Technical Paper No. 308

Local Knowledge, Customary Practices, and Harvest of Sockeye Salmon from the Klawock and Sarkar Rivers, Prince of Wales Island, Alaska

by

Nancy C. Ratner,

Peter Brown,

James Rowan,

Donald Yates,

Morgen Smith,

Jesse A. Dizard,

Amy Paige,

and

Michael F. Turek

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Alaska Department of Fish and Game **Division of Subsistence**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

TECHNICAL PAPER NO. 308

LOCAL KNOWLEDGE, CUSTOMARY PRACTICES, AND HARVEST OF SOCKEYE SALMON FROM THE KLAWOCK AND SARKAR RIVERS, PRINCE OF WALES ISLAND, ALASKA

by
Nancy C. Ratner,
Alaska Department of Fish and Game, Division of Subsistence, Juneau

Peter Brown,
Klawock Cooperative Association, Klawock

James Rowan,
Klawock Cooperative Association, Klawock

Donald Yates,
Craig Community Association, Craig

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

Jesse A. Dizard,
Alaska Department of Fish and Game, Division of Subsistence, Juneau

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

and
Michael F. Turek
Alaska Department of Fish and Game, Division of Subsistence, Juneau

Alaska Department of Fish and Game
Division of Subsistence
PO Box 115526, Juneau, Alaska 99811-5526

December 2006

Final Report to the U.S. Fish and Wildlife Service, Office of Subsistence Management,
to fulfill obligations for Study No. 01-105 under agreements 70181-1-J335 and 70181-1-C068

The Division of Subsistence Technical Paper Series was established in 1979 and represents the most complete collection of information about customary and traditional uses of fish and wildlife resources in Alaska. The papers cover all regions of the state. Some papers were written in response to specific fish and game management issues. Others provide detailed, basic information on the subsistence uses of particular communities which pertain to a large number of scientific and policy questions. Technical Paper Series reports are available through the Alaska State Library and on the Internet: http://www.subsistence.adfg.state.ak.us/

Nancy C. Ratner, Jesse A. Dizard, Amy Paige, Morgan Smith, and Michael F. Turek,
Alaska Department of Fish and Game, Division of Subsistence,
PO Box 115526, Juneau, Alaska, 99811-5526, USA

Peter Brown and James Rowan,
Klawock Cooperative Association,
PO Box 430, Klawock, Alaska 99925-0430, USA

and
Donald Yates,
Craig Community Association,
PO Box 690, Craig, Alaska 99921-3251, USA

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SUMMARY

Title: Local knowledge, customary practices, and harvest of sockeye salmon from the Klawock and Sarkar Rivers, Prince of Wales Island, Alaska

Study Number: FIS01-105

Investigator(s)/Affiliation(s): Nancy C. Ratner, Jesse Dizard, Amy Paige, Morgen Smith, Michael Turek, Alaska Department of Fish and Game, Division of Subsistence; Peter Brown and James Rowan, Klawock Cooperative Association; and Donald Yates, Craig Community Association

Management Regions: Southeast Alaska (1)

Information Type: Traditional Ecological Knowledge (TEK)

Issue(s) Addressed: The Southeast Regional Advisory Council has identified Traditional Ecological Knowledge (TEK) as a priority information need. The council requested information on subsistence fishing patterns in the Tongass National Forest at Klawock River and Sarkar in order to address regulatory proposals pertaining to these fisheries.

Study Cost: $72,635

Study Duration: May 2001 to May 2003

Abstract: This report describes subsistence sockeye salmon harvest and use by the people of Klawock and Craig, Alaska at Klawock River and Sarkar River, Prince of Wales Island. Topics include the historic and contemporary methods of harvest and processing, location of sockeye fisheries, issues of competition, and distribution and exchange of salmon. Traditional Ecological Knowledge was collected through interviews with residents of Klawock and Craig. Observation of fisheries also provided information on which the report is based.

Key Words: Subsistence Fishery, Traditional Ecological Knowledge (TEK), Sockeye Salmon or Red Salmon, Southeast Alaska, Klawock, Sarkar, Prince of Wales Island, Tongass National Forest

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We are indebted to the elders and subsistence harvesters who shared their time, thoughts and expertise including Richard Carl Sr., Fred Hamilton Sr., Cliff Douville, Jeff Sheakley, Leslie Craig, and Adrian LeCornu from Craig; Theodore and Alicia Roberts, Clara Peratrovich, Eileen Harmon-Smith and John Rowan, Sr., Don Nickerson, Jr., Dennis Nickerson, Alfred Woods, Jack Brown from Klawock; and Vicky Lecornu and Victor Burgess from Hydaburg. We would also like to thank those who generously shared their knowledge with us, but prefer to remain anonymous.

The success of the project reflects the dedication and insightful guidance of the local research crew. Peter Brown and James Rowan of Klawock Cooperative Association and Donald Yates of Craig Community Association conducted fieldwork and key respondent interviews, transcribed interviews, provided local knowledge and reviewed draft reports. James Rowan also photo-documented the fishery and wrote the description of fishing groups used verbatim in this report. Lisa Trimmer of the Craig Community Association and Mary Endenshaw of the Klawock Cooperative Association provided administrative support and local guidance. Personnel from both organizations were very helpful.

From the Craig Ranger District, David Johnson and the administrative staff contributed logistical and technical support. Terry Fifield provided archeological expertise and guided the research crew to ancient fishing sites on Prince of Wales Island. Steve Langdon, professor of anthropology at the University of Alaska-Anchorage, shared his expertise on the archeology, history, people, and fisheries of Klawock. Laura Wood from the Alaska Historical Library aided the historical research. Timothy Zadina, retired fish biologist from Alaska Department of Fish and Game provided a biological and historical perspective of the Klawock fishery.

In the Division of Subsistence, Nancy Ratner was the principal investigator and main author of the report. Morgen Smith, a graduate intern, conducted and transcribed interviews and served as crew leader during initial stages of the fieldwork. Mike Turek supervised the project and reviewed drafts. Amy Paige helped initiate the project and prepared appendices and tables and formatting for the draft report. Matt Kookesh reviewed a draft report and provided knowledge of the Tlingit culture. Mathew Brock formatted the final report and helped prepare figures, tables and photographs. Jesse Dizard reviewed and edited the final draft report.

The U.S. Fish and Wildlife Service, Office of Subsistence Management, provided $72,635 in funding support for this project through the Fisheries Resource Monitoring Program, under purchase order number 43-0109-1-0148. Additional funding was provided by the ADFG Subsistence Division.

To all: *Gunalchéesh* and *Háw'aa!*

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INTRODUCTION

This study describes the traditional and contemporary uses of the Klawock River and Sarkar River systems for sockeye salmon (*Oncorhynchus nerka*) by the villages of Craig and Klawock, and provides a descriptive analysis of the historic developments that have affected the fishery. Craig and Klawock are located about seven miles from each other on the west coast of Prince of Wales Island, the largest island in the Southeastern Alaskan archipelago. Together, Craig with 1,725 residents and Klawock with 854 residents in the 2000 census, constitute the two largest communities on the island (Appendix A).

There were three distinct geographical groups of Tlingits, or *kwáans*, inhabiting western Prince of Wales when the Europeans arrived: the Klawakkwan in central region, the Henyakwan to the north, and the Tantakwan to the south (Langdon 1977). Klawock River belonged to the *Teikweidí* and then the *Ganaanx.ádi* clan of the Klawakkwan (Darrow 1934). Sarkar River was the subsistence territory for the *Kaax'oos.hittaan* clan of the Henyakwan (Darrow 1934, Peratrovich 2001). Due to intermarriage between the Kaigani Haidas and the Tlingits of Sarkar, both native groups have ancestral ties to Sarkar (Darrow 1934). In the early twentieth century a small community, called Deweyville, developed adjacent to the site of a fish processing plant in Sarkar Cove. The manager of the saltery married a Tlingit woman and their descendents who now live in Craig still maintain strong emotional connections to this area (Douville 2002).

In recent times, residents from both Craig and Klawock harvested subsistence salmon from the Klawock and Sarkar watersheds. Residents from former logging towns on Prince of Wales also drive to Sarkar River, and to a lesser extent to Klawock, to participate in the subsistence salmon harvest (ADF&G Alexander Integrated Fisheries Database, 2002). Klawock residents have expressed concerns about the strength of the Klawock River sockeye salmon run and in the recent past have submitted proposals to the Alaska Board of Fisheries to further limit subsistence activities in the Klawock estuary. There have also been concerns about the Sarkar sockeye stocks, which led to the federal closure of part of Sarkar River and all of Sarkar Lakes to net fishing. Additionally, the East Prince of Wales Advisory Committee proposed an annual limit of ten sockeye for Sarkar and restricted fishing hours at the 2000 Board of Fisheries meeting in Sitka, Alaska. With proposals concerning Sarkar and Klawock coming before the Alaska Board of Fisheries and justifiable concerns about the health of these sockeye stocks, there was a need to better understand these two systems from the historical, traditional, and local perspectives.

This project was a cooperative effort between the Craig Community Association, the Klawock Cooperative Association and the Alaska Department of Fish and Game (ADFG), Division of Subsistence, funded by the United States Fish and Wildlife Service (USFWS) Office of Subsistence Management, Fisheries Resource Monitoring Program and by ADFG Division of Subsistence. The purpose was to describe the customary and

traditional use of wild salmon at Klawock River and Sarkar River and the contemporary subsistence sockeye salmon harvest from the perspective of the local people whose personal and ancestral history with these sockeye systems spans many generations. The study sought to understand the local ecological knowledge (defined in Appendix B) concerning these systems, document local attitudes toward subsistence regulations, identify past and present land uses, and identify other competing interests that have affected the fishery.

A historical review of west Prince of Wales Island settlement and fisheries was conducted, which highlights the evolution of human activities that have had a profound impact on the people and ecology of the Klawock and Sarkar watersheds. Historical information relevant to the contemporary harvest and home use of Klawock and Sarkar sockeye is provided in this report. The results and discussion are divided into two sections. The first section presents local ecological knowledge gathered during key respondent interviews related to sockeye abundance, run timing, and perceived impacts to the sockeye stocks and the subsistence fisheries. A discussion of these results as they relate to additional available information follows. The second section examines the evolution and current status of the subsistence salmon fisheries at Klawock and Sarkar. It includes a description of past and present harvest technologies, and a local perspective concerning the regulations governing the subsistence fishery. An analysis follows with a discussion of cultural interactions related to the management of these fisheries. The conclusions resulting from the findings of this study encompass both sections, and recommendations suggested by the results of this study are provided.

OBJECTIVES

The intent of this study was to provide a local and historical perspective on the Klawock and Sarkar subsistence fisheries and describe the human and ecological variables affecting these subsistence fisheries. The project's objectives included:

1. A descriptive analysis of historic methods of harvesting non-commercial salmon in Southeast Alaska.
2. A descriptive analysis of Klawock and Craig's historic subsistence sockeye salmon harvests at Klawock River and Sarkar River.
3. A descriptive analysis of Klawock and Craig's contemporary subsistence sockeye salmon harvests at Klawock River and Sarkar River.
4. Assessment of the current trends and characteristics of the subsistence fishery by describing and analyzing the relationships between subsistence, sport, and commercial fishers, local observation of abundance, and location of effort.
5. A written report that summarizes and analyzes the subjects addressed by the research. Computer-accessible text files of key respondent interviews were not produced due to staff and time limitations. Computer-accessible text files of key respondent interviews are included in the Subsistence Division's Southeast

Alaska Sustainable Salmon Fund project, Southeast Salmon Local Knowledge Database, project number 45250. Work on this project began in the fall of 2003.

METHODS

Fieldwork was conducted in 2001 with cooperation from the Craig Community Association (CCA) and the Klawock Cooperative Association (KCA). The principal research team included Donald Yates from Craig Community Association, James Rowan and Pete Brown from Klawock Cooperative Association, and Nancy Ratner and Morgen Smith from the regional office of the Division of Subsistence. Research methodology included participant observations and non-obtrusive observations of the contemporary sockeye fishery at Klawock and key respondent interviews. Three trips were made to Sarkar during the 2001 field season, but subsistence fishing was not observed. According to local respondents, the sockeye fishery at Sarkar is earlier than at Klawock and was over by the time fieldwork for this project began on July 9. The research team visited archeological remains of ancient salmon weirs and traps in and near Klawock, and elsewhere on Prince of Wales Island.

Six interviews were conducted with residents in Craig, seventeen in Klawock and one in Hydaburg. Key respondents included contemporary harvesters and processors, elders, and the current manager of the Klawock hatchery. An interview in Hydaburg was conducted for background information on the native view of subsistence law. Our sample was not representative of the communities as a whole, but served to illustrate the type and range of local knowledge and perceptions concerning the sockeye salmon subsistence fisheries in Klawock and Sarkar. A list of general topics guided interviews rather than a specific schedule of questions. The focus of interviews depended on the age and expertise of the key respondent. For a compilation of all the questions asked during the interviews, see Appendix C.

Respondents were given the option to be credited with the specific information they provided, acknowledged as a participant but not cited or to remain totally anonymous. Only those selecting the first option are specifically cited in this document. Each respondent had the opportunity to review the transcripts of their interview and make corrections or delete information that they did not want to become public knowledge. Tribal council members and other tribal members in Craig and Klawock reviewed a draft of the report for accuracy and were given an opportunity to delete any proprietary information.

STUDY SITES

Klawock and Sarkar watersheds support significant populations of pink salmon (*Onchorhynchus gorbuscha),* chum salmon *(O. keta)*, sockeye salmon (*O. nerka)*, coho

salmon (*O. kisutch)* and steelhead (*O. mykiss*). Native fish species also include cutthroat trout (*Oncorhynchus clarki* spp.) and Dolly Varden char (*Salvelinus malma).* Site maps and aerial photographs can be found in Appendix D.

Klawock Lake Watershed

The Klawock watershed, which covers 29,152 acres, is located in central west Prince of Wales Island about 35 air miles west of Ketchikan. The road from the ferry terminal at Hollis bisects the Klawock watershed and follows the mile long outlet stream to the village of Klawock, which is sited on the river mouth and estuary. Three native corporations own most of the watershed. Klawock Heenya Inc. is the largest landowner with 45 percent of the watershed concentrated in the eastern half of the watershed. Shaan Seet Inc. owns 17 percent, southeast of the lake. The third native corporation, Sealaska Regional Corporation, manages less than one percent (24 acres) on a small section of land in the northern tip of the watershed. The native corporations logged their forested lands, beginning in the mid-eighties (Brown et al. 2001).

The United States Forest Service, Craig Ranger District manages twenty-eight percent of the watershed, mostly ridges and mountains north and east of the lake. At the center of this is Klawock Lake, which comprises 10% of the total watershed and is managed by the State of Alaska (Klawock Watershed Condition Assessment 2002).

There are four main tributaries into Klawock Lake: Half-mile Creek, Three-mile Creek, Hatchery Creek and recently named Inlet Creek. Moser, (1899) indicated that sockeye spawned in three of them. His map shows that the spawning streams were Half-mile Creek, Three-mile Creek, and Inlet Creek (Klawock Watershed Condition Assessment 2002). The largest creek on the southern lakeshore, Hatchery Creek, was not known to have sockeye spawning in the late 1800's. A century later, ADFG (Lewis and Cartwright, 2002) conducted foot escapement surveys on the four major streams and reported the highest peak counts in Three-Mile Creek (2,277), followed by Inlet Creek (356), Half-mile Creek (129) and a few sockeye in Hatchery Creek (11). The community of Klawock's water currently comes from Half-Mile Creek and the city has plans to take additional water out of Three-Mile Creek.

Klawock Lake, which has an elevation of less than 100 feet above sea level, outflows through the Klawock River (2.85 km) into a 160 acre estuary, and into Klawock Bay on the west coast of Prince of Wales through a small constricted opening under the present bridge. Historically, the estuary flushed in two locations, the present opening and one that was blocked by a causeway built in 1962.

The Klawock River has three rapids, one near the mouth of the river, locally known as "First Falls", a second falls about midway, and the third falls, sometimes referred to as Klawock Falls, just below the lake and above the current site of the Klawock hatchery (Brown et al. 2002, Proceedings of the 1999 Klawock sockeye conference). During periods of low water, salmon that have passed the hatchery weir cannot get over the falls and congregate in the pool between the falls and the hatchery weir.

There has been a small run of chinook or king salmon (*O. shawytsha*) returning to Klawock River in recent years. Respondents reported that they occasionally catch chinook salmon in Klawock River and in 2001, thirty-one chinook salmon were counted past the weir. The origin of these chinook salmon is unknown (Bruns 2001).

The Klawock watershed has a long history of human occupation beginning with the first Tlingit settlers who crossed the ridge from Harris River and descended down to Klawock Lake and followed an old animal trail along the Klawock River according to oral history (Darrow 1934). There is an old village site and shell middens adjacent to the river and ancient wood and stone fishing structures in the estuary. They have been radiocarbon dated to about 750 years ago[2] (Langdon 2001). During construction of the Klawock Hatchery a shell midden, evidence of past use of the lake outlet, was discovered. The shell midden contained charcoal and burned bone fragments that have been radiocarbon dated to about 6,500 years ago (Fifield, personal communication, 2005). More recent historical sites include the remains of three canneries, built in the late 1800s and early 1900s in Klawock Inlet and estuary. Currently, there is a housing development on Klawock Heenya land adjacent to Three-Mile Creek (Brown et al. 2001).

Sarkar Watershed

Sarkar comes from the Tlingit word *Sa-kah* which refers to iron spikes or bolts found in driftwood by early Sarkar residents prior to European contact and made into an iron-pointed spear called a *sagatl* (Darrow, 1934). An early settlement was located in Sarkar Cove; the lowest terrace of the archeological site was dated approximately 2,000 years ago (Campbell 1984). At the time of the Haida's incursion into Southeast Alaska, around 200 to 300 years ago (Cogo and Cogo 1983), a Tlingit settlement was located in Sarkar Lake (Darrow 1934). In more recent times, the community of Deweyville developed in the late 1800s around a saltery located in Sarkar Cove near the mouth of the Sarkar River (Moser 1899). Some remains of outbuildings are still present (Brown et al. 2002).

The cultural history includes fox farming from the 1950's and extensive trapping (USFS Recreation Opportunity Guide). A commercial lodge exists on the south side of Sarkar Cove. Sarkar Lake and River are accessible by road via Road 20. Sarkar Lake is 71 road miles from Hollis and twelve road miles from Whale Pass. Sarkar Lakes is also accessible by floatplane and is 76 air miles from Ketchikan.

The State of Alaska manages private patented mining claims that are located around Sarkar Cove. All other uplands, excluding private land, are managed by the U.S. Forest Service (USFS) as a roadless primitive area. The state manages the tidelands and submerged lands and the beds of the navigable lakes in the Sarkar Lake system (Alaska Department of Natural Resources 1998).

[2] All radiocarbon dates in the Study Sites and Historical Background sections are presented in calendar years based on personal communications with Terry Fifield, archeologist for U.S Forest Service, Craig Ranger District, October 2005.

The U.S. Forest Service manages the Sarkar watershed for remote recreation and maintains a rental cabin located on the northwest shore of Sarkar Lake. A boat ramp, toilet facilities, parking area, and kiosk are located on Sarkar Lake off of Road 20. A canoe route extends 15 miles into the Sarkar watershed via a chain of lakes connected by seven portages. A trail near the Route 20 bridge provides walking access to Sarkar Cove, which is on the east side of El Capitan Passage about six miles from Sea Otter Sound and about 18 miles from Shakan Strait. The cove affords good anchorage in a mud bottom at 6 to 8 fathoms (United States Department of Commerce 1988).

Sarkar watershed is a glacially sculpted landscape characterized by numerous lakes, drained by short, clear streams and bordered by low, rolling terrain. Precipitation averages 106 inches annually at Sarkar Cove, with the driest season being July and August (Campbell 1984). Sarkar Lake empties into the head of the cove through a series of rapids. Water at the lower end of the lake is brackish when there is intertidal mixing during high tidal events.

Most of the watershed remains vegetated by old growth forests, dominated by Sitka spruce, western hemlock, and red cedar trees. Logging has encroached on one salmon stream, which flows into Sarkar Lake in the southwest corner (US Forest Service Recreation Opportunity Guide).

HISTORICAL BACKGROUND

Pre-European Contact

The history of the Tlingit people states that they have occupied Prince of Wales Island for thousands of years. Artifacts and human remains have been found in various sites on the Prince of Wales Archipelago. The oldest human remains known from Alaska or Canada were found in a cave on northern Prince of Wales Island (Fifield, personal communication, 2005). The remains represented a man in his twenties who died about 10,300 years ago (Dixon 2000). Evidence of human settlement dating back to approximately 9,000 years ago was also found on Heceta Island northwest of Klawock (Moss 1998). A third site on northeast Prince of Wales Island dated to 8,500 years ago (Fifield, personal communication, 2005). The artifacts from these sites are characterized as micro-blade and bifacial stone technology. By 6,000 years ago people left evidence of their activities along the Klawock River. The earliest human inhabitants of Prince of Wales Island are believed to have consumed a diet rich in shellfish, fish and marine animals, based on chemical analysis of human remains (Dixon 2000).

Pacific salmon began to colonize the newly formed watersheds as the glaciers retreated. Salmonid remains have been found in some of the oldest archeological sites in the Prince of Wales Archipelago, including in a 9,000 year-old shell midden site on Heceta Island (Ames and Maschner 1999, Moss 1998). The upward rebound of land after the melting of glacial ice (isostatic rebound) has outpaced the rising sea levels, to some extent

stabilizing at the current ocean level in most locations about 5,000 to 7,000 years ago (Moss 1994; Putnam and Fifield 1995). Overall the average rise in the land as compared to sea levels on Prince of Wales Island is estimated to be about 0.6 meters per 1,000 years over the last 10,000 years, with some change continuing even in the last 5,000 years (Fifield, personal communication, 2005).

Human habitation of the Klawock watershed occurred at least 6,000 years ago, according to the radiocarbon dates of a shell midden on Klawock River (Fifield, personal communication, 2003). Archeological evidence potentially linking present day Tlingits to this period includes a 5,360 year old spruce root basket from east-central Prince of Wales (Putnam and Fifield 1995). Technological advancements of this later period include a ground stone industry, in addition to developing the fishing technologies that allowed early occupants to harvest mass quantities of salmon. Fish weirs and traps dating back to 3800 years ago have been found in estuaries throughout Prince of Wales Island (Moss 1998). Older fishing structures may have existed when the ocean levels were higher, but would now be buried under forested beach fringes (Putnam and Fifield 1995).

Langdon (1977) provided an analysis of the Tlingit and Haida settlement history of Prince of Wales Archipelago based on oral history and early ethnographic data. The analysis showed a dynamic pattern of clan migration and settlement, separation and consolidation. Eventually before the Europeans arrived, there were three distinct geographical groups of Tlingits known as the Klawakkwan in central Prince of Wales, Henyakwan to the north and the Tantakwan to the south (Langdon 1977). More recent sources (Hope and Thornton 2000) list the three kwáans as *Taanta' a Kwáan*, (now residing in Ketchikan), the *Hinyaa Kwáan* (Klawock) and the *Takjik'aan Kwáan* (Prince of Wales, "coast town tribe") The *Taanta' a Kwáan* have also been referred to as the "Tanta-people" and Tongass-kwan by other sources (Olsen 1967; Langdon 1977). Each *kwáan*, gathered in major winter villages where the various clans from the geographical region collectively resided for part of the year when they were not at their seasonal subsistence camps (Hope and Thornton 2000:34). Tuxekan on the northwest coast of Prince of Wales served as the major winter settlement for the Henyakwan and Klawock for the Klawakkwan (Langdon 1977). The *Taanta' a Kwáan* occupied the lower third of Prince of Wales Island until they were permanently displaced by the northward Haida migration in the 1700s (Langdon 1977).

Early Contact

The first recorded contact between the native inhabitants of Prince of Wales Archipelago and Europeans occurred during the third Spanish expedition to the Northwest Coast, lead by Commander Ignacio de Arteaga. The Spanish ship arrived in Bucareli Bay on May 3, 1779, and a day later encountered two canoes with about 12 men and women (Olsen 2002). It is not certain whether the Spanish explorers encountered the Tlingit or Haida people or both during the Bucareli explorations. The Spanish explorers could not differentiate between the Tlingit and Haida and cultural artifacts were not a good indication because there was extensive trading between the two groups. Olsen (2002)

presented evidence that suggests that the Spaniards may have contacted both native groups.

Scholars speculate that the Spanish may have inadvertently started the first smallpox epidemic in Southeast Alaska when they brought some ill men ashore, ultimately devastating the Native populations of Southeast Alaska (Dauenhauer and Dauenhauer 1994; Langdon 1979; Olsen 2002; Petroff 1884:44). It has also been suggested that the population decline of the Prince of Wales Tlingit, following a smallpox epidemic in the years after the Spanish contact, could have allowed the Kaigani Haida expansion north for a period (Langdon 1979). Aside from epidemics, the main influence of the Spanish was the introduction of new technologies and materials exchanged as trade goods.

The population of Tlingits in 1819 was estimated to be 5,000 according to Tikhménief in his Historical Review (cited in Petroff 1884). Death rates from the first small pox epidemic on the Northwest Coast in the 1770s have been estimated at 33 to 90 percent (Ames and Maschner 1999), suggesting a pre-contact Tlingit population from 7,500 to 50,000. The west coast of Prince of Wales was one of the most populated regions based on the density of Native historical sites (Langdon 1979).

During the approximately 100 years between initial contact with Europeans and the commercialization of salmon, the Native people continued to harvest and process salmon into a stable product for home use. Although there had been a long history of trade between the Northwest Coastal tribes, the arrival of the Europeans provided the Tlingit and Haida people of Prince of Wales with an eager market for salmon and halibut.

> *Although we tried to fish in various inlets, with our gear it was impossible to catch a single one, even using squid for bait as the Indians do, but they brought us an abundance of fish to sell, and there were three kinds which we saw most frequently; one is like flounder, which will be about 5 spans long [about 31/2 feet] another a sort of salmon about 2 span [17 inches] and sardines [herring].* (Translated from First Pilot José Camancho report of the survey of Bucareli Bay in Olson 2002:69)

The local Natives offered fish and furs to trade within three days after the first European expedition encountered Prince of Wales indigenous people in Bucareli Bay on May 3, 1779 (Olson 2002). Throughout May and June, the Native people continued to arrive via canoe for the purposes of trading with the Spanish explorers who remained in the area to survey Bucareli Bay. Fish, including salmon, was in demand by the explorers and became one of the main products exchanged for European goods.

> *As they saw that we enjoyed their fish, the villagers who were living on the nearby shores let not a day pass without bringing a great quantity of various kinds, abounding most in salmon and flounder to which they gave the names Azetla and Chatla, and among others they have cod, sardines, and other fish like cabrillas, from the abundance of which we infer that*

> *there is the same throughout the Sound…* (Translated from the journal of Juan Francisco Bodega y Quadra in Olson 2002:86-87)

The expansion of Russian fur trade into Alaska brought ships from other competing nations including the United States, Great Britain, France and Portugal. By 1792, there were thirty vessels trading along the Southeast Alaska coast with the American "Boston Men" dominating the trade. An American trading ship brought trade goods from the New England or England, spent the summer trading these goods for furs along the Northwest Coast, delivered the furs to China or Hong Kong and repeated the cycle (Dauenhauer and Dauenhauer 1994).

In 1867, the United States purchased Alaska from Russia. At that time, the entire European population living in Alaska numbered no more than three hundred (Harring 1989:280, footnote 7). In Southeast Alaska, the Europeans inhabited Russian trading posts in Sitka and Wrangell. While Russia asserted territorial claims of ownership of Alaska to England, Spain and the United States, they did not attempt to assert these claims on the approximately 8,000 Tlingit people living in Southeast Alaska at the time. Any attempts to assert dominion over the Tlingit by the Russians, such as collecting an imposed tax, were thwarted by Native resistance and the Russians' reliance on the Natives for fur trade (Harring 1989). At the time of the American acquisition of Alaska, the Tlingits had maintained their sovereignty against the Europeans and, with the exception of Sitka and Wrangell, there were no other permanent non-native settlements. The introduction of new technology and tools, such as firearms, iron, and metal carving tools had a significant impact on the Tlingit and Haida on Prince of Wales Island. Traditional Native social systems and subsistence ways including the traditional use and ownership of hunting and fishing territories remained intact during the Russian era (Arnold 1997; Dauenhauer and Dauenhauer 1994).

Major impacts to the Native people and their way of life followed with the American occupation of Southeast Alaska. On the west coast of Prince of Wales Island, native life changed dramatically with the birth of Alaska's commercial salmon fishery.

Commercial Fishing Industry

A saltery was established in Klawock in 1872 and converted to one of the first Alaskan canneries in 1878. The other cannery at Redoubt near Sitka was also a converted saltery, but it only operated for two years (Mobley 1993). Both canneries utilized Tlingit and Haida labor.

A saltery in Sarkar Cove, later called Deweyville, was built possibly as early as the 1870's (the exact date is unknown according to Langdon 1977) and provided fresh sockeye to the Klawock cannery. According to Moser's (1899) ten year records, the average number of sockeye delivered to Klawock from Sarkar each year was 16,000 with a high of 35,033 sockeye in 1891 and a low of 6,476 sockeye in 1897.

After the Redoubt cannery closed, the Klawock cannery was the only cannery in Alaska until 1882 and the only cannery in Southeast Alaska until 1883 when three more canneries started operations increasing the total number of canneries in all of Alaska to six. Slowly other canneries were added throughout Southeast Alaska and by 1889, there were twelve canneries in operation in the region (Alaska Fisheries Board and Alaska Department of Fisheries 1949). Most, like the Klawock cannery, were located near major sockeye streams.

At this time, sockeye salmon was the only salmon species being targeted commercially, the other species being utilized only incidentally (Moser 1899). According to Moser (1899), canneries had three ways of getting their fish: 1) a cannery contracted with a Native person who claimed rights to a stream to supply the cannery with salmon utilizing his own men, nets and boats; 2) a cannery supplied the Natives with gear and boats on the condition that they sell all their catch to the cannery; and 3) a cannery employed its own fishermen to supply the cannery with fish. Charles Demmert remembered that the Klawock natives fished for wages for the canneries until 1900 when they began to be paid per fish (U.S. Department of Interior 1944, Vol. IV: 613). By the late 1800's there were already many disputes concerning the fisheries.

> *A native, whose ancestors have lived on a certain stream for many generations, and whose rights are respected by other natives, supplies a certain cannery with his catch, as possibly he has been doing for years. A rival cannery tells the native that he must sell his catch to it, and that otherwise their men will fish the native's stream. The result is over fishing, complaints, bad feelings, blows, and threats of bloodshed. So far as can be learned, there are now no legal rights or title to any fishing grounds in Alaska except what force or strategy furnish.* (Moser 1899: 22-23)

Petroff (1882) reported that up to 160 Indians (including thirty women and five or six boys) and about 20 "whites" were employed by the Klawock cannery during the canning season in 1880. By 1898, Klawock and Metlakatla canneries were unique in still employing Native people to work in the canneries as other canneries were already using Chinese labor (Moser 1899).

Concerns about the decline of sockeye salmon in Southeast Alaska due to over harvesting by canneries were being voiced by some and denied by others by the late 1800s.

> *When a person interested in a cannery is questioned regarding the decrease of salmon in Alaskan waters, he is likely to assure you at once that there are just as many salmon in the streams as there ever were, and begins his proofs by citing years like 1896, when there was a large run of redfish in Alaska; but any disinterested authority on the subject will say that the streams of Alaska are becoming depleted. While it can hardly be said that the streams will fail entirely within a few years, there is no doubt that the average runs show fewer fish year by year, and if the laws are not*

> *amended and enforced, the time will come in the not very distant future when the canneries must suffer through their own actions.* (Moser 1899:34)

Early commercial fishermen used beach seines, also known as dragnets, during the early cannery era (Langdon 1977, Brown et al. 2002). The mackerel purse seine, used for salmon the first time in Southeast Alaska in 1893, was an improvement over a beach seine because it could surround a school of salmon in open waters, allowing the commercial fishery to move away from estuaries and stream mouths. Klawock Tlingits learned how to handle a purse seine at the turn of the century, first practicing with what they called a "half purse" (U.S. Department of Interior 1944, Vol. IV: 611-612).

In 1908, Craig Millar established a saltery at Shaan-Seet, the current location of Craig. Some of the Kaigani Haida worked at the new facility, living in tents and shacks. In 1910, the Lindenburger Packing Company managed by Craig Millar built a cold storage facility in the area with about 20 to 25 houses. Some Haida families moved to Craig in 1911 when the government pushed to relocate Kagaini Haidas from the villages of Klinkwan, Howkan, and Sukkan to a new site named Hydaburg. A cannery owned by the Lindenburger Packing Company was completed by 1912 (Langdon 1977).

During the 1900s the number of canneries in Southeast Alaska increased to 51 in 1912 around the time when commercial fish traps were first used around Klawock. By 1920, the number of Southeast canneries had peaked at 82. The next year that number had declined to thirty due to a postwar slump in demand (Langdon 1977). Throughout the remainder of the 1920s the number of canneries hovered between 57 and 65. Between 1930 and 1932, the number of Southeast canneries dropped from 57 to 31. During the rest of the 1930s and 1940s, the number of remaining Southeast Alaska canneries varied from 37 to 48. The largest Southeast Alaska salmon pack from 1878 to 1949 was 4,294,333 cases (48 one-pound cans) made in 1941 by 47 canneries (Alaska Fisheries Board and Alaska Department of Fisheries 1949).

> *…in 1912 when the price of salmon went up and canneries made big money, why everybody got wild, and that is when they built canneries all over. I believe there was thirty-four canneries built in southeastern Alaska that one year. They built a cannery at Port Beauclerc (sic). P. Hunt, who used to be our superintendent, he went over there, and then he came over to Shakan and hired me for a beach boss, and I went over there to work for him, then.* (Demmert testimony, U.S. Department of Interior 1944, Vol. IV: 661)

In 1924, a second cannery opened in Klawock owned by Charlie Demmert of the Klawock Oceanside Packing Company. In 1929, there were six canneries in the vicinity of Craig and Klawock: three canneries in Klawock, one in Craig, one south of Craig at Waterfall and one at Steamboat Bay on Noyes Island. There was also one at Hydaburg and another on Dall Island (Landon 1977). Consolidation of canneries occurred due to slumping salmon market and an overabundance of canneries. At one time, there were

134 canneries operating throughout Southeast Alaska. By 1949, only 37 of these canneries were still operating. Throughout the rise and fall of the cannery era, Klawock maintained at least one functioning cannery for over 100 years until the 1980s (Mobley 1993).

Early in the 20th century, pink salmon took over from the sockeye in commercial importance. The floating fish trap was introduced into Southeast Alaska in 1907 and quickly became both widely used and highly controversial (Price 1990). The percentage of commercial salmon caught in floating traps increased to fifty percent by 1910. The first traps were used in the Klawock territory beginning in 1912, the same year that non-native fishermen began to infringe on the traditional territorial rights of Klawock Tlingits, according to Charles Webster Demmert's testimony in 1944 (U.S. Department of Interior 1944, Vol. IV: 657). The abolishment of fish traps was one of the early goals of the Alaska Native Brotherhood, formed in 1912 (Price 1990). In 1914, purse seines still outnumbered fish traps, although the deputy Commissioner of Fisheries considered the fish traps to be a more desirable method of fishing because they were more efficient and delivered a fresher quality of fish (Price 1990).

In 1927, the number of fish traps in Southeast Alaska increased to 575 and by 1932 fish traps caught seventy-four percent of all commercial salmon. Most of these traps were owned by non-natives and cannery owners. Charles W. Demmert, a Tlingit cannery owner from Klawock, was one of the few Native residents that owned a trap. Nevertheless, he testified against their use to the U.S. government (U.S. Department of Interior, 1944, Vol. IV).

According to a Craig elder, the traps created a hardship for native fishermen and they were forced to "rob streams" in order to make a living and feed their families (Brown et al. 2002). Fish traps accounted for seventy percent of the average commercial catch of all salmon species between 1925 and 1934. Only twenty-five percent of the average catch during the ten-year period was taken by seine nets, although there were almost as many seines operating during that time (Alaska Fisheries Board and Alaska Department of Fisheries 1949). In his 1944 testimony, Charles Demmert complained that the Bureau of Fisheries had closed areas to seining, such as Tuxekan passage, while allowing the fish traps on the outside to remain open (U.S. Department of Interior 1944, Vol. IV).

By 1958, the number of traps in Southeast Alaska declined to 146, catching about forty-five percent of the commercially caught salmon. In 1959, after statehood, the number of salmon caught in fish traps dropped to four percent. In 1962, a U.S. Supreme Court decision banned fish traps in state waters, ending a half-century of controversy that dominated Alaskan politics (Price 1990). While the number of salmon caught in fish traps dropped significantly in 1959, the seine catch increased from 42 percent in 1958 to 78 percent in 1959. The seine fleet survived the fish trap era by targeting other salmon species besides pink salmon, which were being targeted by the fish traps (Price 1990).

By the late 1960s the commercial fishery market had declined and the Klawock-Oceanside Packing Company was the only surviving cannery on the west coast of Prince

of Wales Island (Langdon 1977). Statehood heralded progress toward managing salmon resources for a sustainable yield and in season management strategies. Fish traps were abolished; but the number of boats engaged in other gear types (purse seine, troll and gillnet) increased, maintaining previous harvest levels (Pennoyer 1988).

With declining salmon numbers in the 1970s—due to the negative impact of climate changes and the cumulative effects of decades of overharvesting—the state enacted the limited entry program, which reduced the number of boats in each gear class for distressed fisheries. The limited entry program required an amendment to the State Constitution, which passed in 1972 and specified the promotion of "resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the state" (Langdon 1980:1). The Fishery Research and Enhancement Division (FRED) Division was created within the Alaska Department of Fish and Game and the state began actively establishing hatcheries throughout Southeast Alaska, including one on the Klawock River.

In 1975, the state awarded transferable limited-entry permits to commercial power troll and purse seine permit holders; many of the Native fishermen who received permits were elders ready to retire from fishing. The younger fishermen working as crew on these boats were not eligible to receive a free permit. By late 1979, there had been a thirty percent decline in the number of limited-entry permits held by rural residents in Southeast Alaska due to the sale of permits outside the community. Rural residents did not have the financial ability to purchase these permits and the older fishermen apparently felt the need to sell them rather than transfer them to younger members of their family (Langdon 1989).

Klawock Hatcheries

The first hatcheries in Alaska were promoted by the U.S government at the turn of the twentieth century as a response to the overharvesting of sockeye salmon by canneries. Rather than limit commercial fishing, the government encouraged artificial propagation as a solution to declining sockeye stocks. The North Pacific Trading and Packing Company built and operated Klawock's first hatchery in 1897 near the base of Klawock Falls to increase its sockeye salmon catch. The next year the company moved the hatchery to the mouth of Three-mile Creek where it operated through 1916.

In 1915, a portion of the Klawock Falls was blasted to facilitate easier sockeye escapement into the lake (Proceedings of the 1999 Klawock Sockeye Conference). The hatchery closed in 1917 due to the inability of the company to find a suitable replacement for the former superintendent who quit on short notice (Roppel 1982). During its operation the Klawock hatchery incubated fertilized eggs through the fall and planted them in small tributary streams in October and November or released them as sac fry into the lake in December and January. The hatchery constructed a picket fence across Three mile Creek to acquire salmon for brood stock. Although an average of 3.2 million sac fry were released each year, it is unknown how many survived. Some records show that

storms, icing and floods contributed to high mortality. It is unlikely that the Klawock hatchery made any significant contribution to the commercial fishery during its operation (Roppel 1982).

Enhancement efforts for chum and coho salmon on Klawock River began in 1978 when the Alaska Department of Fish and Game constructed a hatchery below the Klawock Falls near the original 1897 hatchery site. The local Hatchery Advisory Council requested in 1985 that Fish and Game begin a program to enhance sockeye due to concerns about sockeye escapements. Two years later, both fed and unfed sockeye fry were released into Klawock Lake. The city of Klawock took over the hatchery operation in 1995, followed by the Prince of Wales Hatchery Association (POWHA), a private non-profit, in 1996. POWHA had been artificially propagating sockeye for six years through 2001 and had the funding to keep the project going for the following four years (Proceedings of the 1999 Klawock Sockeye Conference). Funds for the sockeye program have come from the Southeast Sustainable Salmon Fund, coho cost recovery, memberships, and donations (Bruns 2001).

The hatchery permit has required an escapement of 10,000 sockeye salmon across the entire run, limiting egg take in years when the sockeye escapement fell short. The 2002 permit indicates that about 1,000 sockeye are needed for brood stock.

Artificial propagation of chum salmon was discontinued in 1987, but coho salmon continue to be the mainstay of the hatchery program. The state mandates a target number of 6,000 coho to be released into the lake. Coho are raised in net pens on the lake. The Klawock hatchery also raised steelhead for three years in indoor tanks (Prince of Wales hatchery flyer).

Timber Industry

The timber industry first developed in the late 1800s to provide lumber for the canneries. The Alexander Archipelago Forest Reserve was established in 1902 (Rakestraw 2002). In 1907, the reserve was transformed into the Tongass National Forest. The new national forest encompassed all lands not homesteaded or claimed by miners and canneries and ignored the traditional land claims of the Tlingit and Haida people (Dauenhauer and Dauenhauer 1994). The first timber sales for pulp occurred in 1921, although they proved not to be economically feasible (Rakestraw 2002). The Civilian Conservation Corps was created in 1933 to put men to work on conservation, road and trail construction, increasing the demand for timber (Rakestraw 2002). Part of the program was totem pole restoration and funding was provided for native carvers to restore or duplicate the poles in Tuxekan and create a totem park in Klawock.

In 1942, the Alaska Spruce program was created for the purposes of providing spruce wood for airplane construction for World War II. Field headquarters was set up at Edna Bay. The Forest Service contracted with loggers from the Northwest who began moving to Alaska by the winter of 1942. One of the logging camps was at Tuxekan (Rakestraw 2002). During World War II, the government cut spruce logs on Prince of Wales Island

for airplane construction. During this time, loggers built a trail and hauled logs from Deweyville across to Tuxekan, a distance of about five miles (Charles Demmert testimony, U.S. Department of Interior 1944, Vol. IV: 647).

By 1944, during a testimony on aboriginal claims, Charles Demmert, the native owner of a small mill in Klawock (U.S. Department of Interior, 1944, Vol. IV: 652) complained that the federal government was discriminating against small mills, such as his, in favor of large scale logging by big corporations.

> *The logs and timber, that is all turned over to big outfits. In my young days there was a little mill in Chakan (sic), and a mill here, and our people were allowed to go out any time they want to and fall two or three or more trees and bring them in and sell them, and buy their winter's supply from the money selling them. But since the big corporations have come in we are not allowed to go out and cut a tree for commercial use. It is reserved for big corporations.* (Testimony of Charles Demmert, U.S. Department of Interior 1944, Vol. IV: 653)

In 1944, Milton Daly president and manager of the Ketchikan Spruce Mills and the MacDonald Logging Company of Ketchikan testified that four out of seven of the mills operating in Southeast Alaska got 60 percent of their lumber from the west coast of Prince of Wales and adjacent islands (U.S. Department of Interior 1944, Vol. VIII: 1272-1281). The first fifty-year contract to turn Tongass timber into pulp was signed in 1951. By 1959, a second pulp mill, owned by a Japanese company, was operating out of Sitka. Timber sales expanded from 219 million board feet in 1955 to 405 million in 1965 (Rakestraw 2002).

The Alaska Native Claims Settlement Act (ANCSA) was passed in 1971. As part of ANCSA, one regional corporation, Sealaska Corporation, was created in Southeast Alaska and thirteen village corporations, including Shaan-Seet Incorporated in Craig, and Klawock Heenya Corporation in Klawock. Both village corporations selected lands around Klawock Lake and logged them in the 1980s and 1990s.

RESULTS AND DISCUSSION

Key respondent interviews provided information on the following topics: 1) local knowledge concerning the biology of Klawock and Sarkar sockeye salmon; 2) a perspective of the changes and continuity in traditional harvest technologies and methods before and after the commercialization of salmon; 3) a description of the Sarkar and Klawock River subsistence fisheries, including perceived conflicts and impacts to sockeye salmon and the subsistence fishery; 4) the distribution and processing of sockeye salmon taken in these fisheries; and 5) local perceptions concerning the regulations and management of the Sarkar and Klawock subsistence sockeye salmon fisheries. The

results of household surveys conducted by ADFG Division of Subsistence in 1997 provided data concerning contemporary harvest patterns of Craig and Klawock.

Local Ecological Knowledge

Salmon Migratory Routes

Two possible salmon migratory routes to the Klawock River were identified. In 1944, Charles Demmert (U.S. Department of Interior 1944, Vol. IV:617) testified that salmon heading to Klawock River entered inside waters on the north shore of Noyes Island, passed through Arriaga Passage and traveled along the south side of San Christoval Channel before arriving at Klawock Inlet. More recently, Klawock elder and retired commercial fishermen suggested that Klawock sockeye salmon were coming in from the south through Bucareli Bay past Fern Point on San Fernando Island (Brown et al. 2002).

Sockeye Run Timing

Testimony was consistent concerning differences in size and timing of Klawock sockeye in comparison to Sarkar sockeye, which run earlier than Klawock and are smaller (Brown et al. 2002; Douville 2002).

An elder reported that the first sockeye used to arrive in the Klawock River in May (Brown et al. 2002).

> *The people used to go up from May. This place use to be full of sockeyes from May. Up until that time, using a spear is legal. Federal legalized it again. …I used to go up there too. We used to dry mostly. Everybody dried fish. Used to get sixty sockeyes apiece overnight…some more…for drying.*

Respondents consistently maintained that the Klawock sockeye run was occurring later than it had in the past (Brown et al. 2002).

Respondents agreed that the run timing at Sarkar River was earlier than Klawock River and that it was generally not worth going there to harvest sockeye in the inlet or outlet stream after the July 4th weekend. No sockeye salmon were observed from the bridge over the outlet stream during the 2001 fieldwork for this project, beginning with a trip to Sarkar on July 12th. Respondents said that the run was already over and had occurred earlier in June than usual.

Sockeye Abundance

Respondents observed that the Klawock sockeye abundance had declined in their lifetimes (Brown et.al.2002). Elders described the experience of salmon abundance when they were younger:

> *There was so much fish here before we got married. The whole bay would make a noise, flipping. You know, flipping the tails. At night it was just loud, all the way up along the creek. We got married in forty-two. It was before. I was still going to high school in Wrangell. Come home and then go back up. It's just loud on the bay. It was natural to the people. Now there's no more flips.* (Brown et al. 2002)

The last big run an elder respondent had seen occurred in the sixties, before the hatchery and weir came in. He got four hundred sockeye in one beach seine set (Brown et al. 2002). A younger, middle-aged harvester recalled that the last big run during his lifetime was in the 1980s. "I got 1200 sockeye in one week filling everybody's permit" (Yates 2002).

Respondents in their twenties also said they had experienced a decline in the Klawock sockeye runs in their lifetime. One twenty-seven year old harvester thought that there were less fish now than when he was young, judging by how many more fish they used to be able to get in one set:

> *I remember we used to just let it [the net] go and just bring it in a little bit and we'd be pursing up already. I remember watching my dad doing that. They'd just make a set and bring it in about 20 fathoms or something and purse up. Get a few hundred in one set and call it a day. They wouldn't even see a jump. They'd just go set.* (Nickerson 2001)

The youngest harvester interviewed, who had been fishing for about ten years, said that he hadn't noticed much of a change, but thought there were more fish when he was younger (Brown et al. 2002).

Large die-offs of salmon occur periodically in Klawock River and other streams of Prince of Wales Island associated with dry hot weather, low water levels and large salmon runs. The Ketchikan management biologist recalled a large die-off in 1993 during a large pink salmon run, and the Klawock hatchery manager described another one in 1999, another big pink salmon year when 300,000 pink salmon were counted at the weir (Bruns 2002; Doherty, personal communication, 2001;). Some respondents blamed the weir for the die-offs, because they felt it kept the salmon from getting to the lake. One elder said that the Klawock Lake was important for sockeye survival during periods of dry, hot weather because the sockeye go deep into cooler more oxygen rich waters. Bruns, the hatchery manager, maintains that the die-offs would happen anyways because the waterfall, located upstream of the weir, acts as a natural barrier during low water levels.

Generally, respondents said they had not noticed a change in the abundance of sockeye at Sarkar during their lifetimes; except in recent times when there was more fishing pressure from residents of logging and other non-native communities.

Impacts to Sockeye Abundance

Respondents reported the following potential impacts affecting local sockeye salmon stocks: the hatchery and weir, commercial fishing, off-shore foreign interception, pollution, predation, decline of prey species, logging, the causeway over the estuary, the charter fishing industry, overharvest by the subsistence users, parasites, weather and natural cycles. This report addresses these concerns below with additional information provided in the discussion section.

Commercial Fishing: During hearings in 1944, Demmert warned about the depletion of salmon stocks due to over fishing.

> *…and the fishes are cleaned up by traps before we have got a chance to get any. The fish is not so plentiful. It is getting scarcer. In a matter of a few years, if we keep on going like this, these canneries at Waterfall, Steamboat Bay, you will see stumps of the piling stand, just like across the bay, just because the fish is going to be depleted.* (Charles Demmert Testimony, U.S. Department of Interior 1944, Vol. IV:653)

Elder, Richard Carl, Sr. (2002), remembered when the canneries had a fish trap in the Klawock estuary at the mouth of the river where it was deep enough during low tidal flows:

> *After that they put a trap right in the foot of the stream, out in the bay there and they put a standing trap there and a lot of fish went into the trap. Klawock stream was noted for an abundance of fish: humpies, sockeyes, dogs and cohos. It depleted after that.*

With the canneries depleting salmon stocks before they arrived at natal streams, some native fishermen took to harvesting salmon illegally inside regulatory markers near the stream mouths.

> *It start depleting, the cannery was taking too much. I couldn't make a living from commercial fishing at that time because the fish was depleting, we had to rob creeks to make a living to feed our children.* (Brown et al. 2002)

Key respondents differed in opinion about the continued role of commercial fishing as a contributing agent to the Klawock sockeye decline. One elder was certain that the seine fleet off of Cape Addington or Granite Point was intercepting sockeye bound for Klawock. He remembered a tagging study conducted in the 1950s:

> *In the fifties, the Fish and Game had a… you know where the bite at Cape Addington, right? There was a trap and they tagged the fish. Because Canada is really kicking about putting up all their fish, see. All their fish. After they tagged it, all the fish came into this whole area…all tagged fish.*

> *Like I said the main run of the salmon is way out in the ocean. The one is going to Canada is way out there. The American fishermen are just way in here. But the main run of fish is way out there. So all that salmon that were tagged out there, they just ended up in all the bays around here. Canadian fish travels further out. American fish just stays right in here. There were quite a few tagged fish. Fish and Game got a record of it. They went through all the creeks after it died off. They picked up a whole bunch of the tags.* (Brown et al. 2002)

When asked what areas would need to get closed from the commercial fleet to protect the inside subsistence fishery, the elder, a retired commercial fisherman, responded, "where the seiners is, is just fine. Don't think about closing it off for nothing" (Brown et al. 2002).

Some respondents felt that the subsistence fishery should not be regulated when commercial fishermen are catching Klawock sockeye in the commercial fishery.

> *Out of the 100,000 sockeyes they catch out there, we probably use 6-7,000 of that, which is nothing. I just think they're wasting their time trying to regulate their subsistence rules when they could be spending money elsewhere.* (Brown et al. 2002)

Some respondents felt that commercial seine boats were taking too many Klawock sockeye, even if the amount did not constitute a large percentage of the total commercial catch. Given the legislated subsistence priority, respondents thought that fisheries managers unfairly limited subsistence fishermen while allowing commercial fishermen to intercept sockeye bound for Klawock.

> *The subsistence is nothing compared to what's being hauled away and what they take away and sell to the Canadians and the Japanese. It's nothing.* (Brown et al. 2002)

Other respondents thought that the commercial fishing openings were already too restrictive to be the cause of the Klawock sockeye decline.

> *They are not allowed to fish long enough to have an impact. When they open the season, the seiners only get a 12-hour opening. They really monitor the commercial fisherman, but I don't think they monitor the sports fisherman enough.* (Brown et al. 2002)

Weather Patterns and Climate Change: Respondents recognized natural cycles and weather as a potential factor impacting the sockeye salmon run.

> *It all depends on weather more than anything else, it seems to me, whether you have a good return or no. A couple summers, we had some really dry summers.*

> *I've seen fish trying to go up culverts to try and get to the creeks*. (Brown et al. 2002)

Charter Industry and Sport Fishing: The charter industry was not considered to be directly impacting the numbers of sockeye returning to the Klawock River, but key informants did place blame on the industry for harvesting too many salmon and halibut and for impacting the success rate of subsistence fishermen (Brown et al. 2002). Sport fishing for sockeye salmon is prohibited on the Klawock River, but one respondent suggested that the charter industry had an indirect negative affect on the sockeye run, because they are the reason that coho salmon, which prey on sockeye fry, are being enhanced (Brown et al. 2002).

Aside from impacting sockeye numbers, contemporary harvesters complained that the local charter fleet impacted their success rate because they drove through the Klawock subsistence fishery scattering schools of fish.

> *It's kind of irritating, those boats have to go through our gear all the time…As tough as it is to get sockeye…be sitting on a set and here comes a charter boat.* (Brown et al. 2002)

At times in the past, there have been serious confrontations between subsistence fishermen and charter boat captains:

> *Five, six years ago, I made a set around one boat and sat there and wouldn't let it go. He had to pull up his motor and go over my corks. He got mad at me and I went over and cussed at him. After that I went and talked to the boss and I never did see him again.* (Brown et al. 2002)

Nickerson (2001) suggested that the charter boats use the boat ramp until the subsistence season is over.

There was also a complaint about the pilings that a particular charter-fishing lodge put in the Klawock estuary, but it wasn't clear if it was because the respondent felt the pilings were impacting estuarine habitat or if he was annoyed because, in his opinion, the lodge had not followed proper permitting procedures.

There was the perception among contemporary subsistence harvesters that nonresident sport fishermen take too many fish and in some cases exceed their bag limits by limiting out in both the salt water and the Klawock River in the same day (Brown et al. 2002; Brown 2001). The perception also existed that some sport fishermen were over harvesting and selling their catch.

> *The amount of fish they haul out of here, there is no way they could use it all for personal use, they must be peddling some of it or I don't know.* (Brown et. al, 2002)

> *I was talking to a guy in Ketchikan the other day. Somebody he knows goes sport fishing up here and freezes up all his catch in a big freezer van and he takes it south. And he and his wife have a business. They sell fresh caught sport fish from Alaska. Like for 300% market value.* (Brown et al. 2002)

Charter boats were also blamed with polluting the water in Klawock Inlet by discharging their bilge water:

> *There's been a couple times where they're pumping their bilge when they're leaving or when they're coming back in…There's a couple times this year that there was an oil sheen right behind them, and that kind of irritated me.* (Brown et al. 2002)

There were also complaints that sport fishermen impeded the subsistence fishery at Hatchery Creek and wasted fish.

> *We hiked up to Hatchery Creek to get some fish. There's sport fishermen inside there, there's suppose to be regulations on sport fishermen and they are all over that Hatchery Creek every morning. We were lucky; we went early in the morning. By the time we come down at nine o'clock, there was a long line of tourists that were hiking out there already with all their sport fishing poles. You know they're gonna catch and release, but you know catch and release, they are gonna die anyways. What's that purpose, there? There's no regulation there for Fish and Game to check on them people.* (Brown et al. 2002)

A significant number of sockeye are harvested by sport fishermen at Sarkar River and Lake each year, according to creel estimates. In 2002, sport fishermen harvested an estimated 305 sockeye salmon from Sarkar (Walker et al. 2003).

Pollution: In addition to pollution from charter boats, two other sources of pollution were identified by key informants as having significant impacts on the sockeye salmon. One elder felt that the chemicals people use in their toilets and sinks were being discharged into the estuary and bay, killing off plankton and impacting the food chain.

> *When we first moved here nobody had toilets. We had running water but nobody had flush toilets. They had outhouses. And now that everybody and their uncle has a toilet they take and dump all kinds of stuff in the toilet and it goes into our waterways. It kills the germs in our bathroom but it also kills the plankton and stuff that's in our waters ways. So we're going backwards instead of forward. By flushing our toilets and putting something blue in there to keep our toilets spick and span. It's running out into our waterways and killing that too. So it's one big chain of events going on down that's killing our fish. Outhouses to toilets now you don't*

see none of the animals that come around in the water anymore. (Brown et al. 2001).

Douville (2002) suspected acid rain as a source of sockeye salmon decline. After two aquariums full of exotic fish died in the early 1970's, Douville conducted litmus tests on the source of his water, a catchment system off of a metal roof, and discovered that the water was highly acidic. In recent years, Douville returned to several mountain lakes that he hadn't visited for quite some time. He was disturbed to find the water "crystal clear" when "they used to be murky, biologically alive lakes".

When asked about changes to Klawock Lake, Douville (2002) said that he was seeing a lot more algae around the edges of the lake and down the river.

It's growing into the river, which means there's a source for it. That must be up in the lake.

Ecological Interactions and Predation: Respondents described a complex story of ecological interactions related to restrictions on the Native harvests of gull eggs, overharvesting of Pacific herring, *Cupea harengus pallasi*, destruction of Pacific sandlance, *Ammodytes hexapterus*, habitat by "Caterpillar" logging on area beaches and ultimately greater predation on young sockeye salmon by fish-eating birds.

That's true, there's more seagulls and not much fish and that's why you don't get the smell. That's why we don't get the smell we used to have. Boy it was putrid. But that was the smell of money my dad used to say. That's the smell of money when you smell the fish that died. Make it back for next year. (Brown et al. 2002)

Douville (2002) observed the disappearance of the herring biomass 30-45 years ago:

When herring were seined up out here, to be boiled for oil. In 5 years, they killed off a biomass that would have been unbelievable except for those that remember. I couldn't…If I was to tell you about it, you wouldn't believe it, the biomass that used to be here.

According to testimony from the 1940s, a decline of herring occurred in the 1930s when a herring reduction plant moved into the region. Demmert testified that local herring populations were significantly impacted within three years (U.S. Department of Interior: Vol. IV:634-636).

Douville (2002) also observed a reduction in the sandlance (locally called needlefish) population from Trocadero Bay, a decline he attributes to large machinery running over them while they were buried in the sand during "Caterpillar" logging:

> *…when the Cat, a machine walked on that beach even so much as a hundred feet away, the very action of the gravel like this made sure that very few of them survived.*

After the decline of the herring and sandlance populations, Douville (2002) noticed a lack of marine life in the local bays.

> *And out here, right in Trocadero, right across here, in the wintertime we'd see as many as a dozen plumes of…in the air. Any day that it was clear, you could see as much as a dozen plumes from whales in the air. At any one time, any day through the winter, porpoises used to follow us around here. It's only been in recent history that whales have showed up out here now and again. No porpoises, yet.*

Both Douville and an elder have noticed an increased number of gulls congregating in freshwater eating salmon fry and eggs.

> *And long time ago you never saw them in fresh water. Now you see them in fresh water… And now look at this fall, you'll see the seagull floating down every tributary there is, eating the little eggs and the little fish in the springtime…. But now you can go to any place that has a tributary to a lake and there's seagulls floating around there just getting fat…they'll be on the beach eating any kind of spawn there is.* (Brown et al. 2002).

Two explanations were offered as to why gull predation had increased on juvenile salmon and salmon eggs: Douville suggested that the gulls were targeting salmon in greater numbers, because populations of other forage fish were greatly reduced; and the elder respondent blamed the prohibition stopping native harvest of gull eggs on the expanded gull population (Brown et al. 2002).

> *I think that was our native way of keeping the seagulls down from eating everything that they could get.*

Merganser, *Mergus spp.* (locally called "sawbills"), predation on juvenile salmon was also mentioned as a possible reason for the sockeye salmon decline, especially in Sarkar River (Brown et al. 2002; Peratrovich 2001). Richard Carl Sr. (2002) said that as a child, his family used to eat "sawbills", but not in the fall because they tasted too fishy from eating salmon eggs. In addition, Douville (2002) said he was seeing Canadian geese eating salmon eggs, something he hadn't observed in the past.

Parasites: Two respondents expressed concern about "a lot of white worms" observed inside their sockeye a few years ago (Brown et al. 2002). It isn't clear what species of parasite was observed, but the nematodes *Philonema* are commonly seen in the visceral cavity (Tammy Burton, ADFG Fish Pathologist, personal communication, 2003).

High Seas Interception: An elder remembered an encounter with a Japanese gillnet three miles from Klawock while out fishing with his buddies in 1961.

> *We went up north of False Pass just to see what it looks like. And coming back we ran into a Japanese gillnet. Because the international date line is right there and straight out. He didn't want to cut the net and he didn't want to get it on his prop to try and push it. At that time the Japanese fishing fleet had seven hundred square miles of gillnet. You set it from False Pass and you're gonna go right to Portland.* (Brown et al. 2002)

A couple respondents considered the interception of Klawock sockeye by the foreign fishing fleet to be a continuing problem.

> *You got your high seas drift gill net going on out there. That's a biggie there, I think. They're getting intercepted way out there. And yet, they still go inside the American side of the 200 mile line. Last spring they caught one Russian dragging with his gillnet. He chopped his net right there and took off…. That is my proposal to the federal Fish and Game. It has got to be stopped, once it's cleaned out, we aren't going to have nothing.* (Brown et al. 2001)

Causeway: One of the elders remembered fish moving through the area that is now blocked by the land causeway:

> *It seems like it was a thoroughfare for the fish. We used to go swimming. Fish would swim down there and when the fish were moving up the stream, my dad didn't like us going down there because then there was seals and killer whales that would come in and herd the fish in, feed off of them. My dad didn't like us to go there.* (Smith-Harmon 2001)

Another elder didn't remember fish going that way, because it was always a barrier at low tide. The land was only covered at an extreme high tide (Brown et al. 2002). John Bruns (2001) believes that the causeway changed the circulation patterns at the peak of the high tide and suggests that the fish had more options to avoid predators before. One respondent said there use to be a fish trap near the causeway site, indicating that the fish may have passed through or schooled nearby. The Klawock Watershed Council is working toward getting the causeway replaced with a bridge.

Research Impacts: Two respondents suggested that the stream surveys done late in the year could be damaging salmon redds. They expressed concern that the technicians walking in the middle of the stream could be crushing eggs or kicking them up and exposing them (Brown et al. 2002; Bruns 2001).

Overharvest by Subsistence Users: Elders mentioned over harvest by subsistence fishers as a possible impact to the Klawock sockeye run.

> *I think the main thing about subsistence is people just overdo it. They go over their quota and consequentially the run suffers. It just needs to be monitored more closely.* (Brown et al. 2002)

Contemporary harvesters voiced opposition to blaming subsistence harvests for low sockeye abundance:

> *I ain't going to speak against the subsistence users. It'd be insane to do that. Whatever we take, we use. It's not for sale.* (Brown et al. 2002)

Timber Industry: Respondents' attitudes about the impacts of logging varied. Some respondents felt that logging had not had an impact on the decline of sockeye. Others said that it must have, but did not specify.

The most commonly mentioned impact due to logging was debris in the stream channels blockading salmon passage.

> *There are a lot of things. A lot of our streams need to be cleaned out. You go up some of the streams, there's just logs all over the place in there. Sometimes fish can't get up. If they want to spend moneys, they could concentrate on getting our streams clean and protecting the lake areas. Don't log around it.* (Brown et al. 2002)

> *The only place that really looks bad to me is Crab Creek. I see all those trees cut off and sitting right in the river there. That's the only place I see that looks bad around here.* (Nickerson 2001)

> *About ten years ago, the fire department had to go clean the creek out. It took 15, 16 people with seven heavy-duty chain saws. It took us 16 hours to clean up that creek and we still couldn't clean up the big logs. We had a mound of branches that would have filled up this parking lot. It was choking out our fish. Absolutely no fish could get through that bramble.* (Brown et. al. 2002)

Clara Peratrovich (2001) told how her teenage grandson spent considerable time removing debris that was blocking coho from moving up a stream in the Klawock River sub-basin.

> *Speaking of logging, there's a coho creek up on that side, right across from Canoe Pass, where that road runs up. There's a culvert there. That's a coho creek. They logged up there. They threw all the tree limbs into there.*
>
> *My grandson always checks it out to see if there's coho there. He doesn't get it, he just likes to check it out. He went there and oh…he was so mad. He saw the coho trying to get up. It was stuck in the saltwater and they*

> *were ready to spawn. They couldn't get passed above the culvert. The tide comes up; it's still saltwater.*
>
> *It was getting dark, so the next day he came back after school. He went back up there and his dad went with him this time. He made his dad help him. So they cleaned out that creek. He was so mad. He said, "What's the matter with these loggers…."* (Clara Peratrovich 2001)

John Bruns (2002) said that the Watershed Council was assessing blockages to spawning habitat from the logging operations. Log culverts have been problematic and Klawock Heenya worked with the council in 2001 to remove one that was blocking a stream.

> *A log culvert is where, instead of putting a metal culvert, they just throw a bunch of chunks of wood in there and put the dirt over the top. What happens is eventually, they'll compost down and fill and then the water goes up and starts cutting through the road fill and then there are barriers to fish on top of it…. They put them with the stream so they'll drain through them… They'll just lay a bunch of logs together and they won't lay tight, so water will run through them. But fish can't go through them. And then as they rot, they slowly seal off. They were real acceptable for a long time. A lot of the logging engineers that the village corporations hired initially just used them big time, and it was just amazing to me…these roads are expensive to build.*

Another respondent mentioned landslides due to a major flood event that turned the lake brown (Brown et al. 2002). The Klawock Watershed Condition Assessment indicated a major storm in 1993 that caused serious landslides and scoured some creeks to bedrock. One respondent, who had helped survey the timber cuts for Shaan Seet Inc., said that they had put stream buffers along the creeks, which were approved by resource management agencies. He had been under the impression that these would adequately protect the stream.

The Klawock watershed assessment team found that in some cases the buffers had succumbed to wind throw or had been selectively harvested, but some of the buffers required by the Forest Practices Act remained. Some of the logging in the Klawock watershed had occurred in the 1980s before the required buffers.

> *With the logging, I think they need to have a longer zone to protect the lakes that the salmon go up. What is it, 500 feet now, 250 feet? I think they should stay at least four miles away from the lakes, don't even touch any of the timber around there, just on account of the watershed. The watershed, it's probably [affecting] all these little creeks the sockeyes go up.* (Brown et al. 2002)

Douville (2002) suggested that the clearcuts funnel the wind increasing turbulence and blowdown.

Other logging impacts observed by locals included more run off and raised water temperatures.

> *I was really amazed when they logged around the lake. Klawock Lake has always been a good producer and I'm sure it has an affect on the temperature of the water, the run off, you know, and I'm sure it has an affect on the runs.* (Brown et al. 2002)

When asked about local influence on their native corporations, one Craig respondent didn't know which corporation had logged around the lake; he thought it was either Klawock Heenya or Sealaska and didn't mention that Shaan Seet harvested the south side of the lake.

> *They [the corporations] usually don't pay much attention to opinions. As long as the Fish and Wildlife approve, or the Forest Service approve it, they just go ahead and do it.* (Brown et al. 2002)

One respondent blamed the U.S. Forest Service for the clear cuts around the lake, suggesting that someone should "manage the Forest Service, make sure they don't cut timbers near our rivers or near our lakes." (Brown et al. 2002)

One of the respondents who had worked in the logging industry for 15 years complained about the way the logging was conducted:

> *Now I went from being a fisherman to the logging industry. And now I'm looking for another job, because logging is over pretty much. The closest job is a couple three hours away. And that's coming to a halt. A bunch of those guys are laid off this month. So what do we do to survive around here now?*
>
> *Nothing against the loggers, but the…loggers, all have $200,000 homes down south. They might have lived in trailers here for the last 10-15 years, but when they see an end to it, they go back home to their big homes, after they wiped out the logging industry. They're the one's that made the money. We didn't.* (Brown et al. 2002)

He did not, however, feel that the logging had an adverse effect on the fishing or hunting, except a positive one by making hunting and fishing areas more accessible due to the roads built. Another respondent thought that the logging had had a negative effect on fishing, because it brought more people in (Yates, 2001).

The impact from logging roads drawing in more people was a concern. According to one respondent, the Forest Service has a master plan that involves widening and paving roads, making them more accessible and attractive to outsiders.

> *There's no place else in Alaska that has as much road as Prince of Wales has. If you look at the Forest Service map of all the logging roads…And it won't take anything to turn those into tourist spots. They're making a four-lane highway to Coffman Cove. Then there's going to be just a two-lane highway to Labouchere. This is for us. They're not making a four-lane highway for the people that live here.* (Brown et al. 2002)

The Hatchery and Weir: Key respondent's comments concerning the Klawock hatchery and associated weir reflected a range of attitudes toward this facility. Economic benefits expressed included: 1) a major increase in coho salmon that benefits the charter industry and commercial troll fishery and 2) local employment provided by the hatchery (Brown et al. 2002). The hatchery contributed an estimated 40,000 coho salmon to the fisheries in 2000 (Bruns 2001). The hatchery also provides subsistence coho salmon through its program of giving coho jacks to elders or families in need (Bruns 2001).

One contemporary harvester stated that he had "no problem with the hatchery at all." He commented, "they seem to be having a good return all the time on their fish that they are releasing" (Brown et al. 2002). Another contemporary harvester credited the hatchery with helping the sockeye salmon runs recover: "This seems like a good year, but there seems to be less than before. I'm sure glad they got the hatchery going" (Yates 2001). An elderly respondent from Craig criticized the State of Alaska for giving up on the Klawock hatchery:

> *I think it is a good thing. I was really surprised when the State gave up on a bunch of hatcheries. Here fishing is one of our most important industries, you would think the State would be 100 percent behind this, but they gave up on this one and several others, you know, I couldn't believe that.* (Brown et al. 2002)

One contemporary harvester said that he was starting to see more hatchery fish:

> *I think we caught four this year and that's a record high…but I see an increase in it.*

The hatchery released 1.5 million sockeye fry in 2001 and estimated that 8-12 percent would return. That translates to a contribution of up to 15,000 adults available to the commercial and subsistence fisheries. Two respondents complained that the hatchery needed to be producing more sockeye salmon (Brown et al. 2002).

> *Also, if it [the hatchery] is going to be there on our land, in our river, they need to be enhancing that sockeye run as much as they can, I think.* (Brown et al. 2002)

On the other side of the issue are those, including some elders and contemporary harvesters, who feel that either the weir or the hatchery or both are detrimental to the sockeye salmon stocks. Some respondents went as far as to declare that the weir and its

associated hatchery were the main cause of the Klawock sockeye salmon decline (Brown et al. 2002). One elder stated,

> *Get rid of the white man technology. They'll come back. Get rid of the hatchery. Get rid of the weir. That's stopping them from getting to their natural habitat.* (Brown et al. 2002)

The opposition to the hatchery is not limited to elders. A younger respondent stated:

> *My suspicion is that it [*the salmon population*] has been dropping, since they did that [*put in a hatchery*]. I mean, this was the biggest run in Southeast for sockeye before they did, now it is no longer the biggest run.* (Brown et al. 2002)

The most vocal opposition to the hatchery was against its weir, which some people felt was blocking sockeye salmon from getting to Klawock Lake in a timely fashion (Brown et al. 2002, Nickerson 2001). According to one contemporary harvester: "I always thought if the weir wasn't in there we would have a really big fish run" (Brown et al. 2002).

A couple elders remembered the first weir in the 1930s and the problems it caused. Clara Peratrovich (2001) recalled:

> *When the first weir was put up… it almost depleted the sockeye. So they had to remove it. And there was just one person watching it. And he only had six fingers. And he couldn't move fast because of that. He just had his thumb on this other side; his fingers were all gone, just the thumb was there. His left hand, I think it was that had all his fingers. He was the creek watcher. It got so bad, though, when the fish started dying off, the Native people went up there and pulled the stakes out. And he started shooting above them and they started shooting.*

Another elder stated:

> *And the chief in Klawock chopped that weir out. Federal fish and Game asked, "Why are you dong this?" They owned this place. The federal government recognized my wife's tribe, John Darrow's tribe as the owners of Klawock. They chopped out the weir. "Why are you doing it?" The dead salmon was laying there, he picked it up. You see the nose? It's all worn down, there is no more nose. They try to get past the weir. They just died right there.* (Brown et al. 2002)

One respondent remembered recently seeing hatchery workers pitching dead sockeye back over the weir that hadn't yet spawned, but didn't blame the hatchery for the sharp decline of the sockeye run. The current hatchery manager said that he tries to move the sockeye through the weir when they get backed up (Bruns 2002). In 2001, Bruns (2002)

experimented with an underwater video camera to record numbers and species of fish going through the weir:

> *If it looks like we're having buildup behind that weir and we aren't handling them fast enough in the raceway, on the sorting, we'll just stream them through. And usually… in the two years that I've been here, we've done it three times. And one day, we took and streamed 8,000 fish through that weir and that was last year… Just little short stretches of streaming fish through this year, just to make sure the camera's working.*
>
> *It's going to give us a tool that we can do that…. If we stream coho, say, for three days through there, then we're biasing, almost, our coho take the other direction, in that we're allowing all our escapement to occur in large segments. So, you know, we probably end up opening the weir for just portions. Like last years, on the sockeye, we had 6,000 sockeye come up the fish ladder. We had 4,000 that we streamed through the weir.* (Bruns 2001)

Both Bruns and local observers reported red sockeye behind the weir in September and sockeye spawning in small side tributaries below the weir in 2002, but had different reactions. The local observer was perturbed by seeing sockeye spawning below the lake. Bruns (2002) cited a comment by an elder who had observed sockeye attempting to spawn below in side channels in the outlet stream in the 1940's.

Local observers have noted several impacts on sockeye that they feel are caused by the weir blockading or slowing sockeye salmon ability to move into the lake. For about two months in 2002, one observer estimated that 1,500 to 2,000 sockeye, chum, pink, and coho salmon were backed up behind the weir. According to this observer, fish were backed up to "first falls" near the estuary in August and September (Brown et al. 2002).

The reported impact of sockeye being detained by the weir included: sockeye turning red while behind the weir and becoming too mature before passing up the raceway, sometimes releasing eggs and milt on the sorting table. Sockeye were also observed spawning below the weir in small tributaries and ditches. Sockeye heads were white, the cause believed to be from banging against the weir, and sockeye noses were rubbed off. Some sockeye died before spawning and their carcasses floated down against the weir before getting pitched down river by hatchery workers (Brown et al. 2002).

In 2001, local observers reported that hundreds of sockeye being held for brood stock died in holding tanks because the water got too warm. The 2002 Annual Management Plan for Prince of Wales Hatchery Association stated that 403 out of 891 sockeye died while being held in the raceways for brood stock the previous year. In 2002, the hatchery captured sockeye from the lake for brood stock to avoid a repeat of this situation. The hatcheries annual report for 2002, stated that they successfully took 561 sockeye for brood stock, but an additional 272 sockeye being held died.

Biologists have noted most of the problems reported by local observers, but differed in their assessment about whether solutions to the problems currently caused by the weir and hatchery operation can be resolved satisfactorily. According to one biologist, the white heads and rubbed noses of the sockeye salmon might be a result of the channels holding the pickets being installed upside down. Zadina (2002) noted that he had seen this on other weirs where sockeye bumped against the flat sharp angled side of the channels which had been installed improperly. The channels are "U" shaped in cross-section and should be installed so that the rounded side is facing upward. It isn't known if this was the case on the Klawock weir.

Respondents also had concerns about the hatchery program, itself, in addition to the weir. They cautioned that there was a danger in meddling with natural systems. One contemporary harvester expressed concerns about increased predation of hatchery coho on wild sockeye (Brown et al. 2002).

> *It's not people fishing here that's killing it off. It's the hatchery. They're creating coho. Coho is a voracious eater.*

Discussion of Salmon Migratory Routes

A key respondent and historical testimony suggested two possible migratory routes within the Prince of Wales Archipelago; neither could be confirmed by past tagging studies. Results of the 1950s tagging studies on pink and sockeye salmon conducted for the U.S. Department of Interior (Noerenberg and Tyler 1959) reported that:

> *The major migrations from the Noyes-Baker Islands area, as in 1957, were to the west coast of Prince of Wales Island, Clarence Strait, Revillagigedo Channel in Alaska and the Skeena River area of Canada...*
>
> *The geographical distribution of recoveries from pink and red salmon tagged in the inner part of the West Coast district was comparable to 1957. Nearly all recoveries were made in the waters surrounding Prince of Wales Island, with the heaviest recovery in the Klawock area.*
>
> *...More local fish are present in the samples tagged at Cape Ulitka; more Canadian fish among the samples tagged at Granite Point...In the case of red salmon tagged at Cape Addington, no clear seasonal trends are evident, probably because their run was of short duration and most of the reds were tagged during the only period of abundance, July 25 to Aug. 3.*

More recent tagging studies conducted in the 1980s concluded that migration routes of salmon stocks probably vary annually with changes in oceanic conditions (Pella et al. 1993).

Sockeye coming to Sarkar would either have to travel from the north through El Capitan Passage, from the south up Tuxekan Passage or pass through Sea Otter Sound from the west, which appears to be the most direct.

Discussion of Run Timing and Abundance

Results suggested changes in run timing and abundance during the lifetime of key respondents including a previous Klawock River sockeye salmon run in May and a trend toward the run occurring later than in the past. The strength of the reported early May run can't be determined by weir escapement counts, because the weir generally wasn't installed until mid-June or later. Lewis and Zadina (2002) reported the weir counts, in the years when it was operated, from 1968 through 2000. The earliest date of weir operation was June 14th in 1969 and the earliest recorded sockeye past the weir was on June 16, 1969.

The weir on the Klawock River is difficult to maintain as compared to smaller creeks with less water flow, and salmon were observed passing uncounted through a gap in the weir on 27 August 2001 during a high water event (Lewis and Cartwright 2001). That year there was a significant difference between the Klawock escapement estimates based on weir counts (7,236) and those from the mark-recapture study (14,057), although handling mortality could also have caused an elevated population estimate in the mark-recapture study (Lewis and Cartwright 2001). As one response to the 2001 discrepancy, technicians carefully monitored the weir in 2002, and ADFG biologists believe the 2002 weir counts provided an accurate count of the sockeye escapement (Cartwright 2003).

In 2002, the weir was installed on June 23rd and the earliest counted sockeye were counted on June 25th. The last counts of over ten sockeye occurred on November 6th and 7th when a combined 58 sockeye passed the weir. Fifteen more sockeye passed the weir during the next month when the last straggler passed the weir on December 6. On August 1st, the day after the subsistence fishery closed in 2002, less than 6% of the over 14,000 sockeye escapement had passed by the weir (Appendix Figure E-1 from ADFG 2002, Alexander Database).

Weather affects how much time sockeye spend in the estuary before heading up stream. In dry years, the fish tend to stage in the salt water waiting for the rain and higher water before heading into the river. Zadina (2002) observed that most of the sockeye came into Klawock River during a three-month period during the summer. During 2002, 86% of the escapement had passed by the weir from June 23 to September 23 (ADFG Southeast Region Integrated Fisheries Database). The sockeye that come in sooner, such as in June, generally spend more time in the lake (i.e. 60-90 days). Sockeye that come in September are generally are ready to spawn in about a week (Zadina 2002).

Bruns (2001) reported that elders had told him Klawock used to have seven peaks during the run. It isn't clear how the peaks were identified, but elders said part of the run was now missing. If there were seven peaks in a sixteen week run then the peaks would be about two weeks apart, which suggests a possible tidal relationship. It also suggests that

the sockeye run might be temporally distributed according to where they spawn in the watershed (Zadina 2002).

Anecdotal evidence from commercial fishermen on the outer coast also suggests that salmon move in greater abundance during these peak tidal flows. Appendix Figure E-2 graphs the daily weir counts in 2002 with the height of the highest tide for each day, based on Sitka tides. The graphs suggests a relationship between sockeye movement and tide, but tidal variables might include more than just the height of the highest tide, such as the time of day when peak high tides occur or tidal currents influenced by the difference in height between high and low tides.

Contemporary harvesters reported that their catches were better on the ebb, suggesting that sockeye mill around the estuary during the ebb tide and then push upriver with the incoming tide (Brown et al. 2001). It has also been observed that sockeye spend more time in the intertidal area in dry years, making them more available to subsistence harvesters (Zadina 2002). A graph of river levels and sockeye weir counts (Appendix Figure E-3) suggests that freshwater levels do influence salmon movements upstream. Most of the spikes in weir counts occurred when water levels were increasing on the Klawock River. September 8 appears to be an exception when 814 sockeye were counted passed the weir, but river levels were dropping. This spike in weir counts, however, occurred during the highest tides of the month (11.0 feet in Sitka) and although the river level was dropping, the water level was still fairly high (31 feet 7 inches) in comparison to July levels. A complete analysis of the 2002 weir counts, tidal heights and river levels is beyond the scope of this study, but preliminary observations suggest a complex relationship between tidal range, river levels, subsistence harvests and daily sockeye escapement.

ADFG operated a weir on Sarkar in 1982 and 1983. In 1982, 8157 live adult sockeye were counted at the weir. The weir counts (Appendix Table E-1) fit respondents' description of the Sarkar run. It started sooner, was of shorter duration, and was over sooner than the Klawock sockeye run during the same year. In 1982, more than 1,000 sockeye had passed the Sarkar weir by June 18th, 50% of the escapement had passed by July 3rd; 88% of the escapement had passed by July 15th, and the last large count of 500 sockeye was on July 24th, bringing the cumulative total to 96% (ADFG Integrated Fisheries Database). After 91 sockeye were passed on August 15, the daily counts dropped to ones and twos until August 21 when ten sockeye were counted and the weir was pulled. In contrast, only 57 sockeye had passed the weir in Klawock in 1982 by July 12th, and the last count of over 500 sockeye occurred on September 1st when 2095 sockeye were counted at the weir (Lewis and Zadina 2002).

Over eight thousand sockeye were counted at the Sarkar weir in 1982 as compared to 4,872 at Klawock. The 1983 weir counts at both Sarkar and Klawock were less than 30% of what they were the year before. Both sockeye runs appear to be later in 1983 than in the previous year. Fifty percent of the Sarkar weir counts had passed by July 21. The run dribbled in and the last blast of sockeye (263) went past the weir on July 26 when the cumulative total exceeded 75%. By August 2, 88% of the total had been counted past the

weir (ADFG Integrated Fisheries Database). In contrast, the first sockeye didn't pass the Klawock weir until July 20, over a month after the weir had been installed, and over a month after the first sockeye had been counted in Sarkar on June 16. The only count of over two hundred sockeye went past the Klawock weir on August 15 (Lewis and Zadina 2002). It should be noted that the Klawock weir was being operated by hatchery workers who sometimes left the pickets open and estimated numbers while they were attending to other duties (Lewis and Zadina 2002).

Harvest records, escapement estimates and local knowledge have confirmed the decline of Klawock sockeye from historic levels. Moser (1899) estimated that the Klawock River could sustain a harvest of at least 35,000 and up to 40,000 under good conditions; but if "properly cared for", it was capable of producing 80,000 sockeye yearly for the canneries. Klawock River's sockeye harvest numbers, based on recorded cannery packs for 1886 through 1900 and 1904 through 1927, show harvests greater than 60,000 in years 1888, 1899, 1904 and 1919. The highest reported Klawock River sockeye harvest, 75,000, occurred during June 16 through August 20, 1899 (Moser 1902).

Fish counts from the Klawock weir from 1930 to 1938 showed a range from a high of 65,314 sockeye in 1936 to as few as 7,044 in 1930. Salmon escapements averaged 30,000 sockeye during this period. The 1936 salmon escapement past the weir may have been considerably higher than recorded. Klawock elders recalled that in 1936, a local Native resident destroyed the weir after observing a large die-off ("two to three feet" deep) of salmon behind the weir. It is unknown how many salmon may have passed the weir before officials repaired the damage. The minimum count of all salmon species past the weir in 1936 was over 700,000 salmon (Lewis and Zadina 2002).

The salmon count through the weir in 1936 also didn't take into account the significant die-off that elders observed in the inlet. The elder estimated four million salmon in the inlet (Brown et al. 2002):

> *I'll tell you about 1936. Above the bridge there, that whole bay was just like that…Dry. The whole bay…They couldn't get past the weir. And people come look at it. They are real amazed by it. The whole bay just dry, you can't see the water. Just fins. That's a lot of fish.* (Brown et al. 2002)

> *The whole bay, just all dead salmon. To tell you how much fish there was in there…since so much salmon wasn't going up, they opened it just for one day. Charlie Demmert Canneries was operating; it was still there. I know I seen it. I was watching them make their set. One boat made the set and it took three boats just to hold the seine. They filled up three scows. That's ninety thousand fish. They just let the rest go. That's all they could handle for the cannery*. (Brown et al. 2002)

There were no weirs in the Klawock River for thirty years, between 1938 and 1968. Between 1968 and 2003, Klawock weir counts provided minimum escapement estimates for the years: 1968-1971, 1977, 1980, 1982-1983, 1986-1988, and 1999-2003. The

length of operation of the weir varied; in 1980 the weir counts only covered the period between August 19 and September 12 (Lewis and Zadina 2002). Aerial, boat or foot surveys were also done in some years.

The Klawock weir counts provide only minimum escapement estimates due to high water events allowing fish to pass over and around the weir undetected, and inconsistent operation by technicians. The highest weir count during these years was 19,636 sockeye salmon in 1986 and the lowest escapement was 872 in 1983 (Lewis and Zadina, 2002). The second highest recorded escapement during this time period was 14,296 in 2002.

Some information about Sarkar River's historical abundance can be gleaned from historical commercial fishing catches, reported by Rich and Ball (1933) from 1887 until 1927—although harvest numbers varied according to changes in regulations, market conditions, fishing technologies, and sockeye run strength. The commercial catch records at Sarkar Cove during this period fluctuated widely between years, and ranged from the highest recorded catch of 69,210 sockeye in 1911, to 110 sockeye salmon in 1916. Catches of over 30,000 sockeye also occurred in 1891, 1899, 1905 through 1908. Sarkar Cove was permanently closed to commercial fishing in 1925, although the catch records reported 400 and 1,274 sockeye salmon harvested from there in 1926 and 1927, respectively.

A weir was installed on Sarkar River in 1982 and 1983. As with Klawock River, the Sarkar estimated escapements were far less than the 1911 historic harvest of over 69,000 sockeye. The weir count was 8,157 in 1982 and only 2,354 in 1983 (Appendix Table E-1).

Discussion of Perceived Conflicts and Impacts to Subsistence Fisheries

Commercial Fishing

Insufficient data concerning the contribution of Klawock sockeye to the seine fishery and differing opinions about the commercial catch and its relationship to the decline of Klawock River sockeye stocks has produced disparate attitudes about the potential impacts of commercial fishing on Klawock River sockeye salmon. The majority of sockeye salmon taken by commercial purse seine fisheries in Southeast Alaska occurs in District 104, although the primary target of the purse seine fisheries is pink salmon (ADFG Region I Staff, 2002; Geiger et al. 2003). During the Proceedings of the 1999 Klawock Sockeye Conference, the assistant area management biologist for southern southeast Alaska purse seine fisheries stated that less than .02 percent of District 104 annual commercial sockeye catch were bound for Klawock River. Lewis and Zadina (2002) concluded that efforts to estimate the Klawock River contribution to commercial catches have not been successful. They reported that past coded wire tagging studies, conducted from 1988-1998, did not yield useful information for determining the numbers of Klawock sockeye caught in the commercial fisheries, due mostly to insufficient recovery of tagged fish, and an invalid sampling method. (For a map of ADFG statistical areas, see Appendix Figure D-5).

Appendix Table E-2 reports the commercial seine catches for years 2001-2003 in the statistical areas that encompass a northern migration route for Klawock sockeye past Cape Ulitka through the San Christoval Channel. Appendix Table E-3 shows the potential interception of Klawock sockeye if they follow a more southern route arriving from the north Pacific moving south past Cape Addington and Cape Bartolome, then north through Bucareli Bay to Klawock River. Both tables indicate wide differences between harvest numbers, with the most sockeye salmon caught on the western coast of Noyes and Baker Islands, which is where one might expect the most intermixing with stocks bound for Canadian streams. The catch statistics for the more eastern districts also vary widely even within the same district in different years.

Klawock resident, James Martinez (Proceedings of the 1999 Klawock Sockeye Conference), suggested that ADFG needed to delay the commercial seine opening, at least until July 15, to let more Klawock sockeye get through to the inside waters. The purse seine harvests for both the potential northern and southern sockeye migration routes in 2001-2003 showed greater numbers of sockeye were caught after July 15th. This may simply reflect the nature of the commercial openings rather than the abundance of sockeye salmon in these areas.

Cartwright and Lewis (2004) point out that the subsistence sockeye salmon harvest and the estimated sockeye salmon escapement were about the same for 2001 and 2002, although the sockeye salmon caught by the commercial purse seine fisheries in Districts 103 and 104 fluctuated dramatically between 412,000 sockeye salmon in 2001 and 23,000 sockeye salmon in 2002. They suggest that the 2001 and 2002 commercial purse seine fishery had "no apparent effect on the subsistence fishery or escapement into Klawock Lake" (Cartwright and Lewis 2004:19). In their discussion, they offer four possible explanations including:

> *1) sockeye salmon traveling through these areas are bound for other systems, 2) the concentration of Klawock sockeye salmon in the commercial fishery is so dilute that an 18-fold decrease in harvest does not result in a substantial increase in sockeye salmon returns to this system, 3) the majority of the adult sockeye salmon returning to Klawock River travel inside islands close to the Prince of Wales Island, away from the main commercial fishery, or 4) a combination of the above.*
> (Cartwright and Lewis 2004:19)

It is also possible that the analysis needs to be at the level of statistical areas rather than districts to assess potential impacts of the commercial fishery. Sockeye salmon returning to Klawock River by either the northern or southern routes must pass through statistical area 103-60, which reaches from Big Salt Lake to Trocadero Bay. Klawock River is the only sockeye river east of this district. The number of sockeye harvested by purse seiners in this statistical area ranged from none in 1974 to 7,283 in 1993. The second highest harvest was 3,265 in 1981. Other catches of over 900 sockeye occurred in 1965, 1970,

1989, 1997, 1999, 2003. Harvests of over 400 sockeye occurred in the 1960s: 582 in 1966; 527 in 1960 and 419 in 1963. Commercial purse commercial seine boats harvested less than 400 sockeye in all other years. In 2001, only 373 sockeye salmon were harvested in statistical area 103-60 and only 42 sockeye salmon in 2002 (Appendix Figure E-4).

In years 1985-1999, District 103-60 was opened for seining as early as statistical week #31, but most years it remained closed until week #33 or #34. The statistical area 103-60 was not opened in 1987, 1992 or 2000. In 1993, the commercial seine fleet caught 7,283 sockeye in statistical weeks 34-36. There was no weir in that year, but the most subsistence permits fished (162) and the highest sockeye catch, as reported on the subsistence salmon permits (5,763) also occurred in 1993 (Appendix Figure E-5). The commercial and subsistence catch statistics alone account for over 12,000 sockeye, most of which were probably bound for Klawock River given the close proximity of the commercial fishery to Klawock River and the terminal location of the subsistence fishery at the mouth of the river.

In 1999, 933 sockeye were harvested in statistical area 103-60 during statistical weeks #33-36. The District 103-60 sockeye catches were small compared with the over 700,000 pink caught during the same time period, but in relation to the total 1999 Klawock escapement, they could be significant. According to the 1999 daily weir counts, 42 percent of the total Klawock escapement (5,310) for that year passed by the weir during or after statistical week #34, suggesting that sockeye were still migrating to Klawock Inlet during the 103-60 commercial openings and susceptible to interception by purse commercial seine boats in the area. The 103-60 commercial sockeye harvest of 933 in 1999 represented 17 percent of the total number of sockeye (5,310) counted through the weir and 48 percent of the sockeye escapement that passed the weir in weeks #34 and later (Appendix Table E-5).

If the 1999 Klawock salmon followed the northern route as described by Demmert (U.S. Department of Interior 1944, Vol. IV: 617) then sockeye coming into Klawock might also be intercepted by commercial seine boats off the north shores of Noyes and San Fernando Islands in Statistical Area 103-70. In 1999, the sockeye catch for this district was 4,173 in statistical weeks 33 through 36. Although the sockeye harvest was small compared to the 1,712,828 pink salmon caught in the same district, the 103-70 harvest represented 79 percent of the Klawock escapement. The combined commercial sockeye harvest for both 103-60 and 103-70, equals 96 percent of the entire sockeye escapement into Klawock Lake in 1999 (ADFG Integrated Fisheries Database for Southeast Alaska, vers. 3.6).

These figures represent the maximum percentage of Klawock salmon that might have been caught in the commercial seine openings. It isn't known what percentage of the sockeye salmon harvests were actually bound for Klawock, considering that the western boundary of 103-70 is at Cape Ulitka, where one would expect a mixing of Canadian and Alaskan sockeye salmon stocks. In contrast, only 103 sockeye salmon were caught in

103-50, the statistical area that the sockeye would pass if coming from the south through Bucareli Bay.

Commercial fishing activity in statistical areas 103-80 and 103-90 adjacent to Sarkar Cove would be expected to have minimum effect on Sarkar sockeye salmon, given the early timing and short duration of the sockeye salmon run. The earliest commercial seine openings in Statistical Area 103-90 or 103-80 between 1960 and 2003 occurred in statistical week 30 in 2001. The Sarkar sockeye run should have been into the lakes by week #28, assuming that the Sarkar sockeye followed the usual pattern of entering fresh water by mid-July.

Weather Patterns and Climate Change

Regardless of potential overfishing, salmon populations also fluctuated in the 1900s due to climate changes, and both freshwater and marine conditions. In freshwater, productivity may be affected by stream flow, stream temperature, changes in zooplankton biomass, and density-dependant predation mortality. In marine waters, coastal upwelling, ocean temperatures, predation, prey availability, and density–dependent factors related to at-sea salmon abundance can potentially impact salmon populations (Kruse 1998). The highest recorded escapements in Klawock River for pink (1.4 million in 1930), chum (265,000 in 1932) and sockeye (65,000 in 1936) all occurred during the 1930s, a decade of relatively mild winters (Lewis and Zadina 2002; Pennoyer 1988).

A trend of colder winters in the 1940s and 1950s followed the relatively mild winters of the 1920s and 1930s. Then in the 1970s there were two of the most severe winters on record (Pennoyer 1988). Pennoyer (1988) suggested that although climate played a crucial role, it was the managers' inability to predict the declines, and their inability to respond in a timely fashion through flexible in-season management, which intensified and prolonged the declines.

Ecological Interactions and Predation

It has not been established whether the Klawock native harvests of gull eggs were conducted in a sustainable manner or if the practice actually suppressed gull populations. A study in Glacier Bay on the traditional use of gull eggs by the Huna Tlingit concluded that the Huna traditional egg harvests did not appear to impact the reproductive success of gulls in Glacier Bay (Hunn et al. 2002). Research concerning the predation of gulls on salmon fry, gull population trends, and Prince of Wales traditional gull egg harvests are needed to access what, if any, impacts gulls might be having on the Klawock sockeye salmon stocks.

Parasites

Fluctuations in salmon parasite populations can be due to a variety of factors such as population densities, environmental parameters and the availability of secondary hosts (which many parasites require to complete their life cycles). Greater parasite loads do

not necessarily negatively impact fish health, although fish that are highly parasitized can be stressed and more susceptible to other pathogens. Samples of future parasitic outbreaks should be sent to the State fish pathology laboratory for identification. (Tammy Burton, ADFG Fish Pathologist, pers. comm. 2003).

High Seas Interception

Respondents were not alone in recognizing the impact of the high seas fisheries on local salmon stocks. In a keynote address, former Governor Hickel remembered the difficulty the State had with foreign interception of Alaskan fish:

> *In the 60s when I was Governor the first time, we were tough on the foreign fleet when we could be…but our jurisdiction was only to three miles. The federal government had out to 12, but they didn't seem to care what happened to our fish.* (Hickel 2002)

Overharvest by Subsistence Users

Although a few elders expressed concern about the amount of sockeye being harvested by subsistence fishermen, none of the contemporary harvesters interviewed wanted to implicate the subsistence harvest as a possible impact on sockeye abundance. This difference hints at a possible generational difference between how elders and younger harvesters view the fishery.

The 2001 and 2002 weir counts indicate that only 15 percent of the escapement passed the weir in 2001 and less than 6 percent in 2002 before the closure of the fishery (Appendix Figure E-1). In 2002, only 64 adult sockeye had passed the weir before July 17. On Wednesday, July 17, there was a spike in the counts when 360 adult sockeye were counted, and on Thursday, July 18 another 119 adult sockeye passed the weir (Appendix Figure E-2 and E-3). This pulse of sockeye, which was preceded and followed by three days of no sockeye through the weir, occurred mid-week while the fishery was opened. There doesn't appear to be any significant spikes in weir counts during the weekend closures or the Monday following them, possibly suggesting that other factors such as the river level were keeping sockeye from moving upstream or that the two-day closure is an insufficient amount of time for sockeye to build up in the estuary and move upstream before the fishery reopens again.

The estimated subsistence harvest based on an ADFG creel census was approximately 6,000 sockeye in 2002 (Cartwright and Lewis 2004). This number was expanded from the total creel census to take into consideration missed interviews and days not sampled. The expansion was done only for the entire season, making it difficult to use the creel information to analyze the relationship between daily subsistence harvests and escapement.

The 2002 Klawock River sockeye salmon run was approximately 19,631 sockeye, based on the sum of weir counts (13,631) and the estimated subsistence harvest (6,000)

(Cartwright and Lewis 2004). The subsistence harvest represented about 30% of the total estimated sockeye salmon run, but nearly 90% of the sockeye salmon counted past the weir by July 31, the last day of the fishery. This data suggests that the short duration and timing of the fishery, July 7 through July 31, is significantly impacting the first segment of the Klawock run.

Timber Industry

In 1944, Charles Demmert complained that spawning habitat was being destroyed by the logging practices occurring at the time.

> *And up here at Salt Lake, those creeks right today they are logging up there in those salmon streams, driving those logs in those streams and destroying the salmon hatching places.* (U.S. Department of Interior 1944, Vol. IV:631)

In the 1980s and 1990s, the two major landowners of the Klawock watershed, Klawock Heenya Inc. and Shaan Seet, Inc. harvested timber on their properties. The Klawock Watershed Condition Assessment (2002) found that 68 miles of the 132 miles of water courses (not including some intermittent streams) are fish bearing streams. These streams were divided into four distinct sub-basins and three composite sub-basins. During 1999 and 2000, surveys were conducted on the streams to assess the hydrology, soils and vegetation of riparian areas. A qualitative checklist of 17- 20 characteristics was completed for all identified fish bearing streams. The results showed that Half-mile Creek was the only sub-basin with 100 percent of the sampled area in proper functioning condition. The five remaining sub-basins had stretches that were "functional at risk" and four of these basins also had stretches identified as "non-functional". Overall, however, Inlet Creek and Hatchery Creek were considered to be in "proper functioning condition" based on their aggregate rating. Three-mile Creek sub-basin, one of the main sockeye streams, was labeled "functionally at risk" due to lack of large woody debris, inadequate riparian vegetation and excessive channel erosion and deposition. Although sockeye still spawn in this sub-basin, the spawning gravel is highly unstable during flood events and it is unlikely that fertilized eggs in the gravel will survive as the gravel shifts (Zadina, 2002).

The Hatchery and Weir

Prior to enhancement operations, the natural population of coho salmon was relatively small in Klawock River compared to the sockeye salmon population. For example, in 1898 the Klawock Cannery packed nearly 37,000 sockeye salmon and 65,000 pink salmon compared to less then 12,000 coho salmon. In 1899, the ratios were even more dramatic with 75,000 sockeye salmon and 53,000 pink salmon canned and only 5,000 coho salmon. The differences became even more pronounced in 1900 with 31,000 sockeye harvested, 200,000 pinks and only 500 coho during the same time period as the previous years. Given that other factors, such as market conditions affected which species were targeted, salmon harvests cannot be precisely correlated with escapement

numbers. The relative numbers of early Klawock harvests, however, give a reasonable indication of the relative run strengths between the three species of salmon; pink salmon being the most abundant followed by sockeye salmon, then coho salmon.

Hatchery coho salmon have been released by the Klawock hatchery every year since 1980 (ADFG hatchery records). Weir counts prior to 1980, don't give accurate pre-hatchery escapement numbers, because the weir was pulled by mid-September. The highest count was in 1977; the total on September 1, the last day of the weir, was 4,015. The hatchery production of coho salmon likely exceeds any natural escapement on Klawock River even before the commercialization of salmon in the late 1800s. In 2001, the hatchery released over a million and a half coho salmon smolts. The expected return of coho was 95,783 for 2002. The expected smolt releases for 2002 were expected to be about 2.1 million coho smolts (2002 Annual Management Plan for Prince of Wales Hatchery Association). Some respondents complained that the State turned Klawock River from a sockeye stream into a coho producer (Brown et al. 2002).

Current permitting requirements restrict the number of adult coho salmon that the hatchery can allow to escape into the lake. The number is a scientific best guess, because there have been no studies to precisely determine how many coho salmon the system can support or what the natural run size was prior to enhancement (McGee and Farrington 2003). The hatchery is also prohibited by permit from releasing the coho fry or parrs until June when most of them should have undergone smoltification, the physiological change preparing them for salt water. In April 2003, the Klawock hatchery reported an accidental release of an estimated 147 thousand coho fry into Klawock Lake through a tear in the net pen that had occurred sometime that winter.

Interactions between Hatchery and Wild Salmon Stocks: The Klawock hatchery is unusual in that it was built on a system that already had a substantial salmon run. Most existing hatcheries in Alaska are built on systems with a natural barrier. Enhancement efforts in these cases create a salmon run where one did not previously exit. The Klawock hatchery, on the other hand, was placed in an area with substantial, natural sockeye, coho, pink and chum salmon runs.

Biologists managing the state hatchery program stated that ADFG no longer allows hatcheries where there is a naturally occurring salmon run and they would not permit a hatchery on Klawock River today if there hadn't already been a twenty year history of enhancement on the river. Essentially, the river is being managed for the hatchery fish, not the natural run. In the 1980s, ADFG planned to close the hatchery but community members wanted to keep it going and took over the management (McGee and Farrington 2003).

Some risks relate to the fact that the Klawock hatchery is located on an existing salmon stream, resulting in interactions between wild stocks and hatchery coho salmon, sockeye salmon and steelhead. One respondent said that it didn't make sense to have a hatchery on a system that already had good runs:

> *It's not the fishermen that's hurting it [the salmon]. It's mismanagement of fish and game, of allowing this hatchery. Take down the hatchery. Move it. Let it go to another creek.* (Brown et al. 2002)

Local people are not alone in their concerns about hatchery stocks impacting natural salmon runs. A number of potential concerns have been voiced by scientists including: increased competition for food, competition for habitat between hatchery and wild salmon; predation on wild fish by hatchery salmon; overharvest of wild salmon when stocks are intermixed with hatchery fish; genetic changes in wild populations when they interbreed with hatchery salmon; transfer of diseases from hatchery to wild salmon; altered migration and displacement of natural fish; the removal of wild salmon extraction for brood stock; water pollution from hatchery operations; and the general impact on the carrying capacity of rivers and oceans from the 5.5 billion smolts released by hatcheries in Pacific Rim nations (Committee on Protection and Management of Pacific Northwest Anadromous Salmonids et al. 1996; Fraidenberg and Lincoln 1985; Hard et al. 1992; and Steward and Bjornn 1990).

Potential impacts include genetic altering of wild salmon populations that interbreed with hatchery salmon. Studies have shown that hatchery salmon are genetically different from the wild salmon even when the brood stock came from the same stream (Environment and Natural Resources Institute 2001). Respondents said they could tell the difference between wild and hatchery fish.

> *I don't want hatchery fish anyway. The hatchery fish is a soft, really soft fish. You pick up hatchery fish in your boat and you know it's hatchery fish just by picking it up. The meat is very soft. It's totally different than when it's wild. Wild fish is much firmer, bigger. After you cook it up, it tastes the same, but it's totally different fish.* (Brown et al. 2002)

Studies on coho salmon have shown that hatchery coho were less successful competing for mates and spawning in the wild than wild-origin coho (Environment and Natural Resources Institute, 2001). There have not been comparable studies conducted on sockeye salmon, but the research on coho salmon suggests that the enhancement of a natural population of salmon could negatively alter the genetic structure of the population, reducing their reproductive success, even when the brood stock is from the same population. Given that the Klawock hatchery gets its brood stock from sockeye migrating upstream each year, presumably a mix of wild and hatchery fish, it is unknown to what extent the Klawock hatchery population has been genetically altered from the wild salmon. There have been no studies to evaluate if the intermingling of hatchery and wild sockeye on the Klawock River over many generations could or has already diluted the genome of wild Klawock sockeye or reduced the reproductive success of wild stocks.

Studies have shown that hatchery reared salmon tend to be larger and more aggressive than wild reared salmon, but suffer higher mortality once released as smolts. Incomplete smoltification has been a major concern in Pacific Northwest hatcheries. While fully smolted salmon migrate downstream with little delay, released juveniles that have not

completed the smoltification process tend to remain in freshwater longer and can then compete or prey on other salmon species (Environment and Natural Resources Institute 2001).

The Klawock hatchery releases 1.4 million coho salmon smolts yearly (Bruns 2001). Coho smolts are released when they reach an average size; they have been observed at the river mouth four to six hours after release (Bruns 2001). Those juveniles that fall below the average release size and have not yet completed the smoltification process are likely to stay within Klawock Lake increasing their opportunity to prey on sockeye salmon juveniles and compete with wild coho salmon (Zadina, 2002)

The benefit of artificially enhancing the Klawock sockeye salmon population allows for an increased harvest for both subsistence and commercial fisheries. In the short term this could allow the subsistence fisherman to acquire their needed food fish despite downturns in the wild population and could reduce potential impacts from commercial purse seiners intercepting Klawock sockeye in the mixed stock fisheries. Hatchery salmon can be exploited at higher rates than wild salmon due to their higher survival rates (70 percent or higher versus the 4 percent estimated wild fish survival from egg to spring fry (Proceedings of the 1999 Klawock Sockeye Conference). Scientists, however, have expressed concerns that overharvest of wild stocks could result in mixed stock fisheries when harvest rates are based on hatchery returns (Environment and Natural Resources Institute 2001).

Weir: Biologists from Alaska Department of Fish and Game have observed some sockeye salmon being held back by coho salmon plugging the raceways and as a result becoming too mature. One biologist noted that sockeye salmon that come in behind coho salmon, which generally arrive in mid-August, will not move through a school of coho. Although the raceways on the hatchery side of Klawock River are always open, sockeye salmon may not use these, because coho are blocking the way or because the attractant flow is greater where the river is deeper in the middle and on the opposite side of the channel (Zadina 2002). In some years, hatchery crews have pulled a picket in the weir and counted fish as they passed through, especially when too many fish were backed up behind the weir. In 2002, this was not done, although fish backed up all the way to the "first falls" near the estuary, according to one local observer. Biologists estimated that about 200 sockeye were affected in 2002. This situation could become more problematic in the next few years as more hatchery coho salmon return, plug the raceways, and hold other salmon species back from getting through the weir (Zadina, 2002).

In some instances, low water levels and resulting low oxygen levels have resulted in major die-offs of salmon in the river behind the weir. It is unknown if these die-offs would have occurred anyways without the weir. The hatchery manager suggested that the waterfall above the weir would block fish from entering the lake during low water levels resulting in die-offs even if the weir wasn't in place. As Bruns (2001) pointed out, there have been major die-offs of chum and pink on systems that do not have a weir. One elder, however, acknowledged that other systems have die-offs because they do not have a lake. Both biologists and local observers (Zadina 2002; Brown et al. 2002) have noted

that sockeye in the lake "go deep" to cooler water when the lake temperatures are too warm. The elder stated that there had been no die-offs on Klawock River prior to the introduction of a weir in the nineteen-thirties.

Sockeye salmon have deposited eggs and milt as hatchery crews passed them across the sorting table, before releasing them above the weir. Sockeye were also observed seeking spawning habitat below the weir in 2002. Although, sockeye do regularly spawn in the outlet stream in some systems, this is apparently rare in Klawock River. The comment from an elder (cited by Bruns 2002), who remembered seeing mature sockeye salmon below the lake in the 1940s suggests that this is not a common occurrence in Klawock River.

Two respondents suggested removing the weir for one year and seeing what effect it makes in five years (Brown et al. 2002; Nickerson 2001).

> *There's been a lot of talk about the hatchery. There's always pros and there's gonna be cons. I wouldn't mind seeing the hatchery pulling their weir one year and see what happens in four or five years. That's one of the biggest interests of the people, is that weir. A lot of people are saying when you pull that weir out, you're going to get more salmon.* (Brown et al. 002)

Biologists discount past weir counts due to possible leaks during high water events and inconsistent manning efforts during the years when ADFG ran the hatchery (Lewis and Zadina 2002). ADFG technicians sometimes left the pickets open and then later estimated the number of salmon that they believed to have passed by the weir. According to biologists, the weir is not necessary for stock assessments, which could be accomplished by mark- recapture methods. The weir is, however, an integral part of hatchery operations for cost-recovery efforts and necessary to ensure that only the target number of coho salmon (6,000) is released above the weir.

Even if the removal of the weir benefits the sockeye, there could be a greater impact if the weir was removed without a phasing out of the coho enhancement program, because it would be more difficult for the hatchery to control how many adult coho are released into the lake. If more than the recommended target level of coho were released into the lake, increased coho predation on sockeye fry could have a negative impact on the sockeye salmon population.

There has been some confusion concerning whether 6,000 is the minimum, maximum or target number of adult coho to be released above the weir (Bruns 2002; McGee and Farrington 2003). An additional concern is that the hatchery release coho salmon into the system proportional to how they would enter in a natural run, with most the coho being released in the middle of the run.

Clara Peratrovich (2001) suggested a compromise concerning the weir; she suggested leaving the weir open for the sockeye salmon run and then close it for coho salmon:

> *If it is left open for the sockeyes…you know, leave it open and try to count it as they are going up. How many are going to their natural habitat. If they are going to keep some, fine, but they should get it up at the lake. Get it from up there. And that way they [the sockeye] are safe.*
>
> *They can put it [the weir] there for the coho run. The chum salmon don't go up there. So if they want to build up the coho run, keep it there for the coho, but for the sockeye open it up.*

Unfortunately, the beginning of the coho run and the end of the sockeye run overlap making it difficult to release only one species past the weir while retaining the other.

Logging Mitigation: The hatchery may be helping to mitigate the impacts of extensive logging in the Klawock watershed on salmon spawning habitat. Biologists have concerns about the viability of some of the spawning habitat; in particular, the spawning gravel on Three-mile Creek has been more susceptible to sliding during flood events, since trees were removed near it. Although salmon can still spawn in the gravel, the fertilized eggs in the gravel are crushed and suffocated when the gravel slides (Zadina 2002).

There have been efforts by the Klawock Watershed Council to rehabilitate and restore habitat due to logging impacts, but the sockeye salmon stocks were in serious decline prior to large scale logging, suggesting that other factors have also impacted sockeye abundance over the years. Scientists recommend that salmon enhancement should not supersede finding a remedy to whatever caused the decline in the first place.

Summary Concerning Hatchery Discussion: The current Klawock manager acknowledged the legacy that he inherited from previous managers and said that some of the complaints against the hatchery were based on past practices that no longer occur (Bruns 2002). One respondent acknowledged these past problems, but complemented the current Klawock manager:

> *This new guy we've got, John Bruns, he's really good. But the ones before have been really questionable. They've actually shut off sockeyes from going up at times. There was a time when the whole river was killed off once. It was all white, they were all bellied up. Some of them were told to dump some chemical in the water to kill the sockeyes off that were stuck in the grating.* (Brown et al. 2002*)*

Scientists caution against using hatcheries as a panacea for overharvesting. Even in cases of endangered salmon stocks, scientists advice using caution when deciding whether to enhance a population (See Hard et al. 1992). The Committee on Protection and Management of Pacific Northwest Anadromous Salmonids (1996) recommended that fisheries management recognize and protect the genetic diversity of wild salmon stocks, not just strive to maintain salmon abundance. Without a benefit and risk analysis of the Klawock hatchery practices, we do not know how many of the ecological and genetic

concerns apply to the current Klawock hatchery practices. The current hatchery management regime attempts to reduce or mitigate some if not most of these risks, but there has not been any evaluation of the success or failure of the program.

> *The State of Alaska has a rigorous permit procedure for starting a hatchery, outstanding pathology guidelines and a good genetics policy. These tools are all very good in getting a hatchery properly started. However, hatcheries do not face sufficient supervision, monitoring, or evaluation once they are operating. As can be seen by perusing the reports or plans currently available, it is difficult if not impossible to gauge whether hatchery programs are impacting wild stocks or not.* (Environment and Natural Resources Institute 2001)

The local controversy surrounding the hatchery and weir signals the need to evaluate the enhancement of coho salmon, sockeye salmon and steelhead in Klawock River including an analysis of the risks to the wild salmon populations and the benefits to the community. Based on this information the community needs to decide if the benefits outweigh the risks or if there are ways to mitigate or reduce risks. In 2003, ADFG began a study concerning the predatory effects of coho salmon on sockeye salmon in Klawock Lake, but there also needs to be genetic studies to assess and monitor any alteration of the wild salmon and steelhead genetic diversity in the Klawock system due to interbreeding between wild stocks and potentially genetically altered hatchery salmon. The interactions between sockeye smolts and newly released hatchery coho smolts in the hatchery should also be investigated. One biologist felt that once they have identified the problems they could work to find solutions, although he admitted that the system may be more dynamic than our current knowledge (Zadina 2002).

Increasing the number of hatchery coho salmon in the Klawock system above naturally occurring proportions carries with it certain risks to naturally occurring salmon populations. Despite the small scale of the steelhead project, it should also be evaluated, given the small number of naturally occurring steelhead and the multiple year spawning behavior of steelhead.

Prince of Wales Traditional and Customary Sockeye Fisheries

Traditional Harvest Methods

Archeological remains of ancient fishing structures are situated in areas where salmon concentrate throughout Southeast Alaska. The Prince of Wales Archipelago, spanning from the southern tip of Dall Island to Point Baker on the north is located within the zone (45 to 60 degrees latitude) deemed most favorable for salmon productivity where the optimum conditions for all five species of salmon overlap (Langdon 1979). The extensive and intensive utilization of salmon resources in the Prince of Wales Archipelago is substantiated by the significant abundance of archeological fishing structures all along the coastline of Prince of Wales and outer islands with sites on most major salmon streams and other locations where salmon concentrate on their migrations

(Campbell 1982; Langdon et al. 1986). Archeological surveys conducted on San Fernando Island, Lulu Island and the northern half of Baker Island west of Prince of Wales Island identified at least fifteen intertidal stone fishing structures on these islands (Langdon et al. 1986). Within close proximity of Klawock, there are three archeological fishing sites--located in the Klawock estuary, Little Salt Lake approximately two miles north of the Klawock River, and the third located 50 meters south of the estuary (Langdon 2001).

The remains of these ancient harvesting technologies include stonewall alignments and wooden stakes preserved in oxygen deficient intertidal mud. The wooden stakes from sites throughout Southeast Alaska range from 40 to 3,460 years old, according to the results of radio-carbon dating (Moss 1998). Tlingit ethnohistories have documented the use of traditional stone and wood weirs and traps through the early 1900s (Brown et al. 2002; Ackerman and Shaw 1981). One stone weir, on an island in the Prince of Wales Archipelago, was used until the 1920s; A Klawock elder in his eighties remembered utilizing this stone weir to capture dog salmon when he was a young boy (Langdon 2001, pers. comm.).

Clara Peratrovich (2001) described one of the earliest known harvest techniques in Klawock using wooden stakes. The method exploited the propensity of salmon to jump into the air as they gather at the mouth of a stream. The trap, which consisted of pointed spruce stakes placed in the intertidal mud, was designed to impale salmon when they flopped back down to salt water after a jump. The families would wait until low tide to retrieve their fish.

> *She [Christina Edenso] said that they sharpened the young spruce trees by burning the tips and scraping it and making it real sharp. And they put the sharp point up and staked them into the mud. And real close, children sat on the shore line and would phrase, each family member would be phrasing, "Jump on my mom's, my father's stick. Jump on my father's stick. Everybody would be phrasing their own routing of the fish jumping that the family member's stakes would be catching fish. This was the old days.* (Peratrovich 2001)

Other descriptions of this fishing method from Klawock have been published. Robert Peratrovich (1959:50) also mentioned the role of children in harvesting salmon from these traps:

> *Another ingenious method of catching the salmon was by driving wood shafts of about one and one-half inches in diameter protruding up about a foot from the riverbeds. The method was most effective at the mouth of streams. The pegs were sharpened to a very long fine point after they had been driven into the river bottom. As the tide receded the fish became lodged upon it after the salmon had jumped. Many streams in southeastern Alaska still have many of these pegs seen above low tidewater lines. They are worn down to river bottom by ice drifting over*

> *them down stream. After the tide had receded the salmon were collected by the children who stood watch over them.*

A third description of these impaling traps was provided to Langdon (1977:184-185).

> *George Hamilton states that as a young man he saw sharply pointed stakes set in stream beds behind estuarine weirs at the mouth of streams. They protruded into the air several feet above the flow of water. He presumed they were intended to impale salmon that would treat the weir as they might a waterfall and leap it during high water.*

De Laguna (1960) also reported similar impaling type traps utilized in a couple locations by the Angoon people. According to these accounts, impaling traps were typically placed in the estuary near the mouth of streams and provided a barrier to upstream migration, which the salmon were inclined to jump over.

Later, the method of impaling salmon with stakes evolved and woman wove long cedar mats that they threaded through the stakes. People scared the fish behind the woven cedar barriers where they became trapped (Peratrovich 2001). Eventually the traps evolved to contain a depression or live well behind the barrier, a significant advancement over the early impaling traps, which required careful vigilance by the harvesters as the tide receded and the impaled salmon became exposed to the elements and predators.

Langdon (2001:19) surveyed the extensive wood stake constructions in the Klawock estuary, estimated to be 750 years old, based on radiocarbon dating of sample stakes (Appendix Figure F-1).

> *The visible structure with the greatest integrity consists of over 350 stakes packed tightly together to form an impenetrable wall; they are placed in an asymmetrical V, check or Nike symbol-like pattern with the point directed away from the river. The longer arm of the construction runs parallel to and is closest to the intertidal stream channel while the shorter arm extends toward the shoreline at approximately a 45-degree angle.*

Fifty meters south of the estuary, Langdon (2001) described another wood stake construction -- a semi-circular feature similar to the stone traps, such as Langdon found on the outer islands.

Stonewall constructions were made of irregular cobblestones ranging one half to two feet in length. According to their shape and perceived function, archeologists categorize these stone wall structures into weirs or traps. Weirs were linear in shape and appeared to funnel migrating salmon toward a trap of some kind. Traps were generally semi-circular constructions of cobblestones and boulders piled into the shaped of an arc with the opening facing toward the river mouth and a depression in the beach, perhaps excavated, where water pooled even at low tide (Langdon 2001). Archeologists believe that rocks

were originally piled to a height of two to three feet, although most of the remaining stone walls have eroded to lower than that (Ackerman and Shaw 1981).

Clara Peratrovich (2001) reported that the rocks walls of a traditional stone trap in Klawock estuary used to be much higher, but ice floes have dislodged the upper rocks. The trap was a semi-circular rock formation located in the intertidal area at mid-tide (Langdon 2001; Peratrovich 2001). Clara Peratrovich (2001) described the use of these stone traps.

> *Klawock Island, at the north point, its still there where the fish going by, the old people went and scared the fish into that well that they built up with rock. They called it a fish trap. And when the water is high over the well, they chase the fish into the well. They keep in there until the tide goes out and that's the way they caught the fish a long time ago.*

Later in the fall the same ponds that were used to catch salmon were also used to capture ducks. The people built a hut over the pond and lured the ducks in with salmon eggs. There was a place inside the hut for someone to stand and grab the ducks when the ducks came into the enclosure (Peratrovich 2001).

The intertidal fishing structures of Klawock targeted the large run of sockeye, as well as other salmon species (Brown et al. 2001; Langdon 2003; Moser 1899). These harvest technologies exploited the schooling tendencies of sockeye salmon, which arrived into the estuary and entered the river in accordance with the tidal flushes and freshets.

Charles Webster Demmert (U.S. Department of Interior 1944: 598) described a third kind of intertidal trap referred to as a "tidal fence trap" by Stewart (1977). This method was often used near the mouth of a stream, but could be used in any shallow water with the necessary conditions.

> *In the early part of the season during dry weather, in some places the fish don't go into the creeks and they wait until rainy weather. And at that time, we would build a kind of a fence in the shallow, long flats, so that when the fish gets around behind it, with the tide going out, when they are milling around in the shallow waters, and these branches and poles come up, and when they get out in deep water, they are caught behind the fence and that is how they catch them. I helped to do it at one time*. (Charles Webster Demmert, U.S. Department of Interior 1944:598)

Southeast Alaska Natives used gaff hooks and spears to harvest salmon from rivers. The gaff hook design differed between the northern and southern Tlingit. In the north, the hook was permanently lashed to the end of a pole, whereas the hook of the southern Tlingit was fitted into a shallow groove at the end of the pole. A lanyard connected the hook to the shaft. When the fish was impaled, the hook slipped off the shaft and the salmon was held by the line connecting the hook to the pole (Appendix Figure F-2). The traditional gaff hooks as illustrated in Emmons (1991) were without barbs. More recently

some harvesters started using commercially manufactured "J-hooks", on their gaffs, however traditional barbless hooks are still used in both southern and northern Southeast Alaska by some harvesters (Brown et al. 2002; proceedings of the Federal Regional Advisory Council meeting in October 2003; Unpublished field notes from Hoonah study 2003).

Fish were gaffed with a backward motion as opposed to the forward thrust of a spear. Another unique feature of the southern Tlingit gaff hook was that the hook could be reversed on the pole, turning a gaff hook into a spear (Appendix Figure F-3; Emmons 1991; Brown et al. 2002). When being used as a spear, Emmons observed two methods of use in the late 1800s: 1) retaining the spear in the hand while thrusting it forward and 2) releasing the spear from the harvesters grip while casting it at a distance and retrieving it with a long line attached to the butt end of the pole. Emmons reported the Tlingit name of this type of gaff as a *kohk-da kehk-kah*, "come-back hook", named for the hook that "reverses itself when the fish is struck" (Emmons 1991:111)

Robert Peratrovich from Klawock (1959) described a different type of traditional spear, technically a harpoon because it was thrown at the salmon. As described, it had a barbed spear point and multiple prongs including a main shaft and diverging foreshafts:

> *Another common method of catching the salmon was with a spear tipped with a barbed bone or antler point. The head was connected to the shaft by a short line. The spear was thrown at the salmon that swam with their dorsal fins out of the water in shallow part of a stream or in deep pools. The spear usually had the shaft projecting beyond the diverging foreshafts to protect the main shaft and served as a buffer. This protected the points from breaking on rocks in the river bottom.*

Deep pools, like the one in "first falls" in Klawock, were favored gaffing holes. Other sites on the river were also used as indicated by this elder:

> *One time, I can remember walking up…I went past the first falls with my dad. We went up and got some there. I know we walked a long way. But after we got up and done, we had all these fish that we'd speared. We just ran this, after we cleaned them, we just ran this spear through them…and we were just carrying it down.* (Smith-Harmon 2001)

One Klawock elder, who used a commercial barbed hook on his reversible gaff/spear, told us that it was preferable to aim for the aft end of the salmon, between the tail and the body, because it was less damaging to the fish (Brown et al. 2002). We did not discuss the technique with other local harvesters during this study, because at the time gaffs and spears were not a legal gear type on the subsistence salmon permits.

Elders in Klawock considered harvesting with spears and gaff hooks superior to fishing with a rod and reel, because the technology allowed for selective harvesting of male salmon (Brown et al. 2002; Peratrovich 2001). According to Peratrovich (2001),

traditional harvesters targeted male salmon and avoided disturbing the mature females with eggs (Peratrovich 2001). A Craig elder recalled taking both genders when fishing with his uncle on Klawock River (Brown et al. 2001).

Demmert (1944) indicated that gaffs and spears were utilized in deep river stretches and clubs were used to harvest salmon in shallow water.

> *We had spears and gaff hooks. Some of our hooks we tied on a stick, and we hooked, or we put it over the fish. But when the fish is very scarce we had a hook fastened at the end of a pole, and the hook is shoved in with one end, with the line fastened here (indicating). Now, I can stand here, and I can hit Mr. Gore's leg right from here without missing, and this line pulls off, and it goes back, and we put the salmon on the banks where it is steep water. But in a lot of places the water is shallow, and then we use a club, and club them over the head.* (Demmert testimony, U.S. Department of Interior 1944, Vol. IV:598)

One elder in Klawock recalled that her father still clubbed mature red sockeye from the river when he was 101 years old (Brown et al. 2002).

Funnel shaped basket traps made out of cedar bark were also used to capture salmon in the river. These traps also allowed for the selective harvest of male salmon (Peratrovich 2001). According to Clara Peratrovich (2001), they used to release female sockeye from the traps, but harvested the female chum salmon, because they preferred chum eggs for fermenting and as a source of pectin when making "Indian jam".

> *When the fish hit the creek then they made those round tube like fish traps, out of cedar bark. And they faced it upstream so that when a fish goes by it drifts in. It can't get out once it gets in because the inside is made with sharp at the rim. There are sharp stakes. And they just made a little opening in the center in the way back. The fish goes in there; it can't get out. When that gets full, they roll it out to take the fish out. They don't take it out by hand they just roll the trap over to the side of the creek. Take the fish out of there. So that was the traditional way of catching the fish.* (Peratrovich 2001)

Robert Peratrovich (1959) also provided a description of salmon traps:

> *The small streams were fished for salmon in the early days with native-built traps. Their erection was also very simple. A fence with some openings was stretched across a stream, preferably at rapids. In front of these, upstream, woven baskets were placed, which were built very much like present-day fish weirs and serve the same purpose.*

The Haida people of British Columbia, Canada used nets (trawl, dragnets, and beach seines) made of nettle and cedar bark fiber to capture salmon (Stewart 1977). De Laguna

(1960) reported that the Angoon Tlingits also captured fish in nets, 30 to 40 fathoms long, made from spruce or whale baleen. Although nets were used by native groups to the north and south of Prince of Wales Archipelago, we did not find any documentation of their use by the Tlingit or Haida of Prince of Wales Island, prior to European contact (Brown et al. 2002; Langdon 1977). The earliest record of a net owned by the Prince of Wales people was a small setting seine received from an American trading ship, for furs in 1794 at Kaigani on Dall Island (Howay 1930).

Harvest Methods After the Commercialization of Salmon

Traditional harvest methods remained relatively stable until the establishment of the commercial fishing industry in Southeast Alaska. Following the arrival of canneries to Prince of Wales Island, subsistence harvest patterns and methods evolved with changing conditions, including the involvement of the native population in the commercial fishing industry, regulatory restrictions on traditional practices, the decline of sockeye salmon stocks, and the introduction of cotton beach seines. The following chronology approximates the predominant sockeye subsistence harvest gear since the commercialization of salmon in the late 1800s, compiled from Klawock and Craig interviews (Brown et al. 2002; Langdon 2001) and published references (Langdon 1977; Moser 1902, 1899; Salisbury 1962). Most respondents did not specify dates when describing past subsistence methods making it difficult to precisely delineate when changes occurred.

> Pre-contact until the late 1800s: traditional methods (stone and wood weirs and traps, funnel traps, spears and gaffs).
>
> Late 1800s until about 1920: beach or drag seines and hand purse seines operated from rowboats in the saltwater, spears and gaffs in the rivers.
>
> 1920s until late 1940s: commercial engine powered purse seine vessels and trollers, spears and gaffs in the rivers.
>
> 1950s: beach seines and hand purse seines fished from rowboats, spears and gaffs.
>
> Late 1950s until mid 1980s: beach seines (fished like a purse seine) and hand purse seines from power skiffs, rod and reel (legal snagging off of the Klawock bridge), spears and gaffs until prohibited.
>
> Mid 1980s until 2001: beach seines and hand purse seines used from power skiffs, rod and reel in river.

The overharvest of salmon by the canneries led to regulations that restricted traditional harvest methods. An early Alaskan fishing regulation, passed in 1896, outlawed stream obstructions that impeded salmon migrations upstream and restricted intertidal traps or nets from covering more than a third of the river, stream or channel. The legislation entitled “an act to provide for the protection of the salmon fisheries of Alaska” also

prohibited all stream harvest methods in rivers less than five hundred feet wide, except rod or spears (Moser 1899:113).

> *Klawock Stream has probably been fished longer and more assiduously than any other stream of Alaska. The cannery has been operated twenty seasons and a large number of fish taken from around the mouth of the stream at the cannery door. The natural facilities for taking the fish are very great, as they enter a natural trap in the basin back of the cannery and school around the mouth of the stream. The steam was barricaded and had an Indian trap in it for years, but as it was becoming depleted all traps and barricades were removed some years ago, and now the stream is carefully guarded and less extensively fished, in the hope of building up the run. There are no signs of artificial barriers anywhere.*

The native fishermen continued to harvest sockeye salmon using spears, gaffs and clubs in freshwater, but in estuaries and marine waters began using commercial fishing gear to acquire subsistence salmon from the late 1800s through the 1940s. Beach or drag seines were widely used by commercial fishermen in the late 1800s and early 1900s (Brown et al. 2002). Flat bottom open rowboats 20-25 feet in length were used to encircle the fish with a beach or drag seine and then drag them onto the beach. Early beach seines made of cotton twine ranged from 70 fathoms long, operated by as few as two men, to 175 fathoms long, requiring up to nine men to operate (Langdon 1977). When Charles Webster Demmert (U.S. Department of Interior 1944:600) was a young boy, beach seines were being used:

> *When I can first remember it was beach seines. There was no purse seine. Just beach seines. The seines were tapered off at the ends. It is narrower at the ends, and when the salmon is jumping, they make a set, tie a line to it, and go outside of the school of salmon, and drop the line outside of the school of salmon, and then we go towards the shore and drag the fish up on the beach.*

The first hand purse seines were introduced into Southeast Alaska in 1893. They could be used in open water and enabled fishermen to move away from the stream mouths and estuaries (Price 1990). At first, in the 1900s, fishermen in Klawock used a net called a "half purse" seine, which combined properties of a beach seine and a purse seine.

> *We don't have a purse line, but the seine before was tapered both ways. But this time it was only tapered one end, and then we started practicing fishing off shore. We made a set around the fish, and grabbed an end, and we pulled in the seine until we would get at the place where it tapered from. Then we would pull the lead line. At first there were no rings. There was just a purse line, and we pursed it, and we got in the fish in that way.* (Charles Webster Demmert, U.S. Department of Interior 1944: 614)

The gasoline powered, commercial purse seine boat was introduced to the area around 1915 and by the 1920's, most subsistence sockeye salmon were being harvested using commercial seines before the commercial season opened. From the 1920s until World War II, Klawock families typically left for seasonal camps at Hole-in-the-Wall after school recessed for the summer. Salisbury (1962), the school principal and store supervisor in Klawock in the 1920s, wrote that the entire town cleared out after the last day of school. Even the two stores run by the Peratrovichs and the Demmerts closed down and moved to Hole-in-the-Wall (Langdon 2001). (For locations of sites mentioned in text, see Appendix Figure D-1).

Subsistence king and sockeye salmon were harvested using commercial purse seines off northern Noyes Island-- west of Steamboat Bay, inside Cape Ulitka (Brown et al. 2002; Langdon 2001). Sometimes, the native people did so well on king salmon that they didn't put up sockeye (Langdon 2001). Some families also trolled for king salmon around the Maurelle Islands (Langdon 2001; Salisbury 1962). Salmon were processed at subsistence camps in Hole-in-the-Wall. Klawock and Craig residents also seined subsistence sockeye at Sarkar Cove in June and early July with commercial purse seines. Many Klawock residents returned to Klawock for Fourth of July celebrations then went commercial fishing or worked in the canneries (Brown et al. 2002; Salisbury 1962). A few families stayed at Hole-in-the-Wall for the commercial trolling season. Key respondents remembered having all their sockeye put up by the first of July or hearing about it from their elders (Brown et al. 2002).

Prior to gasoline engines, Klawock residents used to row boats all the way up the coast and use the same seine nets and boats at Sarkar River as in the Klawock subsistence fishery (Brown et al. 2002). Later, people sailed their commercial seine boats to Sarkar to get subsistence sockeye. Elder Eileen Smith Harmon (2001) spent her early years growing up at Hole in the Wall. She remembers going to Sarkar Cove as a family with several other families. They would travel there on one of the big seine boats from Klawock and anchor in the bay and go upstream in rowboats. The families usually spent three or four days there. Another elder also remembered going to Sarkar Cove on a commercial purse seine boat with ten guys and getting enough sockeye for home use in one day, and sometimes in one set. They would bring back about 200 sockeye each (Brown et al. 2001).

One respondent remembered watching an old seine boat captain directing his crew in the skiff like he would do on a set on the outer coast, directing his skiff man to hold the purse seine in place to capture fish moving through. In the meantime, the respondent and his fishing companions saw a fish jump behind the old seine boat, made a 500 fish set, kept 200 of the sockeye, hauled the fish in, and took off before the old seine fisherman had even closed his net (Brown et al. 2002).

Southeast Alaskan Natives also harvested and processed salmon for home use while engaged in commercial fishing. A Haida elder remembered carrying pressure canners on board seine boats to process their by-catch (king and steelhead) for subsistence. Canneries didn't buy steelhead, because the bones were too hard and didn't soften

enough when cooked in the can. King salmon were not bought until the fresh fish market developed with troll caught fish. After a fresh fish market developed for king salmon, seiners continued to put up small kings for subsistence.

> *The years I fished we used to do a lot of our canning while we were fishing. We had cans aboard and a sealer and a pressure cooker and if you had a harbor day or something you would dress out steelhead or small kings, fish that you couldn't sell. Then we would can it while we were on the boat. Consequently we didn't do much beach seining because we had this other set up going. And then like I mentioned earlier, it was a different method in the 40's, they allowed a different system for personal use.* (Brown et al. 2002)

The cannery at Steamboat Bay had cabins for fishermen and their families to live in.

> *Usually the families worked at the salmon canneries, but those that didn't would put up fish for personal use.* (Brown et al. 2002)

At the end of the commercial fishing season when the canneries had closed down for the year and there was no market for salmon, seine boats fished for home use in the inside bays, usually near their resident town. An elder remembered that it was like this when he first got married in 1946 (Brown et al. 2002).

In the 1950s, native people became more dependent on non-commercial subsistence gear. People returned to using beach seines and hand purse seines in open water with rowboats until the invention and acceptance of the outboard motor. Langdon (1977) estimated that outboard motors first appeared in the mid-forties, but it may have been a decade or more before they became widely used in the subsistence fishery near Klawock.

> *My dad said they used to get more when they rowed, because it went out quiet. It didn't make as much noise and it wouldn't spook the fish. He said he used to just sink the seines. He made one set and that was it, because you couldn't work on that much fish in a day.* (Brown et al. 2002)

The reason for the transition back to noncommercial subsistence gear is unclear, but plausible factors include a management regime that favored fish traps on the outer coast and in some cases closed inside waters to seine nets. Charles Webster Demmert complained during the Hanna Hearings in 1944 (U.S. Department of Interior 1944:620) that the government had closed Tuxekan Passage to fishing except traps. Other trends of the 1950s include the "economic collapse" of the large salmon processors beginning in 1953 and declining fish stocks (Langdon 1977). Regulations restricting the use of commercial gear for subsistence didn't occur until the 1960's after statehood. After the introduction and acceptance of outboard motors in the subsistence fishery in the 1950s, there has been little change in the harvesting technologies, except in response to regulatory restrictions.

Snagging salmon off the Klawock Bridge using a rod and reel was a contemporary means of getting Klawock sockeye in saltwater until the mid 1980s when a new bridge was built and the regulations changed making it illegal. Rowan and Brown (2001) remembered selectively targeting sockeye salmon and very large coho from the bridge. Snagging salmon is still done legally off the point of land where marine waters officially begin below the Sarkar Bridge.

At some point since European contact, dip nets began to be used for capturing salmon in local streams. De Laguna recorded their use among the Tlingits for eulachon and the Queen Charlotte Haidas are known to have used them for salmon in concert with traps, but we found no documentation of their traditional use for salmon by the Tlingits (Langdon 1977). Dip nets may have filled a vacant niche for in-river salmon after spears and gaff hooks were banned on the Klawock River. The history of the ban appears to be unknown among ADFG management biologists, but may have been first initiated when a 1963 regulation prohibited spears and gaff hooks in the Ketchikan district. Dip nets are still used in the contemporary fishery on the Klawock River by a few households and in Sarkar Cove below the saltwater marker (Brown et al. 2002). All nets were banned above the Sarkar Bridge in 2001 (Reeves, pers. comm. 2003).

In the late twentieth century, the loss of commercial seining permits by Native residents of Klawock and Craig due to the limited entry program and other economic factors reduced the ability to home pack sockeye salmon from commercial fishing catches and increased the reliance on non-commercial subsistence gear (Brown et al. 2002). Attitudes have also changed since the early 1940s and most contemporary Klawock subsistence fishermen expressed a preference for harvesting sockeye from their subsistence seine nets in the Klawock Inlet over using commercial purse seines on the outer coast, even during times of low abundance. Reduced salmon quality was one reason harvesters objected to using commercial gear. Harvesters also viewed the subsistence seine as their traditional gear type and expressed cultural pride and self-fulfillment in maintaining this tradition. Returning to the use of commercial gear for subsistence needs was seen as a threat to these cultural traditions (Brown et al. 2002). Subsistence sockeye salmon remain important to the native diet and are finely integrated with cultural survival; although harvest methods evolved and adapted to meet economic changes, regulatory restrictions, fluctuating abundance and technological advances.

Discussion of Traditional Methods and Management

Harvest technologies employed by the Tlingit and Haida of Southeast Alaska equaled or surpassed those used by Europeans at the time of contact. It was more than a century before any new fishing technologies were introduced in Alaska that could parallel or exceed the efficiency and ingenuity of the traditional indigenous methods (Langdon 1977). The ancient remains of these technologies provide archeological evidence of the expert skill and inventiveness of the indigenous coastal population.

The Tlingit and Haida people were expert fishermen and their harvest methods took into consideration differences between salmon species, individual stocks and gender including

migration routes, behavioral differences and run timing. A review of the gear types used, as well as those absent from the traditional repertoire of Prince of Wales Island native groups, suggests that the following variables were considered when selecting and developing harvest technologies: 1) intended salmon species and associated behavioral characteristics; 2) intended product or preservation method; 3) desired stage of salmon maturity, size, and oil content for intended product; 4) abundance of a particular salmon stock; 5) physical conditions of the aquatic habitat such as tidal flows, stream velocities, bottom topography, water depth and clarity; 6) physical access to congregations of salmon in the ocean, estuaries or from stream banks; 7) efficiency of harvest method in terms of investment of time to manufacture and maintain technology, harvest salmon, and transport salmon to processing facilities; 8) ability of traps to store salmon live until retrieved; 9) effectiveness of harvest method to target a particular species, gender and life stage and 10) respectful harvest methods that take only what is needed and avoid harming individual salmon unnecessarily.

Although the Southeast Alaska Natives clearly had the technical expertise to deplete or destroy salmon runs when European explorers reached the shores of Southeast Alaska, salmon was plentiful (Langdon 2001). The Tlingit and Haida people accomplished the long term conservation of salmon stocks through a holistic relationship with nature that was integrated into the cultural fabric of native society (Brown et al. 2002; Jones and Williams-Davidson 2000). One respondent stated:

> *When the white man came along, they had to make rules because they didn't know how to manage.* (Brown et al. 2002)

As was true of other indigenous peoples, Tlingit and Haida didn't "manage" resources; rather they lived within a worldview where there was no such thing as "environment" in as much as that word signifies something outside oneself (Thornton 2001). Man and nature were inseparable. Every aspect of nature (clouds, rivers, animals, plants, stones and so forth) was alive and sentient. Nature was aware of a person's thoughts, deeds, and words and good fortune was a result of a proper spiritual relationship with nature.

> *They always said that everything has a spirit. And so when you make fun of it, it'll turn on you, in some way you're going to have bad luck. You're not going to enjoy what you're doing. You may get into an accident, because of that. And so we were not allowed to do that. If you got salmon, if you got deer, sea food: they always told us, "be happy and be lucky. You know, you're lucky. Think that it's given to you. That it was supplied for you. Treat it with respect.* (Clara Peratrovich 2001)

Tlingit and Haida resource management was based on a strategy of limited access with resources allocated according to clan membership (Brown et al. 2002; Jones and Williams-Davidson 2000). Each child inherited the clan of his or her mother and the rights to clan property, which included fishing and hunting territories and other sacred property, called *at.óow* in Tlingit. Tlingit *at.óow* included places, spirits, names, songs, stories, works of art and artistic designs (Dauenhauer 2000). Children and sometimes

adults inherited the name of clan ancestors at naming ceremonies held during *koo.éex'*, which literally means "invitation to feast", but are known in English as memorial parties or potlatches (White and White 2000). These names kept the spirits of the ancestors alive and carried with them certain social responsibilities, such as the stewardship of salmon streams or other clan resource sites (Langdon 2000).

A Tlingit individual could also gain the right to use clan land by formal induction into the clan. Rights to utilize communal clan territory could not be inherited through the father's lineage (Worl 1994). As such, Tlingit children did not have rights to their father's clan territories. The spiritual and cultural connection of Tlingit people to their clan territories was integrated into their sense of personal and clan identity through the ownership of *at.óow*, and the stories, names, songs, and regalia associated with the geographic location (Thornton 2000). Basically, if a clan owned the story of a place, they owned the place (Kookesh 2001). Tlingit *at.óow* continues to play an important role in Tlingit society as embodiments and vehicles of Tlingit cultural tradition, way of life and spiritual survival (Dauenhauer 2000). The Haida have a similar spiritual connection to their clan streams and territories symbolized in their regalia, totem poles, ritual objects, crests, names and songs (Jones and Williams-Davidson 2000).

Initially, the salteries and canneries honored the traditional rights of Native clans and paid clan leaders to harvest salmon from their streams. Charles Webster Demmert testified in 1944 that the manager of the cannery at Sarkar Cove initially paid "Chief Tekite" so that natives could fish for his cannery near the creek. Eventually and deliberately, cannery owners usurped the traditional rights and the resource rights of clans eroded (U.S. Department of Interior 1944). However, the system remains in the memories of elders who recall the history of clan territories in their geographical area, memorialized in petroglyphs marking clan territories and totem poles recording clan ownership (Garfield and Forrest 1948; Peratrovich 2001).

The native concept of clan "ownership" differed from the modern English connotation, which signifies dominion over and possession of land. Tlingit and Haida traditional societies had a spiritual relationship and responsibility to take care of their ancestral territories. In native cosmology, all of nature was considered to be living (Jones and Williams-Davidson 2000; Peratrovich 2001;). For example, rocks had spirits within them, called *té kwáani*, or literally "stone people" (Sergei Kan, 1989). The Tlingit word *kwáani* comes from the root word, *kwáan*, which means "people of a place" (Dauenhauer and Dauenhauer 1994, 1990). Clans didn't "own" the sentient beings rooted within their clan territories, but rather were the stewards of the relationship between people and their sacred clan land.

Salmon, too, were considered to have human like spirits referred to in Tlingit as *xáat kwáani*, or salmon people. The Haida similarly referred to salmon spirits as "people" and had a world view where the boundaries between natural and supernatural, people and animals, physical and spiritual were ambiguous and fluid (Breinig 2000). The perspective that salmon spirits were aware of human thoughts and action influenced traditional subsistence practices. The Salmon Boy story, which has both Tlingit and

Haida versions, illustrated the thin veil between the physical and spiritual worlds and taught proper ways to treat salmon. In one version from Sitka, the boy in the story was transformed into a salmon when he spoke disrespectfully toward a piece of moldy dried salmon (Peck 1986).

> *These legends and depictions of happenings long past are not merely the chronological heritage of the Tlingit. Each contains illustrations of the cultural values to be passed from generation to generation. They are not intended to be entertaining so much as instructional.* (Peck 1986: preface)

Stories, such as the salmon boy, were in essence the Tlingit and Haida "code of regulations" communicated verbally by the elders to younger generations.

Due to the spiritual connection between the Tlingit people and the resources they harvested, the *íx̲t'*, referred to as a shaman by the Russians, played an important role in the subsistence activities of his clan. For example, the *íx̲t'* might be called upon to ask his *yéik*, or spirit helpers, to ensure a successful harvest.

> *Before any undertaking, the clan turned to its shaman for advice. Let us say, a new hunting and fishing season arrived, e.g., during the month of March, herring came close to shore to spawn. (Herring eggs are a favorite Tlingit dish.) Before going out to collect herring eggs, the clan turned to the shaman and asked him to perform, so that, with the help of his yéik, he would chase away bad weather that brings cold air, storms, rains and all other phenomena that interfere with collecting and preparing fish eggs for the entire next year. The same type of performances took place before hunting marine animals (sea otters, hair seals, beavers), bears, and land otters: prior to the arrival of the fish at the shores; before going on a war raid and after returning from it.* (Kamenshii 1906)

The Kaigani Haida also had shamans called *sg̲áagaa*, but by 1910 this way of life was abandoned due largely to the influence of the missionaries (Cogo and Cogo 1983).

In *Indian Fishing: Early Methods on the Northwest Coast*, Stewart (1977) stated, "Among the Haida and Tlingit people there was no salmon ceremony." The basis for this statement may have originated with Frederica de Laguna's Yakutat research which stated: "Informants denied that there was any special ceremony or ritual performed for the first salmon caught" (De Laguna 1972:384). This statement does not appear to be accurate for other areas of Southeast Alaska. In Klawock, the Tlingits held a special ceremony at their traditional estuarine traps to welcome the salmon back to the river each year (Langdon 2001). Reverence toward the first salmon of the year carried over to modern times with special rituals for the first salmon caught in commercial fisheries. Matthew Kookesh (2001) from Angoon recalled that when he was commercial trolling, the first salmon caught was always given away, usually to an elder.

Clan leaders held the ultimate responsibility as caretakers of clan territory. In essence, the clan leaders functioned as the area management biologists for their clan territories to ensure a sustainable yield of clan resources. They monitored the abundance of salmon on clan streams and determined if the run was sufficient to harvest salmon from a particular stream. Clan leaders had the power to grant permission to harvest salmon from their streams to members of other clans. If a run was insufficient to support a harvest, then people went elsewhere to get their fish and gave the creek a chance to replenish (Peratrovich 2001). Goods, such as blankets, were exchanged for permission to fish on another clan's river (Brown and Rowan 2001).

The Haida in Southeast Alaska had a similar system of clan ownership. As with the Tlingit, no one harvested sockeye from another clan's sockeye stream without permission from the clan leader. In years with abundant sockeye salmon runs, the clan leader could invite other clans to share in bounty. Sharing the wealth of their stream increased the rank and status of a chief (Cogo and Cogo 1983).

Cogo and Cogo (1983:29) reported that the chief's ownership of the clan streams was recognized by the U.S. government in 1880. The chiefs were given documents of ownership for their clan's sockeye stream, stamped with the red seal of the Revenue Service of Alaska. The document seen by Cogo (1983) was signed by Captain Glass of the U.S.S. Jamestown, Sitka Harbor.

None of the elder respondents in this study remembered how their clan leaders monitored the success of a salmon run. Each clan leader may have had his own method passed down from his uncles and other elders. Eileen Smith Harmon (2001) remembered her grandfather talking about run abundance, but was too young to pay much attention.

> *I don't know how they knew when it was going to be a good year for fishing or anything. To me, it was always a good year for fishing, when you were younger.*

In his testimony during the Hanna Hearings, Charles Webster Demmert (U.S. Department of Interior 1944, Vol. IV:617) referred to the lack of salmon jumping as a sign of salmon depletion and disturbance due to the proliferation of fish traps from the outside waters to St. Phillip Island and Eleven Mile shore.

> *And by the time they get passed there, there is just a few straggling fish coming along, and out of the bunch there is so much killed, and they are scared, and they don't show up in the air. The fish don't breathe air. Therefore, they are scared, and they make a bee-line to this Salt Lake, up in here (indicating), and they get up in there.*

At another point in his testimony, Demmert (U.S. Department of Interior, 1944, Vol. IV: 621) again stated the importance of salmon jumping:

> *We cannot fish in places where there is no fish. The fish has got to show up. They have got to jump.*

Other sources have indicated that salmon jumps revealed information about the abundance of a salmon run. Lydia George from Angoon (Newton and Moss 1983) told interviewers:

> *One person was delegated to be responsible for the fish. Everyday, he watched the ocean beach for fish jumps and kept track of all movements of the fish. No one was allowed to kill fish before they came upstream to spawn, they believed if the fish was bothered and disturbed during their migration upstream to spawn, they would turn back and go up another river. Since fish was our main food, we were very careful; the fish were treated well. If a man broke any of our laws, his fishing equipment was taken from him, sometimes his spear was broken up.*

Clan leaders recognized different salmon stocks by their varying physical appearances and identified the migration patterns of salmon stocks returning to local streams (Demmert testimony, U.S. Department of Interior 1944; Langdon 2003; Peck 2001). Clan leaders traditionally passed this information on to their maternal nephews (Peck 2001), as with a matrilineal clan system they would be in the same clan.

Knowledge also passed from elders to the younger generation in the community houses. Every night in the wintertime, after dinner, the head of the house and other elders would "preach" the customs and laws. "Our elderly people instruct us how to carry on" (Demmert testimony, U.S. Department of Interior 1944). Unfortunately, most of the details concerning salmon management were not recorded and may have been lost with the passing of these elders.

Conservation of Salmon Stocks

The Haida and Tlingit people had a conservation ethic built into their traditions based on their spiritual connection, respect for the resource, knowledge of spawning habitat and harvest practices that allowed sufficient escapement into the spawning grounds. While the needs of subsistence are self-limiting, native commercial fishermen also showed constraint while commercial fishing (Brown et al. 2002; Demmert testimony in U.S. Department of Interior 1944).

Charles Webster Demmert told several stories during his testimony at the Hanna Hearings that illustrated a native conservation ethic. One story told how the fishermen let the rest of a seine catch go after they caught the number requested by the cannery owner (U.S. Department of Interior, 1944, Vol. IV: 658-659). Demmert also told a story about his uncle's attempt to remove a trap that was barricading Sarkar River. In this story, his uncle told the owner of a saltery in Sarkar:

> *We are catching the fish for you. Now you are going to block the creek. That creek is not going to last long.* (Demmert testimony, U.S. Department of Interior 1944, Vol. IV:609)

Demmert testified that the native commercial fishermen when fishing for the canneries roughly tallied the number of salmon until they had what the cannery superintendent requested and released the rest alive. They also spread out their fishing activities to a number of streams to avoid overfishing one tributary.

> *The next day we went to another creek. We never really fished out one creek, because we were particular. We were figuring on the future. And as the days go along we go away further. We never clean out different bays.* (Charles W. Demmert, U.S. Department of Interior 1944, Vol. IV: 659)

An elder in Klawock said that he went to Sarkar for subsistence sockeye with the late George W. Demmert Sr. on his commercial seine boat. George had a four inch marlon web seine net. Marlon was a synthetic fiber introduced in the 1950's for seine web that was found lacking, in part because it stretched and gilled too many fish (Langdon 1977). The elder and George Demmert Sr. estimated that there were 5,000 sockeye in one school in Sarkar Cove. They pulled up six feet of George's marlon web, counted how many sockeye were gilled, extrapolated for how many were gilled in his sixty-five foot seine net, figured that it was enough for their needs and freed the rest of the salmon encircled by the seine net (Brown et al. 2002).

The traditional stone weirs and traps of the Klawock Tlingit were designed and operated to capture salmon in the estuarine habitats on the ebb tide, while allowing salmon to migrate upstream without impediment on the flood tide (Langdon 2001). Moser (1899) acknowledged that the native people of Klawock recognized the importance of allowing salmon to return to their natal streams to spawn. Moser (1899:36-37), however, also reported:

> *At one place (Klawak)[sic] an Indian owner of a stream used to boast that his trap was so cleverly arranged that not a fish could get up the stream; that he caught them all.*

This observation is not consistent with Tlingit conservation ethics and traditional culture. Boasting about one's ability to catch fish would have been contradictory to the traditional value placed on modesty, especially by high-ranking individuals, such as the *aanyádi*--in modern times called chiefs--who were responsible for the salmon streams that their clan owned (De Laguna, 1972; Kan 1989). Tlingit people were taught to have respectful thoughts and actions toward salmon, lest the salmon would fail to provide themselves to the people (Peratrovich 2002). Also, the Klawock people had a history of removing blockades from salmon stream on both Klawock and Sarkar rivers and have repeatedly spoken out against impeding salmon migration upstream (Brown et al. 2002; Demmert's testimony, U.S. Department of Interior 1944, Vol. IV:609-610; Peratrovich 2001). Both the boastful behavior toward a salmon stream and the act of blocking salmon from

returning to their spawning beds violated traditional Tlingit moral codes of ethical behavior. The contradictions suggest that either this statement represented a disregard of Tlingit traditional values by an outspoken individual, an erosion of Tlingit ethics during the late 1800s or as Langdon (1977) suggested that the statement was an exaggeration.

Tlingits had several strategies for dealing with low salmon returns on a particular stream. If the abundance of salmon was insufficient to support a subsistence harvest, they transferred their subsistence activities to other sockeye streams.

> *They [the clan] just see the abundance of the fish. If it's not very much then people look elsewhere, because it gives a chance for the creek to replenish.* (Clara Peratrovich 2001)

Harvest technologies, such as funnel traps, spears and gaffs also allowed fishermen to selectively harvest only male sockeye (Peratrovich 2001). The Klawock Tlingits may also have utilized enhancement techniques as suggested by John Darrow (1934:37):

> *In case the salmon in a stream fail, a man pays brother-in-law stream. Two from the salt water at the mouth and two from up the creek, these are paid for and then placed the two from the salt water at the mouth of the creek, the others up the creek at the mouth of lake. This cause the salmon from the other good stream to come to the poor one the following year.*

Continuity of Traditional Rules

Traditional values still guide the contemporary subsistence fisheries. Some elders and others continue to believe in the spiritual connection between people and salmon abundance, although they may express their belief within the context of Christianity.

> *White man technology thinks theirs is better, now we've got no salmon. Before they weren't going to open Klawock Lake. He knows it was really bad the last years, nothing. I start praying about it. I go up to Canoe Pass and just pray every day. No more salmon outside. Last year, it was a disaster here. There was nothing out here. Now … You turn to me and I will heal your land.* (Brown et al. 2002)

When asked if there were any traditional rules governing subsistence, elders and contemporary harvesters responded, "share your catch" and "don't waste". A contemporary harvester told us,

> *We were taught don't waste anything you catch. Make sure you use everything. We always make sure everybody has fish. You never see any sockeye being thrown away.* (Brown et al. 2002)

One elder expounded on the principal of "don't waste":

> *One of the things that was really pounded into us was don't waste anything. That was the number one rule. My dad lived to be 102 years old; he fished and ran his own boat until he was 85 years old. You lived off the land and you survived, but you didn't overdo things.* (Brown et al. 2002)

Likewise, a contemporary harvester told us:

> *But not one of my fish go to waste. They're taken care of. They're presented to the elders. I take very strong pride in what I do, in how I am these days.* (Brown et al. 2002)

Traditionally, clan members were expected to share their food and possessions with other clan members without any immediate compensation.

> *Assistance from clan relatives in subsistence activities, warfare, and other pursuits was not asked for but expected, and a person who refused to offer it was marked as a marginal member or even a nonmember of his or her matrilineal group.* (Kan 1989)

One elder remembered being reprimanded by her mother when she complained about giving away subsistence food to an uncle who hadn't participated in subsistence activities during the summer. Eileen Smith Harmon recalled her mother telling her when she was about ten years old:

> *'This is not only our bounty,' she says, 'this is God's bounty. Never turn anybody away.'*

Most of the contemporary harvesters interviewed mentioned sharing their catch as one of the traditional values governing their salmon subsistence activities. Respondents expressed a sense of pride in being able to provide food for their extended families, elders and the community.

> *You take care of your family, and your extended family, and the elders that don't have family to get the fish for them. And we're still doing that now. My skipper, he's the chief of our clan. That's one of our practices. We make sure that people who need it, and make sure the elders got their fish. In all aspects—it's not just sockeye.* (Brown et al. 2002)

Contemporary Harvest Patterns of Craig and Klawock Communities

Subsistence constitutes an important component of the Craig and Klawock economies with every household in Klawock and nearly all (99%) of Craig households using at least one type of wild resource (Appendix Tables G-1 and G-2; ADFG Division of Subsistence 2003). The estimated wild food harvest per capita rose from 185 to 231 pounds per person between 1987 and 1997 in Craig. With the increase in population between the

1987 and 1997 surveys, this amounted to a nearly 86% increase of the total pounds of wild foods harvested by Craig residents from 219,181 pounds per community in 1987 to 406,934 pounds in 1997 (ADFG Division of Subsistence 2003). Some Craig residents stated that they are now more dependent on subsistence resources then during the logging boom due to the current lack of jobs (Brown et al. 2002). The mean wild food harvest per person in Klawock was higher than Craig during survey years, 1987 and 1997, and also rose between 1984 and 1997 from 223.3 pounds per capita to 320.36 pounds per capita (Ellana and Sherrod 1987; ADFG Division of Subsistence 2003).

In Klawock, halibut was the wild resource utilized by the highest percentage of households; the second highest use was of deer. Sockeye salmon ranked third, with almost 69% of the Klawock households utilizing it in 1997 (Appendix Table G-3, ADFG Division of Subsistence 2003). In Craig, sockeye salmon was utilized by nearly 55% of Craig households in 1997 and ranked ninth as the wild resource utilized by the highest percentage of Craig households (Appendix Table G-4; ADFG Division of Subsistence 2003). As in Klawock, halibut was utilized by the highest percentage of households in Craig, followed by deer and then coho salmon.

More households utilized coho and chinook salmon than sockeye salmon in Craig, however sockeye ranked first in terms of numbers and pounds of salmon taken for home use for both Craig and Klawock in 1997 (Appendix Figures G-1 through G-4, ADFG Division of Subsistence 2003). Sockeye salmon contributed 49% of all salmon caught for home use by Klawock households and 42% in Craig. Coho salmon contributed 33% of all salmon caught by Craig for home us, ranking second in terms of numbers and pounds of salmon. In Klawock, more coho salmon (19%) were harvested for home use as compared to Chinook salmon (12%), but Chinook salmon contributed more usable pounds of fish for home use (25.5%) versus 17.8% for coho salmon (ADFG Division of Subsistence 1998).

In 1997, Klawock residents caught an estimated 7,458 sockeye salmon; most of these (6,900) were caught in non-commercial subsistence gear (Appendix Table G-5, ADFG Division of Subsistence 2003). Non-commercial floating nets, including seine nets, provided most of the harvested sockeye, but dip nets, rod and reel and commercial gear were also used to catch sockeye salmon for home use. It isn't clear from the data how or why some respondents delineated between seine nets and floating nets, which by definition can include purse, hand purse, and beach seines (1999-2000 Subsistence and Personal Use Statewide Fisheries Regulations, ADFG), but it is likely an aberration in the way individuals administered the harvest survey. Craig residents also predominantly utilized non-commercial subsistence gear to capture 6,836 sockeye in 1997 out of a total estimated sockeye harvest of 8,371 (Appendix Table G-6, ADFG Division of Subsistence 2003).

Appendix Table G-7 shows the average number of different salmon species caught by Klawock households according to gear categories. In Klawock, 88.7% of the 303 households reported that they used at least one species of salmon, but only 68.9% harvested salmon. The same percentage of households that harvested salmon (68.9%)

utilized sockeye salmon, but only 37.7% (estimated 114) households harvesting sockeye salmon. The reported average estimated number of sockeye salmon caught in 1997 by the harvesting households in Klawock was 65 fish (ADFG Division of Subsistence 2003).

Appendix Table G-8 displays the average number of salmon harvested by Craig's 608 households in 1997. There was little difference between the percentages of households harvesting salmon in Craig (69.4%) as in Klawock. The percentage of households harvesting sockeye salmon was also slightly lower in Craig (35.8%) as in Klawock.

A higher percentage of Craig households (11.6%) removed salmon from commercial gear for home use than in Klawock (3.8%) (Appendix Tables G-7 and G-8). The average number of salmon removed from commercial catches for home use, however, was significantly higher in Klawock (106 salmon per harvesting household) as compared to Craig (41salmon). A similar pattern existed for sockeye, coho and chum salmon with a lower percentage of commercial fishing households keeping a higher average number of salmon for home use in Klawock. Only 2.8% of the households in Klawock harvested sockeye salmon for home use using commercial gear, averaging 46 sockeye salmon per household. In Craig, 8.1% of the households averaged 22 sockeye salmon from commercial gear (ADFG Division of Subsistence 2003).

The majority of sockeye salmon for home use were caught using noncommercial subsistence gear for both Klawock and Craig households. In Klawock, 32.1% of the Klawock households harvested sockeye salmon with non-commercial subsistence gear, averaging 71 sockeye per household (Appendix Table G-7). In Craig, 24.3% of the households harvested an average 46 sockeye per harvesting household using non-commercial subsistence gear (Appendix Table G-8). A few households (4.7% in Klawock and 6.9% in Craig) harvested sockeye salmon using rod and reel, averaging 12 sockeye per household in Klawock and 11 sockeye per household in Craig (Appendix Tables G-7 and G-8).

Appendix Tables G-9 through G-16 displays harvest data from returned subsistence salmon permits for the communities of Klawock and Craig. In 1997, Klawock residents reported a total harvest of 3,390 sockeye salmon on their subsistence salmon permits as compared to 6,900 sockeye salmon reported during door-to-door household surveys (Appendix Tables G-9 and G-5; ADFG Division of Subsistence 2003). Craig residents reported a total sockeye salmon harvest of 2,891 on their subsistence permits in 1997 as compared to 6,836 sockeye salmon in the household surveys (Appendix Table G-10 and Appendix Table G-6). While it is generally conceded by ADFG biologists, social scientists and native harvesters that salmon are underreported on the subsistence salmon permits (ADFG 2002), the harvest permit data is the only yearly data available concerning subsistence harvesting and provides information on harvest trends and locations utilized.

Appendix Tables G-9 and G-11 list the subsistence sockeye salmon permit data from 1985 through 2003 for the community of Klawock. Klawock River was the most utilized location and provided the greatest numbers of sockeye salmon for all returned permits in

all years from 1985 through 2003 (Appendix Table G-11 and G-9). The second most reported location for sockeye salmon varied between years alternating between Sarkar/Deweyville, Hatchery Ck. (Sweetheart) and Karta River. Overall, Hatchery Creek provided the most sockeye salmon for those years as compared to Sarkar River, but more sockeye salmon were harvested from Sarkar River than in Hatchery Creek in seven of the nineteen years including 1987, 1988, 1990,1993, 1998, 2000 and 2003 (Appendix G-9) by Klawock households. Karta River provided more sockeye salmon than either Sarkar River or Hatchery Creek during six years (1986, 1994, 1996-1998, and 2000) according to harvest records. Other locations that provided sockeye salmon to more than one Klawock permit for any given year included: Wolverine Creek, Hetta Inlet, Eek Creek, Dog Salmon Creek, and Deep Bay (Appendix G-11).

The number of Klawock permits that reported sockeye salmon from Klawock River ranged from a high of 103 permits to a low of 50 in 1988 and 1991. The number of Klawock households that reported harvesting sockeye salmon at Sarkar River or Deweyville ranged from 13 permits in 1988 to zero reported use in 1994 and 1995 (Appendix G-11). In 1988, Klawock residents reported catching 253 out of 1,478 (17%) of the total sockeye salmon harvest for 1988 at Sarkar River, the highest percentage for the years 1985-2003. In the same year, fewer Klawock permits (50) reported harvesting sockeye salmon from the Klawock River and reported the lowest sockeye salmon harvest (1,006) than any other year (Appendix Tables G-9 and G-11).

Klawock River, Hatchery Creek (Sweetheart), Sarkar River (Deweyville) and Karta River were also the most utilized sockeye streams by Craig subsistence fishermen from 1985 through 2000 (Appendix Table G-12), according to permit data. In most years, Klawock River was fished by the highest number of Craig permit holders and yielded the most sockeye salmon (Appendix Table G-10). The number of Craig subsistence salmon permits that harvested sockeye salmon at Klawock River varied from a high of 59 permits in 1996 to a low of 14 permits in 1991. Craig households harvested more sockeye salmon from Klawock River than any other location in all years except 1991 and 2000. Craig households harvested less sockeye salmon from Klawock River than Klawock households in all years except 1998, when Craig permits reported 2,550 sockeye salmon as compared to 1,816 sockeye salmon reported on Klawock permits.

In 1991, 1992 and 1999 more Craig subsistence fishermen fished at Hatchery Creek than Klawock River, however more sockeye salmon were reported from Klawock River in 1999. In 2000, Craig residents acquired more sockeye salmon from Sarkar River than at Klawock River, according to the returned permits. Overall, Sarkar River, Hatchery Creek and Karta River combined provided slightly more total sockeye salmon for Craig households than Klawock River alone (19,898 as compared to 19,329 sockeye salmon). Hetta Inlet also provided a significant number of sockeye salmon (3,106 total sockeye salmon) for the Craig households that fished there. Most years, zero to six Craig permits reported sockeye salmon from Hetta Inlet, except in 1999 when the number of permits rose to thirteen. Other locations where sockeye salmon were reported for more than one Craig permit in any given year include: Maybeso Creek, Eek Creek, Dog Salmon Creek,

Red Lake Creek, St. Nicholas (north side), Wolverine Creek, Klakas Lake, 142F Creek, and Klag Bay (Appendix Tables G-10 and G-12).

Ketchikan residents were the third highest harvesters of Klawock River sockeye salmon during 1985 through 2003 (Appendix Table G-13 and G-14). According to the permit data, Klawock households harvested 59%, Craig harvested 28% and Ketchikan harvested 10% of the total subsistence sockeye salmon caught at Klawock River between 1985 and 2003. Other Prince of Wales Communities—Thorne Bay, Kasaan, Metlakatla, Hydaburg, and Point Baker—all caught under 1% of the total harvest (ADFG Integrated Fisheries Database). For Sarkar River, Craig and Thorne Bay households harvested the most sockeye salmon, followed by Ketchikan and Klawock households (Appendix Table G-15 and G-16).

Discussion of Craig and Klawock Harvest Patterns

In general, Klawock residents appeared to be more dependent on the Klawock River for their subsistence salmon than Craig residents, based on the percentage of permits that reported harvesting at Klawock River and the percentage that Klawock River contributed to the total subsistence salmon harvests for each community during 1985 to 2000. Klawock River, however, contributed the highest number of sockeye to the Craig community in most years, suggesting that the Klawock River sockeye are a significant contributor to the Craig subsistence economy and an important subsistence resource for those Craig residents that fish or receive salmon from there. The salmon subsistence activities of Craig residents, in general, appear to be more dispersed between Klawock, Sarkar/Deweyville, Hatchery Creek, Karta River, and to a lesser extent, Hetta Inlet, with a higher number of permits reporting catches from sites other than Klawock River as compared to Klawock households. Although the data indicates smaller numbers of Klawock households using sites other than Klawock River, these sites and others are utilized and may be very important to individual harvesters or as alternatives to Klawock River, especially during years of low abundance (Brown et al. 2002).

Contemporary Klawock River Subsistence Fishery

The Klawock subsistence harvest is predominantly a seine fishery located in the Klawock Harbor between the village and Klawock Island. The fishery is accessible by road and most of the fishing activity can be viewed from the bridge, city dock or fuel dock near the Klawock cannery. Subsistence fishing predominantly occurs west of the bridge. One respondent reported fishing east of the bridge and there are a few others known to prefer to fish the estuary closer to the river mouth.

The sockeye fishing season and weekly openings are restricted by regulation 5 ACC 01.710:

> *From July 7 through July 31, sockeye salmon may be taken in the waters of Klawock Inlet enclosed by a line from Klawock Light to the Klawock Oil Dock, the Klawock River, and Klawock Lake only from 8:00 a.m. Monday until 5:00 p.m. Friday.*

Typically, the season closes on July 31 unless the community requests an extension. Extensions are usually requested if the community has not met their subsistence sockeye needs by July 31. The area management biologist for the Ketchikan district has the authority to extend the season at his discretion and extended it in 1995 for four days and in 1998 for five days. The decision whether to extend the subsistence fishery was based on whether the Klawock escapement was expected to be sufficient to handle the extra fishing effort (Doherty, personal communication, 2003).

After the sockeye season officially closes, local residents who have not gotten the quantity of salmon required by their extended families will continue to seine for other salmon species in the Klawock Harbor or use other means to catch sockeye, coho, steelhead or an occasional Chinook salmon in the river.

Harvest Methods

The most common gear type was the beach seine, used as a hand purse seine. The principal capture method was to encircle a school of sockeye in deep water with a beach seine played out from the "seine" skiff. After bringing the net around in a full circle, crew members used the seine skiff as a working platform while they hauled in the cork and lead lines and one crew member plunged the water with a long handled plunger (similar to those used on a commercial seine boat) to keep fish from escaping under the boat. The fish were caught in the belly of the net formed when the crew brought the cork and lead lines on board after a set. (See Appendix H. Glossary of local fishing terms).

Groups were also observed "hooking off" or attaching one end of the net to the shore on Klawock Island and the other to the city float. Fishing groups rarely used the beach seine in the Klawock fishery as it was originally intended--to circle a school of fish with both ends of the net brought onto shore and the net subsequently drug along the bottom, catching fish as the net was pulled into shore. Only a couple of groups were observed actually using a hand purse seine, the difference being that a beach seine does not have a line through the lead line that can close the bottom of the net like a purse. The details about the variations in technique and equipment used by different groups are discussed below.

The harvest method required a cooperative effort, utilizing between one to three skiffs. Most fishing groups used two or three skiffs. In recent times, three skiffs were often employed: the main skiff with the largest engine, the "tow" or "drag" skiff with an engine of equal or smaller size and the "seine" skiff without a motor which holds the seine and serves as a work platform. One end of the net is tied to the seine skiff and the other is attached to the tow skiff. The driver of the tow skiff helps to bring the net around in the opposite direction from the direction that the main skiff is circling. The two skiffs meet and the cork and lead lines are hauled and coiled onto the seine skiff. Respondents reported that the three skiff system became more prevalent since the regulation restricting motor size.

Before the regulation change, most people used two skiffs, a main skiff and a seine skiff. The two-boat system worked similarly to three, except there was only one boat with a motor, the main skiff, to bring the net around in a circle. The motorless seine skiff was tied to the main skiff and used like a working platform, similar to the three-boat system. Instead of a tow skiff, fishermen tied a bucket to one end of the net to create drag while they brought the net around with the motor on the main skiff. In all cases that we observed, the second skiff was always without a motor and used solely as a work platform for setting and hauling the net

Occasionally groups were observed using a single boat system. In this case, one boat held the net and brought the net around. As in the two-boat system, a bucket served to "anchor" the net in place by causing sufficient drag so that the crew could join both ends of the net. One of the disadvantages to using one boat was that it was more difficult to keep the net from snagging on objects in the main skiff, such as the outboard motor.

Net Size: The length of the nets in town varied between 45 to 121 fathoms in length (Brown et al. 2002). The fishermen considered to have the longest net in town during the 2001 season used a 121 fathom cork line and a 116 fathom lead line. The fishermen who owned this net said that the net worked well for "scoop" sets with one end attached or "hooked off" to the shore and the other held out in the channel by the main skiff. The bigger nets can encircle a larger area, but also have the disadvantage of taking longer to set and haul, making them less efficient in some situations. Fishermen with the longer nets sometimes only set part of their net when the extra length would not be an advantage (Brown et al. 2002).

> *For subsistence, [the gear] has pretty much stayed the same… [Name of Fisherman] has the smallest net, now--he has 45 fathoms. We have 65. But most are 72, 75 fathoms. There's a couple that are bigger. There's two or three that are bigger. But same difference—you've got to pull that in, though, too. It makes it harder and you can't make as many sets.* (Brown et al. 2002)

Motor Size: Motor size is restricted to 35 horsepower by regulation 5 AAC 01.750:

> *In the waters of Klawock Inlet enclosed by a line from Klawock Light to the Klawock Oil Dock, no person may subsistence salmon fish from a vessel that is powered by a motor of greater than 35 horsepower.* (Subsistence and Personal Use Statewide Fisheries Regulations, ADFG 2003)

The motor size used by the groups observed varied between 6 and 30 hp (horsepower). The actual power used ranged from six horsepower on one skiff to sixty horsepower, the combined power of two skiffs each with a 30 hp engine. Key respondents informed us that more power does not necessarily mean more fish. Engine noise can scatter schools of salmon and as discussed in the fishing tips below bringing the net around too fast does

not allow time for the net to hang appropriately. Some elders remembered the days when they used rowboats and suggested that the lack of engine noise was an advantage (Brown et al. 2002).

Other methods: Dip nets are another type of gear used in the Klawock River, although we did not observe anyone using them during the 2001 field season and none of our respondents discussed their use (Brown et al. 2002). According to ADFG subsistence permit data in 2000, three people from Klawock and Ketchikan used dip nets. One person harvested five sockeye using a dip net; the other two permits didn't report any sockeye. In 1999, nine people from Craig and Klawock reported harvesting 120 sockeye using dip nets.

Some of the subsistence fishermen who still need sockeye after the season closes, go upstream to get fish. They might sport fish or use a rod and reel to snag sockeye in the river. Respondents told us that they have to do this because the sockeye often come in after the season closes. Another said that some people go trolling for other species of salmon when they don't get their needed sockeye. One elderly respondent said he got his own salmon, mostly coho salmon and steelhead trout, exclusively fishing with a rod and reel. His sockeye were given to him from relatives and friends.

Harvesting Groups

Most residents do not have their own boat or nets so they crew with somebody who does. At least seven groups were observed fishing regularly (daily or almost daily) in 2001, but over twenty nets were counted on boats around town during the last week of the season; each probably represented a group that fished at some time during the season. The majority of the groups observed during the 2001 field season were from Klawock, Craig, and mixed Craig and Klawock. Residents from Whale Pass with relatives in Klawock were also observed subsistence fishing at Klawock in 2001.

The number of crew required depends on how many boats were being used. Most groups averaged about three crew members, but harvesting groups as large as six and as small as one person were observed; the latter used a hand purse seine. The relationships within the fishing groups varied between a crew of friends to nuclear and extended families and a mix of family and friends. The age of crew members also varied. An 80 year old man was observed taking out his teenage grandchildren. Another group with six members spanned four generations. Key respondents reported that they started learning to fish as early as age seven. Both male and female children were observed fishing. Usually there was at least one adult or adolescent in a group, but not always:

> *We had some little elementary guys out there making sets. They're going into the fourth grade this year. …Their grandparents were out trolling and so they needed fish. So their uncles got their seines ready for them and sent them out.* (Brown et al. 2002)

The person who owns the fishing equipment and has an assertive personality is usually the captain.

> *He's [the captain's] got the gear, and the one that's more aggressive, he's going to be it.* (Brown et al. 2002)

The captain is usually an adult male, although adult females were observed in this role on a couple occasions (Brown and Rowan 2002). The captain's job is to run the main boat, find the fish and take care of the crew.

> *He's the boss. He'll take care of his crew. Sometimes we take a break—he'll have us up for lunch or dinner. He'll bring all kinds of stuff. You don't even have to pack a lunch or anything. He takes care of us pretty good.* (Brown et al. 2002)

In some cases, the composition of fishing groups has remained stable over long periods of time. Dennis Nickerson (2001) reported that he had been fishing for 18 years with the same people who taught him to fish. Anther respondent, who had been fishing for 25 years, also reported that he started fishing at a very young age with the same friend that he still fishes with (Brown et al. 2002).

The following descriptions of selected Klawock Inlet fishing groups were excerpted from the field notes of a local subsistence fishermen, James Rowan, who conducted on-site observations of the 2001 subsistence fishery for this study (Brown et al. 2002). These notes illustrate the diverse social and technical dimensions of the harvesting groups.

> Group 1: Usually three adults, two brothers and a sister who are grandchildren of elders in Klawock. Sometimes brings out friends or other family member. They are one of the few groups that use a hand purse seine. The brothers usually work the net, while the sister does all the plunging. They use an aluminum skiff with a 25 hp engine and a wooden flat bottom skiff without an engine.
>
> Group 2: This is a two person operation, father and son team. The son who is also an adult comes home every summer to help with the fishing and processing. They utilize two 16 foot aluminum skiffs, one with a 25-30 hp engine on it, the other with no motor holds the seine. They use a bucket on one end of their 75 to 140 fathom beach seine for drag. They have fished together like this for a few years.
>
> Group 3: This group consists of five to six cousins and nephews including three adult males and two or three male children. The three children come from Whale Pass with their mother to do their subsistence fishing, mostly because they don't have the means to do it by themselves. This group always fishes together for the entire extended family, many who do not have the means to do their own subsistence fishing and depend on this group to do the fishing for them. They have three boats: a 16 foot aluminum skiff with a 30 hp engine, a 14 foot skiff

with a 9.9 hp engine and a 16 foot aluminum skiff which holds their beach seine and plunger.

Group 4: This is a family group of four adult males spanning three generations. The old timers still come out to fish with their sons and grandchildren. They have two 18 foot Lund skiffs both powered by 30 hp. Engines and a 16-18 foot aluminum skiff with the beach seine. The tow rope is tied to one of the powered skiffs for dragging out the net. Their beach seine is estimated to be 120-140 fathoms long.

Group 5: This group consists of two adult males who are brothers-in-law. They usually fish for their mothers and fathers first, then for themselves and relatives in Ketchikan. The have a 30 fathom beach seine that they fish with two aluminum skiffs and a 10 foot plunger. The main skiff has a 25 hp engine; the other skiff is without a motor and holds the seine.

Group 6: This is a four person family group: two adult males, one adult female and one male child. This is a close family; the uncle and auntie are teaching their nephew how to skipper the fishing gear. They use a beach seine and two 16 foot Lunds, a 20 hp outboard engine on the lead skiff and no motor on the seine skiff. They have an 8 foot plunger and a bucket attached to the end of the seine for drag.

Group 7: This group consists of a nine to ten year old female child and her father and grandfather. Her brother joined them after one set. The little girl did all the plunging while the two adult males handled the net. They use three aluminum skiffs, all about 16 feet long. The lead skiff has a 30 hp engine, the drag skiff has a 25 hp, and the seine skiff has no motor. They use a beach seine and an aluminum plunger.

Group 8: This is one of the largest groups with five adult males and one adult female including grandpa, grandsons and great grandchildren. They have a beach seine, a ten foot aluminum plunger, and two skiffs -- an aluminum one with a 25-30 hp outboard and a 16 foot wooden skiff with the seine.

Group 9: This is a group of three adult males, all long time friends. The oldest of the group has the gear, so he usually is the captain. The younger is the skiff man who ran the drag boat. The other friend plunged and worked the corks, then switched over to pursing the lead line. They use a beach seine, a ten to twelve foot plunger, and three aluminum skiffs, two 16 foot long and one 14 foot long. The lead skiff has a 25 hp outboard motor, the drag skiff is powered with a 15hp and the 16 foot seine skiff has no motor.

Time Spent Fishing

The amount of time spent fishing depends on how strong the sockeye run is.

> *For sockeye...if the run is good, like it was this year, we just did three days and we were done.*
>
> *Last year, every single day we were out there, from dark to dark. You guys are smart, you know the math, you can figure it out. That was even with going to Karta. We loaded up on Karta but we still had to get other people theirs. So right up to the last day, we were out there. It all depends on what the season is.* (Brown et al. 2002)

Zadina (personal communication, 2002) suggested that subsistence catches are also higher when dry weather forces the sockeye to linger in the estuary awaiting higher water levels.

Learning to Fish

Pete Brown and James Rowan (2001) began fishing when they were seven or eight years old. They were put in charge of plunging as this is a physically demanding job. They also started to learn how to clean, process and pack fish at this age. Leslie Yates (2001) said that his brother taught him how to fish when he was 13 years old. He learned how to process the catch from his mother. Another respondent said that he learned how to subsistence fish from his father and uncles when he was 10 years old.

> *When you grow up in it, it's there. You can't help but learn.*
>
> *If you want to eat fish you are expected to learn to fish.* (Brown et al. 2002)

Technique

Subsistence seine fishermen first locate a school of salmon and then determine which direction they are moving. Fishermen look for salmon jumps to find salmon and to judge their direction of travel, but the salmon are not always moving in the direction that they jumped; sometimes the fish are trying to get away from a perceived danger.

If three boats are used the skiff man holds the net in place by putting the motor on the tow skiff in reverse, while the captain powers the main skiff in a circle as the net is played out. As the circle closes, the skiff man powers the net towards the main skiff. When two boats are used, a bucket holds one end of the net in place instead of the tow skiff. In either case, the net is kept on a skiff without a motor, called the seine skiff.

The following account of a three boat fishing technique was based on participant observations during the 2001 field season. All members of the crew watched for salmon

jumps and noted which direction they were jumping. The captain told us not to point at the salmon when communicating the location of a jump to him (Brown et al 2002; and Brown and Rowan 2002). Once the captain had located a school of salmon and determined the direction the school was traveling, he began the set in front where he thought the school was traveling. The captain signaled and a crew member released the bowline that attached the tow skiff to the main skiff.

The net was played out in a circle with the main skiff powering counterclockwise and the tow skiff maneuvering in the opposite direction. As the circle was closed, the captain headed towards the line attached to the tow skiff. The crew grabbed the line and passed it backwards, paying attention to duck under the line and avoid getting knocked out of the boat or chaffed across the neck by the yellow nylon rope. As the line was pulled across the main skiff, the tow skiff passed to the port side of the main skiff and was secured. The seine skiff remained secured to the starboard side of the main skiff. The crew pulled the net across the transom of the seine skiff, which was covered by a blue tarp to keep the net from snagging on any hardware. One person pulled the cork line, while another pulled the lead line, being careful to pull the corks and leads evenly or with the corks slightly ahead of the leads. The cork line was coiled precisely onto a plywood platform so that new corks were placed aft of the previous ones. This was crucial, so that the next set would go out smoothly without tangles. The entire time that the net was being hauled, someone created bubbles by smacking the water with a long handled plunger, like those used for commercial seining. The bubbles were intended to scare the salmon and keep them from escaping under the boat between the two ends of the net.

The net was hauled in from one end until the corks begin to tremble indicating that the salmon were getting stressed or trying to escape. At that point, the lead line was quickly pulled into the boat from both ends of the circle, to "purse" the bottom of the beach seine by bringing it into the boat. Sockeye salmon were removed from the web and deposited into the main skiff. During one evening of fishing, we made six sets to get 70 fish: one water haul, one set with three sockeye, one set with one sockeye and a dog salmon and three productive sets that yielded 66 sockeye (Brown et al. 2002).

Individual Fishing Styles

Most fishing groups utilized all of Klawock Harbor, choosing a specific location dependent upon conditions. A few captains always went to the same spot. For example, one group always fished over by the sort yard. Most groups looked for jumps and then set their net. Groups sometimes looked for jumps outside where another group was setting (Brown et al. 2002; Nickerson 2001).

Individual personalities of the captains affected their fishing style. There were three main fishing personalities observed. Some captains waited for the perfect set. Others set their net at every jump. The third type hooked onto the shore and waited (Brown and Rowan 2002).

Fishing Success

Some harvesters do not believe that engine power has anything to do with fishing success. These harvesters say that experience and luck is what makes the difference (Brown et al. 2002). One of the most successful spots was in front of the Klawock cannery at the beginning of an ebb tide (Brown and Rowan, 2002). Brown and Rowan (2002) suggested that early morning, around 4:00 am, was the best time to fish. The sockeye salmon are in larger schools in the morning when it is possible for a boat to go out very early (by 5:30 am), make one large set and be done for the day before 6:30 am. The best fishing was said to occur on cold foggy mornings when the fish were closer to the surface, jumped more and were easier to see. When it is sunny, fishermen said the fish swim deeper, are harder to see and are more likely to swim under the net (Brown et al. 2002).

Other variables that affect fishing success included: 1) where the captain sets the net in relation to the observed salmon jump, 2) how fast the captain lets the net out, 3) how fast and even the lead and cork line are brought in, 4) how the net is piled for the next set, 5) the location and consistency of the "plunger" and 6) how fast the lead line is brought in after the fish are captured in the belly of the net, causing the corks to bounce. Brown and Rowan (2002) offered these fishing tips:

- Try to set with the salmon jump in the middle of the set.
- Slow, even throttle is better, unless you think you are going to lose them.
- The slower you go when letting the net out, the better the net will hang in the water, unless you think you are going to miss the school.
- If you make a fast set, you need to let the net sink down for a minute or so, so that it hangs. After it sinks down, then you can start hauling it in.
- Bring the leads in slow and even, but keep up with the corks and web. All three (lead, cork and web) must come in at the same time; keep them even. An even net stays like a wall.
- Coil the net so that corks are laid toward the stern, the direction that the net will be played out on the next set.
- Pile the net like a coiled "slinky".
- Plunge close to the boat in the gap between where the lead line is hanging from the bow and stern.
- When you see the corks start bouncing, start pulling net from both ends.
- Plunge like crazy until the lead line is aboard.

Here are some of the things that can go wrong according to Brown and Rowan (2002):

- Forgetting to tie the bucket onto the net before throwing it overboard.
- Leads go out over the cork line, because the net was piled wrong on the last set.
- Whole pile of net comes off at once. Usually caused by a piling error on previous set.
- Water is too shallow. Leads hit bottom causing the leads to roll into the web.
- Net hooks up on a snag under the water.

- Letting salmon escape under the boat by plunging too far from the gap in the net between the bow and stern.
- Missing the school because set was made too close, too far ahead or too far behind a fish jump.

Use of Other Sites

Craig and Klawock residents go to other sites to fish for sockeye when the Klawock run is inadequate as it was in 2000. Other reasons respondents said that they fished areas besides Klawock Inlet included: 1) they wanted sockeye before July 7; 2) they wanted to fish on the weekends when Klawock is closed; or 3) they didn't feel comfortable fishing at Klawock, because it isn't their traditional fishing territory.

Contemporary Sarkar River Subsistence Fishery

The Sarkar subsistence fishery was not observed during the 2001 field season, but respondents discussed the use of Sarkar for sockeye salmon during interviews. Both the Tlingit and Haida people have a traditional connection to Sarkar due to an intermarriage that happened many generations ago when a chief's daughter from a village on Sarkar Lake married a Haida man from Hokan (Darrow 1934). A totem pole from south of Tuxekan commemorates the marriage (Carl Sr. 2002).

Richard Carl Sr. (2002) remembered that they used to make their beach seines from discarded commercial seine nets. It was used similar to how it is being used now in the Klawock fishery, like a miniature seine.

Respondents said that it used to be just local people from Craig and Klawock fishing Sarkar, but in more recent times with easy access from logging roads, residents from various non-native and logging communities, such as Whale Pass and Naukati have started fishing there. These communities also fish Logjam, according to key respondents (Brown et al. 2002).

There was also an increase in the number of people fishing near the mouth of the inlet stream after the Forest Service cabin was moved to a new site away from the mouth of the inlet creek at the head of the first lake. The intent was to reduce use of the area, but it may have had the opposite effect, because in the past, cabin limited use to one party at a time. The site began to be used more as a camp ground with multiple parties sharing the area (Terry Fifield, USFS archeologist, pers. comm., 2001). The increased fishing activity at the mouth of a sockeye spawning creek and rumors about nets being stretched across the mouth prompted the U.S. Forest Service to prohibit the use of nets upstream of the bridge over Sarkar River in 2001. One elder stated his support for this action:

> *So then they opened up where they spawn up at Sarkar, right above Deweyville, that's Sarkar, for dip net. I never seen, but they told me…. It's a small creek, you can clean it out in no time… That's what I was told. They said they'd seen somebody had a gillnet across all the [mouth]. And*

> *that just depreciated the sockeye run down to nothing. Opening up where they spawn. It's on federal land. Federal Fish and Game closed it off now. You can't fish from the lake. From the bridge on up is closed. So it's gonna come back.* (Brown et al. 2002)

Some, but not all of the contemporary harvesters that we interviewed fished both Sarkar and the Klawock River. One respondent said that his family fished Sarkar, but not Klawock. The reasons people gave us for fishing Sarkar in addition to or instead of Klawock Inlet included: 1) the run is earlier than Klawock, 2) elders like to make "fry" fish from the Sarkar sockeye because they are smaller, 3) the outboard engine on their skiff is too big to use at Klawock and 4) traditional connections to one site or another. One elder respondent said he did not feel comfortable utilizing Klawock sockeye because he was Haida and it was traditionally a Tlingit stream (Brown et al. 2001). Another Haida elder, however, said that he had speared fish on the Klawock River when he lived in the community of Klawock with his uncle. He also utilized Sarkar River (Carl Sr. 2002). One Klawock respondent said that he used to fish Sarkar River, but doesn't fish there anymore, because he was "hassled about fishing up there." Instead, he now goes to Karta River for its early run of small sockeye. A couple respondents said that they didn't use Sarkar or only went there occasionally (Brown et al. 2001). Noone from Klawock fished at Sarkar in 2002 according to the returned subsistence permits (ADFG Alexander Database 2003).

The seasonal openings and closings for sockeye salmon are set by the Ketchikan Area Management Biologist for Sarkar/Deweyville on the permit. Sarkar is categorized with "all other systems in the Ketchikan management customary and traditional use areas" and was open from June1 to July 31 for sockeye with a 20 sockeye daily possession limit and no annual limit. The seasonal opening covers the dates of the Sarkar sockeye salmon run and the dates when people historically went to Sarkar for sockeye, according to respondents who stated that the sockeye run begins in June and peaks in early July. One elder remembers going for fish at Sarkar toward the end of June or first part of July. Cliff Douville (2002) recalled that his family usually went to Sarkar by the 15th or 20th of June and didn't bother to go after the fourth of July. In 2001, the run came exceptionally early in June, according to respondents. Subsistence permit data for that year indicated that harvesters fished Sarkar from June 16 to July 15. Only 30 sockeye of the total 430 reported were caught after July 4th.

The reported Sarkar/Deweyville total sockeye subsistence harvest for 2001 was low compared to the 18 year average of 1,172 sockeye for 1985-2002. The average number of sockeye per permit during this time period was 22.

Harvest Methods and Gear

Respondents said that they mostly fished in saltwater near Deweyville at the mouth of the river or in Sarkar Cove. One respondent said that he and his family fished downstream of the river, just below the orange State regulatory marker within sight of the bridge. They never fished above the bridge. Another respondent said that they used to go to the mouth

of the inlet stream in Sarkar Lake near the old Forest Service cabin site and make sets. The U.S. Forest Service, which now manages subsistence fishing in the freshwater of Sarkar River and Lakes, now prohibits the use of nets above the bridge.

Douville (2002) said that in the past they occasionally made a quick set in the lake if they missed the run in the saltwater. Respondents said that they mostly used beach seines at Sarkar, because it was more efficient. For example, Douville (2002) who spent much of his youth at Deweyville said, "Any other method was a waste of time, you know—you didn't have all summer." A Haida elder, said that they always used nets rather than spears at Sarkar:

> *In order to get enough fish for the family, several families, we had to use nets. By spearing the fish it would take a week to get enough fish and with a net, it would take maybe a couple of different days.* (Richard Carl Sr. 2002)

Most respondents said that they used similar gear and techniques as the Klawock fishery when fishing in the saltwater at the mouth of Sarkar River. They used two boats and circled the fish with a beach seine. One respondent says that he used the same gear as Klawock, except sometimes they take a shorter net (Brown et al. 2002).

Dip nets are also used by some harvesters, although all of respondents said they used beach seines, because they were more efficient than other methods (Brown et al. 2002; Douville 2001). In the past there were dip net sites above the bridge, but now that net fishing is illegal above the bridge, people dip net off the point of land were the ADFG regulatory marker for saltwater is located. People also legally snag salmon from this point (Brown et al. 2002).

One Haida elder said that he fished Sarkar most his life. He remembered going for fish at Sarkar toward the end of June or first part of July. The last time he went with his son and son-in-law. That was about 5 or 6 years ago. They ran a speedboat to Sarkar from town, but hauled a small skiff and the beach seine in a truck. They slid the skiff down the bank by the bridge to get it into the water (Brown et al. 2002).

On that trip, they didn't get anything the first day, but got their bag limit on the second day. The respondent and his family fished near the mouth of Sarkar River, just below the orange State regulatory marker within sight of the bridge. They never fished above the bridge. They used a beach seine in the salt water near the river where the water isn't very deep. They had three men, two in the big skiff with the beach seine and one person in the small skiff. The person in the little skiff had one end of the net. The guys in the big skiff let out the net and circled the fish with the seine. Then both boats came to shore and hauled the seine ashore, pulling the fish in. The little skiff served as a kind of tender. The elder's son-in-law still uses the beach seine at Sarkar and Karta rivers (Brown et al. 2002).

Distribution

Traditionally, the Tlingit people lived in communal households with parents, grandparents, aunts and uncles and the contemporary concept of family may reflect this, as illustrated in the following interview excerpt:

> *[So you fish for your family first?] Pretty well…the whole community's my family. [Your immediate family?] My immediate family. That's over half of Klawock!…Parents first, my brothers and sisters, same time. Then I'll go to my aunties and uncles. And then Ketchikan family, it's my godparents, my uncles, my aunts. I'll usually send them about 15 fish a year. That's enough for them to get by. I wish I could do more, but when I'm putting up for so many people, I can't do as much as I want.* (Brown et al. 2002)

Harvesters share their salmon catch with their extended families, whether they reside within the village or are living outside of Prince of Wales or even Alaska. When Smith-Harmon (2001) lived in Seattle for twenty-one years, her family would bring her fish and seaweed.

> *I got a lot of food given to me when I lived in Seattle... When they came down to Seattle, it wasn't an unusual thing for them to bring me down a case of fish or a big sack of seaweed or a big sack of dry fish.*

One contemporary harvester told us that he fishes for four households; each household needs 150-200 sockeye salmon. That means that he needs to get 600-800 sockeye each season to satisfy the needs of his extended family and others who ask him for fish. He is the only member of his family who fishes, although his brother went out once in 2001. His uncles sometimes stop by the house and "bum a few jars". His family does not get anything in return, "Most the time we're lucky if we get the jars back" (Brown et al. 2001).

Respondents indicated that they were responsible for providing salmon to certain households, but also provided salmon to people outside their extended family, depending on who needed fish. The traditional Tlingit moral code of sharing prohibits anyone from refusing someone who expresses a need for the fish. Elder Eileen Smith-Harmon's (2001) mother told her:

> *"Don't you ever, ever turn away anybody that comes to your house for food". She says, "I taught you how to put it up. Now I'm going to teach you how to give it away."*

A recent example of informal sharing was provided during the onsite fisheries observations when a single mother approached the local research crew and their harvesting companions who were busy gutting their catch. The woman, who was no relation to any of them, explained that her husband was down south, but she had made a

deal with another fellow to provide her wood for smoking fish in exchange for a portion of her fish. As she had no way to get any salmon, she requested some and was given over 20% of their catch (Brown et al. 2001). She then went to another harvesting group who was also cleaning their catch and acquired more salmon.

We then went to the senior citizens home to deliver some salmon and an able-bodied construction worker requested some salmon, because the fishery was closed on weekends when he had his days off. Salmon is also distributed at ceremonial and community gatherings as a form of gift giving.

Amount of Fish Needed

The amount of sockeye needed per household varies according to the size of the family and how much sockeye each individual family member consumes each year. An elder from Craig said that his family could get by on 10-15 sockeye per year per person (Brown et al. 2001). He was the only respondent who stated that the daily bag limits were sufficient for his family. The amount of sockeye a family needs can vary according to how much fresh fish they get throughout the year. Clara Peratrovich (2001) said that she and her husband needed about 30 sockeye salmon (15 sockeye per person) per year, but that they supplement their diet all year long with fresh halibut, red snapper and king salmon that their sons catch for them. The contemporary harvester who said that he provides 150 to 200 sockeye per household did not tell us how many individuals were in each household, but based on a family size of five individuals, a household would need from 30 to 40 sockeye per person, more than double or triple the previous examples. Other harvesters confirmed that larger households might need 200 salmon per year:

> *Like my family—in the beginning, when we were all…we'd go through probably 200 fish. Now I have my own family and they're smaller and it's decreased the amount, where I don't need that much. But there are other families that are big that really need to put it away.* (Brown et al. 2002)

Based on this study, the harvesters we consulted needed between 20 to 200 sockeye salmon per household.

ADFG Subsistence Division harvest surveys conducted in Craig and Klawock in 1997 (Appendix Table G-7) found that 68.9% of Klawock's 303 households utilized sockeye salmon in 1997. That works out to an average of 36 sockeye per household for the estimated 7,458 sockeye harvested that year. Fewer Craig households (54.9% out of a total of 608 households) used sockeye for an average of 25 sockeye per household (Appendix Table G-8). This salmon was harvested by only 37.7% of the households in Klawock and 35.8% in Craig. On average, a harvesting household in Klawock provided 65 sockeye for the community and in Craig, harvesting households provided an average of 38 sockeye salmon.

Perceptions about whether people got all the fish they needed in 2001 varied. Clara Peratrovich (2001) knew of some people who had not gotten what they needed. One

contemporary harvester figured that 75% of the community get the fish they need and the others are too lazy or don't have anyone to fish for them (Brown et al. 2001). Another harvester said that people who don't get the sockeye they need, don't get them because they didn't ask. "There are people that go without, but that's because they don't speak up" (Brown et al. 2001).

Salmon are given away in various stages of processing from whole to a finished product. In 2001, Clara Peratrovich got thirty salmon from a friend who is not a relative (ten fish at a time). Her daughter jarred two cases for her and they dried and smoked the rest.

One harvester said that he processes his salmon at home, because sometimes he gets in late at night from fishing. He gives his fish away unprocessed. His own fish, he doesn't gut, but fillets them directly and returns the carcasses to the beach. When returning at dusk from fishing, it is an acceptable practice in Klawock to leave unprocessed fish overnight in a cooler without ice until the next morning (Brown et al. 2002). Elder Eileen Smith-Harmon (2001) recalls waiting until the next day to process a load of salmon (often 300-400 fish) brought in by her brothers when she was young.

> *You couldn't work on them when they first came in. They'd be too stiff. So, usually I'd wait to the next day. Usually there wasn't enough time. [They came in from fishing at night.] We worked on fish a lot, but you couldn't work on it that same day…. it'd be too fresh for it. [The fillets would also start curling up.]*

Products and Processing

Respondents preserved their salmon into a diverse array of products using six basic processes: drying, smoking, freezing, pressure sealing in cans or jars, salting, and fermenting. Processing depended on the end product, but also varied according to individual styles. Some harvesters gutted their salmon at the harbor; others brought their fish home and filleted them without gutting them first. A few harvesters left their fish overnight in a cooler, not on ice, because they fished until dusk (Brown et al. 2002).

The simplest method was to slice a gutted, fresh salmon into steaks and freeze it. Respondents also "plain packed" their fresh salmon steaks into jars that were sealed in a pressure canner. Jarred salmon contains high calcium content due to the cooked bones. Salmon may also be canned, although the respondents for this study were using jars. One elder, who always fished Sarkar, said that years ago they used to use jars, then they used cans and now they are back to using jars. When the Klawock Cannery was still operating, they would have the cannery cook ("retort") their cans after they cleaned, packed, and sealed their catch into cans (Brown et al. 2002).

The number of cases put up every season varies depending on the number of households in a distribution network and how many salmon each family consumes per year. Leslie Yates (2001) said that he puts up about six cases a year, in addition to helping the rest of

the family put up fish. Another respondent put up about forty cases of sockeye salmon in 2001, which were shared with his daughters, brother and grandmother.

People learned to use salt as a way to preserve fish from the salteries in the late 1800s. The bellies of salmon were salted in wooden barrels. To use, people soaked the salted bellies in fresh water for three to five days depending on whether they were going to boil it or fry it (Peratrovich 2001). Eileen Smith Harmon's (2001) mother, Ruby Watson Smith, used mature red sockeye salmon for salt fish. The fish were filleted, half smoked and salted in wooden barrels or a great big glass crock that the family used to have. They would do about 100 fish at a time. The fish were half smoked and then layered with salt in the containers. It took lots of salt. As a child, Eileen liked the taste of salt fish and the fact that it was relatively easy to make. During the winter, they ate salt fish with potatoes. In addition to salting mature salmon, people also salted salmon bellies. Clara Peratrovich (2001) described the process for salting salmon bellies that was learned from the salteries:

> *When the cannery started running, there was a saltery here and after they'd seen what the saltery was doing, the people started getting these here barrels and they cut the bellies off and cut the belly part. They'll cut it down on the bottom of the belly like a butterfly. It opens up. You dry salt that in barrels …All the water comes out of the salmon, itself. It just raises by itself from the fish.*

Smoked salmon is a popular method to process salmon, but smoking itself doesn't preserve a fish for long-term storage. A salmon either has to be frozen, pressure-canned after smoking or dried until all the moisture has been removed from the flesh. Dried, smoked salmon was the main preservation method used on Prince of Wales Island before Europeans arrived in Southeast Alaska. People dried a lot of fish, because it was a main component of the Native diet and had to last all winter (Peratrovich 2001). People still dry salmon, but few, mostly the elders, still know how to do the traditional method (Smith-Harmon 2001). It is quicker and easier for the younger generation to dry salmon in a dehydrator (Peratrovich 2001). Some people dry salmon plain without smoking it or make a product locally called "Hawaiian strip dry fish", named after the use of pineapple juice in the brine.

A popular method of smoking salmon is to cut fillets into strips, smoke the salmon and jar the smoked salmon strips (Appendix Figures F-6 through F-8). Some people make kippered salmon, which is only lightly smoked. One respondent said he smokes his fish for a day when kippering it (Brown et al. 2002). The backbones remaining after filleting are either smoked or the meat is scraped off the bones with a spoon and made into fish hash. Essentially, fish hash is made by mixing spices and condiments with ground salmon meat, then pressure sealed in jars. Families have their own special recipes of ingredients and proportions.

There are a couple of styles of traditional dried salmon made in Klawock, named after the shape of the salmon after it is filleted and dried. "Newspaper" dry fish are filleted twice

into one large piece with the backbone intact. Sockeye was the preferred salmon for this type of dry fish because its high oil content kept the fish relatively soft after drying. Dog salmon is hard when dry. Coho salmon is oilier than dog salmon, but not quite as rich as sockeye salmon. Pink salmon were not used for newspaper fish because they are too small. Instead the Natives made "necktie" style where both fillets remain connected to the backbone near the tail and the entire fish is hung over a stick, like a necktie (Peratrovich 2001).

It took two weeks to dry sockeye salmon; coho and dog salmon took a little longer, about 2½ weeks because of their larger size. Pink salmon dried faster. In the old days, people didn't use much alder, maybe one to three pieces a day. The best way was to use the core (not bark or wood with sap) of hemlock logs for the fire. Traditional smokehouses had wooden slats over a large central fire pit, which caused the smoke to spread out and reach all the fish hanging in the smokehouse above the slats. The boards also protected the fish that was hanging over the fire from burning (Peratrovich 2001).

> *We went and smoked it. They filleted it like a newspaper. They'll fillet it twice. They'll slice it down the side of the backbone. Leave the backbone in. And then they'll put one inch strip against the skin after it is filleted the second time and it is about that wide, lengthwise, and that becomes dried fish, hard dried fish. It gets real big. They punch holes on the backbone side so that when you push the stick through, it stays on the stick. …That backbone keeps it from tear off the fish. You poke a hole through ribs and you put the fish to hang down. You can put about ten fish to a stick to hanging down, for hard dry.*
>
> *… the backbone holds so it doesn't tear through the fish. If you put it on the side that doesn't have the backbone in it, the fish is heavy enough so it would just tear right through. So that backbone is really important. It catches on the top of [the dowel] and holds so it doesn't tear through and that's how it dries about five days. (*Peratrovich 2001)

To eat, dry fish was soaked for three days in salt water until it softened and then cut up and boiled. People might have it with cooked potatoes and smoked deer rib fat (Peratrovich 2001).

Salmon heads are boiled or sometimes split, smoked and partially dried. Heads from larger salmon like chum and king are preferred for fermenting into *k'ínk'*. *K'ínk'* is made through a process that involves burying salmon heads and fish guts in a well in the beach gravel at a specific intertidal zone and fermented them for a week.

As salmon ascend a river, they undergo physiological changes. The flesh of a mature salmon contains less oil and the male salmon, especially pink salmon, develop "big jellied humps" that is almost like gristle. Elders especially like red sockeye boiled.

> *Or boiled—you can get even farther up, like in December, when they get even darker. They've got more rot on them, but it's good underneath and it's got a really good flavor for boiled fish.* (Peratrovich 2001)

> *One of the best meals was boiled fish. Boil a fish and throw in a couple of potatoes and, boy, you had a feast.* (Smith-Harmon 2001)

Other people boil the salmon with hooligan grease. Mature salmon is also ground to make fish hash or dried into jerky.

Salmon eggs, *kaháakw* in Tlingit (Newton and Moss 2005) are fermented into a traditional product, locally referred to as "cheese". In the past, chum eggs were also used as a source of pectin for making berry jams and to make glue. The salmon eggs were mixed with crushed shells and pitch to make the glue, which was used in the seams of bentwood boxes (U.S. Department of Interior, 1944, Vol. IV: 638). A waterproof glue for bentwood boxes was also made by chewing dog salmon skin with cedar bark (Peratrovich 2001). Salmon guts and carcasses were thrown into gardens for fertilizer.

> *One of the things we all had were garden sites, each family had gardens, like we had one on Fish Egg Island and over by the ballpark. Every spring, we planted our garden, potatoes, carrots and turnips and this time of the year we harvested it. We did well, it took a lot of work, we used a lot of natural fertilizers like kelp and clamshells and starfish and old fish like salmon. We made rows of mounds for potatoes to keep it above ground; there is so much water around here.* (Brown et al. 2002)

Learning How to "Put Up Fish"

Most respondents said they learned to put up salmon from their mothers (Brown et al. 2001; Harmon-Smith 2001; Peratrovich 2001). In the past, helping to gather and put up subsistence foods was part of a child's chores. Her responsibilities increased as she got older. Some of the male harvesters who we interviewed helped put up the salmon, while others delivered it to the female heads of households, such as their mothers, to put up. One male respondent said he returned to Klawock from Seattle to help his aging parents get their subsistence foods and was in the process of learning how to put up food in the traditional way:

> *I've been learning for the past four or five years to put up my food. This year and the last year, I put up everything. Even if I have a good understanding how to do it, I go and ask again to make sure it's engrained in me so that I don't forget anything. Some things I can pick up and do once, but some things especially the monotonous things, I have to do two or three times and be told over and over again. How do I do this? How long do I cook it? What do I do with seal meat? What do I do to certain foods, stink eggs, stink head. I am trusted to put up dangerous foods. If*

> *you don't know how to put it up, don't, because it can kill people.* (Brown et al. 2002)

Clara Peratrovich (2001) taught a subsistence class for students after school. They learned how to harvest and prepare sea cucumbers, seal (including seal intestines), fish and berries the traditional way. In February, they thawed all the food that they had frozen and had a big feast with Native dancing for the elders from Craig and Klawock. They sent the elders home with care packages of leftover food. Clara said there is a gap between her generation and the parents of the students in her class, because many of their parents went to boarding schools when they were young and worked during the summers to earn money to go back to boarding schools. Many of Clara's students went home and showed their parents what they learned.

> *So the boarding school was good for education, but not the Native education, because they came back without knowing anything about our traditional foods.* (Peratrovich 2001)

Local Perceptions Concerning Regulations and Management

> *An old Native man is dipnetting on the creek when a young Fish and Game cop approaches him and tells the old man he can't do that. The fish cop is ready to arrest the old man. Then the old man tells him, "My brother around the corner, he's got more fish than me. Try to catch him..." The fish cop runs up there. Pretty soon, a few minutes later, here comes the fish cop running like crazy. The old man asks, "What was it, my brother chase you down? Oh my brother, the bear, he was catching lots of fish."* Local subsistence joke told by an elder in Klawock (Brown et al. 2002)

Most of the contemporary harvesters interviewed felt that the government should not regulate Alaska Native subsistence fishing because it has been their way of life since before the Europeans arrived and they depended on the food to survive. Respondents maintained that the government shouldn't interfere as long as they were utilizing the fish.

> *Another thing that irritates me…every fish that we catch, we never abuse it. That should be our pleading grounds right there. We should be able to fish until we have enough.* (Brown et al. 2002)

Respondents said that many people are very dependent on subsistence sockeye salmon to get them through the winter due to seasonal work or lack of employment. One respondent said that he had become more dependent on subsistence due to the lack of jobs in logging and associated construction.

> *They really need to look at the economy and eliminate some of the regulations for the Alaska Natives, Tlingit people.* (Brown et al. 2002)

Regulatory limits that don't meet the needs of the Native people who depend on the customary harvest of traditional foods for economic and cultural survival compelled harvesters to take subsistence food illegally to meet their needs. People felt that enforcement needed "to bend the rules" when people were just trying to catch a fish because they were hungry.

> *Not being belligerent or obnoxious, but if we need it, we're going to go get it. It's just plain and simple. They can write all the regulations they want, but this is the stuff, it's our chemical make-up. Our bodies need that.* (Brown et al. 2002)

Subsistence means more to Alaska Natives than just getting food; it's a way of life. It encompasses more than physical survival, but also cultural survival. Some respondents voiced their frustrations at all the government regulations, especially in Klawock, which they thought seemed excessive compared to other sites. The Alaska Department of Fish and Game was blamed for the regulations, although many of them were proposed by local residents concerned about the declining Klawock sockeye salmon stocks and subsequently passed by the Board of Fisheries. The only regulation mentioned in the interviews that was directly instituted by Fish and Game via the area management biologist was the prohibition against using spears and gaff hooks on the Klawock subsistence permit. No one acknowledged the local role in creating the regulations, which some respondents seemed to bitterly resent.

> *You go to another spot and they've got no time limits or no guidelines whatsoever.* (Brown et al. 2002)

> *Subsistence to me is gathering your food with no problems, no interference. It's plain and simple. You don't have to have a book of amendments or anything.* (Brown et al. 2002)

An elder who had little income and was very dependent on the fish that he catches told us that he once caught a steelhead that was slightly under the 36" size restriction. The enforcement officer confiscated it and gave him a $150 ticket. He asked the officer what he was going to do with the fish and the officer said he was going to give it to the senior center. The elder said, "I'm a senior, let me have it'," but the officer wouldn't give him the fish. Stories like the following circulate around the village adding dimension to the sentiment that the rules and enforcement are unreasonable and don't take into consideration the subsistence needs of the individual, especially an elder (Brown et al. 2002).

There was, however, concern expressed that enough sockeye salmon are allowed to escape up the river and despite the general dissatisfaction with the weekend closures (see below), most respondents supported having a two-day closure sometime during the week and some thought that the river mouth should be closed to seine nets to ensure salmon escapement into the river (Brown et al. 2002).

Daily Bag Limit

The Klawock and Sarkar subsistence salmon permits limit individuals and households to 20 sockeye salmon per day; there is no annual limit. Some respondents mistakenly thought that the daily bag limit was a seasonal limit. One elder was shocked to be told about this limit when she returned to Klawock after two decades living in Seattle.

> *The first time I came up here, they were saying that Fish and Game was giving somebody a ticket because they caught over the twenty, twenty limit per house. And that was, I was amazed, I says, 'Twenty per house?' I couldn't believe that. I says, 'you got to be kidding!' I went down to the Fish and Game and I was asking him about that and seeing how that could be lifted. I says, 'I worked on three to four hundred a day for our house.' I could not believe where they put down…a twenty fish limit.* (Smith-Harmon 2001)

> *I thought it was a one time thing, if you got a permit like 10 to a family, there's two of us in this household so you're allowed 20 sockeye, that was it. (*Brown et al. 2002)

Generally, respondents felt that household bag limits don't work, because people share their fish throughout the community and it is more efficient to work on eighty fish at once rather than only twenty fish a day (Brown et al. 2002; Peratrovich 2001).

Proxy Fishing

State subsistence regulations state that a subsistence fisherman can harvest one individual or household bag limit per day and with a special proxy permit, also fish for an individual who is blind, physically disabled or 65 years of age or older. Most of the respondents' attitudes toward the proxy regulation could be divided into two categories: those who thought that they should be allowed to fish more than two permits (their permit and one proxy) and those that didn't even realize that there was a restriction on the number of permits that they could fish.

> *Lot of the people that needed fish, they contacted my mother, or [the captain] would hear of somebody. We would always just go grab all their permits and fill them. A lot of people don't have seines or boats. It works out pretty good all the way around…. When it comes to sockeye, it doesn't take long for the word to get around.* (Brown et al. 2002)

> *To tell you the truth, I don't even know, because it really don't matter. We're going to pull it in and if we need it, we're going to get it. I don't know anything about that one [laughter]. There's time when people can't go out so they're going to hand you their permits. If it's limited to two, that's nuts. There's times when I can't get out and they'll take my permit*

> *and I'll have fish at the end of the day. I won't even have to go pull the web. And that works out great.* (Brown et al. 2002)

Most of our respondents responded that the proxy system did not accommodate large families and others that can't get out fishing (Brown et al. 2002; Yates 2001).

> *The laws don't fit us. A lot of people don't go out. Only one in the family goes out.* (Brown et al. 2002)

Only one contemporary harvester indicated that the system was working for his fishing group.

> *We just bring one [permit]. If there's five guys out there, we make sure we all have one. We just catch our limit and then we come back in.* (Nickerson 2002)

Weekend Closure

The Klawock fishery closes Friday at 5 pm and reopens at 8 am on Monday. Few respondents remembered that the weekend closure was a proposal presented to the Board of Fisheries by Klawock residents as a way to reduce the number of non-local people who fished the river. Brown (2001) said he supported the weekend closure, because he remembers when he used to see boats from Ketchikan, Wrangell, Petersburg and Juneau:

> *The weekends have been working just fine as far as I know. I used to watch 10-12 boats out there and 2 of them would be from Klawock on the weekend and so that speaks for itself too. When they shut it down on the weekend you don't see them anymore.*

One key respondent remembered that many of the people coming over from Ketchikan had tribal connections in Klawock (Brown et. al 2002). He described the dilemma:

> *It's kind of hard, because if you're working a job, you're gonna have to take time off and you're losing a day's wage. But then you got the other thing, just like what we have going on with the deer hunting. You've got 90% of Ketchikan comes over on opening day. It kind of happened here with sockeyes. It's got its good points and its bad points.* (Brown et al. 2002)

Another respondent thought that the reason they closed the subsistence fishery on weekends was because commercial seiners used to come in and fish the Klawock fishery on the weekends and then sell the fish. (Brown et al. 2002).

Most of the respondents said they didn't like the weekend closure because it was hard for working people to get their subsistence fish (Brown et al. 2002; Peratrovich 2001). Generally, they were not opposed to having a two-day closure happen mid-week rather

than on the weekend. Most seemed unaware that it was local people who proposed the weekend closure to reduce the number of Ketchikan and other non-local residents fishing in Klawock.

> *When I was working, I always complained about it, because we'd work from six in the morning till five at night and be too tired to go out fishing. I can see where the working people that still want to put up fish never have a chance. Because they have to all work all day and …never get a chance to get fish… They're trying to take away your subsistence, because you don't get a chance to actually do it.* (Brown et al. 2002)

Peratrovich (2001) suggested that the way to reopen the weekends, but keep non-locals from fishing the area would be to having all the fish caught go into a community pool that is then distributed by the local Klawock Community Association according to family need.

A side effect of the weekend rule is that some harvesters are focusing their efforts on other streams during the closure. One fisherman said that he used to go to Warm Chuck on the weekends where he could get 80 to 90 fish a day or up to 200 fish per weekend, but it was a small run that was getting "wiped out". According to this harvester, the run is starting to come back (Brown et al. 2002).

Another strategy to get sockeye salmon on the weekend was to fish outside the "blinkers" or closed area on weekends. The fisherman that used this strategy said that once a state trooper tried to ticket him and he told him that he couldn't unless he changed the regulations. The regulation book, not the permit, specifies the area closed on weekends:

> *From July 7 through July 31, sockeye salmon may be taken in the waters of Klawock Inlet enclosed by a line from Klawock Light to the Klawock Oil dock, the Klawock River, and Klawock Lake only from 8:00 a.m. Monday until 5:00 p.m. Friday.*
> (2000-2001 Subsistence and Personal Use State wide Fisheries Regulations, ADFG)

Some workers have to rely on others, family or friends to get their fish, because they are working during the week when the fishing is open. For example, a construction worker working at the senior citizen center asked our field crew if we could spare some fish, because he said he wasn't able to fish with the weekend being closed (Brown et al. 2002).

Seasonal Opening and Closing Dates

Sockeye salmon may only be taken in Klawock Inlet from July 7 through July 31, according to regulations. Some respondents thought that both the opening and closing dates should be more flexible and depend on the run. Others thought that the opening date was okay, but the closing date should depend on whether people had gotten all their

sockeye salmon or not. Harvesters complained that most of the sockeye were coming in after the closure (Brown et al. 2002; Yates 2001).

> *Fishery should be open until people's subsistence needs are met. I could understand opening it the first week of July, but they need to keep it open a little bit longer.*
>
> *Actually, I see different people every year now. That's what makes it so hard, if there's so many boats and so little fish. It'd be nice to get that date changed. We should have two months.*
>
> *It would always seem like we'd miss the sockeye run the way they set up the subsistence schedule, like they would be closed and the big run would come in, the biggest run.*
>
> *This year was pretty good, but the salmon came in the last three, four days of our deadline date. Seems like there's too much work to get what little fish we have now.*

Motor Size Restriction

Subsistence regulations restrict the motor size in Klawock Inlet to no greater than a 35 horsepower engine. Regulation 5AAC 01.750 reads:

> *In the waters of Klawock Inlet enclosed by a line from Klawock Light to the Klawock Oil Dock, no person may subsistence salmon fish from a vessel that is powered by a motor of greater than 35 horsepower.*

Some respondents did not think that the motor size was having too much of an effect on people, because most people had kickers (Brown and Rowan 2002). One key respondent, however, was no longer able to participate in the Klawock fishery when the motor size restriction was passed, because he had a 40 Hp. motor that exceeded the size restriction. Since then, he had been going to Sarkar and Karta rivers for his sockeye salmon.

Some respondents felt that larger motors did not necessarily equate with better fishing. Some thought that the quieter the boats the better, because engine noise can scare a school of salmon. Other respondents suggested that people adapted to the change by making their seines deeper or utilizing two skiffs with motors instead of one (Brown et al. 2002).

Prohibition Against Spears and Gaff Hooks on Klawock Permit

Area management biologists have the option of restricting gear type on the subsistence permits, in addition to regulations passed by the Board of Fisheries. In 2001, spears and gaffs were not listed as a legal gear type on the Ketchikan area subsistence permit, which includes the Klawock and Sarkar rivers. At the time, the only other Southeast area permit

which prohibited gaff hooks and spears was the subsistence salmon permit for Haines. A couple of elders and others expressed their dismay at having a traditional method banned, which has limited their ability to get mature salmon for boil fish (Brown et al. 2002; Peratrovich 2001).

Clara Peratrovich (2001) said that she only wanted the male salmon and preferred pink salmon, because they have the biggest humps. Harvesting with spears allowed fishermen to target males only. She considered spears and gaffs to be a superior method of getting mature male salmon than rod and reel or snagging, because harvesters could be more selective and target the individual salmon of choice. Respondents also objected to the restriction against spears and gaff hooks, because it abolished a traditional method. A contemporary harvester remembered when they used to go up the river to spear fish for the elders (Brown et al. 2002).

> *I know the last couple of times, people were getting fined for spear fishing. It always amazes me. That was just the way we'd get things when we were younger.* (Smith-Harmon 2001)

> *That's part of life, you know, spearing fish. Can't do it anymore.* (Brown et al. 2002)

As a result of the concerns expressed by respondents during this study, the Ketchikan area management biologist included spears and gaffs as legal gear types in the 2003 subsistence salmon permit.

Proposed Closing of the East Side of the Bridge

Respondents had a mixed response to a proposal to close the Klawock estuary east of the bridge to subsistence fishing.

> *I don't know about that. That's kind of a touchy one. Once they [the salmon] get that far, they should be granted to go that far. They make that big journey to get to the river…If the fish make it that far, they should at least let them go the distance. Even right past the creek would be a lot better.* (Nickerson 2001)

> *[How do you feel about fishing past the bridge?] I don't think it disturbs the fish. It hasn't ever, yet. There's people that still go fish up there. There's two or three boats that go up there. I don't because it's so shallow, rocks. I bent a prop up there about 15 years ago and it's just not worth it.* (Brown et al. 2002)

Net Size Restriction

Generally, respondents don't want to see more restrictions of the Klawock fishery. One respondent acknowledged that some seine nets have gotten longer over the years but said that it is acceptable, because they are sharing their catch with others.

> *There's only a couple people that have [increased their net size]. But those couple people that have, have also shared with everybody else here. I haven't seen them be greedy with the fish. If they had a good catch, they made sure to give out to the elderly people first and then people that had permits…* (Brown et al. 2002)

Seine Boat Proposal

Respondents were asked what they thought about getting sockeye salmon from a commercial purse seine boat rather than subsistence fishing it near Klawock River. When asked, most respondents did not like the idea of using a commercial seine boat to bring in subsistence sockeye. They gave a number of reasons including poor quality, the importance and emotional satisfaction of subsistence fishing, too much waste, and not workable because seine boat captains and crew need to make money to cover their expenses (Brown et al. 2002; Peratrovich 2001)

> *By the time they kill it, throw it down into their hatch, it's a 6-8 foot drop, it gets soft there then they got to throw it back up into a net with 3 or 4 hundred other fish and squeeze 'em into a little net and then bring 'em here. It is just like mud by the time they bring it to me. It is not going to happen. I like my fish nice and firm, still wiggling when it is done.* (J. Brown 2001)

> *That takes the fun out of it. Fishing is the ultimate rush. After that, it's all work.* (Brown et al. 2002)

> *It wouldn't work because even if there is a special opening during a closure, the crew still has to pay for fuel, food and other stuff.* (Peratrovich 2002)

> *One thing, even if they did bring up that proposal, I think it would almost be wasting fish. Out here, we don't take humpies, we put them back. If we're taking dog salmon for eggs, we'll take the dogs—if we're not, we let them go. But if they went out on a big boat and done that, if it was for subsistence, it would almost be a lot of incidental kills on the fish people don't want. I don't think that would be any advantage for subsistence users.* (Brown et al. 2002)

One respondent liked the idea of using a seine boat to get fish for people who don't have an opportunity to get them otherwise. He thought it was a good idea so that working

people (who can't fish on weekends) and others who need fish can get what they need. He didn't see any down side to this proposal as long as everybody who needs fish has a chance to get some. He wasn't talking about commercial seine boats replacing subsistence nets, but rather supplementing what was caught locally.

> *I think it would be a good idea for people who don't have an opportunity to either dipnet or purse seine. Get a couple boats out there to do it once a year…I'm sure you'd have no problem with people coming to get it. While a few people are still working which is good, you've got to work if you like, but also you've gotta have your food to put up to survive also in winter time. It would be a good way for the working class people that are putting up with the change of rules that shut it down on the weekend. People that will have a chance to get on that seine boat and say "hey, let's …go get some fish and can it up or smoke it up for winter time. And that's the whole purpose of us subsistence fishing to put it away for the winter time.* (Brown et al. 2002)

Non-retention of King Salmon in Commercial Fisheries

The non-retention of king salmon caught incidentally by commercial purse seiners as dictated by the Pacific Salmon treaty, was a key issue for one Klawock elder. The elder felt that seiners should be able to keep salmon that died in their nets for home use. This same viewpoint was shared by a contemporary harvester from Craig:

> *Yeah, that's another thing. I can never understand how you can dump all the king salmon overboard...You're taking hundreds of thousands of pounds of kings that are suppose to be dumped and what's the purpose of that. Those regulations have to be changed. People all over Southeast Alaska could use that fish. There's people up north that are starving that haven't….that had a real poor fishing season up there this year…Evidently, they had a real bad season. And the king salmon that are dumped overboard down here could feed them people up North. ...Why dump them overboard and kill them. It doesn't make any sense. I've never been able to understand that law.* (Brown et al. 2002)

Sport Fishing Regulations

Contemporary harvesters mostly indicated that they felt that the nonresident sport fishermen were under regulated while the subsistence fisherman was over regulated. Some felt that some charter boat lodges were letting their guest exceed daily bag limits by fishing in both the salt and fresh water in the same day.

> *After these [name of lodge] people, they get their six a day out there in the ocean and then come and take 12 in the Creek. That's probably per person, I think it's 18 a day. You see 'em every year like that. Nobody regulates them. And then we get regulated, you know.*

> *I know everybody records it and they should have numbers there at the office. Out of the 100,000 sockeyes they catch out there, we probably use 6-7,000 of that, which is nothing. I just think they're wasting their time trying to regulate their subsistence rules when they could be spending money elsewhere.*

Respondents suggested that the regulations be changed to allow senior citizens to harvest all the fish that they want. Lacking other transportation, one elder carries his fishing pole on his bicycle to the Klawock River to harvest his almost daily diet of fish, mostly coho salmon. In January he fishes for steelhead and trout (Brown et al. 2002).

Suggestions for Changes to Regulations

Respondents strongly suggested that the seasonal closure be more flexible to reflect the seasonal variations of the sockeye run timing.

> *The might give it a little leeway on the times, you know, if the fish ain't there. Because they come in late, they've been coming in later and later. That set time man put there, it needs to be flexible, I think. [So, would you like to see that every year; they open it when they see the fish start coming back?] Well, it's got to have a set opening, but I think that the close time could* [be flexible], *depending on if the people aren't getting their fish.* (Brown et al. 2002)

In response to problems with the daily bag limits, proxy rule, and weekend closures, Elder Clara Peratrovich (2001) suggested community bag limits to regulate the number of fish caught in the fishery, but ensure that people get what they need. She suggested that the local IRA maintain a list of how many sockeye salmon each household needs, control the harvest and distribute salmon according to need throughout the community.

Peratrovich (2001) also suggested that in times of low abundance, subsistence fishermen should switch their efforts to other systems with sockeye salmon, such as Karta, Sarkar, Dry Pass, Tokeen and Red Bay.

Discussion on Regulations and Fisheries Management

Opinions about the regulations varied, but most respondents expressed frustration toward at least one particular regulation such as the prohibition of spears, the Klawock weekend closures, or the daily bag limit. A few respondents raged against the injustice of the entire post-contact history, wishing to be left alone to subsist like their ancestors had been doing successfully for thousands of years prior to the European invasion. These frustrations are not new; Southeast Alaskan Natives have expressed their frustrations since the late 1800s and throughout the twentieth century (Moser 1899; U.S. Department of Interior 1944).

Despite differences of opinion about how to manage subsistence fisheries, local residents and management biologists share a common goal to ensure a sustainable yield of Klawock sockeye for future generations. Respondents complained about the limited, pre-determined three-week season and weekend closures, but supported the current opening date and having closures during the week to allow sockeye escapement into the river. Local concerns about a significant portion of the Klawock sockeye escapement occurring after the subsistence season is closed are supported by the weir counts. The late timing of the run, which locals say is later than in the past, could result in significant interception of Klawock sockeye during late seine openings, particularly in statistical area 103-60.

Several factors appear to impede the ability of state fisheries managers to effectively manage Klawock River sockeye for a subsistence priority including: 1) ADFG does not have escapement goals for Klawock River sockeye salmon stocks (Geiger et al. 2003); 2) ADFG management of the commercial purse seine fisheries predominantly is concerned with the abundance of pink salmon stocks (ADFG Region I staff 2002); 3) sockeye catches in the commercial seine fisheries are primarily incidental to pink salmon harvests—on average sockeye salmon account for 2% of the total Southeast Alaska purse seine harvests (ADFG Region I staff 2002); and 4) subsistence harvesters fish in the terminal area in Klawock Inlet after the Klawock sockeye salmon run has been potentially intercepted by commercial purse seiners.

Past tagging studies have failed to yield useful information for determining the contribution of Klawock River sockeye salmon stocks to commercial harvests (Lewis and Zadina). Lacking better information, fisheries managers have used tagging data to estimate the percent of Klawock River sockeye caught by commercial seine boats (for example during the Proceedings of the 1999 Klawock Sockeye Conference). A review of the weir counts and commercial harvests suggests that in some years there may have been a significant percentage of the Klawock escapement intercepted by the commercial seine fleet. Other variables, however, may currently constitute greater limiting factor on Klawock sockeye abundance than commercial fishing interception, such as depletion of spawning habitat due to past logging activities.

At issue is whether it is ultimately fair or legal to have the subsistence fishery closed, while allowing a commercial harvest in waters that Klawock sockeye must pass through (that is Statistical area 103-60: Big Salt to Trocadero). Further, subsistence fishermen have raised concerns that they are fishing hard on one segment of the run to harvest the amount of sockeye salmon needed by their extended families by the closing date when a substantial portion of the run is occurring after the July 31st closure.

An accurate assessment of the number of sockeye salmon harvested by subsistence users would help inform the amount needed for subsistence sockeye salmon and support an effort to manage state fisheries for a subsistence priority. Explanations for why harvesters fail to accurately report their catches included: 1) fear of reporting harvests that exceed daily possession limits, 2) an attitude that the permit system and required harvest reporting constitute government meddling in Native traditional and customary

practices and 3) a permit system that does not reflect the formal and informal distribution networks within the community.

Cultural Conflicts in Fisheries Management

Government officials refer to Federal and State management of subsistence harvests in Alaska as "dual management", but most Native harvesters are operating under a three sets of rules: state, federal, and traditional. The predominant traditional rules still operating in Klawock and Craig are (1) don't waste, (2) take only what you need, (3) share your catch, and (4) respect nature. Some fisheries management policies directly conflict with these traditional rules.

Perceptions of Waste: The non-retention of king salmon in the Pacific Salmon Treaty requires commercial fisherman to discard their bycatch of king salmon back into the ocean, even if they are already dead. This policy directly contradicts the traditional rule not to waste and is offensive to some native elders and others.

> *The seiners out there that seine the outside waters. They throw the king salmon back in the water. I wonder why they don't save it for the people. Put it in ice. Good king salmon, they throw it back in the water… high priced fish.* (Brown et al. 2002)

The discarding of incidentally harvested king salmon also contradicts State of Alaska policies against dumping and wasting of salmon, but policy makers overlook this fact because they fear that if they allowed the retention of bycatch one or more commercial fishermen may intentionally target king salmon (Gaudet 2002). Given that the Noyes Island seine fishery on the outside coast west of Klawock is the only seine fishery with significant interception of king salmon, there ought to be a way to enable the deceased, incidentally harvested king salmon to be legally delivered to a tribal organization, such as the Craig Community Association or Klawock Cooperative Association, and distributed to elders.

The sport "catch and release" policy has also been controversial within some Alaska Native communities. Many Alaska Natives find this policy contradictory to their traditional beliefs—catch only what you need, respect the fish, do not waste. Klawock residents have noticed large numbers of dead fish in sport fishing areas, which they attribute to "catch and release" mortality. One respondent complained that observed die-offs at Hatchery Creek were due to sport fishermen practicing catch and release. He found the practice distasteful because it wastes fish that die after being released and it takes fish from locals who need them to survive (Brown et al. 2002). Complaints were also lodged about the practice on Harris River by other respondents.

> *We noticed that on the Harris River walking bridge area where all the natural run of fish, where people weren't fishing, there was very little die off. But right where all the people were catch and release fishing, right in*

that area, there was like thirty, forty fish dead right there in the bottom. (Brown et al. 2002)

In western Alaska, the elders repeatedly said that removing a fish from water is a violent act (Lyman 2003). The Haida Nation also has a cultural and moral aversion to the "catch and release" policy of the Canadian government; it is viewed as disrespectful practice with potential serious consequences (Jones and Williams-Davidson 2000). Research has confirmed that removing a fish from the water when releasing them increases mortality due to a build up of lactic acid in the muscle tissue during the "fight" (Lyman 2003).

Jon Lyman, Information Officer for Sport Fish Division of ADFG believes that the problem isn't with the catch and release policy, which is intended to be a guideline for selective harvest whereby anglers carefully release those fish that they do not intend to eat. The problem, he says, is with the amoral response by some anglers to abuse the practice while trying to impress their friends with how many fish that they can catch in a day. At an estimated ten percent mortality rate, if an angler catches a hundred fish over the course of a day, then he or she has killed ten fish.

Respect of Natural Cycles: Langdon's (2001) examination of ancient weir sites in the Klawock estuary and elsewhere on west Prince of Wales, revealed an ancient technology that harvested salmon efficiently without impeding the salmon's migration to spawning grounds. Salmon were harvested on the ebb; the tide and salmon flowed over the stone and wood weirs and traps during the high flood tide. This harvesting method reflected a respect for the natural flow and cycles of nature. Negative impacts related to logging, expressed by respondents, most commonly referred to the blockage of the stream by logging debris.

The Klawock weir is offensive to elders and others, who have observed fish backed up behind the weir and die-offs in the creek below the weir due to low water levels. It has been argued whether the weir negatively impacts the salmon or these die-offs are natural, but these arguments ignore the fact that the weir contradicts a traditional rule of subsistence salmon management by impeding the movement of fish to their spawning grounds. The complaints against weirs by Southeast Natives is not restricted to the Klawock weir, but the Tlingit people in the Haines area have also expressed opposition against the weir on the Chilkoot River (ADFG Division of Subsistence and Sitka Tribe of Alaska, Southeast Alaska Subsistence Salmon Local Knowledge Database, forthcoming).

The weir in Klawock is needed for the hatchery. The hatchery, itself, is controversial and while some respondents objected to the hatchery for strictly scientific reasons, such as the decline of sockeye due to increased predation of enhanced coho salmon on sockeye salmon; others simply stated that it was bad policy to "mess with mother nature."

Respect toward salmon includes respecting their habitat. Respondents expressed concerns about impacts on salmon redds due to fish technicians walking on the gravel during repeated stream surveys. In addition to the gratitude that Native people demonstrate to individual salmon, traditional subsistence harvesters show respect by

catching only the fish that are needed by the community. The self-limiting needs of subsistence combined with not wasting the catch are two integral rules guiding the traditional management of subsistence salmon harvests. Respondents to this study stated that they didn't understand why they were being regulated when they only took what they needed for their families.

Respect for salmon was also exhibited by the traditional harvest methods employed that avoided harming non-target fish. Male sockeye salmon were selectively harvested from basket traps, a technology that enabled females to be released without harm. According to one elder, harvesters that gaffed salmon in streams aimed to hook the tail peduncle[3]. The method was considered superior to hooking a fish in its mouth where the wounds were considered to be more detrimental to the fish if it got away (Brown et al. 2002).

The care in how one thinks about salmon, speaks about salmon and acts toward an individual salmon, reflects the emphasis indigenous people place on individuals within a population. Western science, in contrast is more concerned with the well being of an entire population.

Sharing as a Harvest Rule: ***S***ubsistence salmon permits and daily bag limits are based on individual and household harvests. This "household" focus of the subsistence permit system does not fit for the extended family, community-based harvest by the Native community. Native subsistence fishers harvest for their traditional households, including parents, siblings, aunts, uncles, grandparents and other extended family members, and for the community at-large including elders, single mothers, and others not able to get their own fish. Some harvesters are fishing for four or more households. Both elders and contemporary harvesters indicated that sharing their catch was one of the traditional rules that they followed. For the most part, harvesters ignore the "proxy" regulations gathering permits from households that they are going to fish for.

Local harvesters still follow the traditional guidelines: "Take what you need. If you do get too much, give it to someone who needs it" (Brown et al. 2002). Elders still informally monitor the subsistence catch to some degree.

Regulatory Compliance: The physical, cultural, social and economic need for sockeye salmon is greater than the desire to follow "white man's rules". When a resource agency's rules directly conflict with traditional rules, the Native subsistence harvester has to choose which set of rules to break and risk offending an elder and going against his cultural value system or being fined for violating government regulations (Brown et al. 2002).

> *If I was to say, "Sorry, Mom. I can't get your fish this year"…Of course, I'd never say that. I'd be an outlaw.* (Brown et al. 2002)

[3] Gaff hook technology differs between the northern and southern Tlingit, and techniques may vary between communities and individuals. Harvesters who still use traditional gaff hooks in the Hoonah region aim behind the head, where their gaff hook is designed to slice through the salmon's backbone and immobilize it.

When regulations do not conform to the culture of subsistence harvesters, more is at stake then just irritating subsistence harvesters. The purpose of subsistence permits is to have a means for monitoring catch numbers, but harvest information is not being reported accurately on permits. Harvesters, who exceed daily bag limits because they are harvesting for more than one household or have more than 20 fish in possession, will generally only report numbers of sockeye salmon up to their legal limit.

Reducing the efficiency of the harvesting method to increase escapement appears to be ineffective as a management tool. Subsistence harvesters respond by increased effort, adapting their technology or fishing until they catch the amount of fish that they perceive is needed by the community. People fish harder and more people fish in order to get their needed sockeye (Brown et al. 2002; Brown 2001). Jack Brown, Jr. (2001) estimated that there were five times more people fishing now, because of fewer fish and that the net sizes had gotten bigger. Another respondent said that the use of three skiffs started after the motor size was limited.

Certain regulations are ignored, although not always intentionally. Few of the key respondents mentioned the regulation requiring subsistence fish to be marked by removing the dorsal fin, although no one was observed removing fins until they arrived on the dock with their catch. Traditionally, and even today, fish are sometimes not gutted until the next day. Few if any harvesters mark their fish by removing fins until they are actually processing the fish. In cases where the salmon is not going to be gutted until the next day, removing the dorsal fin would open up the flesh to bacteria. In the few cases where respondents were aware of this regulation, they complained that they were being singled out when sport fishermen were not required to mark their fish (Brown et al. 2002)

The absence of spears and gaff hooks as a legal gear type on the permits seemed to be more indicative of the lack of effective communication between subsistence harvesters in Klawock and managing biologists in the Ketchikan ADFG office, rather than a conservation concerns. No one in the Ketchikan office remembered why spears and gaff hooks were removed from the permit, yet year after year the prohibition was repeated with each subsequent printing of the new subsistence permit. Meanwhile in the village, elders were unhappy because the prohibition of spears and gaffs on the Klawock permit limited the elders' ability to get mature salmon for boiled fish. As a result of this research, the area management biologist learned of the concern and responded by adding spears and gaffs to the permit.

Comparison of Contemporary and Traditional Management: Traditional Haida and Tlingit societies in Southeast Alaska managed their fishing activities in a manner that allowed for a sustainable yield of sockeye salmon. These management systems included the basic principals and strategies of modern fisheries management within a different cultural context. Both modern and indigenous fisheries management limit who can use the resource, assign managers who oversee the seasonal harvest of sockeye and employ rules that need to be followed to ensure the long term survival of salmon stocks. Today

we call these rules "regulations". In traditional times, harvesting rules were integrated into daily life; they provided basic guidelines for appropriate behavior—respect the resource, don't waste, take only what you need, share. As basic guidelines of a conservation ethic, these rules endured through the centuries, passed on to each new generation by the elders through stories and teachings.

In addition to a basic code of ethics, the Native people had a system of in-season management that was the responsibility of the clan leader. Seasonal openings and closures, harvest quotas, and other regulatory restrictions could be instituted in times of low abundance. The clan leader had the power and responsibility to limit the harvest of salmon from his clan's sockeye stream in accordance with the run strength.

Today, managers count salmon returning to streams and use statistical models to predict fish abundance. In pre-contact Southeast Alaska, clan leaders utilized qualitative observations of abundance and environmental conditions. Unfortunately, early researchers failed to ask elderly respondents about how they managed their fisheries. Did they make pre-season predictions about run strength? Were there special rituals or considerations given to the first salmon to come up the stream? What was the role of the *íx̲t'*? How did they differentiate between salmon stocks? What route did the salmon take to migrate to their stream? Much of the richness of detail has been lost with the passing of elders. The role of the clan leader in regulating the use of the stream seems to be somewhat forgotten by the contemporary harvesters who remember and hear stories from the era before statehood when there were no subsistence regulations.

> *A lot of stories about how it used to be. Just go out and do anything you want whenever you wanted.* (Brown et al. 2002)

Application of Traditional Management Principles

When state or federal regulations conflict with traditional rules and practices, the conflicting governmental regulations are largely ignored. The results of this study suggest that those regulations most aligned to traditional management are the ones most accepted and followed. It follows than that the most effective management of the Klawock fishery would be one that compliments Native traditions while conserving the sockeye salmon stocks. The following list of basic principals of traditional fishing methods and management was compiled based on the historical and contemporary review of the Klawock and Sarkar fisheries:

Place-based management: Fisheries managers (clan leaders) lived on site, participated in the subsistence harvest, and knew what the subsistence needs of the clan were.

In-season management: The clan leaders monitored the return of the salmon and with the help of the *íx̲t"* determined when the clan could begin harvesting salmon. Clan leaders knew how many salmon were needed by the clan and used behavioral observations to monitor the salmon run.

Resource allocation for species with limited abundance: Sockeye streams were allocated to specific clans. Only members of a clan had the rights to fish, a member of another clan had to ask permission for the privilege.

Monitored abundance using qualitative observations as an indicator of run strength. Details are unknown, but observation of fish jumps may have been important.

Fisheries harvest "rules" were integrated into cultural values: Respect, don't waste, share, take only what you need were rules that governed all subsistence activities.

Efficient harvest technologies incorporated built in conservation strategies: Stone traps only fished on the ebb, allowing fish to pass unimpeded on the flood. Essentially, by design of the harvest method, the fishery was only open part of the time.

Strategies for times of low abundance: Clan leaders "closed" a fishery, if the run strength was too low. Clan leaders requested permission from other clans to harvest from another clan's stream or granted permission to other clans to harvest from their stream. Harvest techniques like gaff hooks and basket traps also allowed clans to selectively harvest only the males unless they specifically wanted the eggs for specific products.

Efficient use of resource: The entire salmon had a use including guts for fermenting heads and garden fertilizer. Backbones were smoked or scraped.

Harvest techniques provided for selective harvest: Harvesters could target mature males with spears and gaffs and basket traps allowed people to release females.

No bycatch: Everything was utilized.

Harvest methods favored high fish quality: Capture methods kept fish alive until harvested. Fish were kept live in ponds behind stone traps and in basket traps in the streams until people were ready to process them.

Reciprocity and balance: The basic principals of the Northwest Coastal cultures, including the fishery, were about balance and reciprocity. One respondent described living in balance with the earth as: "no wake behind" (Douville 2002).

CONCLUSIONS

The analysis of this research conducted during this project supports the following conclusions.

- Archeological evidence suggests that people have inhabited Prince of Wales for at least 10,000 years and Klawock River has been inhabited for at least 6,000 years based on the radiocarbon dating of a shell midden located at the current Klawock

hatchery site. An ancient basket found in northeast Prince of Wales potentially links the present day Tlingit people with inhabitants of 6,000 years ago. A proliferation of intertidal stone and wood weirs and traps on Prince of Wales archipelago appears to have occurred around 3,000 years ago during a time when ocean levels stabilized and salmon populations expanded.

- When Europeans first encountered the Native people of Prince of Wales, the Tlingits and Haida provided them with salmon and other fish, in exchange for manufactured goods. The Native fishing technology and skills at the time exceeded the fishing abilities of the newcomers.

- The first canneries were built in Klawock and Sitka in the late 1800s. By the early 1900s, Klawock River sockeye were already showing a decline due to over harvest of sockeye by the canneries and regulations were enacted that lead to the prohibition of traditional Native traps and weirs by the early 1900s. Traditional and customary harvest methods and technology evolved, at least in part, due to regulations prohibiting traditional methods and the involvement of Native people in the commercial fisheries. During the heyday of the canning industry, Klawock and Craig families harvested salmon for home use with commercial purse seines. Sometime after World War II, people went back to using beach seines and hand purse seines, similar to the commercial gear use in the late 1800s, except the seine skiffs had outboard motors.

- Reversible gaffs/ spears were used on rivers prior to European contact and continue to be used today on Klawock River, despite an undetermined period of time, maybe as early as the1960s and ending in 2003, during which time spears and gaffs were omitted off the State subsistence salmon permits for Klawock as legal gear types. In the past, clubs were also used to harvest salmon in shallow water.

- Prior to the commercialization of salmon, the Tlingit and Haida people had a sophisticated system of fisheries management based on allocation of sockeye stocks according to clan or house group. Cannery owners in the 1900s ignored the traditional ownership rights of the Native people and the proliferation of cannery owned floating commercial fish traps bypassed the commercial fishermen.

- Beach seines used like hand purse seines are the predominant method used for harvesting sockeye salmon in Klawock Inlet and at Sarkar Cove. Dip nets are also used in both sites at the mouth of both rivers. Rod and reel are also used to snag sockeye salmon.

- The native people of Craig and Klawock feel a cultural, physical and economic need for salmon. Subsistence regulations that do not comply with traditional and customary Native practices frustrate harvesters and may be ineffective as a tool for conserving sockeye salmon stocks. Regulations which attempt to make the

subsistence fishery more inefficient are not constructive, because harvesters will attempt to harvest the number of sockeye needed by their families by fishing harder, adapting their technology or ignoring regulations. Regulations that were consistent with traditional fisheries management such as periodic closures to let escapement into the river appeared to be most accepted.

- A major problem with the regulations is the focus on individual households that does not accommodate the formal distribution networks and informal sharing that occurs throughout the community. The result may be an underreporting on the subsistence salmon permit for those harvesters fishing for numerous households.

- The restrictions of motor size in Klawock forced some residents to give up fishing their own boats. Those who cannot afford to buy a smaller motor, fish on other captain's boats, depend on others to get their fish or go to other streams to get their sockeye.

- Contemporary harvesters were largely unaware of the open public process that creates subsistence regulations. Regulations, for the most part were viewed as rules imposed on harvesters by State or Federal agencies, although some of the recent regulations had been proposed to the Board of Fisheries by community members concerned about the diminishing Klawock sockeye salmon stocks.

- A significant portion of the Klawock escapement has occurred after the subsistence fishery closed in recent years. Contemporary harvesters and others are concerned that the short three-week season is concentrating the subsistence fishery on one segment of the sockeye salmon run, and in the long term may seriously deplete a portion of the sockeye run unless the fishing effort is spread out over a longer period of time in the future.

- Most harvesters supported a two-day closure to allow sockeye past the fishery, although a majority of respondents spoke against the weekend closures, preferring the closures to happen mid-week. Weekend closure has made it harder for working residents to fish themselves so they depend on others to get their fish, may go before or after work or fish other areas on the weekends. Few respondents knew the impetus behind the weekend closure: to reduce the harvest of Klawock sockeye salmon by residents from other communities.

- Perceived impacts affecting local sockeye stocks included the commercial purse seine fishery, the hatchery and weir, off-shore foreign interception, pollution, predation, decline of prey species, logging, the causeway over the estuary, the charter fishing industry, overharvest by subsistence fishers, parasites, researchers walking on spawning habitat, and natural weather cycles.

RECOMMENDATIONS

The recommendations, based on the analysis and conclusions from this research, fall under three categories: 1) communication, 2) research and 3) management.

Communication

A communication and education strategy should be designed and implemented to better communicate the regulatory process, foster intercultural understanding and resolve conflicts.

(1) Subsistence regulations need to be presented in a form that people can understand. A booklet specific to Prince of Wales could include results of Klawock and Sarkar biological and subsistence research, changes in regulations (including who proposed them and why), the value of reporting accurate harvests and information about the Board of Fisheries process.

(2) Improved intercultural communication training for fisheries managers and others including traditional styles of conflict resolution.

(3) Incorporate intercultural conflict management processes to resolve and reduce fisheries management conflicts. Explore other options besides the typical governmental public meeting approach, such as traditional Tlingit or Haida methods of conflict resolution and problem-solving strategies.

(4) Provide curriculum or resource materials to educate high school and middle students about the science and history of subsistence salmon including the biology, history, and management of the Klawock and Sarkar subsistence fisheries.

Research

(1) Expand the Klawock Lake Sockeye Salmon Stock Assessment Project being conducted by ADFG in the Klawock watershed to include a daily and weekly estimate of subsistence harvests and conduct an analysis to better understand the relationships between run timing, weather, tides and subsistence harvests. Determine if a two-day closure on the weekends is sufficient to allow escapement into the river during the subsistence fishery.

(2) Employ genetic stock assessment methods to better assess interception of Klawock sockeye in the commercial seine fisheries.

(3) Conduct genetic sampling to better determine temporal and spatial patterns of sockeye movements within the Klawock watershed.

(4) Conduct research incorporating biological investigations with local and traditional knowledge of Native seine boat captains concerning sockeye migrations, run timing and abundance. Collaborate with native seine boat captains to employ local observers and record species composition of specific hook-off points and areas of high sockeye abundance, collect scale samplings for aging, measure gonad size of female salmon to determine maturity and collect genetic samples to determine if there is a spatial or temporal pattern of sockeye movements within Statistical Areas 103 and 104 in relation to oceanic conditions.

5) Determine the run timing of hatchery sockeye salmon in relation to wild stocks.

6) Conduct a risk assessment on the hatchery so that the costs can be assessed and benefits maximized. Evaluate the hatchery program in regards to positive and negative impacts on target and non-target species. Any increase in hatchery production cannot be recommended at this time until a risk assessment has been accomplished.

Subsistence Fisheries Management

Regulations would be more effective if they conformed to the local native culture. It has been suggested that we need to return to place-based management in subsistence fisheries incorporating traditional ethics and principals (Jones and Williams Davidson 2000). Some of the traditional fisheries management principals that might be applied are:

> Fisheries management based on balance and reciprocity: develop a community harvest permit based on community need and harvest reporting pooled by the IRA or other entity and reported to ADFG as number of harvesters, number of households fished for, number of fish caught.
>
> Strategy for years with low abundance: develop a strategy with local harvesters for years with poor sockeye salmon returns—such as (1) use of other streams; (2) selective harvest practices (for example, taking only male sockeye salmon from beach seines or utilizing other gear types including spears and gaffs or traps that allow females to be released unharmed; (3) limit interception of sockeye salmon by commercial fishery; and/or (3) institute a community fishery with sockeye salmon pooled and distributed by the IRA (Peratrovich 2001).
>
> Avoid impeding salmon migration upstream: if other methods besides weir counts could be used to determine escapement numbers—such as mark recapture estimates—leave the weir open during the sockeye salmon run, until the coho salmon arrive. Explore ways to get sockeye salmon that come in after the coho salmon arrive past the weir efficiently.
>
> Conduct in-season monitoring and management. Involve local residents in the process of monitoring the fishery. In some cases, the Canadians Department of

Fisheries and Oceans hires a local technician to gather harvest numbers from local people, which are reported weekly.

Change the current Klawock River regulations to make the opening and closing dates of the fishery more flexible and allow the area management biologist to make seasonal openings and closures based on the run strength. Traditionally, some clans allowed a certain amount of fish "the first run" into the river before they began harvesting. Close the fishery when the community has enough fish or by emergency order when necessary.

Have periodic closures during the week to allow sockeye escapement passed the fishery. Traditionally, these were built into the harvest techniques, because the intertidal traps only captured salmon during a certain stage of the ebb tide. Fish could move upriver during the flood tide when the weather and tidal conditions were ideal, and be harvested efficiently during the ebb as salmon were milling around the estuary. In lieu of openings and closures based on tides, the best pattern needs to be identified to balance escapement and harvest efficiency. The two-day weekend closure doesn't appear to be sufficient to allow escapement during the subsistence fishery and may need to be expanded to encompass more days in a row. Or an every-other-day approach to openings and closures--for example opening the fishery from 12:01 am to midnight on Monday, Wednesday and Friday and closing at noon Saturday--may best balance harvests and escapement. In either case, the season should be extended to spread out the fishing effort over a longer period of time.

Careful handling of salmon catch: Do not require the removal of the dorsal fin, which exposes the salmon flesh to bacteria prematurely. This is not required in other areas of the state. If enforcement feels the marking of subsistence fish is absolutely necessary, have the harvester remove the pectoral fin rather than the dorsal fin. Also, it would be less confusing if the federal and state regulations required the same fin to be removed.

Do not tolerate waste: Allow the Chinook salmon bycatch in seine fishery to be delivered to either the Craig or Klawock IRAs and distributed to elders. Prohibit individual fishermen from being able to keep the chinook salmon for themselves. If a seine boat is boarded by enforcement and found to have chinook, the captain could be required to provide proof of delivery to the IRA within a reasonable time period.

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APPENDIX A. POPULATION AND DEMOGRAPHICS OF CRAIG AND KLAWOCK

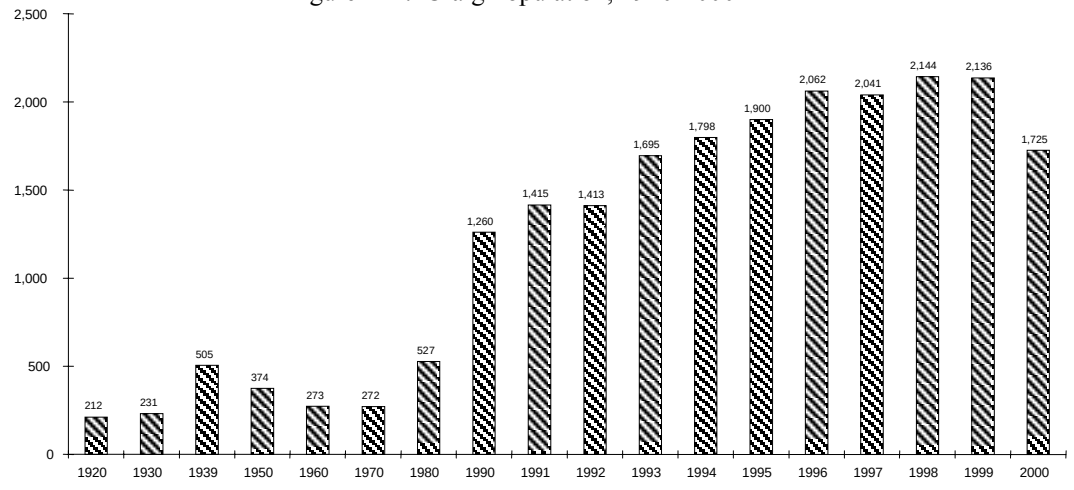
Excerpt from: Report to the Federal Subsistence Board, ADFG Division of Subsistence, August 2002

The Community of Craig

Craig appears in the U.S. Census of Population for the first time in 1920, with a population of 212. By 1939 the population had more than doubled to 505. Paralleling the decline in the salmon canning industry in the decades following, Craig lost population in the 1940s, 50s and 60s, reaching a low of 272 in 1970. During the 1970s Craig began to grow again, reflecting increasing logging activity. By 1980 Craig had more than regained its earlier high, and the during the decade of the 1980s, the town and adjacent residential area experienced a growth spurt, reaching a population of 1,260 in 440 households by 1990. That trend continued through 1998 reaching a population high of 2,144 in that year. Since 1998, with the decline in logging activity on Prince of Wales Island, Craig has experienced a drop in population. The 2000 Census of Population reports a population of 1,725 and a household count of 631 for the area encompassed by the Craig Alaska Native Village Statistical Area, which encompasses the town of Craig, plus the population residing on the adjacent lands selected by the Craig Native village corporation (Appendix Figure A-1).

Based on the 1990 census, the mean size of households in Craig was 2.84. By 2000 the average household size was 2.67. The median age of the population in Craig in 2000 was 33.7 years. Alaska Natives represented 29% of the population of Craig.

Figure A-1. Craig Population, 1920-2000



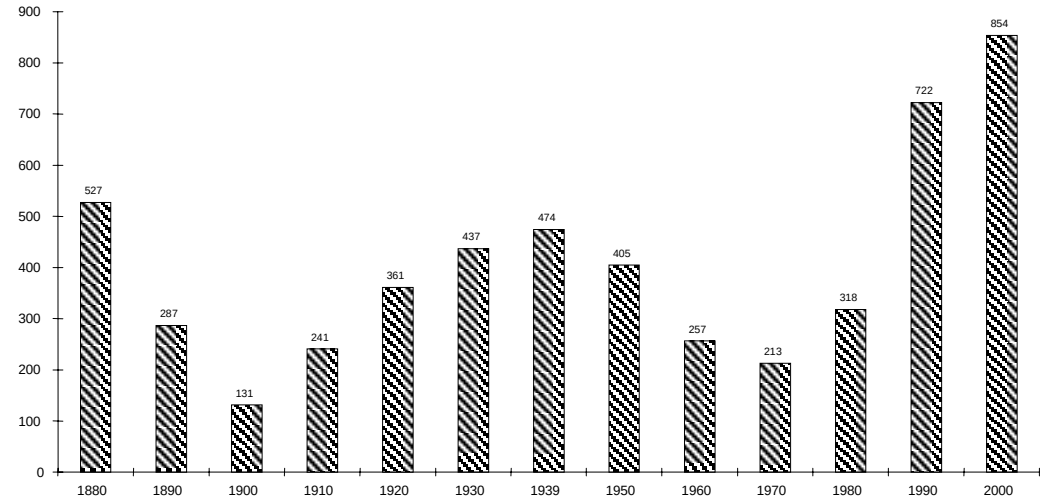
Sources: U.S. Census of Population and Alaska Department of Labor estimates

Figure A- 1. Craig Population, 1920-2000

The Community of Klawock

The community of Klawock appears in the U.S. Census of Population for the first time in 1880, with a population of 527, and has experienced fluctuations during the following decades, until the 1980s. From a population of 318 in 1980, Klawock grew dramatically during the 1980s, reaching 722 by 1990, an increase of 127%. There were 241 Klawock households in 1990, with a mean household size of 3.0. This increase was the result of growth in the timber industry on Prince of Wales Island, attracting loggers and others in timber industry support services from the lower 48. The decade of the 1990s continued high population levels, although there was some decline in the last four years of the decade. The 2000 Census of Population reports a population of 854 for Klawock, (Appendix Figure A-2) and a household count of 313. In 2000 the average household size was 2.73. The median age of the population in Klawock in 2000 was 34.5 years. Alaska Natives represented 58.1% of the population of Klawock.

Figure A-2. Klawock Population, 1880-2000



Sources: U.S. Population censuses; Alaska Department of labor population estimates.

Figure A- 2. Klawock Population, 1880-2000

APPENDIX B. DEFINITION OF LOCAL ECOLOGICAL KNOWLEDGE

The term "local ecological knowledge" was used in this report to reflect the geographical context and dynamic continuity of traditional knowledge. These terms are further described in the following excerpt (Turek and Brock 2005):

> *Traditional Ecological Knowledge (TEK) is often interchanged with a variety of similar terms, such as traditional knowledge and local knowledge (Bielawski 1992; Brouwer 1998). TEK, traditional knowledge and local knowledge refer to the sum total of the knowledge and skills that people in a particular geographic area possess which enable them to get the most out of their natural environment. TEK, traditional knowledge and local knowledge describe locally-specific knowledge which is cumulative and adaptive (Vanek 2003). Most of this knowledge has been passed down from earlier generations, but individual men and women in each new generation adapt and add to this body of knowledge in a constant adjustment to changing circumstances and environmental conditions (Brouwer 1998, quoting Grenier 1998). TEK, traditional knowledge and local knowledge are terms used to differentiate the knowledge developed by a given community from the international knowledge system, sometimes also called the* Western *system, generated through universities, government research centers and private industry. These terms refer to the knowledge of indigenous peoples as well as any other defined community (Warren 1992: 3-4).*

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APPENDIX C. INTERVIEW QUESTIONS

(NOTE: There was no set interview schedule. Interviews were geared toward the expertise of the respondent. The following list of questions represents the topics covered during all the interviews.

Personal Fishing History

1. Age of Respondent
2. Length of time fishing
3. Who taught you how to fishing
4. Relationship to person or people that taught you?
5. First jobs on the boat
6. Who do you fish with?
7. Do you always fish with the same people?
8. Relationship to people you fish with.?
9. How much time do you spend in the summer fishing?
10. What were the rules you were taught about fishing when you were learning?

Distribution of Fish

1. Number of people or households fished for
2. Number of fish needed per household
3. Relationship of people to harvester
4. Is the community getting all the fish they need?

Processing and Products

1. Where are fish processed?
2. Does processing occur immediately or sometime later?
3. What products do you make from sockeye?
4. Are the fish taken from farther up the river used for different products than the ones taken in the salt water?
5. Do (did) you take red sockeye for dry fish? For boiled fish?
6. What products did you used to make in the past?
7. Has the way of processing changed from when you were younger?

Areas fished

1. Where do you fish?
2. Do you ever fish upstream of the bridge?
3. Are there people who prefer fishing east of the bridge? Why?
4. Do you get fish from the river? From the lake or inlet streams?
5. Do other people get their fish from these areas?
6. Do you fish other places besides Klawock?
7. Did you ever fish Sarkar/ Deweyville?
8. Do you know anyone who fishes there?
9. Are there people who fish Deweyville more than here?
10. Are there advantages to fishing Deweyville over Klawock?

Possible Impacts to Sockeye Abundance

1. Do you have an opinion about why the sockeye are declining?
2. What do you think of the hatchery?
3. Do you think logging had any impact on the sockeye?
4. Does commercial fishing impact subsistence?
5. Do the charter boats have any impact on subsistence?

Current methods of Harvesting

1. Modern equipment used
2. Changes of methods/ gear during lifetime
3. Changes during parents lifetime
4. Did you ever use spears, gaff hooks, dipnets…?
5. Do you or someone you know dipnet fish from the river or river mouth? Did they dipnet this year?
6. Do/Did you get subsistence fish from a commercial catch?
7. When did subsistence seine nets first come into use?
8. What is the history of cannery fish traps in the inlet or river? Who managed these traps? Did people also get subsistence fish from these traps?
9. What were the Historic/ Traditional fishing methods?
11. Where and how do people fish at Sarkar?

Knowledge of Sockeye Abundance, Timing, etc.

1. Have you seen any changes in the number of sockeye or the timing of the run.
2. Indicators of Sockeye abundance?
3. Was it easier to get your fish in the past or now?
4. Other changes noticed?
5. Memory or record of more than one sockeye run or peak?
6. Traditional ways of assessing sockeye abundance?
7. Are there any changes in run strength or timing in Sarkar/ Deweyville?
8. Do fish from Sarkar look different than Klawock fish?

Regulations

1. Do the regulations make sense to you?
2. Do you think anything needs to be changed? If so, what would you change?

Traditional Native Fishery Management

1. What kind of rules did the Native people have about when or how they harvested salmon?
2. How did Native people judge how abundant the fish were going to be for a particular year.
3. How did each clan monitor the stream that they had responsibility for?
4. Did they have special practices or ceremonies to ensure the health of the run or to welcome the fish back to the stream?
5. What did Native people do in years when the abundance was low.
6. What are the major clans in Craig and Klawock, today?

Proposals

1. Someone proposed getting subsistence fish from a commercial seine boat. What do you think of this idea?

APPENDIX D. SITE MAPS AND AERIAL PHOTOGRAPHS

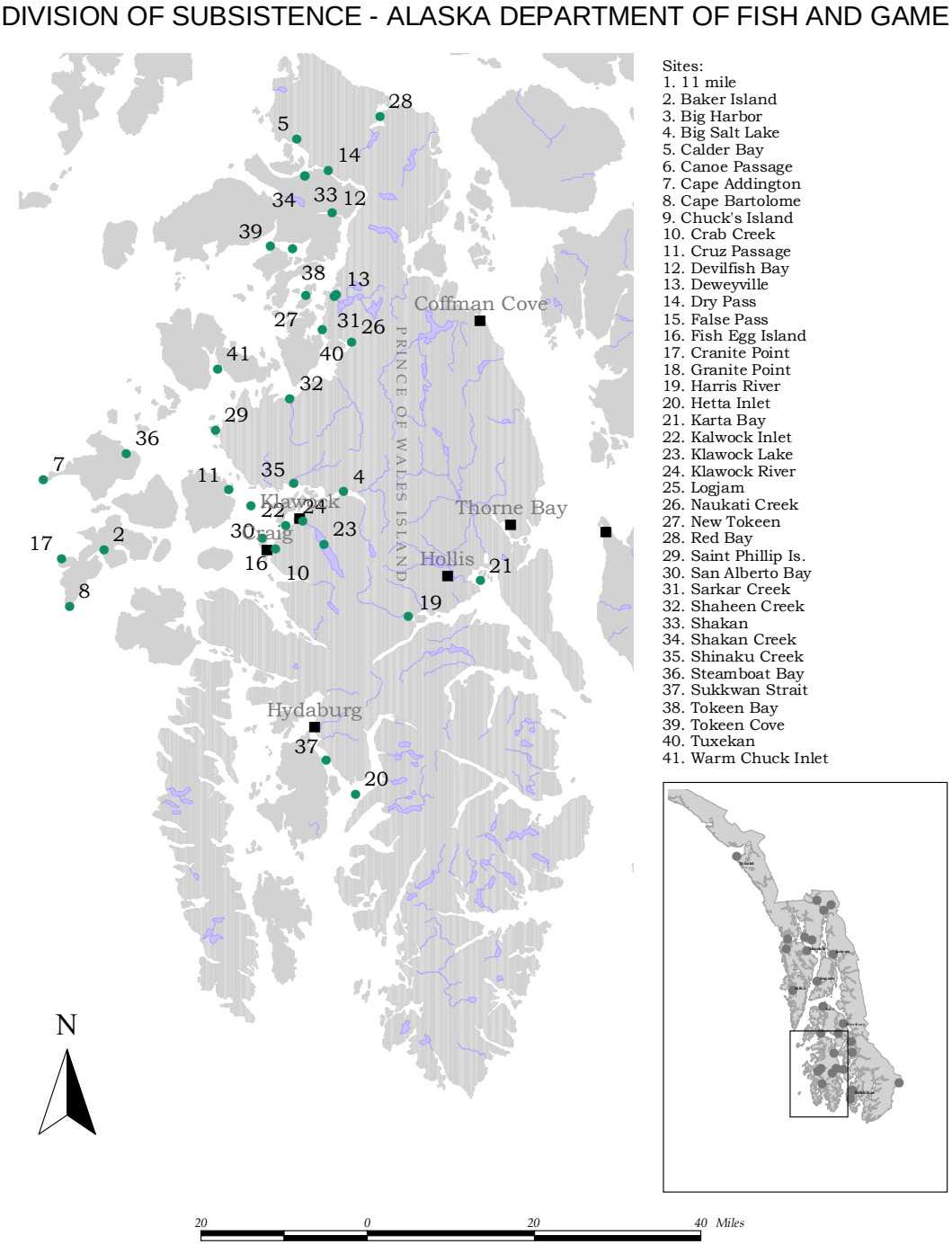

Figure D- 1. Site Map of Prince of Wales Island and Archipelago.

Figure D- 2. Aerial Photograph of Klawock Inlet

Figure D- 3. Aerial Photograph of Klawock River

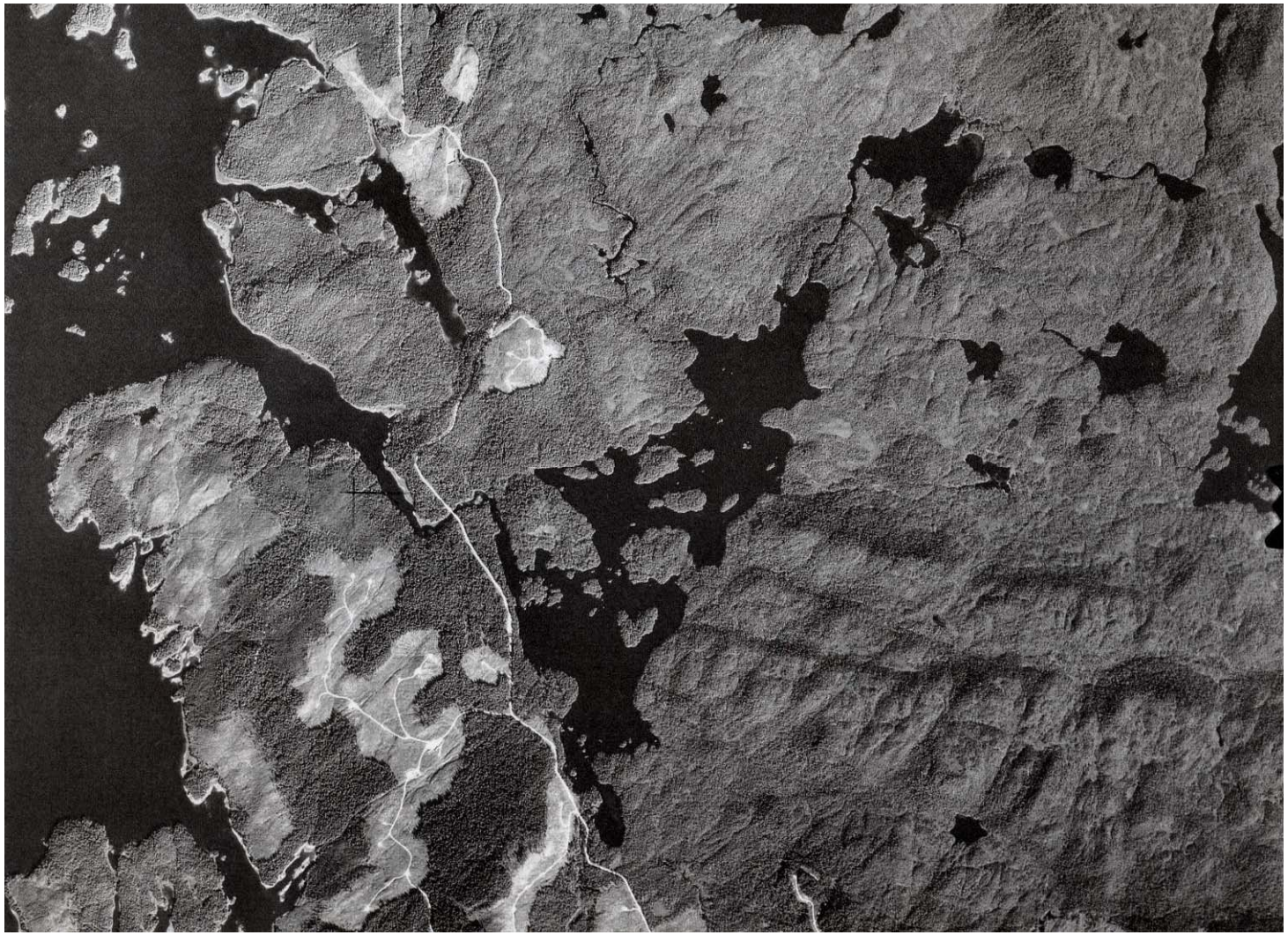

Figure D- 4. Aerial Photograph of Sarkar River.

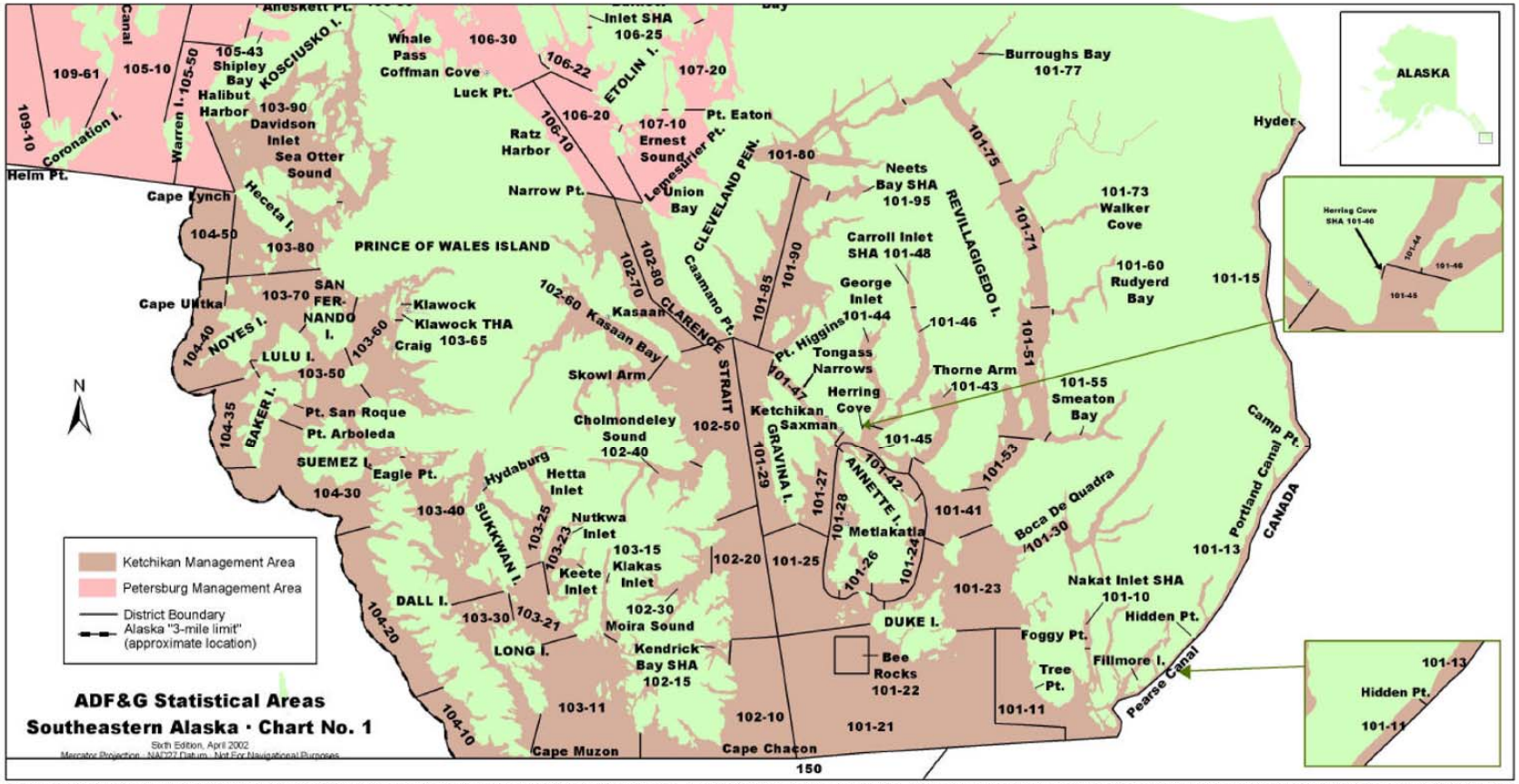

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Figure D- 5. Map of ADF&G Statistical Areas, West Coast of Prince of Wales Island Including Sarkar Cove and Klawock Inlet.

APPENDIX E. BIOLOGICAL AND COMMERCIAL HARVEST DATA

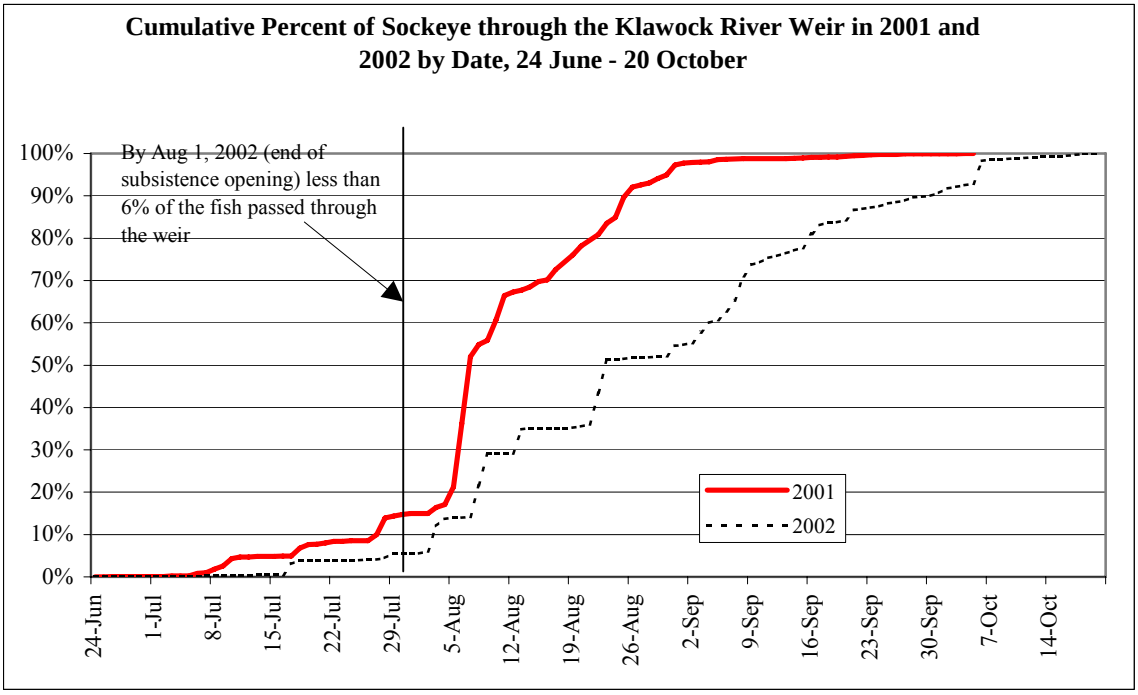
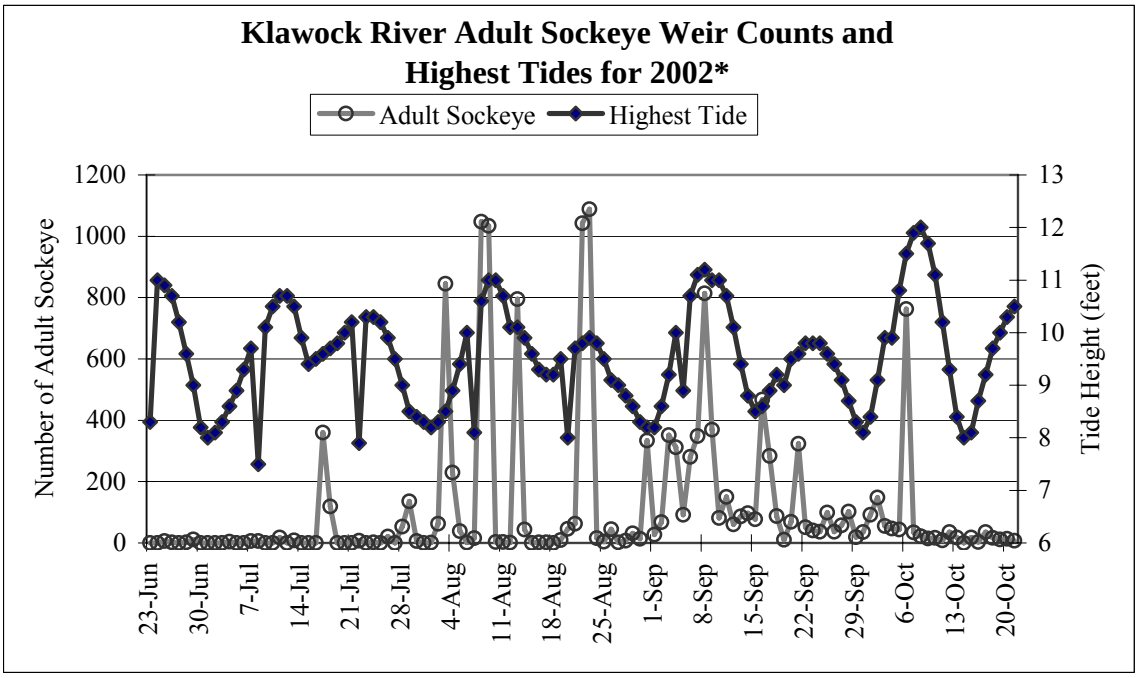


Figure E- 1. Cumulative Percentages of Sockeye Salmon Counted Through the Klawock River Weir in 2001 and 2002 between 24 June and 20 October.



Source: ADFG Division of Commercial Fisheries, Alexander: Integrated Fisheries Database for Southeast Alaska and Yakutat, Ver. 3.6

Figure E- 2. Klawock River Adult Sockeye Weir Counts and Highest Tides for 2002.

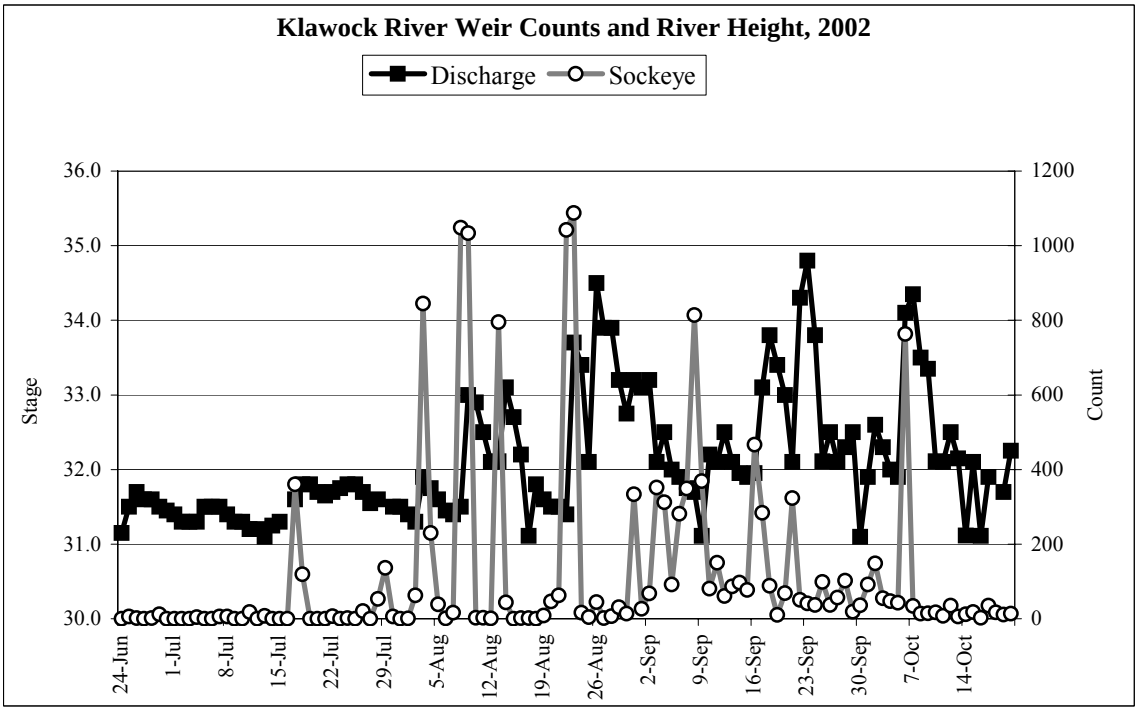


Figure E- 3. Klawock River Weir Counts and River Height, 2002.

Table E- 1. Sockeye Salmon Weir Counts at Sarkar River, 1982 and 1983

Year	Observation Date	Statistical Week	# of Sockeye	Cumm. Total	Cumm. %
1982	6/14/1982	25	6	6	0.1%
1982	6/15/1982	25	3	9	0.1%
1982	6/16/1982	25	940	949	11.6%
1982	6/17/1982	25	0	949	11.6%
1982	6/18/1982	25	54	1,003	12.3%
1982	6/19/1982	25	250	1,253	15.4%
1982	6/20/1982	26	3	1,256	15.4%
1982	6/21/1982	26	150	1,406	17.2%
1982	6/22/1982	26	19	1,425	17.5%
1982	6/23/1982	26	14	1,439	17.6%
1982	6/24/1982	26	24	1,463	17.9%
1982	6/25/1982	26	1,625	3,088	37.9%
1982	6/26/1982	26	19	3,107	38.1%
1982	6/27/1982	27	0	3,107	38.1%
1982	6/28/1982	27	35	3,142	38.5%
1982	6/29/1982	27	27	3,169	38.9%
1982	6/30/1982	27	7	3,176	38.9%
1982	7/1/1982	27	802	3,978	48.8%
1982	7/2/1982	27	0	3,978	48.8%
1982	7/3/1982	27	114	4,092	50.2%
1982	7/4/1982	28	53	4,145	50.8%
1982	7/5/1982	28	1,221	5,366	65.8%
1982	7/6/1982	28	338	5,704	69.9%
1982	7/7/1982	28	0	5,704	69.9%
1982	7/8/1982	28	0	5,704	69.9%
1982	7/9/1982	28	293	5,997	73.5%
1982	7/10/1982	28	0	5,997	73.5%
1982	7/11/1982	29	12	6,009	73.7%
1982	7/12/1982	29	130	6,139	75.3%
1982	7/13/1982	29	345	6,484	79.5%
1982	7/14/1982	29	15	6,499	79.7%
1982	7/15/1982	29	684	7,183	88.1%
1982	7/16/1982	29	100	7,283	89.3%
1982	7/17/1982	29	72	7,355	90.2%
1982	7/18/1982	30	0	7,355	90.2%
1982	7/19/1982	30	0	7,355	90.2%
1982	7/20/1982	30	0	7,355	90.2%
1982	7/21/1982	30	0	7,355	90.2%
1982	7/22/1982	30	0	7,355	90.2%
1982	7/23/1982	30	0	7,355	90.2%
1982	7/24/1982	30	500	7,855	96.3%
1982	7/25/1982	31	0	7,855	96.3%
1982	7/26/1982	31	0	7,855	96.3%
1982	7/27/1982	31	0	7,855	96.3%
1982	7/28/1982	31	0	7,855	96.3%
1982	7/29/1982	31	0	7,855	96.3%
1982	7/30/1982	31	0	7,855	96.3%
1982	7/31/1982	31	0	7,855	96.3%

Year	Observation Date	Statistical Week	# of Sockeye	Cumm. Total	Cumm. %
1982	8/1/1982	32	0	7,855	96.3%
1982	8/2/1982	32	1	7,856	96.3%
1982	8/3/1982	32	3	7,859	96.3%
1982	8/4/1982	32	0	7,859	96.3%
1982	8/5/1982	32	35	7,894	96.8%
1982	8/6/1982	32	66	7,960	97.6%
1982	8/7/1982	32	2	7,962	97.6%
1982	8/8/1982	33	23	7,985	97.9%
1982	8/9/1982	33	0	7,985	97.9%
1982	8/10/1982	33	21	8,006	98.1%
1982	8/11/1982	33	0	8,006	98.1%
1982	8/12/1982	33	17	8,023	98.4%
1982	8/13/1982	33	26	8,049	98.7%
1982	8/14/1982	33	2	8,051	98.7%
1982	8/15/1982	34	91	8,142	99.8%
1982	8/16/1982	34	1	8,143	99.8%
1982	8/17/1982	34	2	8,145	99.9%
1982	8/18/1982	34	0	8,145	99.9%
1982	8/19/1982	34	1	8,146	99.9%
1982	8/20/1982	34	1	8,147	99.9%
1982	8/21/1982	34	10	8,157	100.0%
1982	**Total**	**Weeks 25-34**	**8,157**		
1983	6/16/1983	25	1	1	0.0%
1983	6/17/1983	25	0	1	0.0%
1983	6/18/1983	25	0	1	0.0%
1983	6/19/1983	26	0	1	0.0%
1983	6/20/1983	26	0	1	0.0%
1983	6/21/1983	26	13	14	0.6%
1983	6/22/1983	26	0	14	0.6%
1983	6/23/1983	26	219	233	9.9%
1983	6/24/1983	26	70	303	12.9%
1983	6/25/1983	26	2	305	13.0%
1983	6/26/1983	27	42	347	14.7%
1983	6/27/1983	27	10	357	15.2%
1983	6/28/1983	27	3	360	15.3%
1983	6/29/1983	27	0	360	15.3%
1983	6/30/1983	27	65	425	18.1%
1983	7/1/1983	27	45	470	20.0%
1983	7/2/1983	27	51	521	22.1%
1983	7/3/1983	28	201	722	30.7%
1983	7/4/1983	28	0	722	30.7%
1983	7/5/1983	28	0	722	30.7%
1983	7/6/1983	28	5	727	30.9%
1983	7/7/1983	28	0	727	30.9%
1983	7/8/1983	28	35	762	32.4%
1983	7/11/1983	29	7	769	32.7%
1983	7/12/1983	29	6	775	32.9%

Year	Observation Date	Statistical Week	# of Sockeye	Cumm. Total	Cumm. %
1983	7/13/1983	29	0	775	32.9%
1983	7/14/1983	29	2	777	33.0%
1983	7/15/1983	29	76	853	36.2%
1983	7/16/1983	29	28	881	37.4%
1983	7/17/1983	30	6	887	37.7%
1983	7/18/1983	30	8	895	38.0%
1983	7/19/1983	30	0	895	38.0%
1983	7/20/1983	30	12	907	38.5%
1983	7/21/1983	30	474	1,381	58.7%
1983	7/22/1983	30	49	1,430	60.7%
1983	7/23/1983	30	35	1,465	62.2%
1983	7/24/1983	31	38	1,503	63.8%
1983	7/25/1983	31	13	1,516	64.4%
1983	7/26/1983	31	263	1,779	75.6%
1983	7/27/1983	31	20	1,799	76.4%
1983	7/28/1983	31	6	1,805	76.7%
1983	7/29/1983	31	14	1,819	77.3%
1983	7/30/1983	31	54	1,873	79.6%
1983	7/31/1983	32	93	1,966	83.5%
1983	8/1/1983	32	78	2,044	86.8%
1983	8/2/1983	32	33	2,077	88.2%
1983	8/3/1983	32	13	2,090	88.8%
1983	8/4/1983	32	84	2,174	92.4%
1983	8/5/1983	32	73	2,247	95.5%
1983	8/6/1983	32	17	2,264	96.2%
1983	8/7/1983	33	10	2,274	96.6%
1983	8/8/1983	33	8	2,282	96.9%
1983	8/9/1983	33	11	2,293	97.4%
1983	8/11/1983	33	5	2,298	97.6%
1983	8/12/1983	33	6	2,304	97.9%
1983	8/13/1983	33	2	2,306	98.0%
1983	8/14/1983	34	1	2,307	98.0%
1983	8/15/1983	34	13	2,320	98.6%
1983	8/16/1983	34	9	2,329	98.9%
1983	8/18/1983	34	18	2,347	99.7%
1983	8/19/1983	34	7	2,354	100.0%
1983	**Total**	**Weeks 25-34**	**2,354**		

Table E- 2. Klawock River Sockeye Salmon Weir Counts and Commercial Purse Seine Catch Following the Northern Migration Route

Following the Northern Migration Route (Demmert 1944):

Arriaga Passage to San Christoval Channel (Eleven Mile shore)

				SOCKEYE SALMON				
				Seine Sockeye Harvests in Subdistricts			Weir Counts	
YEAR	STAT_WEEK	Beginning Date	Ending Date	104-40	103-70	103-60	103-60-47	Notes
2003	**26**	22-Jun	28-Jun				1	
	27	29-Jun	5-Jul				8	
	28	6-Jul	12-Jul	819			6	Subs. Fishery opened 7/7/03
	29	13-Jul	19-Jul	7,572			51	
	30	20-Jul	26-Jul	27,405	746		124	
	31	27-Jul	2-Aug	22,555	1,441		190	Subs. Fishery closed 7/31/03
	32	3-Aug	9-Aug	37,139	3,820	160	1271	
	33	10-Aug	16-Aug	14,893	4,258	1,307	1412	
	34	17-Aug	23-Aug	40,969	986	337	1112	
	35	24-Aug	30-Aug	9,664	490	4	202	
	36	31-Aug	6-Sep				521	
	37-43	7-Sep	25-Oct				1300	
				161,016	**11,741**	**1,808**	**6,198**	
2002	**26**	23-Jun	29-Jun				22	
	27	30-Jun	6-Jul				4	
	28	7-Jul	13-Jul	351			39	Subs. Fishery opened 7/8/02
	29	14-Jul	20-Jul	4,193			480	
	30	21-Jul	27-Jul	7,653			32	
	31	28-Jul	3-Aug	2,953			1,110	Subs. Fishery closed 7/31/02
	32	4-Aug	10-Aug	1,577	354		2,401	
	33	11-Aug	17-Aug	531	316		849	
	34	18-Aug	24-Aug	75	84	8	2,279	
	35	25-Aug	31-Aug	328	167	34	448	
	36	1-Sep	7-Sep				1,485	
	37-47	8-Sep	7-Dec				5,147	
				17,661	**921**	**42**	**14,296**	
2001	**25**	17-Jun	23-Jun				6	
	26	24-Jun	30-Jun				10	
	27	1-Jul	7-Jul	1,671			321	
	28	8-Jul	14-Jul	51,864			155	Subs. Fishery opened 7/9/01
	29	15-Jul	21-Jul	49,087	1,882		127	
	30	22-Jul	28-Jul	4,283	10,333		499	
	31	29-Jul	4-Aug	130,377	2,658		3,032	Subs. Fishery closed 7/31/01
	32	5-Aug	11-Aug	36,371	3,237	47	1,288	
	33	12-Aug	18-Aug	6,446	1,368	232	1,003	
	34	19-Aug	25-Aug	6,288	817	73	1,085	
	35	26-Aug	1-Sep	2,466	519	21	347	
	36	2-Sep	8-Sep			-	16	
	37-42	9-Sep	20-Oct				177	
				288,853	**20,814**	**373**	**8,066**	

Source: ADFG Division of Commercial Fisheries, Alexander: Integrated Fisheries Database for Southeast Alaska & Yakutat, Ver. 3.6

Table E- 3. Klawock River Weir Sockeye Salmon Counts with the Commercial Purse Seine Harvests Following the Southern Migration Route

Southern Migration Route: Bucareli Bay past Fern Point on San Fernando Island

YEAR	STAT WEEK	Beginning Date	Ending Date	Sockeye Harvests by Purse Seiners by Subdistricts					Weir Counts	Notes
				104-40	104-35	104-30	103-50	103-60	103-60-47	
2003	**26**	22-Jun	28-Jun						1	
	27	29-Jun	5-Jul						8	
	28	6-Jul	12-Jul	819					6	Subs. Fishery opened 7/7/03
	29	13-Jul	19-Jul	7,572	6,496	415			51	
	30	20-Jul	26-Jul	27,405	20,406		19		124	
	31	27-Jul	2-Aug	22,555	15,191	796			190	Subs. Fishery closed 7/31/03
	32	3-Aug	9-Aug	37,139	12,478	225	1,224	160	1271	
	33	10-Aug	16-Aug	14,893	5,437	24	265	1,307	1412	
	34	17-Aug	23-Aug	40,969	1,130	18	280	337	1112	
	35	24-Aug	30-Aug	9,664			20	4	202	
	36	31-Aug	6-Sep						521	
	37-43	7-Sep	25-Oct						1300	
			Totals	**161,016**	**61,138**	**1,478**	**1,808**	**1,808**	**6,198**	
2002	**26**	23-Jun	29-Jun						22	
	27	30-Jun	6-Jul						4	
	28	7-Jul	13-Jul	351	94				39	Subs. Fishery opened 7/8/02
	29	14-Jul	20-Jul	4,193	2,283				480	
	30	21-Jul	27-Jul	7,653	1,059				32	
	31	28-Jul	3-Aug	2,953	567	85			1,110	Subs. Fishery closed 7/31/02
	32	4-Aug	10-Aug	1,577	163	72	89		2,401	
	33	11-Aug	17-Aug	531	2	72	75		849	
	34	18-Aug	24-Aug	75		63	83	8	2,279	
	35	25-Aug	31-Aug	328		3	11	34	448	
	36	1-Sep	7-Sep						1,485	
	37-47	8-Sep	7-Dec						5,147	
			Totals	**17,661**	**4,168**	**295**	**258**	**42**	**14,296**	
2001	**25**	17-Jun	23-Jun						6	
	26	24-Jun	30-Jun						10	
	27	1-Jul	7-Jul	1,671	301				321	
	28	8-Jul	14-Jul	51,864	6,428	1,566			155	Subs. Fishery opened 7/9/01
	29	15-Jul	21-Jul	49,087	17,216	2,570			127	
	30	22-Jul	28-Jul	4,283	3,533				499	
	31	29-Jul	4-Aug	130,377	43,144	2,360			3,032	Subs. Fishery closed 7/31/01
	32	5-Aug	11-Aug	36,371	14,480	2,154	288	47	1,288	
	33	12-Aug	18-Aug	6,446	3,958	205	54	232	1,003	
	34	19-Aug	25-Aug	6,288	1,827	106	73	73	1,085	
	35	26-Aug	1-Sep	2,466	0	3	57	21	347	
	36	2-Sep	8-Sep					0	16	
	37-42	9-Sep	20-Oct						177	
			Totals	**288,853**	**90,887**	**8,964**	**472**	**373**	**8,066**	

Source: ADFG Division of Commercial Fisheries, Alexander: Integrated Fisheries Database for Southeast Alaska & Yakutat, Ver. 3.6

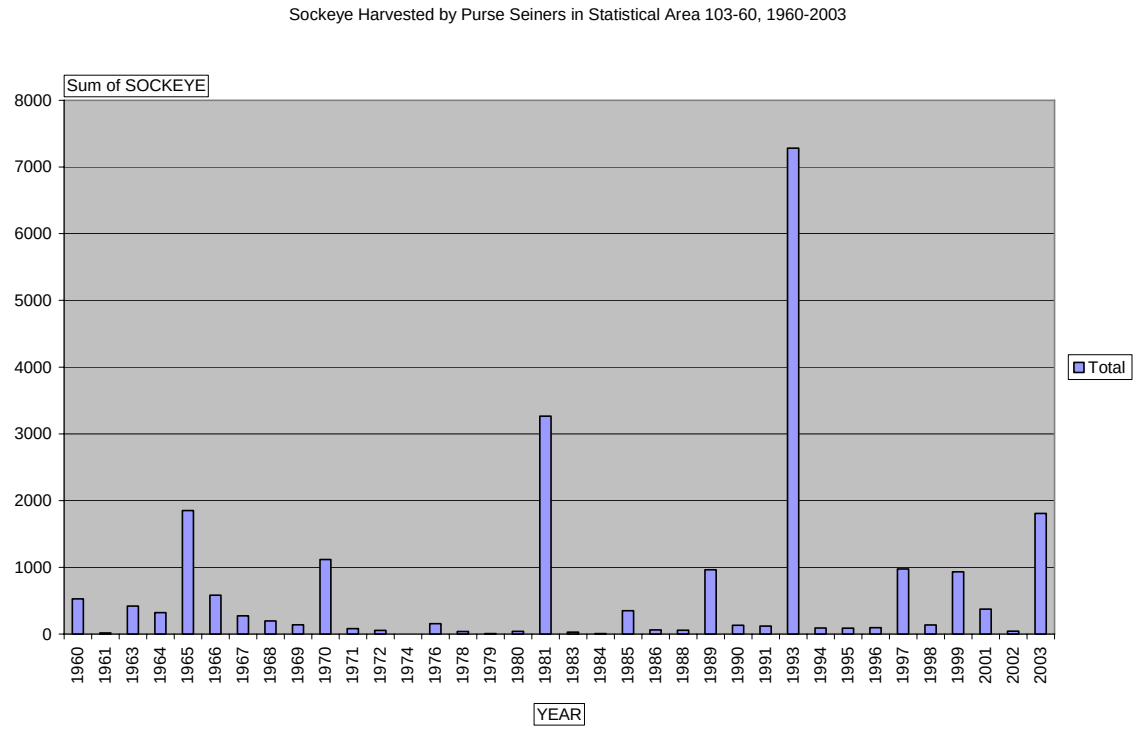


Figure E- 4. Sockeye Harvested by Purse Seiners in Statistical Area 103-60, 1960-2003

Table E- 4. 1999 Commercial Sockeye Harvests in Statistical Areas 103-50, 60, 70 with Klawock Weir Sockeye Counts

Statistical Week	1999 Commercial Seine Catches			Klawock
	103-70	103-50	103-60	Weir Counts
25				
26				
27				
28				53
29				63
30				252
31				1,809
32				15
33	1,287	0	15	900
34	1,372	86	248	1,710
35	1,056	16	498	174
36	458		172	15
37				89
38				40
39				188
40				
41				2
Totals	**4,173**	**102**	**933**	**5,310**

Source: ADFG, Division of Commercial Fisheries. Alexander:
Integrated Fisheries Database for Southeast Alaska and Yakutat, ver. 3-6

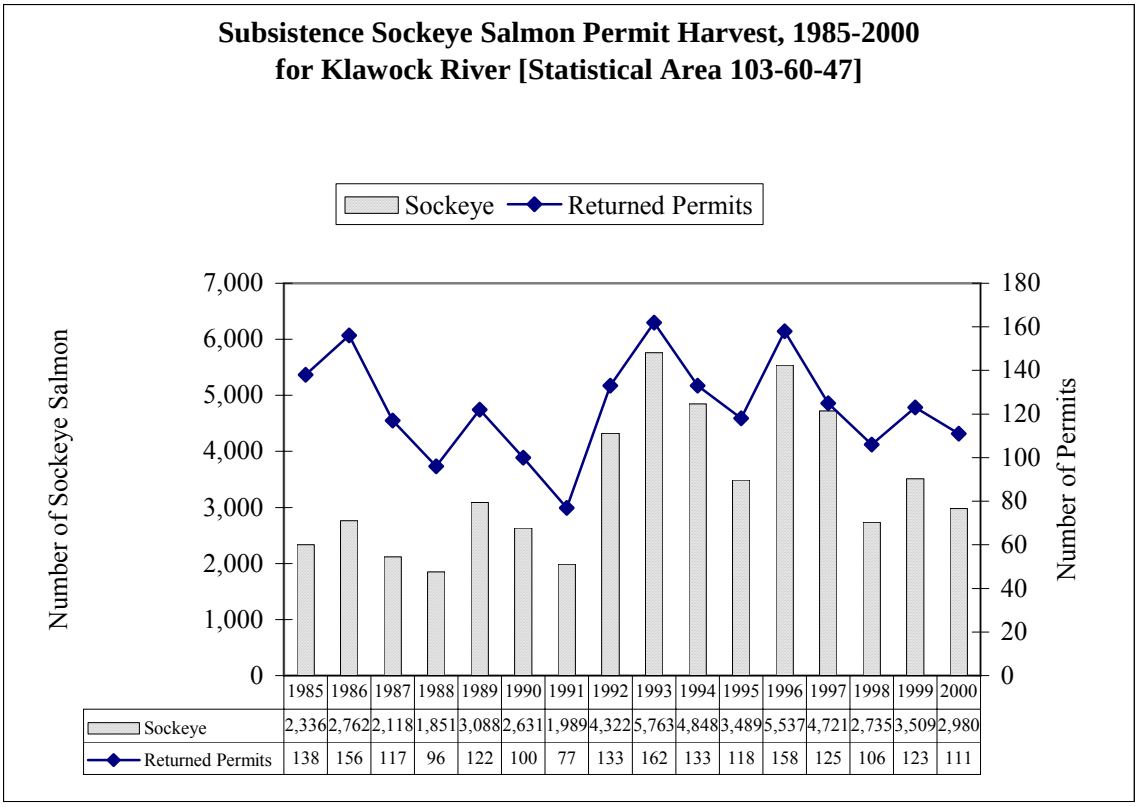


Figure E- 5. Subsistence Sockeye Salmon Harvests for Klawock River Based on Permit Data.

Table E- 5. Commercial Sockeye Harvests in Statistical Areas 103-50, 60, 70 and Klawock Weir Sockeye Counts in 1999

1999 Commercial Sockeye Harvests in Statistical Areas 103-50, 60, 70 with Klawock Weir Sockeye Counts

Statistical Week	1999 Commercial Seine Catches			Klawock
	103-70	103-50	103-60	Weir Counts
25				
26				
27				
28				53
29				63
30				252
31				1,809
32				15
33	1,287	0	15	900
34	1,372	86	248	1,710
35	1,056	16	498	174
36	458		172	15
37				89
38				40
39				188
40				
41				2
Totals	**4,173**	**102**	**933**	**5,310**

Source: ADFG, Division of Commercial Fisheries. Alexander:
Integrated Fisheries Database for Southeast Alaska and Yakutat, ver. 3-6

APPENDIX F. PHOTOGRAPHS OF HARVEST METHODS AND PROCESSING

Figure F- 1. The Remains of a V-shaped Wood Stake Fish Trap
Dr. Steve Langdon pointing out the remains of a V-shaped wood stake fish trap located in the Klawock estuary. The wood stakes were carbon dated to be over 750 years old. Photograph by Nancy Ratner.

Figure F- 2. Reversible Spear or Gaff from Klawock
Traditional southern Tlingit gaff or spear with the hook detached from pole, as it would be after a harvester impales a salmon.
Spear/gaff owned by Thomas George. Photographs by Tom Mophet, used by permission.

Figure F- 3. Traditional Klawock Spear with Hook Attached.
As a spear, the hook is attached with the point facing away from the handle. If the hook was reversed on the pole with the point pointed toward the handle, the technology would function as a gaff. The hook is handmade in the traditional manner without barbs.

Figure F- 4. Three Boat System for Seining in the Klawock Subsistence Fishery.
Clockwise from Left: (**1**) "Main" skiff (the Lund); (**2**) "Seine" skiff (no engine) is tied to the side of the main skiff and to the (**3**) "Tow" or "drag" skiff (second outboard engine). The top end of the piled seine net is tied to the "tow" boat the bottom end is secured in the "seine" skiff. In this picture, the captain and "drag" skiff driver are looking for a school of sockeye salmon while the rest of the crew takes a break.

Figure F- 5. Fishing Group Hauling a Beach Seine After Encircling a School of Salmon in Klawock Inlet.
In this picture all three boats are tied next to each other. The fishing group is hauling the net back onto the "seine" boat, the main skiff is in the middle and the "tow" skiff is tied to the left side of the main skiff on the side away from the net.

Photo. 1

Photo. 2

Photo. 3

Photograph:
1. Preparing table and cooler
2. Load of sockeye salmon
3. Gutting and removing eggs
4. Eggs saved to ferment into a form of Tlingit "cheese"

All photos by James Rowen

Photo. 4

Figure F- 6. Gutting and Preparing to Process Sockeye Salmon.
Demonstration by Peter Brown. Photographs by James Rowan.

Photo. 4

Photo. 5

Photo. 6

Photo. 7

Photo.8

Photo.9

Photos 4-8: Process of filleting Sockeye salmon
Photo 9: minimal flesh left on back bone. Some people scrape backbone and use it to make fish hash

All photos by James Rowen

Figure F- 7. Demonstration of Filleting Sockeye salmon by Peter Brown

Photo. 9

Photo. 12

Photo. 10

Photo. 11

Photo. 13

All photos by James Rowen.

Photos 9-11: Peter Brown cuts sockeye salmon fillet into strips

Photos 12: Sockeye strips hung and smoked in smoke-house

Photo 13: Outside of smokehouse

Figure F- 8. Stripping and Smoking Sockeye Salmon Strips

APPENDIX G. SUBSISTENCE HARVEST DATA

Table G- 1. Percentages of Households Using, Attempting to Harvest, Harvesting, Receiving, and Giving Wild Resources, Craig 1997

Resource Category	Used	Attempted	Harvested	Received	Gave
All Resources	98.8%	91.3%	90.2%	91.3%	70.5%
Fish	96.0%	79.8%	78.0%	73.4%	58.4%
Salmon	88.4%	71.1%	69.4%	50.9%	46.2%
Non-Salmon Fish	90.8%	69.9%	67.1%	61.3%	47.4%
Land Mammals	80.9%	59.5%	48.0%	50.3%	30.1%
Marine Mammals	8.7%	6.4%	6.4%	4.0%	5.8%
Birds and Eggs	15.6%	12.7%	12.1%	6.9%	5.8%
Marine Invertebrates	80.3%	49.1%	49.1%	65.9%	34.1%
Vegetation	74.0%	67.6%	67.6%	37.6%	34.7%

Table G- 2. Percentages of Households Using, Attempting to Harvest, Harvesting, Receiving, and Giving Wild Resources, Klawock 1997

Resource Category	Used	Attempted	Harvested	Received	Gave
All Resources	100.0%	92.5%	90.6%	94.3%	77.4%
Fish	97.2%	76.4%	75.5%	81.1%	62.3%
Salmon	88.7%	69.8%	68.9%	58.5%	50.0%
Non-Salmon Fish	94.3%	67.9%	67.9%	71.7%	47.2%
Land Mammals	72.6%	60.4%	47.2%	38.7%	29.2%
Marine Mammals	19.8%	12.3%	12.3%	8.5%	13.2%
Birds and Eggs	19.8%	16.0%	14.2%	5.7%	5.7%
Marine Invertebrates	76.4%	49.1%	47.2%	59.4%	31.1%
Vegetation	82.1%	70.8%	70.8%	40.6%	40.6%

Table G- 3. Top Ten Resources Used by Most Klawock Households

	Klawock 1997	%HH
1	Halibut	85.8%
2	Deer	71.7%
3	Sockeye Salmon	68.9%
4	Coho Salmon	67.9%
5	Berries	67.9%
6	Chinook Salmon	60.4%
7	Dungeness Crab	54.7%
8	Rockfish	52.8%
9	Shrimp	46.2%
10	Herring Spawn on Kelp	43.4%
11	Black Seaweed	43.4%

Table G- 4. Top Ten Resources Used by Most Craig Households

	Craig 1997	%HH
1	Halibut	80.9%
2	Deer	75.7%
3	Coho Salmon	64.2%
4	Dungeness Crab	63.6%
5	Berries	61.8%
6	Rockfish	58.4%
7	Chinook Salmon	57.2%
8	Shrimp	55.5%
9	Sockeye Salmon	54.9%
10	Wood	37.0%

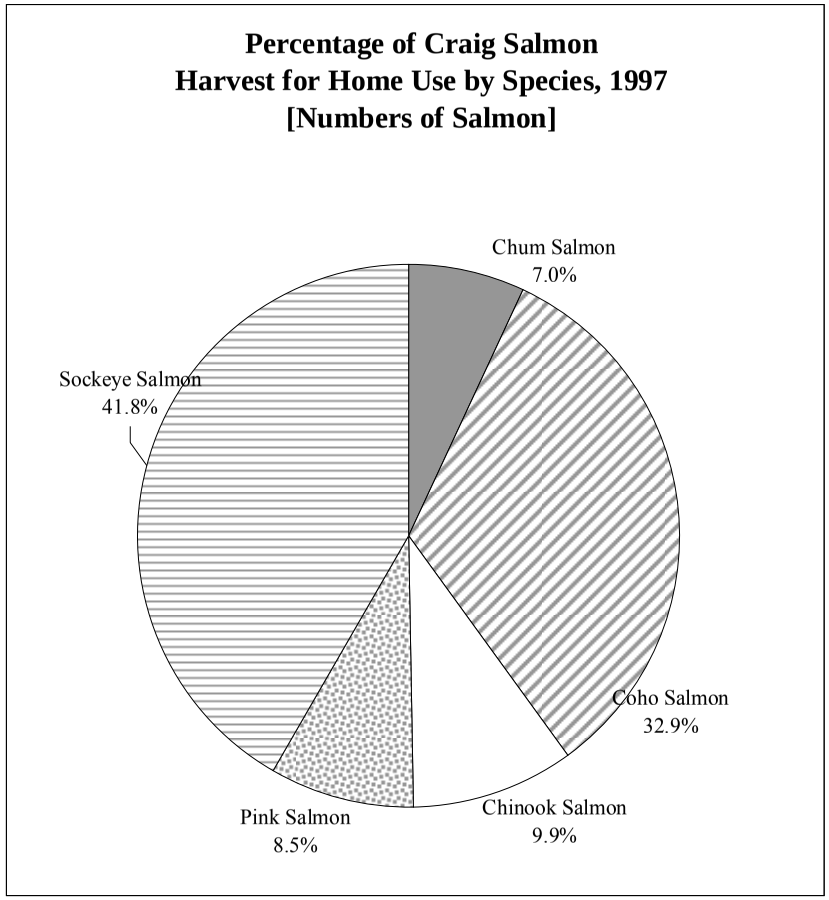


Figure G- 1. Percentage of Craig Salmon Harvest for Home Use by Species, 1997

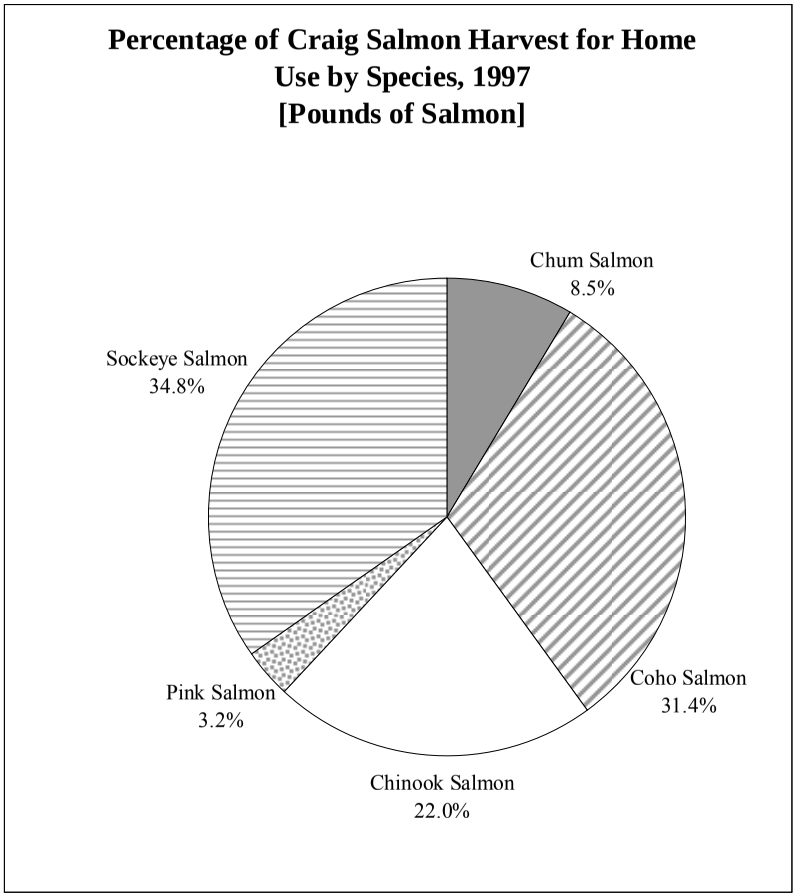


Figure G- 2. Percentage of Craig Salmon Harvest for Home Use by Species, 1997 [Pounds of Salmon]

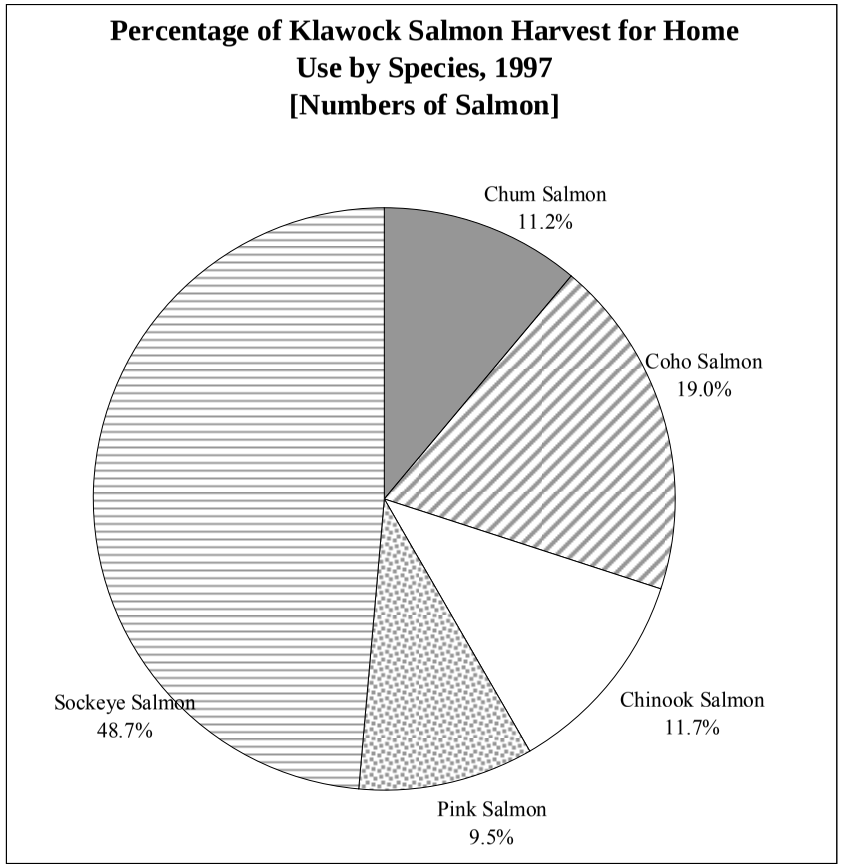


Figure G- 3. Percentage of Klawock Salmon harvested for Home Use by Species, 1997 [Number of Salmon]

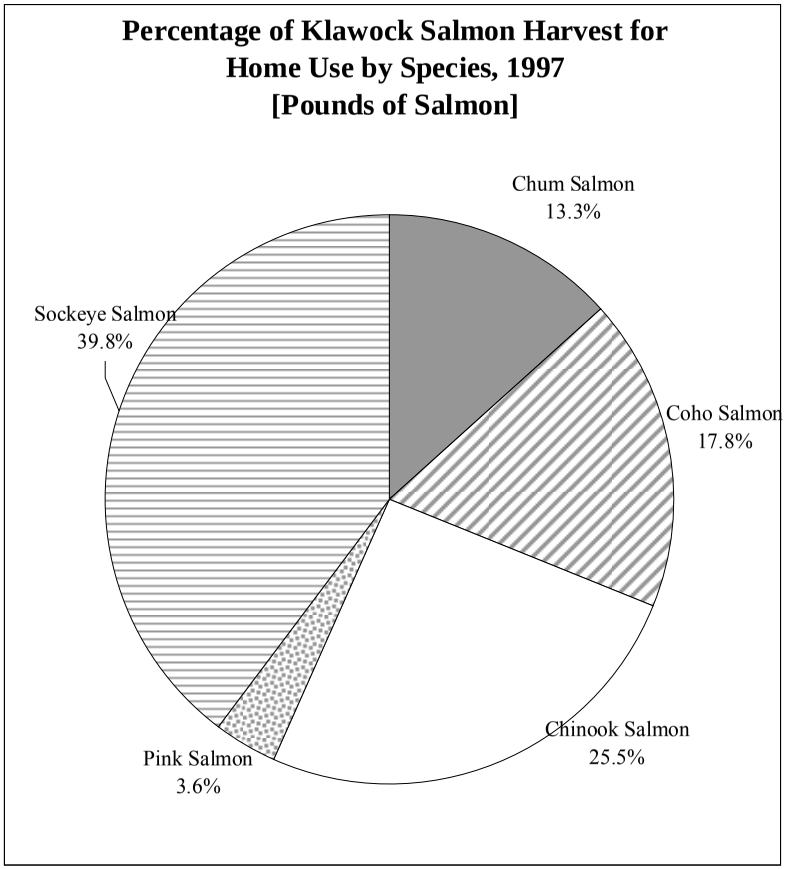


Figure G- 4. Percentage of Klawock Salmon Harvest by Home Use by Species, 1997 [Pounds of Salmon]

Table G- 5. Estimated Salmon Harvest by Gear Type, Klawock, 1997

		Subsistence Methods												Removed from Commercial Catch		Rod and Reel		Any Method	
		Set Net		Floating Net		Seine		Dip Net		Handline		Subsistence Gear Any Method							
	Harvest Units	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean
Salmon	numbers	94.33	0.31	1,292.04	4.26	7,183.39	23.71	543.11	1.79	557.41	1.84	9,670.27	31.92	1,214.86	4.01	4,419.23	14.58	15,304.36	50.51
	pounds	447.13	1.48	6,397.53	21.11	34,692.07	114.50	2,698.99	8.91	3,549.67	11.72	47,785.39	157.71	7,209.11	23.79	33,750.71	111.39	88,745.21	292.89
Sockeye Salmon	numbers	94.33	0.31	1,143.40	3.77	5,176.73	17.08	485.94	1.60	0.00	0.00	6,900.40	22.77	388.75	1.28	168.65	0.56	7,457.80	24.61
	pounds	447.13	1.48	5,419.70	17.89	24,537.68	80.98	2,303.37	7.60	0.00	0.00	32,707.88	107.95	1,842.70	6.08	799.41	2.64	35,349.98	116.67

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 1998

Table G- 6. Estimated Salmon Harvest by Gear Type, Craig, 1997

		Subsistence Methods												Removed from Commercial Catch		Rod and Reel		Any Method	
		Set Net		Floating Net		Seine		Dip Net		Handline		Subsistence Gear Any Method							
	Harvest Units	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean
Salmon	numbers	0.00	0.00	7.03	0.01	7,949.69	13.08	660.72	1.09	1,300.35	2.14	10,202.45	16.78	2,864.28	4.71	6,965.64	11.46	20,032.37	32.95
	pounds	0.00	0.00	24.32	0.04	39,686.87	65.27	3,110.64	5.12	7,151.20	11.76	52,102.30	85.69	16,510.12	27.15	45,376.83	74.63	113,989.25	187.48
Sockeye Salmon	numbers	0.00	0.00	3.51	0.01	6,090.54	10.02	629.09	1.03	70.29	0.12	6,835.61	11.24	1,075.42	1.77	460.39	0.76	8,371.42	13.77
	pounds	0.00	0.00	16.66	0.03	28,869.18	47.48	2,981.87	4.90	333.17	0.55	32,400.78	53.29	5,097.50	8.38	2,182.26	3.59	39,680.54	65.26
Unknown Salmon	numbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	pounds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 1998

Table G- 7. Klawock Community: Salmon Harvest for Home Use, 1997

	Study Year	Estimated Population	Number of Households	Estimated Number Salmon Harvested	Est. Pounds Salmon Harvested Study Year	Number Salmon Per Capita	Number Salmon Per Household in the Community	Pounds Salmon Per Capita Study Year	Pounds Salmon Per HH Study Year	Percent of Households Using Salmon	Percent of Households Harvesting Salmon	Est. Number of Households Harvesting Salmon	**Avg. Number of Salmon Per Harvesting Household**	Percent Gear Group of Total Species Harvested
ALL SALMON	**1997**	**847**	**303**	**15,304**	**88,745**	**18.06**	**50.51**	**104.89**	**292.89**	**88.7**	**68.9**	**208.8**	**73.31**	**100.0%**
Commercial Gear	1997	847	303	1,215	7,209	1.43	4.01	8.52	23.79	3.8	3.8	11.5	**105.52**	7.9%
Rod and Reel	1997	847	303	4,419	33,751	5.22	14.58	39.89	111.39		54.7	165.7	**26.66**	28.9%
Non-Commercial Gear	1997	847	303	9,670	47,785	11.41	31.91	56.48	157.71		35.8	108.5	**89.15**	63.2%
Sockeye	**1997**	**847**	**303**	**7,458**	**35,350**	**8.80**	**24.61**	**41.78**	**116.67**	**68.9**	**37.7**	**114.2**	**65.29**	**100.0%**
Commercial Gear	1997	847	303	389	1,843	0.46	1.28	2.18	6.08	2.8	2.8	8.5	**45.85**	5.2%
Rod and Reel	1997	847	303	169	799	0.20	0.56	0.94	2.64		4.7	14.2	**11.87**	2.3%
Non-Commercial Gear	1997	847	303	6,900	32,708	8.14	22.77	38.66	107.95		32.1	97.3	**70.94**	92.5%
Chinook	**1997**	**847**	**303**	**1,784**	**22,617**	**2.11**	**5.89**	**26.73**	**74.64**	**60.4**	**36.8**	**111.5**	**16.00**	**100.0%**
Commercial Gear	1997	847	303	200	2,537	0.24	0.66	3.00	8.37	1.9	1.9	5.8	**34.74**	11.2%
Rod and Reel	1997	847	303	1,512	19,174	1.78	4.99	22.66	63.28		34.9	105.7	**14.30**	84.8%
Non-Commercial Gear	1997	847	303	71	906	0.08	0.23	1.07	2.99		1.9	5.8	**12.33**	4.0%
Coho	**1997**	**847**	**303**	**2,901**	**15,783**	**3.42**	**9.57**	**18.65**	**52.09**	**67.9**	**53.8**	**163.0**	**17.80**	**100.0%**
Commercial Gear	1997	847	303	283	1,539	0.33	0.93	1.82	5.08	2.8	2.8	8.5	**33.36**	9.8%
Rod and Reel	1997	847	303	1,884	10,248	2.22	6.22	12.11	33.82		44.3	134.2	**14.04**	64.9%
Non-Commercial Gear	1997	847	303	735	3,996	0.87	2.43	4.72	13.19		7.5	22.7	**32.34**	25.3%
Chum	**1997**	**847**	**303**	**1,709**	**11,829**	**2.02**	**5.64**	**13.98**	**39.04**	**22.6**	**17.0**	**51.5**	**33.18**	**100.0%**
Commercial Gear	1997	847	303	114	791	0.13	0.38	0.94	2.61	0.9	0.9	2.7	**41.80**	6.7%
Rod and Reel	1997	847	303	352	2,433	0.42	1.16	2.88	8.03		9.4	28.5	**12.36**	20.6%
Non-Commercial Gear	1997	847	303	1,243	8,605	1.47	4.10	10.17	28.40		6.6	20.0	**62.16**	72.7%
Pink	**1997**	**847**	**303**	**1,452**	**3,166**	**1.71**	**4.79**	**3.74**	**10.45**	**23.6**	**19.8**	**60.0**	**24.20**	**100.0%**
Commercial Gear	1997	847	303	229	499	0.27	0.76	0.59	1.65	1.9	1.9	5.8	**39.78**	15.8%
Rod and Reel	1997	847	303	503	1,097	0.59	1.66	1.30	3.62		11.3	34.2	**14.69**	34.6%
Non-Commercial Gear	1997	847	303	720	1,570	0.85	2.38	1.86	5.18		7.5	22.7	**31.68**	49.6%

Source: ADFG Division of Subsistence Household Surveys 1998, Community Profile Data Base

Table G- 8. Craig Community: Salmon Harvest for Home Use, 1997

	Study Year	Estimated Population	Number of Households	Estimated Number Salmon Harvested	Estimated Pounds Salmon Harvested	Number Salmon Per Capita	Number Salmon Per Household in the Community	Pounds Per Capita Study Year	Pounds Per HH Study Year	Percent of Households Using Salmon	Percent of Households Harvesting Salmon	Estimated Number of Households Harvesting Salmon	**Average Number of Salmon Per Harvesting HH Study Year**	Percent Gear Group of Total Species Harvest
ALL SALMON	**1997**	**1764**	**608**	**20,032**	**113,989**	**11.35**	**32.95**	**64.61**	**187.48**	**88.4**	**69.4**	**422.0**	**47.47**	**100.0%**
Commercial Gear	1997	1764	608	2,864	16,510	1.62	4.71	9.36	27.15	11.6	11.6	70.5	**40.61**	14.3%
Rod and Reel	1997	1764	608	6,966	45,377	3.95	11.46	25.72	74.63		54.9	333.8	**20.87**	34.8%
Non-Commercial Gear	1997	1764	608	10,202	52,102	5.78	16.78	29.53	85.69		26.6	161.7	**63.08**	50.9%
Sockeye	**1997**	**1764**	**608**	**8,371**	**39,681**	**4.74**	**13.77**	**22.49**	**65.26**	**54.9**	**35.8**	**217.7**	**38.46**	**41.8%**
Commercial Gear	1997	1764	608	1,075	5,098	0.61	1.77	2.89	8.38	8.1	8.1	49.2	**21.83**	5.4%
Rod and Reel	1997	1764	608	460	2,182	0.26	0.76	1.24	3.59		6.9	42.0	**10.96**	2.3%
Non-Commercial Gear	1997	1764	608	6,836	32,401	3.87	11.24	18.37	53.29		24.3	147.7	**46.27**	34.1%
Chum	**1997**	**1764**	**608**	**1,399**	**9,679**	**0.79**	**2.30**	**5.49**	**15.92**	**13.9**	**12.7**	**77.2**	**18.12**	**7.0%**
Commercial Gear	1997	1764	608	190	1,313	0.11	0.31	0.74	2.16	1.7	1.7	10.3	**18.38**	0.9%
Rod and Reel	1997	1764	608	337	2,335	0.19	0.55	1.32	3.84		6.9	42.0	**8.03**	1.7%
Non-Commercial Gear	1997	1764	608	872	6,031	0.49	1.43	3.42	9.92		5.2	31.6	**27.58**	4.4%
Coho	**1997**	**1764**	**608**	**6,590**	**35,847**	**3.74**	**10.84**	**20.32**	**58.96**	**64.2**	**52.6**	**319.8**	**20.61**	**32.9%**
Commercial Gear	1997	1764	608	1,146	6,233	0.65	1.88	3.53	10.25	8.7	8.7	52.9	**21.67**	5.7%
Rod and Reel	1997	1764	608	4,425	24,070	2.51	7.28	13.64	39.59		45.1	274.2	**16.14**	22.1%
Non-Commercial Gear	1997	1764	608	1,019	5,544	0.58	1.68	3.14	9.12		6.9	42.0	**24.29**	5.1%
Chinook	**1997**	**1764**	**608**	**1,979**	**25,089**	**1.12**	**3.25**	**14.22**	**41.26**	**57.2**	**42.2**	**256.6**	**7.71**	**9.9%**
Commercial Gear	1997	1764	608	274	3,476	0.16	0.45	1.97	5.72	6.9	6.9	42.0	**6.53**	1.4%
Rod and Reel	1997	1764	608	1,237	15,686	0.70	2.03	8.89	25.80		35.8	217.7	**5.68**	6.2%
Non-Commercial Gear	1997	1764	608	467	5,927	0.26	0.77	3.36	9.75		2.9	17.6	**26.49**	2.3%
Pink	**1997**	**1764**	**608**	**1,694**	**3,693**	**0.96**	**2.79**	**2.09**	**6.07**	**20.8**	**19.7**	**119.8**	**14.14**	**8.5%**
Commercial Gear	1997	1764	608	179	391	0.10	0.29	0.22	0.64	1.2	1.2	7.3	**24.53**	0.9%
Rod and Reel	1997	1764	608	506	1,103	0.29	0.83	0.63	1.81		13.3	80.9	**6.26**	2.5%
Non-Commercial Gear	1997	1764	608	1,009	2,199	0.57	1.66	1.25	3.62		5.8	35.3	**28.61**	5.0%

Source: ADFG Division of Subsistence Household Surveys 1998, Community Profile Data Base

Table G- 9. Klawock Community: Number of Sockeye Salmon Harvested by Location, as Reported by Klawock Subsistence Permit Holders, 1985-2003

Sum of SOCKEYE	YEAR																			
STREAM	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Klawock River	1184	1801	1388	1006	1809	1768	1503	2929	3227	2508	2117	3027	3120	1816	2094	1922	2658	2446	1938	40261
Hatchery Ck Sweethrt	20	70	60	191	48	31	180	229	77	51		90	106	94	54	74	162	215	110	1862
Sarkar/Deweyville	61	29	120	253	43	47	146	19	165			62	23	116	30	84	60	80	254	1592
Karta River	46	85	7	8	10		25	90	48	147	51	114	120	220		148	48	1	0	1168
Wolverine Creek						60		85	11	20	56				25					257
Deep Bay							130													130
Hetta Inlet										15	10		21	7	40	23				116
Eek Creek									40						30	12	22			104
Stream not named			38		30		27													95
Red Lake Creek							10	30											30	70
142F Creek									20	35	14									69
Necker Bay Lake						50														50
Redoubt Lake Outlet						50														50
Tsirku-Big Salmon R						50														50
Klakas Lake Creek					20				10					14						44
Dog Salmon Creek				20	0															20
Chuck Lake Creek																			20	20
Dolomi Creek								20												20
Kutlaku Creek											20									20
Staney Creek								20												20
Thorne River		2																		2
Total	1311	1987	1613	1478	1960	2056	2021	3422	3598	2776	2268	3293	3390	2267	2273	2263	2950	2742	2352	46020

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 10. Craig Community: Number of Sockeye Salmon Harvested by Location, as Reported by Craig Subsistence Permit Holders, 1985-2003

Sum of SOCKEYE	YEAR																			
STREAM	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Klawock River	685	641	490	612	786	596	227	835	1800	1363	975	1725	1133	2550	1150	708	1412	984	657	19329
Sarkar/Deweyville	253	120	351	506	299	73	366	373	801	115	423	479	378	764	504	849	300	535	615	8104
Hatchery Ck Sweethrt	25	133	186	359	225	173	683	1378	450	333	102	659	296	202	499	283	598	205	271	7060
Karta River	172	150	172	156	289	278	174	609	527	432	80	259	479	219	61	361	138	46	132	4734
Hetta Inlet	42	30	10		60		20		60	1045	77	150	275	65	584	180	282	41	185	3106
Eek Creek									20			320	265	100	60	20		0		785
Stream not named			25	88	20	50	63													246
Wolverine Creek								80		52		0	20				10			162
Dog Salmon Creek				39										0	30	0	0	0	30	99
Klakas Lake Creek				10									20			25		38		93
Kutlaku Creek			25						40											65
Necker Bay Lake												49								49
Red Creek								40								5				45
Red Lake Creek							6						15		0			14	6	41
Fish Camp -Klag Bay												35								35
Salmon Bay Creek															10	10	15			35
142F Creek											20						5			25
Dolomi Creek			20					5												25
Polk Inlst				23																23
Maybeso Creek				0	0	0	0	0	0			0	0	0	0	10	0	0	10	20
St Nicholas N Side				0				20			0			0	0	0	0			20
Gut Bay Head				10																10
Polk Creek										10										10
Shinaku Creek											10									10
Helm Bay Head										9										9
Chuck Lake Creek													8							8
Kegan Cove										5			2							7
Leask Creek							6													6
Harris River						0														0
Sockeye Ck-Hugh Smit				0																0
Total	1177	1074	1279	1803	1679	1170	1545	3340	3698	3364	1687	3676	2891	3900	2898	2451	2760	1863	1906	44161

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 11. Klawock Community: Number of Subsistence Permits Reporting Sockeye Salmon Harvest by Location, 1985-2003

Sum of PERMITS	YEAR																			
STREAM	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Klawock River	68	103	77	50	63	63	50	86	82	67	65	71	66	61	72	63	72	72	51	1302
Hatchery Ck Sweethrt	2	6	5	13	3	4	13	16	5	5		8	5	6	5	11	20	28	13	168
Sarkar/Deweyville	4	2	6	13	4	3	5	1	5			2	3	7	2	5	2	4	4	72
Karta River	3	5	1	1	1		2	3	3	4	3	4	8	7		7	2	4	2	60
Wolverine Creek						1		2	1	1	2				1					8
Hetta Inlet										1	1		1	1	2	1				7
Stream not named			4		2		1													7
Eek Creek									1						2	1	1			5
142F Creek									1	1	1									3
Dog Salmon Creek				2	1															3
Klakas Lake Creek					1				1					1						3
Red Lake Creek							1	1											1	3
Deep Bay							2													2
Chuck Lake Creek																			1	1
Dolomi Creek								1												1
Kutlaku Creek											1									1
Necker Bay Lake						1														1
Redoubt Lake Outlet						1														1
Staney Creek								1												1
Thorne River		1																		1
Tsirku-Big Salmon R						1														1
Total	77	117	93	79	75	74	74	111	99	79	73	85	83	83	84	88	97	108	72	1651

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 12. Craig Community: Number of Subsistence Permits Reporting Sockeye Salmon Harvest by Location, 1985-2003

Sum of PERMITS	YEAR																			
STREAM	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Klawock River	38	37	26	31	35	26	14	31	52	39	36	59	41	50	43	36	46	34	27	701
Hatchery Ck Sweethrt	4	13	18	25	17	14	34	68	35	20	11	43	28	28	46	34	55	31	32	556
Sarkar/Deweyville	15	7	20	20	13	4	13	18	33	10	13	22	21	43	24	37	9	18	14	354
Karta River	9	11	10	11	13	13	13	23	21	25	8	12	20	15	7	16	12	7	10	256
Hetta Inlet	2	1	1		3		1		3	4	3	1	3	4	13	6	6	2	4	57
Maybeso Creek				1	2	1	1	1	1			1	2	3	2	1	2	2	3	23
Eek Creek									1			4	2	2	3	2		1		15
Dog Salmon Creek				4										2	2	1	1	1	1	12
Stream not named			5	2	1	2	2													12
Red Lake Creek							1						2		1			3	1	8
St Nicholas N Side				1				1			1			1	1	1	2			8
Wolverine Creek								3		2		1	1				1			8
Klakas Lake Creek				1									2			2		1		6
142F Creek											2						1			3
Salmon Bay Creek															1	1	1			3
Dolomi Creek			1					1												2
Fish Camp -Klag Bay												2								2
Kegan Cove										1			1							2
Kutlaku Creek			1						1											2
Red Creek								1								1				2
Chuck Lake Creek													1							1
Gut Bay Head				1																1
Harris River						1														1
Helm Bay Head										1										1
Leask Creek							1													1
Necker Bay Lake												1								1
Polk Creek										1										1
Polk Inlst				1																1
Shinaku Creek											1									1
Sockeye Ck-Hugh Smit				1																1
Total	68	69	82	99	84	61	80	147	147	103	75	146	124	148	143	138	136	100	92	2042

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 13. Klawock River: Number of Sockeye Salmon Harvested by Community, as Reported by Subsistence Permit Holders, 1985-2003

Sum of SOCKEYE	YEAR																			
CITY	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	**Total**
Klawock	1184	1801	1388	1006	1809	1768	1503	2929	3227	2508	2117	3027	3120	1816	2094	1922	2658	2446	1938	40261
Craig	685	641	490	612	786	596	227	835	1800	1363	975	1725	1133	2550	1150	708	1412	984	657	19329
Ketchikan	427	270	220	167	363	207	247	409	717	502	320	624	328	243	262	308	233	348	545	6740
Thorne Bay		20	20					127		100		20	10							297
Hydaburg		30			30	40		22				35	50				60			267
Metlakatla	20				40		12			32	10	68	49	16						247
Kasaan										220			6	20						246
Juneau										43	10		20				60			133
Saxman						20			19	40			30							109
Anchorage												35				10			15	60
Point Baker																60				60
Ward Cove									0	40						7				47
Kodiak											42									42
Barrow																			40	40
Petersburg	20										15									35
Douglas					20												10			30
Wrangell														25						25
Haines				20																20
Hoonah				20																20
Sitka				20																20
Hollis												19								19
Fairbanks				6																6
Total	2336	2762	2118	1851	3048	2631	1989	4322	5763	4848	3489	5553	4746	4670	3506	3015	4433	3778	3195	68053

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 14. Klawock River: Number of Subsistence Permits Reporting Sockeye Salmon Harvest by Community, 1985-2003

Sum of PERMITS	YEAR																		
CITY	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Klawock	68	103	77	50	63	63	50	86	82	67	65	71	66	61	72	63	72	72	51	1302
Craig	38	37	26	31	35	26	14	31	52	39	36	59	41	50	43	36	46	34	27	701
Ketchikan	30	14	12	10	18	8	12	14	25	17	13	22	12	11	9	11	8	10	11	267
Hydaburg		1			1	2		1				2	2				1			10
Metlakatla	1				2		1			1	1	1	1	1						9
Thorne Bay		1	2					1		1		1	1							7
Juneau										2	1		1				2			6
Kasaan										3			1	1						5
Saxman						1			1	2			1							5
Anchorage												2				1			1	4
Ward Cove									2	1						1				4
Douglas					1												1			2
Petersburg	1										1									2
Sitka				2																2
Barrow																			1	1
Fairbanks				1																1
Haines				1																1
Hollis												1								1
Hoonah				1																1
Kodiak											1									1
Point Baker																1				1
Wrangell														1						1
Total	138	156	117	96	120	100	77	133	162	133	118	159	126	125	124	113	130	116	91	2334

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 15. Sarkar River: Number of Sockeye Salmon Harvested by Community, as Reported by Subsistence Permit Holders, 1985-2003

Sum of SOCKEYE	YEAR																			
CITY	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Craig	253	120	351	506	299	73	366	373	801	115	423	479	378	764	504	849	300	535	615	8104
Thorne Bay	419	393	433	341	301	222	469	834	885	183	757	783	589	218	215	170		100	68	7380
Ketchikan	165	138	20	237	356	124	339	311	376	52	170	192	251	183	107	96	60	230	243	3650
Klawock	61	29	120	253	43	47	146	19	165			62	23	116	30	84	60	80	254	1592
Whale Pass				117	129				40		15	27								328
Meyers Chuck					27			90	60		27	79	24	12						319
Kasaan			20		15											20		150	16	221
Ward Cove			20		20	16	20	20	30	11		17				14		20	0	188
Hydaburg				69			60													129
Edna Bay								40	40						8					88
Coffman Cove											20	12				8				40
Michen Cove				40																40
Palmer									40											40
Auke Bay					0			30												30
Sitka				30																30
Naukiti																19	10			29
Juneau					20					6										26
Fairbanks															20					20
Petersburg			20																	20
Hyder																10				10
Point Baker																10				10
Douglas					1															1
Total	898	680	984	1593	1211	482	1400	1717	2437	367	1412	1651	1265	1293	884	1280	430	1115	1196	22295

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

Table G- 16. Sarkar River: Number of Subsistence Permits Reporting Sockeye Salmon Harvests by Community, 1985-2003

Sum of PERMITS	YEAR																			
CITY	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	**Total**
Craig	15	7	20	19	13	4	13	18	32	10	13	22	21	43	24	36	9	18	14	351
Thorne Bay	25	23	25	21	16	13	18	23	35	13	23	21	28	8	12	12		3	4	323
Ketchikan	9	10	4	7	13	8	13	8	11	4	5	8	10	13	3	7	1	12	9	155
Klawock	4	2	6	10	4	3	5	1	5			2	3	7	2	5	2	4	4	69
Ward Cove			1		1	1	1	1	1	2		1				1		1	1	12
Whale Pass				1	6				3		1	1								12
Meyers Chuck					1			1	1		1	2	1	1						8
Kasaan			1		1											1		3	1	7
Edna Bay								1	1						2					4
Hydaburg				3			1													4
Coffman Cove											1	1				1				3
Auke Bay					1			1												2
Juneau					1					1										2
Naukiti																1	1			2
Douglas					1															1
Fairbanks															1					1
Hyder																1				1
Michen Cove				1																1
Palmer									1											1
Petersburg			1																	1
Point Baker																1				1
Sitka				1																1
Total	53	42	58	63	58	29	51	54	90	30	44	58	63	72	44	66	13	41	33	962

Source: ALEXANDER, Alaska Department of Fish and Game, Commercial Fisheries Division, Version 3.8, Build 147

APPENDIX H. GLOSSARY OF LOCAL FISHING VOCABULARY

Bucket: used for setting the net, tied onto the free end of the net to create drag when using only one motored boat to bring the net around.

Beach seine: a floating net consisting of a cork line, seine web and a lead line, designed to surround fish, which is intended to be set from and hauled to the beach, but is often used like a hand purse seine in deep water.

Captain: Crew member who operates the main skiff and makes decision about where and how to set the net.

Coiled slinky: A description for the pattern used to pile the net onto the seine skiff. Refers to the shape of the coil-like child's toy called a "Slinky" when flattened.

Corks or Cork Line: The string of plastic floats that keeps one edge of the net at the surface of the water.

Drag skiff: The motored boat used in a three-boat system to help bring one end of the net around to the main skiff. Also called a tow skiff.

Hand purse seine: a floating net designed to surround fish and which can be closed at the bottom by pursing the lead line. According to state regulations, pursing may only be done by hand power, and free-running line through one or more rings attached to the lead line is not allowed.

Hooking off; hooking onto shore: Process of attaching one end of the seine net to shore at the beginning of a scoop set.

Humpy: Nickname for pink salmon.

Kicker: An auxiliary outboard motor used on a boat. Serves as an extra motor when the main engine fails and is sometimes used to idle the engine at slower speeds than can be efficiently accomplished with the main engine.

Leads or lead line: The weighted line on a beach seine that sinks the bottom of the net, creating a vertical wall of web that salmon cannot pass through.

Main skiff: The skiff with the largest outboard motor, usually driven by the captain of a fishing group, used to bring the net around in a circle to surround a school of salmon.

Necktie style: a traditional method of filleting and drying pink salmon where the fillets remain connected at the tail, like a necktie.

Needlefish: local term for Pacific sandlance, *Ammodytes hexapterus.*

Newspaper salmon: a traditional method of drying sockeye, coho or chum salmon where the fish is sliced twice but the fillets remain attached to the backbone and fold out like a newspaper.

Plain pack: fresh salmon that is pressure sealed in jars or cans.

Playing out: the process of slowly releasing the cork and lead line into the water while setting the net.

Plunger: Person who thrusts a long handled plunger into the water to create bubbles and keep fish from escaping in the gap between the two ends of a seine net while the net is being hauled in.

Puller: person who pulls the net back onto the boat after it has been set in the water.

Sawbill duck: local term for a merganser, a fish eating duck, *Mergus spp*.

Scoop set: seine net set with one end attached to the beach and the other held by the boat in the channel. Net intercepts salmon as they travel upstream and is most effective at the tide change, beginning of the flood, when fish start moving upstream.

Skiff man: Crew member responsible for operating the tow or drag skiff in a three-boat seining operation.

Seine skiff: Boat, lacking a motor, used as a working platform to hold the net in a two or three-boat operation.

Set or setting the net: The process of uncoiling the net in the water, usually in a circle to surround a school of salmon.

Sort yard: The log sorting yard for the local sawmill.

Tow skiff: The motored boat used in a three-boat system to help bring one end of the net around to the main skiff. Also called a drag skiff.