used to be you could just put out a net when you wanted to (fish) and avoid the peak of the run. Now you have to catch sticks for several weeks to ensure you'll have a site when the fish come." In 1984 the problem was usually solved by sharing sites, concurrently or consecutively. In this manner, everyone eventually found a place to fish.

A second set of subsistence fishing locations was used during June and July. A number of Dillingham families moved to fish camps along Nushagak Bay, particularly at Ekuk, Igushik, Nushagak, and Clark's Point. There, they participated in both the commercial and subsistence salmon fisheries. These camps were equipped with cabins, outhouses, drying racks, and smokehouses. Some families also had steambath houses at their camps. Obtaining safe drinking water at the camps is a problem because of the presence of ghiardia

TABLE 25. SUBSISTENCE SALMON HARVESTS, NUSHAGAK DISTRICT, 1965-1986

Year	Permits Issued	Number of Fish[a]						Harvest in Dillingham Area[c]
		Sockeye	King	Chum	Pink	Coho	Total	
1965	121	47,500	4,600	18,400	2 0 0	5,400	76,100	42,200
66	110	23,600	3,700	6,000	4,900	2,400	40,600	19,000
67	128	34,900	3,700	14,000	800	4,000	57,400	34,700
68	115	30,000	6,600	8,600	5,800	1,900	52,900	31,400
69	162	27,700	7,100	8,200	100	7,100	50,200	33,500
1970	147	41,100	6,300	9,400	1,500	900	59,200	33,300
71	164	42.400	4,400	4,200	0	2,300	53,300	18,100
72	168	24,100	4,000	8,200	1,200	1,000	38,500	12,600
73	216	28,000	6,600	7,600	100	2,200	44,500	19,700
74	261	41,200	7,900	10,200	4,300	4,700	68,300	23,900
1975	340	47’300	7,100	5,600	1,300	4,300	65,600	22,100
76	317	34,700	6,900	7,200	2,700	2,100	53,600	17,700
77	306	43,300	5,200	7,300	200	4,500	60,500	15,700
78	331	33,200	6,600	14,300	11,100	2,500	67,700	27,700
79	364	40,200	8,900	6,800	500	5,200	61,600	20,600
1980	425	76,800	11,800	11,700	7,600	5,100	113,000	47,900
81	395	44,600	11,500	10,200	2,300	8,700	77.300	23,900
82	376	34,700	12,100	11,400	7,300	8,900	74,400	24,700
a3	389	38,400	11,800	9,200	500	5,200	65,100	20,100
84	438	43,200	9,800	10,300	6,600	8,100	78,000	30,500
1985	383	37,000	8,000	4,400	700	5,400	55,500	16,900
86	426	49,500	12,900	10,000	5,400	9,400	87,200	25,700
22 Year Total	6,082	863,400	167,500	203,200	58,400[b]	92,000	1,400,500	561,900
22 Year Average	276	39,200	7,600	9,200	5,300[b]	4,200	63,400	25,500

[a] Estimates extrapolated from returned permits, rounded to nearest 100 fish.

[b] Even years only.

[c] Except for 1984, 1985, and 1986, includes harvests by non-residents of Dillingham who subsistence fished in the Dillingham area. Harvests for 1984, 1985, and 1986 are those of Dillingham residents only.

Source: Wright et al. 1985:100; Files, Division of Subsistence, Anchorage.

in local streams. Families collected rainwater or hauled water from Dillingham. Others risked using the local water supply from streams and wells. The cabins were heated with oil or wood stoves, and some families had their own electric generators. Camps near canneries had access to a wider range of facilities, including clinics, grocery stores, a water supply, laundromats, showers, and public phones.

Preferred Species, Processing, and Preservation Methods

As noted above, kings, sockeyes, and cohos were the most frequently targeted species for subsistence, commercial, and sport uses. Chums and pinks were usually caught incidentally and were considered less desirable.

During the study period, there was a feeling of anticipation in the air as people began setting nets for king salmon at the end of May. In fact, the harvest of the first king and the name of the successful fisherman is always announced on the local news. A good-natured rivalry for this distinction existed between some local residents. Kings were used by a larger proportion of the sample (83.7 percent) than any other salmon species. About 57.5 percent of the households attempted to harvest kings and about 56.9 percent were successful.

When king salmon started "hitting the beach," they were frequently eaten fresh and widely shared. According to respondents, Yup'ik tradition holds that if "you share the first catch, you'll be lucky and catch more." Some kings were also frozen to be eaten later in the year. But the most preferred method for preserving kings was to prepare dried and smoked salmon "strips," a time consuming process. First, the fish were filleted and cut into thin strips, then soaked in a brine solution and hung to dry. When the strips

were well dried, they were hung in the smokehouse to be smoked by a smoldering fire until the skins turned golden. Smoking and drying time varied depending on weather and taste preference. When finished, the pieces were cut into smaller strips and stored by the bagful in freezers or caches. Most long term residents could not imagine themselves not preparing strips, and many newcomers also develop a taste for this traditional food. In fact, 33 percent of the sample owned drying racks and 47 percent possessed smokehouses. Since such facilities were commonly shared with other households, it is likely that an even larger percentage of the sampled households prepared dried and smoked salmon.

In addition to strips, king salmon were preserved in a variety of other ways. In one method, they were cleaned, filleted, partially dried, and then smoked while the filleted sections were still connected by the tail. When boiled to eat, these were called **egumcaat**. Kings, especially the heads, were also salted to make sulunaq. Heads were also cooked in chowder or fermented in the ground, creating a local delicacy known as "stinky heads" (tepa). Pickling and canning were other common methods of preserving king salmon.

Sockeye salmon, which were used by 67.3 percent of the sample and harvested by 49.7 percent, comprised an important part of the preserved salmon catch. Because they arrived in such large concentrations, sockeye salmon was a dependable resource and could be obtained in large quantities. In fact, many people even avoided setting nets near the peak of the run for fear of catching too many. Most frequently, sockeyes were split, dried, and smoked, but they were also eaten fresh, frozen, or salted (sulunaq). Spawned-out red salmon (savalleq), caught in September at Snake Lake or the Wood River lakes, was a favorite food for long term residents. Due to the low oil content, they dried easily. Prepared in this fashion, they were called tamaunaq and were

especially enjoyed by older people. The usual condiment with tamaunaq was seal oil.

Coho salmon were harvested by 45.8 percent of the sample and used by 61.4 percent. Cohos were a local favorite for freezing but were also eaten fresh, dried, smoked, or canned. If the king season was a poor one, silvers were considered the best substitute for preparing strips. Silver salmon heads were also eaten raw or fermented. These were considered the best salmon heads for boiling or fermenting because they are not as rich as those of king salmon.

As reported earlier, pinks and chums were most frequently caught incidentally. Chums were taken by 18.3 percent of the sample and pinks by 20.3 percent. About 23.5 percent of the sampled households used chums, and 29.4 percent used pinks. Because of their soft flesh, pinks were difficult to work with, but some spawned-outs were dried in the fall. Chums were sometimes dried for dog food, earning them the nickname of "dog salmon." Spawned-out chums were caught along with sockeyes in the fall and processed in the same manner. This species is also canned.

Marine Fish: Herring and Herring Spawn-on-Kelp

In 1984, herring were harvested for both commercial sale and subsistence use by Dillingham residents. The Bering Sea seasonally supports the world's largest herring population, which returns each spring to spawn along the coast between the Yukon and Kuskokwim rivers and on the east side of Togiak Bay as well as in Hagemeister Straight and along Cape Newenham. Spawning fish usually deposit their eggs on rockweed and eelgrass in intertidal and shallow subtidal waters.

Dillingham fishermen who participated in the herring fishery in 1984 traveled about 40 miles west to the Togiak District (Fig. 9). Many of the Native families had traditionally lived and camped in the Kulukak and Metervik Bay area in the spring, particularly former residents of Kulukak or Togiak. Subsistence fishing was usually done in conjunction with commercial activities. Commercial crews were most commonly composed of male relatives and friends. Many of their families traveled to the herring grounds during weekend closures of the commercial fishery to participate in subsistence activities. A few families camped in Kulukak and Metervik Bays for the duration of the herring season (Wright and Chythlook 1985:50-51).

Herring for subsistence use was either removed from the commercial catch or caught with non-commercial set gill nets. It was most often salted with the roe intact (melug) or split, dried, and smoked. The harvest of herring spawn-on-kelp (melucuaq) occurred within a week after spawning. It was usually picked by hand, though rakes and knives were occasionally used. No permits were required but only set gill nets were permitted for subsistence herring. No limits were imposed. Spawn-on-kelp was preserved by salting and freezing, and was served with seal oil as a condiment.

About 16 percent of the sampled households reported using herring in 1984. Eighteen households (11.8 percent) harvested this resource, for a total take of 230 gallons. About 22 percent of the households used spawn-on-kelp. The total harvest was 270 gallons by 16 households (10.5 percent of the sample).

Smelt

Boreal smelt are an anadromous species that migrates inshore and congregate near the mouths of rivers and streams during the winter (Peters et al. 1984:17). During the study period, "smelting" was a popular late winter subsistence activity for Dillingham residents who enjoyed jigging through the ice with hook and line. Smelt were also caught with seines or dipnets as the ice formed, usually in October. They were seined with small mesh gear in the fall along Dillingham beaches. No permit or license was required for jigging or seining. Of the sampled households, 15.7 percent reported using smelt in 1984. The total harvest was 305 gallons by 33 households (21.6 percent). Smelt were prepared in a variety of ways including fried, boiled, dried, or eaten frozen with seal oil.

Shellfish

Dillingham residents reported harvesting butter and razor clams in 1984. Butter clams are larger and easier to obtain. Although not available in the immediate Dillingham area, both species were usually harvested in the spring in conjunction with herring fishing (Fig. 7). There were no limits, closed seasons, or permitting requirements. Thirteen households (8.5 percent of the sample) harvested a total of 105 gallons of butter clams during the 1984 study period, while 9.8 percent of the sample reported using butter clams. Four households harvested 60 gallons of razor clams, and 5.2 percent of the sample used this species. Clams were eaten raw, fried, or used in chowders.

Freshwater Fish

Bristol Bay drainages are productive breeding grounds for a variety of freshwater fish species. Rainbow trout, Arctic char and Dolly Varden (these two closely related species will be collectively referred to as Dolly Varden, cf. ADF&G 1985d:239), Arctic grayling, and northern pike are found in all major Bristol Bay drainages. Bristol Bay rainbow trout are world renowned for their size and are prized by both local residents and non-local sportfishermen. Lake trout are abundant in many of the region's cold, clear, deep lakes as well as in some of the large clear rivers, glacial lakes, and tundra pools including the Tikchik drainage. Round, broad, and humpback whitefish are common in the Bristol Bay drainages as far south as Ugashik Lakes. Burbot are moderately abundant in the cool, deep lakes north of the Ugashik River.

Dillingham fishermen harvested eight kinds of freshwater fish resources during 1984. During the summer and fall, trout, Dolly Varden, and grayling were sought with rod and reel, with the most concentrated effort taking place along the Nushagak, Agulowak, and Agulukpak rivers. Whitefish were harvested with nets as the ice formed. Once freeze-up occurred, people jigged through the ice for Dollies and pike. Trout and Dolly Varden were harvested at Lake Aleknagik while Bear Lake and Okstukuk Lake were favored spots for pike. Some people put nets out throughout the winter for Dolly Varden and burbot, especially in Lake Aleknagik and other Wood River lakes. Lake trout were usually taken incidentally in nets in the Tikchik Lakes system or Togiak Lake. Also, whitefish were caught in nets in late fall and again in early spring along the Nushagak River (Fig, 8). One household harvested a small number of

blackfish. The systematic survey did not collect information on gear types used for non-salmon species.

All rod and reel fishing required a sport fishing license. Rainbow trout legally could be taken only under sport fishing regulations. These regulations are summarized in Table 24. The harvesting of char and other trout with nets required a subsistence permit. In Bristol Bay ice fishing was recognized as a subsistence activity by state regulations.

Dolly Varden/arctic char, rainbow trout, grayling, and pike were the fish harvested in the greatest numbers by the largest number of households (Table 19, Table 26). Whitefish, lake trout, burbot and blackfish were harvested by fewer households and in smaller numbers.

Freshwater fish were used in a variety of ways. Rainbow trout were most often eaten fresh. Dolly Varden were eaten fresh or dried and smoked. Whitefish and pike were eaten fresh or dried; whitefish were also smoked and fermented. Sometimes, lake trout were also fermented. Freshwater fish which were usually eaten frozen, including grayling, whitefish, and pike, were grouped in a category called aumlanaq, and were usually served with seal oil.

Moose

Moose is an important big game resource for Dillingham residents, second only to caribou in the extent of its use and first in terms of pounds harvested per household in 1984 (88.2 pounds). Most hunting by Dillingham residents takes place in Game Management Unit 17 along the Nushagak and Mulchatna rivers and in the Wood-Tikchik Lake system. During 1983, the Division of Game, ADF&G, conducted a winter moose census in portions of GMU 17c. The results indicated approximately 1,212 moose with an overall low to

TABLE 26. FRESHWATER FISH HARVESTS BY SAMPLED DILLINGHAM HOUSEHOLDS, 1984. N = 153

Species	% HH Harvesting	# of HH Harvesting	# fish caught	Average #/ sampled HH	Average #/per HH harvesting
Dolly Varden/ arctic char	29.4	45	661	4.3	14.7
Rainbow trout	27.5	42	420	2.8	10.0
Grayling	19.6	30	269	1.8	9.0
Pike	17.0	26	177	1.2	6.8
Whitefish	5.9	9	132	.9	14.7
Lake/Togiak trout	5.9	9	61	.4	6.8
Burbot	2.0	3	26	.2	8.7
Blackfish	.7	1	4	.03	4.0

moderate density of about .7 moose per square mile. In the Nushagak drainage portion of GMU 17B, estimates were similar at .6 to .9 moose per square mile. The Mulchatna drainage portion of 17B had a slightly higher density of 1 to 1.3 per square mile. A very low density of less than .1 per square mile was estimated for GMU 17A (ADF&G 1985d:135). Except for 17A, the moose population has been fairly stable in the 1980s and was slowly increasing in 1986 (Ken Taylor, ADF&G, Pers. Comm., 1986).

In the study year of 1984, state hunting regulations permitted a fall and winter hunting season for moose in portions of GMU 17B and C (Table 27). A hunting license was required. In designated areas, hunting was allowed by registration permit from August 20 through September 4. Permits were issued only from the Dillingham ADF&G office. Hunting for the remainder of the season required that the hunter obtain a harvest ticket from licensing agents or ADF&G. In all seasons, only bull moose could be taken, and each hunter was limited to a season limit of one bull.

In the fall season, Dillingham moose hunters traveled up river by skiffs or commercial fishing boats. Increasingly, Dillingham residents were beginning to fly to hunting areas in the fall. During the winter season, airplanes-and snowmachines were used to reach hunting areas. Harvest areas for the period from 1963 to 1983 are depicted in Figure 6, and Table 15 lists the frequency of use of specific areas in 1984. Moose were shot with high powered rifles. The meat was usually divided between partners in the field and then distributed again by individual hunters upon their return home. The meat was most commonly preserved by freezing, but some people dried some moose meat as well.

According to records maintained by ADF&G, 215 hunters obtained permits for the early fall moose hunt in 1984 (Table 28). Of these, 126 (58.6

TABLE 27. MOOSE HUNTING REGULATIONS, 1984 REGULATORY YEAR, GMU 17

Unit	Open Seasons	Bag Limit
17A	no open season	0
17B that portion which includes all drainages of the Mulchatna River, upstream from, and including, the Chilchitna River drainage	Sept. 5-15	1 Bull
Remainder 17B	Aug. 20 - Sept. 4 by registration permit; Sept. 5 - 15 Dec. 10 - 31	1 Bull
17C, that portion including the Iowithla drainage and Sunshine Valley	Aug. 20 - Sept. 4 by registration permit; Sept. 5 - 15	1 Bull
Remainder 17C	Aug. 20 - Sept. 4 by registration permit; Sept. 5 - 15 Dec. 10 - 31	1 Bull

Source: ADF&G 1984a:36-37

TABLE 28. MOOSE HARVESTS BY AREA OF RESIDENCE OF HUNTERS, GMU 17, 1984

Early Permit Hunt Area	Successful hunters	Unsuccessful hunters	Total hunters
Dillingham	24	102	126
Other Bristol Bay	13	55	68
Other Alaska	1	17	18
Non-Alaska Res.	2	1	3
Total	40	175	215

General Hunt Area	Successful hunters	Unsuccessful hunters	Total hunters
Dillingham	39	75	114
Other Bristol Bay	19	29	48
Other Alaska	21	49	70
Non-Alaska Res.	38	32	70
Unspecified Res.	1	1	2
Total	118	186	304

Source : Alaska Department of Fish and Game, Division of Game, Dillingham, unpublished data.

percent) were Dillingham residents, 68 (31.6 percent) were from other Bristol Bay communities, and 21 (9.8 percent) came from outside the region. Forty moose were taken; 24 by Dillingham hunters, 13 by other Bristol Bay residents, and 3 by non-local hunters. During the remainder of the 1984 hunting season, 304 people hunted moose in GMU 17; 114 of these hunters (37.5 percent) were from Dillingham, 48 (15.8 percent) from other Bristol Bay communities, and 140 (46.1 percent) from outside the region. Dillingham hunters harvested 39 moose during this general season, other Bristol Bay hunters took 19, and other hunters took 60. Of the total reported moose harvest of 158 in 1984, Dillingham hunters took 63, about 40 percent of the total. This figure may be an underestimate, because some successful hunters may not have reported their kills. Notably, the early season hunt was responsible for 34.8 percent of the moose harvested in Dillingham.

Of the 153 households surveyed during the division's study, 61.4 percent used moose meat in 1984. Moose was the fifth most frequently used resource after king salmon, berries, caribou, and red salmon. Thirty two percent of the sampled households hunted moose, and about half of these, 16.3 percent of the entire sample, were successful. These households reported a harvest of 25 moose in 1984. Expanded to a community total of 691 households, the estimated moose harvest in 1984 was 113 animals (+/- 36), more than the 63 estimated from harvest ticket returns. As noted above, many Dillingham households received moose meat from other Bristol Bay communities in 1984 (Table 22).

Caribou

During the 1984 study period, a larger percentage of the sampled Dillingham households used (69.9 percent) and harvested (22.2 percent) caribou

than any other big game species. With a harvest of 82.4 pounds per household, caribou contributed more to the wild resource harvest than any resource but king salmon, sockeye salmon, and moose (Table 19).

Over the last 20 years, Dillingham hunters have taken caribou from two major herds, the Mulchatna Herd and the Northern Alaska Peninsula Herd. The Mulchatna Herd roams the area generally west of the Alaska Range and north of Iliamna Lake, as far north as the Taylor Mountains and the Stoney River (ADF&G 1985d:117). The size of the Mulchatna Herd has fluctuated in the past, and historical data on the herd are limited. In the mid 1960s the herd was estimated at 3,000 to 5,000 animals (ADF&G 1985d:118-119). Census information for 1983 indicated a herd size of 26,000 animals. Since 1981, the herd has been growing at about 20 percent per year (Ken Taylor, ADF&G, Pers. Comm., 1986). The Mulchatna Herd reached a size of 42,900 caribou in 1985. Dillingham hunters harvest Mulchatna caribou in portions of GMUs 9B and 17.

The Northern Alaska Peninsula Herd ranges from the Naknek River south to Port Moller and numbered 20,000 animals in 1983 (ADF&G 1985d:117-118). There has been a relatively steady growth in this herd since the 1930s, although recently the population has stabilized (ADF&G 1985d:118-119; Ken Taylor, Pers. Comm., 1986). Hunting of this herd takes place in GMUs 9C and 9E.

The health of these two herds has allowed liberal hunting seasons and bag limits (Table 29). Regulations for the 1984-85 season authorized hunting in GMUs 9 and 17 from August 10 to March 31 with a season limit of three animals. Only one caribou could be taken before November 1, however. Regulations allowed caribou hunting in GMUs 9A and 9B from August 10 to September 4 and from September 26 to March 31. Limits were identical to those of GMU 17. For GMUs 9C, D, and E, the season extended from August 10 to March 31 with a

TABLE 29. CARIBOU HUNTING REGULATIONS, 1984 REGULATORY YEAR, GMUs 9 and 17

Unit	Open Seasons	Bag Limit
Units 9A & B	Aug. 10–Sept. 4 Dec. 26 – March 31	Three caribou; however, not more than one caribou may be taken before Nov. 1.
Units 9C, D, & E	Aug. 10 – March 31	Four caribou, however, not more than one may be taken from Sept. 1 – Oct. 31
Unit 17	Aug. 10 – March 31	Three caribou, however, not more than one may be taken before Nov. 1.

Source: ADF&G 1984a:26, 28

season limit of four caribou, but only one could be taken between September 1 and October 31.

In early fall, Dillingham hunters often combined caribou and moose hunting, traveling up the Nushagak and Mulchatna rivers to hunting areas by skiff or commercial boat. In winter, caribou hunters traveled by plane or snowmachine. Most travel to the Alaska Peninsula was by airplane although a few fishermen hunted caribou during their return from commercial fishing. Areas Dillingham residents used for caribou hunting from 1963 to 1983 are shown in Figure 5, and frequencies of use in 1984 are reported in Table 16. Caribou were shot with high powered rifles. The meat was usually divided between partners in the field and then distributed again at home by individual hunters. There, the meat was butchered, hung to dry, and then packaged into smaller portions. Most caribou meat was preserved by freezing, but some people continued to dry meat, especially in the spring. As with moose, many Dillingham households received caribou meat from friends and relatives in other Bristol Bay communities during the study period.

Furbearers

A variety of furbearers are present in the Bristol Bay area. Beavers are common throughout the region, and are particularly abundant in the Nushagak and Mulchatna drainages. The beaver population in GMU 17 increased steadily in the 1970s and 1980s, reversing an earlier decline that was attributed to overharvesting (ADF&G 1985d:90). Other common furbearers include land otter, mink, short tailed and least weasel, and red fox. Wolverine, lynx, and marten are widespread but less common. A few packs of wolves roam throughout the region (Peters et al. 1984:20). Muskrats and

arctic squirrels, locally called "parky squirrels," also inhabit the area. Tables 30 and 31 summarize trapping and hunting regulations for these species. Seasons were timed to coincide with pelt primeness. Although no systematic data were collected on harvests by hunting and trapping during the survey, it is likely that the vast majority of the furbearers taken by the sample were trapped since bullet holes decrease the value of the fur.

In 1984, sampled Dillingham households attempted to harvest eight species of furbearers, including beaver, mink, fox, wolf, wolverine, land otter, marten, and muskrat. Beaver and muskrat were taken for food as well as fur. Trapping occurred in areas adjacent to Dillingham, particularly in the Wood River Lakes system and the lower and middle Nushagak River (Fig. 7). The most common method of transportation to trapping areas was snowmachine, although all terrain vehicles were used during periods of poor snowcover.

Most furs were sold during the annual Beaver Round-Up Festival in early March when three buyers, two local and one from Seattle, purchase furs from Dillingham and other Bristol Bay trappers. Very few furs were sold through the mail or at auctions. Some households kept some furs to make clothing or craft items.

During 1984, 16.7 percent of the sample participated in trapping activities. Successful trappers harvested 157 beaver, 25 mink, 24 red fox, 5 wolf, 3 wolverine, 19 land otter, 9 muskrat, and 82 marten. Beaver was the species most often sought. Also, over 17 percent of the sample received beaver meat or fur from trappers in Dillingham or other Bristol Bay villages. No trappers reported harvesting lynx or parky (arctic ground) squirrels in the study year, but lynx are sometimes taken by Dillingham trappers (Ken Taylor, pers. comm. 1986). Some families engaged in parky squirrel hunting in the

TABLE 30. FURBEARER TRAPPING REGULATIONS, GMU 17, 1984

Species	Units	Open Seasons	Bag Limits
Beaver *	17A	Jan. 1 - Jan. 31	20 limit
	17B, 17C	Jan. 15 - March 15	
Fox, Red	17A, B, C	Nov. 10 - Feb 15	No limit
Lynx *	17A, B, C	Nov. 10 - March 31	No limit
Marten *	17A, B, C	Nov 10 - Jan. 31	No limit
Mink & Weasel	17A, B, C	Nov. 10 - June 10	No limit
Muskrat	17A, B, C	Nov. 10 - June 10	No limit
Otter, land *	17A, B, C	Nov. 10 - March 31	No limit
Wolf *	17A, B, C	Nov. 10 - March 31	No limit
Wolverine *	17A, B, C	Nov. 10 - March 31	No limit

* Sealing required

Source : ADF&G 1984c

TABLE 31. HUNTING REGULATIONS FOR FURBEARER SPECIES, GM-U 17, 1984

Species	Open Seasons	Bag Limits
Red fox	Nov. 1 - Feb 15	2
Lynx	Nov 1 - March 31	2
Wolf	Aug. 10 - April 30	4
Wolverine	Sept. 1 - March 31	1

NO OPEN SEASON: Beaver, land otter, marten, mink, weasel, muskrat,

Source: ADF&G 1984a:44-45

past and a few may still hunt this species. Parky squirrel furs were valued for making parkas and their meat was also eaten.

Other Small Mammals

Besides furbearers, other small mammals used by Dillingham residents included porcupine and hare. Both were usually harvested incidentally with other subsistence activities. There were no closed seasons or bag limits on either animal. Porcupines were harvested throughout the year, but were especially favored in the late fall. They are slow moving animals that were easily clubbed or shot with .22 calibre rifles. Some quills were used in jewelry, especially earrings. Snowshoe and arctic hare were harvested from November to April with snares or .22s. The hare population is cyclic, so harvests have varied greatly in size from year to year. Seventeen households reported harvesting a total of 53 porcupines, and eight households took 57 hares.

Birds

In 1984, 62.7 percent of the sampled Dillingham households used birds, including spruce grouse, ptarmigan, cranes, and numerous species of ducks and geese. Seagull and murre eggs were also harvested in the spring.

The willow ptarmigan is a common year-round resident of the region, inhabiting scrub thickets, while rock ptarmigan flourish on mountain slopes. Spruce grouse prefer the coniferous forests found in the northeast part of the region (Peters et al. 1984:19). Spruce grouse were hunted primarily in September and October; ptarmigan were hunted when they formed large flocks in

late winter and early spring. In the spring, geese and ducks were hunted primarily around Nushagak Bay and along the rivers, particularly in conjunction with seal hunting. Most fall waterfowl hunting took place around Nushagak Bay, but some Dillingham residents preferred to fly to the Alaska Peninsula for goose hunting (Fig. 8). Fall waterfowl hunting often took place in conjunction with moose and caribou hunting. A hunting license was required for hunting all these bird species. In addition, a federal duck stamp was needed to harvest waterfowl. Table 32 summarizes hunting regulations for these species.

Birds comprised 2.2 percent of the total harvest by weight. Spruce grouse and ptarmigan were of particular importance, with 49 percent of the sampled households using grouse and 39.2 percent harvesting this species. Ptarmigan were harvested by a smaller group of hunters, 19.6 percent of the sample, but were used by nearly a third, 31.4 percent. In total, 871 grouse and 546 ptarmigan were harvested by the sample in 1984.

The most commonly sought species of ducks were mallards, pintails, green-winged teal, widgeons, goldeneyes, eiders, and mergansers. Seven households in the sample harvested 280 seaducks (mostly eiders), and 19 households took a total of 299 other ducks. Fifteen percent of the households used ducks during 1984.

Brant, Canada, emperor, and white-fronted were the geese most commonly hunted. Approximately 18 percent of the sample used geese during the study year, and 15 households harvested a total of 77 geese of various species.

TABLE 32. HUNTING REGULATIONS FOR SELECTED SPECIES OF BIRDS, GMUs 9 AND 17, 1984

Species	Unit	Open Season	Bag Limits	Possession Limit
Grouse	17	Aug. 10 - April 30	Fifteen a day	40
Ptarmigan	17	Aug. 10 - April 30	Twenty a day	30
Ducks	9	Sept. 1 - Dec. 16	Eight a day	24
(except seaducks)	17	Sept. 1 - Dec. 16	Ten a day	30
Seaducks [a] and Mergansers	9 & 17	Sept. 1 - Dec. 16	Fifteen a day	30
Geese [b]	9 & 17	Sept. 1 - Dec. 16	Six a day	12[c]
Brant	9 & 17	Sept. 1 - Dec. 16	Four a day	8
Cranes	9 & 17	Sept. 1 - Dec. 16	Two a day	4
Emperor Geese	9 & 17	Sept. 1 - Dec. 16	Six a day	12

---

[a] Eiders, scoters, old squaw, harlequin

[b] Canada, white-fronted, and snow

[c] Exceptions: No more than four daily or eight in possession may be combination of Canada or white-fronted geese, provided that: in Unit 9 no more than two daily, or four in possession, may be white-fronted geese.

Source: ADF&G 1984a:47-48.

Marine Mammals

The coastal waters of Bristol Bay host a wide array of sea mammals. Of relevance to Dillingham residents were harbor (spotted) seals, belukha, stellar sea lions, and walrus. Harbor seals are a common year-round resident of coastal areas throughout the North Pacific. Although primarily a coastal inhabitant, harbor seals enter rivers seasonally. Ringed and bearded seals are also present in the area. Belukha feed on numerous species of anadromous fish, bottom fish, and shellfish in Bristol Bay, including the mouths of the Snake, Igushik, Wood, and Nushagak rivers (Peters et al. 1984:20). Although not present in the immediate Dillingham area, walrus and sea lion inhabit portions of northern Bristol Bay. Stellar sea lions are year round residents of Bristol Bay where they feed on large concentrations of herring and capelin. Walrus live along the ice edge in Bristol Bay in the winter and haulout on land in specific locations in the spring. A major haulout, Round Island, is 70 miles west of Dillingham.

Since the passage of the Marine Mammal Protection Act in 1972, the federal government has held management authority over most marine mammals. Under the provisions of that law in effect in 1984, only Alaska Natives living on the coast of the North Pacific and Arctic Oceans were permitted to harvest marine mammals for food or handicrafts. No permits were required for subsistence hunting.

During 1984, 41 sampled Dillingham households (26.8 percent) used at least one of the following marine mammals: harbor seal, walrus, sea lion, and belukha. None of these species was harvested extensively by Dillingham households. Fourteen harbor seals were taken by six households. One

household took a walrus, and another hunted walrus without success. No sampled Dillingham households harvested sea lion or belukha in 1984.

Dillingham households most frequently hunted seals in the spring in Nushagak Bay in conjunction with duck hunting or while in Togiak Bay and Kulukak Bay for herring fishing. They were also harvested in the fall when hunters traveled about the bay by boat (Fig. 5). Seals were usually shot with .22 calibre rifles but were occasionally salvaged from commercial fishing nets.

Despite relatively low harvests, Dillingham households used marine mammal products much more frequently than the harvest figures indicate because of extensive sharing with harvesters from other communities, especially those in the Togiak subregion. This was especially true for harbor seals, which were used by over one-quarter (26.1 percent) of the sample. Seal meat was eaten both fresh and dried. In addition, some people used the skin to make waterproof garments and craft items. Seal oil was the most important local condiment produced from wild foods, especially for boiled or dried fish and meat. Seal oil was rendered by placing a jar filled with strips of blubber in a cool, dark place. Seal blubber was also eaten.

Other marine mammals used included walrus by six households, belukha by seven, and sea lion by one. Walrus meat, oil, and skin were consumed. The blubber, meat, skin, and flippers of the belukha were eaten. For members of the Russian Orthodox faith, belukha oil is a permissible substitute for seal oil during the lenten season. All portions of sea lion were eaten, but the flippers were considered a special delicacy.

Plants and Berries

Berries were the most commonly harvested and used wild resource, with 62.1 percent of the sample harvesting berries, and 79.1 percent using them. The sample harvested 904 gallons of berries in 1984. A variety of species was used. Salmonberries, the first to ripen in the summer and a particular favorite, were harvested in large quantities in the Nushagak Bay area in July and early August. Blueberries, huckleberries, blackberries, highbush cranberries and lowbush cranberries were also sought as they ripened in the summer and fall (Wright et al. 1985:44).

Most often, berries were collected by women working in small groups, but men participated to a smaller degree. Many women used a berry picking device for greatest efficiency. These hand held, box-like devices made of wood or metal have a number of prongs on the end. As the woman raked the prongs through the tundra plants, the berries snapped off and were deposited in the box. When the box was nearly full, the picker transferred the berries to her bucket. Berries were picked along roads and rivers near Dillingham, but it was not uncommon for people to travel to other villages where berries were more abundant than in local areas (Fig. 9). This often was an occasion to combine subsistence activities with visits to friends and relatives.

In 1984, berries were served in akutag, a locally popular mixture of berries, crisco, and sugar. They were also used in baked goods, syrups, and jellies. Berries were stored in bags in freezers.

A variety of other plants were used by Dillingham households during the study period, including wild celery, wild spinach, fiddlehead ferns, and herbs such as stinkweed and tundra tea. Fifteen percent of the sample used plants other than berries during 1984.

CASE HOUSEHOLDS

This section provides some case examples of hunting and fishing patterns by Dillingham residents based on key respondent interviews. Respondents discussed their "typical" activities, so these descriptions do not pertain to a specific year. The first two cases are examples of households which have moved to Dillingham from outside southwest Alaska and have fitted hunting and fishing into their yearly round of economic activities. The second two households are composed of life-long Bristol Bay residents who moved to Dillingham for employment and educational opportunities, but for whom hunting and fishing continue to have major economic and cultural importance.

Case 1.

The husband and wife in this household moved to Dillingham in the early 1980s from outside the state. The husband is a professional educator and the wife is also employed full-time in a local service agency. They have no children. The husband cited their enjoyment of hunting and fishing as "the main reason we chose to move to this area." Before they came to Dillingham, they frequently hunted game birds, deer, and antelope in the western state where they resided. Ironically, the husband feels that he has less time to go hunting now than before. In his previous residence, harvest areas were accessible by road, but now hunting and fishing require more time since access is by skiff or airplane. He uses much of his vacation time as well as weekends to hunt and fish. His wife is his only hunting partner. Although they never hunted moose or caribou before, they now hunt and use both. They

frequently share their game with friends and co-workers in Dillingham and also with friends in some Alaska Peninsula villages.

This household said that they prefer to catch their salmon with rod and reel for several reasons. They can better limit the size of their catch to what they can use, and they enjoy the outings to local rivers and lakes. Also, they had never used set net gear before moving to Dillingham, but had frequently enjoyed sport fishing. The couple preserved most of their fish by freezing, but also smoked a small portion.

The husband took a salary cut to accept his present position but would "rather have outdoor activities available to us here than live somewhere else." The couple said they prefer to eat wild over store bought foods as a taste preference, but also see the savings as a compensation for the lower salary.

Case 2.

As with Case 1, the single man in this household moved to Dillingham from outside Alaska, where he was an avid waterfowl hunter. He has lived in Dillingham since the late 1970s and was employed as a professional administrator in a Native service organization in 1986. Since moving to Dillingham, he has hunted moose and caribou. He now prefers the taste of moose to all other meat and depends on harvesting one moose each year as a food staple. This man hunts with a number of co-workers, and learned where to hunt by asking local residents. He tried to learn butchering techniques by observation, but found that only trial and error was effective. He shares his moose often, especially in Dillingham where he likes to let newcomers "see what it tastes like." When this man is invited to dinner, he usually provides

the meat for the meal, as well as some extra meat for the hosts. Also, he sometimes brings some to relatives outside when he visits. Although he gives and receives meat frequently, the sharing partners vary.

Although this man has stayed at three different upriver villages during his hunting trips, he has not hunted with any village residents. Visiting a particular friend who lives upriver has become part of his annual hunting pattern. He also visits and receives visits from several upriver hunting parties. This has also become routine.

This man hunts moose at least once a year and goes a second time if a friend needs a partner. He also hunts caribou twice a year. In addition, he estimated that he hunts about 15 times a year for birds, notably ducks, ptarmigan, or grouse. Overall, he tries to go hunting or fishing every weekend for something, explaining, "hunting is often an excuse to go out...**whether** I get something or not doesn't really make that much difference — with the exception of moose."

This man harvests salmon both with rod and reel and with set net gear. He was an enthusiastic sportfisherman before moving to Dillingham and chose this location partly because of the good sportfishing opportunities. Having never used set nets before, he had to master the techniques. He did this by speaking with and helping more experienced residents and did not find it a problem to learn. He has his own net and his fishing partners are usually different colleagues from work. He attributed the variation to the high turnover in the workforce. He both freezes and smokes salmon and has his own smokehouse. Through trial and error he has determined the number of fish he can use and has cut down on the amount of salmon he once put up.

This man's biggest problem, he said, is getting enough time off from work to go hunting. Since most of his colleagues are hunters, they allocate

time off among themselves so each gets a chance to go. This man summed up the importance of hunting and fishing to him by saying that, "hunting and fishing are probably the main reasons I've decided to stay in the area...it feels like a healthier lifestyle to gather my own food than to purchase it in the store. I don't think I'd stay just for the scenery."

Case 3.

This Alaska Native household of 11 members moved to Dillingham from a nearby village so the children could attend high school. Four household members are commercial fishermen and they have no other employment. The family lives in low income HUD housing.

The father and his sons hunt for the family; they have no other partners. Every year, they hunt moose, caribou, and seal. When they harvest an animal, they bring it home, where the husband butchers it and the wife stores it in their freezer. The household usually shares with the husband and wife's mothers, as well as with six neighboring families. The husband explained, "It's sort of tradition, if you share your first catch you'll be lucky and catch more." This household also gives meat to people who cannot hunt or who need meat. The husband said that he could not afford the expense of buying meat in a store and always tries to keep his freezers full of moose meat, caribou, and fish.

Each summer, the household moves to a Nushagak Bay fishcamp to put up salmon with the help of their children, both those who live in their household and those who had their own homes. The wife explained to the researchers:

> My (married) daughters usually help me put up fish and we all work together. For example, my sons and daughters will set the net out; my sons and daughters as well as my husband and I pick the nets; my

> daughters and I split, salt, and hang fish, and the boys help wash, split, and put fish on the racks to dry. When the fish are dry, then it's my job to smoke them.

The fish were stored in the grandmother's cache, and all the children were welcome to some whenever they needed them.

This household said that they receive food so often from others that they have a difficult time estimating the amount. They received a wide variety of foods from local villages and in the month before the interview had received smelt, salmon, caribou, akutaq, clams, and grayling from two different villages. They had also received jellies and baked goods from neighbors in Dillingham. They have company from villages so often that they said it is "almost every night." They visit four villages regularly to see relatives and also to pick berries.

This household's members cited lack of money as one of their biggest problems in resource harvesting. One of the parents said, "It's hard to get Native foods when we want them. Sometimes we can't afford the gas to have our boys go hunting for us...Nowadays if we don't have money we can't hunt."

Case 4,

This Alaska Native family of six moved to Dillingham from a Bristol Bay village in 1979 for employment opportunities and for their children's education. Both spouses are employed in skilled positions in a federal agency and a health center. The husband hunts with his oldest son, "to get out in the wilderness, but more importantly we are able to have our wild meat we are used to, and it also cuts down on our budget. Store bought meat doesn't satisfy our hunger for meat somehow... if we didn't have any fish or meats

stored in our freezer for the winter, it would be worse than having no money in the bank."

The husband hunts with his oldest son or with his brother or another relative. He often selects as a hunting partner a relative who needs meat. The husband and wife work together to process the meat. It is shared with relatives who in turn frequently send this household various traditional foods, especially marine mammal products.

The household puts up salmon every year, something the wife had been doing, she said, "Ever since I was big enough to handle fish." They fish at Kanakanak or "wherever we can find a spot for our net." In the fall, they go up to Lake Aleknagik for spawned out red salmon. Their sons and daughters assist them in putting up fish. They dry, smoke, freeze, and salt the salmon. It is stored in their freezer or smokehouse.

The members of this household frequently share their harvests. As the wife explained it, "I was taught by my adopted parents always to share whatever I have even though I would not give in big quantities to friends, relatives, and ones in need." In return, they often receive food from friends in local villages. In the month before the interview, they received grayling, moose, and caribou from New Stuyahok, pike from Manokotak, moose from Aleknagik, trout from Togiak, and smoked dried fish from Ekwok. Most of these foods were sent by people who had stayed with them while in Dillingham. The household has village visitors three or four times each week, both friends and relatives. They also said they received Dillingham visitors almost daily. During Beaver Round-Up, all the floor space in their apartment was used by overnighting guests. Family members visited friends and relatives in Manokotak, Aleknagik, New Stuyahok, Iliamna, Ekwok, Portage Creek, Togiak, and

Platinum once or twice each year to pick berries, fish, celebrate **Slavi**, or just for a visit.

Discussion

Based on the key respondent interviews, and using these four cases as examples, it is possible to suggest some generalizations about hunting and fishing patterns by Dillingham households grouped by their place of origin. For example, some differences appeared between families of local origin and those that had moved to the region regarding the composition of workgroups for salmon fishing and processing. Respondents who were born in the Bristol Bay area tended to work predominately in kin-related groups composed of extended family members from several households. For these people, the fishing season was often a time for family reunions. One family with origins in Bristol Bay noted that the fishing season saw the return of all their sons and daughters from distant parts of the state to Queens Slough, a cannery-related fish camp on Nushagak Bay. All members of the extended family then worked together on a winter's supply of salmon.

In some of these extended families, the fish were stored in a freezer or cache at the oldest female relative's house. In other cases, families divided the fish when the smoking was finished.

Non-locally born respondents usually had to master set-netting as their first challenge because very few newcomers had fished with nets before arriving in Dillingham. Most reported that they learned the techniques and locations for success by speaking with or helping more experienced residents. Because most newcomers had moved to Dillingham alone or with nuclear families, they fished as a single household or sought partners in the workplace or

through other social contacts. Some of these respondents expressed concern about not catching "too much" salmon. This is probably due to a combination of factors. Non-locally born households tended to be smaller than those of local origin and were not linked to as many households through obligations of sharing. Also, these households were not accustomed to eating salmon as frequently as those who had grown up with it as a staple food. For instance, a respondent told the researchers that "Our ideal is 30 **coho**... (We) smoke a few, freeze a few, can some later in the winter. We just don't eat that much fish."

In addition, differences emerged in generalized attitudes about hunting and fishing. All the households of non-local origin shared a love of the outdoors. All said they came to Alaska and to Dillingham mainly to hunt and fish. All wanted to do more hunting and fishing than they had previously. Ironically, their jobs often caused scheduling conflicts, but nevertheless all made time to hunt, often through social arrangements with co-workers. All of these households felt that the ability to harvest wild foods was the single most important reason for being in Dillingham. They saw hunting and fishing as ways to economize and as a healthier food source than purchasing meat in stores. However, many of these households also spoke of the recreational aspect of their outdoor pursuits. One man said, "[Hunting] is not a necessity but I wouldn't go on a hunt just for the trophy; the meat is a way to economize." Some saw the activity itself as more important than a successful harvest. As one man put it, "It doesn't really matter if I get something or not."

Some households have arrived in Dillingham with little hunting experience, or with little familiarity with particular species, methods, or hunting areas. These households report that resource harvesting activities

are "so much a part of what's going on that it's fairly easy to find guidance and encouragement from those who are more experienced." As shown in Case 2, the social relationships of relative newcomers can extend to neighboring villages in addition to co-workers and neighbors in Dillingham itself.

Life-long residents of southwest Alaska, the majority of whom are Alaska Native, also stressed the importance of hunting and fishing. However, unlike some newcomers, none of these respondents stated that they simply liked to be outdoors or that harvesting a resource did not matter. In fact, all hunting and fishing activities for these households were oriented towards providing food that is considered necessary for health and well-being. Typical comments included: "Our stomachs can't take store bought food." "We can't go one day without eating our Native foods." "We don't feel satisfied until we eat our foods; there's no replacement if you're used to the taste." "We live to eat our Native food. We eat store bought foods at times, but we still crave something better." None of the families of non-local origin spoke so emotionally about wild foods, but they did speak pragmatically about health or economy. Some in addition talked about a "good quality hunt." In fact, although both groups saw the use of wild foods as a way to economize, a Native family said, "Even if we could afford store bought meat, it doesn't curb our hunger." These families were also concerned that if they did not have wild foods on hand they would have nothing to feed frequent village guests.

CHAPTER 4

SUBPOPULATIONS

INTRODUCTION

The report has thus far documented that use of non-commercially harvested fish, game, and plant resources was very widespread in Dillingham during the study year of 1984. Also, the results of the research have shown that participation in resource harvest activities was quite high, and furthermore, that per capita harvest levels remained stable over an 11 year period. On the other hand, the previous chapter has also documented a wide range of household harvest levels within the sample, with a large segment of the population harvesting few resources, and a smaller segment being responsible for most of the subsistence production in the community. While resource sharing networks linked many non-harvesters with these very active households, it is evident that the extent of involvement in subsistence activities and use of subsistence products in Dillingham was variable between households in 1984.

This finding of between-household diversity within the Dillingham sample is consistent with findings about other Alaskan regional centers, as summarized in Chapter 1, and confirms Hypothesis Two (see Chapter 1). It remains to explore Hypothesis Three, that subpopulations exist within Dillingham that display distinct resource use patterns and can be identified by demographic, economic, and sociocultural variables. It is the goal of the present chapter to attempt to describe subpopulations, and to identify those factors associated with high resource harvest levels in Dillingham in 1984.

For data analysis, "degree of wild resource use" for each sampled household was operationalized as: 1) household per capita resource harvest;

2) number of kinds of resources harvested; and 3) number of kinds of resources used. Households with higher scores on these three variables are the most involved in subsistence uses of fish, game, and plant resources for the purpose of these comparisons.

HOUSEHOLD ECONOMIC FACTORS AND RESOURCE USE

One of the study's hypotheses proposed a negative relationship between a household's degree of involvement in wage earning activities and wild resource uses. The hypothesis stated that as households' involvement in wage employment increased, as measured by the number of months employed for adult members of the household, subsistence production would decrease as a consequence of: 1) lack of time; and 2) decreased need as cash income allows the purchase of substitutions for fish and game.

Analysis of the survey results did not confirm the hypothesis. No significant relationship existed between the three measures of involvement in subsistence activities and degree of wage employment. In other words, household harvests in pounds edible weight or in variety of resources used or harvested, did not decrease as length of wage employment increased. This finding is consistent with the household harvest patterns illustrated in the case studies in Chapter 3. Individuals with full time employment often arranged to hunt and fish during vacations and weekends. These case studies also showed that households need cash in order to hunt and fish.

A second component of the hypothesis about employment and resource uses postulated that certain kinds of cash employment will be associated with high levels of resource harvest and use. Specifically, commercial fishing was hypothesized to be compatible with subsistence production at the household

level because of the associated ownership of equipment, familiarity with resources, and seasonality of employment. Research findings supported this hypothesis. As shown in Figure 19, commercial fishing households took 366 pounds per capita of wild resources, while other households took 162 pounds per capita. Over half (53 percent) of the commercial fishing households took over 200 pounds of wild foods per capita, while 73 percent of the non-commercial fishing households took less than 200 pounds per person. Commercial fishing households also harvested a wider variety of resources and used a greater range of resources than those not engaged in commercial fishing (Fig. 20).

LENGTH OF RESIDENCY

Another research hypothesis proposed that a positive relationship would be found between length of households' residency in Dillingham and high levels of involvement in resource harvest and use. This relationship is explained by the greater familiarity with local resources of long term residents, who may also be more likely to possess harvest and processing equipment. Further, it was hypothesized that as households' length of residency increased, so would degree of involvement in resource harvest and use.

Research results supported this hypothesis. As shown in Figure 21A, the 72 households of local origin had a mean household harvest of 1012.9 pounds. For households moving to Dillingham from outside the Bristol Bay area, household harvests increased with length of residency. Households living in Dillingham for one or two years (n-29) took 261.5 pounds of wild foods: households with three to five years residency (n-21) harvested 428.8 pounds; and households with residence of six or more years took 664.0 pounds. Figure

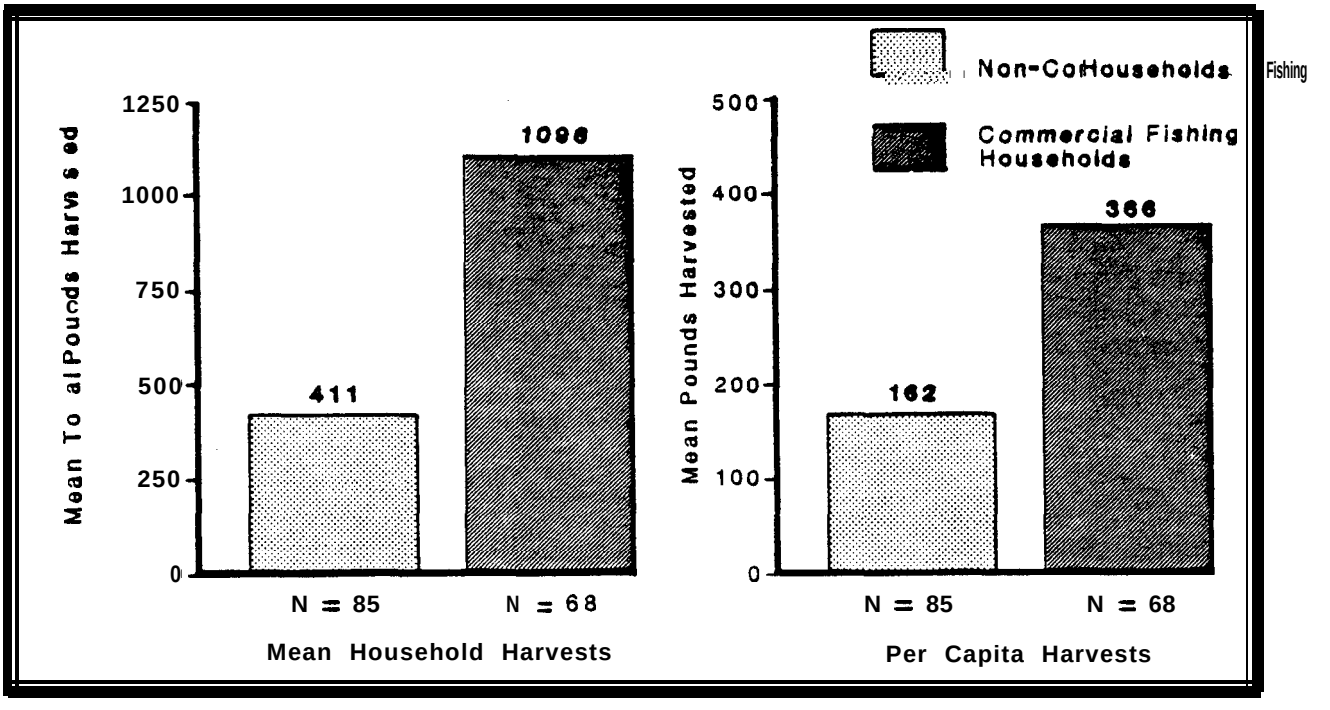


Figure 19. Comparison of Mean Household Non-Commercial Harvests and Per Capita Harvests of Commercial Fishing and Non-Commercial Fishing Households.

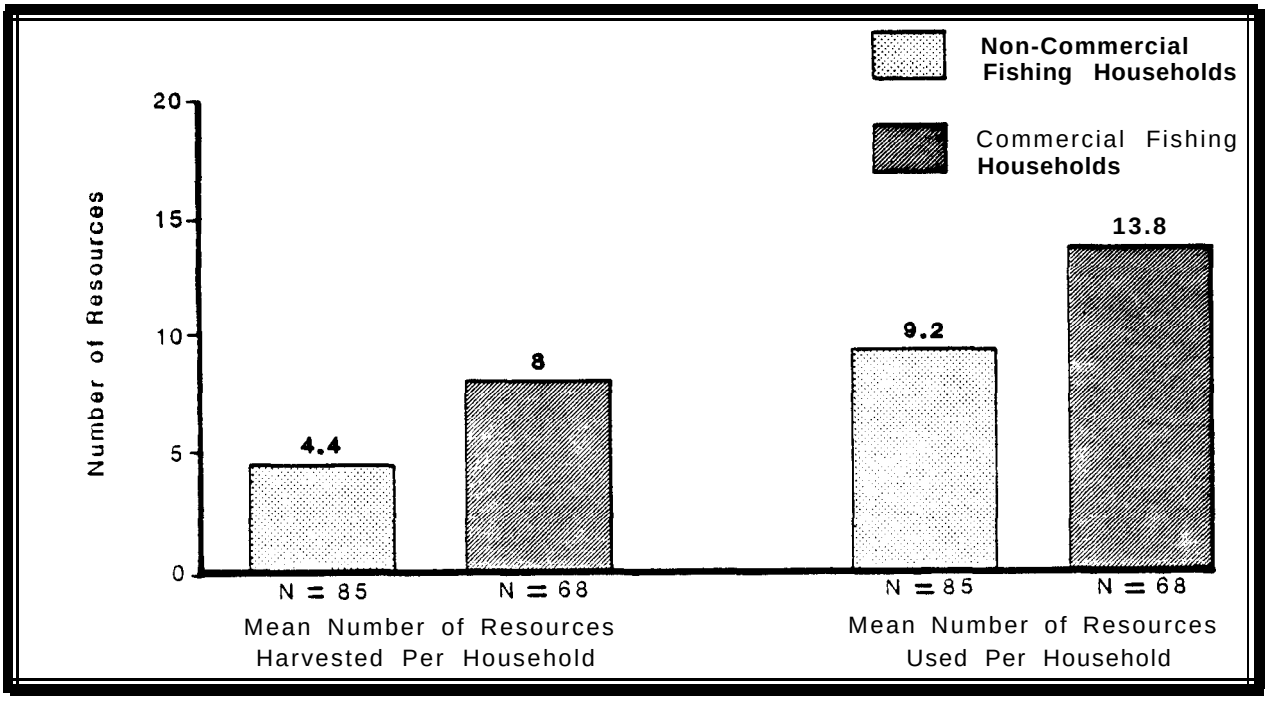


Figure '20. Comparison of Number of Resources Used and Harvested, Commercial and Non-Commercial Fishing Households.

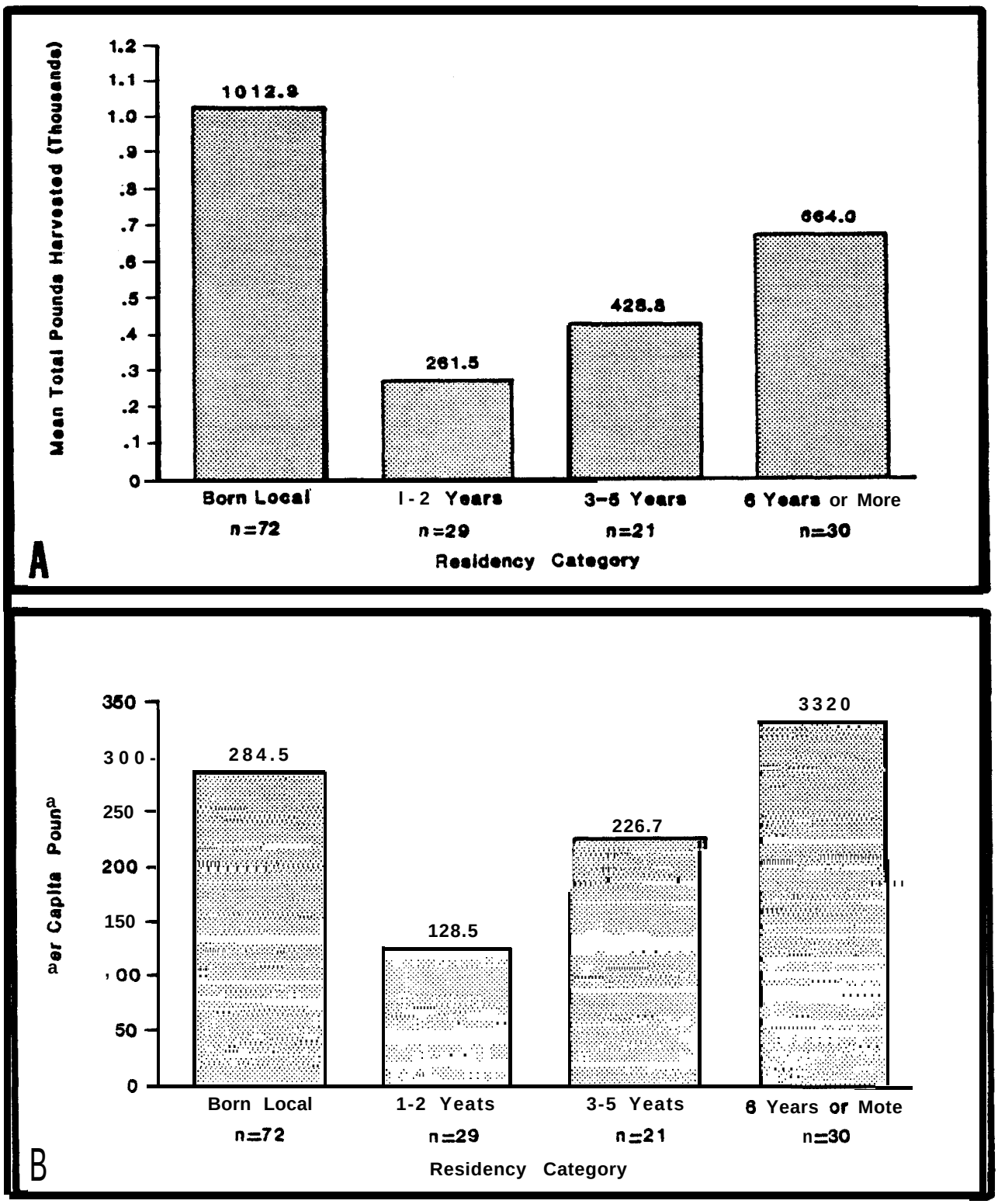


Figure 21. Resource Harvest Quantities by Length of Residency, Dillingham, 1984. (Note: one household reported "0" years residency and no resource harvest.)

21B illustrates this same relationship, but compensates for household size. Per capita household harvests increase from 128.5 pounds for the one to two year residency group, to 226.7 for the three to five year group, to 332 pounds for the six year and over group. Because of its lower mean household size, the group of Dillingham residents of non-local origin who have lived in the community for six years or more actually exceeded the per capita harvest of the Dillingham residents of local origin, who took 284.5 pounds per capita. The trends shown in Figures 21A and 21B strongly suggest that people who move to Dillingham become socialized into the prevailing pattern of high use of fish and game resources.

The same relationship between length of residency and involvement in resource use activities exists for the other two measures of involvement: number of resources harvested and number of resources used (Fig 22 A,B). In both cases, the number of resources increases with length of residency, with the group of households of local origin using and harvesting the most. That the locally-born group uses about four more resources than the six year and over residency households is probably explained by the wider links with other Bristol Bay communities maintained by people of local origin, and the wider use of foods such as marine mammals and bird eggs by Native people, who make up most of the life-long resident group.

CULTURAL FACTORS: ETHNICITY

As shown in Figures 23 and 24, the Alaska Native portion of the Dillingham sample harvested and used greater amounts and a wider variety of resources than the non-Native sample in 1984. For this comparison, an Alaska Native household was defined as a household where at least one of the

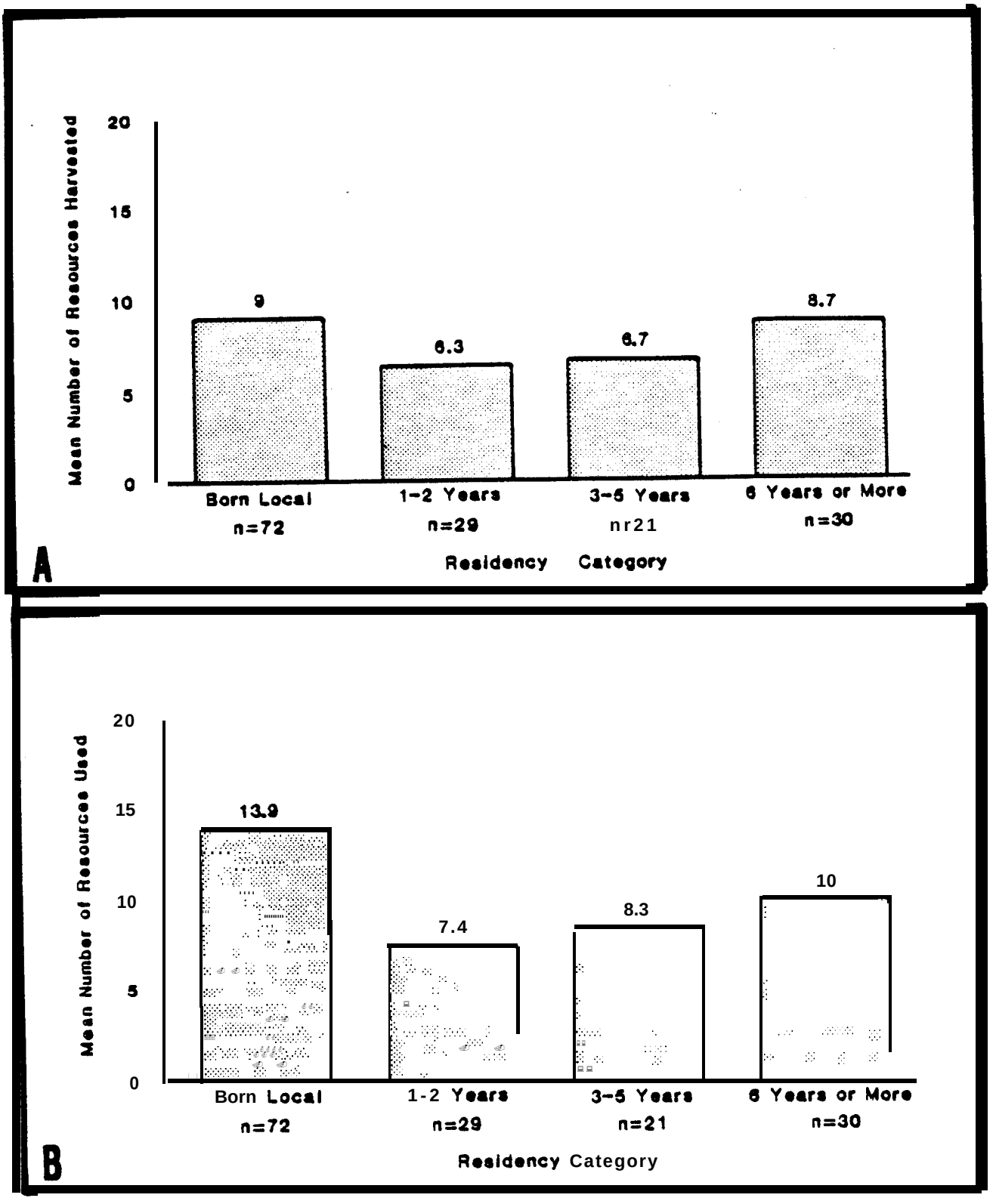


Figure 22. Number of Resources Harvested and Used by Length of Residency, Dillingham, 1984.

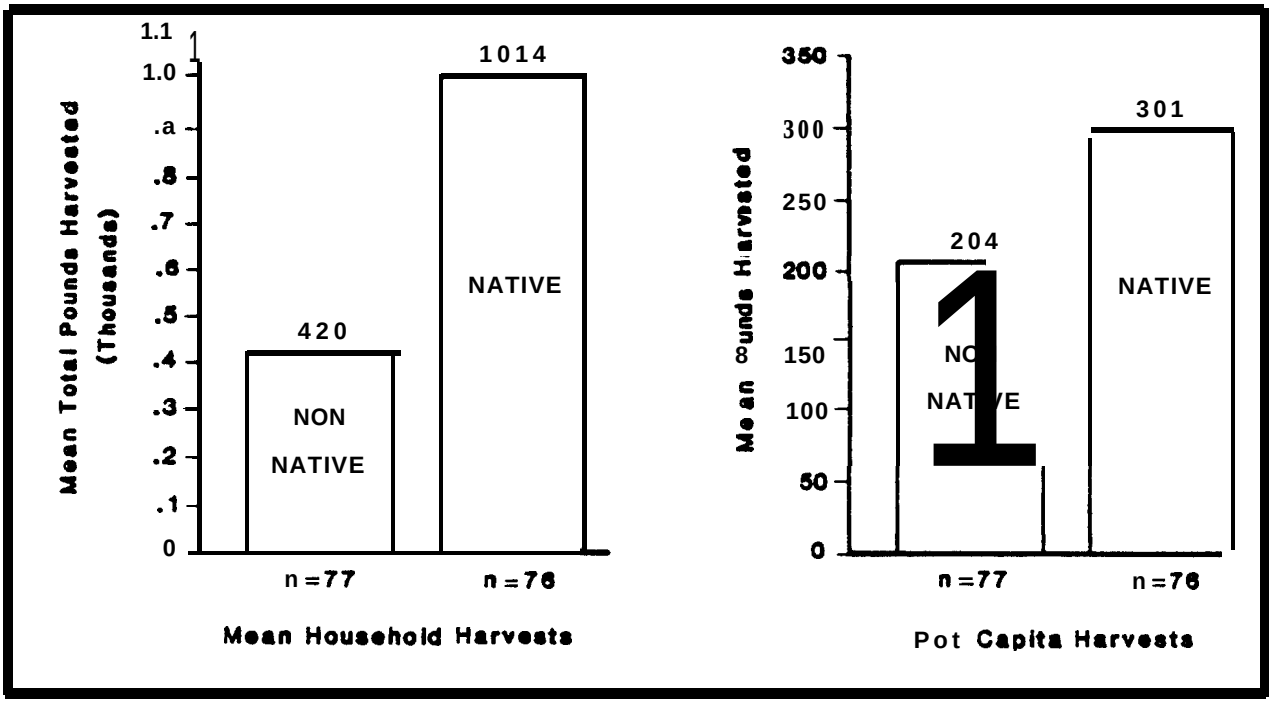


Figure 23. Mean Household Harvest and Per Capita Harvests, Pounds Dressed Weight, by Ethnic Category, Dillingham, 1984.

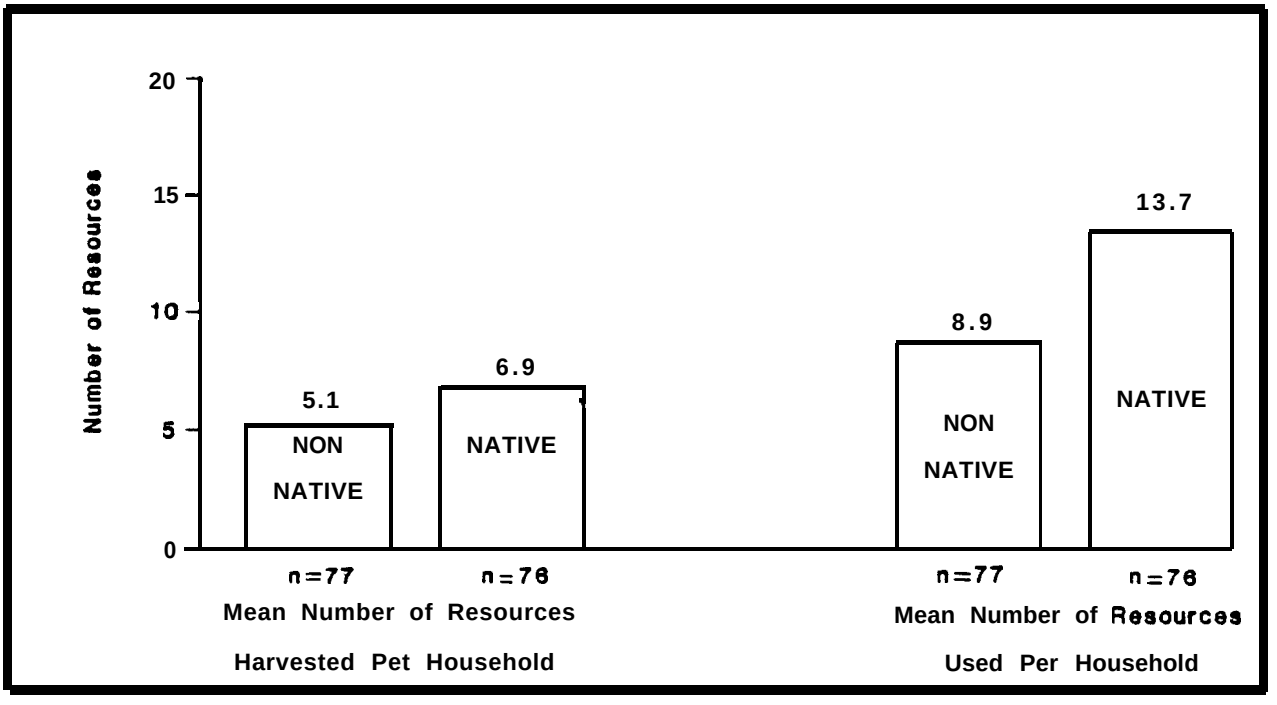


Figure 24. Mean Number of Resources Harvested and Used per Household, by Ethnic Category, Dillingham, 1984.

household heads was an Alaska Native. The per capita harvest for the 76 Native households (about 50 percent of the sample) was 301 pounds, while the per capita harvest for the 77 non-Native households was 204 pounds (Fig. 23). About 72 percent of the non-Native households harvested less than 200 pounds of wild resources per capita, while almost half (48.8 percent) of the Native households harvested over 200 pounds per person. Native households also harvested a wider range of resources, with an average of 6.9, than the non-Native sample (mean of 5.1 resources), and used an even wider variety of resources, 13.7 compared to 8.9 for the non-Native sample (Fig. 23).

For the most part, the Native sample and the portion of the sample with household heads born in southwest Alaska were identical. Therefore, some of the same explanations for differences between the Native and non-Native samples may apply as were used to explain differences based on length of residency. Native households have greater familiarity with local resources and harvest areas. Their cultural heritage includes using local fish and game resources. Kinship ties with other households in Dillingham and with other Bristol Bay villages maintain resource exchange networks that bring resources such as marine mammal products and big game to Dillingham households in exchange for such services as lodging and transportation. Non-Natives enter Dillingham lacking this knowledge, cultural orientation, and kinship ties. They have arrived in Dillingham largely because of employment opportunities. However, as shown in the previous section, as these households remain in Dillingham, their harvest sizes and ranges increase, and after six years, approximate those of locally born, Native households.

DISCUSSION: SUBPOPULATIONS

Data analysis of the survey results confirms the existence of sub-groups within the Dillingham community which display different patterns of resource use. Differences in harvest patterns between subgroups are associated with commercial fishing, length of residency, place of birth, and ethnicity. On the other hand, the data did not support the hypothesis that subsistence production is inversely related to involvement in wage employment. Many people take time from work to hunt and fish, and cash income is necessary for effective resource harvesting.

In conclusion, sociocultural factors, rather than economic factors, were found to be the best indicators of household harvest and use levels in Dillingham. This suggests that cultural traditions relating to resource use continue to operate in the community. These traditions are reinforced by kin ties and resource exchanges, and are supported by continued open access to fish and game populations. While employment opportunities are greater than in villages in the Bristol Bay region, high costs of living also encourage Dillingham residents to invest in harvest equipment and supply themselves with fish and game. Newcomers to the community who arrive for job opportunities often lack strong cultural traditions of resource use. Their harvests are low and tend therefore to reduce the community mean. Nevertheless, many newcomers are socialized into the community, and their harvests consequently increase. This is evidence that the traditions surrounding resource use in Dillingham are viable enough and visible enough to incorporate new families.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Dillingham, the largest community in the Bristol Bay region, conforms to the characteristics of an Alaskan regional center as outlined by Wolfe (1983:268-271). As described in Chapter 2, Dillingham is a center of *services, commerce,* and transportation for the many smaller communities of southwest Alaska. Its moderate population size of 2,004 is much higher than any other Bristol Bay community, but is smaller than most of the large communities along Alaska's highway system. Also, Dillingham's population has diverse origins. Unlike southwest Alaska's small villages, about half of Dillingham's households have moved there from outside the region. On the other hand, the rest of the population was born in Bristol Bay communities. Thus, Dillingham, like other regional centers such as Nome (Ellanna 1983), is composed of subcommunities of diverse origin, cultural heritage, and educational and work experience.

The results of the division's research also demonstrate that Dillingham residents participate in a "mixed economy" (Wolfe 1983:252-257), with significant cash and subsistence sectors. Substantial numbers of households follow an economic strategy that combines wage employment or seasonal commercial fishing (or both) with non-commercial harvest and use of relatively large quantities of fish and game. As noted in Chapter 2, direct involvement in commercial fishing and processing provide cash income for almost half of Dillingham's households, and this industry generates additional employment opportunities in the service sector. However, commercial fishing in Bristol Bay is a highly seasonal industry; run sizes and commercial harvests, and hence incomes, vary year by year. Also, non-residents of the region earn most

of the income produced by this industry. Dillingham's role as a service center also results in job opportunities in government, health services, social services, and trade, thus leveling out some of the effects of the seasonal commercial fishery. Consequently, cash incomes in Dillingham are, on average, higher than those of surrounding villages. On the other hand, costs are substantially higher than in more accessible areas of Alaska. In short, the availability of employment and services, and generally higher incomes, contrast Dillingham with the surrounding Bristol Bay villages, but like those villages, there is a significant seasonal component to Dillingham's economy and costs of living are high.

Because of these economic characteristics, the division's research began with an hypothesis that levels of participation in the harvest and use of wild resources would be high in Dillingham (Hypothesis One). While non-commercial production of wild foods, as measured in pounds edible weight, would on average be lower than those of smaller Bristol Bay communities, these would still be much higher than those of urbanized areas of the state. The results of the research confirmed this hypothesis, thus demonstrating the presence of a mixed economy in the community. As discussed in Chapter 3, most sampled households harvested and used a variety of wild resources, with 75 percent or more of the sample using salmon, plants, game, and other fish, and over half harvesting salmon, plants, and other fish (Fig. 11). These harvest activities followed a patterned seasonal round tied primarily to resource availability and hunting and fishing regulations.

Furthermore, levels of participation in the harvest of wild foods in Dillingham in 1984 were remarkably similar to levels reported for 1973 (Fig. 17). Also, as noted in Chapter 3 (Table 21), the per capita level of wild food production in 1984 of 242 pounds was quite similar to that reported by a

sample of Dillingham households in 1973. This suggests that despite a substantial growth in population and the arrival of many newcomers to the community between 1970 and 1984, the use of non-commercially taken fish and game has maintained its prominent role in Dillingham's economy.

Table 33 compares the per capita harvest of wild resources in Dillingham in 1984 with recent estimates for other Bristol Bay communities. In accordance with the first research hypothesis, Dillingham's 1984 per capita harvest was lower than, for example, that of the Nushagak River village of New Stuyahok (896 pounds) or in Iliamna Lake region communities such as Nondalton (1,175 pounds), Pedro Bay (865 pounds), and Newhalen (767 pounds). Reported harvests of some small Alaska Peninsula communities such as Perryville (396 pounds), Ivanof Bay (445 pounds), and Egegik (385 pounds) are also higher than those of Dillingham, but are generally lower than those of Nushagak River and Iliamna Lake villages. Dillingham's per capita harvest in 1984 was quite similar to recent estimates for the Bristol Bay Borough communities of South Naknek (268 pounds), King Salmon (220 pounds), and Naknek (188 pounds). This is not surprising, given that the Bristol Bay Borough serves as a regional center for some Alaska Peninsula and Iliamna Lake communities, and like Dillingham has a seasonal economy dominated by commercial fishing and processing (Morris 1985).

Table 34 compares Dillingham's 1984 non-commercial fish and game harvest with those reported for other Alaskan communities with populations over 2000. Dillingham's per capita harvest is the highest of any of these communities. The larger communities with harvest levels most closely approaching Dillingham's are Sitka (213 pounds), Cordova (149 pounds), and Kodiak City (143 pounds). Like Dillingham, these three communities are not connected by road to the rest of the state, although all three are part of the marine

TABLE 33. DEMOGRAPHIC, ECONOMIC, AND PER CAPITA HARVEST DATA FOR SELECTED BRISTOL BAY COMMUNITIES

Community	1984 Population	% Alaska Native, 1980	1982 Average Taxable Income	cost of Food Index	Per capita Harvest, lbs
Chignik Bay	141	53	$17,176	NA	196 (1984)
Chignik Lagoon	46	85	23,937	NA	229 (1984)
Chignik Lake	153	89	12,688	NA	282 (1984)
Dillingham	2,004	57	16,213	172	242 (1984)
Egegik	72	76	10,780	NA	385 (1984)
Igiugig	32	76	NA	NA	618 (1983)
Iliamna	90	40	13,453	NA	416 (1983)
Ivanof Bay	38	93	12,688	NA	445 (1984)
King Salmon	434	6	22,032	209	220 (1983)
Kokhanok	80	96	8,644	NA	697 (1983)
Naknek	405	51	17,920	206	188 (1983)
Newhalen	157	94	8,644	NA	767 (1983)
New Stuyahok	246	94	5,882	NA	896 (1983)
Nondalton	231	93	8,560	NA	1,175 (1983)
Pedro Bay	32	94	NA	NA	865 (1983)
Perryville	107	93	12,688	NA	396 (1984)
Port Alsworth	40	19	NA	NA	361 (1983)
South Naknek	185	86	11,747	NA	268 (1983)

Source : Alaska Department of Labor 1985, Alaska Department of Revenue 1985, Alaska Department of Fish and Game 1986a.

TABLE 34. DEMOGRAPHIC, ECONOMIC, AND PER CAPITA HARVEST DATA FOR SELECTED ALASKA COMMUNITIES

Community	1984 Population	% Alaska Native, 1980	1982 Average Taxable Income	cost of Food Index	Per capita Harvest, lbs
Barrow	2,942	76	29,406	195	NA
Bethel	3,681	68	18,796	166	NA
Dillingham	2,004	57	16,213	172	242 (1984)
Kotzebue	2,345	77	18,566	176	NA
Nome	3,184	59	19,745	181	NA
Anchorage	243,829	5	23,590	100	10
Cordova	2,108	15	19,296	164	149
Fairbanks	27,103	7	24,178	110	22
Homer	3,373	3	17,295	127	104
Juneau	23,729	11	22,968	115	37
Kenai	6,072	6	23,405	110	37
Ketchikan	7,633	15	21,693	114	NA
Kodiak	6,069	14	19,259	135	143
Palmer	2,772	4	21,879	109	17
Petersburg	3,137	11	19,743	128	NA
Seward	2,038	13	18,524	NA	NA
Sitka	7,611	21	20,392	114	213
Soldotna	3,538	3	22,251	110	NA
Valdez	3,687	6	27,587	122	NA
Wasilla	3,459	5	23,198	109	17
Wrangell	2,376	18	21,301	119	NA

Sources: Alaska Department of Labor, 1985, Alaska Department of Revenue 1985, Alaska Department of Fish and Game 1986a.

highway system. In addition, like Dillingham, commercial fishing plays a prominent role in the economy of all of these communities, and economic activities in each display seasonality. Furthermore, all three have indigenous Alaska Native populations which have retained traditional values and practices concerning the harvest and use of wild foods (Gmelch, Gmelch, and Nelson 1984; McNeary 1978; Kodiak Area Native Association 1983) .

In contrast, the larger communities along the road system such as Anchorage (10 pounds), Fairbanks (22 pounds), Palmer and Wasilla (17 pounds), Kenai (37 pounds), and Homer (104 pounds), have substantially lower non-commercial harvests than Dillingham. Cash incomes in these communities are higher than those in Dillingham, and the cost of living in each is lower. These communities have more diversified economies than Dillingham, and have undergone rapid population growth, mostly as a result of the effects of the development of Alaska's natural resources. An example is the rapid transformation of Kenai from a small village oriented around commercial fishing to a moderately-sized city with an economy based on oil and gas production (Reed 1984). These data strongly suggest that wild fish and game harvests play a markedly different role in the economy of regional centers such as Dillingham than in communities in more developed parts of the state (cf. Wolfe 1983:271).

Another research hypothesis (Hypothesis Two) predicted that the research would identify multiple patterns of resource use and ranges of participation in the harvest of wild foods. Ellanna (1983) documented such patterns in the regional center of Nome. As discussed in Chapters 3 and 4, the research findings confirmed this hypothesis. There was a diversity of involvement in non-commercial use of wild foods in terms of the number of resources harvested and used, as well as harvest quantities. About 10 percent of the households,

for example, harvested 60 percent of the game taken by the entire sample. Nevertheless, almost no sampled households used no wild foods. This finding, along with data showing the large portion of the sample that received fish and game from other households, demonstrated the existence of extensive non-commercial networks of resource distribution and exchange. In addition, as discussed in Chapter 3 and in accordance with research hypothesis four, sharing of wild foods commonly occurs between Dillingham households and residents of other Bristol Bay communities. Often, this sharing is part of reciprocal relationships between families that include the Dillingham households' providing temporary lodging, transportation, and other services to visitors from the villages in exchange for such resources as caribou meat or seal oil that are more accessible to village residents.

Additionally, the researchers hypothesized (Hypothesis Three) that this diversity of harvest patterns would be linked to the presence of subcommunities within Dillingham defined on the basis of cultural, demographic, and economic characteristics. In Nome, for example, patterns of resource use were found to vary based on ethnicity, place of origin, and length of residence in the community. As discussed in Chapter 4, the research results confirmed the presence of subgroups in Dillingham with different resource use patterns. Households with origins in the Bristol Bay region, most of which contained Alaska Natives, harvested and used a wider range of resources and harvested resources in larger amounts, than those households which had moved to the community from outside southwest Alaska (Fig. 22). Case household materials using data from key respondent interviews also documented different patterns of resource use, such as the different organizational principles operating in subsistence fishing work groups,

various methods of preserving wild foods, and different values associated with wild foods, that are linked to ethnicity and place of origin.

Nevertheless, there was very active participation in resource harvesting by many households which had moved to Dillingham from other areas. In fact, the research demonstrated that as length of residency in the community increased, so did involvement in wild resource harvesting and use (Figs. 21 and 22). The same relationship was found in Nome (Ellanna 1983:111). This suggests that newcomers to regional centers are socialized into the strong resource harvesting traditions of these communities. Household Cases 1 and 2 in Chapter 3 provided further evidence of this socialization process, and also suggested that many people who move to Dillingham to accept employment are pre-adapted to wild resource harvesting patterns through their interest and involvement in hunting and fishing in their former homes.

Except for a strong relationship between involvement in commercial fishing and levels of resource harvest (Figs. 19 and 20), the research did not support the hypothesis that levels of involvement in non-commercial hunting and fishing would be inversely related to length of wage employment. This suggests that individuals take time from wage employment to hunt and fish (e.g. Household Cases 1 and 2). Further, since harvesting activities require investments in equipment and fuel, it is likely that it is necessary for households in Dillingham to earn enough cash in order to adequately provision themselves with wild foods (cf. Wolfe et al. 1984).

Finally, the research design posited (Hypothesis Five) that Dillingham residents would generally use areas relatively close to Dillingham for harvesting activities. As shown in Chapter 3 (Tables 15-18; Fig. 10), the results supported this hypothesis. No hunters reported traveling outside the Bristol Bay area to hunt moose or caribou. Those areas with the highest

percentage of use, such as the lower and middle Nushagak River drainage and the Wood River Lakes, are the areas closest and most accessible to Dillingham residents.

Therefore, the research findings demonstrated that during the study period Dillingham residents participated in a mixed socioeconomic system characterized by high levels of fish and game harvest and use, a patterned seasonal round of harvesting activities followed by a large portion of the community, extensive sharing of wild foods, use of traditional and accessible local harvest areas, socialization of newcomers and young people into wild resource harvesting patterns, use of efficient harvest methods such as gill nets for salmon and whitefish, and traditional method of preservation of wild foods such as drying and smoking.

As noted earlier, Dillingham is one of several Alaskan communities which function as regional service centers for smaller rural villages. These communities, which include Barrow, Bethel, Kotzebue, and Nome as well as Dillingham, share a number of characteristics, as shown in Table 34, which serve to set them apart from other mid-sized and larger communities in the state. For example, all have moderate population sizes, ranging from a high of 3,681 in Bethel to Dillingham's 2,004. All have large Alaska Native populations, which means that a majority of their populations are of local origin and have therefore been enculturated into a way of life that includes wild resource harvesting. Although these communities' average incomes exceed those of most smaller communities and match those of some of the larger communities, costs of living are much higher than in more accessible parts of the state.

In addition, it is likely that wild resource harvests play similar roles in the economies of each of these regional centers. Although quantified

harvest data are available only for Dillingham, descriptions of resource harvest patterns in Nome (Ellanna 1983) suggest that harvest levels may be similar to those of Dillingham. As noted above, similarities were found between Dillingham and Nome in terms of the presence of subcommunities, the role of ethnicity, and the positive relationship between length of residency and high levels of resource harvest and use.

In conclusion, Dillingham is a prime example of a type of community in Alaska called a "regional center" with a distinctive socioeconomic system. These communities are functionally linked to the smaller surrounding communities as centers of services and commerce. Residents of regional centers such as Dillingham participate in a mixed economy. They earn cash through commercial fishing and through wage employment in government, service industries, and trades. Cash earning opportunities in regional centers are typically seasonal, and food and other costs are higher than in urban areas. In regional centers, households harvest substantial quantities of wild foods through non-commercial hunting and fishing, and share these foods with other households. In addition, many residents of regional centers have long ties to the region and to the resource harvest traditions of the smaller communities where they were born or where they have relatives. These traditions are viable enough that newcomers are socialized into hunting and fishing patterns. As a result of this combination of commercial activities and subsistence activities, of newcomers and life-long residents, Dillingham is unique among the communities of southwest Alaska. But, as a consequence of this same combination, Dillingham is very much a part of the mixed cash and subsistence economic system of the Bristol Bay region.

REFERENCES CITED

Alaska Department of Fish and Game

1984a Alaska Game Regulations No. 25. Juneau.

1984b 1984 Alaska Sport Fishing Regulations Summary. Juneau.

1984c Alaska Trapping Regulations No. 25. Juneau.

1984d 1984 Subsistence Finfish Fishing Regulations. Juneau.

1985a Alaska Habitat Management Guide. Southwest Region, Volume II: Human Use of Fish and Wildlife. Division of Habitat. Juneau.

1985b Annual Management Report 1984, Bristol Bay Area. Division of Commercial Fisheries. Anchorage.

1985c Alaska Habitat Management Guide Reference Maps. Southwest Region Volume IV: Human Use of Fish and Wildlife. Division of Habitat. Juneau.

1985d Alaska Habitat Management Guide. Southwest Region, Volume II: Fish and Wildlife. Division of Habitat. Juneau.

1986a Alaska Habitat Management Guide: Economic Overview of Fish and Wildlife. Volume II: Hunting, Trapping, Nonconsumptive Use, and Subsistence and Other Local Use. Division of Habitat. Juneau.

1986b Annual Management Report 1985, Bristol Bay Area. Division of Commercial Fisheries. Anchorage.

1986c Preliminary Review of the Bristol Bay Salmon Fishery -- 1986. Annual Salmon Management Report to the Board of Fisheries. Division of Commercial Fisheries. Anchorage.

Alaska Department of Labor

1985 Alaska Population Overview. Administrative Services Division. Juneau.

1986 Nonresidents Working in Alaska. Juneau.

n.d. Alaska Cost and Income Measures. Juneau.

Alaska Department of Revenue

1985 Federal Income Taxpayer Profile 1978, 1981, 1982 by Alaska Community and Income Level and Filing Status. Juneau.

Behnke, Steven R.

1982 Wildlife Utilization and the Economy of Nondalton. Alaska Department of Fish and Game, Division of Subsistence Technical paper No. 47. Juneau.

Ellanna, Linda J.
1983 Nome: Resource Uses in a Middle-Sized Regional Center of Northwestern Alaska. In Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities. Robert J. Wolfe and Linda J. Ellanna, compilers, pp. 85-123. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 61. Juneau.

Fall, James A., Dan J. Foster, and Ronald T. Stanek
1984 The Use of Fish and Wildlife Resources in Tyonek, Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 105. Juneau.

Gasbarro, Anthony G. and George Utermohle
1974 Unpublished field data, Bristol Bay Subsistence Survey. Files, Division of Subsistence, Alaska Department of Fish and Game, Dillingham.

Gmelch, George, Sharon Bohn Gmelch, and Richard Nelson
1984 Sitka: Resource Use in a Small Alaskan City. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 90. Juneau.

Kodiak Area Native Association
1983 Kodiak Island Area Local Fish and Game Resource Guide. Kodiak.

Magdanz, James, and Annie Olanna
1984 Controls on Fishing Behavior on the Nome River. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 102. Juneau.

McNeary, Stephen A.
1978 Local Exploitation of D-2 Lands in the Gulf of Alaska Region. University of Alaska, Cooperative Park Studies Unit. Fairbanks.

Nebesky, Will, Steve Langdon, and Teresa Hull
1983a Economic, Subsistence, and Sociocultural Projections in the Bristol Bay Region. Volume I: Analysis and Projections. University of Alaska, Institute of Social and Economic Research. Anchorage.

1983b Economic, Subsistence, and Sociocultural Projections in the Bristol Bay Region. Volume II: Village Descriptions. University of Alaska, Institute of Social and Economic Research. Anchorage.

Peters, Greg, Tim Hostetler, and Patricia Roullier
1984 Bristol Bay Coastal Management Program. Volume 1: Resource Inventory. Bristol Bay Coastal Resource Service Area Board. Dillingham.

Petterson, John S., Lawrence A. Palinkas, Bruce M. Harris, Kathleen Barlow, and Michael Downs
1984 Sociocultural/Socioeconomic Organization of Bristol Bay: Regional and Subregional Analyses. Minerals Management Service, Social and Economic Studies Program, Technical Report Number 103. Anchorage.

Reed, Carolyn E.
1985 The Role of Wild Resource Use in Communities of the Central Kenai Peninsula and Kachemak Bay, Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 106. Juneau.

Stratton, Lee, and Susan Georgette
1984 The Use of Fish and Game by Communities in the Copper River Basin, Alaska: A Report on a 1983 Household Survey. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 107. Juneau.

Tryck, Nyman, and Hayes
1985 City of Dillingham Comprehensive Plan 1985. Dillingham.

United States Bureau of the Census
1980 Census of Population and Housing, 1980. Summary Tape File 3A.

VanStone, James W.
1967 Eskimos of the Nushagak River: An Ethnographic History. Seattle and London: University of Washington Press.

1984 Mainland Southwest Alaska Eskimo. In Handbook of North American Indians, Volume 5: Arctic. David Damas, ed., pp. 224-242. Washington: Smithsonian Institution.

Wolfe, Robert J.
1981 Norton Sound/Yukon Delta Sociocultural Systems Baseline Analysis. Bureau of Land Management, Alaska OCS Socioeconomic Studies Program Technical Report No. 72; Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 59. Anchorage and Juneau.

1983 Understanding Resource Uses in Alaskan Socioeconomic Systems. In Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities. Robert J. Wolfe and Linda J. Ellanna, compilers, pp. 248-274. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 61. Juneau.

Wolfe, Robert J., Joseph J. Gross, Steven J. Langdon, John M. Wright, George K. Sherrod, Linda J. Ellanna, Valerie Sumida, and Peter J. Usher.
1984 Subsistence-Based Economies in Coastal Communities of Southwest Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 89. Juneau.

Wright, John M. and Molly B. Chythlook
1985 Subsistence Harvests of Herring Spawn-On-Kelp in the Togiak District of Bristol Bay. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 116. Juneau.

Wright, John M., Judith M. Morris, and Robert Schroeder
1985 Bristol Bay Regional Subsistence Profile. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 114. Juneau.

APPENDIX A: SURVEY INSTRUMENT
DILLINGHAM RESOURCE USE STUDY

MAP NAME _____ Interviewer _____

HOUSEHOLD ID# _____ Date _____

The purpose of this survey is to gather information about the fish and game resource activities of your household from January to December 1984. When we ask "Did you use a resource?" we mean did your filmily eat it, serve it, or otherwise use it in your home.

1. HOUSEHOLD INFORMATION

(* = Respondent)

ID #	M/F	BIRTH DATE	RESIDENCE OF PARENT WHEN YOU WHERE BORN	YEAR MOVED TO DILL.	PREVIOUS RESIDENCE	ETHNICITY	EDUCATION*
.m-m-							
1 HEAD							
.ma--							
2 HEAD							
3							
4							
						.----e-e---.	
5							
6							
						m------w--m	
7							
						m--------w-	
8							
9							
10							

2. **Using Person's I.D. #'s from the table above, indicate which household members participated in harvesting activities during 1984.**

Hunting	____	____	____	____	____	____	____
Fishing (include clams, etc)	-	-	-	-	-	-	-
Plant gathering	-	p	-	-	p	-	-

* 1 = Less than high school
2 = high school or G.E.D.
3 = sane college
4 = college or more

3. Do you have other relatives living in Dillingham? Y E S NO ____

4. COMMERCIAL FISHING

Did members of your household participate in commercial fishing during 1984?

YES ____ NO ____

If YES, please complete the following table:

SPECIES	FISHED YES	FISHED NO	LOCATION	GEAR TYPE	NUMBER REMOVDFOR HOME USE	I.D. t's OF FISHERMEN
KING SALMON						
RED SALMON						
CHUM SALMON						
PINK SALMON						
SILVER SALMN						
KINGCRAB				XXXXXX		
DUNGNESS CRB				XXXXXX		
TANNER CRAB				XXXXXX		
HERRING				XXXXXX		
ROE ON KELP				XXXXXX		
COD				XXXXXX		
HALIBUT				XXXXXX		
SHRIMP				XXXXXX		
GROUND FISH				XXXXXX		
CAPELIN				XXXXXX		
OTHER				XXXXXX		

5. NON-COMMERCIAL FISHING

A. Did your household have a subsistence salmon fishing permit in 1984?
YES _____ No _____ ID# of Permitholder _ - - _____

B. Did you household harvest or use any type of fish or marine invertebrate in 1984?
YES _____ NO _____

If YES, please complete the following table:

SPECIES	USED YES	USED NO	TRIED TO HARVEST YES	TRIED TO HARVEST NO	NO. HARVESTED BY GEAR TYPE: SUBS. NET	ICE FISH	ROD & REEL	OTHER	RECEIVED YES	RECEIVED NO	GAVE AWAY? YES	GAVE AWAY? NO
KING SLM												
RED SLM												
CHUM SLM												
PINK SLM												
SLVR SLM												
SLM (UKN)												
SMELT								bts.				
HERRING								bts.				
HRRNGROE								bts.				
WHITEFSH												
RAINBOW												
TOGIAK TR (LAKE TR)												
GRAYLING												
DOLLY VARDEN												
BURBOT												
PIKE												
BLK FISH												
BUTTER CLAMS								bts.				
RAZOR CLAM								bts.				
OTHER												

6 . GAME

Did your household try to harvest or use game in 1984?

YES _____ NO _____

If YES, please complete the table below:

SPECIES	USED YES	NO	TRIED TO HARVEST YES	NO	NUMBER HARVESTED	RECEIVED YES	NO	GAVE AWAY? YES	NO
CARIBOU									
MOOSE									
BROWN BEAR									
PORCUPINE									
RABBIT(HARE)									
OTHER									

7. MARINE MAMMALS

Did your household try to harvest or use marine mammals or marine mammal products during 1984?

YES _____ NO _____

If YES, please canplete the table below:

SPECIES	USED YES	NO	TRIED TO HARVEST YES	NO	NUMBER HARVESTED	AMOUNT OR PORTIONS USED	RECEIVED YES	NO	GAVE AWAY YES	NO
HARBOR SEAL										
OTHER SEAL (specify)										
WALRUS										
SEA LION										
BELUKHA										
OTHER										

8. FURBEARERS

Did anyone in your household try to harvest or use furbearers during 1984?
YES. _____ NO _____

If YES, please complete the following table:

SPECIES	USED YES	USED NO	TRIED TO HARVEST YES	TRIED TO HARVEST NO	NUMBER HARVESTED	NUMBER USED FOR FOOD	NUMBER USED FOR FUR	RECEIVED YES	RECEIVED NO	GAVE AWAY YES	GAVE AWAY NO
BEAVER											
MINK							XXXX				
Fox							XXXX				
WOLF							XXXX				
WOLVERINE							XXXX				
LAND OTTER							XXXX				
MUSKRAT											
LYNX											
PARKA SQURRL											
OTHER											

9. BIRDS

Did your household try to harvest or use birds during 1984?
YES _____ NO _____

If YES, please canplete the table below:

SPECIES	USED YES	USED NO	TRIED TO HARVEST YES	TRIED TO HARVEST NO	NUMBER HARVESTED	RECEIVED YES	RECEIVED NO	GAVE AWAY YES	GAVE AWAY NO
SPRUCE GROUSE									
PTARMIGAN									
SEA DUCKS									
OTHER DUCKS									

-continued-

BIRDS, continued

SPECIES	USED YES	USED NO	TRIED TO HARVEST YES	TRIED TO HARVEST NO	NUMBER HARVESTED	RECEIVED YES	RECEIVED NO	GAVE AWAY YES	GAVE AWAY NO
GEESE: SPECY									
GEESE: SPCY									
GEESE: SPECY									
CRANES									
SWANS									
EGGS SPC									
EGGS SPC									
EGGS SPC									
OTHER									

10. PUNTS

Did your household harvest or use wild plants in 1984?

YES _____ NO _____

If YES, please complete the table below:

	USED YES	USED NO	TRIED TO HARVEST YES	TRIED TO HARVEST NO	NUMBER HARVESTED	RECEIVED YES	RECEIVED NO	GAVE AWAY YES	GAVE AWAY NO
BERRIES					gal				
PLANTS					XXXXXX				

RESOURCE SHARING QUESTIONS

11. If the household indicated receiving or giving away MOOSE, CARIBOU, ANY SALMON, or ANY MARINE MAMMAL PRODUCT in 1984, list the community of residence of all households received from and given to for each of these resources. Write NONE if the household did not give or receive the resource.

a. MOOSE

Communities sent to	Communities received from

b. CARIBOU

Communities sent to	Communities received from

c. SALMON

Communities sent to	Communities received from

d. MARINE MAMMALS

Communities sent to	Communities received fran

12. Does your household give, share, or trade any of the following items to people in other villages in the Bristol Bay region.

	Send to Others		Receive from Others	
	Yes	No	Yes	No
BEAVER MEAT				
MOOSE MEAT				
CARIBOU MEAT				
SEAL MEAT				
SEAL OIL				
WALRUS				
SEA LION FLIPPERS				
BEHUKHA				
HERRING				
SALMON				
SALTED SALMON HEADS				
SMELT				
BERRIES				
FRESHWATER FISH				
PTARMIGAN				
CLAMS				

13. How often do people from other Bristol Bay region villages stay at your house in Dillingham?

Never _____

Sometimes _____ (1 or 2 times a year)

Regularly (every other month or 30 or more)

14. EQUIPMENT

A. Please indicate the number of each type of equipment that you own or regularly use:

ATV _____	Dogteam _____	Freezer _____
Airplane _____	Fishcamp _____	Steam bath _____
Snowmachine _____	Drying rack _____	Skiff (18 ft.or less) _____
Highway Vehicle _____	Smokehouse _____	Commercial boat _____
	Other camp _____	

USE AREA QUESTIONS

15. MOOSE HUNTING

While living in Dillingham, have members of this household ever hunted moose?

YES _____ **No** _____ **ID I's** _____ _____ _____ _____ _____

If YES, refer to map:

For while you have lived in Dillingham, please indicate the frequency of your use of each of these areas for hunting moose:

AREA	EVER USED WHILE LIVING IN DILLINGHAM? YES	NO	FREQUENCY OF USE REGULARLY ev.1,2-3yr	SELDOM once/twice	USED IN 1984 YES	NO
A. Kuklukak/Togiak						
B. Wood River & Lks						
C. Tikchik Lake & Nuyakuk River						
D. Upper Nushagak						
E. Mulchatna River						
F. Nunachuak Drng						
G. Mdl. Nushagak & Kokwok Drainage						
H. Lwr. Nushagak & Iowithna drnag.						
I. Kvichak/Iliamna Iake Clark						
J. Alaska Peninsula						
Other _____						
Other _____						

16. CARIBOU HUNTING

While living in Dillingham, have members of this household ever hunted caribou?

YES ____ NO ____ ID #'s ____ ____ ____ ____ ____

If YES, refer to map:

For while you have lived in Dillingham, please indicate the frequency of your use of each of these areas for hunting caribou?

AREA	EVER USED WHILE LIVING IN DILLINGHAM? YES	NO	FREQUENCY OF USE: REGULARLY ev1,2,3yr.	SELDOM once/twice	USED IN 1984 YES	NO
A. Kuklukak/Togiak						
B. Wood River & Lks						
C. Tikchik Lake & Nuyakuk River						
D. Upper Nushagak						
E. Mulchatna River						
F. Nunachuak Drng						
G. Mil. Nushagak & Kokwok Drainage						
H. Lwr. Nushagak & Iowithna drnag.						
I. Kvichak/Iliamna Lake Clark						
J Alaska Peninsula						
Other ____						
Other ____						

17. TRAPPING

While living in Dillingham, have members of this household ever trapped?

YES ____ NO ____ ID b's ____ ____ ____ ____ ____

If YES, refer to map:

For while you have lived in Dillingham, please indicate the frequency of your use of each of these areas for trapping:

AREA	EVER USED WHILE LIVING IN DILLINGHAM? YES	No	FREQUENCY OF USE REGULARLY ev1,2,3yr	SELDOM once/twice	USED YES	N 1984 No
A. Kuklukak/Togiak						
B. Wood River & Lks						
C. Tikchik Lake & Nuyakuk River						
1. Upper Nushagak						
E. Mulchatna River						
F. Nunachuak Drng						
G. Mdl. Nushagak & Kokwok Drainage						
H. Lwr. Nushagak & Iowithna drnag.						
I. Kvichak/Iliamna Lake Clark						
J. Alaska Peninsula						
Other						
Other						

18. When you hunt in areas around a village, how important is it to have relatives or friends in that village?

Very important _____

Somewhat important _____

Unimportant _____

Not applicable _____

19. When you moved to Dillingham from _____, did you stop using areas around _____?

YES _____ No _____ N/A _____ Explain _____

_____

_____

20. EMPLOYMENT HISTORY

Please canplete the following information for all jobs held by the employed household members listed in question 1 during 1984.

ID # FROM QUESTION 1	JOB TITLE	# OF MONTHS WORKED P/YEAR	FULL TIME/ PART TIME

21. Please estimate you household's cash income in 1984.

less than $5000 ____

$5000 - $9999

$10,000 - $14,999 ____

$15,000 - $19,999 ____

$20,000 - $24,999 ____

$25,000 - $29,999 ____

$30,000 - $34,999 ____

535,000 - $39,999

$40,000 - $49,999 ____

$50,000 - $54,999 ____

$55,000 - $59,000 ____

$60,000 - $64,999 ____

$65,000 - $69,999 ____

$70,000 - $74,999 ____

$75,000 - $97,999 ____

$80,000 - $84,999 ____

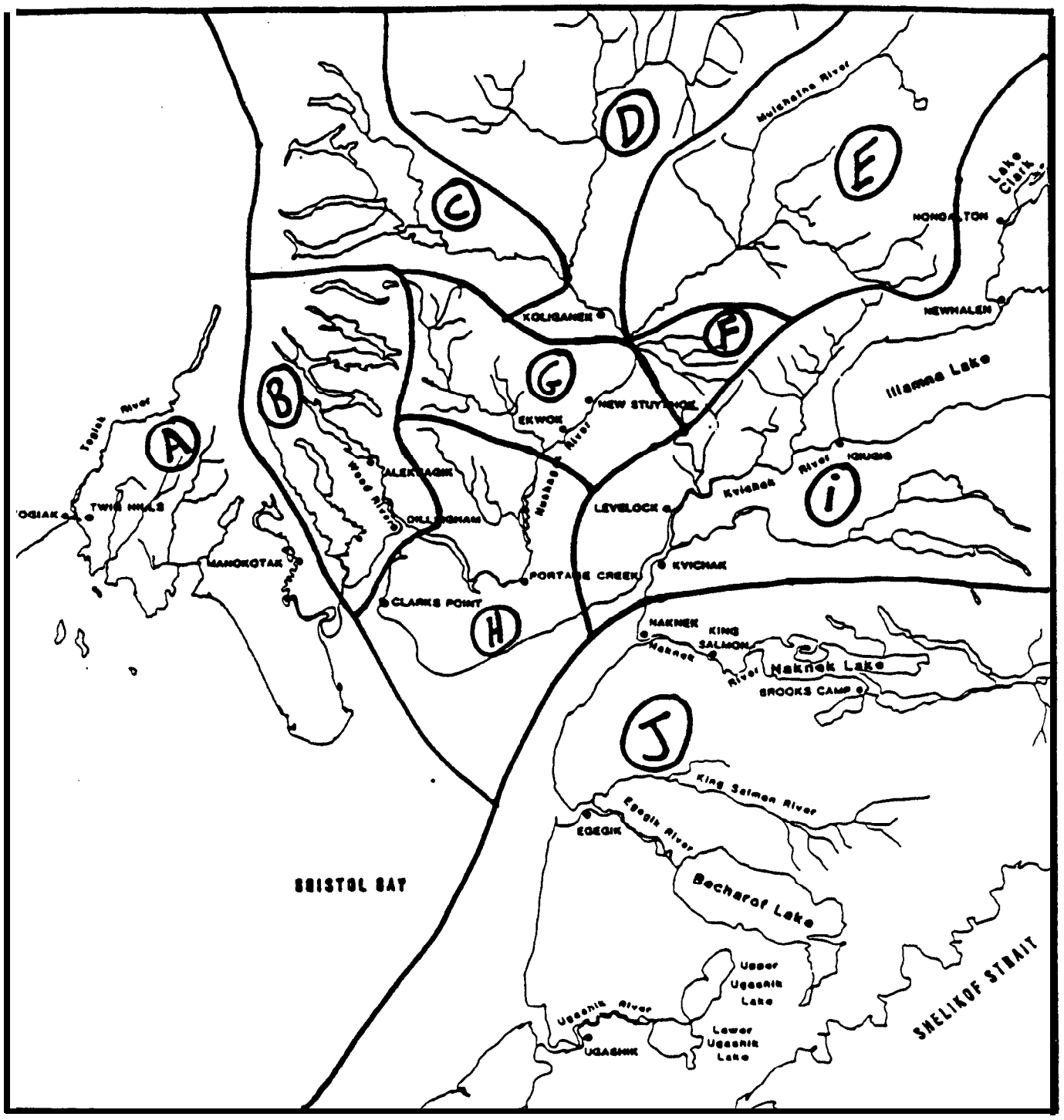
$85,000 - $89,999 ____

$90,000 - $94,999 ____

$95,000 - $99,999 ____

$100,000 or over ____

NO RESPONSE ____



A. KUKLUKAK/TOGIAK
B. WOOD RIVER AND LAKES
C. TIKCHIK LAKES AN0 NUYAKUK RIV.
0. UPPER NUSHAGAK
E. MULCHATNA RIVER
F. NUNACHUAK DRAINAGE
G. MID. NUSHAGAK AN0 KOKWOK DRAINAGE
H. LOWER NUSHAGAK AN0 IOWITHNA ORAINAGE
I. KVICHAK/ILIAMNA/LAKE CLARK
J. ALASKA PENINSULA

APPENDIX B

CONVERSION FACTORS FOR DILLINGHAM DATA ANALYSIS

	Weight per animal	Source
King Salmon	15.2	a
Red Salmon	4.8	a
Chum Salmon	4.9	a
Pink Salmon	2.7	a
Silver Salmon	4.8	a
Salmon, species unknown	4.8	a
King Crab	2.3	KANA 1983
Dungeness Crab	1.6	KANA 1983
Tanner Crab	.7	KANA 1983
Herring	30.0/5 gal. bkt.	Reed 1985
Herring Roe Kelp	40.0/5 gal. bkt.	Wright, Chythlook 1985:44
Cod	1.0	KANA 1983
Smelt	30.0/5 gal. bkt.	Reed 1985
Whitefish	1.0	Wright et al. 1985
Rainbow Trout	1.4	Wright et al. 1985
Lake Trout	2.7	Wright et al. 1985
Grayling	.7	Wright et al. 1985
Dolly Varden	1.4	Wright et al. 1985
Burbot	1.0	Wright et al. 1985
Pike	2.8	Wright et al. 1985
Butter Clams	15.0/5 gal. bkt.	researcher estimate
Razor Clams	15.0/5 gal. bkt.	Fall et al. 1984
Caribou	150.0	Wright et al. 1985
Moose	540.0	Wright et al. 1985
Brown Bear	100.0	Wright et al. 1985
Porcupine	8.0	Wright et al. 1985
Hare (assumed to be snowshoe)	2.0	Wright et al. 1985
Harbor Seal	56.0	Wright et al. 1985
Walrus	560.0	Wolfe 1981
Belukha	700.0	Wright et al. 1985
Beaver	20.0	Wright et al. 1985
Spruce Grouse	1.0	Wright et al. 1985
Ptarmigan	.7	Wright et al. 1985
Sea Ducks	1.4	Wright et al. 1985
Other Ducks	1.4	Wright et al. 1985
Geese	4.0	Wright et al. 1985
Cranes	6.0	Wright et al. 1985
Eggs	.05	KANA 1983
Berries	4.0/gallon	Stratton, Georgette 1984

[a] Average 1984 Round Weights of Commercial Salmon, Nushagak District,

	Weight	Conversion Factors	Usable Weight
King	20.78	.73	15.2
Red	6.16	.78	4.8
Chum	6.54	.75	4.9
Pink	3.18	.85	2.7
Silver	6.60	.73	4.8

Sources: Alaska Department of Fish and Game 1985b:167-169; KANA 1983.

APPENDIX C: KEY RESPONDENT INTERVIEW GUIDE

INTERVIEW GUIDE - Dillingham Resource Use Study Question
to clarify distribution and exchange patterns.

PART A
For respondents who are not from this area.

TOPIC	TYPES OF QUESTIONS
Background	I see you've been 'living in Di'liinqham for .___
	Before you moved to Dillingham, did you go hunting?
	What kind/type of hunting did you do?
	How often?
	How about fishing?
	What kind of fishing did you do?
	How often?
	Did you fish with nets? (If yes, where?)
	Have you noticed any changes in your hunting and fishing activities since you moved here? (amount of time spent, amount of wild foods used, dependence on wild foods)
	00 you eat any wild foods that you didn't eat before you moved here?
	If yes, can you give some examples?
Encu'ituration	When you moved here how did you find out where to go hunting?
	Who did you go with?
	Did you notice any differences in your hunting techniques?
	Who do you usually hunt with?
	What's your relationship (relative, friend, co-worker, neighbor, etc.)?
	Do you have regular hunting partner(s) or varied ones?

Enculturation (continued)	When you moved here how did you find out where to set nets for salmon?
	How did you learn how to set nets?
	Who helped you? (Relationship)?
	Who dfd you fish with? (Relationship if different from above).
	What kinds of problems did you encounter?
	Who helped you? (Re'latfonship)
	Do you fish with the same people each year or does it change?
Processing	How did you preserve your fish (smoke, dry, freeze, etc.)?
	Is that different than how you did ft elsewhere? If yes, how did you learn?
	Where do you store your fish?
	How did you preserve your meat?
	Is that different that before you 7 fved here? If yes, how did you learn?
	Where do you store your food?
	How do you use your berries?
Sharing	Have you given out any of your wild foods to people in Dillingham lately?
	Which food?
	To whom?
	Relationship?
	Who in your family decides what foods are going to be shared?

Sharing (continued)

Have you received any wild foods 'lately?

What kind?

fra whom (and where)?

Relationship?

Are there partfcu'iar times of year you usually receive food?

When and what kinds of food?

Are there peop'ie who regu'iar'iy share food with you?

Re'iatfonshfp?

What types of food?

Have you send any food out of Dilingham lately?

Where?

Relationship?

00 people from the vf'i'lages ever send you food?

How frequently?

What types?

Relationship?

Do these people stay at your house?

When you receive food do you pass some of it on to others?

Reiatfonshfp?

How often?

Visiting

Do you have many visitors stay at your house?

Where are they from?

Are they related you you?

How?

Vfsftfng (continued)	What are the main reasons they came to visit?
	Do you stay overnight in any of the villages around here?
	Which vf'i'iages?
	What are the main reasons you visit the vf'i'iages? (Distinguish between trave'iing for work and social reasons.)
	What's your relationship to the people you stay with (family, friend, co-worker, etc.)
Other	How does your job effect your hunting, fishing and gathering activities? (How do you fit these activities into your work schedule?)
	In your own words, what is the importance of hunting and fishing to you and your family.

INTERVIEW GUIDE - Dillinqham Resource Use Study Questions
to clarify distribution and exchange.

PART B

For respondents from the Bristol Ray area.

TOPICS	QUESTIONS
Background	I see from your survey that you were born in _____.
	Are are your parents 'living?
	Where else in Alaska do you have relatives?
	What were your reasons for moving to Dillingham?
	Now that you 'live in a regional center, do you have any problems getting Native foods?
	Is there anything you 'like to eat but can't get here?
Sa'imon	Did you put up salmon 'last year?
	Where did you fish?
	Who did you (subsistence) fish with? Are you related? How?
	00 you fish with them every year? (If not find out who they do fish with and relationship)
	Who was involved in setting the nets, picking the fish, and preserving them? (Get everybody down, sketch relationships)
	How were the fish preserved (smoked, dried, frozen, etc.)?
	Where do you keep your fish?
	Is there a central cache or each family keeps their own?
	How is ft qiven out?
	Who decides who gets some?

Game

Anybody in the house go hunting lately?

Who?

Any luck?

Who usually does the hunting?

Who do they (you) go with?

Do they go with the same person(s) every year or partners change?

Relationship? (Get everybody down and sketch out relationships)

When a hunter in your household catches some game, where does he bring it?

Who decides who will get some?

How is the meat preserved?

How is it stored?

Where is it stored?

Berries

Did you get berries last year? What did you use them for?

Sharing

What kinds of foods have you received lately? and from what villages?

Relationship of sender?

Do they visit you?

Do you have many other visitors?

How often?

Are they related? (Again, try to get specific relationships as possible.)

What villages do you visit?

How related?

How often?

What are the main reasons you visit these villages?

Sharing (continued)	Are there particular times of the year peop'ie in the villages send you food?
	Is there an agreement to send them to you or people just do it?
	kre you supposed to send anything in return?
	Do you every trade any food (ex. seal oil for moose, etc.)?
	00 you ever buy any Native foods from the villages?
	Was there more sharing in the past or now?
	How has it changed?
	Do you share equipment for hunting or fishing with anyone? (snowgo, boats, p'ianes, nets, snokehouse, etc.) (chart relationships
Employment	How does your job effect your hunting, fishing, and gathering? (i.e. how do you fit them fnto your schedule?)
	Ooes someone else in your household hunt for you?
General	What is the importance of hunting and fishing to you and your family?