

Harvest and Biological Characteristics of the Subsistence Fishery in Arctic Village, Alaska, 2001-2003

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Abstract

The subsistence fishery in Arctic Village during 2001-2003 was described from post season user interviews and biological sampling. An educational component to build village capacity for similar projects was also conducted during this time. Interviews and sampling were conducted by local technicians during the open water and ice cover seasons over the two years. Ten species of fish were harvested. An estimated 10,944 fish, weighing 11,230 kg were harvested with humpback whitefish comprising the largest number and weight of all species harvested. Annual harvests for all species except whitefish were similar to those reported from 1973, but the harvest of whitefish increased 32-85% during 2001-2003. Gill nets harvested almost ten times the amount harvested by all the other methods combined. The highest number and amount of fish harvested with all gear combined occurred during the ice cover season of the second year. The Chandalar River and Old John Lake provided the largest numbers of fish harvested. Most households considered fishing quality to be good regardless of the location or period, and fishing frequency was consistent during the study. More households received fish than gave away fish. Despite the difficulties in accurately recalling the number and species of fish that were harvested several months prior to the interview, results from the interviews were consistent with the species and their distributions from the literature. Broad whitefish, Arctic grayling, lake trout, and northern pike were sampled for length and age, but small sample sizes prevented further interpretation. The local technicians assisted with educational outreach at elementary school classes. A Gwich'in/English fish identification chart, a poster and a fact sheet describing the study were distributed to the village council, the school, and individual community members. Presentations by the local technicians were conducted during village meetings, coordination meetings, and Traditional Gatherings. Harvest surveys and educational outreach for the village should be conducted on a regular basis to identify trends and strengthen rapport with the community.

Introduction

Arctic Village is an isolated community (Figure 1) that is dependent on a subsistence way of life. Although it is not located within Arctic National Wildlife Refuge (Refuge), its residents are reliant on fishery resources within the Refuge (U.S. Fish and Wildlife Service 1994). In 2000 the village was comprised of 152 people (U.S. Census Bureau 2000) that depend mostly on the Porcupine Caribou Herd for subsistence, but fish, especially whitefish Coregoninae, are also important in residents' diets (U.S. Fish and Wildlife Service 1994). Because the village is located upstream of most Chinook *Oncorhynchus tshawytscha* and chum *O. keta* salmon spawning areas (U.S. Fish and Wildlife Service 1994), few of these species are available for harvest. However, salmon are received from trading and bartering with other villages, but residents are almost solely dependent on freshwater species for their dietary needs.

Residents of Arctic Village have expressed concerns about declines in harvests of whitefish, lake trout *Salvelinus namaycush*, and northern pike *Esox lucius*. These users are concerned that their harvests may not be sustainable in the future, and limited information exists to document residents' use. Although Caulfield (1983) described the annual cycle of subsistence activities,

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Patterson (1974) provided the only information that documented amounts of harvest. Patterson (1974) reported that residents' annual harvest of fish in 1973 comprised 18% of the total subsistence resources used and consisted of an estimated 2,000 whitefish, 1,000 Arctic grayling *Thymallus arcticus*, 200 northern pike, 150 lake trout, 50 burbot *Lota lota*, and 50 longnose suckers *Catostomus catostomus* for a total harvest of 3,450 fish equal to 6,477 kg. Subsequent investigations concerning subsistence use in the area have focused on other resources, and not on the fishery.

Maintenance of subsistence opportunity to harvest fish and wildlife within the Refuge was considered a major issue during development of the Refuge's Comprehensive Conservation Plan (U.S. Fish and Wildlife Service 1988). To maintain this opportunity for subsistence fishing, reliable and updated information was needed to describe use patterns, species and amounts harvested. In 1994 the Refuge recognized the need for updated information and adopted Task 3.1.1 of the Refuge Fishery Management Plan to conduct harvest surveys in Arctic Village during 1995 and 1997 (U.S. Fish and Wildlife Service 1994). Due to a variety of reasons these surveys had not been conducted.

Few studies have been conducted on fish populations in the area. The earliest and most extensive sampling was conducted in the early 1970's as part of the proposed Arctic gas pipeline (Craig and Wells 1975; McCart 1974; and Ward and Craig 1974). Additional sampling was conducted by the Alaska Department of Fish and Game from the mid-1960's to the late 1970's (Pearse 1979 and 1978). These studies used short time periods and small sample sizes to describe lake trout, Arctic grayling, humpback whitefish *Coregonus pidschian*, round whitefish *Prosopium cylindraceum*, northern pike, longnose suckers, and slimy sculpin *Cottus cognatus* as common to the area. Arctic char *Salvelinus alpinus*, broad whitefish *Coregonus nasus*, least cisco *C. sardinella*, and burbot were also observed. These populations were typical of Arctic areas and were slow growing, late maturing, long lived, and attained smaller maximum sizes than similar species in southern areas (Craig and Wells 1975). While subsistence and sport fishing pressure on these populations has been minimal, Arctic populations may be more vulnerable to harvest pressure than populations in other areas (U.S. Fish and Wildlife Service 1994). The lack of adequate information to manage these populations has been a concern since the Refuge was established (U.S. Fish and Wildlife Service 1994 and 1988).

To address subsistence use and fishery resource status, the U.S. Fish and Wildlife Service's (Service) Fairbanks Fish and Wildlife Field Office (FFWFO) conducted a harvest survey from summer 2001 to spring 2003. The first year of the study was designed to evaluate the feasibility of conducting the project and included these objectives: 1) describe the types of fishing gear used; 2) identify the primary areas where subsistence harvest occurred; 3) estimate the number of fish of each species harvested from these areas; 4) determine if fishing was considered poor, fair, or good at each location; 5) determine if households fished more often, the same, or less often than in the past; 6) determine if the harvest was shared; and 7) describe length and age compositions of each species harvested. After a successful first year, the second year was designed to satisfy these same objectives as well as the following: 8) use the second year's information to complement the information from the first; 9) introduce local school children to fish anatomy and fishery science; and 10) develop the educational and interpretative skills of the local technicians and students.

Study Area

Arctic Village, established in 1930, is the only permanent settlement on the south slope of the Brooks Range that borders the Refuge (U.S. Fish and Wildlife Service 1994; Figure 1). The village is populated predominantly by Gwich'in Athabascans. It is located on the East Fork of the Chandalar River, approximately 200 km north of Ft. Yukon. The area surrounding Arctic Village has a continental subarctic climate characterized by large seasonal temperature variations and little precipitation. The area is part of the Porcupine Plateau, a rolling, broad upland zone with irregular drainage patterns and numerous lakes. Vegetation of the area is characterized as sparsely scattered patches of spruce *Picea* spp. interspersed with upland and lowland tundra.

Methods

To describe the subsistence fishery and promote an understanding of fishery management by residents of the village, the project was divided into three components: 1) a survey to characterize the harvest and characteristics of the fishery; 2) a biological component to describe the population structure of the species harvested; and 3) an educational component to provide users with an introduction to fish biology and fishery management. For the first two components, each year during 2001-2003 was divided into open water (June-September) and ice cover (October-May) fishing seasons to reflect differences in fishing activity and access methods. The educational portion began in 2001 as part of a separate, but related, traditional ecological knowledge project (Gustafson 2004) and was further developed during 2002-2003.

The Arctic Village Council (Council) provided recommendations for selection of locally hired technicians. Pre-fieldwork training sessions for the local technicians were conducted by a FFWFO technician familiar with harvest survey and fish sampling methods. Training included familiarization with historic studies, review of project objectives, identification of species expected to be harvested, and practice in survey and fish sampling procedures. These sessions were also assisted by the Park Ranger/Community Liaison from the Refuge who conducted the traditional knowledge project. All aspects of the harvest survey, fish sampling, and educational component followed guidelines for interaction with resource users (National Academy of Sciences 1998) and were coordinated with the related project.

Harvest Survey

Door-to-door systematic household surveys and interviews were conducted after each fishing season by the local technicians who were trained to implement the surveys. Responses to interview questions were recorded on standardized carbon survey forms in triplicate that included Gwich'in names for local fishes (Appendix 1). One copy of the completed form remained with the household, one copy was sent to the Alaska Department of Fish and Game Subsistence Division (ADFG-Sub) for data verification and coding, and the original remained with the FFWFO technician. A chart with color pictures of these fish with Gwich'in and English names (Appendix 2) facilitated species identification.

Technicians attempted to contact 100% of the households within a month of the end of each period. Data were analyzed according to ADFG-Sub protocols, and estimates of harvest for the village were expanded proportionally from the number of households interviewed. For each period, households were asked the number of people in the household and to identify fishing gear used, locations fished, and the number and species harvested from each location. Additionally each household was asked if fishing was good, fair, or poor at each location, if they fished more, the same, or less often than in the past, and if they gave or received any of the harvest. ADFG-

Sub Community Profile Database conversion factors (Scott et al. 2001) were used to estimate the useable amounts harvested by species (Table 1). However, conversion factors for some species from the Arctic Village area did not exist and factors from other areas in the state were substituted.

Biological Component

Because scales are known to underestimate age (Howland et al. 2004; Barnes and Power 1984), only the sagittal otoliths were collected for age estimation. Ages from otoliths were read according to Brown (2004). Fork length was measured to the nearest cm. Mean length at age was calculated among periods within species. Small sample sizes within species and periods prevented statistical testing. Due to the opportunistic sampling and small sample sizes involved, biological data were not expanded to the total harvest.

Educational component

The educational component included training for the local technicians to assist with classroom instruction at the Arctic Village School, distribution of outreach materials, and presentations at several meetings. All activities were coordinated with the Council and the related traditional knowledge project, as well as the school for school related functions. Local technicians were also provided training in composing, editing, and using Powerpoint presentations.

Results and Discussion

Harvest Survey

Interviews for the harvest survey typically lasted less than 30 minutes, and all interviews within a survey period were usually completed within a two week period. The number of households surveyed ranged from 40 for Period 4 to 45 for Period 1 with corresponding percentages of households surveyed ranging from 80-90% (Table 2). The decrease in the percent of households participating in the interviews was described by users as interview fatigue, where continual requests by researchers for resource information caused residents to lose interest in responding to interviews.

During the interviews for both years of the study, 10 species of fish plus unidentified whitefish were documented as being harvested (Table 3). Burbot, Arctic grayling, northern pike, and broad and humpback whitefish were harvested during all periods (Table 4). Least cisco were harvested only during the first period. For the entire study an estimated total of 10,944 fish weighing 11,234 kg was harvested. Humpback whitefish comprised the largest number and weight of all species harvested. Annual harvest for periods 1 and 2 (year 1) equaled 4,562 fish weighing 4,307 kg. For periods 3 and 4 (year 2) annual harvest was 6,382 fish weighing 6,927 kg. The number of fish harvested in each of these two years was more than Patterson's (1974) estimate of 3,450 fish. During year 1 the weight of fish harvested was less than Patterson (1974) reported (6,477 kg), but the weight of the harvest from year 2 was more than Patterson (1974) reported. The lower number of fish harvested documented by Patterson (1974) could be attributed to a smaller population size of the village. Patterson (1974) documented the population of the village to be 80 residents, but the estimated population size from 2000 was almost double at 152 residents (U.S. Census Bureau 2000). Differences in the weights between the studies could be based on differing conversion factors or differing proportions of larger or smaller fish within each species.

Patterson's (1974) estimate of a total annual whitefish harvest of 2,000 fish was less than the 2,874 fish harvested during periods 1 and 2 and the 4,999 fish harvested during periods 3 and 4. Patterson (1974) estimated that 1,000 Arctic grayling were harvested in 1973, approximately midway between the harvest of 1,200 fish in year 1 and 716 in year 2. In year 1, 181 northern pike were harvested which was similar to the 200 northern pike harvested in 1973 (Patterson 1974). However, the year 2 harvest of 495 northern pike was more than twice the number reported by Patterson (1974). Patterson's (1974) estimate for lake trout harvest was 150, approximately midway between the year 1 harvest of 183 and the year 2 harvest of 106. The number of longnose suckers harvested in year 1 was 22 and in year 2 it was one. Patterson (1974) reported a harvest of 50 longnose suckers. Patterson (1974) also documented a harvest of 50 burbot, nine more than the 41 harvested in year 1, but 15 less than the harvest from year 2 (65). Compared to harvests in 1973, the annual harvest of species other than whitefish was similar. However, the total harvest increased considerably due to an increase in whitefish harvest.

Harvests during 2001-2003 varied by gear type, number, location, and species. Gill nets harvested almost ten times the weight harvested by all the other methods combined (Table 5). Hook and line gear included rod and reel, jigging through the ice, and "can" fishing. "Can fishing" is a method where a coffee can is used as the reel, and the lure is cast with an across-the-body motion that releases the line and lure off the end of the can. The highest number and amount of fish harvested with all gear combined occurred in Period 4 (Table 6). The Chandalar River supplied the largest numbers and amounts of fish harvested during Periods 1 and 2, but Old John Lake provided the largest numbers and amounts during Periods 3 and 4 (Table 7). The large numbers from the Chandalar River were due to a mixture of species with Arctic grayling and broad and humpback whitefish comprising most of the harvest. Conversely, the harvest from Old John Lake was mostly comprised of humpback whitefish. The large numbers from the Chandalar River were also due to its proximity to the village that allowed easy and frequent access to fishing areas. In contrast, Old John Lake was one of the more distant fishing areas, but villagers typically fished the area for several days continuously until they had harvested their desired amount. Despite the difficulties in accurately recalling the number and species of fish that were harvested several months prior to the interview, and also in distinguishing among whitefish species and life stages, the results from the interviews were consistent with the species and their distributions according to Gustafson (2004), Mecklenberg et al. (2002), Pearse (1979 and 1978), Craig and Wells (1975), McCart (1974), and Ward and Craig (1974). Species observed by the FFWFO technician were also consistent with results from the interviews. There appeared to be no trends in harvest numbers by species, gear, or location among periods.

Users were also asked to describe the quality and frequency of fishing, as well as the extent of harvest sharing that occurred. Overall, most households considered fishing quality to be good regardless of the location or period (Table 8). Period 2 received the highest "good" rating at 72% while period 1 was rated the highest "fair" period (76%), and period 3 was the poorest (25%) period. Only the Chandalar River and Old John Lake received ratings for all periods with Old John Lake providing higher quality fishing in all periods except period 2. For period 1, most households reported fishing frequency as the same as the prior year (Table 9). For periods 2 and 4, an almost equal number of households reported fishing the same or less than the prior year. However, during period 3 a higher percent of households reported fishing less often than the prior year. More households received fish than gave away fish (Table 9). Only during period 2 did a higher percent of households give away fish than received fish. Despite concerns about

declining harvests expressed during the formulation of this project, most households considered fishing to be “good”. Good fishing is further supported by most households fishing at the same frequency as the prior year.

Biological Component

A total of 71 fish from four species were sampled for length and age (Table 10). Broad whitefish were sampled in three of four periods, Arctic grayling and lake trout in two, and northern pike in one. The largest sample occurred in period 3 and consisted of two lake trout and 42 broad whitefish. The smallest number of fish sampled occurred in period 2 and consisted of two Arctic grayling and three broad whitefish species. For the study Arctic grayling were sampled from Old John Lake and the Chandalar River. Lake trout were sampled exclusively from Old John Lake, northern pike exclusively from Loon Lake, and broad whitefish exclusively from the Chandalar River.

For the entire study, the ages of two of the three sampled Arctic grayling were seven years with corresponding lengths of 28 and 33 cm. The third fish was 18 years old and measured 33 cm, also. The ages of the three lake trout sampled were 9, 18, and 19 years with lengths of 38, 43, and 58 cm. The sample of northern pike consisted of three fish aged as 5 year olds averaging 60 cm. The 15 year old fish measured 96 cm. The ages of the 61 broad whitefish that were sampled ranged from 5-10 years with lengths from 40-52 cm. As with the results from the harvest survey, the lengths, ages, and distributions of these species were similar to previous studies from the region (Gustafson 2004; Mecklenberg et al. 2002; Pearse 1979 and 1978; Craig and Wells 1975; McCart 1974; and Ward and Craig 1974). However, the small numbers of fish sampled may not accurately represent the populations.

Educational component

One classroom session for the school year 2002-2003 was conducted for all grades. The local technicians assisted the FFWFO technician and an FFWFO biologist with the classes and were encouraged to interact with the students and describe their duties and responsibilities related to the harvest survey. Activities in the classroom focused on fish identification, fish anatomy, and fishery biology and complemented students’ normal science classes. Each student was provided a form (Appendix 3) to guide their activities while being coached in measuring, record keeping, and mathematics. Students were keenly interested in the program and were especially fascinated with anatomy and viewing organs and aging structures (otoliths and scales) with hand lenses and microscopes.

Outreach materials were distributed to the Council, the school, and individual community members. The most requested item was the Gwich’in/English fish identification chart (Appendix 2) that was also an integral part of the classroom sessions at the school. A poster (Appendix 4) was developed to describe in detail the justification, the methods, and early results from the project. Because the poster was large and cumbersome, a fact sheet (Appendix 5) was developed as a handout. Both the poster and the fact sheet were distributed at meetings and other presentation forums. The poster has also been displayed in public areas near Service offices in the Federal Building in Fairbanks as well as being displayed at the Service’s Region 7 Leadership Conference.

Presentations to the Council and community members were conducted during regularly scheduled Council meetings as well as during annual coordination meetings between the

community and the Refuge. In conjunction with the related traditional knowledge project, additional presentations were conducted during the Traditional Gatherings held in 2001 at Old John Lake and in 2002 on the Chandalar River. These gatherings were sponsored by the Council, Tanana Chiefs Conference (TCC), the Refuge, and FFWFO and were integrated with TCC's "Young Chiefs Leadership Institute" program. During a special session of the Council, the local technicians used their skills with Powerpoint to prepare and present programs about the life history and TEK of Arctic grayling and whitefish. This session also included an exhibition of pencil drawings about traditional fishing methods and gear by a local high school student. Presentations were well accepted, and comments by the community corroborated results of the study.

Conclusions and recommendations

This project further documented the importance of freshwater fishery resources to subsistence users from Arctic Village, and also documented the continued significance of fishing as part of users' seasonal activities. While somewhat limited in its scope, this project provided the only harvest and biological information about subsistence fishing in nearly 30 years. To avoid a similar lapse in documentation and to monitor changes in harvest and use patterns, periodic surveys should be conducted to further describe the variation and trends over time. Likewise, further study is needed to describe the life histories and behaviors of harvested species to assess the availability of these species to the fishery. Continued documentation of harvest, use patterns, and biological characteristics will foster a better understanding of the fishery by users and resource managers. Developing conversion factors for all harvested species in the Arctic Village area would also add to the value of future studies.

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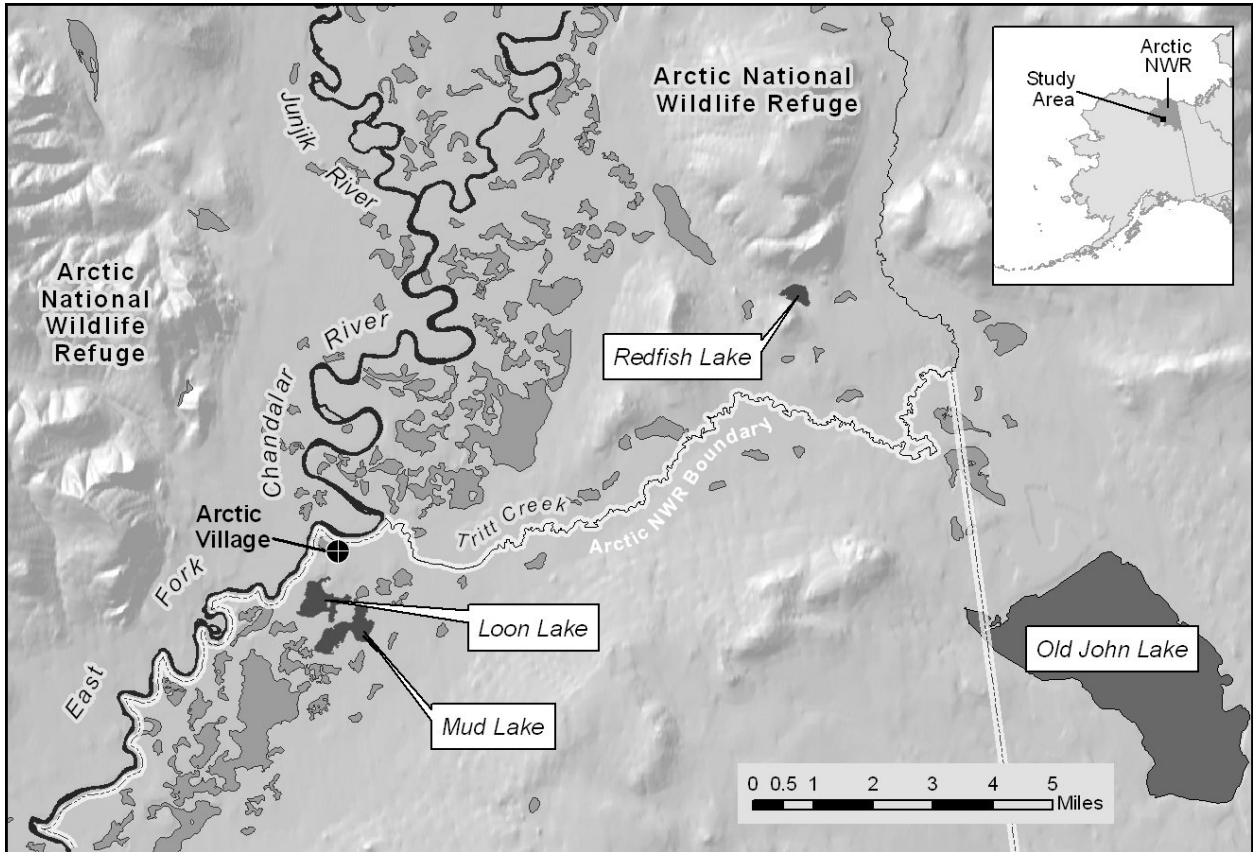


Figure 1. Arctic Village, fishing locations, and surrounding landmarks.

Table 1. Conversion factors used to estimate weights of species harvested from the subsistence fishery in Arctic Village, 2001-2003.

Species	Conversion factor (kg/individual)	Year	Community	Region
Burbot	0.9	1997	Fort Yukon	Interior
Arctic char	0.6	1992	Cordova	Southcentral
Lake trout	0.5	1993	Arctic Village	Interior
Arctic grayling	0.5	1997	Arctic Village	Interior
Northern pike	1.4	1998	Fort Yukon	Interior
Longnose sucker	0.9	1996	Circle	Interior
Broad whitefish	1.8	1995	Rampart	Interior
Humpback whitefish	1.0	1995	Shishmaref	Arctic
Round whitefish	0.2	1985	Beaver	Interior
Least cisco	0.2	1995	Shishmaref	Arctic
Unknown whitefish	0.8	1995	Shishmaref	Arctic

Table 2. Community sampling and participation rates for the subsistence fishery harvest survey conducted for Arctic Village, 2001-2003. The survey was designed as a census.

Period	Period	Number of households	Number of households surveyed	Percent of households surveyed	Number of households unable to contact
1	June-September 2001	50	45	90	5
2	October 2001-May 2002	50	43	86	7
3	June-September 2002	50	44	88	6
4	October 2002-May 2003	50	40	80	10

Table 3. Estimated total number harvested and corresponding weights by species by year with all gear combined for the subsistence fishery in Arctic Village, 2001-2003.

Species	2001-02 (periods 1 and 2)		2002-03 (periods 3 and 4)		Total	
	Number	kg	Number	kg	Number	kg
Burbot	41	37	65	58	106	95
Arctic char	61	39	0	0	61	39
Lake trout	183	83	106	49	289	132
Arctic grayling	1,200	544	716	326	1,916	870
Northern pike	181	247	495	674	676	921
Longnose sucker	22	21	1	1	23	22
Broad whitefish	909	1,652	1,362	2,476	2,271	4,128
Humpback whitefish	1,684	1,608	3,345	3,192	5,029	4,800
Round whitefish	229	52	142	32	371	84
Least cisco	31	7	0	0	31	7
Unknown whitefish	21	17	150	119	171	136
Total	4,562	4,307	6,382	6,927	10,944	11,234

Table 4. Estimated total number harvested and corresponding weights by species by period with all gear combined for the subsistence fishery in Arctic Village, 2001-2003.

Species	Period 1		Period 2		Period 3		Period 4		Total	
	Number	kg	Number	kg	Number	kg	Number	kg	Number	kg
Burbot	34	31	7	6	7	6	58	52	106	95
Arctic char	14	9	47	30	0	0	0	0	61	39
Lake trout	0	0	183	83	6	3	100	46	289	132
Arctic grayling	842	382	358	162	332	151	384	175	1,916	870
Northern pike	144	196	37	51	186	253	309	421	676	921
Longnose sucker	10	9	12	12	1	1	0	0	23	22
Broad whitefish	438	796	471	856	258	469	1,104	2,007	2,271	4,128
Humpback whitefish	1,682	1,606	2	2	1,705	1,627	1,640	1,565	5,029	4,800
Round whitefish	206	47	23	5	142	32	0	0	371	84
Least cisco	31	7	0	0	0	0	0	0	31	7
Unknown whitefish	0	0	21	17	0	0	150	119	171	136
Total	3,401	3,083	1,161	1,224	2,637	2,542	3,745	4,385	10,944	11,234

Table 5. Estimated total number harvested and corresponding weights by species by period within each gear type for the subsistence fishery in Arctic Village, 2001-2003.

Species	Period 1		Period 2		Period 3		Period 4		Total	
	Number	kg	Number	kg	Number	Kg	Number	kg	Number	kg
Gill net										
Burbot	34	31	0	0	7	6	9	8	50	45
Arctic char	0	0	0	0	0	0	0	0	0	0
Lake trout	0	0	143	65	6	3	56	26	205	94
Arctic grayling	227	103	35	16	57	26	4	2	323	147
Northern pike	136	185	3	5	67	91	300	409	506	690
Longnose sucker	10	9	2	2	1	1	0	0	13	12
Broad whitefish	438	796	471	856	258	469	1,100	2,000	2,267	4,121
Humpback whitefish	1,682	1,606	0	0	1,705	1,627	1,640	1,565	5,027	4,798
Round whitefish	198	45	0	0	142	32	0	0	340	77
Least cisco	0	0	0	0	0	0	0	0	0	0
Unknown whitefish	0	0	0	0	0	0	150	119	150	119
Total	2,725	2,775	654	944	2,243	2,255	3,259	4,129	8,881	10,103
Fish trap										
Burbot	0	0	0	0	0	0	0	0	0	0
Arctic char	0	0	0	0	0	0	0	0	0	0
Lake trout	0	0	0	0	0	0	0	0	0	0
Arctic grayling	14	6	0	0	0	0	0	0	14	6
Northern pike	0	0	0	0	0	0	0	0	0	0
Longnose sucker	0	0	0	0	0	0	0	0	0	0
Broad whitefish	0	0	0	0	0	0	0	0	0	0
Humpback whitefish	0	0	0	0	0	0	0	0	0	0
Round whitefish	3	1	0	0	0	0	0	0	3	1
Least cisco	26	6	0	0	0	0	0	0	26	6

Table 5. cont'd.

Species	Period 1		Period 2		Period 3		Period 4		Total	
	Number	kg	Number	kg	Number	Kg	Number	kg	Number	kg
Unknown whitefish	0	0	0	0	0	0	0	0	0	0
Total	43	13	0	0	0	0	0	0	43	13
Spear										
Burbot	0	0	0	0	0	0	0	0	0	0
Arctic char	0	0	0	0	0	0	0	0	0	0
Lake trout	0	0	0	0	0	0	0	0	0	0
Arctic grayling	0	0	0	0	0	0	0	0	0	0
Northern pike	0	0	0	0	17	23	0	0	17	23
Longnose sucker	0	0	0	0	0	0	0	0	0	0
Broad whitefish	0	0	0	0	0	0	0	0	0	0
Humpback whitefish	0	0	0	0	0	0	0	0	0	0
Round whitefish	0	0	0	0	0	0	0	0	0	0
Least cisco	0	0	0	0	0	0	0	0	0	0
Unknown whitefish	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	17	23	0	0	17	23
Hook and line										
Burbot	0	0	7	6	0	0	49	44	56	50
Arctic char	14	9	47	30	0	0	0	0	61	39
Lake trout	0	0	40	18	0	0	44	20	84	38
Arctic grayling	601	273	323	146	275	125	380	173	1,439	654
Northern pike	8	11	34	46	102	139	9	12	146	198
Longnose sucker	0	0	10	10	0	0	0	0	10	10
Broad whitefish	0	0	0	0	0	0	4	7	4	7

Table 5. cont'd.

Species	Period 1		Period 2		Period 3		Period 4		Total	
	Number	kg	Number	kg	Number	Kg	Number	kg	Number	kg
Humpback whitefish	0	0	2	2	0	0	0	0	2	2
Round whitefish	5	1	23	5	0	0	0	0	28	6
Least cisco	5	1	0	0	0	0	0	0	5	1
Unknown whitefish	0	0	21	17	0	0	0	0	21	17
Total	633	295	507	280	377	264	486	256	1,856	1,022

Table 6. Estimated total number harvested and corresponding weights by species by gear within each period for the subsistence fishery in Arctic Village, 2001-2003.

Species	Gillnet		Fish trap		Spear		Hook and line		Total	
	Number	kg	Number	kg	Number	kg	Number	kg	Number	kg
Period 1										
Burbot	34	31	0	0	0	0	0	0	34	31
Arctic char	0	0	0	0	0	0	14	9	14	9
Lake trout	0	0	0	0	0	0	0	0	0	0
Arctic grayling	227	103	14	6	0	0	601	273	842	382
Northern pike	136	185	0	0	0	0	8	11	144	196
Longnose sucker	10	9	0	0	0	0	0	0	10	9
Broad whitefish	438	796	0	0	0	0	0	0	438	796
Humpback whitefish	1,682	1,606	0	0	0	0	0	0	1,682	1,606
Round whitefish	198	45	3	1	0	0	5	1	206	47
Least cisco	0	0	26	6	0	0	5	1	31	7
Unknown whitefish	0	0	0	0	0	0	0	0	0	0
Total	2,725	2,775	43	13	0	0	633	295	3,401	3,083
Period 2										
Burbot	0	0	0	0	0	0	7	6	7	6
Arctic char	0	0	0	0	0	0	47	30	47	30
Lake trout	143	65	0	0	0	0	40	18	183	83
Arctic grayling	35	16	0	0	0	0	323	146	358	162
Northern pike	3	5	0	0	0	0	34	46	37	51
Longnose sucker	2	2	0	0	0	0	10	10	12	12
Broad whitefish	471	856	0	0	0	0	0	0	471	856
Humpback whitefish	0	0	0	0	0	0	2	2	2	2
Round whitefish	3	1	0	0	0	0	23	5	23	5
Least cisco	0	0	0	0	0	0	0	0	0	0

Table 6. cont'd.

Species	Gill net		Fish trap		Spear		Hook and line		Total	
	Number	kg	Number	kg	Number	kg	Number	kg	Number	kg
Unknown whitefish	0	0	0	0	0	0	21	17	21	17
Total	654	944	0	0	0	0	507	280	1,161	1,224
Period 3										
Burbot	7	6	0	0	0	0	0	0	7	6
Arctic char	0	0	0	0	0	0	0	0	0	0
Lake trout	6	3	0	0	0	0	0	0	6	3
Arctic grayling	57	26	0	0	0	0	275	125	332	151
Northern pike	67	91	0	0	17	23	102	139	186	253
Longnose sucker	1	1	0	0	0	0	0	0	1	1
Broad whitefish	258	469	0	0	0	0	0	0	258	469
Humpback whitefish	1,705	1,627	0	0	0	0	0	0	1,705	1,627
Round whitefish	142	32	0	0	0	0	0	0	142	32
Least cisco	0	0	0	0	0	0	0	0	0	0
Unknown whitefish	0	0	0	0	0	0	0	0	0	0
Total	2,243	2,309	0	0	17	23	377	264	2,637	2,542
Period 4										
Burbot	9	8	0	0	0	0	49	44	58	52
Arctic char	0	0	0	0	0	0	0	0	0	0
Lake trout	56	26	0	0	0	0	44	20	100	46
Arctic grayling	4	2	0	0	0	0	380	173	384	175
Northern pike	300	409	0	0	0	0	9	12	309	421
Longnose sucker	0	0	0	0	0	0	0	0	0	0
Broad whitefish	1,100	2,000	0	0	0	0	4	7	1,104	2,007
Humpback whitefish	1,640	1,565	0	0	0	0	0	0	1,640	1,565

Table 6. cont'd.

Species	Gill net		Fish trap		Spear		Hook and line		Total	
	Number	kg	Number	kg	Number	kg	Number	kg	Number	Kg
Round whitefish	0	0	0	0	0	0	0	0	0	0
Least cisco	0	0	0	0	0	0	0	0	0	0
Unknown whitefish	150	119	0	0	0	0	0	0	150	119
Total	3,259	4,129	0	0	0	0	486	256	3,745	4,385

Table 7. Estimated total number harvested and corresponding weights by species by location within each period for the subsistence fishery in Arctic Village, 2001-2003.

Fish species	<u>Chandalar River</u>		<u>Mud Lake/Creek</u>		<u>Loon Lake</u>		<u>Old John Lake</u>		<u>Redfish Lake</u>		<u>Junjik River</u>		<u>Total</u>	
	Number	kg	Number	kg	Number	kg	Number	kg	Number	Kg	Number	kg	Number	kg
Period 1														
Burbot	31	28	3	3	0	0	0	0	0	0	0	0	34	31
Arctic char	14	9	0	0	0	0	0	0	0	0	0	0	14	9
Lake trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic grayling	767	349	52	24	0	0	7	3	16	7	0	0	842	383
Northern pike	102	139	39	53	0	0	3	4	0	0	0	0	144	196
Longnose sucker	0	0	10	9	0	0	0	0	0	0	0	0	10	9
Broad whitefish	376	684	39	71	0	0	27	49	0	0	0	0	442	804
Humpback whitefish	871	831	768	733	0	0	43	41	0	0	0	0	1,682	1,605
Round whitefish	141	32	32	7	0	0	33	8	0	0	0	0	206	47
Least cisco	16	4	10	2	0	0	5	1	0	0	0	0	31	7
Unknown whitefish	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,318	2,076	953	902	0	0	118	106	16	7	0	0	3,405	3,091
Period 2														
Burbot	7	6	0	0	0	0	0	0	0	0	0	0	7	6
Arctic char	47	30	0	0	0	0	0	0	0	0	0	0	47	30
Lake trout	0	0	0	0	0	0	183	83	0	0	0	0	183	83
Arctic grayling	357	162	0	0	0	0	0	0	0	0	0	0	357	162
Northern pike	15	21	1	2	0	0	21	29	0	0	0	0	37	52
Longnose sucker	6	5	0	0	0	0	7	6	0	0	0	0	13	11
Broad whitefish	471	856	0	0	0	0	0	0	0	0	0	0	471	856
Humpback whitefish	2	2	0	0	0	0	0	0	0	0	0	0	2	2
Round whitefish	23	5	0	0	0	0	0	0	0	0	0	0	23	5
Least cisco	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 7. Cont'd.

Fish species	<u>Chandalar River</u>		<u>Mud Lake/Creek</u>		<u>Loon Lake</u>		<u>Old John Lake</u>		<u>Redfish Lake</u>		<u>Junjik River</u>		<u>Total</u>	
	Number	Kg	Number	kg	Number	kg	Number	kg	Number	Kg	Number	kg	Number	kg
Unknown whitefish	21	17	0	0	0	0	0	0	0	0	0	0	21	17
Total	949	1,104	1	2	0	0	211	118	0	0	0	0	1,161	1,224
Period 3														
Burbot	0	0	0	0	0	0	7	6	0	0	0	0	7	6
Arctic char	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake trout	0	0	0	0	0	0	6	3	0	0	0	0	6	3
Arctic grayling	213	97	0	0	0	0	34	15	0	0	85	39	332	151
Northern pike	166	226	0	0	19	26	1	2	0	0	0	0	186	254
Longnose sucker	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Broad whitefish	258	469	0	0	0	0	0	0	0	0	0	0	258	469
Humpback whitefish	0	0	0	0	0	0	1,705	1,627	0	0	0	0	1,705	1,627
Round whitefish	57	13	0	0	0	0	85	19	0	0	0	0	142	32
Least cisco	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown whitefish	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	695	806	0	0	19	26	1,838	1,672	0	0	85	39	2,637	2,543
Period 4														
Burbot	56	51	0	0	0	0	1	1	0	0	0	0	57	52
Arctic char	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake trout	0	0	0	0	0	0	100	45	0	0	0	0	100	45
Arctic grayling	353	160	0	0	0	0	31	14	0	0	0	0	384	174
Northern pike	308	419	0	0	0	0	1	2	0	0	0	0	309	421
Longnose sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broad whitefish	270	491	0	0	0	0	834	1,516	0	0	0	0	1,104	2,007
Humpback whitefish	0	0	0	0	0	0	1,640	1,565	0	0	0	0	1,640	1,565

Table 7. Cont'd.

Fish species	<u>Chandalar River</u>		<u>Mud Lake/Creek</u>		<u>Loon Lake</u>		<u>Old John Lake</u>		<u>Redfish Lake</u>		<u>Junjik River</u>		<u>Total</u>	
	Number	kg	Number	Kg	Number	kg	Number	kg	Number	Kg	Number	kg	Number	kg
Round whitefish	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Least cisco	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown whitefish	0	0	0	0	0	0	150	119	0	0	0	0	150	119
Total	987	1,121	0	0	0	0	2,757	3,262	0	0	0	0	3,744	4,383

Table 8. Number and percent of households reporting fishing quality as good, fair, or poor by location within a period for the subsistence fishery in Arctic Village, 2001-2003. Several households rated fishing quality for more than one location. Totals may not equal 100% due to rounding error.

Quality	<u>Chandalar River</u>		<u>Mud Lake/Creek</u>		<u>Loon Lake</u>		<u>Old John Lake</u>		<u>Redfish Lake</u>		<u>Junjik River</u>		<u>Total</u>	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Period 1														
Good	8	24	3	25	0	0	1	33	1	100	0	0	13	24
Fair	26	76	9	75	4	100	2	67	0	0	0	0	41	76
Poor	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	34	100	12	100	4	100	3	100	1	100	0	0	54	100
Period 2														
Good	11	85	0	0	0	0	2	50	0	0	0	0	13	72
Fair	2	15	1	100	0	0	2	50	0	0	0	0	5	28
Poor	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	13	100	1	100	0	0	4	100	0	0	0	0	18	100
Period 3														
Good	4	36	0	0	2	100	2	100	0	0	0	0	8	50
Fair	3	27	0	0	0	0	0	0	0	0	1	1	4	25
Poor	4	36	0	0	0	0	0	0	0	0	0	0	4	25
Total	11	100	0	0	2	100	2	100	0	0	1	100	16	100
Period 4														
Good	5	45	0	0	0	0	8	67	0	0	0	0	13	57
Fair	5	45	0	0	0	0	4	33	0	0	0	0	9	39
Poor	1	9	0	0	0	0	0	0	0	0	0	0	1	4
Total	11	100	0	0	0	0	12	100	0	0	0	0	23	100

Table 9. Percent of households reporting fishing frequency as more often, same, or less often compared to the prior year and percent of households sharing fish for the subsistence fishery in Arctic Village, 2001-2003. Totals may not equal 100% due to rounding error.

Period	Percent of households describing fishing frequency as:			Percent of households sharing fish	
	More	Same	Less	Receive	Give
1	7	87	5	52	34
2	6	50	44	5	14
3	24	12	65	34	20
4	14	45	41	50	23

Table 10. Mean fork length (FL) and fork length range (R) at age (yr) by species and period for sampled fish from the Arctic Village subsistence harvest, 2001-2003.

Species	Age	N	FL (cm)	R (cm)	Location
Period 1					
Arctic grayling	7	1	33	-	Old John Lake
Lake trout	18	1	58	-	Old John Lake
Northern pike	5	3	60	53-66	Loon Lake
	15	1	96	-	Loon Lake
Period 2					
Arctic grayling	7	1	28	-	Chandalar River
	18	1	33	-	Chandalar River
Broad whitefish	6	3	44	43-46	Chandalar River
Period 3					
Lake trout	9	1	38	-	Old John Lake
	19	1	43	-	Old John Lake
Broad whitefish	5	20	45	41-49	Chandalar River
	6	6	45	43-48	Chandalar River
	7	10	46	44-50	Chandalar River
	8	1	43	-	Chandalar River
	9	4	49	47-52	Chandalar River
	10	1	45	-	Chandalar River
Period 4					
Broad whitefish	5	1	40	-	Chandalar River
	6	3	43	42-45	Chandalar River
	7	5	46	44-47	Chandalar River
	8	6	44	42-46	Chandalar River
	10	1	43	-	Chandalar River

Appendix 1. Form used for interviewing households for the Arctic Village harvest survey, 2001-03.

Household information will not be released without your permission.

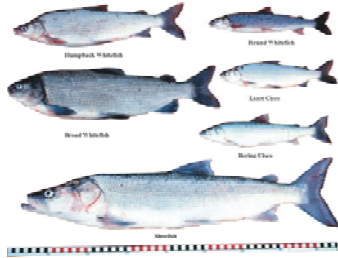
If you would like a summary of the survey, please give your name to the interviewer.

Mahsi' choo

1. HOW MANY PEOPLE LIVE IN YOUR HOUSEHOLD? _____								DID NOT FISH _____			
2. FOR EACH OF THE FOLLOWING LOCATIONS FROM OCTOBER 2001 TO MAY 2002:										5. DID YOUR HH SHARE FISH?	
WHAT GEAR DID YOUR HOUSEHOLD AT EACH LOCATION?								OTHER FISHING AREA		WHICH SPECIES?	
LOCATION	Old John Lake	Chandalar River	Redfish Lake	Mud Lake	Vazhrai	First Bend	First Tower			RECEIVE	GIVE AWAY
Gear Used*:	:	:	:	:	:	:	:	:	:	Yes/No	Yes/No
Lake Trout/ <i>Neerahnjik</i>											
Arctic Char/ <i>Nehdlii</i>											
Arctic Grayling/ <i>Shrijaa</i>											
Sheefish/ <i>Shryah</i>											
Broad Whitefish/ <i>Chihshoo</i>											
Humpback Whitefish/ <i>Neeghan</i>											
Round Whitefish/ <i>Khaltai</i>											
Least Cisco/ <i>Ch'ootsik</i>											
Bering Cisco/ <i>Treeluk</i>											
Unidentified whitefish											
Burbot/ <i>Chehluk</i>											
Northern Pike/ <i>Itin</i>											
Longnose Sucker/ <i>Deets'at</i>											
Alaska Blackfish/ <i>Chyah</i>											
Other:											
Other:											
3. HOW WAS FISHING AT EACH LOCATION?											
(good, fair, poor)											
4. DID YOUR HOUSEHOLD FISH MORE OFTEN, THE SAME, OR LESS OFTEN AT EACH LOCATION THIS SEASON COMPARED TO OTHER YEARS?											
(more, same, less)											

Appendix 2. Species identification guide used for the harvest survey, fish sampling, and educational components of the Arctic Village harvest survey, 2001-03.

Arctic Village Area Fish Chart



Round Whitefish/*Khaltai*



Arctic Grayling/*Shriija*



Broad Whitefish/*Chihshoo*



Lake Trout/*Neerahnjik*



Burbot/*Chehluk*



Humpback Whitefish/*Neeghan*



Arctic Char/Dolly Varden/*Nehdlii*



Longnose Sucker/*Deets'at*



Least Cisco/*Ch'ootsik*



Northern Pike/*Iltin*



Alaska Blackfish/*Chyah*

USFWS, Fairbanks Fishery Resource Office (800) 801-5108

Appendix 3. Forms used at Arctic Village school during the educational component of the Arctic Village harvest survey, 2001-03.

Arctic Village School - Fish Education

Station #1 - Fish identification, length, and weight					
	<u>Fish name</u>	<u>Gwich'in name</u>	<u>Name from fish key</u>	<u>Length (mm)</u>	<u>Weight (g)</u>
Specimens					
#1					
#2					
#3					
Photos					
#1				Names of fish you catch:	
#2					
#3					

Station #2 - Dissection				
	<u>Fish name</u>	<u>Gwich'in name</u>	<u>Name from key</u>	<u>Organs identified</u>
#1				
#2				

Station #3 - Aging			
	<u>Scales (grayling)</u>	<u>Otolith (Arctic char)</u>	<u>Vertebrae (chum salmon)</u>
Age			

Station #4 - Summary (average fork lengths, weights, and ages)				
Average				
	<u>Length</u>	<u>Weight</u>		<u>Age</u>
#1			<u>Scales (Arctic grayling)</u>	
#2			<u>Otoliths (Arctic char)</u>	
#3			<u>Vertebrae (chum salmon)</u>	

Appendix 4. Poster used to describe the harvest survey at Arctic Village, 2001-03.

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SUBSISTENCE HARVEST OF FRESHWATER FISH FROM WATERS NEAR ARCTIC VILLAGE



INTRODUCTION

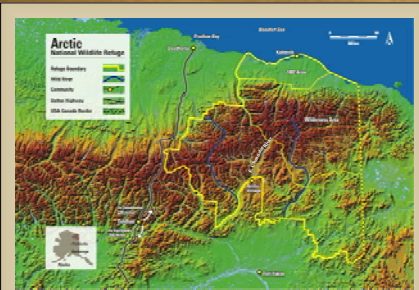
Pacific salmon do not occur in the Arctic Village area, and the community is reliant on freshwater fish to support its subsistence lifestyle. However, no information had previously been collected to describe this fishery. In cooperation with Arctic Village Council, Arctic National Wildlife Refuge, Office of Subsistence Management, and Alaska Department of Fish and Game, the Fairbanks Fish and Wildlife Office conducted the first survey to characterize this subsistence fishery. The following describes results from May-October 2001 harvest period, the first of four semi-annual surveys.

RESULTS

All 45 households in the village were interviewed, and 88% harvested fish. Sharing and exchange of fish occurred in over half of the households. Nearly three tons of fish were harvested with Arctic grayling being used by most households. However, the species that contributed the greatest numbers and weight was broad whitefish. Northern pike were used by a quarter of the households.

DISCUSSION

This first-ever subsistence fishery harvest survey in Arctic Village has provided users and managers with insights about the fishery and the village's subsistence lifestyle. The information collected described the importance of the fishery to the village and also provided additional understanding about the species available. By partnering with the village, local residents were introduced to the type of information needed to manage fishery resources. Partnering also provided managers with an appreciation for the subsistence way of life and the complexities of sharing resources within the village. The success of this project has set the stage for conducting similar projects in other villages in northern Alaska.



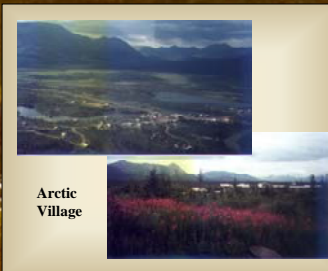
Arctic Village is located in the heart of the Arctic National Wildlife Refuge



Arctic Village residents fishing on Old John Lake



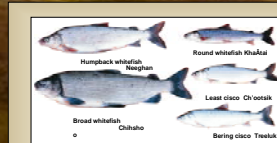
Gill nets were the most commonly used fishing equipment by residents of Arctic Village



Arctic Village

The Chandalar River was the water body most used by villagers. Over 40% of the fish harvested were captured in this stream with broad whitefish comprising the greatest number. Almost three quarters of the fish harvested were captured with a gill net, but hook and line and fish traps were also used.

Nearly 90% of the households reported fishing the same amount as the previous year, and fewer than 1% fished less. About three quarters of the households described fishing as fair compared to the previous year. The remaining quarter stated that fishing was good, and no household reported fishing to be poorer.



Variety of white fish harvested by the residents of Arctic Village

METHODS

During October 2001, two local technicians were hired by the Arctic Village Council to conduct post season interviews with all households in the village. Heads of households were requested to describe their subsistence fishing activities. Information requested included: numbers of each species captured, fishing locations, fishing gear used, and whether harvest was shared. Households were also requested to compare their fishing effort and success between the previous and current years.

Jeff Adams and Theresa Tanner; USFWS Fairbanks Fish and Wildlife Office; Box 17, Room #222, 101 12th Avenue, Fairbanks, AK 99701; Jeff_Adams@fws.gov

Poster by Dan Gwinn

Fairbanks Fish & Wildlife Office

Building partnerships to manage and conserve natural resources in northern Alaska

Appendix 5. Fact sheet describing the harvest survey in Arctic Village, 2001-03 (FFWFO formerly known as the Fairbanks Fishery Resources Office).



U.S. Fish & Wildlife Service

Fairbanks

Fishery Resources Office

Subsistence Harvest of Freshwater Fish Near Arctic Village

Subsistence users from Arctic Village have recently expressed concerns about declines in harvests of whitefish, lake trout, and northern pike. In response, Fairbanks FRO initiated a harvest survey with the village. The focus of the project was to use local residents to collect information to characterize the fishery, document the number of each species of fish harvested, and collect length and age information. Information collected over the next two years will be stratified into ice free and ice cover periods to reflect the harvest characteristics of each season.

The project has been guided by ADFG Subsistence Division protocols and has been coordinated with a traditional ecological knowledge project conducted by Arctic Refuge. Arctic Village Council hired 1 technician and 2 interns to interview fishers and collect biological samples of the catch.

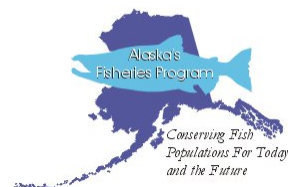
For the ice free season in 2001, 45 of 45 expected interviews have been completed. The Chandalar River near the village received a large majority of the

fishing effort. The completed interviews indicated that six species of fish were harvested during the ice free season. Whitefish were harvested most frequently and also accounted for the greatest number harvested. Arctic grayling accounted for the next highest frequency and number. Other species included: burbot, northern pike, Arctic char, and longnose sucker.

Results indicated that all the households in the village fished at least once during the open water season.

The majority of the fish harvested were captured with a gill net, but rod and reel and fish traps were also used.

Length and age characteristics of the harvest were typical for these species in Arctic environments. Future work will include continuing the interviews and collecting samples as well as conducting training sessions for the local hires to become environmental education instructors.



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