Technical Paper No. 343

The Subsistence Harvest of Herring Spawn in Sitka, Alaska 2002–2010

By

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and

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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

all commonly-accepted abbreviations e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
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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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.

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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 subsistence herring spawn fishery reveals that subsistence herring spawn 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. In 2002, ADF&G and the Sitka Tribe of Alaska (STA) signed a Memorandum of Agreement (MOA) to work cooperatively in assessing the subsistence harvest of herring spawn. This report presents the results of harvest surveys conducted in Sitka in 2002–2010. The surveys generated data used to calculate estimates of the total 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 subsistence herring spawn harvest monitoring discussion 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).

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 Alaska and the Pacific Northwest, only a small number of people have the time, equipment, skills, and knowledge required to harvest herring spawn. Sitka Sound herring spawn was, and continues to be, shared throughout the region, as well as 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 transported from Sitka via boat and commercial air carriers to people in other Alaskan communities and beyond. The purpose of this report is to review findings of 9 years of studies (2002–2010) to estimate subsistence harvests in the Sitka Sound herring spawn fishery. The report will also review changes in methodology over time in an effort to improve the estimate of subsistence herring egg harvests and better understand the complexity of this important subsistence harvest.

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. Russians living in Sitka in the 19th century wrote about the large numbers of Tlingit who gathered to collect herring spawn. Rezanov wrote that over a thousand 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). In the 1860s, herring were so numerous around Sitka in February and March that the water became milky from spawn 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 and milt on the branches of the hemlock, which were then removed from the water. Other substrates used include *Macrocystis* kelp, various species of hair seaweed, 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. The arrival of widespread commercial fishing operations introduced freezers into the community. As freezers became more common in households as well as in commercial operations, freezing became the preferred method of preserving herring spawn.

At its February 1989 meeting, the Alaska Board of Fisheries (BOF) made a customary and traditional use determination for the harvest of herring spawn in Sitka Sound. In September 2001, a meeting between Commissioner Frank Rue 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 of Southeastern Alaska 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 a proposal requesting recognition of the geographically and historically important areas used for subsistence herring spawn harvest. During this meeting, the BOF 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. The BOF revised the ANS in 2009 to 136,000–227,000 lb (5 AAC 01.716 (b)). State regulations currently 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. Although the Schroeder and Kookesh estimate was not based on household survey data, they did measure the amount of herring spawn on branches sent out of the community for barter and trade, which was 50,000 lb, and assumed that the amount of herring spawn used by Sitka residents was about the same as the amount sent out of the community for barter and trade.

THE MONITORING PROGRAM

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 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 the Division. The STA and the Division work cooperatively on survey design and data collection. The Division provides technical consultation and, when possible, field survey and interviewing support for the project. It is also agreed the STA will provide the Division with raw harvest data each year for analysis by the Division's standard statistical methods. The Division participated in the monitoring program in 2002, 2003, 2006, 2007, 2008, 2009, and 2010. Because of insufficient funding, the Division did not participate in the monitoring program in 2004 or 2005. The Division analyzed survey data in 2002, 2003, 2006, 2007, 2009, and 2010 but, because of a lack of funding, was unable to analyze the data from 2004 and 2008 until 2009.

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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.

The monitoring program produced estimates of the subsistence herring spawn harvest in Sitka Sound for 2002–2010 by systematically identifying and surveying herring spawn harvesting households in Sitka. The 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 project community upon completion of the research.

The objectives of the harvesting monitoring were to:

1. Conduct in-person interviews with household members in Sitka who were identified as harvesters and users of herring spawn for subsistence;
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

The following discussion on methods is organized into 3 parts. Part One provides information on surveys conducted by the Division in the 1980s and 1990s. Part Two provides information on surveys conducted by the Division in cooperation with STA between 2002 and 2009. The background will enable the reader to understand the context for the necessity of developing new conversion factors and the method of constructing the sample of harvesters. Partial results have been included in this section to enable the reader to understand the necessity of developing new conversion factors. More detailed results will be provided in the results section. Part Three is a description of the methods used during the 2010 harvest assessment. This section will compare and contrast methods used in estimating the harvest as well as the strategy used in creating a sample of potential harvesters.

PART ONE: EARLY SUBSISTENCE SURVEYS: 1983, 1987, AND 1996

Prior to the start of the annual harvest monitoring program in 2002, the Division of Subsistence conducted comprehensive household harvest surveys in Sitka in 1983, 1987, and 1996. In 1983, 139 randomly selected households were included in the survey. When the sample was expanded, the results showed that an estimated 586 households (24% of the entire community) were estimated to have harvested 42,000 lb of herring spawn on all substrates (Gmelch and Gmelch 1985). In 1987, 296 households were randomly selected and interviewed. The results showed that an estimated 261 households (9% of the entire community) were estimated to have harvested 20,494 lb of herring spawn on all substrates. In 1996, the sampling strategy was changed to sample a portion of the general population of Sitka and a sample of STA member households. This survey included a stratified sample composed of 92 households from the general population and 58 from a list of STA households, for a total sample size of 150 households. When expanded, the results showed an estimated 464 households, 15% of the entire community, harvested 127,174 lb of herring spawn on all substrates. Harvest estimates for 1983 and 1987 may be low due to the small size of the random sample, which may have failed to include households who were very active in the subsistence herring spawn fishery.

PART TWO: THE 2002–2009 SURVEYS AND THE SAMPLING LIST

Surveys conducted between 2002 and 2009 were based on a list of harvesters, by household, compiled by the STA and Division. Several assumptions went into compiling this list: 1) only a limited number of people had the skill, time, and equipment to participate in the harvest; 2) harvesting herring spawn is a visible activity, which means people see and know other fishery participants, so a "snowball" sample could be used (identified participants would identify other participants to be added to the list); 3) by

reviewing and updating the lists each year, researchers assumed that the potential universe of harvesters had been defined; and 4) the rules for developing and refining the list were valid.

The list attempted to represent all known harvesters (Native and non-Native) living in Sitka. The list also included a small number of people from other Southeast Alaska communities who travel to Sitka to harvest herring spawn, including crew members of commercial seine boats. STA staff included these harvesters in the list of target households to interview. STA also wanted a broader sample that included not only current harvesters but also others who were long-term users of herring spawn and who might harvest in the immediate future even if they did not harvest during the survey year. Over the course of the project, as the list of interviewees was refined, Division researchers asked the STA to eliminate non-harvesters from the list. Thus, over the course of the project this general rule became as follows: if harvesters on the list did not attempt to harvest for 3 years in a row, then they were removed from the list. Table 1 lists the sample size, number of households surveyed, and the interview success rate for 2002–2010. The outcome of the survey would give a harvest estimate based on the household list and would not be expanded, as was the case in the 1983, 1987, and 1996 baseline household surveys.

Table 1.–Sample achievement for Sitka subsistence herring spawn surveys, 2002–2010.

Year	Sample size	Number of households surveyed	Interview success rate
2002	108	86	80%
2003	163	118	72%
2004	197	144	73%
2005	182	159	87%
2006	160	127	79%
2007	168	126	75%
2008	131	128	98%
2009	190	150	79%
2010	132	132	100%

Sources CSIS 2011; Brock and Turek 2007.

In 2002, the first year of the annual monitoring program, the list of households was developed by the STA and Division staff, with input from traditional herring spawn harvesters, using a snowball method. This method involved the referral of additional harvesters to the survey universe by someone who was on the household list. In this case, additional Sitka herring spawn harvesters were identified by others on the list as being active harvesters. STA staff also conducted research to locate new harvesting households, which were added to the list.

The 2002 list was composed of 108 households and was the foundation for the 2003 survey. The household list generated from the 2003 survey, which included 163 households, was then used as the foundation for the 2004 survey, and so forth. The 2004 list included 197 active households and the list for the next year, 2005, included 182 active households. Prior to implementation of the survey in 2006, the 2005 list was reviewed and 58 households were removed from the active survey list because they were listed more than once, had moved away, were deceased, or were inactive (those who had not participated in the fishery for 3 years were removed). New harvester households were also added to the 2005 list. Following these actions, a list with 160 households was generated and this served as the sample target for the 2006 survey. Prior to implementation of the 2007 survey, the list was updated using the same criteria as in 2006; that is, removing deceased or absent participants or participants who had not harvested spawn in the last 3 years. A new total of 168 households was generated and served as the target population for the 2007 survey. Using the same methods to revise the list, the target population for the 2008 survey was determined to be 131 households. In 2009, a similar method was used to revise the list; i.e., removing

households that had not been active in 3 years, resulting in a list of 190 households that were potential harvesters.

Survey Instruments, 2002–2009

The survey instruments were 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.
5) The location of their harvests.

The survey instruments varied slightly from year to year. The matrix presented in Table 2 summarizes differences in the instruments. For most years, respondents were asked about their harvest on branches, kelp, and seaweed. In 2002, 2004, and 2005, harvest location data were collected by STA staff but not analyzed by Division staff due to lack of funding. Harvest location data for 2003 and 2006 were collected. However, only the location data for 2006 were comparable to data collected in 2009 and 2010, therefore only these data have been included in the results section. The STA did not provide harvest location information to the Division for 2007 and 2008 due to a request from STA members to maintain confidentiality. The 2007 survey focused only on the local harvest and uses of herring spawn on branches; it did not ask questions about seaweed harvests, nor did it ask detailed questions about the distribution of kelp harvest. In 2008 and 2009, the survey once again became more robust, asking additional questions about distribution of the harvest in order to understand the complexity of sharing of the harvest both within Sitka as well as within the larger region. The survey instruments are found in Appendix A.

Weights, 2002–2009

Surveyors asked herring spawn harvesters to estimate the processed (net) weight of their harvests. In 2002, Turek worked with STA staff to develop weight estimates by volume. In that year, researchers found that the weight of eggs was comparable to the weight of an equivalent volume of water. Researchers estimated that this factor could then be applied to larger containers, by volume. STA and Division staff then developed estimates for pounds of herring spawn harvested based on the size of containers most commonly used by Sitka subsistence fishers. If respondents had difficulty estimating the weight of their harvests, they were asked the volume. It was found that people harvesting more than 100 lb of herring spawn share, and often ship, most of the product. The assumption was that these experienced harvesters are knowledgeable about weights through handling, packaging, and shipping herring spawn (Schroeder and Kookesh 1990). Respondents were asked to give the weight as recorded during shipping of containers, if at all possible. The weight of the container was subtracted from the total.

After analyzing the 2009 harvest estimate, STA and Division of Subsistence researchers realized the need to develop a more rigorous method for gauging harvest weights. In addition, although water weight was found to be accurate for the 2002 harvest, this measure of weight to volume was not continuously tested annually. Density of harvest varies over time and therefore weight should be rechecked annually. In 2009, researchers decided to completely redo the conversion formula for volume of herring spawn to weight of herring spawn by actually weighing the most commonly used containers filled with herring spawn on various substrates. Weights using a conversion factor will never be exact, but researchers concluded that through a more rigorous testing method for estimating conversion factors, a more accurate conversion factor could be developed. The methodology is explained in detail in Part Three of this section.

Table 2.–Survey instrument question summary, 2002–2010.

Response type	Question	2002	2003	2004	2005	2006	2007	2008	2009	2010
Y/N	Used herring spawn	X	X	X	X	X	X	X	X	X
	Attempted to harvest		X	X	X	X	X	X	X	X
	Harvested	X	X	X	X	X	X	X	X	X
	Received	X	X	X	X	X	X	X	X	X
	Gave away	X	X	X	X	X	X	X	X	X
	Used in garden						X	X	X	X
	Subsistence needs met						X	X	X	X
	Harvested in past							X	X	X
Number, total pounds on branches	Harvested	X	X	X	X	X	X	X	X	X
	For personal use	X	X	X	X	X		X	X	X
	Given away in Sitka	X	X	X	X	X		X	X	X
	Shipped out of Sitka	X	X	X	X	X		X	X	X
Number, total pounds on kelp	Harvested	X	X	X	X	X		X	X	X
	For personal use	X	X	X	X	X		X	X	X
	Given away in Sitka	X	X	X	X	X		X	X	X
	Shipped out of Sitka	X	X	X	X	X		X	X	X
Number, total pounds on seaweed	Harvested	X	X	X	X	X		X	X	X
	For personal use	X	X	X	X	X		X	X	X
	Given away in Sitka	X	X	X	X	X		X	X	X
	Shipped out of Sitka	X	X	X	X	X		X	X	X
Number, total pounds on kelp/other	Harvested						X			
	For personal use									
	Given away in Sitka									
	Shipped out of Sitka									
Number	Vessel size	X	X		X	X	X	X	X	X
Location	Harvest location	X	X	X	X	X			X	X

Survey Implementation, 2002–2009

In 2002 and 2003, Division staff traveled to Sitka to assist STA staff in training 2 residents of Sitka in the process and procedures for conducting the survey. The goal was to contact all the households on the survey list so they could complete the harvest survey. Participation was voluntary and all individuals' and households' information is confidential under AS 16.05.815. Division staff oversaw the survey and analyzed the data in 2002 and 2003, but lack of ADF&G funding support for the survey in 2004 and 2005 resulted in the STA assuming primary responsibility for conducting the surveys and assembling and analyzing the data. In 2006–2008, Division staff again assisted STA staff in conducting the survey and analyzing the household level harvest data.

In 2009, Division and STA researchers realized that there needed to be a better explanation of how the sample list was developed. For this reason, refinements were made not only to questions about how the harvest was captured, but also in how the survey data were recorded during the post season survey. This process created a better characterization of the harvesting universe while still allowing for households that received herring spawn to be included in a survey.

PART THREE: THE 2010 SURVEY PLAN AND IMPLEMENTATION

The STA and the Division met prior to the start of the 2010 subsistence herring spawn harvest to plan the method for compiling the sampling list and creating and validating the conversion factors. The methods outlined in this section are a collaborative effort between the Division of Subsistence and the STA. Division of Subsistence staff member Jory Stariwat was present for 10 days during the herring spawn harvest to participate in refining the conversion factors and Davin Holen and Stariwat were present during the beginning and end of the survey. STA staff worked closely with Stariwat during the entire process of creating conversion factors and STA staff conducted the household survey.

Development of the Household Survey List

For 2010, the list of households targeted for interviewing included all the potential harvesters with a high probability of participating in the fishery. The STA spent a considerable amount of time tracking down every known harvester in the community. In keeping with past methods of compiling the harvester list, each household remained on the list if they attempted to harvest within the last 3 years. If the household did not attempt to harvest for 3 consecutive years, then they were removed from the list at that time.

To refine the process of creating a list of potential harvesters, STA and the Division of Subsistence agreed on the following plan for 2010:

- Researcher would begin with the 2009 list of harvesters, and document reasons for dropping a name off the list.
- If a person is on the list, and researchers later found that she or he had not harvested, that person's name would remain on the list for 3 years.
- Every household on the list was classified as "interviewed," "refused to be interviewed," or "no contact."
- The list would be expanded, if possible, using a chain referral method in which people who are already on the list will provide names of other known harvesters.
- In addition to using the chain referral method, STA would conduct outreach to alert harvesters about the survey and to collect names for the list.
- The list would include all known noncommercial harvesters who harvest herring spawn in Sitka Sound. This meant the list included STA members and the general population of Sitka, as well as residents from other communities in Southeast Alaska who come to Sitka Sound to harvest herring spawn.

- Each harvester would be assigned a number and retain that number as long as he or she is an active harvester. When the person retired or became inactive for 3 years, the number would be retired.
- When STA supplied harvest data to the Division of Subsistence, the only identifiers would be the household ID numbers. No names would be attached to the surveys.
- Harvest location data would be aggregated to show where harvests took place and amounts of herring spawn obtained. No names would be associated with the location of harvest.
- STA would share the sampling list with the Division of Subsistence so the known harvesting universe could be created. However, the Division of Subsistence would not retain the list.

For 2010, STA was able to revise the list and carry out the survey based on the refined method of creating the subsistence herring spawn harvester list. Each household on the list was interviewed. STA was able to interview 132 potential harvesters (Table 1). The surveys were then given a code (see Appendix B for code book) based on user status: 1) individual harvester, 2) non-harvester, 3) STA boat, or 4) the F/V *Julia Kae*, a boat funded by Silver Bay Seafoods which distributes herring spawn on branches in Sitka (population 8,810 in 2010), Hoonah (pop. 760), Angoon (pop. 459), Kake (pop. 557), Craig (pop. 1,201), and Klawock (pop. 755; U. S. Census Bureau 2011). Holen went with local researcher Dan Williams to conduct the first 5 surveys and was able to talk with actual harvesters. Stariwat also accompanied Williams on several surveys. After the completion of the survey, Holen returned to Sitka to debrief STA staff on the outcome of the survey.

The harvest estimates that appear in this report are estimates for the entire subsistence herring spawn fishery at Sitka Sound based on estimates from individual harvesters, the STA boat, and the *Julia Kae*. However, because the list was not generated from a random sample of all Sitka households, but rather from a list of potential harvesters, the percentage of households using, receiving, and giving away herring spawn for the entire community of Sitka cannot be estimated. Thus the percentages that appear in this report pertain only to the subpopulation of Sitka that was classified as potential harvesters of herring spawn and to a small number of previously-identified harvesters from other communities.

Through a collaborative process with the professional biological staff at STA, the above methods were carried out and no problems were found. This method will be applied in the 2011 survey.

The 2010 Conversion Factor Revision

Prior to the subsistence herring spawn fishery in 2010, the Division of Subsistence devised a plan for refining the conversion factors for storage containers and pounds of herring spawn as follows:

- STA and the Division of Subsistence would work together to develop a set of conversion factors.
- The conversion factors would include conversion weights for the most common types of containers used by harvesters to hold or store herring spawn.
- To obtain these conversion factors, staff from STA and the Division of Subsistence would process and weigh herring spawn harvested by STA. This would provide a controlled environment for weighing herring spawn in specific containers.
- To develop an average weight for a container, 2 containers would be weighed, the mean computed; then 3 containers would be weighed, and the mean computed; then 4 containers; and so on until there were no significant differences in the mean when new containers were added to the sample. It was estimated that 12 containers from each of the container types would have to be weighed.

- In addition to weighing the containers, the condition and type of container would be noted. This would include noting the level of spawn packed into a container: i.e., one-half full, three-quarters full, or full (close to 100%).

Before conducting fieldwork, STA and Division of Subsistence staff identified some possible container types. These included plastic gallon-, quart-, and pint-sized zip-top bags; various sizes of coolers; and various sizes of "wet lock" boxes—a type of waxed cardboard box commonly used for shipping seafood. Researchers identified 25 lb and 50 lb wet lock boxes and plastic zip-top gallon-sized bags as the most common container types. Quart-sized zip-top bags were also weighed since these are a common type of bag used when sharing herring spawn. Eighty-pound wet lock boxes were considered to be common containers in years past, but lately have been difficult to purchase in the community. They were added to the list of containers and during the 2010 survey it was found that respondents still use these containers.

In June 2010, Stariwat participated in the herring spawn fishery. Stariwat worked with STA to process 2,533 lb of herring spawn on hemlock branches. This was the first harvest of the subsistence herring spawn fishery and was conducted using a boat operated by a STA member.

The process of revising conversion factors followed the procedures outlined below.

1. STA staff filled a plastic fish tote of the type commonly used in commercial fisheries with unprocessed branches that had been cut from the tree. Stariwat of ADF&G and an STA employee then recorded, by hand, the scaled gross weight (including container weight) on a sheet of paper. (Following the fieldwork they compared their notes for accuracy). The container weight was subtracted from the total.
2. Once an unprocessed tote had been weighed, STA employees then offloaded the tote to the dock, and continued to process the spawn. STA employees used pruning shears to snip off the bigger branches, and then loaded wet lock boxes with this spawn. Processing the harvest included cutting off the larger branches and leaving the spawn on the smaller branches and needles. The processed weight is the usable weight that could be stored for consumption in something as small as a quart bag.
3. Then 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 comfortable reporting rather than giving direct estimates of pounds harvested.
    a. Stariwat recorded processed spawn weight, in pounds, as loaded by STA employees into 25 lb, 50 lb, and 80 lb wet lock boxes.
    b. All the wet lock boxes from a batch were returned to the tote and weighed from the hanging scale. Weights were taken for each box in order to understand variability and then for all the boxes together in order to compare against the unprocessed weight to understand unprocessed versus processed weight. The gross weight was recorded by hand (weight of the plastic tote plus the weight of the wet lock boxes plus the weight of the spawn).
    c. The net weights of all boxes of spawn coming from the original unprocessed tote were compared in order to understand the difference between the unprocessed and processed spawn. In addition, as noted above, the gross weights of the boxes were taken independently so as to develop an average weight for processed spawn for each of the box sizes. Thus, 2 measurements occurred during the same process: the difference in weight between unprocessed and processed spawn, and the average weight of 3 sizes of wet lock boxes completely full (100%) of processed spawn.
    d. 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 totes during the

processing into boxes, so the boxes that were not completely filled were included into tote gross weight calculations, but not included in mean box weight calculations.

Immediately following the measurements at the boat, the processed spawn was moved to the STA office which is located just above the dock. At the STA office, a table scale was used to take 2 types of measurements:

1. Plastic gallon zip-top bag weight (lb); and
2. Plastic quart zip-top bag weight (lb).

In total 13 totes were weighed. For the first 5 totes, the first steps of the method above remained the same. For the final 8 totes, instead of loading the processed spawn into wet lock boxes, the processed spawn was loaded into an identical tote and weighed. This was done because enough weights had already been taken of wet lock boxes (17 large boxes and 12 small boxes) to get consistent averages from the samples. The weighing of the final 8 totes enabled researchers to calculate the differences between processed and unprocessed weights.

To avoid differences due to evaporation, researchers recorded estimates of weights for gallon and quart bags immediately following the tote weight analysis described above. In the STA office located above the dock, estimates of the average weight of spawn packed into gallon and quart bags were generated using the following steps:

1. All wet lock boxes from the first tote were taken to the STA office. If any small branches were still visible, the ends were trimmed in order to not tear the bags.
2. The bags were filled completely (100%) using spawn from 1 batch. By measuring spawn from only 1 batch, researchers were able to compare the processed weight to the unprocessed weight.
3. Each gallon and quart bag was weighed on a table scale and the weights were recorded by hand on a sheet of paper.

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 the smaller branches. The difference in weight between primary and secondary processing was 2.8% (see Appendix C). This decrease has been factored into the conversion formula for 2010.

DATA ANALYSIS

Division Information Management staff analyzed the data from all survey years to produce estimates of the total harvest of herring spawn on all substrates. For 2002–2009, the surveys were coded for data entry by the Division's Information Management staff in Anchorage. For 2010, the surveys were coded by Holen in Anchorage using the conversion factors that were created as a result of the 2010 fieldwork described above. Holen also created codes for responses given to assessment questions (see Appendix B for 2010 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.

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.

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 each 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. This approach was applied for 2010. In 2010, all known harvesting households were contacted and no estimation occurred. Information Management staff used the following formula to generate 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 unsurveyed households 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:

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

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 (CI) for household surveys conducted in 1987 and 1996 as well as data from the annual monitoring program are presented in Table 3. Confidence intervals are not available for the 1983 harvest estimates (Table 3).

RESULTS

Project objectives 1 and 2, conducting interviews with Sitka herring spawn harvesting households and producing estimates of the total pounds of herring spawn harvested, were met for all years of the survey.

The 2002 and 2003 surveys related to objective 1 were conducted jointly by the STA and the Division. Since 2004, the household surveys have been conducted by STA with assistance by Division staff.

To present estimates of subsistence harvests of herring spawn in Sitka Sound per objective 2, this report contains a discussion that addresses data from all 9 project years, 2002–2010. Project results for years 2002, 2003, and 2006 are also discussed in Brock and Turek (2007).

Project objective 3, identification of herring spawn harvest locations, was met for 2003, 2006, 2009, and 2010. In 2002, 2004, and 2005, harvest location data were collected by STA staff but were not analyzed by Division staff due to lack of funding. In 2007 and 2008, the STA requested that location data not be included in the joint survey due to the confidential nature of specific individual harvest location information. Harvest and use information were once again included in 2009 and 2010. Detailed harvest locations that could be mapped were collected in 2006, 2009, and 2010 (see figures below).

Figure 1 shows the harvest and use of herring spawn among Sitka households that participated in the surveys. Table 4 summarizes estimated harvests of herring spawn by substrate for each of the 9 project years. The subsequent discussion is organized by study year. Following this results section is a summary that compares the harvest over time as well as harvest locations.

2002

During the first year of the survey, 86 households (80% of the 108 identified) were successfully contacted and interviewed. The total subsistence harvest of herring spawn was estimated to be 151,707 lb (Table 4). Of the total harvest, approximately 92% (139,756 lb) were harvested on hemlock branches, 5% (7,642 lb) on hair seaweed, and 3% (4,309 lb) on kelp. Survey responses indicated that 71% of surveyed households harvested herring spawn and that 97% reported using herring spawn, from any or all substrates (Figure 1). Over one-half of the households interviewed (54%) said they had received herring spawn, while 40% said they gave away herring spawn (Brock and Turek 2007).

2003

In 2003, the overall number of identified households increased to 163 from the previous year's 108 (Table 1). One hundred and eighteen households (72% of those identified) were interviewed. The total estimated subsistence harvest was 278,799 lb on all substrates combined, an 83% increase from 2002 (Table 4). Of the total harvest, approximately 97% (269,904 lb) was harvested on hemlock branches. Ninety six percent of the households reported using herring spawn, a decline of 1 percentage point from 2002, while the percentage (71%) of households reported harvesting herring spawn on any or all substrates was the same as in 2002 (Figure 1).

Table 3.–Estimated harvest of herring spawn in Sitka Sound, 1983–2010.

	Percentage of households attempting to harvest	Estimated number of households attempting to harvest	Percentage of households harvesting	Estimated number of households harvesting	Percentage of 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	20%	127,174	72%	35,131	219,217
For the following 9 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	40%	151,717	23%	116,701	186,734
2003	n/a	n/a	71%	116	72%	278,799	19%	225,704	331,895
2004	61%	120	60%	118	60%	381,226	18%	312,224	450,229
2005	61%	111	52%	95	36%	79,064	9%	72,272	85,856
2006	n/a	n/a	55%	88	61%	219,356	20%	176,484	262,228
2007	55%	92	48%	81	63%	87,211	22%	67,702	106,720
2008	45%	59	41%	54	40%	71,936	6%	67,764	76,108
2009	48%	91	48%	91	88%	213,712	9%	193,623	233,801
2010	30%	40	30%	40	31%	154,620	10%	139,872	169,367

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.

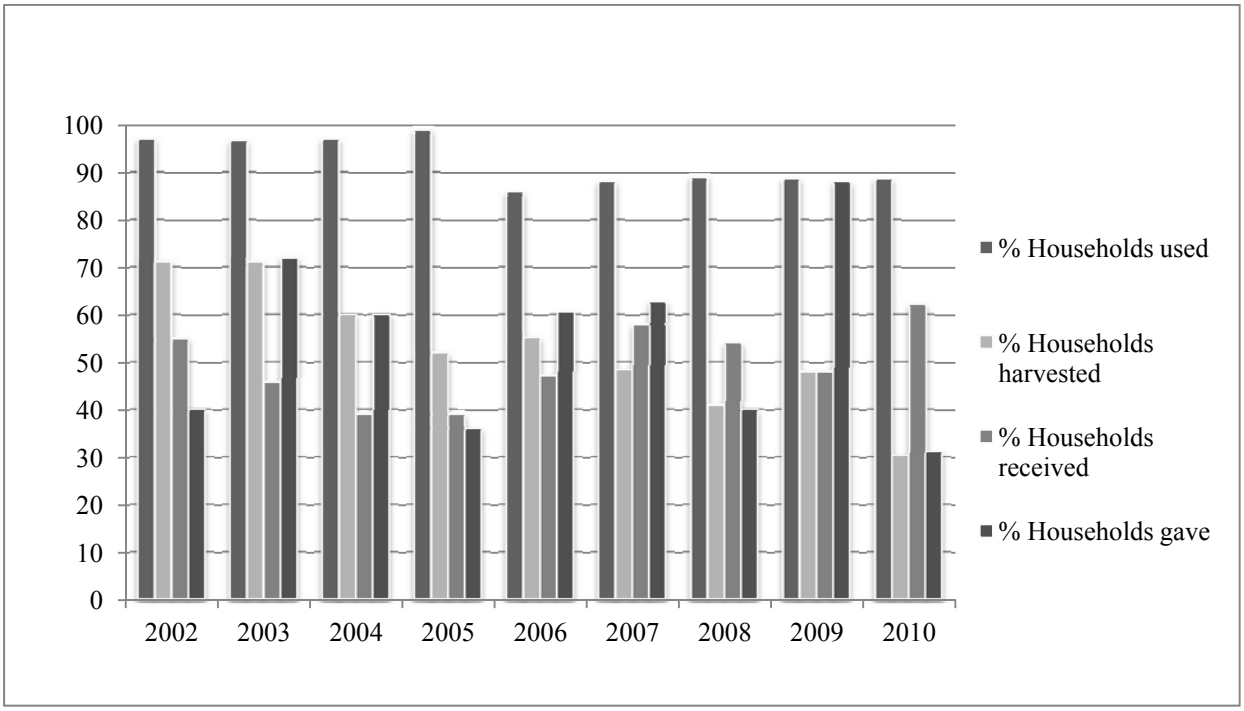

Figure 1.–Harvest and distribution of subsistence herring spawn, Sitka, 2002–2010.

Table 4.–Total estimated harvest of herring spawn, pounds, by substrate, 2002–2010.

Resource	2002	2003	2004	2005	2006	2007	2008	2009	2010
Herring spawn on kelp	4,270	4,556	11,494	3,176	4,373	3,117	1,409	2,571	4,105
Herring spawn on seaweed	7,642	4,339	13,039	3,848	2,031	n/a[a]	2,118	5,751	2,020
Herring spawn on hemlock branches	139,756	269,904	356,693	72,039	212,952	84,093	68,409	205,390	148,495
Total	**151,717**	**278,799**	**381,226**	**79,064**	**219,356**	**87,211**	**71,936**	**213,712**	**154,620**

Sources STA and ADF&G Division of Subsistence household surveys, 2002–2010.

a. Data for 2007 were collected using "herring spawn on kelp/other" and "herring spawn on hemlock branches" categories. The "spawn on kelp/other" included seaweed substrate harvest amounts, in contrast to the other survey years.

2004

In 2004, 144 households (73% of the 197 identified) were interviewed. Outreach efforts by STA staff resulted in an increase of the total number of identified households for 2004: 21% above the 2003 total and 82% above the 2002 total (Table 1). Total pounds harvested for subsistence uses in 2004 was estimated to be 379,148, an increase of 36% over 2003 and 150% over 2002. A majority of the herring spawn (approximately 94%) was harvested on hemlock branches (Table 4). Sixty percent of surveyed households reported harvesting herring spawn, while 97% reported using spawn. Thirty-nine percent of households said they received herring spawn and 60% said they gave spawn away. This was a decline of 6 and 12 percentage points, respectively, from 2003 (Figure 1).

2005

Of the 182 households identified in 2005, 159 (87%) were interviewed (Table 1). Analysis of 2005 data conducted by the Division in 2008 produced a harvest estimate of 83,985 lb for all substrates. The 2005 harvest was 78% lower than the 2004 harvest, 70% lower than the 2003 harvest, and 45% lower than the 2002 harvest. Of the total harvest, approximately 92% (76,961 lb) were harvested on hemlock branches (Table 4). Of households surveyed, 52% reported harvesting herring spawn, while 99% reported using herring spawn. In 2005, 39% of households reported receiving herring spawn and 36% reported giving away herring spawn. The percentage of households receiving spawn was the same as in 2004, but 6 fewer percentage points than in 2003, and 15 fewer percentage points than in 2002. The percentage of households giving away spawn (36%) was 24 percentage points fewer than in 2004, 36 percentage points fewer than in 2003, and 4 percentage points fewer than in 2002.

2006

Of the 160 households identified in 2006, 127 (79%) were interviewed (Table 1). The total estimated harvest of herring spawn for subsistence uses in Sitka in 2006 was 219,355 lb, an increase of 161% from 2005, and a 45% increase over 2002. However, the 2006 harvest was 42% lower than in 2004 and 21% lower than in 2003 (Table 4). Of the total 2006 harvest, approximately 97% (212,952 lb) was harvested on hemlock branches (Table 4). In 2006, 55% of households reported harvesting herring spawn, while 86% reported using herring spawn. Forty-seven percent of households reported receiving herring spawn, an increase of 8 percentage points from 2005, while 61% of households reported giving away herring spawn, an increase of 25 percentage points from 2005 (Figure 1).

2007

In 2007, 168 households were identified as harvesting or using herring spawn, and 126 (75%) were interviewed (Table 1). The total estimated harvest was 87,210 lb, a 60% decline from 2006 (Table 4). Note that in 2007, no distinction was made on the survey between spawn harvested from kelp, hair seaweed, or other substrates except hemlock branches. Of the total estimated harvest for 2007, approximately 96% (84,093 lb) was harvested on hemlock branches (Table 4). Survey data showed a reasonably similar distribution of use, harvest, and sharing, despite the significant decline in actual quantity harvested. Survey data showed that 48% of households surveyed reported harvesting herring spawn, and 88% reported using herring spawn. Sharing for 2007 was similar to previous years, with 58% of households receiving herring spawn and 63% giving away herring spawn (Figure 1).

2008

In 2008, 131 households were identified as potentially harvesting herring spawn; of those, 128 (98%) were interviewed (Table 1). The estimated harvest was 71,936 lb on all substrates combined, an 18% decrease from 2007, and a 67% decrease from 2006. Approximately 95% of the total harvest (68,409 lb) was on hemlock branches (Table 4). Forty-one percent of surveyed households reported harvesting herring spawn and 89% reported using spawn. Of those households interviewed, 54% said they received spawn while 40% reported giving away herring spawn (Figure 1).

2009

In 2009, 190 households were identified as potentially harvesting herring spawn; of those, 150 (79%) were interviewed (Table 1). The estimated harvest was 213,712 lb on all substrates combined, a significant increase over 2007 and 2008, which Sitka harvesters noted were poor spawn years during interviews. Approximately 96% of the total harvest (205,390 lb) was on hemlock branches (Table 4). Forty-eight percent of surveyed households reported harvesting herring spawn and 89% reported using spawn. Of those households interviewed, 48% said they received spawn while 88% reported giving away herring spawn (Figure 1).

2010

In 2010, 132 households were identified as potentially harvesting herring spawn and all were surveyed (Table 1). The estimated harvest was 154,620 lb on all substrates combined, a 28% decrease from 2009; however it was still considerably higher than 2008. Approximately 96% of the total harvest (148,495 lb) was on hemlock branches (Table 4). Thirty percent of surveyed households reported harvesting herring spawn and 89% reported using spawn. Of those households interviewed, 62% said they received spawn while 31% reported giving away herring spawn (Figure 1).

As noted in the methods section of this report, the methodology in both creating conversion factors and the sampling strategy in 2010 differed from previous years; therefore, although general trends can be viewed it would be difficult to make conclusions based on these trends. For example, in the 2009 survey when households estimated their harvest in term of gallons, the conversion factor was 8.337 lb per gallon. This conversion factor was then expanded based on the size of the container, except that larger harvests were estimated based on the actual weight as defined during the shipping and distribution of the harvest. As noted earlier, the harvest estimate with a conversion factor of 8.337 lb per gallon also applied to the 2002 harvest; however, it was not rechecked annually.

During the 2010 survey, one gallon of processed product was estimated at 4.07 lb, based on the conversion factor strategy outlined in the methods section of this report. An additional example of varying conversion factors is evidenced by the fact that, during the 1983 survey, one gallon was estimated to weigh 5 lb (Gmelch and Gmelch 1985:42).

The methodology employed in 2010 will continue in future surveys with an additional objective of trying to determine if density also affects weight as measured by volume. The revised methodology of rigorously retesting weight by volume each year will ensure more accurate estimates into the future.

There were also differences in the sample of the number of households harvesting herring spawn: in 2010, 40 households reported harvesting, while in 2009, 91 households reported harvesting herring spawn. Both 2009 and 2010 saw an abundant spawn activity, yet there was lower participation in the harvest in 2010. Some of the reasons for this will be explored below.

HARVEST LOCATIONS

In 2003, respondents were asked to identify harvest locations on a map marked with 5 areas inside Sitka Sound. Of the 118 households interviewed that year, 55 (47%) reported harvesting herring spawn in near Gagarin, Crow, and Middle islands, and the coast of Baranof Island north of the Halibut Point recreation area. Thirty-seven households (31%) reported harvesting near the Kasiana Islands and the coast of Baranof Island south of the Halibut Point recreation area. Only 1 household reported harvesting near the east coast of Kruzof Island. Reported harvests showed that the majority of harvest occurred within Sitka Sound, from downtown Sitka to the north. Figure 2 identifies the area most commonly utilized by harvesters as identified during household surveys and interviews conducted by Division researchers. The 2003 data points were recorded differently than 2006, 2009, and 2010. For consistency, only the 2006, 2009, and 2010 data are reported below, in tables 5, 6, and 7.

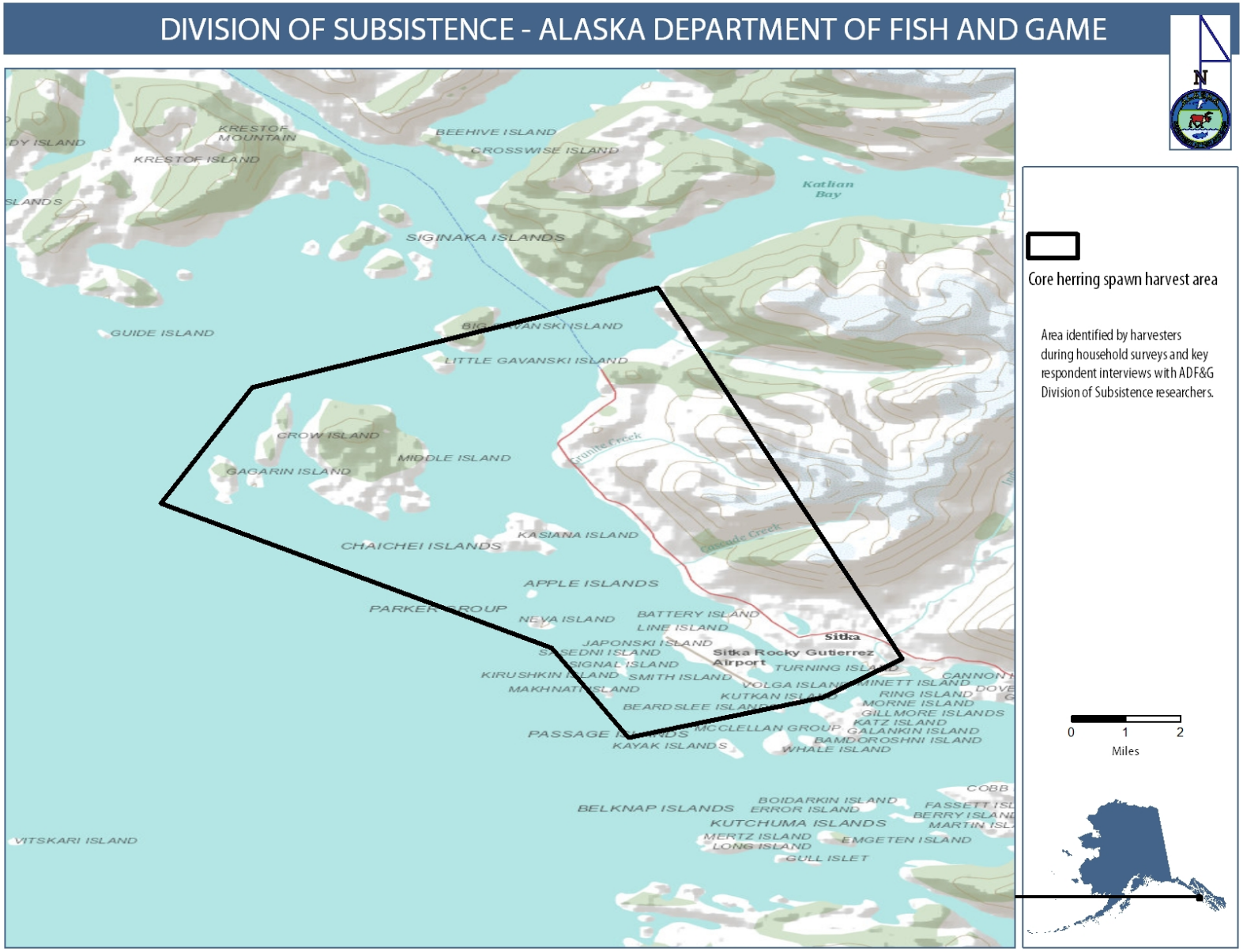

Figure 2.–Core herring spawn harvest area, as identified by harvesters.

In 2006, and for the first time, respondents were asked to identify harvest areas by specific locations. Using information from this question, Division staff compiled a list of general harvest areas. From this effort a Division researcher compiled the maps shown here as figures 3, 4 and 5. As shown in Table 5, in 2006 a majority (38%) of the harvest effort occurred near the Kasiana Islands group. Other heavily-used locations included South Middle Island (20%), Crow and Gagarin islands (17%), and North Middle Island (13%). During surveys, Division staff noted that respondents discussed 2 important factors for choosing harvest locations. The first factor was a location with a clean gravel bottom. If the water gets rough, respondents said, sand and soil in the water can be "kicked up" and stick to the spawn. The second factor was that respondents preferred to stay within the core area as identified by STA, because, they said, bad weather can come quickly, and most harvesters use small watercraft. High seas can quickly swamp a boat loaded with trees to be set, or with herring spawn on branches. In 2006, some respondents reported traveling outside the core area to harvest spawn; however, as shown in Figure 3, most harvests occurred close to Sitka.

Table 5.–Reported harvest locations of herring spawn, Sitka area, 2006.

Location	Number of households reporting use of locations	Percentage of harvesting households using location
Kasiana Islands group	42	38%
South Middle Island	22	20%
Crow/Gagarin islands	19	17%
North Middle Island	14	13%
Big/Little Gavanski islands	5	4%
Eastern/Promise Bay	3	3%
Apple/Parker group	2	2%
North Halibut Point Road	2	2%
North Japonski/Whiting Harbor	2	2%
Redoubt/Kanaga Bay	1	1%

Sources STA and ADF&G Division of Subsistence household survey, 2006.

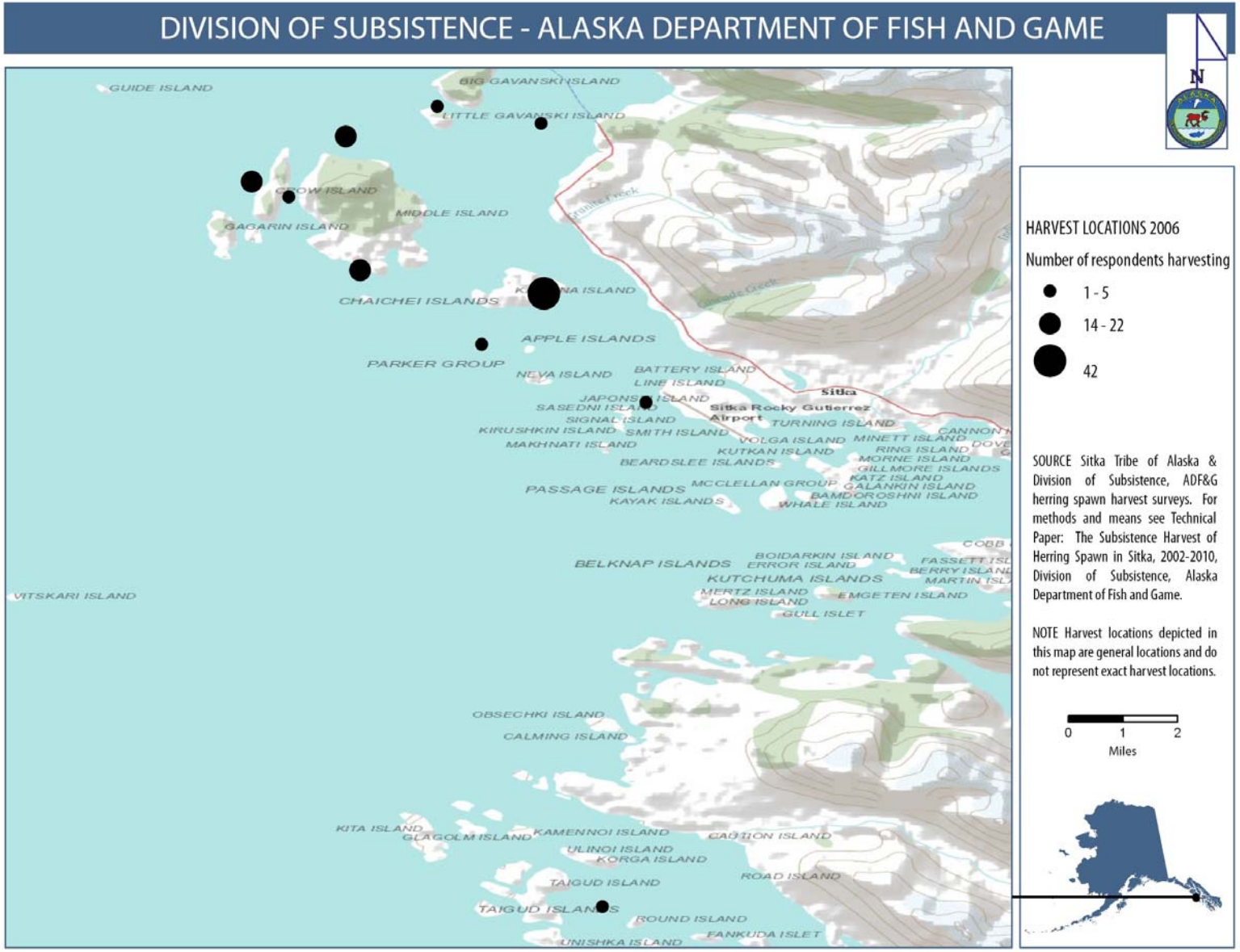

Figure 3.–Reported harvest locations, 2006.

In 2007 and 2008, harvest locations were not collected. Harvest locations were, however, collected in 2009 and the list of locations was expanded because some harvest areas had changed since the 2006 survey. As shown in Table 6, Middle Island (48%) once again was identified as an important location for harvest, along with Crow Pass (26%) and the Kasiana Islands group (12%). These locations, as well as the harvest effort, are shown in Figure 4.

Table 6.–Reported harvest locations of herring spawn, Sitka area, 2009.

Location	Number of households reporting use of locations	Percentage of harvesting households using location
Aleutkina	1	1%
Bielie Rock	1	1%
Crow Island	1	1%
Crow Pass	29	26%
South Crow Pass	1	1%
Halibut Point	1	1%
Halibut Point Road	1	1%
North Halibut Point Road	4	4%
Kasiana Islands group	13	12%
Kerr Island	1	1%
Middle Island	54	48%
North Middle Island	2	2%
South Middle Island	1	1%
Promisla Island	1	1%
Starrigavan	1	1%
The Cove[a]	1	1%

Sources Sitka Tribe of Alaska and ADF&G Division of Subsistence household survey, 2009.

a. Location could not be verified by ADF&G or STA staff.

As will be discussed below, 2010 was a good year for harvesting herring spawn as reported by respondents during the survey. Respondents noted during the surveys that they did not have to travel far to set their trees, and all of the harvest was able to occur in the core area of Sitka Sound, as shown in Figure 5. The most important locations, as shown in Table 7, include the Kasiana Islands group (33%), South Middle Island (30%), Crow and Gagarin islands (14%), and North Middle Island (12%).

Table 7.–Reported harvest locations of herring spawn, Sitka area, 2010.

Location	Number of households reporting use of locations	Percentage of harvesting households using location
Kasiana Islands group	28	33%
North Middle Island	10	12%
South Middle Island	25	29%
Crow/Gagarin islands	12	14%
North Japonski/Whiting Harbor	2	2%
North Halibut Point Road	8	9%

Sources STA and ADF&G Division of Subsistence household survey, 2010.

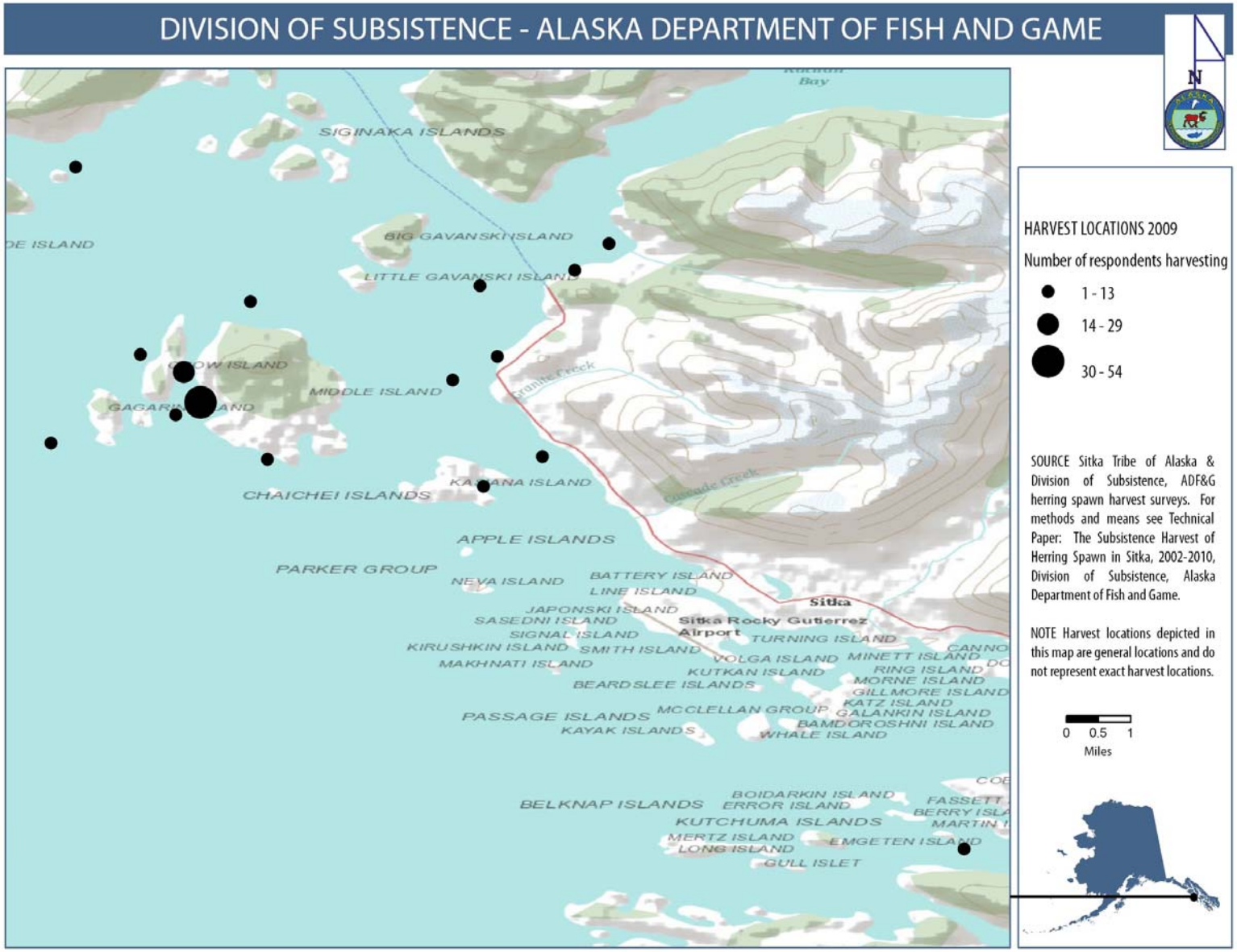

Figure 4.–Reported harvest locations, 2009.

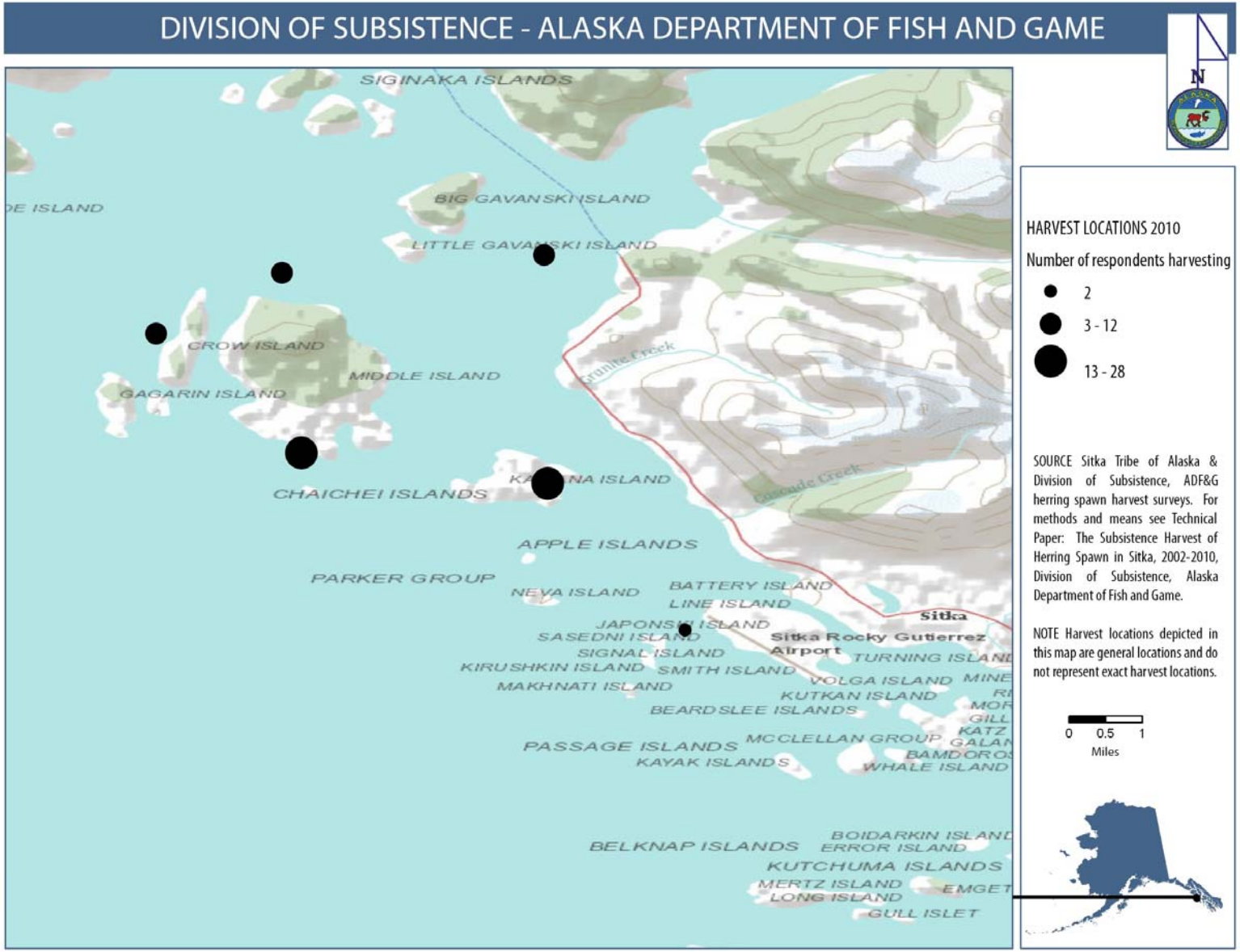

Figure 5.–Reported harvest locations, 2010.

SUMMARY

The list of potential harvesting households grew from 108 households in 2002 to a high of 197 in 2004. The sampling strategy in 2010 only interviewed households that had harvested in the previous 3 years, thus reducing the list of potential harvesters to 132 households (Table 1). Except for 2005, 2007, and 2008, the estimated harvest was within or above the ANS range (Figure 6). The 2010 harvest estimate, which employed the revised methodology of estimating weight by volume, is within the current ANS range.

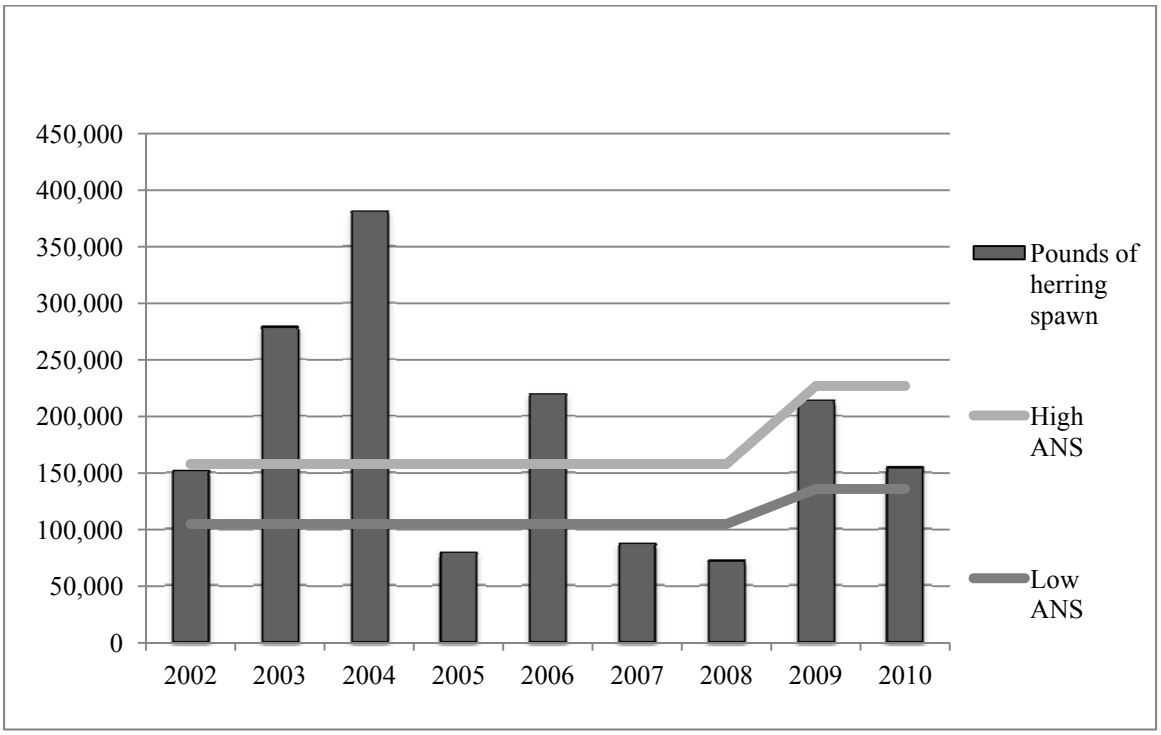

Figure 6.–Total pounds usable weight and amount necessary for subsistence (ANS) of herring spawn harvested on all substrates in Sitka, 2002–2010.

The percentage of households that harvested herring spawn (on any or all substrates) also declined from 71% in 2002 and 2003 to 30% in 2010 (Figure 7). However, it should be noted, as stated above, that the list was revised in 2006 and households were removed from the active survey list because they were either listed more than once, had moved away, were deceased, or inactive (those who had not participated in the fishery for 3 years). New harvester households were also added to the 2005 list. Thus, as noted in Figure 7, a shift in the trend can be seen, but it is a product of restructuring the household list through a more regimented approach. Reasons for a reduction in participation in the harvest will be further analyzed in the discussion section below.

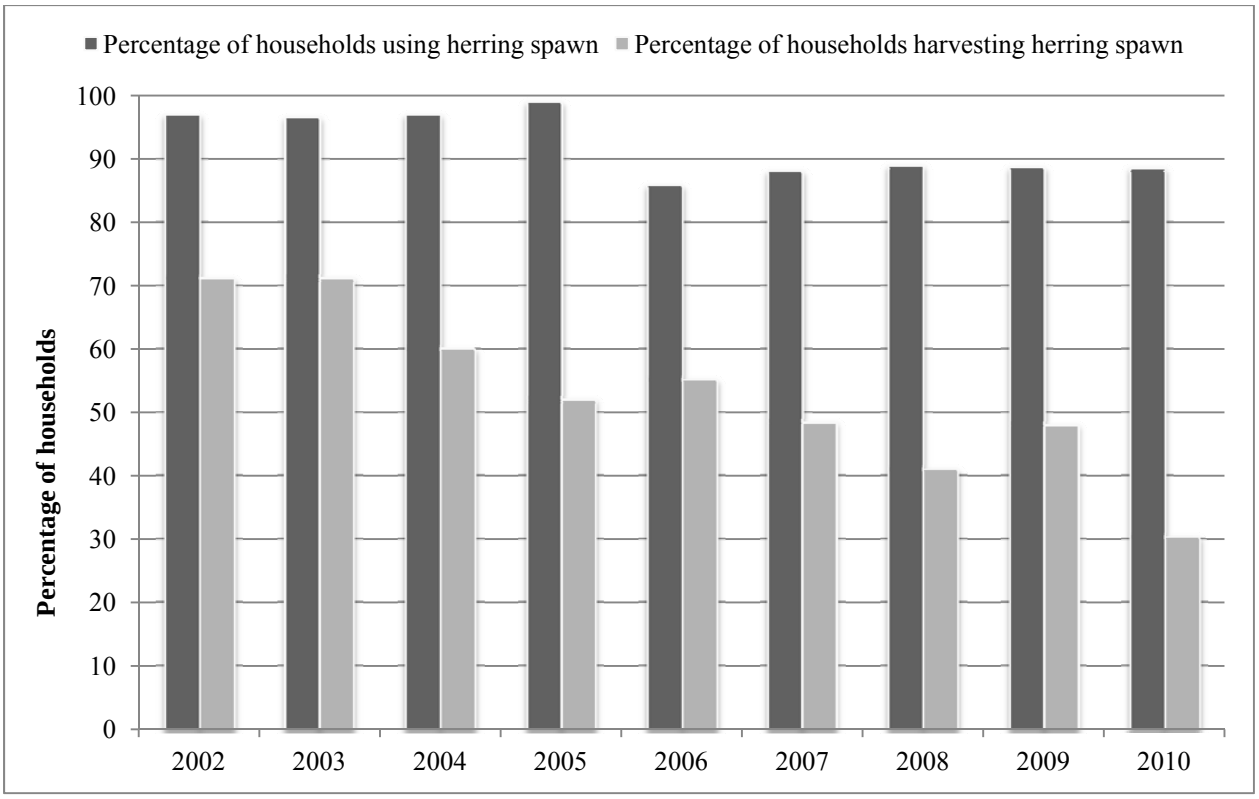

Figure 7.–Percentages of households harvesting and using herring spawn, 2002–2010.

DISCUSSION

Over the 9 years' duration of the annual monitoring program, the number of surveys administered ranged from 86 households in 2002 to 159 households in 2005, and was 132 households in 2010. Survey participation ranged from 72% in 2003 to 100% in 2010 (Table 1). Table 8 gives a summary of the harvest and use of herring spawn by harvesters in the Sitka herring spawn fishery. The average total harvest of herring spawn between 2002 and 2009 was 185,371 lb and the recent 5 year average was 134,256 lb. In 2010, the harvest was 154,620 lb.

Observations made during the 2010 survey by Division researchers demonstrated that experienced harvesters were able to accurately estimate weights. However, respondents and managers are also interested in how the density of the harvest of herring spawn on branches changes the estimated weights. Therefore, the Division and STA will continue each year to weigh herring spawn on branches to understand any changes that need to be made in conversion factors due to density of herring spawn.

Table 8.–Historical harvest and use comparisons for herring spawn, Sitka area, 2002–2010.

Year	Total harvest, pounds	Percentage of households				
		Used	Attempted	Harvested	Gave	Received
2002	151,667	97%	n/a	71%	40%	55%
2003	278,799	97%	n/a	71%	72%	46%
2004	381,226	97%	61%	60%	60%	39%
2005	79,064	99%	61%	52%	36%	39%
2006	219,356	86%	n/a	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%
5-year average (2005–2009)	134,256	90%	53%	49%	57%	49%
Historical average (2002–2009)	185,371	93%	57%	56%	57%	48%

Sources STA and ADF&G Division of Subsistence household surveys, 2002–2010.
n/a = data were not collected during the study year.

Participation rates throughout the annual monitoring program have been high, but the sample universe has declined from a high of 197 households in 2004 to 132 in 2010. This creates a smaller sampling universe and each year since 2006 the list has been refined. STA continues to search out new harvesters each year to add to the list regardless of affiliation with STA. As shown in Figure 8, harvesters have a diversity of affiliations. In order to better understand participation in the herring spawn fishery in 2010, Division researchers coded harvesters into 1 of 4 categories as noted in the methods section: (1) individual harvester, (2) non-harvester, (3) STA boat, and (4) the F/V *Julia Kae*, a boat funded by Silver Bay Seafoods which distributes herring spawn on branches in Sitka, Hoonah, Angoon, Kake, Craig, and Klawock (see Appendix B for code book). Residency was also noted. Table 9 reports that of a total harvest of 154,620 lb of herring spawn. Sitka households surveyed harvested 72,567 lb (47%), residents of other communities located mainly in Southeast Alaska harvested 11,656 lb (7%), the STA boat harvested 5,570 lb (4%), and the *Julia Kae* harvested 64,827 lb (42%) (Figure 8). Most of this harvest was herring spawn on hemlock branches; however, both Sitka respondents and the STA boat harvested herring spawn on kelp and on hair seaweed.

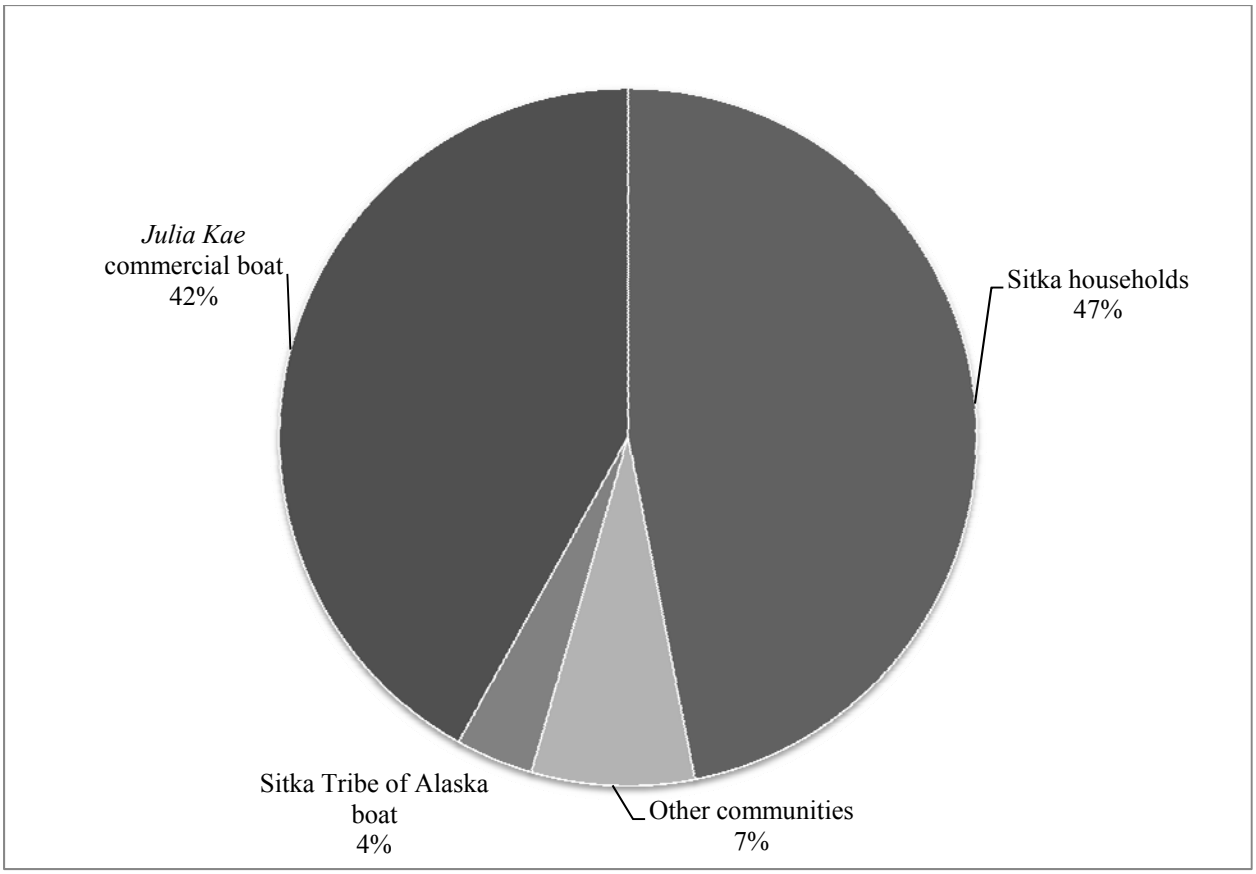

Figure 8.–Harvest of herring spawn by category, 2010.

Table 9.–Reported harvest and use of herring spawn by community, Sitka area, 2010.

Resource	Percentage of households						Reported pounds harvested, total	Confidence interval		
	Used	Attempted	Harvested	Gave	Received	Used in garden		CI %	Low	High
Sitka households										
Herring spawn on kelp	n/a	n/a	11%	n/a	n/a	n/a	4,085	5%	3,870	4,300
Herring spawn on hair seaweed	n/a	n/a	5%	n/a	n/a	n/a	2,020	3%	1,960	2,080
Herring spawn on other	n/a	n/a	0%	n/a	n/a	n/a	0	0%	0	0
Herring spawn on hemlock branches	n/a	n/a	23%	n/a	n/a	n/a	66,462	3%	64,296	68,628
Subtotal, herring spawn, all types	90%	30%	30%	31%	64%	3%	72,567	4%	69,981	75,152
Other communities										
Herring spawn on kelp	n/a	n/a	0%	n/a	n/a	n/a	0	0%	0	0
Herring spawn on hair seaweed	n/a	n/a	0%	n/a	n/a	n/a	0	0%	0	0
Herring spawn on other	n/a	n/a	0%	n/a	n/a	n/a	0	0%	0	0
Herring spawn on hemlock branches	n/a	n/a	25%	n/a	n/a	n/a	11,656	3%	11,289	12,023
Subtotal, herring spawn, all types	75%	25%	25%	25%	50%	0%	11,656	3%	11,289	12,023
Sitka Tribe of Alaska boat										
Herring spawn on kelp	n/a	n/a	100%	n/a	n/a	n/a	20	0%	20	20
Herring spawn on hair seaweed	n/a	n/a	0%	n/a	n/a	n/a	0.0	0%	0	0
Herring spawn on other	n/a	n/a	0%	n/a	n/a	n/a	0.0	0%	0	0
Herring spawn on hemlock branches	n/a	n/a	100%	n/a	n/a	n/a	5,550	0%	5,550	5,550
Subtotal, herring spawn, all types	100%	100%	100%	100%	0%	0%	5,570	0%	5,570	5,570
Julia Kae commercial boat										
Herring spawn on kelp	n/a	n/a	0%	n/a	n/a	n/a	0.0	0%	0.0	0.0
Herring spawn on hair seaweed	n/a	n/a	0%	n/a	n/a	n/a	0.0	0%	0.0	0.0
Herring spawn on other	n/a	n/a	0%	n/a	n/a	n/a	0.0	0%	0.0	0.0
Herring spawn on hemlock branches	n/a	n/a	100%	n/a	n/a	n/a	64,827	0%	64,827	64,827
Subtotal, herring spawn, all types	100%	100%	100%	100%	0%	0%	64,827	0%	64,827	64,827
TOTAL	**89%**	**30%**	**30%**	**31%**	**62%**	**3%**	**154,620**	**10%**	**139,872**	**169,367**

Sources STA and ADF&G Division of Subsistence household survey, 2010.

n/a = data were not expanded during the 2010 study year.

The distribution of the herring spawn in 2010 is shown in Table 10. Of a total harvest of 154,620 lb, 91,879 lb were shared with residents within Sitka (59%), 52,295 lb (34%) were shared with residents outside of Sitka, and 10,446 lb (7%) were kept for personal use. This means that 93% of the total harvest was given away by harvesters.

Table 10.–Distribution of herring spawn, Sitka area, 2010.

	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	4,095	100%	0	0%	10	0%	4,105
Herring spawn on hair seaweed	1,620	80%	0	0%	400	20%	2,020
Herring spawn on other	0	0%	0	0%	0	0%	0
Herring spawn on hemlock branches	4,730	3%	91,879	62%	51,885	35%	148,495
Herring spawn - all types	**10,445**	**7%**	**91,879**	**59%**	**52,295**	**34%**	**154,620**

Sources STA and ADF&G Division of Subsistence household survey, 2010.

To understand the high level of distribution of the harvest, respondents who did not harvest in 2010 were asked why they did not participate in the herring spawn fishery. Most of these respondents (24%) reported that they did not harvest because they received their herring spawn from the *Julia Kae*. As noted above, the *Julia Kae* harvested 42% of the overall harvest of 154,620 lb in 2010. Although some respondents received their harvest from the STA boat, which harvested 5,570 lb (4%) in 2010, during interviews respondents did not cite this as a reason why they did not harvest. Several respondents told Division and STA researchers that the *Julia Kae* was docked in one of the first slips on the dock, while the STA boat was in a slip further down the dock. Therefore, they said, they simply picked up their herring spawn from the *Julia Kae* instead of walking down the dock to the STA boat.

Over the 9 year duration of the annual monitoring program, the data showed an overall decrease in the percentage of harvesters participating in the herring spawn fishery and a slight decline in the percentage of households using herring spawn (Figure 3). As shown by the 2010 data in Figure 9, there are several reasons that fishers who are on the harvest list may not be harvesting. Twenty-two percent of respondents said they were working during the harvest. During interviews Division researchers noted that respondents said that due to the economy and lack of jobs, they needed to work as much as possible during the summer when jobs were available, which is also when the spawn happens. An additional 12% were not present during the spawn and some related that they were in other communities, working. Ten percent of respondents related that they received their harvest from family and another 11% said they received their harvest from friends, for a total of 21% of respondents, just under the 24% who received from the *Julia Kae*. Especially during 2010, due to economic conditions and the price of fuel, respondents related that they combined their efforts and used fewer boats for harvesting. These boats then widely distributed their harvest to others, as shown in Table 10, where only 7% of the harvest was kept for use in the household.

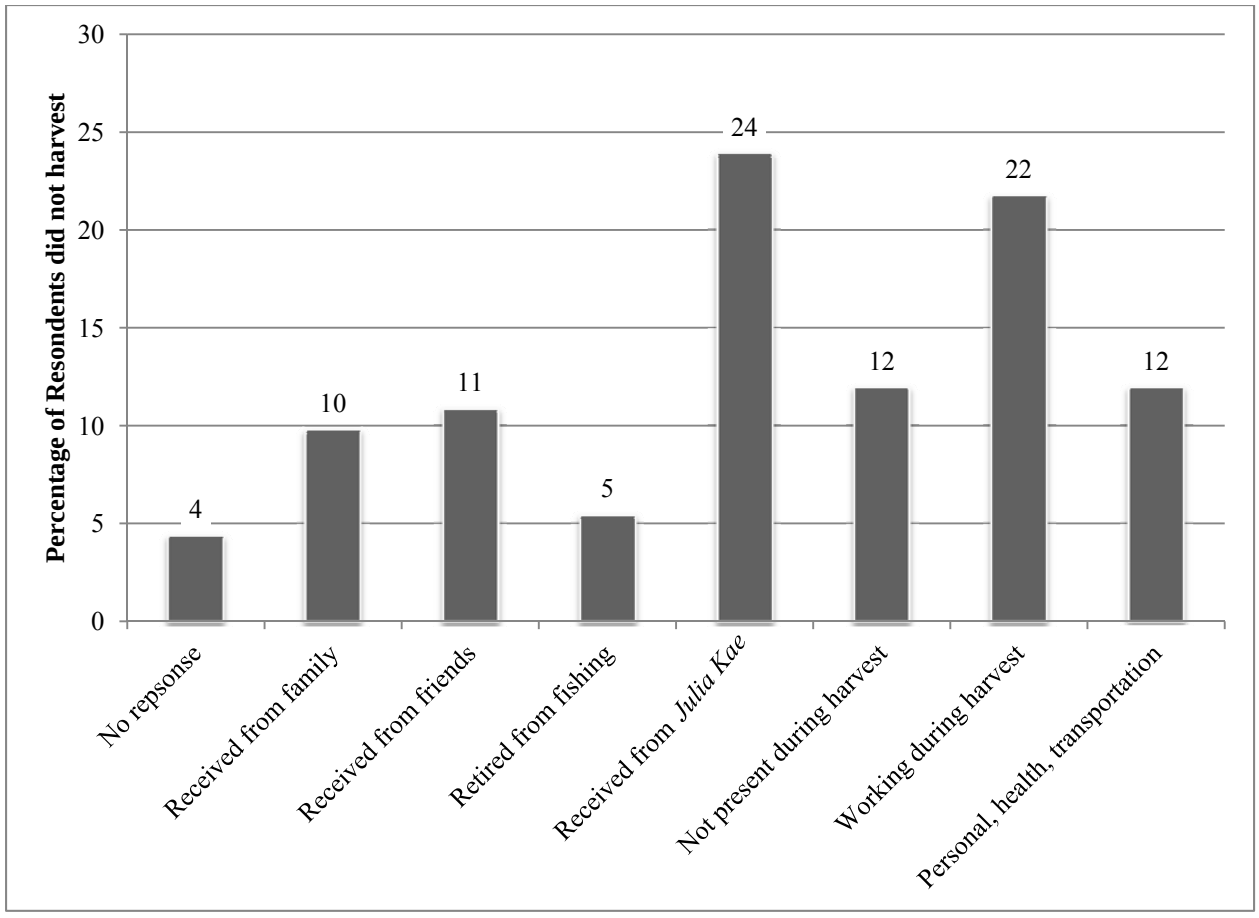

Figure 9.–Reported reasons households did not harvest herring spawn, Sitka area, 2010.

Although documenting the reasons for annual variations and trends in subsistence herring spawn harvests in Sitka Sound was not a project objective, some information on this subject was gathered during the surveys. For 2010, when asked about the harvest compared to recent years, 86% of surveyed households said that it was a good year or that the eggs were thick (Figure 10). Although 2009 and 2010 were good harvest years, respondents related to Division researchers during the survey that they were still concerned about herring abundance based on their observations over time. A short summary of these observations follows to add context to future discussions about management of the fishery and trends in the subsistence harvests. As early as 1983, subsistence and commercial fishers in Sitka expressed concerns about a perceived decline in the herring resource and about difficulties in harvesting herring spawn (Gmelch and Gmelch 1985:101). In 1983, reasons given for the decline in the resource included pollution from a pulp mill and city sewage, and the commercial herring sac roe fishery.

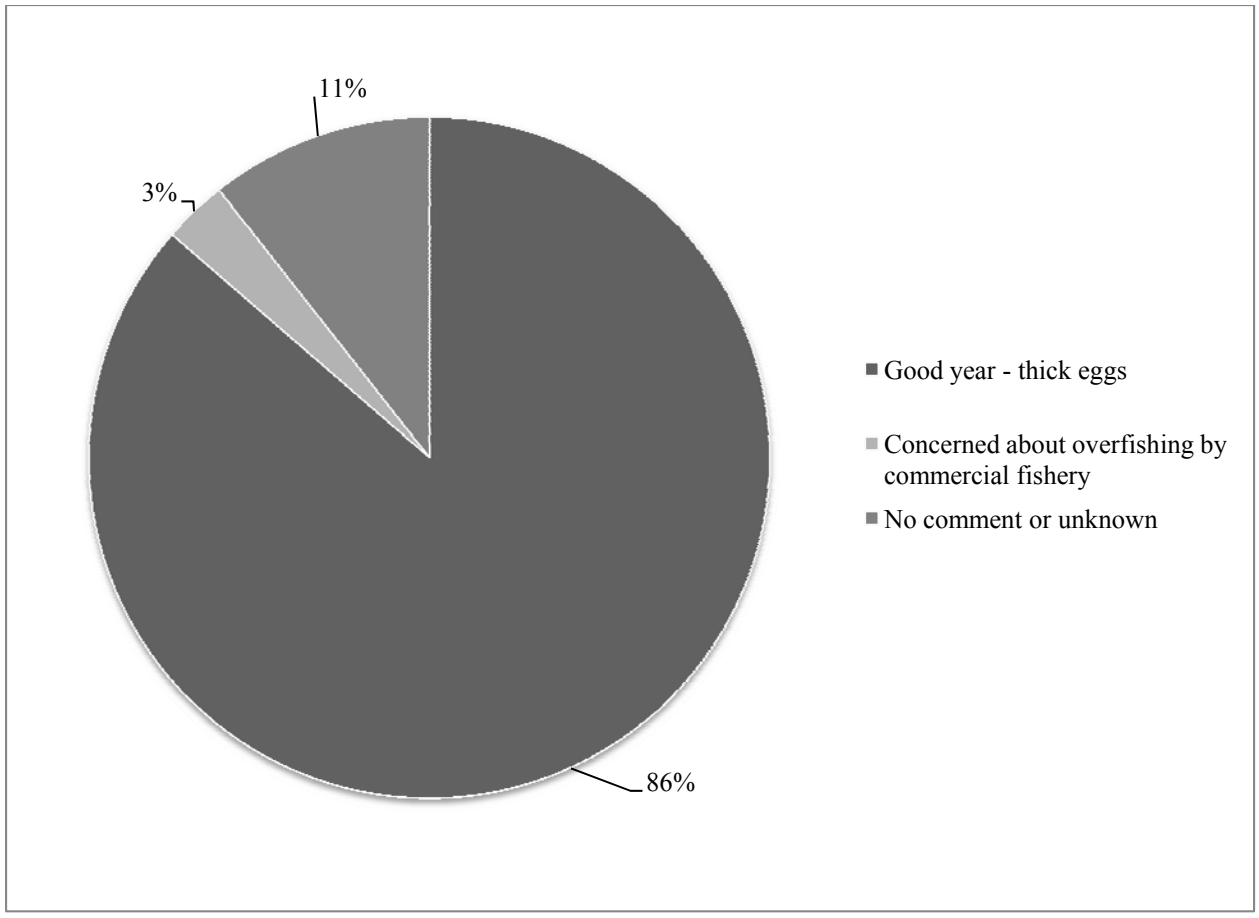

Figure 10.–Reported comments on the herring spawn on branches fishery in 2010.

Comments provided through the open-ended questions on the Sitka household surveys conducted since 2002 included continuing concerns about the commercial sac roe fishery interfering with the subsistence fishery and the lengths of herring spawning periods. Several long-term Sitka residents told researchers during the household surveys in March 2009 that the length of the spawning event in recent years had declined from weeks to days. Although harvesters observed that the herring were present for several weeks, they said that the herring spawn event in recent times lasts for only several days, making it more difficult for fishers to get out, set branches, and harvest spawn than it did when the spawn event lasted a week or more.

In addition, according to long-term Sitka subsistence herring spawn harvesters interviewed in March 2009, other factors also affected the quantity and quality of subsistence herring spawn harvests. According to these respondents, a "false spawn" sometimes occurs, which results in reduced spawn deposition on the various substrates. They described a false spawn as occurring when male herring release their milt before the females release their eggs, resulting in milky-colored waters but no fertilized eggs. In their view, such an event may result in an overestimation of the length of spawning or extent of spawning. The specific locations of spawning events also affected subsistence harvests. Herring spawn in various locations throughout Sitka Sound and the variation of spawning locations can be seen in figures 3 through 5, in which respondents reported harvest locations. Furthermore, as noted earlier, respondents have characterized a successful subsistence herring spawn harvest as occurring in relatively calm waters over a rocky bottom, during times of calm weather or in protected locations, not where large sea swells make traveling in a small skiff, setting branches, and harvesting herring spawn difficult, if not dangerous.

Consequently, subsistence fishers interviewed for this research have reported that they select protected waters in what they consider to be a core harvesting area (Figure 4).

CONCLUSION

The Sitka Sound herring spawn fishery has been, and remains, an important subsistence resource for Alaska residents (Gmelch and Gmelch 1985; Schroeder and Kookesh 1990). Division research on the Sitka subsistence herring spawn fishery (Gmelch and Gmelch 1985:105; Schroeder and Kookesh 1990:52–53) reveals that subsistence herring spawn harvesting is a specialized activity wherein a small proportion of community members harvest and distribute herring spawn to many others. Giving and receiving herring spawn products remains culturally important to Alaska residents. In this respect, the herring spawn harvest resembles the subsistence harvest of marine mammals, which are also typically harvested by a small proportion of community members who then share their harvest with others (Wolfe and Mishler 1994).

There could be several reasons why a relatively small number of Sitka fishers harvest a large proportion of the herring spawn. Successful harvesting of herring spawn requires specific equipment and other resources (e.g., a boat, fuel, etc.), the knowledge of where and how to set branches, 2 to 3 weeks of focused attention, and the freedom to participate in the fishery when the unpredictable spawn begins (Schroeder and Kookesh 1990). Respondents in 2010 noted that they made daily trips to harvesting locations to watch the herring school. Respondents patiently watched each day for the herring to turn "sideways" and flatten out near the top of the water. When this happens, they said, they knew it was time to set the trees.

The Division and the Sitka Tribe of Alaska have been cooperating on a subsistence harvest survey since 2002. In 2004, the STA assumed primary responsibility for conducting the surveys and assembling the raw data, which were then sent to the Division Information Management staff for analysis. In 2007, the Sitka Tribe of Alaska requested that key survey information, including the names of fishery participants and specific harvest locations, no longer be provided to the Division. Reasons cited were that 1) STA staff had adequate knowledge on survey methods to conduct the survey without department oversight, and 2) tribal members expressed concerns about the confidential nature of specific individual harvest information. Because of this, detailed information is missing from some survey years, making it difficult to evaluate trends in the number of high harvesters, the general locations where sets were made, or the number of sets made.

In 2010, researchers included assessment questions to better understand why past harvesters were no longer participating in the fishery. This effort will be included in future surveys, and STA and Division should identify additional questions that need to be asked of respondents. In addition, the collection of harvest locations should continue as well, because this is an important component in understanding trends in the harvest.

The Division is confident that reasonably accurate information can continue to be obtained, provided that the current level of cooperation between the Division and the STA continues. Steps were taken in 2010 to reassess the method for revising the list of harvesters and the methodology for revising conversion factors. This effort will continue in 2011 with the objectives of further refining both the list of harvesters and the conversion factors for commonly used containers. Furthermore, the Division will ensure that the survey methodology is followed in an objective manner, which will provide greater transparency of methods, and thus a higher level of confidence in the results of the survey.

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, Heather Woody, Jeff Feldpausch, and Dan Williams, who currently work at STA, as well as past employees Robi Craig, Jessica Perkins, and Helen

Dangel. 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. We would also like to thank John Littlefield for taking us out on his skiff and sharing his knowledge of the customary and traditional harvests and uses of the Sitka Sound herring spawn, and Ralph Guthrie for sharing his poetry and local knowledge of Sitka herring fisheries. There are many other 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.

Davin Holen would also like to thank the Sitka staff of the ADF&G Division of Commercial Fisheries, in particular Bill Davidson, Dave Gordon, and Eric Coonradt, for their assistance and support.

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APPENDIX A: SURVEY INSTRUMENTS

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

Subsistence Herring Egg Harvest Survey 2003
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Participation in the survey is voluntary and confidential, and will not be used to limit your future harvest activities.

Community_____ How many people lived in your household in 2003?_____

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 **2003**, 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?		

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 **total pounds** of Herring Roe **on Branches** did you harvest during **2003** ? _____ (Total)

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

7. How many **total pounds** of Herring Roe **on Kelp/Other** did you harvest during **2003** ?_____ (Total)

	Macrocystis		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 **2003** ? _____ ____
[**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 **2003** [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 **2003** 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!

Subsistence Herring Egg Harvest Survey 2004
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ How many people lived in your household in 2004?_____

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 2004, 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?		

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 **total pounds** of Herring Roe **on Branches** did you harvest during **2004** ? _____ (Total)

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

7. How many **total pounds** of Herring Roe **on Kelp/Other** did you harvest during **2004** ?_____ (Total)

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

8. Where did you harvest herring eggs in **2004?** _____

Do you have any comments about the **2004** 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!

Subsistence Herring Egg Harvest Survey 2005
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ How many people lived in your household in 2005?_____

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 2005, 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?			

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 **2005** ? _____ (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 **2005** ?_____ (Total)

	Macrocystis		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 2005 ? ____ ____ ____
[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 **2005** *[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 **2005** 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!

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
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

Subsistence Herring Egg Harvest Survey 2007
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ How many people lived in your household in 2007?_____

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 2007, 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?				

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 **2007** ? _____ (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 **2007** ?_____ (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 2007 ? _____ ____
[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 **2007?** See other side of survey.

Do you have any comments about the **2007** 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 2007?					
	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

Subsistence Herring Egg Harvest Survey 2008
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ Date _____ HHID_____

How many people lived in your household in 2008? _____ Interviewer _____

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

[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, RANDOM HOUSEHOLD SURVEY NUMBER.

During 2008, 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 2008 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 have harvested herring eggs in past but not in the last 3 years, why did you stop harvesting herring eggs?

_____

_____

_____

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 2008? _____ Yes _____ No

12. Do you have any comments about the **2008** 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 2008
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.

13. How many **pounds** of Herring Roe **on Branches** did you harvest during **2008** ?

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

14. How many **pounds** of Herring Roe **on Kelp/Other** did you harvest during **2008** ?

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

15. What size vessel(s) did you use to harvest herring eggs in 2008 ? _____ _____ _____ ☐

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

HARVEST LOCATIONS: Where did you harvest herring eggs in **2008?** This information **will not** be shared with Alaska Department of Fish & Game.

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.

STA only survey

16. Where did you harvest herring eggs in **2008?** This information **will not** be shared with Alaska Department of Fish & Game.

Where did you set/fish branches, harvest hair seaweed, macrocystis kelp in 2008?						
	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

STA Supplemental Survey

The area around the causeway islands is under federal control. We are gathering information about the subsistence use of herring eggs in this federal area, which is important in the development of subsistence regulations.

1. In 2008, did you harvest or attempt to harvest in this area? (w/ map) _____ Yes _____ No

1.b. If you harvested in **2008**, how many pounds of roe did you get?

How many **pounds** of Herring Roe **on Branches** ?	
on Macrocystis ?	
On Hair Seaweed-*Né* ?	
Other ?	

2. At any time in the past, have you ever attempted to harvest in this area? _____ Yes _____ No

2.b. If so, when (list range of years, etc) _____

_____

3. Were you successful in harvesting? _____ Yes _____ No

4. Do you know anyone else who has harvested/ attempted to harvest in this area? _____ Yes _____ No

If so, who (father, grandfather, friend) and when? _____

_____

5. What type of roe have you harvested in this area?

- ❑ Branches
- ❑ Macrocystis
- ❑ Né
- ❑ Other_____

6. Under what circumstance do you use this area?

- ❑ For Macrocystis
- ❑ Small skiff, can't get far
- ❑ Other _____
- ❑ Bad weather
- ❑ Traditional area

7. Could you please indicate on the map where in this area you have harvested or attempted to harvest herring eggs?

8. Comments about use of this area: _____

_____

_____

_____

STA only survey

Where did you harvest herring eggs in **2008?** This information **will not** be shared with Alaska Department of Fish & Game.

Where did you set/fish branches, harvest hair seaweed, macrocystis kelp in 2008?

Location	
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	

Subsistence Herring Egg Harvest Survey 2009
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ Date _____ HHID_____

How many people lived in your household in 2009? _____ Interviewer _____

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

[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, RANDOM HOUSEHOLD SURVEY NUMBER.

During 2009, 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 2009 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 2009, 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 2009? _____ Yes _____ No

12. Do you have any comments about the **2009** 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 2009
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.

13. How many **pounds** of Herring Roe **on Branches** did you harvest during **2009** ?

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

14. How many **pounds** of Herring Roe **on Kelp/Other** did you harvest during **2009** ?

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

15. If you shared herring roe with others how many households did you share with? _____

16. What size vessel(s) did you use to harvest herring eggs in 2009? _____ _____ _____ ☐

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

HARVEST LOCATIONS: Where did you harvest herring eggs in **2009?**

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.

17. Where did you harvest herring eggs in **2009?**

Where did you set/fish branches, harvest hair seaweed, macrocystis kelp in 2009?						
	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

Subsistence Herring Egg Harvest Survey 2010
Sitka Tribe of Alaska, and ADF&G Division of Subsistence

Community_____ Date _____ HHID _____

How many people lived in your household in 2010? _____ Interviewer _____

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

[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, RANDOM HOUSEHOLD SURVEY NUMBER.

During 2010, 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 2010 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 2010, 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 2010? _____ 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 2010 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 2010
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 **2010**?

	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 **2010**?

	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 2010? _____

[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 2010 - 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: CODE BOOK

Subsistence Herring Egg Harvest Survey 2010

Herring Spawn User Status	Code
Individual Harvester	1
Non-Harvester	2
STA Boat	3
Julia Kae	4

9.[a] If you did not harvest herring eggs in 2010, 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
Retired from fishing and received eggs	3
Received from *Julia Kae*	4
Not present during the harvest	5
Working during the harvest	6
Other personal/health/transportation reasons	7

12.[a] How do you feel the harvest went this year compared to previous harvests?	Code
Refused	-7
Missing (blank, but should not be & the reason is not clear)	-8
Unknown to respondent	-9
Good year/thick eggs	1
Concerned about overfishing by commercial fishery	2

13.[a] Do you have any additional comments about the 2010 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/better than previous years	1
Concerned about the future of the resource	2
Traditional fishing locations are important for local users	3
Concerned about the effect of the commercial fishery on the resource	4
There should be more involvement by local users in the harvest	5
There was a lot of sharing of the harvest occurring	6

a. Number corresponds to question number in survey instrument.

APPENDIX C: CONVERSION FACTORS

Sitka Sound Subsistence Herring Spawn

CONVERSION FACTORS 2010

Prepared by Division of Subsistence, Alaska Department of Fish and Game and Sitka Tribe of Alaska

Resource container type	Estimated average weight[a]
Ziploc[b] Gallon Bag	4.07 lb
Ziploc[b] Quart Bag	1.42 lb
Wet-Guard[b] X-Large (80 lb) Wet Lock Box	80.26 lb
Sea-Pro[b] Large (50 lb) Wet Lock Box	57.78 lb
Sea-Pro[b] Small (25 lb) Wet Lock Box	25.50 lb

a. Estimated processed weight of herring spawn on hemlock branches is 97.14% of unprocessed weight: *processed weight / 0.9714 = unprocessed weight*

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