Technical Paper No. 327

Sitka Sound Subsistence Herring Roe Fishery, 2002, 2003, and 2006

by

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and

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April 2007

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

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April 2007

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/geninfo/publctns/techpap.cfm

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This document should be cited as:
Brock, M., and M.F. Turek. 2007. Sitka Sound subsistence herring roe fishery, 2002, 2003, and 2006. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 327. Juneau.

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ABSTRACT

The 2006 survey was a cooperative effort between Alaska Department of Fish and Game and the Sitka Tribe of Alaska. The primary goal of this research project was to estimate the amount of Pacific herring *Clupea pallasii* roe harvested for subsistence in the 2006 fishery. The survey methodology used a face-to-face interview strategy to produce harvest estimates of the total pounds taken of herring eggs on hemlock branches *Tsuga heterophylla*, hair seaweed *Desmarestia* and other strata. The study found that 55% of Sitka households harvested a total of 219,356 lb of herring roe. Of this total, 212,952 lb were harvested on hemlock branches; 2,030 lb on hair seaweed; and 4,372 lb on kelp *Macrocystis*. Overall the harvest of herring roe by subsistence harvesters in Sitka in 2006 was less than the 2003 harvest, but greater than the 2002 harvest. Herring roe has been and continues to be an important subsistence resource for the residents of Sitka. It is recommended that the subsistence herring roe harvest survey be conducted jointly for several more survey years, to ascertain any trend in the harvest or stability in the fishery.

Key words: herring eggs, harvest estimate, hair seaweed, Sitka, herring roe, kelp.

INTRODUCTION

BACKGROUND

This survey estimated the amount of roe from Pacific herring *Clupea pallasii* harvested for subsistence in Sitka, Alaska by systematically surveying harvesting households. Survey respondents were asked the amount of herring roe harvested by stratum, the location of the harvest, and the type of fishing vessel used in harvesting. The survey produced estimates for the total harvest of herring roe on Western Hemlock *Tsuga heterophylla* branches and the total harvest on other strata, including, but not limited to, kelp *Macrocystis* and hair seaweed *Desmarestia*. The survey focused on the community of Sitka, Alaska and the local and non-local resident harvesters who harvested herring eggs in Sitka Sound.

At its spring meeting in February 1989, the Alaska Board of Fisheries (Board) determined the residents of Sitka had customary and traditional use of herring and herring roe. In September 2001, a meeting between the Alaska Department of Fish and Game (ADF&G) and the Sitka Tribe of Alaska (STA) was held in Sitka to discuss the Sitka Sound subsistence herring roe fishery. Tribal subsistence harvesters expressed concerns about the apparent low harvest of herring eggs on hemlock branches in spring 2001. In response to these concerns, STA submitted an Agenda Change Request to the Board addressing the subsistence harvest of herring eggs on hemlock branches in Sitka Sound. To address these concerns, ADF&G and STA agreed to work on a collaborative approach to research and management of the herring eggs on hemlock branches fishery in Sitka Sound.

At the January 2002 Board meeting, STA submitted a proposal requesting dispersal of the commercial sac roe herring fishery and recognition of the geographical and historically important areas used for subsistence herring roe harvest. The Board voted to amend the proposal by dropping a suggested requirement for a subsistence permit. In lieu of a permit, the Board requested that ADF&G Division of Subsistence work with STA to conduct face-to-face harvest surveys. At the meeting the Board also made a finding of 105,000 lb to 158,000 lb as the amount reasonably necessary for subsistence (ANS) use of herring roe in Sitka Sound. In fall 2002 a Memorandum of Agreement (MOA) was signed between ADF&G and STA to work cooperatively in the management of the herring fishery. One aspect of the agreement was the creation of an annual customary and traditional herring egg harvest monitoring program. The STA and ADF&G agreed to work cooperatively on survey design and data gathering. The ADF&G would provide technical consultation and, when possible, field survey and interviewing support for the project. In addition, it was agreed the STA would provide ADF&G with harvest

data each year and the raw data would be analyzed by ADF&G using standard statistical techniques. State regulations allow the subsistence harvest of herring and herring spawn in Districts 13(A) and 13(B) north of Aspid Cape on Baranof Island (5AAC 01.716 (7)) and the limited, noncommercial exchange of subsistence-harvested herring roe on kelp is permitted as customary trade (5AAC 01.717).

According to interviews done in the late 1980s by the ADF&G, the sheer abundance of spawn and the length of the spawning period made the Sitka Sound harvest special both in the historic and contemporary period (Schroeder and Kookesh 1990). Prior to the colonial era Sitka Sound was considered the "herring egg capital" of Southeast Alaska. During the annual spawn, thousands of people would travel to Sitka to take part in the harvest. Then, as now, the primary means of harvest was done by using the branches of the Western Hemlock, or in some cases, entire small trees. The branches were sunk, just outside the intertidal zone, before the spawn and were harvested by boat following the spawn. Other strata used, both during the colonial period and currently, included *Macrocystis* kelp, hair seaweed, rockweed *Fucus***,** and at one time blueberry bushes *Vaccinium ovalifolium* and *V. alaskaense***.** Historically herring eggs were either eaten fresh, air dried, or packed in salt for use later on. With the arrival of widespread commercial fishing operations, freezing became the preferred method of preserving herring roe for later use and distribution (Schroeder and Kookesh 1990).

Sitka traded with members of other tribes for specialized foods such as soapberry *Shepherdia canadensis*, eulachon *Thaleichtys pacificus* oil, dried eulachon, other berries, dried seaweed (*Porphyra* sp., *Pamaria* sp., and *Nereocystis luetkeana*) and mountain goat meat *Oreamnos americanus*. In addition, herring roe was also traded for raw materials and handicrafts. Sitka Sound herring roe was traded between members of other tribes coming to Sitka and members of Sitka clans going to other areas, as far north as the Yukon Territory and as far south as British Columbia (Schroeder and Kookesh 1990). Currently the bulk of traded herring roe is transported from Sitka via commercial air carriers to people in other Alaskan communities and cities in the contiguous United States.

2002 AND 2003 HARVESTS

The first subsistence herring harvest survey was conducted by ADF&G and STA in spring 2002. The survey methodology used a face-to-face household interview to estimate the total pounds of harvested herring eggs-on-branches, kelp, hair seaweed, and other strata. The estimated harvest of herring for subsistence uses in Sitka was 151,717 lb on all substrate combined. Of this total, 139,755 lb (92%) were harvested on hemlock branches, 7,642 lb (5%) on hair seaweed, and 4,270 lb (2%) on kelp. Data analysis indicated that even though 71% of surveyed households harvested herring roe, 97% reported using herring roe, from any or all strata. Harvest on hemlock branches was the most common substrate at 65%, followed by herring roe-on-kelp at 35%, and on hair seaweed at 16%. Sharing was demonstrated by 54% of the households having received herring roe while 40% gave herring roe away (Turek 2006).

The survey was conducted again using face-to-face interviews to estimate the amount of herring eggs harvested for subsistence uses by households in the 2003 fishery. The 2003 survey produced harvest estimates for total pounds of herring eggs on hemlock branches, seaweed, and kelp. The estimated subsistence harvest of herring roe in Sitka was 278,799 lb, on all substrate combined. Of this total, 269,904 lb (96%) were harvested on hemlock branches; 4,338 lb (1%) on hair seaweed; and 4,555 lb (1%) on kelp. The percentage of households using herring roe on

any or all substrate was estimated at 96%. The percentage of households harvesting herring roe on any or all substrate was estimated at 71%. Harvest on hemlock branches was the most common substrate at 66%, followed by herring roe-on-kelp at 19%, and on hair seaweed at 13%. Sharing was demonstrated by 45% of the household having received herring roe while 72 % gave away herring roe (Turek 2006).

In 2004, surveys were conducted by STA, however ADF&G, Division of Subsistence did not receive funding for data analysis and no comparison was done between the 2004 harvest and the previous two study years. In 2005, surveys were again conducted by STA, however ADF&G, Division of Subsistence was not involved in the collection or analysis of the data and the results are not included here.

OBJECTIVES

The survey had three main goals:

1. to conduct face-to-face interviews with households in Sitka identified as harvesting herring roe for subsistence;
2. to estimate the total pounds of herring roe harvested on hemlock branches, kelp, hair seaweed, and other strata; and,
3. to identify locations where herring roe is harvested.

METHODS

This project was guided by the research principles detailed in "Alaska Federation of Natives Guidelines for Research" as described by the Alaska Native Knowledge Network, University of Alaska, Fairbanks (AFN 2007). These principles stress community approval for research designs, informed consent, anonymity of study participants, community review of draft findings, and providing study findings to each study community upon completion of the research.

SURVEY DESIGN AND SAMPLE

In order to meet the first goal of the project, to conduct face-to-face interviews with households in Sitka identified as harvesting herring for subsistence, a list between 150 and 200 of known harvesting households needed to be compiled. First, researchers began with a list of known harvesting households generated by STA from the 2002 survey. During the 2002 survey, a chain-referral method was used in which respondents were asked to identify other households involved in the harvest. This list was the foundation for the 2003 survey. The 2003 survey was also conducted using a chain-referral method and the household list generated from that survey, the third generation, was used as the foundation for the 2004 survey. The 2004 and 2005 survey, conducted solely by STA, followed the same chain-referral method. For each survey year, the list of harvesting households was updated to reflect then current activity by removing households that were known to have moved or were no longer active in the fishery. Nonharvesting households were removed from the list after three years of no harvest activity. The 2005 household list served as the base for the 2006 survey. Analysis of the 2003 harvest resulted in a list of 19 "high harvesting" households responsible for 72% of the overall harvest[1]. A review of the 2005 survey list determined that all 19 high harvesters were still active in the

[1] A harvest of 3,000 lb was set as the lower limit for designating high harvesters.

fishery. The 2005 list included 215 active households. Prior to the implementation of the 2006 survey, the list was reviewed and 58 households were removed from the active survey list due to redundant listings, having moved, passed away, or inactivity in the fishery for three years. If a fisher had not fished in three years, they were contacted and asked if they were still harvesting or planning on fishing. Following this review, a new total of 157 households was determined and these served as the universe for the 2006 survey.

SURVEY INSTRUMENT

To meet the second objective of the study, to estimate the total pounds of herring roe harvested on hemlock branches, kelp, hair seaweed, and other strata, the survey instrument needed to be revised in order to meet the third objective, to identify the locations where herring roe is harvested. On the 2005 survey form, respondents were asked to indicate one of five areas where they harvested herring roe. For the 2006 survey, respondents were provided with a list of 21 common harvest locations and asked to note the substrate used for herring roe, the pounds harvested, the quality of the harvest, and any other comments. The list of 21 harvest locations was determined based on reported harvest locations in 2004 and 2005, attached as Appendix A. The 2006 herring roe survey instrument is attached as Appendix B.

SURVEY IMPLEMENTATION AND DATA ANALYSIS

To meet the first goal of conducting face-to-face interviews with harvesting households, ADF&G researchers traveled to Sitka to assist Sitka Tribe of Alaska staff in training two local residents in the process and procedures for conducting the survey. The goal was to contact all the households on the survey list and complete a harvest survey. Participation was voluntary and all individuals and household level responses were confidential.

After all the surveys were conducted, analysis was undertaken to meet the second goal of the study, to produce estimates of the total harvest of herring roe across all strata. To achieve this, all surveys were coded for data entry by ADF&G staff of the Information Management Unit in Anchorage. Responses were coded following standardized codebook conventions used by Division of Subsistence. Department staff set up database structures within a MS SQL Server Access database at ADF&G in Anchorage to retain the survey data. The database structures included rules, constraints, and referential integrity to insure that data were entered completely and accurately. Data entry screens were developed in MS Access available on a secure Internet site. Daily incremental backups of the database occurred, and transaction logs were backed up hourly. Full backups of the database occurred twice weekly. This ensured that no more than one hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered and reviewed to minimize data entry errors.

Once data were entered and confirmed, information was processed with the use of the Statistical Package for the Social Sciences (SPSS) Version 11.5. Initial processing included the performance of standardized logic checks of the data. Logic checks are often needed in complex data set where rules, constraints, and referential integrity do not capture all the possible inconsistencies that may appear. Harvest data collected in numbers or animals, gallons, or buckets were converted to pounds usable weight using standard factors.

SPSS was also used for analyzing the survey information. Analysis included review of raw data frequencies, cross tabulations, table generation, estimation of population parameters, and calculation of confidence intervals for the estimates. Missing information was dealt with

situationally. The Division of Subsistence has standardized practices for dealing with missing information, such as minimal value substitution or use of an average response for similarly characterized households. Typically, missing data are an uncommon, randomly occurring phenomenon in household surveys conducted by the division. In unusual cases where a substantial amount of survey information is missing, the household survey is treated as a "non-response" and not included in community estimates. All adjustments were documented.

Harvest estimates, and responses to all questions, are calculated based upon the application of weighted means. These calculations are standard methods for extrapolating sampled data. As an example, the formula for harvest expansion is:

$$H_i = \bar{h}_i S_i$$

where $\bar{h}_i = \frac{h_i}{n_i}$ (mean harvest per returned survey)

H_i = the total harvest (numbers of resource or pounds) for the community i,
h_i = the total harvest reported in returned surveys
n_i = the number of returned surveys, and
S_i = the number of households in a community.

As an interim step, the standard deviation (SD) (or variance (V), which is the SD squared) was also calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean was also calculated for each community. This was used to estimate the *relative precision of the mean*, or the likelihood an unknown value falls within a certain distance from the means. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percent. Once the standard error was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. The constant for 95% confidence limits is 1/96. Though there are numerous ways to express the formula below, it contains the components of a SD, V, and SE.

$$C.I.\%(\pm) = \frac{t_{\alpha/2} \times \frac{s}{\sqrt{n}} \times \sqrt{\frac{N-n}{N-1}}}{\bar{x}}$$

s = sample standard deviation
n = sample size
N = population size
$t_{\alpha/2}$ = *Student's t* statistic for alpha level (α=.95) with n-1 degrees of freedom.

Small CL percentages indicate that an estimate is likely to be very close to the actual mean of the sample. Larger percentages mean that estimate could be further away from the sampled mean.

The corrected, final data from the household survey will be added to the Division of Subsistence Community Subsistence Information System (CSIS) (ADF&G 2007). This publicly accessible database includes community-level study findings.

RESULTS

The first goal of the study, to conduct face-to-face interviews with between 150 and 200 households, was met. The 2006 survey population included 160 households. Of these 127 (79%) were interviewed. Surveyors were unable to contact 33 households (21%)[2], one household chose to not participate, and it was determined that one individual had passed away. The sample size in 2006, 160 households, grew from 108 households in 2002, and was less then the 2003 sample of 170 households. The percentage of interviewed households in 2006 (79%) was slightly less then the percentage in 2002 (80%) and slightly more than 2003 (72%). The refusal rate for all three of the survey years, 2002, 2003, and 2006, has been 1% or less.

The second goal of the study, to produce estimates of the total harvest of herring roe, on all strata was also met. The estimated harvest of herring roe for subsistence uses in Sitka in 2006 was 219,356 lb, on all substrate combined. Of this total, 212,952 lb (97%) were harvested on hemlock branches, 2,031 lb (1%) on hair seaweed; and 4,373 lb (1%) on kelp (Table 1). The percentage of households using herring roe (on any or all substrate) is estimated at 86 %. The percentage of households harvesting herring roe (on any or all substrate) was estimated at 55%. Sharing is demonstrated by 47% percent of the household having received herring roe while 61% gave herring roe away (Table 2). The mean household harvest of all types of herring roe is estimated at 1,371 lb, while the per capita harvest is estimated at 434 lb (Table 2).

The percentage of households harvesting herring roe on any or all substrate was estimated at 55%. The percentage of households using herring roe on any or all substrate is estimated at 86%. Harvest on hemlock branches was the most common substrate at 51%, followed by herring roe on kelp at 17%, and on hair seaweed at 7%. Sharing was demonstrated by 47% of the households having received herring roe while 61% gave away herring roe (Table 2). According to records obtained from Alaska Airlines just over 14% of the total subsistence harvest of herring roe was shared with households outside of Sitka (Miller 2006). No data exist on the percentage of herring roe shipped out of Sitka to other communities by other air carriers, state ferries, or by private aircraft or boats.

The third goal of the study, to identify harvesting locations, was met. The harvest was centered on the Kasiana Islands with 42 households (33%) reporting harvesting there. Other harvest locations, in descending order, were: South Middle Island, 22 households (17%); Crow and Gagarin islands, 19 households (15%); North Middle Island, 14 households (11%); and Gavanski Island with 5 households (4%) (Table 3). While numerous households reported harvesting at more than one location, and some households reported no harvest location, the data show all of the harvest occurred within Sitka Sound, and the majority north of downtown Sitka.

The primary fishing vessel used to harvest herring roe was a skiff with 32 households (25%) reporting that type of water craft. Other vessel types used were pleasure cruiser between 20 and 24 feet in length, 17 households (13%); commercial or pleasure craft over 24 feet, 23 households (18%); and other, 2 households (2%). Several respondents reporting using more than one type,

[2] Unable to contact refers to any household that has moved or no contact was made after three attempts.

while the majority of respondents, 58 (46%), did not report the type of fishing vessel used (Table 4).

DISCUSSION

Over the three years of this study, 2002, 2003, and 2006, the sample size has fluctuated from 108 households in 2002 and 170 households in 2003, to 160 households in 2006. Without additional survey years, this fluctuation gives no indication of trends in the fishery. However, the high level of participation in the survey, 80% in 2002, 72% in 2003, and 79% in 2006, in conjunction with the overall low refusal rate of 1% or less, does indicate willingness on the part of Sitka residents to take part in the survey. This willingness can be seen as one indicator of the importance of the herring roe fishery to the residents in Sitka.

The estimated total harvest of herring roe on all strata combined, in 2006 (219,356 lb), was greater than the estimated harvest in 2002 (151,717 lb) and less than the 2003 estimated harvest (278,799 lb). The 2006 harvest represents a 44% increase over the 2002 harvest and a 21% decrease when compared to the 2003 harvest (Figure 1). Without additional harvest surveys, no trend in the harvest is evident.

The fluctuation in the harvest on hemlock branches is similar to the total harvest as most of the harvest is on hemlock branches: 2002 (139,755 lb), 2003 (269,904 lb), and 2006 (212,952 lb) (Figure 2). The 2006 harvest of herring roe on hemlock branches was 52% greater then the 2002 harvest and a 21% less then the 2003 harvest. The total pounds harvested on kelp have remained about the same, increasing only slightly in 2006 when compared to an average of 2002 and 2003 (Figure 2). Expressed as a percentage, there was a 2% increase between the 2002 and 2006 harvest and a 4% decrease between the 2003 and 2006 harvest (Figure 2). The 2006 harvest data show a decrease in the total pounds harvested on seaweed. The percentage harvested on seaweed accounted for less than 1% of the total harvest. This represents a decline of 73% compared to 2002 and 53% compared to 2003, in line with an overall decline in that stratum.

The estimated per capita harvest of herring roe on all strata for 2006 was 434 lb. The 2006 per capita harvest represents a 5% (23 lb) decline when compared to the 2002 harvest of 458 lb per person. When compared to the 2003 harvest of herring roe on all strata, the decrease is 18%, or 97 lb, per capita. The per capita harvest for 2006 is lower than the per capita harvest of either 2002 or 2003 (Figure 3). The per capita subsistence harvest of herring roe on hemlock branches remained relatively unchanged between 2002 and 2006; however the per capita harvest declined 18% (93 lb) between the 2003 harvest of 514 lb per person and the 2006 per capita harvest of 422 lb (Figure 4). The per capita herring roe harvest on kelp declined 33% from 13 lb in 2002 to 9 lb in 2006. The roe-on-kelp harvest declined only slightly, 1%, between 2003 (9 lb) and 2006 (9 lb) (Figure 4). The herring roe on seaweed per capita harvest dropped from a high of 23 lb in 2002 to 8 lb in 2003 and 4 lb in 2006. The herring roe on seaweed harvest between 2002 and 2006 represents an 82% (19 lb) decline, while the 2003 and 2006 harvest a 51% (4 lb) decline (Figure 4).

The percentage of households harvesting herring roe was 16% less, down from 71% in 2002 and 2003 to 55% in 2006 (Figure 5). The distribution of herring roe overall declined between 2002, 2003, and 2006. The percentage for households using herring eggs declined somewhat from 97% in 2002 and 97% in 2003 to 86% in 2006 (Figure 5). The percentage of households receiving herring roe declined 7 % when comparing 2002 and 2006; however the percentage increased slightly, 1%, when comparing 2003 to 2006. The percentage of households giving

herring roe increased from 40% in 2002 to 61% in 2006, however the overall percentage of giving between households has declined from 72% in 2003 to 61% in 2006 (Figure 5).

Although a direct comparison between reported harvest locations is not possible due to a change in the reporting method, some general areas emerge when the three data sets are examined. Participants in the 2002 and 2003 harvest survey were asked to indicate the general area, on a map, where they harvested. On the back of the survey form was a map of Sitka Sound that had been divided into five areas, 1A, 1B, 1C, 2A, and 2B respectively (see Appendix A). Area 1A contains the Crow, Gagarin, and Middle islands. Area 1B contains Kasianan and Apple islands. Area 1C contains the Galanikin and Whale islands.

In 2002, 37% and in 2003 46% of the harvest took place in Area 1A. In 2006 harvest was reported at the following locations, within Area 1A, Crow and Gagarin Island, 15%; Middle Island, 28%; these three areas when combined total 43%, which is comparable to the harvest in that area in 2002 and 2003. The same correlation is evident when looking at the area defined as 1B. In 2002 and 2003, 41% and 31% of the harvest, respectively, was reported in the area defined as 1B. In 2006 the combined harvest at the Kasianan and Apple islands (both within the area previously defined as area 1B), is 35%, comparable to the harvest in 2002 and 2003. In 2002, 9% and in 2003, 2%, of the harvest was reported in area 1C. No major harvest was reported, in 2006, at any specific location previously defined as area 1C. While a direct comparison is not possible, the data show the three areas, 1A, 1B, and 1C, containing the Kasianan, Middle, Crow, Gagarin, and Apple islands, continue to be important harvest locations for subsistence herring roe.

CONCLUSIONS

Overall, the 2006 subsistence herring roe harvest from all strata, showed a slight increase, 2%, from the average 2002 and 2003 harvests, though the per capita declined 12%. However, when comparing the average 2002 and 2003 harvests to 2006, the percentage of household harvesting declined 16%, the percentage of households using herring roe declined 11%, and the percentage of households receiving herring roe declined 3%. The percentage of households giving away herring roe increased 5% in 2006 when compared to the average 2002 and 2003 harvests. This increase corresponds with estimated 30,780 lb shipped out of Sitka during the 15 days of the fishery in 2006. The high per capita harvest in combination with the high percentage of households sharing of herring roe reinforces the value and importance of this resource to the subsistence users in Sitka. Without additional surveys using the same methodology as the 2002, 2003, and 2006 surveys, no trend is detectable. This fishery remains important as a subsistence resource to Sitka residents and appears to be within the range of the amount reasonably necessary to provide opportunity for subsistence uses. Several areas, primarily north of Sitka, are especially important for harvesting herring roe among 21 locations identified.

Specifically, we conclude three recommendations for future work would be beneficial for the management of the Sitka Sound subsistence herring roe fishery:

1. It is recommended the subsistence herring roe harvest survey be conducted jointly for several more survey years, to ascertain any trend in the harvest or stability in the fishery.
2. It is recommended the survey continue to document specific areas used for harvesting herring roe, to ascertain any changes in spawning areas.

3. It is recommended that ADF&G and Sitka Tribe of Alaska continue to collaborate on the herring roe survey, in accordance with the MOA and their long standing working relationship.

ACKNOWLEDGEMENTS

The Alaska Department of Fish and Game, Division of Subsistence thanks the staff of the Sitka Tribe of Alaska Resources Protection department for their hard work, in particular Robi Craig, Jessica Perkins, Ron Baines, and Richard Biggs for the long hours, innumerable phone calls, and persistence in trying to reach as many harvesting households as they did given the short amount of time and funding available. The survey would not have been possible without their diligence.

The Sitka Tribe of Alaska would like to thank STA's Herring Committee and Tribal Council for their ongoing dedication to the implementation of the annual subsistence herring egg harvest survey.

Both the Division of Subsistence and Sitka Tribe of Alaska would like to thank the Alaska Department of Fish and Game, Division of Commercial Fisheries, for funding the 2002, 2003, and 2006 Sitka herring roe harvest survey. Gretchen Jennings, ADF&G Sport Fish Division, did the data entry and analysis.

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Table 1.–Estimated pounds of herring roe harvested by strata, Sitka, 2006.

	Pounds Harvested			
Resource Strata	Own Use	Shared within Sitka	Shipped out of Sitka	Total
Herring Spawn-on-kelp	1,395	1,718	1,260	4,373
Herring Roe-on-hair seaweed	149	1,410	472	2,031
Herring Roe-on-hemlock branches	31,497	95,197	86,258	212,952
Total	33,041	98,326	87,990	219,356

Source: Sitka Tribe of Alaska and Alaska Department of Fish and Game, Division of Subsistence, Household Surveys, 2006

Table 2.–Estimated harvest and use of herring roe, Sitka, 2002, 2003, and 2006.

	Percentage of Households				Pounds Harvested		
2006 Subsistence herring roe survey	Use	Harvested	Received	Giving	Total	Mean HH	Percapita
Herring Roe - all types	86	55	47	61	219,356	1,371	434
Herring Spawn on Kelp	0	17	0	0	4,373	27	9
Herring Roe on Hair Seaweed	0	7	0	0	2,031	13	4
Herring Roe on Hemlock Branches	0	51	0	0	212,952	1,331	422
2003 Subsistence herring roe survey							
Herring Roe - all types	97	71	46	72	278,799	1,710	531
Herring Spawn on Kelp	0	19	0	14	4,556	28	9
Herring Roe on Hair Seaweed	0	14	0	9	4,339	27	8
Herring Roe on Hemlock Branches	0	67	0	58	269,905	1,656	514
2002 Subsistence herring roe survey							
Herring Roe - all types	97	71	55	40	151,717	1,405	458
Herring Spawn on Kelp	0	32	0	0	4,270	40	13
Herring Roe on Hair Seaweed	0	17	0	0	7,642	71	23
Herring Roe on Hemlock Branches	0	65	0	0	139,756	1,294	422

Source: Sitka Tribe of Alaska, and Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 2002, 2003, & 2006

Table 3.–Percentage of harvesting households using various locations and pounds harvested, Sitka, 2006.

Location	Reported # of households using location	Percentage of harvesting households using location	Reported pounds harvested
Kasiana Islands Group	42	33	95,165
South Middle Island	22	17	28,640
Crow/Gagarin Islands	19	15	16,891
North Middle Island	14	11	22,346
Big/Little Gavanski Islands	5	4	2,835
Other	5	4	990
Eastern/Promisla Bay	3	2	500
Apple/Parker Group	2	2	950
North Halibut Point Road	2	2	3,690
North Japonski/Whiting Harbor	2	2	1,550
Redoubt/Kanaga Bay	1	1	0
	117	92	173,557

Source: Sitka Tribe of Alaska, and Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 2006

Table 4.–Percentage of households useing various size vessels for herring roe harvest, Sitka, 2006.

Total	Skiff		Pleasure cruiser 20'-24'		Pleasure over 24'		Other - unspecified		provided.	
Households Sampled	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
127	32	25	17	13	23	18	2	2	58	46

Source: Sitka Tribe of Alaska and Alaska Department of Fish and Game, Division of Subsistence, Household Surveys, 2006.

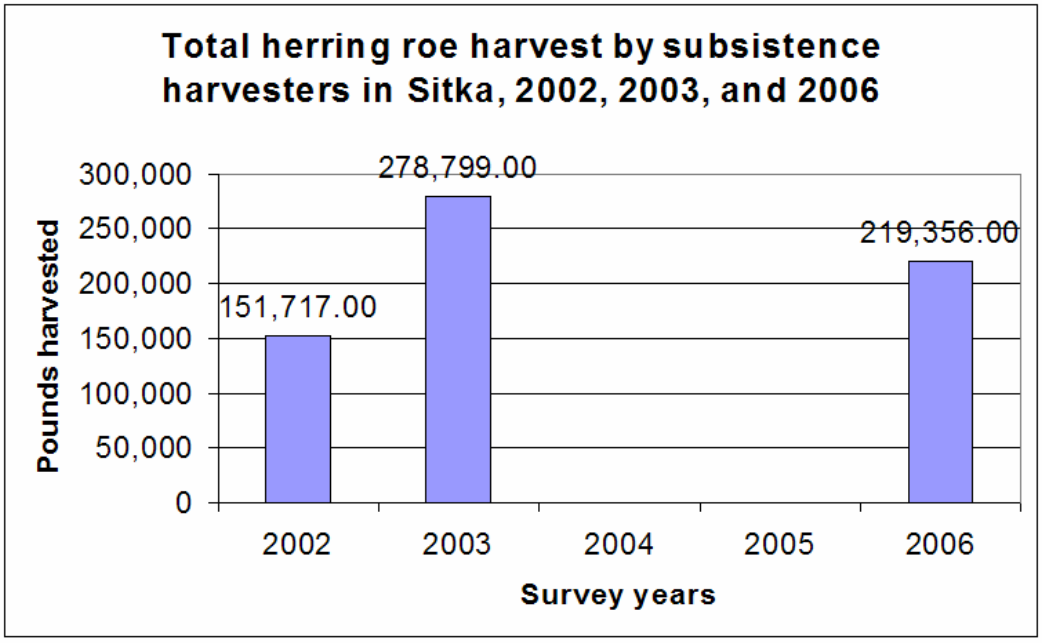


Figure 1.–Total herring roe harvest by subsistence harvesters in Sitka, 2002, 2003, and 2006.

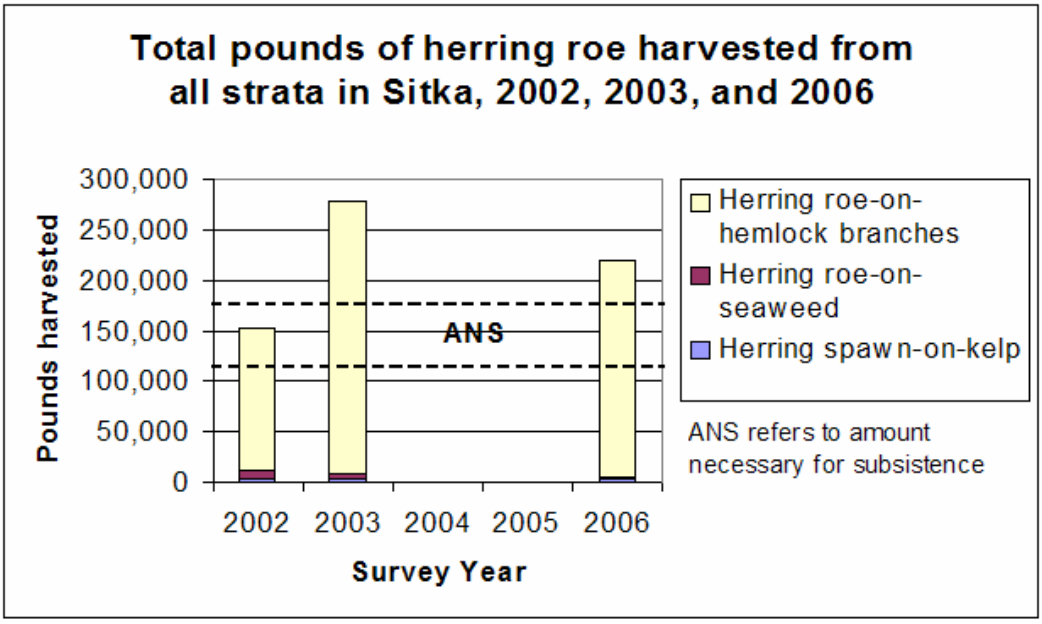


Figure 2.–Total pounds of herring roe harvested from all strata in Sitka, 2002, 2003, and 2006.

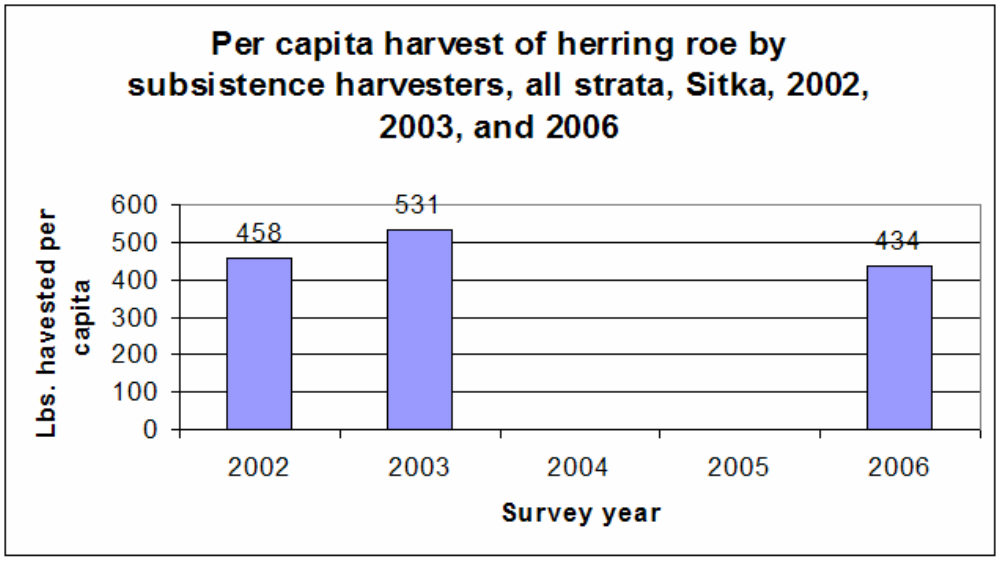


Figure 3.–Per capita harvest of herring roe by subsistence harvesters in Sitka, 2002, 2003, and 2006.

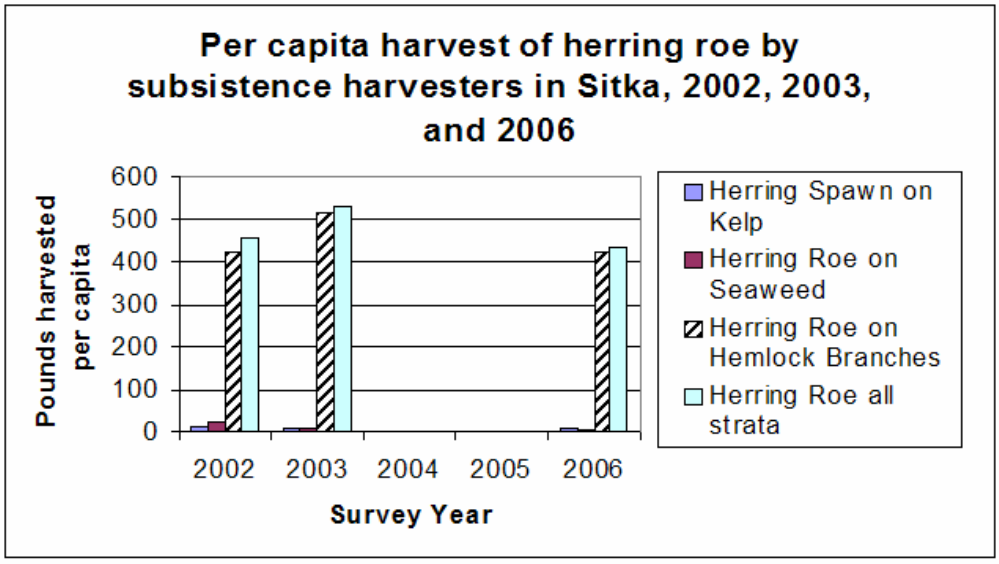


Figure 4.–Per capita harvest of herring roe by subsistence harvesters in Sitka, 2002, 2003, and 2006.

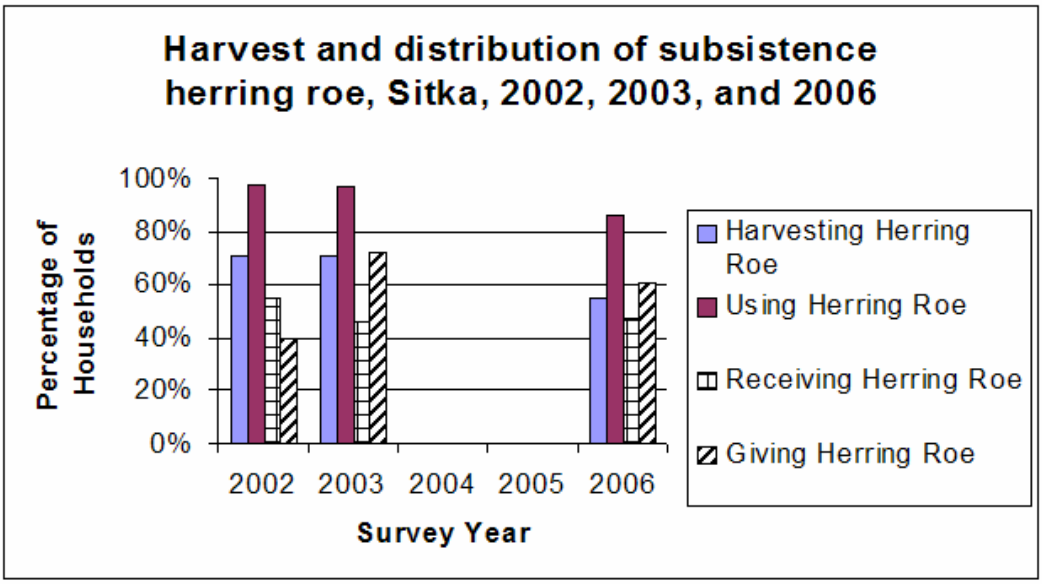


Figure 5.–Harvest and distribution of subsistence herring roe, Sitka, 2002, 2003, and 2006.

APPENDIX A. SUBSISTENCE HERRING ROE SURVEY FORM USED FOR 2002 AND 2003

Subsistence Herring Egg Harvest Survey 2002
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ [ ] How many people lived in your household in 2002?_____

HHID _____ Date _____ [ ] Interviewer _____

If enrolled in a tribal government, which tribe? _____ [ ]

[Sitka Tribe of Alaska= 01; ; Other SE tribe=02; Other Alaska tribe=03; None=04]

Please answer each question to the best of your knowledge. All your answers are confidential and will only be recognized by an assigned household survey number.

During 2002, did you or your household:

		Yes	No	
1.	Use herring eggs in **2002**?			
2.	Harvest herring eggs in **2002**?			
3.	Receive herring eggs in **2002**?			
4.	Give away herring eggs in **2002**			

If you answered yes to question #2, go to question 5. If no, stop here. Thank you for your time and cooperation!

5. How many **<u>total pounds</u>** of Herring Roe **on Branches** did you harvest during **2002** ? _____ [ ]
(Total)

Pounds for your own personal or home use		
Pounds given away in Sitka		
Pounds shipped out of Sitka		

6. How many **<u>total pounds</u>** of Herring Roe **on Kelp/Other** did you harvest during **2002** ?_____ [ ]
(Total)

	Macrocystis		Né		Other	
Pounds for your own personal or home use						
Pounds given away in Sitka						
Pounds shipped out of Sitka						

7. What size vessel(s) did you use to harvest herring eggs in **2002** ? [ ] [ ]
[01=Skiff under 20'; 02=Pleasure cruiser 20'-24'; 03=Commercial or Pleasure over 24'; 04=Other]

8. Where did you harvest herring eggs in **2002** [Circle area]: Area 1A [ ] Area 1B [ ] Area 1C [ ]
Area 2A [ ] Area 2B [ ]
[Mark areas in red on map on reverse to show area(s) where you made sets]

Do you have any comments about the **2002** subsistence herring egg harvest? _____

_____

_____

_____

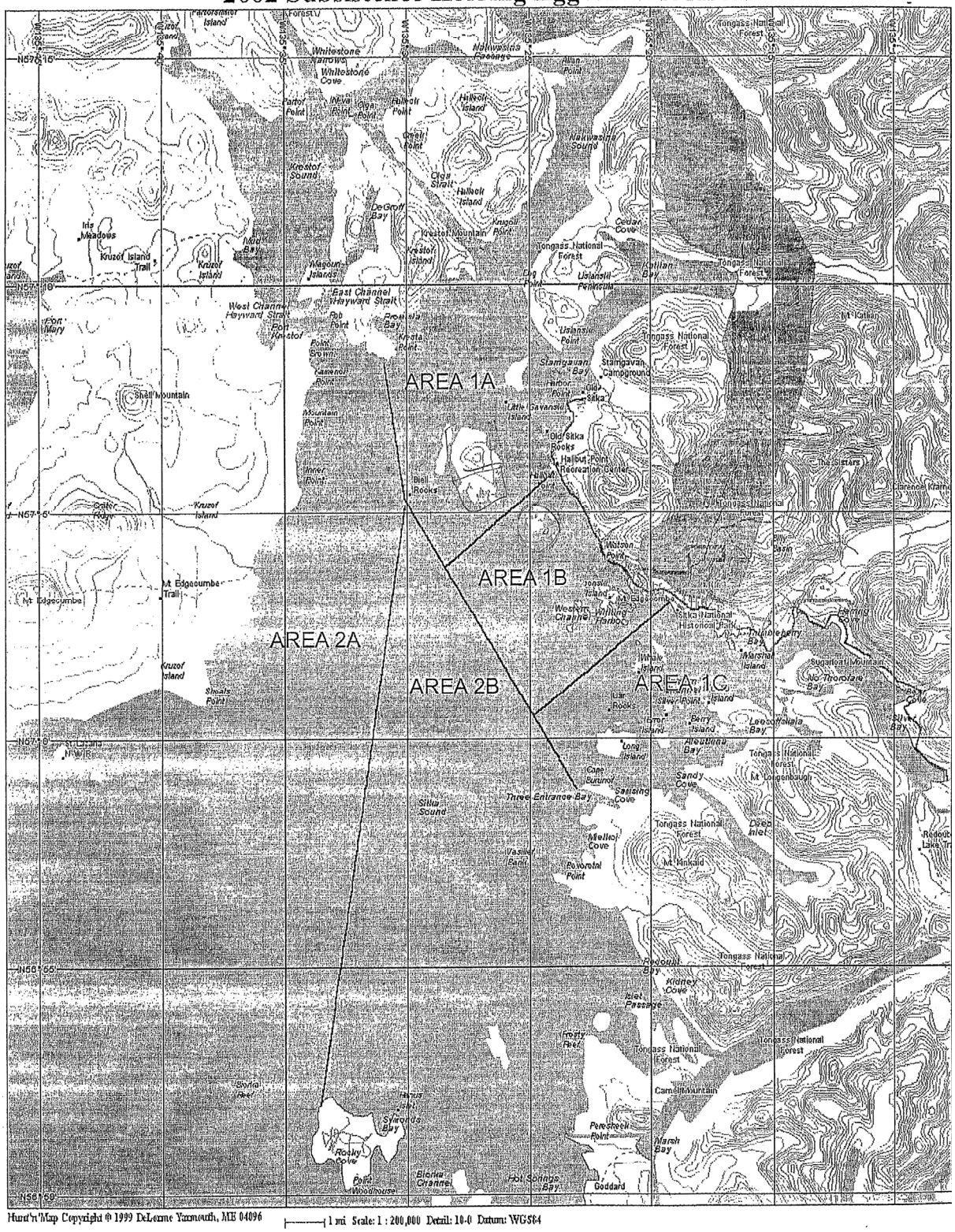
_____

THANK YOU FOR YOUR TIME AND FOR HELPING WITH THIS PROJECT - GUNALCHEESH! HOWÁ!

This information will help Sitka Tribe of Alaska in its efforts to protect subsistence uses of this important resource!

This participant also completed an "STA Supplemental Survey" Yes No

2002 Subsistence Herring Egg Harvest Areas



APPENDIX B. SUBSISTENCE HERRING ROE SURVEY FORM USED FOR 2006

Subsistence Herring Egg Harvest Survey 2006

Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ How many people lived in your household in 2006? _____

HHID _____ Date _____ Interviewer _____

If enrolled in a tribal government, which tribe? _____

[Sitka Tribe of Alaska= **01**; Other SE tribe=**02**; Other Alaska tribe=**03**; None=**04**]

Please answer each question to the best of your knowledge. All your answers are confidential and will only be recognized by an assigned household survey number.

During 2006, did you or your household:		Yes	No	Yes	No
1.	Use herring eggs?				
2.	Attempt to Harvest herring eggs?				
3.	Harvest herring eggs?				
4.	Receive herring eggs?				
5.	Give away herring eggs?				

If you answered yes to question #3, go to question 6. If no, stop here. Thank you for your time and cooperation!

6. How many **<u>total pounds</u>** of Herring Roe **on Branches** did you harvest during **2006** ? _____ (Total)

Pounds for your own personal or home use		
Pounds given away in Sitka		
Pounds shipped out of Sitka		

7. How many **<u>total pounds</u>** of Herring Roe **on Kelp/Other** did you harvest during **2006** ?_____ (Total)

	Macrocystis		Hair Seaweed-*Né*		Other	
Pounds for your own personal or home use						
Pounds given away in Sitka						
Pounds shipped out of Sitka						

8. What size vessel(s) did you use to harvest herring eggs in 2006 ? _____ _____ _____
[01=Skiff under 20'; 02=Pleasure cruiser 20'-24'; 03=Commercial or Pleasure over 24'; 04=Other]

9. Where did you harvest herring eggs in **2006?** See other side of survey.

Do you have any comments about the **2006** subsistence herring egg harvest? _____

_____

THANK YOU FOR YOUR TIME AND FOR HELPING WITH THIS PROJECT - GUNALCHEESH! HOWÁ!

This information will help Sitka Tribe of Alaska in its efforts to protect subsistence uses of this important resource!

	Where did you set/fish branches, harvest hair seaweed, macrocystis kelp in 2006?					
	Location	# of Sets	Substrate	Pounds Harvested	Quality	Comments
1	Kasiana Islands Group					
2	North Middle Island					
3	South Middle Island					
4	Crow/Gagarin Islands					
5	Big/Little Gavanski Islands					
6	Siginaka Islands					
7	North Japonski/Whiting Harbor					
8	South Japonski					
9	South Halibut Point Road					
10	North Halibut Point Road					
11	Eastern/Promisla Bay					
12	Magoons/Hayward					
13	Katlian Bay					
14	Apple/Parker Group					
15	Crescent/Jamestown Bay					
16	Camp Coogan					
17	Aleutkina Bay					
18	Three Entrance Bay					
19	Redoubt/Kanaga Bay					
20	Goddard/Windy Pass					
21	Other					

Substrate: **(B)** Branches **(H)** Hair Seaweed **(K)** Macrocystis Kelp

Quality: Excellent, Good, Fair, Poor