

**AN OVERVIEW OF THE HARVEST AND  
USE OF FRESHWATER FISH BY THE  
COMMUNITIES OF THE BRISTOL BAY REGION,  
SOUTHWEST ALASKA**

by

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## ABSTRACT

This technical paper provides information on the uses of non-salmon fish taken in freshwater by communities of the Bristol Bay region of southwest Alaska, including Arctic grayling, blackfish, burbot, Dolly Varden/Arctic char, lake trout, longnose sucker, northern pike, smelt, rainbow trout, and whitefish.. The report is based upon research conducted by the Division of Subsistence, Alaska Department of Fish and Game. This research included the collection of new information and the review of published and unpublished materials.

After a discussion of research methods and data sources in Chapter One, the second chapter of the report contains a broad overview of the Bristol Bay region, including a discussion of the general patterns of the subsistence use of fish and game. It also provides background on each type of freshwater fish used by the region's residents, and describes the regulatory structure governing the taking of these species. Also reviewed are Yup'ik categories for classifying the "trout" of the Togiak, Igushik, and Nushagak river drainages. These categories, including *anertluaq* ("Togiak trout"), *yugyaq* ("Dolly Varden or "char") and *anyuk* ("sea-run Dolly Varden"), cut across the taxonomy used by western science. Methods used to preserve freshwater fish are also described in Chapter Two.

This general information serves as a frame for the more specific, community-based data presented in Chapter Three. That chapter summarizes the available information on harvest quantities and use patterns of freshwater fish by each Bristol Bay community. At least one year of quantified harvest data is available for every Bristol Bay community except Togiak, Twin Hills, and Portage Creek. For most communities, two or more years of harvest data are available.

Chapter Four, the final chapter, describes the general patterns of use of freshwater fish in the region, first reviewing three "subregional patterns" of resident fish harvest and use, and then species by species. One subregional pattern, the "Togiak-Nushagak-Iliamna Pattern," is found in the communities of the Togiak River drainage, the Nushagak Bay and River drainage, and the Kvichak River - Iliamna Lake drainage, except for the regional center of Dillingham. Harvest estimates from 1973/74, the 1980s, and the 1990s suggest that resident freshwater fish species generally make up about 5 to 10 percent of the subsistence harvests in these communities. Over the last 20 years, harvests of these species in most communities of these subregions have ranged from 100 pounds per household per year to 500 pounds per household per year. The annual range of per capita harvests has been from about 25 pounds to 100 pounds or more. Generally, five kinds of fish dominate the freshwater fish harvests of communities in these subregions. These are whitefish, grayling, pike, rainbow trout, and Dolly Varden ("char"). Harvest methods for freshwater fish in these communities include nets in open water in early spring and late fall, before and after subsistence salmon fishing. Nets are either set near lake outlets or in

streams or used as sweep seines. The second major gear type is hook and line through the ice in winter, either used for jigging or as set hooks. A third method is rod and reel fishing in open water. Traditional methods of preservation, such as drying, half-drying, or smoking are common for some species, such as Dolly Varden, pike, and whitefish, in most of these communities.

The role of non-salmon freshwater fish in the subsistence pattern of communities of the Bristol Bay side of the Alaska Peninsula (Egegik, Pilot Point, Ugashik, and Port Heiden), called the "Alaska Peninsula Pattern," is different in several ways from that just described for the Togiak River, Nushagak River, and Iliamna Lake communities. Per capita harvest levels are lower, especially if smelt are excluded from the totals. Also, compared to communities of the Togiak, Nushagak, or Iliamna Lake areas, residents of these four Alaska Peninsula communities harvest fewer freshwater species.

The third subregional pattern of non-salmon freshwater fish harvest and use, the "Regional Center Pattern," is found in Dillingham and the Bristol Bay Borough (King Salmon, Naknek, and South Naknek). Harvests of freshwater fish as estimated in pounds per capita and per household, are substantially lower in the regional centers than in the villages of the Togiak, Nushagak, and Iliamna Lake subregions. Freshwater fish make up a relatively smaller segment of the overall subsistence harvests in the regional centers, generally less than 10 percent. Another contrast is a different mix of species in the harvests of regional center households. Where whitefish, grayling, pike, and Dolly Varden dominate the harvests of the smaller communities of the Togiak, Nushagak, and Iliamna Lake subregions, at Dillingham and the Bristol Bay Borough, Dolly Varden and rainbow trout, along with grayling, are most notable. Pike and whitefish play a much lesser role. Finally, rod and reel fishing in open water under sport fishing regulations makes a larger contribution to freshwater fish harvests in the regional centers than in the smaller communities.

It is very important to note that large subcommunities are present in both regional centers that generally harvest more wild resources than the communities' means. Such subpopulations are characterized by relatively long lengths of residency in the region, involvement in commercial fishing, and, often, kinship ties to the region's smaller communities. Households in the regional centers which belong to the subcommunities may very well exhibit a pattern of freshwater fish use more like that of the Togiak-Nushagak-Iliamna Lake pattern than the regional center pattern.

The overview concludes that non-salmon freshwater fish have long been used for food throughout the Bristol Bay region. In most of the region's communities, households continued to harvest and use freshwater fish in the 1970s, 1980s, and 1990s. Smelt are harvested in substantial numbers in the coastal communities and shared with inland villages. Of the nine kinds of resident freshwater fish harvested, whitefish, grayling, Dolly Varden, and northern pike are taken in the largest numbers, while pike make the largest contribution in terms of food value.

Differences in species ranking occur between subregions and from year to year. For example, Dolly Varden ("Togiak trout" and "Dolly Varden") are particularly important in the western portion of the region in the communities of Aleknagik, Manokotak, Twin Hills, and Togiak. Rainbow trout figure prominently in harvests by Iliamna Lake communities. Overall, the contribution of freshwater fish to the subsistence harvests of Bristol Bay communities appears to have remained relatively stable during the 1970s, 1980s, and early 1990s.

Harvests of freshwater fish occur year-round in the Bristol Bay region, but there are certain seasons when subsistence harvest efforts target on freshwater species. For example, net fishing for whitefish is important right before freeze-up in the fall and again following break-up in the spring. Fishing with hook and line through the ice is important during winter. Most of this harvest activity takes place near each community, although extensive travel by skiff or snow machine to favorite harvest areas does occur. A variety of methods are used in the region to preserve and prepare freshwater fish. These foods are shared widely, both within communities and between them.

Further research on patterns of freshwater fish use in the Bristol Bay region should occur in several areas. More work is needed to understand local Yup'ik and English language categories of freshwater fish. This could lead to more precise estimates of harvests. Harvest estimates are lacking for certain communities, most notably those of the Togiak River drainage. (The results of a freshwater fish harvest survey conducted in Togiak and Manokotak in 1995 will appear in a forthcoming report.) Monitoring harvests of freshwater fish is particularly difficult because the seasonal use pattern creates problems for reliable retrospective recall from respondents. If harvest information is needed for management, culturally appropriate, non-intrusive methods to monitor harvests need to be developed in consultation with local communities.



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# CHAPTER ONE: INTRODUCTION

## STUDY BACKGROUND

This report provides available information on the uses of non-salmon fish taken in freshwater by residents of the Bristol Bay region of southwest Alaska (Fig. 1).<sup>1</sup> Table 1 lists the communities discussed in the report. In May 1986, the Division of Subsistence, Alaska Department of Fish and Game, began a research project designed to systematically gather and consolidate information on harvest levels and uses of freshwater fish in this part of the state. This research included the collection of new information and the review of published and unpublished materials. Previous research had shown that Bristol Bay area residents harvested several kinds of freshwater fish under subsistence fishing and sport fishing regulations using several types of gear (e.g. Behnke 1980a, 1980b). These fish, listed in Table 2, include Arctic grayling, blackfish, burbot, Dolly Varden, lake trout, longnose sucker, northern pike, rainbow smelt, rainbow trout, and several species of whitefish. Nevertheless, there was no single source of information on levels of local harvests or a discussion of the role these species play in the overall patterns of subsistence fishing and hunting in the Bristol Bay region. It is the purpose of this report to provide that overview and summary.

Justification for the collection of new information during the project centered on the increasing need by resource managers and user groups for quantified data and other general information on these non-salmon freshwater fisheries. Specific management and allocation topics which have arisen include regulations prohibiting subsistence harvests of rainbow trout, limited data to assess the biological impacts of all harvests on freshwater fish stocks, and impacts of potential regulatory changes linked to the growing recreational fishing effort in the Bristol Bay area. In addition, the development of fishery management plans for rainbow trout (Krasnowski 1987) and recreational use plans (such as the Nushagak-Mulchatna Rivers Recreation Management Plan) required information on local freshwater fish harvests.

Research objectives of the project included:

1. Estimates of annual harvests of freshwater fish by species, by community, and by gear type;
2. Documentation of the timing of freshwater fish harvests by species;
3. Maps of freshwater fish harvest locations, including local place names;

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<sup>1</sup> The original draft final version of this technical paper was completed in November 1989. Although that draft received limited circulation, it was not finalized and distributed as part of the Technical Paper Series due to budget cuts and consequent staffing reductions. This revised edition updates harvest estimates from systematic household surveys conducted by the division since 1989, and contains limited updated information from key respondents. Also, rainbow smelt has been added to the list of species discussed in the text. Harvest data and other information collected by the division and the Bristol Bay Native Association in Manokotak and Togiak in the spring of 1995 as part of a collaborative project funded in part by the U.S. Fish and Wildlife Service is not included in this report, but will be the subject of a forthcoming technical paper.

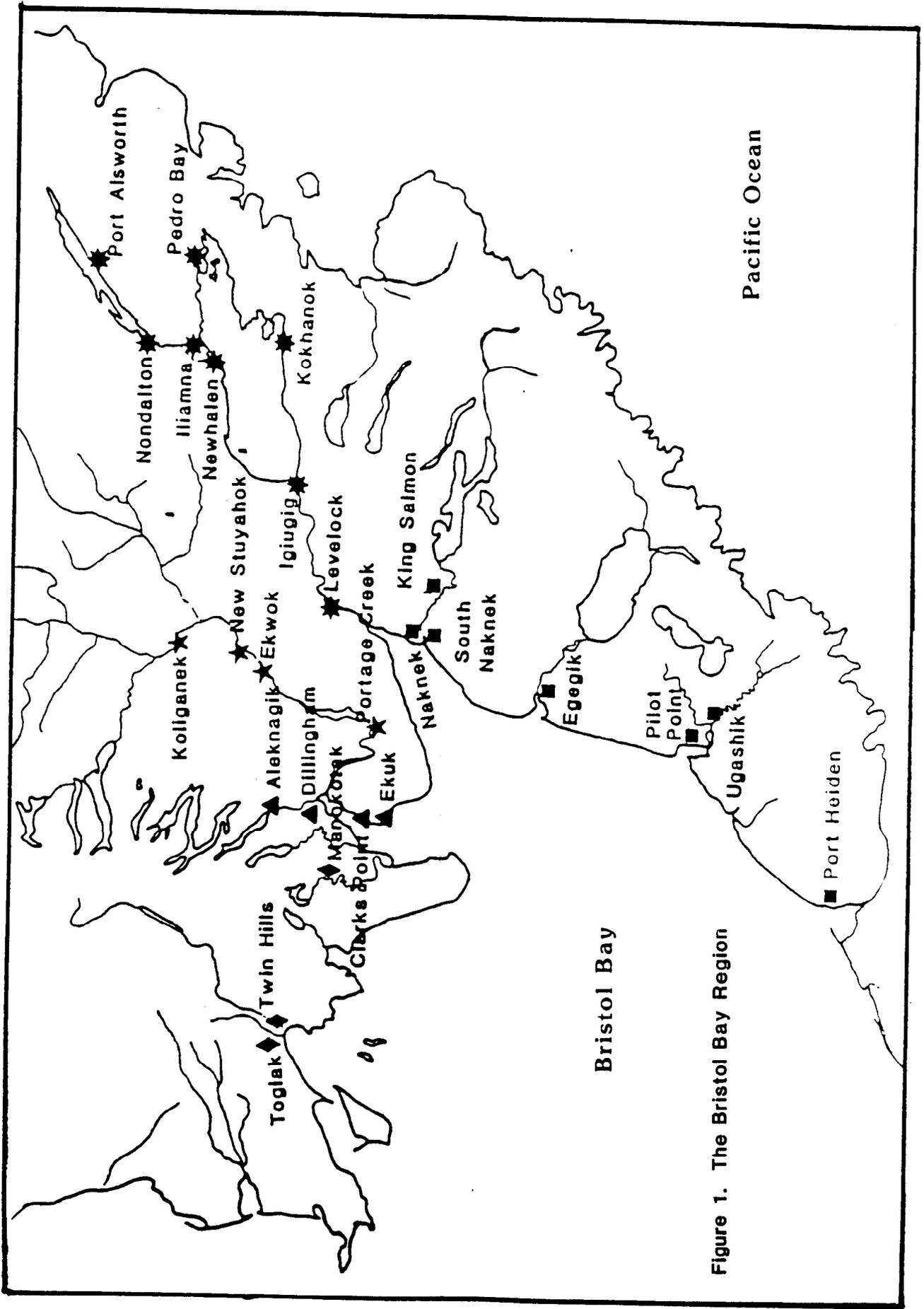


Figure 1. The Bristol Bay Region

Table 1. Population of Bristol Bay Communities Discussed in the Report, 1990

Community <sup>1</sup>	Commercial Fishing District <sup>2</sup>	1990 Total Population	Alaska Native Population	Percentage, Alaska Native
Togiak	Togiak	613	535	87.3%
Twin Hills	Togiak	66	61	92.4%
<b>Aleknagik</b>	Nushagak	185	154	83.2%
Clark's Point	Nushagak	60	53	88.3%
Dillingham	Nushagak	2,017	1,125	55.8%
Ekuk	Nushagak	3	2	66.7%
<b>Ekwok</b>	Nushagak	77	67	87.0%
<b>Koliganek</b>	Nushagak	181	174	96.1%
<b>Manokotak</b>	Nushagak	385	368	95.6%
New Stuyahok	Nushagak	391	375	95.9%
Portage Creek	Nushagak	5	3	60.0%
Balance, Dillingham Census Area	Nushagak	29	8	27.6%
<b>Igiugig</b>	Kvichak	33	26	78.8%
<b>Iliamna</b>	Kvichak	94	62	66.0%
Kokhanok	Kvichak	152	137	90.1%
<b>Levelock</b>	Kvichak	105	87	82.9%
<b>Newhalen</b>	Kvichak	160	151	94.4%
Nondalton	Kvichak	178	159	89.3%
Pedro Bay	Kvichak	42	38	90.5%
Port Alsworth	Kvichak	55	1	1.8%
Balance, Lake & Peninsula Borough	Mixed <sup>3</sup>	31	5	16.1%
King Salmon <sup>4</sup>	Naknek	696	108	15.5%
Naknek	Naknek	575	236	41.0%
South Naknek	Naknek	136	108	79.4%
Balance, Bristol Bay Borough	Naknek	3	3	100.0%
Egegik	Egegik	122	86	70.5%
Pilot Point	Ugashik	53	45	84.9%
Ugashik	Ugashik	7	6	85.7%
Port Heiden	Northern	119	86	72.3%
<b>Bristol Bay Region Total</b>		<b>6,573</b>	<b>4,269</b>	<b>64.9%</b>

<sup>1</sup> Communities in bold type were study communities for the collection of information on freshwater fish uses in 1986 and 1987.

<sup>2</sup> All communities except Port Heiden are in the Bristol Bay Area for commercial and sport fishing regulations. Port Heiden is in the Alaska Peninsula Area.

<sup>3</sup> Includes Kvichak, Egegik, Ugashik, and Northern districts, and the Chignik Management Area.

<sup>4</sup> Includes 267 in group quarters.

Sources: Alaska Department of Labor 1991

Table 2. Names of Freshwater Fish Discussed in the Report

<u>Common English Name</u>	<u>Scientific Name</u>	<u>Yup'ik Name</u>	<u>Dena'ina Name</u>
Arctic Grayling	<i>Thymallus arcticus</i>	<i>Nakrullugpak</i>	<i>Ch'dat'an</i>
Blackfish	<i>Dallia pectoralis</i>	<i>Can'giiq</i>	<i>Huzhegh</i>
Burbot	<i>Lota lota</i>	<i>Manignaq<sup>a</sup></i> <i>Atgiaq<sup>b</sup></i>	<i>Ch'unya</i>
Dolly Varden <sup>c</sup>	<i>Salvelinus malma</i>	<i>Yugyaq<sup>d</sup></i> <i>Anerrluaq</i> <i>Anyuk</i>	<i>Qak'elay</i>
Lake Trout	<i>Salvelinus namaycush</i>	<i>Cikignaq</i>	<i>Zhuk'udghuzha</i>
Longnose Sucker	<i>Catostomus catostomus</i>	<i>Cungartak</i>	<i>Duch'ehti</i>
Northern Pike	<i>Esox lucius</i>	<i>Cuukvak</i>	<i>Ghelguts'i</i>
Rainbow Smelt	<i>Osmerus mordax</i>	<i>Iqalluaq</i>	
Rainbow Trout	<i>Oncorhynchus mykiss</i>	<i>Talaariq</i>	<i>Tuni</i>
Broad Whitefish <sup>e</sup>	<i>Coregonus nasus</i>	<i>Akakiik</i>	<i>Telay</i>
Humpback Whitefish <sup>e</sup>	<i>Coregonus pidschian</i>	<i>Uraruq</i>	<i>Q'untuq'</i>
Round Whitefish <sup>e</sup>	<i>Prosopium cylindraceum</i>	<i>Uraruq</i>	<i>Hesten</i>
Least Cisco	<i>Coregonus sardinella</i>	<i>Cavirrutnaq</i>	<i>Ghelguts'i k'una</i>

<sup>a</sup> Nushagak River villages.

<sup>b</sup> Manokotak, Aleknagik, Twin Hills, Togiak.

<sup>c</sup> Also includes the closely related Arctic char, *Salvelinus alpinus*.

<sup>d</sup> At Togiak, Manokotak, and Aleknagik, and perhaps elsewhere, there are three Yup'ik names for Dolly Varden/Arctic char. *Yugyak* probably refers to resident Dolly Varden/char. *Anerrluaq*, called "Togiak trout" in the local English dialect, probably refers to anadromous fish taken in fresh water. Finally, *anyuk* or "sea run dollies" are Dolly Varden or char taken in salt water. See the text for further discussion of these distinctions.

<sup>e</sup> Broad whitefish are rare to absent in the Bristol Bay region. "Akakiik" is the word used at Aleknagik and Manokotak to refer to whitefish they receive from Kuskokwim River communities, where broad whitefish are common. Humpback whitefish are caught in the Iliamna Lake subregion and called "uraruq." "Uraruq" is used for round whitefish in the Togiak and Nushagak drainages.

Sources: Chythlook n.d. fieldnotes; Jacobson 1984, Kari 1994, Morrow 1980

4. Documentation of types of transportation used to reach fishing sites;
5. Documentation of uses of each species, including methods of preservation and preparation;
6. Documentation of local attitudes towards the value of each species as a food source;
7. Collection of historical information about the use of each species, including gear types, timing, and harvest locations; and
8. Documentation of interactions between local and non-local user groups.

## DATA COLLECTION METHODS

Data collection efforts covered all the communities located within the Bristol Bay watershed from Togiak in the northwest to Port Heiden on the Alaska Peninsula (Table 1, Fig. 1). Research personnel included two subsistence resource specialists, one stationed in Dillingham and one in King Salmon, and a bilingual (Yup'ik and English) fish and game technician stationed in Dillingham (who was a former resident of one of the key communities).

Because of limited staff, funds, and time, a sample of communities was selected for more intensive data collection in 1986 and 1987. These "sample communities" included Manokotak, Aleknagik, Ekwok, Koliganek, Levelock, Igiugig, and Newhalen/Iliamna. Table 3 summarizes research activities in three of these key communities (Aleknagik, Ekwok, and Koliganek). In addition, the division conducted comprehensive resource harvest surveys in three Nushagak River villages -- Ekwok, New Stuyahok, and Koliganek -- in March through May 1988, and in Levelock in December 1988 through January 1989. Among other data, these surveys collected quantitative harvest data for each species of freshwater fish. More recently, comprehensive household surveys were conducted in Clark's Point and Aleknagik in 1989, in Iliamna and Newhalen in 1992, and in Kokhanok, Igiugig, Levelock, and South Naknek in 1993.

### Freshwater Fish Harvest Calendars

In order to collect quantified harvest data for a standardized reporting period, freshwater fish calendars were designed to be used by resource harvesters to record their daily catches of seven kinds of freshwater fish in 1986 and 1987 (Appendix A). These calendars were issued in four-month packets, with the first set covering the months of May through August 1986. Every Bristol Bay household that applied for a subsistence salmon fishing permit for 1986 received a set of the calendars. A cover letter was attached which explained the purpose of the project and where to return the completed calendars, and indicated that the household would be provided a new packet for the next four months at the end of August. On the back of the calendars appeared illustrations and descriptions of each fish, plus their names in English, Central Yup'ik, and Dena'ina Athabaskan. A radio announcement in English and Yup'ik was broadcast at the start of the project to explain the calendars.

Table 3. Summary of Data Collection Efforts in Key Villages Regarding 1986 Freshwater Fish Harvests

**ALEKNAGIK**

Activity

May-86 Distributed 23 calendars for the May - August 1986 reporting period; 8 calendars were returned; identified 16 key fishing households.

May-86 Recall interviews with 11 households regarding Jan- April 1986 harvests.

Sep-86 Calendars issued for Sept. - Dec. 1986. No record of number issued. None were returned.

Dec-86 31 calendars issued for Jan. - April 1987. (Data not compiled.)

Jan-87 6 households were interviewed and provided recall data regarding Sept. - Dec. 1986 harvests.

Jan-87 Recall forms sent to 20 households for Sept. - Dec. 1986 data; 17 forms returned, or completed through phone calls.

SUMMARY:	Households Interviewed	HHs Returned Recall Forms	HHs Returned Calendars	Total
Jan-Apr 86	11	16	0	16
May-Aug 86	0	17	6	23
Sep-Dec 86	6	11	1	17

**EKWOK**

Activity

May-86 11 calendars issued for May -Aug 1986. Two returned; 12 key fishing HHs identified; 5 households interviewed regarding harvests during Jan - April 1986

Sep-86 Calendars issued for Sept - Dec 1986; no record of number issued. Two returned.

Feb-87 Recall forms mailed out for May -Aug and Sep - Dec periods (15 for first period and 3 for second returned).

Apr, May 1987 Field visit to collect recall forms and interview HHs (n= 6)

SUMMARY:	Households Interviewed	HHs Returned Recall Form	HHs Returned Calendars	Total
Jan-May 86	8	5	0	5
Apr-Aug 86	0	18	2	20
Sep-Dec 86	8	18	2	20

**KOLIGANEK**

Activity

May-86 8 calendars issued for the May - Aug period; 1 was returned

May-86 Identified 9 key fishing households, but none were available for interviewing.

Sep-86 21 calendars were distributed house to house for Sept- Dec 1986; none returned.

Oct-86 Interviews conducted to obtain recall data for Jan -Apr 1986 period (N = 12) and May - Aug period (N = 15)

Feb-87 Mail out recall form sent for Sept. - Dec. period. Three households returned the form.

May-87 Interviews with 8 households regarding harvests for Jan. - April 1987 and general use patterns.

SUMMARY	Households Interviewed	HHs Returned Recall Forms	HHs Returned Calendars	Total
Jan-Apr 86	12	0	0	12
May-Aug 86	15	0	1	15
Sep-Dec 86	0	3	0	3

The return rate for the first set of calendars was very low, despite several attempts to encourage fishermen to use and return the forms. Written reminder letters and a harvest recall form (similar to those sent out to subsistence salmon permit holders) were sent to all people who had received the first set, along with another packet of four calendars. In some communities, the researchers visited households to collect completed calendars and issue a new set (see Table 3).

Mail-out distribution of calendars continued in January 1987 for the following four-month period. The return rate of the calendars remained very low. Consequently, recall forms were mailed and visits to the sample communities were undertaken in February and March. During these visits, the calendars were discussed and various other data on freshwater fish harvests were collected.

Because of the low return rates, insufficient staff to follow-up on the mailed forms, and the more effective method of interviewing key households in selected communities (see below), the catch calendar effort was suspended in May 1987. In the report, the only results of the calendars that are used are for Aleknagik, Ekwok, and Koliganek, key communities for which interview data on harvests during 1986 are also available. Returns for all the other communities were far too low to indicate approximate levels of harvest. All harvest data derived from calendars pertain to 1986.

There were several reasons for the low catch calendar return rate. The initial distribution occurred near the beginning of the salmon fishing season; little freshwater fishing effort was taking place at that time and, consequently, the calendars received little attention. Secondly, unlike subsistence salmon fishing, which is usually conducted by groups of people in concentrated time periods, freshwater fishing occurs over many months much more sporadically, with weather and travel conditions playing a major role. Harvesters are more commonly alone or in small groups. Daily catches can be small, but when catches are large, it is not customary to make an exact count of the catch. Consequently, self-monitoring of freshwater fishing requires more effort than reporting salmon harvests on permits, and it is difficult for one person in a household to track the fishing activities of the other household members for multiple species over a year's time.

Despite the low returns, the calendar effort served a useful purpose in the key communities. First, the calendars alerted the key fishing households to the researchers' interest in these species, and provided guides for species identification. Second, the calendars provided a topical focus during the researchers' visits to the communities. Combined with the results of mailed-out recall forms and interviews, the calendar data provided reasonable estimates of freshwater fish harvests and methods for some key communities, which in turn, we believe, are generally representative of patterns occurring in much of the Bristol Bay region.

#### Harvest Recall Interviews

Researchers identified "key fishing households" in the sample communities of Aleknagik, Ekwok, and Koliganek. These households were interviewed about their freshwater fishing activities for the four-

month period from January through April 1986, a period not covered by a set of calendars, so that harvest results for the calendar year 1986 would be available. These households were also interviewed after the four-month calendar periods if they had failed to send back the set. These periodic interviews with active fishing households which elicited recall harvest data were the most effective data collection method. Because the size of the individual harvests of these households are probably not typical of the community overall, harvests were not expanded for a community estimate. These data therefore represent minimum harvests during the study year.

#### Key Respondent Interviews

Often in conjunction with harvest recall interviews, key fishing households in the seven sample communities provided other information on patterns of use of non-salmon freshwater fish. The researchers designed a data collection instrument to guide these discussions (Appendix B). Information gathered during these interviews included harvest methods, harvest locations, methods of preserving catches, and methods of preparing freshwater fish for meals.

#### Other Sources of Quantified Data

The other major source of information on levels of harvests of non-salmon freshwater fish in the Bristol Bay area are community harvest surveys. Table 4 provides a list of community harvest surveys with harvest information conducted by the Division of Subsistence in the region since 1980. The results of these surveys appear in the division's Community Profile Database (Scott et al. 1995). In addition, the University of Alaska conducted a comprehensive survey of harvest activities in most Bristol Bay communities in 1974 (Togiak, Twin Hills, Portage Creek, and Port Alsworth were not surveyed), pertaining to a 12-month period from spring 1973 to spring 1974 (Gasbarro and Utermohle 1974). The division has created a database with the results of this 1974 survey. Final editing of this database is incomplete; therefore, the data for 1973/74 which appear in this report may undergo small modifications in the future.

Division of Subsistence technical papers also provide information on uses of freshwater fish harvests, timing of harvests, descriptions of harvest methods, and harvest area maps. Two region-wide summaries have been prepared (ADF&G 1985a, Wright et al. 1985).

#### Mapped Data

In 1982, the Division of Subsistence conducted research on areas used to harvest fish and wildlife resources by each Bristol Bay community. The results, including community harvest areas for freshwater fish, appear in the Department of Fish and Game's Alaska Habitat Management Guide Reference Map publication (ADF&G 1985b).

Table 4. Division of Subsistence Resource Harvest Surveys in the Bristol Bay Region

<u>Community</u>	<u>Date of Survey</u>	<u>Harvest Year</u>	<u>Total Households</u>	<u>Percent Sampled</u>	<u>Technical Paper Reference</u>
Aleknagik	1989	11/88 - 10/89	42	90.5%	
Clark's Point & Ekuk	1989	11/88 - 10/89	17	100.0%	Seitz 1996
Dillingham	1985	1984	691	22.1%	* Fall et al 1986
Egegik	1985	1984	42	59.5%	* Morris 1987
Ekwok	1988	4/87 - 3/88	32	90.6%	Schichnes & Chythlook 1991
Igiugig	1984	1983	11	27.3%	Morris 1986
	1993	11/92 - 10/93	12	83.3%	
Iliamna	1984	1983	36	55.6%	Morris 1986
	1992	11/91 - 10/92	30	76.7%	
King Salmon	1984	1983	122	35.2%	* Morris 1985
Kokhanok	1984	9/82 - 8/83	27	70.4%	Morris 1986
	1993	11/92 - 10/93	39	92.3%	
Koliganek	1988	4/87 - 3/88	48	87.5%	Schichnes & Chythlook 1991
Levelock	1988, 1989	11/87 - 10/88	33	81.8%	Chythlook & Fall, forthcoming
	1993	11/92 - 10/93	39	76.9%	
Manokotak	1986	1985	59	91.5%	Schichnes & Chythlook 1988
Naknek	1984	1983	123	42.3%	* Morris 1985
Newhalen	1984	1983	26	42.3%	Morris 1986
	1992	11/91 - 10/92	32	81.3%	
New Stuyahok	1983	1982	55	30.9%	Wolfe et al 1984
	1988	4/87 - 3/88	74	54.1%	* Schichnes & Chythlook 1991
Nondalton	1981	1980	35	40.0%	Behnke 1982
	1982	1981	35	54.3%	Behnke 1982
	1984	1983	54	38.9%	Morris 1986
Pedro Bay	1984	1982	21	81.0%	Morris 1986
Pilot Point	1987	6/86 - 5/87	18	94.4%	Fall & Morris 1987
Port Alsworth/ Lake Clark	1984	1983	21	61.9%	Morris 1986
Port Heiden	1987	6/86 - 5/87	37	100.0%	Fall & Morris 1987
South Naknek	1984	1983	49	42.9%	* Morris 1985
	1993	11/92 - 10/93	42	83.3%	
Ugashik	1987	6/86 - 5/87	5	100.0%	Fall & Morris 1987

\* = randomly selected sample

During interviews with key respondent households in 1986, 1987, and 1988, the researchers obtained data on more specific areas used for the harvest of non-salmon fish in freshwater by Bristol Bay area residents. These areas are discussed in the sections of the report on the individual communities.

#### ORGANIZATION OF THE REPORT

Chapter Two provides a broad overview of the Bristol Bay region, including a discussion of the general patterns of the subsistence use of fish and game. It also provides background on each type of freshwater fish used by the region's residents, and describes the regulatory structure governing the taking of these species. This general information serves as a frame for the more specific, community-based data presented in Chapter Three. That chapter summarizes the available information on harvest quantities and use patterns of freshwater fish by each Bristol Bay community. Chapter Four, the final chapter, describes the general patterns of use of freshwater fish in the region, first according to three "subpatterns" and then species by species.

## CHAPTER TWO: GENERAL OVERVIEW

### REGIONAL CHARACTERISTICS

In 1990, the Bristol Bay region contained 26 communities and a total population of about 6,573 (Table 1). About half of this population lived in the two regional centers of Dillingham and the Bristol Bay Borough, which included Naknek, South Naknek, and King Salmon. These larger communities contain substantial non-native populations which have moved to the region from other parts of Alaska or from outside the state. The population of almost all of the rest of the communities is overwhelmingly Alaska Native and most residents were born in the region. Those of the Togiak River and Nushagak River drainages are Yup'ik Eskimo. Most of villages of the Iliamna Lake subregion are also Yup'ik, but two -- Nondalton and Pedro Bay -- are Dena'ina (Tanaina) Athabaskan. Many Alaska Native residents of the Alaska Peninsula communities consider themselves to be Aleuts. The traditional Native language of these villages is Alutiiq (also called Sugpiaq, Sugcestun, or Pacific Yupik), a Yup'ik Eskimo language.

An important sector of the local economy in the Bristol Bay region is commercial salmon fishing. Commercial fishing provides most of the cash incomes in virtually every community. In the villages, there are few other cash earning opportunities, with seasonal construction, jobs with village governments or the schools, and furbearer trapping, being most notable. Dillingham and the Bristol Bay Borough have more developed and diverse cash sectors to their economies because of their larger size and their roles as regional service and transportation centers. For example, jobs with regional, state, or federal government agencies are available, as well as employment with transportation firms, retail outlets, and services such as hotels and restaurants. Nevertheless, much of the employment in these centers is seasonal too, and commercial fishing dominates as in the rest of the region. Finally, seafood processing is a major industry in Bristol Bay, but most jobs are held by non-local residents who leave at the end of the commercial fishing season (Wolfe et al. 1984; Wright et al. 1985:26-27; Fall et al. 1986:27-29; Alaska Dept. of Labor 1986).

### GENERAL PATTERNS OF SUBSISTENCE USE

#### Levels of Participation and Seasonal Round

Everywhere in the Bristol Bay region, the harvest of fish, game, and wild plants for local use plays a major role in the economy and way of life (Wright et al. 1985). Fish and wildlife harvests are substantial, contributing a large portion of the diets of local residents. Furthermore, hunting and fishing take place within a patterned seasonal round of harvest activities. Most people participate in these activities as hunters, fishermen, gatherers, or processors of fish, wildlife, and wild plant harvests. Hunting, fishing, and gathering occur, for the most part, in traditional harvest areas near each community.

Generally, the seasonal cycle of resource harvesting activities begins with the break-up of river and lake ice in the spring. Harvests of freshwater fish such as whitefish and pike with nets occur in sloughs and lake outlets. Harvests of migratory birds take place in the Togiak and Alaska Peninsula subregions. Residents of some Togiak River and Nushagak Bay communities harvest marine mammals in spring as well. In May, preparations begin for commercial and subsistence salmon fishing, and these activities dominate until August or September. King, sockeye, chum, and silver salmon are the major species taken for local use. Activities which take place in the fall include moose and caribou hunting, waterfowl hunting, berry gathering, and fishing for spawning sockeye salmon and for Dolly Varden, char, and other freshwater fish. After freeze-up, fish such as smelt, whitefish, and pike are taken through the ice. Hunting for moose and caribou continues into the winter months, and furbearer trapping is important in many communities (Wright et al. 1985).

This basic pattern of subsistence harvests centered around salmon fishing and big game hunting prevails throughout Bristol Bay, but there are some notable differences between subregions. As discussed below, harvests of fish other than salmon vary between subregions. Moose are a major component of big game harvests in the Nushagak and Kvichak drainages, but play a lesser role at Togiak and on the Alaska Peninsula.

#### Resource Harvest Quantities

Table 5 reports the available data on total wild resource harvests by Bristol Bay communities in pounds usable weight per capita. These harvests are substantial. For example, on average, households in the western United States in 1978 purchased 222 pounds per person of meat, fish, and poultry for home consumption (U.S. Department of Agriculture 1983). Most Bristol Bay communities exceeded this level in the years for which data are available.

### THE FRESHWATER FISH RESOURCE: SPECIES CHARACTERISTICS

#### Arctic Grayling

Arctic grayling (*Thymallus arcticus*) inhabit clear, cold streams and lakes in the Bristol Bay region. They are a slow-growing fish that reach 12 inches in length by six or seven years of age. The average weight of a sport-caught grayling is about 1 - 1.5 pounds (450 - 700 grams). The Bristol Bay region, especially the Ugashik lake system, is known for its trophy-sized grayling. Arctic grayling overwinter in deep water. In April and May, they move upstream to tributaries to spawn. Adult fish then swim further upstream and establish territories in pools in summer. In September, the grayling begin moving downstream to overwintering areas in deep water (Andrews 1984, Morrow 1980:145-147).

Table 5. Per capita Harvests of Wild Resources, Pounds Usable Weight, Bristol Bay Communities, 1973 - 1992

Community <sup>1</sup>	1973	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Aleknagik	204									379				
Clarks Point	335									363				
Dillingham	253					242								
Egegik	219					384								
Ekwok	645								797					
Igiugig	871			618										725
Iliamna	186			416									848	
King Salmon	276			220										
Kokhanok	1,200			697										1,013
Koliganek	762								830					
Levelock	695								1,253					884
Manokotak	406						384							
Naknek	183			188										
Newhalen	633			767									747	
New Stuyahok	617			896					700					
Nondalton	780	1,036	738	1,175										
Pedro Bay	637			865										
Pilot Point	322							384						
Port Alsworth					361									
Port Heiden	126							408						
Portage Creek														
South Naknek	246				268									297
Togiak														
Twin Hills														
Ugashik	889							814						

<sup>1</sup> No comprehensive harvest surveys have been conducted in Portage Creek, Togiak, or Twin Hills.

Sources: for 1973, files, Division of Subsistence, ADF&G, based on Gasbarro and Utermohle 1974; for New Stuyahok 1982, Wolfe et al. 1984; for remainder, Scott et al. 1995.

### Blackfish

Blackfish (*Dallia pectoralis*) are a small (average length eight inches) fish that inhabit densely vegetated areas of ponds, rivers, and lakes in the Bristol Bay drainage. They grow slowly, and may live up to eight years. Blackfish are bottom dwellers that feed primarily on insects. They spawn from May to August. These fish move between summer habitat in tundra ponds and winter habitat in deeper lakes (Armstrong 1982, Morrow 1980:161-163).

### Burbot

Burbot (*Lota lota*), also known as ling cod or lush, inhabit streams and lakes, and are usually concentrated in deep holes through much of the year. They are mostly sedentary, but some move to spawning areas in shallow water. Spawning usually occurs in January and February in lakes under ice cover. Burbot grow slowly, and may reach 20 inches in length after eight years of life. The average weight of an adult burbot is about 1.1 to 2.2 pounds (0.5 to 1 kg) (Williams 1984, Morrow 1980:181-184).

### Dolly Varden

There are both anadromous and resident (non-migratory) populations of Dolly Varden (*Salvelinus malma*) in the Bristol Bay region. (The closely related Arctic char [*Salvelinus alpinus*] may also occur in portions of the region. These are included within the "Dolly Varden" category throughout the report because the subtle biological distinction between "char" and "Dolly Varden" is not meaningful to subsistence fishermen in the region.) The anadromous populations of Dolly Varden spawn in clear water streams in October and November. The eggs hatch in March, and the fish rear in streams and grow slowly. In their third or fourth year, as five inch long smolts, they migrate to the sea in May or June. These anadromous Dolly Varden then spend the rest of their lives moving in April to June from wintering areas in lakes to summer feeding areas in salt water. The return to freshwater occurs in August and September. Mature Dolly Varden (five or six years old, and weighing 0.5 to 1.0 lb.) spawn in their natal streams, and then move on to lakes. The mortality rate for spawning Dolly Varden is about 50 percent. Resident Dolly Varden occur towards the headwaters of the Bristol Bay region. They overwinter in deep pools, and disperse through tributary streams in the summer. They rarely enter the major rivers, however (Armstrong 1984, Morrow 1980:61-63).

### Lake Trout

Lake trout (*Salvelinus namaycush*) are a close relative of the Dolly Varden and are the largest members of their genus, living up to 40 years. They are common in the large, deep, cold lakes of the Bristol Bay region, where they spend their entire lives. In spring, when the lake is cold, lake trout can be found near the surface, but they descend deeper as the lake warms in summer. In August and September, mature lake trout (seven to eight years old, 18 inches long) move to spawning sites along lake

shores (Redick 1984, Morrow 1980:55-58). Lake trout do not inhabit the Wood River system and are probably not present in the Igushik River system either. They are found in the Togiak River drainage and in the Tikchik lakes (Minard, personal communication, 1988).

#### Longnose Sucker

Longnose suckers (*Catostomus catostomus*) are bottom feeders which begin spawning runs in late spring. They move from lakes into inlet streams or from pools in streams to graveled sections. After spawning, adults return to lakes or remain in the rivers, but generally do not undertake any long migrations (Morrow 1980:173-175).

#### Northern Pike

Northern pike (*Esox lucius*) inhabit lakes, rivers, and sloughs. They may reach a size of 20 pounds or more, although six to eight year old fish weigh an average of about five pounds and are 25 inches long. These fish overwinter in deep, slow moving waters of larger rivers or in deeper lakes. In spring, a short migration occurs upstream or inshore to spawning areas. Pike spawn in spring along lake shores or slow-moving portions of streams in shallow, marshy areas after the ice goes out. The adult fish, usually solitary, then occupy "holes" throughout most of the summer (Alt 1984a, Morrow 1980:165-169).

#### Rainbow Smelt

Rainbow smelt (*Osmerus mordax*) are an anadromous species that migrate inshore and congregate near the mouths of rivers and streams during the winter months. They are also called "boreal smelt," "toothed smelt," or "Arctic smelt" (Kessler 1985:12). Rainbow smelt are a small fish, averaging about 30 grams (about an ounce) in weight (Morrow 1980:155). A sample of 30 smelt from the Togiak River weighed by division staff averaged 51 grams (about 1.8 ounces) (range 20 to 72 grams).

#### Rainbow Trout

Rainbow trout (*Oncorhynchus mykiss*) inhabit lakes and streams in the Bristol Bay area. A good sized rainbow trout weighs 2.2 to 4.4 pounds (1 - 2 kg), but lake dwellers grow faster and larger. Adult rainbow trout (three years old) which inhabit lakes move from mid April to late June to shallow, graveled portions of clear water streams to spawn. The adults return to the lake about three to six weeks later, and will spawn again in subsequent years. Rainbow trout in the Iliamna and Naknek drainages return to streams in August and September to feed on salmon eggs and to overwinter. Other rainbow trout spend their entire lives in streams, and are non-migratory (Paddock 1978, Morrow 1980:50-53, Krasnowski 1987:77).

## Whitefish

Whitefish are a generally abundant group of several related species which inhabit all kinds of freshwater habitats. There are several kinds of whitefish in the Bristol Bay drainage. The most common on the western side of the drainage is the round whitefish (*Prosopium cylindraceum*). These whitefish reach up to about 4.5 pounds (two kg) in weight. They spawn in rivers and along lake shores in late September and October. The least cisco (*Coregonus saardinnela*) is the next most common whitefish in the Dillingham area of Bristol Bay. Some least cisco undertake long spawning migrations upstream in September and October to clear streams with gravel bottoms. Lake-dwelling populations of least cisco do not migrate. The humpback whitefish (*Coregonus pidschian*) is closely related to the least cisco. In the Bristol Bay region, they are most common in the Lake Iliamna area. These fish move upstream in summer and fall, and spawn in October in the upper reaches of streams. Also closely related is the broad whitefish (*Coregonus nasus*), which is uncommon in the Bristol Bay drainage, although some occur in the upper Nushagak and in the Wood - Tikchik Lakes system (Alt 1984b; Morrow 1980:29-38; Minard, personal communication, 1987).

## YUP'IK CLASSIFICATION OF "TROUT"

In the villages of the Togiak and Nushagak river drainages, at least, there is no direct one-to-one correspondence between the western "scientific" categories of some types of freshwater fish and the Yup'ik classification system. This discrepancy involves, from the western point of view, three species: Dolly Varden, Arctic char, and lake trout. As shown in Table 6, the local dialect of Central Yup'ik contains three names for fish which cross cut these species. Local English names cross cut the biological categories as well.

Table 7 illustrates the features which distinguish these three types of fish. The contrasts are based on qualities of the flesh and fat which are relevant to preservation and preparation, and on behavioral characteristics that influence how the fish are caught.

### *Anerrluaq*: "Togiak trout"

The most preferred type of Dolly Varden or char in the Igushik, Wood, and Togiak river communities is called *anerrluaq* ("to go out") in Yup'ik and "Togiak trout" in the local English dialect. They are also sometimes called "lake trout," but should not be confused with another species, *S. namaycush*, which is also called "lake trout" in the Bristol Bay region and by biologists. These are called *cikignaq* in Yup'ik and are not present in the Igushik or Wood river systems.

*Anerrluaq* have firm flesh and a desirable fat content for drying. Most of these fish are free of cysts and worms (Table 7). In addition, it is said that the meat has a better flavor for cooking or eating frozen,

Table 6. Yup'ik Categories of "Trout" for the Togiak, Igushik, and Wood River Drainages

<u>Yup'ik Name</u>	<u>Local English Name</u>	<u>Scientific Name</u>	<u>Common English Name</u>
<i>Anerrluaq</i>	Togiak trout	<i>Salvelinus malma</i>	Dolly Varden
	Lake trout	<i>Salvelinus alpinus</i>	Arctic Char
<i>Anyuk</i>	Sea run Dolly Varden	<i>Salvelinus malma</i>	Dolly Varden
		<i>Salvelinus alpinus</i>	Arctic Char
<i>Yugyaq</i>	Dolly Varden	<i>Salvelinus malma</i>	Dolly Varden
		<i>Salvelinus alpinus</i>	Arctic Char
<i>Cikignaqaq</i>	Lake trout	<i>Salvelinus namaycush</i>	Lake trout <sup>a</sup>
<i>Talaariq</i>	Rainbow trout	<i>Oncorhynchus mykiss</i>	Rainbow trout

<sup>a</sup> *Salvelinus namaycush* is probably not present in the Igushik or Wood river drainages. In the local English dialect, "lake trout" is synonymous with "Togiak trout" and refers to either *S. malma* or *S. alpinus*.

Table 7. Distinguishing Features of Three Yup'ik Categories of Fish

	<u>anerrluag</u>	<u>anyuk</u>	<u>yugyag</u>
<u>Features of the flesh and oil</u>			
High fat content	X	X	
Rancid fat		X	X
Firm meat	X	X	
Allergic reaction to slime			X
Abundant worms and cysts			X
<u>Harvest methods</u>			
Sweep seine in river	X		
Set net in river and lake	X		X
Incidental in commercial gill nets in salt water		X	
Jigging in river and lake	X		X
Rod and reel	X		X
Spear	X		X
Set net under ice			X
Year-round harvest	X		X

Source: Chythlook, fieldnotes, updated 1996

although *anerrluaq* must be aged before being frozen or they will cause *miryalingunarquq* (a nauseated feeling).

Togiak trout swim in schools in rivers and are therefore easy to catch with sweep seines when the weather is good for drying in the fall. They are also taken in nets in open water, by jigging through the ice in spring, or with spears. In general, *anerrluaq* are not caught in nets set in lakes for *yugyaq* (another type of Dolly Varden/char) and other freshwater fish.

*Anerrluaq* are prepared in all of the traditional ways listed in Table 8 and described below. Their fat content is similar to that of salmon when processed for drying. They are split and dried, or soaked in brine before drying, or hung whole to half dry. The fat of *anerrluaq* will not turn rancid as quickly as that of "Dolly Varden" (*yugyaq*). The meat of *anerrluaq* is brighter and firmer than that of *yugyaq* and has a richer, less fishy taste. At Togiak, people have begun to can *anerrluaq* as they do salmon.

#### Yugyaq: "Dolly Varden" or "Char"

A second category of *Salvelinus malma* or *Salvelinus alpinus* is called *yugyaq* (perhaps "habitats around people's dwellings") in Yup'ik and Dolly Varden or char in English. These contrast with "Togiak trout" in several ways (Table 7). They have a lower fat content, but unless in good condition and carefully handled do not make very good dried or smoked fish because the fat turns rancid very quickly during the drying or smoking process. Also, worms and cysts are said to abundant in *yugyaq* in comparison with *anerrluaq*. The meat is light in color and softens quickly after the fish dies. Reportedly, some people have allergic reactions from the slime while handling *yugyaq* – a problem that does not occur with *anerrluaq*. Generally, residents of the Nushagak and Togiak areas use *yugyaq* when other fish resources are not available.

*Yugyaq* are never "round hauled" with a sweep seine because, unlike *anerrluaq*, they do not school-up. People at Aleknagik set nets for *yugyaq* under the ice during the winter and early spring. They also jig in lakes for *yugyaq* after freeze-up and throughout the winter and early spring. In addition, these fish can be taken in open water with rod and reel gear. Spawned-out *yugyaq* are taken in the spring and summer, but they usually have worms and cysts inside their stomach lining and entrails.

*Yugyaq* are prepared for use in most of the ways listed in Table 8, except for fresh frozen or frozen after aging. They are generally not stored for a long period of time because of the sensitivity of the fat content. They have a strong fishy smell that lingers in homes when cooked. *Yugyaq* are more readily used for dog food than most other types of freshwater fish.

#### Anyuk: "Sea-run Dolly Varden"

The third category of fish which overlaps the western categories of "Dolly Varden" and "Arctic char" is called *anyuk* ("wanting to go out") in Yup'ik and "sea-run Dolly Varden" in the local English dialect. These fish are caught exclusively as an incidental harvest in commercial salmon nets in Togiak and

Nushagak bays. Unlike *anerrluaq* and *yugyaq*, they are never found in rivers or lakes (Table 7). They are most abundant during the early and mid sockeye salmon season and again, in some years, during the coho salmon runs at Togiak.

*Anyuk* are generally larger than either *anerrluaq* or *yugyaq* and have a higher fat content as well -- about the same as king salmon when fresh boiled. Like *yugyaq*, the fat turns rancid while drying or after smoking (Table 7). The meat stays firm like salmon even if the fish has been dead for a day or more, but will spoil faster than salmon if left in direct sunlight or a warm area. It is said that *anyuk* are best for eating when cooked fresh or half dried and boiled before the fat starts turning rancid.

## AN OVERVIEW OF METHODS FOR USING FRESHWATER FISH IN THE BRISTOL BAY REGION

Table 8 lists the Yup'ik terms for traditional methods for preparing freshwater fish for subsistence use in the Bristol Bay region. The following section describes these methods in more detail.

### Umlikqaq

*Umlikqaq* is fresh boiled fish. All parts of the fish except for the entrails are used to prepare *umlikqaq*. Fresh fish that have been dead for less than a day make the best *umlikqaq* because the meat is still firm. If a freshwater fish is caught with a hook, it is best to kill the fish by hitting its head soon after capture so the meat will stay firm for cooking. The main ingredients of *umlikqaq* are cut-up fish, water, and salt which are boiled for about 20 minutes. This is a preferred food for elders because it is easy to make and is not strongly seasoned. Fish heads are good prepared as *umlikqaq*.

### Salkuuyaq

*Salkuuyaq* is fresh fish baked whole or filleted after the entrails are removed. The meat of fish baked whole is slit horizontally every few inches on one side and slit in the middle lengthwise on the other side. Fish are placed in a baking dish, seasoned, oiled, and baked. Younger people seem to prefer this dish over the plainer boiled fish. It is often eaten with boiled rice.

### Assaliq

*Assaliq* is fresh fried fish. All parts of the fish except the entrails are used to prepare this dish, although often the heads are removed as well. The fish is filleted, dipped in seasoned flour, or just seasoned with salt, and fried in oil. If households enjoy picking and sucking backbones or only a few fish are available, the back bone will be fried along with the filleted pieces. Heads are sometimes fried for the same reasons. Boiled rice is the favorite side dish with this meal. Middle aged and younger people enjoy this meal for the flavor.

Table 8. Yup'ik Terms for Methods of Preparing Fish for Subsistence Use, Nushagak and Togiak River Drainage Communities

<u>Term</u>	<u>Meaning</u>
<i>assaliq</i>	Fried fish
<i>egamaarruk</i>	Split and half dried
<i>kumlivirluuki</i>	Stored in freezer
<i>kumlaneq</i>	Frozen fish
<i>maniaq</i>	Roasted fish
<i>neqerrluk</i>	Split dried and smoked
<i>salkuuyaq</i>	Baked fish
<i>tamalkuryaq</i> or <i>kanartaq</i>	Half dried whole
<i>taryiraq neqerrluk</i>	Salted, dried, and smoked
<i>tepcuaraq</i>	Aged and frozen
<i>umlikqaq</i>	Boiled fish

Source: Chythlook, field notes, updated 1996.

### Maniaq

Roasted (barbecued) fish is called *maniaq*. All parts of the fish except the entrails are used. Over an open fire, a green branch or drift wood is used by inserting the stick in the mouth of the fish, then pushing the stick through the fish along the backbone until the stick emerges at the base of the tail. The stick is then propped up near the open fire to begin roasting. A modern alternative is to wrap the fish in foil and place it in the camp fire.

### Tepcuaraq kumlaneq

Fish that is aged and frozen is called *tepcuaraq kumlaneq*. Fish can be either cleaned of their entrails or left intact, then buried under ground in a pit lined with grass and left for about a week depending on the temperature. If the fish are caught in the late fall, they are stored in a wooden or cardboard box until they are aged, and then frozen. *Tepcuaraq kumlaneq* are eaten with seal oil.

### Neqerrluk

*Neqerrluk* is split dried and smoked fish. The fish are cleaned by removing the head and entrails. They are then filleted by removing the backbone and leaving the tail attached. Backbones are left intact to dry along with the fish. This product is mainly eaten with *akutaq* or with seal oil.

### Taryiraq neqerrluk

Fish that is salted, dried, and smoked is called *taryiraq neqerrluk*. This is processed like *neqerrluk*, except that the fish are put in brine before hung to dry. Brining tends to produce a product that is softer for eating. *Neqerrluk* is eaten with seal oil, but are preferred to be eaten with *akutaq*.

### Egamaarruk

*Egamaarruk* is split and half dried fish. These are prepared much like *neqerrluk*, but are not fully dried and may not be smoked. The half dried fish are boiled and eaten with seal oil.

### Tamalkuryaq or kanartaq

*Tamalkuryaq* (or *kanartaq*) are whole fish that are half dried. The entrails are removed leaving the head intact, although sometimes the head is removed depending upon the processor's preference. The fish are hung whole by using a string or braided grass to pair off two fish per hanging. When half dried, the fish are stored for later use or boiled and eaten with seal oil.

## REGULATIONS

### Subsistence Fishing

Table 9 summarizes the regulations governing the subsistence harvesting of non-salmon freshwater fish in the Bristol Bay area in 1986/87, when this research commenced. Subsistence fishing with a hook and line or rod and reel in open water was prohibited; therefore, local residents were required to abide by sport fishing regulations (see below) when fishing with this gear type in freshwater. Also, a regulation prohibited the subsistence taking of rainbow trout throughout the state.<sup>1</sup> These regulations also required that subsistence fishermen obtain a permit to fish for trout and char (Dolly Varden). Few Bristol Bay residents were aware of this requirement, and the department has not made a strong effort to issue permits to potential fishing households as it has with salmon. Consequently, few freshwater fishing permits are issued and even fewer are returned. The permit data are therefore not useful in estimating subsistence harvests of trout or Dolly Varden. For example, department personnel made an effort in 1977 to issue permits in Iliamna Lake communities. A total of 57 permits was issued in nine locations, but only 17 were returned and only two communities (Igiugig and Kokhanok) reported any harvests (Table 10). Reliance on these data would lead to a severe underestimate of the subsistence take of these species.

Other than the permit requirement for trout and Dolly Varden, the regulations established few other requirements for the subsistence taking of freshwater fish, except for net placement and closed areas. For example, there were no gear restrictions (except the above mentioned prohibition against subsistence hook and line fishing in open water), bag limits, or closed seasons on grayling, blackfish, burbot, suckers, pike, or whitefish. Regulations also allowed subsistence hook and line fishing through the ice in the Bristol Bay Area (Table 9).<sup>2</sup>

### Sport Fishing

Table 11 summarizes the sport fishing regulations for non-salmon freshwater fishing for the Bristol Bay area in 1988. There were a number of regulations that pertain to specific rivers and drainages within the area. Most of these set lower bag and possession limits for rainbow trout, restricted or prohibited the use of baited hooks, or closed a portion of the year to sport fishing. The Department of Fish and Game summarizes annual sport fishing harvests in a report which is based upon postal surveys and creel censuses (e.g. Mills 1987).

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<sup>1</sup> The Alaska Board of Fisheries repealed this statewide regulation against subsistence fishing for rainbow trout and steelhead beginning in 1993. In the Bristol Bay Area, rainbow trout taken incidentally in other subsistence finfish net fisheries and through the ice, were lawfully taken and could be retained for subsistence purposes.

<sup>2</sup> In 1993, the Board of Fisheries found that all the freshwater fish stocks of the Bristol Bay Area support customary and traditional uses.

Table 9. Subsistence Fishing Regulations for Non-Salmon Freshwater Fish, Bristol Bay Area, 1986 - 1987

<u>Species</u>	<u>Regulations<sup>a</sup></u>
Arctic grayling	No gear restrictions, <sup>b</sup> closed seasons, or bag limits
Blackfish	No gear restrictions, <sup>b</sup> closed seasons, or bag limits
Burbot	No gear restrictions, <sup>b</sup> closed seasons, or bag limits
Dolly Varden	Permit required
Lake trout	Permit required
Long nose sucker	No gear restrictions, <sup>b</sup> closed seasons, or bag limits
Northern pike	No gear restrictions, <sup>b</sup> closed seasons, or bag limits
Rainbow smelt	No gear restrictions, <sup>b</sup> closed seasons, or bag limits
Rainbow trout	Subsistence fishing prohibited [5 ACC 01.010 (l)] <sup>c</sup>
Whitefish	No gear restrictions, <sup>b</sup> closed seasons, or bag limits

Other:

No set gill net may obstruct more than one-half the width of a stream

Gill nets are prohibited in that portion of the Naknek River upstream from Sovonaski (sic)

Subsistence fishing with nets is prohibited in 18 streams and within one-fourth mile of the terminus of these streams from Sept. 1 through June 14.

Fish traps are prohibited under AS 16.10.070. However, this prohibition "does not prevent the operation of small hand-driven fish traps of the type ordinarily used on rivers of the state that are otherwise legally operated in or above the mouth of a stream or river." This exemption allows the use of a fyke net, a "fixed, funneling (fyke) device used to entrap fish" (5 AAC 39.105 [d] 17).

<sup>a</sup> 5 AAC 01.300 - 345 unless otherwise noted.

<sup>b</sup> "Fish, other than salmon, herring, and capelin, may be taken by gear listed in 5 ACC 01.010 (a) unless restricted by the terms of a subsistence fishing permit [5 ACC 01.320 (h)]. 5 AAC 01.010 (a) states that "unless otherwise provided in this chapter, the following are legal types of gear for subsistence fishing," including gear specified in 5 ACC 39.105. The regulation then defines "jigging gear," "spear," and "lead." 5 AAC 39.105 lists as permitted subsistence gear, among others, set and drift gill nets, seines, fishwheels, fyke nets, and dip nets. Subsistence fishing by the use of a line attached to a rod or pole is prohibited, except while fishing through the ice [5 ACC 01.010 (g)].

<sup>c</sup> This regulation was subsequently changed to allow retention of rainbow trout "taken incidentally in other subsistence finfish fisheries and through the ice" (5 AAC 01.310 [h]).

Source: Alaska Department of Fish and Game 1986a, 1995

Table 10. Reported Subsistence Harvests of Freshwater Fish with Gill Nets, Iliamna Lake Region, September 1977 - March 1978, Permit Data

	Permits			Reported Harvests in Numbers of Fish *			
	Number Issued	Number Returned	Percent Returned	Rainbow Trout	Whitefish	Char	Grayling
Igiugig	13	7	53.0%	201	1,157	4	115
Iliamna	2	0	0.0%				
Newhalen	11	3	27.0%	0	0	0	0
Nondalton	15	0	0.0%				
Pedro Bay	1	0	0.0%				
Kokhanok	12	5	41.0%	191	82	145	66
Tommy Point	1	1	100.0%	0	0	0	0
Pope-Vannoy Landing	1	1	100.0%	0	0	0	0
Port Alsworth	0	0	0.0%				
<b>Total</b>	<b>57</b>	<b>17</b>	<b>30.0%</b>	<b>392</b>	<b>1,239</b>	<b>149</b>	<b>181</b>

\* As discussed in the text, these permit data are not accurate estimates of harvests of freshwater fish in these communities.

Source: Files, Alaska Department of Fish and Game, King Salmon

Table 11. Sport Fishing Regulations for Non-Salmon Fish, Bristol Bay Area, 1988

<u>Species</u>	<u>Season; Bag, Possession, and Size Limits</u>
<i>For all waters not listed below:</i>	
Rainbow Trout	June 8 - Oct 31; 2 per day, 2 in possession, only 1 over 20 inches Nov. 1 - June 7; 5 per day, 5 in possession, only 1 over 20 inches
Arctic Char/ Dolly Varden	Entire Year; 10 per day, 10 in possession, no size limit
Arctic Grayling	Entire Year; 5 per day, 5 in possession, no size limit (except Ugashik River, which has bag and possession limit of 2)
Burbot	Entire Year; 15 per day, 15 in possession, no size limit
Lake Trout	4 per day, 4 in possession, no size limit
Northern Pike	10 per day, 10 in possession, no size limit
Other	No bag, possession, or size limit

*Special Regulations:*

Agulapak River: rainbow trout fishing is catch and release only.

Brooks River, Negukthlik River drainage, Ungalikthluk River drainage: all sport fishing closed April 10 - June 7.

Copper River, Gibraltar River and tributaries, Bristol Bay Wild Trout Zone<sup>1</sup>, Lower Talarik Creek: Limit of 1 rainbow trout daily and in possession June 8 - Oct. 10. All sport fishing closed April 10 - June 7. Only single-hook artificial flies may be used from June 8 through Oct. 31.

Naknek River, between department markers placed 1/2 mile east of Rapids Camp to department markers placed east of Trefon's cabin: All sport fishing closed April 10 - June 7. Limit of 2 rainbow trout daily and in possession June 8 - Oct. 31. For entire drainage, only unbaited artificial lures may be used from March 1 through Nov. 14.

<sup>1</sup> Defined as: the Kvichak River and its tributaries, and all drainages flowing into Lake Iliamna and Six Mile lake, excluding lake Clark and its tributaries above Six Mile Lake, and including only those waters of lake Iliamna within a 1/2 mile radius of the Kvichak River's outlet from lake Iliamna.

Source: Alaska Department of Fish and Game 1986b, 1988:28-29.

## CHAPTER THREE: FRESHWATER FISH HARVEST AND USE PATTERNS BY COMMUNITY

This chapter describes the patterns of harvest and use of non-salmon fish taken in freshwater in each Bristol Bay region community based upon available data for the 1970s, 1980s, and early 1990s. The communities are grouped by subregion, starting from the west with the Togiak subregion and ending with those on the Alaska Peninsula.

### TOGIAK

#### Community Background

Togiak is located on Togiak Bay near the mouth of the Togiak River. The village had a population of 613 in 1990, of which 87.3 percent of the community was Alaska Native (Table 1), mostly Yup'ik Eskimo. Commercial fishing is a major source of cash income for community residents.

#### Data Sources

When this report was prepared, no quantified harvest data were available for Togiak for non-salmon freshwater fish.<sup>1</sup> Information on species harvested and used, timing of harvests, and harvest methods appears in Wolfe et al. (1984) and is based on interviews with key respondent households conducted in 1983.

#### Use Patterns

As discussed in Wolfe et al. (1984:416), freshwater fish species harvested in Togiak include blackfish, char (Dolly Varden), round whitefish, least cisco, grayling, rainbow trout, "lake trout," smelt, and pike. (See Chapter Two for a discussion of Yup'ik classifications for Dolly Varden at Togiak.) Except for blackfish, which are caught with traps, and smelt, which are mostly jigged through the ice, most of these fish are taken by sweep seining with gill nets in the Togiak River as far upriver as Togiak Lake in late fall just before freeze-up and in early spring just following break-up. After freeze-up, people take freshwater fish by jigging hooked lines through holes in the river ice throughout the winter and early spring.

For sweep seining (sometimes called "beach seining" or "round hauling"), Togiak residents use nylon nets about 15 to 20 fathoms long with two inch to four inch stretch mesh. A person holds one end of the net at the bank of the river or on a sand bar, while the other end is taken out into the river by a skiff. The net is then circled around by the boat, sweeping a portion of the river, and brought back to shore.

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<sup>1</sup> In 1995, the Division of Subsistence ADF&G and the Bristol Bay Native Association conducted a non-salmon, freshwater fish harvest survey with a random sample of Togiak households. The results will appear in a forthcoming report.

Two or more persons pull the net out of the water on to the shore or into the boat. This is an efficient method, with a pair of fishermen sometimes harvesting 200 to 300 fish in a few hours. Seining is usually done by groups of two to five related men (Wolfe et al. 1984:417-8, 420). The catch is shared among the families of the fishermen, unless the catch is unusually large. In the later case, distribution may involve the entire community, with the availability of "trouts" announced over CB radios (Wolfe et al. 1984:423).

In order to hook fish during the winter, Togiak residents use snow machines to reach fishing areas along the Togiak River. They chop holes about one and a half feet wide through about eight to twelve inches of river ice. Jigging lines are made of nylon filament, attached to short sticks with notches on either end for winding the line. Fishermen use unbaited treble hooks with flashers and feathers. The lure is animated a few inches above the river bottom with short, up and down jigging motions. Fish are pulled straight up through the ice hole (Wolfe et al. 1984:418). Production groups include mixed sex groups or groups of females. People of all ages jig for freshwater fish, from young people to elders, and fishing groups include relatives and friends (Wolfe et al. 1984:422).

During summer, some people hook fish in the same manner as during winter, but from the side of a boat moored to the bank or midstream. At camps, milt and small pieces of fish entrails are sometimes mixed with water and dumped into the river to attract the fish. Some people use lures with rod and reel gear, used as a spinning rod. Hooking and spinning rods are preferred methods during summer when small quantities of fresh fish are desired for immediate eating (Wolfe et al. 1984:418).

At Togiak, processing the catch of freshwater fish is generally the responsibility of women. Char classified as "Togiak trout" (*anerrluaq*) are processed much like salmon. They are cut and air dried on racks. Many families half-dry the char and store them unsmoked in freezers. Others smoke the half-dried fish in smoke houses. Freshwater fish caught by jigging are often eaten immediately or frozen (Wolfe et al. 1984:419). Blackfish are trapped in creeks northeast of the village (Chythlook, field notes, 1985).

### Harvest Estimates

When this report was prepared, no harvest estimates were available for freshwater fish in Togiak (but see footnote 1). According to Behnke, "thousands" of Dolly Varden ("Togiak trout") are reportedly taken in the fall (Behnke 1980a:7). This fish is a major resource harvested within the community.

## TWIN HILLS

### Community Background

Twin Hills is located on a slough east of the Togiak River, called the Twin Hills River. The community was founded in 1965 by former residents of Quinhagak and Togiak. In 1990, the village had a population of 66, 92.4 percent of whom were Alaska Native (mostly Yup'ik Eskimos). As in Togiak, commercial fishing is a major part of the local economy at Twin Hills.

### Data Sources and Use Patterns

Mapped data indicate that Twin Hills households use the Togiak River drainage, including Pungokepuk Lake, the Negukthlik River, and the lower Ungalikthluk River to harvest non-salmon fish (ADF&G 1985b). No other data are available on fish and game harvest and use patterns of Twin Hills residents, nor have quantified data on freshwater fish harvests been collected. It is very likely, however, that subsistence uses of fish and game in Twin Hills are very similar to those of Togiak and, to a lesser extent, Manokotak.

## MANOKOTAK

### Community Background

Manokotak is a predominately Yup'ik Eskimo community located on the Igushik River, about 25 miles west of Dillingham. The village had a population of 385 in 1990, 95.6 percent of whom were Alaska Native (Table 1). Most Manokotak households participate in commercial salmon fishing, which is a major part of the community's economy (Schichnes and Chythlook 1988).

### Data Sources

There are three major data sources for information on freshwater fish harvests in Manokotak. The most thorough is a Division of Subsistence survey of 54 households (91.5 percent of the village total) conducted in February – April 1986, which collected comprehensive resource harvest data for the 1985 calendar year. Key respondent interviews and participant observation during that research also provided information on use patterns for freshwater fish (Schichnes and Chythlook 1988). Harvest estimates are also available for a 12-month period in 1973/74, based on interviews with 19 households (51 percent) (Gasbarro and Utermohle 1974). Finally, interviews with active fishing households, part of the division's effort to monitor freshwater fish harvests, provided additional data in 1986 and 1987.<sup>2</sup>

### Harvest Estimates

Freshwater fish were an important source of food for Manokotak residents in 1985. Respondents reported harvesting nine different freshwater fish resources. The average household freshwater fish harvest was 266.3 pounds, 51.0 pounds per capita, which comprised 13.3 percent of the total edible weight of the wild resource harvest that year. In 1985, 100 percent of the Manokotak households used fish other than salmon (this includes herring, herring spawn on kelp, and other marine fish), 100 percent fished for these species, and 90.7 percent were successful harvesters (Table 12, Table 14). Similarly, in

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<sup>2</sup> In 1995, the Division of Subsistence ADF&G and the Bristol Bay Native Association conducted a non-salmon freshwater fish harvest survey with a random sample of Manokotak households, adding another year's data on harvest quantities and household participation. The study results will appear in a forthcoming report.

Table 12. Harvests and Uses of Freshwater Fish, Manokotak, 1973/74 and 1985

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
												Subsistence	Rod & Reel
<u>Study Year 1973/74</u>													
Arctic Grayling			57.9%			1,006	704	27.0	18.9	4.6	3.2		
Dolly Varden			63.2%			1,022	1,430	27.4	38.4	4.7	6.5		
Lake Trout			21.1%			422	1,138	11.3	30.6	1.9	5.2		
Northern Pike			89.5%			1,653	4,628	44.4	124.2	7.5	21.1		
Rainbow Trout			36.8%			290	406	7.8	10.9	1.3	1.9		
Smelt			78.9%			13,412	3,353	360.0	90.0	61.1	15.3		
Whitefish			68.4%			1,516	1,516	40.7	40.7	6.9	6.9		
Totals			89.5%				13,176		353.7		60.0		
<u>Study Year 1985</u>													
Arctic Grayling	51.9%	44.4%	37.0%	35.2%	25.9%	381	267	6.5	4.5	1.2	0.9	74.5%	25.5%
Blackfish	63.0%	27.8%	16.7%	46.3%	25.9%	28	844	0.5	14.3	0.1	2.7	100.0%	0.0%
Burbot	53.7%	42.6%	35.2%	38.9%	22.2%	349	349	5.9	5.9	1.1	1.1	95.1%	4.9%
Dolly Varden	87.0%	79.6%	72.2%	50.0%	40.7%	1,512	2,117	25.6	35.9	4.9	6.9	64.4%	35.6%
Lake Trout	64.8%	40.7%	29.6%	50.0%	31.5%	574	1,549	9.7	26.3	1.9	5.0	79.1%	20.9%
Northern Pike	90.7%	81.5%	75.9%	40.7%	44.4%	1,768	4,950	30.0	83.9	5.7	16.1	64.1%	35.9%
Rainbow Trout	53.7%	48.1%	35.2%	22.2%	22.2%	194	272	3.3	4.6	0.6	0.9	52.8%	47.2%
Smelt	83.3%	50.0%	50.0%	51.9%	33.3%	142	4,253	2.4	72.1	0.5	13.8	100.0%	0.0%
Whitefish	64.8%	50.0%	38.9%	48.1%	40.7%	1,109	1,109	18.8	18.8	3.6	3.6	100.0%	0.0%
Totals	100.0%	100.0%	90.7%	87.0%	66.7%		15,710		266.3		51.0		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.  
<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 13. Methods Used to Preserve Freshwater Fish, Manokotak

Species	Eaten		Dried	Smoked	Boiled	Fermented	Used for	
	Fresh	Preserved Frozen					Eaten Frozen	Dog Food
Round Whitefish ( <i>uraruq</i> )	X	X	X	X	X	X		X
Least Cisco ( <i>cavirutnaq</i> )	X	X	X	X	X	X		X
Pike ( <i>cuukvak</i> )	X	X	X		X			X
Dolly Varden ( <i>yugyaq</i> )	X	X	X <sup>a</sup>	X	X		X	X
Rainbow Trout ( <i>talaariq</i> )	X	X	X	X	X			X
Grayling ( <i>nakruillugpak</i> )	X	X	X	X	X	X		X
"Togiak" Trout ( <i>anerrtuaq</i> )	X	X	X	X	X	X <sup>c</sup>		X
Burbot ( <i>atgiaq</i> )	X	X	X <sup>b</sup>	X	X			X

<sup>a</sup> Half-dried

<sup>b</sup> Half-dried whole

<sup>c</sup> Aged first, then eaten frozen.

Source: Division of Subsistence, ADF&G, fieldnotes, 1986-1987

Table 14. Harvests of Freshwater Fish, Bristol Bay Communities

Community	Study Year	Percentage of Households <sup>1</sup>					Estimated Harvests in Pounds <sup>2</sup>			Percentage of Total Harvest	Harvest w/o Smelt	
		Use	Attempt	Harvest	Receive	Give	Total	Per Household	Per capita		Lbs. per Capita	% of Total Harvest
Aleknagik	73			68.8%			2,813	133.6	26.7	13.1%	26.4	13.0%
Aleknagik	89	94.7%	89.5%	89.5%	73.7%	71.1%	6,952	165.5	48.7	12.9%	44.3	11.7%
Clark's Point	73			81.8%			2,351	166.7	30.6	9.1%	5.4	1.6%
Clark's Point	89	94.1%	82.4%	82.4%	82.4%	70.6%	1,434	84.4	25.6	7.1%	6.5	1.8%
Dillingham	73			68.8%			28,209	123.4	28.8	11.4%	14.9	5.9%
Dillingham	84	75.0%	56.2%	54.9%	39.9%	19.6%	19,665	28.5	9.6	4.0%	5.6	2.3%
Egegik	73			85.0%			1,889	78.4	19.1	8.7%	11.4	5.2%
Egegik	84	64.0%	60.0%	60.0%	24.0%	40.0%	1,102	26.3	11.4	2.9%	6.0	1.5%
Ekwok	73			76.5%			6,235	297.1	60.9	9.4%	57.8	9.0%
Ekwok	87	75.9%	72.4%	62.1%	62.1%	37.9%	7,203	225.1	67.3	8.4%	67.0	8.4%
Igiugig	73			83.3%			5,464	683.0	141.3	16.2%	141.3	16.2%
Igiugig	83		100.0%	100.0%	0.0%		5,440	494.5	78.1	12.6%	78.1	12.6%
Igiugig	92	100.0%	100.0%	100.0%	80.0%	80.0%	4,201	350.0	89.8	12.4%	88.3	12.2%
Iliamna	73			66.7%			1,290	75.9	20.7	11.2%	20.7	11.2%
Iliamna	83		60.0%	60.0%	35.0%		3,671	102.0	26.1	6.3%	26.1	6.3%
Iliamna	91	87.0%	73.9%	73.9%	65.2%	34.5%	6,750	225.0	69.0	8.1%	69.0	8.1%
King Salmon	73			93.3%			6,354	135.6	31.8	11.5%	15.8	5.7%
King Salmon	83			76.7%			5,873	48.1	15.9	7.2%	12.0	5.4%
Kokhanok	73			100.0%			4,633	355.2	57.1	4.8%	57.1	4.8%
Kokhanok	83		78.9%	78.9%	42.1%		13,982	517.9	97.4	14.0%	97.4	14.0%
Kokhanok	92	91.7%	86.1%	86.1%	72.2%	61.1%	17,785	456.0	102.6	10.1%	94.1	9.3%
Koliganek	73			60.0%			5,827	291.3	51.4	6.7%	51.4	6.7%
Koliganek	87	92.9%	81.0%	81.0%	69.0%	57.1%	17,282	360.0	92.8	11.2%	92.1	11.1%
Levelock	73			87.5%			3,751	220.4	47.6	6.9%	33.9	4.9%
Levelock	88	92.6%	70.4%	70.4%	88.9%	63.0%	5,965	180.7	54.8	4.4%	49.6	4.0%
Levelock	92	90.0%	76.7%	73.3%	76.7%	63.3%	6,237	159.9	56.4	6.4%	42.8	4.8%
Manokotak	73			89.5%			13,176	353.7	60.0	14.8%	44.7	11.0%
Manokotak	85	100.0%	100.0%	90.7%	87.0%	66.7%	15,710	266.3	51.0	13.3%	37.2	9.7%
Naknek	73			71.4%			3,444	56.6	14.9	8.2%	5.7	3.1%
Naknek	83			75.0%			7,135	58.0	18.6	9.9%	9.3	4.9%
New Stuyahok	73			84.6%			15,033	485.7	77.5	12.6%	77.4	12.5%
New Stuyahok	87	100.0%	85.0%	82.5%	82.5%	62.5%	11,656	157.5	33.0	4.7%	32.7	4.7%
Newhalen	73			63.6%			5,548	348.0	76.6	12.1%	76.6	12.1%
Newhalen	83		54.5%	45.5%	9.1%		3,394	130.5	27.1	3.5%	27.1	3.5%
Newhalen	91	100.0%	96.2%	92.3%	73.1%	46.2%	5,865	183.3	37.2	5.0%	37.2	5.0%
Nondalton	73			80.8%			6,082	210.5	40.2	5.2%	40.2	5.2%
Nondalton	80						4,550	130.0	27.1	2.6%	27.1	2.6%
Nondalton	81						7,174	204.9	36.0	4.9%	36.0	4.9%
Nondalton	83		90.5%	90.5%	23.8%		48,948	906.4	174.6	14.9%	174.6	14.9%
Pedro Bay	73			87.5%			2,599	259.9	65.0	10.2%	65.0	10.2%
Pedro Bay	82		82.4%	82.4%	17.6%		4,246	202.2	68.7	7.9%	68.7	7.9%
Pilot Point	73			70.0%			681	52.5	13.1	4.1%	6.6	2.0%
Pilot Point	87	94.1%	94.1%	94.1%	35.3%	58.8%	710	39.5	11.0	2.9%	3.1	0.8%
Port Alsworth	83		61.5%	61.5%	7.7%		880	41.9	11.6	3.2%	11.6	3.2%
Port Heiden	73			40.0%			203	15.6	3.7	3.0%	2.0	1.6%
Port Heiden	87	91.9%	62.2%	62.2%	70.3%	45.9%	977	26.4	9.5	2.3%	9.4	2.3%
South Naknek	73			47.1%			1,067	42.7	8.3	3.4%	4.7	1.9%
South Naknek	83			90.5%			2,346	47.9	17.0	6.4%	4.3	1.6%
South Naknek	92	85.7%	77.1%	74.3%	68.6%	48.6%	2,134	50.8	15.9	5.3%	5.8	2.0%
Ugashik	73			100.0%			1,449	144.9	60.4	6.8%	24.7	2.8%
Ugashik	87	100.0%	100.0%	100.0%	0.0%	40.0%	360	72.0	36.0	4.4%	3.5	0.4%

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> Harvests include Arctic grayling, blackfish, burbot, Dolly Varden, lake trout, northern pike, rainbow trout, smelt, unknown trout, and whitefish

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

1973/74, freshwater fish species made up 14.8 percent of the total harvest, with 89.5 percent of the households harvesting non-salmon fish for an average household take of freshwater species of 353.7 pounds and a per capita harvest of 60.0 pounds (Table 12, Table 15).

### Use Patterns by Species

#### Pike (*cuukvak*)

In 1985, 90.7 percent of Manokotak households used pike, and 75.9 percent harvested these fish. The total estimated harvest was 1,768 pike, 30.0 per household. Of these, 64.1 percent were caught in nets or hook and line through the ice, and the rest with rod and reel (Table 12; Schichnes and Chythlook 1988:132). Pike were caught in nets in the early fall and late spring in the mouths of small creeks and sloughs that feed into the Igushik River. Mid February through early March was the most popular time for jigging by men, women, and children. Pike are dried in large numbers in the spring because they make excellent and easily transported food to take to spring camps and to use on commercial fishing boats. They are also eaten fresh, frozen, half-dried and boiled, often accompanied by seal oil (Schichnes and Chythlook 1988:132; Table 13).

As in 1985, in 1973/74 more pike were harvested by interviewed Manokotak households than any other resident freshwater fish. The total estimated take was 1,653 fish, 44.4 per household (Table 12).

Dolly Varden (*yugyaq* or *anerrluaq* ["Togiak trout"]) and Lake Trout (*anerrluaq* ["Togiak trout"], *cikignaq*)

In 1985, 72.2 percent of Manokotak households harvested Dolly Varden, for a village total of 1,512 fish, and a household average of 25.6. (See also below for harvests of "lake trout" that are likely Dolly Varden.) Of the total harvest of Dolly Varden, 64.4 percent were caught with subsistence methods, mostly in nets but also ice fishing with hook and line, and the rest with rod and reel. The estimated 1973/74 Dolly Varden harvest was 1,022, for a catch of 27.4 fish per household (Table 12).

The species which biologists call "lake trout" (*S. namaycush*; *cikignaq*; see Table 6) is not present in the Igushik River system. However, harvests of "lake trout," in contrast to "Dolly Varden" have been reported for Manokotak. These are called *anerrluaq* in Yup'ik at Manokotak. The most common local English name for these fish is "Togiak trout," but "lake trout" is a synonym. Biologists classify these fish as Dolly Varden (*S. malma*). This variety of fish was used by 64.8 percent of Manokotak households in 1985 and harvested by 29.6 percent. An estimated total of 574 "lake trout" was harvested in 1985, with 79.1 percent caught with subsistence methods, mostly in nets set out in the spring and the fall which were targeting Dolly Varden, pike, and whitefish. The remaining 20.1 percent were taken with rod and reel (Table 12; Schichnes and Chythlook 1988:134). The average household take was 9.7 fish. In 1973/74, Manokotak households took an estimated 422 "lake trout," an average of 11.3 per household (Table 12).

Table 15. Estimated Harvests of Freshwater Fish by Bristol Bay Communities, 1973/74

Community	Estimated Number of Households <sup>3</sup>	Percentage of HHs Harvesting Non-salmon Fish <sup>1</sup>	Estimated Harvests in Numbers of Fish										Per Capita Harvest in Pounds	Percentage of Total Harvest
			Arctic Grayling	Dolly Varden	Lake Trout <sup>2</sup>	Longnose Sucker	Northern Pike	Rainbow Trout	Smelt	Whitefish				
Aleknagik	21	68.8%	112	283	284	0	0	318	53	118	576	26.7	13.1%	
Clark's Point	14	81.8%	0	46	0	0	103	0	0	7,731	67	30.6	9.1%	
Dillingham	229	68.8%	2,814	3,243	514	0	1,336	1,121	1,393	54,429	1,393	28.8	11.4%	
Egegik	24	85.0%	119	195	12	0	182	57	153	3,033	153	19.1	8.7%	
Ekwok	21	76.5%	907	27	0	0	665	133	3,204	1,235	60.9	9.4%		
Igiugig	8	83.3%	923	273	0	133	427	1,115	0	1,480	141.3	16.2%		
Iliamna	17	66.7%	202	643	8	0	30	64	0	53	20.7	11.2%		
King Salmon	47	93.3%	1,013	588	6	0	131	894	12,750	0	31.8	11.5%		
Kokhanok	13	100.0%	123	903	170	0	120	638	0	1,596	57.1	4.8%		
Koliganek	20	60.0%	1,613	147	37	141	860	175	0	1,527	51.4	6.7%		
Levelock	17	87.5%	141	44	0	0	268	384	4,343	1,217	47.6	6.9%		
Manokotak	37	89.5%	1,006	1,022	422	0	1,653	290	13,412	1,516	60.0	14.8%		
Naknek	61	71.4%	249	190	22	0	54	402	8,550	92	14.9	8.2%		
New Stuyahok	31	84.6%	4,417	306	510	0	2,760	655	48	1,482	77.5	12.6%		
Newhalen	16	63.6%	587	1,130	268	0	232	1,536	0	30	76.6	12.1%		
Nondalton	29	80.8%	1,782	62	730	0	281	273	0	1,607	40.2	5.2%		
Pedro Bay	10	87.5%	0	655	594	0	3	51	0	0	65.0	10.2%		
Pilot Point	13	70.0%	55	19	13	0	71	29	1,364	0	13.1	4.1%		
Port Heiden	13	40.0%	0	26	26	0	0	0	312	0	3.4	2.7%		
South Naknek	25	47.1%	271	74	0	0	24	34	1,853	199	8.3	3.4%		
Ugashik	10	100.0%	12	110	66	0	80	20	3,424	0	60.4	6.8%		
<b>Totals</b>	<b>676</b>	<b>74.4%</b>	<b>16,346</b>	<b>9,986</b>	<b>3,681</b>	<b>275</b>	<b>9,598</b>	<b>7,923</b>	<b>112,599</b>	<b>16,191</b>	<b>38.1</b>	<b>9.5%</b>		

<sup>1</sup> Includes harvesting marine fish such as herring and flounders.

<sup>2</sup> There are no lake trout in the Igushik or Wood river systems. Fish reported as "lake trout" at Manokotak and Aleknagik, and perhaps Dillingham and elsewhere, might be "Togiak trout," a type of Dolly Varden. See Table 6.

<sup>3</sup> Sampling fractions were as follows: Aleknagik, 76%; Clark's Point, 78%; Dillingham, 14%; Egegik, 83%; Ekwok, 81%; Igiugig, 75%; Iliamna, 53%; King Salmon, 32%; Kokhanok, 69%; Koliganek, 75%; Levelock, 94%; Manokotak, 51%; Naknek, 92%; New Stuyahok, 84%; Newhalen, 69%; Nondalton, 90%; Pedro Bay, 80%; Pilot Point, 77%; Port Heiden, 77%; South Naknek, 68%; Ugashik, 50%.

Source: based upon Gasbarro and Utermohle 1974

As with pike, Dolly Varden were harvested in the late spring and fall when they were netted near the mouths of local creeks and sloughs. A few were also caught by hook and line while people were traveling by skiff. Manokotak residents also harvested Dolly Varden with rod and reel while on hunting trips. They were eaten fresh, or half dried, and boiled or smoked. "Lake trout" were eaten fresh, frozen, dried, smoked, boiled, and fermented, and often are accompanied by seal oil (Table 13).

#### Whitefish (*uraruq, cavirrutnaq*)

Manokotak residents usually catch whitefish in nets with pink salmon-sized (4 1/2 inch) mesh in the fall before freeze-up and in the spring before break-up. In 1985, 38.9 percent of the households harvested whitefish and they were used by 64.8 percent. The total estimated harvest was 1,109 whitefish, 18.8 per household (Table 12). (This may be a low estimate. During the survey, the Yup'ik word for round whitefish (*uraruq*) was used instead of the term for least cisco (*cavirrutnaq*), another common species.) In 1973/74, Manokotak households took an estimated total of 1,516 whitefish, an average of 40.7 per household (Table 12).

In Manokotak, whitefish are eaten fresh, dried, frozen with seal oil, smoked, boiled, or fermented and then frozen. Seal oil was the usual condiment. Some are also preserved by freezing (Table 13).

#### Grayling (*nakrullugpak*)

Manokotak households usually catch grayling incidentally in spring and in fall nets set for other species. In 1985, 37.0 percent of the households harvested an estimated village total of 381 grayling. Of these, 74.5 percent were caught in nets and the rest with rod and reel. The average household take was 6.5 grayling. In 1973/74, the estimated take of 1,006 grayling averaged 27.0 per household (Table 12).

Just over half the households in Manokotak (51.9 percent) used grayling in 1985. They were eaten fresh, frozen, and boiled, with seal oil as a popular condiment (Table 13).

#### Burbot (*atgiaq*)

In Manokotak, most burbot are caught incidentally in nets in the early spring and late fall. The 1985 study estimated a harvest of 349 burbot (5.9 per household), with 95.1 caught in nets (the vast majority), in traps or by jigging, and the rest with rod and reel. Burbot are sometimes sought while people are jigging for pike from mid-February through March. Burbot were used by 53.7 percent of the Manokotak households and harvested by 35.2 percent (Table 12). They are eaten fresh and boiled with seal oil. Some were also frozen (Table 13). No harvest data for this species are available for 1973/74.

### Rainbow Trout (*talaariq*)

The estimated harvest of rainbow trout for Manokotak households in 1985 was 194 fish (an average of 3.3 fish per household). Of these, 52.8 percent were harvested in nets, usually incidentally in the fall while nets were out for other species. The rest of the rainbow trout were caught with rod and reel. A little over half (53.7 percent) of the households used rainbow trout and 37.0 percent of the households harvested them (Table 12). Usually, they were eaten fresh.

The 1973/74 estimated harvest of rainbow trout by Manokotak households was 290 fish. The average household take was 7.8 rainbow trout (Table 12).

### Blackfish (*can'giiq*)

In Manokotak, blackfish are harvested by a few older men with fish traps. Traps are about three or four feet long and are made of wood or chicken wire. They are set in tundra ponds or creeks during the coldest parts of the winter, usually in late January and February when the blackfish are concentrated in the nearly frozen ponds. In 1985, 16.7 percent of the households harvested an estimated 142 gallons of blackfish. These were widely shared, for 63.0 percent of the households used this species (Table 12). Blackfish were most frequently boiled whole with the entrails intact. All parts of the fish but the bones are eaten. No blackfish harvest data are available for 1973/74.

### Smelt (*iqalluaq*)

Smelt are a very widely used resource in Manokotak. They are jigged through the ice in the Igushik River near the village, or further down river near the mouth (where larger smelt can be caught). Some people also travel to Togiak or Twin Hills for smelting. Smelt are prepared in a variety of ways, including frying, boiling, drying, and eating with seal oil (Schichnes and Chythlook 1988:129).

In 1973/74, 78.9 percent of Manokotak households harvested smelt, for a community total of 13,412 fish, 360.0 per household. In 1985, 50.0 percent of Manokotak household harvested smelt, with a community total harvest of 142 five gallon buckets (Table 12).

## ALEKNAGIK

### Community Background

The community of Aleknagik is located on the northern and southern shores of the Wood River at the outlet of Lake Aleknagik. A 25 mile-long road connects the south shore portion of the community with Dillingham. In 1990, Aleknagik had a population of 185; 83.2 percent of the population was Alaska Native

(Table 1). As in most other small communities in the Bristol Bay region, commercial salmon fishing is the major source of earned income for Aleknagik residents.

### Data Sources

The first comprehensive resource harvest survey for Aleknagik was conducted in 1974 (Gasbarro and Utermohle 1974; Table 15). These data pertain to a 12-month study period in 1973/74. The Division of Subsistence collected freshwater fish harvest and use data during interviews with the major harvesting households in 1986 and 1987 (Table 16). Also, the division conducted a comprehensive harvest survey with 38 Aleknagik households (90.5 percent) in late 1989, pertaining to a 12-month study period from November 1988 through October 1989.

### Harvest Estimates

In 1973/74, harvests of whitefish, pike, Dolly Varden, grayling, "lake trout," smelt, and rainbow trout made up 13.1 percent of the wild resource harvest of sampled Aleknagik households. These households harvested an average of 133.6 pounds (usable weight) of freshwater fish, 26.7 pounds per capita (Table 15). With a reported harvest of 1,736 fish, Dolly Varden were the most commonly taken species in 1986, followed by whitefish (541 fish) and pike (519 fish) (Table 16). Note that lake trout (*S. namaycush*) are not present in the Wood River and lakes system. What Aleknagik residents report as "lake trout" are most likely "Togiak trout," a Yup'ik subdivision of Dolly Varden/Arctic char (see Table 6). For 1988/89, virtually every Aleknagik household (94.7 percent) used freshwater fish. The estimated household harvest was 165.5 pounds, 48.7 pounds per person. Dolly Varden again were harvested in the largest numbers (1,588 fish), followed by pike (997 fish) (Table 17).

### Use Patterns by Species

#### Pike (*cuukvak*)

Aleknagik households net pike in the early spring (April - May) and in late fall (Sept. - Nov.) in places called *gamaneqs*, which lack water currents or wind. Favorite places include Hyak Point, Pike Bay, and other bays past the village. They are also caught by jigging in Bear Lake, which is reached by air, or by snow machine during suitable snow and ice conditions. Pike are dried and eaten with seal oil. Their low oil content makes them ideal for eating dried and are therefore rarely smoked. Aleknagik residents also eat pike fresh frozen or fresh raw (Table 18), but this is not as common as in the Nushagak River villages. Older people cook pike heads. The meat of boiled pike is also used to make *akutaq*, along with vegetable shortening, sugar, and berries.

In 1973/74, Aleknagik households took an average 15.1 pike, for an estimated village total of 318 fish, second only to whitefish (Table 17). The reported harvest was 519 pike for 1986, with most (79.2

Table 16. Reported Freshwater Fish Harvests, Aleknagik, 1986

Period	Households <sup>1</sup>		Arctic Grayling		Burbot		Dolly Varden		Lake Trout <sup>2</sup>		Longnose Sucker		Northern Pike		Rainbow Trout		Whitefish						
	Provided Data	Fished	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total					
January - April	16	14	0	20	20	4	31	285	360	645	0	0	0	0	11	108	119	0	5	5	16	37	53
May - August	23	18	16	0	16	4	4	550	47	597	14	0	14	0	288	0	288	13	0	13	111	0	111
September - December	17	15	14	0	14	13	0	474	20	494	36	0	36	0	112	0	112	19	0	19	377	0	377
Annual Total			30	20	50	44	48	1309	427	1736	50	0	50	0	411	108	519	32	5	37	504	37	541

<sup>1</sup> Includes households which were interviewed for harvest recall data and those that returned harvest calendars. For January - April, all data are based on recall interviews. Of the 23 households for which information is available for May - August, 6 returned calendars and 17 were interviewed. All 17 households for the September - December period were interviewed. Harvests are those reported by households and have not been expanded to the entire community because of uncertainty about the representativeness of the sample. According to the US Census, Aleknagik had 57 households in 1990 (Alaska Department of Labor 1991:77).

<sup>2</sup> There are no lake trout in the Wood River system. These may be "Togiak trout," a type of Dolly Varden.

Source: Division of Subsistence, ADF&G, data files

Table 17. Harvests and Uses of Freshwater Fish, Aleknagik, 1973/74 and 1988/89

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods <sup>3</sup>	
												Rod & Reel	
<i>Study Year 1973/74</i>													
Arctic grayling			31.3%			112	78	5.3	3.7	1.1	0.7		
Dolly Varden			37.5%			283	396	13.4	18.8	2.7	3.8		
Lake trout			37.5%			284	767	13.5	36.5	2.7	7.3		
Northern pike			43.8%			318	892	15.1	42.4	3.0	8.5		
Rainbow trout			12.5%			53	74	2.5	3.5	0.5	0.7		
Smelt			12.5%			118	30	5.6	1.4	1.1	0.3		
Whitefish			62.5%			576	576	27.4	27.4	5.5	5.5		
Freshwater Fish			68.8%				2,813		133.6		26.7		
<i>Study Year 1988/89</i>													
Arctic grayling	23.7%	15.8%	13.2%	10.5%	10.5%	53	37	1.3	0.9	0.4	0.3	79.2%	20.8%
Blackfish	36.8%	10.5%	5.3%	34.2%	18.4%	19	9	0.5	2.7	0.1	0.8	100.0%	0.0%
Burbot	21.1%	10.5%	7.9%	13.2%	5.3%	8	8	0.2	0.2	0.1	0.1	100.0%	0.0%
Dolly Varden	92.1%	84.2%	81.6%	50.0%	63.2%	1,588	2,223	37.8	52.9	11.1	15.6	97.9%	2.1%
Lake trout	31.6%	28.9%	26.3%	10.5%	21.1%	588	823	14.0	19.6	4.1	5.8	99.0%	1.0%
Longnose sucker	2.6%	2.6%	2.6%	2.6%	0.0%	28	42	0.7	1.0	0.2	0.3	100.0%	0.0%
Northern pike	76.3%	55.3%	52.6%	39.5%	42.1%	997	2,791	23.7	66.5	7.0	19.6	99.4%	0.6%
Rainbow trout	36.8%	31.6%	28.9%	7.9%	13.2%	95	133	2.3	3.2	0.7	0.9	43.2%	56.8%
Smelt	60.5%	23.7%	18.4%	42.4%	28.9%	104	9	2.5	14.9	0.7	4.4	100.0%	0.0%
Whitefish	47.4%	26.3%	21.1%	34.2%	28.9%	155	155	3.7	3.7	1.1	1.1	100.0%	0.0%
Freshwater Fish	94.7%	89.5%	89.5%	73.7%	71.1%		6,952		165.5		48.7		

<sup>1</sup> For "freshwater fish," includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

<sup>3</sup> Includes incidental harvest of 6 Dolly Varden from commercial salmon fishing nets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 18. Methods Used to Preserve Freshwater Fish, Aleknagik

Species	Eaten		Preserved		Eaten		Dried	Smoked	Boiled	Fermented	Dog Food	Eaten with Seal Oil
	Fresh	Frozen	Frozen	Frozen	Frozen	Seal Oil						
Round Whitefish ( <i>uraruq</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Least Cisco ( <i>cavirutnaq</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Pike ( <i>cuukvak</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Dolly Varden ( <i>yugyaq</i> )	X	X	X	X	X <sup>a</sup>	X	X	X	X	X	X	X
Rainbow Trout ( <i>talaariq</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Grayling ( <i>nakrullugpak</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Lake Trout <sup>b</sup>	X	X	X	X	X	X	X	X	X	X	X	X
Burbot ( <i>atgiaq</i> )	X	X	X	X	X <sup>a</sup>	X	X	X	X	X	X	X

<sup>a</sup> half-dried

<sup>b</sup> Probably "Togiak trout" (*anerluak*), a type of Dolly Varden. There are no lake trout in the Wood River system. See Table 6.

Source: Division of Subsistence, ADF&G, fieldnotes, 1986-1987

percent) taken with nets. Pike were the third most numerous freshwater fish in the 1986 reported harvest, after Dolly Varden and whitefish (Table 16). In 1988/89, Aleknagik households harvested an estimated 997 pike, second only to Dolly Varden (Table 17).

#### Dolly Varden ("char", "Togiak trout"; *yugyaq*, *anerluaq*)

Dolly Varden are common in the Aleknagik area. In summer and winter, people set nets for Dolly Varden near their homes, avoiding places that become too shallow. *Ivqaq* (the Yup'ik name for Hyak Island) is a favorite place for setting nets in summer and winter and for winter jigging through the ice for Dolly Varden. This place is also used by people from Dillingham. Because it is so accessible to people's homes, *Ivqaq* is favored for ice fishing by mothers with small children and older people.

Most Dolly Varden are netted in the winter for a change in diet. They are not highly desired when salmon are available. They do not make good dried fish because their oil develops a rancid taste when dried; but if there is no oil present in the meat, it turns hard and brittle. They make good *egamaarrluk*, half dried fish, however. *Yugyaq* are best boiled or baked. All parts are eaten except the entrails. People also use Dolly Varden for dog food (Table 18).

Dolly Varden are also taken with rod and reel gear, usually in streams flowing into the lakes or rivers between the lakes. Rod and reel fishing is mostly an activity for younger and middle-aged men and women. People of all ages go jigging, depending on the weather and the distance to the fishing location.

Aleknagik residents in 1973/74 took an estimated 283 Dolly Varden and 284 lake trout, for an average take of the two species of 26.9 per household (Table 17). Reported Dolly Varden harvests were substantially higher in 1986, 1,736 fish, more than any other freshwater fish species. Of these, 75.4 percent were taken in nets (Table 16). Dolly Varden were the most numerous species in the 1988/89 harvest, with a take of 1,588 fish (Table 17).

#### Lake Trout

There are no lake trout in the Wood River and lakes system. The reported harvests of lake trout at Aleknagik are most likely "Togiak trout," a Yup'ik subdivision of Dolly Varden. Only 50 "lake trout" were reported separately in 1986. The estimated total for 1973/74 was 284 (13.4 per household), and the estimated harvest in 1988/89 was 588 (14.0 per household) (Table 16, Table 17).

#### Round Whitefish (*uraruq*)

When Aleknagik residents put out nets in Lake Aleknagik in early spring (April-May) for pike, they catch round whitefish (*uraruq*) incidentally. *Uraruq* are also harvested in nets set for "char" (Dolly Varden)

in the fall (Sept. - Nov.). Some of the round whitefish catch is cut up and eaten fresh boiled, including the heads with the gills and the cleaned stomach. They are also baked without the head, entrails, and tails. Other fish are frozen fresh to eat frozen later with seal oil, although some of these frozen fish are fermented first. Because this species is not common in Aleknagik Lake, families do not split, dry, or smoke them unless a large quantity is caught. Like other fish split to dry, *uraruq* are sometimes boiled when the fish is half dry and eaten with seal oil (Table 18). This is called *egamaarlluk*. People who have moved to Aleknagik from the Yukon River area have introduced the practice of making *akutaq* using whitefish; these are now the preferred species for making this delicacy.

Aleknagik residents have no special fishing areas for round whitefish. Families who have relatives from the Kuskokwim area sometimes travel there and fish for whitefish, or else ask relatives to send whitefish (probably broad and round) to them.

In 1973/74, Aleknagik households harvested an estimated 576 whitefish (both round whitefish and least cisco), an average of 27.4 per household, more than any other freshwater fish (Table 17). Interviewed households in 1986 took 541 whitefish, second only to Dolly Varden. Almost all of this harvest (93.2 percent) was with nets (Table 16). The estimated harvest of whitefish dropped in 1988/89 to 155 fish (3.7 per household) (Table 17).

#### Least Cisco (*cavirutnaq*)

This species (a type of whitefish) is sometimes caught by Aleknagik residents in nets set for Dolly Varden and pike. People net and seine for them in late fall (October and November) at the mouth of Aleknagik Lake. They are eaten fresh raw, cut up into small pieces and salted. This is called *kepukaciq*. More fish of this species are caught than *uraruq* (round whitefish), so some households split and smoke them, or just dry them for eating with seal oil. They are also stored in freezers to be eaten frozen, or fermented, frozen, and eaten with seal oil (Table 18). This latter food is called *kumlaneq*. Since the fish are small, they are cut up into two or three sections including the head and tail with the entrails removed, and boiled. This food is called *umlilkaq*, fresh boiled fish. Harvest totals for this species are reported under round whitefish (above).

#### Smelt (*iqalluaq*)

In 1973/74, 12.5 percent of Aleknagik households harvested smelt, for a total estimated harvest of 118 fish. In 1988/89, a total of 104 gallons of smelt was harvested, by 18.4 percent of Aleknagik households. More than twice as many Aleknagik households received smelt (42.4 percent) as harvested them (Table 17).

## Rainbow Trout, Grayling, Burbot, and Blackfish

These species are all taken incidentally by Aleknagik residents in relatively small quantities in nets in both summer and winter, and in summer and fall with rod and reel (trout and grayling) or hook and line (burbot). Estimated harvests of rainbow trout in 1973/74 numbered 53 fish, 2.5 per household, while sampled Aleknagik households in 1986 only reported a harvest of 37 rainbow trout. The estimated harvest for 1988/89 was again relatively small, 95 rainbow trout (2.3 per household). In 1973/74, Aleknagik households harvested 112 grayling, 5.3 per household, while the 1986 reported harvest totaled 50 grayling. The estimated harvest in 1988/89 was just 53 grayling. Interviewed households in 1986 also took 48 burbot. Most of the 1986 harvests of these three species occurred with nets (Table 16). Only eight burbot were harvested in 1988/89. Additionally, Aleknagik households harvested 19 gallons of blackfish in 1988/89 (Table 17).

### CLARK'S POINT

#### Community Background

Clark's Point is located on Nushagak Bay, about 15 miles south of Dillingham. The village had 60 residents in 1990, 88.3 percent of whom were Alaska Native (Table 1). Most households in the community depend on commercial salmon fishing as the primary source of cash income.

#### Data Sources

There are two sources of comprehensive information on wild resource harvests by residents of Clark's Point. The first is a harvest survey conducted in 1974, pertaining to a 12-month period in 1973/74 (Gasbarro and Utermohle 1974). A total of 11 Clark's Point households provided estimates of their 1973 take of fish and game for that research. In 1989, division researchers interviewed 17 (100 percent) of the Clark's Point households about their resource harvests from November 1988 through October 1989 (this sample included the one year-round household living at Ekuk) (Seitz 1996).

#### Harvest Estimates

In 1973/74, Clark's Point households reported harvests of four kinds of freshwater fish, including 103 pike (an average of 7.3 per household), 67 whitefish (4.7 per household), 46 Dolly Varden (3.3 per household), and 7,731 smelt (548.2 per household). The average household took 166.7 pounds of these species, 9.1 percent of the total resource harvest in 1973/74. The per capita harvest was 30.6 pounds (Table 15, Table 19). Excluding the substantial smelt harvest, takes of other freshwater species were much lower at Clark's point than any other community in the Nushagak Bay and Nushagak River subregions in 1973/74.

Table 19. Harvests and Uses of Freshwater Fish, Clark's Point, 1973/74 and 1988/89

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
														Rod & Reel	
<b>Study Year 1973/74</b>															
Arctic grayling			0.0%			0	0	0.0	0.0	0.0	0.0	0.0	0.0		
Dolly Varden			18.2%			46	65	3.3	4.6	0.6	0.8	0.0	0.0		
Lake trout			0.0%			0	0	0.0	0.0	0.0	0.0	0.0	0.0		
Northern pike			18.2%			103	287	7.3	20.4	1.3	3.7	0.0	0.0		
Rainbow trout			0.0%			0	0	0.0	0.0	0.0	0.0	0.0	0.0		
Smelt			81.8%			7,731	1,933	548.2	137.0	100.5	25.1	0.0	0.0		
Whitefish			9.1%			67	67	4.7	4.7	0.9	0.9	0.0	0.0		
Freshwater Fish			81.8%				2,351		166.7		30.6				
<b>Study Year 1988/89</b>															
Arctic grayling	11.8%	5.9%	5.9%	11.8%	11.8%	7	5	0.4	0.3	0.1	0.1	0.0	0.0	100.0%	0.0%
Blackfish	5.9%	5.9%	5.9%	0.0%	5.9%	5	30	0.3 g	1.8	0.1 g	0.5	0.0	0.0	100.0%	0.0%
Burbot	5.9%	0.0%	0.0%	5.9%	5.9%	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0%	0.0%
Dolly Varden	41.2%	17.6%	17.6%	29.4%	5.9%	30	42	1.8	2.5	0.5	0.8	0.0	0.0	100.0%	0.0%
Lake trout	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0%	0.0%
Longnose sucker	5.9%	5.9%	5.9%	0.0%	5.9%	5	7	0.3	0.4	0.1	0.1	0.0	0.0	100.0%	0.0%
Northern pike	41.2%	29.4%	29.4%	23.5%	29.4%	86	241	5.1	14.2	1.5	4.3	0.0	0.0	93.0%	7.0%
Smelt	94.1%	76.5%	76.5%	52.9%	70.6%	178	1,068	10.5 g	62.8	3.2 g	19.1	0.0	0.0	100.0%	0.0%
Whitefish	17.6%	5.9%	5.9%	17.5%	17.6%	32	41	1.9	2.4	0.6	0.7	0.0	0.0	100.0%	0.0%
Rainbow trout	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0%	0.0%
Freshwater Fish	94.1%	82.4%	82.4%	82.4%	70.6%		1,434		84.4		25.6				

<sup>1</sup> For "freshwater fish," includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

A similar pattern was documented for 1988/89. Clark's Point households again harvested smelt in substantial numbers (178 gallons). Additionally, grayling, blackfish, Dolly Varden, longnose suckers, pike, and whitefish were taken in small amounts. The per capita harvest of these species was 25.6 pounds in 1988/89 (Table 19). (See Seitz [1996:65-66] for more details on uses of freshwater fish at Clark's Point.)

## PORTAGE CREEK

Portage Creek is located on the Nushagak River, about 30 miles to the east of Dillingham. The community had 48 residents in 1980, 91.7 percent of whom were Alaska Native. By 1985, however, this population had declined to 35, with families spending much of the year in Dillingham and Ekwok. By the winter of 1987/88, only one household was resident year-round in the community. The 1990 population was 5 (Table 1). Former Portage Creek residents continued to reside in the village seasonally.

There are no comprehensive subsistence harvest data available for Portage Creek. The village was not part of the 1974 University of Alaska survey, nor has the Division of Subsistence conducted research in the community. However, it is likely subsistence hunting and fishing by Portage Creek residents has closely resembled that of Ekwok and New Stuyahok, two other Nushagak River villages.

## EKWOK

### Community Background

Ekwok is located on the Nushagak River, and had a population of 77 in 1990; 87.0 percent of the residents were Alaska Native (mostly Yup'ik Eskimos) (Table 1). As in other Nushagak River villages, most households participate in the Bristol Bay commercial salmon fishery, which is the major source of cash income in the community.

### Data Sources

There have been two comprehensive harvest surveys undertaken in Ekwok. The first, pertaining to a 12-month period in 1973/74, was conducted by Gasbarro and Utermohle in 1974 (Table 15). The second was a Division of Subsistence survey of 29 Ekwok households (90.6 percent) in March 1988. Those data pertain to a 12 month period from April 1987 to March 1988 (see also Schichnes and Chythlook 1991). Also, Ekwok was one of the sample villages during Division of Subsistence research on freshwater fish harvests in 1986 and 1987. Results of interviews with key fishing households include estimates of 1986 harvests by species and gear type, and information on methods of harvest, preservation, and preparation.

### Harvest Estimates

In 1973/74, the mean household harvest of 297.1 pounds of six types of freshwater fish -- whitefish, pike, Dolly Varden, grayling, rainbow trout, and smelt -- made up 9.4 percent of Ekwok's total harvest. The per capita harvest was 60.9 pounds. With 3,204 fish, the whitefish take was by far the largest harvest, followed by smelt (1,235 fish) grayling (907 fish) and pike (665 fish). Of the interviewed Ekwok households, 76.5 percent harvested at least one of these six species in 1973/74 (Table 20).

A summary of the data collected with harvest calendars or compiled from household interviews. (Table 21) shows that whitefish (1,370), pike (1,038), and grayling (338) were again major species of non-salmon fish taken in freshwater by Ekwok residents in 1986. (No harvest data for smelt were collected.)

During the 12-month period from April 1987 to March 1988, Ekwok households harvested on average 225.1 pounds of freshwater fish, 8.4 percent of total community harvest of wild resources. The per capita harvest was 67.3 pounds. Whitefish (1,376 fish) again ranked first, followed by pike (1,233), suckers (861), and grayling (793). Of Ekwok households, 75.9 percent used and 62.1 harvested at least one kind of non-salmon fish (Table 14, Table 20).

### Use Patterns by Species<sup>3</sup>

#### Pike (*cuukvak*)

After the ice goes out in the Nushagak River in early spring (May), and again in late fall, Ekwok residents set nets for pike and whitefish in sloughs and creeks. Pike are more abundant when water levels are high, but people try to time their harvest efforts carefully and set their nets to catch the fish as they are flushed out of the sloughs and creeks. Ekwok residents also fish for pike with hook and line through the ice in winter. Fishing effort and success vary from year to year depending on ice conditions. In 1986/87 for example, the ice was thin and dangerous for ice fishing, and consequently, harvests were relatively low.

In 1973/74, Ekwok households took an estimated 665 pike, an average of 31.7 fish per household (Table 20). Reported pike harvests in 1986 were 1,038 fish; of these, 96.4 percent were taken with nets (Table 21). In 1987/88, pike harvests in Ekwok totaled 1,233 fish. Again, most (92 percent) were taken in subsistence nets; 7 percent by ice fishing, and 1 percent with rod and reel (Schichnes and Chythlook 1991:141).

Dried pike eaten with seal oil is a favorite food at Ekwok (Table 22). Commercial fishermen take dried pike with them in their boats in spring and summer for a quick and easy meal.

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<sup>3</sup> See Schichnes and Chythlook 1991:146 for information on areas used by Ekwok households to harvest freshwater fish.

Table 20. Harvests and Uses of Freshwater Fish, Ekwo, 1973/74 and 1987/88

Resource	Percentage of Households <sup>1</sup>			Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel	
<b>Study year 1973/74</b>												
Arctic grayling			52.9%			907	635	43.2	30.3	8.9	6.2	
Dolly Varden			23.5%			27	38	1.3	1.8	0.3	0.4	
Lake trout			0.0%			0	0	0.0	0.0	0.0	0.0	
Northern pike			41.2%			665	1,863	31.7	88.8	6.5	18.2	
Rainbow trout			52.9%			133	187	6.4	8.9	1.3	1.8	
Smelt			5.9%			1,235	309	58.8	14.7	12.0	3.0	
Whitefish			64.7%			3,204	3,204	152.6	152.6	31.3	31.3	
Freshwater Fish			76.5%				6,235		297.1		60.9	
<b>Study Year 1987/88</b>												
Arctic grayling	69.0%	62.1%	58.6%	17.2%	20.7%	793	556	24.8	17.4	7.4	5.2	41.7%
Blackfish	3.4%	0.0%	0.0%	3.4%	0.0%	0	0	0.0	0.0	0.0	0.0	58.3%
Burbot	13.8%	10.3%	10.3%	6.9%	3.4%	24	24	0.8	0.8	0.2	0.2	100.0%
Dolly Varden	51.7%	48.3%	44.8%	6.9%	3.6%	115	161	3.6	5.0	1.1	1.5	36.5%
Lake trout	27.6%	20.7%	17.2%	10.3%	3.4%	11	30	0.3	0.9	0.1	0.3	63.6%
Longnose sucker	34.5%	27.6%	27.6%	13.8%	6.9%	861	1,291	26.9	40.3	8.0	12.1	100.0%
Northern pike	65.5%	55.2%	51.7%	17.2%	24.1%	1,233	3,451	38.5	107.9	11.5	32.2	99.0%
Rainbow trout	58.6%	58.6%	51.7%	10.3%	10.3%	205	287	6.4	9.0	1.9	2.7	62.9%
Smelt	51.7%	6.9%	6.9%	48.3%	10.3%	4	27	0.1	0.8	0.0	0.3	100.0%
Whitefish	62.1%	58.6%	55.2%	27.6%	20.7%	1,376	1,376	43.0	43.0	12.9	12.9	98.4%
Freshwater Fish	75.9%	72.4%	62.1%	62.1%	37.9%		7,203		225.1		67.3	

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 21. Reported Freshwater Fish Harvests, Ekwok, 1986

Period	Households <sup>1</sup>		Arctic Grayling		Burbot		Dolly Varden		Lake Trout		Longnose Sucker		Northern Pike		Rainbow Trout		Whitefish						
	Provided Data	Fished	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total	Net	Hook Total					
January - April	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15				
May - August	20	13	144	84	228	0	0	80	6	86	0	0	0	0	586	6	592	54	5	59	791	20	811
September - December	20	14	55	55	110	4	0	26	10	36	0	0	0	0	400	31	431	32	4	36	544	0	544
Annual Total			199	139	338	4	0	106	16	122	0	0	0	0	1001	37	1038	86	9	95	1350	20	1370

<sup>1</sup> Includes households which were interviewed for harvest recall data and those that returned harvest calendars. Two households returned calendars for the May - August period, and two did so for the September - December period. The rest of the data are based on household interviews.

Harvests are those reported by households and have not been expanded to the entire community because of uncertainty about the representativeness of the sample. According to the US Census, Ekwok had 30 households in 1990 (Alaska Department of Labor 1991:77).

Source: Division of Subsistence, ADF&G, data files

Table 22. Methods Used to Preserve Freshwater Fish, Ekwok

Species	Eaten		Preserved		Eaten		Dried	Smoked	Boiled	Fermented	Used for	
	Fresh	Frozen	Frozen	Frozen	Frozen	Dog Food					Seal Oil	
Round Whitefish ( <i>uraruq</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Least Cisco ( <i>cavirutnaq</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Pike ( <i>cuukvak</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Dolly Varden ( <i>yugyaq</i> )	X								X		X	
Rainbow Trout ( <i>talaariq</i> )	X								X			
Grayling ( <i>nakrullugpak</i> )	X	X	X	X	X	X	X	X	X	X	X	X
Lake Trout ( <i>cikignaq</i> )	X								X			
Burbot ( <i>manignaq</i> )	X	X	X	X	X <sup>a</sup>	X <sup>a</sup>	X <sup>a</sup>	X <sup>a</sup>	X	X	X	X
Longnosed Suckers ( <i>cungartak</i> )	X										X	

<sup>a</sup> half-dried

Source: Division of Subsistence, ADF&G, fieldnotes, 1986-1987

### Whitefish (*uraruq*)

Whitefish (probably round whitefish) are caught at Ekwok along with pike in nets set in sloughs and creeks after break up in spring and again in late fall. In 1973/74, 1986, and 1987/88, they were the most numerous species in the freshwater fish harvests of sampled Ekwok households. The estimated whitefish harvest in 1973/74 was 3,204 whitefish, 152.6 per household (Table 20). The reported take in 1986 was 1,370 whitefish, with nets accounting for almost all of this harvest (98.5 percent) (Table 21). In 1987/88, the estimated harvest was 1,376 whitefish, again almost all in nets (Table 20; Schichnes and Chythlook 1991:141).

At Ekwok, whitefish are primarily dried or frozen for later use. Frozen whitefish are eaten with seal oil (Schichnes and Chythlook 1991:139).

### Burbot (*manignaq*)

Ekwok residents fish for burbot in sloughs and along sand bars in the Nushagak River above and below the village. Burbot are hooked using fresh fish as bait, and nets are also set for this fish. Harvests in the 1980s are reported to be very low compared to several decades ago. Before 1964, burbot were abundant near a large sandbar upriver from Ekwok where they schooled, and people caught them there with nets. With the disappearance of the sandbar, there is no longer one major burbot fishing area. There are no harvest data on burbot for 1973/74. Only four burbot were taken by interviewed Ekwok households in 1986 (Table 21). In 1987/88, the estimated harvest was 24, all in subsistence nets (Table 20).

In the past, Ekwok people trapped burbot in tundra ponds located some distance from the village. Elders report that no one now knows how to build these traps.

### Blackfish (*can'giiq*)

Blackfish are present in the Ekwok area but were generally not used in the 1980s, reportedly because people no longer construct blackfish traps. One household (3.4 percent) reported receiving and using blackfish in 1987/88, but no interviewed Ekwok household caught any during that study year (Table 20).

### Dolly Varden (*yugyaq*)

Ekwok residents report that Dolly Varden appear in the Nushagak River in the summer along with sockeye salmon. They are taken incidentally in subsistence salmon nets. During the winter, people travel by snow machine for about three to four hours to Lake Nerka to fish for Dolly Varden. Ekwok households

in 1973/74 harvested 27 Dolly Varden (1.3 per household) (Table 20). In 1986, interviewed households took a total of 122, 80.3 percent in nets (Table 21). In 1987/88, the total estimated harvest was 115 Dolly Varden. Most (63.5 percent) were taken with rod and reel (Table 20).

#### Lake Trout (*cikignaq*)

Lake trout are found in the Tikchik lakes. Only 11 were harvested by Ekwok households for 1987/88. No lake trout were harvested by interviewed Ekwok households in 1973/74 or 1986 (Table 20, Table 21).

#### Grayling (*nakrullugpak*)

Ekwok residents catch grayling year-round. There are two major harvesting periods, distinguished by gear type. At breakup in early spring, grayling swim down river in schools and are visible as they jump in the water. They will not bite a hook at this time of year, so people set nets. Reportedly, these grayling are larger than the ones caught in the late fall on hook and line. Smaller harvests occur with hook and line through the ice during the winter. In addition, grayling are caught with rod and reel gear in periods of open water.

Ekwok households had an estimated harvest of 907 grayling in 1973/74, 43.2 fish per household (Table 20). The total reported harvest in 1986 was 338, of which 58.9 percent were taken with nets (Table 21). In 1987/88, the total estimated catch was 793 grayling. Of these, 25 percent were netted, 17 percent were caught with hook and line through the ice, and the rest were harvested with rod and reel (Table 20; Schichnes and Chythlook 1991:141).

#### Rainbow Trout (*talaariq*)

Rainbow trout are not common in the Nushagak River near Ekwok. Sometimes, Ekwok residents take them in the Tikchik lakes. The estimated harvest was 133 rainbow trout in 1973/74, 6.4 per household (Table 20). Reported harvests in 1986 totaled 95 fish, with most (90.5 percent) caught in nets set for other species (Table 21). In 1987/88, Ekwok residents caught 205 rainbow trout, with 58 percent taken in nets, 37 percent with rod and reel, and the rest through the ice with hook and line (Schichnes and Chythlook 1991:141).

### Longnose Sucker (*cungartak*)

Ekwok households did not report any harvest of this species in 1986, probably because this species was not listed on the catch calendars. During fieldwork in 1988, the researchers learned that residents of Ekwok harvest suckers both as an incidental and as a targeted species. Elders, especially, enjoy eating boiled sucker heads, although the remainder of the fish is usually discarded or used for dog food because it is "like pins and needles" (that is, very boney). Others use suckers mostly for dog food (Schichnes and Chythlook 1991:139). In 1987/88, this species ranked third among freshwater fish with a total catch of 861 fish. All of these were taken in subsistence nets (Table 20).

### Smelt (*iqalluaq*)

Generally, smelt do not ascend the Nushagak River above Portage Creek, and are consequently not readily available for harvesting by Ekwok households. Smelt were widely used in Ekwok in the 1987/88 study year, however, by 51.7 percent of the households. Most of these households obtained smelt from coastal communities, for which they exchanged freshwater fish or caribou. A few households traveled to Levelock or the lower Nushagak River (such as Lewis Point or Black Point) to net smelt before freeze up or jig for them through the ice in winter (Schichnes and Chythlook 1991:134-135).

## NEW STUYAHOK

### Community Background

New Stuyahok is a primarily Yup'ik Eskimo community located on the Nushagak River. The village had 391 residents in 1990, 95.6 percent of whom were Alaska Native (Table 1). Commercial fishing is the major source of cash income for New Stuyahok residents. For example, in 1982, 62 percent of the earned income in the community derived from commercial fishing (Wolfe et al. 1984:236).

### Data Sources

In 1974, 26 New Stuyahok households were interviewed about their wild resource harvests during a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). Some quantified harvest data for 1983 are also available from Division of Subsistence interviews with 17 households in 1983 (this was not a random sample).<sup>4</sup> In April and May 1988, the division conducted interviews with 40 randomly selected New Stuyahok households (54.1 percent) about their harvest activities during a 12 month period from April 1987 through March 1988. Results of the harvest surveys pertaining to freshwater fish are reported in

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<sup>4</sup> The data for 1983 were compiled by hand for Technical Paper 89 (Wolfe et al. 1984). They have not been incorporated into the Community Profile Database (Scott et al. 1995), and consequently are not summarized in the tables in this report.

Table 23 (see also Schichnes and Chythlock 1991). Finally, limited harvest and use data were collected during the division's freshwater fish project in 1986 and 1987 (Table 24).

### Harvest Estimates

In 1973/74, New Stuyahok households had a mean harvest of 485.7 pounds of freshwater fish, 77.5 pounds per capita. This was the second largest freshwater fish per capita harvest of all the Bristol Bay communities sampled in 1974. This resource category made up 12.6 percent of the community's total wild resource take in 1973/74 (Table 15). In 1983, the interviewed New Stuyahok households averaged a harvest of 508.8 pounds of non-salmon fish (89.6 pounds per capita), 10 percent of the community total of all wild foods (Wolfe et al. 1984:352,353). In 1987/88, the average household harvest was 157.5 pounds of freshwater fish, 33.0 pounds per capita (Table 23). This represents 4.7 percent of the community's total harvest of wild resources for the study year (Table 14).

### Use Patterns by Species

Freshwater fish harvested in New Stuyahok include round whitefish, broad whitefish, humpback whitefish, grayling, rainbow trout, lake trout, pike, longnose suckers, and occasionally Dolly Varden (char) and smelt (Wolfe et al 1984:416). As in Togiak and in other Nushagak River villages, most freshwater fish are taken in nets in late fall before freeze-up and again in late spring after breakup. New Stuyahok residents net fish in nearby sloughs and in the Nushagak River itself, as well in the Tikchik lakes. Jigging for freshwater fish occurs in patterns similar to those described for Togiak.

#### Whitefish (*uraruq*)

New Stuyahok residents set nylon nets about 10 to 20 fathoms in length perpendicular from the shore in sloughs near the community for round whitefish and other species. They also set them at the head of sloughs and outlets of lakes. The nets used near the community are set for about one to two weeks and checked daily. In the fall of 1986, whitefish nets were being set but water was too high in the sloughs. People reported that they would net whitefish when the water started draining out of the sloughs and creeks to the main river. "Humpy" (pink salmon) nets with 4 1/2 inch stretch mesh are placed in lakes and rivers for humpback whitefish on trips in fall to the Tikchik lakes and checked daily (Wolfe et al. 1984: 418-19). Nets are used in common by members of an extended family network of households or by the hunting groups traveling together to the Tikchik lakes. Set net locations are recognized as the traditional use areas of particular kinship groups. These sites are reused annually by the members of the same kinship group. More distant net locations, as well as jigging sites, appear to be open to all members of the community (Wolfe et al 1984:420). Catching whitefish with set nets near New Stuyahok in spring and fall is usually conducted by two to three closely related males of an extended family group. Young men are

Table 23. Harvests and Uses of Freshwater Fish, New Stuyahok, 1973/74 and 1987/88

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
												Rod & Reel	
<i>Study year 1973/74</i>													
Arctic grayling			65.4%			4,417	3,092	142.7	99.9	22.8	15.9		
Dolly Varden			46.2%			306	428	9.9	13.8	1.6	2.2		
Lake trout			11.5%			510	1,376	16.5	44.4	2.6	7.1		
Northern pike			76.9%			2,760	7,727	89.2	249.6	14.2	39.8		
Rainbow trout			38.5%			655	917	21.2	29.6	3.4	4.7		
Smelt			3.8%			48	12	1.5	0.4	0.2	0.1		
Whitefish			73.1%			1,482	1,482	47.9	47.9	7.6	7.6		
Freshwater Fish			84.6%				15,033		485.7		77.5		
<i>Study Year 1987/88</i>													
Arctic grayling	77.5%	67.5%	67.5%	30.0%	39.5%	1,900	1,330	25.7	18.0	5.4	3.8	95.1%	4.9%
Blackfish	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0		
Burbot	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0		
Dolly Varden	35.0%	30.0%	27.5%	7.5%	13.5%	224	314	3.0	4.2	0.6	0.9	100.0%	0.0%
Lake trout	22.5%	17.5%	17.5%	15.0%	7.5%	228	614	3.1	8.3	0.6	1.7	100.0%	0.0%
Longnose sucker	47.5%	40.0%	40.0%	15.0%	22.5%	1,006	1,510	13.6	20.4	2.8	4.3	96.7%	3.3%
Northern pike	87.5%	72.5%	72.5%	45.0%	38.5%	1,867	5,227	25.2	70.6	5.3	14.8	100.0%	0.0%
Rainbow trout	37.5%	37.5%	37.5%	15.0%	17.5%	389	544	5.3	7.3	1.1	1.5	60.4%	39.6%
Smelt	60.0%	7.5%	5.0%	57.5%	12.8%	17	100	0.2	1.4	0.0	0.3	100.0%	0.0%
Whitefish	77.5%	67.5%	67.5%	47.5%	42.1%	2,017	2,017	27.3	27.3	5.7	5.7	99.1%	0.9%
Freshwater Fish	100.0%	85.0%	82.5%	82.5%	62.5%		11,656		157.5		33.0		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 24. Methods Used to Preserve Freshwater Fish, New Stuyahok

Species	Eaten		Preserved		Eaten		Dried	Smoked	Boiled	Fermented	Used for	
	Fresh	Frozen	Frozen	Frozen	Frozen	Dog Food					Seal Oil	
Round Whitefish ( <i>uraruq</i> )	X		X		X		X	X	X	X	X	X
Pike ( <i>cuukvak</i> )	X		X		X		X		X		X	X
Dolly Varden ( <i>yugyaq</i> )	X								X			
Rainbow Trout ( <i>talaariq</i> )	X								X			
Grayling ( <i>nakrullugpak</i> )	X		X		X		X	X	X	X		X
Lake Trout ( <i>cikignaq</i> )	X								X			
Burbot ( <i>manignaq</i> )	X		X				X		X			X
Longnose Suckers ( <i>cungartak</i> )	X						X		X		X	

Source: Division of Subsistence, ADF&G, fieldnotes, 1986-1987

responsible for checking and picking the nets (Wolfe et al. 1984:422). As in the other communities, women are responsible for processing the catch.

In 1973/74, New Stuyahok households harvested an estimated 1,482 whitefish, an average of 47.9 fish per household (Table 23). Whitefish were the third most numerous freshwater species taken that year, after grayling and pike. In 1987/88, whitefish ranked first among freshwater species at New Stuyahok with a harvest of 2,017 fish (Table 23). Almost all of these were caught in subsistence nets.

Whitefish and pike caught in fall and winter are frozen or eaten fresh. Some are dried (Table 24). In spring and fall they are dried on small racks attached under the eaves of houses (Wolfe et al. 1984:419). Dried whitefish are an important food used in summer when people are engaged in commercial salmon fishing.

#### Dolly Varden (*yugyaq*)

New Stuyahok families travel to Lake Nerka with snow machines in March to fish for Dolly Varden, where they camp over night. In 1973/74, New Stuyahok households caught an estimated 306 Dolly Varden, an average of 9.9 per household. In 1987/88, the estimated harvest of Dolly Varden was 224, with all of these taken with subsistence methods (Table 22), mostly with hook and line but also in nets (Schichnes and Chythlook 1991:144).

#### Pike (*cuukvak*)

Division researchers observed pike and whitefish drying in New Stuyahok in October 1986, and observed New Stuyahok residents putting out nets for pike in May 1987. These residents reported that 1986/87 was bad ice year. January and February are usually the slowest months for freshwater fishing in most years, because they are often too cold and the ice is too thick. In contrast, March and April are often good months for jigging. There is a great deal of light, the temperatures have warmed, and the ice is in good condition for travel.

Pike were the second most numerous freshwater fish in New Stuyahok subsistence harvests reported in 1973/74, with a total estimated catch of 2,760 fish. In 1987/88, pike ranked third among freshwater fish with a total take of 1,867 fish (Table 23). These were caught either in subsistence nets (59 percent) or through the ice with hook and line (41 percent) (Schichnes and Chythlook 1991:144).

#### Grayling (*nakrullugpak*)

New Stuyahok residents reported that grayling run near the community when ice starts drifting, but are not as common now as in the past. With an estimated take of 4,417 fish (142.7 per household), more

grayling were harvested by New Stuyahok households in 1973/74 than any other freshwater fish. In 1987/88, grayling ranked second to whitefish among freshwater species, with a total catch of 1,900 (Table 23). Most grayling were taken in subsistence nets (57 percent) or through the ice with hook and line (38 percent), and the rest with rod and reel (Schichnes and Chythlook 1991:144).

#### Rainbow Trout (*talaariq*)

Households in New Stuyahok in 1973/74 totaled a harvest 655 rainbow trout, an average of 21.2 per household. In 1987/88, households harvested an estimated 389 rainbows. Over half of these (60.4 percent) were caught using subsistence methods (subsistence nets and hook and line); the rest (39.6 percent) were taken with rod and reel (Table 23) (Schichnes and Chythlook 1991:144).

#### Lake Trout (*cikignaq*)

In 1973/74, estimated lake trout harvests by New Stuyahok residents totaled 510 fish, an average of 16.5 per household. In 1987/88, the estimated harvest was 228 lake trout, taken in about equal numbers in nets and with hook and line (Table 23) (Schichnes and Chythlook 1991:144). These fish are harvested from the Tikchik or Wood River lakes. During the latter survey, *anerrluaq* ("Togiak trout", a form of Dolly Varden) was used to translate "lake trout." It is possible, therefore, that reported harvests of lake trout include Dolly Varden too. Perhaps this is also true for the 1973/74 data, which is by far the largest "lake trout" harvest reported for any Nushagak River village.

#### Longnose Suckers (*cungartak*)

No 1973/74 harvest data for this species are available. In 1987/88, New Stuyahok households harvested an estimated total of 1,006 suckers, almost all (97 percent) in subsistence nets (Table 23; Schichnes and Chythlook 1991:144). Suckers are eaten, usually by the elderly, or given to dogs. They are dried or boiled.

#### Burbot (*manignaq*) and Blackfish (*can'giiq*)

No 1973/74 harvest data for these species are available. No burbot or blackfish were caught or used by the interviewed households in 1987/88 (Table 23).

## Smelt (*iqalluaq*)

Few New Stuyahok households harvested smelt in either 1973/74 (3.8 percent) or 1987/88 (5.0 percent). However, well over half the household used smelt in 1987/88, most of which they received from relatives and friends in coastal communities (Table 23; Schichnes and Chythlook 1991:137).

## KOLIGANEK

### Community Background

Koliganek is located on the Nushagak River, upriver from New Stuyahok. The village had 181 residents in 1990, 96.1 percent of whom were Alaska Native (mostly Yup'ik Eskimos) (Table 1). Koliganek's cash economy is similar to that of New Stuyahok, with participation in commercial fishing in Bristol Bay providing most of the community's earned income.

### Data Sources

Comprehensive resource harvest data for Koliganek are available for 1973/74 from the results of interviews with 15 Koliganek households conducted in 1974 (Gasbarro and Utermohle 1974; Table 15). Koliganek was a sample community during Division of Subsistence research on freshwater fish harvests in 1986 and 1987. Results of the research, based on interviews with 15 key fishing households, include estimates of harvest quantities of freshwater fish by species and gear type for 1986, as well as other information on harvest locations and strategies, and preservation and preparation methods (Table 25, Table 26). In April 1988, the division conducted interviews with 42 Koliganek households (87.5 percent). The results of those interviews pertaining to freshwater fish harvests are summarized in Table 27 (see also Schichnes and Chythlook 1991).

### Harvest Estimates

In 1973/74, Koliganek households took an average of 291.3 pounds of seven types of freshwater fish -- whitefish, pike, Dolly Varden, grayling, rainbow trout, longnose suckers, and lake trout. The per capita harvest of these species was 51.4 pounds (Table 27). This was 6.7 percent of the total resource harvest that year (Table 15). Grayling, whitefish, and pike were the major types taken. In 1987/88, Koliganek households caught a mean of 360.0 pounds of freshwater fish, 92.8 pounds per capita (Table 27). This was 11.2 percent of the community's total harvest of wild resources during the study year (Table 14). In Koliganek, 92.9 percent of the households used and 81.0 harvested at least one kind of non-salmon fish in 1987/88 (Table 27).

Table 25. Reported Freshwater Fish Harvests, Koliganek, 1986

Period	Households		Arctic Grayling		Burbot		Dolly Varden		Lake Trout		Longnose Sucker		Northern Pike		Rainbow Trout		Whitefish		
	Provided Data	Fished	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	
January - April	11	7	0	205	0	0	0	10	7	0	0	0	80	575	0	2	90	20	110
May - August	15	8	200	292	0	0	2	37	0	1	1	100	1	24	3	27	309	7	316
September - December	3	1	2	0	0	0	5	0	0	0	0	0	5	0	1	0	2	0	2
Annual Total			202	497	0	0	7	47	0	8	1	100	86	599	4	29	401	27	428

<sup>1</sup> Includes households which were interviewed for harvest recall data and those that returned harvest calendars. One household returned a calendar for the May - August period. The rest of the data are based on recall interviews. Harvests are those reported by households and have not been expanded to the entire community because of uncertainty about the representativeness of the sample. According to the US Census, Koliganek had 47 households in 1990 (Alaska Department of Labor 1991:77).

<sup>a</sup> Includes 10 lake trout, harvest method unknown.

Source: Division of Subsistence, ADF&G, data files

Table 26. Methods Used to Preserve Freshwater Fish, Koliganek

Species	Eaten		Preserved		Eaten		Dried	Smoked	Boiled	Fermented	Used for		Eaten with Seal Oil
	Fresh	Frozen	Frozen	Frozen	Dog Food	Food							
Round Whitefish ( <i>uraruq</i> )	X		X		X		X		X				X
Pike ( <i>cuukvak</i> )	X		X		X		X		X				X
Dolly Varden ( <i>yugyaq</i> )	X								X				
Rainbow Trout ( <i>talaariq</i> )	X								X				
Grayling ( <i>nakrullugpak</i> )	X		X		X		X		X				X
Lake Trout ( <i>cikignaq</i> )	X								X				
Burbot ( <i>manignaq</i> )	X								X				X
Longnose Suckers ( <i>cungartak</i> )	X						X		X			X	

Source: Division of Subsistence, ADF&G, fieldnotes, 1986-1987

Table 27. Harvests and Uses of Freshwater Fish, Koliganek, 1973/74 and 1987/88

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel
<b>Study Year 1973/74</b>													
Arctic grayling			60.0%			1,613	1,129	80.7	56.5	14.2	10.0		
Dolly Varden			33.3%			147	205	7.3	10.3	1.3	1.8		
Lake trout			20.0%			37	101	1.9	5.0	0.3	0.9		
Longnose sucker			6.7%			141	212	7.1	10.6	1.2	1.9		
Northern pike			60.0%			860	2,408	43.0	120.4	7.6	21.2		
Rainbow trout			53.3%			175	245	8.7	12.2	1.5	2.2		
Smelt			0.0%			0	0	0.0	0.0	0.0	0.0		
Whitefish			60.0%			1,527	1,527	76.3	76.3	13.5	13.5		
Freshwater Fish			60.0%				5,827		291.3		51.4		
<b>Study Year 1987/88</b>													
Arctic grayling	73.8%	59.5%	57.1%	33.3%	31.6%	2,305	1,614	48.0	33.6	12.4	8.7	95.1%	4.9%
Blackfish	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0		
Burbot	21.4%	16.7%	16.7%	14.3%	7.3%	153	153	3.2	3.2	0.8	0.8	100.0%	0.0%
Dolly Varden	42.9%	33.3%	33.3%	19.0%	17.5%	146	205	3.0	4.3	0.8	1.1	63.3%	36.7%
Lake trout	40.5%	19.0%	16.7%	31.0%	7.7%	114	309	2.4	6.4	0.6	1.7	90.4%	9.6%
Longnose sucker	42.9%	28.6%	28.6%	21.4%	17.1%	2,446	3,669	51.0	76.4	13.1	19.7	100.0%	0.0%
Northern pike	88.1%	71.4%	71.4%	38.1%	48.7%	2,757	7,718	57.4	160.8	14.8	41.4	97.9%	2.1%
Rainbow trout	59.5%	52.4%	52.4%	19.0%	17.9%	435	610	9.1	12.7	2.3	3.3	38.3%	61.7%
Smelt	38.1%	7.1%	7.1%	33.3%	10.0%	21	123	0.4	2.6	0.1	0.7	100.0%	0.0%
Whitefish	83.3%	57.1%	57.1%	45.2%	37.8%	2,881	2,881	60.0	60.0	15.5	15.5	99.8%	0.2%
Freshwater Fish	92.9%	81.0%	81.0%	69.0%	57.1%		17,282		360.0		92.8		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

## Use Patterns by Species<sup>5</sup>

### Pike (*cuukvak*)

Koliganek households set nets for pike in the spring in *qamaneqs*, places with no current or wind. People also jig for pike through the ice in winter. Pike are dried but not smoked for use during commercial fishing. Pike heads are boiled with the stomach still attached to the head (Table 26).

In 1973/74, Koliganek households harvested an estimated 860 pike, an average of 43.0 fish per household, the third highest total after grayling and whitefish (Table 27). In 1986, reported pike harvests totaled 685, with 87.4 percent taken with hook and line. This estimate may be low because of the small number of sampled households for the September - December period (Table 25). In 1987/88, the total estimated harvest of pike was 2,757 fish, second to whitefish among freshwater species (Table 27). Most of these were taken in subsistence nets (41 percent) or with hook and line through the ice (55 percent) (Schichnes and Chythlook 1991:143).

### Whitefish (*uraruq*)

Koliganek residents begin catching whitefish (mostly round whitefish) with nets in open water in May. They are dried and frozen to be eaten later with seal oil. Whitefish are generally not caught with hooks. During fieldwork in the village in March and April 1988, however, Koliganek residents and one of the researchers, while jigging through the ice for pike, hooked whitefish as well. Koliganek households took an estimated 1,527 whitefish in 1973/74, an average household catch of 76.3 fish, second to grayling (Table 27). In 1986, the reported whitefish harvest was 428, with 93.7 percent of these caught in nets. They were the third most numerous species about grayling and pike (Table 25). In 1987/88, whitefish were the most numerous freshwater species harvested by Koliganek households, with a total estimated catch of 2,881 (Table 27). Most of these fish (82 percent) were caught in subsistence nets (Schichnes and Chythlook 1991:143).

### Burbot (*manignaq*)

Burbot are not common near Koliganek. Occasionally, they are taken incidentally in nets set for pike or whitefish. Sometimes, burbot are taken in nets in Tikchik Lake. There was no reported burbot harvest in 1986; no data are available for 1973/74. In 1987/88, the estimated burbot take was 153, mostly in nets (Table 27).

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<sup>5</sup> See Schichnes and Chythlook 1991:153 for information on areas used by Koliganek households to harvest freshwater fish.

### Longnose Sucker (*cungartak*)

The only harvest method used for suckers at Koliganek is gill nets. These are most common during late spring in areas where whitefish are caught. Koliganek residents reported that suckers are best if eaten fresh. The heads are boiled and eaten but, unlike pike and whitefish, the stomachs are not used. Suckers are also used by some households for dog food. The estimated harvest of longnose suckers in 1973/74 was 141 fish (this may be a low estimate because harvest data for suckers was evidently not collected systematically in this survey) (Table 27). Koliganek households reported a take of 101 longnose suckers in 1986 (Table 25). Because this species was not listed on the calendar, the actual harvest was probably much higher than the calendar returns indicate. In 1987/88, 2,446 suckers were caught in subsistence nets by the Koliganek households (Table 27).

### Grayling (*nakrullugpak*)

Some grayling are caught incidentally in nets at Koliganek, but most are taken in open water with hooks in late spring and late fall, with some harvest in winter as well. In 1973/74, grayling were the most numerous species taken, with an estimated harvest total of 1,613 fish and a household mean of 80.7 fish (Table 27). In 1986, the reported harvest was 699 grayling, with most (71.1 percent) taken by hook and line. In 1986 grayling again was the most numerous species of freshwater fish harvested in Koliganek (Table 25). In 1987/88, large numbers of grayling were again reported in Koliganek household harvests for a total estimated catch of 2,305 (Table 27). Of these, 92.6 percent were harvested through the ice with hook and line (Schichnes and Chythlook 1991:143).

### Rainbow Trout (*talaariq*)

In 1973/74, Koliganek households harvested an estimated total of 175 rainbow trout, an average of 8.7 fish per household (Table 27). In 1986, a harvest of 33 rainbow trout was reported, almost all of which (87.9 percent) were caught with hook and line in open water (Table 25). In 1987/88, the estimated harvest was 435 rainbow trout (Table 27), with most (62 percent) caught with rod and reel gear and some with nets (19 percent) or hook and line (19 percent) (Schichnes and Chythlook 1991:143).

### Lake Trout (*cikignaq*)

Koliganek households caught 37 lake trout in 1973/74, an average of 1.9 fish per household (Table 27). Reported harvests of this species in 1986 were also low, with a village total harvest of 18 fish (Table

25). In 1987/88, an estimated total of 114 lake trout were harvested, mostly in nets (Table 27; Schichnes and Chythlook 1991:143). These fish are available in the Tikchik lakes.

#### Dolly Varden (*yugyaq*)

An estimated total of 147 Dolly Varden were harvested by Koliganek households in 1973/74. The mean household harvest of this species was 7.3 fish (Table 27). In 1986, the reported harvest was 54 fish, with 87 percent of these caught with hook and line, probably for the most part through the ice in winter (Table 24). In 1987/88, the estimated Dolly Varden harvest totaled 146 fish, about equally divided among nets, hook and line, and rod and reel (Table 27; Schichnes and Chythlook 1991:143).

#### Smelt (*iqalluaq*)

As in the other Nushagak River communities, few households in Koliganek harvested smelt in either 1973/74 (none) or 1987/88 (7.1 percent). However, due to sharing with coastal Bristol Bay communities, 38.1 percent of Koliganek households used smelt in 1987/88 (Table 27). Occasionally, Koliganek families jig through the ice for smelt while visiting friends and relatives in the Dillingham area (Schichnes and Chythlook 1991:135).

### DILLINGHAM

#### Community Background

Dillingham is the largest community in the Bristol Bay region, with a population in 1990 of 2,017 people. In 1990, 55.8 percent of Dillingham's population was Alaska Native (Table 1).

Dillingham is the major service center in the Bristol Bay region. As such, employment opportunities are more common than in the region's smaller communities. Nevertheless, harvests of fish and game for local use continue to be significant in Dillingham. For example, in 1984 a sample of 153 households (22 percent) harvested an average of 715 pounds of wild foods, 242 pounds per capita. Salmon (58.4 percent of the total harvest in pounds edible weight), game (27.2 percent), and fish other than salmon (including herring, herring roe-on-kelp, smelt, and resident freshwater fish) (7.7 percent) were the major resource categories (Fall et al. 1986).

#### Data Sources

There are two major sources of information on uses of freshwater fish by residents of Dillingham. The first is a survey of a sample of 32 households with 137 residents conducted by Gasbarro and Utermohle (1974) pertaining to a 12-month period in 1973/74 (Table 15). The second source is a Division

of Subsistence research project conducted in Dillingham in 1985 which collected harvest quantities and other resource use information for a random sample of 153 households with 451 residents, 22 percent of Dillingham households, plus interviews with nine key respondents. The data pertain to 1984 (Fall et al. 1986).

### Harvest Estimates

In 1973/74, the Dillingham households averaged a harvest of 123.4 pounds of seven types of freshwater fish, 28.8 pounds per capita. This was 11.4 percent of the total resource take that year (Table 15, Table 28). In descending order of the size of the harvest, these species were smelt (54,429 fish), Dolly Varden (3,243 fish), grayling (2,814 fish), whitefish (1,393 fish), pike (1,336 fish), rainbow trout (1,121 fish), and lake trout (514 fish) (Table 28).

In 1984, Dillingham households harvested an average of 28.5 pounds of freshwater fish, 9.6 pounds per capita, for 4.0 percent of the total resource harvest (Table 14). In Dillingham in 1984, 75.0 percent of the households used non-salmon fish, 56.2 percent tried to harvest them, and 54.9 percent were successful harvesters. Dolly Varden, with an estimated harvest of 2,985 fish by 29.4 percent of the households, were the most commonly harvested resident freshwater fish species, followed by rainbow trout (1,897 fish harvested by 27.5 percent of the households), grayling (1,215 fish harvested by 19.6 percent of the households), and pike (799 fish harvested by 17.0 percent of the sample) (Table 28). The survey did not collect harvest quantities by gear type.

### Use Patterns: General

Dillingham fishermen harvested nine kinds of freshwater fish during 1984. During summer and fall, rainbow trout, lake trout, Dolly Varden, and grayling were taken with rod and reel. Most of this fishing effort took place along the Nushagak, Agulowak, and Agulukpak rivers. Whitefish were harvested with nets as the ice formed. In October, people caught smelt with seines or dipnets. After freeze-up, people jigged through the ice for Dolly Varden 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, in which they took a few burbot incidentally. Lake Aleknagik and other Wood River lakes were the major Dolly Varden netting areas. Lake trout were usually taken incidentally in nets in the Tikchik lakes system or Togiak Lake. People also jigged through the ice for smelt. Also, whitefish were caught in nets in late fall and again in early spring along the Nushagak River.

Information provided by Dillingham key respondent households in 1985, 1986, and 1987 indicated that 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

Table 28. Harvests and Uses of Freshwater Fish, Dillingham, 1973/74 and 1984

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
<u>Study Year 1973/74</u>											
Arctic grayling			25.0%			2,814	1,970	12.3	8.6	2.9	2.0
Dolly Varden			31.3%			3,243	4,540	14.2	19.9	3.3	4.6
Lake trout			12.5%			514	1,389	2.3	6.1	0.5	1.4
Northern pike			31.3%			1,336	3,740	5.8	16.4	1.4	3.8
Rainbow trout			28.1%			1,121	1,570	4.9	6.9	1.1	1.6
Smelt			46.9%			54,429	13,607	238.1	59.5	55.6	13.9
Whitefish			25.0%			1,393	1,393	6.1	6.1	1.4	1.4
Freshwater Fish			68.8%				28,209		123.4		28.8
<u>Study Year 1984</u>											
Arctic grayling	28.8%	20.3%	19.6%	9.2%	2.6%	1,215	850	1.8	1.2	0.6	0.4
Blackfish	3.9%	0.7%	0.7%	2.6%	0.0%	18	21	0.0	0.0	0.0	0.0
Burbot	2.6%	2.0%	2.0%	2.6%	1.3%	117	117	0.2	0.2	0.1	0.1
Dolly Varden	37.3%	32.0%	29.4%	9.8%	7.2%	2,985	4,181	4.3	6.1	1.5	2.1
Lake trout	11.8%	7.2%	5.9%	4.6%	0.7%	275	746	0.4	1.1	0.1	0.4
Northern pike	25.5%	19.0%	17.0%	7.8%	5.9%	799	2,239	1.2	3.2	0.4	1.1
Smelt	37.3%	22.2%	21.6%	22.2%	12.4%	275	8,264	0.4	12.0	0.1	4.1
Whitefish	13.7%	7.8%	5.9%	8.5%	2.0%	596	594	0.9	0.9	0.3	0.3
Rainbow trout	39.2%	29.4%	27.5%	9.8%	5.2%	1,897	2,653	2.7	3.8	0.9	1.3
Freshwater Fish	75.0%	56.2%	54.9%	39.9%	19.6%		19,665		28.5		9.6

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> Harvests by gear type are not available for either Dillingham survey. Harvests in numbers unless otherwise specified b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

*qumlanaq* by Yup'ik residents of Dillingham, and were usually served with seal oil. Smelt were prepared in a variety of ways, including fried, boiled, dried, or eaten frozen with seal oil.

### Use Patterns by Species

#### Whitefish

Although whitefish are a major freshwater fish resource in other communities of the Nushagak River drainage, this was not the case in Dillingham in 1973/74 or 1984. The total estimated harvest of whitefish in 1973/74 was 1,393, 6.1 per household. In 1984, Dillingham households harvested an estimated 596 whitefish. About six percent of the households participated in this harvest. The average catch per household was 0.9 whitefish in 1984 (Table 28).

#### Pike

As with whitefish, harvests of pike by Dillingham residents are relatively lower than those of the communities further up the Nushagak River. In 1973/74, Dillingham households harvested an estimated 1,336 pike, about 5.8 per household. In 1984, the total estimated harvest was 799 pike, the fourth highest total among resident species after Dolly Varden, rainbow trout, and grayling. The average catch was 1.2 pike per household (Table 28).

#### Dolly Varden

In 1973/74, Dolly Varden were the most numerous resident freshwater fish species in the harvests of Dillingham households. The total estimated take was 3,243 fish, 14.2 per household. The results of the 1985 survey of Dillingham households revealed that a very similar pattern occurred in 1984. Again, Dolly Varden was the most commonly harvested resident freshwater fish. The total estimated take was 2,985, 4.3 per household (Table 28).

#### Grayling

Grayling were a notable part of the freshwater fish harvests by Dillingham residents in 1973/74 and in 1984. As shown in Table 28, the estimated harvest of 2,814 grayling in 1973/74 was second only to the Dolly Varden harvest among resident species. The average catch per household was 12.3 grayling. In 1984, grayling ranked third after Dolly Varden and rainbow trout among resident species, with a total estimated catch of 1,215 fish, 1.8 per household.

## Rainbow Trout

In 1973/74, Dillingham households harvested an estimated total of 1,121 rainbow trout, 4.9 per household. The data for 1984 suggest that the relative position of rainbow trout in the community's freshwater fish harvest increased, with the estimated harvest of 1,897 rainbow trout second only to that of Dolly Varden among resident freshwater fish species. The average catch per household declined however, to 2.7 rainbow trout (Table 28).

## Lake Trout

Lake trout are not available in the Wood River and lakes, but can be found in the Tikchik lakes system. Some people in Dillingham use "lake trout" as a synonym for "Togiak trout," a category of Dolly Varden, so some of these harvests may include the latter species as well. Relatively low harvests of lake trout were reported by Dillingham residents in both 1973/74 and 1984. The total estimated take in 1973/74 of 514 lake trout averaged 2.3 per household. In 1984, the estimated lake trout harvest was 275, for an average household take of 0.4 fish (Table 28).

## Burbot

Harvest data for burbot are only available for 1984. In that year 2.0 percent of Dillingham households harvested burbot, for a total estimated take of 117 fish, 0.2 per household (Table 28).

## Blackfish

Harvest data for blackfish are only available for 1984. Only 0.7 percent of Dillingham households harvested blackfish in that year, for an estimated harvest of 18 fish (Table 28).

## Smelt

Smelting is a popular activity in Dillingham, with most effort taking place in late winter when people jig with hook and line through the ice. Smelt are also harvested with seines and dipnets in October before ice forms. Many households in Dillingham in both study years participated in the harvest of smelt: 46.9 percent in 1973/74 and 21.6 percent in 1984. Harvests as estimated in pounds per person were also notable: 59.5 pounds per person in 1973/74 and 12.0 pounds per person in 1984 (Table 28).

## LEVELOCK

### Community Background

Situated on the right bank of the Kvichak River approximately 58 miles east of Dillingham, Levelock had a population of 105 in 1990; 82.9 percent of the residents were Alaska Native (Table 1). Close kinship ties existed between Levelock and nearby communities, specifically with Igiugig, Newhalen, Iliamna, and Kokhanok. Many services and supplies were provided through facilities located in Dillingham, King Salmon, or Naknek.

### Data Sources

Subsistence harvest characteristics in Levelock were the primary focus of Division of Subsistence research conducted in late 1988 and 1989. As part of this project, 27 households (81.8 percent) were interviewed as part of a comprehensive harvest survey (Chythlook and Fall, forthcoming). Data on freshwater fish harvest and use patterns have also been compiled from information gathered as components of other projects. In 1974, 16 Levelock households were interviewed about their harvest activities in a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). The division distributed freshwater fish calendars in Levelock beginning in May 1986, but the number of returned calendars was too low to provide an estimate of harvests during 1986. However, distribution of the calendars in Levelock and subsequent visits provided opportunities for a division researcher to interview key respondents about non-salmon freshwater fishing in the community. Finally, the division conducted another comprehensive harvest survey in Levelock in 1993, which pertains to a 12-month study period from November 1992 through October 1993. A total of 30 households (76.9 percent) were interviewed for that project. More detailed information about uses of freshwater fish in Levelock will appear in future technical papers (e.g. Chythlook and Fall, forthcoming).

### Harvest Estimates

In 1973/74, 87.5 percent of a sample of Levelock households harvested at least one species of non-salmon fish. The per capita harvest was 47.6 pounds, 6.9 percent of the community's total fish and game harvest in 1973/74 (Table 15). The most numerous species in the harvest were smelt, whitefish, rainbow trout, and pike.

According to results of the harvest survey for 1987/88, 92.6 percent of Levelock households used and 70.4 percent harvested at least one species of non-salmon fish during the study year (Table 29). The mean household harvest of freshwater fish was 180.7 pounds and the per capita harvest was 54.8 pounds. Whitefish were again the most numerous resident freshwater fish in this harvest.

Table 29. Harvests and Uses of Freshwater Fish, Levelock, 1973/74, 1987/88, and 1992/93

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel	
<b>Study Year 1973/74</b>														
Arctic grayling			50.0%			141	99	8.3	5.8	1.8	1.3			
Dolly Varden			18.8%			44	61	2.6	3.6	0.6	0.8			
Lake trout			0.0%			0	0	0.0	0.0	0.0	0.0			
Northern pike			62.5%			268	751	15.8	44.1	3.4	9.5			
Rainbow trout			81.3%			384	538	22.6	31.6	4.9	6.8			
Smelt			18.8%			4,343	1,086	255.1	63.8	55.2	13.8			
Whitefish			75.0%			1,217	1,217	71.5	71.5	15.5	15.5			
Freshwater Fish			87.5%				3,751		220.4		47.6			
<b>Study Year 1987/88</b>														
Arctic grayling	29.6%	22.2%	22.2%	25.9%	25.9%	332	233	10.1	7.1	3.1	2.1	94.6%	5.4%	
Blackfish	18.5%	11.1%	11.1%	14.8%	14.8%	55	4	1.7	0.1	0.5	0.0	100.0%	0.0%	
Burbot	29.6%	18.5%	18.5%	25.9%	22.2%	275	275	8.3	8.3	2.5	2.5	100.0%	0.0%	
Dolly Varden	40.7%	25.9%	25.9%	29.6%	22.2%	131	183	4.0	5.6	1.2	1.7	56.2%	43.8%	
Lake trout	25.9%	14.8%	14.8%	18.5%	14.8%	76	205	2.3	6.2	0.7	1.9	15.8%	84.2%	
Longnose sucker	18.5%	7.4%	7.4%	14.8%	18.5%	98	147	3.0	4.4	0.9	1.4	100.0%	0.0%	
Northern pike	44.4%	33.3%	33.3%	40.7%	37.0%	636	1,780	19.3	53.9	5.8	16.4	100.0%	0.0%	
Rainbow trout	66.7%	44.4%	44.4%	51.9%	40.7%	280	392	8.5	11.9	2.6	3.6	57.5%	42.5%	
Smelt	77.8%	51.9%	51.9%	70.4%	48.1%	95	570	2.9	17.3	0.9	5.2	100.0%	0.0%	
Whitefish	74.1%	33.3%	33.3%	74.1%	40.7%	2,176	2,176	65.9	65.9	20.0	20.0	100.0%	0.0%	
Freshwater Fish	92.6%	70.4%	70.4%	88.9%	63.0%		5,965		180.7		54.8			
<b>Study Year 1992/93</b>														
Arctic grayling	20.0%	13.3%	13.3%	13.3%	10.0%	140	98	3.6	2.5	1.3	0.9	97.9%	2.1%	
Blackfish	3.3%	3.3%	3.3%	3.3%	3.3%	65	5	1.7	0.1	0.6	0.1	100.0%	0.0%	
Burbot	13.3%	6.7%	6.7%	10.0%	6.7%	69	69	1.8	1.8	0.6	0.6	100.0%	0.0%	
Dolly Varden	13.3%	10.0%	10.0%	3.3%	3.3%	13	18	0.3	0.5	0.1	0.2	30.8%	69.2%	
Lake trout	3.3%	3.3%	3.3%	0.0%	3.3%	3	4	0.1	0.1	0.0	0.0	0.0%	100.0%	
Longnose sucker	6.7%	6.7%	6.7%	3.3%	6.7%	130	195	3.3	5.0	1.2	1.8	100.0%	0.0%	
Northern pike	36.7%	26.7%	26.7%	33.3%	26.7%	640	1,791	16.4	45.9	5.8	16.2	100.0%	0.0%	
Rainbow trout	60.0%	53.3%	50.0%	43.3%	40.0%	395	553	10.1	14.2	3.6	5.0	81.0%	19.0%	
Smelt	73.3%	66.7%	66.7%	43.3%	63.3%	251	1,508	6.4	38.7	2.3	13.7	100.0%	0.0%	
Unknown "trout"	16.7%	13.3%	13.3%	3.3%	6.7%	48	67	1.2	1.7	0.4	0.6	97.9%	2.1%	
Whitefish	66.7%	23.3%	23.3%	66.7%	33.3%	1,162	1,929	29.8	49.5	10.5	17.5	99.7%	0.3%	
Freshwater Fish	90.0%	76.7%	73.3%	76.7%	63.3%		6,237		159.9		56.4			

<sup>1</sup> For "freshwater fish," includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

For 1992/93, 90.0 percent of the Levelock households used non-salmon fish, and 73.3 percent harvested them. The average household harvest of freshwater fish was 159.9 pounds, 56.4 pounds per capita. Whitefish again were harvested in the largest numbers among the resident species (Table 29).

#### Use Patterns: General

Levelock's location enabled its residents to harvest a variety of freshwater fish species, including Arctic grayling, rainbow trout, burbot, whitefish, longnose sucker, blackfish, northern pike, Dolly Varden, lake trout, and smelt. In the 1980s, fishing locations included the Kvichak River, the Alagnak River (also called the Branch River), Kaskanak Creek, and Iliamna Lake, as well as other local creeks and small lakes. Fish were taken throughout the year depending on weather, water conditions, and species availability. Harvests took place in open water and through the ice. Men and women were actively involved in harvesting freshwater fish.

Freshwater fishing in open water near Levelock was concentrated during the spring and fall months. Ice fishing occurred once the ice was considered safe, but the development of good ice conditions varies from year to year. In 1987, for example, several residents reported it was late in the winter before the ice was safe. One respondent also said that the channel in the Kvichak River is changing and has made a difference as to when the river freezes. Consequently, in 1987 ice fishing began in March and lasted only a month before a warming trend brought unsafe ice conditions again.

Levelock residents regularly mentioned a number of specific sites with local place names where fishing is particularly good. Examples include "Charlie Jensen's Creek" ("right by Jimmy's cabin"), Pump Lake (across the Kvichak River from Levelock), and the "scow" (in front of the village). This specificity indicates the familiarity with which people refer to local fishing locations which was held as common knowledge.

Gear types included gill nets, which were used for taking suckers and Dolly Varden in the spring months. Seining for whitefish took place during October and November in the river near Igiugig. Hook and line was used for fishing through the ice, while rod and reel fishing was used in open water.

In Levelock, all varieties of freshwater fish were eaten fresh. Respondents reported that fish taken through the ice were frozen for later use more frequently than fish taken in open water. An exception to this generalization was whitefish taken near Igiugig. These whitefish were usually frozen and then distributed to community members once the fisherman returned to Levelock. All types of freshwater fish were reportedly fried, baked, and boiled. When taken in numbers larger than what could be used immediately, freshwater fish were dried for later use. Parts of certain fish, such as the liver of burbot or the tail of a pike, were singled out as particular delicacies to be savored when available.

## Use Patterns by Species

### Arctic Grayling

Levelock households harvested an estimated 141 grayling (8.3 per household) in 1973/74. The estimated harvest totaled 332 grayling in 1987/88. Most of this catch occurred with nets. In 1992/93, an estimated 140 grayling were harvested at Levelock (Table 29).

### Blackfish

No harvest data were collected for blackfish for 1973/74. In 1987/88, 11.1 percent of the households harvested this species in nets and traps for a total take of 55 fish. The estimated harvest in 1992/93 was 65 blackfish (Table 29).

### Burbot

No harvest data for this species are available for 1973/74. The estimated harvest was 275 burbot for 1987/88, with most taken in traps. In 1992/93, the total burbot harvest at Levelock was 69 fish (Table 29).

### Dolly Varden

In 1973/74, Levelock households harvested an estimated total of 44 Dolly Varden (2.6 per household). For 1987/88, the estimated Dolly Varden harvest was 131 fish, with nets and rod and reel accounting for most of the catch. The estimated Dolly Varden catch for 1992/93 at Levelock dropped to 13 fish (Table 29).

### Lake Trout

No Levelock household reported harvesting lake trout in 1973/74. Only 76 were caught in 1987/88, mostly by rod and reel. Only 3 were taken in 1992/93 (Table 29).

### Longnose Suckers

No harvest data are available for this species for 1973/74. An estimated total of 98 suckers were harvested in nets by Levelock households in 1987/88. The 1992/93 estimated harvest was 130 suckers (Table 29).

### Northern Pike

In 1973/74, Levelock households harvested an estimated 268 pike, for an average of 15.8 per household. The total estimated catch was 636 pike for 1987/88, which were taken either with nets or through the ice with hook and line. In 1992/93, Levelock households harvested an estimated total of 640 northern pike (Table 29).

### Rainbow Trout

Levelock households in 1973/74 harvested an estimated 384 rainbow trout (22.6 per household). The estimated take was 280 rainbow trout in 1987/88. Of these, about 43 percent were caught with rod and reel, and the rest using subsistence methods (subsistence gill nets and fishing through the ice with hook and line). The estimated rainbow trout harvest by Levelock households in 1992/93 was 395 fish (Table 29).

### Whitefish

In 1973/74, Levelock households caught more whitefish (unspecified species) than any other resident freshwater fish. The estimated 1973/74 harvest was 1,217 whitefish, a household average of 71.5 fish. Whitefish were important in the freshwater fish catch at Levelock again in 1987/88. The total estimated catch was 2,176 whitefish, almost all taken in subsistence nets. The estimated harvest in 1992/93 was 1,162 whitefish, again more numerous than any other resident species (Table 29).

### Smelt

Levelock residents harvest smelt by jigging through the ice in the Kvichak River just below the village. They are shared with communities along Iliamna Lake. The estimated smelt harvests were 4,343 fish in 1973/74, 95 gallons in 1987/88 (a poor year because of a late freeze-up), and 251 gallons in 1992/93 (Table 29).

### IGIUGIG

#### Community Background

Igiugig is situated at the outlet of Iliamna Lake into the Kvichak River. The smallest community located in the Iliamna area, Igiugig was home to 33 persons in 1990, 78.8 percent of whom had Alaska

Native ancestry (Table 1). The families were related to each other and had settled in Igiugig from areas such as Branch River, Kukaklek Lake, and Levelock.

#### Data Sources

In 1974, six Igiugig households were interviewed as part of a region-wide harvest survey for a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). In 1984, three households (27.3 percent) were interviewed by the Division of Subsistence as part of a study of subsistence uses in the Iliamna Lake region (Morris 1986). Harvest data from these surveys combined with the key informant interviews conducted in 1987 provide information on the variety and role of freshwater fish harvest and use in Igiugig. Finally, in late 1993, division researchers interviewed 10 Igiugig households (83.3 percent) about resource harvests for the period November 1992 through October 1993.

#### Harvest Estimates

In 1973/74, 83.3 percent of Igiugig households harvested freshwater fish. The per capita harvest of 141.3 pounds was 16.2 percent of the community's total resource harvest that year (Table 15). In 1983, all of the sampled households harvested freshwater fish species, for a per capita harvest of 78.1 pounds. This made up 12.6 percent of the total resource take in 1983. For 1992/93, again, all Igiugig households participated in freshwater fish harvests. The per capita harvest was 89.8 pounds, 12.4 percent of the community's total subsistence harvest in that year (Table 14).

In 1973/74, rainbow trout, whitefish, and northern pike contributed the most usable pounds to Igiugig's freshwater fish harvests. In 1983, of the 78.1 pounds of freshwater fish harvested per capita, whitefish accounted for 35.3 pounds, about 45 percent of the entire resource category. Approximately 13 pounds per person were taken of burbot (13.2 pounds per capita) and pike (13.7 pounds per capita). Almost six pounds per capita (5.9 pounds) of rainbow trout were harvested and 7.1 pounds of lake trout. In 1992/93, whitefish contributed the largest harvest of freshwater fish in pounds usable weight (35.6 pounds per person), followed by rainbow trout (21.2 pounds per person) and pike (17.5 pounds per person) (Table 30).

#### Use Patterns: General

Whitefish, pike, grayling, rainbow trout, and burbot have been the most heavily harvested freshwater fish by Igiugig households. Dolly Varden, blackfish, longnose suckers, and lake trout have also been harvested, but in lower quantities. According to Igiugig residents, freshwater fish can be taken throughout the year, though sometimes are better than others. Also, these fish can be taken through the ice or in open water. Major factors which affect fishing in the Igiugig area are weather and travel conditions. Types of factors which key respondents mentioned as determining whether or not they went

Table 30. Harvests and Uses of Freshwater Fish, Igiugig, 1973/74, 1983, and 1992/93

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel
	<i>Study Year 1973/74</i>												
Arctic grayling			66.7%			923	646	115.3	80.7	23.9	16.7		
Dolly Varden			33.3%			273	383	34.2	47.8	7.1	9.9		
Lake trout			0.0%			0	0	0.0	0.0	0.0	0.0		
Longnose sucker			16.7%			133	200	16.7	25.0	3.4	5.2		
Northern pike			66.7%			427	1,195	53.3	149.3	11.0	30.9		
Rainbow trout			83.3%			1,115	1,561	139.3	195.1	28.8	40.4		
Smelt			0.0%			0	0	0.0	0.0	0.0	0.0		
Whitefish			83.3%			1,480	1,480	185.0	185.0	38.3	38.3		
Freshwater Fish			83.3%				5,464		683.0		141.3		
<i>Study Year 1983</i>													
Arctic grayling		100.0%	100.0%	0.0%		293	205	26.6	18.7	4.2	2.9	100.0%	0.0%
Burbot		66.7%	66.7%	0.0%		917	917	83.3	83.3	13.2	13.2	100.0%	0.0%
Dolly Varden		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Lake trout		33.3%	33.3%	0.0%		183	495	16.6	45.0	2.6	7.1	100.0%	0.0%
Longnose sucker		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Northern pike		100.0%	100.0%	0.0%		341	955	31.0	86.8	4.9	13.7	100.0%	0.0%
Rainbow trout		100.0%	100.0%	0.0%		293	411	26.6	37.3	4.2	5.9	100.0%	0.0%
Smelt		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Whitefish		100.0%	100.0%	0.0%		2,457	2,457	223.4	223.3	35.3	35.3	100.0%	0.0%
Freshwater Fish		100.0%	100.0%	0.0%			5,440		494.5		78.1		
<i>Study Year 1992/93</i>													
Arctic grayling	100.0%	100.0%	100.0%	20.0%	20.0%	112	78	9.3	6.5	2.4	1.7	63.4%	36.6%
Blackfish	30.0%	30.0%	30.0%	0.0%	10.0%	7	1	0.6	0.0	0.1	0.0	100.0%	0.0%
Burbot	20.0%	10.0%	0.0%	20.0%	0.0%	0	0	0.0	0.0	0.0	0.0		
Dolly Varden	90.0%	90.0%	90.0%	0.0%	20.0%	120	168	10.0	14.0	2.6	3.6	80.0%	20.0%
Lake trout	60.0%	60.0%	60.0%	10.0%	0.0%	31	44	2.6	3.6	0.7	0.9	93.5%	6.5%
Longnose sucker	40.0%	40.0%	40.0%	0.0%	10.0%	216	324	18.0	27.0	4.6	6.9	100.0%	0.0%
Northern pike	80.0%	60.0%	60.0%	20.0%	40.0%	293	820	24.4	68.3	6.3	17.5	99.7%	0.3%
Rainbow trout	100.0%	100.0%	100.0%	20.0%	70.0%	709	993	59.1	82.7	15.2	21.2	77.7%	22.3%
Unknown "trout"	10.0%	10.0%	10.0%	0.0%	10.0%	24	34	2.0	2.8	0.5	0.7	100.0%	0.0%
Smelt	40.0%	10.0%	10.0%	40.0%	10.0%	12	9	1.0	6.0	0.3	1.5	100.0%	0.0%
Whitefish	90.0%	70.0%	70.0%	30.0%	60.0%	956	1,667	79.7	139.0	20.4	35.6	100.0%	0.0%
Freshwater Fish	100.0%	100.0%	100.0%	80.0%	80.0%		4,201		350.0		89.8		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

fishing included very cold temperatures, ice being too slippery to walk on, or involvement in a special activity such as Slavi (Russian Orthodox Christmas).

Freshwater fish were available in the Kvichak River adjacent to the village, Kaskanak Creek, and other creeks emptying into the river, as well as small nearby lakes. Fishing on the shore of Iliamna Lake occurs when people target lake trout or burbot.

Igiugig residents use a number of gear types for freshwater fishing, including nets, hook and line, and rod and reel (Table 31). Set nets were used in the spring when the ice went out and continued to be used until salmon started arriving, usually the first part of June. Nets were not left out continuously, but were set when fresh fish were desired. In August or September, after the salmon were through the river, nets were again set for freshwater fish in places such as Kaskanak Creek and in front of the village. Hook and line was used through the ice and also in open water. Bait included home cured or store-bought salted salmon eggs. Sometimes pieces of colored yarn were used to attract the fish.

Freshwater fish are a year-round source of food in Igiugig. Freshwater species were fished in less concentrated or intense periods than salmon and were used fresh during much of the year. For example, Igiugig fishermen reported harvesting freshwater species "whenever we feel like it" or "whenever we need to." This harvest activity was interwoven into a whole array of social and environmental elements.

Women appeared to be the main hook and line fishers in Igiugig. Almost all the women in the village talked about fishing both with other women or by themselves. Men talked about seining whitefish, operating set gill nets, or fishing for rainbow trout with rod and reel.

The use of freshwater fish was well integrated into daily life in Igiugig. Harvested on an unscheduled basis, whenever needed or desired, these fish added variety and protein to the local fare. In discussing their fishing activities, Igiugig women could estimate how many fish were necessary to feed their household. For example one lady said if she got "the little ones" (fish estimated to be about eight inches long), she would have to get six or eight for a meal for her family, but if they were "big," she only needed two or three fish. All species of freshwater fish were fried, baked, or boiled.

One aspect of freshwater fish harvest and use among Igiugig households was the large amount of sharing and distribution which took place. Freshwater fish, particularly whitefish, were distributed to many communities in the Iliamna/Kvichak drainage. Whitefish readily available in Igiugig were not available in other communities, such as Newhalen and Iliamna. Whitefish were also regularly traded with residents of these communities and of Kokhanok for spawned-out salmon, which were not available in Igiugig. While whitefish was most often noted as being distributed from Igiugig, dried trout and pike were also given to residents of other communities.

In summary, during the study years, harvest and use of freshwater fish by Igiugig residents was significant for several reasons. They provided protein and variety to families living in this small community that is isolated from commercial sources of food. Igiugig residents depend upon harvesting some type of fish as the need arises. This is a form of food harvesting in which both men and women can participate.

Table 31. Gear Types Used to Harvest Freshwater Fish, Iliamna Lake Subregion Communities, 1983

Community	Arctic Grayling	Burbot	Dolly Varden	Lake Trout	Longnose Sucker	Northern Pike	Rainbow Trout	Unknown Trout	Whitefish
Igiugig	Hook and line <sup>2</sup>	Hook and line, gill net, herring net		Hook and line		Hook and line <sup>2</sup>	Hook and line <sup>2</sup>		Gill net, seine
Iliamna	Hook and line, rod and reel		Hook and line, rod and reel	Rod and reel	Gill net <sup>2</sup>	Rod and reel, gill net <sup>2</sup>	Hook and line, rod and reel	Hook and line, rod and reel, gill net	Hook and line, gill net
Kokhanok	Hook and line	Set hooks	Hook and line	Hook and line		Hook and line	Hook and line		Herring net
Newhalen	Hook and line, rod and reel, gill net	Set hooks	Hook and line, rod and reel, gill net	Hook and line, gill net <sup>2</sup>		Hook and line	Hook and line, gill net <sup>2</sup>	Hook and line, rod and reel	Hook and line, gill net <sup>2</sup>
Nondalton	Hook and line, rod and reel <sup>2</sup>	Hook and line, set net, set hooks <sup>2</sup>	Hook and line, rod and reel, gill net, seine	Hook and line, gill net, set hooks, seine <sup>2</sup>	Gill net, seine	Hook and line, rod and reel, gill net <sup>2</sup>	Hook and line, rod and reel, gill net, seine	Gill net	Hook and line, gill net, set hooks
Pedro Bay	Rod and reel		Hook and line, rod and reel, gill net	Hook and line, rod and reel, gill net		Rod and reel	Hook and line, rod and reel, gill net		
Port Aisworth	Hook and line, rod and reel	Hook and line, set hooks		Hook and line, rod and reel, set hooks		Not recorded			Hook and line, gill net, set hooks

<sup>1</sup> Harvests by specific gear types generally not recorded. Blank cells indicate no harvest in 1983.

<sup>2</sup> Some harvest also occurred with unspecified gear.

Source: Morris 1986

In a community where few external diversions were provided by a commercial sector, fishing is an enjoyable activity which simultaneously provides food. Finally, the harvest and subsequent distribution of freshwater fish by Igiugig residents figured in a systematic pattern of barter and trade within the Iliamna/Kvichak region.

#### Use Patterns by Species

##### Arctic Grayling

Estimated harvests of grayling by Igiugig households were 923 in 1973/74 (115.3 per household), 293 in 1983 (26.6 per household), and 112 in 1992/93 (Table 30). Grayling were taken in nets or by hook and line. These fish were either air-dried or smoked.

##### Burbot

No 1973/74 harvest data for burbot are available. The estimated take was relatively large in 1983, at 917 burbot. There was no burbot harvest in 1992/93, however (Table 30).

##### Dolly Varden

In 1973/74, Igiugig residents harvested an estimated 273 Dolly Varden. There was no harvest in 1983, while the estimated take for 1992/93 was 120 Dolly Varden (Table 30).

##### Lake Trout

Evidently, lake trout harvests at Igiugig are low. No lake trout were reported harvested by Igiugig households in 1973/74, an estimated 183 were taken in 1983 (16.7 per household), and just 31 in 1992/93 (Table 30).

##### Northern Pike

Igiugig residents take northern pike in moderate numbers. The total estimated harvest in 1973/74 was 427, 53.3 per household. The harvest rate was similar in 1983, when households took an average of 31.0 pike, for a total estimated harvest of 341 fish. Similarly, the estimated harvest was 293 pike in 1992/93 (24.4 per household) (Table 30). In Igiugig, pike were split and dried. Those dried in the spring were frequently saved to be used while village residents were commercial fishing in Bristol Bay, a pattern similar to that reported for Manokotak and the Nushagak River villages.

## Rainbow Trout

Estimated harvest quantities of rainbow trout by Igiugig residents have varied widely from study year to study year. The largest estimated harvest was in 1973/74, when 1,115 were taken, an average of 139.3 per household. The estimated harvest was much lower in 1983, at 293 rainbow trout, a household average of 26.7 fish. In 1992/93, the community harvested an estimated total of 709 rainbow trout (59.1 per household) (Table 30). At Igiugig, some rainbow trout were dried and eaten with seal oil or bear fat.

## Smelt

Smelt are not available in the waters near Igiugig. None of the community's households harvested smelt in either 1973/74 or 1983, while 10 percent did so in 1992/93. Forty percent of Igiugig households received gifts of smelt in 1992/93, illustrating the noncommercial sharing networks which link communities in the Lake Iliamna area (Table 30)

## Whitefish

Evidence suggests that whitefish are the freshwater species taken in the greatest quantities at Igiugig. These fish are taken almost exclusively in nets (set or used as seines), and average annual household harvests were relatively large in the three years for which data are available. In 1973/74, the estimated whitefish harvest was 1,480 fish, an average of 185.0 per household. The estimated harvest in 1983 was 2,457 whitefish, 223.4 per household. Harvests dropped in 1992/93 to an estimated total of 956 whitefish, a household average of 79.7 fish (Table 30).

## NEWHALEN

### Community Background

Located on the outlet of the Newhalen River, in the 1980s and 1990s Newhalen was a separate community with its own character and identity despite its road connection with Iliamna, about seven miles away. Newhalen's population in 1990 was 160, and was an Alaska Native community (94.4 percent in 1990; Table 1) where local households are related to one another and nearby communities through kinship ties. In the 1980s, the local school for Newhalen and Iliamna was located in Newhalen as well as other community facilities and services, but there were few commercial enterprises in the community.

### Data Sources

In 1974, 11 Newhalen households were interviewed about their fish and game harvests in 1973 (Gasbarro and Utermohle 1974; Table 15). In 1984, 11 households (42.3 percent) were interviewed about 1983 harvests during a Division of Subsistence research project (Morris 1986). In 1992, a second round of division surveys interviewed 26 Newhalen households (81.3 percent) about resource harvests occurring from November 1991 through October 1992.

### Harvest Estimates

The 1974 study showed that freshwater fish provided 76.6 pounds per capita, 12.1 percent of Newhalen's resource harvest in 1973/74 (Table 15). Results from the 1983 survey indicated that freshwater fish harvest accounted for 27.1 pounds per person, 3.5 percent of Newhalen's resource harvest in that year; in 1991/92, 5.0 percent of Newhalen's total harvest was freshwater fish, at 37.2 pounds per capita (Table 14). The harvest in 1983 consisted of unknown species of trout (13.6 pounds per person), Dolly Varden (5.6 pounds), rainbow trout (2.5 pounds), whitefish (2.7 pounds) (round, humpback, and least cisco), lake trout (1.6 pounds), grayling (0.6 pounds), and burbot (0.4 pounds).

Reasons for the smaller portion of the harvest made up of freshwater fish in 1983 and 1991/92 as compared with 1973/74 are unknown. However, fieldwork conducted in February 1987 pointed to the importance of a number of variables which influence freshwater fish harvesting in the community from year to year. According to key respondents, ice had formed very late during the winter of 1986/87, and constant east winds resulted in unsafe ice conditions at some popular fishing sites. Also, the Newhalen River normally freezes much earlier than it did that winter; due to weather and unusually high water, typical ice fishing patterns did not develop. Another factor which influenced freshwater fishing effort in 1986/87 was that caribou were more available in the Newhalen area during the winter. Newhalen residents reported that due to their taking more caribou than normal, their freshwater fish harvests were lower than in most other years. Caribou abundance increased further in the early 1990s.

### Use Patterns: General

Due to its location, Newhalen residents are conveniently situated to productive freshwater fishing sites. Grayling, lake trout, Dolly Varden, rainbow trout, pike, burbot, longnose sucker, and whitefish all appear in reported harvests. The major fishing period for freshwater species is generally from October through April or May. Regulations intended to protect spawning rainbow trout are a factor which influences preferred fishing times. The Newhalen River is closed to sport (rod and reel) fishing between April 7 and June 7 (Table 11). The Newhalen Lagoon was open for subsistence fishing with nets during this closed period, however. According to local residents, September to October and January through May are the most active freshwater fishing periods. June, July, and August are devoted to harvesting and preserving salmon.

Women appeared to be the premier ice fishers in the community, with men playing a larger role in rod and reel and net fishing. For example, a particular group of women in the community were known as good fishers who spent many hours jigging for fish to feed their families. These women also gave fish to other households. Men reportedly did some ice fishing, but not as much as the women. Conversations with net fishermen suggested that much of the fish taken with this gear type was used for dog food, but no quantified data to support this impression are available.

All types of freshwater fish were used fresh in Newhalen. They were baked, fried, or boiled. They were also ground up and used in patties. Burbot livers were identified as a favored delicacy, as were boiled pike heads. Drying was a preferred way to preserve and eat pike. Grayling taken through the ice were often frozen and eaten raw.

The freshwater fish harvest not only added variety and readily available food source, it also provided a popular resource harvesting activity to Newhalen residents. Freshwater fishing through the ice afforded women an important role in providing subsistence resources for the community. Taken with nets in the spring, freshwater fish provided a reliable supply of food, sometimes in relatively large quantities, at a time when other resources could be running low.

#### Use Patterns by Species

##### Arctic Grayling

In 1973/74, Newhalen harvested an estimated total of 587 grayling (36.8 per household). The estimated harvest in 1983 was 106 grayling (4.1 per household), and the community harvested a total of 593 grayling in 1991/92 (18.5 per household) (Table 32). Most grayling are taken with hook and line or rod and reel (Table 31), in areas where fishing also occurs for Dolly Varden and rainbow trout.

##### Burbot

No harvest data for burbot are available for 1973/74. The estimated harvest was 12 burbot in 1983, and none in 1991/92 (Table 32).

##### Dolly Varden

Newhalen households have reported relatively large Dolly Varden harvests. For 1973/74, the estimated take was 1,130 Dolly Varden (70.9 per household). The 1983 estimated harvest was 496 Dolly Varden (19.1 per household) (see "trout, species unknown," below). In 1991/92, an estimated total of 1,318 Dolly Varden were harvested (Table 32). Dolly Varden were harvested with hook and line through the ice at Pete Andrew's Creek, about a half hour away by three-wheeler. They were also taken by jigging

Table 32. Harvests and Uses of Freshwater Fish, Newhalen, 1973/74, 1983, and 1991/92

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Attempt		Harvest		Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel
	Use													
<u>Study Year 1973/74</u>														
Arctic grayling							587	411	368	25.8	8.1	5.7		
Dolly Varden			54.5%				1,130	1,583	70.9	99.3	15.6	21.8		
Lake trout			45.5%				268	724	16.8	45.4	3.7	10.0		
Northern pike			45.5%				232	649	14.5	40.7	3.2	9.0		
Rainbow trout			27.3%				1,536	2,151	96.4	134.9	21.2	29.7		
Smelt			0.0%				0	0	0.0	0.0	0.0	0.0		
Whitefish			27.3%				30	30	1.9	1.9	0.4	0.4		
Freshwater Fish			63.6%					5,548		348.0		76.6		
<u>Study Year 1983</u>														
Arctic grayling		18.2%	18.2%		0.0%		106	74	4.1	2.9	0.8	0.6	100.0%	0.0%
Burbot		9.1%	9.1%		0.0%		12	12	0.4	0.4	0.1	0.1	100.0%	0.0%
Dolly Varden		27.3%	27.3%		0.0%		496	695	19.1	26.7	4.0	5.6	100.0%	0.0%
Lake trout		36.4%	36.4%		0.0%		76	204	2.9	7.8	0.6	1.6	100.0%	0.0%
Longnose sucker		0.0%	0.0%		0.0%		0	0	0.0	0.0	0.0	0.0	100.0%	0.0%
Northern pike		9.1%	9.1%		0.0%		17	46	0.7	1.8	0.1	0.4	100.0%	0.0%
Rainbow trout		36.4%	36.4%		0.0%		227	318	8.7	12.2	1.8	2.5	100.0%	0.0%
Unknown "trout"		9.1%	9.1%		0.0%		945	1,702	36.3	65.4	7.5	13.6	100.0%	0.0%
Smelt		0.0%	0.0%		0.0%		0	0	0.0	0.0	0.0	0.0	100.0%	0.0%
Whitefish		36.4%	27.3%		9.1%		343	343	13.2	13.2	2.7	2.7	100.0%	0.0%
Freshwater Fish		54.5%	45.5%		9.1%			3,394		130.5		27.1		
<u>Study Year 1991/92</u>														
Arctic grayling	76.9%	73.1%	69.2%		23.1%		593	415	18.5	13.0	3.8	2.6	97.5%	2.5%
Burbot	3.8%	7.7%	0.0%		3.8%		0	0	0.0	0.0	0.0	0.0		
Dolly Varden	96.2%	96.2%	92.3%		30.8%		1,318	1,845	41.2	57.7	8.4	11.7	94.8%	5.2%
Lake trout	53.8%	50.0%	46.2%		19.2%		111	155	3.5	4.8	0.7	1.0	58.6%	41.4%
Longnose sucker	11.5%	11.5%	11.5%		3.8%		151	227	4.7	7.1	1.0	1.4	100.0%	0.0%
Northern pike	46.2%	46.2%	46.2%		3.8%		345	965	10.8	30.2	2.2	6.1	94.8%	5.2%
Rainbow trout	88.5%	88.5%	84.6%		30.8%		1,163	1,628	36.4	50.9	7.4	10.3	83.9%	16.1%
Unknown "trout"	7.7%	7.7%	7.7%		3.8%		148	207	4.6	6.5	0.9	1.3	100.0%	0.0%
Smelt	11.5%	0.0%	0.0%		11.5%		0	0	0.0	0.0	0.0	0.0		
Whitefish	65.4%	46.2%	42.3%		53.8%		354	423	11.1	13.2	2.2	2.7	87.9%	12.1%
Freshwater Fish	100.0%	96.2%	92.3%		73.1%			5,865		183.3		37.2		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

through ice on the Newhalen River nearer the community. Dolly Varden were harvested with rod and reel and gill nets in Newhalen Lagoon or on the beach near the community when open water was present (Table 31).

#### Lake Trout

The estimated harvest of lake trout by Newhalen residents in 1973/74 was 268 fish (16.8 per household). In 1983, an estimated 76 lake trout were taken (2.9 per household) (see "trout, species unknown," below). The estimated lake trout harvest for 1991/92 was 111 (Table 32).

#### Northern Pike

Newhalen households harvested an estimated total of 232 pike in 1973/74, a catch of 14.5 fish per household. In 1983, the estimated harvest was very low, at 17 pike. This increased to 345 pike in 1991/92 (Table 32). Newhalen fishermen generally take pike with gill nets set in Newhalen Lagoon and in nearby lakes such as Pike Lake, East Wind Lake, and Schoolhouse Lake with hook and line. Hook and line fishing through the ice is particularly popular during spring months of March through May.

#### Rainbow Trout

Reported rainbow trout harvests by Newhalen households were particularly high in 1973/74, when an estimated total of 1,536 were taken. This is a harvest of 96.4 rainbow trout per household. Estimated harvests were much lower in 1983, when 227 rainbow trout were taken, 8.7 per household (Table 32) (see also "trout, species unknown," below). Possible reasons for this decline include regulatory changes which prohibited subsistence harvests of rainbow trout after 1980 (this regulation was repealed beginning in 1993) and closed the mouths of certain streams to net fishing in the spring. Another possibility is reluctance to report incidental takes of this species after this regulatory change. In 1991/92, the estimated harvest increased to 1,163 rainbow trout (Table 32). Rainbow trout were harvested in nets, with hook and line through the ice, and with rod and reel (Table 31).

#### Trout, Species Unknown

In 1983, an estimated 945 "trout" of unknown species were harvested by households in Newhalen, an average of 36.4 fish. This harvest of "unknown" trout species may account in part for the lower harvest totals for Dolly Varden, lake trout, and rainbow trout reported for 1983 as compared with 1973. The

harvest estimated of "unknown trout" dropped to 148 in 1991/92, with an increase in estimated harvests of rainbow trout and Dolly Varden (Table 32).

### Whitefish

Newhalen households have reported relatively small harvests of whitefish. In 1973/74, the estimated harvest was only 30 whitefish, about two per household. The estimated harvest was larger in 1983 at 343 whitefish, 13.2 per household and in 1991/92, at 354 whitefish (11.1 per household) (Table 32). As noted above, Newhalen residents trade spawned-out salmon to people in Igiugig for whitefish.

### ILIAMNA

#### Community Background

In the 1980s and 1990s, the community of Iliamna was made up of persons from a variety of cultural backgrounds, including Athabaskans from Nondalton and Pedro Bay, Yup'ik Eskimos, Aleuts, and non-Natives (Euro-Americans). Iliamna served as the departure point for other areas around Lake Iliamna and Lake Clark and was the center for services provided in the local region, including air taxis, store, electric cooperative, and scheduled air transportation to Anchorage. It had overlapping kinship, educational, and economic ties with Newhalen located seven miles away by road. Iliamna was also widely known in the state, and beyond, as a premier area for sport fishing opportunities and several lodges are located there. The population of Iliamna in 1990 was 94; 66.0 percent of the population was Alaska Native (Table 1).

#### Data Sources

In 1974, nine Iliamna households were interviewed about their fish and game harvests for a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). Fish and game use in Iliamna in 1983 was part of a study of resource uses in the Iliamna Lake region (Morris 1986) when 20 households (55.6 percent) were interviewed. One component of the study was freshwater fishing activities and harvest levels. Further research, in the form of key respondent interviews, was conducted in 1986 and 1987 to provide additional details. Finally, the division conducted its second comprehensive harvest survey in Iliamna in 1992, when 23 households were interviewed (76.7 percent) (Table 4).

#### Harvest Estimates

In 1973/74, 66.7 percent of the sampled Iliamna households harvested freshwater fish. The per capita take of these species was 20.7 pounds, 11.2 percent of all resources harvested by the sample that year (Table 15). Harvest levels were similar in 1983. The per capita harvest of freshwater fish species

was 26.1 pounds, 6.3 per cent of all resources harvested (Table 14). Harvests of freshwater fish increased in 1991/92, when Iliamna households took on average 69.0 pounds per person of these fish (8.1 percent of all resources). The species harvested in the largest quantities in 1973/74 were Dolly Varden and grayling; in 1983 "unknown trout" accounted for most of the fish; in 1991/92, the most numerous types were Dolly Varden and rainbow trout (Table 33).

#### Use Patterns: General

In the 1970s, 1980s, and 1990s, Iliamna residents harvested Dolly Varden, rainbow trout, pike, grayling, whitefish, lake trout, burbot, and longnose suckers. During interviews in 1986 and 1987, residents said that fish were taken in open water and through the ice and could therefore be harvested throughout the year, depending on gear type used. A variety of transportation forms were used to reach productive fishing locations, including three-wheelers, trucks, skiffs, or traveling on foot.

In the 1980s in Iliamna, ice conditions were generally the best for ice fishing during the winter months of January through March. At this time of year, Dolly Varden and rainbow trout were taken with hook and line from East Bay and Roadhouse Bay. Fishing was particularly productive when the ice was first forming and a safe shelf was formed on the shoreline. Community residents reported that fish feed on small snails under fresh ice and as the ice thickened and became more widespread, fishing was less successful. When the ice cover was extensive, or the opposite condition of no ice existed, fishermen went to the Newhalen River where fish could generally be found. The Newhalen River was also a popular fishing site during open water, particularly in spring and fall months when rod and reel or handlines were used. In some winters, such as 1986/87, ice conditions were seldom good for using the lake because constant east winds kept the ice melted in the shallow bays. "Trout," which included Dolly Varden, lake trout, and rainbow trout were also fished from Lower Talarik Creek by jigging through the ice with hook and line. Set nets were used in spring in Whistlewing Bay and Newhalen Lagoon to take Dolly Varden, grayling, suckers, whitefish, lake trout, and pike. Called "trout nets," the gear was pieces of pink salmon nets with 4 1/2" mesh. Time spent fishing for freshwater species was lowest between late June and September or October when salmon were present at Iliamna.

At Iliamna, all varieties of freshwater fish were fried, boiled, or baked when freshly caught. Rainbow trout and pike were also dried. Dried fish were eaten with seal oil. Boiled pike heads were a favorite dish for some residents.

Into the 1980s and 1990s, freshwater fish harvesting continued to be popular activity in Iliamna. While men and women of all ages talked about the enjoyment of fishing, the research found that women, particularly older women, were the most zealous about ice fishing. They fished singly or in small groups when the weather permitted. Some Iliamna women obtained rides to Newhalen and fished with friends living there. Men appeared responsible for the net fishing, which often required the use of skiff and which

Table 33. Harvests and Uses of Freshwater Fish, Iliamna, 1973/74, 1983, and 1991/92

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel	
<u>Study Year 1973/74</u>														
Arctic grayling			33.3%			202	141	11.9	8.3	3.2	2.3			
Dolly Varden			33.3%			643	901	37.9	53.0	10.3	14.5			
Lake trout			33.3%			8	20	0.4	1.2	0.1	0.3			
Northern pike			33.3%			30	85	1.8	5.0	0.5	1.4			
Rainbow trout			44.4%			64	90	3.8	5.3	1.0	1.4			
Smelt			0.0%			0	0	0.0	0.0	0.0	0.0			
Whitefish			22.2%			53	53	3.1	3.1	0.8	0.8			
Freshwater Fish			66.7%				1,290		75.9		20.7			
<u>Study Year 1983</u>														
Arctic grayling	25.0%		20.0%	5.0%		54	38	1.5	1.1	0.4	0.3	40.7%		59.3%
Burbot	0.0%		0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			
Dolly Varden	30.0%		30.0%	10.0%		94	131	2.6	3.6	0.7	0.9	55.9%		44.1%
Lake trout	5.0%		5.0%	0.0%		16	44	0.4	1.2	0.1	0.3	0.0%		100.0%
Longnose sucker	10.0%		10.0%	0.0%		144	216	4.0	6.0	1.0	1.5	100.0%		0.0%
Northern pike	30.0%		30.0%	5.0%		140	393	3.9	10.9	1.0	2.8	70.7%		29.3%
Rainbow trout	35.0%		35.0%	10.0%		139	194	3.9	5.4	1.0	1.4	37.7%		62.3%
Unknown "trout"	20.0%		20.0%	0.0%		1,386	2,495	38.5	69.3	9.9	17.8	94.8%		5.2%
Smelt	0.0%		0.0%	5.0%		0	0	0.0	0.0	0.0	0.0			
Whitefish	15.0%		15.0%	10.0%		160	160	4.4	4.4	1.1	1.1	100.0%		0.0%
Freshwater Fish	60.0%		60.0%	35.0%			3,671		102.0		26.1			
<u>Study Year 1991/92</u>														
Arctic grayling	65.2%		65.2%	21.7%	13.0%	565	395	18.8	13.2	5.8	4.0	99.5%		0.5%
Burbot	13.0%	17.4%	8.7%	4.3%	0.0%	22	44	0.7	1.5	0.2	0.4	100.0%		0.0%
Dolly Varden	73.9%	65.2%	65.2%	30.4%	39.1%	1,677	2,348	55.9	78.3	17.1	24.0	88.7%		11.3%
Lake trout	26.1%	30.4%	26.1%	4.3%	4.3%	104	146	3.5	4.9	1.1	1.5	99.0%		1.0%
Longnose sucker	13.0%	13.0%	13.0%	0.0%	4.3%	863	1,295	28.8	43.2	8.8	13.2	100.0%		0.0%
Northern pike	21.7%	26.1%	21.7%	0.0%	8.7%	120	336	4.0	11.2	1.2	3.4	100.0%		0.0%
Rainbow trout	73.9%	65.2%	65.2%	34.8%	26.1%	1,312	1,837	43.7	61.2	13.4	18.8	86.8%		13.2%
Unknown "trout"	4.3%	4.3%	4.3%	0.0%	0.0%	130	183	4.3	6.1	1.3	1.9	100.0%		0.0%
Smelt	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0			
Whitefish	43.5%	26.1%	26.1%	34.8%	13.0%	166	166	5.5	5.5	1.7	1.7	95.8%		4.2%
Freshwater Fish	87.0%	73.9%	73.9%	65.2%	43.5%		6,750		225.0		69.0			

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

resulted in large quantities of fish taken at one time. Men also reported more interest in rod and reel fishing.

Among Lake Iliamna communities, Iliamna alone had a commercial/recreational fishing base. This was reflected in the information given about fishing practices, as more "catch and release" was reported than in other communities. It was basically non-Native residents who had moved into Iliamna from other locations who expressed interest in "catch and release" fishing.

### Use Patterns by Species

#### Arctic Grayling

In 1973/74, the estimated harvest of grayling by Iliamna residents was 202 fish, 11.9 per household. Estimated harvests were low at 54 grayling in 1983, but increased notably in 1991/92 to 565 fish (Table 33).

#### Burbot

No burbot appeared in the reported harvests of sampled Iliamna households in 1983. (No data were collected for 1973/74.) Key respondents in 1987 stated that burbot were occasionally taken with set hooks at Talarik Creek when the ice went out. In 1991/92, an estimated total of 22 burbot were harvested by Iliamna households (Table 33).

#### "Trout": Dolly Varden, Lake Trout, and Rainbow Trout

Three species are freshwater fish, Dolly Varden, lake trout, and rainbow trout, are discussed together here because of the large number of "trout" of unknown type reported in the 1983 harvest. In 1973/74, estimated harvests suggested that Dolly Varden are taken in greater numbers than any other freshwater species at Iliamna. In 1973/74, an estimated 643 were taken by Iliamna households (37.9 fish per household). However, only 8 lake trout were harvested by these Iliamna households in 1973/74. Estimated rainbow trout harvests were also quite low in 1973/74, only 64 fish (3.8 per household) (Table 33). Iliamna residents use nets and hook and line to harvest Dolly Varden and other "trout." (Table 31).

In 1983, Iliamna households harvested an estimated 1,386 "trout" of unknown species, for a take of 38.5 per household. This total substantially exceeds the total estimated harvests specifically for Dolly Varden, lake trout, and rainbow trout. For example, in 1983 the estimated harvest was 94 Dolly Varden, or 2.6 per household. The estimated harvest total for 1983 was 16 lake trout, 0.4 per household. Also in 1983, the Iliamna estimated harvest of rainbow trout was 139, 3.9 per household. Combining the four separate harvest estimates, the average household in Iliamna harvested 45.4 "trout" in 1983. This

compares with a average household catch of Dolly Varden, lake trout, and rainbow trout in 1973 of 42.1 fish (Table 33).

In 1991/92, "unknown trout" harvests declined to 130 fish (4.3 per household). Estimated harvests of Dolly Varden (1,677 fish; 55.9 per household), lake trout (104 fish; 3.5 per household), and rainbow trout (1,312; 43.7 per household) all increased notably (Table 33).

#### Longnose Suckers

Data for this species are only available for 1983, when Iliamna households harvested 144 longnose suckers in nets, and 1991/92, when an estimated total of 863 suckers were harvested (Table 33).

#### Northern Pike

The available data suggest that the pike harvests at Iliamna are relatively low. In 1973/74, the estimated harvest was only 30 pike. For 1983, the estimated take was 140 pike, 3.9 per household. In 1991/92, an estimated 120 pike were harvested (4.0 per household) (Table 33). Pike were harvested from East Wind Lake and School House Lake with hook and line year-round. Nets were used in open water (Table 31).

#### Whitefish

Whitefish harvests at Iliamna are relatively low. In 1973/74, the estimated harvest totaled 53 fish (3.1 per household). In 1983, the estimated total was 160 whitefish (4.4 per household), while in 1991/92, 166 whitefish were harvested by Iliamna households (Table 33). Iliamna residents receive whitefish from Igiugig in exchange for spawned-out salmon.

### NONDALTON

#### Community Background

Nondalton is a primarily Dena'ina Athapaskan village located on Six Mile Lake near Lake Clark. It had a population of 178 in 1990, 89.3 percent of whom were Alaska Native (Table 1). Principal sources of cash income in the community include commercial salmon fishing, furbearer trapping, and seasonal employment in fire fighting and construction (Behnke 1982:14). (See also Ellanna and Balluta 1992 for descriptions of historic and contemporary subsistence activities at Nondalton.)

### Data Sources

Behnke (1982) summarizes harvest data from a 1974 survey of 25 households conducted by Gasbarro and Utermohle (1974), and also reports the results of Division of Subsistence resource harvest surveys pertaining to 1980 (N = 14 households; 40.0 percent) and 1981 (N = 19 households; 54.3 percent). Morris (1986) reports the results of interviews with 21 households (38.9 percent) pertaining to wildlife harvests of 1983 (Table 4).

### Harvest Estimates

The available data suggest that freshwater fish make up a notable portion of wild resource harvests in Nondalton. Harvests occur year-round, with a variety of gear suited to ice and weather conditions (Morris 1986:86; Table 31). In 1973/74, for example, 80.8 percent of the sampled households harvested at least one freshwater fish species. Per capita, 40.2 pounds were harvested in 1973/74, 5.2 percent of the total take of wild fish and game that year (Table 15). The per capita harvest of freshwater fish was 27.1 pounds in 1980, representing 2.6 percent of the total take, and in 1981 the per capita harvest of 36.0 pounds was 4.9 percent of the total. Reported freshwater fish harvest for 1983 exceeded those of the other three years for which data are available. In that year, 90.5 percent of the sample harvested freshwater fish, for a per capita take of 174.6 pounds, 14.9 percent of the total take of wild foods (Table 14, Table 34). The reason for this increase in harvests in 1983 is unknown. It may represent a sampling bias towards very active households, a normal fluctuation in resource harvests associated with increased resource availability or increased effort, or a real change in harvest patterns (Morris 1986:102).

### Use Patterns by Species

#### Arctic Grayling (*ch'dat'an*)

Arctic grayling are among the most commonly harvested freshwater fish species at Nondalton. In fact, in most years, more grayling have been harvested than any other non-salmon fish. Estimated harvests have been 1,782 in 1973/74 (61.7 per household), 1,150 in 1980 (32.9 per household), 3,249 in 1981 (92.8 per household), and 17,517 in 1983 (324.4 per household) (Table 34). Grayling are taken with hook and line through the ice or with gill nets (Morris 1986:86; Table 31).

#### Burbot (*ch'unya*)

Nondalton households harvest relatively small numbers of burbot. No data were collected for 1973/74. Estimated harvests were 35 fish (1.0 per household) in 1980, 35 fish (1.0 per household) in 1981, and 589 fish (10.9 per household) in 1983 (Table 34). Most burbot are probably caught incidentally while people fish through the ice with hook and line or in open water in gill nets (Table 31).

Table 34. Harvests and Uses of Freshwater Fish, Nondalton, 1973/74, 1980, 1981, and 1983

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
												Rod & Reel	
<u>Study Year 1973/74</u>													
Arctic grayling			61.5%			1,782	1,248	61.7	43.2	11.8	8.3		
Dolly Varden			23.1%			62	87	2.2	3.0	0.4	0.6		
Lake trout			61.5%			730	1,971	25.3	68.2	4.8	13.0		
Northern pike			30.8%			281	787	9.7	27.2	1.9	5.2		
Rainbow trout			26.9%			273	383	9.5	13.2	1.8	2.5		
Smelt			0.0%			0	0	0.0	0.0	0.0	0.0		
Whitefish			53.8%			1,607	1,607	55.6	55.6	10.6	10.6		
Freshwater Fish			80.8%				6,082		210.5		40.2		
<u>Study Year 1980</u>													
Arctic grayling			64.0%			1,150	805	32.9	23.0	6.9	4.8		
Burbot			29.0%			35	35	1.0	1.0	0.2	0.2		
Dolly Varden			50.0%			250	350	7.1	10.0	1.5	2.1		
Lake trout			50.0%			830	2,240	23.7	64.0	5.0	13.4		
Northern pike			35.0%			63	175	1.8	5.0	0.4	1.0		
Rainbow trout			43.0%			225	315	6.4	9.0	1.3	1.9		
Whitefish			50.0%			630	630	18.0	18.0	3.8	3.8		
Freshwater Fish			NA				4,550		130.0		27.1		
<u>Study Year 1981</u>													
Arctic grayling			63.0%			3,249	2,275	92.8	65.0	16.3	11.4		
Burbot			16.0%			35	35	1.0	1.0	0.2	0.2		
Dolly Varden			63.0%			726	1,016	20.7	29.0	3.6	5.1		
Lake trout			58.0%			505	1,363	14.4	38.9	2.5	6.8		
Northern pike			26.0%			175	490	5.0	14.0	0.9	2.5		
Rainbow trout			63.0%			525	735	15.0	21.0	2.6	3.7		
Whitefish			63.0%			1,260	1,260	36.0	36.0	6.3	6.3		
Freshwater Fish			NA				7,174		204.9		36.0		

[continued]

Table 34. Harvests and Uses of Freshwater Fish, Nondalton, 1973/74, 1980, 1981, and 1983 [continued]

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give		Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
													Rod & Reel	
<u>Study Year 1983</u>														
Arctic grayling		81.0%	81.0%	0.0%		17,517	12,262	324.4	227.1	62.5	43.8	100.0%	0.0%	
Burbot		52.4%	52.4%	4.8%		589	589	10.9	10.9	2.1	2.1	100.0%	0.0%	
Dolly Varden		57.1%	57.1%	0.0%		2,394	3,352	44.3	62.1	8.5	12.0	96.8%	3.2%	
Lake trout		52.4%	47.6%	4.8%		2,335	6,304	43.2	116.7	8.3	22.5	100.0%	0.0%	
Longnose sucker		28.6%	28.6%	0.0%		1,769	2,654	32.8	49.1	6.3	9.5	100.0%	0.0%	
Northern pike		52.4%	52.4%	4.8%		1,386	3,881	25.7	71.9	4.9	13.9	96.3%	3.7%	
Rainbow trout		66.7%	66.7%	0.0%		3,613	5,058	66.9	93.7	12.9	18.0	97.9%	2.1%	
Unknown "trout"		4.8%	4.8%	0.0%		257	463	4.8	8.6	0.9	1.6	100.0%	0.0%	
Smelt		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			
Whitefish		81.0%	76.2%	23.8%		14,400	14,385	266.7	266.4	51.4	51.3	100.0%	0.0%	
Freshwater Fish		90.5%	90.5%	23.8%			48,948		906.4		174.6			

<sup>1</sup> For "freshwater fish," includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

### Dolly Varden (*qak'elay*)

Estimated harvests of Dolly Varden by Nondalton residents have been quite variable. The lowest estimated harvest was in 1973/74, 62 fish (2.2 per household). In 1980, estimated harvests totaled 250 Dolly Varden (7.1 per household), while in 1981 the community took an estimated 726 Dolly Varden (20.7 per household). The largest harvest occurred in 1983, with an estimated take of 2,394 Dolly Varden (44.3 fish per household) (Table 34). Dolly Varden are harvested with hook and line, in set nets, and by seining with gill nets (Morris 1986:86; Table 31).

### Lake Trout (*zhuk'udghuzha*)

Nondalton residents take lake trout either in gill nets (set or using a seining technique) or with hook and line (Morris 1986:86; Table 31). They are one of the most frequently harvested freshwater species at Nondalton. Estimated harvests were 730 (25.3 per household) in 1973/74, 830 (23.7 per household) in 1980, 505 (14.4 per household) in 1981, and 2,335 (43.2 per household) in 1983 (Table 34).

### Longnose Sucker (*duch'ehdi*)

Nondalton residents harvest longnose suckers in nets (Table 31). Harvest data are available only for 1983, when the estimated harvest was 1,769 suckers, 32.8 per household (Table 34).

### Northern Pike (*ghelguts'i*)

Estimated harvests of pike by Nondalton households have been variable. In 1973/74, an estimated 281 were taken, an average of 9.7 per household. In comparison, the harvest of 63 pike in 1980 (1.8 per household) and 175 in 1981 (5.0 per household) were low. The estimated take increased in 1983 to 1,386 pike (25.7 per household) (Table 34). Nondalton residents harvest pike in nets and with hook and line and rod and reel (Morris 1986:86). Most were taken with hook and line in 1983 (Table 31).

### Rainbow Trout (*tun*)

Harvests of rainbow trout by Nondalton residents were relatively low in three of the four years for which data are available. A total harvest of 273 rainbow trout was estimated for 1973/74, 9.5 fish per household. The estimated take was 225 rainbow trout (6.4 per household) in 1980, and 525 fish (15 per household) in 1981. The estimated harvest of 3,613 rainbow trout (66.9 per household) was substantially higher in 1983, however (Table 34). The rainbow trout catch mostly took place with hook and line gear

through the ice (Table 31), although Nondalton residents also harvest this species incidentally in nets used primarily for other species or with rod and reel in open water (Morris 1986:86).

#### Whitefish (*telay*, *q'untuq'*, *hesten*, *ghelguts'i k'una*)

Nondalton residents have reported harvests of round whitefish, humpback whitefish, and least cisco, but humpback whitefish are the most common type in Nondalton's catches. Estimated harvests suggest that whitefish, along with grayling and lake trout, is one of the more frequently harvested freshwater species in the community. Estimated harvests totaled 1,607 whitefish (55.6 per household) in 1973/74, 630 (18.0 per household) in 1980, 1,260 (36.0 per household) in 1981, and 14,400 (266.7 per household) in 1983 (Table 34). These harvests occur in nets as well as with hook and line (Table 31).

### KOKHANOK

#### Community Background

Kokhanok is located on the southcentral shore of Iliamna Lake. It is a predominately Alaska Native community, with a population of 152 in 1990 (90.1 percent Alaska Native) (Table 1). Participation in the Bristol Bay commercial salmon fishery is a major source of cash income in Kokhanok. Other employment is limited to a few local government jobs and seasonal construction (Morris 1986).

#### Data Sources

There are three sources of data on freshwater fish and other resource uses in Kokhanok. The first is a survey of nine village households (69 percent) conducted in 1974 as part of a region-wide harvest study for in 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). The second is a resource harvest survey conducted by the Division of Subsistence for a September 1982 through August 1983 harvest year (Morris 1986). Nineteen Kokhanok households (70.4 percent) were interviewed during that research. Third, the division conducted another survey in 1993 for a 12-month study period from November 1992 through October 1993, during which 36 households (92.3 percent) were interviewed (Table 4).

#### Harvest Estimates

In 1973/74, all of the sampled Kokhanok households harvested freshwater fish, for an average household take of 355.2 pounds edible weight (57.1 pounds per capita), 4.8 percent of the village harvest total. Whitefish, Dolly Varden, and rainbow trout were the species with the largest harvests in 1973/74 (Table 15). The average household harvest of freshwater fish in Kokhanok in 1982/83 was higher than in 1973/74, 517.9 pounds (97.4 pounds per capita), for 14.0 percent of the total take of fish and game. Most

of the freshwater fish harvest in 1983 was Dolly Varden, round whitefish, and rainbow trout. About 79 percent of the sampled households harvested freshwater fish in 1982/83 (Table 14, Table 35). In 1992/93, harvests of freshwater fish in Kokhanok averaged 456.0 pounds usable weight per household, 102.6 pounds per person, accounting for 10.1 percent of the total subsistence harvest in that year. Whitefish, "unknown trout," rainbow trout, and Dolly Varden accounted for most of the freshwater fish harvest (Table 35).

#### Use Patterns by Species

##### Arctic Grayling

Kokhanok households took an average of 9.4 grayling in 1973/74, for a total estimated harvest of 123 fish. In 1982/83, the estimated harvest of grayling was just 7 fish, while the 1992/93 harvest totaled 302 grayling (Table 35). Grayling are mostly caught by jigging through the ice (Table 31).

##### Dolly Varden

Estimated Dolly Varden harvests in Kokhanok in 1973/74 totaled 903 fish, second most numerous after whitefish. The average household take was 69.2 Dolly Varden. In 1982/83, the estimated community total was 3,868 Dolly Varden, 143.3 fish per household. Again, Dolly Varden was the second most numerous of the freshwater species. All of these were taken with hook and line (Table 31). In 1992/93, the estimated Dolly Varden harvest was 1,577. Also, 1,961 "unknown trout," which were probably Dolly Varden, lake trout, and rainbow trout, were also harvested (Table 35).

##### Lake Trout

The total estimated harvest of lake trout by Kokhanok households was 170 in 1973/74, an average of 13.0 fish per household. The estimated harvest of lake trout was just 17 in 1982/83 and 28 in 1992/93, however (Table 35). Some lake trout may have been included in the "unknown trout" harvest in 1992/93.

##### Northern Pike

With a total estimated harvest of 120 fish and a household average of 9.2, pike was freshwater fish with the lowest reported harvest at Kokhanok in 1973/74. Estimated harvests were larger in 1982/83, with a household average of 23.1 fish and a total take of 625 pike. All of this harvest occurred with hook and line gear (Table 31). In 1992/93, Kokhanok households harvested an estimated 217 pike (Table 35).

Table 35. Harvests and Uses of Freshwater Fish, Kokhanok, 1973/74, 1982/83, and 1992/93

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Pounds	Numbers	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence <sup>3</sup> Methods <sup>3</sup> Rod & Reel	
<b>Study Year 1973/74</b>															
Arctic grayling			55.6%			86	123	9.4	6.6	1.5	1.1				
Dolly Varden			100.0%			1,264	903	69.2	96.9	11.1	15.6				
Lake trout			55.6%			458	170	13.0	35.1	2.1	5.6				
Northern pike			55.6%			337	120	9.2	25.8	1.5	4.2				
Rainbow trout			55.6%			893	638	48.9	68.4	7.9	11.0				
Smelt			0.0%			0	0	0.0	0.0	0.0	0.0				
Whitefish			33.3%			1,596	1,596	122.3	122.3	19.7	19.7				
Freshwater Fish			100.0%			4,633			355.2		57.1				
<b>Study Year 1982/83</b>															
Arctic grayling			5.3%	0.0%		5	7	0.3	0.2	0.0	0.0			100.0%	0.0%
Burbot			5.3%	0.0%		1	1	0.1	0.1	0.0	0.0			100.0%	0.0%
Dolly Varden			68.4%	26.3%		5,415	3,868	143.3	200.6	26.9	37.7			100.0%	0.0%
Lake trout			5.3%	0.0%		46	17	0.6	1.7	0.1	0.3			100.0%	0.0%
Longnose sucker			0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			100.0%	0.0%
Northern pike			47.4%	5.3%		1,751	625	23.1	64.8	4.4	12.2			100.0%	0.0%
Rainbow trout			47.4%	15.8%		2,153	1,538	57.0	79.7	10.7	15.0			100.0%	0.0%
Smelt			0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			100.0%	0.0%
Whitefish			57.9%	26.3%		4,611	4,611	170.9	170.8	32.1	32.1			100.0%	0.0%
Freshwater Fish			78.9%	42.1%		13,982			517.9		97.4				
<b>Study Year 1992/93</b>															
Arctic grayling	41.7%		36.1%	13.9%		212	302	7.7	5.4	1.7	1.2			24.8%	75.2%
Blackfish	0.0%		0.0%	0.0%		0	0	0.0	0.0	0.0	0.0				
Burbot	2.8%		0.0%	2.8%		0	0	0.0	0.0	0.0	0.0				
Dolly Varden	52.8%		47.2%	25.0%		2,208	1,577	40.4	56.6	9.1	12.7			57.9%	42.1%
Lake trout	22.2%		16.7%	11.1%		39	28	0.7	1.0	0.2	0.2			82.1%	17.9%
Longnose sucker	2.8%		2.8%	0.0%		10	7	0.2	0.3	0.0	0.1			100.0%	0.0%
Northern pike	41.7%		33.3%	22.2%		607	217	5.6	15.6	1.3	3.5			72.8%	27.2%
Smelt	25.0%		13.9%	11.1%		1,474	246	6.3	37.8	1.4	8.5			100.0%	0.0%
Rainbow trout	61.1%		50.0%	44.4%		2,712	1,937	49.7	69.5	11.2	15.6			57.8%	42.2%
Unknown "trout"	30.6%		30.6%	13.9%		2,745	1,961	50.3	70.4	11.3	15.8			73.9%	26.1%
Whitefish	66.7%		41.7%	52.8%		7,778	7,280	186.7	199.4	42.0	44.9			100.0%	0.0%
Freshwater Fish	91.7%		86.1%	72.2%		17,785			456.0		102.6				

<sup>1</sup> For "freshwater fish," includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

<sup>3</sup> Includes incidental harvest of 1 Dolly Varden from commercial salmon fishing nets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

## Rainbow Trout

For 1973/74, Kokhanok households harvested an estimated 638 rainbow trout, 48.9 per household. The households in 1982/83 harvested rainbows at about the same rate, 57.0 per household, for an estimated take of 1,538 rainbow trout. Hook and line was the only harvest method for rainbow trout reported by the 1983 sample (Table 31). In 1992/93, the estimated rainbow trout harvest was 1,937 fish, harvested with subsistence methods and with rod and reel in open water. Some rainbow trout were likely included in the estimated harvest of 1,961 "unknown trout" as well (Table 35).

## Whitefish

In 1973/74, Kokhanok households harvested 1,596 whitefish, an average of 122.3 fish per household, more than any other freshwater species. Estimated harvests in 1982/83 totaled 4,611 whitefish (170.8 per household), again more than any other freshwater fish. All of the 1982/83 whitefish harvest was taken in nets (Table 31). Again in 1992/93, white topped the freshwater fish harvest at Kokhanok, with an estimated total of 7,280, all taken with subsistence methods (Table 35).

## Other Freshwater Fish

A few Kokhanok households used and/or harvested small numbers of burbot in 1982/83 and 1992/93, and a few longnose suckers in 1992/93. In 1992/93, several Kokhanok households harvested smelt, which are not available near the community. Due to sharing, 25.0 percent of Kokhanok household used smelt in 1992/93 (Table 35).

## PEDRO BAY

### Community Background

Pedro Bay is a Dena'ina Athapaskan community on the northeast shore of Iliamna Lake. Its population in 1990 was 42 (90.5 percent Alaska Native) (Table 1). A few Pedro Bay residents participate in the Bristol Bay commercial salmon fishery. Employment opportunities in the village are very scarce (Morris 1986).

### Data Sources

In 1974, eight Pedro Bay households were interviewed about their 1973/74 harvests of fish and game (Gasbarro and Utermohle 1974; Table 15). The Division of Subsistence collected harvest information for 1982 from a sample of 17 Pedro Bay households (81.0 percent) (Morris 1986).

### Harvest Estimates

In 1973/74, 87.5 percent of the sampled Pedro Bay households harvested at least one species of freshwater fish, for an average take of 259.9 pounds per household (65.0 pounds per capita), 10.2 percent of the total village take of wild fish and game resources (Table 15). Freshwater fish harvests were similarly high in 1982, with the average sampled household harvesting 202.2 pounds of these species (68.7 per capita) for 7.9 percent of the village's total fish and game take. In 1982, 82.4 percent of the sample harvested at least one species of non-salmon freshwater fish (Table 14, Table 36).

### Use Patterns by Species

#### Arctic Grayling

As with pike (see below), harvests of grayling at Pedro Bay are evidently very low in comparison with most other Bristol Bay communities (but similar to Kokhanok). None were harvested by the 1973/74 sample, while in 1982, the total estimated take of grayling was 25 fish (Table 36).

#### Dolly Varden

In 1973/74, Dolly Varden was the most numerous species in Pedro Bay's freshwater fish catch. Harvests totaled 655 Dolly Varden in that year, 65.5 per household. In 1982, households took 941 Dolly Varden, for a household average of 44.8 fish, second only to lake trout (Table 36). Hook and line probably accounted for most of this harvest.

#### Lake Trout

Lake trout ranked second to Dolly Varden in harvest quantities in 1973/74 and first in 1982. In 1973/74, the village harvested an estimated 594 lake trout, 59.4 per household. In 1982, the harvest total was 966 fish, 46.0 per household. Lake trout are primarily taken with hook and line gear (Table 36).

#### Northern Pike

Estimated harvests of pike by Pedro Bay households are very low. Only 3 pike were harvested in 1973/74 sample, and 19, all with hook and line, in 1982 (Table 36).

Table 36. Harvests and Uses of Freshwater Fish, Pedro Bay, 1973/74 and 1982

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel
<i>Study Year 1973/74</i>													
Arctic grayling			0.0%			0	0	0.0	0.0	0.0	0.0		
Dolly Varden			75.0%			655	917	65.5	91.7	16.4	22.9		
Lake trout			75.0%			594	1,603	59.4	160.3	14.8	40.1		
Northern pike			12.5%			3	7	0.3	0.7	0.1	0.2		
Rainbow trout			37.5%			51	72	5.1	7.2	1.3	1.8		
Smelt			0.0%			0	0	0.0	0.0	0.0	0.0		
Whitefish			0.0%			0	0	0.0	0.0	0.0	0.0		
Freshwater Fish			87.5%				2,599		259.9		65.0		
<i>Study Year 1982</i>													
Arctic grayling		5.9%	5.9%	0.0%		25	17	1.2	0.8	0.4	0.3	0.0%	100.0%
Burbot		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Dolly Varden		64.7%	64.7%	11.8%		941	1,318	44.8	62.8	15.2	21.3	80.0%	20.0%
Lake trout		64.7%	64.7%	17.6%		966	2,608	46.0	124.2	15.6	42.2	79.3%	20.7%
Longnose sucker		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Northern pike		17.6%	17.6%	0.0%		19	52	0.9	2.5	0.3	0.8	0.0%	100.0%
Rainbow trout		52.9%	47.1%	5.9%		179	251	8.5	11.9	2.9	4.1	62.0%	38.0%
Smelt		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Whitefish		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Freshwater Fish		82.4%	82.4%	17.6%			4,246		202.2		68.7		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

## Rainbow Trout

Pedro Bay residents take rainbow trout with hook and line gear or, rarely, in nets set for other fish (Table 31). In 1973/74, households caught 51 rainbow trout, 5.1 per household. In 1982, the average household catch was 8.5 rainbow trout, for a community total of 179 fish (Table 36).

## Whitefish, Burbot, and Longnose Suckers

No harvests of these species were reported by Pedro Bay households for either 1973/74 or 1982.

## PORT ALSWORTH

### Community Background

Port Alsworth is on the eastern shore of Lake Clark on Tanalian Point. It is primarily a non-Alaska Native community, with a population of 55 in 1990 (1.8 percent Alaska Native) (Table 1). In 1983, there was also a dispersed year-round population of about 26 people in 10 households living along Lake Clark. Many of these families ran sport fishing lodges in the summer (Morris 1986).

### Data Sources

The only source of information on uses of freshwater fish by households living at Port Alsworth and Lake Clark is a Division of Subsistence survey of nine households (81 percent) in Port Alsworth and four households (40 percent) along the rest of Lake Clark, pertaining to 1983 (Morris 1986).

### Harvest Estimates

Households in the Port Alsworth - Lake Clark area had a per capita harvest of 11.6 pounds of freshwater fish in 1983. This accounted for 3.2 percent of the total wild resource take by these households in the study year. About 61.5 percent of the sample harvested at least one freshwater fish species (Table 14, Table 37).

### Use Patterns by Species

#### Arctic Grayling

Households at Port Alsworth/Lake Clark took 276 grayling (13.1 per household) in 1983, more than any other non-salmon fish (Table 37).

Table 37. Harvests and Uses of Freshwater Fish, Port Alsworth, 1983

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give		Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	Rod & Reel
<i>Study Year 1983</i>														
Arctic grayling		38.5%	38.5%	0.0%		276	193	13.1	9.2	3.6	2.5	85.9%	14.1%	
Burbot		30.8%	30.8%	0.0%		71	71	3.4	3.4	0.9	0.9	100.0%	0.0%	
Dolly Varden		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			
Lake trout		53.8%	46.2%	7.7%		162	436	7.7	20.8	2.1	5.7	93.8%	6.2%	
Longnose sucker		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			
Northern pike		7.7%	7.7%	0.0%		19	54	0.9	2.6	0.3	0.7	100.0%	0.0%	
Rainbow trout		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			
Smelt		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0			
Whitefish		23.1%	23.1%	0.0%		126	126	6.0	6.0	1.7	1.7	100.0%	0.0%	
Freshwater Fish		61.5%	61.5%	7.7%		880		41.9			11.6			

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: Scott et al. 1995

## Burbot

Port Alsworth/Lake Clark households harvested 71 burbot (3.4 per household) burbot during the 1983 study year, all with hook and line (Table 31, Table 37).

## Lake Trout

With a total harvest of 162 fish (7.7 per household), lake trout were second to grayling as the most numerous species taken by Port Alsworth/Lake Clark households in 1983. Most of this harvest occurred with hook and line (Table 37).

## Northern Pike

In 1983, Port Alsworth/Lake Clark households harvested 19 pike, all taken with nets (Table 37).

## Whitefish

In 1983, Port Alsworth/Lake Clark harvested humpback whitefish and round whitefish. In total, an estimated 126 whitefish were harvested, mostly with hook and line. The average household harvest was 6.0 whitefish (Table 37).

## Rainbow Trout, Dolly Varden, Longnose Sucker

Sampled households in Port Alsworth and around Lake Clark did not report any harvests in 1983 of rainbow trout, Dolly Varden, or suckers.

## BRISTOL BAY BOROUGH: NAKNEK, SOUTH NAKNEK, AND KING SALMON

### Community Background

The Bristol Bay Borough consists of three communities, Naknek and King Salmon on the north side of the Naknek River, and South Naknek near the mouth of the Naknek River on the south shore. In 1990, the Borough had a population of 1,410. Of these, 575 lived in Naknek, 136 lived in South Naknek, 696 lived in King Salmon,<sup>6</sup> and 3 lived outside of these three named communities. In 1990, 41.0 percent of

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<sup>6</sup> Of King Salmon's population in 1990, 267 lived in group quarters associated with the US Air Force base. This base has subsequently closed.

Naknek's population was Alaska Native, as were 79.4 percent of South Naknek's residents, and 15.5 percent of those living in King Salmon (Table 1).

The Bristol Bay Borough serves as a regional service and supply center for the eastern portion of the Bristol Bay region, including many Alaska Peninsula communities as well as those of Iliamna Lake. Several federal, state, and local government agencies operate offices in the Borough. However, both historically and into the 1980s and 1990s, commercial salmon fishing and processing comprised the major component of the community's cash economy. In summer, the population of the Borough swells with seasonal residents who participate in either set netting or drifting for salmon, or who work for one of the several salmon processors in the borough. Sport fishing and big game guiding are growing industries in the borough also. Additionally, there was a U.S. Air Force base at King Salmon during the study years, which has since closed. It is important to note, however, that South Naknek, across the Naknek River from the larger population and commercial centers of the Borough, is more isolated than either King Salmon or Naknek and retains more of the characteristics of other small Bristol Bay communities, such as a predominantly Alaska Native population and a seasonal pattern of employment (Morris 1985).

#### Data Sources

There are two years of data available on freshwater fish harvests by Naknek and King Salmon residents, and three years of data for South Naknek. In 1974, the Borough's communities were included in a region-wide survey of wild resource harvests pertaining to a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). The sample included 56 Naknek households (92 percent), 17 South Naknek households (68 percent), and 15 King Salmon households (32 percent). In 1984, the Division of Subsistence interviewed 116 randomly selected Bristol Bay Borough households (39.4 percent) about their fish and game harvests in 1983 (Morris 1985). In 1993, 35 South Naknek households (83.3 percent) were interviewed about resource harvests and uses that took place in a 12-month study period from November 1992 through October 1993 (Table 4).

#### Harvest Estimates

In 1973/74, 71.4 percent of Naknek households harvested at least one species of freshwater fish. This harvest, at 14.9 pounds per person, accounted for 8.2 percent of the total wild resource take that year in Naknek. In South Naknek, 47.1 percent of the households took freshwater fish in 1973/74, for 8.3 pounds per person, 3.4 percent of the total resource take. Participation was highest in King Salmon, where in 1973/74, 93.3 percent of the households harvested freshwater fish, for 31.8 pounds per person and 11.5 percent of all wild fish and game (Table 15).

In 1983, 75.0 percent of Naknek households harvested freshwater species, for 18.6 pounds per person and 9.9 percent of the wild resource harvest. At South Naknek, these resources made up 6.4 percent of the total resource harvest, with 90.5 percent of the households taking at least one type of

freshwater fish for a harvest of 17.0 pounds per capita. As in 1973/74, in 1983 King Salmon households had a high level of involvement in freshwater fish harvesting, 76.7 percent of the sample, accounting for 7.2 percent of the total resource harvest and a harvest of 15.9 pounds per person (Table 14). With the exception of smelt, almost all the freshwater fish harvest reported by sampled Borough households in 1983 occurred with rod and reel gear under sport fishing regulations (Morris 1985:109).

In 1992/93, 74.3 percent of South Naknek households harvested freshwater fish. The per capita harvest was 15.9 pounds, accounting for 5.3 percent of all wild resources harvested in the study year (Table 14).

### Use Patterns by Species

#### Arctic Grayling

Grayling, along with rainbow trout, is the most common resident freshwater fish species harvested by residents of the Bristol Bay Borough communities of Naknek and King Salmon. In 1973/74, estimated harvests of grayling were 249 fish in Naknek, 271 in South Naknek, and 1,013 in King Salmon. In 1983, the estimated harvests of grayling were 648 in Naknek, 63 in South Naknek, and 687 in King Salmon. For 1992/93, South Naknek residents harvested 24 grayling (Table 38, Table 39, Table 40). In 1993, 35.3 percent of the total Borough households harvested grayling in open water with rod and reel, and 0.9 percent of the households grayling by jigging through the ice (Morris 1985:109).

#### Dolly Varden

In 1973/74, estimated Dolly Varden harvests were 190 by Naknek residents, 74 by South Naknek residents, and 588 by King Salmon residents. In 1983, estimated harvests of Dolly Varden were 357 in Naknek, 105 in South Naknek, and 443 in King Salmon. South Naknek residents harvested 228 Dolly Varden in 1992/93 (Table 38, Table 39, Table 40). In 1983, all the harvested Dolly Varden by Bristol Bay Borough residents were caught with rod and reel under sport fishing regulations (Morris 1985:109).

#### Lake Trout

Estimated lake trout harvests by Bristol Bay Borough residents are very low. In 1973/74, harvests were 22 lake trout at Naknek, none at South Naknek, and 6 at King Salmon. No harvest information was collected on this species for 1983. In 1992/93, South Naknek residents harvested an estimated 120 lake trout, mostly using rod and reel gear in open water (Table 38, Table 39, Table 40).

Table 38. Harvests and Uses of Freshwater Fish, Naknek, 1973/74 and 1983

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
												Rod & Reel	
<i>Study Year 1973/74</i>													
Arctic grayling			33.9%			249	174	4.1	2.9	1.1	0.8		
Dolly Varden			25.0%			190	266	3.1	4.4	0.8	1.2		
Lake trout			1.8%			22	59	0.4	1.0	0.1	0.3		
Northern pike			12.5%			54	152	0.9	2.5	0.2	0.7		
Rainbow trout			44.6%			402	563	6.6	9.3	1.7	2.4		
Smelt			55.4%			8,550	2,138	140.5	35.1	37.1	9.3		
Whitefish			12.5%			92	92	1.5	1.5	0.4	0.4		
Freshwater Fish			71.4%				3,444		56.6		14.9		
<i>Study year 1983</i>													
Arctic grayling			30.8%			648	648	5.3	5.3	1.7	1.7	0.3%	99.7%
Dolly Varden			21.2%			357	536	2.9	4.4	0.9	1.4	0.0%	100.0%
Northern pike			9.6%			140	391	1.1	3.2	0.4	1.0	50.7%	49.3%
Rainbow trout			55.8%			1,318	1,977	10.7	16.1	3.4	5.2	2.1%	97.9%
Smelt			53.8%			14,334	3,583	116.5	29.1	37.4	9.4	100.0%	0.0%
Freshwater Fish			75.0%				7,135		58.0		18.6		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 39. Harvests and Uses of Freshwater Fish, King Salmon, 1973/74 and 1983

Resource	Percentage of Households <sup>1</sup>				Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type		
	Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods	
												Rod & Reel	
<u>Study Year 1973/74</u>													
Arctic grayling			73.3%			1,013	709	21.6	15.1	5.1	3.5		
Dolly Varden			73.3%			588	823	12.5	17.5	2.9	4.1		
Lake trout			13.3%			6	17	0.1	0.4	0.0	0.1		
Northern pike			20.0%			131	368	2.8	7.8	0.7	1.8		
Rainbow trout			73.3%			894	1,251	19.1	26.7	4.5	6.3		
Smelt			80.0%			12,750	3,188	272.0	68.0	63.8	15.9		
Whitefish			0.0%			0	0	0.0	0.0	0.0	0.0		
Freshwater Fish			93.3%				6,354		135.6		31.8		
<u>Study Year 1983</u>													
Arctic grayling			46.5%			687	687	5.6	5.6	1.9	1.9	0.0%	100.0%
Dolly Varden			44.2%			553	830	4.5	6.8	1.5	2.3	0.0%	100.0%
Northern pike			14.0%			136	382	1.1	3.1	0.4	1.0	0.0%	100.0%
Smelt			34.9%			5,822	1,455	47.7	11.9	15.8	3.9	100.0%	0.0%
Rainbow trout			60.5%			1,680	2,519	13.8	20.6	4.6	6.8	0.8%	99.2%
Freshwater Fish			76.7%				5,873		48.1		15.9		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 40. Harvests and Uses of Freshwater Fish, South Naknek, 1973/74, 1983, and 1992/93

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give		Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods <sup>3</sup>	
													Rod & Reel	
<i>Study Year 1973/74</i>														
Arctic grayling			29.4%				271	189	10.8	7.6	2.1	1.5		
Dolly Varden			23.5%			74	103	2.9	4.1	0.6	0.8			
Lake trout			0.0%			0	0	0.0	0.0	0.0	0.0			
Northern pike			11.8%			24	66	0.9	2.6	0.2	0.5			
Rainbow trout			17.6%			34	47	1.4	1.9	0.3	0.4			
Smelt			41.2%			1,853	463	74.1	18.5	14.5	3.6			
Whitefish			29.4%			199	199	7.9	7.9	1.6	1.6			
Freshwater Fish			47.1%				1,067		42.7		8.3			
<i>Study Year 1983</i>														
Arctic grayling			28.6%			63	63	1.3	1.3	0.5	0.5		0.0%	100.0%
Dolly Varden			19.0%			105	157	2.1	3.2	0.8	1.1		0.0%	100.0%
Northern pike			9.5%			26	72	0.5	1.5	0.2	0.5		8.0%	92.0%
Rainbow trout			23.8%			205	308	4.2	6.3	1.5	2.2		0.0%	100.0%
Smelt			85.7%			6,984	1,746	142.5	35.6	50.7	12.7		100.0%	0.0%
Freshwater Fish			90.5%				2,346		47.9		17.0			
<i>Study Year 1992/93</i>														
Arctic grayling	11.4%	5.7%	5.7%	5.7%	2.9%	24	17	0.6	0.4	0.2	0.1		0.0%	100.0%
Blackfish	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0			
Burbot	5.7%	0.0%	0.0%	5.7%	0.0%	0	0	0.0	0.0	0.0	0.0			
Dolly Varden	34.3%	31.4%	31.4%	5.7%	11.4%	228	319	5.4	7.6	1.7	2.4		23.7%	76.3%
Lake trout	2.9%	2.9%	2.9%	2.9%	2.9%	120	168	2.9	4.0	0.9	1.3		0.0%	100.0%
Longnose sucker	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0			
Northern pike	8.6%	0.0%	0.0%	8.6%	5.7%	0	0	0.0	0.0	0.0	0.0			
Rainbow trout	25.7%	25.7%	22.9%	8.6%	11.4%	172	240	4.1	5.7	1.3	1.8		2.3%	97.7%
Smelt	62.9%	60.0%	57.1%	37.1%	31.4%	226	1,354	5.4	32.2	1.7	9		100.0%	0.0%
Unknown "trout"	11.4%	11.4%	8.6%	8.6%	2.9%	17	24	0.4	0.6	0.1	0.2		0.0%	100.0%
Whitefish	25.7%	8.6%	2.9%	22.9%	8.6%	12	12	0.3	0.3	0.1	0.1		100.0%	0.0%
Freshwater Fish	85.7%	77.1%	74.3%	68.6%	48.6%		2,134		50.8		15.9			

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons, b = five gallon buckets.

<sup>3</sup> Includes incidental harvest of 49 Dolly Varden from commercial salmon fishing nets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

### Northern Pike

Estimated harvests of northern pike by Bristol Bay Borough residents are relatively low. In 1973/74, Naknek households harvested 54 pike, South Naknek households harvested 24, and King Salmon households took 131. In 1983, harvests were 140 pike in Naknek, 26 in South Naknek, and 136 in King Salmon. South Naknek residents did not harvest any pike in 1992/93 (Table 38, Table 39, Table 40). In 1983, 9.5 percent of the Borough households harvested pike in open water with rod and reel, and 1.7 percent caught pike while jigging through the ice (Morris 1985:109).

### Rainbow Trout

Bristol Bay residents' harvests of rainbow trout exceed those of most other resident freshwater species. Almost all of this harvest is by rod and reel (Morris 1985:109). In 1973/74, estimated harvests of rainbow trout were 402 in Naknek, 34 in South Naknek, and 894 in King Salmon. For 1983, rainbow trout harvests were 1,318 in Naknek, 205 in South Naknek, and 1,680 in King Salmon. South Naknek residents harvested 172 rainbow trout in 1992/93, mostly using rod and reel in open water (Table 38, Table 39, Table 40).

### Smelt

Smelt are a major subsistence resource in all three Bristol Bay Borough communities. Most are jigged through the ice in December, January, and February in such water bodies at the Naknek River and Paul's Creek. Some dipnetting for smelt also takes place at the mouth of the Naknek River before freeze up, in September and October (Morris 1985 77-78).

In 1973/74, estimated harvests of smelt were 8,550 fish at Naknek, 1,853 fish at South Naknek, and 12,750 fish at King Salmon. Smelt harvests were again significant in 1983: 14,334 fish at Naknek, 6,984 smelt at South Naknek, and 5,822 fish at King Salmon. South Naknek households harvested an estimated 226 gallons of smelt in 1992/93 (Table 38, Table 39, Table 40).

### Whitefish

Data on harvests of whitefish by Naknek and King Salmon residents are available only for 1973/74, when sampled Naknek households harvested 92 whitefish (type unspecified) and King Salmon households none. In 1973/74, the whitefish harvest at South Naknek was 199. No whitefish harvest data were collected in the 1983 survey. In 1992/93, the estimated whitefish harvest at South Naknek totaled just 12 fish (Table 38, Table 39, Table 40).

## EGEGIK

### Community Background

Egegik is located along the southern shore of the Egegik River where it empties into Bristol Bay. The community had 122 residents in 1990, 70.5 percent of whom had Alaska Native ancestry (Table 1). Commercial salmon fishing is the major income source for most Egegik households.

### Data Sources

In 1974, 20 Egegik households were interviewed as part of a region-wide harvest survey. That data refer to harvests during a 12-month period in 1973/74 (Table 15). The Division of Subsistence conducted a comprehensive resource harvest survey in Egegik in 1985, interviewing 25 households (59.5 percent) about their 1984 resource harvests (Morris 1987).

### Harvest Estimates

In 1973/74, Egegik households harvested an average of 78.4 pounds of freshwater fish (19.1 pounds per capita), 8.7 percent of the village total fish and game harvest (Table 15). In 1984, Egegik households caught an average of 26.3 pounds of these species (11.4 per capita), 2.9 percent of the total wild resource harvest that year (Table 14).

### Use Patterns

#### Smelt

Smelt harvests are important at Egegik. The estimated community harvests were 3,033 smelt in 1973/74 and 4,014 smelt in 1984 (Table 41). Smelt are jigged through the ice from late November into March (Morris 1987:81,85).

#### Whitefish

Egegik households averaged a harvest of 6.4 whitefish in 1973/74, for a village total of 153 fish. Harvests of whitefish were much lower in 1984, with a village total of 8 fish (Table 41).

#### Northern Pike

In 1973/74, Egegik households harvested more pike, 182 fish (a household average of 7.6 fish), than any other resident freshwater species except Dolly Varden. However, in 1984, none of the households reported harvesting this species (Table 41).

Table 41. Harvests and Uses of Freshwater Fish, Egegik, 1973/74 and 1984

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type			
	Use		Attempt		Harvest		Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods <sup>3</sup>	Rod & Reel
<u>Study Year 1973/74</u>																
Arctic grayling					30.0%					119	83	5.0	3.5	1.2	0.8	
Dolly Varden					30.0%				195	273	8.1	11.3	2.0	2.8		
Lake trout					15.0%				12	33	0.5	1.4	0.1	0.3		
Northern pike					10.0%				182	509	7.6	21.1	1.8	5.2		
Rainbow trout					15.0%				57	79	2.4	3.3	0.6	0.8		
Smelt					75.0%				3,033	758	125.9	31.5	30.7	7.7		
Whitefish					20.0%				153	153	6.4	6.4	1.5	1.5		
Freshwater Fish					85.0%					1,889		78.4		19.1		
<u>Study Year 1984</u>																
Arctic grayling	40.0%	40.0%	40.0%	4.0%	4.0%	16.0%			166	283	4.0	6.7	1.7	2.9	44.6%	55.4%
Dolly Varden	24.0%	24.0%	24.0%	0.0%	0.0%	8.0%			92	129	2.2	3.1	0.9	1.3	25.0%	75.0%
Lake trout	8.0%	8.0%	8.0%	0.0%	0.0%	0.0%			13	19	0.3	0.4	0.1	0.2	23.1%	76.9%
Northern pike	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0	0	0.0	0.0	0.0	0.0		
Rainbow trout <sup>4</sup>	32.0%	32.0%	32.0%	4.0%	4.0%	16.0%			94	141	2.2	3.4	1.0	1.5	48.4%	51.6%
Smelt	52.0%	44.0%	44.0%	16.0%	16.0%	36.0%			4,014	522	95.6	12.4	41.2	5.4	100.0%	0.0%
Whitefish	4.0%	4.0%	4.0%	0.0%	0.0%	4.0%			8	8	0.2	0.2	0.1	0.1	0.0%	100.0%
Freshwater Fish	64.0%	60.0%	60.0%	24.0%	24.0%	40.0%				1,102		26.3		11.4		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

<sup>3</sup> Includes incidental harvest of 15 Dolly Varden and 3 "lake trout" from commercial salmon fishing nets.

<sup>4</sup> Includes two steelhead caught with rod and reel.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

### Arctic Grayling

The 1973/74 estimated harvest of grayling by Egegik households was 119 fish, 5.0 per household. In 1984, grayling was the most numerous resident freshwater fish species taken, with a village total of 166 fish and a household average of 4.0 (Table 41).

### Dolly Varden

Egegik households in 1973/74 took 195 Dolly Varden, 8.1 per household, more than any other resident fish. In 1984, the village total was 92 Dolly Varden, about 2.2 per household (Table 41).

### Rainbow Trout

In 1973/74, Egegik households harvested 57 rainbow trout, an average of 2.4 per household. In 1984, the community had about the same average take of rainbows, 2.2 fish per household, and the village total was 94 rainbow trout (Table 41).

### Lake Trout

Egegik households harvested very small numbers of lake trout during the two study years, 12 fish in 1973/74 and 13 in 1984 (Table 41).

## PILOT POINT

### Community Background

Pilot Point is a community of 53 residents (1990) located on the Alaska Peninsula at Ugashik Bay, about 80 miles southwest of King Salmon. In 1990, 84.9 percent of the population was Alaska Native (Table 1). Commercial salmon fishing is the principal component of the cash economy of Pilot Point (Fall and Morris 1987).

### Data Sources

Ten Pilot Point households were interviewed as part of a region-wide harvest survey conducted in 1974. The data refer to harvests in a 12-month period in 1973/74 (Table 15). The Division of Subsistence interviewed 17 Pilot Point households (94.4 percent) in May 1987 about their resource harvesting activities for a 12-month period from June 1986 through May 1987 (Fall and Morris 1987).

### Harvest Estimates

Interviews conducted with Pilot Point households in 1974 recorded the harvest of six types of freshwater fish -- smelt, pike, Dolly Varden, grayling, rainbow trout, and lake trout (Table 15, Table 42). These harvests, at 52.5 pounds per household (13.1 pounds per capita), made up 2.7 percent of the total wild resource harvest by the sampled Pilot Point households in 1973/74.

During the 12-month study period in 1986/87, Pilot Point households used seven species of freshwater fish. These were smelt (76.5 percent used), whitefish (5.9 percent used), rainbow trout (11.8 percent used), lake trout (17.6 percent used), grayling (17.6 percent used), Dolly Varden (41.2 percent used), and pike (29.4 percent used). Overall, 94.1 percent of the sample used at least one non-salmon fish species, and 94.1 percent harvested them. The mean household harvest of these seven types of fish was 39.5 pounds edible weight (11.0 pounds per capita), 2.9 percent of the total harvest during the study year (Table 14, Table 42).

### Use Patterns by Species

#### Smelt

As estimated in pounds usable weight, smelt are the most significant non-salmon fish in the subsistence harvests of Pilot Point residents. Most smelt are taken in winter months by jigging through the frozen Ugashik River or the Dog Salmon River (Fall and Morris 1987:102). Total estimated harvests were 1,364 smelt in 1973/74 and 2,045 smelt in 1986/87 (Table 42). Pilot Point households share smelt with residents of Chignik Lake and other Chignik Area communities (Fall et al. 1995:99).

#### Pike

Pilot Point households harvest pike by jigging through the ice at several local lakes. They also harvest pike with nets set in lakes during periods of open water. In 1973/74, Pilot Point households harvested 71 pike, an average of 5.5 fish per household. In 1986/87, the community took 20 pike, a little over one fish per household (Table 42).

#### Whitefish

Although one Pilot Point household used whitefish in 1986/87, no harvests of this freshwater fish was reported for either 1973/74 or 1986/87 (Table 42).

Table 42. Harvests and Uses of Freshwater Fish, Pilot Point, 1973/74 and 1986/87

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give	Pounds	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Harvest Methods <sup>3</sup>	
													Subsistence	Rod & Reel
<u>Study Year 1973/74</u>														
Arctic grayling			20.0%			38	55	4.2	2.9	1.1	0.7			
Dolly Varden			20.0%			27	19	1.5	2.1	0.4	0.5			
Lake trout			10.0%			35	13	1.0	2.7	0.3	0.7			
Northern pike			20.0%			200	71	5.5	15.4	1.4	3.9			
Rainbow trout			20.0%			40	29	2.2	3.1	0.6	0.8			
Smelt			60.0%			341	1,364	105.0	26.3	26.3	6.6			
Whitefish			0.0%			0	0	0.0	0.0	0.0	0.0			
Freshwater Fish			70.0%			681			52.5		13.1			
<u>Study Year 1986/87</u>														
Arctic grayling	17.6%	23.5%	17.6%	0.0%	0.0%	13	19	1.1	0.7	0.3	0.2	0.0%	0.0%	100.0%
Dolly Varden	41.2%	41.2%	41.2%	0.0%	0.0%	82	58	3.2	4.5	0.9	1.3	67.2%	32.8%	
Lake trout	17.6%	23.5%	17.6%	0.0%	0.0%	32	12	0.7	1.8	0.2	0.5	0.0%	0.0%	100.0%
Northern pike	29.4%	70.6%	23.5%	5.9%	5.9%	56	20	1.1	3.1	0.3	0.9	100.0%	0.0%	
Rainbow trout	11.8%	23.5%	11.8%	0.0%	0.0%	16	12	0.7	0.9	0.2	0.3	8.3%	91.7%	
Smelt	76.5%	70.6%	64.7%	23.5%	47.1%	511	2,045	113.6	28.4	31.7	7.9	100.0%	0.0%	
Whitefish	5.9%	5.9%	0.0%	5.9%	0.0%	0	0	0.0	0.0	0.0	0.0			
Freshwater Fish	94.1%	94.1%	94.1%	35.3%	58.8%	710			39.5		11.0			

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

<sup>3</sup> Includes incidental harvest of 36 Dolly Varden and 1 rainbow trout from commercial salmon fishing nets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

### Grayling

Pilot Point households catch grayling with rod and reel gear. Estimated harvests totaled 55 fish for 1973/74, 4.2 per sampled household. The harvest total for 1986/87 was 19 grayling, about one per household (Table 42).

### Dolly Varden

In 1973/74, the Dolly Varden harvest at Pilot Point was 19 fish, 1.5 per household, and in 1986/87 it was 58 fish, 3.2 per household (Table 42). In 1986/87, most of Pilot Point's Dolly Varden harvest was an incidental harvest, removed from commercial salmon nets.

### Rainbow Trout

The few rainbow trout taken by Pilot Point residents are harvested with rod and reel gear. The total take was 29 rainbow trout in 1973/74 (2.2 per household) and 12 in 1986/87 (0.7 per household) (Table 42).

### Lake Trout

Pilot Point residents take a few lake trout with rod and reel gear. The harvest total was 13 fish in 1973/74 and 12 in 1986/87 (Table 42).

## UGASHIK

### Community Background

The community of Ugashik is located on the east bank of the Ugashik River, nine miles upstream from Ugashik Bay. Although Ugashik was a principal Alaska Peninsula settlement in the 19th and early 20th centuries, its year-round population has declined greatly in the last several decades since the 1920s. There were seven year-round residents of the community in 1990, 85.7 percent of whom had Alaska Native ancestry (Table 1). In 1986/87, all Ugashik households were engaged in commercial salmon fishing, which provided most of the community's cash income (Fall and Morris 1987).

### Data Sources

Five Ugashik households were interviewed in 1974 about their resource harvests in a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15)). In May 1987, all five Ugashik households

provided harvest data pertaining to a 12-month study period from June 1986 to May 1987 during a Division of Subsistence research project (Fall and Morris 1987).

#### Harvest Estimates

In 1973/74, 100 percent of Ugashik households harvested freshwater fish. The mean household harvest was 144.9 pounds, 6.8 percent of the community total. Six species were taken: smelt (3,424 fish; 342.4 per household); pike (80 fish, 8.0 per household); Dolly Varden (110 fish, 11.0 per household); grayling (12 fish, 1.2 per household); rainbow trout (20 fish, 2.0 per household); and lake trout (66 fish, 6.6 per household) (Table 15, Table 43).

Harvests of resident freshwater fish by Ugashik households during 1986/87 were very low, with only nine Dolly Varden and eight pike harvested in total. Harvests of smelt were again significant, with 1,300 smelt harvested. The average household harvest of freshwater fish was 72.0 pounds at Ugashik in 1986/87, 4.4 percent of the community total resource harvest (Table 14, Table 43). Patterns of harvest and use of these freshwater fish in Ugashik are similar to those in Pilot Point.

## PORT HEIDEN

#### Community Background

Port Heiden, formerly called Meshik, is located near the mouth of the Meshik River along Port Heiden Bay and Bristol Bay, about 140 air miles southwest of King Salmon. The community had 119 residents in 1990, 72.3 percent of whom had Alaska Native ancestry (Table 1). Most earned income in the community derives from commercial salmon fishing and part time employment with local government entities.

#### Data Sources

In 1974, ten Port Heiden households were interviewed during a region-wide harvest survey. The data pertain to a 12-month period in 1973/74 (Gasbarro and Utermohle 1974; Table 15). The Division of Subsistence conducted a harvest survey in Port Heiden in May 1987 during which 100 percent of the community's 37 households provided data for a 12-month period from June 1986 to May 1987 (Fall and Morris 1987).

#### Harvest Estimates and Use Patterns

Reported harvests of freshwater fish in Port Heiden are low compared to Bristol Bay communities of the Nushagak and Kvichak drainages, but are similar to those of Pilot Point and Ugashik. Harvests of only three species, smelt, Dolly Varden, and lake trout were recorded for 1973/74 and 1986/87. In 1973/74, 40.0 percent of the Port Heiden households harvested freshwater fish. The total harvest was

Table 43. Harvests and Uses of Freshwater Fish, Ugashik, 1973/74 and 1986/87

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give		Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Subsistence Methods <sup>3</sup>	
													Rod & Reel	
<u>Study Year 1973/74</u>														
Arctic grayling			20.0%				12	8	1.2	0.8	0.5	0.4		
Dolly Varden			60.0%				110	154	11.0	15.4	4.6	6.4		
Lake trout			40.0%				66	178	6.6	17.8	2.8	7.4		
Northern pike			60.0%				80	224	8.0	22.4	3.3	9.3		
Rainbow trout			20.0%				20	28	2.0	2.8	0.8	1.2		
Smelt			100.0%				3,424	856	342.4	85.6	142.7	35.7		
Whitefish			0.0%				0	0	0.0	0.0	0.0	0.0		
Freshwater Fish			100.0%					1,449		144.9		60.4		
<u>Study Year 1986/87</u>														
Arctic grayling	0.0%	0.0%	0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Dolly Varden	60.0%	60.0%	60.0%	0.0%	0.0%		9	13	1.8	2.5	0.9	1.3	44.4%	55.6%
Lake trout	0.0%	0.0%	0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Northern pike	20.0%	40.0%	20.0%	0.0%	0.0%		8	22	1.6	4.5	0.8	2.2	100.0%	0.0%
Rainbow trout	0.0%	0.0%	0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Smelt	60.0%	60.0%	60.0%	0.0%	40.0%		1,300	325	260.0	65.0	130.0	32.5	100.0%	0.0%
Whitefish	0.0%	0.0%	0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0		
Freshwater Fish	100.0%	100.0%	100.0%	0.0%	0.0%			360		72.0		36.0		

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

<sup>3</sup> Includes incidental harvest of 4 Dolly Varden from commercial salmon fishing nets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

312 smelt (24.0 per household), 26 Dolly Varden (a household mean of 2.0 fish) and 26 lake trout (2.0 per household). The mean household harvest of 14.2 pounds of these fish represented 2.7 percent of the total community harvest of fish and game in 1973/74 (Table 15, Table 44)). In 1986/87, 62.2 percent of the Port Heiden households harvested either smelt (50 harvested; 1.4 per household), Dolly Varden (507 harvested, 13.7 per household) or lake trout (94 fish harvested, 2.5 per household). The mean household harvest of 26.4 pounds of these fish was 2.3 percent of the community's total harvest during the study year (Table 14, Table 44).

Port Heiden households harvest lake trout and Dolly Varden with rod and reel gear in local rivers and lakes during periods of open water. Unlike Pilot Point, Port Heiden households did not report removing Dolly Varden from commercial salmon nets in 1986. Smelt are not readily available near Port Heiden, but many households receive gifts of smelt from Pilot Point and Ugashik.

Table 44. Harvests and Uses of Freshwater Fish, Port Heiden, 1973/74 and 1986/87

Resource	Percentage of Households <sup>1</sup>						Total Estimated Harvests <sup>2</sup>		Harvests per HH		Harvests per Capita		Percentage of Harvest by Gear Type	
	Use	Attempt	Harvest	Receive	Give	Pounds	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Harvest by Gear Type	
													Subsistence Methods	Rod & Reel
<u>Study Year 1973/74</u>														
Arctic grayling			0.0%			0	0	0.0	0.0	0.0	0.0	0.0		
Dolly Varden			10.0%			26	36	2.0	2.8	0.5	0.7			
Lake trout			10.0%			26	70	2.0	5.4	0.5	1.3			
Northern pike			0.0%			0	0	0.0	0.0	0.0	0.0			
Rainbow trout			0.0%			0	0	0.0	0.0	0.0	0.0			
Smelt			20.0%			312	78	24.0	6.0	5.7	1.4			
Whitefish			0.0%			0	0	0.0	0.0	0.0	0.0			
Freshwater Fish			40.0%				184		14.2		3.4			
<u>Study Year 1986/87</u>														
Arctic grayling	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0			
Dolly Varden	75.7%	51.4%	48.6%	35.1%	29.7%	507	710	13.7	19.2	4.9	6.9		3.0%	97.0%
Lake trout	10.8%	8.1%	8.1%	2.7%	8.1%	94	254	2.5	6.9	0.9	2.5		0.0%	100.0%
Northern pike	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0			
Rainbow trout	2.7%	0.0%	0.0%	2.7%	0.0%	0	0	0.0	0.0	0.0	0.0			
Smelt	48.6%	2.7%	2.7%	45.9%	8.1%	50	13	1.4	0.3	0.5	0.1		100.0%	0.0%
Whitefish	2.7%	0.0%	0.0%	2.7%	0.0%	0	0	0.0	0.0	0.0	0.0			
Freshwater Fish	91.9%	62.2%	62.2%	70.3%	45.9%		977		26.4		9.5			

<sup>1</sup> Includes herring, herring spawn on kelp, and other marine fish. Data are unavailable (not collected) for blank cells.

<sup>2</sup> In numbers of fish unless otherwise specified. g = gallons; b = five gallon buckets.

Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995



## CHAPTER FOUR: DISCUSSION AND CONCLUSIONS

### GENERAL OBSERVATIONS AND HARVEST TRENDS

This review of information about the use of non-salmon freshwater fish by residents of the Bristol Bay region has shown that, overall, the majority of the households in most of the region's communities harvest and use these freshwater fish for subsistence use. Figure 2 summarizes the percentage of households in Bristol Bay communities that reported use of freshwater fish according to harvest surveys conducted in the 1980s and 1990s.<sup>1</sup> In all cases, more than 60 percent of households in each community used freshwater fish in the study year. In 13 of the 18 cases, 90 percent or more of the households did so.

Figure 3 depicts the percentage of households which harvested freshwater fish in each study community. In only 3 of 49 cases did less than half the households participate in harvests of freshwater species. For example, in 1973 the percentage of households in the three Nushagak River villages that harvested at least one type of freshwater fish was 76.5 percent in Ekwok, 84.6 percent in New Stuyahok, and 60.0 percent in Koliganek. In 1987/88, these percentages were 62.1 percent in Ekwok, 82.5 percent in New Stuyahok, and 81.0 percent in Koliganek. Participation levels for the Iliamna Lake area are also high. In 1973/74, the percentage of households which harvested freshwater fish was 100 percent in Igiugig, 100 percent in Kokhanok, 87.5 percent in Levelock, 87.5 percent in Pedro Bay, 45.5 percent in Newhalen, 66.7 percent in Iliamna, and 80.8 percent in Nondalton. These percentages remained high in 1983 and in study years in the late 1980s and early 1990s. The pattern has been similar in the Bristol Bay Borough. The percentage of households harvesting freshwater fish in 1973/74 was 71.4 percent in Naknek, 47.1 percent in South Naknek, and 93.3 percent in King Salmon. For the 1983 study year, this percentage was 75.0 percent in Naknek, 90.5 percent in South Naknek, and 76.7 percent in King Salmon. In the Alaska Peninsula communities of Egegik, Pilot Point, Ugashik, and Port Heiden, the majority of households harvested freshwater fish in the 1973/74 and 1986/87 study years, with the exception of Port Heiden in 1973/74 (40.0 percent) (Fig. 3).

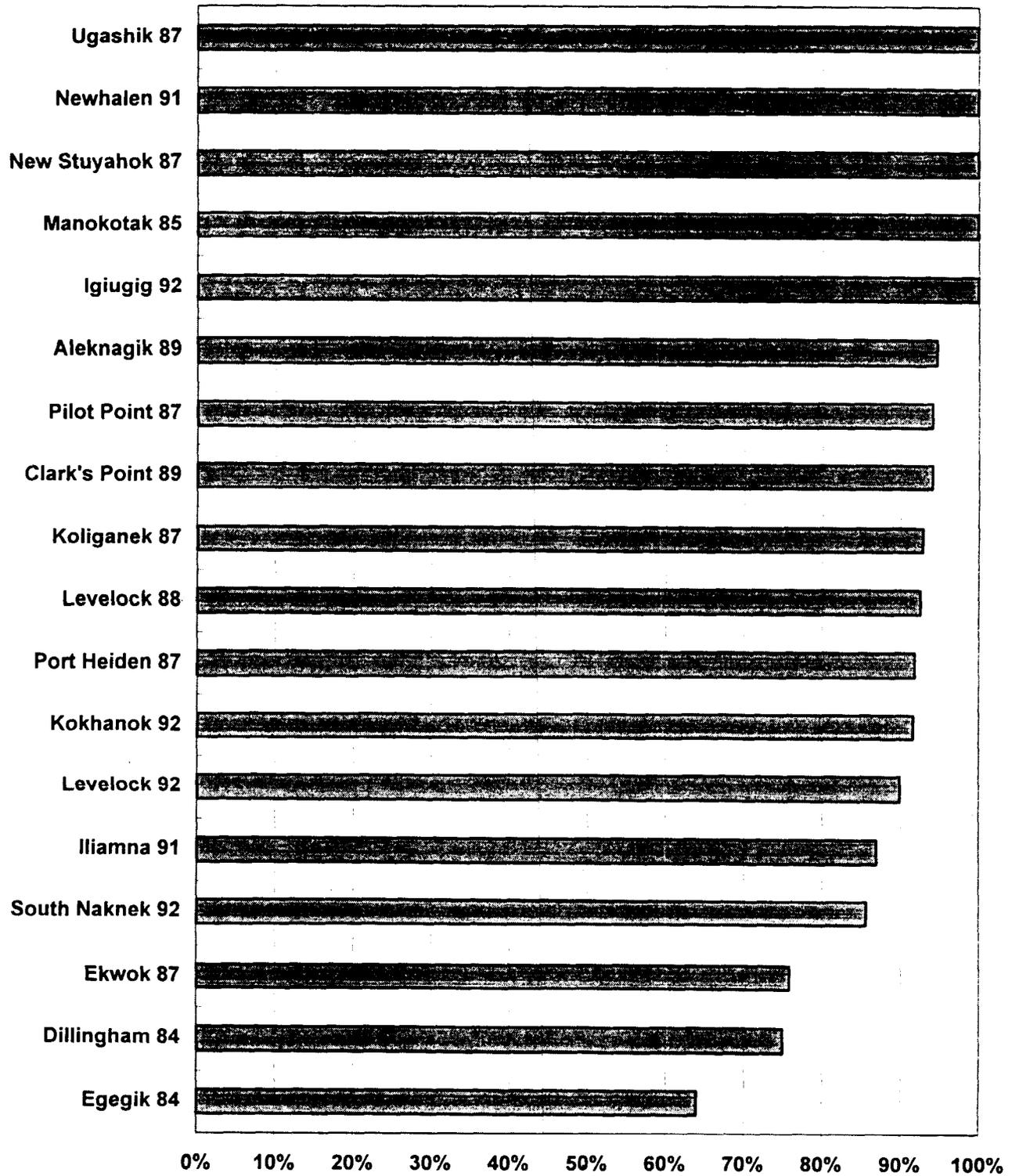
The major methods of harvest of freshwater fish in the Bristol Bay region include gill nets (either set or used as sweep seines), hook and line through the ice, and rod and reel in open water. The choice of methods depends on a number of factors, including season, water conditions, species, fishing regulations, and subregion.

Harvest estimates for non-salmon freshwater fish are more difficult to obtain than for other widely used resources such as salmon, caribou, moose, or furbearers. Commonly, household heads have trouble tracking or remembering precise annual harvests. There are several reasons for this difficulty.

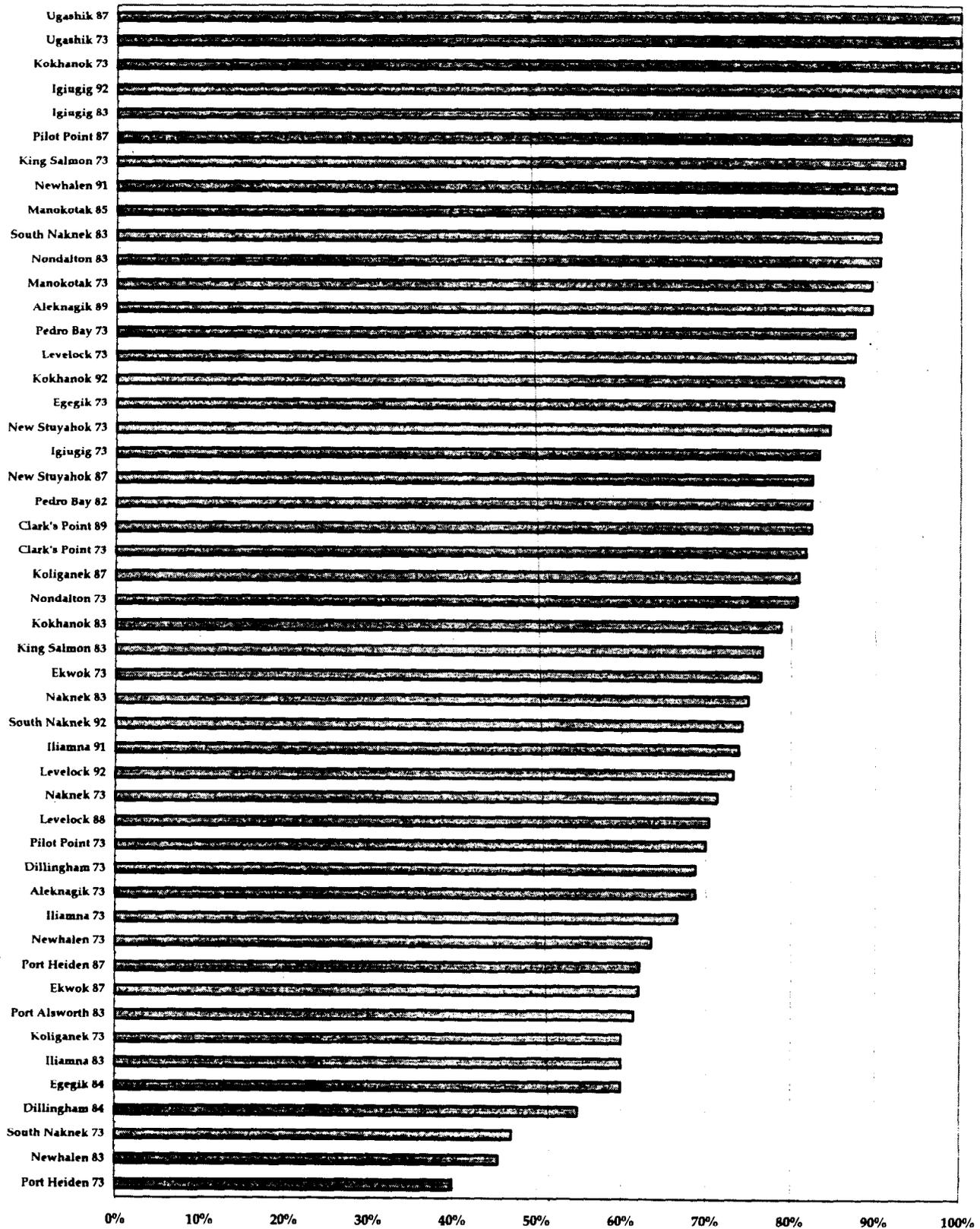
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<sup>1</sup> A subset of communities for which harvest data have been collected appears in Figure 2, because information about "use" of freshwater fish, in addition to harvest data, was not collected in the earlier research.

**Figure 2. Percentage of Households Using Freshwater Fish, Bristol Bay Communities**



**Figure 3. Percentage of Households Harvesting Freshwater Fish, Bristol Bay communities**



Harvests of freshwater often occur in a less concentrated fashion than salmon and over a longer period of time. Particular harvesters within households often vary from season to season or even day to day, again in contrast to salmon where harvest and processing groups are usually quite stable. Furthermore, households often have specific harvest goals for big game (which are also controlled by seasonal limits) and salmon (such as a number of racks in a smokehouse), while families generally do not have specific harvest goals for other freshwater fish (harvests are more opportunistic).

Species identification is sometimes a problem in documenting harvests of freshwater fish. Yup'ik classifications of "trout" in the region are based on different principles than those used by Western taxonomies. Reliable harvest and use data are difficult to obtain without a knowledge of the Yup'ik fish categories. Knowledge of local English names for kinds of freshwater fish is also necessary, as in the case of "lake trout" and "Togiak trout" at Manokotak, Aleknagik, and some other communities. Similar cautions apply to whitefish.

Generalizations about relative harvest quantities of freshwater fish in the Bristol Bay region during the 1970s, 1980, and early 1990s are possible. Dominant species vary by subregion, but overall among resident species, whitefish, grayling, pike, and Dolly Varden are the most commonly caught. Lake trout harvests occur in relatively large numbers in some communities as well (Nondalton and Pedro Bay). In some years, rainbow trout contribute substantially to harvests in some Iliamna Lake communities (Newhalen, Kokhanok, Iguigig). Generally, harvest quantities of burbot and blackfish are relatively low everywhere. Longnose suckers are taken in substantial quantities in some communities, such as those of the Nushagak River, although unlike other kinds of freshwater fish much of the harvest of this species is used for dog food. The anadromous smelt are harvested in substantial quantities by coastal communities, and are shared with more inland villages. Also, it is clear that freshwater fish harvests and use patterns differ from community to community and by subregions.

The available data also suggest that harvests of particular kinds of non-salmon freshwater fish by Bristol Bay communities can vary greatly from year to year, depending upon such factors as weather, species abundance, and the availability of alternative resources. For example, caribou were readily available near Newhalen and Iliamna during the winter of 1986/87, while winter ice conditions were not conducive to freshwater fishing. Consequently, freshwater fish harvest quantities were reported by respondents to be much lower than in some other recent years. At Ekwok, physical changes to the Nushagak River reportedly have led to a decline in burbot harvests. Ekwok residents reported that blackfish are no longer harvested because local knowledge of fish trap construction and use has been lost.

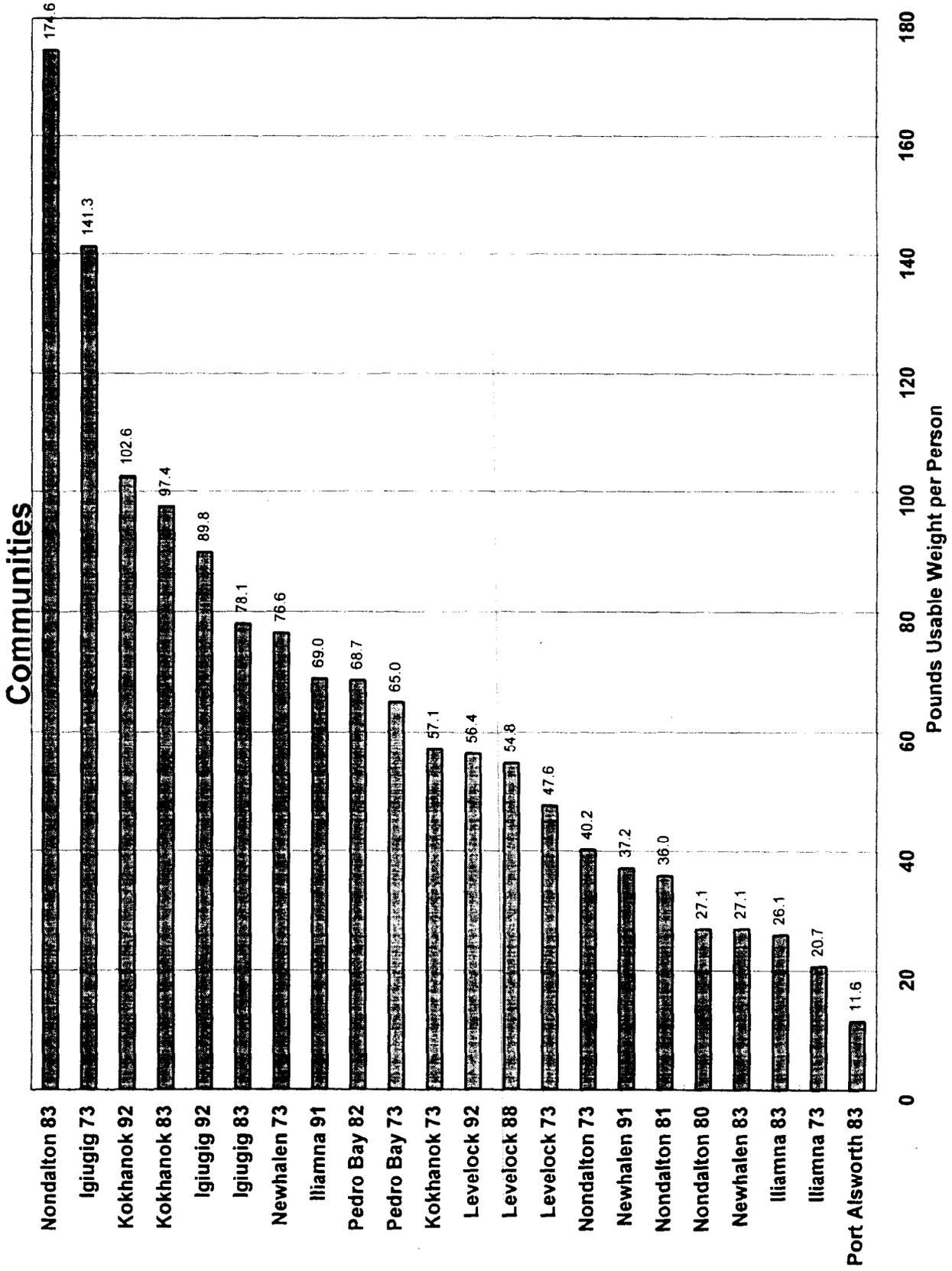
Harvest estimates for Bristol Bay communities for the 1980s and 1990s, compared with information from 1973/74, do not indicate any general trend towards increasing harvests or decreasing harvests of freshwater fish over the last two decades on a per capita basis in the region. Overall, the relative contribution of freshwater fish in communities' total subsistence harvests in the Bristol Bay region is similar

in comparing 1973/74 with later study years. For example, Figure 4 compares community per capita freshwater fish harvests of Iliamna Lake communities in 1973/74 with data for 1982/83 and later study years. For Pedro Bay, the per capita harvests for 1973/74 and 1982 were quite similar (65.0 pounds in 1973, 68.7 pounds in 1982). The three harvest estimates for Levelock (47.6 pounds per person in 1973/74, 54.8 pounds in 1988, and 56.4 pounds in 1992/93) also resemble each other closely. Igiugig decreased from 141.3 pounds in 1973/74 to 78.1 pounds in 1983, but increased to 89.8 pounds in 1992/93. Newhalen decreased from 76.6 pounds per person in 1973/74 to 27.1 pounds in 1983, then rose to 37.2 pounds in 1991/92. Kokhanok recorded an increase from 57.1 pounds in 1973/74 to 97.4 pounds in 1982/83 and 102.6 pounds in 1992/93. The greatest difference occurred at for Nondalton, where the harvest of freshwater fish increased from 40.2 pounds per person in 1973/74 to 174.6 pounds in 1983. Note that the 1973/74 harvest was quite similar to those reported for Nondalton in 1980 (27.1 pounds) and 1981 (36.0 pounds), suggesting that 1983 was an atypical year. For the Iliamna Lake subregion overall, the 1973/74 harvest of non-salmon freshwater fish was 57.5 pounds per person. This increased to 97.0 pounds per person in 1983. However, if Nondalton is excluded from this comparison because of the possibly atypical harvest figures for 1983, the per capita figures for the two years are very similar, 66.3 pounds in 1973/74 and 56.8 pounds in 1983 (Fig. 5).

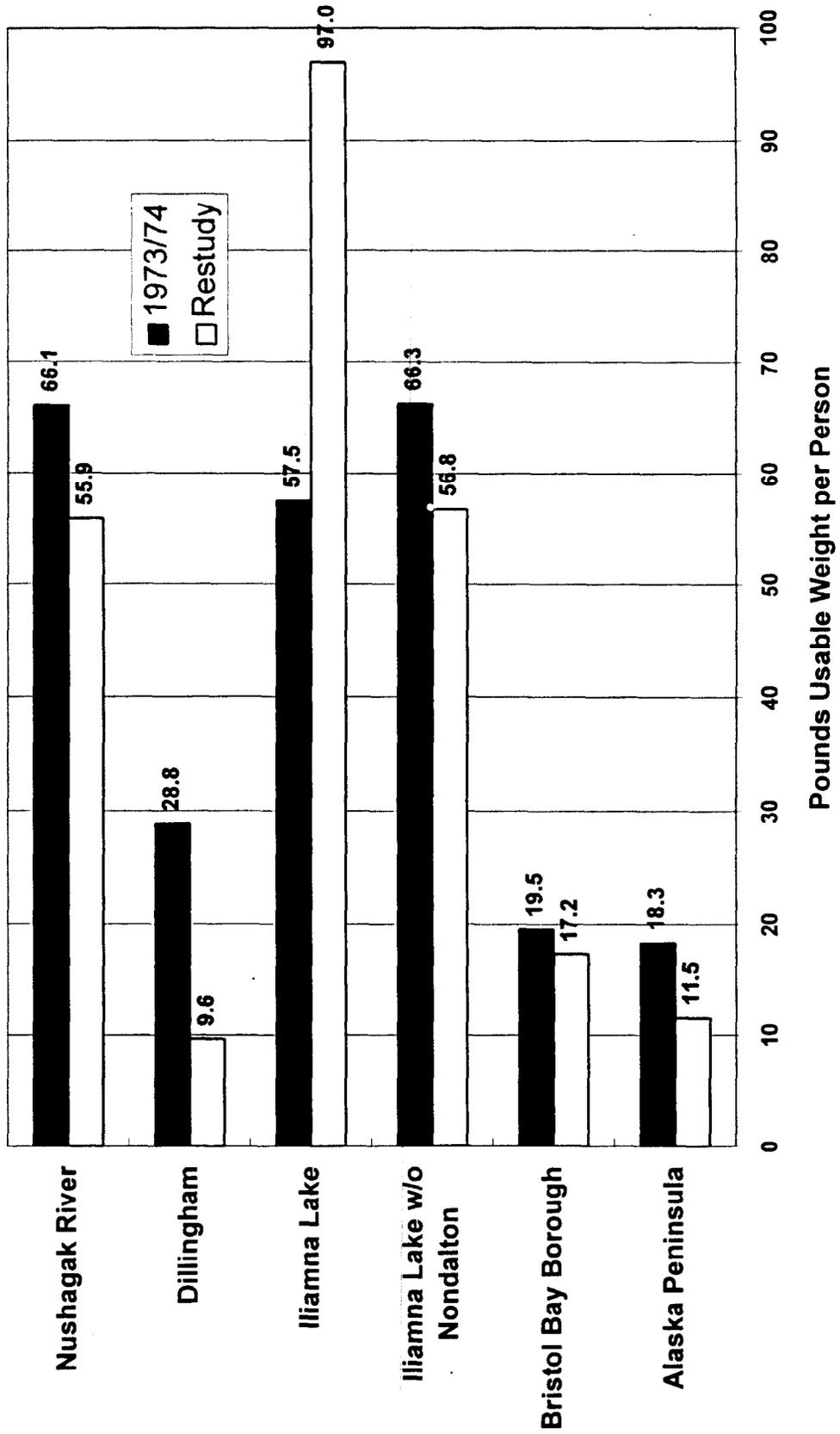
Comparative harvest data for communities in the Nushagak Bay and River drainage area also suggest relative stability in per capita freshwater fish harvests in the Bristol Bay region (Fig. 6). Harvests of this resource category were 60.0 pounds per person in Manokotak in 1973/74, and 51.0 pounds in 1985. Residents of New Stuyahok took 77.5 pounds of freshwater fish per capita in 1973/74, 89.6 pounds in 1983, and 33.0 pounds in 1987/88. At Ekwok, freshwater fish harvests were 60.9 pounds per person in 1973/74 and 67.3 pounds per person in 1987/88. Households at Koliganek caught 51.4 pounds of freshwater fish per person in 1973/74 and 92.8 pounds in 1987/88. For the three Nushagak River communities combined (Ekwok, New Stuyahok, Koliganek), freshwater fish harvests were very similar in 1973/74 (66.1 pounds per capita) and 1987/88 (55.9 pounds per capita) (Fig. 5).

Comparisons of 1973/74 survey data for Alaska Peninsula communities and the Bristol Bay Borough with information from the 1980s suggest declines in per capita harvests of non-salmon freshwater fish over about a 10-15 year period for four of seven communities (Egegik, King Salmon, Pilot Point, and Ugashik) (Fig. 7). Naknek (14.9 pounds in 1973/74, 18.6 pounds in 1983), Port Heiden (3.7 pounds in 1973/74, 9.5 pounds in 1986/87), and South Naknek (8.3 pounds in 1973/74, 17.0 pounds in 1983, 15.9 pounds in 1992/93) recorded increases. In the Bristol Bay Borough overall, freshwater fish harvests in 1983 (17.2 pounds per person) were much like those of 1973/74 (19.5 pounds per person). Freshwater fish harvests in the four Alaska Peninsula communities (Egegik, Pilot Point, Ugashik, Port Heiden) were lower in the mid-1980s (11.5 pounds per person) than in 1973/74 (18.3 pounds per person). However, these variations in harvests in the Bristol Bay Borough and Alaska Peninsula are not particularly

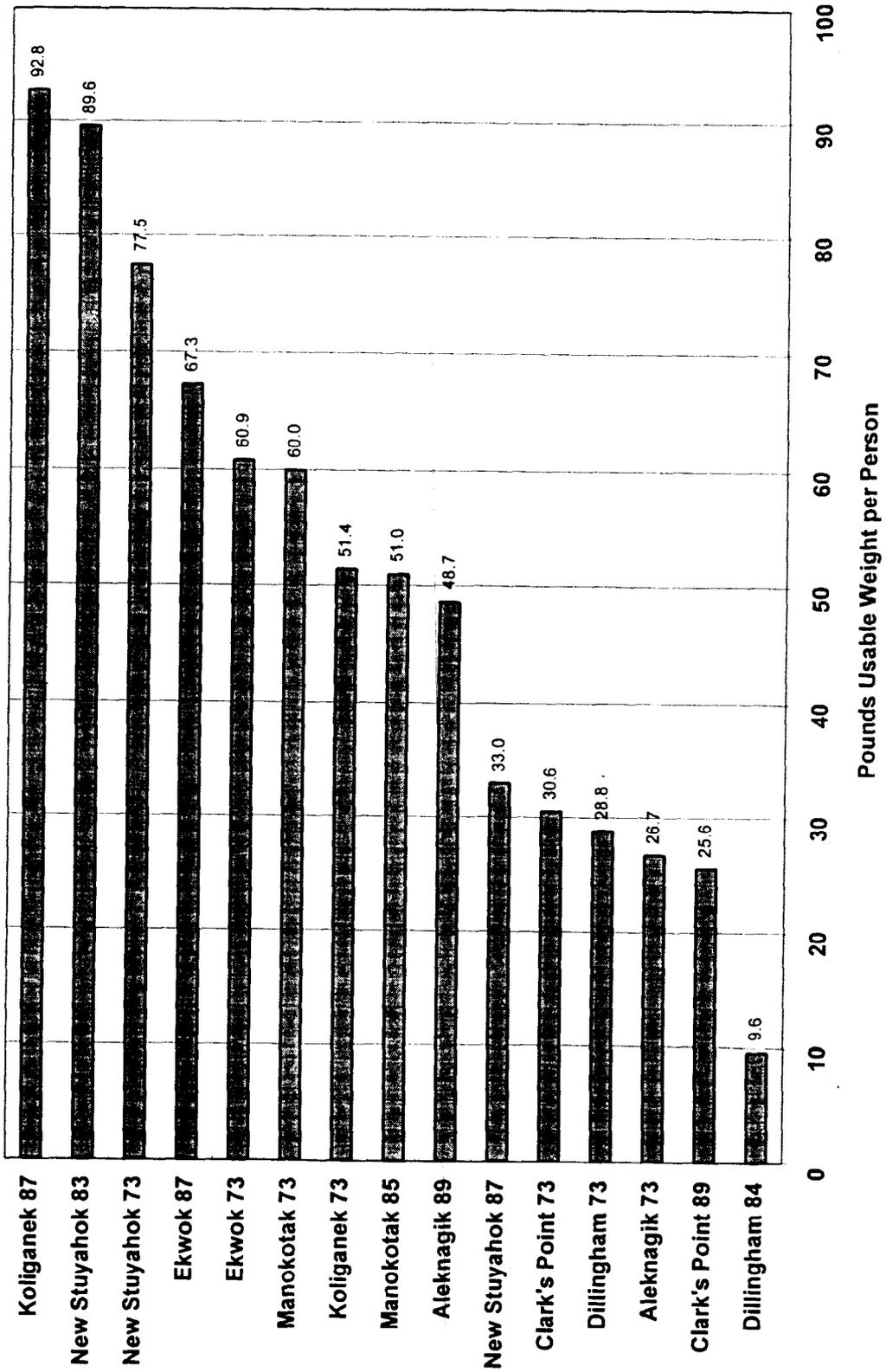
**Figure 4. Freshwater Fish Harvests, Iliamna Lake Subregion**



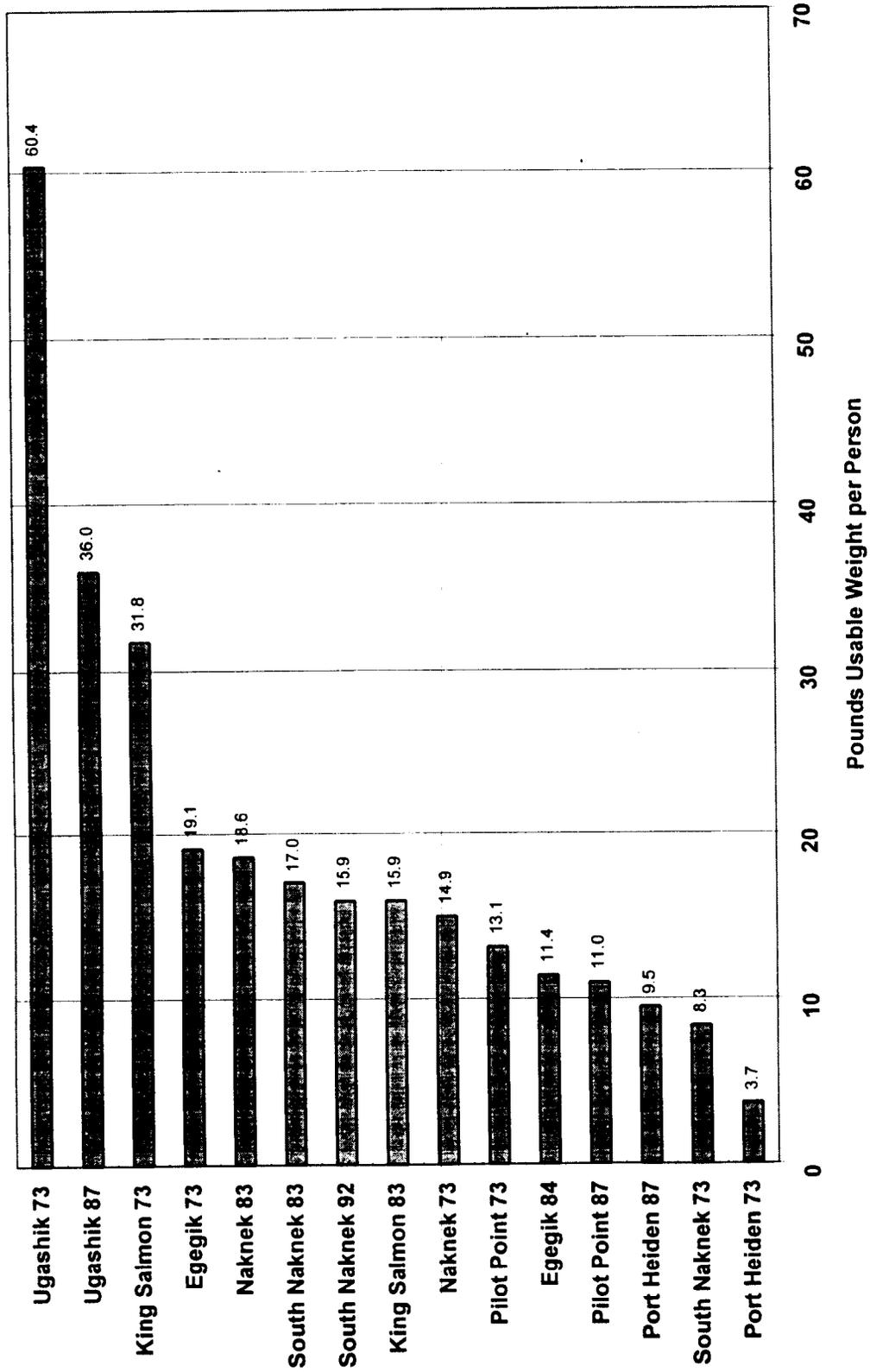
**Figure 5. Sub-regional Estimates of Freshwater Fish Harvests, Bristol Bay**



**Figure 6. Freshwater Fish Harvests, Nushagak River Drainage  
Communities**



**Figure 7 . Freshwater Fish Harvests, Bristol Bay Borough and Alaska Peninsula Communities**



large given the relatively lower harvest quantities of this resource category in these communities in comparison with those of the Togiak, Nushagak, and Iliamna Lake drainage communities (see below).

Harvests of freshwater fish in the regional center of Dillingham were lower in 1984 (9.6 pounds per person) than in 1973/74 (28.8 pounds per person). Lacking additional harvest data, it is not possible to detect a trend towards decreased freshwater fish harvests in Dillingham. It should be noted, however, that demographic changes have occurred in Dillingham that could account for lowered harvests of fish. In 1980, 57 percent of Dillingham's population was Alaska Native, down from 64 percent in 1970, and the overall population increased from 914 in 1970 to 1,563 in 1984 (Fall et al. 1986:22). Research conducted in the 1980s found that Alaska Native residents of Dillingham and more long-term residents of the community harvest larger quantities and a more diverse range of wild resources for subsistence use (Fall et al. 1986:129-136).

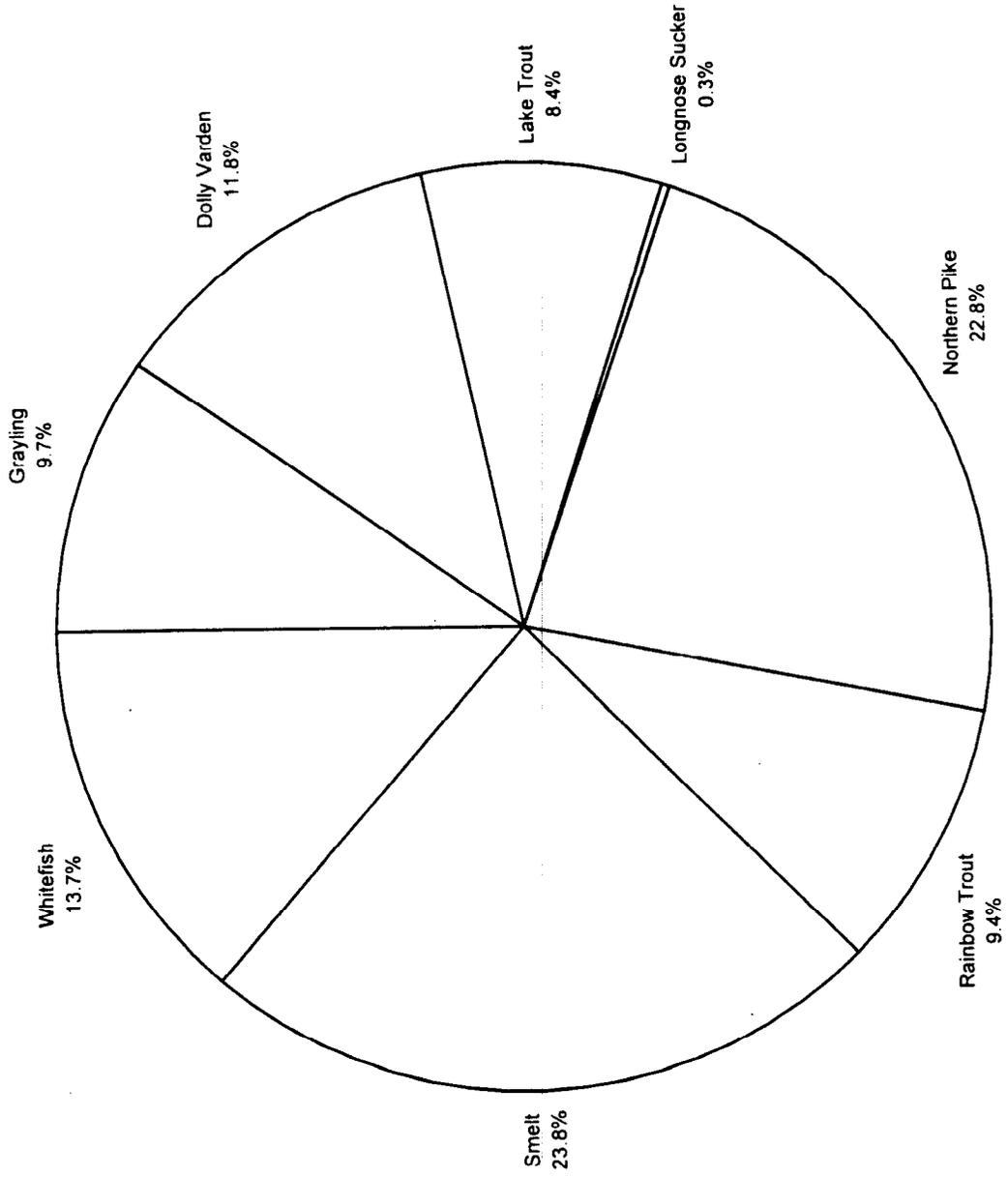
Only in 1974 was a resource harvest survey conducted in most Bristol Bay communities for the same study year (only Togiak, Twin Hills, Portage Creek, and Port Alsworth were not included). In the 1973/74 study year, smelt (23.8 percent), northern pike (22.8 percent), whitefish (13.7 percent), Dolly Varden (11.8), grayling (9.7 percent), and rainbow trout (9.4 percent) all contributed substantially to the harvest, as estimated in pounds usable weight (Fig. 8). Among resident freshwater species, grayling (25.2 percent), whitefish (25.0 percent) Dolly Varden (16.7 percent), northern pike (14.8 percent), and rainbow trout (12.2 percent) were most numerous in the region-wide harvest (as estimated in numbers of fish harvested) (Table 45, Fig. 9). For the entire region, the 1973/74 harvest of freshwater fish was 38.1 pounds per capita. Removing the regional centers (Dillingham and the Bristol Bay Borough) from the regional picture, the harvest was higher, at 50.5 pounds per person (Fig. 10).

Although a comprehensive region-wide survey has not been conducted in the Bristol Bay area since 1974, all communities included in that research have been surveyed at least one additional time. Using the most recent harvest estimates for each community and population estimates for 1995, the freshwater fish harvest by Bristol Bay residents was 27.5 pounds per person in 1995. (See Appendix C for the method used to calculate this estimate.) This is about 27.8 percent below the per capita harvest level of 1973/74. However, if the regional centers are removed from estimates, the per capita harvest for 1995 of 47.7 pounds per person is virtually identical to the 50.5 pounds per person estimate for 1973/74 (Fig. 10).

#### SUBREGIONAL PATTERNS OF FRESHWATER FISH USE

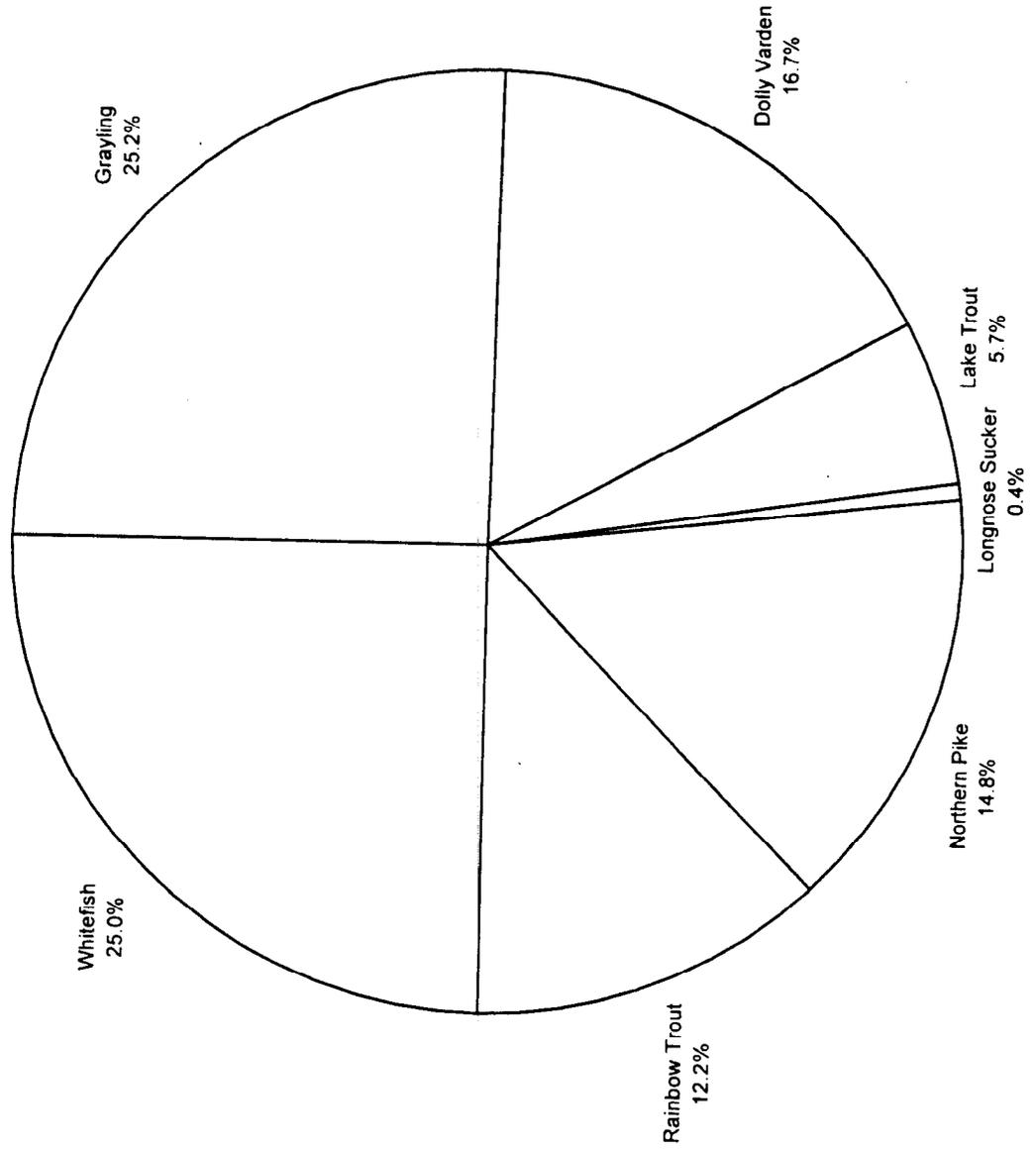
There appear to be three subregional patterns of harvest and use of resident non-salmon freshwater fish within the Bristol Bay region. These patterns are defined based upon a number of factors, including species mix, harvest quantities, relative contribution of this resource category to overall subsistence harvests, and predominate gear types (Table 46). The first subregional pattern is called the

Figure 8. Composition of Subsistence Harvest of Freshwater Fish, Bristol Bay, 1973/74



N = 118,080 pounds; includes all communities but Togiak, Twin Hills, and Portage Creek; no data for blackfish or burbot

**Figure 9. Composition of Subsistence Harvest of Resident Fish, Bristol Bay, 1973/74**



N = 64,858 fish; includes all communities but Togiak, Twin Hills, and Portage Creek; no data for blackfish or burbot

Table 45. Estimated Harvests of Resident Fish by Bristol Bay Communities and Regions, 1973/74

Community	Estimated Harvests in Numbers of Fish						
	Arctic Grayling	Dolly Varden	Lake Trout <sup>1</sup>	Longnose Sucker	Northern Pike	Rainbow Trout	Whitefish
<i>Nushagak Bay and River Subregion</i>							
Aleknagik	112	283	284	0	318	53	576
Clark's Point	0	46	0	0	103	0	67
Ekwok	907	27	0	0	665	133	3,204
Koliganek	1,613	147	37	141	860	175	1,527
Manokotak	1,006	1,022	422	0	1,653	290	1,516
New Stuyahok	4,417	1,164	510	0	2,760	655	1,482
Subregion Totals	8,055 28.6%	2,689 9.5%	1,253 4.4%	141 0.5%	6,359 22.6%	1,306 4.6%	8,371 29.7%
<i>Iliamna Lake Subregion</i>							
Igiugig	923	273	0	133	427	1,115	1,480
Iliamna	202	643	8	0	30	64	53
Kokhanok	123	903	170	0	120	638	1,596
Levelock	141	44	0	0	268	384	1,217
Newhalen	587	1,130	268	0	232	1,536	30
Nondalton	1,782	62	730	0	281	273	1,607
Pedro Bay	0	655	594	0	3	51	0
Subregion Totals	3,758 18.1%	3,711 17.9%	1,769 8.5%	133 0.6%	1,361 6.5%	4,061 19.5%	5,983 28.8%
<i>Bristol Bay Borough and Alaska Peninsula Subregion</i>							
Egegik	119	195	12	0	182	57	153
King Salmon	1,013	588	6	0	131	894	0
Naknek	249	190	22	0	54	402	92
Pilot Point	55	19	13	0	71	29	0
Port Heiden	0	26	26	0	0	0	0
South Naknek	271	74	0	0	24	34	199
Ugashik	12	110	66	0	80	20	0
Subregion Totals	1,718 31.3%	1,202 21.9%	145 2.6%	0 0.0%	542 9.9%	1,435 26.2%	444 8.1%
Dillingham	2,814 27.0%	3,243 31.1%	514 4.9%	0 0.0%	1,336 12.8%	1,121 10.8%	1,393 13.4%
Region	16,346 25.2%	10,844 16.7%	3,681 5.7%	275 0.4%	9,598 14.8%	7,923 12.2%	16,191 25.0%

<sup>1</sup> There are no lake trout in the Igushik or Wood river systems. Fish reported as "lake trout" at Manokotak and Aleknagik, and perhaps Dillingham and elsewhere, might be "Togiak trout," a type of Dolly Varden. See Table 6.

Source: based upon Gasbarro and Utermohle 1974

**Figure 10. Estimates of Subsistence Harvests of Freshwater Fish, Bristol Bay Region, 1973/74 and 1995**

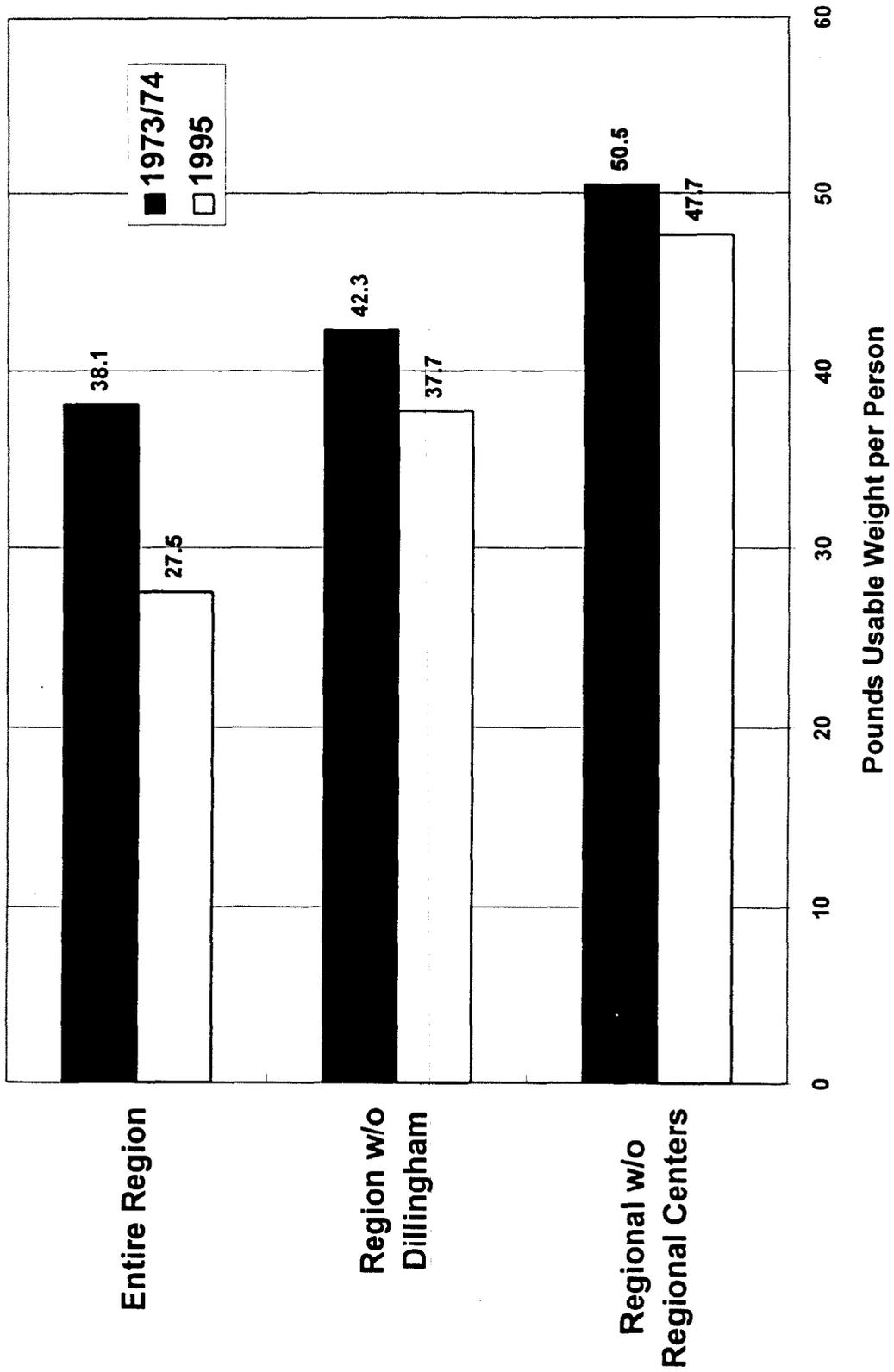


Table 46. Three Subregional Patterns of Resident Freshwater Fish Harvest and Use in the Bristol Bay Region

<u>Pattern</u>	<u>Communities</u>	<u>Harvest Levels</u>	<u>Major Species</u>	<u>Harvest Methods</u>
Togiak-Nushagak-Iliamna Lake <sup>1</sup>	Aleknagik, Clark's Point, Ekwok, Igiugig, Iliamna, Kokhanok, Levelock, Manokotak, Newhalen, New Stuyahok, Nondalton, Pedro Bay, Portage Creek, Port Alsworth, Togiak, Twin Hills	25-100 lbs per capita 100-500 lbs per hh Freshwater fish make up 5 - 10 percent of the annual subsistence harvests.	Whitefish Grayling Pike Dolly Varden Rainbow Trout	Set nets, sweep seines, jigging through the ice, set hooks through the ice, traps
Alaska Peninsula	Egegik, Pilot Point, Ugashik, Port Heiden	2-25 pounds per capita, but usually less than 10. 10-60 pounds per hh, but usually less than 40. Freshwater fish make up less than 5 percent of annual subsistence harvests.	Dolly Varden Grayling Pike	Nets used for whitefish and pike; most of harvest is with hook and line (ice fishing) and rod and reel.
Regional Center	Dillingham, Bristol Bay Borough (Naknek, South Naknek, King Salmon)	5-15 pounds per capita; 10-70 pounds per hh, but usually less than 30. Freshwater fish make up less than 5 percent of annual subsistence harvests	Dolly Varden Grayling Rainbow trout	Rod and reel, esp. for Bristol Bay Borough; some hook and line fishing through the ice; nets used for whitefish, pike, esp. by Dillingham and South Naknek.

<sup>1</sup> There are 3 subpatterns based on species mix. These are: 1) Western (Togiak, Twin Hills, Manokotak, Aleknagik); 2) Nushagak River; and 3) Iliamna Lake. Also, due to its location Nushagak Bay, Clark's Point may harvest lower numbers of freshwater fish. Pedro Bay has a specialized pattern focused on lake trout and Dolly Varden.

"Togiak-Nushagak-Iliamna Pattern," which pertains to the small communities of the Togiak, Nushagak Bay (except Dillingham), Nushagak River, and Iliamna Lake subregions. The second pattern is that of the Alaska Peninsula (excluding the Bristol Bay Borough), and the third is the "regional center pattern" of Dillingham and the three communities of the Bristol Bay Borough (King Salmon, Naknek, and South Naknek).

#### The Togiak-Nushagak-Iliamna Pattern

One pattern of use of non-salmon freshwater fish species (the "Togiak-Nushagak-Iliamna Pattern") is found in the communities of the Togiak River drainage, the Nushagak Bay and River drainage, and the Kvichak River - Iliamna Lake drainage, except for the regional center of Dillingham. Harvest estimates from 1973/74, the 1980s, and the 1990s suggest that resident freshwater fish species generally make up about 5 to 10 percent of the subsistence harvests in these communities. Over the last 20 years, harvests of these species in most communities of these subregions have ranged from 100 pounds per household per year to 500 pounds per household per year. The annual range of per capita harvests has been from about 25 pounds to 100 pounds or more (Table 14).

Generally, five kinds of fish dominate the freshwater fish harvests of communities in these subregions. These are whitefish, grayling, pike, rainbow trout, and Dolly Varden ("char"). Whitefish and grayling are important in virtually every community in these subregions. Pike are taken in relatively greater numbers in the Nushagak drainage, while Dolly Varden/char are more significant in communities of the western portion of the region, such as Aleknagik, Manokotak, Twin Hills, and Togiak, as well as around Iliamna Lake. Lake trout and, in some years, rainbow trout, also take on greater significance in the Iliamna Lake subregion.

Harvest methods for freshwater fish in these communities include nets in open water in early spring and late fall, before and after subsistence salmon fishing. Nets are either set near lake outlets or in streams or used as sweep seines (such as at Togiak for Dolly Varden and at Igiugig for whitefish). The second major gear type is hook and line through the ice in winter, either used for jigging or as set hooks. A third method is rod and reel fishing in open water. This method is used for taking smaller quantities of fish, such as Dolly Varden in the Togiak River and around Aleknagik.

Traditional methods of preservation, such as drying, half-drying, or smoking are common for some species, such as Dolly Varden, pike, and whitefish, in most of these communities. These products are often eaten with seal oil as a condiment. Some portions of certain freshwater fish, such as pike heads or burbot livers, are considered special delicacies. Whitefish are a major ingredient in *akutaq*, another traditional food.

It should be noted that there are probably three "subpatterns" within this overall pattern just described, based upon the mix of and relative harvest quantities of certain species (Table 46). In the "Nushagak River Subpattern," whitefish, grayling, and pike are taken in the greatest numbers. The

"Iliamna Lake Subpattern" differs slightly in that the harvests of pike are relatively lower, while "trout" (Dolly Varden, lake trout, and rainbow trout) assume a more prominent role. Finally, the communities of the western portion of the region -- Aleknagik, Manokotak, Twin Hills, and Togiak -- follow a third subpattern in which Dolly Varden (char) and "Togiak trout" (sometimes also called "lake trout," but a type of Dolly Varden) are harvested in greater numbers than in the Nushagak River villages.

Evidently, a few communities within these subregions display unique harvest characteristics. Based upon two years data (1973/74 and 1988/89), it appears that Clarks Point households harvest relatively few non-salmon fish with the exception of smelt. The community's location on Nushagak Bay perhaps accounts for this relatively lower use. Species availability may also explain why households in Pedro Bay, at the upper end of Iliamna Lake, exhibited a specialized pattern in both 1973/74 and 1982 in which lake trout and Dolly Varden composed almost all the freshwater fish harvest (Table 36). Also, note that few whitefish are taken by some Iliamna Lake villages, such as Iliamna, Newhalen, and Pedro Bay (Table 32, Table 33, Table 36), most likely because of species distribution. Whitefish obtained through trade are used in these communities, however.

#### The Alaska Peninsula Pattern

The role of non-salmon freshwater fish in the subsistence pattern of communities of the Bristol Bay side of the Alaska Peninsula (Egegik, Pilot Point, Ugashik, and Port Heiden), called the "Alaska Peninsula Pattern," is different in several ways from that just described for the Togiak River, Nushagak River, and Iliamna Lake communities. First, per capita harvest levels are lower (especially if smelt are excluded from the totals). In 1973/74, per capita harvests of resident freshwater fish ranged from a high of 24.7 pounds at Ugashik to a low of 2.0 pounds at Port Heiden. These harvests comprised five percent or less of the total resource take at all four communities in 1973/74. This pattern persisted into the 1980s, when estimated per capita harvests of resident freshwater fish in these communities did not exceed 10 pounds and did not make up more than five percent of the total non-commercial resource harvests (Table 14).

Also, compared to communities of the Togiak, Nushagak, or Iliamna Lake areas, residents of these four Alaska Peninsula communities harvest fewer freshwater species. Dolly Varden, grayling, and pike are taken in the greatest quantities. Finally, most non-salmon freshwater fish in these communities are harvested with rod and reel or hook and line. Whitefish at Egegik and, in some cases, pike (such as at Pilot Point) are sometimes caught with nets by residents of the Alaska Peninsula subregion.

#### The Regional Center Pattern

The third subregional pattern of non-salmon freshwater fish harvest and use (the "Regional Center Pattern") is found in Dillingham and the Bristol Bay Borough (King Salmon, Naknek, and South Naknek). Harvests of freshwater fish as estimated in pounds per capita and per household, are substantially lower in the regional centers than in the villages of the Togiak, Nushagak, and Iliamna Lake subregions. For

example, in 1973/74, Dillingham's per capita take of 14.9 pounds of resident freshwater fish was lower than any other community in the Nushagak drainage. The per capita harvest in 1984 was lower still, 9.6 pounds, compared to 89.6 pounds for New Stuyahok in 1983 and 37.2 pounds for Manokotak in 1985. Per capita harvests of these fish species have been similar in the three communities of the Bristol Bay Borough, from a high of 15.8 pounds per person in King Salmon in 1973/74 to a low of 4.3 pounds per person at South Naknek in 1983. Additionally, freshwater fish make up a relatively smaller segment of the overall subsistence harvests in the regional centers, generally less than 10 percent (Table 14).

Another contrast with the Togiak-Nushagak-Iliamna Lake pattern is a different mix of species in the harvests of regional center households. Where whitefish, grayling, pike, and Dolly Varden dominate the harvests of the smaller communities of the former subregions, at Dillingham and the Bristol Bay Borough, Dolly Varden and rainbow trout, along with grayling, are most notable. Pike and whitefish play a much lesser role.

Finally, rod and reel fishing in open water under sport fishing regulations makes a larger contribution to freshwater fish harvests in the regional centers than in the smaller communities. For example, this method provided almost all the reported freshwater fish harvests in the Bristol Bay Borough in 1983 (Table 38, Table 39, Table 40). There is probably more use of nets for taking whitefish and other species, and of jigging through the ice for pike and Dolly Varden at Dillingham, but rod and reel fishing for trout and other fish is very common there as well.

It is very important to note that large subcommunities are present in both regional centers that generally harvest more wild resources than the communities' means (Fall et al 1986:128-137; Morris 1985:179). Such subpopulations are characterized by relatively long lengths of residency in the region, involvement in commercial fishing, and, often, kinship ties to the region's smaller communities. Households in the regional centers which belong to the subcommunities may very well exhibit a pattern of freshwater fish use more like that of the Togiak-Nushagak-Iliamna Lake pattern than the regional center pattern just described. This is especially the case in Dillingham, where many households trace their origins to villages of the Togiak or Nushagak drainages where the harvest and use of freshwater fish is substantial.

#### SUMMARY OF USE PATTERNS AND HARVEST LEVELS BY TYPE OF FISH

##### Arctic Grayling

Arctic grayling, along with whitefish, northern pike, and Dolly Varden, are the resident non-salmon freshwater species taken in the largest quantities by residents of the communities of the Bristol Bay region (Fig. 9). In 1973/74, grayling harvests (total of 8,055) were second only to whitefish (8,371) among resident species in six villages of the Nushagak River area, third in the Iliamna Lake area (after whitefish and rainbow trout), and first in communities of the Alaska Peninsula. Grayling were the most numerous

non-salmon resident freshwater species in the reported 1973/74 harvests of Koliganek, New Stuyahok, Nondalton, King Salmon, and South Naknek; the second most numerous in Dillingham, Ekwok, Iliamna, King Salmon, and Pilot Point. Only three communities (Clarks Point, Pedro Bay, and Port Heiden) reported no grayling harvests in 1973/74 (Table 45, Table 47).

Data collected in the 1980s for Nushagak River drainage communities illustrate a pattern similar to that of 1973/74. In Ekwok and Koliganek in 1986, grayling ranked in the top three, as in 1973/74. In 1987/88, grayling harvests were again substantial at Ekwok (793 fish; fourth among freshwater species), New Stuyahok (1,900 fish; second ranked), and Koliganek (2,305 fish; fourth ranked). At Manokotak in 1985, grayling harvests were generally lower than at the Nushagak River villages, with most harvests occurring in nets set for other species (Schichnes and Chythlook 1988). Note, however, that in all four of these communities, grayling harvests as estimated in pounds per household were lower in the sample year during the 1980s in comparison with 1973/74. Again in conformance with 1973/74, catches of grayling by Aleknagik households were relatively low in 1986 and in 1988/89 (Table 47).

In the Iliamna Lake subregion in 1983, grayling were the second most numerous freshwater species harvested after whitefish. As in 1973/74, grayling harvests were particularly notable at Nondalton, and substantially lower in the other villages, especially Kokhanok and Pedro Bay. Far fewer grayling were caught at Igiugig and Iliamna in 1983 than in 1973/74. Moderate numbers of grayling were harvested in Iliamna and Newhalen in 1991/92 and in Kokhanok in 1992/93 (Table 47).

For communities of the Alaska Peninsula, estimated harvests of grayling in the 1980s were similar to those of 1973/74. Grayling catches were largest in the Bristol Bay Borough communities and Egegik, and lower in the three communities to the south (Pilot Point, Ugashik, and Port Heiden) (Table 47).

Grayling are taken almost year-round by Bristol Bay residents, with harvest effort lowest during the summer months when subsistence and commercial salmon fishing dominate harvest activities. In late fall before freeze-up and again in spring after break-up, large numbers of grayling are taken in nets in communities such as Ekwok and Nondalton. Open water fishing with hook and line or rod and reel is also important in some communities, such as Koliganek, at those times of year. During winter, jigging with hook and line for grayling is important throughout the region. Grayling can be eaten fresh, dried, or frozen. They are also an important source of dog food in some communities such as New Stuyahok and Nondalton.

### Blackfish

Blackfish have been used historically in the Bristol Bay region. However, as shown in Table 48, information about the harvest and use of blackfish in the Bristol Bay region has not been consistently collected in most recent harvest surveys. Research conducted in the 1980s in the Bristol Bay region has documented the harvest and use of blackfish in some communities of the Togiak River and Nushagak River drainages. With the exception of Levelock in 1988 and 1992/93 and Igiugig in 1992/93, no

Table 47. Use and Harvests of Arctic Grayling by Bristol Bay Communities

Community	Study Year	Percentage of Households <sup>1</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	73			31.3%			112	78	5.3	3.7	1.1	0.7
Aleknagik	89	23.7%	15.8%	13.2%	10.5%	10.5%	53	37	1.3	0.9	0.4	0.3
Clark's Point	73			0.0%			0	0	0.0	0.0	0.0	0.0
Clark's Point	89	11.8%	5.9%	5.9%	11.8%	11.8%	7	5	0.4	0.3	0.1	0.1
Dillingham	73			25.0%			2,814	1,970	12.3	8.6	2.9	2.0
Dillingham	84	28.8%	20.3%	19.6%	9.2%	2.6%	1,215	850	1.8	1.2	0.6	0.4
Egegik	73			30.0%			119	83	5.0	3.5	1.2	0.8
Egegik	84	40.0%	40.0%	40.0%	4.0%	16.0%	166	283	4.0	6.7	1.7	2.9
Ekwok	73			52.9%			907	635	43.2	30.3	8.9	6.2
Ekwok	87	69.0%	62.1%	58.6%	17.2%	20.7%	793	556	24.8	17.4	7.4	5.2
Igiugig	73			66.7%			923	646	115.3	80.7	23.9	16.7
Igiugig	83		100.0%	100.0%	0.0%		293	205	26.6	18.7	4.2	2.9
Igiugig	92	100.0%	100.0%	100.0%	20.0%	20.0%	112	78	9.3	6.5	2.4	1.7
Iliamna	73			33.3%			202	141	11.9	8.3	3.2	2.3
Iliamna	83		25.0%	20.0%	5.0%		54	38	1.5	1.1	0.4	0.3
Iliamna	91	65.2%	65.2%	65.2%	21.7%	13.0%	565	395	18.8	13.2	5.8	4.0
King Salmon	73			73.3%			1,013	709	21.6	15.1	5.1	3.5
King Salmon	83			46.5%			687	687	5.6	5.6	1.9	1.9
Kokhanok	73			55.6%			123	86	9.4	6.6	1.5	1.1
Kokhanok	83		5.3%	5.3%	0.0%		7	5	0.3	0.2	0.0	0.0
Kokhanok	92	41.7%	36.1%	36.1%	13.9%	13.9%	302	212	7.7	5.4	1.7	1.2
Koliganek	73			60.0%			1,613	1,129	80.7	56.5	14.2	10.0
Koliganek	87	73.8%	59.5%	57.1%	33.3%	31.6%	2,305	1,614	48.0	33.6	12.4	8.7
Levelock	73			50.0%			141	99	8.3	5.8	1.8	1.3
Levelock	88	29.6%	22.2%	22.2%	25.9%	25.9%	332	233	10.1	7.1	3.1	2.1
Levelock	92	20.0%	13.3%	13.3%	13.3%	10.0%	140	98	3.6	2.5	1.3	0.9
Manokotak	73			57.9%			1,006	704	27.0	18.9	4.6	3.2
Manokotak	85	51.9%	44.4%	37.0%	35.2%	25.9%	381	267	6.5	4.5	1.2	0.9
Naknek	73			33.9%			249	174	4.1	2.9	1.1	0.8
Naknek	83			30.8%			648	648	5.3	5.3	1.7	1.7
New Stuyahok	73			65.4%			4,417	3,092	142.7	99.9	22.8	15.9
New Stuyahok	87	77.5%	67.5%	67.5%	30.0%	39.5%	1,900	1,330	25.7	18.0	5.4	3.8
Newhalen	73			54.5%			587	411	36.8	25.8	8.1	5.7
Newhalen	83		18.2%	18.2%	0.0%		106	74	4.1	2.9	0.8	0.6
Newhalen	91	76.9%	73.1%	69.2%	23.1%	26.9%	593	415	18.5	13.0	3.8	2.6
Nondalton	73			61.5%			1,782	1,248	61.7	43.2	11.8	8.3
Nondalton	80			64.0%			1,150	805	32.9	23.0	6.9	4.8
Nondalton	81			63.0%			3,249	2,275	92.8	65.0	16.3	11.4
Nondalton	83		81.0%	81.0%	0.0%		17,517	12,262	324.4	227.1	62.5	43.8
Pedro Bay	73			0.0%			0	0	0.0	0.0	0.0	0.0
Pedro Bay	82		5.9%	5.9%	0.0%		25	17	1.2	0.8	0.4	0.3
Pilot Point	73			20.0%			55	38	4.2	2.9	1.1	0.7
Pilot Point	87	17.6%	23.5%	17.6%	0.0%	0.0%	19	13	1.1	0.7	0.3	0.2
Port Alsworth	83		38.5%	38.5%	0.0%		276	193	13.1	9.2	3.6	2.5
Port Heiden	73			0.0%			0	0	0.0	0.0	0.0	0.0
Port Heiden	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
South Naknek	73			29.4%			271	189	10.8	7.6	2.1	1.5
South Naknek	83			28.6%			63	63	1.3	1.3	0.5	0.5
South Naknek	92	11.4%	5.7%	5.7%	5.7%	2.9%	24	17	0.6	0.4	0.2	0.1
Ugashik	73			20.0%			12	8	1.2	0.8	0.5	0.4
Ugashik	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> Data are unavailable for blank cells. Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 48. Use and Harvests of Blackfish by Bristol Bay Communities

Community	Study Year <sup>1</sup>	Percentage of Households					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers <sup>2</sup>	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	89	36.8%	10.5%	5.3%	34.2%	18.4%	19 g	113	0.5 g	2.7	0.1 g	0.8
Clark's Point	89	5.9%	5.9%	5.9%	0.0%	5.9%	5 g	30	0.3 g	1.8	0.1 g	0.5
Dillingham	84	3.9%	0.7%	0.7%	2.6%	0.0%	18	21	0.0	0.0	0.0	0.0
Ekwok	87	3.4%	0.0%	0.0%	3.4%	0.0%	0	0	0.0	0.0	0.0	0.0
Igiugig	92	30.0%	30.0%	30.0%	0.0%	10.0%	7	1	0.6	0.0	0.1	0.0
Kokhanok	92	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
Koliganek	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
Levelock	88	18.5%	11.1%	11.1%	14.8%	14.8%	55	4	1.7	0.1	0.5	0.0
Levelock	92	3.3%	3.3%	3.3%	3.3%	3.3%	65	5	1.7	0.1	0.6	0.1
Manokotak	85	63.0%	27.8%	16.7%	46.3%	25.9%	28 b	844	0.5 b	14.3	0.1 b	2.7
New Stuyahok	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
South Naknek	92	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> The 1973/74 University of Alaska survey (Gasbarro and Utermohle 1974) did not collect systematic information on harvests of blackfish.

<sup>2</sup> g = gallons; b = five gallon buckets

Source: Scott et al. 1995

communities of the Kvichak/Iliamna Lake area or the Alaska Peninsula reported using this species. At Togiak, and probably Twin Hills, blackfish are taken in traps in creeks to the northeast of the villages. Harvest quantities are unknown. The most complete documentation of blackfish harvesting in the Bristol Bay area is available for Manokotak. Older men in the community use traps to catch blackfish in tundra ponds or creeks in January and February. In 1985, 16.7 percent of village households harvested 140 gallons of blackfish. These harvests were widely shared, for 63 percent of Manokotak's households used blackfish in 1985. Blackfish harvests during the 1980s were documented for Dillingham, where 0.7 percent of the households caught blackfish in 1985. No households interviewed in the Nushagak River villages of Ekwok, New Stuyahok, and Koliganek harvested blackfish in 1987/88, although a few used blackfish they received as gifts. In Levelock, 11.1 percent of households in 1987/88 harvested blackfish with nets and traps; just 3.3 percent did so in the 1992/93 study year. Thirty percent of Igiugig households harvested and used blackfish in 1992/93 (Table 48).

### Burbot

Information collected in the 1980s and 1990s recorded the harvest and use of burbot in many Bristol Bay villages in the Togiak, Nushagak, and Kvichak/Iliamna Lake drainages (Table 49). Use of this species has not been documented for the Alaska Peninsula communities, with the exception of 5.7 percent of South Naknek households using (but not harvesting) burbot in 1992/93. In general, burbot are taken in a number of ways, including rod and reel in open water, hook and line through the ice, nets, and in blackfish traps. Very often, these harvests occur while fishers are targeting other species (see Manokotak in Chapter Three). Overall, in the 1980s and 1990s burbot harvests have been lower than those of most other freshwater species taken for subsistence use. For example, in Manokotak in 1985, burbot harvests, as estimated in numbers of fish, ranked seventh out of eight freshwater species, exceeding only rainbow trout (Table 12). One notable exception is Igiugig in 1983, where the estimated harvest of 917 burbot outnumbered all other freshwater species but whitefish. However, no Igiugig households harvested burbot in 1992/93. Moderate numbers of burbot were also harvested at Levelock in 1988 (275 fish) and in Nondalton in 1983 (589 fish) (Table 49).

### Dolly Varden

As noted in the discussions of Togiak, Aleknagik, and some of the Iliamna Lake communities, Bristol Bay residents sometimes classify Dolly Varden with lake trout, or combine Dolly Varden, rainbow trout, and lake trout together simply as "trouts." Also, sometimes particular kinds of Dolly Varden are called "Togiak trout" or "lake trout" and are reported as a separate kind of fish. Consequently, reported harvests of each of these species may include some of the others as well. In addition, as discussed in Chapter Two, Dolly Varden (and Arctic char) are divided into three named categories by Yup'ik-speaking

Table 49. Use and Harvests of Burbot by Bristol Bay Communities

Community	Study Year <sup>1</sup>	Percentage of Households <sup>2</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	89	21.1%	10.5%	7.9%	13.2%	5.3%	8	8	0.2	0.2	0.1	0.1
Clark's Point	89	5.9%	0.0%	0.0%	5.9%	5.9%	0	0	0.0	0.0	0.0	0.0
Dillingham	84	2.6%	2.0%	2.0%	2.6%	1.3%	117	117	0.2	0.2	0.1	0.1
Ekwok	87	13.8%	10.3%	10.3%	6.9%	3.4%	24	24	0.8	0.8	0.2	0.2
Igiugig	83		66.7%	66.7%	0.0%		917	917	83.3	83.3	13.2	13.2
Igiugig	92	20.0%	10.0%	0.0%	20.0%	0.0%	0	0	0.0	0.0	0.0	0.0
Iliamna	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Iliamna	91	13.0%	17.4%	8.7%	4.3%	0.0%	22	44	0.7	1.5	0.2	0.4
Kokhanok	83		5.3%	5.3%	0.0%		1	1	0.1	0.1	0.0	0.0
Kokhanok	92	2.8%	2.8%	0.0%	2.8%	2.8%	0	0	0.0	0.0	0.0	0.0
Koliganek	87	21.4%	16.7%	16.7%	14.3%	7.3%	153	153	3.2	3.2	0.8	0.8
Levelock	88	29.6%	18.5%	18.5%	25.9%	22.2%	275	275	8.3	8.3	2.5	2.5
Levelock	92	13.3%	6.7%	6.7%	10.0%	6.7%	69	69	1.8	1.8	0.6	0.6
Manokotak	85	53.7%	42.6%	35.2%	38.9%	22.2%	349	349	5.9	5.9	1.1	1.1
New Stuyahok	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
Newhalen	83		9.1%	9.1%	0.0%		12	12	0.4	0.4	0.1	0.1
Newhalen	91	3.8%	7.7%	0.0%	3.8%	3.8%	0	0	0.0	0.0	0.0	0.0
Nondalton	80			29.0%			35	35	1.0	1.0	0.2	0.2
Nondalton	81			16.0%			35	35	1.0	1.0	0.2	0.2
Nondalton	83		52.4%	52.4%	4.8%		589	589	10.9	10.9	2.1	2.1
Pedro Bay	82		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Port Alsworth	83		30.8%	30.8%	0.0%		71	71	3.4	3.4	0.9	0.9
South Naknek	92	5.7%	0.0%	0.0%	5.7%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> The 1973/74 University of Alaska survey (Gasbarro and Utermohle 1974) did not collect systematic information on harvests of burbot.

<sup>2</sup> Data unavailable for blank cells.

Source: Scott et al. 1995

villages of the Togiak and Nushagak river drainages. Unless researchers inquire about each category, harvests will be underestimated, misclassified, or unreported entirely.

Dolly Varden are taken for subsistence use throughout the Bristol Bay region (Table 50). In 1973/74, for example, every surveyed community reported harvests of this freshwater fish. In the overall Nushagak River and Bay subregion, Dolly Varden harvests ranked fourth of the six species of resident fish on the 1974 survey (Table 45). However, Dolly Varden were relatively more important in the communities in the western portion of this subregion, such as Aleknagik and Manokotak. This was true in the 1980s as well (Table 50). Although quantified harvest data for Togiak and Twin Hills for the 1970s and 1980s are not available,<sup>2</sup> it has been reported that Dolly Varden harvests by these communities in the Togiak River system are substantial, and may approach those of salmon (Behnke 1980a).

Evidently, Dolly Varden harvests are generally higher in the Iliamna Lake subregion than in communities of the Nushagak River. In 1973/74, harvests of this species totaled 3,711 fish, 17.9 percent of the subregion's total (the fourth highest, but virtually the same as grayling) (Table 45). In 1983, Dolly Varden ranked third after whitefish and grayling (Table 50). The 1973/74 and 1982/83 data suggest that Dolly Varden are especially important at Kokhanok and Pedro Bay. Total harvests of Dolly Varden were much lower in 1983 than in 1973 for some communities in this subregion, such as Newhalen and Iliamna. Harvests of 770 "unknown trout" at Iliamna and 400 at Newhalen may in part account for this apparent decline (Table 56). Estimated harvests of Dolly Varden in Newhalen in 1991/92 were very similar to those of 1973/74, and those at Iliamna were substantially higher than earlier estimates.

Dolly Varden are also a dominant species in reported freshwater fish harvests of the Alaska Peninsula communities of Egegik, Pilot Point, Ugashik, and Port Heiden. In 1973/74, they were harvested in every community and the harvest ranked second (after pike) overall (Table 45). Harvest data collected in the mid 1980s suggest that more Dolly Varden were harvested than any other non-salmon freshwater fish (Table 50).

Dolly Varden harvests are also very notable in the regional centers. In 1973/74, more Dolly Varden were harvested than any other non-salmon fish by Dillingham residents and they ranked third in the Bristol Bay Borough communities (Table 45). In 1984, Dolly Varden were again the most numerous species of freshwater fish in Dillingham harvests, and they ranked third again among sampled households in the Bristol Bay Borough, after rainbow trout and grayling (Table 50). More Dolly Varden were taken at south Naknek in 1992/93 than any other resident fish.

Methods of harvest for Dolly Varden include rod and reel in open water, jigging through the ice with hook and line, set nets, sweep seining with gill nets, and removal of incidental takes from commercial salmon harvests. At Togiak, sweep seining is most important, although residents also take Dolly Varden throughout the summer with rod and reel and with hook and line through the ice during the winter. Most

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<sup>2</sup> As noted earlier, a harvest survey of non-salmon fish was conducted in Togiak and Manokotak in 1995, and the findings will appear in a separate report.

Table 50. Use and Harvests of Dolly Varden by Bristol Bay Communities

Community	Study Year	Percentage of Households					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	73			37.5%			283	396	13.4	18.8	2.7	3.8
Aleknagik	89	92.1%	84.2%	81.6%	50.0%	63.2%	1,588	2,223	37.8	52.9	11.1	15.6
Clark's Point	73			18.2%			46	65	3.3	4.6	0.6	0.8
Clark's Point	89	41.2%	17.6%	17.6%	29.4%	5.9%	30	42	1.8	2.5	0.5	0.8
Dillingham	73			31.3%			3,243	4,540	14.2	19.9	3.3	4.6
Dillingham	84	37.3%	32.0%	29.4%	9.8%	7.2%	2,985	4,181	4.3	6.1	1.5	2.1
Egegik	73			30.0%			195	273	8.1	11.3	2.0	2.8
Egegik	84	24.0%	24.0%	24.0%	0.0%	8.0%	92	129	2.2	3.1	0.9	1.3
Ekwok	73			23.5%			27	38	1.3	1.8	0.3	0.4
Ekwok	87	51.7%	48.3%	44.8%	6.9%	3.6%	115	161	3.6	5.0	1.1	1.5
Igiugig	73			33.3%			273	383	34.2	47.8	7.1	9.9
Igiugig	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Igiugig	92	90.0%	90.0%	90.0%	0.0%	20.0%	120	168	10.0	14.0	2.6	3.6
Iliamna	73			33.3%			643	901	37.9	53.0	10.3	14.5
Iliamna	83		30.0%	30.0%	10.0%		94	131	2.6	3.6	0.7	0.9
Iliamna	91	73.9%	65.2%	65.2%	30.4%	39.1%	1,677	2,348	55.9	78.3	17.1	24.0
King Salmon	73			73.3%			588	823	12.5	17.5	2.9	4.1
King Salmon	83			44.2%			553	830	4.5	6.8	1.5	2.3
Kokhanok	73			100.0%			903	1,264	69.2	96.9	11.1	15.6
Kokhanok	83		68.4%	68.4%	26.3%		3,868	5,415	143.3	200.6	26.9	37.7
Kokhanok	92	52.8%	47.2%	47.2%	25.0%	16.7%	1,577	2,208	40.4	56.6	9.1	12.7
Koliganek	73			33.3%			147	205	7.3	10.3	1.3	1.8
Koliganek	87	42.9%	33.3%	33.3%	19.0%	17.5%	146	205	3.0	4.3	0.8	1.1
Levelock	73			18.8%			44	61	2.6	3.6	0.6	0.8
Levelock	88	40.7%	25.9%	25.9%	29.6%	22.2%	131	183	4.0	5.6	1.2	1.7
Levelock	92	13.3%	10.0%	10.0%	3.3%	3.3%	13	18	0.3	0.5	0.1	0.2
Manokotak	73			63.2%			1,022	1,430	27.4	38.4	4.7	6.5
Manokotak	85	87.0%	79.6%	72.2%	50.0%	40.7%	1,512	2,117	25.6	35.9	4.9	6.9
Naknek	73			25.0%			190	266	3.1	4.4	0.8	1.2
Naknek	83			21.2%			357	536	2.9	4.4	0.9	1.4
New Stuyahok	73			46.2%			306	428	9.9	13.8	1.6	2.2
New Stuyahok	87	35.0%	30.0%	27.5%	7.5%	13.5%	224	314	3.0	4.2	0.6	0.9
Newhalen	73			45.5%			1,130	1,583	70.9	99.3	15.6	21.8
Newhalen	83		27.3%	27.3%	0.0%		496	695	19.1	26.7	4.0	5.6
Newhalen	91	96.2%	96.2%	92.3%	30.8%	34.6%	1,318	1,845	41.2	57.7	8.4	11.7
Nondalton	73			23.1%			62	87	2.2	3.0	0.4	0.6
Nondalton	80			50.0%			250	350	7.1	10.0	1.5	2.1
Nondalton	81			63.0%			726	1,016	20.7	29.0	3.6	5.1
Nondalton	83		57.1%	57.1%	0.0%		2,394	3,352	44.3	62.1	8.5	12.0
Pedro Bay	73			75.0%			655	917	65.5	91.7	16.4	22.9
Pedro Bay	82		64.7%	64.7%	11.8%		941	1,318	44.8	62.8	15.2	21.3
Pilot Point	73			20.0%			19	27	1.5	2.1	0.4	0.5
Pilot Point	87	41.2%	41.2%	41.2%	0.0%	0.0%	58	82	3.2	4.5	0.9	1.3
Port Alsworth	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Port Heiden	73			10.0%			26	36	2.0	2.8	0.5	0.7
Port Heiden	87	75.7%	51.4%	48.6%	35.1%	29.7%	507	710	13.7	19.2	4.9	6.9
South Naknek	73			23.5%			74	103	2.9	4.1	0.6	0.8
South Naknek	83			19.0%			105	157	2.1	3.2	0.8	1.1
South Naknek	92	34.3%	31.4%	31.4%	5.7%	11.4%	228	319	5.4	7.6	1.7	2.4
Ugashik	73			60.0%			110	154	11.0	15.4	4.6	6.4
Ugashik	87	60.0%	60.0%	60.0%	0.0%	0.0%	9	13	1.8	2.5	0.9	1.3

<sup>1</sup> Data unavailable for blank cells. Sources: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Dolly Varden at Manokotak are taken with set nets, although jigging through the ice occurs as well. Nets, hook and line through the ice, and rod and reel were all used to take Dolly Varden by Nushagak River villages in 1987/88. In the Iliamna Lake subregion, harvests of Dolly Varden take place with set nets in open water as well hook and line fishing through the ice. In 1987/88, Levelock households harvested Dolly Varden in nets or with rod and reel in open water.

Dolly Varden are preserved and prepared in a number of ways in the Bristol Bay region. At Togiak, they are cut and dried on racks much like salmon. Note, however, that this method is only used with those Dolly Varden classified as *anerrluak* ("Togiak trout") Manokotak and Aleknagik residents eat Dolly Varden (*anerrluak*) fresh, or half dried (*egamaarrluk*) and smoked.

### Lake Trout

As just noted in the discussion of Dolly Varden, Bristol Bay residents sometimes classify Dolly Varden along with the closely related lake trout. People at Manokotak, Aleknagik, and Dillingham may sometimes call Dolly Varden "Togiak trout" or "lake trout" and list these separately from Dolly Varden. Since lake trout, as defined by biologists, do not occur in the Igushik or Wood river drainages, most reported harvests of "lake trout" Manokotak, Aleknagik, and, perhaps, Dillingham, are probably Dolly Varden.

Reported harvest of "lake trout" occurs throughout the region (Table 51). In 1973/74, the harvest was greatest in the Iliamna Lake subregion, where the estimated take of 1,769 was 8.5 percent of all freshwater fish (Table 45). In the Nushagak Bay and River subregions, "lake trout" (probably including "Togiak trout") were especially notable at New Stuyahok, Manokotak, and Aleknagik. Small numbers of lake trout were harvested by residents of most Alaska Peninsula communities in 1973/74 as well (Table 45).

More recent reported harvests have followed a similar pattern to that of 1973/74. For example, "lake trout/Togiak trout" were again important at Manokotak in 1985 when two thirds of the sampled households used this resource. The estimated harvest of 574 lake trout, about 80 percent of which was taken in nets, was the fourth largest freshwater fish harvest after pike, Dolly Varden, and whitefish (Table 51). Calendars and interviews documented only a small take of lake trout by Aleknagik residents in 1986, but this may have been due to residents classifying their catches as Dolly Varden. In 1988/89, Aleknagik residents harvested 588 "lake trout," second after pike among resident species.

As in the 1970s, lake trout harvests by Nushagak River villages in 1987/88 were lower than those reported for the 1980s for Manokotak. As shown in Table 51, estimated lake trout harvests totaled 11, 228, and 114 fish for Ekwok, New Stuyahok, and Koliganek respectively.

In 1983, all six surveyed communities in the Iliamna Lake subregion harvested some lake trout. Harvests were relatively large at Nondalton and at Pedro Bay, where lake trout was the most numerous freshwater fish in village catches (Table 36). Lake trout harvests at Igiugig, Iliamna, Newhalen, and

Table 51. Use and Harvests of Lake Trout by Bristol Bay Communities

Community	Study Year	Percentage of Households					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	73			37.5%			284	767	13.5	36.5	2.7	7.3
Aleknagik	89	31.6%	28.9%	26.3%	10.5%	21.1%	588	823	14.0	19.6	4.1	5.8
Clark's Point	73			0.0%			0	0	0.0	0.0	0.0	0.0
Clark's Point	89	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
Dillingham	73			12.5%			514	1,389	2.3	6.1	0.5	1.4
Dillingham	84	11.8%	7.2%	5.9%	4.6%	0.7%	275	746	0.4	1.1	0.1	0.4
Egegik	73			15.0%			12	33	0.5	1.4	0.1	0.3
Egegik	84	8.0%	8.0%	8.0%	0.0%	0.0%	13	19	0.3	0.4	0.1	0.2
Ekwok	73			0.0%			0	0	0.0	0.0	0.0	0.0
Ekwok	87	27.6%	20.7%	17.2%	10.3%	3.4%	11	30	0.3	0.9	0.1	0.3
Igiugig	73			0.0%			0	0	0.0	0.0	0.0	0.0
Igiugig	83		33.3%	33.3%	0.0%		183	495	16.6	45.0	2.6	7.1
Igiugig	92	60.0%	60.0%	60.0%	10.0%	0.0%	31	44	2.6	3.6	0.7	0.9
Iliamna	73			33.3%			8	20	0.4	1.2	0.1	0.3
Iliamna	83		5.0%	5.0%	0.0%		16	44	0.4	1.2	0.1	0.3
Iliamna	91	26.1%	30.4%	26.1%	4.3%	4.3%	104	146	3.5	4.9	1.1	1.5
King Salmon	73			13.3%			6	17	0.1	0.4	0.0	0.1
Kokhanok	73			55.6%			170	458	13.0	35.1	2.1	5.6
Kokhanok	83		5.3%	5.3%	0.0%		17	46	0.6	1.7	0.1	0.3
Kokhanok	92	22.2%	16.7%	16.7%	11.1%	5.6%	28	39	0.7	1.0	0.2	0.2
Koliganek	73			20.0%			37	101	1.9	5.0	0.3	0.9
Koliganek	87	40.5%	19.0%	16.7%	31.0%	7.7%	114	309	2.4	6.4	0.6	1.7
Levelock	73			0.0%			0	0	0.0	0.0	0.0	0.0
Levelock	88	25.9%	14.8%	14.8%	18.5%	14.8%	76	205	2.3	6.2	0.7	1.9
Levelock	92	3.3%	3.3%	3.3%	0.0%	3.3%	3	4	0.1	0.1	0.0	0.0
Manokotak	73			21.1%			422	1,138	11.3	30.6	1.9	5.2
Manokotak	85	64.8%	40.7%	29.6%	50.0%	31.5%	574	1,549	9.7	26.3	1.9	5.0
Naknek	73			1.8%			22	59	0.4	1.0	0.1	0.3
New Stuyahok	73			11.5%			510	1,376	16.5	44.4	2.6	7.1
New Stuyahok	87	22.5%	17.5%	17.5%	15.0%	7.5%	228	614	3.1	8.3	0.6	1.7
Newhalen	73			45.5%			268	724	16.8	45.4	3.7	10.0
Newhalen	83		36.4%	36.4%	0.0%		76	204	2.9	7.8	0.6	1.6
Newhalen	91	53.8%	50.0%	46.2%	19.2%	19.2%	111	155	3.5	4.8	0.7	1.0
Nondalton	73			61.5%			730	1,971	25.3	68.2	4.8	13.0
Nondalton	80			50.0%			830	2,240	23.7	64.0	5.0	13.4
Nondalton	81			58.0%			505	1,363	14.4	38.9	2.5	6.8
Nondalton	83		52.4%	47.6%	4.8%		2,335	6,304	43.2	116.7	8.3	22.5
Pedro Bay	73			75.0%			594	1,603	59.4	160.3	14.8	40.1
Pedro Bay	82		64.7%	64.7%	17.6%		966	2,608	46.0	124.2	15.6	42.2
Pilot Point	73			10.0%			13	35	1.0	2.7	0.3	0.7
Pilot Point	87	17.6%	23.5%	17.6%	0.0%	0.0%	12	32	0.7	1.8	0.2	0.5
Port Alsworth	83		53.8%	46.2%	7.7%		162	436	7.7	20.8	2.1	5.7
Port Heiden	73			10.0%			26	70	2.0	5.4	0.5	1.3
Port Heiden	87	10.8%	8.1%	8.1%	2.7%	8.1%	94	254	2.5	6.9	0.9	2.5
South Naknek	73			0.0%			0	0	0.0	0.0	0.0	0.0
South Naknek	92	2.9%	2.9%	2.9%	2.9%	2.9%	120	168	2.9	4.0	0.9	1.3
Ugashik	73			40.0%			66	178	6.6	17.8	2.8	7.4
Ugashik	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> Data unavailable for blank cells. Sources: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Levelock, and Kokhanok in study years in the early 1990s were relatively low (about 100 fish or less). Also, lake trout harvests by Alaska Peninsula communities in the 1980s were similar in scale to those of 1973/74 (Table 51).

Harvest methods for lake trout are generally much like those used for Dolly Varden. At Manokotak, for example, this resource is caught in the spring and fall in nets that are targeting Dolly Varden, pike, and whitefish. At Nondalton, harvest methods include set nets, seining, and hook and line through the ice.

#### Longnose Sucker

It is likely that in the past most Bristol Bay communities harvested longnose suckers where they were available. Harvest surveys documented sometimes substantial harvests of this species by the communities of the Nushagak River drainage in 1986/87, and in some villages in the Iliamna Lake area (such as Nondalton in 1983 and Iliamna in 1991/92) (Table 52). There are no reported harvests for Alaska Peninsula communities. Most harvests of longnose suckers in the Bristol Bay region occur with nets, and use of this species for dog food is common.

#### Northern Pike

Northern pike are harvested for subsistence use throughout the Bristol Bay region, and are usually one of the most numerous non-salmon freshwater fish taken (Table 45, Table 53). The largest harvests occur in the Nushagak River area and Manokotak. In 1973/74, pike was the third most numerous species, after whitefish and grayling, making up 22.6 percent of the freshwater fish catch in this subregion (Table 45). More pike were taken in Manokotak than any other freshwater fish, and pike was second to grayling in New Stuyahok. Although all seven Iliamna Lake region communities surveyed in 1973/74 harvested some pike, these harvests were generally lower than those of the Nushagak communities, and made up 6.5 percent of the overall harvest, the lowest percentage of the six resident species for which comprehensive data are available. Pike harvests in the Alaska Peninsula communities in 1973/74 were lower than those of Nushagak or Iliamna Lake, although every community but Port Heiden reported some harvest, and more pike were taken in the subregion overall than any of the other five resident species. More pike were taken than any other non-salmon resident freshwater fish in Egegik in 1973/74 (Table 45).

For the 1980s, the significance of northern pike continued in the Nushagak area communities. More Manokotak households used and harvested pike than any other freshwater fish in 1985, and pike was the most numerous non-salmon species in this community's subsistence harvests that year (Table 12). As reported in catch calendars and during interviews, pike harvests were second to those of whitefish at Ekwok and second to grayling at Koliganek in 1986. In 1987/88, pike were second to whitefish in the freshwater fish harvests of Ekwok households, but, as measured in pounds edible weight, pike contributed more food than any other resource in this category (Table 22). The 1,867 pike harvested by New Stuyahok residents placed this species third among freshwater fish. Again, consistent with Ekwok,

Table 52. Use and Harvests of Longnose Suckers, Bristol Bay Communities

Community	Study Year <sup>1</sup>	Percentage of Households <sup>2</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	89	2.6%	2.6%	2.6%	2.6%	0.0%	28	42	0.7	1.0	0.2	0.3
Clark's Point	89	5.9%	5.9%	5.9%	0.0%	5.9%	5	7	0.3	0.4	0.1	0.1
Ekwok	87	34.5%	27.6%	27.6%	13.8%	6.9%	861	1,291	26.9	40.3	8.0	12.1
Igiugig	73			16.7%			133	200	16.7	25.0	3.4	5.2
Igiugig	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Igiugig	92	40.0%	40.0%	40.0%	0.0%	10.0%	216	324	18.0	27.0	4.6	6.9
Iliamna	83		10.0%	10.0%	0.0%		144	216	4.0	6.0	1.0	1.5
Iliamna	91	13.0%	13.0%	13.0%	0.0%	4.3%	863	1,295	28.8	43.2	8.8	13.2
Kokhanok	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Kokhanok	92	2.8%	2.8%	2.8%	0.0%	2.8%	7	10	0.2	0.3	0.0	0.1
Koliganek	73			6.7%			141	212	7.1	10.6	1.2	1.9
Koliganek	87	42.9%	28.6%	28.6%	21.4%	17.1%	2,446	3,669	51.0	76.4	13.1	19.7
Levelock	88	18.5%	7.4%	7.4%	14.8%	18.5%	98	147	3.0	4.4	0.9	1.4
Levelock	92	6.7%	6.7%	6.7%	3.3%	6.7%	130	195	3.3	5.0	1.2	1.8
New Stuyahok	87	47.5%	40.0%	40.0%	15.0%	22.5%	1,006	1,510	13.6	20.4	2.8	4.3
Newhalen	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Newhalen	91	11.5%	11.5%	11.5%	3.8%	7.7%	151	227	4.7	7.1	1.0	1.4
Nondalton	83		28.6%	28.6%	0.0%		1,769	2,654	32.8	49.1	6.3	9.5
Pedro Bay	82		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Port Alsworth	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
South Naknek	92	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> It appears that harvest data for suckers were not collected systematically for 1973. Harvests were recorded for Igiugig and Koliganek only.

<sup>2</sup> Data unavailable for blank cells. Sources: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 53. Use and Harvests of Northern Pike, Bristol Bay Communities

Community	Study Year	Percentage of Households <sup>1</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	73			43.8%			318	892	15.1	42.4	3.0	8.5
Aleknagik	89	76.3%	55.3%	52.6%	39.5%	42.1%	997	2,791	23.7	66.5	7.0	19.6
Clark's Point	73			18.2%			103	287	7.3	20.4	1.3	3.7
Clark's Point	89	41.2%	29.4%	29.4%	23.5%	29.4%	86	241	5.1	14.2	1.5	4.3
Dillingham	73			31.3%			1,336	3,740	5.8	16.4	1.4	3.8
Dillingham	84	25.5%	19.0%	17.0%	7.8%	5.9%	799	2,239	1.2	3.2	0.4	1.1
Egegik	73			10.0%			182	509	7.6	21.1	1.8	5.2
Ekwok	73			41.2%			665	1,863	31.7	88.8	6.5	18.2
Ekwok	87	65.5%	55.2%	51.7%	17.2%	24.1%	1,233	3,451	38.5	107.9	11.5	32.2
Igiugig	73			66.7%			427	1,195	53.3	149.3	11.0	30.9
Igiugig	83		100.0%	100.0%	0.0%		341	955	31.0	86.8	4.9	13.7
Igiugig	92	80.0%	60.0%	60.0%	20.0%	40.0%	293	820	24.4	68.3	6.3	17.5
Iliamna	73			33.3%			30	85	1.8	5.0	0.5	1.4
Iliamna	83		30.0%	30.0%	5.0%		140	393	3.9	10.9	1.0	2.8
Iliamna	91	21.7%	26.1%	21.7%	0.0%	8.7%	120	336	4.0	11.2	1.2	3.4
King Salmon	73			20.0%			131	368	2.8	7.8	0.7	1.8
King Salmon	83			14.0%			136	382	1.1	3.1	0.4	1.0
Kokhanok	73			55.6%			120	337	9.2	25.8	1.5	4.2
Kokhanok	83		47.4%	47.4%	5.3%		625	1,751	23.1	64.8	4.4	12.2
Kokhanok	92	41.7%	38.9%	33.3%	22.2%	13.9%	217	607	5.6	15.6	1.3	3.5
Koliganek	73			60.0%			860	2,408	43.0	120.4	7.6	21.2
Koliganek	87	88.1%	71.4%	71.4%	38.1%	48.7%	2,757	7,718	57.4	160.8	14.8	41.4
Levelock	73			62.5%			268	751	15.8	44.1	3.4	9.5
Levelock	88	44.4%	33.3%	33.3%	40.7%	37.0%	636	1,780	19.3	53.9	5.8	16.4
Levelock	92	36.7%	26.7%	26.7%	33.3%	26.7%	640	1,791	16.4	45.9	5.8	16.2
Manokotak	73			89.5%			1,653	4,628	44.4	124.2	7.5	21.1
Manokotak	85	90.7%	81.5%	75.9%	40.7%	44.4%	1,768	4,950	30.0	83.9	5.7	16.1
Naknek	73			12.5%			54	152	0.9	2.5	0.2	0.7
Naknek	83			9.6%			140	391	1.1	3.2	0.4	1.0
New Stuyahok	73			76.9%			2,760	7,727	89.2	249.6	14.2	39.8
New Stuyahok	87	87.5%	72.5%	72.5%	45.0%	38.5%	1,867	5,227	25.2	70.6	5.3	14.8
Newhalen	73			45.5%			232	649	14.5	40.7	3.2	9.0
Newhalen	83		9.1%	9.1%	0.0%		17	46	0.7	1.8	0.1	0.4
Newhalen	91	46.2%	46.2%	46.2%	3.8%	15.4%	345	965	10.8	30.2	2.2	6.1
Nondalton	73			30.8%			281	787	9.7	27.2	1.9	5.2
Nondalton	80			35.0%			63	175	1.8	5.0	0.4	1.0
Nondalton	81			26.0%			175	490	5.0	14.0	0.9	2.5
Nondalton	83		52.4%	52.4%	4.8%		1,386	3,881	25.7	71.9	4.9	13.9
Pedro Bay	73			12.5%			3	7	0.3	0.7	0.1	0.2
Pedro Bay	82		17.6%	17.6%	0.0%		19	52	0.9	2.5	0.3	0.8
Pilot Point	73			20.0%			71	200	5.5	15.4	1.4	3.9
Pilot Point	87	29.4%	70.6%	23.5%	5.9%	5.9%	20	56	1.1	3.1	0.3	0.9
Port Alsworth	83		7.7%	7.7%	0.0%		19	54	0.9	2.6	0.3	0.7
Port Heiden	73			0.0%			0	0	0.0	0.0	0.0	0.0
Port Heiden	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
South Naknek	73			11.8%			24	66	0.9	2.6	0.2	0.5
South Naknek	83			9.5%			26	72	0.5	1.5	0.2	0.5
South Naknek	92	8.6%	0.0%	0.0%	8.6%	5.7%	0	0	0.0	0.0	0.0	0.0
Ugashik	73			60.0%			80	224	8.0	22.4	3.3	9.3
Ugashik	87	20.0%	40.0%	20.0%	0.0%	0.0%	8	22	1.6	4.5	0.8	2.2

<sup>1</sup> Data unavailable for blank cells. Sources: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

pike ranked first in pounds per household harvested (Table 23). The pattern was the same at Koliganek (Table 27) where pike ranked first in pounds per household harvested and second (to whitefish) in harvest numbers.

All seven communities included in the 1984 survey in the Iliamna Lake subregion reported harvests of pike for 1983, but these harvests were quite small at Newhalen, Pedro Bay, and Port Alsworth. Pike harvest were highest at Nondalton (1,386) and Kokhanok (625). Levelock households took an average of 53.9 pounds of pike in 1987/88, very similar to the 44.1 pounds per household average in 1973/74, and the 45.9 pounds per household average in 1992/93. Pike harvests at Newhalen in 1991/92 (345 fish) were higher than either 1973/74 or 1983, while the harvest at Iliamna (120 fish) remained much like that of 1983 (Table 53).

Harvest methods for pike include both nets and hook and line through the ice, depending upon the season of the year and water conditions. In 1985, for example, 64 percent of the pike harvest at Manokotak taken with nets or with hook and line (Table 12). In 1986, most of Ekwok's pike harvest occurred with nets, while in the same year, Koliganek residents took the most with hook and line. In 1987/88, most pike were taken with nets at Ekwok and New Stuyahok while, again, Koliganek residents took slightly more through the ice with hook and line than with nets. (See the community chapters and Schichnes and Chythlook [1991] for more discussion of harvests by gear type.) Subsistence nets accounted for most of the pike harvest at Levelock in 1987/88.

In a number of communities (e.g. Manokotak, Aleknagik, Ekwok) dried pike are an important food during spring and summer commercial salmon fishing. Pike heads are considered a delicacy by many residents of the region.

### Rainbow Trout

Historically and into the 1980s, residents of most Bristol Bay communities have harvested rainbow trout for food. The largest rainbow trout harvests have occurred in the Iliamna Lake subregion and the regional centers. In 1973/74, rainbow trout were the second most numerous freshwater species in the reported harvests of Iliamna lake subregion communities (after whitefish). Harvests were highest at Newhalen and Igiugig. In 1983, reported harvests of rainbow trout declined, and were fourth highest after whitefish, grayling, and Dolly Varden. Kokhanok and Nondalton reported the largest harvests, but those of Igiugig and Newhalen declined substantially compared with 10 years earlier. As discussed earlier, both Iliamna and Newhalen in 1983 reported substantial harvests of "unknown trout" (Table 56) which very likely included rainbow trout. Substantial rainbow trout harvests occurred in 1991/92 at Iliamna (1,312 fish) and Newhalen (1,163 fish) and in 1992/93 at Kokhanok (1,937 fish) and Igiugig (709 fish). There was also a substantial harvest of "unknown trout" at Kokhanok in 1992/93 that probably included some rainbow trout as well as Dolly Varden and lake trout, but few "unknown trout" were reported by residents in the other Iliamna Lake communities during harvest surveys in the 1990s. Harvests of rainbow trout were

lower at Levelock in 1987/88 (11.9 pounds per household) and in 1992/93 (14.2 pounds per household) than in 1973/74 (31.6 pounds per household) (Table 54).

Rainbow trout make up a lower percentage of the harvest of freshwater fish in the Nushagak River subregion, where in 1973/74 this species ranked fifth out of six kinds of resident fish for which systematic data were collected (4.6 percent of the total resident fish taken) (Table 45). In 1986, very few rainbow trout appear in the reported harvests of Ekwok and Koliganek fishermen. Rainbow trout harvests, as measured in pounds per household were quite similar at Ekwok and Koliganek in 1987/88 as compared with 1973/74, but were much lower at New Stuyahok (Table 54).

Rainbow trout fishing is important in the regional centers. For example, in 1973/74, Naknek households took more rainbow trout than any other freshwater fish (Table 38). In 1983, 51 percent of the sampled households in the Bristol Bay Borough harvested rainbow trout, almost all in open water with rod and reel gear (Morris 1985:109). The estimated combined take of 3,203 rainbow trout was the highest of the four resident species for which data were collected. In Dillingham in 1984, rainbow trout ranked second after Dolly Varden in total harvests (Table 28).

As noted earlier, much of the rainbow trout harvest in the small communities of the region occurs while people are targeting other species. In 1985, for example, the rainbow trout taken by Manokotak residents were mostly harvested in nets set for whitefish or pike. At Igiugig, some rainbow trout are taken in nets used to harvest whitefish. Rainbow trout are also taken through the ice (such as at Iliamna), but again, it is likely that the target species are grayling, pike, or Dolly Varden.

Rainbow trout taken by these methods are used by households in a fashion similar to other freshwater fish in some communities. Much of the rainbow trout harvest is eaten fresh. Some rainbow trout are also dried (as for example, at Igiugig).

### Smelt

Smelt are an important subsistence resource throughout the Bristol Bay region, and are harvested in substantial quantities by residents of coastal communities. Harvests are shared with residents of the more inland villages who do not have access to smelt fishing near their homes. Most smelt are harvested in the winter months by jigging through the ice, but some are dip netted in open water in late fall before freeze-up. Smelt are dried, smoked, and eaten fresh. Harvest estimates for smelt are reported in Table 55.

### Whitefish

Several kinds of whitefish are harvested in the Bristol Bay region, with round whitefish probably the most common in the western drainages. Other types include broad whitefish, humpback whitefish (in the Iliamna Lake area), and least cisco. Probably more whitefish (as estimated in numbers of fish) are taken for subsistence use in the Bristol Bay region than any other kind of resident non-salmon freshwater fish

Table 54. Use and Harvests of Rainbow Trout, Bristol Bay Communities<sup>1</sup>

Community	Study Year	Percentage of Households <sup>2</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	73			12.5%			53	74	2.5	3.5	0.5	0.7
Aleknagik	89	36.8%	31.6%	28.9%	7.9%	13.2%	95	133	2.3	3.2	0.7	0.9
Clark's Point	73			0.0%			0	0	0.0	0.0	0.0	0.0
Clark's Point	89	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
Dillingham	73			28.1%			1,121	1,570	4.9	6.9	1.1	1.6
Dillingham	84	39.2%	29.4%	27.5%	9.8%	5.2%	1,897	2,653	2.7	3.8	0.9	1.3
Egegik	73			15.0%			57	79	2.4	3.3	0.6	0.8
Egegik	84	32.0%	32.0%	32.0%	4.0%	16.0%	94	141	2.2	3.4	1.0	1.5
Ekwok	73			52.9%			133	187	6.4	8.9	1.3	1.8
Ekwok	87	58.6%	58.6%	51.7%	10.3%	10.3%	205	287	6.4	9.0	1.9	2.7
Igiugig	73			83.3%			1,115	1,561	139.3	195.1	28.8	40.4
Igiugig	83		100.0%	100.0%	0.0%		293	411	26.6	37.3	4.2	5.9
Igiugig	92	100.0%	100.0%	100.0%	20.0%	70.0%	709	993	59.1	82.7	15.2	21.2
Iliamna	73			44.4%			64	90	3.8	5.3	1.0	1.4
Iliamna	83		35.0%	35.0%	10.0%		139	194	3.9	5.4	1.0	1.4
Iliamna	91	73.9%	65.2%	65.2%	34.8%	26.1%	1,312	1,837	43.7	61.2	13.4	18.8
King Salmon	73			73.3%			894	1,251	19.1	26.7	4.5	6.3
King Salmon	83			60.5%			1,680	2,519	13.8	20.6	4.6	6.8
Kokhanok	73			55.6%			638	893	48.9	68.4	7.9	11.0
Kokhanok	83		47.4%	47.4%	15.8%		1,538	2,153	57.0	79.7	10.7	15.0
Kokhanok	92	61.1%	50.0%	50.0%	44.4%	33.3%	1,937	2,712	49.7	69.5	11.2	15.6
Koliganek	73			53.3%			175	245	8.7	12.2	1.5	2.2
Koliganek	87	59.5%	52.4%	52.4%	19.0%	17.9%	435	610	9.1	12.7	2.3	3.3
Levelock	73			81.3%			384	538	22.6	31.6	4.9	6.8
Levelock	88	66.7%	44.4%	44.4%	51.9%	40.7%	280	392	8.5	11.9	2.6	3.6
Levelock	92	60.0%	53.3%	50.0%	43.3%	40.0%	395	553	10.1	14.2	3.6	5.0
Manokotak	73			36.8%			290	406	7.8	10.9	1.3	1.9
Manokotak	85	53.7%	48.1%	35.2%	22.2%	22.2%	194	272	3.3	4.6	0.6	0.9
Naknek	73			44.6%			402	563	6.6	9.3	1.7	2.4
Naknek	83			55.8%			1,318	1,977	10.7	16.1	3.4	5.2
New Stuyahok	73			38.5%			655	917	21.2	29.6	3.4	4.7
New Stuyahok	87	37.5%	37.5%	37.5%	15.0%	17.5%	389	544	5.3	7.3	1.1	1.5
Newhalen	73			27.3%			1,536	2,151	96.4	134.9	21.2	29.7
Newhalen	83		36.4%	36.4%	0.0%		227	318	8.7	12.2	1.8	2.5
Newhalen	91	88.5%	88.5%	84.6%	30.8%	38.5%	1,163	1,628	36.4	50.9	7.4	10.3
Nondalton	73			26.9%			273	383	9.5	13.2	1.8	2.5
Nondalton	80			43.0%			225	315	6.4	9.0	1.3	1.9
Nondalton	81			63.0%			525	735	15.0	21.0	2.6	3.7
Nondalton	83		66.7%	66.7%	0.0%		3,613	5,058	66.9	93.7	12.9	18.0
Pedro Bay	73			37.5%			51	72	5.1	7.2	1.3	1.8
Pedro Bay	82		52.9%	47.1%	5.9%		179	251	8.5	11.9	2.9	4.1
Pilot Point	73			20.0%			29	40	2.2	3.1	0.6	0.8
Pilot Point	87	11.8%	23.5%	11.8%	0.0%	0.0%	12	16	0.7	0.9	0.2	0.3
Port Aisworth	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Port Heiden	73			0.0%			0	0	0.0	0.0	0.0	0.0
Port Heiden	87	2.7%	0.0%	0.0%	2.7%	0.0%	0	0	0.0	0.0	0.0	0.0
South Naknek	73			17.6%			34	47	1.4	1.9	0.3	0.4
South Naknek	83			23.8%			205	308	4.2	6.3	1.5	2.2
South Naknek	92	25.7%	25.7%	22.9%	8.6%	11.4%	172	240	4.1	5.7	1.3	1.8
Ugashik	73			20.0%			20	28	2.0	2.8	0.8	1.2
Ugashik	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> Includes steelhead; harvest data for steelhead collected separately only for Egegik 1984 (2 steelhead, 92 rainbow trout).<sup>2</sup> Data unavailable for blank cells. Sources: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

Table 55. Use and Harvests of Smelt, Bristol Bay Communities

Community	Study Year	Percentage of Households <sup>1</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers <sup>2</sup>	Pounds	Numbers <sup>2</sup>	Pounds	Numbers <sup>2</sup>	Pounds
Aleknagik	73			12.5%			118	30	5.6	1.4	1.1	0.3
Aleknagik	89	60.5%	23.7%	18.4%	42.4%	28.9%	104 g	627	2.5 g	14.9	0.7 g	4.4
Clark's Point	73			81.8%			7,731	1,933	548.2	137.0	100.5	25.1
Clark's Point	89	94.1%	76.5%	76.5%	52.9%	70.6%	178 g	1,068	10.5 g	62.8	3.2 g	19.1
Dillingham	73			46.9%			54,429	13,607	238.1	59.5	55.6	13.9
Dillingham	84	37.3%	22.2%	21.6%	22.2%	12.4%	275 b	8,264	0.4 b	12.0	0.1 b	4.1
Egegik	73			75.0%			3,033	758	125.9	31.5	30.7	7.7
Egegik	84	52.0%	44.0%	44.0%	16.0%	36.0%	4,014	522	95.6	12.4	41.2	5.4
Ekwok	73			5.9%			1,235	309	58.8	14.7	12.0	3.0
Ekwok	87	51.7%	6.9%	6.9%	48.3%	10.3%	4 g	27	0.1 g	0.8	0.0 g	0.3
Igiugig	73			0.0%			0	0	0.0	0.0	0.0	0.0
Igiugig	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Igiugig	92	40.0%	10.0%	10.0%	40.0%	10.0%	12 g	72	1.0 g	6.0	0.3 g	1.5
Iliamna	73			0.0%			0	0	0.0	0.0	0.0	0.0
Iliamna	83		0.0%	0.0%	5.0%		0	0	0.0	0.0	0.0	0.0
Iliamna	91	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0
King Salmon	73			80.0%			12,750	3,188	272.0	68.0	63.8	15.9
King Salmon	83			34.9%			5,822	1,455	47.7	11.9	15.8	3.9
Kokhanok	73			0.0%			0	0	0.0	0.0	0.0	0.0
Kokhanok	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Kokhanok	92	25.0%	13.9%	13.9%	11.1%	13.9%	246 g	1,474	6.3 g	37.8	1.4 g	8.5
Koliganek	73			0.0%			0	0	0.0	0.0	0.0	0.0
Koliganek	87	38.1%	7.1%	7.1%	33.3%	10.0%	21 g	123	0.4 g	2.6	0.1 g	0.7
Levelock	73			18.8%			4,343	1,086	255.1	63.8	55.2	13.8
Levelock	88	77.8%	51.9%	51.9%	70.4%	48.1%	95 g	570	2.9 g	17.3	0.9 g	5.2
Levelock	92	73.3%	66.7%	66.7%	43.3%	63.3%	251 g	1,508	6.4 g	38.7	2.3 g	13.7
Manokotak	73			78.9%			13,412	3,353	360.0	90.0	61.1	15.3
Manokotak	85	83.3%	50.0%	50.0%	51.9%	33.3%	142 b	4,253	2.4 b	72.1	0.5 b	13.8
Naknek	73			55.4%			8,550	2,138	140.5	35.1	37.1	9.3
Naknek	83			53.8%			14,334	3,583	116.5	29.1	37.4	9.4
New Stuyahok	73			3.8%			48	12	1.5	0.4	0.2	0.1
New Stuyahok	87	60.0%	7.5%	5.0%	57.5%	12.8%	17 g	100	0.2 g	1.4	0.0 g	0.3
Newhalen	73			0.0%			0	0	0.0	0.0	0.0	0.0
Newhalen	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Newhalen	91	11.5%	0.0%	0.0%	11.5%	0.0%	0	0	0.0	0.0	0.0	0.0
Nondalton	73			0.0%			0	0	0.0	0.0	0.0	0.0
Nondalton	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Pedro Bay	73			0.0%			0	0	0.0	0.0	0.0	0.0
Pedro Bay	82		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Pilot Point	73			60.0%			1,364	341	105.0	26.3	26.3	6.6
Pilot Point	87	76.5%	70.6%	64.7%	23.5%	47.1%	2,045	511	113.6	28.4	31.7	7.9
Port Atsworth	83		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Port Heiden	73			20.0%			312	78	24.0	6.0	5.7	1.4
Port Heiden	87	48.6%	2.7%	2.7%	45.9%	8.1%	50	13	1.4	0.3	0.5	0.1
South Naknek	73			41.2%			1,853	463	74.1	18.5	14.5	3.6
South Naknek	83			85.7%			6,984	1,746	142.5	35.6	50.7	12.7
South Naknek	92	62.9%	60.0%	57.1%	37.1%	31.4%	226 g	1,354	5.4 g	32.2	1.7 g	10.1
Ugashik	73			100.0%			3,424	856	342.4	85.6	142.7	35.7
Ugashik	87	60.0%	60.0%	60.0%	0.0%	40.0%	1,300	325	260.0	65.0	130.0	32.5

<sup>1</sup> Data are unavailable for blank cells. Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995

<sup>2</sup> In numbers of fish unless otherwise noted. g = gallons b = five gallon buckets

Table 56. Use and Harvests of "Unknown Trout," Bristol Bay Communities<sup>1</sup>

Community	Study Year	Percentage of Households <sup>2</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Igiugig	92	10.0%	10.0%	10.0%	0.0%	10.0%	24	34	2.0	2.8	0.5	0.7
Iliamna	83		20.0%	20.0%	0.0%		1,386	2,495	38.5	69.3	9.9	17.8
Iliamna	91	4.3%	4.3%	4.3%	0.0%	0.0%	130	183	4.3	6.1	1.3	1.9
Kokhanok	92	30.6%	30.6%	30.6%	13.9%	19.4%	1,961	2,745	50.3	70.4	11.3	15.8
Levelock	92	16.7%	13.3%	13.3%	3.3%	6.7%	48	67	1.2	1.7	0.4	0.6
Newhalen	83		9.1%	9.1%	0.0%		945	1,702	36.3	65.4	7.5	13.6
Newhalen	91	7.7%	7.7%	7.7%	3.8%	0.0%	148	207	4.6	6.5	0.9	1.3
Nondalton	83		4.8%	4.8%	0.0%		257	463	4.8	8.6	0.9	1.6
South Naknek	92	11.4%	11.4%	8.6%	8.6%	2.9%	17	24	0.4	0.6	0.1	0.2

<sup>1</sup> "Unknown trout" includes non-salmon fish which respondents did not identify more specifically. This category probably includes harvests of rainbow trout, lake trout, and Dolly Varden/Arctic char.

<sup>2</sup> Data unavailable for blank cells. Source: Scott et al. 1995

(with the possible exception of grayling) (Table 45). In 1973/74, whitefish was the most numerous resident freshwater fish harvested in the Nushagak Bay and River area (8,371 fish; 29.7 percent of all resident freshwater species) and the Iliamna Lake area (5,983 fish; 28.8 percent of all resident freshwater species). Only in Alaska Peninsula communities, where whitefish were fourth, and in Dillingham (third after grayling and Dolly Varden) did whitefish not play as significant a role. Whitefish topped the freshwater fish harvests in five communities in 1973/74: Aleknagik, Ekwok, Igiugig, Kokhanok, and Levelock. They were second in Clarks Point, Koliganek, Manokotak, Nondalton, Egegik, and South Naknek (Table 45).

Similar patterns have been documented through harvest surveys in the 1980s and 1990s. For example, in 1983, more whitefish were taken than any other type of freshwater fish by households in the Iliamna region. Substantial whitefish harvests took place in 1992/93 at Kokhanok (7,280 fish) and Igiugig (956 fish). Harvests of whitefish at Levelock in 1987/88 (65.9 pounds per household) and 1992/93 (49.5 pounds per household) were similar to those of 1973/74 (71.5 pounds). In Manokotak in 1985, the total harvest of whitefish of 1,109 was third after pike and Dolly Varden. As estimated in pounds per household, however, whitefish harvests were half of those of 1973/74. (An undercount of whitefish may have occurred in Manokotak in 1985, because the Yup'ik name for least cisco was not used in addition to that of round whitefish during the harvest survey.) Harvest calendars and interviews pertaining to 1986 suggest that whitefish was the most numerous freshwater fish in Ekwok's harvests that year. In the three Nushagak River villages of Ekwok, New Stuyahok, and Koliganek in 1987/88, average household harvests were 43.0 pounds, 27.2 pounds, and 60.0 pounds respectively. These averages were all lower than those for 1973/74 (Table 57).

Additionally, harvest surveys conducted in the Alaska Peninsula communities in the 1980s confirm the 1973/74 finding of much lower harvest and use of whitefish than in the Bristol Bay communities to the northwest (Table 57). No harvests of whitefish occurred at Pilot Point, Port Heiden, or Ugashik. Data were not collected for this species for the Bristol Bay Borough communities for 1983. In 1992/93, residents of South Naknek harvested 12 whitefish (Table 57).

Most whitefish harvests in the Bristol Bay region occur right before freeze-up and right after break-up, when nets are set near stream mouths and lake outlets (e.g. Aleknagik, Ekwok, Koliganek). Sweep seining also occurs (e.g. Igiugig). Whitefish are preserved in a variety of ways, including freezing and drying for use during summer commercial salmon fishing.

## CONCLUSIONS

This overview documents that non-salmon freshwater fish have long been used for food throughout the Bristol Bay region. In all of the region's communities, households continued to harvest and use freshwater fish in the 1970s, 1980s, and 1990s. Smelt are harvested in substantial numbers in the coastal

Table 57. Use and Harvests of Whitefish, Bristol Bay Communities

Community <sup>2</sup>	Study Year	Percentage of Households <sup>1</sup>					Total Estimated Harvests		Harvests per HH		Harvests per Capita	
		Use	Attempt	Harvest	Receive	Give	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds
Aleknagik	73			62.5%			576	576	27.4	27.4	5.5	5.5
Aleknagik	89	47.4%	26.3%	21.1%	34.2%	28.9%	155	155	3.7	3.7	1.1	1.1
Clark's Point	73			9.1%			67	67	4.7	4.7	0.9	0.9
Clark's Point	89	17.6%	5.9%	5.9%	17.6%	17.6%	32	41	1.9	2.4	0.6	0.7
Dillingham	73			25.0%			1,393	1,393	6.1	6.1	1.4	1.4
Dillingham	84	13.7%	7.8%	5.9%	8.5%	2.0%	596	594	0.9	0.9	0.3	0.3
Egegik	73			20.0%			153	153	6.4	6.4	1.5	1.5
Egegik	84	4.0%	4.0%	4.0%	0.0%	4.0%	8	8	0.2	0.2	0.1	0.1
Ekwok	73			64.7%			3,204	3,204	152.6	152.6	31.3	31.3
Ekwok	87	62.1%	58.6%	55.2%	27.6%	20.7%	1,376	1,376	43.0	43.0	12.9	12.9
Igiugig	73			83.3%			1,480	1,480	185.0	185.0	38.3	38.3
Igiugig	83		100.0%	100.0%	0.0%		2,457	2,457	223.4	223.3	35.3	35.3
Igiugig	92	90.0%	70.0%	70.0%	30.0%	60.0%	956	1,667	79.7	139.0	20.4	35.6
Iliamna	73			22.2%			53	53	3.1	3.1	0.8	0.8
Iliamna	83		15.0%	15.0%	10.0%		160	160	4.4	4.4	1.1	1.1
Iliamna	91	43.5%	26.1%	26.1%	34.8%	13.0%	166	166	5.5	5.5	1.7	1.7
King Salmon	73			0.0%			0	0	0.0	0.0	0.0	0.0
Kokhanok	73			33.3%			1,596	1,596	122.3	122.3	19.7	19.7
Kokhanok	83		57.9%	57.9%	26.3%		4,611	4,611	170.8	170.8	32.1	32.1
Kokhanok	92	66.7%	41.7%	41.7%	52.8%	36.1%	7,280	7,778	186.7	199.4	42.0	44.9
Koliganek	73			60.0%			1,527	1,527	76.3	76.3	13.5	13.5
Koliganek	87	83.3%	57.1%	57.1%	45.2%	37.8%	2,881	2,881	60.0	60.0	15.5	15.5
Levelock	73			75.0%			1,217	1,217	71.5	71.5	15.5	15.5
Levelock	88	74.1%	33.3%	33.3%	74.1%	40.7%	2,176	2,176	65.9	65.9	20.0	20.0
Levelock	92	66.7%	23.3%	23.3%	66.7%	33.3%	1,162	1,929	29.8	49.5	10.5	17.5
Manokotak	73			68.4%			1,516	1,516	40.7	40.7	6.9	6.9
Manokotak	85	64.8%	50.0%	38.9%	48.1%	40.7%	1,109	1,109	18.8	18.8	3.6	3.6
Naknek	73			12.5%			92	92	1.5	1.5	0.4	0.4
New Stuyahok	73			73.1%			1,482	1,482	47.9	47.9	7.6	7.6
New Stuyahok	87	77.5%	67.5%	67.5%	47.5%	42.1%	2,017	2,017	27.3	27.3	5.7	5.7
Newhalen	73			27.3%			30	30	1.9	1.9	0.4	0.4
Newhalen	83		36.4%	27.3%	9.1%		343	343	13.2	13.2	2.7	2.7
Newhalen	91	65.4%	46.2%	42.3%	53.8%	19.2%	354	423	11.1	13.2	2.2	2.7
Nondalton	73			53.8%			1,607	1,607	55.6	55.6	10.6	10.6
Nondalton	80			50.0%			630	630	18.0	18.0	3.8	3.8
Nondalton	81			63.0%			1,260	1,260	36.0	36.0	6.3	6.3
Nondalton	83		81.0%	76.2%	23.8%		14,400	14,385	266.7	266.4	51.4	51.3
Pedro Bay	73			0.0%			0	0	0.0	0.0	0.0	0.0
Pedro Bay	82		0.0%	0.0%	0.0%		0	0	0.0	0.0	0.0	0.0
Pilot Point	73			0.0%			0	0	0.0	0.0	0.0	0.0
Pilot Point	87	5.9%	5.9%	0.0%	5.9%	0.0%	0	0	0.0	0.0	0.0	0.0
Port Alsworth	83		23.1%	23.1%	0.0%		126	126	6.0	6.0	1.7	1.7
Port Heiden	73			0.0%			0	0	0.0	0.0	0.0	0.0
Port Heiden	87	2.7%	0.0%	0.0%	2.7%	0.0%	0	0	0.0	0.0	0.0	0.0
South Naknek	73			29.4%			199	199	7.9	7.9	1.6	1.6
South Naknek	92	25.7%	8.6%	2.9%	22.9%	8.6%	12	12	0.3	0.3	0.1	0.1
Ugashik	73			0.0%			0	0	0.0	0.0	0.0	0.0
Ugashik	87	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0	0.0	0.0	0.0

<sup>1</sup> Data are unavailable for blank cells. Source: for 1973, based on Gasbarro and Utermohle 1974; Scott et al. 1995<sup>2</sup> Data not collected for Bristol Bay Borough communities in 1983, but harvests of whitefish there are low.

communities and shared with inland villages. Additionally, nine kinds of resident freshwater fish are harvested. These include Arctic grayling, blackfish, burbot, Dolly Varden (including arctic char), lake trout, longnose sucker, northern pike, rainbow trout, and whitefish (several species). Of these, whitefish, grayling, Dolly Varden, and northern pike are taken in the largest numbers, while pike make the largest contribution in terms of food value. Differences in species ranking occur between subregions and from year to year. For example, Dolly Varden ("Togiak trout" and "Dolly Varden") are particularly important in the western portion of the region in the communities of Aleknagik, Manokotak, Twin Hills, and Togiak. Rainbow trout figured prominently in harvests by Iliamna Lake communities in 1973/74 (about 20 percent of all freshwater fish harvests), and continued in importance in 1983 (when considering that a portion of the "unknown trout" harvest was likely rainbow trout) and in the early 1990s. Overall, the contribution of freshwater fish to the subsistence harvests of Bristol Bay communities appears to have remained relatively stable during the 1970s, 1980s, and early 1990s.

Harvests of freshwater fish occur year-round in the Bristol Bay region, but there are certain seasons when subsistence harvest efforts target on freshwater species. For example, net fishing for whitefish is important right before freeze-up in the fall and again following break-up in the spring. Fishing with hook and line through the ice is important during winter. Most of this harvest activity takes place near each community, although extensive travel by skiff or snow machine to favorite harvest areas does occur (e.g. to Togiak Lake by Togiak and Twin Hills people; to the Tikchik lakes by Nushagak River villages).

A variety of methods are used in the region to preserve and prepare freshwater fish. These foods are shared widely, both within communities and between them.

Further research on patterns of freshwater fish use in the Bristol Bay region should occur in several areas. More work is needed to understand local Yup'ik and English language categories of freshwater fish. This could lead to more precise estimates of harvests. Harvest estimates are lacking for certain communities, most notably those of the Togiak River drainage. Monitoring harvests of freshwater fish is particularly difficult because the seasonal use pattern creates problems for reliable retrospective recall from respondents. If harvest information is needed for management, culturally appropriate, non-intrusive methods to monitor harvests need to be developed in consultation with local communities.

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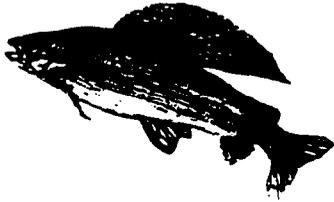
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# FRESHWATER FISH HARVEST CALENDAR



1986 MAY 1986



BRISTOL BAY

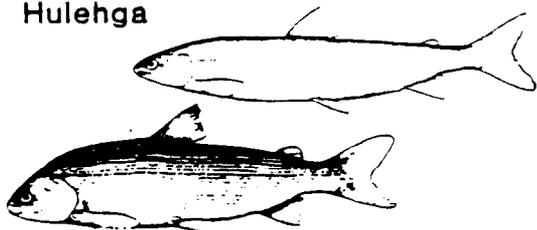
Number \_\_\_\_\_

Please record daily the number of fish you catch under the method of harvest. \_\_\_\_\_

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
				Net Hook	Net Hook	Net Hook
				Whitefish	Whitefish	Whitefish
				Dollies	Dollies	Dollies
				Rainbow	Rainbow	Rainbow
				Grayling	Grayling	Grayling
				Lake Trt	Lake Trt	Lake Trt
				Pike	Pike	Pike
				Burbot	Burbot	Burbot
4	5	6	7	8	9	10
Net Hook						
Whitefish						
Dollies						
Rainbow						
Grayling						
Lake Trt						
Pike						
Burbot						
11	12	13	14	15	16	17
Net Hook						
Whitefish						
Dollies						
Rainbow						
Grayling						
Lake Trt						
Pike						
Burbot						
18	19	20	21	22	23	24
Net Hook						
Whitefish						
Dollies						
Rainbow						
Grayling						
Lake Trt						
Pike						
Burbot						
25	26	27	28	29	30	31
Net Hook						
Whitefish						
Dollies						
Rainbow						
Grayling						
Lake Trt						
Pike						
Burbot						

## FRESHWATER FISH IDENTIFICATION

**Whitefish**  
Uraruq  
Hulehga



Distinguished from the trout and salmon by the small, weak, or absent teeth and the presence of large scales; distinguished from the arctic grayling by the much smaller dorsal fin (15 or fewer rays).

**Dolly Varden**  
Yugyak  
Qak'elay



Round, red, pink, or yellow spots on sides; caudal fin slightly forked; 8-12 anal fin rays; no dark green wavy marks on back or dorsal fin.

**Rainbow Trout**  
Cikignaq  
Talaariq  
Tuni



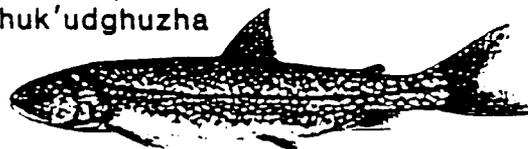
Spots on body dark brown or black; anal fin rays 8-12; reddish band on sides; no red slash under jaw; upper jaw usually does not extend behind eye in adults.

**Arctic Grayling**  
Nakrullugpak  
Ch'dat'an



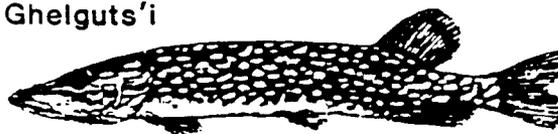
Dorsal fin typically with dark purple edge and much longer (18 or more rays) than in whitefish and fan-like; rows of reddish to orange and/or purple to green spots on dorsal fin; sides of fish are black spotted; scales larger than in trouts.

**Lake Trout**  
Anerlluag  
Zhuk'udghuzha



Body dark green to grayish with oval or irregular white to yellowish spots on sides and back; caudal fin deeply forked; 8-12 anal fin rays; no dark green wavy marks on back or dorsal fin.

**Northern Pike**  
Cuukuak  
Ghelguts'i



Dorsal and anal fins positioned rearward; no adipose fin as in the trouts, salmon, grayling, and whitefish; long flattened jaws with large mouth and many large, sharp teeth; sides are yellowish-gray.

**Burbot**  
Manignaq  
Ch'unya



Two dorsal fins and one anal fin present; no adipose fin as in the trouts, salmon, grayling, and whitefish; pelvic fins very far forward and just under head; body long and tapering; barbel on chin.

APPENDIX B

BRISTOL BAY SUBSISTENCE FRESHWATER FISH SURVEY

Person Interviewed \_\_\_\_\_ Date \_\_\_\_\_ Interviewer \_\_\_\_\_

Village \_\_\_\_\_ Number of Year Round Residents in Household \_\_\_\_\_

I. HARVEST INFORMATION

Species	Method of Harvest			Targeted or Incidental If Incidental, which species	Months Harvested	Type of Transportation Used	Who does fishing (relationship)	Where
	Net	Rod Reel	Jig Other					
WHITEFISH (Uraruq)								
PIKE (Crukvak)								
DOLLIES/ ARCTIC CHAR (Yugyaq)								

Species	Method of Harvest			Targeted or Incidental If Incidental which species	Months Harvested	Type of trans- portation Used	Who does Fishing? (relationship)	Location
	Net	Rod Reel	Jig Other					
RAINBOW TROUT (Talarik)								
GRAYLING (Nakrul lugpak)								
LAKE TROUT (Toglak Trout)								
BURBOT (Atgiaq) (Manignaq)								

II. PRESERVATION

I'd like to ask a few questions about how you preserve your fish:

Species	Eat Fresh	Freeze	Eat Frozen	Dried	Smoked	Bolled	Fermented	Use for Dogs	With Seal Oil
WHITEFISH									
PIKE									
DOLLIES/ CHAR									
RAINBOW TROUT									
GRAYLING									
LAKE TROUT									
BURBOT									



(Have you ever had any interactions with them?)  
4. Do you ever talk to them or visit with them?

5. Have they ever been a problem for you? If yes, how?

IV. (FOR ELDERS) Finally I'd like to ask you some questions to find out if there have been any changes in your fishing over the course of your lifetime:

1. Did you harvest any of these species differently in the past? if so, how
  
2. Did you harvest any of these species in different locations? if so, where?
  
3. Did you used to fish for any of these species at different times of the year than you do now? Why?

4. Did you preserve any of these differently?

5. Have you heard stories about how any of this fishing was different a long time ago?  
(Ex: gear type, location, time of year?)



APPENDIX C  
NON-SALMON FRESHWATER FISH HARVEST ESTIMATES FOR 1995

Community	Representative Study Year <sup>1</sup>	Estimated Population, 1995	Estimated Total Pounds Harvested <sup>2</sup>	Harvest, Pounds Per Capita
<i>Nushagak River and Bay Subregion</i>				
Aleknagik	1988/89	182	8,863.4	48.7
Clark's Point	1988/89	63	1,612.8	25.6
Ekwok	1987/88	86	5,787.8	67.3
Koliganek	1987/88	208	19,302.4	92.8
Manokotak	1985	402	20,502.0	51.0
New Stuyahok	1987/88	421	13,893.0	33.0
Subregion		1,362	69,961.4	51.4
-----				
Dillingham	1984	2,243	21,532.8	9.6
<i>Iliamna Lake Subregion</i>				
Igiugig	1992/93	50	4,490.0	89.8
Iliamna	1991/92	99	6,831.0	69.0
Kokhanok	1992/93	161	16,518.6	102.6
Levelock	1992/93	116	6,542.4	56.4
Newhalen	1991/92	170	6,324.0	37.2
Nondalton	1981	237	8,532.0	36.0
Pedro Bay	1982	45	3,091.5	68.7
Port Alsworth	1983	77	893.2	11.6
Subregion		955	53,222.7	55.7
-----				
<i>Bristol Bay Borough</i>				
King Salmon	1983	539	8,570.1	15.9
Naknek	1983	617	11,476.2	18.6
South Naknek	1992/93	146	2,321.4	15.9
Subregion		1,302	22,367.7	17.2
-----				
<i>Alaska Peninsula Subregion</i>				
Egegik	1984	143	1,630.2	11.4
Pilot Point	1986/87	74	814.0	11.0
Port Heiden	1986/87	126	1,197.0	9.5
Ugashik	1986/87	5	180.0	36.0
Subregion		348	3,821.2	11.0
-----				
Bristol Bay Region		6,210	170,905.8	27.5
Region without Dillingham		3,967	149,373.0	37.7
Region without Dillingham or Bristol Bay Borough		2,665	127,005.3	47.7

<sup>1</sup> The most recent study year was selected, except for Nondalton. Because 1983 data for Nondalton may be atypical, 1981 was chosen as the most recent representative year.

<sup>2</sup> Includes smelt and resident species.

Source: Scott et al. 1995 for harvest estimates and 1995 population estimates.

