Technical Paper No. 454

Subsistence Harvest Assessment and Biological Sampling of Chinook Salmon in the Togiak River Drainage

edited by
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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 Division of Subsistence reports. All others, including deviations from definitions listed below, are noted in the text at first mention, in the titles or footnotes of tables, and in figures or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

Alaska Administrative Code	AAC
all commonly-accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly-accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
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. states	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

ERRATA

Originally published in September 2019, Technical Paper No. 454, *Subsistence Harvest Assessment and Biological Sampling of Chinook Salmon in the Togiak River Drainage*, has been revised on page 24 to reflect the correct regulatory language governing the fishery:

However, commercial fishers are required to report the number or pounds of fish retained for their own use on an ADF&G commercial fish ticket when making a delivery for sale (5 AAC 39.130(c)(12)).

now reads:

However, commercial fishers are required to report the number of king and coho salmon retained for their own use on an ADF&G commercial fish ticket at the time of landing (5 AAC 06.377(b)).

TECHNICAL PAPER NO. 454

SUBSISTENCE HARVEST ASSESSMENT AND BIOLOGICAL SAMPLING OF CHINOOK SALMON IN THE TOGIAK RIVER DRAINAGE

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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.

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

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ABSTRACT

This report provides updated information about the harvests of salmon by the communities of Togiak and Twin Hills, Alaska. This report details the results of a household survey administered for the study years of 2016 and 2017 for harvests and uses of wild salmon by Togiak and Twin Hills households. Also, this report includes information from in-depth interviews conducted with key respondents, as well results from Chinook salmon stock composition data collection and results from Chinook salmon *Ichthyophonus* parasite testing. Both study communities are located in Bristol Bay in Southwest Alaska. As in the past, during the 2016 and 2017 study years, many residents of these study communities relied on fishing for nutrition and to support their way of life. The household surveys found that in both study years, subsistence harvests of salmon were important in both communities: approximately 70% of the salmon harvest weight for Togiak and 90% of the harvest weight for Twin Hills were caught by subsistence gillnet for both study years. Overall, 83 lb per capita in Togiak, and 44 lb per capita in Twin Hills, were harvested in 2016. Chinook salmon and sockeye salmon composed the largest portions of salmon harvests for both communities in 2016. In 2017, the harvests of salmon increased to 109 lb per capita for Togiak, but decreased to 38 lb per capita for Twin Hills. Reflecting 2016, for study year 2017 Chinook salmon and sockeye salmon composed the largest portions of salmon harvests for both communities. This study is part of the effort to collect data about the full range of wild salmon harvests and uses, and areas of harvest, to understand in all its complexity the importance of salmon as a subsistence resource. The project was funded by the Office of Subsistence Management, U. S. Fish and Wildlife Service (OSM, USFWS). This information was collaboratively collected by research staff of the Alaska Department of Fish and Game (ADF&G) Division of Subsistence, and research staff from the Natural Resources Department of Bristol Bay Native Association.

Key words: subsistence, Chinook salmon, salmon, Bristol Bay, Southwest Alaska, Togiak, Twin Hills

1. INTRODUCTION

Bronwyn Jones

This report summarizes the results of a project conducted for study years 2016 and 2017 to address concerns regarding the health and abundance of Togiak River Chinook salmon and a declining subsistence harvest by local communities. The project included two years of post-season salmon harvest and stock assessment surveys, ethnographic interviews and observations, and Chinook salmon tissue sample collections in the communities of Togiak and Twin Hills, which are both located in Togiak Bay in Southwest Alaska (Figure 1-1). The study community populations span a wide range. According to the most recent 5-year (2013–2017) American Community Survey (ACS) estimated average, the populations of Togiak and Twin Hills were 749 and 83, respectively; both communities have predominantly Alaska Native populations (93% and 98%, respectively) (U.S. Census Bureau n.d.). All five species of Pacific salmon found in Alaska are used for subsistence by residents of Togiak and Twin Hills (Table 1-1). This study documented the continuing importance of subsistence salmon fishing to the residents of Togiak and Twin Hills. The mandate of the Division of Subsistence requires research into the subsistence uses of wild resources by Alaska residents, and this research is used to inform management decisions regarding the customary and traditional uses of those resources (Fall 2016).[1] This project aligns with this mandate through the resulting recommendations developed to incorporate these data into best management practices to benefit salmon fisheries, and, more specifically, Chinook salmon fisheries of the Togiak River.

Project Background

The funding for this project was awarded by the United States Fish and Wildlife Service (USFWS), Office of Subsistence Management (OSM), in April 2016 after the 2016 call for proposals. For the communities of Togiak and Twin Hills, Chinook salmon is an important and highly valued salmon species harvested for subsistence. Togiak River Chinook salmon support the largest subsistence fishery with a federal and state jurisdiction nexus in Bristol Bay. Since 1983, a permitting system documenting the subsistence harvests of Chinook salmon by Alaska residents has been administered by the Alaska Department of Fish and Game (ADF&G) Division of Subsistence. Beginning in 2009, subsistence harvests of Togiak River Chinook salmon exhibited a downward trend and residents of Togiak and Twin Hills have expressed concern for local Chinook salmon stock health due to perceived lower abundance, smaller sizes of returning Chinook salmon, and the increasing presence of deformed or diseased fish.

The inability of Togiak and Twin Hills residents to obtain an adequate harvest of Chinook salmon has ramifications for their socio-cultural systems, in addition to economic considerations given their remote location. Participating in this fishery is an important annual activity for local families. In addition to the demand for subsistence-caught Chinook salmon in the Togiak watershed, both commercial and recreational fishing pursuits occur within these waters, furthering the pressure on these salmon stocks.

Based on available data prior to this study, it is difficult to determine causal factors (i.e., abundance, disease, competition) and it is not clear if this decline is linked to poor Chinook salmon returns that have affected other watersheds in the state (ADF&G Chinook Salmon Research Team 2013). The stock does not currently have an escapement goal or an inriver monitoring program. To gain a better understanding of the Chinook salmon population and health profile, and identify factors that are affecting the subsistence harvest of Chinook salmon in the Togiak River watershed, this project conducted inseason participant observation, post-season harvest surveys, local knowledge interviews, and stock composition and health assessments over a two-year period.

1. Alaska Department of Fish and Game, "Division of Subsistence: Division Overview." http://www.adfg.alaska.gov/index.cfm?adfg=divisions.subsoverview (accessed Dec. 1, 2017).

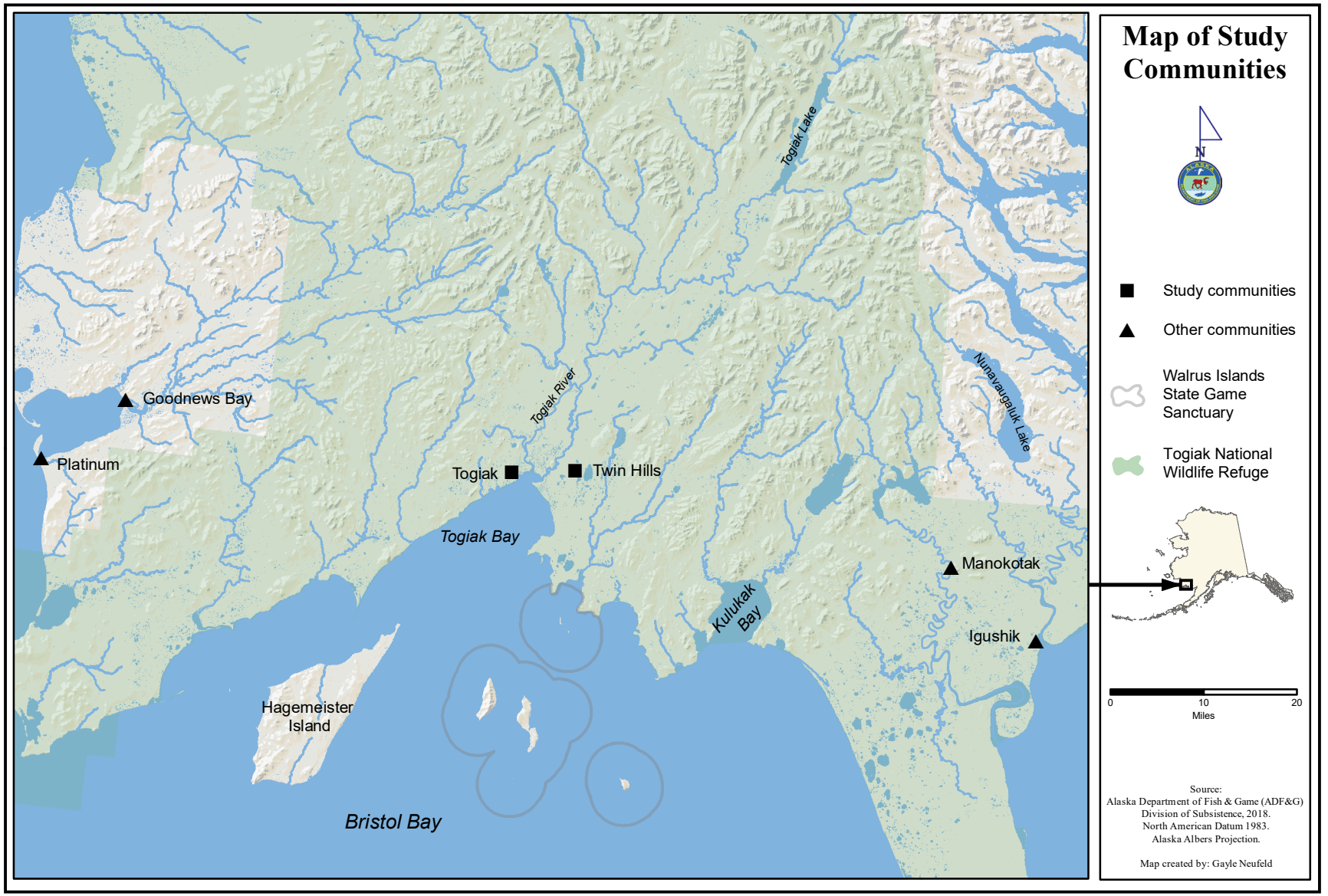

Figure 1-1.–Map of study communities, 2016 and 2017.

Table 1-1.–Species used by study community households, 2016 and 2017.

Resource	Scientific name
Chum salmon	*Oncorhynchus keta*
Coho salmon	*Oncorhynchus kisutch*
Chinook salmon	*Oncorhynchus tshawytscha*
Pink salmon	*Oncorhynchus gorbuscha*
Sockeye salmon	*Oncorhynchus nerka*
Spawning sockeye salmon	*Oncorhynchus nerka*

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Study Objectives

The project had the following objectives:

1. Through participant observation in season, learn how residents of Togiak and Twin Hills are recording and reporting their harvest of Chinook salmon.
2. Conduct interviews with local subsistence users to document their knowledge of Chinook salmon of the Togiak River and potential factors affecting the decline of reported subsistence harvests (e.g., Chinook salmon health, competition, trends, lack of reporting).
3. Collect age, sex, and length (ASL) information to determine Chinook salmon stock composition.
4. Chinook salmon heart collection and analysis to determine the prevalence of fish infected by Ichthyophonus in the fishery.
5. Conduct post-season harvest surveys to obtain amount and locations of household harvests to estimate the subsistence harvests (which contribute to total run estimates).
6. Compare harvest estimates with permit data and historical harvests to provide recommendations for a potentially revised harvest monitoring program based on the study findings.

Research Methods

Ethical Principles for the Conduct of Research

The project was guided by the research principles outlined in the *Alaska Federation of Natives Guidelines for Research*[2] and by the National Science Foundation, Office of Polar Programs, in its *Principles for the Conduct of Research in the Arctic* approved by the International Arctic Research Policy Committee in 1990 (Social Science Task Force, U.S. Interagency Arctic Research Policy Committee 1995), the *Ethical Principles for the Conduct of Research in the North* (Association of Canadian Universities for Northern Studies 2003), as well as the Alaska confidentiality statute (AS 16.05.815). These principles stress community approval of research designs, informed consent, anonymity or confidentiality of study participants, community review of draft study findings, and the provision of study findings to each study community upon completion of the research.

Project Planning and Approvals

This project was carried out as a partnership between the Bristol Bay Native Association (BBNA) and the ADF&G Division of Subsistence. Bronwyn Jones, Subsistence Resource Specialist II with the Division of

2. Alaska Federation of Natives, "Alaska Federation of Natives Guidelines for Research." Last modified Aug. 15, 2006. Alaska Native Knowledge Network, http://www.ankn.uaf.edu/IKS/afnguide.html (accessed November 27, 2018).

Subsistence, led the project as the Principal Investigator, and Cody Larson, Subsistence Fisheries Scientist with BBNA, was the Co-Investigator (Table 1-2). The Division of Subsistence took the lead on overall project management, which included fieldwork logistics, survey and interview design and implementation, collecting biological samples, data analysis, and report writing and communicating with the funding agency. BBNA was tasked with community and tribal coordination, as well as assisting with fieldwork tasks and report writing. The Division of Subsistence also coordinated with the ADF&G Pathology Laboratory and the Division of Commercial Fisheries for the collection and analysis of Chinook salmon heart tissue samples and the tasks associated with analyzing the Chinook salmon ASL information.

While developing this project, letters of support were provided by the Togiak Traditional Council and the Twin Hills Traditional Council. Additionally, after funding was awarded by OSM, a cooperative agreement was signed by both tribal councils. Before project start-up, researchers from BBNA and ADF&G traveled to both study communities to introduce the study plan at a public scoping meeting to provide residents of Togiak and Twin Hills an opportunity to ask questions or express concerns about the project. On May 2, 2016, the community meeting was held in Togiak, and a total of 14 community members attended the meeting, which was led by researcher Jones. A community scoping meeting was held on May 3, 2016, in Twin Hills, and five community members attended (Table 1-3).

Table 1-2.–Project staff.

Task	Name	Organization
Southern Regional Program Manager	Brian Davis	ADF&G Division of Subsistence
Principal Investigator	Bronwyn Jones	ADF&G Division of Subsistence
Co-Investigator	Cody Larson	Bristol Bay Native Association
Data Management Lead	David S. Koster	ADF&G Division of Subsistence
Data Management Assistant	Margaret Cunningham	ADF&G Division of Subsistence
Administrative support	Zayleen Kalalo	ADF&G Division of Subsistence
Programmer	Margaret Cunningham	ADF&G Division of Subsistence
Data entry	Jon Jeans	ADF&G Division of Subsistence
Data entry	Halia Janssen	ADF&G Division of Subsistence
Data entry	Alex DePue	ADF&G Division of Subsistence
Data entry	Alea Robinson	ADF&G Division of Subsistence
Data entry	Anna Petersen	ADF&G Division of Subsistence
Data entry	Kayla Schommer	ADF&G Division of Subsistence
Data cleaning/validation	Margaret Cunningham	ADF&G Division of Subsistence
Data analysis	Margaret Cunningham	ADF&G Division of Subsistence
Cartography	Gayle Neufeld	ADF&G Division of Subsistence
Editorial Review Lead	Mary Lamb	ADF&G Division of Subsistence
Field research lead	Bronwyn Jones	ADF&G Division of Subsistence
Field research staff	Gabriela Halas	ADF&G Division of Subsistence
Field research staff	Zayleen Kalalo	ADF&G Division of Subsistence
Field research staff	Jessie Merriam	ADF&G Division of Subsistence
Field research staff	Cody Larson	Bristol Bay Native Association
Field research staff	Theodore M. Krieg	ADF&G Division of Subsistence
Local research assistant	Maya Kanulie	Togiak
Local research assistant	Walter Kanulie	Togiak
Local research assistant	Brian Abraham	Togiak
Local research assistant	Desiree Green	Togiak
Local research assistant	Andrea Logusak	Togiak
Local research assistant	William Page	Twin Hills

Table 1-3.–Community scoping meetings, study communities, 2016 and 2017.

Community	Date	Attendance	
		Community residents	Staff
Togiak	5/2/2016	14	Jones, Krieg, Larson
Twin Hills	5/3/2016	5	Jones, Krieg, Larson

Systematic Household Surveys and Sample Achievement

The primary method used for collecting subsistence harvest and use information for this project was a systematic household survey. Following receipt of comments at the scoping meetings, in January 2017 ADF&G finalized the survey instrument used to gather salmon resource data for both study years. A key goal was to structure the survey instrument to collect demographic and resource harvest (including by gear type) and use data that are comparable with information collected in other household surveys in the study communities and with data in the Community Subsistence Information System (CSIS[3]). Estimated salmon harvests by study community households are reported in numbers of fish and in pounds usable weight; the estimates include resources harvested by any member of the surveyed households during the study years. "Use" of salmon means any fish harvested, given away, or used by a household, and salmon acquired from other harvesters, either as gifts, by barter or trade, through fishing partnerships, or as meat given by fishing guides and non-local fishers. Additionally, the household survey included a series of questions about Chinook salmon and all other salmon combined regarding stock health and salmon behavior, salmon use and harvest effort changes over time and sufficient resource supply, participation in the subsistence salmon permit system, and mutual or reciprocal influence among subsistence fishing and commercial and sport fishing for salmon. Finally, the household survey also included a series of questions about subsistence salmon permits for the Bristol Bay Area to address the study objective to evaluate the current harvest reporting and monitoring system that is based on subsistence permit returns. Note that when completing the post-season surveys, division staff, if possible, brought a copy of the returned permit to each surveyed household that obtained a permit before the fishing season and returned the permit before survey administration occurred. When harvest amount questions were asked for the survey, the permit was used to verify harvest numbers. In addition, the households were asked if any more harvests occurred after the permit was returned and, if so, those harvests were added to the permit. For those households for which division staff were unable to bring or obtain the household's permit, members of the household used recall to answer harvest amount questions for surveys. Also, researchers issued permits during survey administration to those surveyed households that harvested subsistence salmon but did not originally obtain a permit.

Appendix A is an example of the survey instrument used in this project. Note that the survey form included questions about select nonsalmon fish resources as part of another project underway by the ADF&G Division of Subsistence; to reduce survey fatigue in community households and expenses and time associated with fieldwork, the questions regarding nonsalmon fish were asked concurrently but separate analysis and reporting for those data will occur as part of the other project.

The objective of this study was to survey all Twin Hills households due to the relatively small size of the community (i.e., fewer than 30 households). Because Togiak is a much larger community, a stratified sampling strategy was used to target 80% of households containing a subsistence salmon permit holder, and 20% of the remaining households that did not have a subsistence permit holder. Division of Subsistence and BBNA researchers worked with a combination of local research assistants (LRAs), knowledgeable community members, and tribal administrators to develop household lists in both communities. For Twin Hills, these efforts established an estimate of 28 eligible households to be surveyed in 2016 and 24 in

3. ADF&G Community Subsistence Information System: http://www.adfg.alaska.gov/sb/CSIS/ (hereinafter cited as CSIS).

2017 (Table 1-4). For Togiak in 2016, after verifying permanent household eligibility, 43 permit holder households and 141 non-permit holder households were identified; however, based on initial estimates of 47 permit holder households and 145 other households, the 2016 survey goal was 38 permit holder households and 29 non-permit holder households. During the 2017 survey year, 45 permit holder households were identified in Togiak and 153 non-permit holder households. The 2017 survey goal for Togiak was 36 permit holder households and 31 non-permit holder households based on the initial estimates of 46 permit holder households and 156 other households. During the survey effort, for each residence that researchers attempted to contact, a disposition was applied. The disposition categories included:

- Contains residents who are eligible to participate in the survey based on length of residency (lived in community for at least 6 months) (survey attempted).
- Vacant (no survey attempted).
- Not a dwelling (commercial building or no dwelling exists) (no survey attempted).

If researchers were initially unsuccessful at making contact with an eligible household, two more attempts to survey the household were made. When a reasonable effort was made to survey the household and no contact could be made, this household was assigned a "no contact" disposition. Contacted households could also decline to participate in the survey.

During survey administration, permit data were provided and reviewed with households that had previously returned permits, or households returned a permit during the survey, to verify harvest information and to assist with recall.

Togiak

The sample achievement goal was successfully attained in Togiak in 2016 for each stratum (i.e., 80% of permit holder households and 20% of non-permit holder households). In 2016, 37 permit holder households were successfully surveyed, and 37 non-permit holder households were surveyed, resulting in a sample achievement of 86% of permit holder households and 26% of non-permit households (Table 1-4). In 2016, the average survey length in Togiak was 19 minutes; the longest survey lasted 40 minutes, and the shortest survey was completed in seven minutes (Table 1-5). For the 2017 survey year, 35 permit holder households were successfully surveyed, and 35 non-permit holder households were surveyed, resulting in a sample achievement of 78% of permit holder households and 23% of non-permit holder households (Table 1-4). During the 2017 survey effort, the average survey length was 18 minutes, with the longest survey lasting 80 minutes and the shortest survey taking five minutes (Table 1-5).

Twin Hills

During the 2016 survey effort in Twin Hills, of the 28 qualifying households, 20 were successfully surveyed, resulting in a sample achievement of 71% (Table 1-4). Five households declined to participate in the study, and three households could not be contacted after three attempts. In 2016, the average survey length was 16 minutes with the longest survey taking 42 minutes, and the shortest lasting five minutes (Table 1-5).

Of the 24 qualifying households found in 2017, 18 successfully surveyed, resulting in a sample achievement of 75% (Table 1-4). Two households declined to participate in the study, and four households could not be contacted after three attempts. In 2017, the average survey length was 14 minutes, with the longest survey lasting 40 minutes, and the shortest survey taking five minutes (Table 1-5).

Mapping Locations of Subsistence Salmon Fishing

During household surveys, the researchers asked respondents to indicate the locations of their fishing activities during the study year. In addition, interviewers asked the respondents to mark on maps the sites of each harvest, the species harvested, the amounts harvested, and the month(s) of harvest. Project research staff established a standard mapping method. Points, lines, and polygons were used to mark fishing and harvest locations. Generally, points were used to mark harvest locations such as subsistence set gillnet sites. However, sometimes points were also used to designate a harvest effort location, especially if fishing from

Table 1-4.–Estimated households and sample achievement, study communities, 2016 and 2017.

	Community					
	Togiak				Twin Hills	
	2016		2017		2016	2017
Sample information	Permit holder	Non-permit holder	Permit holder	Non-permit holder	Non-stratified	Non-stratified
Number of dwelling units	47	145	46	156	29	32
Interview goal	38	29	36	31	28	24
Households interviewed	37	37	35	35	20	18
Households failed to be contacted	4	8	0	1	3	4
Households declined to be interviewed	2	4	1	2	5	2
Households moved or occupied by nonresident	4	4	0	4	1	8
Total households attempted to be interviewed	43	49	36	38	28	24
Refusal rate	5.1%	9.8%	2.8%	5.4%	20.0%	10.0%
Final estimate of permanent households	43	141	45	153	28	24
Percentage of total households interviewed	86.0%	26.2%	77.8%	22.9%	71.4%	75.0%
Interview weighting factor	1.16	3.81	1.29	4.37	1.40	1.33
Sampled population	142	151	143	150	55	51
Estimated population	165.0	575.4	183.9	655.7	77.0	68.0

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Table 1-5.–Survey duration, study communities, 2016 and 2017.

Community	Study year	Interview length (in minutes)		
		Average	Minimum	Maximum
Togiak	2016	19	7	40
	2017	18	5	80
Twin Hills	2016	16	5	42
	2017	14	5	40

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

a river bank. Some lines were also drawn in order to depict when the harvesting activity did not occur at a specific point; for example, lines were used to depict courses taken while trolling for fish or driftnetting.

Harvest locations and fishing areas were documented using an application designed on the ArcGIS Runtime SDK for iOS platform; basically, a mapping data collection application for iPad.[4] The point, polygon, or line was drawn on a U.S. Geological Survey topographic relief map downloaded on the iPad. The iPad allowed the user to zoom in and out to the appropriate scale, and the ability to document harvesting activities wherever they occurred in the state of Alaska. Once a feature was accepted, an attribute box was filled out by the researcher that noted the species harvested, amount, method of access to the resource, and month(s) of harvest. Once data collection was complete, the data were uploaded through to a cloud server for storage.

Once a survey was complete researchers conducted a quality control exercise by matching the map data to the survey form to ensure all map data had been documented. This was completed in the field before the surveys were submitted to the community's lead researcher. Once the data had been uploaded, researchers also verified that the household data were logged into the server. The data were first sorted by community, and then resource. Maps were then produced at the species-specific level for each community.

Household Survey Implementation

For both study years, Jones was the research lead for this project. For the 2016 study year, Jones, ADF&G researcher Gabriela Halas, ADF&G volunteer Jessie Merriam, and BBNA researcher Larson arrived in Togiak on March 23, 2017, and trained LRAs Brian Abraham, Desiree Green, Maya Kanulie, and Walter Kanulie in the afternoon of the same day. Year 1 survey administration occurred until April 1, 2017. Researchers traveled from Togiak to Twin Hills to conduct surveys on March 29, 2017. William Page was trained and hired as an LRA the same day. Some remaining surveys were left for Page to complete over the ensuing week. These surveys were completed and then sent on a plane to the research team in Togiak.

For the 2017 study year, Jones, Halas, ADF&G staff Zay Kalalo, and Larson arrived in Togiak on March 15, 2018, and trained LRAs Andrea Logusak and Maya Kanulie in the afternoon of the same day. Year 2 survey administration occurred until March 20, 2018. Researchers traveled from Togiak to Twin Hills to conduct surveys on March 16, 2018. William Page was hired as an LRA again during Year 2 surveys. Some remaining surveys were left for Page to complete over the ensuing week. These surveys were completed and then sent on a plane to the research team in Togiak.

Key Respondent Interviews

While researchers were in the study communities they consulted with tribal governments, community councils, and LRAs to identify key respondents to interview. The purpose of the key respondent interviews was to provide additional context for the quantitative data and also to provide information for the community background section at the beginning of each chapter; harvest-over-time analysis; salmon stock health

4. Product names are given because they are established standards for the State of Alaska or for scientific completeness; they do not constitute product endorsement.

assessments; permit participation assessments; gear type use; and the community comments and concerns section at the end of each community survey results chapter. The number of key respondent interviews (KRIs) varied between the two study communities. KRIs were semi-structured and directed by a KRI protocol designed by ADF&G and BBNA researchers Jones and Larson (see Appendix B). In addition to gathering qualitative data through the KRI protocol, staff took notes during interviews to provide additional context to quantitative results for this report. Researchers analyzed KRI responses and interview notes in preparation for this report. Key respondents were informed that, to maintain anonymity, their names would not be included in this report. For the community of Togiak, a total of 10 KRIs were conducted with residents and four interviews were conducted with Twin Hills residents.

Participant Observation

Participant observation is an important method used by researchers to gain an in-depth understanding of the timing, location, methods, logistical considerations, and social organization that combine to create the subsistence salmon harvest patterns practiced by residents of Togiak and Twin Hills. For participant observation, researchers worked with community members to help harvest and process salmon. This involved learning how to set a gillnet in Togiak Bay, driftnetting in Togiak River, observing how harvests were being recorded on permits, and participating in cutting and processing salmon. Simultaneously, researchers also did biological sampling and took age, sex, and length information from subsistence harvested Chinook salmon during this time.

Participant observation for this project occurred in June and July of both study years and the field effort was led by Jones (Plate 1-1; Plate 1-2). In 2016, Larson and ADF&G researcher Theodore Krieg assisted with participant observation and biological sampling, and in 2017 Larson and Halas assisted with this portion of the project.

Plate 1-1.–Project staff assist residents with hanging Chinook salmon strips, Togiak, 2016.

Plate 1-2.–Observing community members drift for Chinook salmon near the community, Twin Hills, 2016.

Age, Sex, and Length

While in the communities for participant observation, researchers also collected age, sex, and length (ASL) data for Chinook salmon caught in the subsistence fishery. ASL analysis provided necessary information regarding age profiles and sex composition of the Chinook salmon stocks to detect potential factors affecting Chinook salmon reproduction and health. Chinook salmon age data collection consisted of removing five scales from the preferred area of each fish to determine age (International North Pacific Fisheries Commission 1963). Scales were mounted on numbered and labeled gum cards. Sex was determined by visually examining external morphology such as the development of the kype, roundness of the belly, and the presence or absence of an ovipositor. Length was measured to the nearest millimeter from mid-eye to tail fork. Sample date, gummed card number, fish number, sex, length, and notes were recorded on standardized Rite-in-the-Rain datasheets. After sampling was concluded, datasheets were transferred into a standardized Microsoft Excel workbook and submitted with the scales for dating. In 2016, ASL data for 153 Chinook salmon were recorded and, in 2017, ASL data was collected for 60 Chinook salmon.

Ichthyophonus

The disease *Ichthyophonus* is a systemic pathogen localizing in major organ systems, such as the heart, that is found in a wide range of marine and anadromous fish species. *Ichthyophonus* is transmitted to predator fish species such as Chinook salmon through the ingestion of infected prey, such as Pacific herring *Clupea pallasi*. Some species are more susceptible to *Ichthyophonus* infections and have sustained large mortality from the disease, while other species seem to be more resistant to exposure and the effects of the infection

(Meyers et al. 2019:46–47). Prior to this study, no documentation of *Ichthyophonus* had been found in Chinook salmon in Bristol Bay (though cases have been documented in other salmon species, such as coho salmon) (Jayde Ferguson, Fish Pathologist, ADF&G, Anchorage, personal communication); however, many Togiak and Twin Hills residents reported concerns about "white spots" and "pustules" that they have observed in the flesh of Chinook salmon harvested; a possible explanation for the lesions was that these Chinook salmon were infected with *Ichthyophonus*.

Project researchers also collected Chinook salmon hearts to test for the presence of the parasite *Ichthyophonus* while in the communities for participant observation. For the *Ichthyophonus* testing, the Chinook salmon heart was removed while being careful not to introduce contaminating organisms from the outside of the fish to the sample tissue. Each heart was placed into a separate sterile 2-ounce white-label plastic bag that was then refrigerated. Bagged tissue samples were labeled with permanent black marker and placed into a cooler or insulated container and sent to the ADF&G Fish Pathology Laboratory for processing within 72 hours of sampling. In 2016, there were 65 heart samples collected, and 61 samples were taken in 2017.

Data Analysis and Review

Survey Data Entry and Analysis

Surveys were coded for data entry in each community by research staff and reviewed by the project lead Jones for consistency. Responses were coded following standardized conventions used by the Division of Subsistence to facilitate data entry. Information Management staff within the Division of Subsistence set up database structures within Microsoft SQL Server at ADF&G in Anchorage to hold the survey data. The database structures included rules, constraints, and referential integrity to ensure that data were entered completely and accurately. Data entry screens were available on a secured internet site. Daily incremental backups of the database occurred, and transaction logs were backed up hourly. Full backups of the database occurred twice weekly. This ensured that no more than one hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered twice and each set compared in order to minimize data entry errors.

Once data were entered and confirmed, information was processed with the use of Statistical Package for the Social Sciences (SPSS) software, version 19. Initial processing included the performance of standardized logic checks of the data. Logic checks are often needed in complex data sets where rules, constraints, and referential integrity do not capture all of the possible inconsistencies that may appear. Harvest data collected as numbers of fish were converted to pounds usable weight using standard factors (see Appendix C for conversion factors).

ADF&G staff also used SPSS for analyzing the survey information. Analyses 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 on a case-by-case basis according to standardized practices, such as minimal value substitution or using an averaged response for similarly-characterized households. Typically, missing data are an uncommon, randomly-occurring phenomenon in household surveys conducted by the division. In unusual cases where a substantial amount of survey information was missing, the household survey was treated as a "non-response" and not included in community estimates. ADF&G researchers documented all adjustments. Due to one community in this study—Togiak—being a stratified sample, formulas for data analyses are given for both survey methods. Harvest estimates and responses to all questions were calculated based upon the application of weighted means (Cochran 1977).

Analysis for Census Survey Effort (Twin Hills)

These calculations are standard methods for extrapolating sampled data from a census survey effort. As an example, the formula for harvest expansion is:

$$H_i = \bar{h}_i S_i \tag{1}$$

$$\bar{h}_i = \frac{h_i}{n_i} \tag{2}$$

where:

$H_i =$ the total estimated harvest (numbers of resource or pounds) for the community *i*,

$\bar{h}_i =$ the mean harvest of returned surveys,

$h_i =$ the total harvest reported in returned surveys,

$n_i =$ the number of returned surveys, and

$S_i =$ the number of households in a community.

As an interim step, the standard deviation (SD) (or variance [V], which is the SD squared) was also calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean, was also calculated for Twin Hills. This was used to estimate the relative precision of the mean, or the likelihood that an unknown value would fall within a certain distance from the mean. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percentage. Once SE was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. The value of the constant is derived from the student's *t* distribution and varies slightly depending upon the size of the community. Though there are numerous ways to express the formula below, it contains the components of SD, V, and SE:

$$CL\%(\pm) = \frac{t_{\alpha/2} \times \frac{s}{\sqrt{n}} \times \sqrt{\frac{N-n}{N-1}}}{\bar{x}} \tag{3}$$

where:

$s =$ sample standard deviation,

$n =$ sampled households,

$N =$ total number of households in the community,

$t_{\alpha/2} =$ student's *t* statistic for alpha level (α=0.95) with n–1 degrees of freedom, and

$\bar{x} =$ sample mean.

Analysis for Stratified Sample Effort (Togiak)

Harvest estimates and responses to all questions were calculated based upon the application of weighted means (Cochran 1977). These calculations are standard methods for extrapolating sampled data. Since Togiak was sampled in multiple strata, each stratum is expanded separately. As an example, the formula for harvest expansion is:

$$H_i = \bar{h}_i S_i \tag{1}$$

$$\bar{h}_i = \frac{h_i}{n_i} \tag{2}$$

where:

$H_i =$ the total estimated harvest (numbers of resource or pounds) for the each stratum *i*,

$\bar{h}_i =$ the mean harvest per returned survey for each stratum *i*,

$h_i =$ the total harvest reported in returned surveys for each stratum *i*,

$n_i =$ the number of returned surveys, and

$S_i =$ the number of households in a community.

In order to obtain the total community estimate, the estimate for each stratum is added, as represented by:

$$X = \sum_{i=1}^{z} H_i \tag{3}$$

where:

$z =$ the total number of strata in the community, and

$X =$ the total community harvest estimate.

As an interim step, the standard deviation (SD) (or variance [V], which is the SD squared) was also calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean, was also calculated for Togiak. This was used to estimate the relative precision of the mean, or the likelihood that an unknown value would fall within a certain distance from the mean. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percentage. Once SE was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. The value of the constant is derived from student's *t* distribution and varies slightly depending upon the size of the community. Though there are numerous ways to express the formula below, it contains the components of SD, V, and SE:

$$C.L.\%(\pm) = \frac{t_{a/2}\sqrt{\frac{1}{N^2}\sum_{i=1}^{z} N_i(N_i - n_i)\frac{s^2}{n_i}}}{\bar{x}} \tag{4}$$

where:

$s =$ sample standard deviation,

$n =$ sampled households,

$N =$ total number of households in the community,

$z =$ the total number of strata in the community,

$t_{\alpha/2} =$ student's *t* statistic for alpha level (α=.95) with n–1 degrees of freedom, and

$\bar{x} =$ mean.

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

The corrected final data from the household survey will be added to the Division of Subsistence CSIS. This publicly-accessible database includes community-level study findings.

Comparisons of Harvest Estimates From Subsistence Permits and Surveys

Harvest amounts from household surveys were reconciled against data from subsistence permits that were issued and returned both before and during the time when post-season surveys were administered. For each community, a set of tables is provided that compares: 1) subsistence salmon permit participation based on surveys and returned permits, and 2) harvest estimates from before and after the time that post-season surveys occurred.

The first table in the set shows the number of permits issued to and returned from the community before the household surveys occurred, along with an initial permit return rate. During post-season household survey administration, permits could be returned to the researcher; this generally occurred if a household forgot to send its permit to ADF&G but located it when researchers visited. Additionally, any surveyed household that had not obtained a permit and reported harvests using subsistence nets on the post-season survey was issued a permit; the table notes the number of households that were issued a permit during the survey and an estimated number of community households that fished without a permit based on the household survey sample achievement of the census (Twin Hills) or stratified random (Togiak) sampling goal. A final tally of permits issued in each study community is provided with the revised permit return rate.

Participation following the conclusion of the household surveys is also summarized in the first table in the set. The total number of households is all households identified as eligible for the post-season survey combined with the number of households that obtained a permit and cited the study community as the place of residence but were not found to be eligible for the survey. The total contacts represents the sum of the number of households that completed a post-season survey, unsurveyed households that returned a permit in the mail, and the number of households that obtained and returned a permit citing the study community as the place of residence but not found to be eligible for the survey.

The second table in the set is an account of reported and estimated subsistence salmon harvests, by species, based on returned permits and post-season surveys. Harvests reported on permits returned to ADF&G before the surveys were administered are presented in the first row of this table. The second row is a community harvest estimate based on harvests reported by permit holders; note that without face-to-face post-season household surveys occurring, these are the harvest estimates that would have been published in the Alaska Subsistence Fisheries Database (ASFDB) and used to inform fisheries management decisions.

As mentioned previously, if more salmon were harvested by permit holders after the permit was returned, the permit was updated to increase the reported harvest. Additionally, permits could be returned by a household during the survey (the household obtained and completed the permit, but had not returned it). Post-season surveys also recorded harvests by households that fished without a permit and these harvests also contributed to the overall revised reported harvests. A community harvest estimate based on the revised harvest numbers from both the permits and post-season surveys is provided in the table to reflect the overall estimated salmon harvest (using only subsistence gear) for the study year. Lastly, since the Division of Subsistence did not survey every household in the study communities, the final row of the table shows the estimated harvest based on returned permits only, which includes permits returned by households that were not surveyed and permits obtained and returned by households that cited the study community as a place of residence but were not included in the post-season household survey list of permanent community households. Note that only harvests reported by surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated number of households in each study community that fished without a permit. These harvest estimates are published in the ASFDB and the Division of Subsistence's annual report summarizing subsistence and personal use fisheries; these values represent the permit system's estimation of each community's total harvest.

Population Estimates and Other Demographic Information

As noted above, a goal of the research was to collect demographic information for all year-round households in Twin Hills and a sample of households in Togiak. For this study, "year-round" was defined as being domiciled in the community when the surveys took place and for at least six months during the study years 2016 and 2017. Because not all households were interviewed, population estimates for each community were calculated by multiplying the average household size of interviewed households by the total number of year-round households, as identified by Division of Subsistence researchers in consultation with community officials and other knowledgeable respondents.

There may be several reasons for the differences among the population estimates for each community generated from the division's surveys and other demographic data developed by the 2010 federal census (U.S. Census Bureau 2011), the U.S. Census Bureau's American Community Survey (U.S. Census Bureau n.d.), and the Alaska Department of Labor and Workforce Development (ADLWD n.d.). Two possible reasons for the differences may relate to varying sample sizes and factors for expansion, and the time and season of data collection. Differing population estimates may also relate to the criteria agencies used to determine "full time" residency and eligibility in the particular study. Population estimates are discussed in the section "Population Estimates and Demographic Information: 2016 and 2017" in chapters 3 and 4.

Map Data Entry and Analysis

As discussed above, maps were generated based on data collected using an iPad. All data were entered on the iPad and map features were matched to the survey form to ensure that all harvest data were recorded accurately. Once all data were uploaded to the cloud server, ADF&G researchers created search and harvest location maps for each species in ArcGIS 10.5 using a standard template for reports. Maps show fishing and harvest locations for each study year for all salmon species, including locations depicted separately for spawning sockeye salmon. Maps were reviewed at a community review meeting to ensure accuracy.

Key Respondent Analysis

Following transcription of the recorded KRIs to complement notes from interviews where no audio recording occurred, analysis for the key respondent interviews was done using QSR NVivo version 10.0, a qualitative program that allowed the researcher to thematically group the interview content. This iterative process organized themes and sub-themes into categories of linked responses. This allowed for quick and effective retrieval of respondent narratives related to each theme. QSR NVivo version 10.0 software is able to produce a series of reports based on themes, creating an efficient tool from which to draw out quotations and ethnographic information. This analysis process was also applied to survey comment data, which were responses to open-ended questions and allowed respondents to add comments regarding subsistence salmon.

Participant Observation Analysis

For participant observation analysis, fieldwork notes, photographs, and recordings from the participant observation trips in 2016 and 2017 were organized and sorted by category. Data from these sources were categorized by themes and sub-themes pertaining to the qualitative information categories developed during KRI analysis.

Age, Sex, and Length Analysis

Chinook salmon age was estimated from the collected scales. Scales were mounted on gummed cards and impressions were made in cellulose acetate (Clutter and Whitesel 1956). Scale impressions were magnified using a 5 microfiche reader with a 15mm, 48x, F/2.8 lens. Cathy Tilly from ADF&G, a trained scale ager with more than 30 years of experience aging salmon, estimated total age by counting the number of annuli (ring-shaped appearances) in the freshwater and saltwater zones. Annulus was defined as a concentration and interruption in the growth pattern of the ridges (circuli) on the upper surface of the anterior field of the scale (Mosher 1969). Typically, annuli presented as three or more tightly spaced and broken circuli that appeared to cross over each other. Freshwater age was estimated for all scales that had less than 10 mm of

Table 1-6.–Community review meetings, study communities, 2016 and 2017.

		Attendance	
Community	Date	Community residents	Staff
Togiak	11/8/2018	6	Jones, Krieg, Larson
Twin Hills	11/9/2019	28	Jones, Krieg, Larson

regeneration around the scale focus. Saltwater age was estimated for all scales that had at least some portion of the outer edge of the scale visible.

The total age was reported in European Age Notation (Koo 1962); numerals preceding the decimal refer to the number of freshwater annuli (i.e., 1 winter = age-1.X) and numerals following the decimal refer to the number of marine annuli (i.e., 3 winters = age-X.3 or 4 winters = age-X.4). Total age from time of egg deposition, or brood year, is the sum of these two numbers plus one to account for incubation time. The Chinook ages were then entered in the 2016 and 2017 Microsoft Excel ASL data summary tables. The ASL data tables include the age, sex, and length statistics for each sampled Chinook salmon (Appendix D; Appendix E).

Ichthyophonus Testing Analysis

For *Ichthyophonus* analysis, each Chinook salmon heart was sub-sampled by dissecting it into small pieces and randomly selecting half of the tissue samples for either explant culture or histopathology. Explant tissue culture was performed in accordance with Meyers (2009) by incubating samples in MEM-5 with antibiotics at 14°C–15°C for 14 days and observing samples for *Ichthyophonus* growth under an inverted microscope. Histopathology was performed on the second half of the heart for samples that produced macrospores and exhibited vegetative hyphal growth during explant culture. These samples had been previously formalin fixed in the laboratory while they were sub-sampled for tissue explant culture and they were processed and sectioned by routine histologic procedures and mounted onto slides and stained with hematoxylin and eosin. Three stained slides, with two sections per slide, from each culture-positive sample were examined under compound microscopy by the pathologist to determine the infection intensity (mean number of parasites per section) and interpret the pathologic changes associated with the infection. These data were then used to generate and infection severity grade based on the system described by Marty et al. (1998).

Community Review Meetings

Jones, Larson, and Krieg presented preliminary survey findings and associated search area and harvest maps at a meeting in each community. The purpose of the community review meeting was to provide an opportunity for community members to comment on the findings of the study and for researchers to capture concerns that were not documented during the survey but community members felt were important.

The LRAs and tribal administrators were informed about the review meeting. These community members hung flyers and informed residents of the meeting. A total of six community members attended the Togiak meeting at the Togiak Tribal Hall and 28 community members attended the Twin Hills meeting at the Twin Hills School (Table 1-6).

Final Report Organization

This report summarizes the results of systematic household surveys, key respondent interviews, participant observation, and Chinook salmon biological data collection by staff from ADF&G and BBNA, as well as LRAs, and the report also summarizes resident feedback provided at the community review meetings. The findings are organized as follows:

- Chapter 2 provides an in-depth history of subsistence, commercial, and recreational regulations within the Togiak district, as well as an overview of the subsistence permit program.

- Chapter 3 presents Togiak community background and demographic information for the 2016 and 2017 study years. This chapter includes a discussion of historical and contemporary (2016 and 2017) harvests, an assessment of the uses of salmon by Togiak residents, and addresses the subsistence salmon permit system for Togiak.
- Chapter 4 provides community background for Twin Hills and demographic information for the 2016 and 2017 study years. This chapter includes a discussion of historical and contemporary (2016 and 2017) harvests, an assessment of the uses of salmon by Twin Hills residents, and addresses participation in the Twin Hills subsistence salmon permit system.
- Chapter 5 is a discussion of observations and trends of Togiak River salmon. Results from survey responses, key respondent interviews, participant observation, and biological testing and ASL data collection are addressed in this chapter.
- Chapter 6 provides a short, general overview of the findings for each study objective and recommendations for administering the subsistence permit program.

ADF&G provided a draft report to the Office of Subsistence Management and to BBNA for review and comment. After receipt of comments, the report was finalized. ADF&G distributed copies of the report to the Togiak and Twin Hills tribal councils, the local school, Togiak Refuge Cabin, and the Togiak Refuge office in Dillingham. Additionally, for each community, a short (four-page) summary of the study findings is available to the councils and community members; contact the the ADF&G Division of Subsistence for a summary.

2. REGULATIONS AND PERMIT SYSTEM

Theodore M. Krieg

Chapter Overview

Togiak and Twin Hills are located within the exterior boundary of the Togiak National Wildlife Refuge; waters within that area have been federally managed for subsistence fishing since October 1, 1999. Federal regulations provide a subsistence fishing priority for qualified residents of Togiak and Twin Hills. State subsistence fishing regulations do not provide a rural priority for subsistence fishing; instead, state subsistence fishing opportunities apply to all qualified state residents having at least one year of residency in Alaska. This chapter describes: 1) the origin and history of this dual management regime, 2) state and federal subsistence salmon fishing regulations in the study region, 3) early implementation of the subsistence salmon permit system and associated harvest estimates, and 4) commercial and sport salmon fishing activities and regulations and how those relate to subsistence fishing for the residents of Togiak and Twin Hills.

Fisheries Management

Dual Management Overview

The communities of Togiak and Twin Hills are proximate to the head of Togiak Bay near the mouth of the Togiak River. The lands adjacent to the communities are owned by Togiak Natives Limited and Twin Hills Native Corporation, which are Alaska Native village corporations in the regional area for the Bristol Bay Native Corporation. Beyond those corporation lands are the federal lands of the Togiak National Wildlife Refuge. The Alaska Native corporation-owned lands buffer the east–west coastline along Togiak Bay running from south of the mouth of the Togiak River northward to a point of land on the western shore of Togiak Bay. Along that stretch of the lower Togiak River, Alaska Native corporation lands extend up to 13 miles to the east and west of the river. Corporation-owned lands and waters are within the exterior boundary of the Togiak National Wildlife Refuge (see the map showing federal management boundaries in Federal Subsistence Management Program [n.d.:37]). Waters within and adjacent to the exterior boundary of the Togiak National Wildlife Refuge are federally managed for subsistence fishing.

Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA), which was passed by the U.S. Congress in 1980, mandates a subsistence hunting and fishing priority for qualified rural residents, which, for the Togiak Management Area, includes specifically the residents of the communities of Togiak, Twin Hills, and Manokotak. For other fishers who are not rural residents of the Togiak National Wildlife Refuge or adjacent area, State of Alaska fishing regulations apply for the federal public waters of the Togiak National Wildlife Refuge; fishing opportunities for nonrural Alaska residents are described later. Following is a brief history of the legislative, legal, and bureaucratic events that resulted in dual state and federal subsistence fisheries management in Alaska, and specifically how state and federal subsistence salmon fishing regulations apply to the communities of Togiak and Twin Hills.

The Alaska Native Claims Settlement Act (ANCSA) was passed by the U.S. Congress in 1971. The catalyst for the act was the need to determine land ownership so that the pipeline to carry oil from the North Slope to the Port of Valdez could be constructed. ANCSA also established the 12 land-holding Alaska Native regional corporations that were given title to land and monetary compensation for the settlement of land claims within the state of Alaska. Aboriginal hunting and fishing rights were extinguished by ANCSA, but during discussion before the act was passed there was an expression of Congressional intent that action by the Secretary of the Interior and the State of Alaska would provide protection for the subsistence needs of Alaska Natives.[1]

1. Federal Subsistence Management Program, "Overview and History of Subsistence Management in Alaska," https://www.doi.gov/subsistence/library/history (accessed February 2019).

In 1978, the state subsistence law was adopted by the state legislature and created a priority for subsistence uses over all other uses of fish and wildlife, but it did not define subsistence users.[2] Then, ANILCA was enacted by the U.S. Congress in 1980 and established refuges, parks, and preserves throughout the state of Alaska.[3] Title VIII of ANILCA defined a subsistence priority for all rural residents, which established that if restrictions were required to conserve a fish or wildlife resource, then rural Alaska residents in that area would have harvest priority over other uses of the resource. Title VIII offered that the State of Alaska could regulate subsistence on federally owned public lands (in addition to its own jurisdiction over state and private lands) if it would enact and implement a subsistence priority that defined subsistence uses and users in a way that was consistent with the federal law.[4] In 1982, the Alaska Joint Board of Fisheries and Game adopted regulations creating a rural subsistence priority that complied with Title VIII of ANILCA. By adopting the rural priority into state regulations, the State of Alaska had the authority to manage fish and wildlife for subsistence uses on both state and federal lands and waters.

In February 1985, the *Madison et al. v. ADF&G and Alaska Board of Fisheries* decision by the Alaska Supreme Court ruled that the Alaska boards of Fisheries and Game did not have the authority to limit the subsistence priority to rural residents, which rendered the state out of compliance with Title VIII of ANILCA.[5] In May 1986, the Alaska Legislature amended the subsistence statute to define subsistence uses of fish and game as customary and traditional uses by residents of rural areas. The amended statute established that subsistence was a priority over other uses. Additionally, the Alaska Board of Fisheries was given the authority to create personal use fisheries for nonrural residents of the state (ADF&G 1988:81).

In 1989, the Alaska Supreme Court decision in the case *McDowell et al. v. State of Alaska, ADF&G, Alaska Board of Fisheries, Alaska Board of Game, and Don W. Collinsworth* determined that, under the state constitution, all Alaska residents have equal access to the state's fish and wildlife resources. Therefore, the rural subsistence priority in state law, adopted to comply with ANILCA, was unconstitutional, placing the state out of compliance with Title VIII of ANILCA. State regulations could no longer be used to provide a rural preference for subsistence uses on federal public lands in Alaska.[6]

On July 1, 1990, because the State of Alaska was not in compliance with ANILCA, the federal government assumed management of subsistence trapping, hunting, and limited fishing on federal public lands and waters.[7] In 1992, the federal government adopted final subsistence management regulations for federal public lands in Alaska. In 1993, federal subsistence regional advisory councils, as required by ANILCA, were created and the Federal Subsistence Board (FSB) process was established. The FSB—the federal decision-making body that is the counterpart to the Alaska boards of Fisheries and Game—determines subsistence fishing and hunting regulations on federal public waters and lands. The federal subsistence regional advisory councils, also known as RACs, provide an opportunity for Alaskans to participate in the

2. Federal Subsistence Management Program, "Overview and History of Subsistence Management in Alaska," https://www.doi.gov/subsistence/library/history (accessed February 2019).
3. U.S. Fish and Wildlife Service, "Digest of Federal Resource Laws and Interest to the U.S. Fish and Wildlife Service: Alaska National Interest Lands Conservation Act of 1980," https://www.fws.gov/laws/lawsdigest/alaskcn.html (accessed February 2019).
4. Alaska Federation of Natives, "Subsistence Chronology: A Short History of Subsistence Policy in Alaska Since Statehood (revised edition, 1998)." Alaska Native Curriculum and Teacher Development Project, http://www.alaskool.org/projects/ancsa/subsistence_chron/subchron.htm (accessed February 2019).
5. National Park Service, "Alaska Subsistence, A National Park Service Management History—Chapter 6: Managing Alaska's Subsistence Program, 1985–1989." Last modified March 14, 2003. https://www.nps.gov/parkhistory/online_books/norris1/chap6.htm (accessed February 2019).
6. Alaska Federation of Natives, "Subsistence Chronology: A Short History of Subsistence Policy in Alaska Since Statehood (revised edition, 1998)." Alaska Native Curriculum and Teacher Development Project, http://www.alaskool.org/projects/ancsa/subsistence_chron/subchron.htm (accessed February 2019).
7. Federal Subsistence Management Program, "Overview and History of Subsistence Management in Alaska," https://www.doi.gov/subsistence/library/history (accessed February 2019).

management of subsistence resources by giving resource users the opportunity to comment and offer input about subsistence issues during council meetings (Federal Subsistence Management Program n.d.:4).

In 1995, "the Ninth Circuit Court of Appeals ruled that the FSB should expand its management of subsistence fisheries to include all navigable waters in which the United States holds reserve water rights, such as waters on or next to wildlife refuges, national parks, and national forests."[8] After 1995, several Congressional moratoriums provided opportunities for the state to comply with Title VIII. After several failed attempts by the state to enact legislation to comply with Title VIII, the federal government started the process of assuming management of subsistence fisheries in waters within federal public lands. The booklet summarizing federal regulations for harvesting fish notes:

> On October 1, 1999, the Secretaries of the Interior and Agriculture published regulations (36 CFR 242 and 50 CFR 100) to provide for Federal management of subsistence fisheries on Alaska rivers and lakes and limited marine waters within and adjacent to Federal public lands. This was directed by the 9th Circuit Court in the Katie John case, and meets the requirements of the rural subsistence priority in Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA). … The Alaska Department of Fish & Game regulations continue to apply statewide to all commercial fisheries, sport fisheries, personal use fisheries, and subsistence fisheries, unless otherwise superseded by Federal regulations. (Federal Subsistence Management Program n.d.:3)

The genesis of federal subsistence fisheries regulations in 1999 was State of Alaska regulations. The original 1999 federal fisheries regulations duplicated state subsistence fishing regulations with the rural priority in Title VIII of ANILCA applied to federal public lands and waters. The initial goal was to keep the regulations on federal public waters consistent with state regulations, as much as possible, with the understanding that through the FSB federal regulations could be changed.[9]

All navigable and non-navigable waters within and adjacent to the exterior boundaries of the Togiak National Wildlife Refuge are federal public waters (see the map in Federal Subsistence Management Program [n.d.:37]). Those waters are subject to federal subsistence fishing regulations where in times of shortage of a resource the subsistence priority afforded by Title VIII of ANILCA could be initiated and fishing by nonrural residents and nonresidents could be restricted or closed.

The regulations also indicate that where state and federal management of subsistence fisheries occur in the same area, rural residents cannot combine the harvest amounts from federal and state regulations. Federal regulation harvest amounts only apply to harvests on federal public waters unless the regulations specifically authorize combining federal and state harvest amounts (Federal Subsistence Management Program n.d.:3).

Federal fishing regulations apply to qualified rural residents of communities having a positive customary and traditional use determination (see the upcoming section "Federal Subsistence Board"). State fishing regulations apply to nonqualified rural residents, nonrural residents, and nonresidents on federal public lands and waters unless specifically closed to them.

Salmon populations returning to Togiak Bay have been relatively healthy: restrictions to limit subsistence harvests are not in effect for salmon for those waters. In the general provisions section of the summarized federal subsistence fishing regulations, the user is instructed to check to see if state or federal subsistence fishing permits are required in the area to be fished (Federal Subsistence Management Program n.d.:16). Additionally, any reporting requirements and harvest limits must be followed. If a state subsistence fishing

8. Federal Subsistence Management Program, "Overview and History of Subsistence Management in Alaska," https://www.doi.gov/subsistence/library/history (accessed February 2019).
9. National Park Service, "Alaska Subsistence, A National Park Service Management History—Chapter 7: The Federal Assumption Process, 1989–1993." Last modified March 14, 2003. https://www.nps.gov/parkhistory/online_books/norris1/chap7a.htm (accessed February 2019).

permit is acquired and federal regulations are less restrictive or conflict with those associated with the state permit, qualified users are instructed to follow the federal regulations.

Alaska Board of Fisheries

The Alaska Board of Fisheries (BOF) is given authority by the Alaska Legislature under Alaska Statute (AS) 16.05.221 "for the purposes of the conservation and development of the fishery resources of the state." The fisheries are subsistence, sport, guided sport, personal use, and commercial. AS 16.05.251 describes a wide range of management considerations for regulations that the BOF may adopt, including seasons, bag limits, and methods and means for taking fish. The BOF comprises seven members appointed by the governor and confirmed by a joint session of the Alaska Legislature for staggered three-year terms. The members are selected based on knowledge of fisheries and ability to provide informed discussion and regulation decisions for the board. Additionally, "The appointed members shall be residents of the state and shall be appointed without regard to political affiliation or geographical location of residence" (AS 16.05.221). Traditionally the BOF has almost always had one member appointed from the Bristol Bay Area.

One aspect of the decisions the BOF is tasked with includes customary and traditional use determinations for fish stocks. To determine if a fish stock is eligible to receive subsistence preference over commercial and recreational uses, regulation 5 AAC 99.010 requires the BOF to use eight criteria in determining a positive or negative customary and traditional (C&T) use finding. The BOF considers changes to regulations by region of the state every three years. All finfish regulations for the Bristol Bay Area are considered on this three-year cycle. A BOF meeting for this purpose was held in Dillingham during November 28–December 3, 2018. The changes adopted at this meeting became effective starting in May 2019. The Bristol Bay meeting prior to that was held from December 2–8, 2015, in Anchorage, and the regulations adopted at that meeting went into effect in July 2016. Proposals for BOF meetings are accepted from December 1–April 10 in the year before the scheduled BOF meeting. After the proposals have been submitted, ADF&G reviews them and compiles biological and socio-economic information that is relevant to each proposal. Based on an evaluation of that information, ADF&G presents a department determination that is neutral on the proposed regulation change (often because the proposal is allocative) or recommends that the board either adopt or reject the proposed change. Public comments can be submitted to the ADF&G Boards Support Section up to two weeks prior to the start of the board meeting. Those comments are included with the meeting packet materials prepared for the BOF meeting. A final chance to submit written comments is to do so in person at the meeting or via fax, and those are provided to board members periodically throughout the meeting.

ADF&G Fish and Game advisory committees are an important component of the BOF process and are authorized by AS 16.05.260. Advisory committees are local groups that meet to discuss fish and wildlife issues, provide a local forum for those issues, and make recommendations to the Alaska boards of Fisheries and Game. Their purpose, as established by the Alaska Joint Board of Fisheries and Game, includes:

- Developing regulatory proposals,
- Evaluating regulatory proposals and making recommendations to the appropriate board,
- Providing a local forum for fish and wildlife conservation and use, including matters relating to habitat, and
- Consulting with individuals, organizations, and agencies.[10]

The Togiak Fish and Game Advisory Committee addresses the west side of Bristol Bay in Game Management Unit (GMU) 17A and has seven designated seats—three for Togiak, three for Manokotak, and one for Twin Hills; additionally, there are eight undesignated seats. Committee members meet in person or by teleconference one to two times per year, as the state budget allows.[11] Togiak and Manokotak each also have

10. Alaska Department of Fish and Game, "Advisory Committees: About Advisory Committees," http://www.adfg.alaska.gov/index.cfm?adfg=process.advisory (accessed February 2019).
11. Alaska Department of Fish and Game, "Togiak Advisory Committee," http://www.adfg.alaska.gov/index.cfm?adfg=process.acinfo&ac=togiak (accessed February 2019).

one seat on the Nushagak Fish and Game Advisory Committee. With those two seats addressing areas west of the Nushagak River and Bay, all of the federally recognized villages on the west side of Bristol Bay (in GMUs 17A, 17B, and 17C) are represented on the Nushagak Fish and Game Advisory Committee except for Twin Hills and Ekuk.[12] At the BOF meetings, a representative of each advisory committee is given 10–15 minutes of time during public testimony to provide the BOF with additional information concerning the proposals.

Federal Subsistence Board

The Federal Subsistence Board (FSB) process was established in 1993 by the United States Secretary of the Interior and Secretary of Agriculture (secretaries). The purpose and duties of the FSB are published in the Code of Federal Regulations (CFRs), which are available online[13] (36 CFR §242.10 and 50 CFR §100.10). The FSB was developed for the purpose of establishing "responsibility for administering the subsistence taking and uses of fish and wildlife on public lands." Another important responsibility of the FSB is directing the customary and traditional use determination process. For this process, the FSB determines those communities in which fish stocks and wildlife populations have been customarily and traditionally used for subsistence. The members of the FSB include: 1) the chair, a member of the public appointed by the secretaries; 2) two public members who have experience with subsistence uses in rural Alaska, also appointed by the secretaries; 3) the Alaska Regional Director, U.S. Fish and Wildlife Service; 4) the Alaska Regional Director, National Park Service; 5) the Alaska Regional Forester, U.S. Forest Service; 6) the Alaska State Director, Bureau of Land Management; and 7) the Alaska Regional Director, Bureau of Indian Affairs. The FSB is required to meet at least two times per year to address regulations for the management of subsistence taking and uses of fish and wildlife on public federal lands.

RACs were also established in 1993, in 10 regions, to serve as a local forum for the collection of opinions and recommendations on matters related to subsistence resources (see 36 CFR §242.11 and 50 CFR §100.10). To become a RAC member, one must be a resident of the region in which he or she is appointed and must be knowledgeable about the region and subsistence uses of the public lands therein. The FSB accepts nominations and makes recommendations to the secretaries for membership on the RACs. Selected RAC members serve three-year terms and may be reappointed.

Among other duties, the RAC members are tasked to "review, evaluate, and make recommendations to the Board on proposals for regulations, policies, management plans, and other matters relating to the subsistence take of fish and wildlife under the regulations in this part within the region." According to federal regulations, the FSB "shall consider the reports and recommendations of the Regional Councils concerning the taking of fish and wildlife on public lands within their respective regions for subsistence uses." However, the FSB is the final administrative authority on the promulgation of federal regulations relating to the subsistence taking of fish and wildlife.

Customary Trade

Alaska state law does recognize customary trade, or "the limited noncommercial exchange, for minimal amounts of cash, as restricted by the appropriate board, of fish or game resources" (AS 16.05.940(8)). However, by state regulation, it is unlawful to sell most subsistence-caught fish—state subsistence fishing regulations state: "Unless otherwise specified in this chapter, it is unlawful to buy or sell subsistence-taken fish, their parts, or their eggs, except that it is lawful to buy or sell a handicraft made out of the skin or nonedible by-products of fish taken for personal or family consumption" (5 AAC 01.010(d)); note that the

12. Alaska Department of Fish and Game, "Nushagak Advisory Committee," http://www.adfg.alaska.gov/index.cfm?adfg=process.acinfo&ac=nushagak (accessed February 2019).
13. See "Parks, Forests, and Public Property," *Code of Federal Regulations*, title 36 (2002):239–241 (https://www.govinfo.gov/content/pkg/CFR-2018-title36-vol2/pdf/CFR-2018-title36-vol2-sec242-10.pdf) and "Wildlife and Fisheries," *Code of Federal Regulations*, title 50 (2002): 698–701 (https://www.govinfo.gov/content/pkg/CFR-2018-title50-vol9/pdf/CFR-2018-title50-vol9-sec100-10.pdf); search for other cited Codes of Federal Regulations online at: https://gov.ecfr.io/cgi-bin/ECFR.

only location for which customary trade of subsistence-caught salmon is "otherwise specified" as allowed is the Norton Sound-Port Clarence Area (see 5 AAC 01.188). Also, by state regulation, "Persons licensed under AS 43.75.011 to engage in a fisheries business may not receive for commercial purposes or barter or solicit to barter for subsistence-taken salmon or their parts" (5 AAC 01.010(j)).

Federal regulations define customary trade as: "the traditional exchange of cash for subsistence-harvested fish or wildlife resources, not otherwise prohibited by Federal law or regulation, to support personal and family needs, and does not include trade which constitutes a significant commercial enterprise" (Federal Subsistence Management Program n.d.:91). Only qualified rural residents can receive cash in trade for subsistence-harvested salmon. Customary trade regulations apply differently to the recipient of the salmon—if the recipient of the salmon is a qualified rural resident then the recipient could involve the salmon in another customary trade transaction for cash, but nonrural residents must consume the salmon. Additionally, the FSB has stated that federal regulations allow the customary trade of legally caught subsistence fish to take place on non-federal lands, but warns that the State of Alaska may interpret the law differently and could choose to prosecute individuals if the transaction takes place on state or private lands (Federal Subsistence Management Program n.d.:19).

State food safety laws require that any food to be sold that has been processed must meet certain standards, and federal customary trade regulations do not preempt those state laws. Processing includes anything that changes the physical condition of the fish meat from its freshly caught, just-out-of-the-water state (including freezing, cooking, smoking, drying, salting, etc.) (Krieg et al. 2007:3). The combination of the state food safety regulation and the federal customary trade regulation means that federally qualified rural residents can only exchange fresh salmon caught in federal public waters in a customary trade transaction.

Specific federal regulations concerning limits on the amount of cash that can be received in a customary trade transaction involving salmon for the Bristol Bay Area federal management region were proposed by the Bristol Bay RAC and adopted by the FSB in 2003 (Krieg et al. 2007:3). Bristol Bay Area federal subsistence fishing special provisions concerning customary trade state:

> The total cash value per household of salmon taken within Federal jurisdiction and exchanged in customary trade to rural residents may not exceed $500 annually. The total cash value per household of salmon exchanged between rural residents and nonrural individuals may not exceed $400 annually and must be recorded on a customary trade record-keeping form, available from the Bristol Bay Area in-season manager or from National Park Service, Lake Clark National Park and Preserve office at Port Alsworth, Alaska (Phone: 907-781-2218). (Federal Subsistence Management Program n.d.:40)

Regulations

These following sections summarize: 1) state subsistence salmon fishing regulations for the Bristol Bay Area's Togiak District, 2) federal subsistence salmon regulations that apply to the residents of Togiak and Twin Hills, and 3) select differences between the two sets of subsistence salmon fishing regulations. For reference, Plate 2-1, which appears at the end of this chapter, provides excerpts of state regulations (pages 1–3) as they apply to subsistence fishing for salmon in Bristol Bay and federal subsistence salmon fishing regulations (pages 4–8) taken from the Code of Federal Regulations published online (see 50 CFR §100.27).

State Subsistence Fishing Regulations

The Alaska BOF found that salmon of the Bristol Bay Area support customary and traditional (subsistence) uses (5 AAC 01.336). In 1993, the board established a range of 157,000–172,171 salmon as the amount reasonably necessary for subsistence uses (ANS[14]). For all of Bristol Bay, subsistence permits are required

14. Under AS 16.05.258(a), the board is charged with identifying fish stocks, or portions of stocks, that "are customarily and traditionally taken or used for subsistence" (known as a C&T use finding). If a portion of these stocks having a positive C&T use finding can be harvested consistent with sustained yield principles, the board "shall determine

and there is a limit of one permit per household. The permit must be returned with a record of harvest (5 AAC 01.015). If salmon are retained by a commercial fisher from commercial catches, a subsistence fishing permit is not required (5 AAC 01.015). However, the Bristol Bay Subsistence Salmon Fishery Permit has a yes or no question asking if the household fished commercially and a box where salmon that are retained from a commercial catch can be recorded (see Appendix F for an example of the permit). There is no requirement for recording those salmon on the subsistence fishing permit. However, commercial fishers are required to report the number of king and coho salmon retained for their own use on an ADF&G commercial fish ticket at the time of landing (5 AAC 06.377(b)).

There is no seasonal or annual limit for salmon harvests in the Togiak subsistence salmon fishery. Allowable subsistence gear includes drift and set gillnets in waters open to commercial fishing; set gillnets only are allowed in other waters, with certain exceptions. Spears, and, since 2007, drift gear may be used in the Togiak River. Subsistence drift gillnetting (with a 10-fathom net) may also occur between the mouth of the Togiak River and upstream approximately two miles to a specific line across the river designated by latitude and longitude locations (5 AAC 01.320). Except as follows, fishing is open at any time—in areas open to commercial fishing: from May 1–31 and October 1–31, from 9:00 a.m. Monday to 9:00 a.m. Friday; from June 1–September 30, during open commercial fishing periods. When the commercial district is closed to commercial fishing, subsistence fishing is also closed (5 AAC 01.310).

Federal Subsistence Fishing Regulations

The booklet summarizing federal regulations for harvesting fish notes that there is a positive C&T use determination in the Togiak District for salmon and other freshwater fish for "residents of the Togiak District and [residents of the] freshwater drainages flowing into the district, and the community of Manokotak" (Federal Subsistence Management Program n.d.:39). There is no harvest limit, and a state Bristol Bay subsistence salmon fishery permit is required for harvesting salmon.

In general in federal public waters, the allowable maximum length of gillnets to catch salmon is 50 fathoms, a subsistence net cannot block more than one-half the width of a stream, and harvesters may not fish for subsistence within 300 feet of any dam, fish ladder, weir, culvert, or other artificial obstruction (Federal Subsistence Management Program n.d.:17–18). Additionally, in the Bristol Bay Area, "you may not take fish from waters within 300 feet of a stream mouth used by salmon," and "within Federal public waters of any district, you may take salmon … only by gillnets. Outside district boundaries you may take salmon only by set gillnet [maximum length allowed is 25 fathoms, except for in the Egegik River where the maximum length is 10 fathoms]" (Federal Subsistence Management Program n.d.:40–41). There are additional Bristol Bay Area regulations that apply to the use of a set gillnet: 1) setnets must be at least 300 feet apart, 2) the subsistence permit holder must stake and buoy each setnet, and 3) the subsistence permit number and the first initial and last name of the permit holder must either be identified on the buoy or keg attached to a setnet, or written on a sign that is placed at (or near) the setnet (Federal Subsistence Management Program n.d.:41). Also, outside district boundaries, harvesters may take salmon by spear in the Togiak River, excluding its tributaries, and "in the first two miles of the Togiak River upstream from its mouth to the ADF&G regulatory markers[15], you may take salmon using a drift gillnet no longer than 10 fathoms" (Federal Subsistence Management Program n.d.:40).

The Nexus of Dual Management and Fishing Regulations

Interpreting state and federal subsistence regulations can be complicated. An added complexity to interpreting regulations is the dual management of subsistence resources, and the differences that exist in some cases between state and federal regulations. Dual management can lead to confusion—for example,

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the amount of the harvestable portion that is reasonably necessary for subsistence uses," which is known as the ANS (AS 16.05.258(b)).

15. Currently no ADF&G regulatory markers are in place at the mouth of the Togiak River (Tim Sands, Fishery Biologist, ADF&G, Dillingham, April 2019, personal communication).

specific to Togiak, federal regulations appear to include provisions that do not apply to federal public waters. In the booklet summarizing federal subsistence fishing regulations, the term "district" is used, as is the term "Togiak District" (Federal Subsistence Management Program n.d.:39). On page 91 of the same federal regulations summary booklet, under the heading "Definitions," the terms "area, district, subdistrict and section means one of the geographical areas defined in the codified ADF&G regulations found in Title 5 of the Alaska Administrative Code." The description of the Togiak District defined in Title 5 is the commercial fishing district in the waters of Togiak Bay; however, the waters of Togiak Bay are outside the boundary of the federal public lands and waters.

According to 5 AAC 01.305, "Description of districts" for the Bristol Bay Area, the districts and sections for subsistence salmon fishing in that area are described in 5 AAC 06.200. The definition of "district" that therefore applies to federally qualified subsistence users is the geographical area defined in 5 AAC 06.200 as: "(e) Togiak District: all waters north of a line from Cape Newenham … to Cape Pierce … to Right Hand Point … to Kulukak Point …." Generally, this is the greater Togiak Bay area. Note that requirements of Title 5, Chapter 06, apply to commercial fishing in the Bristol Bay Area (see 5 AAC 06.001), and that the Togiak River is outside of the Togiak District described in 5 AAC 06.200, but the river is within the exterior boundaries of the Togiak National Wildlife Refuge. The Togiak District waters of Togiak Bay are not federal public waters, but appear to be included in the federal fishing regulations since this area is presented in state regulations as a place where (during commercial fishing openers) subsistence fishing is allowed.

Another issue facing subsistence fishers is understanding the legal gear types allowed in both the state and federal subsistence salmon fisheries; for example, both state and federal set gillnet and rod and reel regulations are highlighted to illustrate what subsistence fishers have to understand to deploy legal subsistence gear depending on subsistence fishery and area fished.

The maximum gillnet length allowed is 50 fathoms under state and federal regulations to subsistence fish for salmon (see 5 AAC 01.010(c) and Federal Subsistence Management Program [n.d.:17]). Specifically, within each of the districts of the Bristol Bay Area, only drift and set gillnets are allowed under state regulation 5 AAC 01.320(a). Federal regulations do not apply to the Togiak District; that is, the commercial fishing district in Togiak Bay outside of the mouth of the Togiak River.

Outside Togiak District boundaries, in federal public waters of the Togiak River, both state and federal regulations allow for subsistence salmon harvests by set gillnet (see 5 AAC 01.320(b) and Federal Subsistence Management Program [n.d.:40]). State regulations do not regulate a net length less than 50 fathoms, but federal regulations provide additional gillnet provisions.

The federal regulations state the maximum length of set gillnets that can be used in the Bristol Bay Area to take salmon is 25 fathoms (Federal Subsistence Management Program n.d.:41). It appears that in this case concerning allowable set gillnet length, 50 fathoms is allowed in the Togiak River under state regulations and under federal regulations the maximum length of a set gillnet is only 25 fathoms; therefore, the state regulations that apply to the Togiak drainages are less restrictive than the federal regulations.

Regulations surrounding the use of rod and reel as a subsistence gear type are complex due to dual management. Under the BOF's subsistence fishing regulations, a rod and reel is not a recognized legal subsistence fishing gear type: "Subsistence fishing by the use of a hook and line attached to a rod or pole is prohibited, unless otherwise provided in this chapter" (5 AAC 01.010(g)); note that there are no other salmon fishing regulations provided in the Bristol Bay Area chapter that provides for an exception to the statewide provision in 5 AAC 01.010(g). Alaskans can use a rod and reel to subsistence fish when fishing through the ice (5 AAC 01.320(l)). Conversely, rod and reel is included as a subsistence gear type for salmon under federal regulations. However, the federal regulations state that gear types may be restricted in specific fisheries management areas (Federal Subsistence Management Program n.d.:17). According to federal regulations listed on page 40 of the federal fisheries regulations booklet, salmon may only be taken by gillnets and spear in the Togiak River; therefore, rod and reel is not a legal subsistence gear type for salmon in the Togiak River.

Development of the Subsistence Permit System and Early Harvest Estimates

With the advent of statehood (1959), subsistence salmon fishing permits in Bristol Bay, by state regulation, were required in the Naknek River and the area within 12 miles of commercial salmon fishing districts' boundaries, with the exception of the Togiak District where a permit was not required (Nelson 1970:2). Although the permits had been required since statehood, it was not until 1963 that ADF&G started collecting subsistence salmon harvest data. At the time commercial fisheries managers knew that subsistence salmon fishers were not aware that they were required to obtain a permit. The initial effort to collect subsistence salmon harvest data was focused on the Naknek-Kvichak and Nushagak drainages and implemented the permit system in which fishers were required to record their subsistence salmon harvests and through village surveys by department personnel. Commercial fisheries managers at the time were concerned that in some cases subsistence harvests in-river might be preventing spawning escapement needs from being met. Subsistence harvest data would also provide an estimate of the number of salmon needed for subsistence uses. Commercial fisheries managers could then add the amount needed for subsistence to their escapement goals upstream from the commercial districts (Nelson 1970:1–3).

Table 2-1 presents subsistence salmon harvest estimates for the Togiak District for 1965–1982 based on subsistence salmon permit returns collected by the Division of Commercial Fisheries. Data are not available for all of these early years, and this section compiles information from previous ADF&G reports that describes the evolution of the department's effort to issue and collect subsistence salmon permits.

In 1965, subsistence fishing regulations were changed to require subsistence salmon permits in all areas of Bristol Bay (Nelson 1970:2). The ADF&G Annual Management Report (AMR) for the Bristol Bay Area for

Table 2-1.–Estimated historical subsistence salmon harvests, Togiak District, 1965–1982.

	Permits		Estimated salmon harvest					
Year	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	**Total**
1965	36	14	100	4,600	2,200	1,600	100	**8,600**
1966	NA	NA	NA	NA	NA	NA	NA	**NA**
1967	NA	NA	NA	NA	NA	NA	NA	**NA**
1968	NA	NA	NA	NA	NA	NA	NA	**NA**
1969[a]	NA	2	19	133	8	60	17	**237**
1970	NA	NA	NA	NA	NA	NA	NA	**NA**
1971	NA	NA	NA	NA	NA	NA	NA	**NA**
1972	NA	NA	NA	NA	NA	NA	NA	**NA**
1973	NA	NA	NA	NA	NA	NA	NA	**NA**
1974	68	NA	1,200	7,400	1,800	2,000	500	**12,900**
1975	41	NA	800	4,600	2,800	1,600	0	**9,800**
1976	30	NA	500	2,800	500	900	100	**4,800**
1977	41	NA	400	2,100	1,100	800	0	**4,400**
1978	29	NA	300	900	500	700	300	**2,700**
1979	25	5	200	800	700	300	0	**2,000**
1980	46	NA	900	3,600	1,200	300	300	**6,300**
1981	52	NA	400	1,900	2,200	800	100	**5,400**
1982	50	NA	400	1,900	1,300	300	400	**4,300**

Sources ADF&G (1982a:52) for 1979; Nelson (1970:17) for 1965 and 1969; and Nelson (1984:161) for 1974–1978 and 1980–1982.

Note "NA" indicates that no data are available.

a. The 1969 salmon harvests are reported, while all other years are estimated salmon harvests for the Togiak District.

1965 does not mention subsistence catches in relation to determining total run and escapement (ADF&G 1966). The AMRs for the Bristol Bay Area for 1966 and 1967 contain some catch data regarding subsistence fisheries for watersheds in the Bristol Bay Area, but not for the Togiak District (ADF&G 1968; Middleton et al. 1967). There continued to be no specific subsistence catch data for Togiak District for 1968 based on returned fishing permits; however, a footnote to an appendix table stated, "preliminary data indicates that the Togiak district catches fall in the range of 10-20,000 salmon" (ADF&G 1969:93).

In 1970, subsistence catch data from 1963–1969 were consolidated and published into a single ADF&G report (Data Report No. 19) (Nelson 1970). For the Togiak District subsistence fishery, Michael L. Nelson, an ADF&G fishery biologist stationed in Dillingham, recorded that the local inhabitants from Togiak and Twin Hills were the subsistence salmon harvesters in the Togiak District. Nelson (1970:17) wrote, "Due to the remoteness of [the] Togiak drainage all efforts to obtain subsistence catches have been made through the village postmasters. Participation in the permit system has been poor, due primarily to a lack of understanding of subsistence regulations."

Despite the permit participation issues, Nelson (1970:17) reported that in 1965, there were 36 permits issued in the Togiak area and 14 permits were returned to the department. From those returns it was estimated that the total catch among all permit holders was 8,600 salmon. Not enough information was available to determine the number of subsistence fishing "family units" in the Togiak District to accurately expand the harvest for the communities of Togiak and Twin Hills to account for households that did not obtain permits.

In 1969, for the Togiak District, two permits were returned and recorded catches of 133 sockeye salmon ("reds"), 19 Chinook ("king") salmon, 60 chum salmon, 17 pink salmon, and 8 coho salmon for a total of 237 salmon (Nelson 1970:17). Tables in Nelson (1970) do not include any additional subsistence harvest data for the Togiak District for 1963–1969; however, the previously mentioned table footnote from the 1968 AMR repeats at the end of a table summarizing Naknek-Kvichak and Nushagak district subsistence salmon catches for 1963–1969: "preliminary data indicates that the Togiak district catches fall in the range of 10-20,000 salmon" (Nelson 1970:22).

The Togiak District 1963–1969 subsistence fishery section concludes with the following paragraph:

> An extensive and thorough subsistence survey is tentatively planned for the fall of 1970. A house to house survey will be conducted and the subsistence reporting requirements will be explained to all fishermen. In addition to tabulating the subsistence harvest the surveys will determine the number of dogs and snowmachines present and the number of family units. (Nelson 1970:18)

In the concluding "Discussion" to Data Report No. 19, upgrading and better implementation of the subsistence salmon permit system and conducting more consistent and timely community surveys were planned for the future. "With an adequate monitoring program it should be possible to prevent destruction of races of fish, as has been the case on several creek spawning red salmon stocks on Aleknagik Lake of the Wood River system" (Nelson 1970:18).

The 1974 fishing season was the first year that data were recorded for a subsistence salmon catch in Togiak and published in a Bristol Bay Area AMR (ADF&G 1976:76). In Data Report No. 47, which discussed Bristol Bay Area subsistence fishing from 1963–1973, the "Discussion" section states: "The Togiak district still remains to be a problem area and, although contacts with the postmistress and license vendor in the village have been made for issuing permits, no reliable data has been received" (Schroeder 1974:17).

The first AMR to include a table[16] that showed the number of permits issued for the Bristol Bay Area by district and place of residence is for 1976. In the Togiak District, Togiak system, which included the residents of Togiak and Twin Hills, there were 30 permits issued but the number of permits returned was not reported.

16. See Table 28 titled, "Subsistence catch of salmon by species, district and village area, Bristol Bay, 1976" in ADF&G (1979:75).

The Division of Subsistence was established by the Alaska Legislature in 1978 with its passage of Alaska's first subsistence statute. Since that time, the division has scientifically investigated and documented the customary and traditional uses of wild subsistence resources, including subsistence harvest numbers.[17] In the 1979 season, participation in the subsistence salmon permit system in Bristol Bay was generally good "with the exception of the Togiak district where the number of permits issued and the reported catches are not indicative of actual subsistence use patterns in that area. Although the resident population of the Togiak area is over 450, only 25 permits were issued there in 1979 and of these, only five permits have been returned" (ADF&G 1982a:52).

In 1980, Steven Behnke became a staff member for the Division of Subsistence in the Dillingham ADF&G office. In 1981, Molly Chythlook and John Wright started working in the Dillingham office and Judith Morris began working for the Division of Subsistence in the King Salmon ADF&G office. In 1981, with a full Division of Subsistence staff working in the Bristol Bay region, the division assumed responsibility to hire permit vendors in every community, issue subsistence salmon permits, and follow up to remind permit holders to return their subsistence salmon permit harvest numbers every year (James Fall, December 13, 2018 and Molly Chythlook, December 14, 2018: personal communication). Chythlook's local knowledge and family connections to the Togiak area were especially valuable in the effort to educate and encourage participation by the community of Togiak in the subsistence salmon permit program.

According to Halas and Neufeld (2018:4) in a report presented to the BOF, in 1983 the Division of Subsistence started performing data entry and analysis for the Bristol Bay subsistence salmon harvest permit program. Since 1983, the Division of Subsistence has compiled annual subsistence salmon harvest numbers for the Bristol Bay Area., In addition to Division of Subsistence reports and publications, the annual subsistence salmon harvest estimates are published every year in Bristol Bay Area AMRs produced by the ADF&G Division of Commercial Fisheries. Reports and publications by the Division of Subsistence for the Bristol Bay Area do not present subsistence salmon harvest data recorded prior to 1983; however, subsistence harvests for 1974–1983 in Togiak District are available in Nelson (1984:161).

Within a few years, the permit system for the general Bristol Bay Area seemed to have improved:

> The permit system has been refined and expanded and this year [1985] a total of 1,033 were issued [in the Bristol Bay Area]. It is felt that the majority of the salmon caught for subsistence are now being reported, the exception being those fish taken by commercial vessels that are consumed on the fishing grounds. Growth of the local population, a yearly influx of non-watershed residents, and a renewed interest in sport dog mushing have resulted in an increase in the subsistence harvest of salmon in Bristol Bay. (ADF&G 1986:75)

Since the establishment of the permit system, it has become clear that the level of effort expended each year by the department in making permits available, contacting individuals/local vendors, and sending harvest form return reminder letters greatly influences the degree of compliance, and probably the accuracy, of the records. With the exception of residents of a few communities, contemporarily most subsistence users are obtaining permits and reporting their catches. However, fish removed from commercial catches for immediate consumption, or future personal use, are probably not fully accounted for (for more information, refer to Chapter 6: "Discussion and Conclusions").

Subsistence Harvests Overview: 1965–1982

For 1974 and every subsequent year afterward, subsistence salmon catches for the Togiak District have been reported in the Bristol Bay Area AMR produced by the ADF&G Division of Commercial Fisheries. Prior to 1983, the subsistence salmon permit system in the Bristol Bay region was entirely administered by the Division of Commercial Fisheries and that division's AMRs were the only source for yearly subsistence salmon harvest data for the Bristol Bay Area. Starting with the 1999 fishing season, the ADF&G Division

17. Alaska Department of Fish and Game, "Division of Subsistence: Division Overview," http://www.adfg.alaska.gov/index.cfm?adfg=divisions.subsoverview (accessed February 2019).

Table 2-2.–Estimated historical subsistence salmon harvests, Togiak District, 1983–2017.

	Permits		Estimated salmon harvest					
Year	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	**Total**
1983	38	27	657	2,385	636	717	148	**4,543**
1984	40	27	634	3,735	4,087	1,857	287	**10,600**
1985	46	33	640	3,065	1,423	937	75	**6,141**
1986	25	22	654	2,195	460	801	56	**4,226**
1987	46	34	661	3,531	1,393	970	10	**6,565**
1988	30	28	367	1,978	673	608	37	**3,663**
1989	40	33	551	2,825	976	891	112	**5,355**
1990	37	32	480	3,689	1,111	786	60	**6,126**
1991	43	38	470	3,517	1,238	553	27	**5,805**
1992	40	25	1,361	3,716	1,231	626	135	**7,069**
1993	38	29	784	2,139	743	571	8	**4,245**
1994	25	23	904	1,777	910	398	77	**4,066**
1995	22	19	448	1,318	703	425	0	**2,894**
1996	19	6	471	662	199	285	59	**1,676**
1997	31	31	667	1,440	260	380	0	**2,747**
1998	42	42	782	2,211	310	412	76	**3,791**
1999	76	72	1,244	3,780	217	479	84	**5,804**
2000	54	35	1,134	3,023	366	616	72	**5,211**
2001	124	122	1,612	4,162	388	367	61	**6,590**
2002	36	35	703	2,319	241	605	10	**3,878**
2003	92	89	1,208	4,403	883	483	451	**7,428**
2004	46	40	1,094	1,795	204	383	108	**3,584**
2005	45	38	1,528	2,299	295	301	26	**4,449**
2006	61	48	1,630	2,728	408	492	355	**5,613**
2007	48	36	1,234	2,548	111	420	19	**4,332**
2008	91	89	1,337	3,770	541	701	114	**6,463**
2009	40	38	827	2,220	272	365	5	**3,689**
2010	64	55	1,162	3,256	514	735	113	**5,780**
2011	68	62	966	3,462	545	497	42	**5,512**
2012	53	38	933	5,265	293	764	84	**7,339**
2013	64	47	695	3,695	208	380	34	**5,012**
2014	59	52	607	4,587	486	669	190	**6,539**
2015	48	43	876	2,387	650	312	23	**4,249**
2016	70	65	1,141	3,780	521	377	198	**6,017**
2017	69	62	949	5,436	900	556	107	**7,948**
5-year avg (2013–2017)	62	54	854	3,977	553	459	111	**5,953**
10-year avg (2008–2017)	63	55	949	3,786	493	536	91	**5,855**
Historical avg (1983–2017)	51	43	897	3,003	697	592	93	**5,284**

Source ADF&G Division of Subsistence, ASFDB 2018 (ADF&G 2019).

of Subsistence has also been publishing annual subsistence salmon fisheries data summaries in its Technical Paper series; the annual data summaries have expanded to also include personal use fishery harvests in order to offer a more comprehensive and detailed overview of non-recreational fish harvests for home use.

A review of early Bristol Bay Area AMRs shows that incomplete subsistence salmon permit returns made it difficult to estimate the amount of salmon harvested for subsistence in the Togiak District. For example, an appendix[18] in ADF&G (1976) indicates a subsistence catch in the Togiak District for 1974 of 7,400 sockeye salmon, 1,200 Chinook salmon, 2,000 chum salmon, 500 pink salmon, and 1,800 coho salmon for a total of 12,900 subsistence-caught salmon. Of note is that the appendix table footnote changed from previous versions in earlier AMRs, which had stated the Togiak District subsistence catches fall in the range of 15,000–20,000 salmon, and stated instead that "preliminary data indicates that the Togiak district catches fall in the range of 5-10,000 salmon." Note that in Schroeder (1974:16–17) a village council president who was interviewed placed the estimated subsistence salmon requirement in the Togiak District at 5,000–10,000 salmon annually, which matched the information in the AMR published for the 1974 season.

The description of the 1974 subsistence fishing season in the AMR indicated that early in the commercial season most Bristol Bay districts were closed to commercial fishing. This resulted in a much higher use of subsistence-caught salmon—apparently because commercial fishers were not commercial fishing and had more time to focus on subsistence fishing. An example noted is that in 1974 the "Nushagak-Togiak subsistence catches showed a 47% increase over the harvest in 1973" (ADF&G 1976:18). For clarification, it appears that the inclusion of Togiak in this description is an error. The 47% value applies to the Nushagak District alone and, as summarized in Table 2-1, there were no subsistence catch numbers recorded for the Togiak District in 1973 so the comparison between 1974 and 1973 could not be made.

A table in the AMR for the 1982 fishing season published a summary of the number of permits issued and subsistence harvests for the Togiak District spanning 1975–1982 (ADF&G 1983:165); the estimated subsistence salmon harvests based on returned permits in those years are depicted in Table 2-1. Over the period 1974–1982, an average of 42 permits were issued, with the lowest number issued in 1979 at 25 permits, and the highest in 1974 at 68 permits. The average estimated salmon harvest for all species from 1974–1982 was 5,844 salmon, the lowest estimated salmon harvest was in 1979 at 2,000 salmon, and the highest estimated harvest was in 1974 at 12,900 salmon.

Beginning in 1983, ADF&G Division of Subsistence began managing the subsistence permit system. Table 2-2 presents estimated subsistence salmon harvests from 1983–2017 for the Togiak District based on subsistence salmon permit returns. Over the period 1983–2017, an average of 51 permits were issued, and the average harvest was 5,284 total salmon. The latest 5-year (2013–2017) average total salmon harvest has increased to 5,953 total salmon. Sockeye salmon subsistence harvests likely account for much of the increase to the average for 2013–2017 in comparison to the average for 1983–2017: the sockeye salmon average harvest increased by 974 fish from the historical average of 3,003 fish to the latest 5-year average of 3,977 fish.

Salmon for Dog Food

The AMR summarizing the 1970 fisheries season stated: "Salmon subsistence catches for personal use and dog food consumption have been recorded since 1963 in Bristol Bay. This subsistence fishery is primarily centered around the Naknek-Kvichak and Nushagak drainages where local inhabitants, especially outlying villagers, are still dependent on salmon for winter dog food as well as to augment their own diets" (Van Ray et al. 1971:20).

A brief "Subsistence Fishery" section of the Division of Commercial Fisheries AMR for 1976 adds to information presented in previous AMRs about the importance of the use of salmon to feed sled dogs.

> Residents of the Bristol Bay watershed have historically caught large numbers of salmon and other freshwater fish species for subsistence or personal use. Dog

18. See Appendix Table B29 titled, "Subsistence catch of salmon, for Bristol Bay, by district and species, 1965–1974" in ADF&G (1976:75–76).

> team travel and use has been largely replaced by modern snow machines, but the expected decrease in fish requirements to feed dogs has not occurred. Subsistence catches of salmon show a high sustained level in recent years (Appendix Table 35). In all probability, the increase in population and better documentation of subsistence harvest levels has suggested an over-all increase of fish taken for personal use. (ADF&G 1979:34)

Early in the following decade, salmon caught to feed dogs continued to be an important consideration for the Bristol Bay Area subsistence salmon fishery. According to ADF&G (1982b:52), "The advent of the snow machine has replaced the dog sled as a means of winter travel, which has resulted in a substantial decrease in fish requirements to feed dogs. However, due to the recent revival of dog racing and sport mushing, demand for salmon to feed dogs is expanding."

By the late 1980s, the subsistence fishery summary identified a change in the level of need for salmon to feed dogs, as shown in the AMR for the 1987 fishing season:

> The permit system has been refined and expanded and this year a total of 998 permits were issued. Growth of the local population and a yearly influx of non-watershed residents are probably the main factors responsible for the increased subsistence harvest. However, some of this increase has been offset by the replacement of dog teams with snow machines. Although there has been a renewed interest in recreational dog mushing in some communities, the number of dog teams in the regions does not approach the numbers in the past when dog teams were a critical means of winter transportation. (ADF&G 1988:80–81)

Relationships Among Salmon Fisheries

For the residents of Togiak and Twin Hills, both commercial and sport fisheries affect subsistence fishing efforts in one way or another. It is important to study the relationships among the various salmon fisheries in order to understand how they affect each other. Additionally, in the absence of a long-term in-river escapement monitoring program for the Togiak River, accurate subsistence harvest estimates are critical proxies for escapement monitoring in combination with sport and commercial harvests. Therefore, an understanding of the rules and regulations for all Togiak fisheries is important for complete comprehension of harvest estimates.

State Commercial Fishing Regulations

For reference, Plate 2-1, which appears at the end of this chapter, provides excerpts of state fishing regulations (pages 9–10) as they apply to commercial fishing for salmon in Bristol Bay. Note that there were no in-season emergency orders issued during the study years announcing special fisheries management rules.

State Commercial Harvests: 2016 and 2017

The total number of commercially caught salmon of all species in the Togiak District in 2016 was 1,063,672 fish, and the 2017 total was 806,949 fish. The 2016 catch was the second largest catch since 1997. The 20-year average from 1997–2016 was 719,111 fish. The 10-year average from 1997–2006 was 609,930 fish, and the 10-year average from 2007–2016 was 828,292 fish (Elison et al. 2018:75).

The number of commercially caught Chinook salmon delivered to processors in the Togiak District in 2016 was 3,831 fish, and in 2017 the commercial catch of Chinook salmon that was delivered to processors was 4,643 fish. The 20-year average from 1997–2016 of commercially caught Chinook salmon was 6,349 fish. The 10-year average from 1997–2006 was 8,335 fish, and the 10-year average from 2007–2016 was 4,362 fish (Elison et al. 2018:71).

The Togiak District commercial catch of sockeye salmon in 2016 was 645,797 fish and in 2017 it was 516,488 fish. The 20-year average (from 1997–2016) commercial catch of sockeye salmon was 539,153 fish. The 10-year average from 1997–2006 was 479,202 fish, and the 10-year average from 2007–2016 was 599,104 sockeye salmon (Elison et al. 2018:70).

The chum salmon commercial catch in 2016 was 187,508 fish and in 2017 it was 204,518 fish. The 20-year average from 1997–2016 was 144,364 fish. The 10-year average from 1997–2006 was 120,141fish, and the 10-year average from 2007–2016 was 168,587 chum salmon (Elison et al. 2018:72).

The pink salmon commercial catch in 2016 was 217,190 and in 2017 it was 26,797 fish. In this system, pink salmon are highest in abundance on even-numbered years (i.e., 2016 and 2018). The commercial harvest of pink salmon in 2017 was by far the highest number in odd years since 1997. For example, in 2005, a total of 2,108 pink salmon were commercially harvested and 1,219 were harvested in 2015. The commercial harvest in 2016 was also by far the largest harvest of pink salmon in the last 20 even-numbered years. For example, in 2008, there were 125,409 pink salmon caught, and 118,682 pink salmon were caught in 2014. The 20-year average from 1997–2016 of commercially caught pink salmon was 63,552. The 10-year average from 1997–2006 was 21,291, and the 10-year average from 2007–2016 was 105,814 fish. The averages only include catches during the even-numbered years (Elison et al. 2018:73).

The commercial catch of coho salmon in 2016 was 9,346 fish and in 2017 it was 54,503 fish. The 20-year commercial catch average from 1997–2016 was 11,111 fish. The 10-year average 1997–2006 was 8,507, and the 10-year average from 2007–2016 was 13,715 coho salmon (Elison et al. 2018:74).

Coho and pink salmon return later in the season after the majority of the sockeye salmon commercial harvest has been completed. Pink salmon are for the most part not considered to be a desirable commercially caught fish because they usually only produce a very low price for commercial fishers. Coho are more desirable and command a higher price in comparison to pink salmon. If a market is available for coho salmon, commercial fishers will fish later in the season to sell coho salmon and therefore catch more pink salmon in the process, especially in the even-numbered years.

State Sport Fishing Regulations

For reference, Plate 2-1, which appears at the end of this chapter, provides excerpts of state sport fishing regulations (pages 11–13). Note that there were no in-season emergency orders issued during the study years announcing special fisheries management rules.

As with the subsistence and commercial salmon fisheries, there are license and harvest reporting requirements for the state salmon sport fishery. A summary of general requirements provided by Alaska Statutes is provided in this section.

Alaska residents age 18-years-old and older, and nonresidents age 16-years-old and older, are required to purchase a sport fishing license to fish in the state of Alaska (AS 16.05.400). In 2018, an annual sport fishing license for a resident was $29. For nonresidents the license fee was $25 for one day, $45 for a three-day license, $70 for 7 days, $105 for 14 days, and an annual nonresident sport fishing license was $145. Fees are set by the Alaska Legislature, as published in AS 16.05.340, so they may change; the ADF&G website has the latest information online[19]. For Alaska residents who satisfy specific criteria set by the state legislature in AS 16.05.340, AS 16.05.341, and AS 16.05.403, there are special sport fish licenses available that have unique fees and also, in some cases, harvest record requirements or regulatory exemptions to allow meaningful access to harvest activities.

- An Alaska resident sport fish license is available for $5 for an applicant "who has an annual family or household income equal to or less than the most recent poverty guidelines for the state set by the United States Department of Health and Human Services for the year preceding application (see AS 16.05.340(a)(6)(A)).
- A free Disabled Veteran (DAV) card is available to license hunting and sport fishing for Alaska residents who are disabled veterans (with a disability of 50% or greater that was

19. For the latest information regarding resident and nonresident sport fish license prices, see the ADF&G website: http://www.adfg.alaska.gov/index.cfm?adfg=license.pricinglist (accessed March 2019).

incurred during military service); if the DAV cardholder becomes a nonresident it is no longer valid (see AS 16.05.341(1) and AS 16.05.341(2)).

- An Alaska resident sport fish license is available for 50 cents for an applicant who is blind (see AS 16.05.340(a)(1) and AS 16.05.403(a)).
- An Alaska resident sport fish license is available for free for an applicant with physical disabilities (see AS 16.05.403(b)).
- A free Permanent ID (PID) (or "senior") card is available to license hunting and sport fishing for Alaska residents who are 65 years old or older; if the PID cardholder becomes a nonresident it is no longer valid (see AS 16.0.403(c)).

By state regulation, because there is an annual limit of five fish (20 inches or longer) for the sport harvest of Chinook salmon for the Bristol Bay region, anyone who sport fishes must record his or her harvest on a Sport Fishing Harvest Record Card. Harvest Record Cards are available at no cost on the ADF&G web page, and from ADF&G offices or fishing license vendors. If fishing for Chinook salmon, a Chinook salmon stamp must also be purchased every year by residents and nonresidents.[20] Chinook salmon stamps may be purchased[21] on the ADF&G web page and from a license vendor.

The Togiak River drainage is within the Bristol Bay Management Area; sport fishing regulations for seasons, size limits, and annual, possession, and bag limits[22] are included in 5 AAC 67.020, and special provisions for methods and means are included in 5 AAC 67.22—excerpts from both are in Plate 2-1. To illustrate the application of the harvest limits, consider that if fishing for one day in the Togiak River drainage, residents and nonresidents can keep a maximum of three Chinook salmon that are 20 inches or longer in length, and only one of those can be 28 inches or longer in length; plus, 10 Chinook salmon less than 20 inches in length can also be kept. Applying the preserved fish definition to the bag limit, if a freezer is available—for instance, at a local sport fishing lodge—a person staying at the lodge could catch the possession limit one day and place those fish in a freezer; then, the next day, because the previous day's catch is preserved, that person could catch and keep two more Chinook salmon that are 20 inches in length or longer, one of which could be 28 inches or longer in length, and another 10 Chinook salmon that are less than 20 inches in length. The fisher would then have his or her annual limit of five Chinook salmon 20 inches or longer. Because there is no annual limit for Chinook salmon less than 20 inches in length, the sport fisher could continue to fish and keep 10 Chinook salmon less than 20 inches in length per day as long as those fish were frozen every day. Catch-and-release fishing is allowed throughout Bristol Bay including the Togiak River drainage (see 5 AAC 67.020(1)(C) and 5 AAC 67.022(j) in Plate 2-1). As long as a Chinook salmon, when reeled in by a sport fisher, is not lifted out of the water, it can be released and is not counted in the bag limit. There is no limit on the amount of Chinook salmon that can be caught and released (5 AAC 67.020(1)(c)).

20. Note that the following fishers are not required to purchase Chinook salmon stamps: residents under age 18, nonresidents under age 16, resident PID and DAV cardholders, and residents who obtain a sport fishing license under the low income and blind person qualifications.
21. For the latest information regarding resident and nonresident sport fish Chinook salmon stamp prices, see the ADF&G website: http://www.adfg.alaska.gov/index.cfm?adfg=license.pricinglist (accessed March 2019).
22. Pertinent definitions are provided in 5 AAC 75.995:
    - "bag limit" means the maximum legal take of fish per person per day, in the area in which the person is fishing, even if part or all of the fish are immediately preserved;
    - "possession limit" means the maximum number of unpreserved fish, except halibut, that a person may have in possession; and
    - "preserved fish" means fish prepared in such a manner, an in an existing state of preservation, as to be fit for human consumption after a 15-day period, and does not include unfrozen fish temporarily stored in coolers that contain ice or dry ice or fish that are lightly salted.

State Sport Harvests: 2016 and 2017

The Togiak River is one of three major river systems within the Togiak National Wildlife Refuge. Most of the sport fishing in the Togiak River occurs in the lower 20 miles of the river, downstream of the wilderness area boundary of the Togiak National Wildlife Refuge. Sport fishing angler effort is largely composed of nonresident guided anglers who access the river by flying out from nearby lodges to fish for the day. In addition, there are two river-based lodges that cater to nonresident anglers, one of which is owned by the local Alaska Native corporation in Togiak and leased to a concession group (Dye and Borden 2018:28,39). Chinook and coho salmon are the two most harvested species of salmon by sport anglers in the Togiak River. From 1977 through 2006, guided angler-days averaged 2,691, which increased to 5,616 guided angler-days on average for 2012 through 2016 (Dye and Borden 2018:4).

The Chinook salmon sport fishery on the Togiak River is concentrated along the lower 15 miles of the river and runs from late June through the month of July. The total number of sport-caught Chinook salmon in the Togiak drainage in 2016 was 787 fish, and the 2017 total was 978 fish (Dye and Borden 2018:16). The Chinook salmon sport harvest from 2012–2017 ranged from a high of 2,166 fish in 2014, to a low of 787 in 2016, with an average of 1,139 fish harvested from the Togiak River drainage for 2012–2016. From 2012 through 2017, angler effort for the Togiak River drainage peaked in 2012 with a high of 9,526 angler-days; average effort for 2012–2016 was 5,616 angler-days. During 2016, effort was 3,159 angler-days, and in 2017 effort was 4,960 angler-days (Dye and Borden 2018:4,29).

Coho salmon are a popular component of the Togiak River sport fishery. Coho salmon fisheries occur from late July through mid-September in the lower 20 miles of the Togiak River. Sport harvests of coho salmon from the Togiak River averaged 2,649 fish annually from 2013 through 2017 (Dye and Borden 2018:39). The total number of sport-caught coho salmon in the Togiak drainage in 2016 was 2,719 fish, and the 2017 total was 2,985 fish (Dye and Borden 2018:40). From 2007 through 2016, guided angler-days have ranged from 873 in 2010 to 2,211 in 2011 with an average of 1,633 angler-days from 2012 through 2016 (Dye and Borden 2018:41).

Plate 2-1.–Excerpts of state and federal fishing regulations.

State of Alaska Subsistence Fishing Regulations Excerpts

Excerpts of state subsistence salmon fishing regulations provided below were taken from the Alaska Administrative Code published online: http://www.legis.state.ak.us/basis/aac.asp.

Part 1: Commercial and Subsistence Fishing and Private Nonprofit Salmon Hatcheries

Chapter 1: Subsistence Finfish Fishery

Article 1. Statewide Provisions

5 AAC 01.010. Methods, means, and general provisions

(a) Unless otherwise provided in this chapter, the following are legal types of gear for subsistence fishing:

(3) A spear which is a shaft with a sharp point or fork-like implement attached to one end, used to thrust through the water to impale or retrieve fish and which is operated by hand.

(c) Gillnets used for subsistence fishing for salmon may not exceed 50 fathoms in length, unless otherwise specified by the regulations in particular areas set forth in this chapter.

(g) Subsistence fishing by the use of a hook and line attached to a rod or pole is prohibited, unless otherwise provided in this chapter.

(h) A subsistence fisherman shall plainly and legibly inscribe that person's first initial, last name, and address on that person's fish wheel, keg or buoy attached to a gillnet, and other unattended subsistence fishing gear.

5 AAC 01.015. Subsistence fishing permits and reports

(a) Salmon may be taken only under the authority of a subsistence fishing permit issued by the commissioner, unless a permit is specifically not required in a particular area by the subsistence regulations in this chapter, or unless the fisherman is retaining salmon from the fisherman's commercial catch consistent with 5 AAC 39.010.

(b) If a subsistence fishing permit is required by this chapter, the following permit conditions apply unless otherwise specified by the subsistence fishing regulations in this chapter:

(3) Permits must be retained in the possession of the permittee and be readily available for inspection while taking fish; a person who transports subsistence-taken fish shall have a subsistence fishing permit in that person's possession.

(5) If specified on the permit, each subsistence fisherman shall keep accurate daily records of the catch involved, showing the number of fish taken by species, location and date of the catch and such other information as the department may require for management or conservation purposes.

(7) If applicable, the total annual possession limit for the permittee must be entered on each permit by the local representative of the department issuing the permit; if applicable, the local representative of the department issuing the permit shall require from an applicant documented proof of residency, income or other criteria required by regulation, or in absence of such documentation, a signed affidavit setting forth duration of residency, income, or other criteria required by regulation, to determine the applicable annual possession limit and residency of the applicant.

(c) If the return of catch information necessary for management and conservation purposes is required by a subsistence fishing permit, a permittee who fails to comply with such reporting requirement is ineligible to receive a subsistence permit for that activity during the following calendar year, unless the permit applicant demonstrates to the department that failure to report was due to loss in the mail, accident, sickness or other unavoidable circumstances.

1

5 AAC 01.020. Subsistence fishing by commercial fisherman

(b) No person, when participating in a commercial and a subsistence fishery at the same time, may use an amount of combined commercial and subsistence fishing gear in excess of that allowed under the appropriate commercial fishing regulations.

Part 1: Commercial and Subsistence Fishing and Private Nonprofit Salmon Hatcheries

Chapter 1: Subsistence Finfish Fishery

Article 6. Bristol Bay Area

5 AAC 01.310. Fishing seasons and periods

(a) Unless restricted in this section and 5 AAC 01.325, or unless restricted under the terms of a subsistence fishing permit, fish, other than rainbow trout, may be taken at any time in the Bristol Bay Area.

(b) In all commercial salmon districts, from May 1 through May 31 and October 1 through October 31, subsistence fishing for salmon is permitted from 9:00 a.m. Monday until 9:00 a.m. Friday. From June 1 through September 30, within the waters of a commercial salmon district, salmon may be taken only during open commercial fishing periods.

5 AAC 01.320. Lawful gear and gear specifications

(a) Within any district, salmon, herring, and capelin may be taken only by drift and set gillnets.

(b) Outside the boundaries of any district, salmon may only be taken by set gillnet, except that salmon may also be taken as follows:

(1) in the Togiak River,

(A) Excluding its tributaries, by spear.

(B) Between the mouth of the river and upstream approximately two miles to a line across the river at 59_ 05.50' N. lat., by a drift gillnet that is not more than 10 fathoms in length.

(d) No part of a set gillnet may be operated within 300 feet of any part of another set gillnet.

(e) A set gillnet may not obstruct more than one-half the width of a stream and any channel or side channel of a stream.

(f) Each set gillnet must be staked and buoyed. Instead of complying with 5 AAC 01.010 (h), a subsistence fisherman may plainly and legibly inscribe that person's first initial, last name, and subsistence permit number on a sign at or near the set gillnet.

(g) No person may operate or assist in operating subsistence salmon net gear while simultaneously operating or assisting in operating commercial salmon net gear.

(l) Subsistence fishing by use of a hook and line attached to a rod or pole is prohibited, except when fishing through the ice.

Editor's note: At its February 23-27, 1993 meeting, the Board of Fisheries readopted 5 AAC 01320 (a) - (k) in their entirety without change, under ch.1 SSSLA 1992 (the 1992 subsistence law), which repealed and reenacted AS 16.05.258.

5AAC 01.330. Subsistence fishing permits

(a) Salmon may only be taken under authority of a subsistence fishing permit.

(c) Only one subsistence fishing permit may be issued to each household per year.

5AAC 01.336. Customary and traditional subsistence uses of fish stocks and amounts necessary for subsistence uses

(a) The Alaska Board of Fisheries (board) finds that the following fish stocks are customarily and traditionally taken or used for subsistence in the Bristol Bay Area:

(1) All finfish.

(b) The board finds that:

(1) 157,000 - 172,171 salmon are reasonably necessary for subsistence uses in the Bristol Bay Area, including 55,000 - 65,000 Kvichak River drainage sockeye salmon; this finding does not include salmon stocks in the Alagnak River.

5 AAC 01.340. Marking of subsistence-taken salmon

In the Togiak River drainage, a person may not possess

(1) Coho salmon taken under authority of a subsistence fishing permit unless both lobes of the caudal fin (tail) or the dorsal fin have been removed;

(2) Salmon taken under authority of a subsistence fishing permit with a drift gillnet unless both lobes of the caudal fin (tail) or the dorsal fin have been removed.

Federal Subsistence Fishing Regulations Excerpts

Excerpts of federal subsistence salmon fishing regulations provided below were taken from the Code of Federal Regulations published online: https://gov.ecfr.io/cgi-bin/ECFR.

Title 50, Chapter 1, Subchapter H, Part 100

100.27 Subsistence taking of fish

(a) *Applicability*.

(1) Regulations in this section apply to the taking of fish or their parts for subsistence uses.

(2) You may take fish for subsistence uses at any time by any method unless you are restricted by the subsistence fishing regulations found in this section. The harvest limit specified in this section for a subsistence season for a species and the State harvest limit set for a State season for the same species are not cumulative, except as modified by regulations in paragraph (e) of this section. This means that if you have taken the harvest limit for a particular species under a subsistence season specified in this section, you may not, after that, take any additional fish of that species under any other harvest limit specified for a State season.

(3) You may not possess, transport, give, receive, or barter subsistence-taken fish or their parts that have been taken contrary to Federal law or regulation or State law or regulation (unless superseded by regulations in this part).

(b) *Methods, means, and general restrictions.*

(1) Unless otherwise specified in this section or under terms of a required subsistence fishing permit (as may be modified by regulations in this section), you may use the following legal types of gear for subsistence fishing:

(i) A set gillnet;

(ii) A drift gillnet;

(iii) A purse seine;

(iv) A hand purse seine;

(v) A beach seine;

(vi) Troll gear;

(vii) A fish wheel;

(viii) A trawl;

(ix) A pot;

(x) A longline;

(xi) A fyke net;

(xii) A lead;

(xiii) A herring pound;

(xiv) A dip net;

(xv) Jigging gear;

(xvi) A mechanical jigging machine;

(xvii) A handline;

(xviii) A cast net;

(xix) A rod and reel; and

(xx) A spear.

(3) For subsistence fishing for salmon, you may not use a gillnet exceeding 50 fathoms in length, unless otherwise specified in this section. The gillnet web must contain at least 30 filaments of equal diameter or at least 6 filaments, each of which must be at least 0.20 millimeter in diameter.

(4) Except as otherwise provided for in this section, you may not obstruct more than one-half the width of any stream with any gear used to take fish for subsistence uses.

(5) You may not use live nonindigenous fish as bait.

(6) You must have your first initial, last name, and address plainly and legibly inscribed on the side of your fish wheel facing midstream of the river.

(7) You may use kegs or buoys of any color but red on any permitted gear.

(8) You must have your first initial, last name, and address plainly and legibly inscribed on each keg, buoy, stakes attached to gillnets, stakes identifying gear fished under the ice, and any other unattended fishing gear which you use to take fish for subsistence uses.

(9) You may not use explosives or chemicals to take fish for subsistence uses.

(10) You may not take fish for subsistence uses within 300 feet of any dam, fish ladder, weir, culvert or other artificial obstruction, unless otherwise indicated.

(11) *Transactions between rural residents.* Rural residents may exchange in customary trade subsistence-harvested fish, their parts, or their eggs, legally taken under the regulations in this part, for cash from other rural residents. The Board may recognize regional differences and regulates customary trade differently for separate regions of the State.

(i) Bristol Bay Fishery Management Area—The total cash value per household of salmon taken within Federal jurisdiction in the Bristol Bay Fishery Management Area and exchanged in customary trade to rural residents may not exceed $500.00 annually.

(12) *Transactions between a rural resident and others.* In customary trade, a rural resident may exchange fish, their parts, or their eggs, legally taken under the regulations in this part, for cash from individuals other than rural residents if the individual who purchases the fish, their parts, or their eggs uses them for personal or family consumption. If you are not a rural resident, you may not sell fish, their parts, or their eggs taken under the regulations in this part. The Board may recognize regional differences and regulates customary trade differently for separate regions of the State.

(i) Bristol Bay Fishery Management Area—The total cash value per household of salmon taken within Federal jurisdiction in the Bristol Bay Fishery Management Area and exchanged in customary trade between rural residents and individuals other than rural residents may not exceed $400.00 annually. These customary trade sales must be immediately recorded on a customary trade recordkeeping form. The recording requirement and the responsibility to ensure the household limit is not exceeded rest with the seller.

(13) *No sale to, nor purchase by, fisheries businesses.*

(i) You may not sell fish, their parts, or their eggs taken under the regulations in this part to any individual, business, or organization required to be licensed as a fisheries business under Alaska Statute AS 43.75.011 (commercial limited-entry permit or crew license holders excluded) or to any other business as defined under Alaska Statute 43.70.110(1) as part of its business transactions.

(ii) If you are required to be licensed as a fisheries business under Alaska Statute AS 43.75.011 (commercial limited-entry permit or crew license holders excluded) or are a business as defined under Alaska Statute 43.70.110(1), you may not purchase, receive, or sell fish, their parts, or their eggs taken under the regulations in this part as part of your business transactions.

(15) You may not use fish taken for subsistence use or under subsistence regulations in this part as bait for commercial or sport fishing purposes.

(16) Unless specified otherwise in this section, you may use a rod and reel to take fish without a subsistence fishing permit. Harvest limits applicable to the use of a rod and reel to take fish for subsistence uses shall be as follows:

(i) If you are required to obtain a subsistence fishing permit for an area, that permit is required to take fish for subsistence uses with rod and reel in that area. The harvest and possession limits for taking fish with a rod and reel in those areas are the same as indicated on the permit issued for subsistence fishing with other gear types.

(ii) Except as otherwise provided for in this section, if you are not required to obtain a subsistence fishing permit for an area, the harvest and possession limits for taking fish for subsistence uses with a rod and reel are the same as for taking fish under State of Alaska subsistence fishing regulations in those same areas. If the State does not have a specific subsistence season and/or harvest limit for that particular species, the limit shall be the same as for taking fish under State of Alaska sport fishing regulations.

(17) Unless restricted in this section, or unless restricted under the terms of a subsistence fishing permit, you may take fish for subsistence uses at any time.

(18) Provisions on ADF&G subsistence fishing permits that are more restrictive or in conflict with the provisions contained in this section do not apply to Federal subsistence users.

(19) You may not intentionally waste or destroy any subsistence-caught fish or shellfish; however, you may use for bait or other purposes, whitefish, herring, and species for which harvest limits, seasons, or other regulatory methods and means are not provided in this section, as well as the head, tail, fins, and viscera of legally taken subsistence fish.

(20) The taking of fish from waters within Federal jurisdiction is authorized outside of published open seasons or harvest limits if the harvested fish will be used for food in traditional or religious ceremonies that are part of funerary or mortuary cycles, including memorial potlatches, provided that:

(i) Prior to attempting to take fish, the person (or designee) or Tribal Government organizing the ceremony contacts the appropriate Federal fisheries manager to provide the nature of the ceremony, the parties and/or clans involved, the species and the number of fish to be taken, and the Federal waters from which the harvest will occur;

(ii) The taking does not violate recognized principles of fisheries conservation, and uses the methods and means allowable for the particular species published in the applicable Federal regulations (the Federal fisheries manager will establish the number, species, or place of taking if necessary for conservation purposes);

(iii) Each person who takes fish under this section must, as soon as practical, and not more than 15 days after the harvest, submit a written report to the appropriate Federal fisheries manager, specifying the harvester's name and address, the number and species of fish taken, and the date and locations of the taking; and

(iv) No permit is required for taking under this section; however, the harvester must be eligible to harvest the resource under Federal regulations.

(c) *Fishing permits and reports*.

(1) You may take salmon only under the authority of a subsistence fishing permit, unless a permit is specifically not required in a particular area by the subsistence regulations in this part, or unless you are retaining salmon from your commercial catch consistent with paragraph (d) of this section.

(2) If a subsistence fishing permit is required by this section, the following permit conditions apply unless otherwise specified in this section:

(i) You may not take more fish for subsistence use than the limits set out in the permit;

(ii) You must obtain the permit prior to fishing;

(iii) You must have the permit in your possession and readily available for inspection while fishing or transporting subsistence-taken fish;

(iv) If specified on the permit, you must record, prior to leaving the fishing site, daily records of the catch, showing the number of fish taken by species, location and date of catch, and other such information as may be required for management or conservation purposes; and

(v) If the return of catch information necessary for management and conservation purposes is required by a fishing permit and you fail to comply with such reporting requirements, you are ineligible to receive a subsistence permit for that activity during the following calendar year, unless you demonstrate that failure to report was due to loss in the mail, accident, sickness, or other unavoidable circumstances. You must also return any tags or transmitters that have been attached to fish for management and conservation purposes.

(d) *Relation to commercial fishing activities.*

(1) If you are a Federally qualified subsistence user who also commercial fishes, you may retain fish for subsistence purposes from your lawfully-taken commercial catch.

(2) When participating in a commercial and subsistence fishery at the same time, you may not use an amount of combined fishing gear in excess of that allowed under the appropriate commercial fishing regulations.

(e) *Fishery management area restrictions*.

(5) *Bristol Bay Area.* The Bristol Bay Area includes all waters of Bristol Bay, including drainages enclosed by a line from Cape Newenham to Cape Menshikof.

(i) Unless restricted in this section, or unless under the terms of a subsistence fishing permit, you may take fish at any time in the Bristol Bay area.

(ii) In all State commercial salmon districts, from May 1 through May 31 and October 1 through October 31, you may subsistence fish for salmon only from 9:00 a.m. Monday until 9:00 a.m. Friday. From June 1 through September 30, within the waters of a commercial salmon district, you may take salmon only during State open commercial salmon fishing periods.

(iv) You may not take fish from waters within 300 feet of a stream mouth used by salmon.

(vi) Within any district, you may take salmon, herring, and capelin by set gillnets only.

(vii) Outside the boundaries of any district, unless otherwise specified, you may take salmon by set gillnet only.

(A) You may also take salmon by spear in the Togiak River, excluding its tributaries.

(B) You may also use drift gillnets not greater than 10 fathoms in length to take salmon in the Togiak River in the first two river miles upstream from the mouth of the Togiak River to the ADF&G regulatory markers.

(viii) The maximum lengths for set gillnets used to take salmon are as follows:

(B) In the remaining waters of the area, you may not use set gillnets exceeding 25 fathoms in length.

(ix) You may not operate any part of a set gillnet within 300 feet of any part of another set gillnet.

(x) You must stake and buoy each set gillnet. Instead of having the identifying information on a keg or buoy attached to the gillnet, you may plainly and legibly inscribe your first initial, last name, and subsistence permit number on a sign at or near the set gillnet.

(xi) You may not operate or assist in operating subsistence salmon net gear while simultaneously operating or assisting in operating commercial salmon net gear.

(xiv) You may take salmon only under authority of a State subsistence salmon permit (permits are issued by ADF&G) except when using a Federal permit for fyke net and lead.

(xv) Only one State subsistence fishing permit for salmon and one Federal permit for use of a fyke net and lead for all fish (except rainbow trout) may be issued to each household per year.

(xvi) In the Togiak River section and the Togiak River drainage:

(A) You may not possess coho salmon taken under the authority of a subsistence fishing permit unless both lobes of the caudal fin (tail) or the dorsal fin have been removed.

(B) You may not possess salmon taken with a drift gillnet under the authority of a subsistence fishing permit unless both lobes of the caudal fin (tail) or the dorsal fin have been removed.

State of Alaska Commercial Fishing Regulations Excerpts

Excerpts of state subsistence salmon fishing regulations provided below were taken from the Alaska Administrative Code published online: http://www.legis.state.ak.us/basis/aac.asp.

Part 1: Commercial and Subsistence Fishing and Private Nonprofit Salmon Hatcheries

Chapter 6. Bristol Bay Area

Article 3. Salmon Fishery

5 AAC 06.320. Fishing periods

(a) In the Togiak District, salmon may be taken only as follows:

(3) In the Togiak River Section, from 9:00 a.m. Monday to 9 a.m. Friday, except as provided in 5 AAC 06.369(c)(1).

5 AAC 06.369. Togiak District Salmon Management Plan

(a) The department shall manage the commercial salmon fishery in the Togiak District in accordance with the guidelines set out in this management plan. The goal of this plan is to ensure adequate spawning and harvest objectives for sockeye, coho, and king salmon stocks returning to the Togiak District. It is the intent of the Board of Fisheries (board) that Togiak District salmon stocks be harvested in the fisheries that have historically harvested them. The department shall manage the Togiak District salmon stocks in a conservative manner consistent with sustained yield principles and the subsistence priority.

(b) The department shall manage the commercial fishery in the Togiak River Section of the Togiak District to achieve adequate escapement from all segments of the run by spacing openings throughout the run and, to the extent practicable, manage for escapements within the lower or upper portions of escapement goals proportional to the run size based on the preseason forecast and inseason assessment of the run size.

(c) Fishing periods in the Togiak District under this section are as follows:

(1) from 9:00 a.m. June 1 to 9:00 a.m. September 30, salmon may be taken in the Togiak District during fishing periods established under 5 AAC 06.320, except that in the Togiak River Section of the Togiak District, from July 1 through July 16, the weekly fishing periods shall be 9:00 a.m. Monday to 9:00 p.m. Saturday;

(2) the commissioner may reduce, by emergency order, fishing periods if information sources indicate a lack of spawning escapement; information sources may include such factors as observations by local elders, fish caught and observed in subsistence nets, sonar counts, counting tower counts, creel counts, test fisheries, daily monitoring, and aerial surveys;

(3) the commissioner may increase, by emergency order, the fishing periods in the Togiak River Section of the Togiak District by a maximum of 48 hours each week, in addition to the normal weekly schedule, if the commissioner determines that sockeye salmon run strength warrants additional fishing time.

(d) From 9:00 a.m. June 15 to 9:00 a.m. July 15, only gillnets with a mesh size of five and one-half inches or less will be allowed in the Togiak District under this section. If the commissioner determines that the king salmon run strength is adequate to sustain a directed king salmon fishery, the commissioner may close, by emergency order, the commercial salmon fishing season and immediately reopen that season during which there is no mesh size restriction for set gillnets.

5 AAC 06.370. Registration and reregistration

(k) Notwithstanding (b) of this section, a CFEC permit holder and fishing vessel registered before 9:00 a.m. July 17 to fish in the

(1) Togiak District may not take salmon or be used to take salmon in the Nushagak, Naknek-Kvichak, Egegik, or Ugashik District from 9:00 a.m. June 1 to 9:00 a.m. July 27;

(2) Nushagak, Naknek-Kvichak, Egegik, or Ugashik District may not take salmon or be used to take salmon in the Togiak District from 9:00 a.m. June 1 to 9:00 a.m. July 27.

5 AAC 06.377. Reporting requirements

(b) Each commercial fisherman shall report, on an ADF&G fish ticket, at the time of landing, the number of king [Chinook] and coho salmon taken but not sold.

5 AAC 06.380. Unlawful possession of subsistence-taken salmon fish

It is unlawful to purchase or sell salmon from which both lobes of the caudal fin (tail) or the dorsal fin have been removed.

Part 1: Commercial and Subsistence Fishing and Private Nonprofit Salmon Hatcheries

Chapter 39. General Provisions

Article 1. General

5 AAC 39.010. Retention of fish taken in a commercial fishery

(a) A person engaged in commercial fishing may retain fish from lawfully taken commercial catch for that person's own use, including for the use as bait in a commercial fishery. Fish retained under this section may not be sold or bartered.

(b) Except as otherwise specified in 5 AAC 01 - 5 AAC 39, a commercial fisherman shall report on an ADF&G fish ticket, at the time of delivery of the commercial catch, the number of steelhead retained from the commercial catch but not sold. For the purposes of this subsection "delivery" means the offloading of the finfish for sale or for transport to a buyer for later sale.

State of Alaska Sport Fishing Regulations Excerpts

Excerpts of state subsistence salmon fishing regulations provided below were taken from the Alaska Administrative Code published online: http://www.legis.state.ak.us/basis/aac.asp.

Part 2: Sport Fishing and Personal Use Fishery

Chapter 67: Bristol Bay Area

5 AAC 67.020. General provisions for seasons and bag, possession, annual, and size limits for the Bristol Bay Area

Except as otherwise provided in 5 AAC 67.022, 5 AAC 67.025, or by an emergency order issued under AS 16.05.060, the seasons and bag, possession, annual, and size limits for finfish and shellfish in the Bristol Bay Area are as follows:

(1) king salmon:

(A) in fresh waters, as follows:

(i) 20 inches or greater in length; may be taken only from May 1 through July 31; bag and possession limit of three fish, of which only one fish may be 28 inches or greater in length; annual limit of five fish 20 inches or greater in length taken in combination from fresh waters and salt waters; a harvest record is required as specified in 5 AAC 75.006;

(ii) less than 20 inches in length; may be taken from January 1 through December 31; bag and possession limit of 10 fish;

(B) in salt waters: may be taken only from May 1 through July 31; bag and possession limit of three fish, of which only two fish may be 28 inches or greater in length; annual limit of five fish 20 inches or greater in length taken in combination from fresh waters and salt waters; a harvest record is required as specified in 5 AAC 75.006;

(C) a king salmon removed from the water shall be retained and becomes part of the bag limit of the person originally hooking it; a person may not remove a king salmon from the water before releasing the fish;

(2) salmon, other than king salmon: may be taken from January 1 through December 31; bag and possession limit of five fish; no size limit.

5 AAC 67.022. Special provisions for seasons, bag, possession, and size limits, and methods and means in the Bristol Bay Area

(j) In all fresh water drainages between Cape Newenham and Cape Menshikof a person may not remove a king salmon from the water before releasing the fish.

(k) In the fresh waters of the Bristol Bay Area where the use of bait is not allowed, a sport fishing guide or a guide's client may not place in the water any substance for the purpose of attracting fish by scent, including

(1) fish eggs in any form;

(2) natural or preserved animal, fish, fish oil, shellfish, or insect parts;

(3) natural or processed vegetable matter; and

(4) natural or synthetic chemicals.

Part 2: Sport Fishing and Personal Use Fishery

Chapter 75: Statewide Provisions

Article 2. Methods and Means

5 AAC 75.020. Sport fishing gear

(a) Unless otherwise provided in 5 AAC 47 - 5 AAC 75, sport fishing may only be conducted by the use of a closely attended single line having attached to it not more than

(1) one plug;

(2) one spoon;

(3) one spinner or series of spinners;

(4) two artificial flies; or

(5) two hooks.

(b) An attractor, including a bead, when used with an artificial fly, artificial lure, or bare hook, must be either fixed within two inches of the bare hook, fly, or lure, or be free sliding on the line or leader. For the purposes of this subsection, a bead not attached to the hook is an attractor, not an artificial fly.

(c) A person who gaffs a fish must retain that fish as part of that person's bag and possession limit. A person may not gaff a fish for which the fishing season is closed, that is not of legal size, or that is to be released.

(d) A power-assisted fishing reel may only be used to sport fish if the

(1) power-assisted fishing reel is mounted on a fishing rod by means of a reel seat;

(2) power-assisted fishing reel assembly, motor, gearbox, fishing line, reel-mounted battery, or other reel-mounted attachments weigh no more than 15 pounds in total when detached from the fishing rod.

(e) In this section,

(1) "fishing rod" means a tapered, flexible rod typically used for sport fishing, equipped with a hand grip and a line guide system that guides the line from the reel to the tip of the rod, and upon which is mounted a fishing reel used to deploy and retrieve the sport fishing line;

(2) "gaff" means to puncture any part of a fish with a hook, other than a hook attached to an angler's fishing line;

(3) "power-assisted fishing reel" means a reel used to deploy and retrieve the sport fishing line that is operated or assisted by any electronic, hydraulic, or other mechanical power source other than by hand-cranking a handle attached to the reel;

(4) "reel seat" means an attachment mechanism that holds the fishing reel to the rod using locking, threaded rings, sliding bands, or other attachment devices and is designed to allow the reel to be readily detached from the fishing rod.

5 AAC 75.021. Ice fishing gear

(a) Sport fishing through the ice is permitted with the use of two closely attended lines, provided only one hook or artificial lure is used on each line, except that additional gear may be used for northern pike and burbot as specified by statewide or area regulations.

(b) The maximum number of hooks and type of lines that may be deployed by an angler targeting all species of fish, including northern pike and burbot, is not cumulative and is equal to the maximum number of hooks allowed for northern pike, burbot, or other species, whichever is greater, provided that the maximum number of lines and hooks used to target a species may not exceed the number allowed for that species.

5 AAC 75.022. Freshwater sport fishing

(a) Unless otherwise provided in 5 AAC 47 - 5 AAC 75, a person may not fish in fresh water with

(1) fixed or weighted hooks and lures, except those of standard manufacture;

(2) multiple hooks with gap between point and shank larger than one-half inch;

(3) a spear;

(4) an arrow.

(b) Repealed 3/13/2004.

(c) It is unlawful to intentionally snag or attempt to snag any fish in fresh water. Fish unintentionally hooked elsewhere than in the mouth must be released immediately. "Snag" means hook a fish elsewhere than in the mouth.

(d) Beginning January 1, 2012, the use of footgear with absorbent felt or other fiber material on the soles is prohibited while sport fishing in fresh water.

5 AAC 75.023. Gear for single-hook waters

Repealed.

5 AAC 75.024. Gear for fly-fishing-only waters

In waters designated as fly-fishing-only waters, sport fishing is permitted only as follows:

(1) with not more than one single-hook artificial fly that weighs less than one-fourth ounce, including the hook, and with a gap between the point and shank of the hook that is three-eighths inch or less;

(2) weights may be used and any weights used must be 18 inches or more ahead of the artificial fly;

(3) an attractor as described in 5 AAC 75.020(b) may be used.

3. TOGIAK

Bronwyn Jones

Community Background

Togiak is located on Togiak Bay, about two miles southwest of the mouth of the Togiak River, in the Bristol Bay region in Southwest Alaska. Dillingham, Bristol Bay's regional center, is 67 miles to the east. Primary access to Togiak is by air from Dillingham; the community is not on a road system. Togiak village is located along the coastal expanse of Togiak Bay, and surrounding this community is miles of treeless tundra and the many lakes and streams that make up the Togiak National Wildlife Refuge.

At the time of the earliest European exploration of the Bristol Bay area in the late 18th century, the present-day Togiak area was occupied by the *Tuyuryarmiut* (also known as the *Togiagamiut*), one of the three Central Yup'ik-speaking regional groups of southwestern Alaska. The subsistence activities of the Tuyuryarmiut included hunting birds, small game, and marine mammals in spring; salmon fishing through the summer; hunting caribou; fishing for whitefish, Alaska blackfish, northern pike, and other fish; trapping beaver in fall; and hunting caribou, trapping furbearers, and fishing through the ice in the winter (VanStone 1984; Wolfe et al. 1984).

The community of Togiak developed at its present location in about 1950 with the founding of a school, as well as the construction of a cannery on the east side of Togiak Bay. It attracted families from other Yup'ik settlements in the Togiak Bay area, such as Old Togiak, Osviak, and villages along the Togiak River, all of which are no longer occupied year-round. Togiak has also drawn population from Yup'ik communities of the Kuskokwim River area (Coiley-Kenner et al. 2003; Sepez et al. 2005; Wolfe et al. 1984).

Today Togiak is incorporated as a second-class city. The Togiak Traditional Council is the Alaska Native tribal governing body. Presently, facilities in Togiak include the Togiak Sub-Regional Health Clinic, operated by the Bristol Bay Area Health Corporation, and most homes are connected to a piped water and sewer system as well as to electricity supplied by a new large diesel generator system. In 2010, Togiak Seafoods, a salmon processing facility, opened in Togiak, which is jointly owned by the Togiak Traditional Council (through funds provided by the Bristol Bay Economic Development Corporation) and Copper River Seafoods. The facility employs community residents. Another processor, Togiak Fisheries, owned by North Pacific Seafoods of Seattle, WA, operates on the east side of Togiak Bay.

A new school for grades kindergarten through 12 was constructed in 2004. During the 2017–2018 school year, 204 students were enrolled in the Togiak school.[1] The community has two grocery stores, a gasoline station, a fuel delivery service, and a takeout restaurant. Three air taxi services operate regular flights between Togiak and Dillingham. There is also a public library and cultural center.

Population Estimates and Demographic Information: 2016 and 2017

This study found an estimated population for Togiak in 2016 of 741 individuals in 184 households, and in 2017 the population was estimated to be 840 individuals in 198 households (Table 3-1). The 2016 estimate is lower than the 2010 U.S. Census Bureau estimate of 817 individuals in 261 households, and the American Community Survey (ACS) 5-year (2012–2016) average estimate of 771 individuals in 246 households (Figure 3-1; Table 3-1). The 2017 estimate is higher than both the 2010 U.S. Census Bureau population and household estimates and the ACS 5-year (2013–2017) average estimate of 749 individuals in 191 households. A reason these estimates differ may relate to different criteria used by the agencies to determine full-time residency. The criteria employed in this study required at least six consecutive months of occupancy in the community during the study years (2016 and 2017) and self-identification as a full-time resident.

1. Alaska Department of Education and Early Development, "Togiak School: School Information," https://education.alaska.gov/DOE_Rolodex/SchoolCalendar/Home/SchoolDetails/450110 (accessed November 2018).

Table 3-1.–Sample and demographic characteristics, Togiak, 2010, 2016 and 2017.

	Togiak[a]	
Characteristics	2016	2017
Sampled households	74	70
Eligible households	184	198
Percentage sampled	40.2%	35.4%
Sampled population	293	293
Estimated community population	740.5	839.6
Range[b]	656 – 825	754 – 925
Household size		
Mean	4.0	4.2
Minimum	1	1
Maximum	9	10
Age		
Mean	30.7	29.0
Minimum[c]	0	0
Maximum	84	87
Median	30	25
Alaska Native		
Estimated households[d]		
Number	182.8	188.0
Percentage	99.4%	94.9%
Estimated population		
Number	729.7	796.4
Percentage	98.5%	94.9%
Range[b]	647 – 813	707 – 886
U.S. Census	**(2010)**	**(2010)**
Households	261	261
Population	817	817
Alaska Native population	767	767
ACS 5-year average	**(2012–2016)**	**(2013–2017)**
Households	246	191
Range[e]	229 – 263	168 – 214
Population	771	749
Range[e]	695 – 847	665 – 833
Alaska Native Population	690	697
Range[e]	617 – 763	625 – 769

Sources U.S. Census Bureau (2011); U.S. Census Bureau for American Community Survey (ACS) for 2016 and 2017 estimates (5-year average); and ADF&G Division of Subsistence household surveys, 2017 and 2018.

a. A stratified random sampling method was used in Togiak.

b. Division of Subsistence estimates range is 95% confidence interval.

c. A minimum age of 0 (zero) is used for infants who are less than 1 year of age.

d. The estimated number of households in which at least 1 head of household is Alaska Native.

e. ACS data range is the reported margin of error.

The overall population of Togiak has increased since 1950 (Figure 3-2). The community experienced steady growth from a population of 220 in 1960 to 809 in 2000, followed by a relatively stable population from 2000 to 2010. A study conducted by the Division of Subsistence for 2008 estimated 801 residents in Togiak (Fall et al. 2012). Since the 2008 study, the population of Togiak has remained relatively steady.

Overall, both the 2016 and 2017 population profiles indicate that the ratio of females versus males is unevenly distributed within many age cohorts in Togiak (Figure 3-3; Figure 3-4). The 2016 study estimated the average age of Togiak residents to be 31 years old with the youngest individual being less than 1 year old and the oldest individual being 84 years old (Table 3-1). The 2017 study estimated the average age of Togiak residents to be 29 years old with the youngest individual being less than 1 year old and the oldest individual being 87 years old. The Togiak population is characterized by a strong representation of youth in the community as evidenced by the frequency that young age cohorts were relatively large. For the 2016 study year, the largest female age cohort was for the ages of 0–4 and the second largest female age cohort was for the ages of 50–54 (Table 3-2; Figure 3-3). The largest male age cohort in 2016 was for the ages of 5–9, and the second largest male age cohorts were for the ages of 0–4 and 10–14. In 2017, the largest female age cohort was for the ages of 10–14 and the second largest female age cohort was for the ages of 0–4 (Table 3-3; Figure 3-4). The largest male age cohort in 2017 was for the ages of 5–9, and the second largest male age cohort was for the ages of 0–4. In both study years, approximately 40% of the population was children (i.e., residents aged 0 to 19) (Table 3-2; Table 3-3).

The 2016 survey estimated 54% of household heads' parents were living in Togiak at the time of their birth, and 77% of Togiak's total population had parents living in Togiak when they were born (Table 3-4; Table 3-5). For the 2017 study year, 59% of household heads' parents were living in Togiak at the time of their birth, and 75% of Togiak's total population had parents living in this community when they were born (Table 3-6; Table 3-7).

According to the ACS 5-year (2013–2017) average estimate, which encompasses both study years for this community, the median household income in Togiak was $41,250 (U.S. Census Bureau n.d.). Commercial salmon fishing is an important industry and source of income for households in Togiak, and, generally, participation in the cash economy is linked to household subsistence participation characteristics (Wolfe 1984; Wolfe and Ellanna 1983). In 2016, an estimated 16% of Togiak households (28 households) indicated that 100% of their household income came from commercial fishing, 18% (31 households) had commercial fishing contribute 51%–75% to the household income, and an additional estimated 14% (25 households) indicated that 1%–25% of their household income came from commercial fishing; as such, approximately one-third of households were estimated to have had a majority of income provided by commercial fishing (Table 3-8). Similarly, in 2017, nearly an estimated one-third of households had the majority of income provided by commercial fishing (51%–99%). In both study years, about 30% of households got 1%–50% of income from commercial fishing, and slightly more than one-third (about 36%) of households did not have any income from commercial fishing. No additional questions about employment and income characteristics for Togiak households were included in the Division of Subsistence surveys for 2016 and 2017.

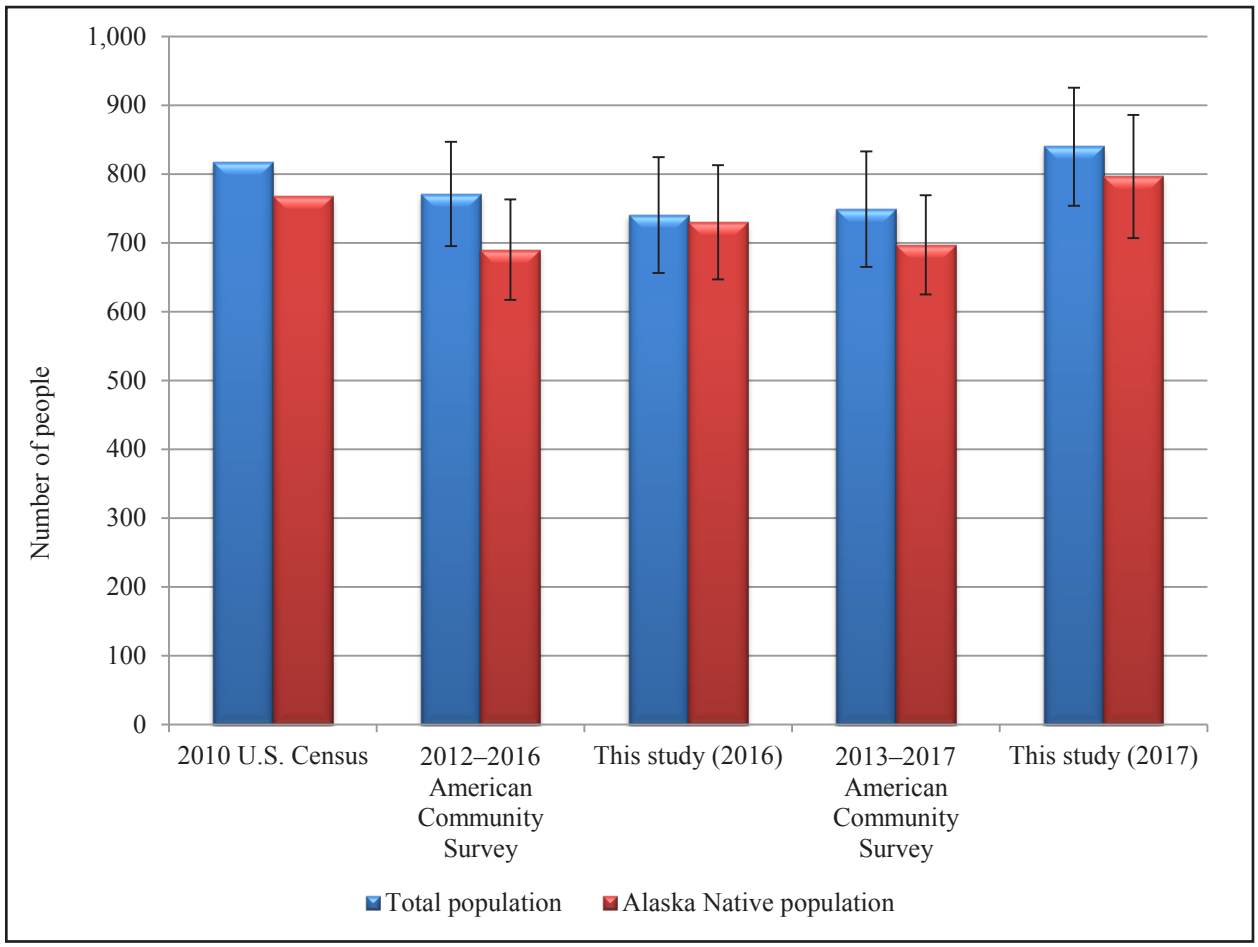

Figure 3-1.–Alaska Native and overall population estimates, Togiak, 2010, 2016, and 2017.

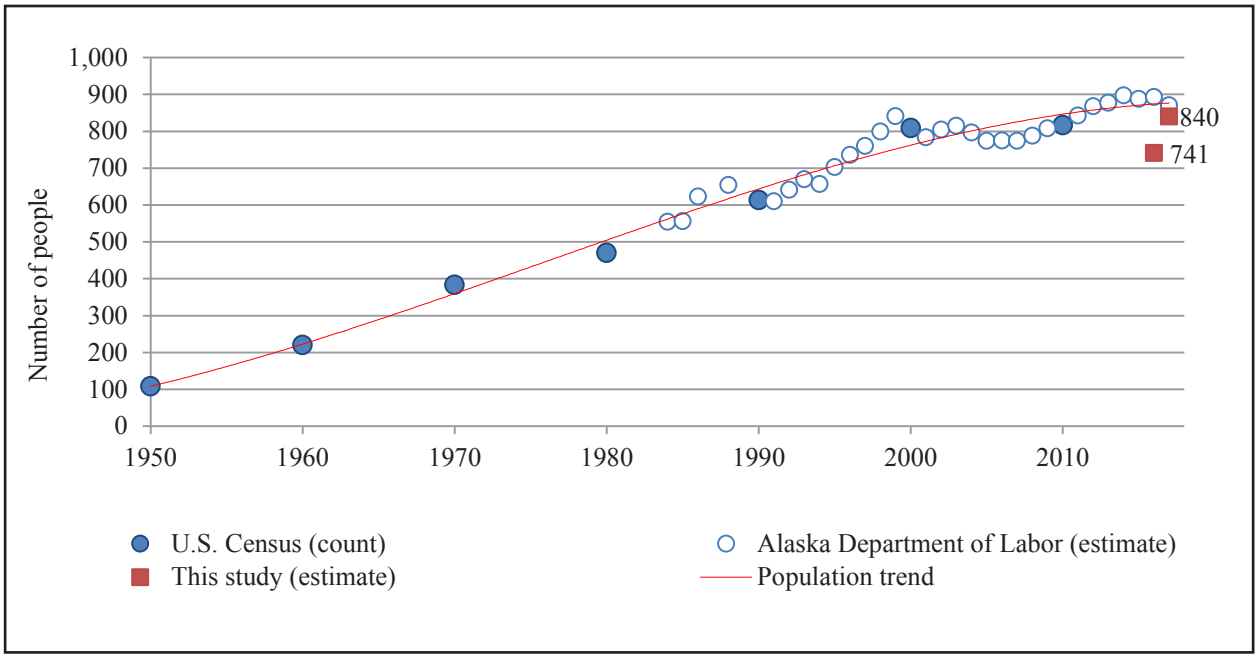

Figure 3-2.–Historical population estimates, Togiak, 1950–2017.

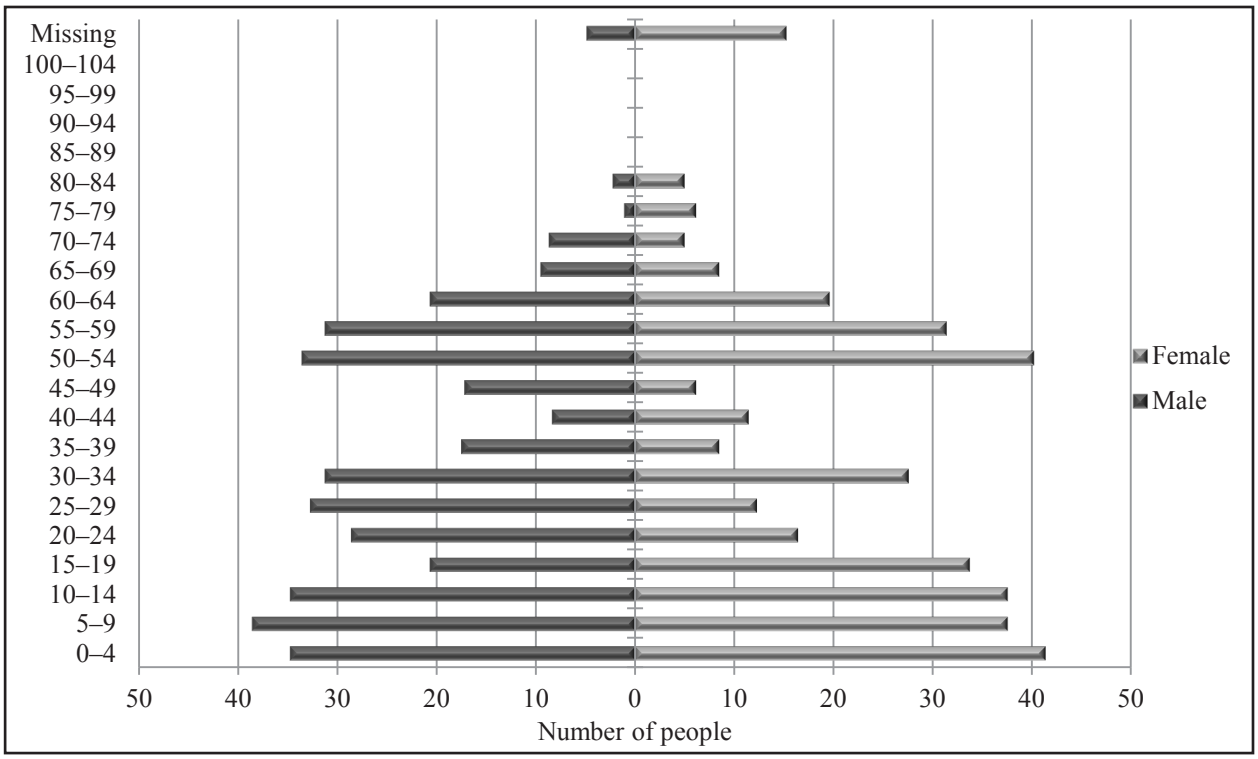

Figure 3-3.–Population profile, Togiak, 2016.

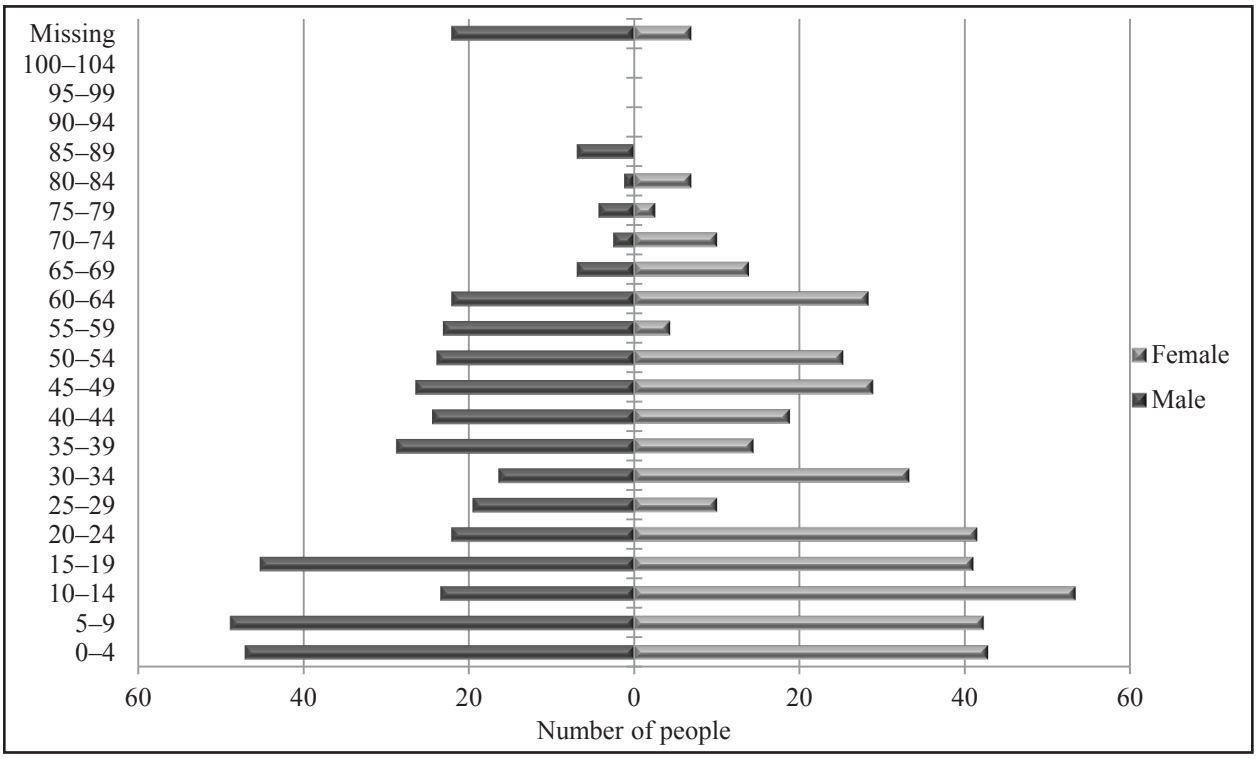

Figure 3-4.–Population profile, Togiak, 2017.

Table 3-2.–Population profile, Togiak, 2016.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	34.8	9.2%	9.2%	41.3	11.4%	11.4%	76.1	10.3%	10.3%
5–9	38.6	10.2%	19.4%	37.5	10.3%	21.7%	76.1	10.3%	20.5%
10–14	34.8	9.2%	28.7%	37.5	10.3%	32.0%	72.3	9.8%	30.3%
15–19	20.7	5.5%	34.2%	33.6	9.3%	41.3%	54.4	7.3%	37.7%
20–24	28.7	7.6%	41.7%	16.4	4.5%	45.8%	45.1	6.1%	43.7%
25–29	32.8	8.7%	50.4%	12.3	3.4%	49.2%	45.1	6.1%	49.8%
30–34	31.3	8.3%	58.7%	27.5	7.6%	56.8%	58.8	7.9%	57.8%
35–39	17.6	4.7%	63.4%	8.5	2.3%	59.1%	26.0	3.5%	61.3%
40–44	8.5	2.2%	65.6%	11.4	3.2%	62.3%	19.9	2.7%	64.0%
45–49	17.2	4.6%	70.2%	6.1	1.7%	64.0%	23.4	3.2%	67.1%
50–54	33.6	8.9%	79.1%	40.1	11.1%	75.0%	73.8	10.0%	77.1%
55–59	31.3	8.3%	87.4%	31.3	8.6%	83.6%	62.6	8.5%	85.6%
60–64	20.7	5.5%	92.9%	19.6	5.4%	89.0%	40.3	5.4%	91.0%
65–69	9.6	2.5%	95.4%	8.5	2.3%	91.4%	18.1	2.4%	93.4%
70–74	8.8	2.3%	97.8%	5.0	1.4%	92.7%	13.8	1.9%	95.3%
75–79	1.2	0.3%	98.1%	6.1	1.7%	94.4%	7.3	1.0%	96.3%
80–84	2.3	0.6%	98.7%	5.0	1.4%	95.8%	7.3	1.0%	97.3%
85–89	0.0	0.0%	98.7%	0.0	0.0%	95.8%	0.0	0.0%	97.3%
90–94	0.0	0.0%	98.7%	0.0	0.0%	95.8%	0.0	0.0%	97.3%
95–99	0.0	0.0%	98.7%	0.0	0.0%	95.8%	0.0	0.0%	97.3%
100–104	0.0	0.0%	98.7%	0.0	0.0%	95.8%	0.0	0.0%	97.3%
Missing	5.0	1.3%	100.0%	15.2	4.2%	100.0%	20.2	2.7%	100.0%
Total	**377.6**	**100.0%**	**100.0%**	**362.8**	**100.0%**	**100.0%**	**740.5**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2017.

Table 3-3.–Population profile, Togiak, 2017.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	47.1	11.3%	11.3%	42.7	10.1%	10.1%	89.7	10.7%	10.7%
5–9	48.9	11.8%	23.1%	42.2	10.0%	20.0%	91.0	10.8%	21.5%
10–14	23.4	5.6%	28.7%	53.2	12.6%	32.6%	76.6	9.1%	30.7%
15–19	45.3	10.9%	39.6%	40.9	9.6%	42.2%	86.1	10.3%	40.9%
20–24	22.1	5.3%	44.9%	41.4	9.8%	52.0%	63.5	7.6%	48.5%
25–29	19.5	4.7%	49.6%	10.0	2.4%	54.4%	29.6	3.5%	52.0%
30–34	16.5	4.0%	53.6%	33.2	7.8%	62.2%	49.6	5.9%	57.9%
35–39	28.8	6.9%	60.5%	14.4	3.4%	65.6%	43.2	5.1%	63.1%
40–44	24.4	5.9%	66.4%	18.8	4.4%	70.0%	43.2	5.1%	68.2%
45–49	26.5	6.4%	72.7%	28.8	6.8%	76.8%	55.3	6.6%	74.8%
50–54	23.9	5.8%	78.5%	25.2	5.9%	82.8%	49.1	5.8%	80.6%
55–59	23.1	5.6%	84.0%	4.4	1.0%	83.8%	27.5	3.3%	83.9%
60–64	22.1	5.3%	89.4%	28.3	6.7%	90.5%	50.4	6.0%	89.9%
65–69	6.9	1.7%	91.0%	13.9	3.3%	93.8%	20.8	2.5%	92.4%
70–74	2.6	0.6%	91.7%	10.0	2.4%	96.1%	12.6	1.5%	93.9%
75–79	4.4	1.1%	92.7%	2.6	0.6%	96.7%	6.9	0.8%	94.7%
80–84	1.3	0.3%	93.0%	6.9	1.6%	98.4%	8.2	1.0%	95.7%
85–89	6.9	1.7%	94.7%	0.0	0.0%	98.4%	6.9	0.8%	96.5%
90–94	0.0	0.0%	94.7%	0.0	0.0%	98.4%	0.0	0.0%	96.5%
95–99	0.0	0.0%	94.7%	0.0	0.0%	98.4%	0.0	0.0%	96.5%
100–104	0.0	0.0%	94.7%	0.0	0.0%	98.4%	0.0	0.0%	96.5%
Missing	22.1	5.3%	100.0%	6.9	1.6%	100.0%	29.1	3.5%	100.0%
Total	**415.8**	**100.0%**	**100.0%**	**423.8**	**100.0%**	**100.0%**	**839.6**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2018.

Table 3-4.–Birthplaces of household heads, Togiak, 2016.

Birthplace	Percentage
Akiachak	0.4%
Aleknagik	1.6%
Anchorage	2.0%
Bethel	7.5%
Clarks Point	1.3%
Dillingham	3.3%
Gweek River	1.3%
Goodnews Bay	1.3%
Hooper Bay	0.4%
Juneau	0.4%
Kasigluk	0.4%
Kipnuk	0.4%
Manokotak	5.3%
Nunapitchuk	0.4%
Platinum	2.5%
Quinhagak	3.8%
Togiak	54.3%
Twin Hills	1.6%
Wainwright	1.3%
Kuskokwim Delta	0.4%
Nelson Island	1.3%
Osviak	2.0%
Angel Bay	0.4%
Lower Yukon	1.3%
Other U.S.	2.8%
Missing	2.5%

Source ADF&G Division of Subsistence household surveys, 2017.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 3-5.–Birthplaces of population, Togiak, 2016.

Birthplace	Percentage
Akiachak	0.2%
Aleknagik	0.7%
Anchorage	2.0%
Bethel	3.1%
Clarks Point	0.5%
Dillingham	2.5%
Gweek River	0.5%
Goodnews Bay	0.5%
Hooper Bay	0.2%
Juneau	0.2%
Kasigluk	0.2%
Kipnuk	0.2%
Manokotak	2.7%
Nunapitchuk	0.2%
Platinum	1.5%
Quinhagak	1.5%
Togiak	77.0%
Twin Hills	1.2%
Wainwright	0.5%
Kuskokwim Delta	0.2%
Nelson Island	0.7%
Osviak	1.0%
Angel Bay	0.2%
Lower Yukon	0.5%
Other U.S.	1.1%
Missing	1.2%

Source ADF&G Division of Subsistence household surveys, 2017.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 3-6.–Birthplaces of household heads, Togiak, 2017.

Birthplace	Percentage
Akiachak	0.4%
Anchorage	5.5%
Bethel	4.2%
Dillingham	2.9%
Eek	1.3%
Goodnews Bay	1.3%
Hooper Bay	0.4%
Juneau	0.4%
Manokotak	2.9%
Naknek	1.3%
Napakiak	1.3%
New Stuyahok	1.3%
Platinum	1.7%
Port Alexander	1.3%
Quinhagak	3.7%
Togiak	59.1%
Twin Hills	1.3%
Yakutat	1.3%
Other U.S.	5.9%
Foreign	2.6%

Source ADF&G Division of Subsistence household surveys, 2018.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 3-7.–Birthplaces of population, Togiak, 2017.

Birthplace	Percentage
Akiachak	0.2%
Aleknagik	0.5%
Anchorage	4.5%
Bethel	1.9%
Dillingham	1.3%
Eek	0.5%
Fairbanks	0.5%
Goodnews Bay	0.5%
Hooper Bay	0.2%
Juneau	0.2%
Manokotak	1.2%
Naknek	0.5%
Napakiak	0.5%
New Stuyahok	0.5%
Platinum	1.2%
Port Alexander	0.5%
Quinhagak	1.5%
Togiak	74.9%
Twin Hills	1.0%
Wales	1.0%
Yakutat	0.5%
Osviak	0.3%
Old Togiak	0.2%
Other U.S.	4.1%
Foreign	1.0%
Missing	0.7%

Source ADF&G Division of Subsistence household surveys, 2018.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 3-8.–Estimated number of households having income from commercial fishing, Togiak, 2016 and 2017.

Percentage of income	2016		2017	
from commercial fishing	Number	Percentage	Number	Percentage
0%	64	36.5%	69	36.4%
1%–25%	25	14.1%	33	17.2%
26%–50%	29	16.3%	30	15.9%
51%–75%	31	17.6%	43	22.5%
76%–99%	0	0.0%	15	8.0%
100%	28	15.6%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Summary of Harvest and Use Patterns

All five species of Pacific salmon found in Alaska pass through the area surrounding Togiak on the way to freshwater spawning grounds. In this chapter, harvest survey results from this study (2016 and 2017) are first presented, which include harvest estimates and identifying the gear types[2] used to harvest salmon. Subsistence gillnets are used by Togiak community members to harvest salmon by setnetting and driftnetting. For setnetting, the gillnet is staked into the ground on both ends, while driftnetting requires a boat to which one end of the net is attached while the other end is held up by a buoy. Togiak community members setnet along beaches, in Togiak Bay, in tributaries of the Togiak River, and in Togiak Lake. Togiak households tend to limit driftnetting to the Togiak River. During the subsistence household survey, respondents were not prompted to specify which method of gillnetting they were using, therefore all gillnet harvests have been included in a single gear type category for this report.

Following an overview of survey results is a discussion of subsistence permit participation in Togiak. Next, the results of the harvest and use assessment questions from the household survey are presented. Assessment questions attempt to gauge to what degree salmon harvest and use patterns by the community have changed over time. Finally, the 2016 and 2017 salmon harvest data are then compared to harvest survey results from previous study years 1999 (Coiley-Kenner et al. 2003) and 2008 (Fall et al. 2012), and also compared to the subsistence salmon harvest permit data for 1983–2017. Following presentation of these data, local community comments and concerns are presented; information for this section came from the harvest surveys, and is contextualized with qualitative information obtained from key respondent interviews and participant observation.

Household Salmon Harvest and Use Characteristics in Togiak: 2016

In 2016, Togiak residents harvested an estimated total of 61,447 lb, or 83 lb per capita, of salmon (Table 3-9). In terms of total pounds harvested and harvest proportion in percentages, the greatest harvest by salmon species was Chinook salmon (25,445 lb, 34 lb per capita, or 41% of the total salmon harvest), followed by sockeye salmon (19,712 lb, 27 lb per capita, or 32%), coho salmon (7,772 lb, 11 lb per capita, or 13%), spawning sockeye salmon (4,934 lb, 7 lb per capita, or 8%), chum salmon (2,321 lb, 3 lb per capita, or 4%), and pink salmon (1,262 lb, 2 lb per capita, or 2%) (Table 3-9; Figure 3-5).

In 2016, an estimated 73% of community households owned a gillnet to harvest salmon and 71% of households owned a boat (Table 3-10). Overall, an estimated 48% of Togiak households owned a boat used for commercial fishing. In 2016, there were 36 households that indicated a person who was a commercial fishery permit holder resided at the residence, 37 households had crew members, and 47 households had either permit holders or crew members residing at the residence (Table 3-11). Based on responses from surveyed households that retained salmon from commercial catches, an estimated 75 households indicated that its members usually retain Chinook salmon from commercial fishing for home use, and an estimated 63 households indicated they usually retain Chinook for home use and also participate in subsistence salmon fishing (Table 3-12).

Table 3-13 lists in number of fish and pounds harvested each salmon species harvested by Togiak residents in 2016; Figure 3-6 is a complementary visual representation of the salmon harvest weight caught by gear type. Togiak residents harvested the majority of their salmon by subsistence gillnets (68% of salmon harvest weight); the other methods used to harvest salmon were removals from commercial catches (28% of harvest weight), and rod and reel (4%) (Table 3-14). More than one-half (61%) of the Chinook salmon harvest was caught using subsistence gillnets, 38% was removed from commercial catches, and the remaining 1% was harvested using an unspecified method or rod and reel. For sockeye salmon, 73% of the harvest weight was caught using subsistence gillnets, 26% was removed from commercial catches, and 2% of the sockeye salmon harvest was caught using rod and reel. Slightly more than one-half (55%) of the coho salmon harvest weight was caught using subsistence gillnets; the other methods used to harvest coho salmon were

2. According to both state and federal subsistence salmon fishing regulations, spear is a legal subsistence gear type in Togiak River; however, no surveyed households used spears.

Table 3-9.–Estimated uses and harvests of salmon, Togiak, 2016.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
Salmon	**97.3**	**75.3**	**75.3**	**61.5**	**62.4**	**61,446.6**	**333.9**	**83.0**	**11,634.0**	**ind**	**63.2**	**24.5**
Chum salmon	44.6	29.5	29.5	23.5	19.7	2,321.2	12.6	3.1	515.1	ind	2.8	29.5
Coho salmon	69.5	52.4	51.8	32.4	30.0	7,772.0	42.2	10.5	1,744.3	ind	9.5	29.4
Chinook salmon	86.3	68.5	68.5	41.8	42.7	25,445.2	138.3	34.4	2,704.1	ind	14.7	39.4
Pink salmon	33.3	24.0	24.0	14.6	15.2	1,261.7	6.9	1.7	441.2	ind	2.4	33.5
Sockeye salmon	87.7	62.3	62.3	47.6	48.1	19,712.4	107.1	26.6	4,982.2	ind	27.1	21.6
Spawning sockeye salmon	27.2	21.0	21.0	9.6	9.5	4,934.2	26.8	6.7	1,247.1	ind	6.8	45.3
Unknown salmon	2.1	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2017.

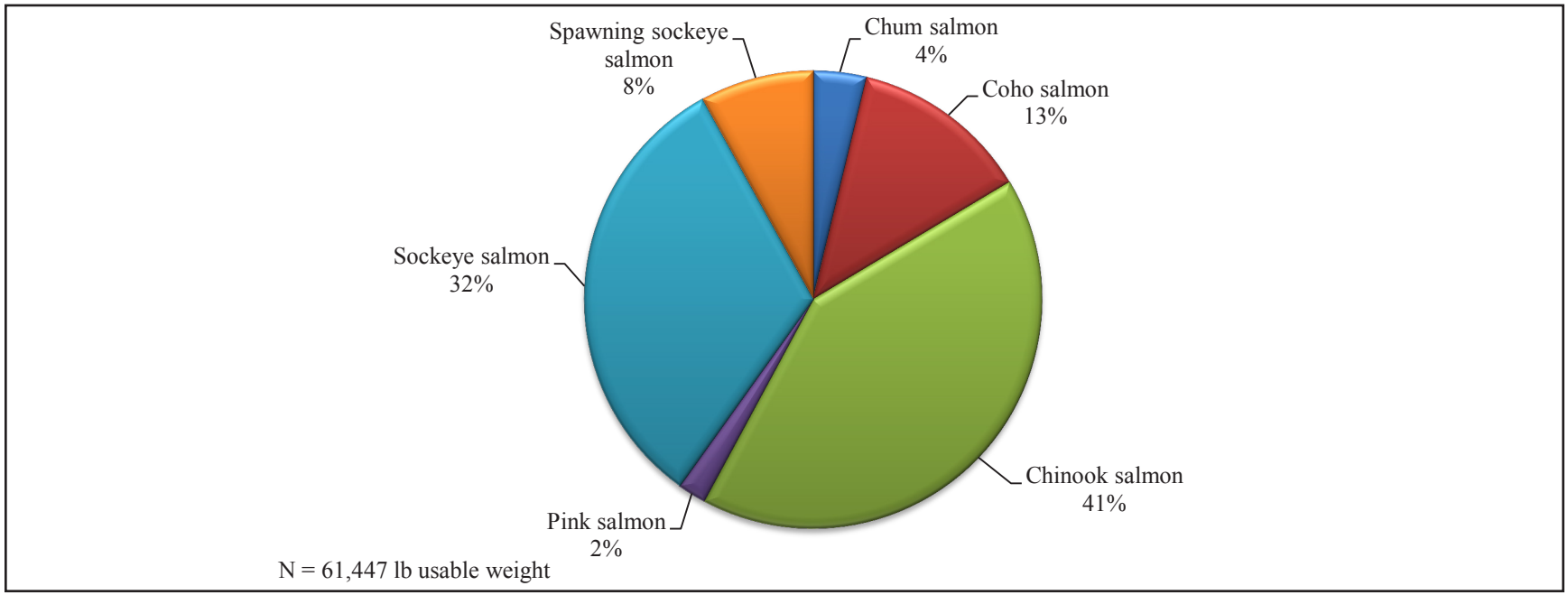

Figure 3-5.–Composition of salmon harvest in pounds usable weight, Togiak, 2016.

Table 3-10.–Estimated number of households owning a net or boat, Togiak, 2016.

Estimated households	Households owning a net		Households _____ . owning a boat		owning a boat used for commercial fishing	
	Number	Percentage	Number	Percentage	Number	Percentage
184.0	134.8	73.3%	131.0	71.2%	88.0	47.8%

Source ADFG Division of Subsistence household surveys, 2017.

Table 3-11.–Reported number of households having a household member involved with commercial salmon fishing, by commercial fishery role, Togiak, 2016.

	Commercial salmon fishery role		
	Permit holder	Crew	Either
Number of households	36	37	47

Source ADF&G Division of Subsistence household surveys, 2017.
Note This question was asked only of households that commercial fished in the study year.

Table 3-12.–Estimated number of households that usually retain Chinook salmon from commercial catch for home use and subsistence fish, Togiak, 2016.

	Household usually _____ .	
	retains Chinook salmon from commercial fishing	retains Chinook salmon from commercial fishing, and participates in subsistence salmon fishing
Number of households	75	63

Source ADF&G Division of Subsistence household surveys, 2017.

rod and reel (27%), and removals from commercial catches (18%). Coho salmon, which made up 83% of the rod and reel harvest weight, is the only species more often fished for by rod and reel. The majority of chum salmon were harvested using subsistence gillnets (85% of harvest weight), and 15% of the harvest weight was removed from commercial catches. For pink salmon, 56% of the harvest weight was caught using subsistence gillnets and the remaining 44% of the pink salmon harvest weight was harvested through removals from commercial catches.

Figure 3-7 shows the percentages of households that used salmon, and attempted to harvest and harvested salmon. During 2016, 97% of Togiak households used salmon, and 75% attempted to harvest salmon and all were successful in their salmon harvest pursuits. More than one-half of the Togiak households shared salmon in 2016: 62% of households gave salmon away and 62% of households received salmon during the study year (Table 3-9).

Sockeye salmon was the most used salmon species in 2016; the majority (88%) of Togiak households used sockeye salmon during the study year, 62% of households harvested sockeye salmon, 48% shared this salmon species, and 48% of households received sockeye salmon (Table 3-9). For Chinook salmon, most (86%) Togiak households used Chinook salmon during the study year, 69% of households harvested Chinook salmon, 43% shared this salmon species, and 42% received Chinook salmon. In 2016, more than one-half (70%) of Togiak households used coho salmon, 52% harvested this salmon species, 30% gave away coho salmon, and 32% of households received this salmon species. A little less than one-half (45%) of Togiak households used chum salmon in 2016. A smaller percentage (33%) of households in Togiak used pink salmon in 2016, and 27% of households used spawning sockeye salmon during the study year.

In 2016, starting from the west and moving toward the east, Togiak respondents reported harvesting Chinook salmon near the mouth of the Osviak River, close to First and Second creeks, along the beaches near the community of Togiak, in the mouth of the Togiak River, in the Togiak River as far north as Ekilik, along the eastern shore of Togiak Bay, and at Anchor Point and Rocky Point (Figure 3-8). During the first study year, the other salmon species (chum, coho, pink, and sockeye) were generally harvested in the same locations as Chinook salmon (Figure 3-9). Most sockeye salmon spawnouts were harvested in Togiak Lake in 2016. Several Togiak households harvested sockeye salmon spawnouts at the mouth of Togiak Lake, while other households traveled north to harvest these salmon further up in the lake (Figure 3-10).

Table 3-13.–Estimated harvest of salmon by gear type and resource, Togiak, 2016.

	Removed from commercial catch		Subsistence methods									
			Gillnet		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**2,888.8**	**17,037.8**	**8,175.8**	**41,846.4**	**11.1**	**65.4**	**8,186.9**	**41,911.8**	**558.2**	**2,497.1**	**11,634.0**	**61,446.6**
Chum salmon	76.6	345.4	437.3	1,970.5	1.2	5.2	438.4	1,975.8	0.0	0.0	515.1	2,321.2
Coho salmon	319.9	1,425.2	961.0	4,281.9	0.0	0.0	961.0	4,281.9	463.4	2,064.9	1,744.3	7,772.0
Chinook salmon	1,030.3	9,695.3	1,659.5	15,615.6	3.8	35.9	1,663.3	15,651.5	10.5	98.4	2,704.1	25,445.2
Pink salmon	193.8	554.2	247.4	707.5	0.0	0.0	247.4	707.5	0.0	0.0	441.2	1,261.7
Sockeye salmon	1,268.2	5,017.7	3,624.7	14,341.3	5.0	19.7	3,629.6	14,361.0	84.4	333.7	4,982.2	19,712.4
Spawning sockeye salmon	0.0	0.0	1,245.9	4,929.6	1.2	4.6	1,247.1	4,934.2	0.0	0.0	1,247.1	4,934.2
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2017.

Note The harvested number of salmon is represented as individual fish harvested.

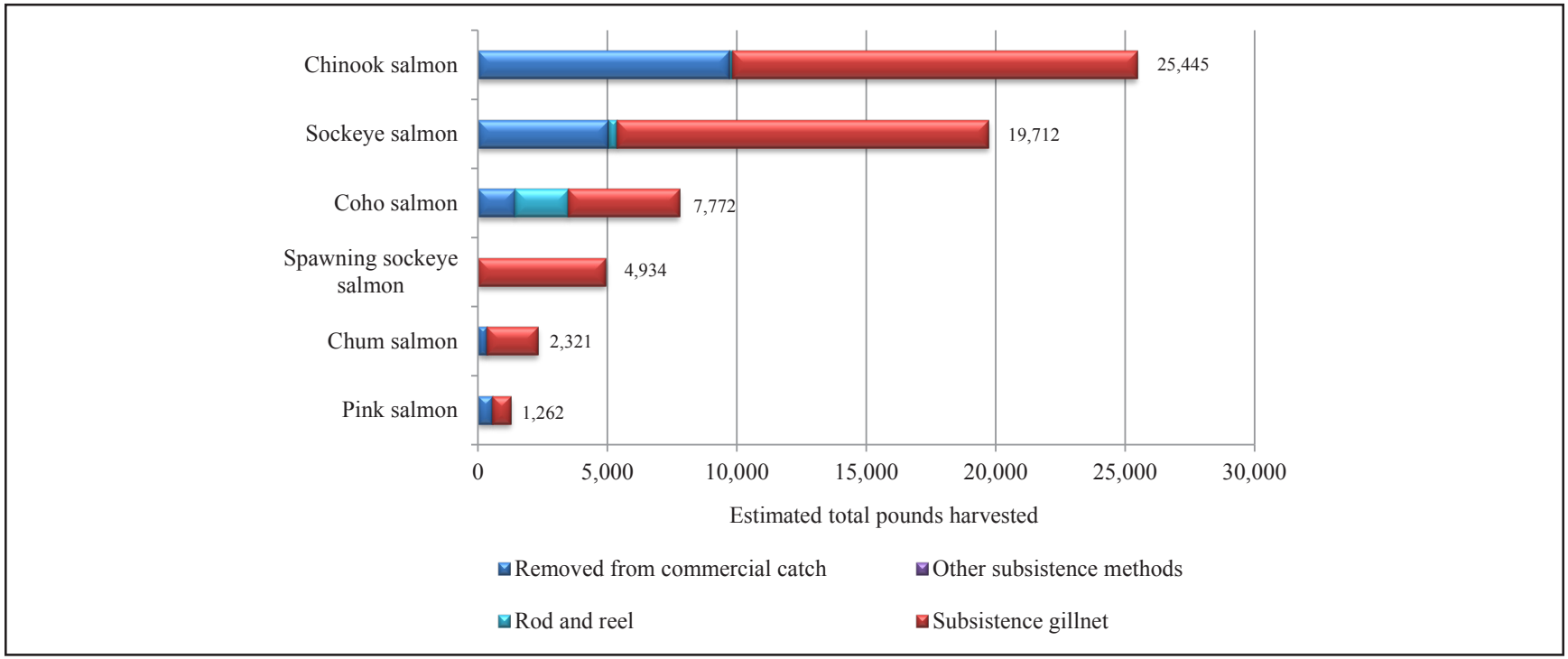

Figure 3-6.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Togiak, 2016.

Table 3-14.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Togiak, 2016.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet	Other	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**27.7%**	**68.1%**	**0.1%**	**68.2%**	**4.1%**	**100.0%**
	Total	**27.7%**	**68.1%**	**0.1%**	**68.2%**	**4.1%**	**100.0%**
Chum salmon	Gear type	2.0%	4.7%	8.0%	4.7%	0.0%	3.8%
	Resource	14.9%	84.9%	0.2%	85.1%	0.0%	100.0%
	Total	0.6%	3.2%	0.0%	3.2%	0.0%	3.8%
Coho salmon	Gear type	8.4%	10.2%	0.0%	10.2%	82.7%	12.6%
	Resource	18.3%	55.1%	0.0%	55.1%	26.6%	100.0%
	Total	2.3%	7.0%	0.0%	7.0%	3.4%	12.6%
Chinook salmon	Gear type	56.9%	37.3%	54.9%	37.3%	3.9%	41.4%
	Resource	38.1%	61.4%	0.1%	61.5%	0.4%	100.0%
	Total	15.8%	25.4%	0.1%	25.5%	0.2%	41.4%
Pink salmon	Gear type	3.3%	1.7%	0.0%	1.7%	0.0%	2.1%
	Resource	43.9%	56.1%	0.0%	56.1%	0.0%	100.0%
	Total	0.9%	1.2%	0.0%	1.2%	0.0%	2.1%
Sockeye salmon	Gear type	29.5%	34.3%	30.1%	34.3%	13.4%	32.1%
	Resource	25.5%	72.8%	0.1%	72.9%	1.7%	100.0%
	Total	8.2%	23.3%	0.0%	23.4%	0.5%	32.1%
Spawning sockeye salmon	Gear type	0.0%	11.8%	7.0%	11.8%	0.0%	8.0%
	Resource	0.0%	99.9%	0.1%	100.0%	0.0%	100.0%
	Total	0.0%	8.0%	0.0%	8.0%	0.0%	8.0%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

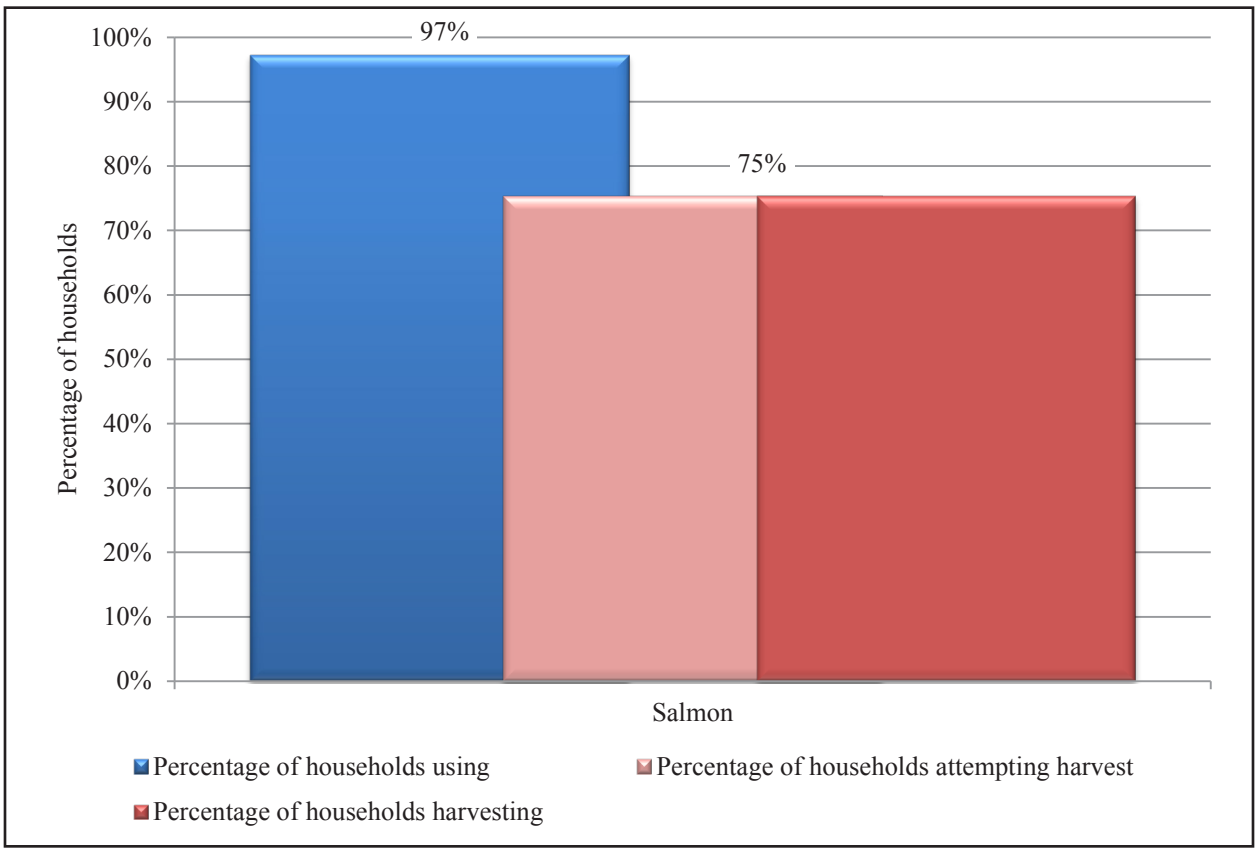

Figure 3-7.–Percentage of households using, attempting to harvest, and harvesting salmon, Togiak, 2016.

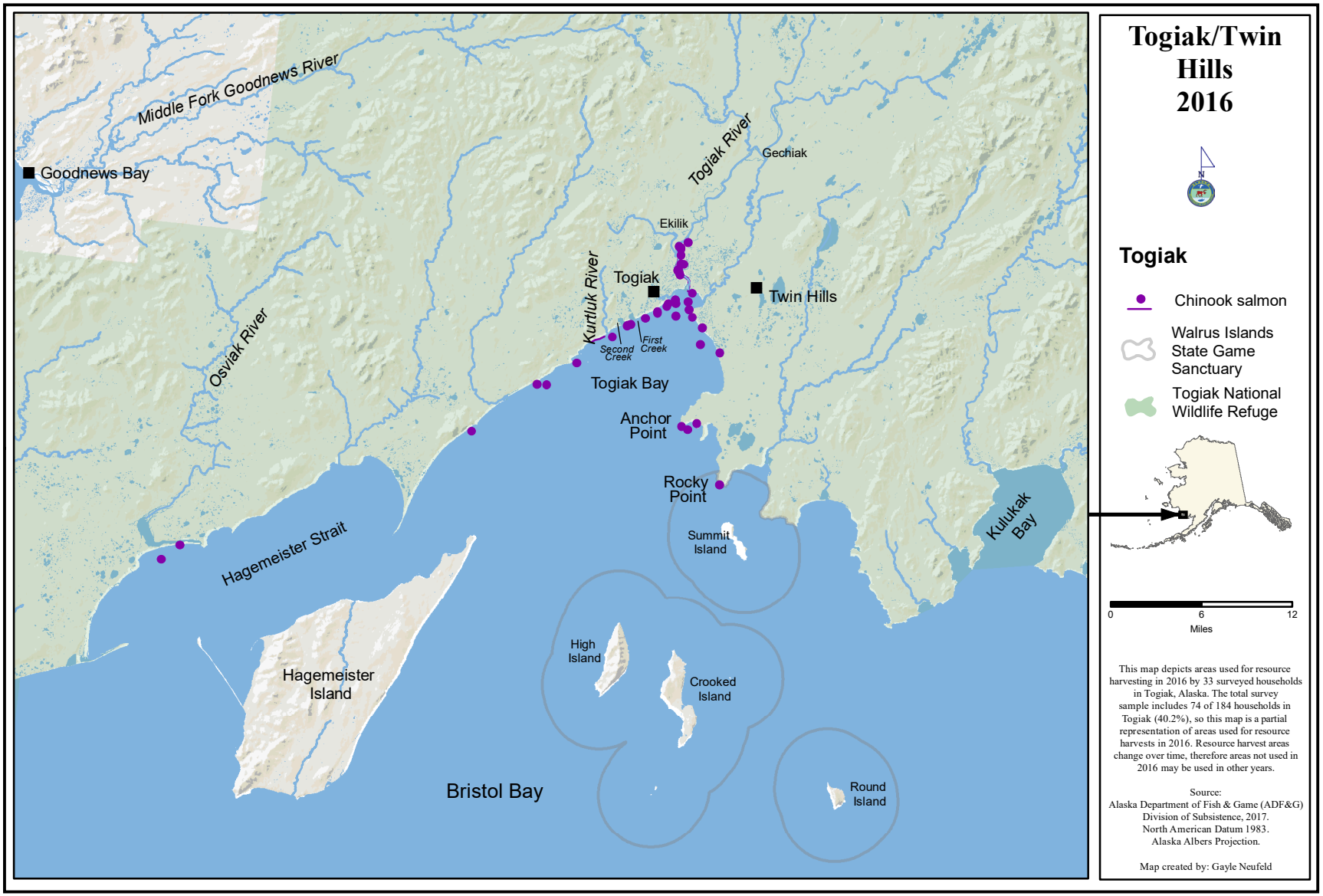

Figure 3-8.–Fishing and harvest locations for Chinook salmon, Togiak, 2016.

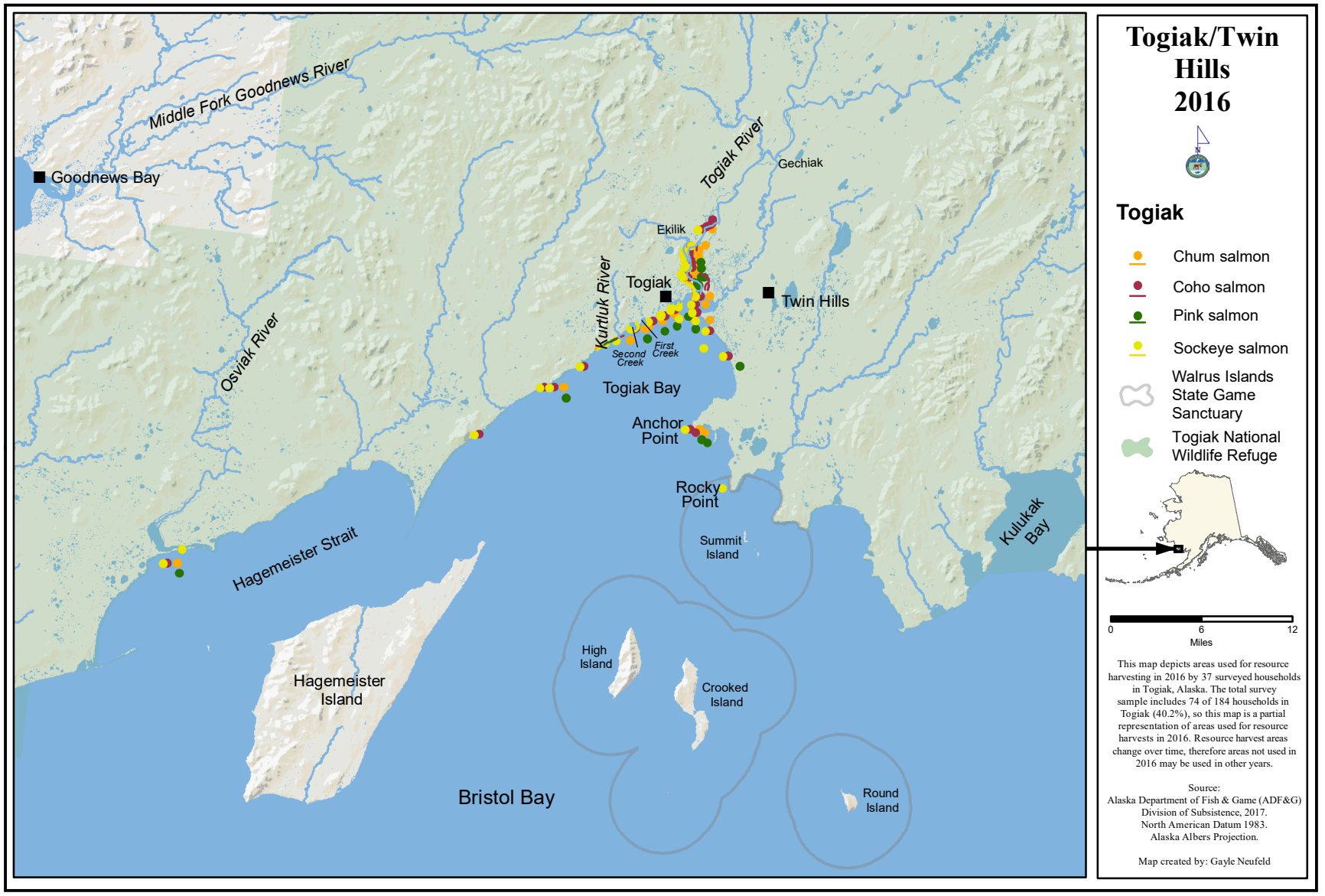

Figure 3-9.–Fishing and harvest locations for chum, coho, pink, and sockeye salmon, Togiak, 2016.

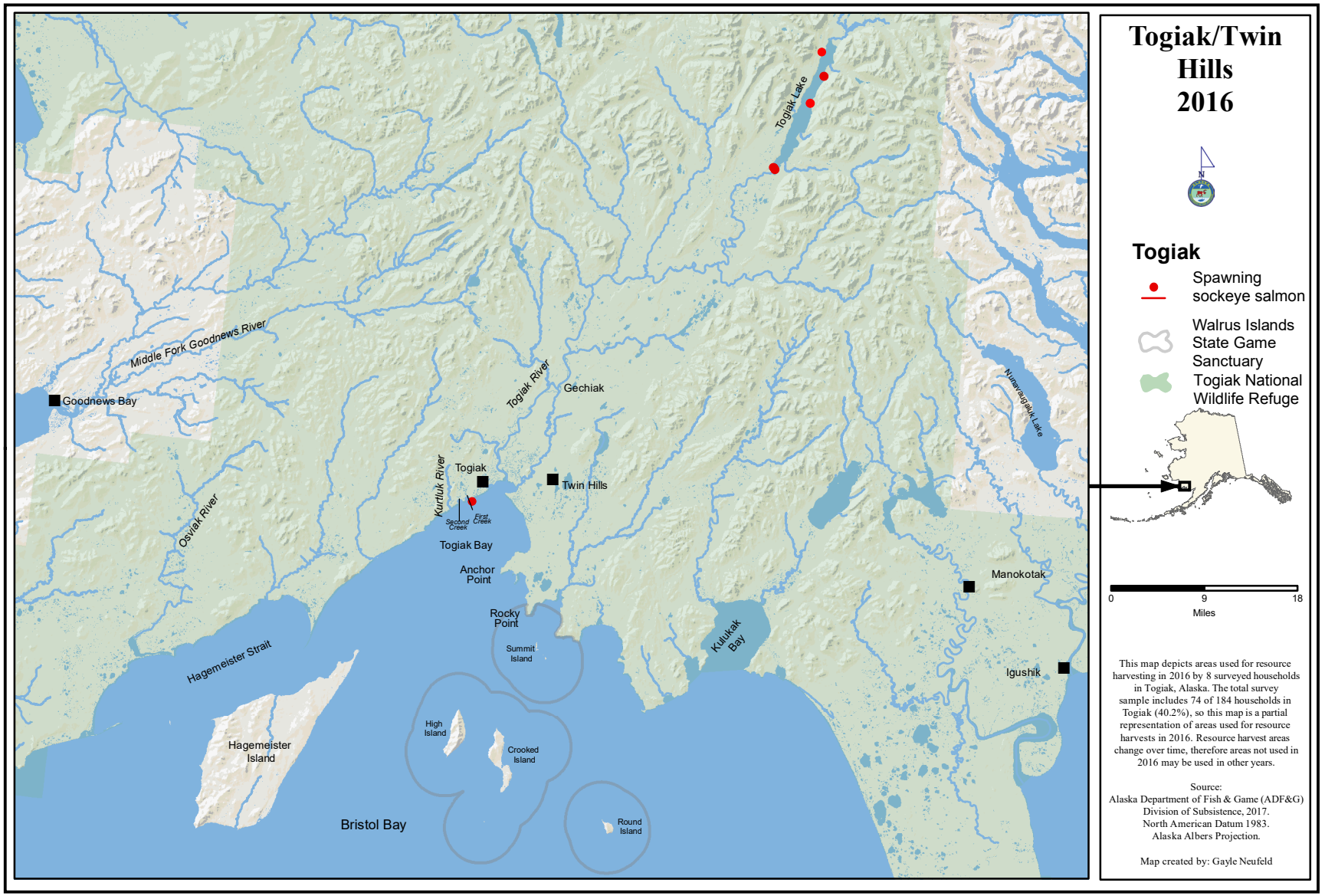

Figure 3-10.–Fishing and harvest locations for spawning sockeye salmon, Togiak, 2016.

Household Salmon Harvest and Use Characteristics in Togiak: 2017

In 2017, Togiak residents harvested an estimated total of 91,573 lb, or 109 lb per capita, of salmon (Table 3-15). In terms of total pounds harvested and harvest proportion in percentages, the greatest harvest by salmon species was sockeye salmon (40,844 lb, 48 lb per capita, or 44%), followed by Chinook salmon (22,787 lb, 27 lb per capita, or 25% of the total salmon harvest), coho salmon (18,156 lb, 22 lb per capita, or 20%), spawning sockeye salmon (5,272 lb, 6 lb per capita, or 6%), chum salmon (3,305 lb, 4 lb per capita, or 3%), and pink salmon (1,570 lb, 2 lb per capita, or 2%) (Table 3-15; Figure 3-11).

In study year 2017, an estimated 65% of Togiak households owned a gillnet to harvest salmon and 73% of households owned a boat (Table 3-16). Overall, an estimated 40% of households in Togiak owned a boat used for commercial fishing. In 2017, there were 29 households that indicated a person holding a commercial fishery permit resided at the residence, 25 households had crew members, and 45 households had either permit holders or crew members residing at the residence (Table 3-17). Based on responses from surveyed households that retained salmon from commercial catches, an estimated 88 households indicated that its members usually retain Chinook salmon from commercial fishing for home use, and an estimated 67 households indicated they usually retain Chinook salmon from commercial fishing for home use and also participate in subsistence salmon fishing (Table 3-18).

Table 3-19 lists in number of fish and pounds harvested each salmon species harvested by Togiak residents in 2017; Figure 3-12 is a complementary visual representation of the salmon harvest weight caught by gear type. Togiak residents harvested most of their salmon by subsistence gillnets (73% of salmon harvest weight); the other methods used to harvest salmon were removals from commercial catches (13% of harvest weight), rod and reel (13%), and a nominal 1% of the harvest was caught by another unspecified subsistence method (Table 3-20). More than one-half (66%) of the Chinook salmon harvest weight was caught using subsistence gillnets, 28% was removed from commercial catches, and the remaining 6% was caught with rod and reel. For sockeye salmon, 91% of the harvest weight was caught using subsistence gillnets, almost 9% was removed from commercial catches, and less than 1% of the sockeye salmon harvest was caught using rod and reel. Slightly more than one-half (55%) of the coho salmon harvest weight was caught using rod and reel; the other methods used to harvest coho salmon were subsistence gillnets (36% of harvest weight) and removals from commercial catches (9%). The majority of chum salmon were harvested using subsistence gillnets (86% of harvest weight), 10% of the harvest weight was removed from commercial catches, and 4% was harvested using rod and reel. For pink salmon, 72% of the harvest weight was caught using subsistence gillnets, 24% of the harvest weight was removed from commercial catches, and the remaining 4% was harvested using rod and reel (Table 3-20).

Figure 3-13 shows the percentages of households that used salmon, and attempted to harvest and harvested salmon. During 2017, 96% of Togiak households used salmon, 89% attempted to harvest salmon, and almost all households that attempted to harvest salmon were successful (86% of community households overall). More than one-half of the Togiak households in 2017 shared salmon: 70% of households gave salmon away and 58% of households received salmon during the study year (Tale 3-15).

In 2017, the majority (92%) of Togiak households used sockeye salmon, 71% of households harvested sockeye salmon, 51% shared this salmon species, and 42% received sockeye salmon (Table 3-15). For Chinook salmon, 90% of Togiak households used this salmon species during the study year, 75% of households harvested Chinook salmon, 43% shared this salmon species, and 39% received Chinook salmon. In 2017, more than one-half (72%) of Togiak households used coho salmon, 58% harvested this salmon species, 37% gave away coho salmon, and 33% of households received coho salmon. Less than one-half (39%) of Togiak households used chum salmon in 2017. A smaller percentage (20%) of households in Togiak used pink salmon in 2017, and 8% of households used spawning sockeye salmon during the study year.

Table 3-15.–Estimated uses and harvests of salmon, Togiak, 2017.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**96.5**	**88.6**	**86.4**	**57.8**	**69.5**	**91,573.4**	**462.5**	**109.1**	**19,359.2**	**ind**	**97.8**	**33.6**
Chum salmon	39.0	32.6	28.2	16.2	11.6	3,304.6	16.7	3.9	702.4	ind	3.5	34.4
Coho salmon	72.1	60.0	57.8	33.0	37.1	18,155.9	91.7	21.6	3,808.4	ind	19.2	62.7
Chinook salmon	90.1	80.0	74.9	39.4	43.2	22,786.7	115.1	27.1	2,746.8	ind	13.9	26.2
Pink salmon	19.7	15.6	15.6	4.2	5.7	1,570.4	7.9	1.9	574.7	ind	2.9	85.7
Sockeye salmon	92.1	77.5	70.9	41.6	51.4	40,483.7	204.5	48.2	10,198.8	ind	51.5	40.1
Spawning sockeye salmon	7.9	7.9	7.9	0.6	5.1	5,272.0	26.6	6.3	1,328.1	ind	6.7	79.1
Unknown salmon	4.4	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2018.

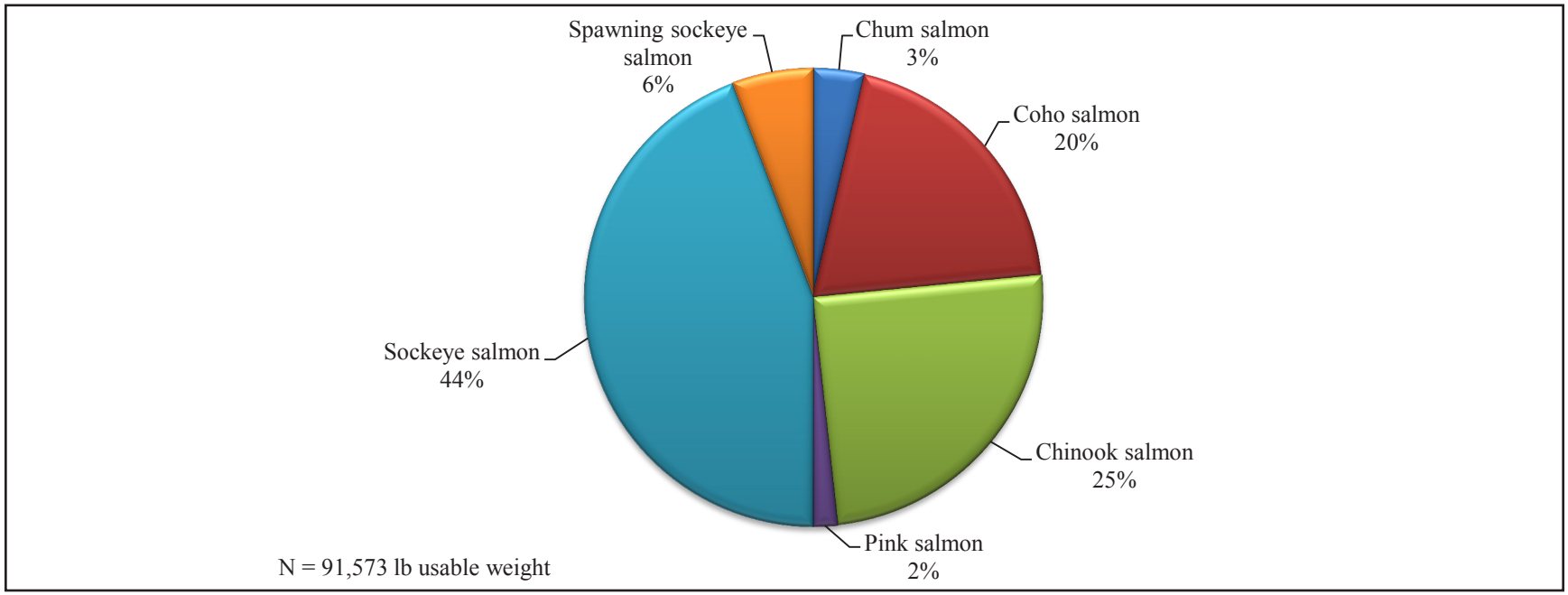

Figure 3-11.–Composition of salmon harvest in pounds usable weight, Togiak, 2017.

Table 3-16.–Estimated number of households owning a net or boat, Togiak, 2017.

Estimated households	Households owning a net		Households _____ . owning a boat		owning a boat used for commercial fishing	
	Number	Percentage	Number	Percentage	Number	Percentage
198.0	128.6	64.9%	144.6	73.0%	78.4	39.6%

Source ADFG Division of Subsistence household surveys, 2018.

Table 3-17.–Reported number of households having a household member involved with commercial salmon fishing, by commercial fishery role, Togiak, 2017.

	Commercial salmon fishery role		
	Permit holder	Crew	Either
Number of households	29	25	45

Source ADF&G Division of Subsistence household surveys, 2018.
Note This question was asked only of households that commercial fished in the study year.

Table 3-18.–Estimated number of households that usually retain Chinook salmon from commercial catch for home use and subsistence fish, Togiak, 2017.

	Household usually _____ .	
	retains Chinook salmon from commercial fishing	retains Chinook salmon from commercial fishing, and participates in subsistence salmon fishing
Number of households	88	67

Source ADF&G Division of Subsistence household surveys, 2018.

Table 3-19.–Estimated harvest of salmon by gear type and resource, Togiak, 2017.

Resource	Removed from commercial catch		Subsistence methods: Gillnet		Subsistence methods: Other method		Subsistence methods: Subsistence gear, any method		Rod and reel		Any method	
	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**2,185.9**	**12,145.6**	**14,661.4**	**67,085.8**	**131.1**	**520.0**	**14,792.5**	**67,605.8**	**2,380.8**	**11,822.0**	**19,359.2**	**91,573.4**
Chum salmon	73.0	343.6	600.4	2,824.9	0.0	0.0	600.4	2,824.9	28.9	136.1	702.4	3,304.6
Coho salmon	323.2	1,540.9	1,381.2	6,584.8	1.3	6.1	1,382.5	6,590.9	2,102.7	10,024.1	3,808.4	18,155.9
Chinook salmon	768.3	6,374.0	1,816.7	15,071.0	0.0	0.0	1,816.7	15,071.0	161.7	1,341.8	2,746.8	22,786.7
Pink salmon	135.0	368.9	416.6	1,138.3	1.3	3.5	417.9	1,141.8	21.9	59.7	574.7	1,570.4
Sockeye salmon	886.3	3,518.2	9,246.9	36,705.2	0.0	0.0	9,246.9	36,705.2	65.6	260.3	10,198.8	40,483.7
Spawning sockeye salmon	0.0	0.0	1,199.6	4,761.7	128.6	510.4	1,328.1	5,272.0	0.0	0.0	1,328.1	5,272.0
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2018.

Note The harvested number of salmon is represented as individual fish harvested.

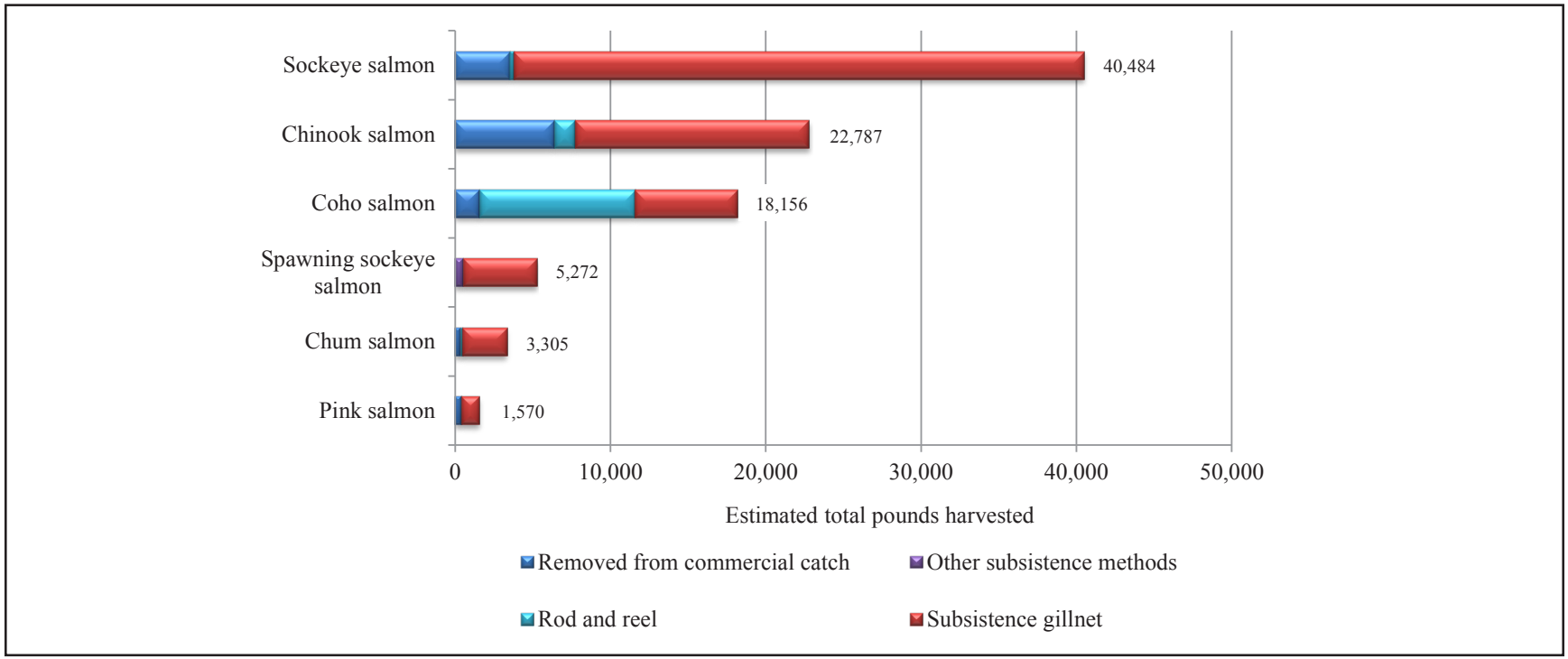

Figure 3-12.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Togiak, 2017.

Table 3-20.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Togiak, 2017.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet	Other	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**13.3%**	**73.3%**	**0.6%**	**73.8%**	**12.9%**	**100.0%**
	Total	**13.3%**	**73.3%**	**0.6%**	**73.8%**	**12.9%**	**100.0%**
Chum salmon	Gear type	2.8%	4.2%	0.0%	4.2%	1.2%	3.6%
	Resource	10.4%	85.5%	0.0%	85.5%	4.1%	100.0%
	Total	0.4%	3.1%	0.0%	3.1%	0.1%	3.6%
Coho salmon	Gear type	12.7%	9.8%	1.2%	9.7%	84.8%	19.8%
	Resource	8.5%	36.3%	0.0%	36.3%	55.2%	100.0%
	Total	1.7%	7.2%	0.0%	7.2%	10.9%	19.8%
Chinook salmon	Gear type	52.5%	22.5%	0.0%	22.3%	11.3%	24.9%
	Resource	28.0%	66.1%	0.0%	66.1%	5.9%	100.0%
	Total	7.0%	16.5%	0.0%	16.5%	1.5%	24.9%
Pink salmon	Gear type	3.0%	1.7%	0.7%	1.7%	0.5%	1.7%
	Resource	23.5%	72.5%	0.2%	72.7%	3.8%	100.0%
	Total	0.4%	1.2%	0.0%	1.2%	0.1%	1.7%
Sockeye salmon	Gear type	29.0%	54.7%	0.0%	54.3%	2.2%	44.2%
	Resource	8.7%	90.7%	0.0%	90.7%	0.6%	100.0%
	Total	3.8%	40.1%	0.0%	40.1%	0.3%	44.2%
Spawning sockeye salmon	Gear type	0.0%	7.1%	98.1%	7.8%	0.0%	5.8%
	Resource	0.0%	90.3%	9.7%	100.0%	0.0%	100.0%
	Total	0.0%	5.2%	0.6%	5.8%	0.0%	5.8%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

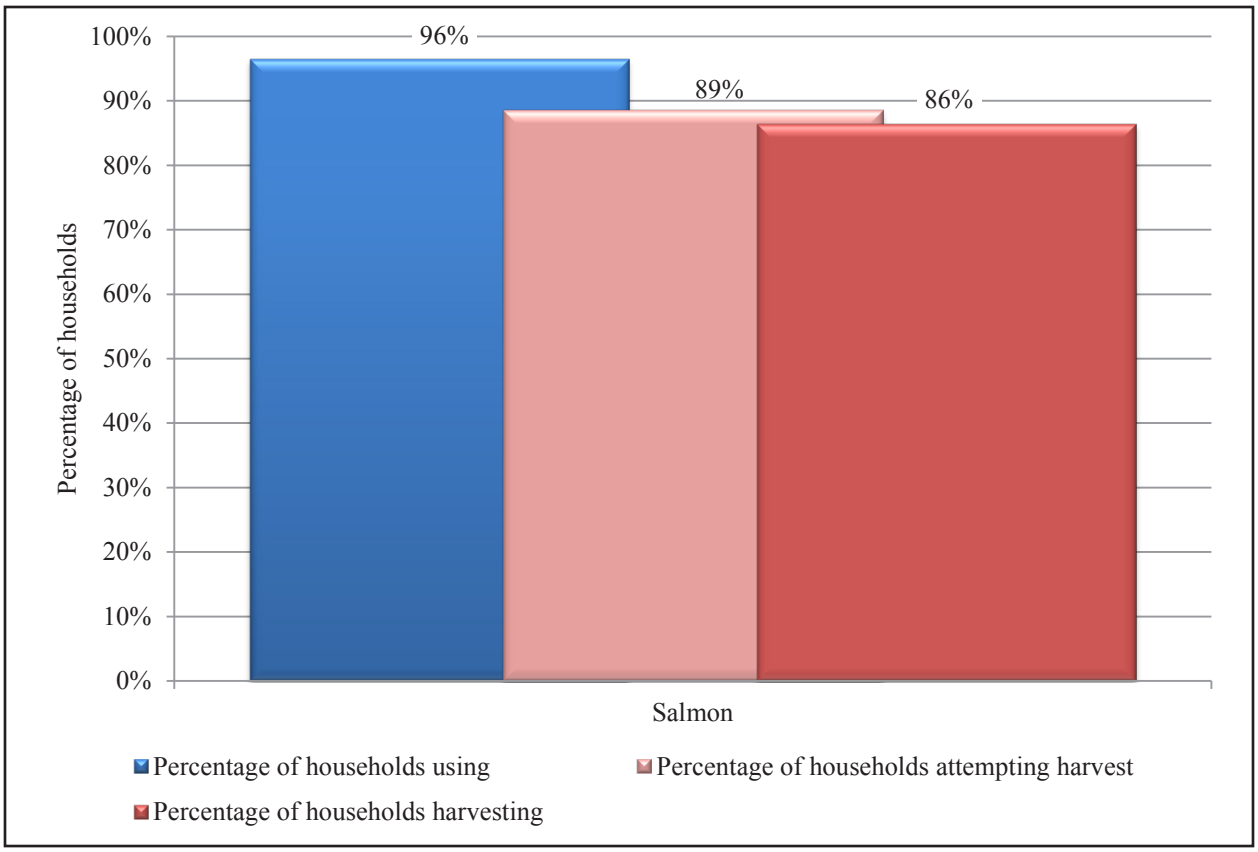

Figure 3-13.–Percentage of households using, attempting to harvest, and harvesting salmon, Togiak, 2017.

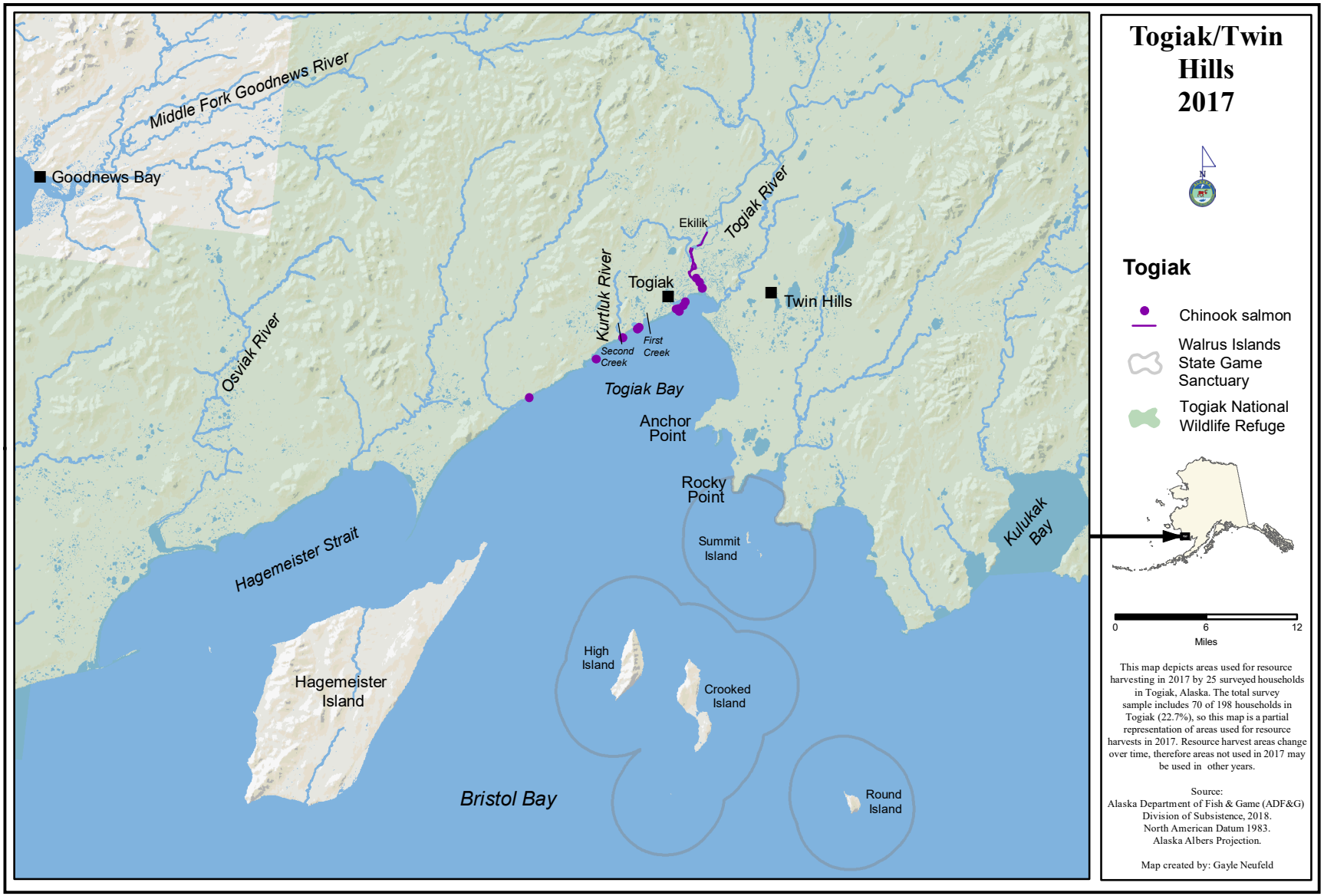

Figure 3-14.–Fishing and harvest locations for Chinook salmon, Togiak, 2017.

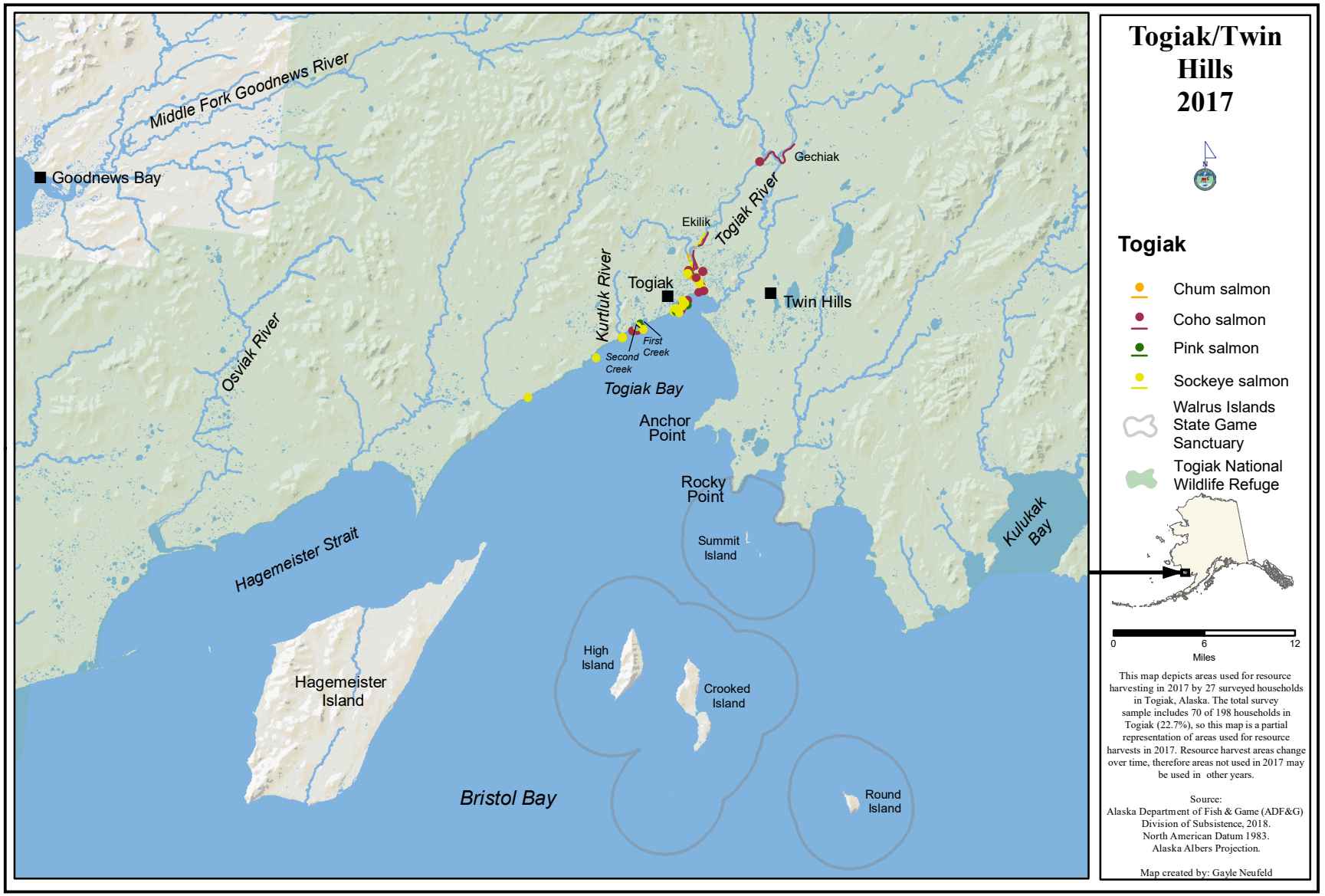

Figure 3-15.–Fishing and harvest locations for chum, coho, pink, and sockeye salmon, Togiak, 2017.

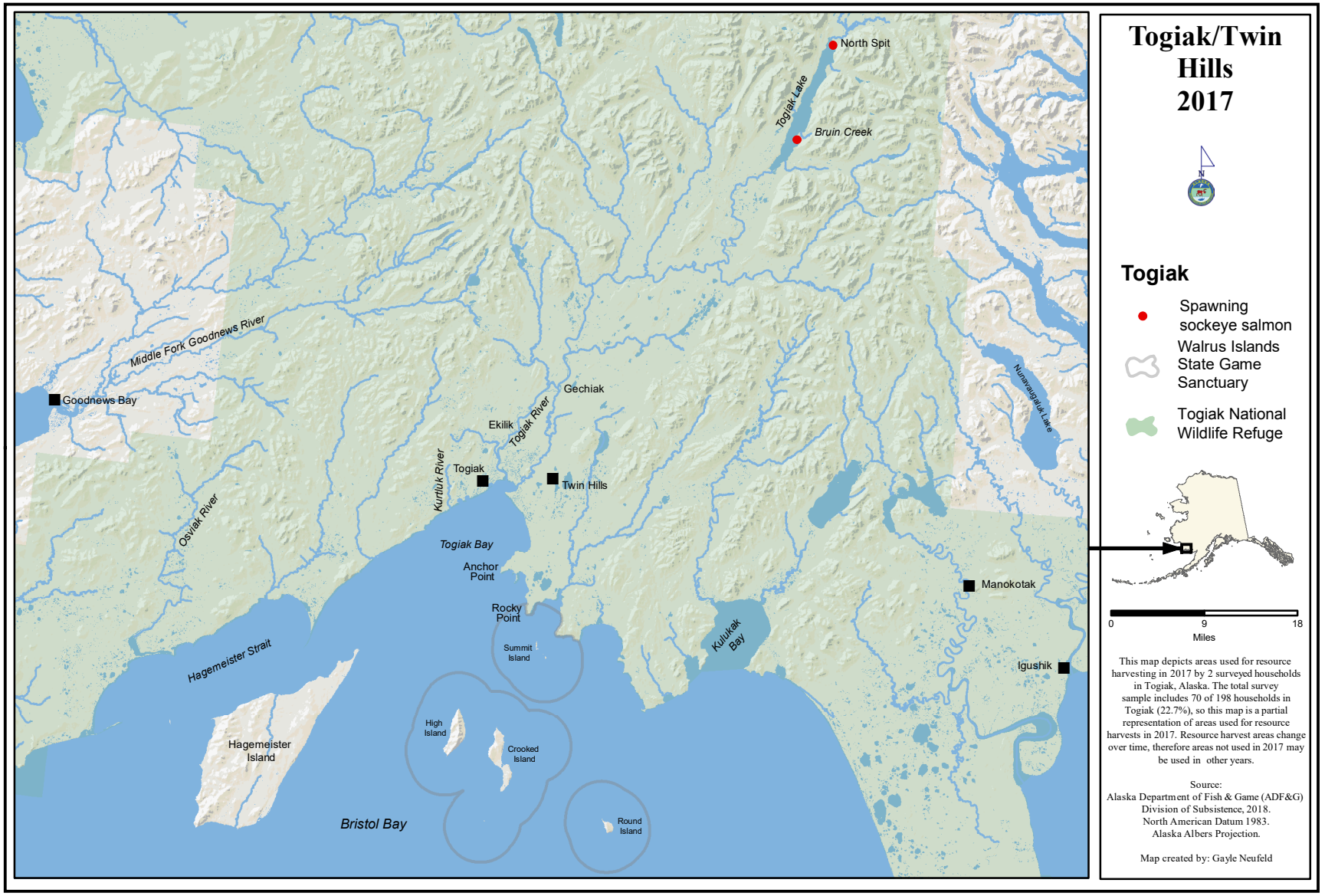

Figure 3-16.–Fishing and harvest locations for spawning sockeye salmon, Togiak, 2017.

During the 2017 study year, starting from the west and moving toward the east, Togiak respondents reported harvesting Chinook salmon near Kurtluck River, close to First and Second creeks, along the beaches near the community of Togiak, in the mouth of the Togiak River, and in the Togiak River (Figure 3-14). In 2017, sockeye salmon were generally harvested in the same locations as Chinook salmon, while pink and chum salmon were harvested close to Togiak and the majority of coho salmon harvest locations were in the Togiak River, with some households harvesting as far north as Gechiak Creek (Figure 3-15). In 2017, all sockeye salmon spawnouts were harvested in Togiak Lake. One harvest location for spawning sockeye salmon was in the lower portion of the lake near Bruin Creek, and some spawnouts were harvested in the North Spit of Togiak Lake (Figure 3-16).

Comparing 2016 and 2017 Harvest and Use Characteristics

The overall salmon harvest weight increased by 30,127 lb from 2016 to 2017, or 26 lb per capita (Table 3-9; Table 3-15). The two species that contributed the greatest harvest weight increase from 2016 to 2017 were sockeye and coho salmon. For sockeye salmon, the harvest weight increased by 20,771 lb in 2017 and for coho salmon the harvest weight increased by 10,384 lb. However, for Chinook salmon, the harvest weight was 2,659 lb more in 2016 than it was in 2017; this represents a reduced total Chinook harvest weight by approximately 10% in the second study year. Furthermore, from 2016 to 2017, the percentage of Togiak households attempting to harvest and harvesting any species of salmon increased by a difference of 14% (fishing) and 11% (harvesting), respectively. Regarding individual salmon species, the percentage of Togiak households attempting to harvest and harvesting sockeye salmon increased by an additional 16% (fishing) and 9% (harvesting), and for coho salmon increased by a difference of 8% (fishing) and 6% (harvesting). Interestingly, even though the harvest weight of Chinook salmon decreased in 2017, the percentage of households attempting to harvest and harvesting Chinook salmon increased by a difference of 11% (attempted harvest) and 6% (harvest) from 2016 to 2017.

Changes in gear type may account for the overall increase of harvest weight between 2016 and 2017 (see tables 3-13, 3-14, 3-19, and 3-20). For example, in 2017, the proportion of salmon weight harvested with a subsistence gillnet was 5% higher than in 2016, and there was a 25,239 lb increase in the salmon harvest using subsistence gillnets in 2017. However, in 2016 the portion of salmon weight harvested by commercial removals was 14% higher than in 2017, and in 2016 the salmon harvest weight from commercial catch removals was 4,892 lb higher than in 2017. The changes in gear type harvests between the 2016 and 2017 study years, coupled with the overall increase to harvest attempts and successful harvests in 2017, could indicate that more Togiak residents chose to participate in the subsistence salmon fishery in 2017 rather than indicate that households were taking smaller amounts of salmon from their commercial catches for home use.

The Subsistence Salmon Permit System

Permit System Individual Participation Based on Post-Season Household Surveys: 2016 and 2017

In 2016, there were 47 permits issued prior to the Togiak household survey, and the average number of individuals from other households listed on permits of surveyed households was estimated to be 1 individual per permit. In the same year, the average number of surveyed household members listed on permits obtained by a different household was 0.2 (Table 3-21). In 2017, 46 permits were issued prior to the Togiak household survey, and the average number of individuals from other households listed on permits of surveyed Togiak households was estimated to be 0.7 per permit, and the average number of surveyed household members listed on permits obtained by a different household was 0.3. Results in the second study year were improved as shown by the reduction in the average number of non-household individuals being listed on surveyed household permits.

Evaluating Subsistence Salmon Permit System Harvest Estimates from Before and After Post-Season Household Surveys

Each year, subsistence salmon household permits are issued and collected for the Bristol Bay Area to estimate harvests by each community. The post-season salmon harvest surveys administered for this project in Togiak for 2016 and 2017 complement the permit system and increase the accuracy of documented subsistence salmon harvest levels. This section reviews the changes to the reported and estimated salmon harvests as the result of reconciling post-season survey data with returned permits, which helps to illustrate how well the permit system generally performs as a tool for documenting harvests. There is a set of tables (two for each year) that compares: 1) subsistence salmon permit participation based on surveys and returned permits (Table 3-22; Table 3-24), and 2) harvest estimates from before and after the time that post-season surveys occurred (Table 3-23; Table 3-25). The structure of these tables is described fully in Chapter 1: "Introduction" in the subsection "Survey Data Entry and Analysis."

Harvest Survey and Subsistence Permits in Togiak: 2016

In 2016, there were 47 permits issued to households with Togiak addresses for the subsistence salmon fishery, and 35 of those permits were returned prior to the post-season salmon harvest survey (75% return rate) (Table 3-22). During the 2016 survey, seven permits were collected by research staff or LRAs from Togiak households that had not already returned their permit. Other households (15) that did not obtain a permit but did fish with subsistence gear were issued a permit that was completed based on respondents' recall of harvests during the survey. The recall data were incorporated into the permit database (i.e., Alaska Subsistence Fisheries Database, or ASFDB) after the surveys were finished. Several of the surveyed households that fished but did not have a permit were listed on another household's permit. In these cases, researchers did not issue a permit to these households to avoid duplication of harvest data in the ASFDB, but the recall data were recorded on the household survey as "received" salmon to capture households that engaged in salmon resource use.

The additional 15 permits issued increased the total 2016 subsistence permits for Togiak from 47 to 62. The combination of the 15 new permits and 7 additional returned permits increased the number of returned permits to 57, or a 92% return rate. Overall, there were 188 households that were eligible for the household survey or cited Togiak as the permit holder's place of residence. The combined number of households that were surveyed (74) and number of permits (5) that were returned by a household that was not surveyed—whether from Togiak or a household that was not eligible for the Togiak community survey—was 79, which represents 42% of the 188 total households (Table 1-4; Table 3-22).

Harvest by Species in Togiak: 2016

Prior to the 2016 household surveys, the reported subsistence Chinook salmon harvest from the 35 returned Togiak permits was 731 fish, which was expanded to an initial estimated harvest of 982 Chinook salmon (Table 3-23). An additional 296 Chinook salmon harvests were reported during the household surveys (52 added to previously returned permits, 20 recorded on permits returned during surveys, and 204 from households that did not have a permit while fishing). The initial harvested 731 Chinook salmon reported from the permits and the additional 296 harvests recorded during the household surveys increased the reported Chinook salmon harvest to 1,007 fish, which was expanded to a community harvest estimate of 1,676 Chinook salmon in 2016. Only the harvests reported by 15 surveyed households that fished without a permit were added to the ASFDB (permit database), and not the estimated harvest for the estimated total 57 households in Togiak that fished without a permit. Therefore, the estimated Chinook salmon harvest by Togiak residents for the Togiak District for 2016 in the ASFDB is 1,086 fish (Table 3-23).

For sockeye salmon, prior to the 2016 household surveys, the reported subsistence harvest from the 35 returned Togiak permits was 2,337 fish, which was expanded to an initial estimated harvest of 3,138 sockeye salmon (Table 3-23). An additional 769 sockeye salmon harvests were reported during the household surveys (21 added to previously returned permits, 265 recorded on permits returned during surveys, and 483 from households that did not have a permit while fishing). The initial 2,337 sockeye salmon reported from the permits and the additional 769 salmon recorded during the household surveys increased the reported

Table 3-21.–Average number of non-household members listed on subsistence permits, Togiak, 2016 and 2017.

Study year	Permits issued[a]	Estimated population	Mean number of individuals from other households listed on permits	Mean number of household members listed on other permits
2016	47	740.5	1.0	0.2
2017	46	839.6	0.7	0.3

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

a. Initial number (from prior to post-season surveys occurring) from the Division of Subsistence Bristol Bay permit database, based on community of residence.

Table 3-22.–Subsistence salmon permit participation estimates based on returned permits and surveys, Togiak, 2016.

	Togiak
Permits	
Before surveys	
Number of permits issued	47
Number of permits returned	35
Initial return rate	74.5%
After surveys	
Number of previously issued permits returned during survey	7
Surveyed households that fished without a permit[a]	15
Estimated total number of households that fished without a permit	57
Number of permits issued[b]	62
Revised number of permits returned	57
Final return rate	91.9%
Participation	
Total number of households[c]	188
Permit holders (pre-survey)	47
Non-permit holders (final estimate)	141
Total contacts	79
Proportion of contacted households	42.0%

Source ADF&G Division of Subsistence household surveys, 2017, and inseason catch permits, 2016.

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

c. Sampling for Togiak was stratified into 2 groups–permit holders and non-permit holders; the estimate generated from household surveys is used here.

Table 3-23.–Subsistence salmon harvest estimates based on returned permits and surveys, Togiak, 2016.

Harvest	Chinook	Sockeye	Coho	Chum	Pink	Total
Before surveys						
Initial harvest reported on permits	731	2,337	212	259	172	3,711
Initial estimated harvest, all permit holders	982	3,138	285	348	231	4,983
						0
After surveys						0
Additional harvest added to previously returned permits	52	21	-3	24	1	95
Harvest recorded on permits returned during the survey	20	265	55	15	2	357
Harvest by households that did not have permits	204	483	169	26	14	896
Reported harvest from both permits and surveys	1,007	3,106	433	324	189	5,059
Total estimated harvest, from both permits and surveys	1,676	4,847	947	441	249	8,160
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	1,086	3,398	471	348	198	5,502

Source ADF&G Division of Subsistence household surveys, 2017, and inseason catch permits, 2016.

Note Negative numbers indicate downward adjustment. Under state permits, rod and reel is not a legal subsistence gear, so those harvests cannot be included in the subsistence totals.

a. Based only on known fishers.

sockeye salmon harvest to 3,106 fish, which was expanded to a community harvest estimate of 4,847 sockeye salmon in 2016. For the same reasons noted above for Chinook salmon, the subsistence sockeye salmon estimate in the permit database was lower, at 3,398 fish.

Prior to the 2016 household surveys, the reported subsistence coho salmon harvest from the 35 returned Togiak permits was 212 fish, which was expanded to an initial estimated harvest of 285 coho salmon (Table 3-23). An additional 221 coho salmon harvests were reported during the household surveys (3 removed from previously returned permits, 55 recorded on permits returned during surveys, and 169 from households that did not have a permit while fishing). The initial harvested 212 coho salmon reported from the permits and the additional 221 fish recorded during the household surveys increased the reported coho salmon harvest to 433 fish, which was expanded to a community harvest estimate of 947 coho salmon in 2016. For the same reasons noted above for Chinook salmon, the subsistence coho salmon estimate in the permit database was lower, at 471 fish.

For chum salmon, prior to the 2016 household surveys, the reported subsistence harvest from the 35 returned Togiak permits was 259 fish, which was expanded to an initial estimated harvest of 348 chum salmon (Table 3-23). An additional 65 chum salmon harvests were reported during the household surveys (24 added to previously returned permits, 15 recorded on permits returned during surveys, and 26 from households that did not have a permit while fishing). The initial harvested 259 chum salmon reported from the permits and the additional 65 harvests recorded during the household surveys increased the reported chum salmon harvest to 324 fish, which was expanded to a community harvest estimate of 441 chum salmon in 2016. For the same reasons noted above for Chinook salmon, the subsistence chum salmon estimate in the permit database was lower, at 348 fish.

Prior to the 2016 household surveys the reported subsistence harvest of pink salmon from the 35 returned Togiak permits was 172 fish, which was expanded to an initial estimated harvest of 231 pink salmon (Table 3-23). An additional 17 pink salmon harvests were reported during the household surveys (1 added to previously returned permits, 2 recorded on permits returned during surveys, and 14 from households that did not have a permit while fishing). The initial harvested 172 pink salmon reported from the permits and the additional 17 fish recorded during the household surveys increased the reported pink salmon harvest to 189 fish, which was expanded to a community harvest estimate of 249 pink salmon in 2016. For the same reasons noted above for Chinook salmon, the subsistence pink salmon estimate in the permit database was lower, at 198 fish.

In comparing the initial estimated harvest for permit holders against the revised community subsistence harvest estimate based on permit results for the ASFDB (following post-season household surveys being administered), the coho salmon harvest exhibited the most significant change: an increase of 65% (from 285 fish to 471 fish). The harvest estimate increased by 11% for Chinook salmon, and by 8% for sockeye salmon. However, as discussed above, the subsistence harvest estimate based on permit and household survey results combined, including survey-based estimates for households that were not interviewed and therefore not added to the permit database, is higher for every species in comparison to the ASFDB estimates based on permit returns only; sockeye salmon is the species for which the additional number of individual fish harvested increased the most (1,449 salmon), followed by Chinook salmon (590 salmon).

Harvest Survey and Subsistence Permits in Togiak: 2017

In 2017, there were 46 permits issued for the Togiak subsistence salmon fishery, and 33 of those permits were returned prior to the post-season salmon harvest survey (72% return rate) (Table 3-24). During the 2017 survey, nine permits were collected by research staff or LRAs from Togiak households that had not already returned their permit. Other households (14) that did not obtain a permit but did fish with subsistence gear were issued a permit that was completed based on their recall of harvests during the survey. The recall data were incorporated into the ASFDB after the surveys were finished. Several of the surveyed households that fished but did not have a permit were listed on another household's permit. In these cases, researchers did not issue a permit to these households to avoid duplication of harvest data in the ASFDB,

but the recall data was recorded on the household survey as "received" to capture households that engaged in salmon resource use.

The additional 14 permits issued increased the total 2017 subsistence permits for Togiak from 46 to 60. The combination of the 14 new permits and 9 additional returned permits increased the number of returned permits to 56, or a 93% return rate. Overall, there were 199 households that were eligible for the household survey or cited Togiak as the permit holder's place of residence. The combined number of households that were surveyed (70) and number of permits (8) that were returned by a household that was not surveyed—whether from Togiak or a household that was not eligible for the Togiak community survey—was 78, which represents 39% of the 199 total households (Table 1-4; Table 3-24).

Harvest by Species in Togiak: 2017

Prior to the 2017 household surveys, the reported Chinook salmon harvest from the 33 returned Togiak permits was 508 fish, which was expanded to an initial estimated harvest of 687 Chinook salmon (Table 3-25). An additional 339 Chinook salmon harvests were reported during the household surveys (8 added to

Table 3-24.–Subsistence salmon permit participation estimates based on returned permits and surveys, Togiak, 2017.

	Togiak
Permits	
Before surveys	
Number of permits issued	46
Number of permits returned	33
Initial return rate	71.7%
After surveys	
Number of previously issued permits returned during survey	9
Surveyed households that fished without a permit[a]	14
Estimated total number of households that fished without a permit	61
Number of permits issued[b]	60
Revised number of permits returned	56
Final return rate	93.3%
Participation	
Total number of households[c]	199
Permit holders (pre-survey)	46
Non-permit holders (final estimate)	153
Total contacts	78
Proportion of contacted households	39.2%

Source ADF&G Division of Subsistence household surveys, 2018, and inseason catch permits, 2017.

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

c. Sampling for Togiak was stratified into 2 groups–permit holders and non-permit holders; the estimate generated from household surveys is used here.

Table 3-25.–Subsistence salmon harvest estimates based on returned permits and surveys, Togiak, 2017.

Harvest	Chinook	Sockeye	Coho	Chum	Pink	Total
Before surveys						
Initial harvest reported on permits	508	2,552	232	236	50	3,578
Initial estimated harvest, all permit holders	687	3,453	314	319	68	1,388
After surveys						
Additional harvest added to previously returned permits	8	241	15	55	-10	309
Harvest recorded on permits returned during the survey	119	202	55	51	2	429
Harvest by households that did not have permits	212	1,595	238	40	80	2,165
Reported harvest from both permits and surveys	847	4,590	540	382	122	6,481
Total estimated harvest, from both permits and surveys	1,606	10,176	1,363	541	395	14,081
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	870	4,901	539	503	131	6,943

Source ADF&G Division of Subsistence household surveys, 2018, and inseason catch permits, 2017.

Note Negative numbers indicate downward adjustment. Under state permits, rod and reel is not a legal subsistence gear, so those harvests cannot be included in the subsistence totals.

a. Based only on known fishers.

previously returned permits, 119 recorded on permits returned during surveys, and 212 from households that did not have a permit while fishing). The initial harvested 508 Chinook salmon reported from the permits and the additional 339 harvests recorded during the household surveys increased the reported Chinook salmon harvest to 847 fish, which was expanded to a community harvest estimate of 1,606 Chinook salmon in 2017. For the same reasons noted above for Chinook salmon in 2016, only the harvests reported for 2017 by 14 surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated total 61 household in Togiak that fished without a permit. Therefore, the subsistence Chinook salmon estimate in the permit database was lower, at 870 fish.

For sockeye salmon, prior to the 2017 household surveys, the reported harvest from the 33 returned Togiak permits was 2,552 fish, which was expanded to an initial estimated harvest of 3,453 sockeye salmon (Table 3-25). An additional 2,038 sockeye salmon harvests were reported during the household surveys (241 added to previously returned permits, 202 recorded on permits returned during surveys, and 1,595 from households that did not have a permit while fishing). The initial harvested 2,552 sockeye salmon reported from the permits and the additional 2,038 harvests recorded during the household surveys increased the reported sockeye salmon harvest to 4,590 fish, which was expanded to a community harvest estimate of 10,176 sockeye salmon in 2017. For the same reasons noted above for Chinook salmon in 2017, the subsistence sockeye salmon estimate in the permit database was lower, at 4,901 salmon.

Prior to the 2017 household surveys, the reported coho salmon harvest from the 33 returned Togiak permits was 232 fish, which was expanded to an initial estimated harvest of 314 coho salmon (Table 3-25). An additional 308 coho salmon harvests were reported during the household surveys (15 added to previously returned permits, 55 recorded on permits returned during surveys, and 238 from households that did not have a permit while fishing). The initial harvested 232 coho salmon reported from the permits and the additional 308 harvests recorded during the household surveys increased the reported coho salmon harvest to 540 fish, which was expanded to a community harvest estimate of 1,363 coho salmon in 2017. For the same reasons noted above in 2017 for Chinook salmon, the subsistence coho salmon estimate in the permit database was lower, at 539 fish.

For chum salmon, prior to the 2017 household surveys, the reported harvest from the 33 returned Togiak permits was 236 fish, which was expanded to an initial estimated harvest of 319 chum salmon (Table 3-25). An additional 146 chum salmon harvests were reported during the household surveys (55 added to previously returned permits, 51 recorded on permits returned during surveys, and 40 from households that did not have a permit while fishing). The initial harvested 236 chum salmon reported from the permits and the additional 146 harvests recorded during the household surveys increased the reported chum salmon harvest to 382 fish, which was expanded to a community harvest estimate of 541 chum salmon in 2017. For the same reasons noted above for Chinook salmon in 2017, the subsistence chum salmon estimate in the permit database was 503 fish.

Prior to the 2017 household surveys the reported harvest of pink salmon from the 33 returned Togiak permits was 50 fish, which was expanded to an initial estimated harvest of 68 pink salmon (Table 3-25). An additional 72 pink salmon harvests were reported during the household surveys (10 subtracted from previously returned permits, 2 recorded on permits returned during surveys, and 80 from households that did not have a permit while fishing). The initial 50 pink salmon reported from the permits and the additional 72 harvests recorded during the household surveys increased the reported pink salmon harvest to 122 fish, which was expanded to a community harvest estimate of 395 pink salmon in 2017. For the same reasons noted above for Chinook salmon in 2017, the subsistence pink salmon estimate in the permit database was 131 fish.

In comparing the initial estimated harvest for permit holders against the revised community subsistence harvest estimate based on permit results for the ASFDB (following post-season household surveys being administered), the pink salmon harvest, followed by the coho salmon harvest, exhibited the most significant changes: an increase of 93% (from 68 fish to 131 fish) and 71% (from 314 fish to 539 fish), respectively. The harvest estimate increased by 27% for Chinook salmon, and by 42% for sockeye salmon. However, as discussed above, the subsistence harvest estimate based on permit and household survey results combined,

including survey-based estimates for households that were not interviewed and therefore not added to the permit database, is higher for every species in comparison to the ASFDB estimates based on permit returns only; sockeye salmon is the species for which the additional number of individual fish harvested increased the most (5,275 salmon), followed by coho salmon (824 salmon) then Chinook salmon (736 salmon).

Comparing Uses and Harvests in 2016 and 2017 with Previous Years

Assessments of Use

Researchers asked respondents to assess their Chinook salmon use in two ways: whether they used more, less, or about the same amount of salmon in each study year as in the past five years, and whether they "got enough" Chinook salmon. Households also were asked to provide reasons if their use was different or if they were unable to get enough Chinook salmon. Also, if they did not get enough, respondents were asked to evaluate the severity of the impact to their household as a result of not getting enough. They were further asked how much Chinook salmon did the household need annually and whether they did anything differently (such as supplement with store-bought food or switch to a different subsistence resource) because they did not get enough. Households were also asked to assess whether their Chinook salmon fishing efforts or locations changed during the study years compared to usual activities. The same series of questions was asked regarding salmon other than Chinook (all other salmon species grouped). Because not every household uses salmon resources, some households did not respond to the assessment questions. Additionally, some households that do typically use salmon resources simply did not answer questions. For each type of assessment, households could give more than one reason for changes to use amount, not having enough salmon, or increased effort or travel to get salmon. This section discusses responses to those questions.

Assessments of Salmon Use in Togiak: 2016

Chinook Salmon

During the 2016 study year, 69 Togiak households reported using Chinook salmon (Table 3-26). Of the 73 responding households that answered the questions, 44% (32 households) reported less use of Chinook salmon in 2016 than used in previous years, 26% (19 households) explained that they used the same amount of Chinook salmon, and 25% (18 households) reported more use of Chinook salmon (Table 3-26; Figure 3-17). Of the households that provided reasons why Chinook salmon use was less, 23% of respondents cited that the resource was less available, which was the most commonly cited reason (Table 3-27). However, 17% of households indicated less Chinook salmon use due to family/personal reasons and working/no time. Table 3-28 depicts reasons for more use of Chinook salmon cited by 16 households; 63% of respondents used more Chinook salmon because of increased availability in 2016, 13% stated more use was due to an increased effort to harvest, and 13% stated they needed more Chinook salmon. When asked if the household got enough Chinook salmon in 2016, 42% (30 responding households) indicated that they did not, and 40% of these households reported the impact of not getting enough Chinook salmon as minor, 37% reported the impact as major, 7% reported the impact as severe, and 10% reported the impact as not noticeable (Table 3-29). Fifty-five percent of sampled households obtained enough Chinook salmon in 2016 (Figure 3-18). When asked what households that did not get enough Chinook salmon did as the result of not getting enough, 64% (18 households) indicated that they replaced Chinook salmon with other subsistence foods, 14% (4 households) stated that they used more commercial foods, and 11% (3 households) asked others for help (Table 3-30). The 30 households that did not obtain enough Chinook salmon were asked how many are needed annually, and responses indicated an average of 29 Chinook salmon (Table 3-31). In 2016, 12 Togiak households reported having to work harder than usual to obtain enough Chinook salmon. Of those households that provided a response, reasons provided for why households had to work harder to obtain enough Chinook salmon in 2016 included: more time needed (four households), unsuccessful (two households), family/personal (two households), needed more salmon (two households), and resource availability (one household) (Table 3-32). In 2016, five households reported that they had to travel further than usual, and five reported traveling to different locations than normal to obtain enough Chinook salmon for their household needs (Table 3-33).

Table 3-26.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Togiak, 2016.

Resource category	Sampled households	Valid responses[a]	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Any salmon	**74**	**74**	**73**	**98.6%**	**37**	**50.0%**	**32**	**43.2%**	**31**	**41.9%**	**5**	**6.8%**
Other salmon	74	74	72	97.3%	22	29.7%	25	33.8%	25	33.8%	2	2.7%
Chinook salmon	74	73	69	94.5%	32	43.8%	19	26.0%	18	24.7%	4	5.5%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households that did not provide any response.

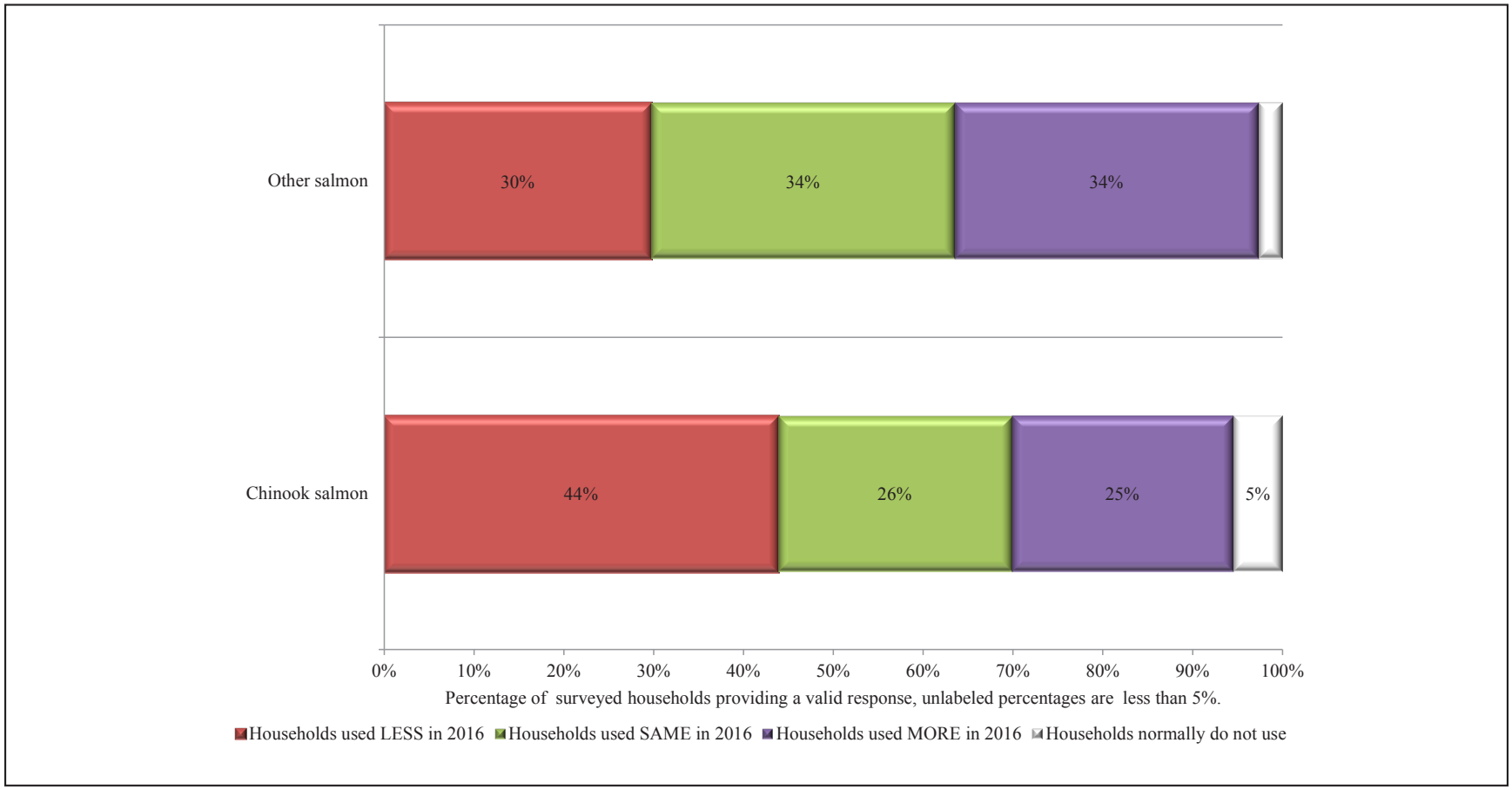

Figure 3-17.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Togiak, 2016.

Table 3-27.–Reasons for less household uses of salmon compared to recent years, Chinook and other salmon, Togiak, 2016.

Resource category	Valid responses[a]	Households reporting reasons for less use	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**74**	**36**	**6**	**16.7%**	**9**	**25.0%**	**1**	**2.8%**	**1**	**2.8%**	**5**	**13.9%**	**5**	**13.9%**	**3**	**8.3%**	**2**	**5.6%**
Other salmon	74	21	5	23.8%	3	14.3%	0	0.0%	1	4.8%	3	14.3%	2	9.5%	1	4.8%	0	0.0%
Chinook salmon	73	30	5	16.7%	7	23.3%	1	3.3%	1	3.3%	3	10.0%	4	13.3%	2	6.7%	2	6.7%

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Table 3-27.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for less use	Working/ no time		Regulations		Did not need		Gas/equipment too expensive		Used other resources		Competition		Had no help		Other reasons	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**74**	**36**	**7**	**19.4%**	**0**	**0.0%**	**4**	**11.1%**	**1**	**2.8%**	**1**	**2.8%**	**1**	**2.8%**	**0**	**0.0%**	**2**	**5.6%**
Other salmon	74	21	5	23.8%	0	0.0%	2	9.5%	0	0.0%	1	4.8%	0	0.0%	0	0.0%	1	4.8%
Chinook salmon	73	30	5	16.7%	0	0.0%	2	6.7%	1	3.3%	0	0.0%	1	3.3%	0	0.0%	2	6.7%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households that did not provide any response and households reporting never using the resource.

Table 3-28.–Reasons for more household uses of salmon compared to recent years, Chinook and other salmon,Togiak, 2016.

Resource category	Valid responses[a]	Households reporting reasons for more use	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**74**	**31**	**19**	**61.3%**	**1**	**3.2%**	**0**	**0.0%**	**2**	**6.5%**	**3**	**9.7%**	**4**	**12.9%**
Other salmon	74	24	13	54.2%	1	4.2%	0	0.0%	2	8.3%	1	4.2%	4	16.7%
Chinook salmon	73	16	10	62.5%	0	0.0%	0	0.0%	1	6.3%	2	12.5%	2	12.5%

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Table 3-28.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for more use	More success		Had more time		Got/fixed equipment		Substitute for unavaialable resource(s)		Had more help		Other	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**74**	**31**	**2**	**6.5%**	**0**	**0.0%**	**0**	**0.0%**	**1**	**3.2%**	**0**	**0.0%**	**2**	**6.5%**
Other salmon	74	24	2	8.3%	0	0.0%	0	0.0%	1	4.2%	0	0.0%	2	8.3%
Chinook salmon	73	16	1	6.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households that did not provide any response and households reporting never use.

Table 3-29.–Reported impact to households reporting that they did not get enough salmon resources, Chinook and other salmon, Togiak, 2016.

		Households not getting enough _____ .				Impact to those not getting enough _____ .									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource category	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	74	73	98.6%	18	24.7%	4	22.2%	2	11.1%	5	27.8%	7	38.9%	0	0.0%
Chinook salmon	74	71	95.9%	30	42.3%	2	6.7%	3	10.0%	12	40.0%	11	36.7%	2	6.7%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

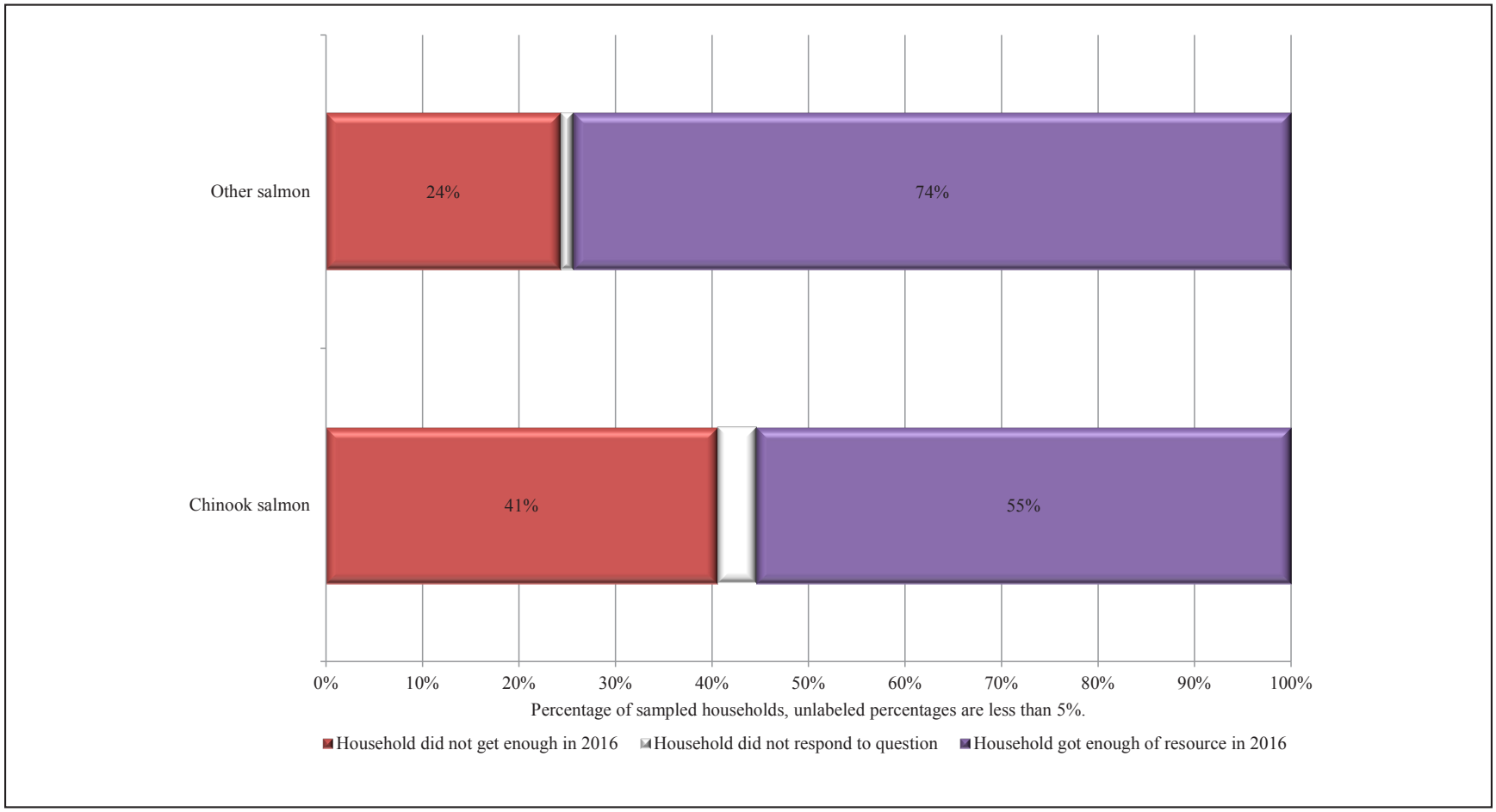

Figure 3-18.–Percentage of sampled households reporting whether they had enough salmon, Chinook and other salmon, Togiak, 2016.

Table 3-30.–Things households reported doing differently as the result of not getting enough salmon, Chinook and other salmon, Togiak, 2016.

Resource category	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Increased effort	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	13	0	0.0%	2	15.4%	6	46.2%	2	15.4%	0	0.0%
Chinook salmon	28	1	3.6%	4	14.3%	18	64.3%	3	10.7%	1	3.6%

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Table 3-30.–Continued.

Resource category	Valid responses[a]	Made do without		Obtained food from other sources		Got public assistance		Other reasons	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	13	3	23.1%	0	0.0%	2	15.4%	0	0.0%
Chinook salmon	28	2	7.1%	1	3.6%	0	0.0%	1	3.6%

Source ADF&G Division of Subsistence household surveys, 2017.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

Table 3-31.–Salmon resources that sampled households reported needing, Togiak, 2016.

Resource category	Households needing resource	Total amount needed (Number of fish)	Average amount needed (Number of fish)
Other salmon	18	962	53
Chinook salmon	30	862	29

Source ADF&G Division of Subsistence household surveys, 2017.

Table 3-32.–Reasons that households worked harder to get more salmon, Chinook and other salmon, Togiak, 2016

			Households reporting _____ .		Reason cited for working harder than usual: _____ .							
					Family/personal		Resource availability		Unsuccessful		More time needed	
Resource category	Sampled households	Valid responses	Not working harder than usual	Working harder than usual	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	74	62	57	5	1	1.8%	0	0.0%	0	0.0%	3	5.3%
Chinook salmon	74	65	53	12	2	3.8%	1	1.9%	2	3.8%	4	7.5%

-continued-

Table 3-32.–Continued.

			Households reporting _____ .		Reason cited for working harder than usual: _____ .							
					Needed more		Small or diseased resources		Other reasons		No response	
Resource category	Sampled households	Valid responses	Not working harder than usual	Working harder than usual	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	74	62	57	5	0	0.0%	1	1.8%	1	1.8%	0	0.0%
Chinook salmon	74	65	53	12	2	3.8%	0	0.0%	0	0.0%	2	3.8%

Source ADF&G Division of Subsistence household surveys, 2017.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Table 3-33.–Households reporting that they traveled further or to different locations, Togiak 2016.

			Households reporting that they _____ .	
Resource category	Sampled households	Valid responses	Traveled further	Traveled to different locations
Other salmon	74	62	3	3
Chinook salmon	74	65	5	5

Source ADF&G Division of Subsistence household surveys, 2017.

Other Salmon

In 2016, 72 Togiak households reported using other salmon species (sockeye, coho, chum, and pink) (Table 3-26). Of the 74 surveyed households, 25 (34%) stated that they used the same amount of other salmon species as they used in previous years, 34% (25 households) reported more use, and 30% (22 households) reported less use of other salmon (Table 3-26; Figure 3-17). When asked the reasons why other salmon use was less, 24% of respondents indicated it was due to family/personal reasons and 24% cited working/no time (Table 3-27). Additionally, 14% of households indicated less use of other salmon due to resources being less available and less sharing of salmon. Of the 24 households that provided a reason for increased other salmon use, 54% of respondents stated more use was due to increased availability in 2016, and 17% of households stated more use due to an increased harvest effort (Table 3-28). When asked if the household got enough other salmon in 2016, 25% (18 responding households) indicated that they did not and 39% of these households reported the impact as major, 28% reported the impact as minor, and 11% reported the impact as not noticeable (Table 3-29). Seventy-four percent of sampled households obtained enough other salmon in 2016 (Figure 3-18). When asked what households that did not get enough other salmon did as the result of not getting enough, 23% (three households) indicated that they made do without, 15% (two households) stated that they used more commercial foods, asked others for help, and got public assistance, but the most cited response (46%; six households) was that other salmon resources were replaced by other subsistence foods (Table 3-30). The 18 households that did not have enough other salmon were asked how many are needed annually, and responses indicated an average of 53 other salmon (Table 3-31). In 2016, five Togiak households reported having to work harder than usual to obtain enough other salmon. Of those households that provided a response, reasons provided for why households had to work harder to obtain enough other salmon in 2016 included: more time needed (three households), family/personal (one household), small or diseased resources (one household), and other reasons (one household) (Table 3-32). In 2016, three households reported that they had to travel further, and three households reported traveling to different locations than normal to obtain enough other salmon for their household needs (Table 3-33).

Assessments of Salmon Use in Togiak: 2017

Chinook Salmon

During the 2017 study year, 67 Togiak households reported using Chinook salmon (Table 3-34). Of the 69 responding households that answered the questions, 41% (28 households) reported less use of Chinook salmon in 2017 than they used in previous years, 38% (26 households) explained that they used the same amount of Chinook salmon, and 19% (13 households) reported more use of Chinook salmon (Table 3-34; Figure 3-19). When asked the reasons why Chinook salmon use was less, 31% of respondents cited that the resource was less available, which was the most commonly cited reason (Table 3-35). Twenty-three percent of households indicated less Chinook salmon use due lack of effort, 19% cited a lack of equipment, and 12% stated they did not need this resource, were working or had no time, or that Chinook salmon was shared less. Table 3-36 depicts reasons for more use of Chinook salmon cited by 11 households; 36% of respondents stated they used more Chinook salmon because of increased availability in 2017, 18% stated more use was due to an increased effort to harvest,18% stated they needed more Chinook salmon, and 18% indicated they used more Chinook salmon in 2017 because they had more help. When asked if the household got enough Chinook salmon in 2017, 37% (25 responding households) indicated that they did not, and 44% of these households reported the impact as minor, 32% reported the impact as major, 12% reported the impact as severe, and 4% reported the impact as not noticeable (Table 3-37). Sixty-one percent of sampled households obtained enough Chinook salmon in 2017 (Figure 3-20). When asked what households that did not get enough Chinook salmon did as the result of not getting enough, 60% (nine households) indicated that they replaced Chinook salmon with other subsistence foods, 27% (four households) stated that they used more commercial foods, and 13% (two households) asked others for help, made do without Chinook salmon, or got public assistance (Table 3-38). The 25 households that did not obtain enough Chinook salmon were asked how many were needed annually, and responses indicated an average of 33 Chinook salmon (Table 3-39). In 2017, six Togiak households indicated having to work harder than usual to obtain enough

Chinook salmon. Of those households that provided a response, reasons provided for why households had to work harder to obtain enough Chinook salmon in 2017 included: more time needed (two households), other reasons (one household), and unsuccessful (one household) (Table 3-40). In 2017, three households reported that they had to travel further, and four reported traveling to different locations than normal to obtain enough Chinook salmon for their household needs (Table 3-41).

Other Salmon

In 2017, 67 Togiak households reported using other salmon (Table 3-34). Of the 69 responding households that answered the questions, 37 (54%) stated that they used the same amount of all other salmon species as they used in previous years, 26% (18 households) reported less use, and 17% (12 households) reported more use of other salmon (Table 3-34; Figure 3-19). When asked the reasons why other salmon use was less, 33% of respondents indicated this was due to lack of effort, and 22% stated lack of equipment (Table 3-35). Of the 12 households that indicated increased other salmon use, 25% of respondents stated more use was due to increased resource availability in 2017, and 25% of households received more other salmon resources (Table 3-36). The majority (87%) of sampled households did get enough other salmon during the study year (Figure 3-20). However, 9% (six responding households) indicated that they did not get enough other salmon in 2017 (Table 3-37). Of those six Togiak households, one-half (50%) reported the impact as major, and one-half (50%) reported the impact as minor. When asked what households that did not get enough other salmon did as the result of not getting enough, 50% (two households) indicated that they asked others for help, obtained food from other sources, and replaced other salmon with other subsistence foods (Table 3-38). The 6 households that did not obtain enough other salmon were asked how many were needed annually, and responses indicated an average of 73 other salmon (Table 3-39). In 2017, three Togiak households reported having to work harder than usual to obtain enough other salmon. Of those households that provided a response, reasons provided for why households had to work harder to obtain enough other salmon in 2017 included: more time needed (one household), and other reasons (one household) (Table 3-40). In 2017, one household reported having had to travel further, and three reported traveling to different locations than normal to obtain enough other salmon for their household needs (Table 3-41).

While for both 2016 and 2017 not all surveyed households answered the questions about changes to their harvest effort and fishing locations for Chinook and all other salmon, the responses for 2017 were generally improved compared to those from 2016 (tables 3-32, 3-33, 3-40, and 3-41). For the other use assessment questions, there was very little change to the proportion of responding households that said their use of Chinook and all other salmon was less than recent previous years, and responses indicating households did not have enough Chinook salmon only slightly improved in 2017 (Figure 3-17; Figure 3-19; Table 3-29; Table 3-37). The use assessment that showed the most improvement was the change in the number of households that did not have enough other salmon in 2016 (18) compared to 2017 (6) (Table 3-29; Table 3-37).

Table 3-34.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Togiak, 2017.

Resource category	Sampled households	Valid responses[a]	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Any salmon	**70**	**70**	**69**	**98.6%**	**32**	**45.7%**	**45**	**64.3%**	**21**	**30.0%**	**3**	**4.3%**
Other salmon	70	69	67	97.1%	18	26.1%	37	53.6%	12	17.4%	2	2.9%
Chinook salmon	70	69	67	97.1%	28	40.6%	26	37.7%	13	18.8%	2	2.9%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households that did not provide any response.

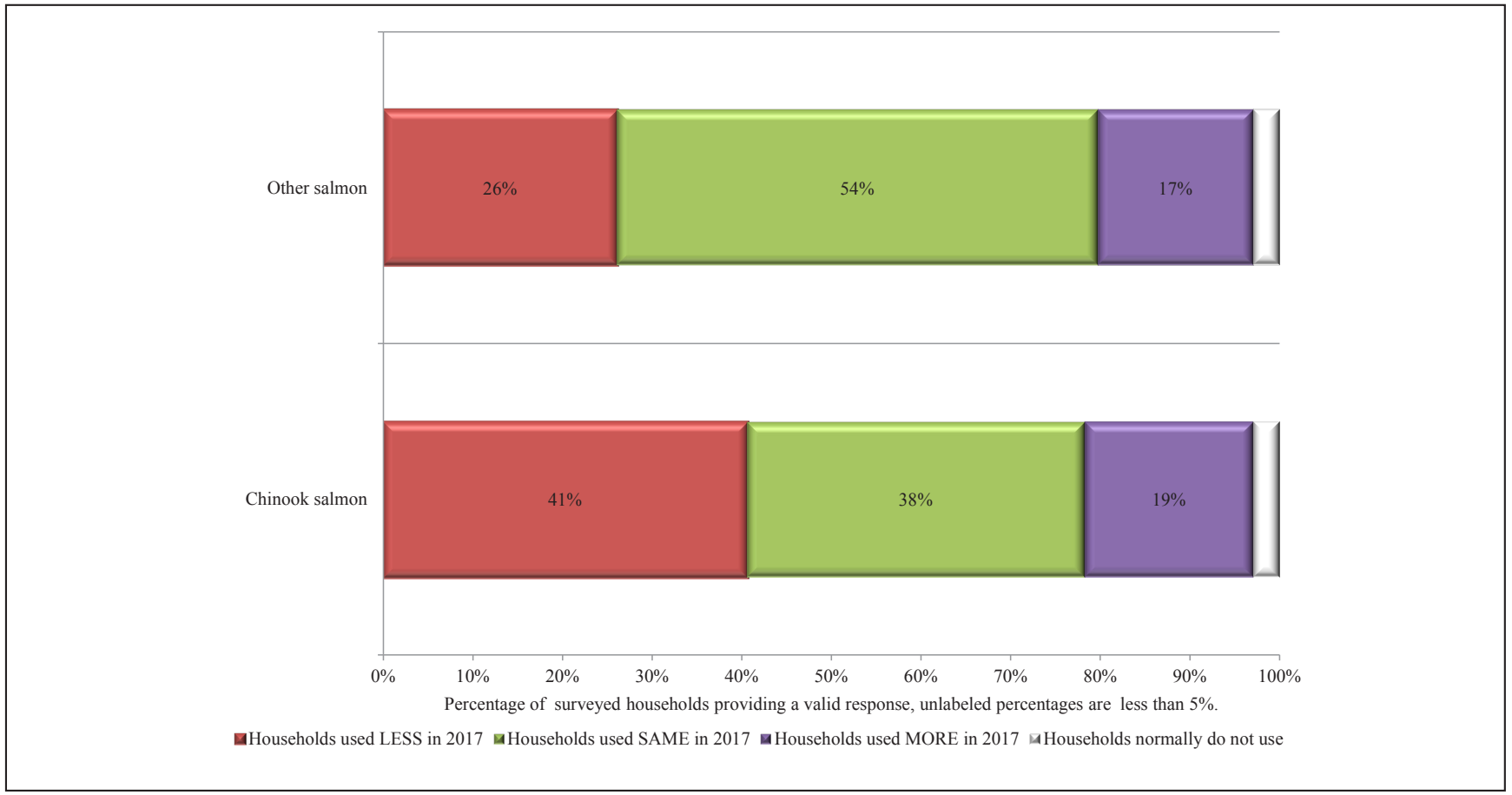

Figure 3-19.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Togiak, 2017.

Table 3-35.–Reasons for less household uses of salmon compared to recent years, Chinook and other salmon, Togiak, 2017.

Resource category	Valid responses[a]	Households reporting reasons for less use	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**70**	**32**	**3**	**9.4%**	**9**	**28.1%**	**0**	**0.0%**	**5**	**15.6%**	**3**	**9.4%**	**10**	**31.3%**	**1**	**3.1%**	**1**	**3.1%**
Other salmon	69	18	3	16.7%	1	5.6%	0	0.0%	4	22.2%	1	5.6%	6	33.3%	0	0.0%	1	5.6%
Chinook salmon	69	26	1	3.8%	8	30.8%	0	0.0%	5	19.2%	3	11.5%	6	23.1%	1	3.8%	0	0.0%

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Table 3-35.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for less use	Working/ no time		Regulations		Did not need		Gas/equipment too expensive		Used other resources		Competition		Had no help		Other reasons	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**70**	**32**	**4**	**12.5%**	**1**	**3.1%**	**4**	**12.5%**	**0**	**0.0%**	**0**	**0.0%**	**1**	**3.1%**	**2**	**6.3%**	**0**	**0.0%**
Other salmon	69	18	2	11.1%	0	0.0%	2	11.1%	0	0.0%	0	0.0%	0	0.0%	2	11.1%	0	0.0%
Chinook salmon	69	26	3	11.5%	1	3.8%	3	11.5%	0	0.0%	0	0.0%	1	3.8%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households that did not provide any response and households reporting never using the resource.

Table 3-36.–Reasons for more household uses of salmon compared to recent years, Chinook and other salmon,Togiak, 2017.

Resource category	Valid responses[a]	Households reporting reasons for more use	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**70**	**19**	**7**	**36.8%**	**0**	**0.0%**	**0**	**0.0%**	**3**	**15.8%**	**4**	**21.1%**	**4**	**21.1%**
Other salmon	69	12	3	25.0%	0	0.0%	0	0.0%	3	25.0%	2	16.7%	2	16.7%
Chinook salmon	69	11	4	36.4%	0	0.0%	0	0.0%	1	9.1%	2	18.2%	2	18.2%

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Table 3-36.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for more use	More success		Had more time		Got/fixed equipment		Substitute for unavaialable resource(s)		Had more help		Other	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**70**	**19**	**1**	**5.3%**	**1**	**5.3%**	**1**	**5.3%**	**1**	**5.3%**	**3**	**15.8%**	**0**	**0.0%**
Other salmon	69	12	0	0.0%	0	0.0%	1	8.3%	1	8.3%	2	16.7%	0	0.0%
Chinook salmon	69	11	1	9.1%	1	9.1%	0	0.0%	0	0.0%	2	18.2%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households that did not provide any response and households reporting never use.

Table 3-37.–Reported impact to households reporting that they did not get enough salmon resources, Chinook and other salmon, Togiak, 2017.

		Households not getting enough _____ .				Impact to those not getting enough _____ .									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource category	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	70	67	95.7%	6	9.0%	0	0.0%	0	0.0%	3	50.0%	3	50.0%	0	0.0%
Chinook salmon	70	68	97.1%	25	36.8%	2	8.0%	1	4.0%	11	44.0%	8	32.0%	3	12.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

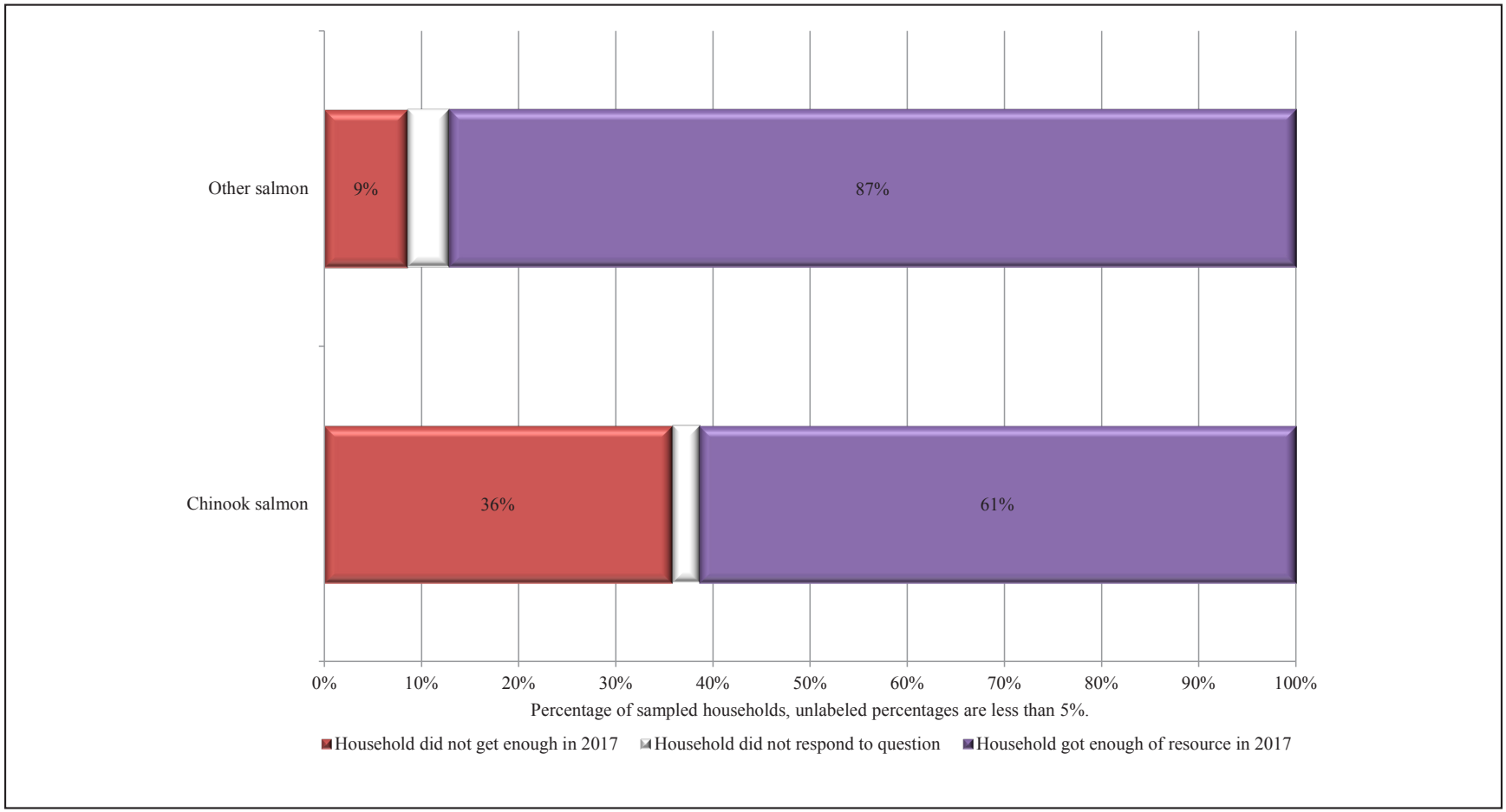

Figure 3-20.–Percentage of sampled households reporting whether they had enough salmon, Chinook and other salmon, Togiak, 2017.

Table 3-38.–Things households reported doing differently as the result of not getting enough salmon, Chinook and other salmon, Togiak, 2017.

Resource category	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Increased effort	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	4	0	0.0%	1	25.0%	2	50.0%	2	50.0%	0	0.0%
Chinook salmon	15	0	0.0%	4	26.7%	9	60.0%	2	13.3%	0	0.0%

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Table 3-38.–Continued.

Resource category	Valid responses[a]	Made do without		Obtained food from other sources		Got public assistance		Other reasons	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	4	0	0.0%	2	50.0%	1	25.0%	0	0.0%
Chinook salmon	15	2	13.3%	0	0.0%	2	13.3%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

Table 3-39.–Salmon resources that sampled households reported needing, Togiak, 2017.

Resource category	Households needing resource	Total amount needed (Number of fish)	Average amount needed (Number of fish)
Other salmon	6	435	73
Chinook salmon	25	825	33

Source ADF&G Division of Subsistence household surveys, 2018.

Chinook Salmon and Other Salmon

Of the 56 households that reported harvesting or attempting to harvest Chinook salmon in 2016 and answered the questions, 46 (82% of households) indicated their usual harvest method for Chinook salmon was subsistence gillnet, 22 (39%) indicated commercial home pack, 5 (9%) indicated rod and reel, 4 (7%) indicated other methods, and 1 (2%) indicated seine as their usual Chinook salmon harvest method (Table 3-42). Of those five households that responded rod and reel is a usual Chinook salmon harvest method, reasons provided for why included: fun (three households), other reasons (two households), selectivity (one household), and tradition (one household) (Table 3-43). In 2016, there were 57 households that harvested or attempted to harvest all other salmon, and subsistence gillnet was the usual harvest method cited by 46 households (81%), which is aligned with the responses for usual Chinook salmon harvest methods; however, more households (18, or 32% of households) cited rod and reel as a usual harvest method of other salmon in comparison to Chinook salmon (Table 3-42). Conservation was cited by 2 households (11%) as the reason why rod and reel is used to harvest other salmon, and fun (13, or 72% of households) was cited more than other reasons (Table 3-43).

Assessments of Salmon Harvest Methods in Togiak: 2017

Chinook Salmon and Other Salmon

Of the 56 households that reported harvesting or attempting to harvest Chinook salmon in 2017 and answered the questions, 33 (59% of households) indicated their usual harvest method for Chinook salmon was subsistence gillnet, 20 (36%) indicated commercial home pack, 10 (18%) indicated other methods, and 6 (11%) indicated rod and reel, as their usual Chinook salmon harvest method (Table 3-44). Of those six households that responded rod and reel is a usual Chinook salmon harvest method, reasons provided for why included: fun (four households), ease (two households), and also selectivity (one household), tradition (one household), and "other" or not specified (one household) (Table 3-45). In 2017, there were 51 households that harvested or attempted to harvest all other salmon, and subsistence gillnet was the usual harvest method cited by 38 households (75%), which was more than the responses for usual Chinook salmon harvest methods; and more households (15, or 29% of households) cited rod and reel as a usual harvest method of other salmon in comparison to Chinook salmon (Table 3-44). Fun was cited by the majority (13, or 87% of households) as the reason why rod and reel is used to harvest other salmon, and selectivity, ease and other reasons were each cited by 3 households Table 3-45).

Comparing Harvests in 2016 and 2017 with Estimated Harvests from Previous Study Years and the Permit System

Changes in the harvest of salmon by Togiak residents can also be discerned through comparisons with findings from other study years and through data from the subsistence permit database; the permit data collected by ADF&G Division of Subsistence begins in 1983. Comprehensive subsistence harvest surveys were conducted in Togiak for the study years 1999 and 2008 (Coiley-Kenner et al. 2003; Fall et al. 2012). During the years for which subsistence harvest surveys were administered, Division of Subsistence staff members opportunistically collected unreturned permits from households in Togiak; the data from previously unreturned permits were then included in the subsistence permit database.

Three goals of the 2016 and 2017 household salmon surveys included collecting unreturned subsistence permits from Togiak households, gathering harvest data from households that did not obtain a subsistence permit but still subsistence fished, and collecting information about the amount of salmon retained from commercial catches for home use or harvested with rod and reel. This additional information collected through the administration of household surveys provides a more accurate representation of a Togiak fishing season and total harvests for home use than data from returned subsistence salmon permits alone.

Table 3-40.–Reasons that households worked harder to get more salmon, Chinook and other salmon, Togiak, 2017

			Households reporting _____ .		Reason cited for working harder than usual: _____ .							
					Family/personal		Resource availability		Unsuccessful		More time needed	
Resource category	Sampled households	Valid responses	Not working harder than usual	Working harder than usual	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	70	56	53	3	0	0.0%	0	0.0%	0	0.0%	1	1.9%
Chinook salmon	70	56	50	6	0	0.0%	0	0.0%	1	2.0%	2	4.0%

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Table 3-40.–Continued.

			Households reporting _____ .		Reason cited for working harder than usual: _____ .					
					Small or diseased resources		Other reasons		No response	
Resource category	Sampled households	Valid responses	Not working harder than usual	Working harder than usual	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	70	56	53	3	0	0.0%	1	1.9%	1	1.9%
Chinook salmon	70	56	50	6	0	0.0%	1	2.0%	2	4.0%

Source ADF&G Division of Subsistence household surveys, 2018.
Note The sum of percentages may not be 100% because households were able to give more than one answer.

Table 3-41.–Households reporting that they traveled further or to different locations, Togiak 2017.

			Households reporting that they _____ .	
Resource category	Sampled households	Valid responses	Traveled further	Traveled to different locations
Other salmon	70	56	1	3
Chinook salmon	70	56	3	4

Source ADF&G Division of Subsistence household surveys, 2018.

Table 3-42.–Usual household harvest methods, Chinook and other salmon, Togiak, 2016.

Resource category	Households harvesting, or attempting to harvest	Commercial home pack		Seine		Subsistence gillnet		Rod and reel		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	56	22	39.3%	1	1.8%	46	82.1%	5	8.9%	4	7.1%
Other salmon	57	16	28.1%	4	7.0%	46	80.7%	18	31.6%	3	5.3%

Source ADF&G Division of Subsistence household surveys, 2017.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Note Subsistence gillnet includes both set and drift gillnet harvest methods.

Table 3-43.–Reasons for using a rod and reel to harvest salmon, Chinook and other salmon, Togiak, 2016.

Resource category	Households using rod and reel	Conservation		Selectivity		Gillnet mesh too small		Tradition		Ease		Fun		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	5	0	0.0%	1	20.0%	0	0.0%	1	20.0%	0	0.0%	3	60.0%	2	40.0%
Other salmon	18	2	11.1%	0	0.0%	0	0.0%	4	22.2%	0	0.0%	13	72.2%	4	22.2%

Source ADF&G Division of Subsistence household surveys, 2017.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

As mentioned above, a total of 22 and 23 additional permits were collected/issued as a result of the survey efforts for 2016 and 2017, respectively; this resulted in a higher number of issued household permits—62 and 60—than historically average (47), as well as improved permit return rates both years (tables 3-22, 3-24, and 3-46). In Togiak, the permit return rate prior to survey administration was 75% in 2016 and 72% in 2017, but the return rates improved to 92% and 93%, respectively, after surveys were conducted (Table 3-22; Table 3-24).

According to both the salmon harvest survey data and the subsistence permit system, Togiak subsistence salmon harvests have fluctuated since 1983 (Figure 3-21). From the harvest surveys, the total community subsistence harvest estimates were: 7,532 salmon in 1999, 9,502 salmon in 2008, 8,187 salmon in 2016, and 14,793 salmon in 2017. Based on subsistence permit data, the historical average harvest of all salmon species from 1983–2017 is 5,136 fish, the 10-year (2008–20117) average is 5,645 salmon, and the 5-year (2013–2017) average is 5,615 fish (Table 3-46).

The subsistence harvests of Chinook salmon have fluctuated since 1983, but Chinook salmon harvest amounts have remained relatively stable over the past decade (Figure 3-22). For example, in 2008, based on post-season household survey results, the estimated number of subsistence-caught Chinook salmon was 1,802 fish, and 8 years later, in 2016, the estimated Chinook salmon subsistence harvest was 1,663 fish, and in 2017 the subsistence harvest included 1,817 Chinook salmon. Germane to the survey data results, the subsistence permit database shows annual variation for Chinook salmon harvest amounts, but also demonstrates relatively stable harvest amounts over time. Based on subsistence permit data, the historical average harvest of Chinook salmon from 1983–2017 is 876 fish, the 10-year (2008–2017) average is 922 Chinook salmon, and the 5-year (2013–2017) average is 819 fish (Table 3-46).

Post-season household survey results show that the total harvests of spawning salmon (spawnouts) have decreased since the 2008 study. During the 1999 study year, the community of Togiak harvested a total estimated 2,166 spawnouts, in 2008 the spawnouts harvest was 2,381 fish, and in 2016 and 2017 the estimated total harvests of spawnouts were 1,247 and 1,328 fish, respectively (Table 3-47). Although total harvests of spawning sockeye have decreased over time, the overall harvests of sockeye salmon have increased over time (Table 3-47). Like the other species of salmon, the harvest amounts of sockeye and coho salmon vary each study year; but, according to Figure 3-23, there is a rise in the harvest of sockeye and coho salmon as a proportion of the total harvest for study years 2016 and 2017. Pink salmon and chum salmon are typically not the preferred salmon species for residents of Togiak, and both these species have, based on household surveys, historically and contemporarily made up less than 10% of the total salmon harvest composition by weight (Coiley-Kenner et al. 2003:63; Fall et al. 2012:176; Figure 3-5; Figure 3-11). Coho salmon are harvested later than other salmon species; in years with lower abundance of Chinook and sockeye salmon, Togiak residents may choose to harvest more coho salmon, while most of the pink and chum salmon harvests are incidental while fishers are targeting Chinook and sockeye salmon. Therefore, with the exception of 1984, the subsistence harvest amounts of other salmon (coho, pink, and chum salmon) have remained relatively steady since 1983 but increased slightly in years with low Chinook or sockeye salmon harvests (Figure 3-22).

Local Comments and Concerns

Following is a summary of local observations of salmon populations and trends that were recorded during the surveys in Togiak. Some households did not offer any additional information during the survey interviews, so not all households are represented in the summary. In addition, respondents expressed their concerns about salmon during the community scoping meeting, the key respondent interviews, and the community review meeting. These concerns have been included in the summary.

Chinook Salmon

Many residents of Togiak expressed concerns about the overall run health and abundance of Chinook salmon. Specifically, respondents reported a decrease in the overall size of Chinook salmon during their lifetimes and many Togiak community members mentioned more “jack” Chinook salmon (small Chinook salmon that mature after spending only one winter in the ocean are commonly referred to as “jacks,” and

Table 3-44.–Usual household harvest methods, Chinook and other salmon, Togiak, 2017.

Resource	Households harvesting, or attempting to harvest	Commercial home pack		Seine		Subsistence gillnet		Rod and reel		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	56	20	35.7%	0	0.0%	33	58.9%	6	10.7%	10	17.9%
Other salmon	51	16	31.4%	4	7.8%	38	74.5%	15	29.4%	3	5.9%

Source ADF&G Division of Subsistence household surveys, 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Note Subsistence gillnet includes both set and drift gillnet harvest methods.

Table 3-45.–Reasons for using a rod and reel to harvest salmon, Chinook and other salmon, Togiak, 2017.

Resource category	Households using rod and reel	Conservation		Selectivity		Gillnet mesh too small		Tradition		Ease		Fun		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	6	0	0.0%	1	16.7%	0	0.0%	1	16.7%	2	33.3%	4	66.7%	1	16.7%
Other salmon	15	1	6.7%	3	20.0%	0	0.0%	3	20.0%	1	6.7%	13	86.7%	3	20.0%

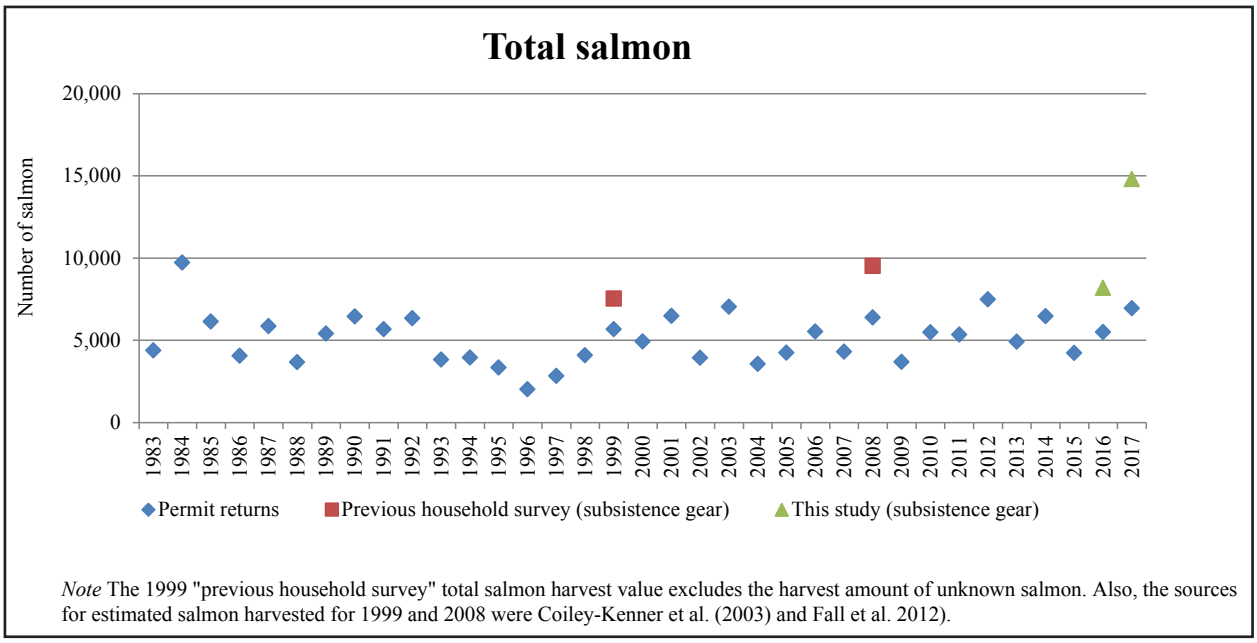
Source ADF&G Division of Subsistence household surveys, 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Table 3-46.–Historical harvest of salmon based on Bristol Bay permit returns, Togiak, 1983–2017.

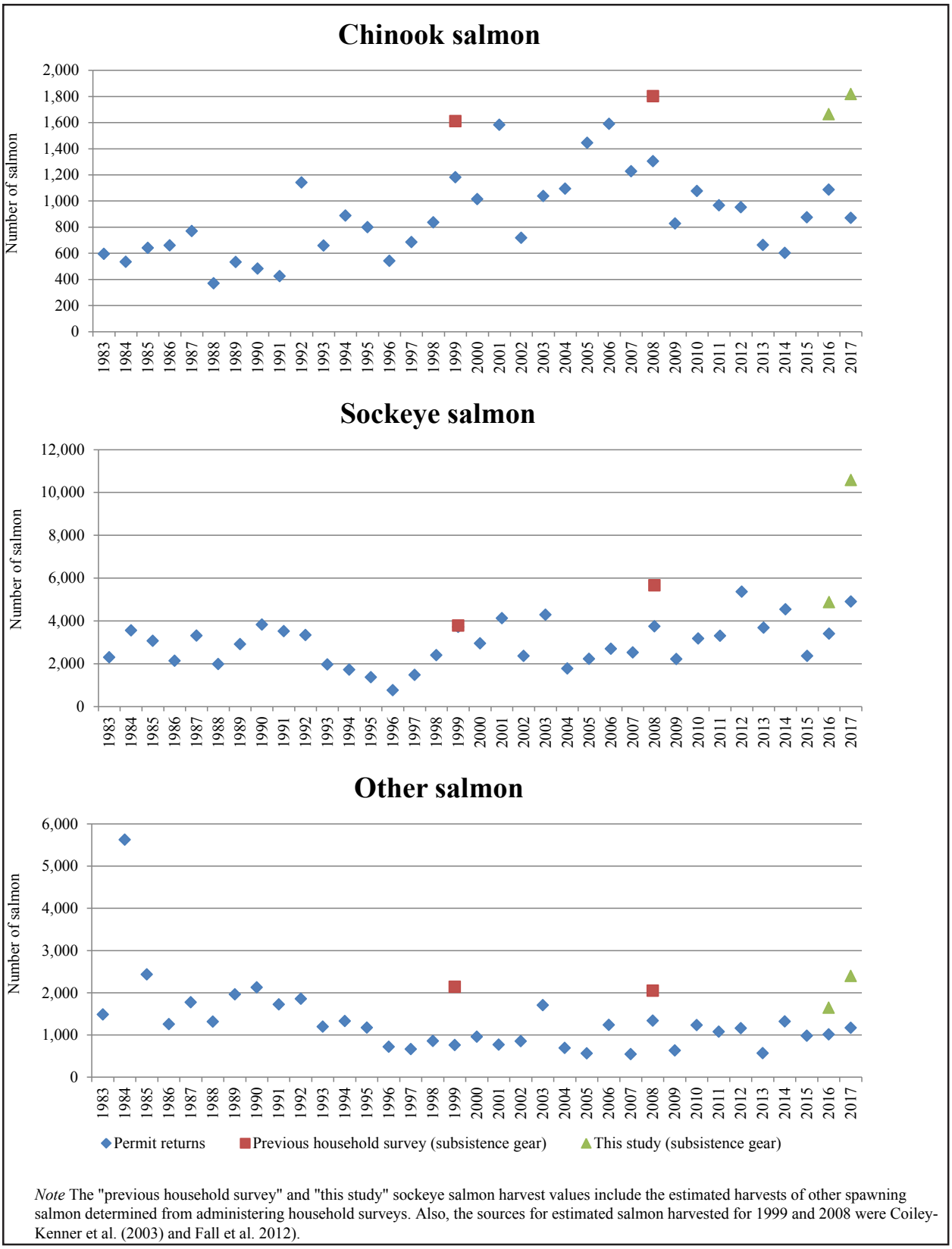
	Permits		Percentage of returned	Estimated salmon harvest					
Year	Issued	Returned	permits	Chinook	Sockeye	Coho	Chum	Pink	**Total**
1983	35	25	71.4%	594	2,295	636	705	148	**4,378**
1984	31	21	67.7%	534	3,553	3,575	1,768	285	**9,715**
1985	45	32	71.1%	640	3,065	1,423	937	75	**6,141**
1986	24	20	83.3%	660	2,135	420	781	56	**4,052**
1987	40	30	75.0%	769	3,311	862	908	5	**5,854**
1988	30	28	93.3%	370	1,980	673	608	37	**3,667**
1989	38	31	81.6%	533	2,913	973	887	102	**5,408**
1990	35	31	88.6%	482	3,826	1,230	843	57	**6,438**
1991	40	37	92.5%	424	3,520	1,177	529	21	**5,670**
1992	34	22	64.7%	1,141	3,341	1,209	564	83	**6,338**
1993	35	27	77.1%	658	1,966	620	570	8	**3,822**
1994	24	23	95.8%	888	1,722	871	378	80	**3,939**
1995	23	22	95.7%	799	1,365	784	389	0	**3,337**
1996	21	7	33.3%	541	762	281	341	99	**2,024**
1997	30	30	100.0%	685	1,472	275	390	0	**2,822**
1998	42	42	100.0%	836	2,393	317	457	84	**4,087**
1999	73	70	95.9%	1,181	3,718	217	460	87	**5,662**
2000	52	40	76.9%	1,014	2,945	342	533	83	**4,917**
2001	90	89	98.9%	1,582	4,122	378	362	31	**6,475**
2002	35	34	97.1%	718	2,358	241	605	10	**3,932**
2003	84	81	96.4%	1,037	4,283	778	483	446	**7,027**
2004	44	38	86.4%	1,094	1,770	204	383	108	**3,559**
2005	43	36	83.7%	1,444	2,223	281	259	26	**4,232**
2006	59	46	78.0%	1,589	2,699	408	487	342	**5,525**
2007	45	33	73.3%	1,227	2,521	110	420	19	**4,298**
2008	89	88	98.9%	1,303	3,744	535	691	114	**6,387**
2009	38	36	94.7%	827	2,220	262	365	5	**3,679**
2010	60	51	85.0%	1,075	3,176	489	663	83	**5,485**
2011	66	60	90.9%	966	3,301	540	497	42	**5,346**
2012	53	38	71.7%	951	5,364	298	779	85	**7,478**
2013	63	46	73.0%	663	3,679	208	363	0	**4,946**
2014	57	50	87.7%	602	4,539	486	646	189	**6,463**
2015	48	43	89.6%	874	2,365	650	310	23	**4,223**
2016	62	57	91.9%	1,086	3,398	471	348	198	**5,502**
2017	60	56	93.3%	870	4,901	539	503	131	**6,943**
5-year avg (2013–2017)	58	50	86.9%	819	3,776	471	434	108	**5,615**
10-year avg (2008–2017)	60	53	88.1%	922	3,669	448	517	87	**5,645**
Historical avg (1983–2017)	47	41	86.2%	876	2,941	650	577	90	**5,136**

Source ADF&G Division of Subsistence, ASFDB 2018 (ADF&G May 2019).



Note The 1999 "previous household survey" total salmon harvest value excludes the harvest amount of unknown salmon. Also, the sources for estimated salmon harvested for 1999 and 2008 were Coiley-Kenner et al. (2003) and Fall et al. 2012).

Figure 3-21.–Historical estimated subsistence salmon harvests, total salmon, Togiak, based on permit returns, 1983–2017, and household surveys, 1999, 2008, 2016, and 2017.



Note The "previous household survey" and "this study" sockeye salmon harvest values include the estimated harvests of other spawning salmon determined from administering household surveys. Also, the sources for estimated salmon harvested for 1999 and 2008 were Coiley-Kenner et al. (2003) and Fall et al. 2012).

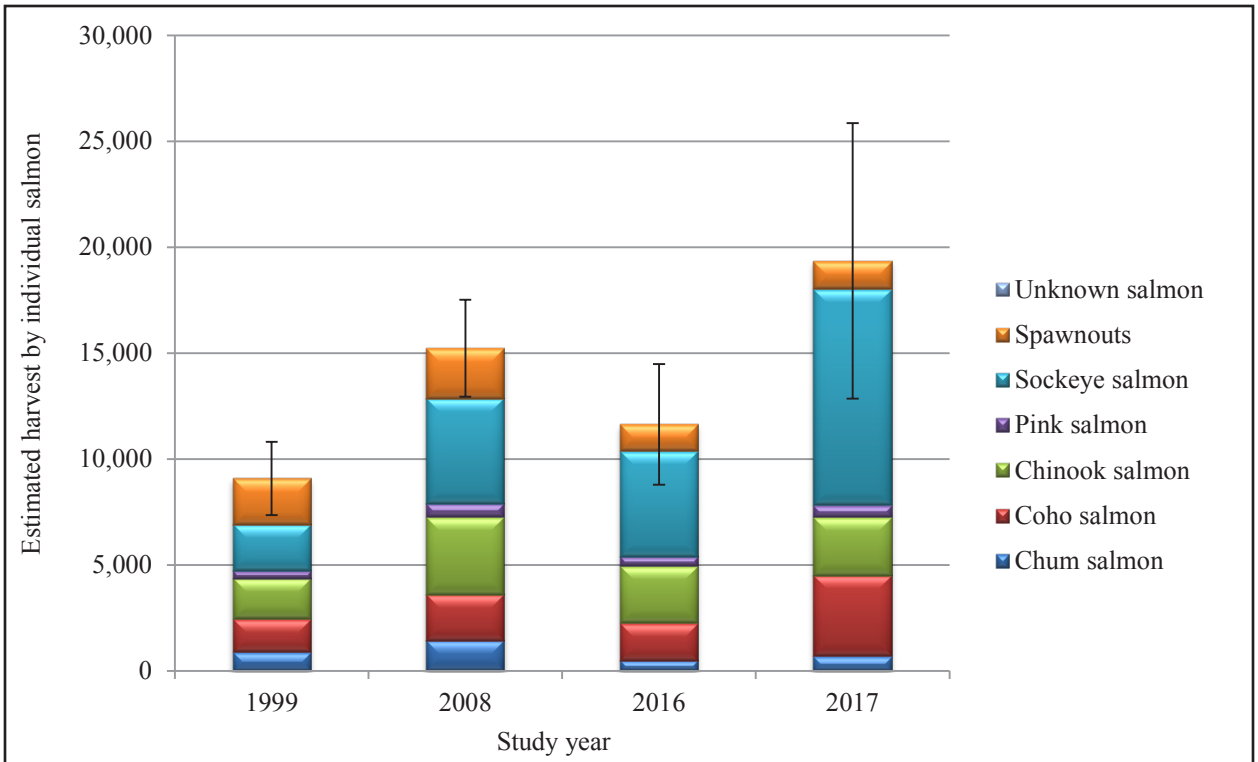
Figure 3-22.–Historical estimated subsistence salmon harvests, by species, Togiak, based on permit returns, 1983–2017, and household surveys, 1999, 2008, 2016, and 2017.

Table 3-47.–Comparison of estimated total salmon harvests, Togiak, 1999, 2008, 2016, and 2017.

	Estimated number of salmon harvested							
	1999		2008		2016		2017	
Resource	Number	CIP	Number	CIP	Number	CIP	Number	CIP
Salmon	**9,088.0**	**19.0%**	**15,232.6**	**15.0%**	**11,634.0**	**24.5%**	**19,359.2**	**33.6%**
Chum salmon	899.0	32.0%	1,440.7	27.6%	515.1	29.5%	702.4	34.4%
Coho salmon	1,564.0	29.0%	2,173.3	24.7%	1,744.3	29.4%	3,808.4	62.7%
Chinook salmon	1,917.0	23.0%	3,643.6	16.0%	2,704.1	39.4%	2,746.8	26.2%
Pink salmon	365.0	43.0%	634.8	28.3%	441.2	33.5%	574.7	85.7%
Sockeye salmon	2,172.0	26.0%	4,958.7	19.4%	4,982.2	21.6%	10,198.8	40.1%
Spawnouts[a]	2,166.0	29.0%	2,381.4	22.4%	1,247.1	45.3%	1,328.1	79.1%
Unknown salmon	5.0	76.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%

Sources For 2016 and 2017, ADF&G Division of Subsistence household surveys, 2017, 2018; for previous study years, ADF&G Division of Subsistence Community Subsistence Information System (CSIS), accessed 2018.

a. In 2008, 2016, and 2017, "spawnouts" were spawning sockeye salmon; in 1999, "spawnouts" were not identified by species.



Note Error bars represent the upper and lower bounds of the 95% confidence interval. Also, in 2008, 2016, and 2017, "spawnouts" were spawning sockeye salmon; in 1999, "spawnouts" were not identified by species.

Figure 3-23.–Composition of total salmon harvest, by species and individual fish, Togiak, 1999, 2008, 2016, and 2017.

are typically male[3]) were returning during the study years than in previous years. In addition, many people remarked that the run timing and abundance of Chinook salmon returns during the past 15 years have been sporadic and unpredictable. A large portion of Togiak residents mentioned the presence of bottom trawlers fishing commercially for yellowfin sole near the community and attributed the decreased returns of Chinook salmon to the effect of seafloor habitat destruction and bycatch from these fishing vessels. Several survey participants and key respondents explained that prior to the reopening of the fishery for trawlers, the Togiak-bound Chinook salmon population seemed stable but has changed in the ensuing years. Some community members explained that as a result of decreasing Chinook harvests, they have placed more effort on targeting other salmon species, such as sockeye and coho salmon, in order to put away enough salmon for the year. Togiak residents also noted that some sport fishing practices seem to be wasteful, citing seeing large amounts of wasted Chinook salmon near sport fishing lodges and popular sport fishing locations in the Togiak River. Several residents stated that they believed some Chinook salmon were being harvested for their eggs to be used as bait and the rest of the fish was being wasted. The lack of Chinook salmon escapement monitoring in the Togiak River was also a concern for some community members.

Sockeye Salmon

Some Togiak respondents mentioned a lower abundance of sockeye salmon within the past five years. These respondents were concerned the decrease in sockeye salmon populations may be a result of the local

3. Alaska Department of Fish and Game, "Chinook Salmon." Last modified 2008. https://www.adfg.alaska.gov/static/education/wns/chinook_salmon.pdf (accessed April 2019).

trawling operations. One respondent explained that they recently switched to using subsistence Chinook gear as a means for allowing sockeye salmon to pass.

Coho Salmon

Togiak residents remarked on the quality and appearance of coho salmon in 2016 and 2017. Several people explained that some coho salmon appeared diseased, having round white spots on the meat and some of this fish species had large sections on the skin on which scales were missing. The presence of worms found inside the meat of coho salmon was also frequently mentioned as a concern by Togiak residents during the study years.

Trawlers

Almost all Togiak residents who expressed concerns related to salmon stock health mentioned the presence of bottom trawlers fishing for yellowfin sole near the community. Residents believe that this fishing method is harmful for the local marine environment and that this fishery is also intercepting salmon bound for the Togiak river as bycatch.

Commercial Retention for Home Use

During the surveys, some Togiak residents remarked that the rules and regulations surrounding the retention of commercially caught salmon for home use were not clear. Several Togiak residents informed project staff that they were not sure where they were supposed to record the amount of fish they were taking from their commercial catch for home use; they explained that the processors did not ask this question when they delivered fish, and some residents were unsure if they were supposed to record commercial retention on their subsistence permit.

Pebble Mine

Concerns regarding Pebble Mine, an open-pit copper/gold/molybdenum mine proposed at Bristol Bay's headwaters, were mentioned during both years of household harvest surveys. Feedback from Togiak respondents included remarks about the potential threats to fish populations, subsistence and commercial fisheries, and other natural resources if Pebble Mine was built. The risk of pollution and contamination from the mine site worried Togiak survey respondents. No single comment from any survey or interview data supported Pebble Mine; all perspectives focused on the mine's potential negative effects on the region's salmon and ecosystem health.

4. TWIN HILLS

Bronwyn Jones

Community Background

Twin Hills is located about one-and-a-half miles inland on an eastern tributary of the Togiak River called the Twin Hills River, which breaks off from the main channel about 12 miles upriver. This tributary is navigable during high tides and the community is approximately five miles from the neighboring community of Togiak. Depending on seasonal conditions, boat or snowmachine travel between Twin Hills and Togiak Bay is possible. Primary access to Twin Hills is by air from the regional hub, Dillingham.

The community of Twin Hills is located within a climatic transition zone and is affected by both maritime and continental influences. Cloudy skies and moderately heavy precipitation characterize the area. Tundra is the dominant vegetation type surrounding the community, but willows and scattered clumps of cottonwood trees grow along the rivers. Small patches of spruce grow in some areas. The land is dotted with small tundra ponds and lakes.

Twin Hills was founded in 1965 by former residents of Quinhagak and Togiak (Fall et al. 1996:28). Today the Twin Hills Traditional Council is the Alaska Native tribal governing body. Presently, facilities in Twin Hills include a health clinic that is operated by the Bristol Bay Area Health Corporation, a K–12 school built in 1978, and a commercial fish processor, Togiak Fisheries, owned by North Pacific Seafoods of Seattle, WA. Most homes in Twin Hills are connected to a piped water and sewer system as well as to electricity supplied by a diesel generator. Two air taxi services operate regular flights between Twin Hills and Dillingham.

Population Estimates and Demographic Information: 2016 and 2017

This study found an estimated population for Twin Hills in 2016 of 77 individuals in 28 households, and in 2017 the population was estimated to be 68 individuals in 24 households (Table 4-1). The 2016 estimate is comparable to the 2010 U.S. Census Bureau and the American Community Survey (ACS) 5-year (2012–2016) average estimates of 74 individuals in 29 households (Figure 4-1; Table 4-1). The 2017 estimate is lower than both the 2010 U.S. Census Bureau population and household estimates and the ACS 5-year (2013–2017) average estimate of 83 individuals in 30 households. These estimates may differ due to different criteria used by the agencies to determine full-time residency. The criteria employed in this study required at least six consecutive months of occupancy in the community during the study years (2016 and 2017) and self-identification as a full-time resident.

The overall population of Twin Hills has been stable since 1970 (Figure 4-2), although, according to the Alaska Department of Labor's population estimates, the community experienced a decline in population during the 1980s, with 39 people living in Twin Hills in 1988. However, since the early 1990s the population of Twin Hills has remained relatively stable, with slight decreases and increases over the ensuing 30 years. In 1991, the Alaska Department of Labor population estimate was approximately 72 Twin Hills residents, which is close to the population estimates based on household surveys for the study years.

Overall, both the 2016 and 2017 population profiles indicate that the ratio of females versus males is unevenly distributed within many age cohorts in Twin Hills (Figure 4-3; Figure 4-4). The 2016 study estimated the average age of Twin Hills residents to be 31 years old with the youngest individual being 1 year old and the oldest individual being 72 years old (Table 4-1). The 2017 study estimated the average age of Twin Hills residents to be 30 years old with the youngest individual being 2 years old and the oldest individual being 85 years old. For the 2016 study year, the two largest female age cohorts were for the ages 5–9, and 55–59, followed by the female age cohort of 30–34 (Table 4-2). The two largest male age cohorts in 2016 were for the ages of 10–14, and 15–19, and the second largest male age cohort was between for the ages of 65–69. In 2017, there were four female age cohorts tied for largest: 0–4, 5–9, 10–14, and 55–59;

Table 4-1.–Sample and demographic characteristics, Twin Hills, 2010, 2016 and 2017.

Characteristics	Twin Hills 2016	2017
Sampled households	20	18
Eligible households	28	24
Percentage sampled	71.4%	75.0%
Sampled population	55	51
Estimated community population	77.0	68.0
Range[a]	62 – 92	56 – 80
Household size		
Mean	2.8	2.8
Minimum	1	1
Maximum	8	7
Age		
Mean	30.9	30.2
Minimum[b]	1	2
Maximum	72	85
Median	31	29.5
Alaska Native		
Estimated households[c]		
Number	28.0	24.0
Percentage	100.0%	100.0%
Estimated population		
Number	75.6	66.7
Percentage	98.2%	98.0%
Range[a]	60 – 91	56 – 78
U.S. Census	**(2010)**	**(2010)**
Households	29	29
Population	74	74
Alaska Native population	72	72
ACS 5-year average	**(2012–2016)**	**(2013–2017)**
Households	29	30
Range[d]	17 – 41	21 – 39
Population	74	83
Range[d]	52 – 96	62 – 104
Alaska Native population	73	81
Range[d]	51 – 95	61 – 101

Sources U.S. Census Bureau (2011); U.S. Census Bureau for American Community Survey (ACS) for 2016 and 2017 estimates (5-year average); and ADF&G Division of Subsistence household surveys, 2017 and 2018.

a. Division of Subsistence estimates range is 95% confidence interval.

b. A minimum age of 0 (zero) is used for infants who are less than 1 year of age.

c. The estimated number of households in which at least 1 head of household is Alaska Native.

d. ACS data range is the reported margin of error.

an estimated 12% of the population fell in each of those cohorts (Table 4-3). The largest male age cohort in 2017 was for the ages of 15–19, and the second largest male age cohort was for 10–14. Similar to Togiak, in both study years, approximately 40% of the population was children (i.e., residents aged 0 to 19) (Table 4-2; Table 4-3).

The 2016 survey estimated 21% of household heads' parents were living in Twin Hills at the time of their birth, and 44% of the total population had parents living in Twin Hills when they were born (Table 4-4; Table 4-5). For the 2017 study year, 28% of household heads' parents were living in Twin Hills at the time of their birth, and 43% of the Twin Hills total population had parents living in this community when they were born (Table 4-6; Table 4-7).

According to the ACS average 5-year estimate for 2013–2017, which encompasses both study years for this community, the median household income in Twin Hills was $29,167 (U.S. Census Bureau n.d.). Participation in the cash economy is linked to household subsistence participation characteristics (Wolfe 1984; Wolfe and Ellanna 1983); of note, the Bristol Bay commercial salmon fishery is a primary component to the cash economy in the region where the study community is located. The 2017 inshore Bristol Bay sockeye salmon run of 57.6 million fish had an ex-vessel value (the post-season adjusted price per pound for the first purchase of commercial harvest) of $216.4 million (all salmon species combined), which was 50% above the 10-year average (2007–2016) of $144.6 million (Elison et al. 2018:4, 28). However, survey results indicated that few households in Twin Hills engage in the cash economy through commercial fishing activities: an estimated more than 70% of households in both study years did not have any income from commercial fishing (Table 4-8). No additional questions about employment and income characteristics for Twin Hills households were included in the Division of Subsistence surveys for 2016 and 2017.

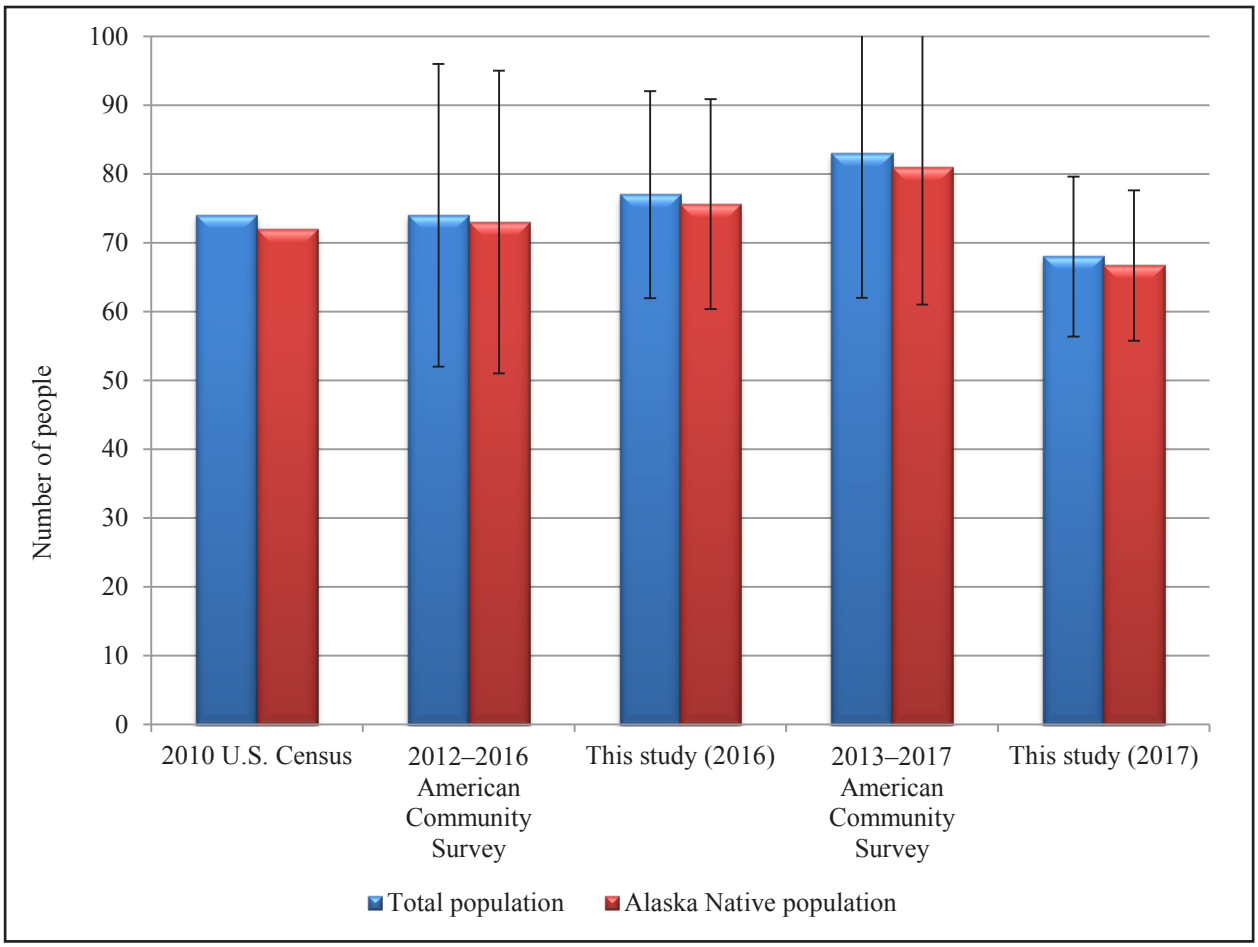


Figure 4-1.–Alaska Native and overall population estimates, Twin Hills, 2010, 2016, and 2017.

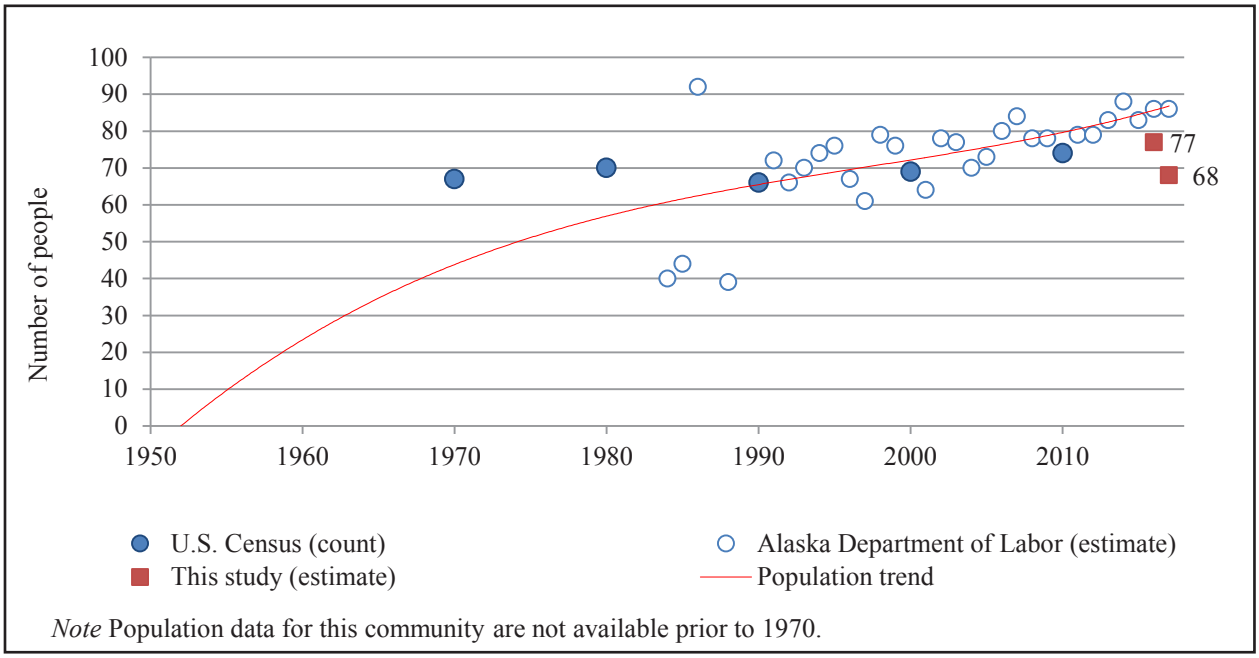


Figure 4-2.–Historical population estimates, Twin Hills, 1950–2017.

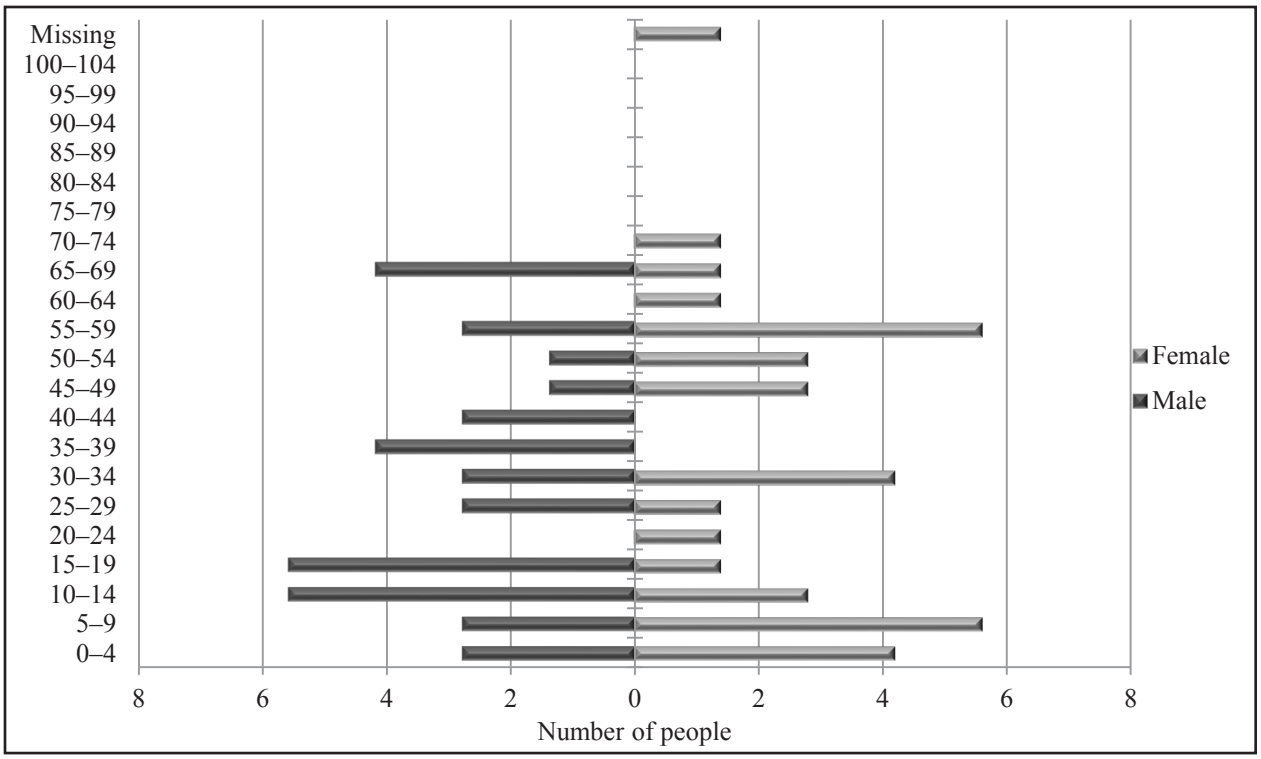


Figure 4-3.–Population profile, Twin Hills, 2016.

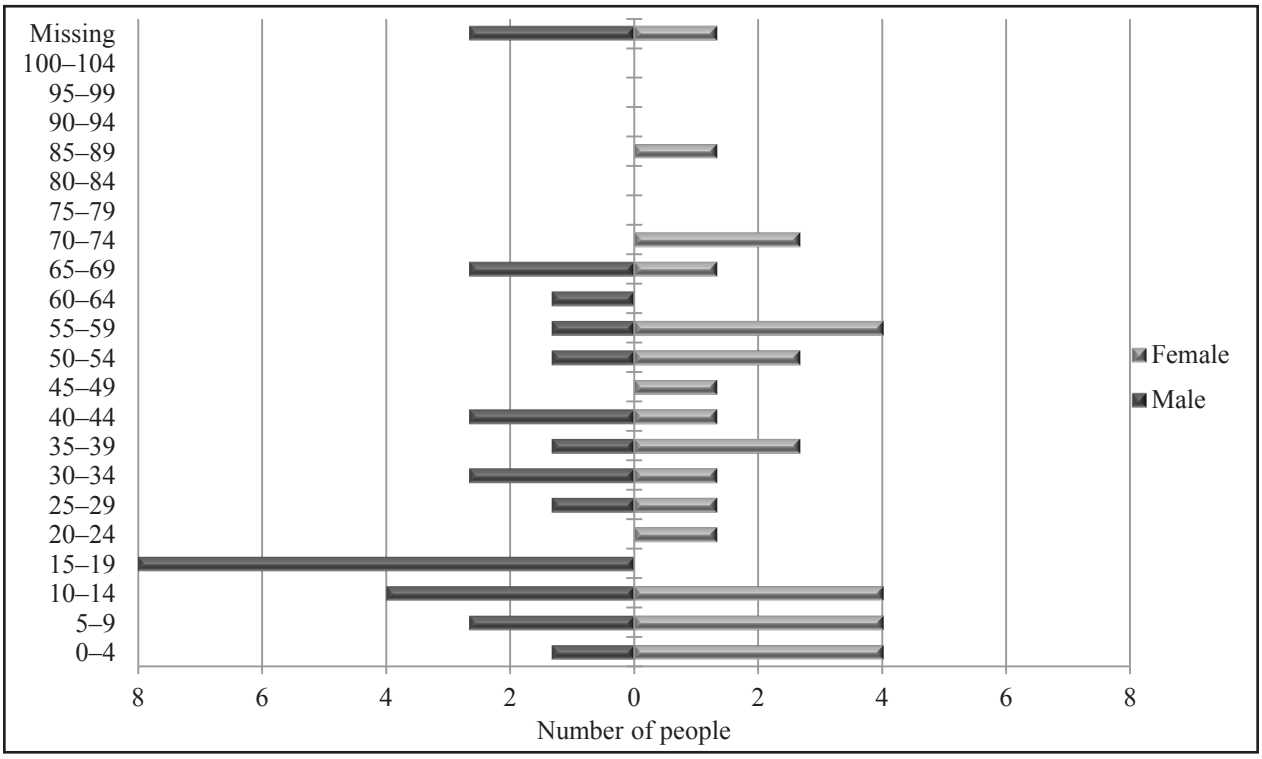


Figure 4-4.–Population profile, Twin Hills, 2017.

Table 4-2.–Population profile, Twin Hills, 2016.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	2.8	7.1%	7.1%	4.2	11.1%	11.1%	7.0	9.1%	9.1%
5–9	2.8	7.1%	14.3%	5.6	14.8%	25.9%	8.4	10.9%	20.0%
10–14	5.6	14.3%	28.6%	2.8	7.4%	33.3%	8.4	10.9%	30.9%
15–19	5.6	14.3%	42.9%	1.4	3.7%	37.0%	7.0	9.1%	40.0%
20–24	0.0	0.0%	42.9%	1.4	3.7%	40.7%	1.4	1.8%	41.8%
25–29	2.8	7.1%	50.0%	1.4	3.7%	44.4%	4.2	5.5%	47.3%
30–34	2.8	7.1%	57.1%	4.2	11.1%	55.6%	7.0	9.1%	56.4%
35–39	4.2	10.7%	67.9%	0.0	0.0%	55.6%	4.2	5.5%	61.8%
40–44	2.8	7.1%	75.0%	0.0	0.0%	55.6%	2.8	3.6%	65.5%
45–49	1.4	3.6%	78.6%	2.8	7.4%	63.0%	4.2	5.5%	70.9%
50–54	1.4	3.6%	82.1%	2.8	7.4%	70.4%	4.2	5.5%	76.4%
55–59	2.8	7.1%	89.3%	5.6	14.8%	85.2%	8.4	10.9%	87.3%
60–64	0.0	0.0%	89.3%	1.4	3.7%	88.9%	1.4	1.8%	89.1%
65–69	4.2	10.7%	100.0%	1.4	3.7%	92.6%	5.6	7.3%	96.4%
70–74	0.0	0.0%	100.0%	1.4	3.7%	96.3%	1.4	1.8%	98.2%
75–79	0.0	0.0%	100.0%	0.0	0.0%	96.3%	0.0	0.0%	98.2%
80–84	0.0	0.0%	100.0%	0.0	0.0%	96.3%	0.0	0.0%	98.2%
85–89	0.0	0.0%	100.0%	0.0	0.0%	96.3%	0.0	0.0%	98.2%
90–94	0.0	0.0%	100.0%	0.0	0.0%	96.3%	0.0	0.0%	98.2%
95–99	0.0	0.0%	100.0%	0.0	0.0%	96.3%	0.0	0.0%	98.2%
100–104	0.0	0.0%	100.0%	0.0	0.0%	96.3%	0.0	0.0%	98.2%
Missing	0.0	0.0%	100.0%	1.4	3.7%	100.0%	1.4	1.8%	100.0%
Total	**39.2**	**100.0%**	**100.0%**	**37.8**	**100.0%**	**100.0%**	**77.0**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2017.

Table 4-3.–Population profile, Twin Hills, 2017.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	1.3	4.0%	4.0%	4.0	11.5%	11.5%	5.3	7.8%	7.8%
5–9	2.7	8.0%	12.0%	4.0	11.5%	23.1%	6.7	9.8%	17.6%
10–14	4.0	12.0%	24.0%	4.0	11.5%	34.6%	8.0	11.8%	29.4%
15–19	8.0	24.0%	48.0%	0.0	0.0%	34.6%	8.0	11.8%	41.2%
20–24	0.0	0.0%	48.0%	1.3	3.8%	38.5%	1.3	2.0%	43.1%
25–29	1.3	4.0%	52.0%	1.3	3.8%	42.3%	2.7	3.9%	47.1%
30–34	2.7	8.0%	60.0%	1.3	3.8%	46.2%	4.0	5.9%	52.9%
35–39	1.3	4.0%	64.0%	2.7	7.7%	53.8%	4.0	5.9%	58.8%
40–44	2.7	8.0%	72.0%	1.3	3.8%	57.7%	4.0	5.9%	64.7%
45–49	0.0	0.0%	72.0%	1.3	3.8%	61.5%	1.3	2.0%	66.7%
50–54	1.3	4.0%	76.0%	2.7	7.7%	69.2%	4.0	5.9%	72.5%
55–59	1.3	4.0%	80.0%	4.0	11.5%	80.8%	5.3	7.8%	80.4%
60–64	1.3	4.0%	84.0%	0.0	0.0%	80.8%	1.3	2.0%	82.4%
65–69	2.7	8.0%	92.0%	1.3	3.8%	84.6%	4.0	5.9%	88.2%
70–74	0.0	0.0%	92.0%	2.7	7.7%	92.3%	2.7	3.9%	92.2%
75–79	0.0	0.0%	92.0%	0.0	0.0%	92.3%	0.0	0.0%	92.2%
80–84	0.0	0.0%	92.0%	0.0	0.0%	92.3%	0.0	0.0%	92.2%
85–89	0.0	0.0%	92.0%	1.3	3.8%	96.2%	1.3	2.0%	94.1%
90–94	0.0	0.0%	92.0%	0.0	0.0%	96.2%	0.0	0.0%	94.1%
95–99	0.0	0.0%	92.0%	0.0	0.0%	96.2%	0.0	0.0%	94.1%
100–104	0.0	0.0%	92.0%	0.0	0.0%	96.2%	0.0	0.0%	94.1%
Missing	2.7	8.0%	100.0%	1.3	3.8%	100.0%	4.0	5.9%	100.0%
Total	**33.3**	**100.0%**	**100.0%**	**34.7**	**100.0%**	**100.0%**	**68.0**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2018.

Table 4-4.–Birthplaces of household heads, Twin Hills, 2016.

Birthplace	Percentage
Aleknagik	3.4%
Atmautluak	3.4%
Beluga	3.4%
Dillingham	3.4%
Goodnews Bay	3.4%
Koliganek	3.4%
Platinum	10.3%
Portage Creek	3.4%
Quinhagak	24.1%
Togiak	10.3%
Twin Hills	20.7%
Other U.S.	10.3%

Source ADF&G Division of Subsistence household surveys, 2017.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 4-5.–Birthplaces of population, Twin Hills, 2016.

Birthplace	Percentage
Aleknagik	1.8%
Atmautluak	1.8%
Beluga	1.8%
Bethel	3.6%
Dillingham	3.6%
Goodnews Bay	1.8%
Koliganek	1.8%
Manokotak	1.8%
Platinum	5.5%
Portage Creek	1.8%
Quinhagak	18.2%
Togiak	5.5%
Twin Hills	43.6%
Other U.S.	7.3%

Source ADF&G Division of Subsistence household surveys, 2017.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 4-6.–Birthplaces of household heads, Twin Hills, 2017.

Birthplace	Percentage
Dillingham	3.4%
Manokotak	3.4%
Nightmute	3.4%
Nunapitchuk	3.4%
Platinum	6.9%
Quinhagak	31.0%
Togiak	6.9%
Tununak	3.4%
Twin Hills	27.6%
Other U.S.	3.4%
Missing	6.9%

Source ADF&G Division of Subsistence household surveys, 2018.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 4-7.–Birthplaces of population, Twin Hills, 2017.

Birthplace	Percentage
Bethel	2.0%
Dillingham	2.0%
Manokotak	2.0%
Nightmute	2.0%
Nunapitchuk	2.0%
Platinum	3.9%
Quinhagak	27.5%
Togiak	7.8%
Tununak	2.0%
Twin Hills	43.1%
Other U.S.	2.0%
Missing	3.9%

Source ADF&G Division of Subsistence household surveys, 2018.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 4-8.–Estimated number of households having income from commercial fishing, Twin Hills, 2016 and 2017.

Percentage of income from commercial fishing	2016		2017	
	Number	Percentage	Number	Percentage
0%	21	78.9%	17	72.2%
1%–25%	3	10.5%	3	11.1%
26%–50%	1	5.3%	3	11.1%
51%–75%	0	0.0%	1	5.6%
76%–99%	0	0.0%	0	0.0%
100%	1	5.3%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Summary of Harvest and Use Patterns

All five species of Pacific salmon found in Alaska are available for harvest by Twin Hills residents. In this chapter, harvest survey results from this study (2016 and 2017) are first presented, which includes harvest estimates and identifying the gear types[1] used to harvest salmon. Subsistence gillnets are used by Twin Hills community members to harvest salmon by setnetting and driftnetting. For setnetting, the gillnet is staked into the ground on both ends, while driftnetting requires a boat to which one end of the net is attached while the other end is held up by a buoy. Setnetting often occurs along beaches and in tributaries of the Togiak River and in Togiak Lake. Driftnetting usually occurs in Togiak River. During the subsistence household surveys, respondents were not prompted to specify which method of gillnetting they were using, therefore all gillnet harvests have been included in a single gear type category for this report.

Following an overview of survey results is a discussion of subsistence permit participation in Twin Hills. Next, the results of the harvest and use assessment questions from the household survey are presented. Assessment questions attempt to gauge to what degree salmon harvest and use patterns by the community have changed over time. Finally, the 2016 and 2017 salmon harvest data are compared to harvest survey results from the previous study year 1999 (see Coiley-Kenner et al. 2003) and also compared to the subsistence salmon harvest permit data for 1983–2017. Following presentation of these data, local community comments and concerns are presented; information for this section came from the salmon harvest surveys, and is contextualized with qualitative information obtained from key respondent interviews and participant observation.

Household Salmon Harvest and Use Characteristics in Twin Hills: 2016

In 2016, Twin Hills residents harvested an estimated total of 3,365 lb, or 44 lb per capita, of salmon (Table 4-9). In terms of total pounds harvested and harvest proportion in percentages, the greatest harvest by salmon species was sockeye salmon (1,723 lb, 22 lb per capita, or 51% of the total salmon harvest), followed by Chinook salmon (790 lb, 10 lb per capita, or 23%), coho salmon (399 lb, 5 lb per capita, or 12%), spawning sockeye salmon (332 lb, 4 lb per capita, or 10%), and chum salmon (120 lb, 2 lb per capita, or 4%). There was no harvest of pink salmon (Table 4-9; Figure 4-5).

In 2016, an estimated 35% of community households owned a gillnet to harvest salmon and 55% of households owned a boat (Table 4-10). Overall, an estimated 11% of Twin Hills households owned a boat used for commercial fishing. In 2016, there were two households that indicated a person with a commercial fishery permit resided at the residence, five households had crew members, and five households had either permit holders or crew members residing at the residence (Table 4-11). Based on responses from surveyed households that retained salmon from commercial catches, an estimated four households indicated they

1. According to both state and federal subsistence salmon fishing regulations, spear is a legal subsistence gear type in Togiak River; however, no surveyed households used spears.

usually retain Chinook salmon from commercial fishing for home use, and an estimated three households indicated they usually retain Chinook salmon for home use and also participate in subsistence salmon fishing (Table 4-12).

Table 4-13 lists, in number of fish and pounds harvested, each salmon species harvested by Twin Hills residents in 2016 by gear type; Figure 4-6 is a complementary visual representation of the salmon harvest weight caught by gear type. Twin Hills residents harvested the majority of their salmon with subsistence gillnets (92% of salmon harvest weight); the other methods used to harvest salmon were rod and reel (6%) and removals from commercial catches (2%) (Table 4-14). Almost all (98%) of the sockeye salmon harvest was caught using subsistence gillnets; the remaining 2% was caught using rod and reel. For Chinook salmon, 87% of the harvest weight was caught using subsistence gear, 8% was removed from commercial catches, and 5% of the Chinook salmon harvest was caught using rod and reel. Chinook salmon was the only species removed from commercial catches in Twin Hills in 2016. More than three-quarters (78% of harvest weight) of coho salmon were harvested using subsistence gillnets, and the other method used to harvest coho salmon was rod and reel (22%). The majority of chum salmon were harvested using subsistence gillnets (74%), and the remaining 26% of the harvest weight was caught using rod and reel. All of the spawning sockeye salmon harvest was caught using subsistence gillnets.

Figure 4-7 shows the percentages of households that used salmon, and attempted to harvest and harvested salmon. During 2016, 90% of Twin Hills households used salmon, 75% attempted to harvest salmon, and all were successful in their salmon harvest pursuits. In 2016, less than one-half of households (35%) gave salmon away and 65% of households received salmon (Table 4-9).

More than one-half (65%) of Twin Hills households used sockeye salmon during the study year, 40% of households harvested sockeye salmon, 15% shared this salmon species, and 35% received sockeye salmon (Table 4-9). For Chinook salmon, more households in Twin Hills used (75%), harvested (55%), and shared (30% giving and 45% receiving) this species during the study year than any other salmon species. In 2016, one-half (50%) of Twin Hills households used coho salmon, 35% harvested this salmon species, 10% gave away coho salmon, and 20% of households received this salmon species. Less than one-half (35%) of Twin Hills households used chum salmon in 2016, and fewer households (15%) used spawning sockeye salmon during the study year. Only 5% of households used pink salmon, all of which were received from households in another community.

In 2016, Twin Hills respondents reported harvesting Chinook salmon in the mouth of the Togiak River, in the Togiak River a little south of Ekilik, and along the eastern shore of Togiak Bay (Figure 4-8). During the first study year, the other salmon species (chum, coho, and sockeye) were generally harvested in the same locations as where Chinook salmon were harvested: near the mouth of the Togiak River and eastern shoreline of Togiak Bay, with the exception of a coho harvest location as far north as Ekilik in the Togiak River (Figure 4-9). Spawning sockeye salmon were harvested in the south end of Togiak Lake in 2016 (Figure 4-10).

Table 4-9.–Estimated uses and harvests of salmon, Twin Hills, 2016.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
Salmon	**90.0**	**75.0**	**75.0**	**65.0**	**35.0**	**3,364.6**	**120.2**	**43.7**	**719.6**	**ind**	**25.7**	**48.6**
Chum salmon	35.0	20.0	20.0	20.0	5.0	119.9	4.3	1.6	26.6	ind	1.0	55.7
Coho salmon	50.0	35.0	35.0	20.0	10.0	399.2	14.3	5.2	89.6	ind	3.2	70.8
Chinook salmon	75.0	55.0	55.0	45.0	30.0	790.4	28.2	10.3	84.0	ind	3.0	35.4
Pink salmon	5.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0
Sockeye salmon	65.0	45.0	40.0	35.0	15.0	1,722.7	61.5	22.4	435.4	ind	15.6	63.8
Spawning sockeye salmon	15.0	5.0	5.0	10.0	5.0	332.4	11.9	4.3	84.0	ind	3.0	111.9
Unknown salmon	5.0	0.0	0.0	5.0	5.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2017.

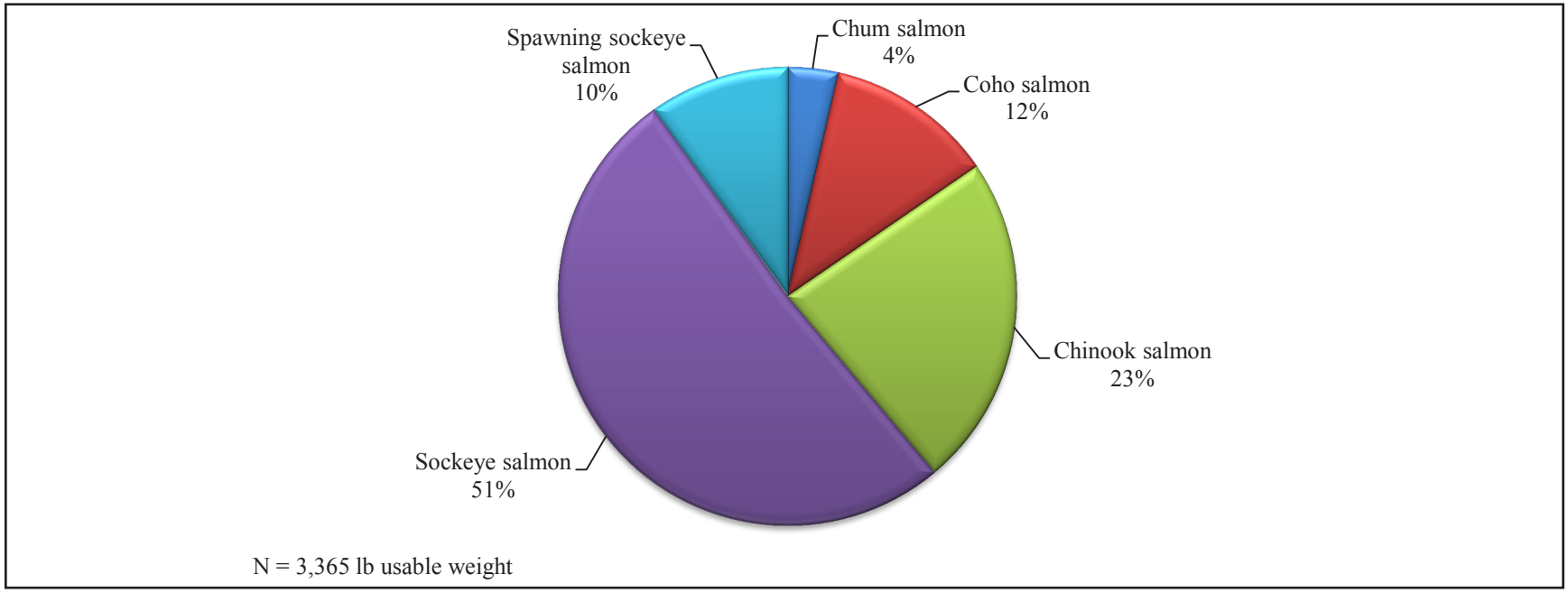


Figure 4-5.–Composition of salmon harvest in pounds usable weight, Twin Hills, 2016.

Table 4-10.–Estimated number of households owning a net or boat, Twin Hills, 2016.

Estimated households	Households owning a net		Households _____ . owning a boat		owning a boat used for commercial fishing	
	Number	Percentage	Number	Percentage	Number	Percentage
28.0	9.8	35.0%	15.4	55.0%	2.9	10.5%

Source ADFG Division of Subsistence household surveys, 2017.

Table 4-11.–Reported number of households having a household member involved with commercial salmon fishing, by commercial fishery role, Twin Hills, 2016.

	Commercial salmon fishery role		
	Permit holder	Crew	Either
Number of households	2	5	5

Source ADF&G Division of Subsistence household surveys, 2017.
Note This question was asked only of households that commercial fished in the study year.

Table 4-12.–Estimated number of households that usually retain Chinook salmon from commercial catch for home use and subsistence fish, Twin Hills, 2016.

	Household usually _____ .	
	retains Chinook salmon from commercial fishing	retains Chinook salmon from commercial fishing, and participates in subsistence salmon fishing
Number of households	4	3

Source ADF&G Division of Subsistence household surveys, 2017.

Table 4-13.–Estimated harvest of salmon by gear type and resource, Twin Hills, 2016.

	Removed from commercial catch		Subsistence methods									
			Gillnet		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**7.0**	**65.9**	**673.4**	**3,099.4**	**1.4**	**13.2**	**674.8**	**3,112.6**	**37.8**	**186.1**	**719.6**	**3,364.6**
Chum salmon	0.0	0.0	19.6	88.3	0.0	0.0	19.6	88.3	7.0	31.5	26.6	119.9
Coho salmon	0.0	0.0	70.0	311.9	0.0	0.0	70.0	311.9	19.6	87.3	89.6	399.2
Chinook salmon	7.0	65.9	71.4	671.9	1.4	13.2	72.8	685.0	4.2	39.5	84.0	790.4
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sockeye salmon	0.0	0.0	428.4	1,695.0	0.0	0.0	428.4	1,695.0	7.0	27.7	435.4	1,722.7
Spawning sockeye salmon	0.0	0.0	84.0	332.4	0.0	0.0	84.0	332.4	0.0	0.0	84.0	332.4
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2017.

Note The harvested number of salmon is represented as individual fish harvested.

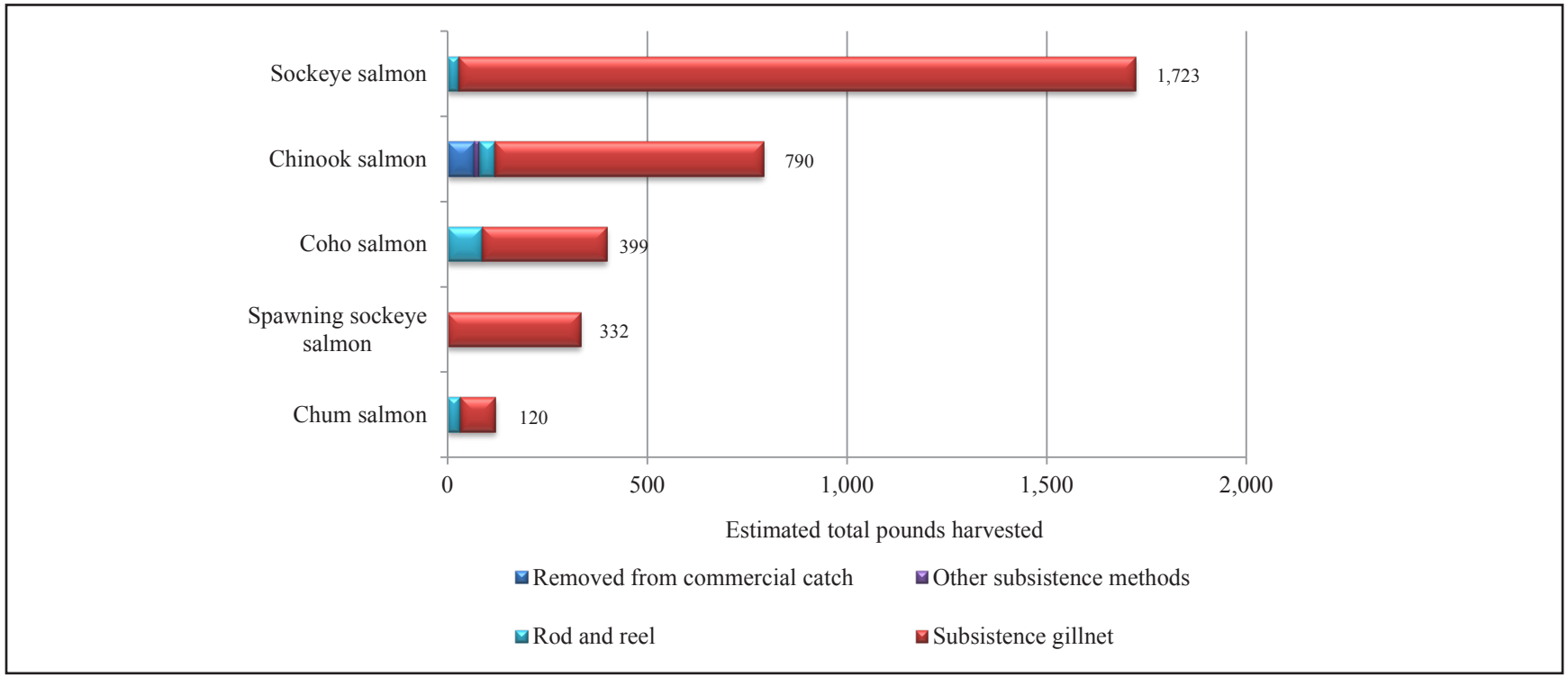


Figure 4-6.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Twin Hills, 2016.

Table 4-14.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Twin Hills, 2016.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet	Other	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**2.0%**	**92.1%**	**0.4%**	**92.5%**	**5.5%**	**100.0%**
	Total	**2.0%**	**92.1%**	**0.4%**	**92.5%**	**5.5%**	**100.0%**
Chum salmon	Gear type	0.0%	2.8%	0.0%	2.8%	17.0%	3.6%
	Resource	0.0%	73.7%	0.0%	73.7%	26.3%	100.0%
	Total	0.0%	2.6%	0.0%	2.6%	0.9%	3.6%
Coho salmon	Gear type	0.0%	10.1%	0.0%	10.0%	46.9%	11.9%
	Resource	0.0%	78.1%	0.0%	78.1%	21.9%	100.0%
	Total	0.0%	9.3%	0.0%	9.3%	2.6%	11.9%
Chinook salmon	Gear type	100.0%	21.7%	100.0%	22.0%	21.2%	23.5%
	Resource	8.3%	85.0%	1.7%	86.7%	5.0%	100.0%
	Total	2.0%	20.0%	0.4%	20.4%	1.2%	23.5%
Pink salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sockeye salmon	Gear type	0.0%	54.7%	0.0%	54.5%	14.9%	51.2%
	Resource	0.0%	98.4%	0.0%	98.4%	1.6%	100.0%
	Total	0.0%	50.4%	0.0%	50.4%	0.8%	51.2%
Spawning sockeye salmon	Gear type	0.0%	10.7%	0.0%	10.7%	0.0%	9.9%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	9.9%	0.0%	9.9%	0.0%	9.9%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

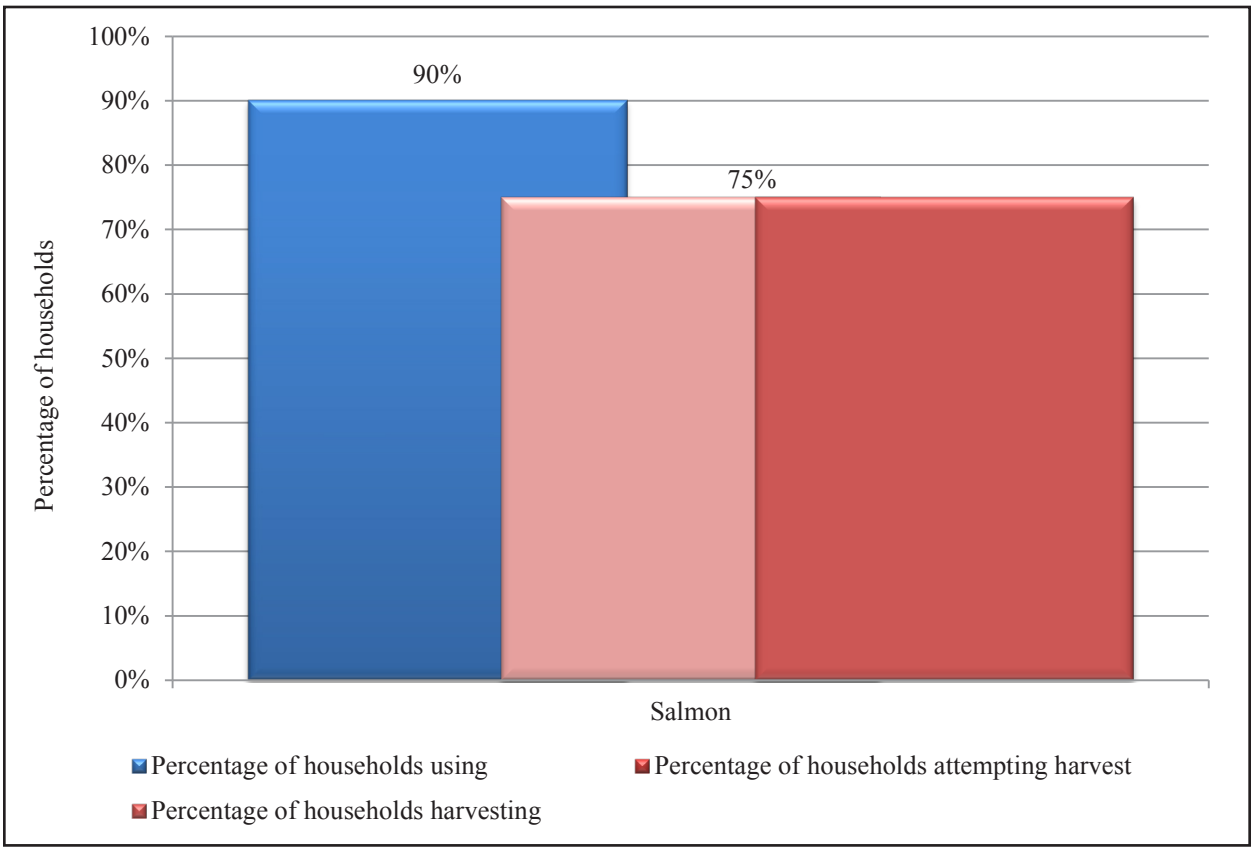


Figure 4-7.–Percentage of households using, attempting to harvest, and harvesting salmon, Twin Hills, 2016.

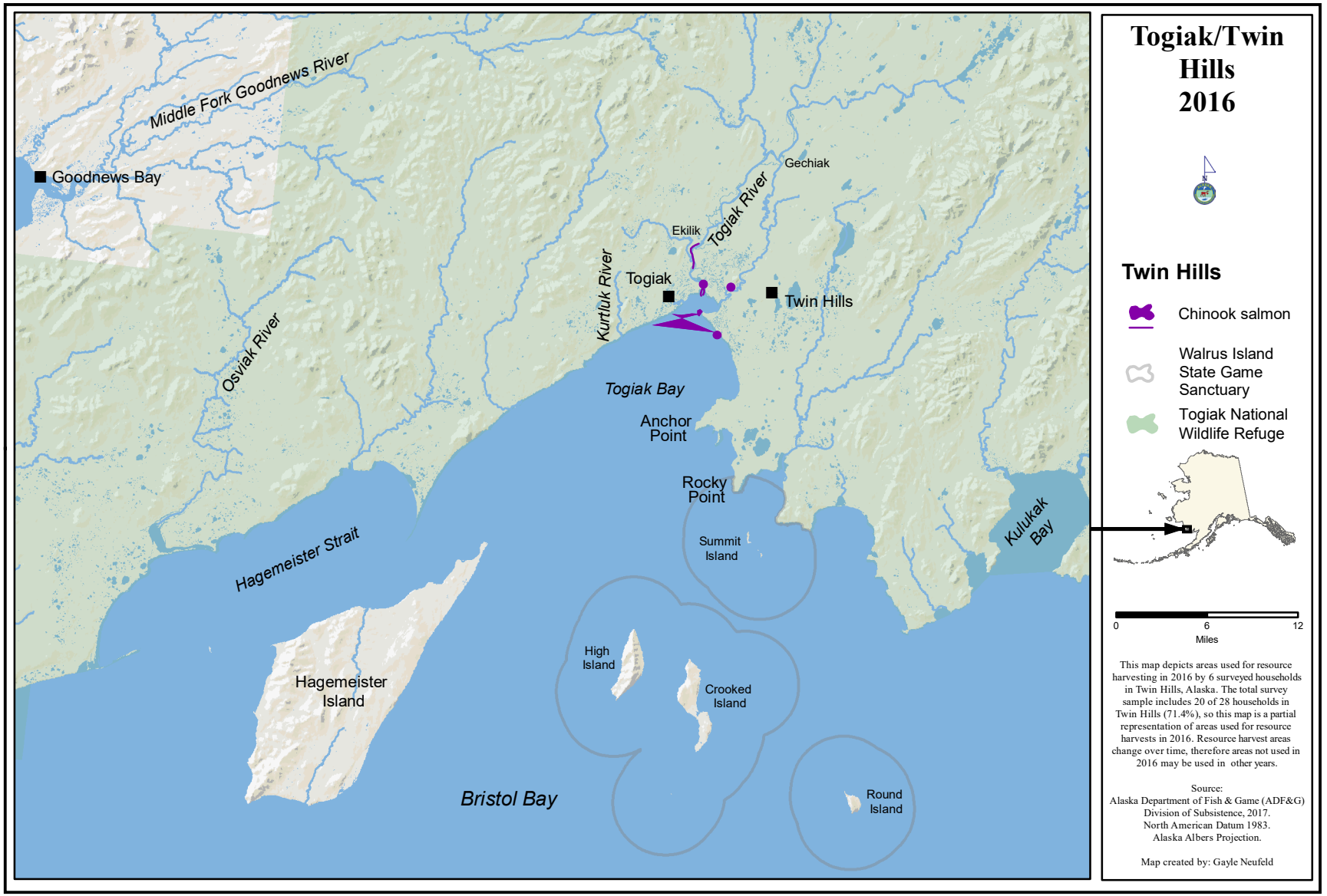


Figure 4-8.–Fishing and harvest locations for Chinook salmon, Twin Hills, 2016.

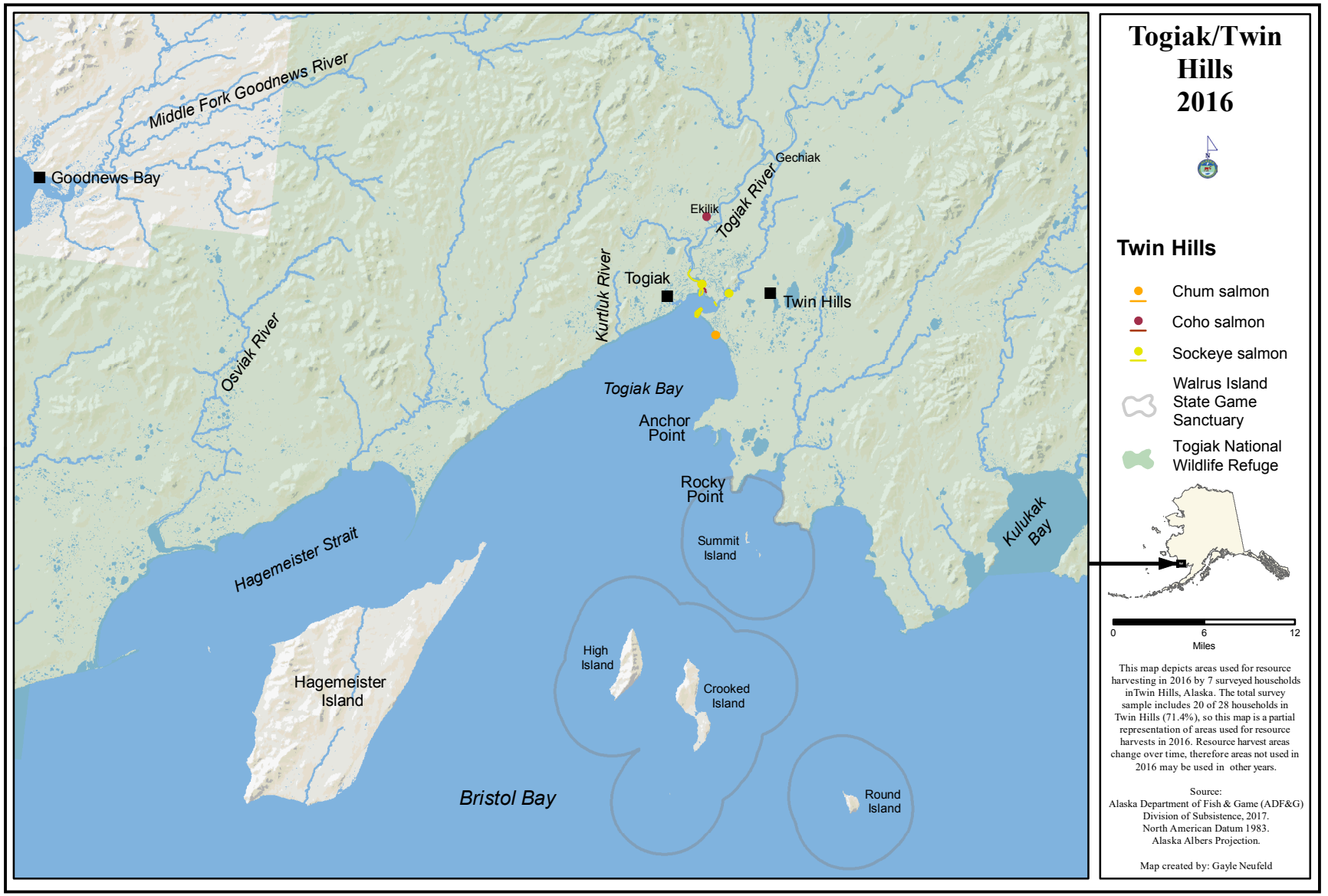


Figure 4-9.–Fishing and harvest locations for chum, coho, and sockeye salmon, Twin Hills, 2016.

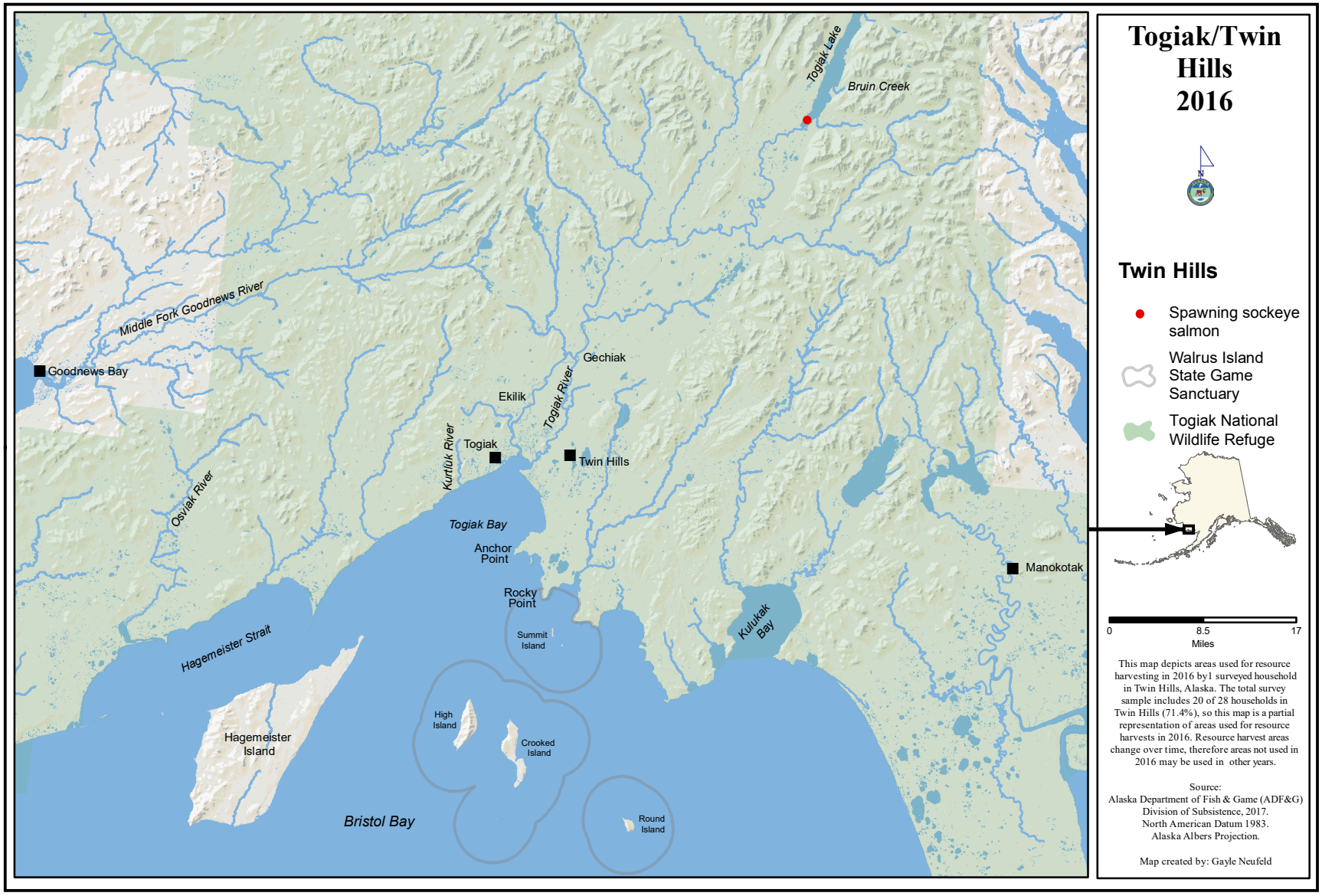


Figure 4-10.–Fishing and harvest locations for spawning sockeye salmon, Twin Hills, 2016.

Household Salmon Harvest and Use Characteristics in Twin Hills: 2017

In 2017, Twin Hills residents harvested an estimated total of 2,591 lb, or 38 lb per capita, of salmon (Table 4-15). In terms of total pounds harvested and harvest proportion in percentages, the greatest harvest by salmon species was sockeye salmon (1,180 lb, 17 lb per capita, or 46% of the total salmon harvest), followed by Chinook salmon (796 lb, 12 lb per capita, or 31%), coho salmon (426 lb, 6 lb per capita, or 16%), and chum salmon (188 lb, 3 lb per capita, or 7%). There was no harvest or use of pink salmon (Table 4-15; Figure 4-11).

For study year 2017, an estimated 78% of community households owned a gillnet to harvest salmon and 72% of households owned a boat. Overall, an estimated 22% of households in Twin Hills owned a boat used for commercial fishing (Table 4-16). In 2017, there were two households that indicated a person holding a commercial fishery permit resided at the residence, three households had crew members, and five households had either permit holders or crew members residing at the residence (Table 4-17). Additional survey results further emphasize lack of involvement in commercial fishing by Twin Hills households: there were no estimated households that retained salmon from commercial catches and no households were asked the additional questions about usually retaining Chinook salmon.

Table 4-18 lists in number of fish and pounds harvested each salmon species harvested by Twin Hills residents in 2017; Figure 4-12 is a complementary visual representation of the salmon harvest weight caught by gear type. Twin Hills residents harvested the majority of their salmon with subsistence gillnets (86% of salmon harvest weight); the only other method used to harvest salmon was rod and reel (14%) (Table 4-19). Almost all (96%) of the sockeye salmon harvest was caught using subsistence gillnets, and the remaining 4% was caught using rod and reel. For Chinook salmon, all (100%) of the harvest was caught using subsistence gillnets; this represents a change from the 2016 study year in which small proportions of the Chinook salmon harvest were caught by rod and reel and removed from commercial catches (Table 4-19; Table 4-14). About three-quarters (75%) of the coho salmon were harvested using rod and reel, and the remaining 25% of the coho salmon harvest was caught with subsistence gillnets, which is opposite the gear type harvest proportions estimated for 2016. All chum salmon were caught using subsistence gillnets (Table 4-19).

Figure 4-13 shows the percentages of Twin Hills households that used salmon, and attempted to harvest and harvested salmon. During 2017, 89% of Twin Hills households used salmon, 61% attempted to harvest salmon, and all were successful in their salmon harvest pursuits. One-half (50%) of the Twin Hills households gave salmon away and 72% of households received salmon during the 2017 study year (Table 4-15).

The majority (72%) of Twin Hills households used sockeye salmon in 2017, 44% of households harvested sockeye salmon, 39% gave away this salmon species, and 50% received sockeye salmon (Table 4-15). For Chinook salmon, more Twin Hills households (83%) used Chinook salmon during the study year in comparison to sockeye salmon, but the same proportion (44%) of households harvested Chinook salmon, and fewer households (33%) shared this salmon species, and more (61%) received Chinook salmon. In 2017, nearly three-quarters (72%) of Twin Hills households used coho salmon, 44% harvested this salmon species (which are the same use and harvest rates as for sockeye salmon), 33% gave away coho salmon, and 44% of households received this salmon species. In 2017, the estimated use among households in comparison to 2016 changed more for coho salmon than any other species: coho salmon use increased from 50% (2016) to 72% of households in 2017. Less than one-half (33%) of Twin Hills households used chum salmon in 2017, and, while no harvests occurred, a smaller proportion of households (6%) used spawning sockeye salmon during the study year; these fish were received.

In 2017, Twin Hills respondents reported harvesting Chinook salmon in the mouth of the Togiak River, and in the river close to the community of Twin Hills (Figure 4-14). In comparison to 2016, there were fewer fishing and harvest areas for Chinook salmon in 2017; there was especially a lack of harvest effort in Togiak Bay. During the second study year, the other salmon species (coho and sockeye) were harvested within the river near the community and about two miles south of Twin Hills along the coast (Figure 4-15).

Table 4-15.–Estimated uses and harvests of salmon, Twin Hills, 2017.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
Salmon	**88.9**	**61.1**	**61.1**	**72.2**	**50.0**	**2,590.7**	**107.9**	**38.1**	**522.7**	**ind**	**21.8**	**35.8**
Chum salmon	33.3	27.8	27.8	16.7	22.2	188.2	7.8	2.8	40.0	ind	1.7	70.3
Coho salmon	72.2	44.4	44.4	44.4	33.3	425.9	17.7	6.3	89.3	ind	3.7	32.4
Chinook salmon	83.3	44.4	44.4	61.1	33.3	796.4	33.2	11.7	96.0	ind	4.0	41.7
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0
Sockeye salmon	72.2	44.4	44.4	50.0	38.9	1,180.3	49.2	17.4	297.3	ind	12.4	43.7
Spawning sockeye salmon	5.6	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2018.

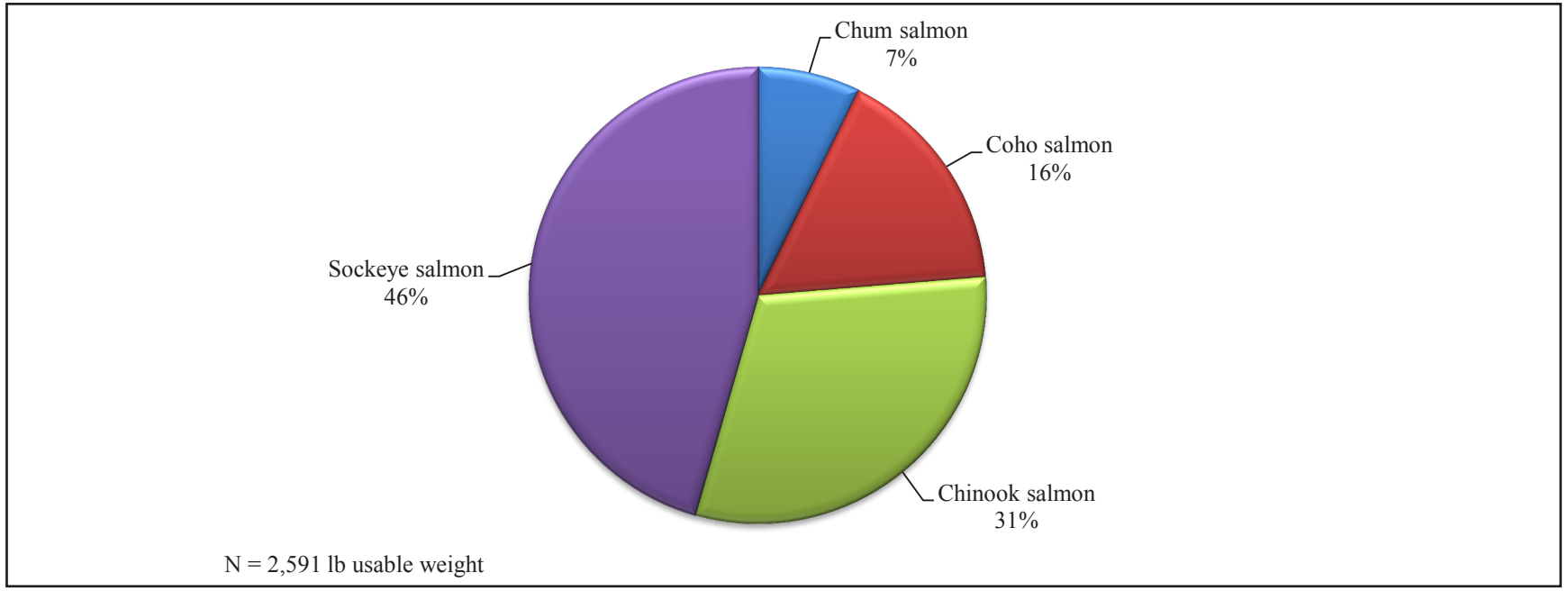


Figure 4-11.–Composition of salmon harvest in pounds usable weight, Twin Hills, 2017.

Table 4-16.–Estimated number of households owning a net or boat, Twin Hills, 2017.

Estimated households	Households owning a net		Households _____ . owning a boat		owning a boat used for commercial fishing	
	Number	Percentage	Number	Percentage	Number	Percentage
24.0	18.7	77.8%	17.3	72.2%	5.3	22.2%

Source ADFG Division of Subsistence household surveys, 2018.

Table 4-17.–Reported number of households having a household member involved with commercial salmon fishing, by commercial fishery role, Twin Hills, 2017.

	Commercial salmon fishery role		
	Permit holder	Crew	Either
Number of households	2	3	5

Source ADF&G Division of Subsistence household surveys, 2018.
Note This question was asked only of households that commercial fished in the study year.

Table 4-18.–Estimated harvest of salmon by gear type and resource, Twin Hills, 2017.

Resource	Removed from commercial catch		Subsistence methods						Rod and reel		Any method	
			Gillnet		Other method		Subsistence gear, any method					
	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**0.0**	**0.0**	**445.3**	**2,230.6**	**0.0**	**0.0**	**445.3**	**2,230.6**	**77.3**	**360.2**	**522.7**	**2,590.7**
Chum salmon	0.0	0.0	40.0	188.2	0.0	0.0	40.0	188.2	0.0	0.0	40.0	188.2
Coho salmon	0.0	0.0	22.7	108.1	0.0	0.0	22.7	108.1	66.7	317.8	89.3	425.9
Chinook salmon	0.0	0.0	96.0	796.4	0.0	0.0	96.0	796.4	0.0	0.0	96.0	796.4
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sockeye salmon	0.0	0.0	286.7	1,137.9	0.0	0.0	286.7	1,137.9	10.7	42.3	297.3	1,180.3
Spawning sockeye salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2018.

Note The harvested number of salmon is represented as individual fish harvested.

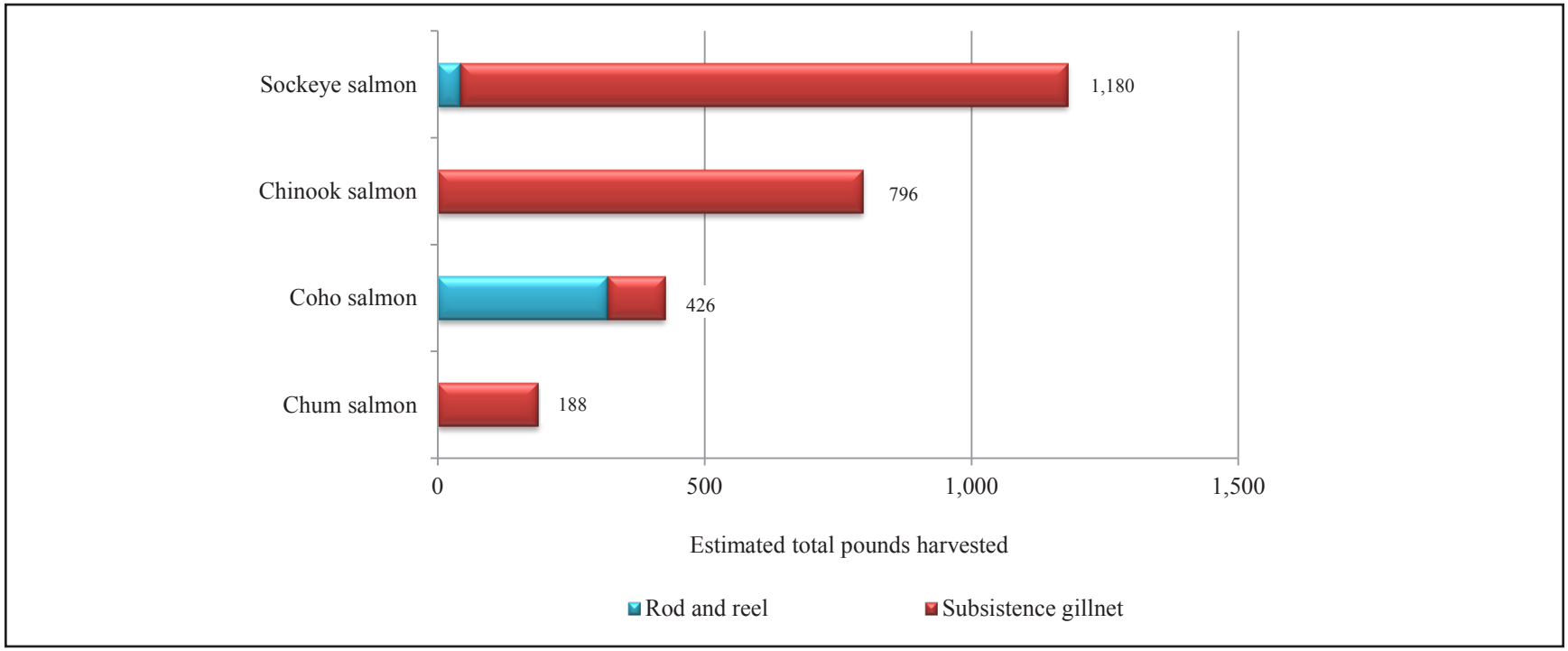


Figure 4-12.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Twin Hills, 2017.

Table 4-19.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Twin Hills, 2017.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet	Other	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**0.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.0%**	**86.1%**	**0.0%**	**86.1%**	**13.9%**	**100.0%**
	Total	**0.0%**	**86.1%**	**0.0%**	**86.1%**	**13.9%**	**100.0%**
Chum salmon	Gear type	0.0%	8.4%	0.0%	8.4%	0.0%	7.3%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	7.3%	0.0%	7.3%	0.0%	7.3%
Coho salmon	Gear type	0.0%	4.8%	0.0%	4.8%	88.2%	16.4%
	Resource	0.0%	25.4%	0.0%	25.4%	74.6%	100.0%
	Total	0.0%	4.2%	0.0%	4.2%	12.3%	16.4%
Chinook salmon	Gear type	0.0%	35.7%	0.0%	35.7%	0.0%	30.7%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	30.7%	0.0%	30.7%	0.0%	30.7%
Pink salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sockeye salmon	Gear type	0.0%	51.0%	0.0%	51.0%	11.8%	45.6%
	Resource	0.0%	96.4%	0.0%	96.4%	3.6%	100.0%
	Total	0.0%	43.9%	0.0%	43.9%	1.6%	45.6%
Spawning sockeye salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

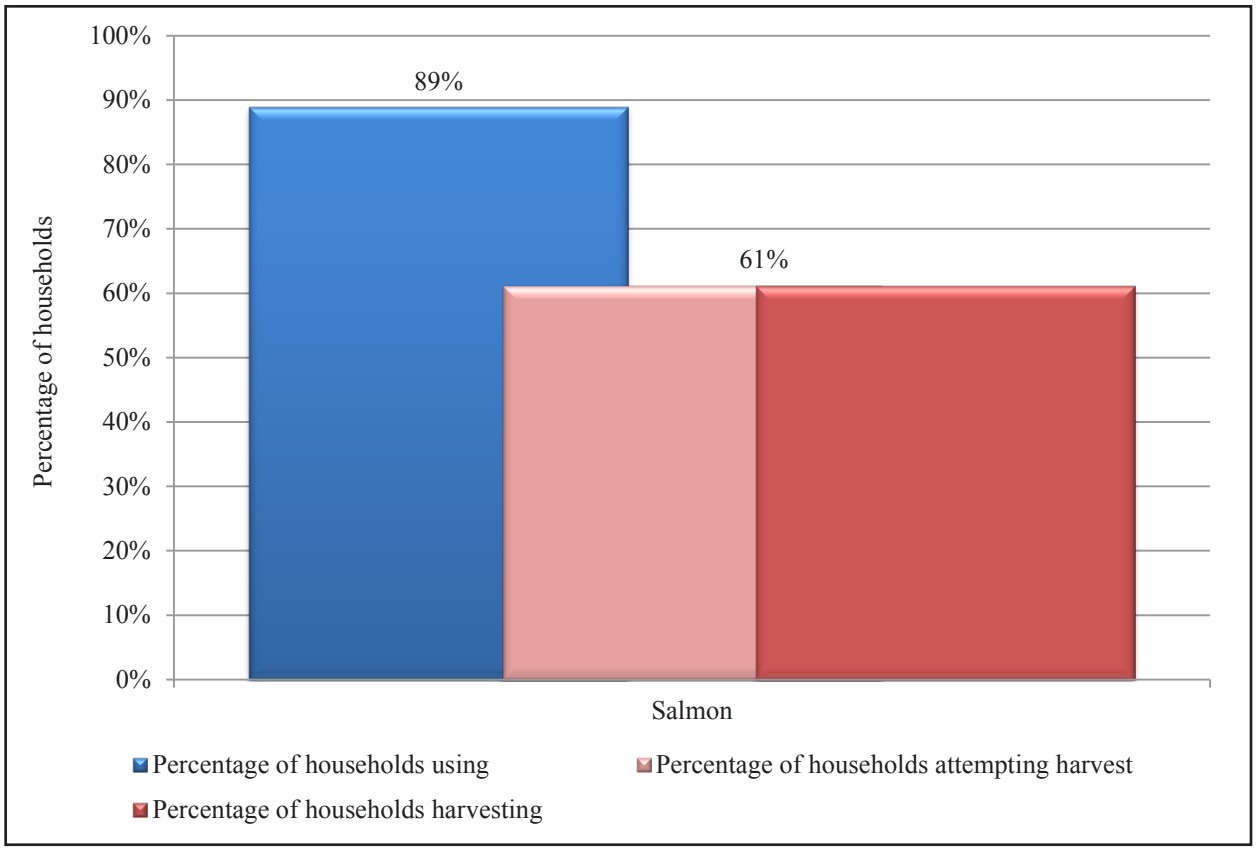


Figure 4-13.–Percentage of households using, attempting to harvest, and harvesting salmon, Twin Hills, 2017.

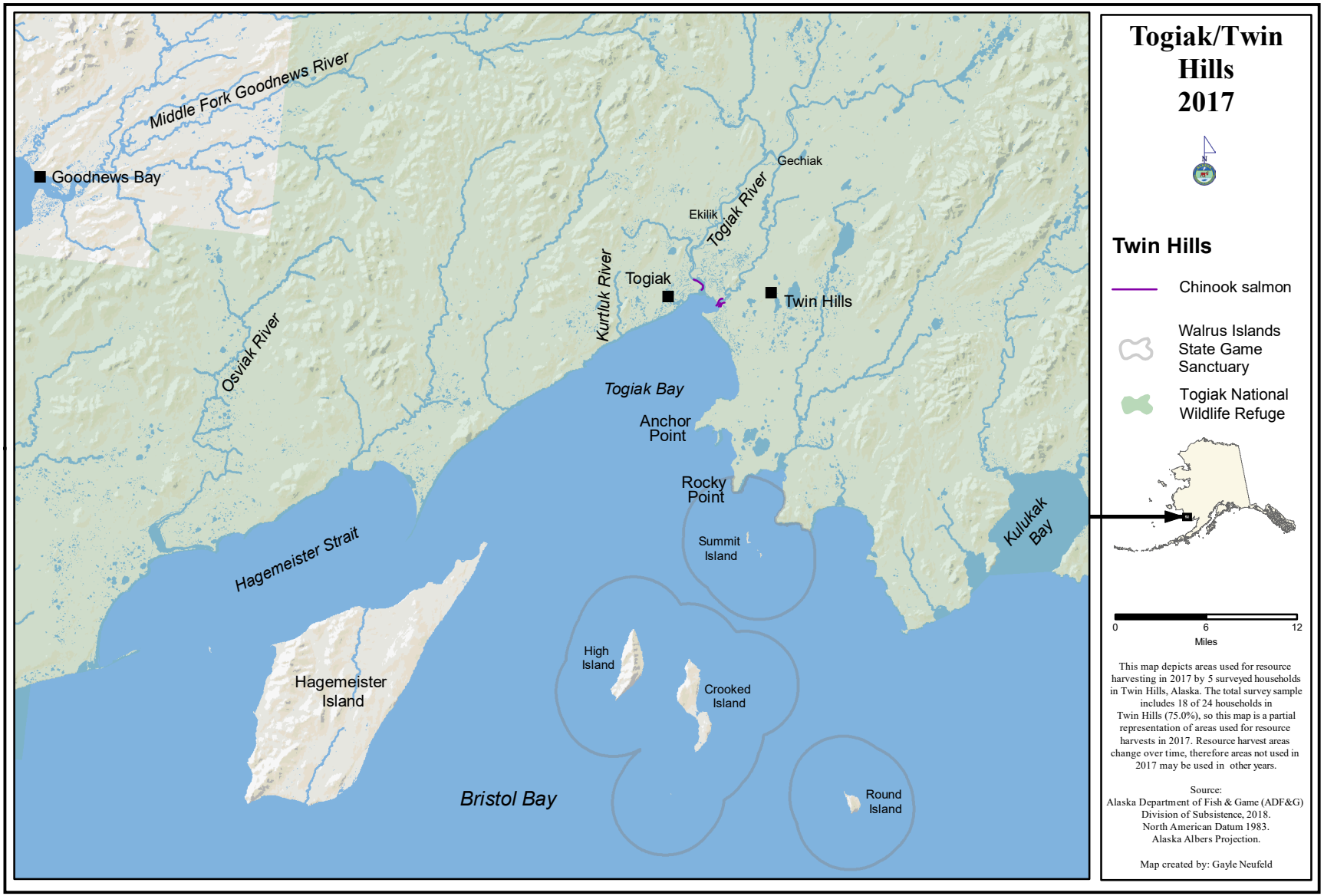


Figure 4-14.–Fishing and harvest locations for Chinook salmon, Twin Hills, 2017.

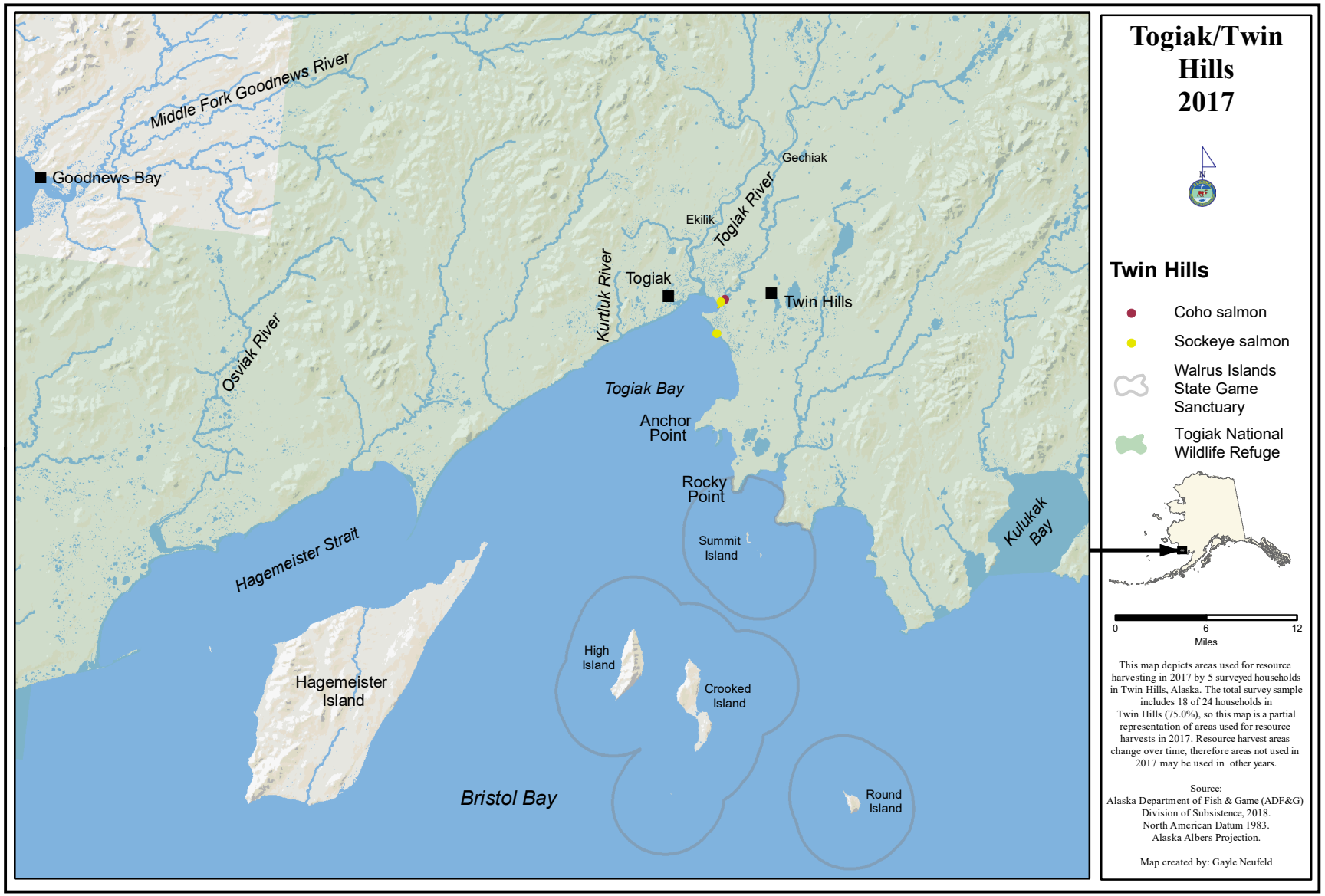


Figure 4-15.–Fishing and harvest locations for chum, coho and sockeye salmon, Twin Hills, 2017.

Comparing 2016 and 2017 Harvest and Use Characteristics

The overall salmon harvest weight at Twin Hills decreased by 774 lb from 2016 to 2017, or 6 lb per capita (Table 4-9; Table 4-15). The sockeye salmon harvest accounted for the greatest decrease, by 542 lb from 2016 to 2017. The per capita harvest of sockeye salmon in Twin Hills was 22 lb in 2016, decreasing to 17 lb in 2017. The harvest of spawning sockeye salmon also decreased from 2016, when the harvest weight was 332 lb, to no harvest in 2017. Interestingly, the Chinook salmon harvest stayed relatively close in both study years, increasing only slightly in 2017 (6 lb increase). The harvest of coho and chum salmon increased marginally from 2016 to 2017 (68 lb increase for chum salmon and 27 lb for coho salmon).

Germane to the overall decreased harvest weight from 2016 to 2017 is that the percentage of Twin Hills households attempting to harvest and harvesting salmon decreased by a difference of 14% across the study years. Regarding individual salmon species, Chinook salmon was the species for which the percentage of Twin Hills households attempting to harvest and harvesting the resource decreased the most: 55% of households in 2016 changed to 44% in 2017. For spawning sockeye salmon, the proportion of harvesting households decreased between the study years from 5% to none. Low participation in 2016, coupled with the fact that no harvests of spawning sockeye salmon were reported in 2017, suggests that spawning sockeye salmon is not a species that the majority of households in Twin Hills harvest in a given year. In spite of the lower sockeye salmon harvest weight in 2017, all households that attempted to harvest sockeye salmon were successful, which was not the case in 2016; also, the proportion of households that harvested sockeye salmon in 2017 (44%) was slightly increased compared to 2016 (40% of households). The percentage of Twin Hills households attempting to harvest and harvesting coho salmon and chum salmon increased from 2016 to 2017 (8% more for chum salmon and 9% for coho salmon). For coho salmon, the increase of harvest weight and effort between 2016 and 2017 may be attributed to a change in gear type used. For example, in 2016 the coho salmon harvest by rod and reel was 87 lb, and in 2017 the rod and reel harvest increased by 231 lb for a total coho salmon harvest by rod and reel of 318 lb in 2017 (Table 4-13; Table 4-18).

The Subsistence Salmon Permit System

Permit System Individual Participation Based on Post-Season Household Surveys: 2016 and 2017

In 2016, two permits were issued prior to the Twin Hills household survey, and there were no cases of non-household members being listed on permits of Twin Hills households. In the same year, there we no cases of surveyed household members being listed on permits obtained by a different household (Table 4-20). In 2017, more (six) permits were issued prior to the survey, and the average number of individuals from other households listed on permits of Twin Hills households was estimated to be 0.1, but there were no cases of surveyed household members being listed on permits obtained by a different household.

Evaluating Subsistence Salmon Permit System Harvest Estimates from Before and After Post-Season Household Surveys

Each year, subsistence salmon household permits are issued and collected for the Bristol Bay Area to estimate harvests by each community. The post-season salmon harvest surveys administered for this project in Twin Hills for 2016 and 2017 complement the permit system and increase the accuracy of documented subsistence salmon harvest levels. This section reviews the changes to the reported and estimated salmon harvests as the result of reconciling post-season survey data with returned permits, which helps to illustrate how well the permit system generally performs as a tool for documenting harvests. There is a set of tables (two for each year) that compares: 1) subsistence salmon permit participation based on surveys and returned permits (Table 4-21; Table 4-23), and 2) harvest estimates from before and after the time that post-season surveys occurred (Table 4-22; Table 4-24). The structure of these tables is described fully in Chapter 1: "Introduction" in the subsection "Survey Data Entry and Analysis."

Table 4-20.–Average number of non-household members listed on subsistence permits, Twin Hills, 2016 and 2017.

Study year	Permits issued[a]	Estimated population	Mean number of individuals from other households listed on permits	Mean number of household members listed on other permits
2016	2	77.0	0.0	0.0
2017	6	68.0	0.0	0.1

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

a. Initial number (from prior to post-season surveys occurring) from the Division of Subsistence Bristol Bay permit database, based on community of residence.

Table 4-21.–Subsistence salmon permit participation estimates based on returned permits and surveys, Twin Hills, 2016.

	Twin Hills
Permits	
Before surveys	
Number of permits issued	2
Number of permits returned	1
Initial return rate	50.0%
After surveys	
Number of previously issued permits returned during survey	1
Surveyed households that fished without a permit[a]	6
Estimated total number of households that fished without a permit	8
Number of permits issued[b]	8
Revised number of permits returned	8
Final return rate	100.0%
Participation	
Total number of households	28
Total contacts	21
Proportion of contacted households	75.0%

Source ADF&G Division of Subsistence household surveys, 2017, and inseason catch permits, 2016.

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

Harvest Survey and Subsistence Permits in Twin Hills: 2016

In 2016, there were two permits issued to households with Twin Hills addresses for the subsistence salmon fishery, and one of those permits was returned prior to the post-season salmon harvest survey (50% return rate) (Table 4-21). During the 2016 survey, the one remaining unreturned permit was collected by research staff. Other households (six) that did not obtain a permit, but did subsistence fish were issued a permit that was completed based on respondents' recall of harvests during the survey. The recall data were incorporated into the permit database (i.e., Alaska Subsistence Fisheries Database, or ASFDB) after the surveys were finished. Several of the surveyed households that fished but did not have a permit were listed on another household's permit. In these cases, researchers did not issue a permit to these households to avoid duplication of harvest data in the ASFDB, but the recall data were recorded on the household survey as "received" to capture households that engaged in salmon resource use.

The additional six permits issued increased the total 2016 subsistence permits for Twin Hills from two to eight. The combination of the six new permits and one additional returned permit increased the number of returned permits to eight, or a 100% return rate. Overall, there were 28 Twin Hills households that were eligible for the household survey. The combined number of households that were surveyed (20) and number of permits that were returned by a household that was not surveyed—whether from Twin Hills or a household that was not eligible for the Twin Hills community survey— was 21, which represents 75% of the 28 total households (Table 1-4; Table 4-21).

Harvest by Species in Twin Hills: 2016

Prior to the 2016 household surveys, the reported Chinook salmon harvest from the one returned Twin Hills permit was three fish, which was expanded to an initial estimated harvest of six Chinook salmon (Table 4-22). An additional 51 Chinook salmon were reported harvested with subsistence nets during the household surveys by households that did not have a permit while fishing. The initial harvested 3 Chinook salmon reported from the first permit, and the additional 51 harvests recorded during the household surveys increased the reported Chinook salmon harvest to 54 fish, which was expanded to a community harvest estimate of 72 Chinook salmon in 2016. (The second permit, which was collected during the surveys, did not record any Chinook harvest.) Only the harvests reported by six surveyed households that fished without a permit were added to the ASFDB (permit database), and not the estimated harvest for the estimated eight households in Twin Hills that fished without a permit. Therefore, the estimated Chinook salmon harvest by residents of Twin Hill for the Togiak District for 2016 in the ASFDB was 54 fish (Table 4-22).

For sockeye salmon, prior to the 2016 household surveys, the reported harvest from the 1 returned Twin Hills permit was 20 fish, which was expanded to an initial estimated harvest of 40 sockeye salmon (Table 4-22). An additional 362 sockeye salmon harvests were reported during the household surveys (22 recorded on the permit returned during surveys, and 340 from households that did not have a permit while fishing). The initial harvested 20 sockeye salmon reported from the permit and the additional 362 harvests recorded during the household surveys increased the reported sockeye salmon harvest to 382 fish, which was expanded to a community harvest estimate of 509 sockeye salmon in 2016. For the same reasons noted above for Chinook salmon, the subsistence sockeye salmon estimate in the permit database was lower, at 382 fish.

Prior to the 2016 household surveys, there was no reported coho salmon harvest for Twin Hills from the returned permits (Table 4-22). However, 50 coho salmon harvests were reported during the household surveys from households that did not have a permit while fishing, which was expanded to a community harvest estimate of 67 coho salmon in 2016. For the same reasons noted above for Chinook salmon, the subsistence coho salmon estimate in the permit database was less (50 fish).

For chum salmon, prior to the 2016 household surveys, the reported harvest from the 1 returned Twin Hills permit was 15 fish, which was expanded to an initial estimated harvest of 30 chum salmon (Table 4-22). An additional 14 chum salmon harvests were reported during the household surveys from households that did not have a permit while fishing. The initial harvested 15 chum salmon reported from the returned permit and the additional 14 harvests recorded during the household surveys increased the reported chum salmon harvest to 29 fish, which was expanded to a community harvest estimate of 39 chum salmon in 2016. For

Table 4-22.–Subsistence salmon harvest estimates based on returned permits and surveys, Twin Hills, 2016.

Harvest	Chinook	Sockeye	Coho	Chum	Pink	Total
Before surveys						
Initial harvest reported on permits	3	20	0	15	0	38
Initial estimated harvest, all permit holders	6	40	0	30	0	76
						0
After surveys						0
Additional harvest added to previously returned permits	0	0	0	0	0	0
Harvest recorded on permits returned during the survey	0	22	0	0	0	22
Harvest by households that did not have permits	51	340	50	14	0	455
Reported harvest from both permits and surveys	54	382	50	29	0	515
Total estimated harvest, from both permits and surveys	72	509	67	39	0	687
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	54	382	50	29	0	515

Source ADF&G Division of Subsistence household surveys, 2017, and inseason catch permits, 2016.

a. Based only on known fishers.

the same reasons noted above for Chinook salmon, the subsistence chum salmon estimate in the permit database was less (29 fish).

The initial harvest estimates based on returned permits alone were lower for each species, except pink salmon (the final estimate remained at zero for pink harvests), when compared to the revised community subsistence harvest estimate based on permit results for the ASFDB (following post-season household surveys being administered). Sockeye salmon is the species for which the difference between the estimated values is greatest (difference of 342 sockeye salmon), followed by coho salmon (difference of 50) and Chinook salmon (difference of 48 fish) (Table 4-22). Additionally, the subsistence harvest estimate based on permit and household survey results combined, including survey-based estimates for households that were not interviewed and therefore not added to the permit database, is higher for every species in comparison to the ASFDB estimates based on permit returns only; sockeye salmon is the species for which the estimated additional number of individual fish harvested increased the most (127 salmon), followed by Chinook salmon (18 salmon), coho salmon (17 salmon) and then chum salmon (10 salmon) (Table 4-22).

Harvest Survey and Subsistence Permits in Twin Hills: 2017

In 2017, six permits were issued to Twin Hills residences for the subsistence salmon fishery, and four of those permits were returned prior to the post-season salmon harvest survey (67% return rate) (Table 4-23). During the 2017 survey, one permit was collected by research staff from a Twin Hills household that had not already returned its permit. Other households (three) that did not obtain a permit but did fish with subsistence gear were issued a permit that was completed based on respondents' recall of harvests during the survey. The recall data were incorporated into the ASFDB after the surveys were finished. Several of the surveyed households that fished but did not have a permit were listed on another household's permit. In these cases, researchers did not issue a permit to these households to avoid duplication of harvest data in the ASFDB, but the recall data were recorded on the household survey as "received" to capture households that engaged in salmon resource use.

The additional three permits issued increased the total 2017 subsistence permits for Twin Hills from six to nine. The combination of the three new permits and one additional returned permit increased the number of returned permits to eight, or an 89% return rate. Overall, there were 24 households that were eligible for the household survey. The combined number of surveyed households, and number of permits returned by a Twin Hills household that was not surveyed—whether from Twin Hills or a household that was not eligible for the Twin Hills community survey—was 19, which represents 79% of the 24 total households.

Harvest by Species in Twin Hills: 2017

Prior to the 2017 household surveys, the reported Chinook salmon harvest from the 4 returned Twin Hills permits was 28 fish, which was expanded to an initial estimated harvest of 42 Chinook salmon (Table 4-24). An additional 51 Chinook salmon harvests were reported during the household surveys (5 added to previously returned permits, 2 recorded on the permit returned during surveys, and 44 from households that did not have a permit while fishing). The initially reported 28 Chinook salmon harvested and the additional 51 harvests recorded during the household surveys increased the reported Chinook salmon harvest to 79 fish, which was expanded to a community harvest estimate of 100 Chinook salmon in 2017. For the same reasons noted above for Chinook salmon in 2016, only the harvests reported for 2017 by three surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated total four households in Twin Hills that fished without a permit. Therefore, the subsistence Chinook salmon estimate in the permit database was lower, at 89 fish.

For sockeye salmon, prior to the 2017 household surveys, the reported harvest from the 4 returned Twin Hills permits was 74 fish, which was expanded to an initial estimated harvest of 111 sockeye salmon (Table 4-24). An additional 159 sockeye salmon harvests were reported during the household surveys (11 added to previously returned permits, 10 recorded on the permit returned during surveys, and 138 from households that did not have a permit while fishing). The harvested 74 sockeye salmon initially reported from the permits and the additional 159 harvests recorded during the household surveys increased the reported sockeye salmon harvest to 233 fish, which was expanded to a community harvest estimate of 294

sockeye salmon in 2017. For the same reasons noted above for Chinook salmon in 2017, the subsistence sockeye salmon estimate in the permit database was lower, at 261 fish.

Prior to the 2017 household surveys, there was no reported coho salmon harvest for Twin Hills from the four returned permits (Table 4-24). However, 15 coho salmon harvests were reported during the household surveys (10 recorded on permits returned during surveys, and 5 from households that did not have a permit while fishing), which was expanded to a community harvest estimate of 19 coho salmon in 2017. For the same reasons noted above for Chinook salmon in 2017, the subsistence coho salmon estimate in the permit database was lower, at seven fish.

For chum salmon, prior to the 2017 household surveys, the reported harvest from the 4 returned Twin Hills permits was 23 fish, which was expanded to an initial estimated harvest of 35 chum salmon (Table 4-24). An additional four chum salmon harvests were reported during the survey from households that did not have a permit while fishing. The initially reported 23 chum salmon harvested and the additional 4 harvests recorded during the household surveys increased the reported chum salmon harvest to 27 fish, which was

Table 4-23.–Subsistence salmon permit participation estimates based on returned permits and surveys, Twin Hills, 2017.

	Twin Hills
Permits	
Before surveys	
Number of permits issued	6
Number of permits returned	4
Initial return rate	66.7%
After surveys	
Number of previously issued permits returned during survey	1
Surveyed households that fished without a permit[a]	3
Estimated total number of households that fished without a permit	4
Number of permits issued[b]	9
Revised number of permits returned	8
Final return rate	88.9%
Participation	
Total number of households	24
Total contacts	19
Proportion of contacted households	79.2%

Source ADF&G Division of Subsistence household surveys, 2018, and inseason catch permits, 2017.

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

Table 4-24.–Subsistence salmon harvest estimates based on returned permits and surveys, Twin Hills, 2017.

Harvest	Chinook	Sockeye	Coho	Chum	Pink	Total
Before surveys						
Initial harvest reported on permits	28	74	0	23	0	125
Initial estimated harvest, all permit holders	42	111	0	35	0	188
						0
After surveys						0
Additional harvest added to previously returned permits	5	11	0	0	0	16
Harvest recorded on permits returned during the survey	2	10	10	0	0	22
Harvest by households that did not have permits	44	138	5	4	0	191
Reported harvest from both permits and surveys	79	233	15	27	0	354
Total estimated harvest, from both permits and surveys	100	294	19	34	0	447
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	89	261	7	42	0	398

Source ADF&G Division of Subsistence household surveys, 2018, and inseason catch permits, 2017.

a. Based only on known fishers.

expanded to a community harvest estimate of 34 chum salmon in 2017. For the same reasons noted above for Chinook salmon in 2017, the subsistence chum salmon estimate in the permit database was lower, at 42 fish.

The initial harvest estimates based on returned permits alone were lower for each harvested species when compared against the revised community subsistence harvest estimate based on permit results for the ASFDB (following post-season household surveys being administered). Sockeye salmon is the species for which the difference between the estimated values is greatest (difference of 150 sockeye salmon), followed by Chinook salmon (difference of 47 Chinook salmon), then coho and chum salmon (both species had a difference of 7 salmon) (Table 4-24). Additionally, the subsistence harvest estimate based on permit and household survey results combined, including survey-based estimates for households that were not interviewed and therefore not added to the permit database, is higher for every species—except chum salmon—in comparison to the ASFDB estimates based on permit returns only; sockeye salmon is the species for which the estimated additional number of individual fish harvested increased the most (33 salmon), followed by coho salmon (12 salmon) and Chinook salmon (11 salmon), while chum salmon decreased by 8 fish (Table 4-24).

Comparing Uses and Harvests in 2016 and 2017 with Previous Years

Assessments of Use

Researchers asked Twin Hills respondents to assess their Chinook salmon use in two ways: whether they used more, less, or about the same amount of salmon in each study year as in the past five years, and whether they "got enough" Chinook salmon. Households also were asked to provide reasons if their use was different or if they were unable to get enough Chinook salmon. Also, if they did not get enough, respondents were asked to evaluate the severity of the impact to their household as a result of not getting enough. They were further asked how much Chinook salmon did the household need annually and whether they did anything differently (such as supplement with store-bought food or switch to a different subsistence resource) because they did not get enough. Households were also asked to assess whether their Chinook salmon fishing efforts or locations changed during the study years compared to usual activities. The same series of questions was asked regarding salmon other than Chinook (all other salmon species grouped). Because not every household uses salmon resources, some households did not respond to the assessment questions. Additionally, some households that do typically use salmon resources did not answer questions. For each type of assessment, households could give more than one reason for changes to use amount, not having enough salmon, or increased effort or travel to get salmon. This section discusses responses to those questions.

Assessments of Salmon Use in Twin Hills: 2016

Chinook Salmon

During the 2016 study year, 16 Twin Hills households reported using Chinook salmon (Table 4-25). Of the 20 surveyed households, one-half (50%, or 10 households) reported less use of Chinook salmon in 2016 than they used in previous years, 25% (5 households) used the same amount, and 5% (1 household) reported more use of Chinook salmon (Table 4-25; Figure 4-16). When asked the reasons why Chinook salmon use was less, 30% of respondents cited that the resource was less available and due to working/no time available (Table 4-26). Also, in 2016, 20% of households that used less Chinook salmon indicated less sharing and a lack of equipment as reasons why. When asked if the household got enough Chinook salmon in 2016, 50% (eight responding households) indicated that they did not and 50% of these households reported the impact as minor, 25% reported the impact as major, and 13% reported the impact as not noticeable (Table 4-27). The proportion of sampled households that got enough Chinook salmon (40%) was the same as the proportion of sampled households that did not get enough in 2016 (Figure 4-17). When asked what households did as the result of not getting enough, 83% (five responding households) indicated that they replaced Chinook salmon with other subsistence foods, 17% (one responding household) stated that they used more commercial foods, and 17% (one responding household) stated that they got public assistance (Table 4-28). The 8 households that did not have enough Chinook salmon were asked how many are needed

annually, and responses indicated an average of 10 salmon (Table 4-29). In 2016, one Twin Hills household reported having to work harder than usual to obtain enough Chinook salmon, and more time needed was the cited reason for why this household had to work harder to obtain enough Chinook salmon (Table 4-30). In 2016, one household reported that members had to travel further, and one household reported traveling to different locations than normal to obtain enough Chinook salmon to meet household needs (Table 4-31).

Other Salmon

In 2016, 18 Twin Hills households reported using other salmon (Table 4-25). Of the 20 surveyed households, 9 (45%) stated that they used less other salmon species than they used in previous years, 40% (8 households) reported the same amount was used, and 5% (1 household) reported more use of other salmon (Table 4-25; Figure 4-16). When asked the reasons why other salmon use was less, respondents indicated less other salmon use due to lack of effort (22%); less sharing (22%); lack of need (22%); working/no time (11%); family/personal situation (11%); and lack of equipment (11%) (Table 4-26). The one household that indicated increased other salmon use in 2016 cited increased availability as the reason for more use (Table 4-32). When asked if the household got enough other salmon in 2016, 28% (five responding households) indicated that they did not and 40% of these households reported the impact as major (Table 4-27). The majority (65%) of sampled households got enough other salmon in 2016 (Figure 4-17). When asked what households did as the result of not getting enough salmon, 67% (two responding households) indicated that they replaced these salmon resources with other subsistence foods, and 33% (one responding household) bought/bartered to obtain other salmon (Table 4-28). The five households that did not have enough other salmon were asked how many are needed annually, and responses indicated an average of 24 salmon (Table 4-29). In 2016, two Twin Hills households reported having to work harder than usual to obtain enough other salmon (resource availability was the only specific cited reason for why), two households reported that members had to travel further, and two reported traveling to different locations than normal to obtain enough other salmon to meet household needs (Table 4-30; Table 4-31).

Table 4-25.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Twin Hills, 2016.

Resource category	Sampled households	Valid responses	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Any salmon	**20**	**20**	**18**	**90.0%**	**12**	**60.0%**	**10**	**50.0%**	**2**	**10.0%**	**4**	**20.0%**
Other salmon	20	20	18	90.0%	9	45.0%	8	40.0%	1	5.0%	2	10.0%
Chinook salmon	20	20	16	80.0%	10	50.0%	5	25.0%	1	5.0%	4	20.0%

Source ADF&G Division of Subsistence household surveys, 2017.

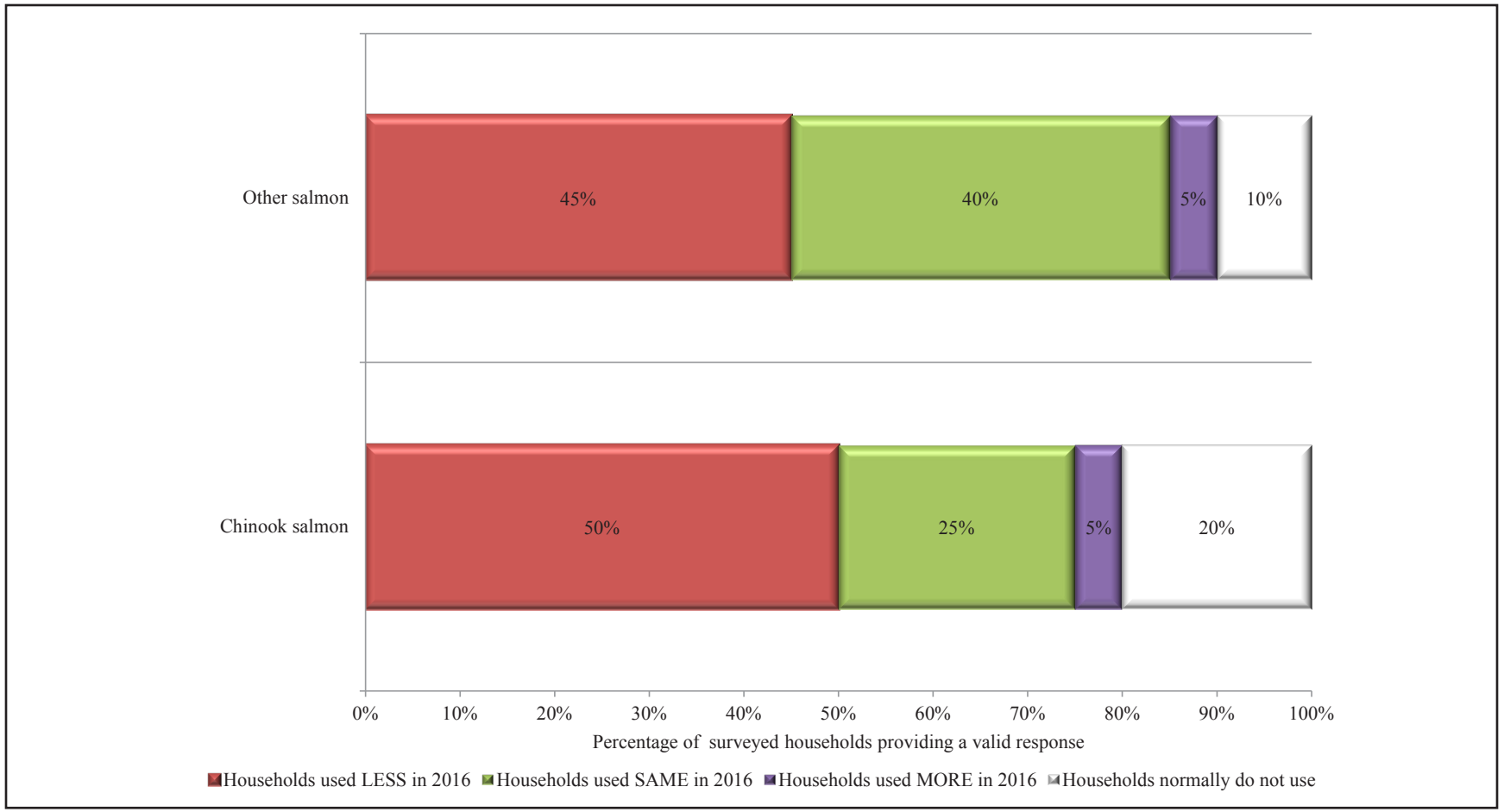


Figure 4-16.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Twin Hills, 2016.

Table 4-26.–Reasons for less household uses of salmon compared to recent years, Chinook and other salmon, Twin Hills, 2016.

Resource category	Valid responses[a]	Households reporting reasons for less use	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**20**	**12**	**1**	**8.3%**	**3**	**25%**	**0**	**0.0%**	**3**	**25%**	**3**	**25%**	**2**	**17%**	**0**	**0.0%**	**0**	**0.0%**
Other salmon	20	9	1	11.1%	0	0%	0	0.0%	1	11%	2	22%	2	22%	0	0.0%	0	0.0%
Chinook salmon	20	10	0	0.0%	3	30%	0	0.0%	2	20%	2	20%	1	10%	0	0.0%	0	0.0%

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Table 4-26.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for less use	Working/ no time		Regulations		Did not need		Gas/equipment too expensive		Used other resources		Competition		Had no help		Other reasons	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**20**	**12**	**3**	**25.0%**	**0**	**0%**	**2**	**16.7%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**
Other salmon	20	9	1	11.1%	0	0%	2	22.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	20	10	3	30.0%	0	0%	1	10.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households that did not provide any response and households reporting never using the resource.

Table 4-27.–Reported impact to households reporting that they did not get enough salmon resources, Chinook and other salmon, Twin Hills, 2016.

		Households not getting enough _____ .				Impact to those not getting enough _____ .									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource category	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	20	18	90.0%	5	27.8%	3	60.0%	0	0.0%	0	0.0%	2	40.0%	0	0.0%
Chinook salmon	20	16	80.0%	8	50.0%	1	12.5%	1	12.5%	4	50.0%	2	25.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

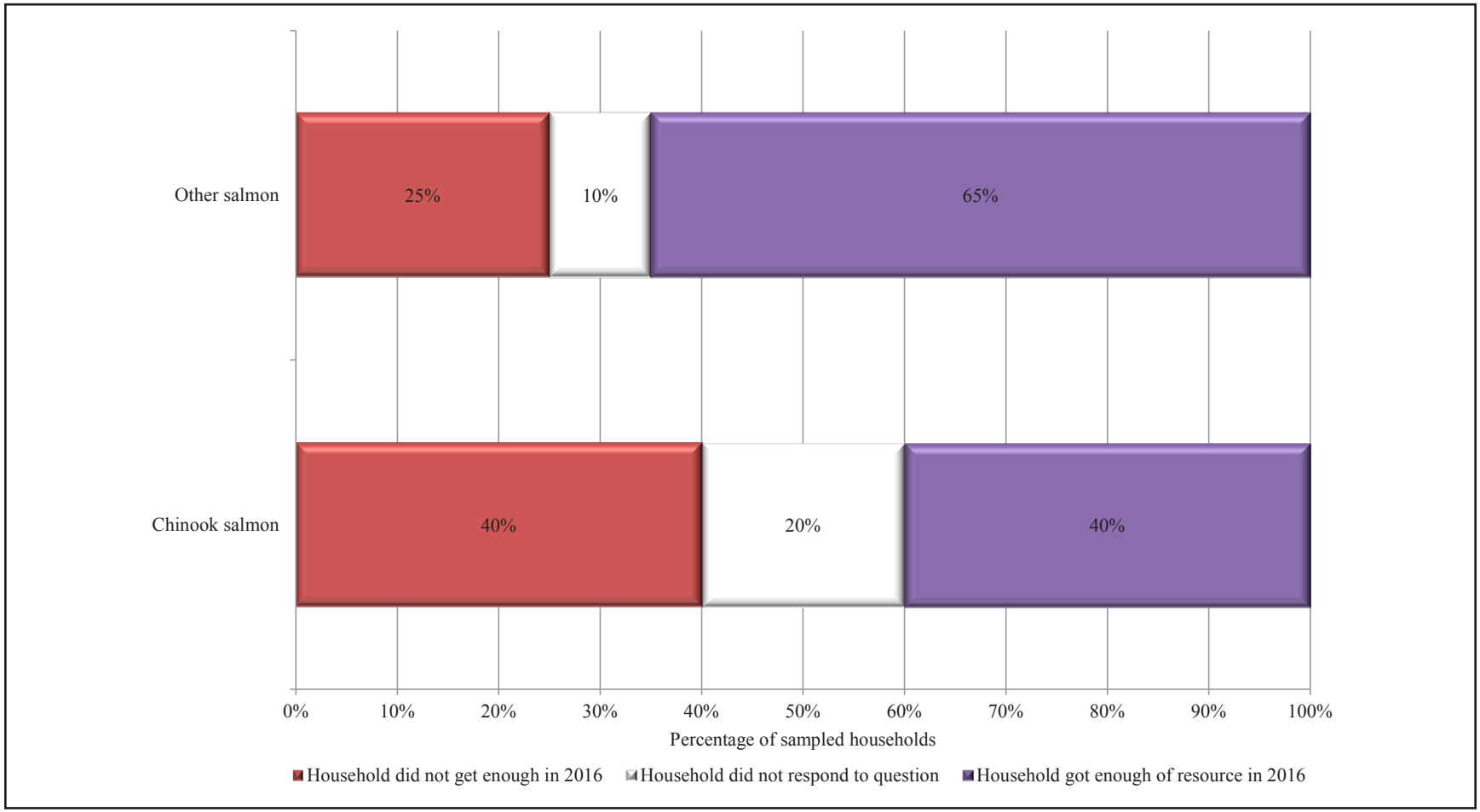

Figure 4-17.–Percentage of sampled households reporting whether they had enough salmon, Chinook and other salmon, Twin Hills, 2016.

Table 4-28.–Things households reported doing differently as the result of not getting enough salmon, Chinook and other salmon, Twin Hills, 2016.

Resource category	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Increased effort	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	3	1	33.3%	0	0.0%	2	66.7%	0	0.0%	0	0.0%
Chinook salmon	6	0	0.0%	1	16.7%	5	83.3%	0	0.0%	0	0.0%

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Table 4-28.–Continued.

Resource category	Valid responses[a]	Made do without		Obtained food from other sources		Got public assistance		Other reasons	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	3	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	6	0	0.0%	0	0.0%	1	16.7%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

Table 4-29.–Salmon resources that sampled households reported needing, Twin Hills, 2016.

Resource category	Households needing resource	Total amount needed (Number of fish)	Average amount needed (Number of fish)
Other salmon	5	120	24
Chinook salmon	8	76	10

Source ADF&G Division of Subsistence household surveys, 2017.

Table 4-30.–Reasons that households worked harder to get more salmon, Chinook and other salmon, Twin Hills, 2016

Resource	Sampled households	Valid responses	Households reporting… not working harder than usual	Households reporting… working harder than usual	Family/Personal Number	Family/Personal Percentage	Resource availability Number	Resource availability Percentage	Unsuccessful Number	Unsuccessful Percentage	More time Number	More time Percentage
Other salmon	20	13	11	2	0	0.0%	1	9.1%	0	0.0%	0	0.0%
Chinook salmon	20	14	13	1	0	0.0%	0	0.0%	0	0.0%	1	7.7%

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Table 4-30.–Continued.

Resource	Sampled households	Valid responses	Households reporting… not working harder than usual	Households reporting… working harder than usual	Small or diseased resources Number	Small or diseased resources Percentage	Other reasons Number	Other reasons Percentage	No Response Number	No Response Percentage
Other salmon	20	13	11	2	0	0.0%	1	9.1%	1	9.1%
Chinook salmon	20	14	13	1	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.
Note The sum of percentages may not be 100% because households were able to give more than one answer.

Table 4-31.–Households reporting that they traveled further or to different locations, Twin Hills 2016.

Resource	Sampled households	Valid responses	Households reporting that they... traveled further	Households reporting that they... traveled to different locations
Other salmon	20	13	2	2
Chinook salmon	20	14	1	1

Source ADF&G Division of Subsistence household surveys, 2017.

Table 4-32.–Reasons for more household uses of salmon compared to recent years, Chinook and other salmon,Twin Hills, 2016.

Resource category	Valid responses[a]	Households reporting reasons for more use	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**20**	**1**	**1**	**100.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**
Other salmon	20	1	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	20	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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Table 4-32.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for more use	More success		Had more time		Got/fixed equipment		Substitute for unavaialable resource(s)		Had more help		Other	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**20**	**1**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**
Other salmon	20	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	20	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households that did not provide any response and households reporting never use.

Chinook Salmon

During the 2017 study year, 16 Twin Hills households reported using Chinook salmon (Table 4-33). Of the 18 surveyed households, 17% (3 households) reported less use of Chinook salmon in 2017 than they used in previous years, 33% (6 households) used the same amount of Chinook salmon, and 39% (7 households) reported more use of Chinook salmon (Table 4-33; Figure 4-18). When asked the reasons why Chinook salmon use was less, the following responses were each cited by one household (33%): family/personal reasons, less sharing, lack of effort, and had no help (Table 4-34). Table 4-35 depicts reasons for more use of Chinook salmon cited by six households. Reasons for increased Chinook salmon use in 2017 include: increased effort (50%), received more (33%), needed more (17%), and had more help (17%). When asked if the household got enough Chinook salmon in 2017, 13% (two responding households) indicated that they did not, and the assessments were split between characterizing the effect to the household as minor and major (Table 4-36). The majority (78%) of sampled households did get enough Chinook salmon in 2017, which was an improvement in comparison to the previous study year (Figure 4-19; Figure 4-17). When asked what households did as the result of not getting enough salmon, 50% (one household) indicated that they replaced Chinook salmon with other subsistence foods, and 50% (one household) stated that they made do without (Table 4-37). The two households that did not have enough Chinook salmon were asked how many are needed annually, and responses indicated an average of eight salmon (Table 4-38). In 2017, no Twin Hills households reported having to work harder than usual to obtain enough Chinook salmon, nor did any households report having had to travel further or to different locations than normal to obtain enough Chinook salmon (Table 4-39; Table 4-40).

Other Salmon

In 2017, 16 Twin Hills households reported using other salmon (Table 4-33). Of 18 surveyed households, 5 (28%) stated that they used less other salmon species than they used in previous years, 50% (9 households) reported using the same amount, and 11% (2 households) reported more use of other salmon (Table 4-33; Figure 4-18). When asked the reasons why other salmon use was less, three respondents indicated less sharing (50%); also, lack of need and equipment (25% each) and had no help (25%) were cited as reasons for less use of other salmon (Table 4-34). Of the two households that indicated increased other salmon use during the study year, 50% cited receiving more and 50% cited increased effort as a reason why (Table 4-35). When asked if the household got enough other salmon in 2017, the majority (83%) of sampled households did get enough (Figure 4-19); however, one responding household (6%) indicated not having enough and this household reported the impact as major (Table 4-36). The responding household indicated that it bought/bartered as a result of not having enough other salmon and that an average of 20 other salmon are needed annually (Table 4-37; Table 4-38). In 2017, no Twin Hills households reported having to work harder than usual to obtain enough other salmon, nor did any households report having had to travel further or to different locations than normal to obtain enough other salmon, which was also the case for Chinook salmon in 2017 (Table 4-39; Table 4-40).

While for both 2016 and 2017 not all surveyed households answered the questions about changes to their harvest effort and fishing locations for Chinook and all other salmon, the responses for 2017 were improved compared to those from 2016 (tables 4-30, 4-31, 4-39, and 4-40). Additionally, for the other use assessment questions, responses in 2017 were better compared to 2016: more households indicated the same or more use of both Chinook and all other salmon, and fewer households reported that they did not have enough Chinook or all other salmon (tables 4-25, 4-33, 4-27, and 4-36).

Table 4-33.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Twin Hills, 2017.

Resource category	Sampled households	Valid responses	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Any salmon	**18**	**18**	**17**	**94.4%**	**6**	**33.3%**	**10**	**55.6%**	**7**	**38.9%**	**3**	**16.7%**
Other salmon	18	18	16	88.9%	5	27.8%	9	50.0%	2	11.1%	2	11.1%
Chinook salmon	18	18	16	88.9%	3	16.7%	6	33.3%	7	38.9%	2	11.1%

Source ADF&G Division of Subsistence household surveys, 2018.

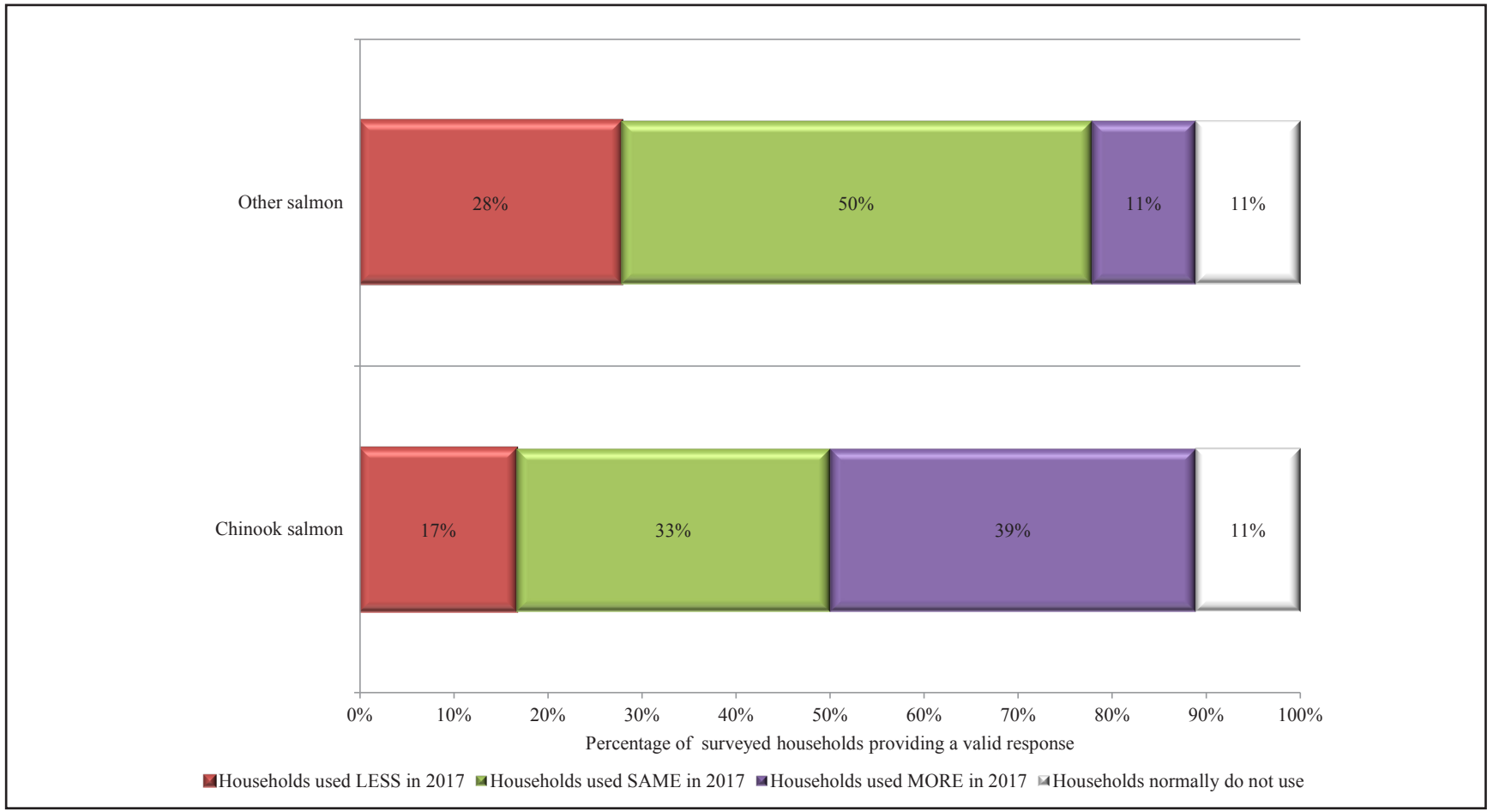

Figure 4-18.–Changes in household uses of salmon compared to recent years, Chinook and other salmon, Twin Hills, 2017.

Table 4-34.–Reasons for less household uses of salmon compared to recent years, Chinook and other salmon, Twin Hills, 2017.

Resource category	Valid responses[a]	Households reporting reasons for less use	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**18**	**5**	**1**	**20.0%**	**0**	**0%**	**0**	**0.0%**	**1**	**20%**	**2**	**40%**	**1**	**20%**	**0**	**0.0%**	**0**	**0.0%**
Other salmon	18	4	0	0.0%	0	0%	0	0.0%	1	25%	2	50%	0	0%	0	0.0%	0	0.0%
Chinook salmon	18	3	1	33.3%	0	0%	0	0.0%	0	0%	1	33%	1	33%	0	0.0%	0	0.0%

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Table 4-34.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for less use	Working/ no time		Regulations		Did not need		Gas/equipment too expensive		Used other resources		Competition		Had no help		Other reasons	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**18**	**5**	**0**	**0.0%**	**0**	**0%**	**1**	**20.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**1**	**20.0%**	**0**	**0.0%**
Other salmon	18	4	0	0.0%	0	0%	1	25.0%	0	0.0%	0	0.0%	0	0.0%	1	25.0%	0	0.0%
Chinook salmon	18	3	0	0.0%	0	0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	33.3%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households that did not provide any response and households reporting never using the resource.

Table 4-35.–Reasons for more household uses of salmon compared to recent years, Chinook and other salmon,Twin Hills, 2017.

Resource category	Valid responses[a]	Households reporting reasons for more use	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**18**	**6**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**2**	**33.3%**	**1**	**16.7%**	**4**	**66.7%**
Other salmon	18	2	0	0.0%	0	0.0%	0	0.0%	1	50.0%	0	0.0%	1	50.0%
Chinook salmon	18	6	0	0.0%	0	0.0%	0	0.0%	2	33.3%	1	16.7%	3	50.0%

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Table 4-35.–Continued.

Resource category	Valid responses[a]	Households reporting reasons for more use	More success		Had more time		Got/fixed equipment		Substitute for unavaialable resource(s)		Had more help		Other	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any salmon	**18**	**6**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**1**	**16.7%**	**0**	**0.0%**
Other salmon	18	2	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	18	6	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	16.7%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households that did not provide any response and households reporting never use.

Table 4-36.–Reported impact to households reporting that they did not get enough salmon resources, Chinook and other salmon, Twin Hills, 2017.

		Households not getting enough _____ .				Impact to those not getting enough _____ .									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource category	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	18	16	88.9%	1	6.3%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%
Chinook salmon	18	16	88.9%	2	12.5%	0	0.0%	0	0.0%	1	50.0%	1	50.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

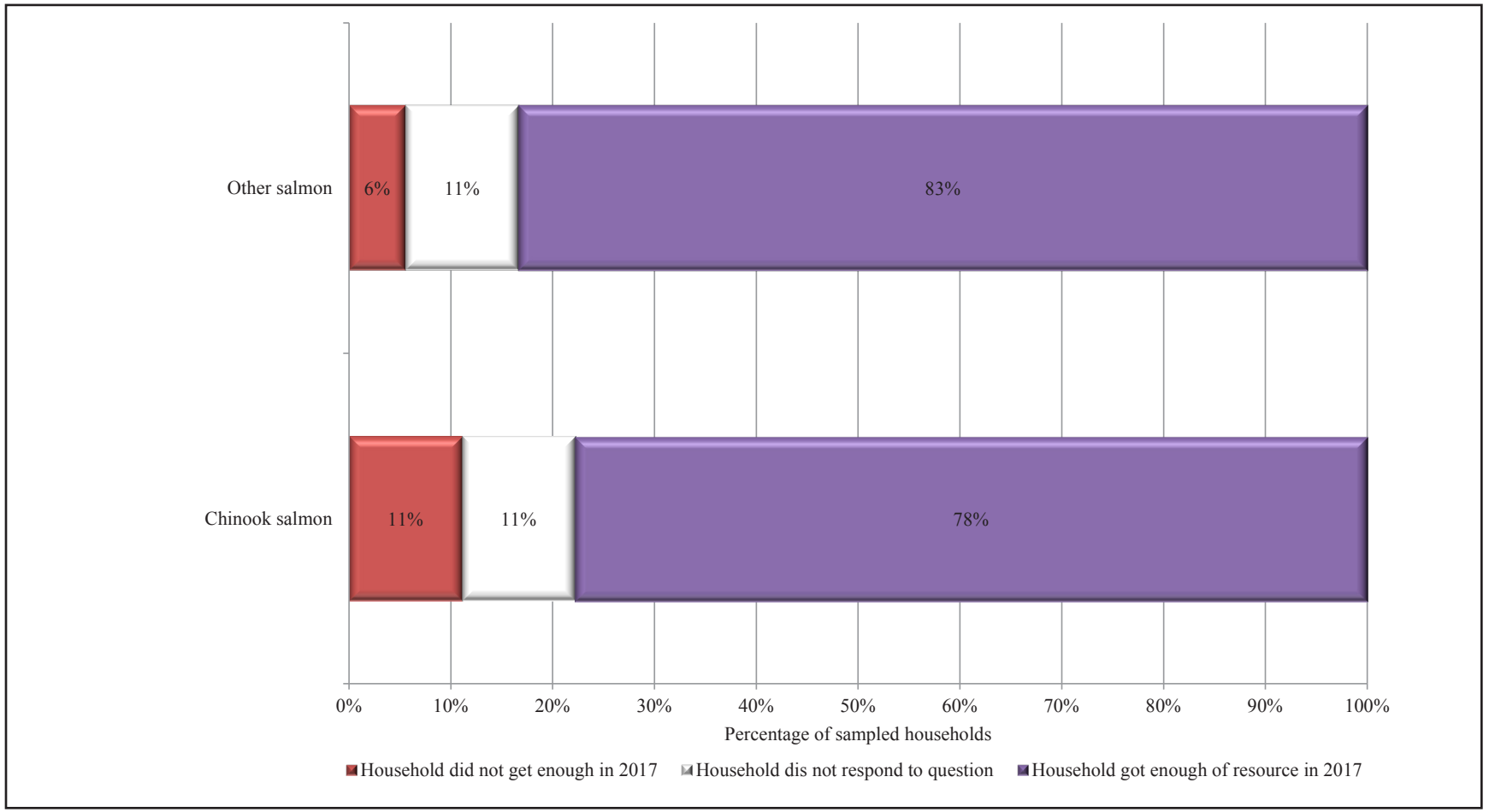

Figure 4-19.–Percentage of sampled households reporting whether they had enough salmon, Chinook and other salmon, Twin Hills, 2017.

Table 4-37.–Things households reported doing differently as the result of not getting enough salmon, Chinook and other salmon, Twin Hills, 2017.

Resource category	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Increased effort	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	1	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	2	0	0.0%	0	0.0%	1	50.0%	0	0.0%	0	0.0%

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Table 4-37.–Continued.

Resource category	Valid responses[a]	Made do without		Obtained food from other sources		Got public assistance		Other reasons	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	2	1	50.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Valid responses do not include households failing to respond to the question and those households that never used the resource.

Table 4-38.–Salmon resources that sampled households reported needing, Twin Hills, 2017.

Resource category	Households needing resource	Total amount needed (Number of fish)	Average amount needed (Number of fish)
Other salmon	1	20	20
Chinook salmon	2	15	8

Source ADF&G Division of Subsistence household surveys, 2018.

Table 4-39.–Reasons that households worked harder to get more salmon, Chinook and other salmon, Twin Hills, 2017

Resource	Sampled households	Valid responses	Households reporting… not working harder than usual	Households reporting… working harder than usual	Family/Personal Number	Family/Personal Percentage	Resource availability Number	Resource availability Percentage	Unsuccessful Number	Unsuccessful Percentage	More time Number	More time Percentage
Other salmon	18	12	12	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	18	10	10	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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Table 4-39.–Continued.

Resource	Sampled households	Valid responses	Households reporting… not working harder than usual	Households reporting… working harder than usual	Small or diseased resources Number	Small or diseased resources Percentage	Other reasons Number	Other reasons Percentage	No Response Number	No Response Percentage
Other salmon	18	12	12	0	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	18	10	10	0	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.
Note The sum of percentages may not be 100% because households were able to give more than one answer.

Table 4-40.–Households reporting that they traveled further or to different locations, Twin Hills 2017.

Resource	Sampled households	Valid responses	Households reporting that they... traveled further	Households reporting that they... traveled to different locations
Other salmon	18	12	0	0
Chinook salmon	18	10	0	0

Source ADF&G Division of Subsistence household surveys, 2018.

Chinook Salmon and Other Salmon

Of the 11 households that reported harvesting or attempting to harvest Chinook salmon in 2016 and answered the questions, 9 (82% of households) indicated their usual harvest method for Chinook salmon was subsistence gillnet, 2 (18%) indicated commercial home pack, 1 (9%) indicated seine, 1 (9%) indicated rod and reel, and 2 (18%) indicated other methods as their usual Chinook salmon harvest method (Table 4-41). The one household that responded rod and reel is a usual Chinook salmon harvest method cited ease as the reason why (Table 3-42). In 2016, there were 14 households that harvested or attempted to harvest all other salmon, and subsistence gillnet was the usual harvest method cited by 9 households (64%), which is lower than the responses for usual Chinook salmon harvest methods; however, more households (4, or 29% of households) cited rod and reel as a usual harvest method of other salmon in comparison to Chinook salmon (Table 4-41). Ease was cited by two households (50%) as the reason why rod and reel was used to harvest other salmon, and fun was also cited by two households (50%) (Table 4-42).

Chinook Salmon and Other Salmon

Of the eight households that reported harvesting or attempting to harvest Chinook salmon in 2017 and answered the questions, two (25% of households) indicated their usual harvest method for Chinook salmon was subsistence gillnet, two (25%) indicated commercial home pack, and six (75%) indicated other methods (Table 4-43). Of those two households that responded rod and reel is a usual Chinook salmon harvest method, reasons provided for why included fun (two households) and tradition (one household) (Table 4-44). In 2017, there were eight households that harvested or attempted to harvest all other salmon, and subsistence gillnet was the usual harvest method cited by four (50% of households), which was more than the responses for usual Chinook salmon harvest methods; and more households (three, or 38% of households) cited rod and reel as a usual harvest method of other salmon in comparison to Chinook salmon (Table 4-43). Of those three households that responded rod and reel is a usual other salmon harvest method, reasons provided for why included fun (three households) and ease (one household) (Table 4-44).

Table 4-41.–Usual household harvest methods, Chinook and other salmon, Twin Hills, 2016.

Resource category	Households harvesting, or attempting to harvest	Commercial home pack		Seine		Subsistence gillnet		Rod and reel		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	11	2	18.2%	1	9.1%	9	81.8%	1	9.1%	2	18.2%
Other salmon	14	1	7.1%	2	14.3%	9	64.3%	4	28.6%	1	7.1%

Source ADF&G Division of Subsistence household surveys, 2017.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Note Subsistence gillnet includes both set and drift gillnet harvest methods.

Table 4-42.–Reasons for using a rod and reel to harvest salmon, Chinook and other salmon, Twin Hills, 2016.

Resource	Households using rod and reel	Conservation		Selectivity		Gillnet mesh too small		Tradition		Ease		Fun		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%
Other salmon	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	50.0%	2	50.0%	2	50.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Table 4-43.–Usual household harvest methods, Chinook and other salmon, Twin Hills, 2017.

Resource category	Households harvesting, or attempting to harvest	Commercial home pack		Seine		Subsistence gillnet		Rod and geel		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	8	0	0.0%	0	0.0%	2	25.0%	2	25.0%	6	75.0%
Other salmon	8	0	0.0%	0	0.0%	4	50.0%	3	37.5%	4	50.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Note Subsistence gillnet includes both set and drift gillnet harvest methods.

Table 4-44.–Reasons for using a rod and reel to harvest salmon, Chinook and other salmon, Twin Hills, 2017.

Resource	Households using rod and reel	Conservation		Selectivity		Gillnet mesh too small		Tradition		Ease		Fun		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chinook salmon	2	0	0.0%	0	0.0%	0	0.0%	1	50.0%	0	0.0%	2	100.0%	0	0.0%
Other salmon	3	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	33.3%	3	100.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

Comparing Harvests in 2016 and 2017 with Estimated Harvests from Previous Study Years and the Permit System

Changes in the harvest of salmon resources by Twin Hills residents can also be discerned through comparisons with findings from other study years and data from the subsistence permit database. However, even though permit data have been collected by ADF&G Division of Subsistence beginning in 1983, the subsistence permit participation rate in Twin Hills has been low, leading to low confidence in estimated harvests. Prior to this study, the only other survey in Twin Hills was a comprehensive subsistence harvest survey for 1999 (Coiley-Kenner et al. 2003). During the administration of subsistence harvest surveys in 2017 and 2018, Division of Subsistence staff members opportunistically collected unreturned permits from households in Twin Hills. The data from collected permits were then included in the subsistence permit database, as were data from interviewed households that did not have permits prior to being surveyed but did subsistence fish; this makes 2016 and 2017 years for which estimated subsistence salmon harvests are likely very reliable in comparison to other estimates available in the ASFDB for Twin Hills.

Goals of the 2016 and 2017 household salmon survey efforts included collecting unreturned Twin Hills subsistence permits, gathering harvest data from those households that did not obtain a subsistence permit but still subsistence fished, and collecting information about the amount of salmon retained from commercial catches for home use as well as rod and reel harvests. This additional information collected through the administration of household surveys provides a more accurate representation of a Twin Hills fishing season and harvests for home use than data from returned subsistence permits and commercial fish tickets alone. As mentioned previously, for the 2016 study year, a total of seven additional permits were collected/issued as a result of the survey efforts (100% permit return rate), and for the 2017 study year, a total of four additional permits were collected/issued during survey administration (89% permit return rate) (Table 4-21; Table 4-23). The total number of issued and returned permits for both study years exceeded the recent 5-year (2013–2017) average of four issued and returned permits (Table 4-45).

Although the population of Twin Hills has been stable (Figure 4-2), according to available estimates based on harvest survey data and permit returns, the overall community subsistence harvest of salmon by Twin Hills households has fluctuated since 1983 (Figure 4-20; Table 4-45). Based on the 1999 harvest survey, the community subsistence harvest of salmon was 2,028 fish, and during the ensuing 16 years, the estimated subsistence harvest amount based on household surveys dropped: by 2016 the total community subsistence harvest amount was estimated to be 675 salmon, and in 2017 it was estimated at 445 salmon (Figure 4-20). Based on subsistence permit data, the historical average harvest of all salmon species from 1983–2017 is 283 fish, the 10-year (2008–2017) average is 165 salmon, and the 5-year (2013–2017) average is 223 fish (Table 4-45). While the Twin Hills permit participation has been consistently low, the historical average (283 fish) is influenced by generally higher harvests estimated and permit returns in the 1980s and 1992. The recent 5-year average (223 fish) includes 2016 and 2017, which have high permit return rates, but the harvest estimates are still less in comparison to the historical average, suggesting that the salmon harvest by Twin Hills households has declined over time.

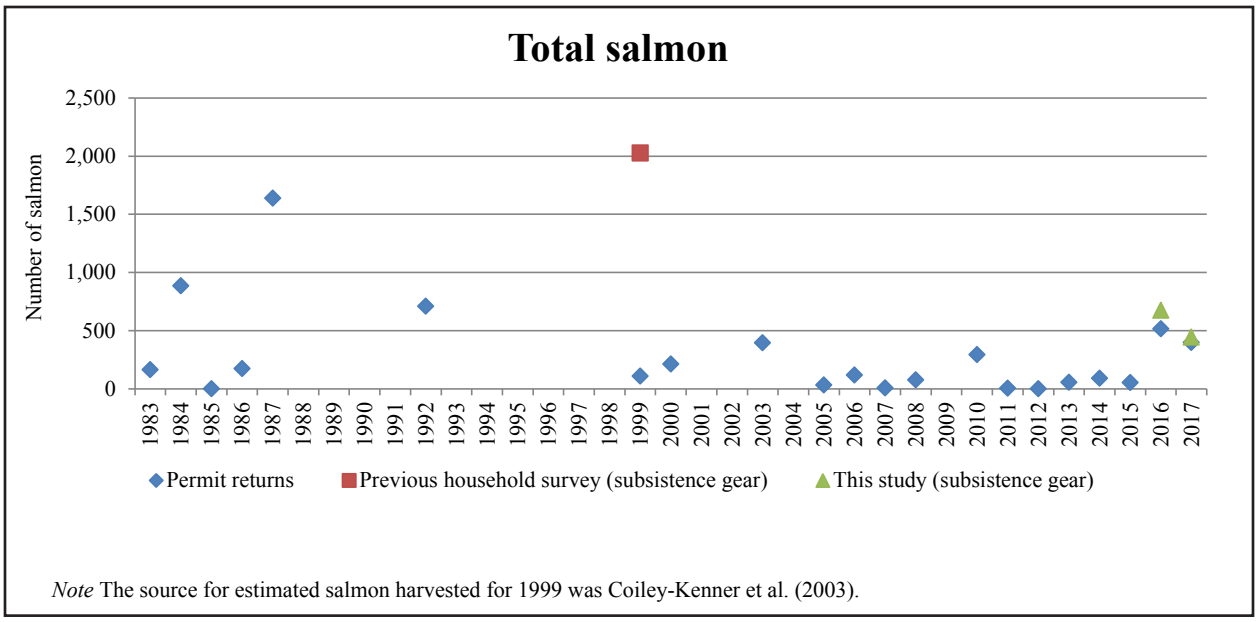
Based upon the available permit data for Twin Hills, subsistence harvests of Chinook salmon appear to have fluctuated since 1983 (Figure 4-21). Based on the subsistence permit database, the historical average Chinook salmon subsistence harvest from 1983–2017 is 56 fish, the 10-year (2008–2017) average is 34 Chinook salmon, and the 5-year (2013–2017) average is 36 fish (Table 4-45). Based only on the three study years of household survey results, Chinook salmon subsistence harvests appear to have declined (Figure 4-21). The 1999 survey results estimated a community subsistence harvest of 335 Chinook salmon, and the Chinook salmon subsistence harvests in 2016 were 73 fish, and 96 fish in 2017.

Table 4-45.–Historical harvest of salmon based on Bristol Bay permit returns, Twin Hills, 1983–2017.

	Permits		Percentage of returned	Estimated salmon harvest					
Year	Issued	Returned	permits	Chinook	Sockeye	Coho	Chum	Pink	**Total**
1983	3	2	66.7%	63	90	0	12	0	**165**
1984	9	6	66.7%	102	182	512	89	2	**885**
1985	1	1	100.0%	0	0	0	0	0	**0**
1986	2	2	100.0%	54	60	40	20	0	**174**
1987	3	1	33.3%	40	600	800	200	0	**1,640**
1988									
1989									
1990									
1991									
1992	5	3	60.0%	178	333	60	57	81	**709**
1993									
1994									
1995									
1996									
1997									
1998									
1999	1	1	100.0%	72	26	0	11	0	**109**
2000	1	1	100.0%	102	68	0	36	7	**213**
2001									
2002									
2003	7	7	100.0%	171	115	105	0	5	**396**
2004									
2005	1	1	100.0%	33	0	0	0	0	**33**
2006	3	3	100.0%	61	29	0	12	16	**118**
2007	1	1	100.0%	6	1	0	0	0	**7**
2008	2	1	50.0%	34	26	6	10	0	**76**
2009									
2010	2	2	100.0%	87	80	25	72	30	**294**
2011	1	1	100.0%	0	1	5	0	0	**6**
2012	1	0	0.0%	0	0	0	0	0	**0**
2013	2	2	100.0%	28	16	0	12	0	**56**
2014	2	2	100.0%	9	57	0	23	1	**90**
2015	1	1	100.0%	2	47	0	5	0	**54**
2016	8	8	100.0%	54	382	50	29	0	**515**
2017	9	8	88.9%	89	261	7	42	0	**398**
5-year avg (2013–2017)	4.4	4.2	95.5%	36	153	11	22	0	**223**
10-year avg (2008–2017)	3.1	2.8	89.3%	34	97	10	21	3	**165**
Historical avg (1983–2017)	3.1	2.6	83.1%	56	113	77	30	7	**283**

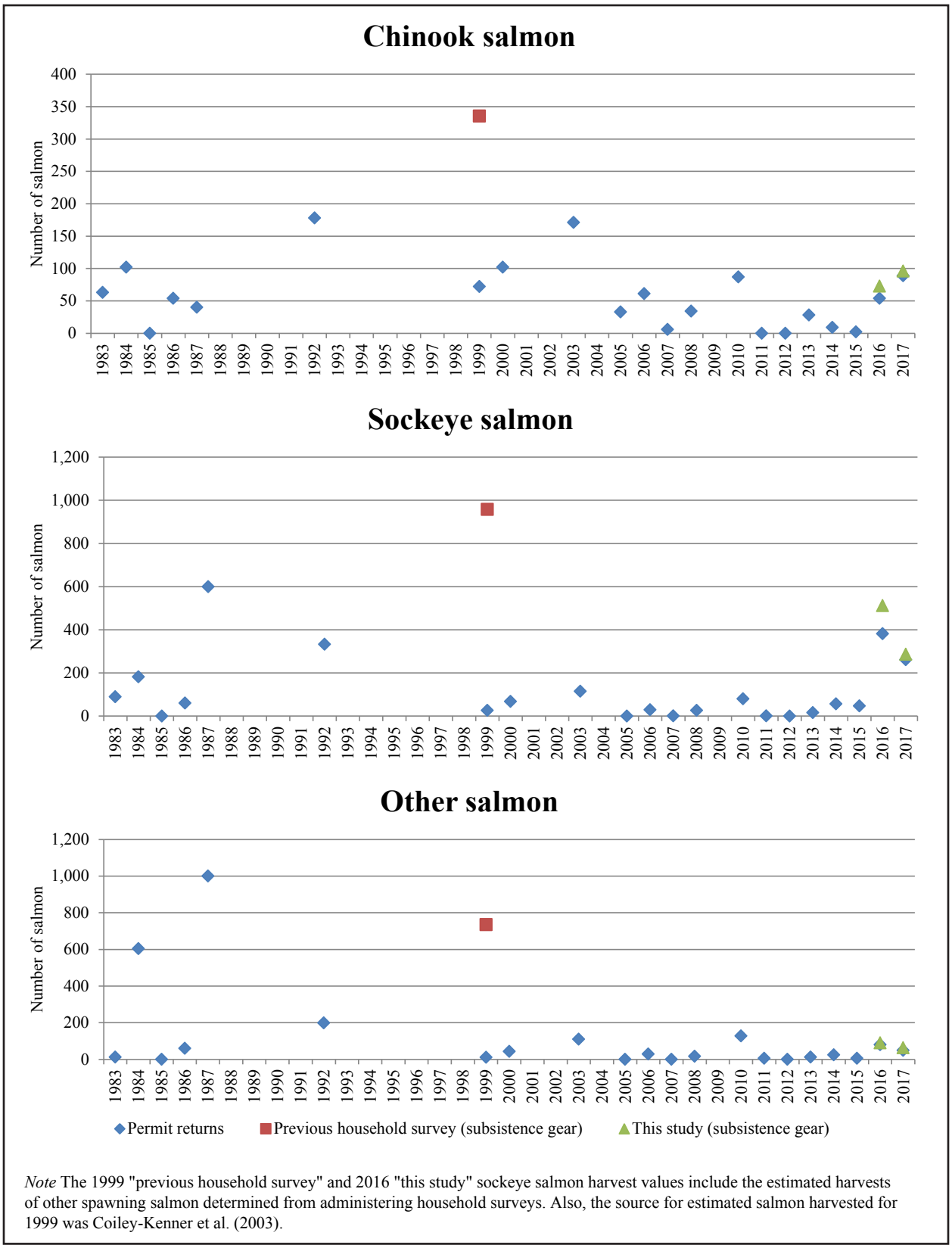
Source ADF&G Division of Subsistence, ASFDB 2018 (ADF&G March 2019).

Note Years with no data are years for which no permits were issued and, therefore, no harvest estimates can be made.



Note The source for estimated salmon harvested for 1999 was Coiley-Kenner et al. (2003).

Figure 4-20.–Historical estimated subsistence salmon harvests, total salmon, Twin Hills, based on permit returns, 1983–2017, and household surveys, 1999, 2016, and 2017.



Note The 1999 "previous household survey" and 2016 "this study" sockeye salmon harvest values include the estimated harvests of other spawning salmon determined from administering household surveys. Also, the source for estimated salmon harvested for 1999 was Coiley-Kenner et al. (2003).

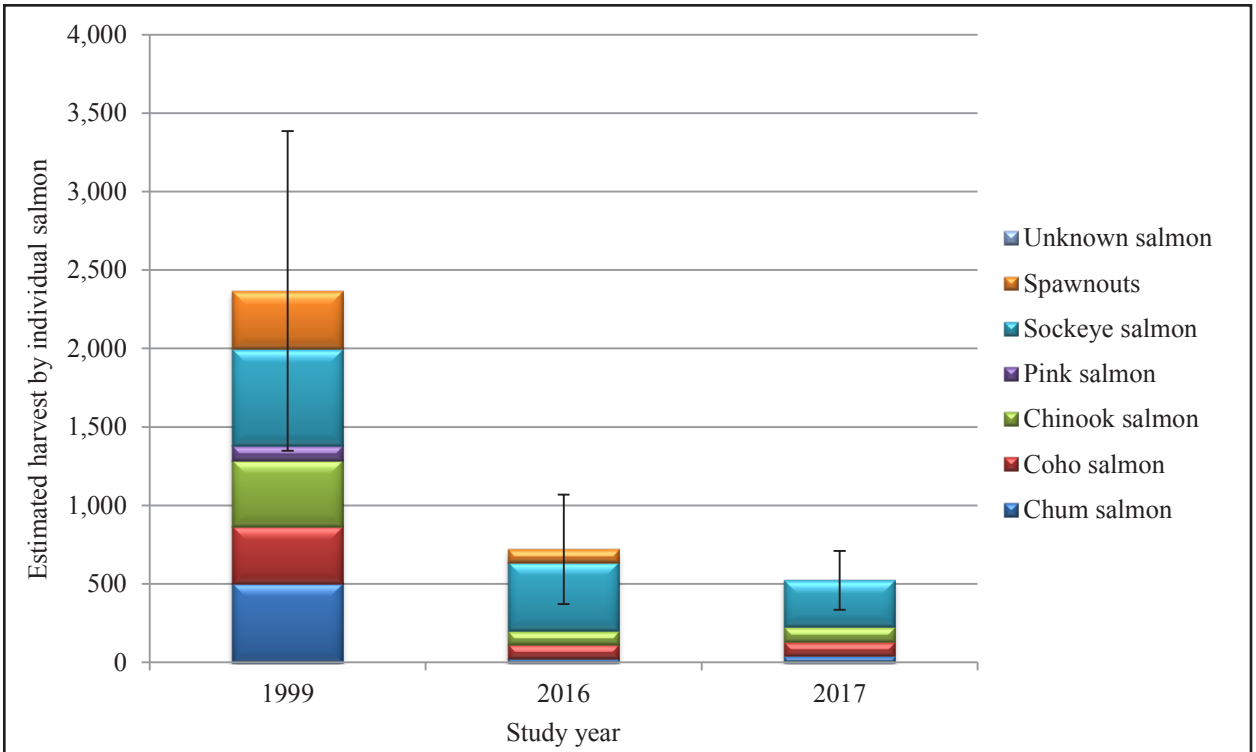
Figure 4-21.–Historical estimated subsistence salmon harvests, by species, Twin Hills, based on permit returns, 1983–2017, and household surveys, 1999, 2016, and 2017.

Table 4-46.–Comparison of estimated total salmon harvests, Twin Hills, 1999, 2008, 2016, and 2017.

	Estimated number of salmon harvested					
	1999		2016		2017	
Resource	Number	CIP	Number	CIP	Number	CIP
Salmon	**2,367.0**	**43.0%**	**719.6**	**48.5%**	**522.7**	**35.9%**
Chum salmon	502.0	86.0%	26.6	55.7%	40.0	70.3%
Coho salmon	364.0	67.0%	89.6	70.8%	89.3	32.4%
Chinook salmon	420.0	68.0%	84.0	35.4%	96.0	41.7%
Pink salmon	96.0	123.0%	0.0	0.0%	0.0	0.0%
Sockeye salmon	613.0	98.0%	435.4	63.8%	297.3	43.7%
Spawnouts[a]	372.0	83.0%	84.0	112.0%	0.0	0.0%
Unknown salmon	0.0	0.0%	0.0	0.0%	0.0	0.0%

Sources For 2016 and 2017, ADF&G Division of Subsistence household surveys, 2017, 2018; for previous study year, ADF&G Division of Subsistence Community Subsistence Information System (CSIS), accessed 2018.

a. In 1999, "spawnouts" were not identified by species; in 2016, "spawnouts" were spawning sockeye salmon.



Note Error bars represent the upper and lower bounds of the 95% confidence interval. Also, in 1999, "spawnouts" were not identified by species; in 2016, "spawnouts" were spawning sockeye salmon.

Figure 4-22.–Composition of total salmon harvest, by species and individual fish, Twin Hills, 1999, 2016, and 2017.

Like the fluctuation in Chinook salmon harvests, the harvests of sockeye, coho, chum, and pink salmon also display variation based on the available permit data (Figure 4-21). The historical average sockeye salmon subsistence harvest from 1983–2017 is 113 fish, the 10-year (2008–2017) average is 97 sockeye salmon, and the 5-year (2013–2017) average is 153 fish. For coho salmon, the historical average harvest from 1983–2017 is 77 fish, the 10-year (2008–2017) average is 10 coho salmon, and the 5-year (2013–2017) average is 11 fish. The historical average chum salmon subsistence harvest from 1983–2017 is 30 fish, the 10-year (2008–2017) average is 21 chum salmon, and the 5-year (2013–2017) average is 22 fish. For pink salmon the historical average harvest from 1983–2017 is seven fish, the 10-year (2008–2017) average is three pink salmon, and the 5-year (2013–2017) average is zero fish (Table 4-45). Based on household survey data, during the 1999 study year the community of Twin Hills harvested an estimated total 613 sockeye salmon; in 2016, the sockeye salmon harvest was 435 fish, and in 2017 the estimated total harvest of sockeye salmon was 297 fish (Table 4-46). During this project's study years, most Twin Hills households did not attempt to harvest spawning sockeye salmon. As shown in Table 4-46, the total harvest of spawnouts decreased over time: in 1999 an estimated total 372 spawnouts were harvested, which reduced to 84 spawnouts in 2016, and none harvested in 2017. Based on household survey estimates, the sockeye salmon harvest provided an increased proportion of the total salmon harvest in comparison to 1999, and Chinook and coho salmon harvests contributed about the same proportion to the total harvest (Figure 4-22).While the sockeye salmon harvest changed from composing one-quarter of the harvest to a little more than one-half, the chum, pink, and spawning salmon harvests composed reduced proportions of the total harvest (Table 4-46; Figure 4-22).

Local Comments and Concerns

Following is a summary of local observations of salmon populations and trends that were recorded during the surveys in Twin Hills. Some households did not offer any additional information during the survey interviews, so not all households are represented in the summary. In addition, respondents expressed their concerns about salmon during the community scoping meeting, the key respondent interviews, and the community review meeting. These concerns have been included in the summary.

Overall Salmon Health

Regarding salmon health, several Twin Hills residents indicated that throughout the past decade they have become concerned with the health of Togiak Bay Chinook salmon and sockeye salmon stocks. According to some survey respondents, both the Chinook salmon and sockeye salmon that return are smaller than they were in the past, and the abundance of both salmon species seems to fluctuate in a more extreme way than it did in the past. During the survey effort there were numerous reports of increased sea lice on salmon and respondents mentioned harvesting an alarming number of Chinook salmon with deformities or parasites—missing fins, large bellies, worms in the meat, and odd-shaped bodies. Community members also mentioned having concerns about the safety of consuming fish that may have possible contamination from ocean oil spills and the Fukushima Daiichi nuclear disaster in Japan in 2011. Additionally, several respondents mentioned that "salmon colored sooner" than they used to. One Twin Hills community member stated that their grandparents explained that this phenomenon meant the fish were stressed and early spawning usually occurred during a time of scarcity.

Trawlers

Many community members from Twin Hills expressed concerns about the presence of bottom trawlers commercial fishing for yellowfin sole in the Aleutian Islands and close to Togiak Bay. Residents believe that this fishing method is harmful for the local marine environment and that too much salmon are being caught and wasted as bycatch in this fishery. People were concerned that the amount of bycatch affects both Chinook and sockeye salmon stocks.

Pebble Mine

Twin Hills residents brought up their concerns about Pebble Mine during the 2016 and 2017 household harvest surveys. Community members expressed concerns about the potential negative effects to salmon populations if Pebble Mine is developed. The uncertainty of the effects of this mine on the region and the risk of pollution and contamination from the mine site worried community members.

5. OBSERVATIONS AND TRENDS OF TOGIAK RIVER CHINOOK SALMON

Bronwyn Jones, Jayde Ferguson, and Cody Larson

Introduction

This chapter presents traditional ecological knowledge (TEK) shared by community members of Togiak and Twin Hills about Chinook salmon in the Togiak River alongside the results from biological sampling of Chinook salmon and analysis of selected Togiak and Twin Hills survey data. The research methods employed to produce this chapter include systematic household surveys, Chinook salmon biological tissue sampling, key respondent interviews (KRIs), participant observation, review of existing literature, and archival research. A detailed description of the data collection process for this research is provided in Chapter 1: "Introduction." After an overview of TEK, the Chinook salmon data in this chapter are presented in four trends categories: quality, abundance, behavior, and escapement.

Traditional Ecological Knowledge (TEK) in Research

Within the scientific community there is much debate about what should be characterized as TEK, and what should be called indigenous knowledge, local knowledge, local traditional knowledge, or experiential knowledge, among other terms. In this report, the term TEK will be used in its most inclusive sense to embrace all categories of localized knowledge regarding salmon populations and local ecosystems (Agrawal 2002; Berkes 2012; Ingold 2011; Usher 2000).

There are many different definitions of TEK; here is a definition according to Inglis et al. (1993:vi):

> TEK refers to the knowledge base acquired by Indigenous and local peoples over many hundreds of years through direct contact with the environment. It includes an intimate and detailed knowledge of plants, animals, and natural phenomena, the development and use of appropriate technologies for hunting, fishing, trapping, agriculture, and forestry, and a holistic knowledge, or "world view" which parallels the scientific discipline of ecology.

Another definition of TEK offered by Huntington and Mymrin (1996:x) states:

> Traditional Ecological Knowledge is a system of understanding one's environment. It is built over generations, as people depend on the land and the sea for their food, materials, and culture. TEK is based on observations and experience, evaluated in light of what one has learned from one's elders. People have relied on this detailed knowledge for their survival—they have literally staked their lives on its accuracy and repeatability. TEK is an important source of information and understanding for anyone who is interested in the natural processes at work in that area. While the scientific perspective is often different from the traditional perspective, both have a great deal to offer one another. Working together is the best way of helping us achieve a better common understanding of nature.

TEK is more than useful facts possessed by local people—it is an entire knowledge system that can provide important information for a variety of purposes. It is important to understand the socio-cultural embeddedness of TEK. Terms such as TEK were developed by the Western science community and the meaning of TEK may be confusing to people outside of scientific disciplines. In the Yup'ik culture, the traditional way of life, or *piciryaraq*, is the true meaning of, simply, how the people live their lives. The Alaska Native people of Togiak and Twin Hills do not have a word for subsistence in their language but refer to "our traditional way of life." Today, the English word "subsistence" is commonly used by Alaska Natives to describe a way of life, thus combining traditional ideas with contemporary words. It is important

to note that each family has unique ways of passing on the Alaska Native traditions they were taught by their Yup'ik elders and ancestors. Therefore, some TEK may not be accessed simply by asking the right questions of the right people; it may be contained in stories and reflected in resource harvesting, processing, and management practices.

Traditional Ecological Knowledge and Western Science

Though there are both similarities and differences between TEK and Western science, these two bodies of knowledge can be complementary. Historical perspectives and local observations, including long-range temporal and place-based perspectives, can serve to provide in-depth and holistic knowledge of localized wildlife populations. Freeman (1985) and Eythorsson (1993) both argue that both types of knowledge rest on the systematic gathering of empirical observations, with the main difference being the methods used for collection and analysis of data. According to Eythorsson (1993:134):

> Scientific knowledge needs a wide range of methodical observations to establish a model of a situation, for instance to estimate the development of a certain stock of animals within an ecosystem. Before a biologist can come to a conclusion about the development of the stock, he must collect great amounts of quantitative data over some time. A local fisherman, who is familiar with the area, will react spontaneously to observations that deviate from the usual pattern. He will be observant to qualitative changes, signs which indicate that something unusual is happening. He will interpret such signs within the context of his experience and traditional knowledge, and discuss his interpretations with fellow fishermen and neighbours.
>
> From this standpoint there is no need for a contradiction between traditional knowledge and scientific knowledge. The two types of knowledge should be complementary, and resource managers should gain from using both types as a basis for management regimes.

The complementary nature of using TEK and Western science together can increase our understanding of Chinook salmon stocks. The following sections of this chapter synthesize these types of data. What follows in this chapter are local observations about Chinook salmon in the Togiak River collected by researchers from local Togiak and Twin Hills residents, quantified stock assessment data, and the results from biological sampling of the Togiak River Chinook salmon stock.

Chinook Salmon Quality

Changes to the quality of Chinook salmon were fundamental points of discussion with Togiak and Twin Hills community members throughout this project. When people spoke about Chinook salmon quality, two major themes arose. These themes were Chinook salmon external appearance—which included sub-themes such as size, deformities, marks, missing scales, etc.—and Chinook salmon internal appearance—with sub-themes apparent regarding soft meat, tissue discoloration, parasites, and worms, among others. In this section, data from survey responses about Chinook salmon quality assessments are first presented, followed by information about salmon quality gathered through interviews and participant observation; age, sex, and length (ASL) analysis; and *Ichthyophonus* infection results.

Chinook Salmon Quality Assessments

During the 2016 and 2017 household salmon surveys in Togiak and Twin Hills, researchers asked respondents to answer yes or no to the question: have you observed any changes in the quality or appearance of Chinook salmon you harvested last year? Household respondents who answered "yes" were prompted to provide a response to the open-ended question: what changes have you observed? This section discusses responses to those questions.

In 2016, 34 Togiak households (46% of total surveyed households) reported observing changes in the quality of Chinook salmon (Table 5-1). Of those 34 households, 15 households (44%) stated in their open-

ended question response that Chinook salmon were smaller, 14 households (41%) responded that more Chinook salmon appeared to be diseased, 11 households (32%) mentioned an increased amount of jack[1] salmon being present, 2 households (6%) stated that there was a greater size variation among returning Chinook salmon than usual, and 2 households stated that there were fewer scales on the fish. In 2016, eight Twin Hills households (40% of total surveyed households) reported observing changes in the quality of Chinook salmon. Of those eight households, the majority (six households, or 75%) stated in their response to the open-ended follow-up question that Chinook salmon were smaller, and three households (38%) responded that Chinook salmon appeared to be diseased.

In 2017, 32 Togiak households (46% of total surveyed households) reported observing changes in the quality of Chinook salmon. Of those 32 households, more than one-half (19 households, or 59%) stated that Chinook salmon were smaller, 8 households (25%) reported that more Chinook salmon appeared to be diseased, and 5 households (16%) mentioned an increased amount of jack salmon during the 2017 study year. For Twin Hills, during the 2017 study year, seven households (39% of total surveyed households) reported observing changes in the quality of Chinook salmon. Of those seven households, more than one-half (four households, or 57%) stated that Chinook salmon appeared to be diseased, three households (43%) reported that Chinook salmon were smaller in 2017, and two Twin Hills households (29%) mentioned an increased amount of jack salmon.

Interviews and Participant Observation

Community members frequently commented on the topic of Chinook salmon quality throughout interviews, and also while researchers spent time harvesting and processing salmon with residents of Togiak and Twin Hills. Below are common local observations and related quotes grouped into two categories: first, Chinook salmon external appearance, followed by Chinook salmon internal appearance. The data in this section are derived from KRIs, notes and observations made by researchers while harvesting and processing salmon with local community members, and from discussions at community meetings reviewing early study results.

Chinook Salmon External Appearance

According to residents of Togiak and Twin Hills, returning Chinook salmon are smaller than they were in the past. Respondents explained that prior to 15 years ago, the average size of a Chinook salmon was 45 lb, and now the average seems to be closer to 30 lb. During KRIs, one respondent discussing the size of Chinook salmon stated: "They have gotten smaller; they are not the monsters we used to have." Though the average size has been characterized by community residents as decreased overall, there are still reports of large Chinook salmon being caught; however, harvesting large Chinook salmon is rarer than it was in the past. One community member explained, "We used to catch bigger kings [Chinook salmon], we didn't think about how big they were because they were all like, now we think about it when we get a big one, it's exciting."

In 2016 and 2017, many community residents expressed concerns about the growing number of jack salmon being caught during the fishing season. A jack salmon is a male that returns to spawn one year earlier than the bulk of the return.[2] During discussions of the decreasing size of Chinook salmon, many people equated the increased number of jacks to the decreased number of large Chinook salmon returning. For example, one respondent from Twin Hills explained, "The size of the kings that we used to catch, they used to be from 30 to 45 pounds, sometimes bigger than that. Nowadays they are mostly jacks. Once in a while if you are lucky you can still get a 40 pounder." A respondent from Togiak expressed a similar sentiment as the

1. As described in Chapter 3: "Togiak," a jack salmon is a small, typically male Chinook salmon that matures after spending only one winter in the ocean.
2. Alaska Department of Fish and Game, "Scale Terminology." Last modified April 2014. https://mtalab.adfg.alaska.gov/OTO/Files/Terminology.pdf (accessed February 2019); note that the terminology list is designed to be a living document as noted by Alaska Department of Fish and Game, "Thermal Mark Recovery Laboratory: Chinook Salmon Scale Age Meeting (April 2–3, 2014)," https://mtalab.adfg.alaska.gov/OTO/ChinookScaleAgeMeeting.aspx#/general (accessed February 2019).

Table 5-1.–Observed changes in quality of salmon, Chinook salmon, , Togiak and Twin Hills, 2016 and 2017.

Study year	Community	Households harvesting, or attempting to harvest	Households reporting a change in salmon quality	Smaller size of fish		Larger size of fish		Greater size variation		Watermarked/spots		Fatter size of fish		Looked like hatchery fish	
				Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
2016	Togiak	41	34	15	44.1%	0	0.0%	2	5.9%	0	0.0%	0	0.0%	0	0.0%
	Twin Hills	9	8	6	75.0%	0	0.0%	0	0.0%	1	12.5%	0	0.0%	1	12.5%
2017	Togiak	56	32	19	59.4%	0	0.0%	0	0.0%	1	3.1%	0	0.0%	0	0.0%
	Twin Hills	8	7	3	42.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

-continued-

Table 5-1.–Continued.

Study year	Community	Households harvesting, or attempting to harvest	Households reporting a change in salmon quality	Diseased		Increased amount of jacks		Fewer scales on fish		Immature		Other		No response	
				Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
2016	Togiak	41	34	14	41.2%	11	32.4%	2	5.9%	0	0.0%	1	2.9%	0	0.0%
	Twin Hills	9	8	3	37.5%	0	0.0%	0	0.0%	1	12.5%	0	0.0%	0	0.0%
2017	Togiak	56	32	8	25.0%	5	15.6%	0	0.0%	1	3.1%	1	3.1%	0	0.0%
	Twin Hills	8	7	4	57.1%	2	28.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

respondent from Twin Hills during an interview, "Now we have more jacks than the big kings, back in my time they were bigger, and we never saw these small jacks."

Most people who spoke about the increasing number of jacks were concerned. Community members expressed that they did not like harvesting jacks because those fish yielded such a small amount of meat. Others were concerned about the factors behind the increase in returning jacks. People wondered why jacks were returning in such large numbers, and what happened to them once they reached the river. For example, one respondent provided the following information during an interview: "I don't know what happens to the jacks in the river, I've never seen a carcass of one, but I see the carcasses of king salmon all the time."

Chinook Salmon Internal Appearance

- An increased number of worms in the flesh of Chinook salmon over the past 15 years was a concern cited by community members residing in Togiak and Twin Hills. Worms were found in internal organs such as the stomach, as well as in the salmon flesh. In most cases, people have seen worms in Chinook salmon before; concerns about worms were related to a perceived increasing number of fish that had worms.
- The presence of "white spots" in Chinook salmon meat was mentioned during surveys, community meetings, and throughout KRIs. Additionally, some people described the presence of "white pus" in the meat of Chinook salmon. For example, the following is a description from a key respondent: "I opened one [a Chinook salmon] and there was white stuff in between the meat. Milky stuff. We didn't use those." In cases where there was the presence of white spots or white pus in Chinook salmon, people observed that the Chinook salmon meat seemed to be more "soft" or "mushy" than normal. Salmon with these phenomena were typically not trusted by community members as being edible and were discarded.

Age, Sex, and Length (ASL) Data

To gain a better understanding of the Togiak River Chinook salmon stock composition, researchers collected ASL data for two years while in Togiak and Twin Hills (Plate 5-1). The collected scales were aged by an ADF&G fish and wildlife technician, Cathy Tilly, in 2018. The scales were aged and documented using European Age Notation.[3] European Age Notation is a method of age notation for salmonid scales where the first number is the number of winters spent in fresh water before going to sea (i.e., one winter = age-1.X) followed by the number of winters spent at sea (i.e., three winters = age-X.3 or four winters = age-X.4). Data summary tables were generated that list the age, sex, and length statistics for each sampled Chinook salmon (see tables in Appendix D showing 2016 results and Appendix E showing 2017 results). See Chapter 1: "Introduction" for more detailed information on the Chinook salmon ASL data collection and ASL analysis methods.

A total of four age classes were present in 2016 (see Appendix D) and the dominant age class of the sampled Chinook salmon was 1.3. Of the 153 collected samples from 2016, 4 salmon were aged 1.1, 43 were 1.2, 81 were 1.3, 19 were 1.4, and age determinations could not be made for 6 fish. In 2016, 59% of the sampled Chinook salmon were male (90 salmon), 39% were female (60 salmon), and the sex of 3 Chinook salmon could not be determined. The average length of sampled Chinook salmon in 2016 was 709 mm, with 300 mm being the length of the smallest fish, and the largest sampled Chinook salmon was 1,000 mm. For the 1.1 age class, the average length was 343 mm, and all of these salmon were male. The average length for

3. Alaska Department of Fish and Game, "Scale Terminology." Last modified April 2014. https://mtalab.adfg.alaska.gov/OTO/Files/Terminology.pdf (accessed February 2019); note that the terminology list is designed to be a living document as noted by Alaska Department of Fish and Game, "Thermal Mark Recovery Laboratory: Chinook Salmon Scale Age Meeting (April 2–3, 2014)," https://mtalab.adfg.alaska.gov/OTO/ChinookScaleAgeMeeting.aspx#/general (accessed February 2019).

Plate 5-1.–Researchers Cody Larson and Theodore M. Krieg collecting ASL data in Togiak, 2016.

the 1.2 age class was 597 mm and the ratio of male Chinook salmon to female Chinook salmon was 32 male fish to 11 female fish. The average length was 756 mm for the Chinook salmon in the 1.3 age class. For the 1.3 age class Chinook salmon, 40 were male fish, 38 were female fish, and 3 fish were an unknown sex. For the 1.4 age class the average length was 836 mm, 9 of these salmon were male and 10 were female. The average length of the six fish whose sex was unknown was 710 mm.

In 2017 (see Appendix E), a total of three age classes were present (1.2, 1.3, and 1.4); the dominant age class of the sampled Chinook salmon was 1.3. Of the 60 collected samples from 2017, 20 were aged 1.2, 24 were 1.3, 12 were 1.4, and age determinations could not be made for 4 fish. In 2017, 62% of the sampled Chinook salmon were male (37 salmon), and 38% were female (23 salmon). The average length of sampled Chinook salmon in 2017 was 692 mm, with the smallest Chinook salmon being 410 mm, and the largest sampled fish being 930 mm. For the 1.2 age class, the average length was 608 mm; 16 of these salmon were male and 4 were female. The average length for the 1.3 age class was 734 mm and the ratio of male Chinook salmon to female Chinook salmon was 14 male fish to 10 female fish. For the 1.4 age class the average length was 775 mm; five of these salmon were male and seven were female. The average length of the four Chinook salmon whose sex was unknown was 606 mm.

Ichthyophonus

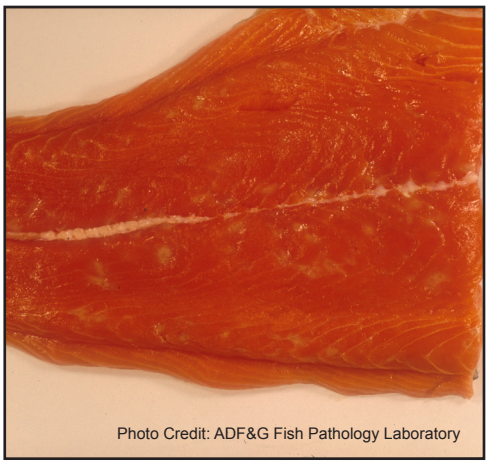


Plate 5-2.–An example of a Chinook salmon fillet infected with *Ichthyophonus*, provided by the ADF&G Fish Pathology Laboratory.

While working on a different Chinook salmon project in the Nushagak River drainage in 2014 and 2015, researchers from the Division of Subsistence heard concerns about "white spots" and "white pus" that had been observed on the flesh of Chinook salmon harvested by local Nushagak River community residents (Halas and Koster *In prep*). These residents were concerned about the health of the Chinook salmon stock, as well as the safety of eating fish that displayed these characteristics. In consultation with ADF&G pathologists, it was determined the observed lesions may have derived from the parasite *Ichthyophonus* and historically some Bristol Bay salmon have tested positive for this parasite (Plate 5-2; Plate 5-3). Prior to the start of this research, while ADF&G researchers were designing this Togiak River Chinook salmon study, communication with the Togiak Traditional Council reported similar cases of Chinook salmon with lesions appearing in the Togiak River.

Ichthyophonus is a disease that localizes in major organ systems of marine and anadromous fish species. This disease is transmitted to predator fish species such as Chinook salmon through the ingestion of infected prey like Pacific herring. *Ichthyophonus* is not dangerous for humans to ingest or come into contact with by handling infected salmon. However, Chinook salmon that are clinically diseased are more susceptible to morbidity than healthy fish (Meyers et al. 2008:46–47).

Declining Chinook salmon harvests and abundance in the Togiak River indicate potential stressors on Chinook salmon that could be exacerbated by a high rate of *Ichthyophonus* in the population. The proportion of *Ichthyophonus* in the stock can be determined by the collection and testing of a sample of Chinook salmon hearts. Therefore, this study included an objective to gather Togiak River Chinook salmon heart samples for pathological analysis of the parasite *Ichthyophonus*. For more detailed information on the Chinook salmon heart sample collection and *Ichthyophonus* analysis methods see Chapter 1: "Introduction."

In 2016, there were 65 Chinook salmon hearts collected by researchers in Togiak and Twin Hills. Out of the 65 samples, 3 had fungal contamination and were not usable. *Ichthyophonus* testing occurred on 62 uncontaminated hearts. Of the 62 Chinook salmon hearts, 2 had suspicious large dark spores, which were transferred to an enrichment medium, but did not produce *Ichthyophonus* spores; these were determined to also be contaminated with fungi. One of the 62 hearts was incubated in MEM-5 medium for 14 days and did result in a positive finding for *Ichthyophonus*. The positive finding was for sample #55 that corresponded to Scale Card #9, Fish #3, from sample collection date June 28, 2016 (see Appendix Table D4). The Chinook salmon that tested positive for *Ichthyophonus* was a male, 710 mm in length, age 1.3, and was harvested in the Togiak River.

Three slides were prepared and the average number of *Ichthyophonus* was 132/section (range = 27–195). A total of five sections were evaluated and the infection severity was found to be within the moderate to severe range and graded as a 2–3 based on the system of Marty et al. (1998). Several parasites appeared degenerated and were associated with chronic myocarditis and granulomas. Plate 5-4 is a visual display of the histopathology of Chinook salmon heart #55. Numerous basophilic macrospores of *Ichthyophonus* can be seen in Plate 5-4, and the inset shows higher magnification of the parasite.

In 2017, there were 61 Chinook salmon hearts collected by researchers in Togiak and Twin Hills. One out of the 61 samples had fungal contamination and was unusable. Of the remaining 60 hearts, no *Ichthyophonus* presence was detected in the submitted 2017 samples.

Plate 5-3.–An example of a Chinook salmon heart with spots, provided by the ADF&G Fish Pathology Laboratory.

The results of this two-year study show that returning adults from this stock have a low prevalence of *Ichthyophonus* based on culturing of sub-sampled heart tissue. *Ichthyophonus* was detected in only one fish, corresponding to a low prevalence of less than 1%. The one infection was graded as moderate to severe based on the number of spores in the histological section. Such a low prevalence would likely not have a negative effect on the population at large. Typically, the majority of hosts within a population are uninfected or lightly infected by parasites while only a few of the hosts harbor high parasite burdens. This phenomenon of an aggregated distribution of parasites within the host population can be statistically described as a negative binomial distribution.

The infected fish was a male of 710 mm in length. A total of four jacks were sampled over the two years, which could have biased results due to a slightly lower probability of acquiring an infection since jacks presumably eat lower trophic level prey. As mentioned above, salmon become infected by eating Pacific herring or other marine fish species. Less time spent in the ocean would also reduce the amount of exposure to the parasite. However, the sample size, when excluding the jacks, still provided high statistical power.

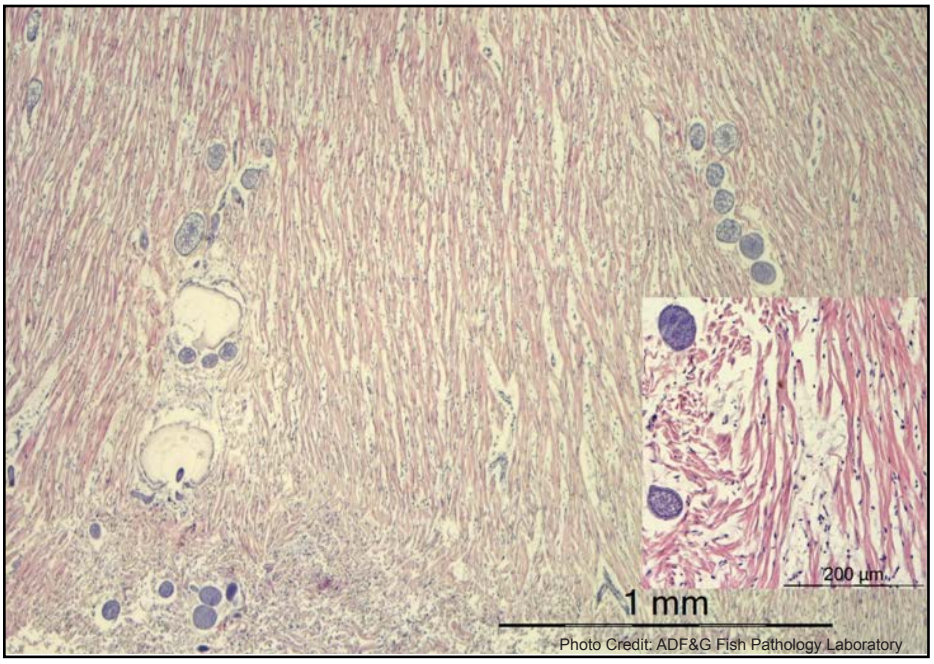


Plate 5-4.–Histopathology of the heart of Chinook Salmon No. 55, provided by the ADF&G Fish Pathology Laboratory.

According to the ADF&G Fish Pathology Laboratory, it is possible that the white spots or pustules reported by subsistence harvesters are caused by something other than *Ichthyophonus*. If such lesions are encountered in the future, then the Fish Pathology Laboratory could be contacted for potential sample submission and diagnosis.

Chinook Salmon Abundance

Many Togiak and Twin Hills community members expressed concerns about the changes in Chinook salmon abundance in 2016 and 2017. Many households have observed Chinook salmon abundance decreasing throughout the past 10 to 15 years. When people spoke about changes in the abundance of the Chinook salmon stock, five major themes arose, which included: unpredictable/varying run strength each season, overfishing and bycatch by trawlers, concerns about sport fishing practices, changes in the Togiak River, and the potential effects of marine ecosystem health on the Chinook salmon stock. In this section, assessment data from survey responses about Chinook salmon abundance are first presented, followed by data gathered through interviews and participant observation.

Chinook Salmon Abundance Assessments

During the 2016 and 2017 household salmon surveys in Togiak and Twin Hills, researchers asked respondents to answer yes or no to the question: have you observed any changes to the number (abundance) of Chinook salmon in your area? Household respondents who answered "yes" were prompted to provide a response to the open-ended question: what changes have you observed? This section discusses responses to those questions.

In 2016, there were 46 Togiak households (62% of total surveyed households) that reported a change in the abundance of Chinook salmon. Of those 46 households, the majority (41 households, or 89%) stated that Chinook salmon were less abundant (Table 5-2). For Twin Hills in 2016, seven households (35% of total surveyed households) reported a change in the abundance of Chinook salmon. Of those seven households, the majority (six households, or 86%) stated that Chinook salmon were less abundant.

For 2017, there were 35 Togiak households (50% of total surveyed households) that reported a change in the abundance of Chinook salmon. Of those 35 households, the majority (27 households, or 77%) stated that Chinook salmon were less abundant. For Twin Hills in 2017, eight households (44% of total surveyed households) reported a change in the abundance of Chinook salmon. Of those eight households, the majority (six households, or 75%) stated that Chinook salmon were less abundant. Though the majority of households in both communities reported less abundance of Chinook salmon, a small portion of community members indicted that Chinook salmon were more abundant.

Interviews and Participant Observation

The following section is a discussion of observations and trends about Chinook salmon abundance collected through interviews with key respondents from Togiak and Twin Hills, as well as information gathered during participant observations. Five topic categories related to Chinook salmon abundance were identified through qualitative data analysis. The five categories are run strength, trawlers, sport fishing, Togiak River ecology, and marine ecosystem health.

Run Strength

According to community members from Togiak and Twins Hills, the amount of Chinook salmon returning each season has been much more unpredictable and variable than it was in the past. Respondents explained that Chinook salmon returns have always exhibited varied abundance from year to year, but throughout the past 15 years, the variation seems more extreme. As one key respondent described: "Every year how many of the kings that come back changes, you never get the same each year. It's always been like that. But it never used to be like now, such differences between years."

Though the run strength varies each year, community members stated that they normally get enough salmon, but many have anxiety about the future of the Chinook stock. Below is a quote from an interview respondent elaborating on this sentiment:

Table 5-2.–Observed changes in salmon abundance, Chinook salmon, , Togiak and Twin Hills, 2016 and 2017.

Study year	Community	Households harvesting, or attempting to harvest	Households reporting change in abundance	Species less abundant		Species more abundant		Normal variation		Smaller first run		Other		Do not know	
				Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
2016	Togiak	41	46	41	89.1%	6	13.0%	0	0.0%	1	2.2%	1	2.2%	1	2.2%
	Twin Hills	9	7	6	85.7%	0	0.0%	0	0.0%	0	0.0%	1	14.3%	0	0.0%
2017	Togiak	56	35	27	77.1%	8	22.9%	0	0.0%	0	0.0%	2	5.7%	1	2.9%
	Twin Hills	8	8	6	75.0%	2	25.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

> It might take a little bit longer to get what we need, but we usually do. We work hard, and we quit when we got enough. My mom always said, "When we have enough, we have enough, we don't try to get more after that."

Trawlers

During interviews, Togiak residents mentioned the presence of bottom trawlers fishing for yellowfin sole and other groundfishes near the community and attributed the decreased returns of Chinook salmon to the effects of seafloor habitat destruction and bycatch from these fishing vessels. The fishery these community members were referring to is the Bering Sea and Aleutian Islands (BSAI) groundfish fishery.[4]

Survey respondents and key respondents explained that prior to opening fishing to trawlers, the Togiak-bound Chinook salmon population seemed stable, but this has changed in the ensuing years.

> For some reason the kings have not been as many as there used to be. Why, I don't know for sure, but me personally, I blame it on high seas trawlers. Yeah, they catch them [Chinook salmon] and throw them away. At least that's what I've heard. My sons have gone out a few times and they saw them catch kings and throw them away.

Community members from both study communities were concerned with the amount of Chinook salmon bycatch.

> The way this fishery is managed, it pays to have less bycatch, they have incentives, you know? So, guess what … they just get rid of the bycatch, throwing kings and others overboard. What I want to know is how is that good for anyone?

Sport Fishing

The Chinook salmon sport fishery in the Togiak River is concentrated along the lower 15 miles of the river and runs from late June through July (Dye and Borden 2018:28). During this research for study years 2016 and 2017, residents of Togiak and Twin Hills voiced concerns regarding the prevalence of sport fishing in the Togiak River. The findings from this study were similar to conclusions from a 1987 Division of Subsistence study that was designed to understand the interactions between the subsistence fishery in the Togiak River and the recreational fishery (Gross 1991rev.). Both studies found that local community members perceived an increase in the amount of sport fishing and were concerned this may be placing too much pressure on the salmon stocks and river system. Concerns of salmon overharvest, wasteful fishing practices, and catch-and-release mortality rates were also cited as local concerns in both studies.

Local community members have noticed an increase in the number of Chinook salmon being harvested by sport anglers and mentioned it during the 2016 and 2017 surveys and interviews. "There was hardly any [sport fishing] when I was younger. Over the past 25 years or maybe 15 to 20 years, there has been a large increase in pressure from sports fishing." Table 5-3 presents sport fishing effort in angler-days alongside sport fishing Chinook salmon harvests in the Togiak River from 1977–2017. Sport fishing effort, as measured by angler-days[5], has increased since 1977 in the Togiak River. The average number of angler-days for 1977–1986 in the Togiak River was 1,345; for 1987–1996, the average was 1,918; for 1997–2006, average angler-days was 4,009; and for 2007–2017, the average number of angler-days was 4,956. The average harvest of Chinook salmon by sport fishing in the Togiak River has also increased. Average annual sport fish harvests of Chinook salmon from the Togiak River were 285 Chinook salmon harvested for 1977–1986; 542 for 1989–1998; 948 for 1999–2008; and 1,035 for 2009–2017.

During the 2016 and 2017 study years, there were active sport fishing lodges in operation along the Togiak River with overnight accommodations, as well as daily fly-in fishing trips available from other areas to the Togiak River to fish for Chinook salmon. In 2016, the total angler-days was 3,159 and 787 Chinook

4. For more information about BSAI see: https://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf .
5. Angler-day is time spent fishing by one person for any part of a day.

Table 5-3.–Sport fishing effort in angler-days and reported sport fishing Chinook salmon harvest, Togiak River, 1977–2017.

Year	Sport fishing effort in angler-days	Chinook salmon harvest
1977	675	62
1978	539	35
1979	1,666	78
1980	1,513	34
1981	932	
1982	1,160	231
1983	972	535
1984	3,497	46
1985	1,290	925
1986	1,208	618
Average (1977–1986)	**1,345**	**285**
1987	848	338
1988	1,055	
1989	1,174	234
1990	1,638	445
1991	1,729	284
1992	1,419	271
1993	1,647	225
1994	2,361	663
1995	3,384	581
1996	3,926	790
Average (1987–1996)	**1,918**	**426**
1997	3,789	1,165
1998	5,206	763
1999	4,059	645
2000	4,700	478
2001	4,931	1,004
2002	2,193	76
2003	4,448	706
2004	2,004	1,388
2005	6,272	1,734
2006	2,485	1,064
Average (1997–2006)	**4,009**	**902**

-continued-

Page 2 of 2.–Continued

Year	Sport fishing effort in angler-days	Chinook salmon harvest
2007	5,181	1,501
2008	4,695	892
2009	3,638	606
2010	3,636	591
2011	4,326	1,438
2012	9,526	859
2013	3,170	900
2014	8,098	2,172
2015	4,129	983
2016	3,159	787
2017	4,960	978
Average (2007–2017)	**4,956**	**1,064**

Sources ADF&G Fisheries Management Reports and Fishery Data Series publications.

Note "Angler-day" is the time spent fishing by one person for any part of a day.

Note Blank cells indicate no data are available.

salmon were harvested by sport fishing in the Togiak River (Dye and Borden 2018:4, 30). In 2017, the total angler-days was 4,960 and 978 Togiak River Chinook salmon were harvested by sport fishing (Dye and Borden 2018:4, 30).

Twin Hills and Togiak residents reported witnessing some sport fishing practices that, to them, are wasteful, citing seeing large amounts of discarded Chinook salmon near a sport fishing lodge and popular sport fishing locations in the Togiak River. According to one interviewee: "Upriver I see lots of dead kings floating, with maybe only one filet taken, lots of meat left on them. It's so wasteful." Several residents stated that they believed some Chinook salmon were being harvested for their eggs to be used as bait by some sport fishing operations and the rest of the fish was being wasted.

The lack of law enforcement on the river was concerning to community members. Because of a low enforcement presence, some worried that sport fishing anglers may be over-harvesting Chinook salmon and not properly reporting the quantity of fish being kept. Related to this concern, one interviewee said, "There should be more limits imposed on sport fishermen, but even if there were, there isn't anyone there to make sure they are following the rules anyways."

The catch-and-release mortality rate of Chinook salmon was a major concern of community members from Togiak and Twin Hills. A key respondent stated, "I don't agree with the waste by sport fishermen in Togiak River, hook-and-release you know? Those fish are dead in pools downstream. They should share the fish if they will die anyway."

Concerns about targeting the largest Chinook salmon and the possible effects of this type of selective fishing were cited during interviews in 2016 and 2017. Several key respondents equated smaller Chinook salmon returns to increased pressure from sport fishing of the Togiak River Chinook salmon stock.

> The salmon runs this summer were pretty good to everyone, but we worry, ever since they started, rodding and reeling, sport fishing, you know. There is a bunch of them upriver. They target all the big kings, the spawners. That's the reason I worry. There are a lot of people, they come for a long time, the numbers of kings they are taking, it adds ups.

Several circumstances were reported by local community members of stakeholder conflicts between subsistence drifting fishers and sport fishing anglers. Several community members reported that sport fish anglers had acted aggressive toward Togiak and Twin Hills community members who were drifting for Chinook salmon close to guided sport fishing operations.

Togiak River Ecology

Ecological changes in the Togiak River and its tributaries were cited as potential factors affecting Chinook salmon abundance. Interview respondents cited a decrease in water levels of the Togiak River, increased beaver activity/beaver dams, and slowing of the water flow in the smaller tributaries.

> I've never seen a king salmon up at Togiak Lake, they spawn downstream, in all the small creeks. I've noticed a change in these tributaries. Lots of little ones are blocked by dams, mostly beaver dams, which slows down the current. The little creeks are not as fast as the main river. These creeks are hatcheries for all the salmon species. Little creeks no longer flow; they are closed up, and fish can't get up there to spawn like they used to. The king salmon are diminishing, and I believe that it's partly because of these little rivers. When I was little, we would go with my relatives up the river, really, it's only about 20 miles or so, and they would point to these little tributaries and tell me that these are where the salmon come to lay eggs.
>
> The river has changed a lot over time. It's not the same river it used to be when I was a kid. There are a lot more channels. It's a lot shallower and the water is getting really low. It doesn't snow anymore.

Marine Ecosystem Health

Concerns about the overall health of local and global marine ecosystems were cited during this project. Concerns that were cited regarding marine ecosystem health included rising ocean temperatures, the presence of new fish species being caught locally, and trawl fishing effects on the ocean floor habitat.

A major concern was that community members were more frequently catching different species of fish than in the past and also catching more of fish species that used to be rare near these communities, such as Pacific cod. In 2016, one key respondent from Togiak said, "We've been catching different ocean fish, like mackerel. These fish don't usually come up this way, but they are more and more." According to another community member in 2017, the local canneries have announced that they are going to start buying Pacific cod because such a large number of cod are being caught. This respondent explained that this will be the first time ever that the cannery will buy this fish species. People speculated that the presence of new marine fish species in Togiak Bay may be due to an increase in ocean temperatures. Respondents stated that rising marine temperatures and new species of fish likely influence Chinook salmon, or are an indication of ecosystem change that may negatively be affecting the Chinook salmon stock.

Trawling as a fishing method was brought up frequently in relation to Chinook salmon health as well as marine ecosystem health. People worried that trawl fishing was "destroying the ocean floor and killing everything that lives on it." Some people associated what they see as habitat destruction with changes to the marine food web and Chinook salmon food sources.

Chinook Salmon Behavior

Community members in Togiak and Twin Hills have observed behavioral changes in Chinook salmon during their lifetimes. When discussing Chinook salmon behavioral changes, community residents spoke about the effects of unpredictable/varying run timing. In this section, data from survey responses about Chinook salmon behavior assessments is first presented, followed by data gathered through interviews and participant observation.

Chinook Salmon Behavior Assessments

During the 2016 and 2017 household salmon surveys in Togiak and Twin Hills, researchers asked respondents to answer yes or no to the question: have you observed any changes in the behavior of Chinook salmon in your area; such as run timing or harvest location? Those respondents who answered "yes" were prompted to provide a response to the open-ended question: what changes have you observed? This section discusses responses to those questions.

Table 5-4.–Observed changes in salmon behavior, Chinook salmon,, Togiak and Twin Hills, 2016 and 2017.

Study year	Community	Households harvesting, or attempting to harvest	Households reporting a change in behavior	Early run		Late run		Sporadic run		Spawning early		Swimming deeper		Other		Do not know	
				Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
2016	Togiak	41	25	2	8.0%	11	44.0%	12	48.0%	0	0.0%	0	0.0%	2	8.0%	0	0.0%
	Twin Hills	9	8	4	50.0%	0	0.0%	3	37.5%	0	0.0%	0	0.0%	1	12.5%	0	0.0%
2017	Togiak	56	18	6	33.3%	5	27.8%	3	16.7%	1	5.6%	1	5.6%	3	16.7%	0	0.0%
	Twin Hills	8	1	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Note The sum of percentages may not be 100% because households were able to give more than one answer.

In 2016, there were 25 Togiak households (34% of total surveyed households) that reported observing changes in the behavior of Chinook salmon. Of those 25 households, a little less than one-half (12 households, or 48%) stated in their open-ended question response that Chinook salmon runs were sporadic in comparison to the past, and 11 households (44%) responded that Chinook salmon runs seemed late (Table 5-4). In 2016, eight Twin Hills households (40% of total surveyed households) reported observing changes in the behavior of Chinook salmon. Of those eight households, one-half (four households) stated in their open-ended question response that Chinook salmon runs seemed early, and three households (38%) responded that Chinook salmon runs were sporadic.

During the 2017 study year, 18 Togiak households (26% of total surveyed households) reported observing changes in the behavior of Chinook salmon. Of those 18 households, 6 households (33%) stated in their response to the open-ended follow-up question that Chinook salmon runs were early, 5 households (28%) stated that Chinook salmon runs were late, and 3 households (17%) stated that Chinook salmon runs were sporadic. In 2017, only one Twin Hills household (6% of total surveyed households) reported observing changes in the behavior of Chinook salmon. This one household characterized the Chinook salmon run as seeming sporadic.

Interviews and Participant Observation

People in Togiak and Twin Hills remarked that run timing of returning Chinook salmon for the past 15 years has been sporadic and unpredictable. This unpredictability is difficult to navigate when managing salmon harvest efforts for community members who maintain jobs and have other commitments during the short

Plate 5-5.–Chinook salmon strips hanging to dry, Togiak, 2017

summer months. For some, putting up Chinook salmon is an important task, and it takes a great deal of coordination, planning, time, and energy to do so, but due to the uncertainty of run timing, planning these activities has become increasingly difficult.

Because of the variations in run timing, during the study years community members from Togiak and Twin Hills were catching Chinook salmon much later than they normally do, which was problematic for several reasons. According to community members, the later in the season that Chinook salmon are harvested, the greater the chances are for warm and dry weather occurring when fish are being processed. Warm and dry weather means that flies and maggots can be more prevalent. The way many people prepare Chinook salmon to be smoked in these communities requires hanging fish for open-air drying (Plate 5-5; Plate 5-6). Insects can become a problem when Chinook salmon is being dried because they can land on the hanging fish and lay eggs in the meat or spread bacteria. "You've got to get them [Chinook salmon strips] dry before the black flies come out. They lay eggs really fast, and then, it's over."

Plate 5-6.–Chinook salmon strips drying in a smoke house, Twin Hills, 2016

An interview respondent explained how the late Chinook salmon runs affected their fishing efforts.

> Last year, we didn't have that much this time to get kings. Too many flies. It was too warm. Before we had to throw a whole bunch away because flies got to it and maggots got in. When the flies come that's it … people want to have things done before then. That's why we didn't catch as much kings as we wanted to, because of the flies. See I didn't want to waste, that's why I didn't get enough kings.

Another interviewee echoed this sentiment about warm weather and late Chinook returns affecting their salmon harvesting and processing efforts.

> The early part of June we usually start [catching Chinook salmon] but this year it was different. You know, that's why I never get more fish even if I want to, because I didn't want them to get spoiled by flies. It was too hot.

In 2016 and 2017, residents from Togiak and Twin Hills also spoke about Chinook salmon arriving earlier in some recent years (but not during the 2016 and 2017 study years) than people generally have observed in the past. Previously, the early arrival of Chinook salmon caught some residents unprepared for subsistence fishing: people spoke about not having subsistence gear ready to use. An interview respondent spoke about her observations of Chinook salmon arriving early.

> A few years ago, the kings arrived two weeks early, around the first week of May. And that was weird to me, so uncommon. They usually arrive around the end of May or beginning of June. It was so unusual. We were working on fixing our commercial boat, switching to putting up lots of kings was tricky.

While people expressed concerns about Chinook salmon arriving earlier in recent years, community members also cited Chinook salmon arriving later than what they considered typical.

> My aunt used to say when the swallows come, that was a sign that the kings were swimming. The rule of thumb was that right after hooligans [eulachon], they [the Chinook, or king, salmon] show up. That's their main source of food. The kings used to show up in the middle of May. My uncle would say that whenever they would set a net in May that they would catch, nowadays it seems like it's getting later, like in June.

The uncertainty of Chinook salmon behavior is problematic for residents of Togiak and Twin Hills. The arrival of the Chinook salmon run dictates when people need to concentrate on subsistence fishing. As expressed by interview respondents, not being able to plan when subsistence harvesting and processing will occur can be disruptive to the lives of Togiak and Twin Hills community members.

Chinook Salmon Escapement

The escapement of Chinook salmon into the Togiak River has been estimated inconsistently by aerial surveys from fixed-wing aircraft since 1980, and, due to budget constraints, aerial Chinook salmon counts were not conducted from 2010 through 2018; aerial counts are expanded to account for missed fish and thus represent total escapement estimates. According to a Bristol Bay Area fishery management report, in 2006, the escapement goal for Togiak River Chinook salmon became a sustainable escapement goal (SEG) of 9,300 fish; however, lacking annual escapement information, this goal was dropped in 2012 (Dye and Borden 2018:29).

The lack of Chinook salmon escapement monitoring was a main concern of Togiak and Twin Hills residents when discussing their perceptions of Chinook salmon escapement during this research project. A portion of residents interviewed for this project believed that enough Chinook salmon were making their way up the Togiak River to spawn, some respondents stated that they had no way of knowing if adequate Chinook salmon escapement was being met in the Togiak River, and some Togiak and Twin Hills community members stated that they did not believe there was sufficient escapement in the Togiak River. In this section, information from survey responses about Chinook salmon escapement assessments is first presented, followed by information gathered through interviews and participant observation.

Table 5-5.–Observations on escapement of Chinook salmon in the local river systems, Togiak and Twin Hills, 2016 and 2017.

Study year	Community	Sampled households	Adequate escapement		Inadequate escapement		Do not know		Missing	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
2016	Togiak	74	44	59.5%	12	16.2%	15	20.3%	3	4.1%
	Twin Hills	20	6	30.0%	1	5.0%	10	50.0%	3	15.0%
2017	Togiak	70	35	50.0%	15	21.4%	18	25.7%	2	2.9%
	Twin Hills	18	8	44.4%	1	5.6%	5	27.8%	4	22.2%

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

Chinook Salmon Escapement Assessments

In 2016 and 2017 Togiak and Twin Hills survey respondents were asked to answer yes or no to the question: do you feel there is adequate escapement of Chinook salmon through commercial and sport fisheries to maintain a future healthy stock, as well as enough to provide for subsistence needs? Those respondents who answered "no" were prompted to provide an explanation to an open-ended question asking why. This section discusses responses to this question.

For study year 2016, more than one-half of Togiak households (44 households, or 60%) stated that they believed there was adequate Chinook salmon escapement in the Togiak River, 15 households (20%) stated that they did not know if Chinook salmon had adequate escapement, and 12 households (16%) cited that they did not believe that there was adequate Chinook salmon escapement in the Togiak River (Table 5-5). For Twin Hills for study year 2016, one-half of the households (10 households, or 50%) stated that they that they did not know if Chinook salmon had adequate escapement in the Togiak River, 6 households (30%) believed there was adequate Chinook salmon escapement, and 1 household (6%) cited that they did not believe that there was adequate Chinook salmon escapement.

In 2017, one-half of Togiak households (35 households, or 50%) stated that they believed there was adequate Chinook salmon escapement in the Togiak River, 18 households (26%) stated that they did not know if Chinook salmon had adequate escapement, and 15 households (21%) cited that they did not believe that there was adequate Chinook salmon escapement in the Togiak River. For Twin Hills for study year 2017, a little less than one-half of Twin Hills households (eight households, or 44%) stated that they believed there was adequate Chinook salmon escapement in the Togiak River, five households (28%) stated that they did not know if Chinook salmon had adequate escapement, and one household (6%) cited that they did not believe that there was adequate Chinook salmon escapement. Overall for both study years and both study communities, survey respondents indicated that they believed there was adequate Chinook salmon escapement or respondents could not characterize whether escapement is sufficient, and the fewest respondents characterized Togiak River Chinook salmon escapement as inadequate.

Interviews and Participant Observation

The lack of current Chinook salmon escapement monitoring and other types of Chinook salmon studies in the Togiak River were topics of concern for community members. Some residents from Togiak and Twin Hills were aware of past Chinook salmon monitoring studies such as aerial counting surveys, counting towers, radio telemetry projects, and mark-recapture work conducted at weirs in the river system. One Togiak resident stated, "If they are not counting [Chinook salmon escapement] how will they know when there is a real problem for the kings? If they won't listen to us, and they won't look for themselves, I think it'll be too late once they realize there is a problem."

6. DISCUSSION AND CONCLUSIONS

Bronwyn Jones

This project had six principal objectives. In order to address the project objectives, research staff from the Division of Subsistence and Bristol Bay Native Association worked together in collaboration with the Togiak and Twin Hills tribal councils to conduct household salmon surveys for study years 2016 and 2017. In addition, researchers engaged in participant observation and biological sampling of Chinook salmon with local subsistence fishers in both communities and conducted key respondent interviews to gather additional information about salmon health and the subsistence permit system. The data gathered from time spent in the communities were analyzed by project research staff and have been presented in this report. Each project objective and associated findings are summarized below.

Objective One: Through Participant Observation In Season, Learn How Residents Are Recording And Reporting Their Harvest Of Chinook Salmon

In order to complete this objective, researchers spent several weeks in the study communities each season engaging with local subsistence fishers during both salmon harvesting and processing efforts. Through conversations with residents, and by observing salmon sharing and distribution patterns, researchers were able to better comprehend how subsistence users record salmon harvests on subsistence permits.

In both 2016 and 2017, project research staff observed that subsistence fishers in the communities generally recorded their total salmon harvest amount on the permit of the owner of the subsistence net, including when a portion of the catch was being distributed to other households not part of a cooperative fishing and processing group (note that state regulations require that received fish do not get recorded as a harvest on a recipient household's permit).

In cases when a net was borrowed, the person who set the net and harvested the fish recorded the catch on his/her own permit. Generally, the fish that were shared were not recorded on the recipient's permit; harvests were only on the permit of the person who harvested the fish. However, in some cases, one family member, such as a matriarch, obtained a permit and recorded the harvests of all her extended family members, even though other family members did not live in her household and may or may not have had a subsistence permit on which their portion of the harvest should have been recorded. Recording all the harvest of a cooperating group on one permit results in underestimates of participation in the fishery, though it captures accurate and representative harvest amounts by harvest location. In Bristol Bay, one subsistence permit per household is allowed, and only members of the household should be listed on the permit. According to household survey results, another project finding was that not all households in Togiak and Twin Hills knew that only household members should be listed on their permit. Some households included visiting friends and family members on their household permit (Table 3-21; Table 4-21). Any confusion that surrounds the subsistence permit system could be addressed through more outreach by ADF&G Division of Subsistence that teaches the importance of obtaining permits, recording household activities, and how to record cooperative harvests.

Project researchers were made aware by Togiak and Twin Hills residents that there is confusion surrounding the regulations regarding reporting the retention of commercially caught salmon for home use. In 2008, a new regulation requiring reporting on an ADF&G commercial fish ticket of all salmon retained from commercial harvests statewide went into effect (Sill et al. 2019:28). Though this regulation has been in place since 2008, a study finding was that people retaining fish from commercial catches for home use were not sure where they were supposed to record the amount of salmon they were taking from the commercial catch for home use, and often did not record these numbers anywhere. Several Togiak residents informed project staff that the local fish processors did not ask about taking for home use when they delivered fish, and some residents were unsure if they were instead required to record commercial retention on their subsistence permit. In 2016, researchers observed that the two local processors did not request this

information to be recorded on fish tickets when commercial fishers delivered their catch. Because the local processors did not ask residents about fish taken for home during fish deliveries, some residents recorded these salmon on the subsistence permit where directed to record commercial salmon retention for home use (see Appendix F for an example of the Bristol Bay subsistence salmon fishery permit). It would be beneficial to include information regarding the retention of commercially caught salmon for home use regulations on the subsistence permits to address this confusion.

Objective Two: Conduct Interviews With Local Subsistence Users To Document Their Knowledge Of Chinook Salmon Of The Togiak River And Potential Factors Affecting The Decline Of Reported Subsistence Harvests

A total of 14 KRIs were conducted during this project: 10 interviews were completed with residents of Togiak, and 4 interviews were conducted with Twin Hills residents. The four major themes that emerged from the KRIs were changes in: 1) Chinook salmon quality, 2) Chinook salmon abundance, 3) Chinook salmon behavior, and 4) Chinook salmon escapement.

For the first theme—Chinook salmon quality—KRI participants described changes in both the external and internal appearance of salmon. For external changes, people described an overall reduction in the size of Chinook salmon over the past 20 years and explained that more jack Chinook salmon were recently returning than in the past. For internal appearance changes, an increase in worms and an increased presence of white spotting in the salmon meat were cited by respondents.

For the second theme—Chinook salmon abundance—five topic categories relating to Chinook salmon abundance were identified through qualitative data analysis of the interviews. The five categories included: 1) run strength, 2) trawlers, 3) sport fishing, 4) Togiak River ecology, and 5) marine ecosystem health. In relation to Chinook salmon run strength, interview participants stated the amount of Chinook salmon returning each season has been much more unpredictable and variable than it was in the past. Interview participants mentioned the presence of bottom trawlers fishing for groundfishes near the community and attributed the decreased returns of Chinook salmon to the effects of seafloor habitat destruction and bycatch from these fishing vessels. The presence of increasing sport fishing activity on the Togiak River and the possible negative effects of catch-and-release on Chinook salmon stocks was mentioned during the interviews. Ecological changes in the Togiak River and its tributaries—such as lower water level, increased beaver activity, and slower-flowing tributaries—were cited as potential factors affecting Chinook salmon abundance. The overall health of local and global marine ecosystems was cited as a concern by participants. Warming ocean temperatures, the presence of new marine fish species being caught in the local communities, and habitat loss due to trawl fishing methods were cited by KRI participants as potential marine ecosystem changes that may be affecting Togiak Chinook salmon stocks.

Regarding the third topic—Chinook salmon behavior—interview participants spoke about the effects of recent unpredictable and varying run timing of the Chinook salmon stock returning to the Togiak River. According to KRIs, sporadic and unpredictable salmon returns are difficult to navigate when managing salmon harvest efforts for community members who maintain jobs and have other commitments during the short summer months. As expressed by interview participants, not being able to plan when subsistence harvesting and processing will occur can be disruptive to the lives of Togiak and Twin Hills community members.

Regarding the fourth topic—Chinook salmon escapement—the lack of Chinook salmon escapement monitoring was a main concern of interview participants when discussing their perceptions of Chinook salmon escapement. A portion of residents interviewed for this project believed that enough Chinook salmon were making their way up the Togiak River to spawn, some participants stated that they had no way of knowing if adequate Chinook salmon escapement was being met in the Togiak River, and some Togiak and Twin Hills community members stated that they did not believe there was sufficient escapement in the Togiak River. However, there was a consensus among the interview participants that Chinook salmon escapement should be monitored.

Objective Three: Collect Age, Sex, And Length Information To Determine Chinook Salmon Stock Composition

The collection of age, sex, and length (ASL) information to determine Chinook salmon stock composition was completed at the same time as other summer fieldwork tasks for both study years. In 2016, ASL data for 153 Chinook salmon were recorded, and ASL information was recorded for 60 Chinook salmon in 2017. The collected scales were aged at the end of the two years. A total of 4 age classes (1.1, 1.2, 1.3, and 1.4) were present in 2016; 59% of the sampled Chinook salmon were male and 39% were female, and the average length of sampled Chinook salmon in 2016 was 709 mm. In 2017, a total of three age classes (1.2, 1.3, and 1.4) were present; 62% of the sampled Chinook salmon were male and 38% were female, and the average length of sampled Chinook salmon was 692 mm in 2017.

Objective Four: Chinook Salmon Heart Collection And Analysis To Determine The Prevalence Of Fish Infected By *Ichthyophonus* In The Fishery

Reports of what was thought to be observable *Ichthyophonus* symptoms, such as white spotting on Chinook salmon flesh and unusually soft meat, were given by residents of Togiak and Twin Hills to Division of Subsistence staff prior to the start of this project. These reports led researchers to include *Ichthyophonus* testing as part of this project. *Ichthyophonus* is found in a wide range of marine and anadromous fish species, including Chinook salmon. Project researchers collected Chinook salmon hearts to test for the presence of the parasite *Ichthyophonus* while in the communities for participant observation. In 2016, there were 65 heart samples collected, and 61 samples were taken in 2017. One Chinook salmon collected in 2016 tested positive for *Ichthyophonus* and no positive findings occurred for 2017. It was determined that Togiak River Chinook salmon have a low prevalence of *Ichthyophonus*, and such a low prevalence would likely not have a negative effect on the population at large.

Objective Five: Conduct Post-Season Harvest Surveys To Obtain Amount And Locations Of Household Harvests To Estimate The Subsistence Harvests

1. Objective five was completed for both study years 2016 and 2017. Togiak has more households than Twin Hills, resulting in larger community harvest estimates; also, the per capita harvests are greater in Togiak than they are in Twin Hills. Togiak residents harvested an estimated total of 61,447 lb, or 83 lb per capita, of salmon in 2016 and 91,573 lb, or 109 lb per capita, of salmon in study year 2017. For Twin Hills, residents harvested an estimated total of 3,365 lb, or 44 lb per capita, of salmon in 2016 and 2,591 lb, or 38 lb per capita, of salmon in study year 2017. Households from both study communities set subsistence nets or drifted in boats using gillnets to harvest salmon in the mouth of the Togiak River and within the Togiak River. Additionally, both communities have subsistence setnet sites along the shoreline of Togiak Bay, either close to their communities or near their commercial salmon setnet sites.

Objective Six: Compare Harvest Estimates With Permit Data And Historical Harvests To Provide Recommendations For A Revised Harvest Monitoring Program Based On The Study Findings

2. Objective six was to compare findings from the 2016 and 2017 household surveys with the subsistence permit data and data from past household survey to provide insight on subsistence harvests and participation in order to provide recommendations for improved harvest monitoring for the study communities. For Togiak and Twins Hills, comparing

available household survey data with the permit data suggests lower participation in the permit system when compared to actual participation in the subsistence fishery (Figure 3-22; Figure 4-21). As demonstrated throughout this report, the subsistence permit data are more accurate when a higher percentage of households participate in the subsistence permit program, and when a higher percentage of subsistence permits are returned. While in Twins Hills during the survey effort for the first study year, researchers were made aware that Twin Hills' community members had difficulty obtaining permits in the past either because the local permit vendor lived in Togiak or was not readily available to issue permits. In 2016 Twin Hills did not have a permit vendor that lived in the community, and this project found that Twin Hills has a low permit participation rate in comparison to the number of households that did participate in subsistence fishing as identified through the household surveys. For example, in 2016, the initial number of permits issued was two, and during the survey six additional households were found to have subsistence fished with no permit (Table 4-21). For the 2017 season, the Division of Subsistence established a new permit vendor in Twin Hills. In 2017, the initial number of Twin Hills households obtaining a permit increased to six, and the number of surveyed households that fished with no permit declined to three (Table 4-23). To improve permit participation specifically for Twin Hills, it would be beneficial for ADF&G to maintain a permit vendor who lives in Twin Hills or coordinate with the Twin Hills Traditional Council to issue permits to improve permit participation.

Conclusions and Recommendations

This two-year study documented the continuing importance of subsistence salmon harvesting and processing for the residents in the communities of Togiak and Twin Hills. In both study years, almost all households in Togiak and Twin Hills used salmon (Togiak: 97% in both years; Twin Hills: 90% in 2016, and 89% in 2017), coinciding with a high level of household participation in fishing efforts (Togiak: 75% in 2016, and 89% in 2017; Twin Hills: 75% in 2016, and 61% in 2017). In 2016 and 2017 in both communities, the salmon harvest was primarily composed of Chinook, sockeye, and coho salmon, with much smaller amounts of spawning sockeye, pink, and chum salmon harvests contributing to the harvest weight. According to survey and interview respondents, the exchange of salmon was of critical importance for these communities since many families and individuals were reliant upon salmon shared by other, high-harvesting households and detailed networks of exchange assisted in increasing the diversity and amounts of salmon used by most residents. More than one-half of households in both communities received salmon resources (Togiak: 62% in 2016, and 58% in 2017; Twin Hills: 65% in 2016, and 72% in 2017). As shown in the findings, especially for objectives 1 and 6, subsistence permit data are more comprehensive when participation in the subsistence permit program is high, and results from this study suggest in both study communities that participation in the permit system is less than participation in the subsistence fishery. Therefore, recommendations for improved harvest monitoring include:

- Increase outreach by Division of Subsistence to reiterate the importance of obtaining permits, recording household activities, and how to record cooperative harvests;
- Maintain a permit vendor who lives in the community in which the permits are being issued; and
- Include state regulations that address recording retained commercially caught salmon for home use on the subsistence permits for reference.

During the surveys and throughout the community review meeting at each community, participants expressed concerns about the overall health and abundance of Chinook salmon stocks returning to the Togiak River. According to the survey results from both study years and both study communities combined,

of all households harvesting or attempting to harvest salmon, 71% observed changes in the quality of Chinook salmon in recent years (Table 5-1). Survey respondents and interview respondents commented that returning Chinook salmon were much smaller than they used to be, and the amount of jack Chinook salmon returning each year has increased. Almost one-half (46%) of all households in Togiak and Twin Hills harvesting or attempting to harvest salmon in 2016 and 2017 observed changes in the behavior of Chinook salmon in recent years (Table 5-4). Many respondents stated in interviews and surveys that the run timing and run strength of Chinook salmon have been sporadic and unpredictable for the past 10 to 15 years (Table 5-4; Table 5-2).

Due to local concerns about the health of Chinook salmon stocks, respondents commented that they had to focus on catching more sockeye and coho salmon in order to obtain enough fish for their household's needs. The decrease in Chinook salmon harvests and this increase in the harvests of sockeye and coho salmon are reflected in the permit database results for Togiak and Twin Hills (Figure 3-22; Figure 4-21), and also through comparisons of past harvest survey data with the 2016 and 2017 harvest survey data (Figure 3-23; Figure 4-22). For example, in both Togiak and Twin Hills, sockeye salmon represented about one-quarter of the individual fish harvested in 1999, but in 2017 the harvest composition changed and sockeye salmon composed approximately one-half of the harvest (Table 3-47; Table 4-46).

Even when subsistence harvest activities were hampered by changes in salmon abundance, age, inability, lack of time or equipment, and other restricting factors, most residents in both study communities expressed their preference for obtaining wild salmon compared to food purchased in stores. Community members from Togiak and Twin Hills expressed that securing enough salmon each season was important for their household food security and for continuing important cultural practices.

As demonstrated by the study findings, subsistence uses of healthy salmon populations link people to their past, and are vital to the present health of these communities. Community members from Togiak and Twin Hills desire to continue harvesting and processing subsistence salmon, not only for themselves, but also for their children and other future generations. The intent of this report has been to provide information that will help Togiak and Twin Hills residents maintain their goal of sustaining their subsistence way of life.

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APPENDIX A: EXAMPLE SURVEY INSTRUMENT (TOGIAK, 2016)

SUBSISTENCE HARVEST ASSESSMENT AND BIOLOGICAL SAMPLING OF CHINOOK SALMON IN THE TOGIAK RIVER DRAINAGE

TOGIAK

JANUARY 1, 2016, to DECEMBER 31, 2016

This survey is used to estimate subsistence and other non-commercial salmon harvests and uses for the Chignik Management Area, for 2016. Additional questions will be asked to compare your household's use and harvest of salmon in previous years. We share this information with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Park Service, the Alaska Board of Fisheries, and the Federal Subsistence Board. We work with the local Fish and Game Advisory Committees, the Federal Regional Advisory Councils, and the Chignik Regional Aquaculture Association to better manage subsistence and to the implement the federal and state subsistence priorities.

We will NOT identify your household, or members of your household. We will NOT use this information for enforcement. Participation in this survey is voluntary. Even if you agree to be surveyed, you may stop at anytime.

HOUSEHOLD ID:		
COMMUNITY ID:		345
INTERVIEWER 1:		
INTERVIEWER 2:		
INTERVIEW DATE:		
START TIME:		
STOP TIME:		
DATA CODED BY:		
DATA ENTERED BY:		
SUPERVISOR:		

COOPERATING ORGANIZATIONS

DIVISION OF SUBSISTENCE
ALASKA DEPT OF FISH & GAME
333 RASPBERRY ROAD
ANCHORAGE, AK 99518
907-267-2353

BRISTOL BAY NATIVE ASSOCIATION
BOX 310
DILLINGHAM, AK 99576
907-842-5257

TRADITIONAL COUNCIL OF TOGIAK
PO BOX 310
TOGIAK, AK 99678
907-493-5003

U.S. FISH & WILDLIFE SERVICE
OFFICE OF SUBSISTENCE MANAGEMENT
1011 E. TUDOR ROAD
ANCHORAGE, AK 99503
907-786-3888

HOUSEHOLD MEMBERS

HOUSEHOLD ID

First, I would like to ask about the people in your household, permanent members of your household who sleep at your house. This includes students who return home every summer. I am NOT interested in people who lived with you temporarily, even if they stayed several months.

Last year, that is, between January 1, 2016, and December 31, 2016, WHO were the head or heads of this household?

Is this person answering questions on this survey?		How is this person related to HEAD 1?	Is this person MALE or FEMALE?	Is this person an ALASKA NATIVE?	In what year was this person born?	Where were parents living when this person was born?	How many years has this person lived in the Togiak area?
ID#	*circle*	*relation*	*circle*	*circle*	*year*	*(AK city or state)*	*number*
HEAD	Y N		M F	Y N			
1							
NEXT enter spouse or partner. If household has a SINGLE HEAD, leave HEAD 2 row BLANK, and move to PERSON 3.							
HEAD	Y N		M F	Y N			
2							
BELOW, enter children (oldest to youngest), grandchildren, grandparents, or anyone else living full-time in this household.							
PERSON 3	Y N		M F	Y N			
3							
PERSON 4			M F	Y N			
4	0						
PERSON 5			M F	Y N			
5	0						
PERSON 6			M F	Y N			
6	0						
PERSON 7			M F	Y N			
7	0						
PERSON 8			M F	Y N			
8	0						
PERSON 9			M F	Y N			
9	0						
PERSON 10			M F	Y N			
10	0						
PERSON 11			M F	Y N			
11	0						
PERSON 12			M F	Y N			
12	0						
PERSON 13			M F	Y N			
13	0						
PERSON 14			M F	Y N			
14	0						

HOUSEHOLD INFORMATION: 01 **TOGIAK: 345**

HOUSEHOLD MEMBERS

HOUSEHOLD ID

		… IF this person DID have a subsistence permit…				… If this person DID NOT have a subsistence permit
Person ID# FROM PAGE 2	this person have a subsistence SALMON permit?	Where did they get their permit?	What was their Permit Number?	Did they return their permit?	How many people from other households were listed on this permit?	Were they listed on another household's permit?
ID#	*circle*	*Location*	*permit number*	*circle*	*# (0 if none)*	
HEAD	Y N ?			Y N ?		Y N ?
1						
HEAD	Y N ?			Y N ?		Y N ?
2						
PERSON 3	Y N ?			Y N ?		Y N ?
3						
PERSON 4	Y N ?			Y N ?		Y N ?
4						
PERSON 5	Y N ?			Y N ?		Y N ?
5						
PERSON 6	Y N ?			Y N ?		Y N ?
6						
PERSON 7	Y N ?			Y N ?		Y N ?
7						
PERSON 8	Y N ?			Y N ?		Y N ?
8						
PERSON 9	Y N ?			Y N ?		Y N ?
9						
PERSON 10	Y N ?			Y N ?		Y N ?
10						
PERSON 11	Y N ?			Y N ?		Y N ?
11						
PERSON 12	Y N ?			Y N ?		Y N ?
12						
PERSON 13	Y N ?			Y N ?		Y N ?
13						
PERSON 14	Y N ?			Y N ?		Y N ?
14						

HOUSEHOLD INFORMATION: 01 **TOGIAK: 345**

RETAINED COMMERCIAL HARVESTS

HOUSEHOLD ID

1. Do you or members of your household USUALLY participate in commercial salmon fisheries?..... Y N

2. During the last year (JANUARY 1, 2016, to DECEMBER 31, 2016),
did you or members of your household PARTICIPATE in a commercial salmon fishery?..... Y N

IF the answer to QUESTION 2 is NO, go to the subsistence harvests section.

IF the answer is YES, continue on this page…

During the last year,[1]
did you or members of your household….

A …FISH commercially for salmon?

B …KEEP any salmon from your commercial catch for your own use[2] or to share?

If KEEP is "yes"

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD removed from commercial harvests for personal use during the last year.

Include COMMERCIALLY HARVESTED salmon that members of this household gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If helping others, report ONLY THIS HOUSEHOLD'S share.

Read names below in blanks above	*A COM FISH?*	*B KEEP?*	How many did you remove from your commercial catch?[3]	Of those removed how many did you give to OTHERS?[4]	Units[5]	Person ID from page 2	
			number	*number*	*specify*	*number*	*comments*
CHINOOK SALMON *KING SALMON*	Y N	Y N					
113,000,001							
SOCKEYE SALMON *RED SALMON*	Y N	Y N					
115,000,001							
COHO SALMON	Y N	Y N					
112,000,001							
CHUM SALMON *DOG SALMON*	Y N	Y N					
111,000,001							
PINK SALMON *HUMPIES*	Y N	Y N					
114,000,001							
Record incidental harvests below.							
DOLLY VARDEN *Togiak Trout*	Y N	Y N					
125,006,000							
	Y N	Y N					

If fish were retained from commercial harvests,

Do you household USUALLY retain CHINOOK SALMON from your commercial catch for home use? Y N

If you retain chonook salmon for home use, do you still participate in subsistence fishing? Y N

Is a member of your household… 1. Permit holder 2. Crew 3. Both

How much of your household income comes from commercial fishing?

0%	1-25%	26-50%	51-75%	100%
(0)	*(1)*	*(2)*	*(3)*	*(4)*

1 *"LAST YEAR" means from JANUARY 1, 2016, to DECEMBER 31, 2016.*
2 *"USE" includes eating, feeding to dogs, sharing or trading with others, etc.*
3 *Do NOT include amounts skippers gave to crew.*
4 *Record the number from the total amount removed by skippers or crew and given to non-crew members.*
5 *UNITS will differ by species and situation. Units may be pounds (lbs), individuals (ind), portions of individuals (1/4), buckets, sacks, tubs, etc.*

COMMERCIALLY HARVESTED RESOURCES: 03 **TOGIAK: 345**

HARVESTS: SALMON

HOUSEHOLD ID

1. Do you or members of your household own a net for harvesting salmon? ..... Y N
2. Do you or members of your household own a boat? ..... Y N
   if YES, is that boat used for commercial fishing? ..... Y N

1. Do you or members of your household USUALLY fish for salmon for subsistence, personal use, or sport? ..... Y N

2. During the last year (between January 1, 2015 and December 31, 2015),
   did you, or members of your household USE or TRY TO HARVEST salmon? ..... Y N

IF the answer to QUESTION 2 is NO, to to the *NEXT PAGE*.

IF the answer is *YES*, continue on this page …

During the last year,[1]

did you or members of your household…

A … use[2] _____?
B …receive _____ from another HH or community
C …give _____ to another HH or community?
D …try[2] to harvest _____?
E …actually harvest any _____?

if harvest is "yes"

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD got during the last year. How many were harvested with ….

INCLUDE salmon that members of this household gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If fishing with or helping others, report ONLY THIS HOUSEHOLD'S share of the harvest.DO NOT INCLUDE catch and release fish or retained commercial harvests.

Read names below in blanks above	A USE	B REC	C GIVE	D TRY	E HAR	DIP NET	GILL NET OR SEINE	TROLL GEAR	ROD & REEL[3]	OTHER GEAR (specify type)	Units[4]
						(number harvested by each gear type)				*amount / type*	*specify*
CHINOOK SALMON	Y N	Y N	Y N	Y N	Y N					/	IND
113000000											
COHO SALMON	Y N	Y N	Y N	Y N	Y N					/	IND
112000000											
SOCKEYE SALMON	Y N	Y N	Y N	Y N	Y N					/	IND
115000000											
CHUM SALMON	Y N	Y N	Y N	Y N	Y N					/	IND
111000000											
PINK SALMON	Y N	Y N	Y N	Y N	Y N					/	IND
114000000											
SALMON (UNKNOWN)	Y N	Y N	Y N	Y N	Y N					/	IND
119000000											
	Y N	Y N	Y N	Y N	Y N					/	IND

1 *"LAST YEAR" means between JANUARY 1, 2016, to DECEMBER 31, 2016.*
2 *"USE" includes harvesting, processing, eating, trading, feeding to dogs, etc. "TRY" includes looking, hunting, fishing, or any attempt to get.*
3 *"ROD AND REEL" includes fish caught in open water with a hook and and a line attached to a rod or a pole. Jigging through the ice is "ice fishing."*
4 *UNITS will differ by species and situation. Units may be pounds (lbs), individuals (ind), portions of individuals (1/4), buckets, sacks, tubs, etc.*

SALMON: 04 **TOGIAK: 345**

SUBSISTENCE SUMMARY: CHINOOK (KING) SALMON

HOUSEHOLD ID

ASSESSMENTS: CHINOOK (KING) SALMON 115,000,000

Note: Ask the following questions to all households and continue with other questions if the household USED CHINOOK (KING) SALMON last year (January 1,2016 to December 31, 2016) or in recent years.

Last year[1] ….

…did your household USE LESS, the SAME, or MORE CHINOOK (KING) SALMON than in recent years? X L S M
(X = do not use)

If LESS or MORE…

WHY was your use different?..... _____ 1
_____ 2

Note: Ask the following questions only for households that have USED CHINOOK (KING) SALMON last year or in recent years. If no to either time period, then go to next page.....*

Last year[1] ….

…did your household GET ENOUGH CHINOOK (KING) SALMON ? Y N

(If yes, continue with the next section at the bottom on this page)

IF NO, about how many CHINOOK (KING) SALMON does your household need annually? ____

IF NO, did your household do anything differently because you did not get enough CHINOOK (KING) SALMON ? Y N

IF YES…

What did your household do differently? _____ 1
_____ 2

How would you describe the impact of your household not getting enough CHINOOK (KING) SALMON last year?

(circle one) not noticable? (0) minor? (1) major? (2) severe? (3)

*Note: Ask the following questions only for households that HARVESTED or ATTEMPTED to harvest CHINOOK (KING) SALMON last year.**

Last year[1] ….

... did you or members of your household need to work harder (spend more time / take more trips) than you usually have in recent years in order to get the amount of CHINOOK (KING) SALMON that you needed? Y N

If YES, please explain why. _____ 1
_____ 2

Last year[1] ….
… did you or members of your household need to travel further, or to different locations than you usually go in order to harvest CHINOOK (KING) SALMON ?

Travel further: Y N
Different locations: Y N

If YES, please explain why and where? _____ 1
_____ 2

Where do you usually harvest your CHINOOK (KING) SALMON ?

_____

How do you usually harvest your CHINOOK (KING) SALMON ?

Home Pack? (4) Seine? (7) Set gillnet? (5) Rod and Reel? (15) Handline? (16) Other? (17) _____ 1

circle methods(s) *(Specify)* 2

If you use a rod and reel, handline, or jigging gear to harvest CHINOOK (KING) SALMON why?

Conservation? (1) Selectivity? (2) Gillnet mesh too small? (3) Tradition? (4) Ease? (5) Fun? (6) Other? (7) _____ 1 2

circle response(s) *(Specify)*

*1 or *) "Last year" means from January 1st, 2016 to December 31, 2016.*

ASSESSMENTS OF CHINOOK (KING) SALMON : 66 **TOGIAK: 345**

SUBSISTENCE SUMMARY: CHINOOK (KING) SALMON

HOUSEHOLD ID

OBSERVATIONS: CHINOOK (KING) SALMON

115,000,000

1. Have you observed any changes to the number (abundance) of CHINOOK (KING) SALMON in your area? Y N

   IF YES…
   What changes have you observed? _____ 1
   _____ 2

2. Have you observed any changes in the quality or appearance of CHINOOK (KING) SALMON you harvested last year? Y N

   IF YES…
   What changes have you observed? _____ 1
   _____ 2

3. Have you observed any changes in the behavior of CHINOOK (KING) SALMON in your area; such as run timing or harvest location? Y N

   IF YES…
   What changes have you observed? _____ 1
   _____ 2

4. Do you feel there is adequate escapement of CHINOOK (KING) SALMON through the commercial & sport fisheries to maintain a future healty stock as well as enough to provide for subsistence needs? Y N

   IF NO, please explain. _____ 1
   _____ 2

5. Do you have any other comments or concerns about CHINOOK (KING) SALMON ?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ASSESSMENTS OF CHINOOK (KING) SALMON : 66 **TOGIAK: 345**

SUBSISTENCE SUMMARY: OTHER SALMON (SOCKEYE, PINK, COHO, CHUM)

HOUSEHOLD ID

ASSESSMENTS: OTHER SALMON 115,000,000

Note: Ask the following questions to all households and continue with other questions if the household USED OTHER SALMON last year (January 1,2016 to December 31, 2016) or in recent years.

Last year[1] ….

…did your household USE LESS, the SAME, or MORE OTHER SALMON than in recent years? X L S M
(X = do not use)

If LESS or MORE…

WHY was your use different?..... 1 _____
2 _____

Note: Ask the following questions only for households that have USED OTHER SALMON last year or in recent years. If no to either time period, then go to next page.....*

Last year[1] ….

…did your household GET ENOUGH OTHER SALMON ? Y N

(If yes, continue with the next section at the bottom on this page)

IF NO, about how many OTHER SALMON does your household need annually? _____

IF NO, did your household do anything differently because you did not get enough OTHER SALMON ? Y N

IF YES…

What did your household do differently? 1 _____
2 _____

How would you describe the impact of your household not getting enough OTHER SALMON last year?

(circle one) not noticable? (0) minor? (1) major? (2) severe? (3)

*Note: Ask the following questions only for households that HARVESTED or ATTEMPTED to harvest OTHER SALMON last year.**

Last year[1] ….

... did you or members of your household need to work harder (spend more time / take more trips) than you usually have in recent years in order to get the amount of OTHER SALMON that you needed? Y N

If YES, please explain why. 1 _____
2 _____

Last year[1] ….
… did you or members of your household need to travel further, or to different locations than you usually go in order to harvest OTHER SALMON ?

Travel further: Y N
Different locations: Y N

If YES, please explain why and where? 1 _____
2 _____

Where do you usually harvest your OTHER SALMON ? _____

How do you usually harvest your OTHER SALMON ?

Home Pack? (4) Seine? (7) Set gillnet? (5) Rod and Reel? (15) Handline? (16) Other? (17) _____ 1
circle methods(s) *(Specify)* 2

If you use a rod and reel, handline, or jigging gear to harvest OTHER SALMON why?

Conservation? (1) Selectivity? (2) Gillnet mesh too small? (3) Tradition? (4) Ease? (5) Fun? (6) Other? (7) _____ 1 2
circle response(s) *(Specify)*

*1 or *) "Last year" means from January 1st, 2016 to December 31, 2016.*

ASSESSMENTS OF OTHER SALMON : 66 **TOGIAK: 345**

SUBSISTENCE SUMMARY: OTHER SALMON (SOCKEYE, COHO, PINK, CHUM) **HOUSEHOLD ID**

OBSERVATIONS: OTHER SALMON 115,000,000

❶ Have you observed any changes to the number (abundance) of OTHER SALMON in your area? Y N

IF YES…
What changes have you observed? 1
2

❷ Have you observed any changes in the quality or appearance of OTHER SALMON you harvested last year? Y N

IF YES…
What changes have you observed? 1
2

❸ Have you observed any changes in the behavior of OTHER SALMON in your area; such as run timing or harvest location? Y N

IF YES…
What changes have you observed? 1
2

❹ Do you feel there is adequate escapement of OTHER SALMON through the commercial & sport fisheries to maintain a future healty stock as well as enough to provide for subsistence needs? Y N

IF NO, please explain. 1
2

❺ Do you have any other comments or concerns about OTHER SALMON ?

ASSESSMENTS OF OTHER SALMON : 66 **TOGIAK: 345**

COMMENTS & SUMMARY

HOUSEHOLD ID

QUESTIONS, COMMENTS, CONCERNS

Do you have any questions, comments, or concerns?

INTERVIEW SUMMARY

Use this space for interviewer's comments about survey, especially factors that might have affected the household's responses.

BE SURE TO FILL IN THE STOP TIME ON THE FIRST PAGE!!!!

INTERVIEW SUMMARY: 300 **TOGIAK: 345**

APPENDIX B: KEY RESPONDENT INTERVIEW PROTOCOL

Subsistence Fishing Questions:

- What is your earliest memory of salmon fishing?
- What type of salmon do you fish for?
- Who do you fish with?
- What gear type do you use for harvesting the different types of salmon?
    - Rod and Reel
    - Gill Net
        - Do you know what mesh size(s) net you use?
    - Seine
    - Spear
    - Has your gear changed over time?
- Where do you fish for the different types of salmon species? (map locations)
- What is your pattern of salmon fishing for the summer/fall?
- How do you decide how many fish you need for your family for the winter?
- Do you have any difficulties getting enough fish?
    - If you didn't get enough salmon, what happened?
- How do you preserve the fish?
  Quantity for:
    - Freeze
    - Smoke- (type of wood)
    - Dry
    - Salt
    - Can
- Have you changed how you preserve fish over time?
    - Why?
- Who does which jobs to process fish?
- How are tasks divided up?
    - Gender?
    - Age?
- Do you observe any traditional practices when harvesting salmon? (i.e. traditional management?)
- Do you make any handicrafts from salmon/skin?

History:

- Can you tell me about subsisting for salmon in your community in the past?
    - Are the runs better or worse?
        - Why are they better or worse?
    - Is the quality of the fish any different?
        - What is responsible for those changes?

    - How about the quality of the water? (temperature, water levels, pollution)
        - How do changes in the weather patterns warming or cooling, wet or dry, affect your fishing and your harvests?
    - Have you observed any changes to the migration timing of different salmon species?
        - If so, do you have an idea of what is causing those changes
    - Do you have to fish in different areas now?
        - Where?
        - How did you select those new sites?
- Has the number of salmon you harvest changed from past years?
    - If so, which type of salmon has been affected?
        - By how much?
        - Why did those numbers change?
- Have you noticed any changes in the health of king salmon?
    - What do you think is causing those changes?
- If you have noticed significant changes to salmon fishing and/or salmon abundance, what do you think is the main reason?
- Have you noticed any changes among younger generations in relation to salmon harvesting?
- How would you like your knowledge passed on to younger generations?

<u>Commercial Fishing:</u>

- Do you commercial fish?
- How do you subsistence fish and commercial fish in the same season?
- Do you keep any fish from your commercial fish for subsistence?
    - Which fish do you keep?
        - Why?
    - Do you share these fish before they are processed?
        - With who?
        - Is this written anywhere?

<u>Sport Fishing:</u>

- Do you use rod and reel to fish for king salmon? If so do you keep the salmon and use it for subsistence?
    - Do you write this down?
    - Do you release any? (Males, Females, Jacks)
- Tell me about the presence of sport fishing on the Togiak River in your life time.

<u>Regulations:</u>

- Are any regulations affecting your opportunity for subsistence?
    - Commercial
    - Sport
    - Subsistence
    - State
    - Federal
- Do you have any recommendations for regulatory change or management?

Permits:

- Do you usually get a subsistence permit? How?
- Who's permit do you record a harvest on if you are sharing a net?
- Do you share fish that you have caught?

APPENDIX C: CONVERSION FACTORS

The following table presents the conversion factors used in determining how many pounds were harvested of each resource surveyed. For instance, if respondents reported harvesting 3 individual Chinook salmon, the quantity would be multiplied by the appropriate conversion factor (in this case 9.4099 for study year 2016) to show a harvest of 28.2 lbs of Chinook salmon.

		Conversion factor			
		Togiak		Twin Hills	
Resource name	Reported units	2016	2017	2016	2017
Chum salmon	Individual	4.5065	4.7048	4.5065	4.7048
Chum salmon [CF retention]	Individual	4.5065	4.7048	4.5065	4.7048
Coho salmon	Individual	4.4557	4.7673	4.4557	4.7673
Coho salmon [CF retention]	Individual	4.4557	4.7673	4.4557	4.7673
Chinook salmon	Individual	9.4099	8.2957	9.4099	8.2957
Chinook salmon [CF retention]	Individual	9.4099	8.2957	9.4099	8.2957
Pink salmon	Individual	2.8594	2.7325	2.8594	2.7325
Pink salmon [CF retention]	Individual	2.8594	2.7325	2.8594	2.7325
Sockeye salmon	Individual	3.9566	3.9695	3.9566	3.9695
Sockeye salmon [CF retention]	Individual	3.9566	3.9695	3.9566	3.9695
Spawning sockeye salmon	Individual	3.9566	3.9695	3.9566	3.9695
Unknown salmon	Individual	5.1790	4.7658	4.6756	4.9567

Source ADF&G Division of Subsistence household surveys, 2017 and 2018.

APPENDIX D: SUBSISTENCE CHINOOK SALMON SAMPLING FORMS (2016)

Appendix Table D-1.– Sampling form, Chinook salmon collected June 24–25, 2016.

Togiak Chinook Salmon Subsistence Sampling Form

Date: D 6/24 and 6/25/16 **Sampler(s):** BEJ, TK and KK **Page:** _1_of_1_

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Chinook_____

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
1	1	Y	M	790	Togiak River (Map 1)	13		
	2	Y	M	570	Togiak River (Map 1)	12		
6/24 (1-4)	3	Y	F	780	Twin Hills River (Map 1)	14		
	4	Y	M	750	Twin Hills River (Map 1)	13		
6/25 5 on	5	Y	F	850	Togiak River Lodge	13		
	6	Y	UK	720	Togiak River Lodge	13		
	7	Y	UK	800	Togiak River Lodge	13		
	8	Y	F	760	Togiak River Lodge	13		
	9	Y	UK	785	Togiak River Lodge	13		
	10	Y	F	820	Togiak River Lodge	14		
	1	Y	F	790	Togiak River Lodge	13		
2	2	Y	M	725	Togiak River Lodge	13		
	3	Y	M	690	Togiak River Lodge	13		
	4	Y	F	850	Togiak River Lodge	13		
	5	Y	F	855	Togiak River Lodge	13		
	6	Y	F	800	Togiak River Lodge	13		
	7	Y	F	770	Togiak River Lodge	13		
	8	Y	M	800	Togiak River Lodge	13		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated.

Appendix Table D-2.– Sampling form, Chinook salmon collected June 26, 2016.

Togiak Chinook Salmon Subsistence Sampling Form

Date: D 6/26/16 **Sampler(s):** BEJ, TK and KK **Page:** ___of___

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Chinook

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	F	840	Togiak River Lodge	13		
	2	Y	F	780	Togiak River Lodge	13		
3	3	Y	M	765	Togiak River Lodge	13		
	4	Y	F	835	Togiak River Lodge	13		
	5	Y	F	780	Togiak River Lodge	13		
	6	Y	M	780	Togiak River Lodge	13		
	7	Y	F	750	Togiak River Lodge	13		
	8	Y	M	870	Togiak River Lodge		3	
	9	Y	F	815	Togiak River Lodge	13		
	10	Y	F	810	Togiak River Lodge	13		
	1	Y	F	920	Togiak River Lodge	13		
	2	Y	F	740	Drift net Togiak River	13		
4	3	Y	F	745	Drift net Togiak River	13		
	4	Y	M	735	Drift net Togiak River	14		
	5	Y	M	650	Drift net Togiak River	13		
	6	Y	M	710	Drift net Togiak River	14		
	7	Y	M	640	Drift net Togiak River	12		
	8	Y	F	760	Drift net Togiak River	13		
	9	Y	M	605	Drift net Togiak River	12		
	10	Y	M	650	Drift net Togiak River		3	

-continued-

Appendix Table D-2.-Page 2 of 2.

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
5	1	Y	M	730	Drift net Togiak River	13		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table D-3.– Sampling form, Chinook salmon collected June 27, 2016.

Togiak Chinook Salmon Subsistence Sampling Form

Date: D 6/27 **Sampler(s):** BEJ, TK and KK **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Chinook_____

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	F	820	Togiak River Lodge	13		
	2	Y	F	860	Togiak River Lodge	13		
6	3	Y	M	740	Togiak River Lodge	13		
	4	Y	F	850	Togiak River Lodge	13		
	5	Y	F	880	Togiak River Lodge	14		
	6	Y	M	860	Togiak River Lodge	14		
	7	Y	M	1000	Togiak River Lodge	14		
	8	Y	M	550	Togiak River Setnet	12		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table D-4.– Sampling form, Chinook salmon collected June 28, 2016.

Togaik Chinook Salmon Subsistence Sampling Form

Date: D 6/28 **Sampler(s):** BEJ, TK and CL **Page:** ___of___

Start Time: _____ **End Time:** _____

Togiak Chinook

Togiak Chinook

Sampling Location (i.e. dock, processor): _____ **Togiak**

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	830	Togiak River Lodge	13		
	2	Y	M	810	Togiak River Lodge	13		
	3	Y	F	815	Togiak River Lodge	14		
	4	Y	M	650	Togiak River Lodge	13		
	5	Y	M	300	Togiak River Lodge	11		
7	6	Y	F	745	Togiak River Lodge	13		
	7	Y	M	835	Togiak River Lodge	14		
	8	Y	M	735	Togiak River Setnet	13		
	9	Y	M	605	Subsistence setnet ED	12		
	10	Y	M	575	Subsistence setnet ED	12		
	1	Y	M	560	Subsistence setnet ED	12		
	2	Y	M	690	Togiak River Lodge	12		
8	3	Y	F	880	Togiak River Lodge	14		
	4	Y	F	780	Togiak River Lodge	13		
	5	Y	F	910	Togiak River Lodge	13		
	6	Y	M	960	Togiak River Lodge	14		
	7	Y	M	800	Togiak River Lodge	13		
	8	Y	F	820	Togiak River Lodge	13		
	9	Y	M	360	Togiak River Lodge	11		
	10	Y	M	330	Togiak River Lodge	11		

-continued-

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Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	381	Togiak River Lodge	11		
	2	Y	F	880	Togiak River Lodge	13		
9	3	Y	M	710	Togiak River Lodge	13		
	4	Y	F	835	Gray Carlos	14		
	5	Y	M	635	Gray Carlos	12		
	6	Y	F	735	Gray Carlos	13		
	7	Y	M	825	Gray Carlos	13		
	8	Y	F	896	Gray Carlos	14		
	9	Y	M	711	Gray Carlos		3	
	1	Y	M	750	Westside commerical removal	13		
10	2	Y	M	550	Westside commerical removal	12		
	3	Y	M	650	Westside commerical removal	12		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table D-5.– Sampling form, Chinook salmon collected June 29, 2016.

Togaik Chinook Salmon Subsistence Sampling Form

Date: D 6/29 **Sampler(s):** BEJ, TK and CL **Page:** ___of___

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	675	Lower Togiak River Drift - Helen	13		
	2	Y	M	735	Lower Togiak River Drift - Helen	13		
	3	Y	F	570	Lower Togiak River Drift - Helen	13		
	4	Y	F	815	Lower Togiak River Drift - Helen	12		
	5	Y	F	742	Lower Togiak River Drift - Helen	12		
11	6	Y	M	735	Lower Togiak River Drift - Helen	13		
	7	Y	M	523	Lower Togiak River Drift - Helen	12		
	8	Y	M	650	Lower Togiak River Drift - Helen	12		
	9	Y	F	645	Lower Togiak River Drift - Helen	12		
	10	Y	M	724	Lower Togiak River Drift - Helen	14		
	1	Y	F	UK	Lower Togiak River Drift - Helen	12		
	2	Y	M	743	Lower Togiak River Drift	13		
12	3	Y	F	490	Lower Togiak River Drift	12		
	4	Y	F	740	Lower Togiak River Drift	13		
	5	Y	F	710	Lower Togiak River Drift	12		
	6	Y	M	725	Lower Togiak River Drift	13		
	7	Y	F	775	Lower Togiak River Drift	14		
	8	Y	F	910	Lower Togiak River Drift	13		
	9	Y	M	745	Lower Togiak River Drift	13		
	10	Y	M	540	Lower Togiak River Drift	12		

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Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	510	Lower Togiak River Drift	12		
	2	Y	F	685	Lower Togiak River Drift	13		
	3	Y	M	520	Lower Togiak River Drift	12		
	4	Y	F	741	Lower Togiak River Drift	12		
13	5	Y	F	650	Lower Togiak River Drift		3	
	6	Y	F	610	Lower Togiak River Drift	12		
	7	Y	M	710	Lower Togiak River Drift	13		
	8	Y	M	615	Lower Togiak River Drift	12		
	9	Y	M	600	Lower Togiak River Drift	12		
	10	Y	F	590	Lower Togiak River Drift	12		
	1	Y	M	620	Lower Togiak River Drift	12		
	2	Y	M	540	Lower Togiak River Drift	12		
	3	Y	M	630	Lower Togiak River Drift	12		
14	4	Y	F	660	Lower Togiak River Drift	13		
	5	Y	F	640	Lower Togiak River Drift	12		
	6	Y	M	600	Lower Togiak River Drift	13		
	7	Y	M	645	Lower Togiak River Drift	13		
	1	Y	M	554	Lower Togiak River Drift	12		
	2	Y	F	778	Lower Togiak River Drift	13		
	3	Y	F	870	Lower Togiak River Drift	13		
15	4	Y	M	655	Lower Togiak River Drift	12		
	5	Y	F	789	Lower Togiak River Drift	13		
	6	Y	M	568	Lower Togiak River Drift	12		
	7	Y	F	750	Lower Togiak River Drift	13		
	8	Y	M	505	Lower Togiak River Drift	12		
	9	Y	M	502	Lower Togiak River Drift	12		
	10	Y	M	465	Lower Togiak River Drift	12		

-continued-

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Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
16	1	Y	M	500	Lower Togiak River Drift	12		
	2	Y	M	605	Removed from Comm Catch	12		
	3	Y	M	518	Removed from Comm Catch	13		
	4	Y	M	650	Removed from Comm Catch	13		
	5	Y	M	585	Removed from Comm Catch	12		
	6	Y	M	540	Removed from Comm Catch	12		
	7	Y	M	670	Lower Togiak River Drift	13		
	8	Y	M	600	Lower Togiak River Drift	12		
	9	Y	M	612	Lower Togiak River Drift	13		
	10	Y	M	675	Lower Togiak River Drift	13		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table D-6.– Sampling form, Chinook salmon collected July 1, 2016.

Togaik Chinook Salmon Subsistence Sampling Form

Date: D 7/1 **Sampler(s):** BEJ, TK and CL **Page:** _1_of_1_

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub_____

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
17	1	Y	M	817	1st Creek setnet	14		
	2	Y	F	705	2nd Creek setnet	13		
	3	Y	F	614	3rd Creek setnet	12		
	4	Y	M	794	4th Creek setnet	13		
	5	Y	F	797	Togiak Bay (near Tank farm)	14		
	6	Y	F	884	Togiak Bay (near Tank farm)	14		
	7	Y	M	718	Togiak Bay (near Tank farm)	13		
	8	Y	M	738	Togiak Bay (near Tank farm)		3	
	9	Y	M	774	Togiak Bay (near Tank farm)	13		
	10	Y	M	886	Togiak Bay (near Tank farm)	14		
18	1	Y	M	845	Togiak Bay (near Tank farm)	13		
	2	Y	M	825	Togiak Bay (near Tank farm)	13		
	3	Y	F	743	Togiak Bay (near Tank farm)	13		
	4	Y	F	694	Togiak Bay (near Tank farm)	13		
	5	Y	M	730	Togiak Bay (near Tank farm)	13		
	6	Y	M	661	Togiak Bay (near Tank farm)	13		
	7	Y	M	639	Togiak Bay (near Tank farm)		3	

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

APPENDIX E: SUBSISTENCE CHINOOK SALMON SAMPLING FORMS (2017)

Appendix Table E-7.– Sampling form, Chinook salmon collected June 17, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 6/17/2017 **Sampler(s):** BEJ and CL **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	F	785	Togiak Bay	14		
	2	Y	M	620	Togiak Bay	14		
	3	Y	F	705	Togiak Bay	12		
1								

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-8.– Sampling form, Chinook salmon collected June 18, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 6/18/2017 **Sampler(s):** BEJ and CL **Page:** _1_of_1_

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	615	1st Creek	12		
	2	Y	M	595	1st Creek	12		
	3	Y	F	735	1st Creek	13		
2								

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-9.– Sampling form, Chinook salmon collected June 19, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 6/19/2017 **Sampler(s):** BEJ and CL **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	685	1st Creek setnet	13		
	2	Y	F	840	2nd Creek setnet	14		
	3	Y	M	560	2nd Creek setnet	12		
	4	Y	M	605	2nd Creek setnet	13		
	5	Y	F	725	2nd Creek setnet	12		
3	6	Y	F	620	2nd Creek setnet	12		
	7	Y	M	410	2nd Creek setnet	14		
	8	Y	F	715	2nd Creek setnet	12		
	9 (25,33,41) on scale card)	Y	M	610	2nd Creek setnet	12		
	10 (26, 34,42 on scale card)	Y	M	520	3rd Creek	12		
	11 (27,35,43)	Y	M	620	3rd Creek	12		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-10.– Sampling form, Chinook salmon collected June 20, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 6/20/2017 **Sampler(s):** BEJ and CL BEJ and CL **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	F	855	Togiak Bay	13		
	2	Y	M	610	Togiak Bay		3	
	3	Y	M	635	Togiak Bay	13		
	4	Y	M	590	Togiak Bay	12		
	5	Y	F	725	Togiak Bay	14		
4	6	Y	M	595	Togiak Bay	13		
	7	Y	F	890	Togiak Bay	14		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-11.– Sampling form, Chinook salmon collected June 21, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 6/21/2017 **Sampler(s):** BEJ and CL **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
5	1	Y	M	610	Togiak Bay	12		
	2	Y	F	825	Togiak Bay		3	
	3	Y	M	650	Togiak Bay	12		
	4	Y	M	695	Togiak Bay	13		
	5	Y	M	595	Togiak Bay	12		
	6	Y	M	625	Togiak Bay	13		
	7	Y	M	655	Togiak Bay	13		
	8	Y	F	605	Togiak Bay	13		
6	1	M	M	530		12		
	2	M	F	530			3	
	3	M	M	565		12		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-12.– Sampling form, Chinook salmon collected July 19, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 7/19/2017 **Sampler(s):** _____ CL **Page:** _1_of_1_

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): _____ **Togiak Sub**

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	F	820	Togiak Bay	13		
	2	Y	F	830	Togiak Bay	14		
	3	Y	F	825	Togiak Bay	13		
	4	Y	F	820	Togiak Bay	13		
	5	Y	M	820	Togiak Bay	14		
7	6	Y	M	735	Togiak Bay	13		
	7	Y	F	790	Togiak Bay	13		
	8	Y	F	885	Togiak Bay	13		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-13.– Sampling form, Chinook salmon collected July 20, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 7/20/2017 **Sampler(s):** CL **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	460	Togiak Bay		3	
	2	Y	M	700	Togiak Bay	13		
	3	Y	M	930	Togiak Bay	13		
	4	Y	F	800	Togiak Bay	13		
8								
	1	Y	M	770	Togiak Bay	14		
	2	Y	F	720	Togiak Bay	13		
	3	Y	M	795	Togiak Bay	13		
9	4	Y	M	630	Togiak Bay	13		
	5	Y	M	580	Togiak Bay	12		
	6	Y	F	930	Togiak Bay	14		
	7	Y	M	585	Togiak Bay	12		
	8	Y	M	615	Togiak Bay	12		

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

Appendix Table E-14.– Sampling form, Chinook salmon collected July 21, 2017.

Togiak Chinook Salmon Subsistence Sampling Form

Date: 7/21/2017 **Sampler(s):** CL **Page:** 1 of 1

Start Time: _____ **End Time:** _____

Sampling Location (i.e. dock, processor): Togiak Sub

Gear type: Set net

GCL code: **Fin Clip:** Axillary

Card # *	Fish #	Scales taken Y/N	Sex M/F/U	Length (mm)	Catch Location (statistical area)	Age	Error Code	
	1	Y	M	830	Togiak Bay	13		
	2	Y	M	650	Togiak Bay	13		
	3	Y	F	815	Togiak Bay	14		
	4	Y	M	865	Togiak Bay	14		
	5	Y	M	555	Togiak Bay	12		
10								

Scales: Put 4 scales from preferred area on gum card; Length: mid eye to fork-of-tail (nearest 5 mm)

Note Error code 3 = regenerated

APPENDIX F: BRISTOL BAY SUBSISTENCE SALMON PERMIT

Alaska Department of Fish & Game

Bristol Bay Subsistence Salmon Fishery Permit

ALASKA RESIDENTS ONLY

Community _____

Permit No. _____

Year _____

First Name | Initial | Last Name

Permanent Mailing Address | City

State | Zip Code | Phone number

Number of year-round residents in household ▶

Names of household members who will assist in operation of subsistence net:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

Drainage to be fished: Naknek ☐ Kvichak ☐ Egegik ☐ Ugashik ☐

Nushagak ☐ Togiak ☐ Other _____

Primary fishing location (specific): _____

Number of fathoms allowed at this site: 10 ☐ 25 ☐ Gear type: _____

Please specify set gear, drift gear, spear, or dip net.

I understand that I am applying for a subsistence fishing permit for my household in accordance with current regulations and hereby swear the information contained on this application is a true statement as witnessed by my signature below; and that I have been an Alaska resident for the last calendar year.

Applicant's signature _____ Date _____

TO BE COMPLETED BY ISSUING OFFICER ONLY

The above-named person and designated household members are authorized to fish for salmon for subsistence purposes in the Bristol Bay Area during the calendar year of _____ according to current laws and regulations of the State of Alaska.

Authorizing Officer _____ Date _____

1. Only one subsistence salmon fishing permit may be issued to each household per year. People using the net/site and not of this household are required to have their own permit and file a separate report of their harvest.
2. Fish caught for subsistence uses may not be sold or allowed to enter commercial use.
3. An accurate record of fish taken under authority of this permit must be returned to the Alaska Department of Fish and Game when the permit expires. Failure to return subsistence catch records is grounds for denial of future permit privileges.

NOTE: Commercially-caught salmon may also be utilized for subsistence purposes and must be reported on the back of this form as well as a Commercial Fish ticket.

Return form to: (fax) 907-267-2450/ (email) dfg.sub.permits@alaska.gov/ or Division of Subsistence, ADF&G, 333 Raspberry Rd, Anchorage, AK 99518

DAILY SUBSISTENCE SALMON CATCH TOTALS

Please record the dates and locations fished.

Please report spawned-out (red fish) by date and location in the "red" column.

Community _____

Permit No. _____

Year _____

DID NOT FISH ☐ **NAME** _____

Date	Specific location	Method*	Red	King	Chum	Pink	Coho	Date	Specific location	Method*	Red	King	Chum	Pink	Coho

TOTAL SUBSISTENCE HARVEST

What was your total SUBSISTENCE harvest? ▶

Red	King	Chum	Pink	Coho

Did you COMMERCIAL fish? YES ☐ **or NO** ☐

*TOTAL SALMON RETAINED FROM **COMMERCIAL CATCH** FOR SUBSISTENCE USE*

Record additional salmon taken from the COMMERCIAL CATCH for home use here: ▶

Red	King	Chum	Pink	Coho