Technical Paper No. 369

The Subsistence Harvest of Herring Spawn in Sitka Sound, Alaska, 2011

by

Lauren Sill

and

Terri Lemons

May 2012

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the reports by the Division of Subsistence. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

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.)	$, ¢
mnths (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	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. 369

THE SUBSISTENCE HARVEST OF HERRING SPAWN IN SITKA SOUND, ALASKA, 2011

by

Lauren Sill,
Alaska Department of Fish and Game, Division of Subsistence, Juneau

and

Terri Lemons
Alaska Department of Fish and Game, Division of Subsistence, Anchorage

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

May 2012

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 Resources Library and Information Services (ARLIS), the Alaska State Library and on the Internet: http://www.adfg.alaska.gov/sf/publications. This publication has undergone editorial and professional review.

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

and
Terri Lemons
Alaska Department of Fish and Game, Division of Subsistence,
333 Raspberry Rd., Anchorage, AK 99518-1599, USA

This document should be cited as:
Sill, L. and T. Lemons. 2012. The subsistence harvest of herring spawn in Sitka Sound, Alaska, 2011. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 369, Juneau.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

LIST OF APPENDICES

Appendix **Page**

ABSTRACT

The subsistence fishery for the spawn of Pacific herring *Clupea pallasi* in Sitka Sound has been, and remains, important to Alaska residents. Alaska Department of Fish and Game (ADF&G) Division of Subsistence research on the Sitka Sound subsistence herring spawn fishery reveals that harvesting is a specialized activity in which a relatively small number of community members harvest and distribute herring spawn to many others. The giving and receiving of herring spawn products remains culturally important to Alaska residents. This report presents the results of the tenth annual harvest survey conducted in Sitka in 2011. The survey generated data used to calculate estimates of the subsistence harvest of herring spawn on hemlock branches as well as on other substrates, including, but not limited to, kelp and seaweed in Sitka Sound. This report provides additional data and complements the Sitka Sound subsistence herring spawn harvest monitoring discussions found in *Sitka Sound Subsistence Herring Roe Fishery, 2002, 2003, and 2006*, by Mathew Brock and Michael F. Turek (ADF&G Division of Subsistence Technical Paper No. 327) and *The Subsistence Harvest of Herring Spawn in Sitka, Alaska 2002–2010* by Holen et al. (ADF&G Division of Subsistence Technical Paper No. 343).

Key words: Pacific herring, *Clupea pallasi*, herring spawn, subsistence fishing, harvest estimate, subsistence, Sitka, Sitka Tribe of Alaska.

INTRODUCTION

The spawn (fertilized eggs) of Pacific herring *Clupea pallasi*, generally known as "herring eggs," is a traditional food for Native Americans throughout the Pacific Northwest and Southeast Alaska. Although herring spawn is consumed throughout this region, only a small number of people have the time, equipment, skills, and knowledge required to harvest it. Sitka Sound herring spawn was, and continues to be, shared throughout the area and beyond, as far north as the Yukon Territory and as far south as Hawaii (Schroeder and Kookesh 1990). Herring spawn was traditionally exchanged for specialized foods, such as eulachon *Thaleichthys pacificus* oil and dried eulachon, berries, dried seaweed, and mountain goat *Oreamnos americanus* meat. Herring spawn was also traded for raw materials and handicrafts. Currently, the bulk of traded herring spawn is distributed to other communities via boat and commercial air carriers. This report presents findings of the tenth annual project designed to document subsistence harvests in the Sitka Sound herring spawn fishery. The report covers the 2011 spring herring spawn fishery (See Holen et al. 2011for a discussion of the 2002–2010 study years).

The sheer abundance of herring spawn and the length of the spawning period made the Sitka Sound harvest special in both the historical and contemporary periods (Schroeder and Kookesh 1990). In the 19th century, Sitka was a center for harvesting herring and herring spawn. Russians living in Sitka at the time wrote about the large numbers of Tlingit who gathered to collect herring spawn. Rezanov, a plenipotentiary of the Russian American Company, wrote that over 1,000 *Kolosh* (Tlingit) had come to Sitka Sound to be present for the herring spawn harvest on March 22, 1806 (Pierce 1972). In 1827, Frédéric Lütké, a captain in the Russian Navy, reported that, in the spring, up to 1,000 Tlingit gathered near Baranov's castle, and an equal number on nearby islands, to collect herring spawn (Emmons 1991:119). Tlingit came from all over Southeast Alaska to Sitka Sound. In the 1860s, herring were so numerous around Sitka in February and March that the water became milky from eggs and milt and it was easy to catch herring with a rake (Tikhmenev 1978:422).

Then, as now, the primary method of harvest was to submerge branches of the Western hemlock *Tsuga heterophylla* in salt waters just outside the intertidal zone before spawning took place. The herring deposited their eggs on the branches of the hemlock, which were then removed from the water. Other substrates used include *Macrocystis* kelp, hair seaweed *Desmarestia* spp., rockweed *Fucus* spp., and, at one time, blueberry *Vaccinium* spp. bushes. Historically, herring spawn was consumed either fresh or air-dried, or was packed in salt for later use and distribution. As freezers became more common in households in the 1940s and 1950s, freezing became the preferred method of preserving herring spawn.

At its February 1989 meeting, the Alaska Board of Fisheries (BOF) made a positive customary and traditional use determination for the harvest of herring spawn in Sitka Sound. In September 2001, a meeting between the commissioner of the Alaska Department of Fish and Game (ADF&G), the directors of the ADF&G Division of Commercial Fisheries and the ADF&G Division of Subsistence, and the Sitka Tribe of Alaska (STA) was held in Sitka to discuss the Sitka Sound subsistence herring spawn fishery. Members of the STA and other individuals stated that they were unsuccessful in meeting their subsistence needs for herring spawn in the Sitka Sound area during spring 2001. They cited the intensive commercial harvest of herring in the Middle, Crow, and Kasiana islands areas as affecting the subsistence users' ability to successfully harvest herring spawn on hemlock branches.

At the January 2002 BOF meeting, the STA submitted an unsuccessful proposal requesting recognition of the geographically and historically important areas used for the subsistence herring spawn harvest. During this meeting the BOF also considered, but did not adopt, a permit program for the subsistence fishery. Consequently, the BOF requested that the Division of Subsistence work with the STA to develop a harvest monitoring program based on in-person harvest surveys. The BOF also made a determination that the amount reasonably necessary for subsistence[1] (ANS) was between 105,000 and 158,000 lb of herring spawn harvested from Section 13A and that portion of Section 13B that is north of the latitude of Aspid Cape (5 AAC 01.716 (b)). In 2009, the BOF revised the ANS to 136,000–227,000 lb. In the Sitka Sound area, state regulations allow the subsistence harvest of herring and herring spawn in sections 13A and 13B north of Aspid Cape on Baranof Island (5 AAC 01.716 (a) (7)) as well as the limited noncommercial exchange of subsistence-harvested herring spawn on kelp for customary trade (5 AAC 01.717).

The 2002 ANS finding was based on 3 ADF&G Division of Subsistence harvest estimates: 1) a 1996 Sitka household harvest survey estimate of 127,174 lb[2]; 2) this 1996 estimate expanded to the 2000 Sitka population, which resulted in an estimate of 131,642 lb; and 3) the Schroeder and Kookesh (1990) estimate of between 80,000 and 120,000 lb. The 2009 ANS finding was based on the mean estimated harvest from 2002–2008 (181,330 lb), with a range of plus or minus 25%. The mean estimated harvests of those years were determined through the annual herring spawn harvest survey conducted by the Division and STA (see Holen et al. 2011).

Monitoring the subsistence harvest of herring spawn in Sitka Sound is an ongoing project. Division of Subsistence participation in the annual harvest monitoring program is and has been supported by a reimbursable services agreement (RSA) from the Division of Commercial Fisheries to the Division of Subsistence and by the Division of Subsistence (Division) using core state general funds. The STA provides its own funding for the project, except for the harvest survey component of the research, which is supported by a cooperative agreement with ADF&G. The STA and the Division collaborate on survey design and data collection. The Division provides technical consultation and, when possible, field survey and interviewing support for the project. The STA provides the Division with surveys and raw harvest data each year for analysis by the Division's standard statistical methods.

PROJECT OBJECTIVES

The primary goal of the project was to document the subsistence harvest of herring spawn in Sitka Sound for the year 2011. The objectives of the harvest monitoring were to:

1. Conduct in-person interviews with household members in Sitka and surrounding communities who were identified as likely harvesters of herring spawn from Sitka Sound for subsistence;

1. Pursuant to Alaska Statute 16.05.258, the Alaska Board of Fisheries and the Alaska Board of Game are charged with identifying the fish stocks and game populations that are customarily and traditionally taken or used for subsistence, and for determining the amount of the harvestable portion that is reasonably necessary for subsistence uses.
2. Data from this survey are in the ADF&G Division of Subsistence Community Subsistence Information System (http://www.subsistence.adfg.state.ak.us/CSIS), hereinafter cited as CSIS.

2. Produce estimates of the total pounds of herring spawn harvested on hemlock branches, *Macrocystis* kelp, hair seaweed, and "other" substrates; and,
3. Identify locations where herring spawn were harvested.

METHODS

Estimates of the subsistence herring spawn harvest in Sitka Sound have been produced for 2002–2011 by systematically identifying and surveying herring spawn harvesting households. Households were identified by knowledgeable STA and Division staff. This project was guided by the research principles detailed in the *Alaska Federation of Natives Guidelines for Research* as described by the Alaska Native Knowledge Network of the University of Alaska, Fairbanks (ANKN 2009). These principles stress community approval for research designs, informed consent, anonymity of project participants, community review of draft findings, and provision of project findings to each study community upon completion of the research.

SURVEY PLAN AND IMPLEMENTATION

STA and the Division met prior to the start of the 2011 subsistence herring spawn harvest to review the survey instrument, the methods for compiling the household list, and the methods for creating and validating conversion factors. The methods outlined in this section are a collaborative effort between the Division and STA. Division staff participated in the beginning of the herring spawn harvest in Sitka during April 2011 and collaborated with STA staff in the creation of weight conversion factors for 2011. STA staff conducted the household survey. STA staff worked closely with Division staff during the entire process.

Development of the Household Survey List

To meet Objective 1, a list of all likely harvesting households to target for interviews needed to be created. STA attempted to track down every known harvester in the community. Beginning with the 2010 household list, new harvesters were added and known non-harvesters were removed, following the methods discussed below and enumerated in Holen et al. 2011. Outreach by STA and a chain referral method were employed to expand the list. Harvesting is a highly visible activity; therefore it was assumed that active harvesters would be aware of other harvesters. Based on the knowledge of active harvesters identified through STA outreach efforts, additional harvesters were added to the household list. The household list also included households from other communities who harvested herring spawn in Sitka Sound, identified through STA outreach efforts and knowledge of the surveyor and STA staff. Once added to the household list, an identified household remains on the list unless 1 of 3 situations occurs. If the household is surveyed for 3 consecutive years and has not attempted to harvest within that time, it is removed, even if the household answers in the affirmative as to whether they plan to harvest in the future. If a household is unable to be contacted for 3 consecutive years, it is removed from the list. Finally, if the household identifies that it no longer plans to harvest, it is removed from the list. Once removed from the list, the household identification (ID) number is retired.

The Survey Instrument

Objectives 2 and 3 were addressed through the use of a household survey. The survey instrument was designed to collect information about:

1) Whether respondents harvested, attempted to harvest, used, received, or gave away herring spawn.
2) The amount of herring spawn harvested.
3) The kind of substrate used.

4) The amount of herring spawn respondents gave away locally or shipped out of Sitka and the communities where they shared the harvest.

5) The location of their harvests.

6) A qualitative description of the herring spawn harvest and the respondents' participation in the harvest.

There were no substantive changes to the survey instrument from the 2010 survey. A copy of the 2011 instrument can be found in Appendix A.

Survey Implementation

STA updated the 2010 household list and performed the survey in April, May, and June 2011, directly after the herring spawned. Using the 2010 household list as a base, STA created a list of 149 potential harvesters and successfully interviewed 97 of them. Forty-eight households were unable to be contacted and 4 households chose to not participate in the survey. Local researcher Dan Williams conducted the surveys. An interview was attempted for each household on the list. After the survey was finished, completed surveys were sent to the Division for coding and analysis. Completed surveys were given a code (see Appendix B for code book) based on user status: 1) individual harvester, 2) non-harvester, or 3) STA boat. Each year STA staff harvest some amount of herring spawn on hemlock branches for distribution to STA tribal members; the survey of STA is assigned the third code. STA harvest data is treated as individual harvest data for the general analysis.

Update of the 2011 Conversion Factor

Prior to the household survey, conversion factors to estimate pounds of herring spawn from common storage containers were created following the methods established in 2010. In May 2011, Division staff worked with STA to process 2,314 lb of herring spawn on hemlock branches. This was the first harvest of the season and was conducted using a boat owned and operated by STA. Prior to the beginning of the spawn, STA staff set hemlock branches in Sitka Sound. The location of the sets was determined by STA staff, based on their knowledge of the herring spawn and their experience with the harvest. Five of these sets were harvested by STA and ADF&G staff and used for the conversion factor update.

STA and Division researchers identified 25 lb and 50 lb "wet lock" boxes—a type of waxed cardboard box commonly used for shipping seafood—as well as plastic zip-top gallon- and quart-sized bags, as the most common container types for herring spawn. Eighty-pound wet lock boxes were considered to be common containers in years past, but researchers were unable to find one for purchase in the community in 2011.

Based on the plan devised by STA and the Division of Subsistence, the following steps were taken to measure weights in the field in 2011.

1. Once the boat returned to the harbor, STA staff used a hanging scale connected to a hydraulic hoist attached to the dock to weigh the branches and remove them from the boat. While still on the deck of the boat, some of the branches were placed in a plastic fish tote of the type commonly used in commercial fisheries. Once full, the tote was lifted off the boat and weighed. Some branches were not placed in totes; these branches were tied up with rope, then weighed and removed from the boat.
2. Division staff recorded, by hand, the scaled gross weight (including the weight of the tote, if applicable) on a sheet of paper.
3. STA staff then loaded the branches to a pickup truck for transfer to the STA offices, where the spawn was immediately processed. STA staff used pruning shears to snip off the bigger branches, and then loaded wet lock boxes with this spawn. Depending on the storage container, processing

the harvest included cutting off the larger branches and the parts of branches sparsely covered with spawn, and leaving the spawn on the smaller branches and needles. If the processed spawn was to be packed into zip-top bags, the more rigid branches were discarded, leaving the softer branches and needles that would not tear the bags. The processed weight was the usable weight that could be stored for consumption in something as small as a quart bag.

4. The processed spawn was placed in containers identified by STA as common containers used to store, move, and ship herring spawn. The container types reflected the units harvesters might be familiar with and able to report rather than giving direct estimates of pounds harvested.
    a. Each wet lock box from a herring set was placed in a plastic tote and weighed from a hanging scale. The gross weight of each tote was recorded by hand (weight of the plastic tote plus the weight of the wet lock box plus the weight of the spawn).
    b. Weights were taken for each box in order to understand variability between boxes. An average weight of each type of box was established. The net weights of all boxes of spawn coming from the original unprocessed set were compared to understand the difference between the unprocessed and processed spawn.
    c. During each processing event, some of the wet lock boxes did not get filled to the 100% mark. Researchers did not want to combine spawn from different sets during the processing into boxes, so the boxes that were not completely filled were included into the gross weight calculations for the set, but not included in mean box weight calculations.
5. A few wet lock boxes from each set were taken into the STA offices and further processed for quart and gallon zip-top plastic bags. Weights of the filled bags were taken by a desktop analog scale and recorded by hand.
    a. The weights of all zip-top bags coming from one wet lock box of spawn were compared to the weight of the wet lock box to understand the effect of additional processing.
    b. The weights of the bags were also taken independently for the purpose of developing an average weight for processed spawn for each bag size.
    c. During the processing, some of the plastic bags did not get filled to the 100% mark. Researchers did not want to combine spawn from multiple wet lock boxes, so any bags that were not completely filled were included into gross box calculations, but not included in mean bag weight calculations.

In all, 5 sets of branches were brought back to the harbor, and 3 of these sets were processed and weighed. The remaining 2 sets were weighed when brought off the boat, but only some of these 2 sets were processed into wet lock boxes and plastic bags. Since all of these 2 sets were not weighed before and after processing, the weights were only used for obtaining average weights on wet lock boxes and bags and were not included in overall harvest weight comparisons.

Researchers found that there was a slight decrease in weight between primarily processed (from tote to wet lock box) and secondarily processed (from box to bag) weights, which could be explained by the removal of branches during processing. The difference in weight between primary and secondary processing was 6.8%. This decrease has been factored into the conversion formula for 2011 (see Appendix C for the 2011 conversion factors).

DATA ANALYSIS

Division Information Management staff analyzed the data from the 2011 survey to produce estimates of the total harvest of herring spawn on all substrates. For 2011, the surveys were coded for data entry by Division staff in Anchorage using the conversion factors that were determined as described above. Division staff also created codes for responses given to assessment questions (see Appendix B for 2011

codebook). Responses were coded following standardized conventions used by the Division. Division Information Management staff in Anchorage set up database structures within a Microsoft SQL Server[3] database. The database structures included rules, constraints, and referential integrity to ensure that data were entered completely and accurately. Data entry screens were developed in Microsoft Access and made available on a secure network. 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 1 hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered twice and reviewed so as to minimize data entry errors.

Once data were entered and quality-control checked using standardized procedures employed by Division Information Management staff, the information was processed using the Statistical Package for the Social Sciences (SPSS), Version 18. Initial processing included performing standardized logic checks of the data, which are often needed in complex datasets where rules, constraints, and referential integrity do not capture all the possible inconsistencies that may appear.

Data analysis also 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 in a manner appropriate to each situation, following such standardized practices as minimal value substitution or the use of an average response for similarly-characterized households (mean replacement). Typically, missing data are an uncommon, randomly-occurring phenomenon in Division household surveys. 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.

The Division applied the weighted means method (Cochran 1977) to generate harvest estimates for herring spawn from an interviewed sample of households drawn from a list of households known to harvest herring spawn in Sitka during the study year. In cases where a household was known to be an active harvester during one year, but the harvest was unknown that year, the mean household harvest of that year was used as an estimate of that household's actual harvest. Information Management staff used the following formula to generate these estimates:

$$H = N\left(\frac{\sum x}{n}\right) \tag{1}$$

Where

H= Total estimated harvest,

N = Total number of households identified,

n = Number of sampled households, and

x = household's reported harvest.

In this approach, the mean of the estimate remains the same as the sampled mean so percentages derived from sampled households can be applied to the entire household list. The principal assumption is that the group of households from the household list of likely harvesters that were unable to be surveyed in 2011 has (on average) the same harvest and use patterns as the households that were successfully contacted. Since the mean is the primary statistic used to develop the estimates, Information Management staff produced a 95% confidence interval (CI), represented as a percentage, to measure the relative precision of the mean. The CI can also be applied to the total estimated harvest to obtain a likely upper and lower range for the estimate. The following formula was applied to create the CI percentage:

3. Product names are given because they are established standards for the State of Alaska, and for scientific completeness; they do not constitute an endorsement.

$$CI\% = \frac{t_{\propto/2} \times \frac{s}{\sqrt{n}} \times \sqrt{1 - \frac{n}{N}}}{\bar{x}} \quad (2)$$

Where

s = sample standard deviation,

n = sampled households,

N = total households identified,

$t_{\alpha/2}$ = student's t statistic for alpha level ($\alpha = 0.05$) with n–1 degrees of freedom, and

$\bar{x}$ = mean harvest.

A small CI percentage indicates low variance in household harvest amounts and that the actual mean is very close to the sampled mean. A larger CI percentage would indicate that there is a larger variance between household harvest amounts and an increased likelihood that the actual mean differs, possibly substantially, from the sampled harvest mean. Confidence intervals for household surveys conducted in 1987 and 1996 as well as data from the annual monitoring program are presented in Table 1. Confidence intervals are not available for the 1983 harvest estimates (Table 1).

2011 RESULTS

All 3 project objectives were satisfied in 2011. Ninety-seven of 149 households identified as potentially harvesting herring spawn were successfully interviewed. As provided in Table 1, 57 of the interviewed households attempted to harvest herring spawn, but only 53 of those households were successful. While this is an increase in the number of households attempting to harvest over 2010, it is still the third lowest number of harvesters documented over the course of this project.

Of the 65% of surveyed households who did not harvest any spawn in 2011, the majority had harvested spawn in previous years, and most planned to harvest again in the future (Table 2). The most common reason given for not participating in the harvest in 2011 was that the respondent received eggs from family members. This was followed closely by "working during the harvest" and "not having transportation/boat with which to harvest" (Figure 1). When asked for a qualitative assessment of the harvest in 2011, the most common comment was that the spawn "did not last long." The frequency of other comments offered on the survey is shown in Figure 2.

The second objective of the project was to estimate the total harvest of herring spawn in Sitka Sound during 2011. Table 3 presents the total estimated harvest (83,443 lb) of herring spawn by harvester type and substrate. As has been seen in prior years of study, the vast majority of spawn was harvested by Sitka residents. Regardless of who harvested the spawn, by far the most common substrate for the harvest was hemlock branches (Figure 3). Ninety-nine percent (82,796 lb) of reported harvests occurred on hemlock branches, while less than 1% was herring spawn on hair seaweed (303 lb) or herring spawn on kelp (343 lb).

Table 1.–Estimated harvest of herring spawn in Sitka Sound, 1983–2011.

Year	Percentage of households attempting to harvest	Estimated number of households attempting to harvest	Percentage of households harvesting	Estimated number of households harvesting	Percentage of harvesting households giving away herring spawn	Estimated harvest, all substrates, pounds	95% confidence interval (±)	Range: low	Range: high
For the following 3 years, the data pertain to the entire population of Sitka, based on a random sample.									
1983	n/a	n/a	24%	586	n/a	42,000[a]	n/a	n/a	n/a
1987	n/a	n/a	9%	261	n/a	20,494[a]	91%	1,755	39,235
1996	16%	476	15%	464	n/a	127,174	72%	35,131	219,217
For the following10 years, the data pertain to only those Sitka households identified as potential participants in the subsistence herring spawn fishery.									
2002	n/a	n/a	71%	77	95%	151,717	23%	116,701	186,734
2003	72%	117	71%	116	88%	278,799	19%	225,704	331,895
2004	61%	120	60%	118	93%	381,226	18%	312,224	450,229
2005	61%	111	52%	95	82%	79,064	9%	72,272	85,856
2006	58%	93	55%	88	91%	219,356	20%	176,484	262,228
2007	55%	92	48%	81	89%	87,211	22%	67,702	106,720
2008	45%	59	41%	54	73%	71,936	6%	67,764	76,108
2009	48%	91	48%	91	84%	213,712	9%	193,623	233,801
2010	30%	40	30%	40	85%	154,620	10%	139,872	169,367
2011	39%	57	35%	53	94%	83,443	5%	79,719	87,166

Sources CSIS; Brock and Turek 2007; STA household surveys, as summarized in Gmelch and Gmelch 1985.

a. Harvest estimates for 1983 and 1987 are likely low due to the small size of the random sample, which might have failed to include high harvesting households that specialize in harvesting herring spawn.

n/a = data were not collected during the study year.

Table 2.–Characteristics of households not harvesting herring spawn in 2011.

	Reported non-harvesting households				
			Plan to harvest in the future		
Total 2011 non-harvesting households	Harvested in previous years				Average years since last harvest
	Number	Percentage	Number	Percentage	
62	61.0	98.4%	60.0	96.8%	3.1

Sources STA and ADF&G Division of Subsistence household survey, 2011.

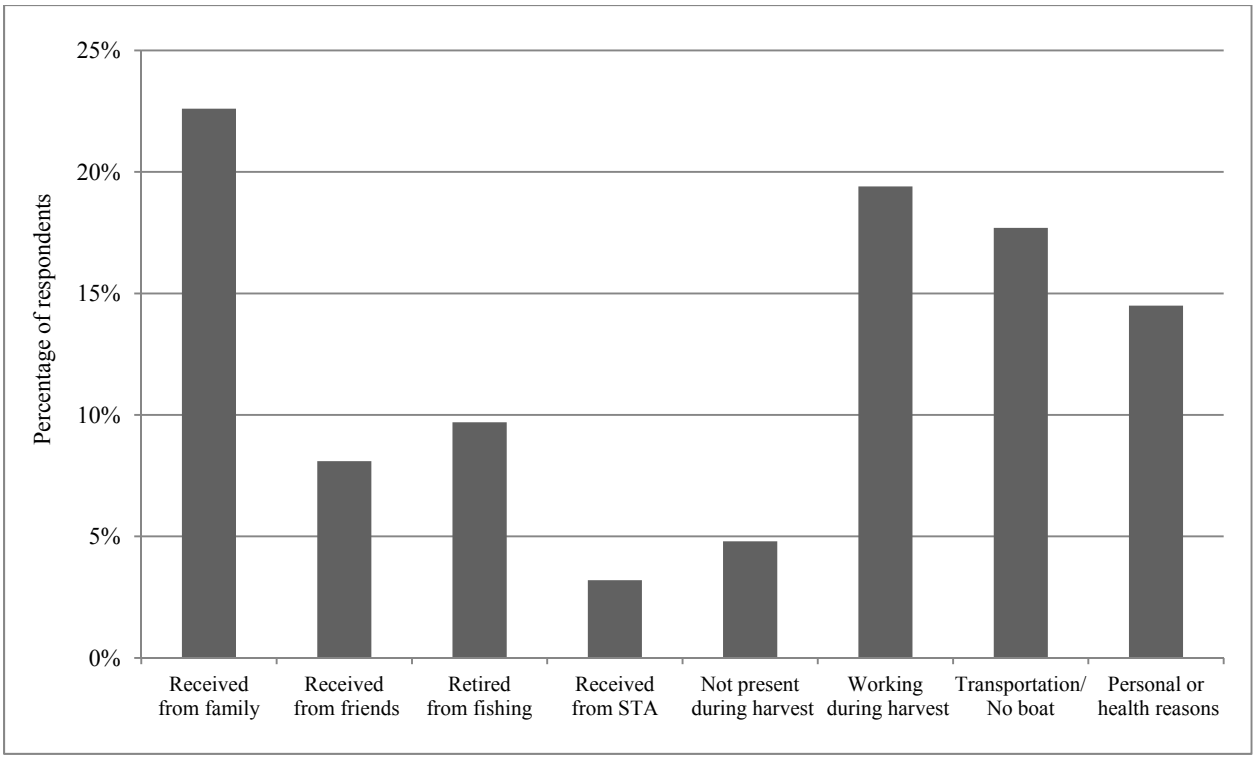

Figure 1.–Reported reasons households did not harvest herring spawn, Sitka area, 2011.

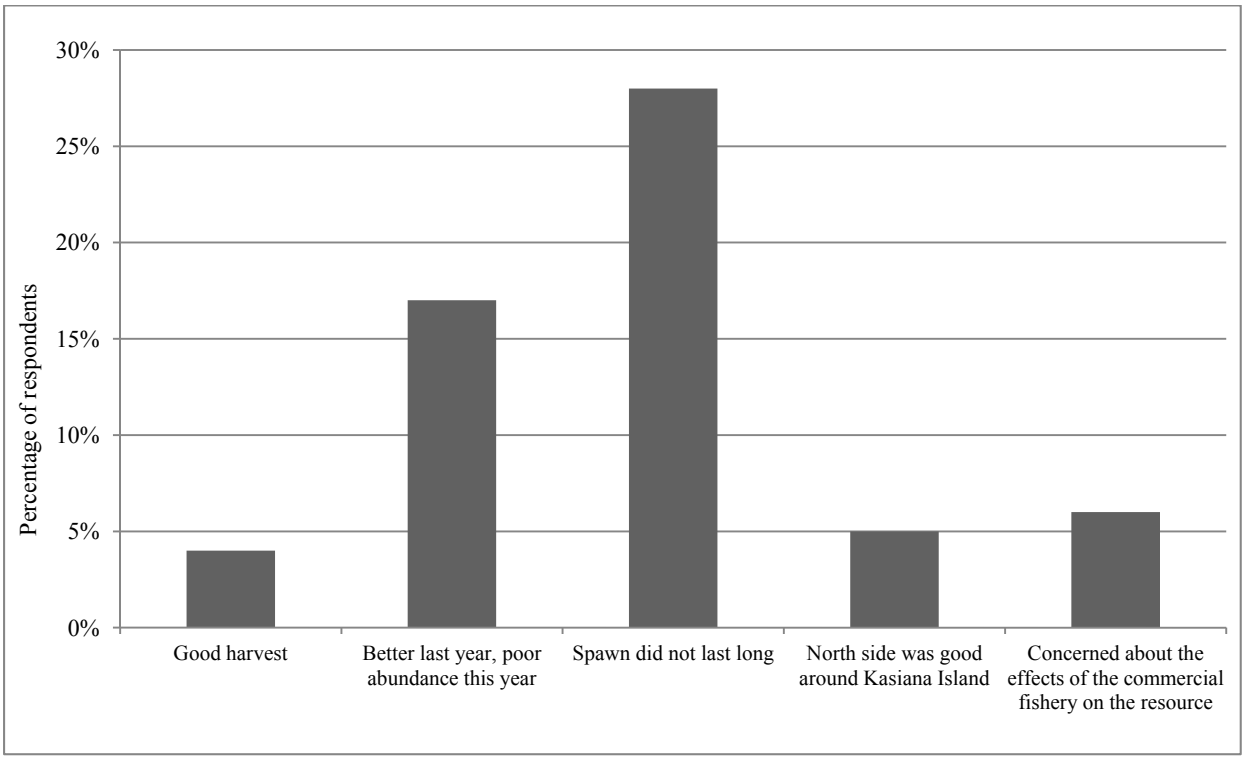

Figure 2.–Comments offered on the 2011 herring spawn harvest.

Table 3.–Harvest and use of herring spawn by community of residence, Sitka area, 2011.

Resource	Percentage of households						Estimated pounds harvested, total
	Used	Attempted	Harvested	Gave	Received	Used in garden	
Sitka households (n=91)							
Herring spawn on kelp	n/a	n/a	6.6%	n/a	n/a	n/a	297.2
Herring spawn on hair seaweed	n/a	n/a	4.4%	n/a	n/a	n/a	303.4
Herring spawn on other	n/a	n/a	0.0%	n/a	n/a	n/a	0.0
Herring spawn on hemlock branches	n/a	n/a	28.6%	n/a	n/a	n/a	71,518.9
Subtotal, herring spawn, all types	**98.9%**	**37.8%**	**34.1%**	**34.4%**	**66.7%**	**1.1%**	**72,119.5**
Other communities (n=5)							
Herring spawn on kelp	n/a	n/a	20.0%	n/a	n/a	n/a	46.2
Herring spawn on hair seaweed	n/a	n/a	0.0%	n/a	n/a	n/a	0.0
Herring spawn on other	n/a	n/a	0.0%	n/a	n/a	n/a	0.0
Herring spawn on hemlock branches	n/a	n/a	40.0%	n/a	n/a	n/a	3,633.2
Subtotal, herring spawn, all types	**100.0%**	**40.0%**	**40.0%**	**40.0%**	**40.0%**	**0.0%**	**3,679.4**
Sitka Tribe of Alaska (n=1)							
Herring spawn on kelp	n/a	n/a	0.0%	n/a	n/a	n/a	0.0
Herring spawn on hair seaweed	n/a	n/a	0.0%	n/a	n/a	n/a	0.0
Herring spawn on other	n/a	n/a	0.0%	n/a	n/a	n/a	0.0
Herring spawn on hemlock branches	n/a	n/a	100.0%	n/a	n/a	n/a	7,643.8
Subtotal, herring spawn, all types	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**0.0%**	**7,643.8**
Total	**99.0%**	**38.5%**	**35.4%**	**35.4%**	**65.6%**	**1.0%**	**83,442.7**

Sources STA and ADF&G Division of Subsistence household survey, 2011.

n/a = data were not collected for each individual resource type.

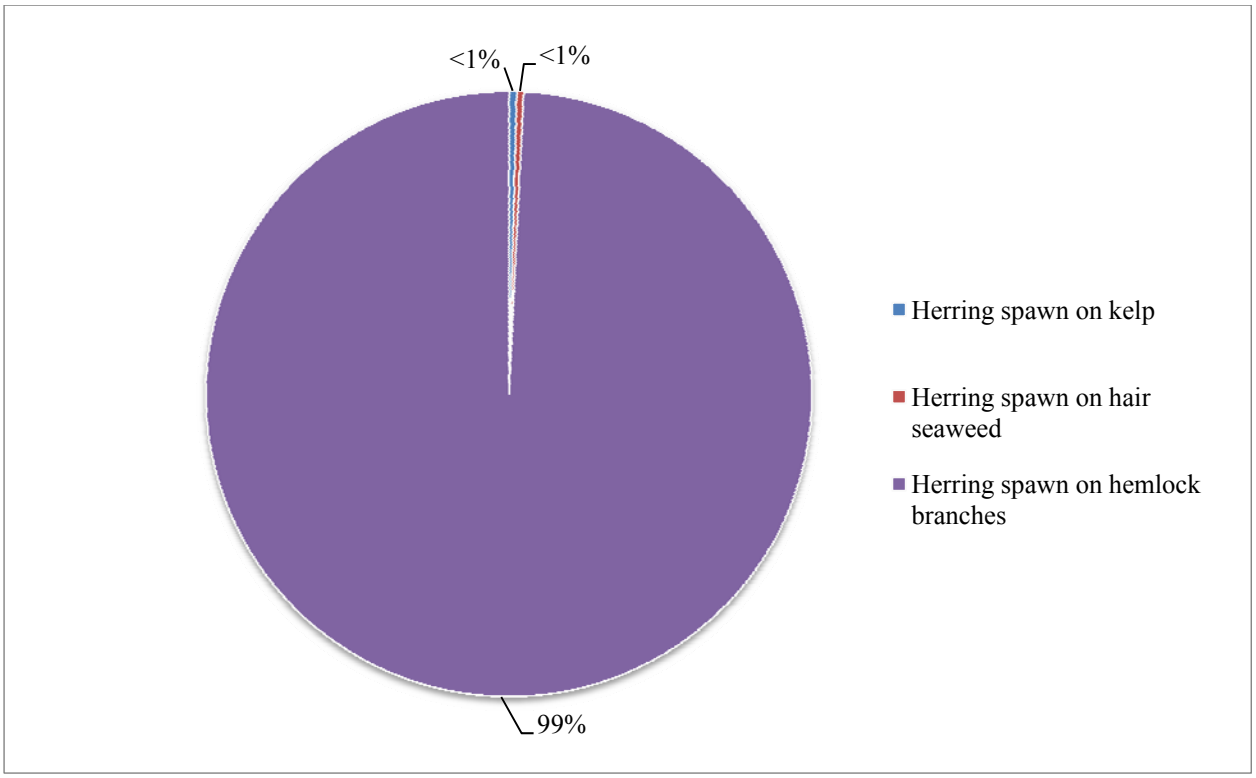

Figure 3.–Distribution of herring spawn harvest by substrate, Sitka area, 2011.

Much of the 2011 estimated harvest was shared with the community and beyond. Sixty-six percent of households in the survey universe received spawn in 2011, while 35% of households gave away some of their harvest. Of just the households that harvested spawn, 94% shared their harvest. It is likely that there are many households in Sitka and beyond that received herring spawn but were not on the list of potential harvesters, and are therefore not included in these percentages. Of the total amount of herring spawn that was harvested, only 7% was kept for use by the harvesting household; the remainder was given away. Of the more than 90% that was shared with others, just over one-half was shared with residents of Sitka, and the remainder was shipped outside of Sitka (Figure 4). The majority of the harvest of hemlock branches was either shared within Sitka or shipped out of the community; only a small percentage was retained by the harvester. The harvest of herring spawn on kelp or hair seaweed was not shared with families outside of Sitka. Approximately 89% of the hair seaweed harvest was shared with other households in Sitka, while the herring spawn on kelp harvest was almost equally divided between sharing with other Sitka households and keeping for the harvester's own use (Table 4).

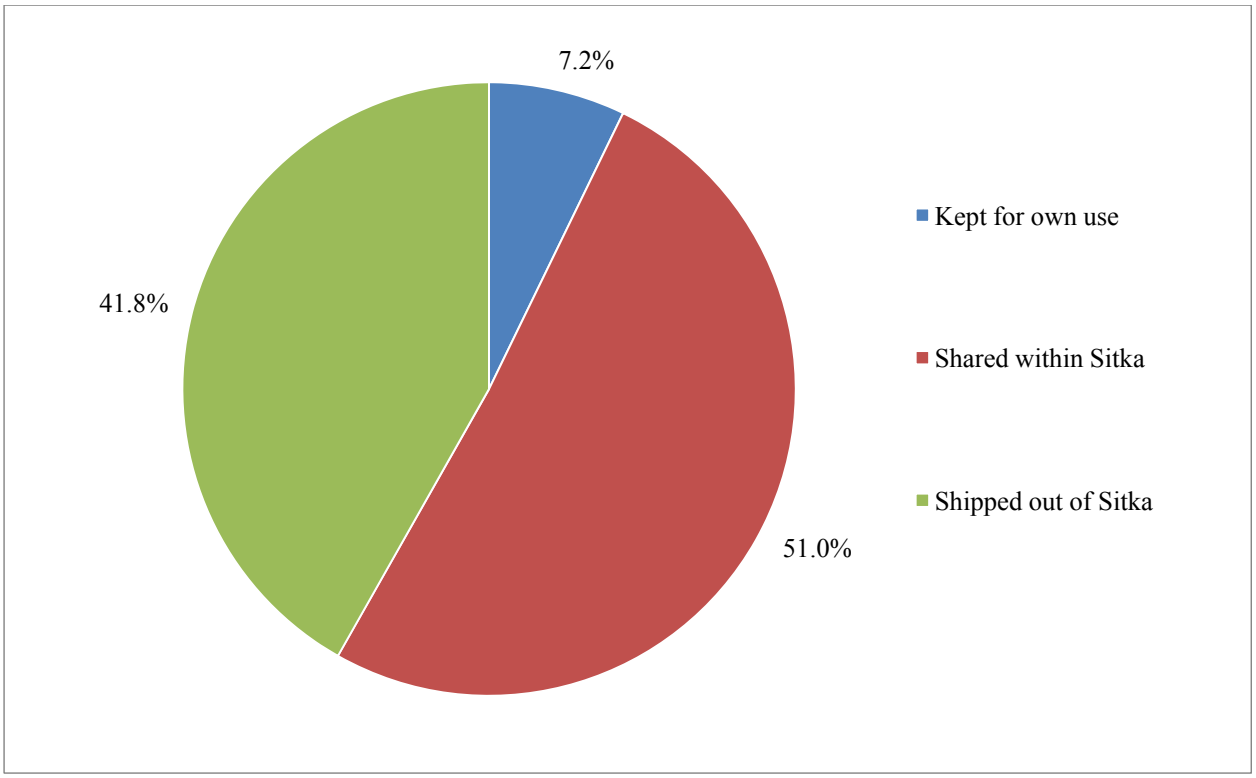

Figure 4.–Percentage of harvested herring spawn that was shared, 2011.

Table 4.–Distribution of herring spawn, Sitka area, 2011.

	Reported harvest						
	Kept for own use		Shared within Sitka		Shipped out of Sitka		Total
Resource	Pounds	Percentage	Pounds	Percentage	Pounds	Percentage	pounds
Herring spawn on kelp	161.7	47.1%	181.7	52.9%	0.0	0.0%	343.4
Herring spawn on hair seaweed	33.9	11.2%	269.5	88.8%	0.0	0.0%	303.4
Herring spawn on other	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0
Herring spawn on hemlock branches	5,833.6	7.0%	42,109.6	50.9%	34,852.7	42.1%	82,795.9
Herring spawn, all types	**6,029.1**	**7.2%**	**42,560.8**	**51.0%**	**34,852.7**	**41.8%**	**83,442.7**

Sources STA and ADF&G Division of Subsistence household survey, 2011.

The final project objective was to document where the herring spawn harvest took place. The aggregate locations of harvest by all survey respondents are shown in Figure 5. The majority of the harvest occurred in the core area of Sitka Sound. As can be seen more readily in Table 5, the most important locations include Kasiana Islands group (24.6%), North Middle Island (23.0%) and Crow/Gagarin islands (23%). These harvest locations compare favorably to 2010, where the Kasiana Islands group, South Middle Island and the Crow/Gagarin islands were the locations with the largest percentage of spawn harvested. One particular place to note on Figure 5 is the point just south of town. This area has not been used often in the past, but in 2011 residents said that the herring spawn was abundant in this area and harvesters took advantage of the new location.

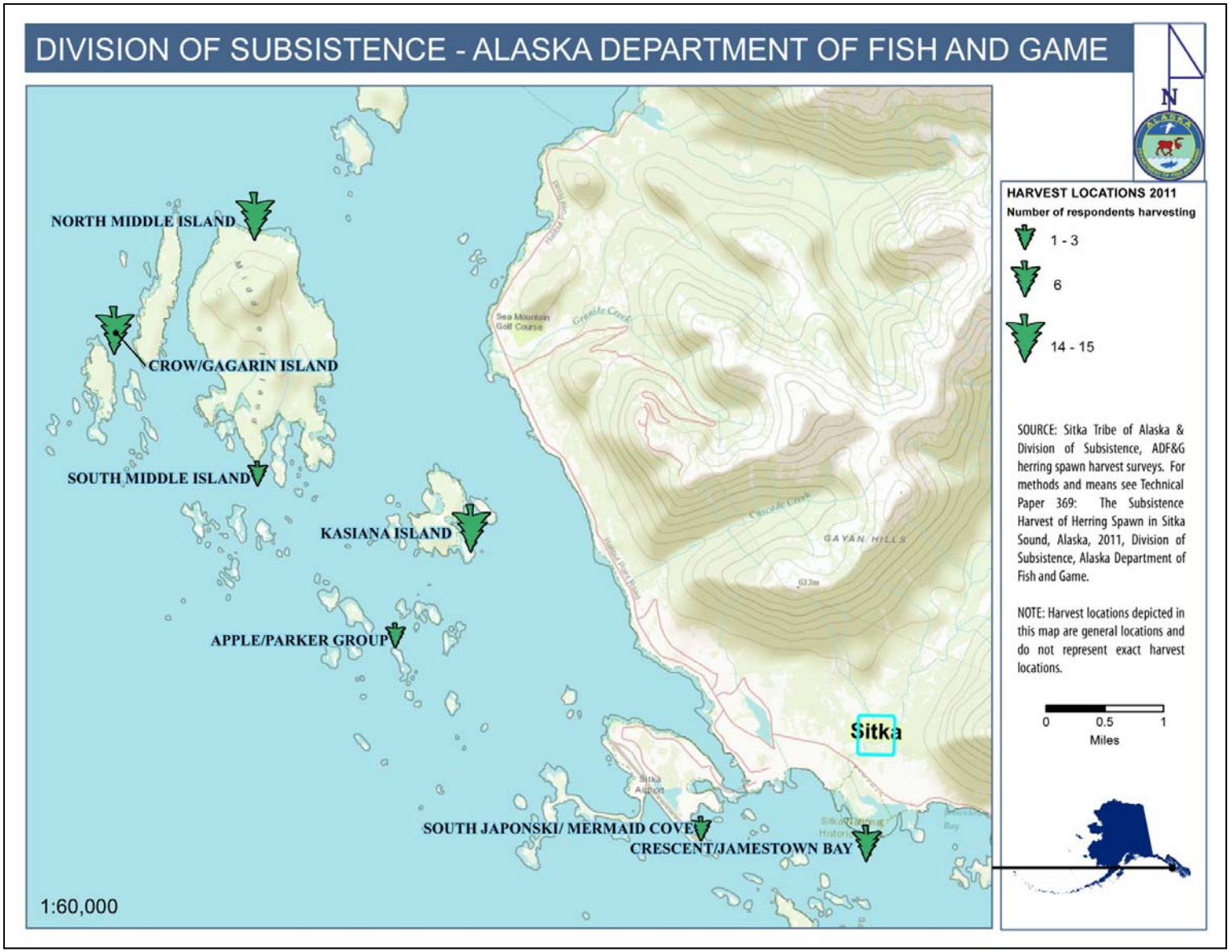

Figure 5.–Reported harvest locations, 2011.

Table 5.–Reported locations of herring spawn harvest, Sitka Sound, 2011

Location	Number of households reporting use of locations	Percentage of harvesting households using location
Kasiana Islands Group	15	24.6%
North Middle Island	14	23.0%
Crow/Gagarin islands	14	23.0%
South Japonski/Mermaid Cove	6	9.8%
Other	5	8.2%
Crescent/Jamestown Bay	3	4.9%
South Middle Island	3	4.9%
Apple/Parker Group	1	1.6%

Sources STA and ADF&G Division of Subsistence household survey, 2011.

DISCUSSION

Project methods underwent a major revision in 2010, making it difficult to directly compare study results from the years before and after 2010 (see Holen et al. 2011 for further discussion). However, between 2010 and 2011, there are clear similarities and differences in the harvest and distribution of herring spawn. Thirty five percent of surveyed households harvested herring spawn in 2011, while 30% harvested in 2010. In part, this increase can be attributed to the refined household list: each year the list is becoming more precise in targeting only harvesters. However, this observed increase may also be in response to an increased demand for spawn or because the 2011 season was regarded as not as good as the 2010 season, so more effort may have been required to attempt to meet subsistence needs. A similar trend can be seen in household sharing of herring spawn. In 2011, 94% of harvesting households shared some of their harvest, while in 2010 only 85% of harvesting households shared. The percentage of harvesting households who share their harvest fluctuates from year to year with no discernible pattern. Years of low harvest are sometimes years with high sharing (such as in 2011) but sometimes not (such as in 2008). Consistently, however, a large majority of households share their harvest, highlighting the importance of sharing in the subsistence economy. Approximately one-half (51%) of the herring spawn was given away to households within the community of Sitka, whereas slightly less than one-half (42%) was shipped out of the community and only a small percentage was kept for use by the harvester. In 2011, herring spawn from Sitka Sound was shared with residents of the following communities: Anchorage, Angoon, Barrow, Bethel, Fairbanks, Haines, Hoonah, Hydaburg, Juneau, Kake, Ketchikan, Klawock, Metlakatla, Nome, Point Hope, Ruby, Yakutat, Seattle, and Whitehorse in the Yukon Territory. This is a similar pattern as was seen in 2010, when 93% of the entire harvest was shared with other families within and outside of Sitka. Harvesting herring spawn is a specialized activity and not every user of herring spawn has the time, equipment, or skills to successfully harvest it. The pattern of a smaller percentage of respondents harvesting than using and a high degree of sharing is therefore expected.

The clearest difference between 2011 and 2010 is in the total harvest amount—the 2011 harvest (83,443 lb) is 54% of the 2010 harvest (154,620 lb; Table 6). There is no obvious explanation for this observed decline, but there are a few possible reasons, such as a short and sparse spawn, changing harvest patterns and low survey response rates. One explanation that is not supported by the survey results is a lack of effort. Even though the number of harvesters varies from year to year, and there appears to be a downward trend in the number of households participating in the harvest, lack of effort cannot explain the decline in harvest from 2009 and 2010 (Figure 6). In 2011, like some other very low harvest years, such as 2008, the number of harvesters attempting to harvest has actually increased from previous years. In 2011, 57 households attempted to harvest, compared to 40 households in 2010. Based on answers to the open-ended, qualitative questions on the harvest survey, the 2011 herring spawn was perceived as short in duration but with eggs of good quality; however, overall, respondents said the spawn and subsequent

harvest was worse than in 2010. Only 4.1% of respondents volunteered that they felt that the 2011 harvest was good. Interestingly, 92% of respondents answered affirmatively that their subsistence needs for herring spawn were met in 2011. This highlights the fact that the survey only targets harvesters; it does not assess whether the overall needs of the community were met. The 2011 harvest is one of the lowest documented over the course of this project (Figure 7).

One of the most common comments given by respondents about the 2011 herring season was that it was short in duration. A short spawn can make it more difficult for residents to participate in the harvest because work and other obligations may interfere. Some herring spawn harvesters, during this survey as well as at public meetings, commented that the herring spawn that used to last for weeks is much quicker now, making it more challenging to balance the time demands of wage employment with subsistence harvesting of herring spawn. In 2011, the second most popular reason respondents gave for not participating in the harvest was because they were working during the harvest. Although the 2011 spawn throughout all of Sitka Sound lasted an average length of time and was documented over 73 nautical miles, it does not necessarily follow that the spawn was available to harvesters for the entire time or in all locations. Harvesters are limited in their access to herring spawn locations and the herring do not spawn in the same location each year. A harvester's assessment of the length of the spawn is localized to areas that are accessible to that harvester and therefore may not be the same as the documented duration of the spawn, which is determined through aerial surveys that cover all of Sitka Sound. Ocean conditions, boat size, and seafloor substrate all factor into where a harvester is able to obtain a preferred quality of spawn. In 2011, harvesters felt that the amount of time spawn was available to them for harvest was shorter than in years past.

Table 6.–Historical harvest and use comparison for herring spawn, Sitka Sound, 2002–2011.

Year	Total harvest, pounds	Percentage of households				
		Used	Attempted	Harvested	Gave	Received
2002	151,717	97%	n/a	71%	40%	55%
2003	278,799	97%	72%	71%	72%	46%
2004	381,226	97%	61%	60%	60%	39%
2005	79,064	99%	61%	52%	36%	39%
2006	219,356	86%	58%	55%	61%	47%
2007	87,211	88%	55%	48%	63%	58%
2008	71,936	89%	45%	41%	40%	54%
2009	213,712	89%	48%	48%	88%	48%
2010	154,620	89%	30%	30%	31%	62%
2011	83,443	99%	39%	35%	35%	66%
5-year average (2007–2011)	122,184	91%	43%	41%	43%	66%
Historical average (2002–2011)	172,108	93%	52%	51%	49%	55%

*Source*s STA and ADF&G Division of Subsistence household surveys, 2002–2011.

n/a = data were not collected during the study year.

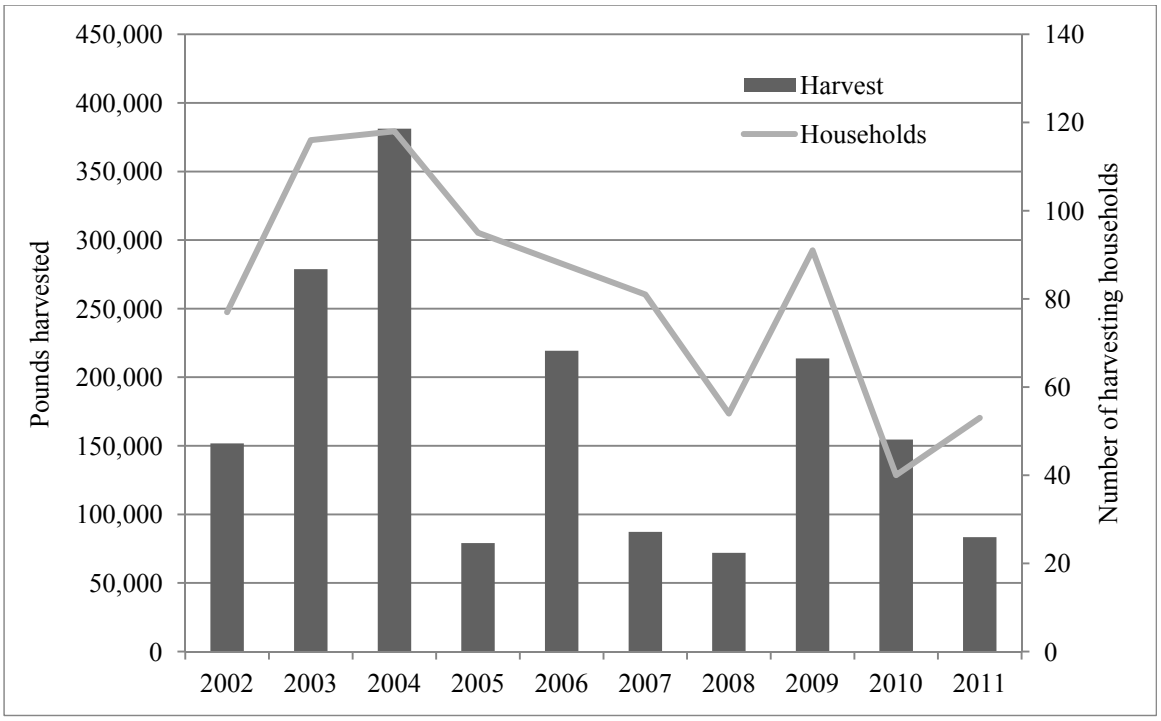

Figure 6.–Estimated number of harvesting households and estimated total harvest of herring spawn from Sitka Sound, 2002–2011.

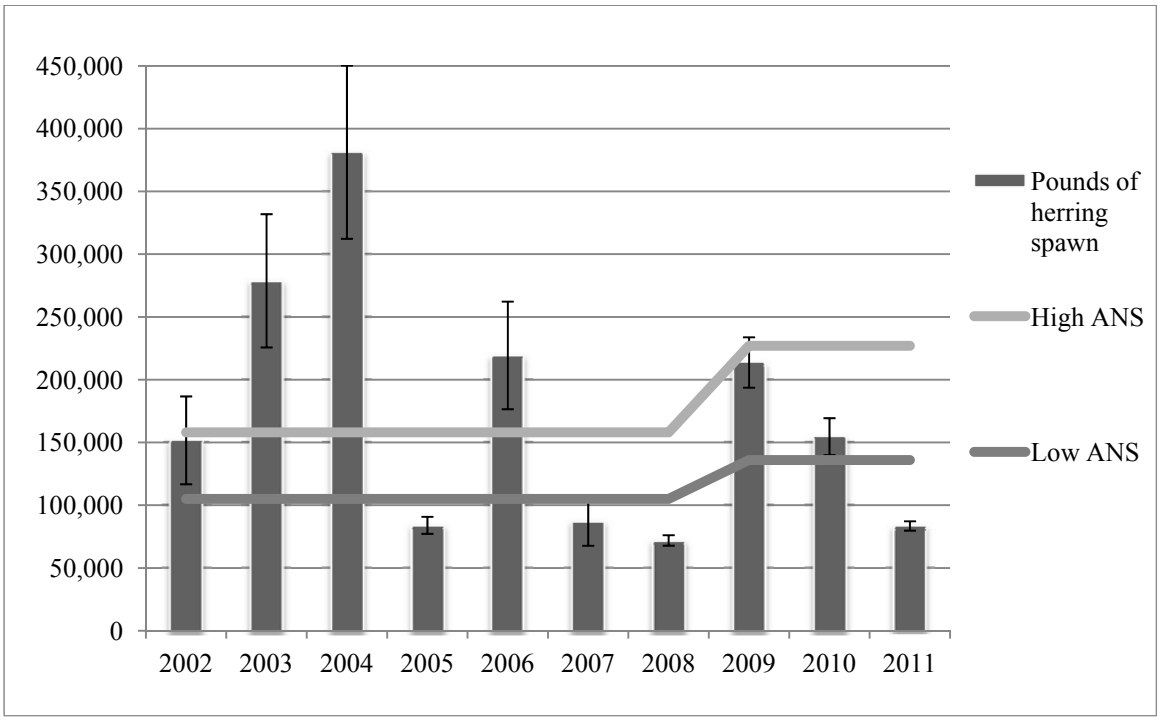

Figure 7.–Total pounds useable weight and amount reasonably necessary for subsistence (ANS) of herring spawn on all substrates in Sitka Sound, 2002–2011.

In addition to the perceived short period of available spawn, respondents indicated the density and abundance of eggs in 2011 was less than in 2010. How the density of the eggs on hemlock branches affects the overall harvest is a characteristic of the herring spawn harvest that project researchers are beginning to investigate. Creating conversion factors each year is one facet of the nascent investigation. A less dense spawn means fewer eggs are deposited on hemlock branches. Therefore, assuming that the herring spawn processors are relatively consistent in how they process branches for packing containers, the gross average weight of a wet lock box should vary annually with spawn density and should be less in years with low density. Preliminary data appear to support this hypothesis, helping account for the low harvest totals in 2011. As can be seen in Table 7, in 2010 the average weight of a container of herring spawn was higher than the average weight of the same sized container in 2011. The average weight of a 50 lb wet lock box filled with herring spawn on hemlock branches in 2010 was 57.78 lb, whereas in 2011 the average weight was 53.27 lb, a decrease of 7.8%. The quart-size zip-top bags were the only container size that had an average weight greater in 2011 (1.46 lb) than in 2010 (1.42 lb), but this is most likely due to the very small quantity of spawn being measured in each bag.

Subsistence harvesters say there is an ideal spawn density on hemlock branches where there is enough spawn on each branch to make hauling and processing the sets worthwhile, but the spawn is not so dense that the interior eggs do not cook properly during preparation. Years in which the spawn is sparse can result in less overall harvest. Harvesters may spend more time moving their sets to areas with better spawn and branches that are harvested may have less spawn on them. For some sets, it may not be worth the effort to bring the branches in and process them because of the sparse amount of spawn on them. Even if spawning is documented in many areas of Sitka Sound, if there is not sufficient density, subsistence harvests may suffer. The Division of Commercial Fisheries produces estimates of average spawn densities during yearly spawn deposition surveys, and in 2011 average spawn density was one of the highest over the last 10 years (K. Hebert, Fishery Biologist IV, ADF&G, Douglas, personal communication, January 5, 2012). The ADF&G estimates have not been compared to subsistence harvesters' observations over time but such comparison is a line of inquiry worth pursuing in 2012. It is hypothesized that there will be disparities between the 2 estimates because, like spawning length, a harvester's evaluation of spawn density will be based on a more limited geographic area than the spawn deposition surveys conducted by ADF&G. In general, additional work with spawn densities and weights of hemlock branches needs to be done to further understand the role spawn density plays in subsistence harvests.

Table 7.–Conversion factors for 2010 and 2011.

Resource container type	2011 estimated average weight	2010 estimated average weight
Sea Pro[a] large (50 lb) wet lock box	53.27 lb	57.78 lb
Sea Pro[a] small (25 lb) wet lock box	24.88 lb	25.50 lb
Ziploc[a] gallon bag	3.87 lb	4.07 lb
Ziploc[a] quart bag	1.46 lb	1.42 lb

a. Product names are given for scientific completeness and they do not constitute endorsement.

A third factor contributing to the difference in harvests between the 2 study years is the participation of the F/V *Julia Kae* in the 2010 herring spawn harvest. The F/V *Julia Kae* was a boat sponsored by the Southeast Herring Conservation Alliance to harvest herring spawn and distribute it to households in Sitka, Klawock, Craig, Hoonah, Angoon, and Kake in 2009 and again in 2010. This boat alone accounted for

47% of the total harvest in 2010. The boat was not able to return in 2011.[4] While some of the households that received spawn from the F/V *Julia Kae* in 2010 would have obtained spawn in 2011 from other sources (such as from family; a greater percentage of respondents reported receiving spawn from family in 2011 than in 2010, see Figure 1), it is not clear that all households would have found an alternative source. If existing harvesters did not increase their harvests to supply herring spawn to all the individuals who received spawn from the F/V *Julia Kae* in 2010, then the overall harvest would be lower in 2011. Because this survey targets harvesters only, findings from the survey cannot speak directly to changes in use patterns or whether the subsistence needs of the communities at large are being met.

Finally, 149 households were identified as potential herring spawn harvesters in 2011, but only 97 (65%) of these were interviewed. This is the lowest response rate in all 10 years of the project and is due mostly to the inability to contact many households. In all, 48 households, both from Sitka and from surrounding communities, could not be contacted. Of these, one-third had a documented harvest in at least 1 of the 3 previous years. Only 3 of these households had consistently harvested in each of the prior 3 years. In addition, STA, who administered the survey, said that there were 4 high harvesting households in Sitka who declined to participate in the 2011 survey. Seven high harvesting households (those with harvest amounts over 3,000 lb) were contacted and surveyed. The accuracy of the harvest estimates increases with response rate; additional efforts to improve survey response rates will be made in future study years. Another aspect of the household list that may have affected the total harvest from Sitka Sound is that a number of high harvesting households are no longer active harvesters, either because the harvester had retired or was deceased. Similar to capturing the efforts of the F/V *Julia Kae*, it is not clear from these surveys what happened to the households that traditionally received spawn from these high harvesters, or from where the now-retired harvesters are receiving spawn. Key respondent interviews with current and past high-harvesters, as well as users of herring spawn, may be able to provide some insight into this facet of the changing subsistence herring spawn fishery.

In addition to further investigating the role of spawn deposition on weight conversion measurements, another aspect of the herring spawn fishery that researchers will explore is the spawn-on-kelp fishery. While the survey attempts to interview all harvesters of herring spawn, regardless of the substrate, herring spawn on branches accounts for the majority of the harvest and has therefore received the most attention. According to spawn-on-kelp permits (which are required for harvest), in 2011 approximately 2,740 lb of herring spawn on kelp was harvested. This project only documented 330 lb of spawn on kelp. The disparity between the 2 harvest estimates may be attributable to a variety of factors, such as less participation in the survey by harvesters of spawn-on-kelp, or missed households. In 2012, additional effort will be concentrated on identifying and increasing participation of spawn-on-kelp harvesters in the survey. Key respondent interviews will also be conducted with spawn-on-kelp permit holders so that this aspect of the herring spawn fishery may be better understood in terms of harvest, use, and reporting. Permit data will also be compared to survey data over the duration of the survey project to look for trends over time in the 2 estimates.

The final aspect of the subsistence herring harvest that the project attempts to understand is the location of harvest. While the question concerning harvest locations was not on the survey every year, from the years when this information was sought it is clear that there is year-to-year variability in the locations most heavily used for the harvest. However, there appears to be an overall consistency in locations used for herring spawn harvest. There are a number of reasons for this pattern. Within limits, harvesters will go where the herring are spawning. Herring do not have site fidelity like salmon; therefore, where they spawn each year can change. Harvesters will also look for areas they feel are most likely to produce high quality spawn. Some harvesters do not have access to a boat, so they need to harvest in locations accessible by the road system, regardless of where the herring are spawning. Skiffs and other small boats

4. After the 2011 season, it came to light that the owner and operator of the F/V *Julia Kae* was not a resident of the State of Alaska, and was therefore ineligible to harvest subsistence resources.

are commonly used by herring harvesters, and wind and rough seas can make harvesting dangerous; therefore, protected areas are sought. Protected areas are also favored for their likelihood of high quality spawn since ocean surge can stir up sand on the seafloor, degrading the quality of the herring spawn. As Sitka has developed, and concerns for water quality have grown, harvesters have also tried to ensure that the area they harvest from is not negatively impacted by development.

CONCLUSION

The harvest of herring spawn in Sitka Sound continues to be an important activity for Southeast residents. The majority of herring spawn that is harvested is shared with other households. The percentage of households harvesting, using, giving and receiving has varied over time, with small differences seen in 2011. The important locations for harvesting subsistence herring spawn have remained relatively consistent over time. In future years, it is important that this harvest survey continue, employing the revised methodology of 2010, in order to track changes in the subsistence harvest of herring spawn over time. Identifying and surveying every household that harvests spawn in Sitka Sound is of utmost importance to ensure robust results. Methodology for determining differences in spawn density on hemlock branches as well the effects of spawn density on overall household harvests should also be further explored.

ACKNOWLEDGEMENTS

The ADF&G Division of Subsistence would like to thank the staff of the Sitka Tribe of Alaska for their hard work and dedication to this project; in particular Jeff Feldpausch and former employees Heather Woody and Dan Williams. The survey would not have been possible without their leadership and cooperation. We would like to thank the Sitka Tribe of Alaska Tribal Council and Herring Committee members for their dedication and support of the project. There are many subsistence harvesters and commercial fishers who contributed to the success of this project by taking the time to speak to us and we would like to take this opportunity to thank them as well.

REFERENCES CITED

ANKN. 2009. Alaska Federation of Natives guidelines for research. Alaska Native Knowledge Network, Fairbanks http://www.ankn.uaf.edu/IKS/afnguide.html

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. http://www.subsistence.adfg.state.ak.us/TechPap/tp327.pdf

Cochran, W. G. 1977. Sampling techniques. 3rd edition. John Wiley & Sons, New York.

Emmons, G. T. 1991. The Tlingit Indians. Edited with additions by F. de Laguna. The University of Washington Press, Seattle, and The American Museum of Natural History, New York.

Gmelch, G., and S. B. Gmelch 1985. Resource use in a small Alaskan city–Sitka. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 90, Juneau. http://www.subsistence.adfg.state.ak.us/TechPap/tp090.pdf

Holen, D., J. Stariwat, T. Lemons, V. Ciccone, and M. F. Turek 2011. The subsistence harvest of herring spawn in Sitka, Alaska 2002–2010, Anchorage http://www.adfg.alaska.gov/techpap/TP%20343.pdf

Pierce, R. A. 1972. Alaskan shipping, 1867–1878: arrivals and departures at the Port of Sitka. Pages 63 *in* Materials for the study of Alaska history. Limestone Press, Kingston, Ont.

Schroeder, R. F., and M. Kookesh 1990. The subsistence harvest of herring eggs in Sitka Sound, 1989. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 173, Juneau. http://www.subsistence.adfg.state.ak.us/TechPap/tp173.pdf

Tikhmenev, P. A. 1978. A history of the Russian-American Company. University of Washington Press, Seattle.

APPENDIX A: SITKA SOUND SUBSISTENCE HERRING EGG HARVEST SURVEY, 2011

Subsistence Herring Egg Harvest Survey 2011
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ Date _____ HHID_____

How many people lived in your household in 2011? _____ Interviewer _____

Is anyone in HH enrolled in a tribe, and if so, which? _____

Please answer each question to the best of your knowledge. ALL YOUR ANSWERS ARE CONFIDENTIAL AND WILL ONLY BE RECOGNIZED BY AN ASSIGNED, RANDOM HOUSEHOLD SURVEY NUMBER.

During 2011, did you or your household:			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?			
6.	Use herring eggs in your garden?			

7. If you did not harvest herring eggs in 2011 have you harvested herring eggs in the past? _____Yes _____No

8. If you answered Yes to 7, when did you last harvest herring eggs? _____

9. If you did not harvest herring eggs in 2011, why didn't you?

_____

_____

10. If you have not harvested herring eggs in the last 3 years do you plan on harvesting herring eggs in the future?

_____ Yes _____ No.

11. Were your subsistence herring egg needs met in 2011? _____ Yes _____ No

12. How do you feel the harvest went this year compared to previous harvests?

_____

_____

13. Do you have any additional comments about the 2011 subsistence herring egg harvest?

_____

_____

If you harvested herring eggs continue survey on next page. If you did not harvest stop here. Thank you for your time and cooperation!

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

This information will help Sitka Tribe of Alaska and the ADF&G protect subsistence uses of herring eggs.

Subsistence Herring Egg Harvest Survey 2011
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Interviewer_____ HHID

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

14. How much Herring Eggs **on Branches** did you harvest during **2011**?

	Bags (gallon, quart)	**Boxes** (size or weight of box?)	**Other**	**Pound Conversion**
How much did you harvest for personal use				
How much did you give away in Sitka				
How much did you ship out of Sitka				

15. How much Herring Eggs **on Kelp/Other** did you harvest during **2011**?

	Macrocystis	**Hair Seaweed-*Né***	**Other**	**Pound Conversion**
How much did you harvest for personal use				
How much did you give away in Sitka				
How much did you ship out of Sitka				

16. If you shared herring eggs with others how many households did you share with?

Number of Households	Community

17. What size vessel(s) did you use to harvest herring eggs in 2011? _____

[**01=Skiff under 20'; 02=Pleasure cruiser 20'-24'; 03=Pleasure over 24'; 04=Commercial, 05=Other**]

GO TO NEXT PAGE TO COMPLETE SURVEY!!!!!!!

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

This information will help Sitka Tribe of Alaska and the ADF&G protect subsistence uses of herring eggs.

18. Where did you harvest your herring eggs in 2011 - set branches, harvest seaweed, macrocystis kelp**?**

	Location	# of Sets	Substrate	How much Harvested	Quality	When? Date	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/Mermaid Cove						
9	Causeway Islands						
10	South Halibut Point Road						
11	North Halibut Point Road						
12	Eastern/Promisla Bay						
13	Magoons/Hayward						
14	Katlian Bay						
15	Apple/Parker Group						
16	Crescent/Jamestown Bay						
17	Camp Coogan/Sandy Cove						
18	Aleutkina Bay/Leesofskia Bay						
19	Three Entrance Bay						
20	Redoubt/Kanaga Bay						
21	Goddard/Windy Pass/Dorothy Narrows						
22	Other:_____						

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

Quality: Excellent, Good, Fair, Poor

APPENDIX B: 2011 CODE BOOK

Subsistence Herring Egg Harvest Survey 2011

Herring Spawn User Status	Code
Individual Harvester	1
Non-Harvester	2
STA Boat	3

9.[a] If you did not harvest herring eggs in 2011, why didn't you?	Code
Harvester - no response necessary	Blank
Refused	-7
Missing (blank, but should not be, and the reason is not clear)	-8
Unknown to respondent	-9
Received from family	1
Received from friends	2
Elder/Retired from fishing and received eggs	3
Received from STA boat	4
Not present during the harvest	5
Working during the harvest	6
Transportation/no boat	7
Personal or health issues	8

12.[a] How do you feel the harvest went this year compared to previous harvests?	Code
Refused	-7
Missing (blank, but should not be, and the reason is not clear)	-8
Unknown to respondent	-9
Thick eggs	1
Good quality eggs	2
Fair/Okay	3
Spawn did not last long	4
Better last year/poor abundance	5
South of bridge was good	6
Spawn-on-kelp was good	7
Concerned about over-fishing by commercial fishery	8

13.[a] Do you have any additional comments about the 2011 subsistence herring egg harvest?	Code
Refused	-7
Missing (blank, but should not be, and the reason is not clear)	-8
Unknown to respondent	-9
Good harvest/thick eggs	1
Better last year/poor abundance	2
Spawn did not last long	3
North side was good/Kasiana Island	4
Concerned about the future of the resource	5
Concerned about the effect of the commercial fishery on the resource	6

a. Number corresponds to question number in survey instrument.

APPENDIX C: 2011 CONVERSION FACTORS

Resource container type	Estimated average weight (pounds)
Ziploc[a] gallon bag	3.87 lb
Ziploc[a] quart bag	1.46 lb
Sea-Pro[a] large (50 lb) wet lock box	53.27 lb
Sea-Pro[a] small (25 lb) wet lock box	24.88 lb
Weight lost due to primary processing	10.5%
Weight lost due to secondary processing	6.8%

a. Product names are given because they are established standards for the State of Alaska; they do not constitute endorsement.