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North Slope (Anaktuvuk Pass) Subsistence Fish Harvest Assessment

Annual Report No. FIS 02-050-3

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ANNUAL REPORT SUMMARY PAGE

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INTRODUCTION

This project was initiated in response to local issues and information needs identified by Arctic/Kotzebue/Norton Sound Regional Subsistence Advisory Councils during February 2000 (U.S. Fish and Wildlife Service 2000:4-5; Stock Status and Trends, and Subsistence Harvest Monitoring). In addition, the need for this study was raised by the Anaktuvuk Pass representative to the North Slope Borough Fish and Game Management Committee at its December 2000 meeting in Barrow, Alaska. The committee endorsed the project as did staff from the Gates of the Arctic National Park and Preserve. Support for this project focused on the need for information useful in resource management and planning on park and nearby state lands.

The Nunamiut (inland) Eskimos of Anaktuvuk Pass rely on a smaller range of subsistence resources than do their relatives in other North Slope Borough (NSB) communities. As is the case in other NSB communities, however, a variety of fish species serve as important subsistence resources to Anaktuvuk Pass residents. Several accounts document the long time importance of fish both as human and dog food (Campbell 1962; Gubser 1965; Ingstad 1954; Hall 1986). Additionally, archaeological and oral historical accounts indicate that prior to settling in Anaktuvuk Pass in the early 1950s, Nunamiut seasonal settlements were typically situated near productive caribou hunting and fishing grounds (Campbell 1962; Gubser 1965).

Documentation of fish harvests (both numbers and species composition) and fish harvest locations by Anaktuvuk Pass residents is limited. While estimates of community harvests are scarce and incomplete, several studies provide some insight into the importance of fish to the Nunamiut diet. Patterson (1974) estimated that in 1973, total annual fish harvest averaged approximately 4,000 pounds, or about 3 percent of the diet. Twenty years later, Brower (1996) estimated that Anaktuvuk Pass residents harvested approximately 1,300 fish annually. This harvest was estimated to comprise about 4 percent of the total diet.

In addition to limited harvest data, some data on fishing locations has also been collected. Pedersen (1979) documented general community fishing areas for Anaktuvuk Pass and Nelson (1982) collected limited information of species fishing locations. Some Nunamiut TEK information on the species of fish harvested is available in Campbell (1962) and Gubser (1965), but there is a paucity of comprehensive historical information from community residents.

Based on these varied and incomplete accounts, it appears that Dolly Varden, lake trout and Artic grayling are the fish species of primary importance, although burbot and several species of whitefish are also harvested by Anaktuvuk Pass residents (Brower 1996; Campbell 1962; Gubser 1965; Hall 1985; Ingstad 1954). Of all these fish, Dolly Varden is thought to be one of the most important both in terms of numbers harvested and local preference as in many other NSB communities (Craig 1987; Fall 1995; Pedersen 2000; Scott 2000). The majority of Dolly Varden taken in the Anaktuvuk Pass fishery is anadromous, and they are harvested in mixed stock fisheries within and outside of federal conservation units. These stocks migrate to and from federal conservation units for spawning and over-wintering.

Residents of Anaktuvuk Pass expressed concern about protecting over-wintering areas and maintaining sustainable Dolly Varden populations (noted in OSM's subsistence monitoring issues). At the December 2000 NSB Fish and Game Management Committee meeting in Barrow, a representative from Anaktuvuk Pass noted that the community was concerned over potential negative effects of possible nearby industrial development on availability and access to community subsistence resources. Community leaders also noted that while limited information on caribou and sheep harvests exits, there is no comprehensive ethnographic or current detailed information on the subsistence fishery in Anaktuvuk Pass. Because of the importance of these stocks for local subsistence users, and due to the fact that there is no current comprehensive harvest assessment information for fish species, this fish harvest assessment, TEK, and stock status project was undertaken.

OBJECTIVES

There are five objectives for this project:

1. To estimate the total annual subsistence harvest by Anaktuvuk Pass residents of all fish species, including Dolly Varden, through two annual community household surveys (Oct. 2001-Sept. 2002 and Oct. 2002-Sept. 2003).
2. To compile information on fishing locations, productivity, effort, gear types, and participation rates based on survey information.
3. To collect descriptive Nunamiut natural history information on key fish species utilized by Anaktuvuk Pass residents.
4. To sample subsistence Dolly Varden harvests for genetic analysis for estimation of stock composition of harvests and investigation of seasonal movement patterns and stock origins of subsistence harvested Dolly Varden.
5. To develop local capacity in Anaktuvuk Pass to participate in defining research questions, collecting, reviewing and analyzing data, and reporting the study findings.

METHODS

A. Harvest Assessment

Community subsistence fish harvest data for Study Years 1 and 2 (October 2001 through September 2002, and October 2002-September 2003) were collected through four separate systematic seasonal household surveys ("Winter" 2001-2002, "Summer" 2002, "Winter" 2002-2003, and "Summer" 2003) in which all households in the community, at the time of the survey,

were contacted. Thus a census, rather than sampling, approach was used in this study. Household survey information was based on retrospective recall for a period of up to eight months. The two annual survey periods used in each study year were devised based on community representative recommendations on the logic that we would obtain better information if we contacted fishers after the end of each local fishery "season." Winter was locally defined as generally beginning in October and lasting through May – a period when snowmobiles were the principal mode of transportation. "Summer" was then basically the snow-free season (June through September) when wheeled types of transportation predominated. See Appendix A for a sample survey instrument.

This study was conducted in accordance with the Division of Subsistence policy on research ethics and employed a local research assistant, Ms. Cheryl Hugo, hired by the City of Anaktuvuk Pass and trained by division staff, to administer each survey. Households were contacted and provided information about the voluntary and confidential nature of their participation. In addition, households were given contact information for people involved in the study in the event that they wanted additional project information.

Survey Approach

Based on a July 2002 updated community household listing available from the City of Anaktuvuk Pass an initial household survey list was drawn up. This list was reviewed and updated as needed by the local research assistant prior to each household survey effort.

At the time this study began there were less than100 households in Anaktuvuk Pass. Given that community size, a census approach to obtaining the desired information was deemed appropriate. Thus, all community households present at the time of the survey effort were invited to participate.

Pre-Fieldwork Training Sessions

A pre-fieldwork training session with Ms. Cheryl Hugo, the local research assistant, was conducted in July 2002 in preparation for the "Winter" 2001/2002 survey. Though that training session, and the associated community survey, took place later than planned, subsequent training was conducted as planned. The first training session accomplished the following:

1. Provided the local research assistant with information on previous fishery research in the community.
2. Reviewed and discussed goals and procedures for this study.
3. Helped the local research assistant understand basic survey administration and record keeping.
4. Afforded realistic practice in contacting households and conducting successful household interviews.

Subsequent training sessions built on the first and extended training into practical experience in recording general observations of community fishing activity during each survey period.

Ms. Hugo was supplied with a training and support packet which included: a training manual to guide the local research assistant in survey administration and other project record keeping, a fish identification guide, and specific information regarding the survey (such as confidentiality of survey responses) that each participating household needed to be advised of.

Data Collection Phase

Harvest and use data for the period October 2001 through June 2002 (referred to as "Winter " 2001-2002) were collected in August and September 2002, in locally conducted, face-to-face interviews between the local research assistant and a knowledgeable household representative. Using the same approach "Summer" 2002 (July through September 2002) were collected during October 2002, "Winter" 2002-2003 were obtained in June and July 2003, and "Summer " 2003 harvest surveys were conducted in late September and through October 2003. Division of Subsistence staff in Fairbanks and City of Anaktuvuk Pass staff carefully monitored the local research assistant to ensure her safety and to answer questions or provide additional information and clarification on survey implementation.

Subsistence harvest data collected based on face-to-face household surveys have consistently resulted in harvest estimates that far better characterize community harvest levels than those derived from more formal instruments (i.e. harvest tickets). Furthermore, harvest surveys administered by local research assistants indicate that community residents are often more comfortable with local interviewers, that they, as a result, generate better information and can lead to higher levels of participation.

B. Collection of Natural History Information (TEK)

Associated with obtaining quantitative measures of subsistence fish harvests in Anaktuvuk, this project has included a modest effort to obtain highly focused local natural history information, or TEK (Traditional Ecological Knowledge), about Dolly Varden and Arctic char in the Brooks Range. A one-page interview guide was developed with assistance from Mr. Grant Spearman, of the Simon Paneak Memorial Museum in Anaktuvuk Pass, and Ms. Cheryl Hugo received hands-on training in this information collection method from both the PI and Mr.Spearman.

Primary data collection, through interviews with key informants in Anaktuvuk Pass, was undertaken in late winter 2002/2003 and again in July and August 2003. Individuals that were considered particularly knowledgeable about fish species in the central Brook Range were identified with the assistance of city and Tribal personnel in Anaktuvuk Pass.

These interviews have all been semi-structured in format, meaning that the interviewer only outlines general areas of inquiry and considerable flexibility is provided the respondent in providing answers. Interviews were carried out in a quiet office area provided by the City of Anaktuvuk Pass, tape recorded with the use of a small non-invasive cassette recorder, and supplemented with interview notes. During interviews, maps, and in some cases pictures were used as prompts. Relevant information (e.g., locations of spawning areas, rearing habitat, traditional harvesting areas, etc.) was mapped on a clear plastic overlay over USGS 1:250,000 maps. Interview tapes were dated and marked with the key informants name. Individual interviews were transcribed and the respondent was given a copy to review and provide additional information or comments. Each interview map-overlay was carefully marked with respondents name, date of interview, interviewer's name and a key to markings made on the overlay.

Recorded interviews include the following types of information (as reported by local experts): species utilized and local names for fish species; natural history information including habitat preferences, spawning & rearing areas, seasonal movements of fish; traditional as well as contemporary harvest methods, including timing of harvest, gear used, mapping of harvest areas and collection of fish- and fishing-related place names; and relative abundance and population trends. Emphasis of the natural history information focused on Dolly Varden, for which we, as part of this project, also have collected certain biological information as outlined in D.

C. Ethnographic Information

Development of an ethnographic summary from Anaktuvuk Pass is closely related to the previous section (*B.*), although its focus is on the development a body of information from published, unpublished and a wider selection of local expert sources. This effort, funded as part of this project, is administered as a separate USFWS-FIS contract with Mr. Grant Spearman, Curator at the Simon Paneak Memorial Museum in Anaktuvuk Pass (a unit of the North Slope Borough's Planning Department).

The goal of the component is to produce a basic ethnography of Nunamiut fishing that provides a deeper temporal perspective than what is captured in harvest assessment and general TEK components of this project (Nunamiut is the term the Inupiat people of Anaktuvuk Pass use to refer to themselves).

Methods used to obtain this information include literature review, general as well as focused interviews with particularly experienced and knowledgeable local fishers and elders (former fishers). Key informant interviews are taped and information transcribed. Biological sketches of key species taken by the Nunamiut, as well as the importance of fish in the Nunamiut diet over time, and changing fishing methods and technology will be discussed in this summary.

The local research assistant supported Mr. Spearman in a number of key informant interview sessions (during the Spring of 2003) pertaining to resource use information for some northern Brooks Range drainages, assisting in transcribing taped interviews, and obtaining additional local information on the Inupiat spelling of place names mentioned in interviews.

D. Biological Sampling

Fin-clipping (taking a small portion of the dorsal fin) of a sample of "Winter" and "Summer" subsistence harvested Dolly Varden for stock (DNA) assessment, was an important part of this project. Local research assistant, Ms. Cheryl Hugo, received general and practical training in field identification of Dolly Varden, the art of taking a fin-clip sample, sample care, and record-keeping from project staff. The approach and procedures for this work was documented in a field manual kept by the research assistant. Sample vials, fish measuring and sampling equipment and record-keeping forms for the 2001-2002 and 2002-2003 study years were provided.

Throughout the project community fishers were notified (by CB and through notices placed at the post office, store and in the City Office) that the local research assistant was seeking samples from Dolly Varden. To encourage participation in this effort, the City offered to pay fishers $10.00 per sample obtained by the local research assistant. A maximum number of 100 samples from a variety of harvest locations in the Anaktuvuk Pass was set for each of the two funded study years.

Each fin-clip sample obtained from a locally harvested Dolly Varden was placed in a sequentially numbered vial, recorded on a sample sheet where date and location of harvest, and a fork length (in mm.) of the fish was recorded. Each sample vial was placed in a specially designed plastic box capable of holding up to fifty samples.

As sampling progressed, record sheets and sample vials were provided to the PI from-time-to-time. After review by the PI, sample boxes and associated documentation were turned over to Fairbanks ADF&G-Sport Fish biologist Tim Viavant and sent out for analysis by the USFWS' Fisheries Genetics Laboratory.

E. Capacity Building

A significant component of the capacity building aspect of this project was to train and help develop a local resident to effectively participate in this study. The selected community research assistant received training to confidently, and fairly independently, prepare for, carry out, and document household fishery harvest assessment surveys in the community. Additionally the research assistant was trained to obtain and organize key respondent natural history (TEK) information the local subsistence fishery and practical experience in taking and systematically

recording DNA (biological) samples and physical measurements of locally harvested Dolly Varden.

Finally, the local research assistant will gain experience in project completion through participation in discussion of project findings and review of project draft reports.

Community capacity to undertake and monitor local resource-related projects was enhanced through engaging staff from the City of Anaktuvuk Pass and the local Tribal Office in review of the proposed harvest survey instrument, in monitoring survey progress and performance, assisting in the design and implementation of biological sampling of subsistence harvested Dolly Varden, and in monitoring project research assistant performance through regular project reporting to City Council meetings. Finally, consultation with City and Tribal officials during project report preparation and inviting their staff to review the report draft also serve as local capacity-building mechanisms.

RESULTS

A. Harvest Assessment

Four "seasonal" subsistence fishery harvest assessments ("Winter" 2001-2002, "Summer" 2002, "Winter" 2002-2003, and "Summer" 2003) representing two 12-month study years (October through September) have been completed in Anaktuvuk Pass. All household surveys from each "season" have been reviewed and undergone initial data processing. Statistical summary results for Study Year 1 have been completed, and results from the Study Year 2 will be available early in the next reporting period.

Survey participation was very good in the two Study Years. For the "Winter" 2001-2002 survey 82 of 97 community households (or 85%) were interviewed, and for "Summer" 2002 survey 78 of 89 community households (or 88%) were interviewed.

In each seasonal survey effort there were always households either out of town, not available for a variety of other reasons (working, never home, etc.) or refusing to participate while surveys were taken.

At the time "Summer" 2002 surveys were taken there were technically 99 households in the community. However, ten households (nine school teachers and a Public Safety officer) had been in Anaktuvuk Pass for one month or less, and not participated in fishing in the community area during that time. Rather than inflating the estimated total community harvest for the summer by including these households, the "Summer" estimate was based on 89 households resident for the entire survey period.

During "Winter" 2001-2002 the estimated edible weight of the landed community subsistence fish harvest was 3,178.5 lbs., and the "Summer" 2002 harvest yielded an estimated 3,416.4 lbs edible fish for the community. Estimated community useable harvests by "season" were derived by statistical extrapolation from the known, random, household sample to all community households. Estimated edible weight, not live fish weight, was used to derive harvest estimates by species. North Slope resource studies established edible weight conversion factors used in this work (Scott 1992: Table 1).

Fifteen distinct (and named) community fishing locations were reported for the "Winter" 2001-2002 subsistence fishery, and 18 were reported for the "Summer" 2002 fishery (Appendix 2). Reported harvest locations were located and documented on 1:250,000 USGS Quads.

Fish harvests in Anaktuvuk Pass during Study Year 1 comprised five species (burbot, Dolly Varden, Arctic char, lake trout, Arctic grayling, and, based on local description, Arctic cisco). The "Winter" 2001-2002 estimated harvest comprised four species: Dolly Varden (1,172.5 lbs), lake trout (1,041.0 lbs), Arctic grayling (917.7 lbs), and burbot (47.3lbs). Five species were reported in the "Summer" 2002 subsistence fishery, with Arctic grayling providing the greatest estimated edible harvest contribution (2,599.6 lbs) and lake trout, Dolly Varden, burbot and whitefish providing a smaller, but significant, estimated catch (374.5, 320.4, 69.4, and 52.6 lbs respectively).

Combining results of the two surveys provides an annual (October 2001 through September 2002) estimated community edible fish harvest of 6,595.0 lbs, or 20.0 lbs of fish per capita in Anaktuvuk Pass. Arctic grayling was the most commonly harvested fish species, comprising 53 percent of the estimated harvest (10.9 lbs per capita). Dolly Varden and lake trout comprised 23 and 21 percent of the estimated harvest and contributed 4.4 and 4.2 lbs per capita, respectively. Estimated catches of burbot and whitefish in Study Year 1 were relatively low (116.7 and 52.6 lbs, or 0.4 and 0.2 lbs per capita, respectively).

Draft results from the recently completed "Winter" 2002-2003 and "Summer" 2003 harvest surveys have not yet been adequately compiled to include in this report. However, household participation in the two surveys continued to be good

B. Collection of Natural History Information (TEK)

Collection of TEK data for this project is ongoing. Ten interviews having been conducted to date (Nov. 2003). An additional five TEK interviews have been planned and will be conducted in mid-winter 2003/2004.

Raw data sets from completed interviews consists of 6 hours of audio tape, over twenty pages of transcription notes from the taped interviews, and a base map (USGS 1:250,000) with master acetate overlay with harvest sites, winter Dolly Varden concentration sites, fish spawning areas, and other mapped information offered by respondents.

Information collected from respondents with respect to Dolly Varden and other harvested fish species represents a substantial body of information and a significant source of traditional knowledge accumulated through many lifetimes lived in the central Brooks Range. These data are still being reviewed and synthesized. However, for each species, the information collected fall generally into the following categories: 1) Native terms and systematics; 2) life history, seasonal movements and spawning areas; 3) traditional and contemporary harvest methods; 4) relative abundance; and 5) traditional stories, myths and beliefs.

In terms of Inupiaq names of fish we are finding that those in use today for key species have not changed other than in orthography as the language is gradually transitioning into unified spelling rules across the North Slope. We do not have sufficient interviews in which detailed information on systematics is provided, but there seems to be general agreement that Arctic char, Dolly Varden and lake trout are all closely related, as are the two types of whitefish (round whitefish and Arctic Cisco) caught in the Brooks Range and the northern foothills. The remaining key fishes harvested by the Nunamiut (Arctic grayling, burbot) are clearly not seen as related to one another or the other commonly harvested fishes.

Seasonal movements, abundance and distribution of Dolly Varden and Arctic grayling in rivers are described in some detail in our interviews, and highly predictable over-wintering areas for Dolly Varden, predominantly in northern drainages, have been described and their locations marked on USGS 1:250,000 scale maps.

Considerable information on fishing methods now in little use (such as impoundment and fish traps) has been provided in the interviews, and is accompanied by detailed description of the technology and how it was employed. Additional information on these traditional methods is presented and discussed in Mr. Spearman's report (Appendix C).

C. Ethnographic Information

Draft sections of the ethnographic report on Nunamiut fishing being prepared by Mr. Grant Spearman, North Slope Borough,(under a separate, but project-connected contract with the USFWS-OSM/FIS), have been submitted to the PI and are added to this report as Appendix C.

The draft manuscript addresses topics such as "Distribution of Fish common to the Brooks Range", "Fish in Oral Nunamiut Tradition", "Traditional Fishing Methods and Technologies", and includes a discussion section entitled "Traditional Ecological Knowledge and Nunamiut Fishing".
In addition three hours of taped key informant sessions discussing, naming, and placing (on USGS 1:25,000 scale maps) fishing sites and traditional Nunamiut use of fish on the north side of the Brooks Range have been recorded. These tapes are currently being transcribed.

PI Pedersen is beginning to review the manuscript, and will coordinate comments to Mr. Spearman through the USFWS-OSM/FIS. Completion of the draft ethnographic report is as planned late winter 2003-2004.

D. Biological Sampling

Sampling of "Winter 2001-2002" catches from Anaktuvuk Pass residents was not possible due to the late start-up of the study. By the time staff was organized and ready to sample fish from this period none could be obtained in the community.

Four fin-clip samples from two distinct locations were obtained from the "Summer" 2002 fishery. In spite of an increased effort to obtain summer samples in 2003, none were made available by fishers. Though disappointing, this poor result is a reflection of the local fish utilization pattern during summer, where fish are largely consumed in the field and there is great demand among residents for the few brought back to the community.

Winter sampling was more successful in Study Year 2. We obtained 195 fin-clips from Dolly Varden, Arctic char and "old man fish" (midget variety of Dolly Varden) during the "Winter" 2002-2003. Sample access was much better due to larger individual catches and less consumption of harvested fish in the field. Furthermore, general environmental conditions (cold to very cold temperatures) and household storage of fish in outside cold storage or freezers contributed to the significant increase in samples obtained.

DISCUSSION

Fishing by residents of Anaktuvuk Pass continues to be an important cultural and economic activity. The estimated community harvest of fish in Study Year 1 (October 2001 through September 2002) was 6,595 lbs. and compares well with estimates made of community harvests dating back to the early 1970's (Patterson 1974) and 1990's (Brower 1996). Based on cursory observation it appears that as local employment and income have resulted in a more mixed cash-subsistence economy than when Patterson (1970) developed his estimate, local subsistence production of fish is not showing signs of decreasing. In fact, when recalling that fish was a common working-dog food in Anaktuvuk Pass into the 1970's (Gubser 1965, Nelson 1982, Spearman 1979) and since there are now (2003) very few working dogs in the community, fish are probably as important as human food today as they were back in the 1970's. We explore this matter further in the Final Report.

When processed survey data from the 2002-2003 fishery in Anaktuvuk Pass is available we will be able to better compare present community subsistence fishery production with that observed in the past. Field information from Study Year 2 ("Winter" 2002-2003 and "Summer" 2003) indicates that community fishing activity was comparable with that observed in Study Year 1. Key informant interviews planned for the fall and winter of 2003 will include added inquiry into the question about how significant community residents consider the fishery resource contribution to the overall diet of today as compared to the 1970's and earlier.

Based on fishery observations in Anaktuvuk Pass by Campbell (1962), Gubser (1965), Ingstad (1954) and others a high percentage of the annual subsistence fish harvest was thought to be composed of Dolly Varden and Arctic char. However, in Study Year 1 (October 2001 through September 2002) Arctic grayling was, both numerically and by weight, the most commonly harvested fishery resource and Dolly Varden/Arctic char ranking third in numbers harvested and a distant second in terms of estimated pounds harvested. Whether this represents a shift in fishery focus, selection of fishery locations, status of the resources, or simply was the way the fishery was conducted that year, is a question that will be investigated further with knowledgeable community fishers this fall (2003).

Subsistence harvest production by "season" in 2001-2002 did not show any great variation in terms of total useable weight. There was however a considerable difference in catch composition. In "Winter" the three most commonly harvested fishery resources (Dolly Varden, lake trout, and Arctic grayling) contributed landed useable weights that were close. That condition was not mirrored in the "Summer" 2002 subsistence fish harvest where the estimated community Arctic grayling harvest was over six times that of lake trout and Dolly Varden. Whether this "seasonal" difference in catch composition is the norm will be explored when results from Study Year 2 are available and in winter 2003-2004 through key informant interviews.

Fishers ranged over a wide area, especially during winter, and appeared to expend considerable effort and time to produce catches, especially of Lake trout. In comparing recorded summer fishing location distribution with that of winter fishing forays, we note that fishers travel two to three times as far in winter, yet utilize fewer harvest locations. Forthcoming analysis of community fishery harvest data from 2001-2002, and 2002-2003, will provide more informed insight into local fishery harvest production by season, site and species.

Descriptive information on traditional harvest and use by the Nunamiut of fishery resources in the central Brooks Range has been drafted, but no comparisons with current fishing practices, technology used, species caught, or areas used have been undertaken yet. Once we have completed collection and processing of two years of "new" information we will endeavor to undertake some limited comparisons as part of this study. However, it already seems clear that additional time should be sought to spend on such a comparison, especially in light of potential gas exploration and development in the foothills of the Brooks Range, which constitutes an important territorial component of the Nunamiut home range.

Information from this study addresses core issues raised by the community and noted by the North Slope Regional Advisory Council (USFWS 1999). Results from this work, taken together

with what is already known from other studies on movements, distribution, abundance and ecological requirements of fishes in the northern foothills and central Brooks Range, help inform management of these resources that have been and continue to be, of key importance to residents of Anaktuvuk Pass. Furthermore, it is also clear from this work that area residents are concerned about these resources, possess intimate knowledge about them, and that they would welcome active representation in local fishery management, planning, and policy-making.

Biological sampling of Dolly Varden/Arctic char was very slow in Study Year 1 (2001-2002). In part this was due to a late start of the project, which as a consequence completely missed the most productive local harvest period (spring ice-fishing) for the target species. In addition, incomplete understanding of fisher behavior during the "Summer" also prevented successful collection of specimens.

"Summer" caught fish are not brought back to the community, but are consumed in situ, at, or near, the particular fishing site. Lack of understanding of this relatively simple condition by the project leader resulted in only four samples being obtained during the summer of 2002.

Adapting to this condition, and having sample collection staff visit favored fishing sites near the community, improved summer sampling in 2003 (which is still ongoing at the time this is being written). Winter sampling was very successful in the spring of 2003, with nearly two hundered samples being obtained of Dolly Varden/Arctic char from traditional Nunamiut fishery harvest locations. As we were not particularly successful in this aspect due to a late project start-up in 2002, we will, if funding allows, try to obtain samples from the spring 2004 season instead.

Fishing households in Anaktuvuk Pass have been very supportive of this project and many have made a special effort to "share" their catch with the scientific community. Residents have expressed a strong interest in learning more about how Dolly Varden/Arctic char populations they rely on for cultural and nutritional sustenance, relate to others on the North Slope and in the circumpolar Arctic. Though results of the sampling we are undertaking as part of this project will not be available for inclusion in our final report, we hope that FIS will find a constructive way to provide and present that additional piece of our work to the community. Presenters of that information will find an engaged, intrigued, and appreciative audience in the Nunamiut of Anaktuvuk Pass.

CONCLUSIONS

Conclusions will be more fully documented in the final report, when project analysis is complete.

RECOMMENDATIONS

Recommendations will be more fully documented in the final report, when project analysis is complete.

ACKNOWLEDGEMENTS

The authors would like to thank the City Council of Anaktuvuk Pass for their strong support of this project, and the people of Anaktuvuk Pass for their patient participation in household surveys and willingness to share their knowledge about the central Brooks Range fishery resources. We are indebted to the elders, city and tribal personnel, and village residents who participated in or helped with making this project a success.

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APPENDIX A: Survey Form

HH ID _____-02W DATE_____ INTERVIEWER _____ COMMUNITY 12

ANAKTUVUK SUBSISTENCE FISH HARVEST SURVEY

A cooperative effort of the City of Anaktuvuk Pass and Alaska Department of Fish and Game, Division of Subsistence.

1. How many people lived in the household this past year? _____ INUPIAT HH? YES NO
2. Since freeze-up last fall (October 2001) through break-up this May/June (2002), did you or anyone in your household:

   GO FISHING? YES NO HOW MANY IN HH FISHED? _____ Catch Fish? YES NO

   RECEIVE FISH FROM ANOTHER HOUSEHOLD? YES NO

   GIVE FISH TO ANOTHER HOUSEHOLD? YES NO

   If NO to Go Fishing? ask Receive and Give questions then skip to Question 6
   If NO to Catch Fish? ask Receive and Give questions then skip to Question 5.

3a. How many iqalukpik (char), sulukpaugaq (grayling), iqaluaqpak (lake trout), tittaaliq (burbot) and other fish did all the people fishing in your household catch during winter (by month)?

Fish Type	2001			2002						Unknown	Overall Total
	Oct.	Nov.	Dec.	Jan	Feb.	March	April	May	June		
Iqalukpik											
Sulukpaugaq											
Iqaluaqpak											
Tittaliq											
Other Fish											

Please tell us where your household caught the fish reported in 3(a); turn the page to list by month, where, fish type, fishing method and how you got to the fishing area.

4. During the winter did you or anyone in your household catch any fish that were not used because they did not look healthy? YES * NO

   *If YES, what was wrong with them?

Symptom	What kind of fish, how many, which month(s) and where?	Symptom	What kind of fish, how many, which month(s) and where?
1.		3.	
2.		4.	

Were these fish counted (reported) in question 3(a)? YES NO

5. If your HH did not catch any fish this winter - What was the reason that your household was unsuccessful?
6. DO YOU HAVE ANY COMMENTS OR CONCERNS ABOUT FISHING IN THE ANAKTUVUK AREA?

Quyanaq!

APPENDIX A (continued)

3b. FISH HARVEST LOCATION INFORMATION – WINTER 2001/2002

WHERE DID YOUR HOUSEHOLD CATCH FISH IN THE MONTHS REPORTED IN QUESTION 3a.

			KIND, NUMBER, AND FISHING METHOD			HOW DID YOU GET TO THE FISHING AREA?		
MONTH	WHERE (PLACE NAME)	Loc. Code	FISH KIND	NUMBER CAUGHT	FISHING METHOD	SNOWMACHINE? Y/N	ATV? Y/N	OTHER? DESCRIBE

APPENDIX B: Reported Harvest Locations

Anaktuvuk Pass Subsistence Fish Harvest Locations Reported in 2001 and 2002

Location #	Name	Season of Use*
1	John River	(S, W)
2	Annivik	(S, W)
3	Tulugak Lake	(S)
4	Contact Creek (Big Contact)	(S)
5	Glacier	(S, W)
6	Ikiakpuk	(S, W)
7	Cache Lake	(S, W)
8	Anaqtiqtuaq	(S, W)
9	Ekopuk	(S)
10	Inukpak (Giant Creek)	(S)
11	Char Hole	(S)
12	Qalutaq	(S)
13	Anaktuvuk River	(S)
14	Chandler Lake	(S, W)
15	Eleanor Lake	(S, W)
16	Weasel	(S)
17	Itkillik Lake	(W)
18	Shainin Lake	(W)
19	Little Chandler Lake	(W)
20	Willow Lake	(W)

* S = "Summer"; W = "Winter"

APPENDIX C: Nunamiut Fish Ethnography Excerpts

Fish Excerpts

by

Grant Spearman
Simon Paneak Memorial Museum
North Slope Borough
Anaktuvuk Pass, Alaska

At the request of the Alaska Department of Fish and Game, I have excerpted limited portions of the Nunamiut Fish Ethnography narrative in order to provide interested parties some idea of the level and scope of coverage this topic is being given. It is not an overview, nor does not reflect either the totality of topics given coverage or the final degree of detail that any particular topic will receive. It is simply a fragmented snapshot of a work in progress.

The basic array of topics that are anticipated to be covered in the final report include

- Introduction and methodology
- Introductory narrative
- Physical environment of the study area
- Distribution of fish in the study area
- Biological sketches of key fish species
- Cultural and nutritional values of fish
- Processing and storage
- Spiritual values associated with fish
- Fish in oral traditions
- Traditional fishing methods and technologies
- Traditional Ecological Knowledge as applied to fishing
- Continuity and change in the role of fishing through time
- Fishing today

Included here are: the introduction and methodology section to give the reader some idea of how the research was approached and conducted, the introductory portion of the narrative establishing the position of the Nunamiut and their level of dependance upon fish relative to other Native Alaska peoples, an example of one of their traditional fishing technologies, a minor exploration of the spiritual aspects of fish and how it relates to Nunamiut fishing lore, along with elements of T.E.K. and the very first section dealing with a more comprehensive discussion of continuity and change in Nunamiut fishing practices through time.

It would be well to keep in mind that even these few sections are not complete but are only in draft form and will quite likely undergo further refinement as completion of the final report progresses, over the next 12 months.

Ever since coming to the attention of the scientific community in the late 1940's, the Nunamiut people of Anaktuvuk Pass have, over the past five plus decades, had a history of close cooperation with visiting scholars and researchers. As a result, they have, in their own special and substantial way made some very valuable contributions to the worlds knowledge and understanding of the arctic environment in which they live. It is no exaggeration to say that quite a number of first rank, and some world renown scientists from a variety of fields of inquiry from anthropology, archaeology, botany, biology and others, have come to not only study but to actively learn from these patient, perceptive and insightful people.

While at first glance it might seem that there scarcely remains an unturned stone in the voluminous studies of their traditional ways and knowledge, one of the least examined topics concerns their knowledge and long standing involvement with fish and fishing. Thus Campbell's succinct and decades old observation that "...little systematic ichthyology has been done at Anaktuvuk Pass." rings as true today as it did when first made forty years ago. (1962:94)

Even when casting across the full range of years of scientific inquiry here, it is swiftly apparent that the researchers who have turned their attention to even a rudimentary examination of either biologically or culturally based Nunamiut knowledge of fish can be quickly counted on the fingers of a single hand.

Perhaps the earliest was Vladimir Walters, a fish scientist who spent some time working on the Arctic Slope in the late 1940's and in 1957 produced a volume entitled "Fishes of Western Arctic America and Eastern Arctic Siberia, Taxonomy and Zoogeography", that enumerated the fish species of the North Slope and Arctic Region, with occasional reference to traditional Nunamiut knowledge and use.

The first person to have produced a more focused coverage of the Nunamiut and fish was John Martin Campbell who began working among the people of Anaktuvk Pass as early as 1956. An archaeologist by profession, naturalist by inclination and inveterate angler by avocation, Campbell's life-long preoccupation with fish and fishing coupled with his examination of cultures and their adaptation to arctic landscapes, led him to produce, in 1962, perhaps the most thorough and perceptive, though brief examination of the Nunamiut and fish in existence to date.

Subsequent to Campbell, the next contributions are to be extracted from Gubser (1965) in his excellent ethnography of the Nunamiut, based upon his 14 months spent among them in 1960 and 1961. Some additional incidental nuggets relating to these people and fish can be gleaned from Ingstad (1954), Irving (1964) and 1951 field notes, Amsden (1977) and Binford (1978) among others.

From a more formally biological perspective, the literature on North Slope and Brooks Range fisheries bloomed briefly in the early to mid 1970;s as a number of joint State of Alaska/ Federal fishery studies were done to gather baseline data in advance of construction of the Trans Alaska Oil Pipeline.

In more recent years some Fish and Wildlife and National Park Service research projects were conducted at various locations around Gates of the Arctic National Park and Preserve including studies at Ulu (Itkillik) and Chandler Lakes.

Finally, beginning in the mid 1980's the present writer began to refocus attention upon previously under-reported or undocumented aspects of Nunamiut culture, as part of a North Slope Borough funded "Nunamiut Survival Skills Project". Thus much of the data, especially concerning traditional fishing methods and technologies, appearing here in this ethnographic sketch of Nunamiut fishing lore was recorded, though never written up or published at that time. This though has begun to change as these materials have come to the attention of resource managers, state, local and federal, which are in need of such information.

Methodology

Over the past several months that previously recorded information has been considerably augmented by more currently collected data to broaden and deepen our knowledge of this fascinating part of an ancient and on-going cultural tradition.

More specifically, the museums involvement in the current research has involved several lines of inquiry and documentation, done in cooperation and conjunction with project staff in the employ of the City of Anaktuvuk Pass.

Our primary charge is to research and produce an overall accounting of both traditional and contemporary Nunamiut fishing lore, practices, technologies environmental knowledge as well as the underlying cultural values from which they stem. Specific topics of inquiry and documentation include

- The nature of the physical environmental setting, the areas fish species and their preferred habitat
- A tracing of the importance of fish, in relation to other resources, through time and space, noting how it may have changed with reference to areas of human habitation, as well as by species.
- Recording Traditional Ecological Knowledge concerning the various species of fish of importance to the Nunamiut.
- The mapping of fishing localities, both past and present, in the north central Brooks Range and Arctic Foothills provinces, recording the availability of species, the seasonality of harvest and the methods of take.
- A detailed accounting of traditional fishing methods and technologies.
- Methods of preservation and preparation, both past and present.

- Oral traditions and cultural values associated with fish and fishing.

In addition to these research questions specifically tasked to the museum, our cooperative relationship with the City of Anaktuvuk involved providing their staff with access to research data and references from the museum library as well as providing technical aid and expertise in building their interview skills for conducting of ethnographic interviews with village elders.

The museum also took a lead in the interview process leading to the location of traditionally significant fishing localities. Much of this data was collected in interviews which began by defining the cultural landscape in which these specific localities occur, particularly through the recording of place names of prominent and defining physical feature such as mountains, valleys, hills, rivers, creeks, streams, lakes, etc. Once a working knowledge of the landscape was secured by the researchers, then specific fishing localities were documented, drainage by drainage, working downstream from the headwaters to the endpoint of fish resources.

Interviews on these physical landscape and fishing localities were recorded on 90 minute cassette tapes. Most interviews were conducted in English, but when requested by resource persons they were done in Inupiaq with the aid of translators. Specific data on specific fishing localities was recorded with the aid of prepared matrix like forms that included such data points as the name of the locality, the map quad, the physical setting of the locality, the species of fish and their seasonal availability, water conditions, and technologies employed.

Fish Narrative Introduction

Among the many and varied native peoples of Alaska, fish, both freshwater and salt, anadramous and lacustrine, have long been a vital source of physical, cultural and spiritual sustenance. From the Stikine River of Southeast Alaska, around the arc of the Gulf of Alaska, through the Aleutians to Bristol Bay and beyond, to the Kuskokwim, Yukon, Kobuk and Noatak Rivers of the Kotzebue Sound area, great summer runs of Chum, King, Coho and Silver Salmon have, since time out of mind, been the ever renewable bounty to peoples both coastal and those living far into the Interior.

Some cultures, like those of the Northwest Coast Indians of northwestern Canada and southeast Alaska have virtually been built upon these powerful and magnificent runs of salmon that yearly inundate their rivers and streams. Many other peoples, both coastal and inland, Eskimo and Athapaskan, rely upon salmon and other fish as key components of their diet to augment their otherwise primary reliance upon the hunting of large sea or land mammals. Without a plentiful and reliable fishery resource to depend, or at minimum draw, upon, life for them would have been very different, and perhaps very difficult.

Interestingly, as one moves farther to the north, beyond the Noatak and into the Arctic waters stretching from Point Hope to Canada, the seemingly inexhaustible runs of pacific salmon dwindle and diminish into insignificance. In their place, herring, Arctic char and several species of white fish become the dominant and staple varieties of fish inhabiting and swimming the

Arctic rivers that flow down from the Brooks Range, through the Arctic foothills, and into the chill, dark waters of the Chukchi and Beaufort Seas.

Collectively these richly varied species of fish have, nearly without exception, provided Alaskan native peoples with either the foundation of, or a very strong and enduringly supportive element in, their subsistence resource base. Yet there are also those very few, like the Nunamiut Inupiat, the Inland Eskimo, of the north central Brooks Range, who stand in rather dramatic contrast to this generalization, and for whom fish generally represented a relatively small, though at times significant, part of their total diet. Estimates as to the percentage of fish in their traditional diet range from a low of perhaps 10%, under normal circumstances, when caribou and other resources were readily available (Campbell 1968) to as much as 20% in times when caribou and the other fall back resources were in short supply. (Gubser 1965)

The Nunamiut remain to this day, perhaps the premier caribou hunting society in Arctic Alaska, if not all of North America. Like most big-game hunting peoples, they were, up until quite recent decades, nomadic, or more properly semi-nomadic, as well. With an economy, and indeed a culture, based upon the hunting of these highly mobile and sometimes elusively migrant animals it could hardly have been any other way. The ability to move, swiftly and sometimes far, in search of game and other resources was key to the Nunamiut way of life. But, by virtue of their largely montane and foothill territorial core, they were frequently limited in their access to large and reliable runs of anadromous fish, they naturally fell back upon those fish most readily available to them, what Campbell termed "locally resident species" (1962:90), those fish which either seasonally or on a year round basis occupy the upper reaches of the areas rivers, creeks and, especially, its many lakes.

Spirituality and Fish

Unlike the Tlingit, Haida, Tsimshian and other tribes of Southeast Alaska, whose dependance upon salmon in particular and other fish in general spawned an elaborate complex of spiritual beliefs and ceremonial observations surrounding these creatures, the Nunamiut seem to have possessed only the most modest of fish related beliefs. This is a reflection, perhaps, of their generally subordinate role as a food resource or, maybe, the fact that as a nomadic big game people they were more deeply engaged in trying to make a living rather than having much time to spare philosophizing about fish. Or, perhaps, simply because earlier researchers never recorded any such related traditions that might have existed while they were still readily accessible.

Based upon what is known, in the Nunamiut scheme of things, fish, like all the other wild creatures and beings which made up the natural (and supernatural) world were viewed as possessing a spiritual or essential life force which they call it's Inua.

In turn, the collective life force of all fish was embodied in, an all-encompassing power wielded by a supernatural being or guardian spirit. This guardian, which possess its own distinct personality was referred to as both the "Qaluich Kaÿiat" the chief, or literally the "root or source of the fish" or more simply "iqaluum Inua" the fish spirit.

According to Nunamiut oral tradition the fish spirit is a long haired woman whose flowing tresses obscure her face from view. Perpetually dwelling beneath the waters of lakes and rivers, she was likened to a mother of fish and always respected and perhaps occasionally feared for her power to control the availability of fish, alternately withholding or disbursing fish for the use of humans. Her inclination to either make fish plentifully available or to capriciously withhold them was seen as a direct response to peoples behavior towards her.

As with all creatures, the demonstration of respect and the observation of correct and appropriate behavior towards its Inua or spirit was essential to maintaining a good relationship with that spirit so that it would its associated creatures to be caught.

Part and parcel of this relationship with the Iqaluum Inua was the obligation to abide by a number of key restrictions to avoid angering the spirit. Judging by the admittedly fragmentary information presently available, it appears that a central concept in these restrictions is the necessity of refraining from activities involving certain other types of subsistence activities including berry picking or working and using products obtained from animals that provided food.

For example, one source reports that "...if a woman scraped or sewed caribou skins near a fishing place, the Inua of the fish would be angered and a fisherman would have bad luck there." (Gubser 1965:200) Additional insights into these restrictions can be seen in a story entitled "Qaluich Kaÿiat" which was recorded in Anaktuvuk Pass in 1949, published in 1987 and presented in the Fish in Oral Tradition section.

Traditional Fishing Methods and Technologies

As a big game hunting and gathering society, the Nunamiut people survived by drawing upon a deep and detailed knowledge of their world that was amassed and compiled over the course of many generations. Fish and fishing, of course was an integral part of that knowledge base, and the most successful fisherman were those who best combined the lore of their fathers and the skills of their own experience. This knowledge involved a thorough understanding of the favored habitat, feeding and breeding habits and the seasonal movements of each species of fish, combined with a detailed knowledge of the physical landscape, the precise locations where each type of fish can be found at any time of year, under varying conditions from spring floods to winter freeze up.

Thus the need and, more to the point, ability to reliably catch fish under any and all circumstances was nothing short of a necessity. So it was that the Nunamiut developed, refined and employed a sophisticated suite of, methods, techniques and technologies to take fish.

Among the traditional methods by which they secured this resource were the use of gill seine and dip nets, wooden traps and weirs, - occasionally used in conjunction with organized drives to herd the fish toward the contrivances - fish-spears and fish-arrows, hook and line jigging, trot lines, gaff-hooks, as well as a handful of others including the use of rocks and sticks and taking advantage of naturally occurring situations when falling and freezing waters stranded fish in cut off sloughs or left them high and dry in empty stream beds.

In the following section each of these methods techniques and technologies will be described in detail, exploring how they were made and used, from traditional times to the present day.
Example: Qagruqsaaq

Qaåruqsaqtuq
Lush Hook Fishing

Introduction

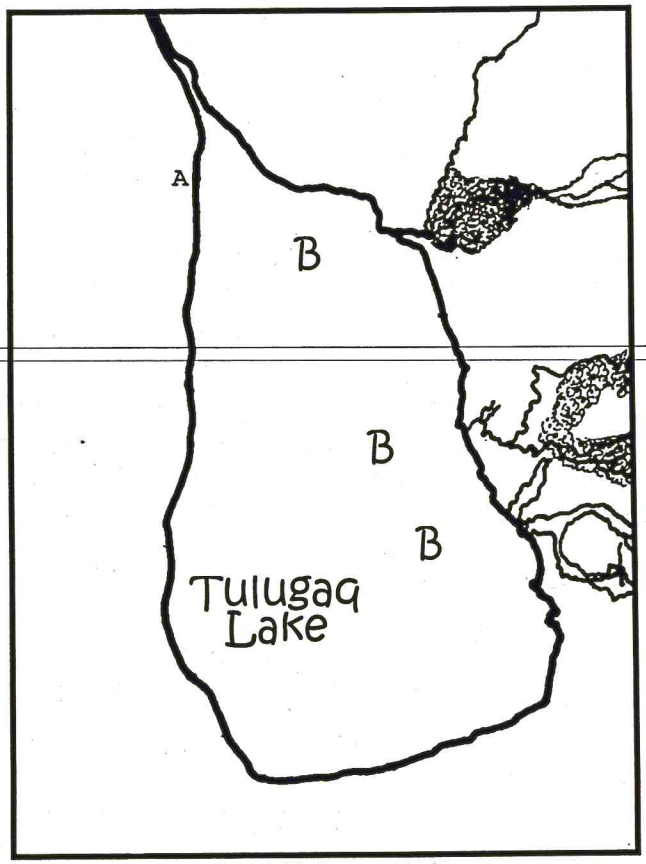
This is an ancient method of fishing which the **Nunamiut** have used from early traditional times until fairly recently, primarily to take two species of predatory, bottom feeding fish: the **Tittaaliq**, the ling-cod or burbot (*Lota lota*) and the **Siulik** or Northern pike (*Esox lucius Linnaeus*). Using both large hooks called **Qaåruqsaq** or throat gorges known as both **Sanniåuåiaq**, these baited lures were set out overnight in areas of shallow water, where these fish are most active in their feeding.

It was an all purpose method which could be used in both lakes and rivers, in the open waters of summer and beneath the shallow ice of late fall and early winter. Even more importantly, it was so very reliable that it allowed men, women and children to freely pursue other activities, and even sleep, while the fish essentially caught themselves. Although the ling and, to a lesser degree, the pike were usually the fish caught by this method, it was by no means limited just to them

In the pages to follow, information will be presented which includes a detailed description of the basic **Qaåruqsaq** tackle, how and from what materials they were made, how they were baited and how they were set, as well.

Fishing Localities

Each of these fish are equally at home in both lakes and rivers. According to one elder, river sets are usually restricted to **Qaglu,** the quiet pools or backwaters, where river currents are slow. The best lake set locations, particularly for ling, are said to be at **Nuiøak** the shallow waters at the head of a lake outlet stream, and **Kuugum Paaÿa** the mouths of inlet streams which flow down from the neighboring mountainsides. It is here that young grayling and lake trout come to feed on insects, insect larvae, and various nutrients washed down from upstream, and in the process, become easy prey for the wily and ever hungry ling. (Map 1)



Map 1 Tulugaq Lake

Illustrating A; Nuiøak and B; creek outlet, Kuugum Paaÿa

are the types of locations where Qaåruqsat were set.

People say that the best time to take the ling by use of **Qaåruqsaq,** is in early fall, just around freeze up, because after a full summer of feeding, they are at their fattest and best condition of the year. A fat fall **Tittaaliq** was considered a real treat to be enjoyed. They could also be taken in summer, but at this time of year they represented more of a back up food resource if caribou or other game was scarce.

Although, ling can be found in many lakes and outlet streams around **Anaqtuuvak** and elsewhere, some places were known to produce bigger, fatter fish than others. For example, **Tulugaq** Lake is known for nice fat ling, and the **Pittaich** lakes area, just a bit north from there was also a good place to take them, but another locality, not far from the village does not enjoy quit the same reputation. "*Where is lotta ling-cod, maybe down by Cache Lake* ***(Kanÿuumavium Narvaÿa)****, mouth of the* ***Kanÿuumavik*** *to the lake, best place to set up there too, is got ling-cod too, but the real slim one, they say*"

Qaåruqsaq
Tackle and Sets

Lines

The most basic **Qaåruqsaq** tackle outfit consists of the tether-line, the lure and the stay. Lines varied in material from rawhide to baleen. Lures were of two basic types; hooked lures and gorges. The stays were simply stout stakes either driven into the ground or frozen onto the surface of a lake, river, or large stream. Sets could vary from a single lure at the end of a short line to a much longer line with a wooden float at the far end, and baited with multiple lures. Each will be described in detail, below.

The tether line, known variously as the **Ipiutaq**, or the **Pituutaÿa**, was traditionally made from either of two materials; **Quniguq** and **Suqqaq**. **Quniguq** is a form of babiche, a rawhide line, usually about ¼ inch thick, made from de-haired caribou skin, and because it was a locally available material which the **Nunamiut** made themselves, it was perhaps more widely used than **Suqqaq.** (Figure 3)

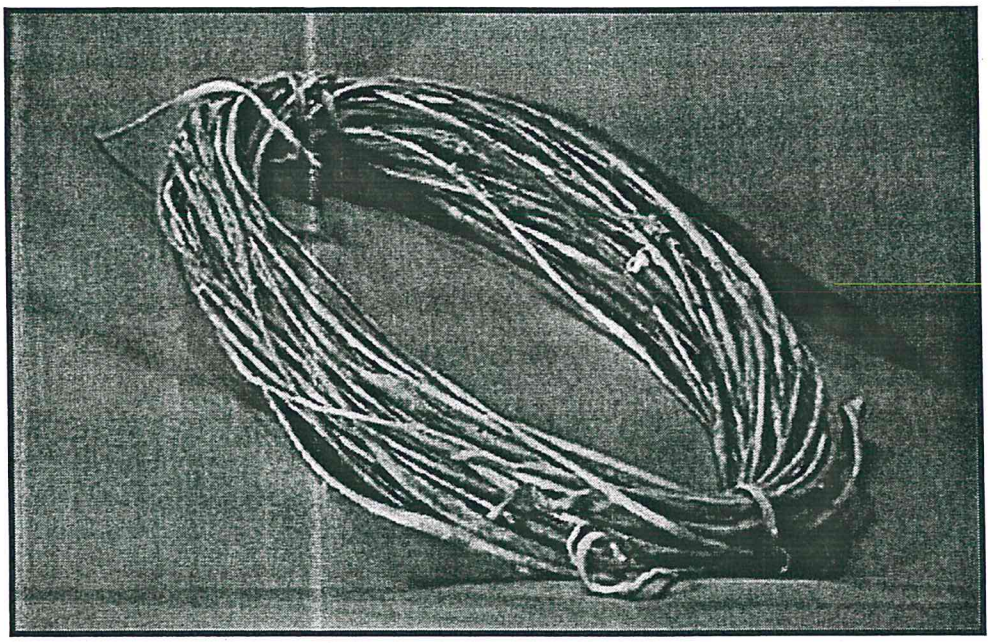


Figure 3

Quniguq

Suqqaq line was thin, flexible and very, very durable. Obtained in trade from coastal **Iñupiat**, it is made from thin strips of baleen or **Suqqaq,** that grow in the mouths of **Aåviq,** the bowhead whale, (*Balaena mysticetus*). This type of line was said to be especially good for use in ice fishing because it was so shiny and slick, that it was less prone to accumulating ice than **Quniguq**, and was more easily cleared.

Tether lines varied in length. In the experience of one elder, he recalled seeing the use of lines as short as two feet and as long as six, with the length of the line varying, depending on the depth of the water and the slope of the beach. As might be expected, a shallowly sloping beach might require a longer line than one that drops off quickly into deeper water. The lines could also be quite a bit longer, as will be described further on.

Lures

The lures could take either of two basic forms: that of the **Qaåruqsaq** proper, a hooked lure, and the **Sanniåuåiaq**, a bi-pointed gorge. (Figure 4)

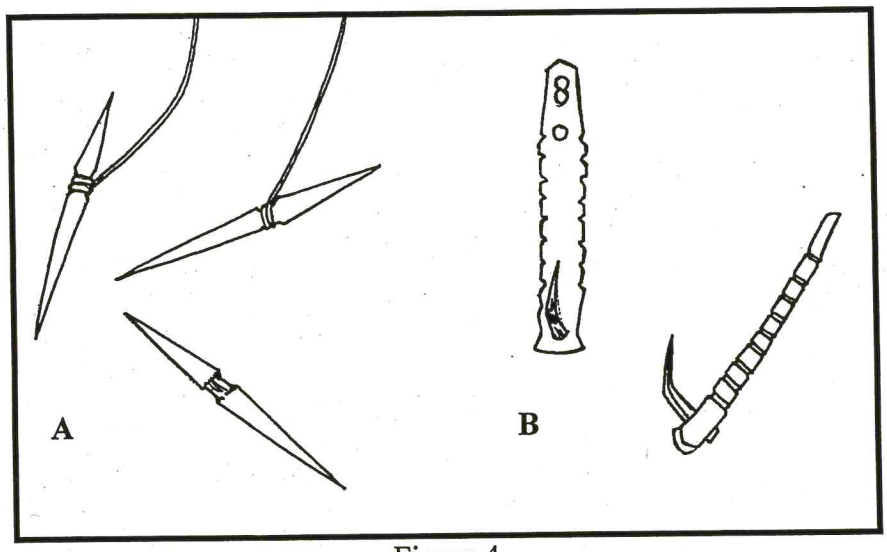


Figure 4
A; the Sannuåuåiaq gorges and
B; the hooked Qaåruqsaq lure

Although, **Qaåruqsaq** lures might vary somewhat in size, material, and form, they were typically made of either antler or perhaps ivory. They had a fairly narrow, slightly arched, flat body with serrated notches cut into each edge. At the upper end, a pair of small holes was drilled through the body, one slightly below the other, to accommodate the fishing line. At the bottom end would be a barb-less hook. In earlier days, before the introduction of metal, a sharpened spike of marrow bone would have been inserted through a hole drilled at an angle from the back side, or as indicated in Figure 5, a drawing by Simon Paneak (1900-1975), the hook spike would have been tied or sewn to the shank of the lure. In more recent times, at least since the latter part of the 19th century, the hook was often fashioned from a square metal nail bent to the proper angle and inserted through a drilled hole.

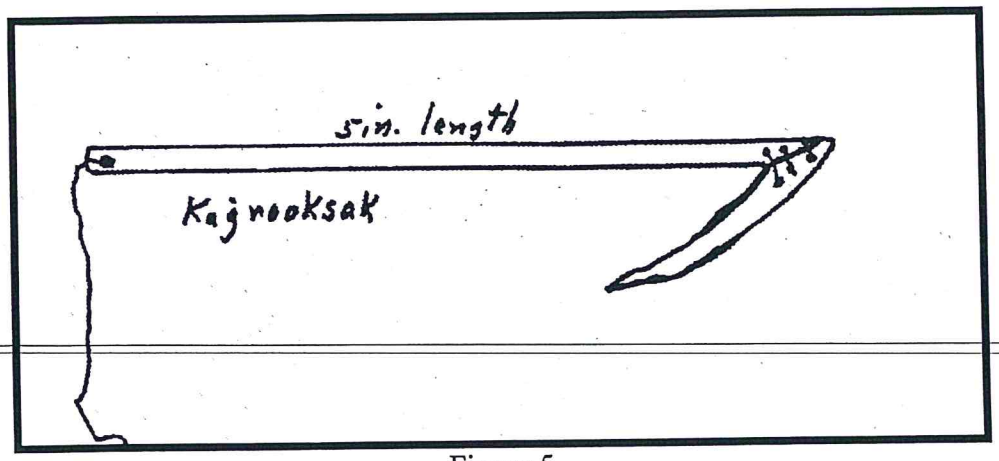


Figure 5

Simon Paneak's drawing of Qaåruqsaq

Examples of such a hook can be seen in the photograph of Figure 6, an archaeological specimen in the Simon Paneak Memorial Museum, and in Figure 7 an engraving of a specimen collected in Barrow by John Murdoch in 1881, and now in the collections of the Smithsonian Institution.

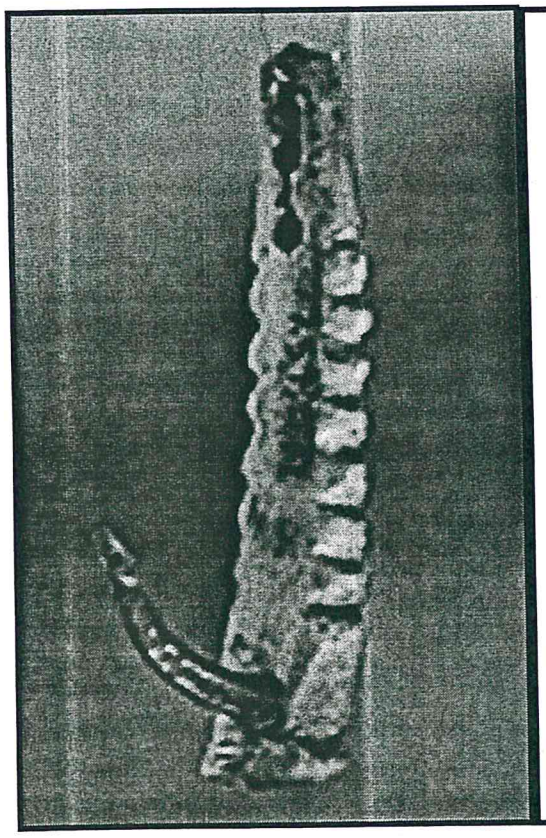


Figure 6
Qaåruqsaq, from Anaqtuuvak area

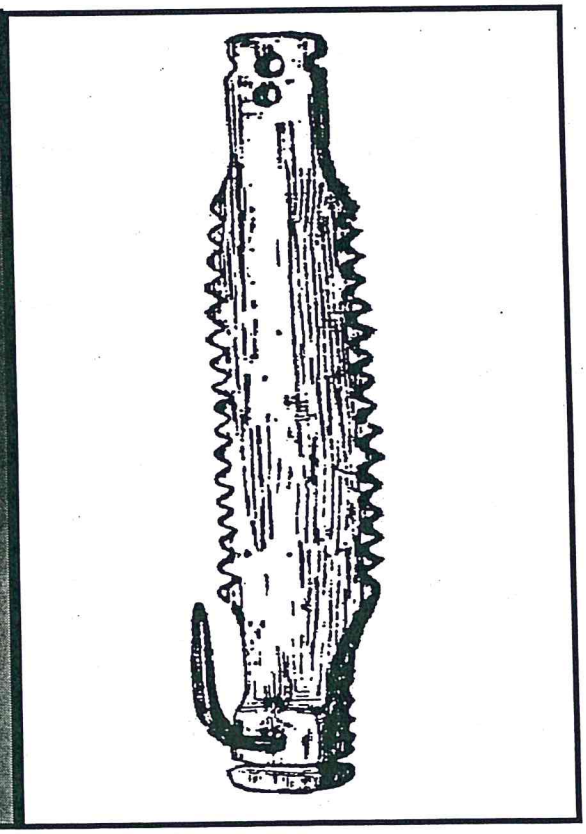


Figure 7
Qaåruqsaq, collected in Barrow

The Paneak Museum specimen is made from caribou antler and sports a barbless metal hook fashioned from a square nail. The lure has a narrow flat body, roughly rectangular in cross-section and a slight bow or curvature from end to end. It is thickest and broadest at the bottom, or distal end, where the hook is mounted through a drilled hole, and slightly thinner and narrower at the top or proximal end. At this top end were drilled three holes through which the tether line was threaded and tied off. The sides are shallowly notched, parallel to one another, to aid in tying the bait to the shank so it would not slip off. The overall size of the lure measures two and ½ inches in length, 7/16 of an inch wide and 3/16 of an inch thick at its mid point.

Two other forms of hooked lures used for ling (Figures 8 and 9) are also illustrated in Murdoch, but it remains to be determined, if the contemporary elders of Anaktuvuk Pass recall having seen these types of lures used among their people.

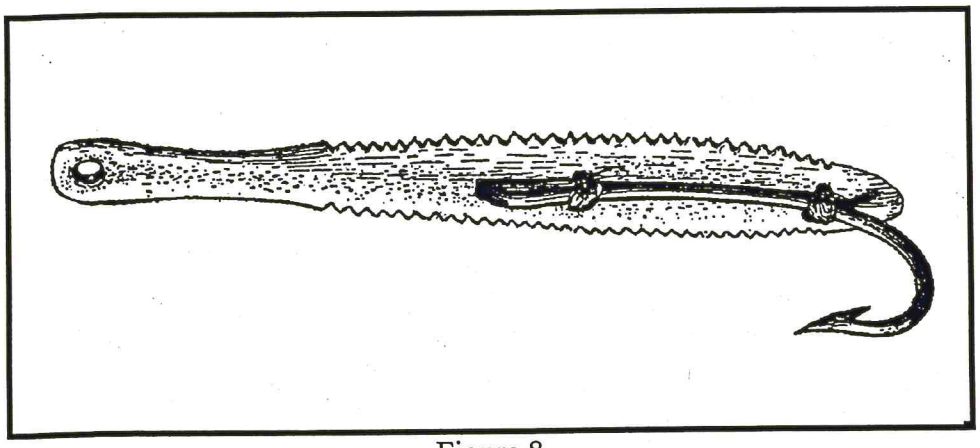


Figure 8

Qaåruqsaq, Utqiaåvik, Barrow area

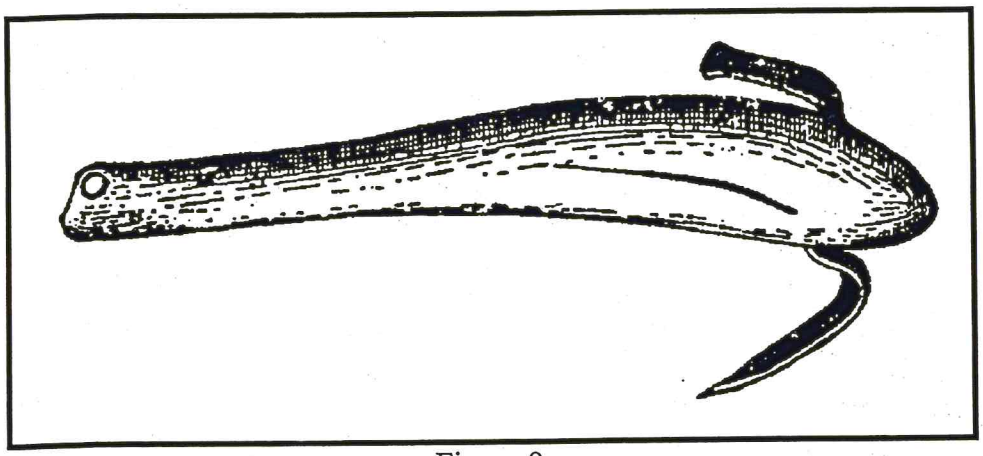


Figure 9

Qaåruqsaq, Utqiaåvik, Barrow area

According to one man, the lure was customarily baited using what the **Nunamiut** refer to as **Papiåuq**. (Figure 10) First, a several inch long hind section of a fish, complete with the tail,

was cut away, after which the smaller top and bottom fins were removed. (A). After the belly was slit open and the guts and bones removed (B), it was turned inside out so that the flesh was now facing outward, and the **Qagruqsaq** lure was inserted (C) Finally this rear portion of the fish was tied tightly around the lure using a small string called the **Qipiutaq**. (D) It has also been pointed out that because such a baited hook was sometimes apt to float, people were sometimes known to add a little rock "inside" or under the bait to help it sink. The **Qaåruqsaq** was then ready for use.

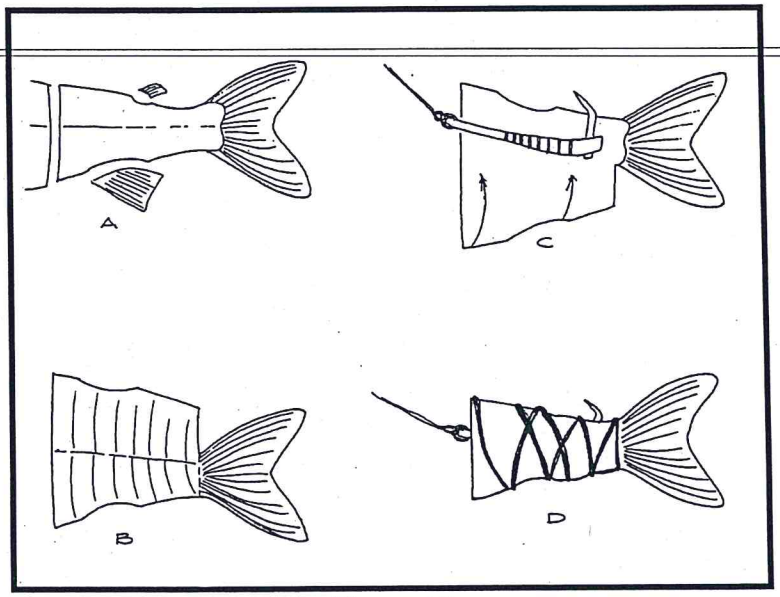


Figure 10
Illustrating how a Qaåruqsaq lure was baited.

The **Sanniåuåiaq** type of lure was a three to four inch long bi-pointed bone or antler gorge, with a shallow groove carved around its middle to allow a short line to be attached to the main tether line. (Figures 11 and 4A). These gorges worked on the principal that once the bait was swallowed and the fish tried to swim away or spit it back out, the sharply pointed gorge would swivel or toggle - turn sideways - and get stuck in place.

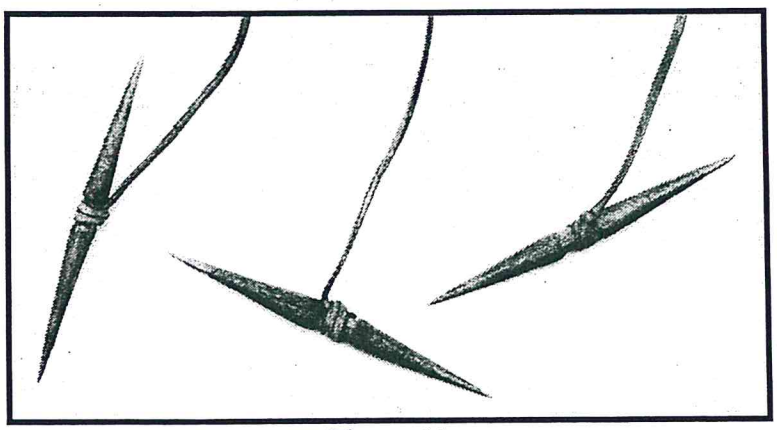


Figure 11

Sanniåuåiaq Gorges

It should be noted here that the photograph of the gorges illustrated immediately above, are in the collections of the Smithsonian Institution, they were originally collected in the Norton Sound area and have been identified as having been used to catch seagulls. Nevertheless, they do serve to illustrate what the Nunamiut fish gorges looked like.

These gorges were presumably baited in a manner similar to the hooked lures, but since none of today's **Nunamiut** elders have ever seen one in use, no further information is available beyond this brief snippet from one man who noted that.

"In those days we always used home made hooks made from a straight bone that is sharpened at both ends with a line tied to the center if it. Then it is wrapped with a piece of fish. When a fish swallows it, the hook gets stuck inside. That's how they catch the ling-cods."

Sets

As we have seen, **Qagruqsaq** lures could be used year round, in the open waters of summer and the freshly ice covered waters of fall, with the preferred locales in shallow near-shore inlet and outlet waters of lakes and quiet pools and back-waters in rivers and streams.

Fall ice sets usually involved chopping an **Alluaq**, a roughly 12 inch hole, in the ice through which the lure was dropped down to the shallow lake bottom. As one man remarked, in fall *"...Never put in deep water, something like two or three feet deep, under the ice, they catch 'em."* The line was then tethered to an 18 to 20 inch long wooden stick laid across the top of the hole then frozen in place by covering the ends with snow and adding water. Interestingly, this cross-piece stick was known by two names, one, **Pitugvik**, because it served as a secure tethering point, and also as a **Saaniåuåiaq**, because it was laid cross-ways over the **Alluaq** hole, much in the same way as the **Saaniåuåiaq** gorge would turn cross-wise inside the fish once it was swallowed. This precaution was said to help guard against foxes or other night predators like weasels from stealing the catch. (Figure 12)

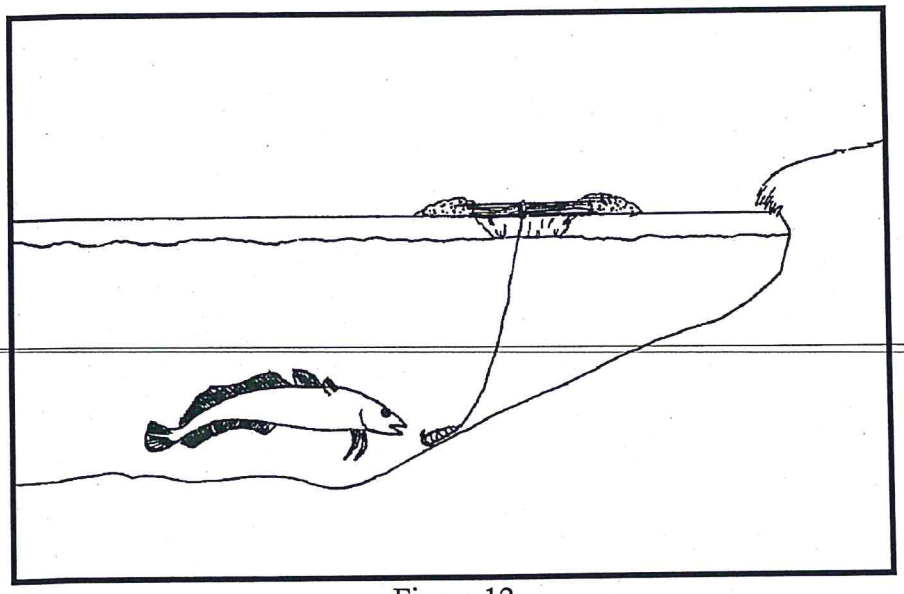


Figure 12

Typical fall Qaåruqsaq set with the Pitugvik/Sanniåutaq frozen in place

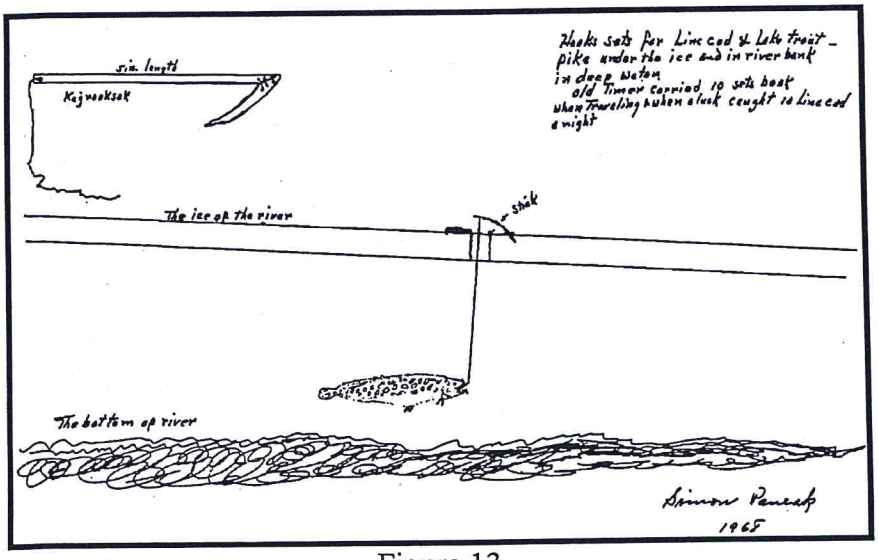


Figure 13

Another representation of a fall set drawn by Simon Paneak

In summer, the land end of the line was either tied to a nearby willow or anchored to a wooden stake or **Paugaq** driven into the ground, while the baited lure was thrown out from the shore. Summersets show a bit more variability than the fall ones. While some people might prefer to set out one or even a series of several short, single lure lines, other fishermen and women liked to set out long lines with multiple lures and floats, perhaps as much as 20 feet or more, as this passage illustrates from a summer spent one year in the Twin Lakes, **Narvaqpak**, area of the upper Koyukuk drainage.

"That's how we made a living in the summer, putting out nets...and baited hooks. My father always put some out with a long line...with an anchor on this end. Then he puts all the bait hooks with half a piece of fish all in a row. Using a piece of wood for a float at the end of the line, a hand made float with hand made floats for each hook. When one catches a fish, its float bobs up and down...they can catch many fish that way."

Qaåruqsaq was once a vital and productive fishing method actively pursued by the **Nunamiut**, but those days are pretty much over now. In today's world, fishing is more of a pleasant diversion than the necessity it once was. Although some fall fishing is conducted with gill or, more often, dip nets at one or two locations, mostly it is done by jigging through lake ice in spring and fall, and by rod and reel in summer. The use of **Qaåruqsaq** is virtually nil. Even tastes have changed, when stacked up against the flavorful and handsome fish like the arctic char, lake trout and grayling, the homely, bottom-dwelling **Tittaaliq** doesn't hold much status among young people today. Still, elders like to remember the pleasures of a well-boiled ling and the treat of **Tiÿugaq**, and occasionally catch one to satisfy their craving. Some of the old men yet retain one or two old **Qaåruqsaq** lures in their tackle boxes, and upon occasion a new one is made, but they rarely put them to use. Somehow, it looks as though both the fish and the lures that once caught them are going out of fashion. No doubt those fish are greatly relieved.

Traditional Ecological Knowledge and Fishing

Like most hunting and gathering peoples the Nunamiut possess a strong heritage as accomplished naturalists, keen observers of and by nature whose survival depended upon a complete and thorough knowledge of the world in which they moved and the animals upon which they depend for survival.

Thus it should come as no surprise that it was common practice for hunters to routinely examine the stomach contents of fish to gain a better idea of what kinds of food they are feeding upon at any particular time at any particular location. Such detailed examinations were only one of the methods they employed to compile as comprehensive as possible, a natural history and ecological profile of various fish species including such things as it's travels, behavior, its breeding patterns, spawning locations, favorite foods and favorite habitats and how they could or might vary with the seasons or conditions, as well as of course the best methods and techniques of catching them.

Clearly, the application of T.E.K. to the pursuit of fishing is a process and a practice that goes far beyond the knowledge of good fishing holes and the skillful use of a highly refined technology. It is a process that is broad in scope that brings together and into play a wide array of highly detailed knowledge involving the weather, snow and ice conditions, topography, lake, creek and river morphology, vegetation and habitat along with fish habits, patterns and movements.

This knowledge and understanding stems from two key sources, the accumulated knowledge of elders, that has been refined, built upon and passed on from generation to generation, coupled with a persons direct observation and personal experience.

It represents, in plain terms, nothing less that the totality of knowledge about the environment, both physical and spiritual, in which a people live. It encompasses both the seen and the unseen, the empirically based and the inferentially drawn knowledge (information?), which when combined and viewed through the lens of a particular cultural tradition provides them with, what is for them, the best, or most appropriate or most useful of most reliable or most productive, or fulfilling insights or explanations of the world, both natural and supernatural, upon which they depend.

Any attempt to capture or portray the full nature and extent of these peoples' encyclopedic knowledge about fish would be far beyond either the scope or goals of this report, and in truth, if it could be accomplished at all, could only be done by someone of the culture who grew up steeped in the knowledge and traditions of the Nunamiut.

Perhaps the best way to illustrate at least something of the nature and degree of their TEK concerning fish is to give concrete examples of specific kinds of knowledge tied to specific seasons, localities and species. While hardly exhaustive it is still quite indicative of the depth and sophistication of peoples' knowledge and understanding of the environment which they regularly and successfully applied to the multi-faceted challenges facing them, season by season and year to year.

As fall freeze up progresses and winter begins to set in, the waterflow of a number of headwaters rivers and their tributary creeks begins to decrease, and in some stretches, dry up altogether. As a result several species of fish, notably grayling, old man fish and a few others retreat from these areas and proceed downstream, often for may miles, to areas where substantial waterflow and deep pools provide a safe haven in which to overwinter.

Fortuitously for man, if not necessarily for the fish, these refuge areas often coincide with the presence of warmsprings, or a sufficiently strong current that served to keep the water open or at least substantially retard ice formation, so that the fish could be accessed with a minimum of effort. Needless to say all such locations, throughout the valleys of the central Brooks Range and their northern foothills are known by all elders, as are the species of fish that frequent them and the most practical method to take them.

The knowledge of these areas of open water was especially crucial in late winter and early spring, a time when stores of caribou and other meat were often at low ebb, and when fish resources in many of the large lakes were effectively sealed off by icecaps 6 to 8 feet thick. In times of limited food, one can readily appreciate the relative ease and key advantages of fishing through open water as opposed to the expenditure of time and, more importantly, caloric energy required and consumed by the hard labor of chipping holes through several feet of hard and solid ice in hopes of catching fish.

Even so, the Nunamiut never regarded an 8 foot thick ice cap, even in the days before metal tipped blades, as a sufficient impediment to deter them from feeding their family. To paraphrase the late Jesse Ahgook, a man in his seventies at the time, who as he set out on foot after some quite distant caribou observed to a visitor "caribou are never too far away"(Ingstad 1954) it could just as easily and truthfully be said that "the ice is never too thick".

Also part of the knowledge base are the locations where plentiful numbers of fish often become stranded by falling water levels in small lakes, headwater creeks and sloughs, and left dry and frozen, often protected by a thin mantle of ice. Among such locations are a series of small creeks making up the very headwaters of the Kuparuk River, in the heights immediately north of the Atigun canyon and a river slough along the lower portion of the Killik River, in the northern foothills.

Other very basic knowledge included how to recognize shallow creek and river ice that has frozen clear to the streambed in contrast to ice that still allows a substantial flow of water, and fish, beneath it. (Paneak in Campbell tapes)

People were also highly skilled at watching seemingly unrelated environmental cues to time and prompt some of their fishing activities. For example, in January, when the first rays of the rising and returning sun begin to once again light the tips of the mountain peaks- -for the first time since late November – people say that the round whitefish "...see the sunlit mountain peaks and begin to leave the lakes." (Gubser 1965:194) This is a good time to set their nets at the Nuilaq or mouth of the outlet stream draining Tulugak Lake, some 12 miles north of the village.

When fall ice fishing for ling cod, peoples knowledge of this fishes feeding habits and preferences, of its predilection for feeding in shoal waters in the evening hours, prompted people to set their baited lush hooks close to shore and to leave them overnight for collecting in the morning.

The observation and understanding of the feeding habits of various species of fish are also vital bits of intelligence that people use to maximize their fish harvest. This knowledge ranges from the fundamental to the insightful to the sophisticated.

At the fundamental end of the scale, it is common and basic knowledge that fish are most active in their feeding in the early morning and evening hours. It is also known that small creeks and inlet streams flowing into lakes bring with them bugs, larvae and other edible items that routinely bring certain species of fish, particularly grayling and lake trout to these locations to feed. In fact it is not at all unusual for the waters of these tributary creeks to hollow out shallow bowls or Iluqsraq ? , in the lakeshore sediments at the entry point where they join the lake and where several grayling and trout will enter the bowl to feed.

People also know that come spring, the fish, especially lake trout, are "hungry" and as the margins of the lake ice begin to melt, the fish will feed from under the edge of the ice sheet in close proximity to the mouths of the inlet streams. (Binford 1978:255) Thus such locations have long been popular fishing locations.

Continuity and Change in Fishing Values and Practices Through Time

In any economy based on hunting and gathering, fluctuations in resource availability and resulting alterations in land use patterns are to be expected. Thus in times of shortages the hunter must adjust his food gathering strategies by either shifting emphasis from a now scarce resource to a relatively more plentiful one, or by entering new areas where resources are more plentiful, or a combination of both. These were the two basic options and responses open to the Nunamiut during a period of extreme hardship that struck them in the years surrounding the end of the 19th and the beginning of the 20th centuries.

During this time, the Nunamiut abandoned their traditional territories because of resource shortages, spent a number of years in coastal exile, then later returned inland to reestablish themselves and their traditional way of life, before finally becoming involved in a series of events, and choices, that led them to give up their semi nomadic lifestyle and to establish a permanent village at Anaktuvuk Pass. Working within the context of the events that overtook

them during these years, researcher Charles W. Amsden made a detailed examination of changes in their settlement dynamics between 1898-1969.

One of the most interesting and perhaps instructive aspects of a close examination of the Nunamiut fishing practices and values, is how they have changed over time, often in response to stress in either the social or physical environment. In times of plenty and a steady resource base, the how, when and where of fishing activities was largely at the discretion of the fisherman, fitting it in, as appropriate, to the overall scheme of his seasonal settlement and subsistence pattern. In times of resource shortages however, the locations and availability (or not) of accessing fishing resources actually became a driving force behind the radical restructuring of the settlement and subsistence pattern so that, in effect, they could actually determine peoples movements and where they focused their subsistence efforts.

In regards to fishing, Amsden documented and traced out some interesting trends and shifts in its overall role and importance in the Nunamiut food quest as well as the relative importance or use of specific species through time. In general terms - accepting Campbell's and Gubser's assertions that fish played a minor role in both the early contact (circa 1875) and contemporary periods (circa 1960) – he found that "... fish were relatively important during the rest of the century" (Amsden 1978:180) Broadly speaking, in the early years of the 20th century, in the midst of the worst that period had to offer, and people were often located along rivers in the foothills or the coastal plain, fishing was intensively pursued, at some 00% of the recorded sites for that period, with white fish being the predominant species taken. In subsequent years, as conditions improved and people were more readily able to re-exploit parts of their former range farther inland " whitefish appear to have been de-emphasized and lake trout, char and especially grayling became increasingly important." (Ibid:185) This in essence represented a shift from mainly riverine species to mainly lake species that resulted from peoples shift from a coastal and coastal plain where riverine species predominate back to the montane headwater setting, most suitable for other species.

Other key trends he noted included the fact that the utilization of fish, in general, decreased over time. During the first decade of the 20th century fish were taken or utilized at some 60% of camps, while between roughly 1910 to 1950 it had fallen to only about 30% and over the next decade decreased further to only about 20%. This is reflective of the fact that over the decades caribou were becoming more plentiful and the need for reliance upon fish was consequently decreasing. Interestingly, within this overall shift he also was able to discern that throughout these crucial decades of change, people nevertheless hewed closely to an enduring seasonal pattern of fishing that was most active in the summer and fall and less so in the winter and spring. (Ibid:181)

A more specific look at these trends will be examined below in relation to historic events and shifts in land use practices. He has traced these changes through a series of "periods" which he feels correspond well to documented historic events, They have been summarized here, along with encapsulated contextual summaries of the historic events that propelled them into being. Of particular interest here are how these events and the changes they put into play were reflected in

peoples fishing practices When appropriate, illustrative oral history passages have been included to help highlight these events and trends in more personal and immediate terms.

PERIOD 1 1898 to 1909

During the years that Amsden has designated as Period One, the Nunamiut population of interior northern Alaska was severely reduced by a combination of starvation, disease, and emigration. The first was the result of a precipitate decline in their primary food resource: the Western Arctic Caribou Herd. The second compounded the first, and led to the third, these latter two stemming from circumstances and conditions brought about through direct contact with the New England Whaling Fleet.

Clearly, the most fundamental disruption to the Nunamiut way of life resulted directly from the caribou crash that led to recurrent winters of famine and death among the inlanders. This downturn in the caribou herds is today recognized as having been part of a recurrent natural cycle of population highs and lows, which led one prominent researcher to conclude that "...human populations largely dependant upon caribou will be faced with a major resource crisis at least once every two or three generations." (Burch 1972:356) The herds eventually grew so diminished that between 1890 and 1920 it "...had virtually ceased to exist as a functional unit." (Ibid:357) By 1900 the herd appears to have reached its nadir, with a remnant population of perhaps 15 to 20,000 animals which had been reduced to merely widely scattered bands of animals whose formerly regular annual migration movements had ceased. (Ibid:357)

With this, the foundation of the Nunamiut economy had been struck a crippling blow and, in short order, their population was repeatedly ravaged by the resulting famines and by new diseases that had been introduced by contact with commercial whalers. Over the course of several years a series of flu and measles epidemics, repeatedly swept inland killing large numbers of people, which further compounded the caribou problem.

As a consequence of this widespread death and the resulting disruption of their social structure, there was a dramatic population shift north to the Arctic coast and east into Canada. This movement was driven by two key factors: the more easterly and plentiful Porcupine caribou herd, as well as the availability of jobs and trade goods from the whaling ships which regularly over-wintered in coastal waters. Between the years 1890 and 1898 alone "...whaleships made 60 winterings east of Point Barrow and most of the ships carried native families to act as hunters and seamstresses." (Bockstoce 1986:241

Even so, the heyday of the whaling years soon came to a crashing end with the total collapse of the price of whale bone in 1907. Only two years later, the once mighty western Arctic whaling fleet had been reduced to total of three ships. (Bockstoce 1986:345) Fortuitously, however, its end came at about the same time that the Arctic Fur Trapping Industry, based upon the trapping of the white furred Arctic fox, began its rise. Over roughly the next 25 years this industry and the numerous trading posts it spawned and supported effectively replaced the Whaling fleet as a

source of trade goods and income and therefore played a very important and ultimately pivotal role in the lives of the Nunamiut people.

In turning from these historical events to examining their impacts upon Nunamiut land use patterns and practices and, fishing activities in particular, we see that as a direct result of the broad-based northward and eastward movement of people, the use the forest zone along the southern edge of the Brooks Range ceased altogether, but that the remaining zones, from the coast to the mountains remained in use, with the largest proportion of sites occurring in the foothills. (Amsden 1977:81) According to him, winters were now spent either in the mountains hunting sheep or *ice fishing* along major rivers on the coastal plain. Spring was spent in the foothills or on the plain, and after breakup the Nunamiut would travel down to the coast to spend the summer *fishing* and trading. Fall saw a return inland to the foothills to await freeze-up, and then back either to the mountains or the coastal plain for winter. This pattern was established to take advantage of food resources and game that might, under normal circumstances, have been of only secondary importance. During this period fish were especially important, though mountain sheep, ptarmigan and ground squirrels were also vital food sources. Significantly, Amsden points out that " *Between 1898 and 1909 fish were taken at more than 60% of the camps in that period – over twice the number in which either caribou or sheep were killed*" (Ibid :181) There was also a high degree of mobility and great distances between camps, because the scarce resources were rapidly depleted at any one location.

The seasonal pattern he was able to discern was that " during nearly every summer and fall.... the major activity involved the catching and drying of fish for use in the coming months, and supplies of fish were often cached at various locations for use as emergency rations" (182) interestingly it appears that whitefish were the most important species, followed in turn by grayling, shee fish and ling cod. (Ibid:184)

This resultant mobility in the face of limited resources, as well as the dependance upon fish, is especially well illustrated by the experiences of an elder who recalled a very difficult winter spent in the foothills. It was passed moving from camp to camp, subsisting primarily on fish, fishing at any particular locality until they could catch no more, and then moving on. After a number of moves from their starting point along the Itkillik River, they finally arrived a fishing hole known as Qalugauraq or "the little fish" along the Anaktuvuk River.

> "We would go upriver into the Anaqtuuvak on foot and at the end of the place where it doesn't completely freeze through, we would hook for Anmaqqut and make our living in this way....after a while we began to experience hunger, and the fish became difficult to hook. They learned that we were in that area. That is the way fish are when people stay close. They became out of reach to us."(Arctic John Etalook)

It was time again to move on and hope that the next fishing hole they came to would not have already been fished out by somebody else, or better yet, that they would find some caribou and that conditions would improve. In this instance they did and the family survived, but it didn't

always work out that way, as is clear in this brief vignette about some of the people who starved to death one winter along the Sagavanirktok River, again as recalled by Elijah Kakinya

> "Then there was Utualuuraqs father Aqamak who would hook for fish and his wife would trap. While fishing one day he caught a fish and he was so happy he started jumping around and lost his fish in through another fishing hole. That fish was to save his life, and he also died of starvation."

As should be evident from the fore-going passages, life in the interior during this period could be, and often was, an extremely precarious proposition. Caribou were incredibly scarce, if they were to be found at all, sheep populations were quickly depleted and the fall back resources of fish and ptarmigan were, at best, just barely enough to get through a hard cold winter. In many ways life was made even more challenging for those who remained inland because of the loss of so many friends and relatives and the sense of desolation and loneliness that inevitably results. Thus the seductive draw of people and resources in coastal areas was a powerful incentive to give up this isolated existence and to seek out a more secure future there.

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