Fishery Management Report No. 22-08

2019 Annual Management Report for Norton Sound, Port Clarence, Arctic, and Kotzebue Management Areas

by

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November 2022

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

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

FISHERY MANAGEMENT REPORT NO. 22-08

2019 ANNUAL MANAGEMENT REPORT FOR NORTON SOUND, PORT CLARENCE, ARCTIC, AND KOTZEBUE MANAGEMENT AREAS

by

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ABSTRACT

This report provides information about the 2019 commercial and subsistence fisheries of Norton Sound, Port Clarence, Arctic, and Kotzebue Management Areas of the Arctic, Yukon, and Kuskokwim (AYK) Region of the Alaska Department of Fish and Game, Division of Commercial Fisheries. The management areas consist of all waters from Point Romanof north of the Yukon River and west of long 141°W and those waters draining into the Bering Sea north of Yukon River and the Chukchi Sea, Beaufort Sea, and Arctic Ocean. Commercial and subsistence fisheries target 5 species of salmon (Chinook *Oncorhynchus tshawytscha,* sockeye *O. nerka*, chum *O. keta*, coho *O. kisutch*, and pink *O. gorbuscha* salmon), Pacific herring *Clupea pallasii*, red king crab *Paralithodes camtschaticus*, and miscellaneous species such as inconnu (sheefish) *Stenodus leucichthys*, whitefish *Coregonus laurettae*, Dolly Varden *Salvelinus malma*, and saffron cod *Eleginus gracilis.*

Keywords: Chinook salmon *Oncorhynchus tshawytscha,* chum salmon *Oncorhynchus keta*, coho salmon *Oncorhynchus kisutch,* pink salmon *Oncorhynchus gorbuscha,* sockeye (red) salmon *Oncorhynchus nerka,* red king crab *Paralithodes camtschaticus*, Pacific herring *Clupea pallasii*, inconnu sheefish *Stenodus leucichthys*, whitefish *Coregonus laurettae, Coregonus pidschian, Coregonus sardinella, Coregonus nasus,* Dolly Varden *Salvelinus malma*, saffron cod *Eleginus gracilis,* subsistence, commercial fishery, management, escapement, Norton Sound, Port Clarence, Kotzebue Sound, Arctic, Annual Management Report, AMR, Fishery Management Report, FMR.

INTRODUCTION

This report summarizes the 2019 season and historical information concerning management of the commercial and subsistence fisheries of Norton Sound–Port Clarence and Arctic–Kotzebue Management Areas of the Arctic, Yukon, and Kuskokwim (AYK) Region. Data from select management and research projects are included in this report. A more complete documentation of project results is presented in separate biannual project reports. Most of the historical harvest and escapement information in this report goes back to 1990. For information prior to 1990 see Menard et al. 2013.

Data presented in this report supersede information found in previous annual management reports (e.g., Menard et al. 2020). An attempt has been made to correct errors present in earlier reports, and previously unreported data were included. Current-year catch data presented were derived from seasonal field data.

This report is organized into the following major sections:

(1) Management Area Overviews
(2) Salmon Fisheries
(3) Pacific Herring Fisheries
(4) King Crab Fisheries
(5) Miscellaneous Species

Tabular data have been separated into 2 categories to facilitate use of this report: (1) Tables 1–14 present annual data, and (2) Appendices generally present historical comparisons.

SECTION 1: MANAGEMENT AREA OVERVIEWS

AREAWIDE BOUNDARIES

Norton Sound–Port Clarence Area and Arctic–Kotzebue Area include all waters from Point Romanof in southern Norton Sound and St. Lawrence Island and west of long 141˚W, to the U.S.–Canada border (Figure 1). This area encompasses over 100,000 mi² and has a coastline exceeding that of California, Oregon, and Washington combined. For crab management the southern boundary is Cape Romanzof.

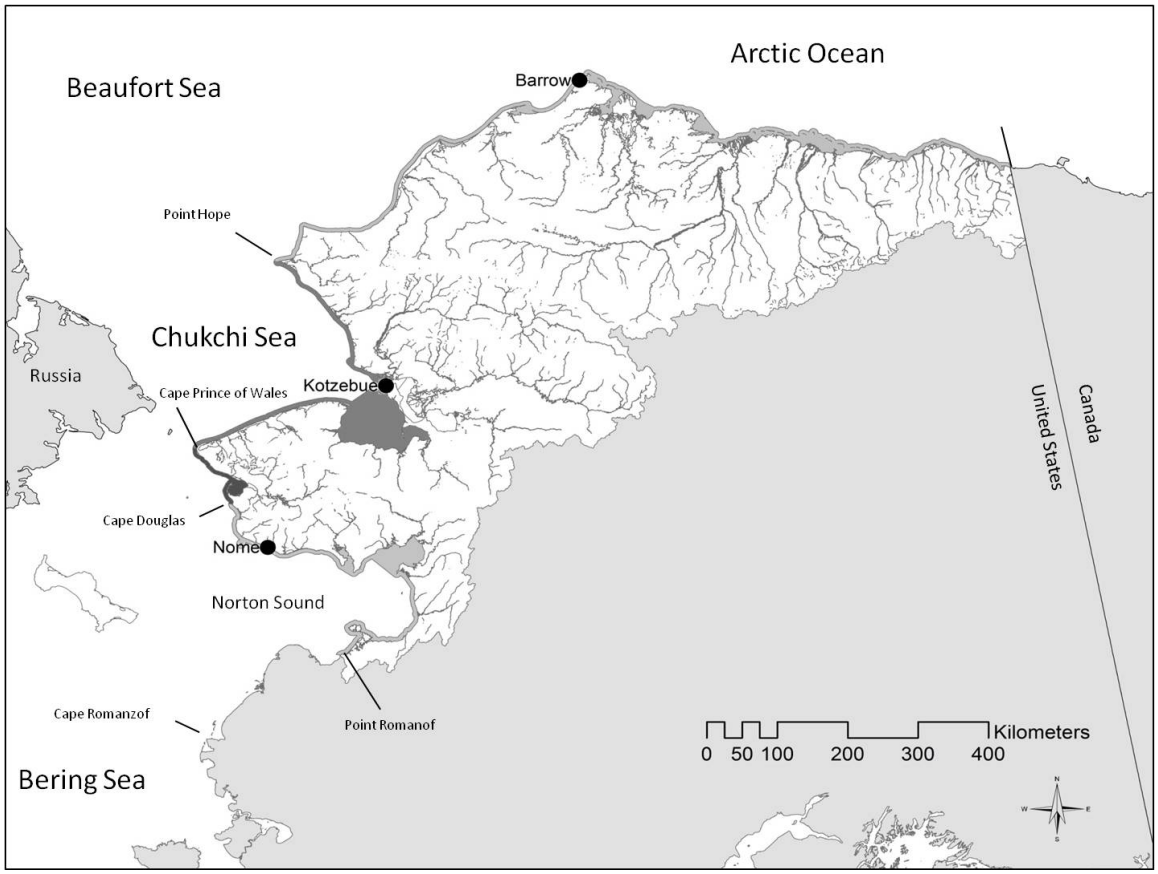

Figure 1.–Norton Sound, Port Clarence, Kotzebue Sound, and Arctic management districts.

AREAWIDE SALMON OVERVIEW

There are 5 species of Pacific salmon indigenous to the area; however, chum *Oncorhynchus keta* and pink salmon *O. gorbuscha* historically are the most abundant. Chum and Chinook (king) salmon *O. tshawytscha* are found as far north as Utqiagvik (formerly known as Barrow), but they are less common north of the Kotzebue Sound drainages. The northernmost large concentrations of chum salmon are found within Kotzebue Sound drainages, but large numbers of Chinook and coho *O. kisutch* salmon are not found north of Norton Sound. Small sockeye (red) salmon *O.*

nerka populations exist within a few Southern Seward Peninsula drainages. Pink salmon have been observed by aerial survey in increasing numbers in rivers north of Point Hope to Barrow. Small numbers of chum, pink, sockeye, and Chinook salmon have been reported by subsistence fishery participants along the Arctic coast.

COMMERCIAL SALMON FISHERY

In 1959 and 1960, Alaska Department of Fish and Game (ADF&G) biologists conducted resource inventories that indicated harvestable surpluses of salmon were available in several river systems of Norton Sound, Port Clarence, and Kotzebue Districts. Since statehood, ADF&G has supported liberalizing various regulations by encouraging processors to explore and develop new fishing grounds. As a result, commercial salmon fishing activity grew significantly in the region and enabled some residents to obtain cash income.

Currently, most commercial fishery operators and many buying station workers are resident Alaska Natives (Yupik, Inupiat, and Siberian Yupik). Commercial set gillnetters work from outboard-powered skiffs, and all commercially caught salmon are harvested in coastal marine waters.

There is no commercial salmon fishery in the Arctic District.

SUBSISTENCE SALMON FISHERY

There are approximately 23,000 people in the area, the majority of whom are Alaska Natives, residing in more than 40 small villages scattered along the coast and major river systems. Nearly all residents are dependent to varying degrees on fish and game resources for their livelihoods.

Subsistence fishery participants harvest salmon with gillnets or seines mostly in the main rivers and less often in coastal marine waters. Beach seines are used to catch schooling or spawning salmon and other species of fish. The major portion of fish taken during summer months is air-dried or smoked for later consumption by residents or occasionally their dogs.

Historical subsistence harvest information is discontinuous. Prior to 1960, subsistence data are either incomplete or entirely lacking. From the early 1960s until 1982, ADF&G conducted annual household surveys in communities with major salmon fisheries. In 1983, budgetary restrictions made it impossible to conduct surveys in each Norton Sound village, and surveys in many areas were suspended until 1994, when ADF&G initiated a new annual postseason household subsistence salmon harvest survey program. This program was also cut after the 2003 season in Norton Sound and after 2004 in Kotzebue Sound due to budget constraints. However, expansion of subsistence salmon permits in 2004 to Port Clarence District (affecting the communities of Teller and Brevig Mission) and Norton Sound Subdistricts 2 and 3 (affecting the communities of Council, White Mountain, Golovin, and Moses Point/Elim) has resulted in fewer household surveys because subsistence harvests for those communities are now reported through subsistence permits.

Also in 2004, the Division of Commercial Fisheries began annual subsistence salmon household surveys in Shaktoolik and Unalakleet (and in Koyuk starting in 2008) and in other southern Norton Sound villages periodically. Surveyors attempt to contact all households. ADF&G staff members use a community household list and annually update any new households and delete those no longer there. Salmon survey data are expanded to include those households that usually fish but ADF&G was unable to contact.

Prior to the fishing season, ADF&G personnel usually make at least 1 visit to each village to issue subsistence salmon fishing permits. Fishery participants can also call the Nome office toll free, and a permit will be mailed or faxed when possible. Village residents can mail completed permits to the Nome office postage free. Attempts are made to contact, by phone or letter, all permit holders who did not return their household permit. Also, trips to villages are made postseason by ADF&G personnel to collect permits and discuss the fishing season.

In 2008, a cooperative project (among ADF&G Divisions of Commercial Fisheries, Habitat, and Subsistence; and the North Slope Borough Department of Wildlife Management and Planning) was initiated to assess Pacific salmon resources in the Arctic District. Components of the project include (1) documenting subsistence salmon fishing patterns such as species targeted, fishing gear and methods, harvest timing, local salmon abundance and run timing, historical knowledge, and observations of spawning locations; (2) conducting aerial surveys to document adult salmon distribution in river systems and determine which rivers could be used as index areas for future monitoring; and (3) acquiring age, sex, and length (ASL) information and genetic samples for salmon. Funding for the project ended after the 2013 season.

SPORT SALMON FISHERY

Sport salmon harvests occur throughout all areas of Norton Sound (Appendices A14–A17). However, in northern Norton Sound from Bald Head near Elim to Point Hope in the Kotzebue area, a fishing pole is legal subsistence gear, and catches are often reported as subsistence harvests. More detailed description of sport fish harvest is reported in the fishery management report for sport fisheries in the Northwest/North Slope management area (Scanlon 2017).

SALMON FISHERIES MANAGEMENT

ADF&G Division of Commercial Fisheries manages commercial and subsistence fisheries in this vast area. Permanent full-time staff assigned to this area during 2019 include an Area Management Biologist, an Assistant Area Management Biologist, a Research Biologist, and a Fish and Game Program Technician, all stationed in the Nome office. In addition, seasonal assistance in conducting various management and research activities was provided by approximately 20 seasonal biologists and technicians in Norton Sound, Port Clarence, and Kotzebue Sound. Biologists from regional staff provided additional assistance. In 2019, interns funded by Norton Sound Economic Development Corporation (NSEDC) were utilized as fisheries technicians at some projects. There are 6 cooperative projects staffed by NSEDC and 2 projects jointly operated by NSEDC and ADF&G in Norton Sound that supplemented salmon escapement monitoring activities of area staff.

The main objective of ADF&G's program is to manage commercial and subsistence salmon fisheries on a sustained yield basis. Field projects are conducted to provide information on salmon abundance, migration, and stock composition. Summaries of ADF&G and NSEDC projects are presented in Appendix G2.

Management of salmon fisheries is complicated by insufficient comparative catch and return information and difficulties in obtaining accurate escapement data. Management difficulties are compounded by the need to provide not only for adequate escapements but also for the needs of several different user groups. Alaska law requires subsistence users to receive priority over other users of fish and wildlife resources. If subsistence harvest increases, commercial fishing and sport fishing may be restricted.

The cornerstone regulation that governs commercial salmon harvest in all districts is the scheduled weekly fishing period. Commercial salmon fishing regulations allow for variable fishing periods per week during the open season depending on area and season differences. ADF&G attempts to distribute fishing effort throughout the entire return to avoid harvesting only particular segments of the run. Occasionally, fishing time is increased or decreased by emergency order. Emergency orders issued in 2019 are listed in Appendix G7. Managers issue emergency orders depending upon fishing conditions and strength of runs or spawning escapements, as determined by evaluation of available run timing and abundance indicators. Weekly fishery reports with fishery status and schedules are broadcast during the fishing season over radio stations KICY and KNOM in Nome, and fishery news articles are published in the *Nome Nugget* and *Arctic Sounder*.

NORTON SOUND SALMON OVERVIEW

DISTRICT BOUNDARIES

Norton Sound Salmon District consists of all waters between Cape Douglas in the north and Point Romanof in the south. The district is divided into 6 subdistricts and corresponding statistical areas: Subdistrict 1, Nome (333-10); Subdistrict 2, Golovin (333-20); Subdistrict 3, Elim (333-31, 32, 33); Subdistrict 4, Norton Bay (333-40); Subdistrict 5, Shaktoolik (333-50); and Subdistrict 6, Unalakleet (333-60). The subdistrict and statistical area boundaries were established to facilitate management of individual salmon stocks, and each subdistrict contains at least 1 major salmon-producing stream (Figure 2).

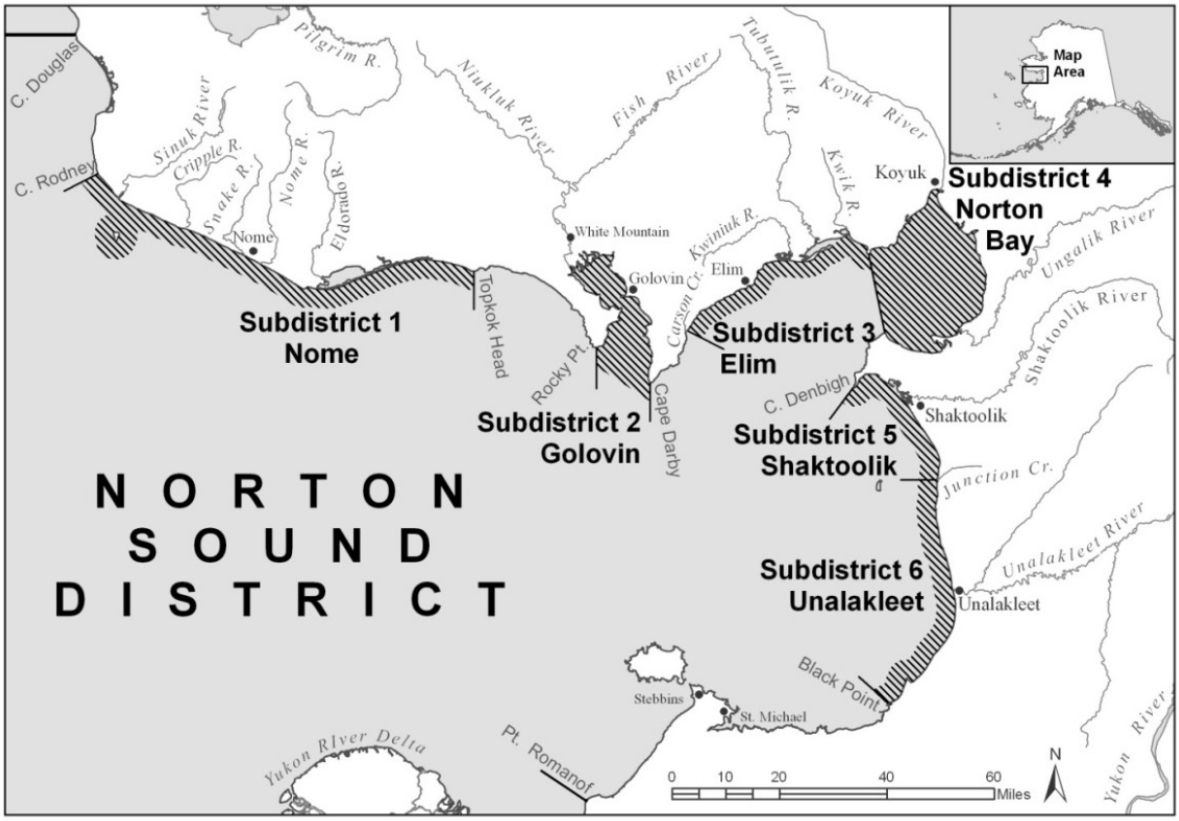

Figure 2.–Norton Sound commercial salmon fishing subdistricts.

All commercial salmon fishing in the district is by set gillnets in marine waters; however, fishing effort is usually concentrated near river mouths. Commercial fishing typically begins in June and targets Chinook salmon if sufficient run strength exists. Emphasis switches to chum salmon in July, and the coho salmon fishery begins the fourth week of July and closes in September. Pink salmon are much more abundant in even-numbered year returns. A pink salmon-directed fishery may coincide with, or may be scheduled to alternate periods with, the historical chum salmon-directed fishery.

Salmon management changed significantly beginning in the mid-1990s because of limited market conditions and marginal returns of several salmon stocks within the district; however, rebounding salmon returns in the mid-2000s resulted in renewed buyer interest. There was no commercial interest in pink salmon from 2000 to 2006 but beginning in 2007 there was some commercial fishing to harvest a small portion of the pink salmon run. Additionally, there has been renewed buyer interest in Golovin and Elim Subdistricts starting in 2007 and in Norton Bay Subdistrict starting in 2008. Commercial fishery managers use estimates of run strength from escapement counting projects, test fisheries, aerial surveys, and commercial fishing CPUE. Nome Subdistrict is managed intensively for subsistence use—Tier II chum salmon subsistence permits, registration permits, closed waters, fishing-period length restrictions, gear limits, and harvest limits are all tools that can be employed during the season to provide for escapement needs and to maximize subsistence opportunity.

HISTORICAL FISHERY USE

Archeological evidence dating back 2,000 years indicates fishing has been a part of life for Norton Sound residents for many centuries (Bockstoce 1979). The largest precontact settlements on the Bering Strait Islands and the western Seward Peninsula were located where marine mammals were the primary subsistence resource. The rest of the region's population lived in small groups scattered along the coast, often moving seasonally to access fish and wildlife resources (Thomas 1982). During summer months, residents would usually disperse in groups composed of 1 or 2 families and set up camps near the mouths of streams. Harvest levels of fish on any 1 stream were relatively small because of low concentrations of people who caught only what their families and 1 or 2 dogs needed through the winter (Thomas 1982).

A large-scale fur trade was developed by the Russians in the late 1800s and continued after the American purchase (Magdanz and Punguk 1981). These activities and support for hundreds of commercial whalers and trade ships caused trading to increase in the region around 1848 (Ray 1975). Increased competition for walrus, caribou, and other species from outsiders may have increased the importance of salmon to area residents (Magdanz and Punguk 1981). In the late 1890s, gold was discovered on the Seward Peninsula, and boom towns sprang up and thousands of new immigrants flocked to the region. Commerce and the establishment of missions drew people to central year-round communities.

Mining affected fish populations significantly. Nearly every stream on the Seward Peninsula has had some sort of mining operation, ranging from simple gold panning or sluice boxes to hydraulic giants or bucket-line dredges. One example of extensive impact is the Solomon River, which is only 30 miles long but had 13 dredges working at a time. Another obvious impact was the large number of people who came to live in the region between 1900 and 1930. Communities like Nome, which had a population of 30,000, and Council, which had 10,000 residents, did not exist before gold was discovered.

In the late 19th century, the size of dog teams increased from 2 or 3 to as many as 10 to 20. At about the same time, wooden boats began to replace kayaks (Thomas 1982). Consequently, the demand for dried fish to feed the dog teams increased along with the development of better means to harvest fish. Winter transportation throughout the region consisted of hired dog teams and drivers who carried mail or freight along the coast and across the state to the ice-free port at Seward. Dried fish, primarily chum and pink salmon, became a major barter item in response to the increased demand for dog food (Thomas 1982).

Residents spent most of their summers catching and drying large amounts of salmon, some of which they kept for themselves; the rest they bartered or sold to mining camps, roadhouses, and trading posts or stores. For example, the Haycock mining camp on the Koyuk River bought about 2 tons of dried fish each year. Roadhouses were located at Golovin, Walla Walla, Moses Point, Isaac's Point, Ungalik, Robertvale, Foothills (south of Shaktoolik), Egavik, and other locations. Dried fish was bought in units of bundles (50 dried fish tied together) at a typical price of $0.10 per pound from resident fishing families. One elder in the area thought fishery participants kept more fish for their own use—which may have averaged 5–10 bundles per household—than they sold (Thomas 1982).

The population gradually decreased over the next 20 years after the gold rush and the gold deposits were worked out. The number of dog teams diminished by the mid-1930s when mail planes and mechanical tractors were introduced, and the last dog-team mail contract ended in 1962 at Savoonga. However, local stores continued to trade and barter in dry fish at Shaktoolik, St. Michael, Unalakleet, and Golovin. An example of quantity was the 8 × 20 × 40-foot cache at the Shaktoolik store filled to the top with dry fish. One elder said the stores would buy the fish for $0.06 per pound and then sell them for $0.10 per pound or their equivalent in groceries and supplies (Thomas 1982). By the early 1960s, commercial salmon fishing developed into a source of summer cash and snow machines were replacing the need for dog teams. The use of dry fish to feed dogs decreased and cash became more available for exchange at stores.

COMMERCIAL FISHERY OVERVIEW

Commercial salmon fishing in Norton Sound District began in Shaktoolik and Unalakleet Subdistricts in 1961. Most early interest involved Chinook and coho salmon flown in dressed condition to Anchorage for further processing. A single U.S. freezer ship purchased and processed chum and pink salmon during 1961. In 1962, 2 floating cannery ships operated in the district and commercial fishing was extended into Norton Bay, Moses Point, and Golovin. The peak in salmon canning operations occurred in 1963.

Since then, markets have been sporadic, and some subdistricts have often been unable to attract buyers for entire seasons. A joint venture between KEG (Koyuk–Elim–Golovin) Fisheries and NPL Alaska Inc. operated from 1984 until midseason in 1988. Two Japanese freezer ships were permitted to buy salmon caught in the internal waters of Golovnin and Norton Bays directly from the domestic commercial fishery. The most consistent markets are at Shaktoolik and Unalakleet, and onshore processing occurs at Unalakleet. Appendix G3 provides a list of commercial processors and buyers that operated in Norton Sound and Kotzebue Sound in 2019.

The commercial salmon fishing season usually opens by emergency order between June 8 and July 1 but depends on run timing within each subdistrict. The season closes by regulation on August 31 in Subdistricts 1, 2, and 3, and on September 7 in Subdistricts 4, 5, and 6 (with possible extensions set by emergency order), but processors often terminated their operations

before regulatory closure dates. However, during recent years Norton Sound Seafood Products (NSSP) has remained operational until the regulatory fishing season closure. Commercial fishing periods are set by emergency order. No commercial salmon fishing periods occurred in the Nome Subdistrict from 1997 to 2012 because of regulatory restrictions on chum salmon, lack of buyer interest, or weak runs. Beginning in 2013, limited commercial fishing has occurred for chum and pink salmon, and for coho salmon beginning in 2016 (Appendix A6).

Commercial fishing gear is restricted to gillnets. However, regulations adopted in 2016 allow for the use of seine gear in Shaktoolik and Unalakleet Subdistricts. A maximum aggregate length of 100 fathoms is allowed for each participant and there are no depth restrictions. However, mesh size is often restricted to try to direct harvest toward a specific species of salmon. Fishing periods restricted to 6.0-inch and smaller mesh gillnets are used to target chum and coho salmon. Most gillnets fished are approximately 5.875-inch stretched mesh. In Unalakleet and Shaktoolik Subdistricts, 8.25-inch stretched mesh gillnets are commonly used if there are Chinook salmon fishing periods in June through early July. During years when large pink salmon runs occur and there is a buyer, ADF&G establishes fishing periods allowing only 4.5-inch mesh or less to be used. These special small-mesh periods are an attempt to target pink salmon and reduce harvest of larger sized salmon species.

COMMERCIAL FISHERY MANAGEMENT

Norton Sound District is managed on comparative commercial catch data, escapements, and weather conditions. A combination of factors is considered before managers issue emergency orders affecting seasons, fishing periods, allowable mesh size, and fishing areas.

Aerial surveys are used to monitor escapements in most Norton Sound streams. Weather conditions, time of day, type of aircraft, water and bottom conditions, date of survey, and efficiency of surveyor and pilot must be considered when making interannual aerial survey comparisons. Counting towers and weirs are a more consistent and accurate method of obtaining escapement information and have been utilized on several river systems in Norton Sound. In 2019, in an effort to improve accuracy of escapement counts, hierarchical Bayesian analysis (Adkison and Su 2001) to estimate missed passage was done on Chinook and chum salmon at escapement projects that were operated for at least 5 years and where historical operational periods covered the entire species run (Appendices A22, A23, A26, A27, A30, and A31).

In 2019, there were 5 counting towers and 7 weirs in operation (Figure 3) including a combination sonar/tower project on the Shaktoolik River, but the project was still in development and was not used for inseason management.

Early inseason management emphasis is on Chinook salmon, switching to chum salmon around July 1, and then gradually shifting to coho salmon during the fourth week in July. Pink salmon are abundant during even-numbered years, but often no buyer is available for this species except as incidentally caught fish when there are other salmon directed fisheries. Coho salmon catches have been increasing in recent years, surpassing even the high levels seen in Norton Sound in the mid-2000s, with average catch for the last 5 years exceeding 164,000 fish (Appendix A14). Chum salmon catches have been rebounding in recent years to the best catches since the 1980s, and average catch for the last 6 years, excluding 2016, exceeded 155,000 fish (Appendix A14). Management actions have consisted of a series of emergency orders that open and close fishing seasons and periods and establish gillnet mesh size specifications.

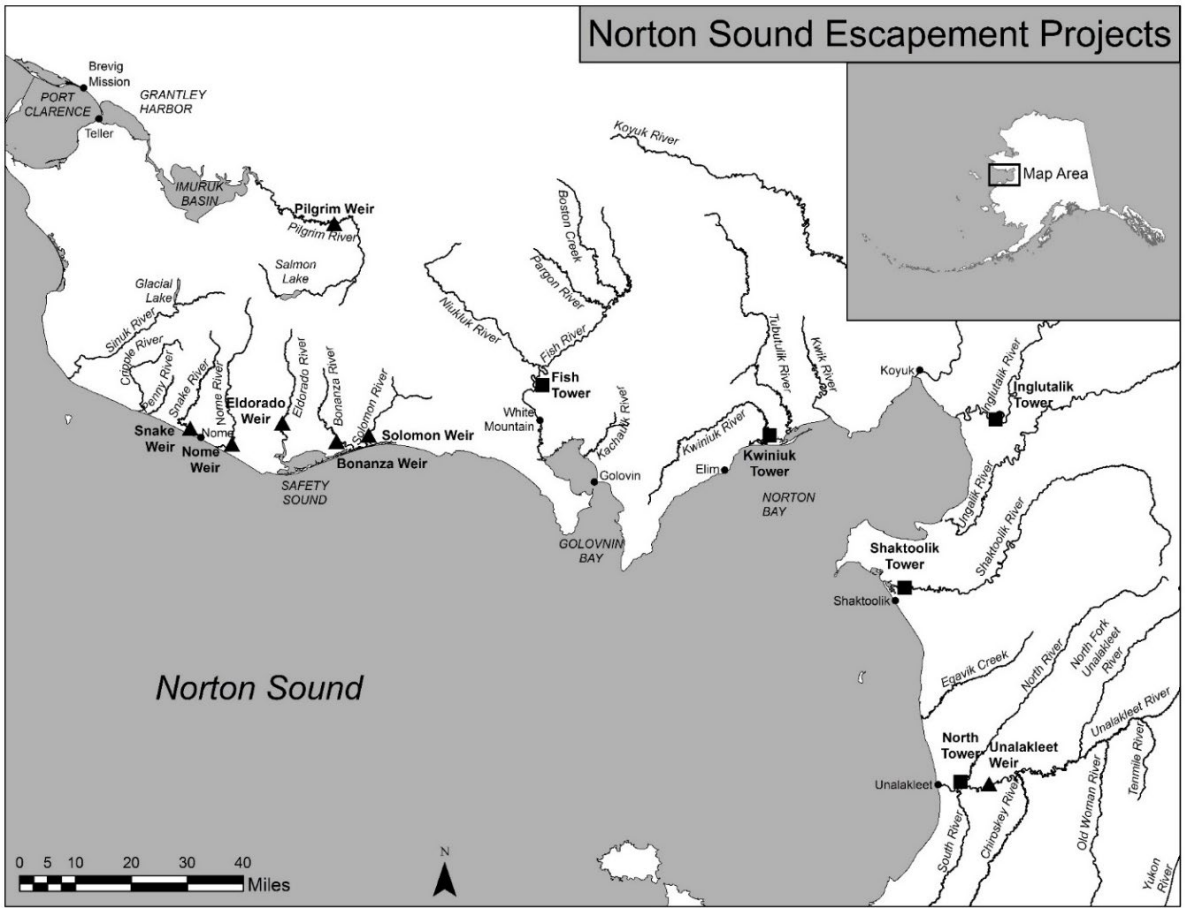

Figure 3.–Norton Sound escapement projects.

Little or no commercial salmon harvest has occurred in Nome and Norton Bay Subdistricts since the early 1980s. Nome Subdistrict had very depressed chum salmon stocks that, until the mid-2000s, required closure or severe restrictions of the subsistence fishery. However, salmon runs have greatly improved, with record runs of pink and coho salmon in the mid-2000s and the best chum salmon runs in recent years since the 1980s. Nome Subdistrict had been unable to attract a buyer for pink and coho salmon until recently and was closed to commercial chum salmon fishing by regulation until 2013. The Norton Bay Subdistrict often had healthy stocks, but it had been unable to attract markets willing to operate in this remote area until recently. Since 2008, improving market conditions resulted in NSSP bringing more tenders to the subdistrict, and commercial salmon fishing has resumed in Norton Bay.

Commercial fisheries in Golovin and Elim Subdistricts have targeted chum salmon in June and most of July, pink salmon in June and July during even-numbered years, and coho salmon in late July and August. Starting in the mid-1980s, commercial chum salmon harvests began to drop dramatically. Poor chum salmon runs resulted in restrictive management actions during the late 1990s and early 2000s, but in the mid-2000s there was little market interest even as runs began to rebound. However, Norton Sound chum salmon runs continued to improve in the late 2000s, sparking renewed buyer interest in the northern subdistricts.

Both Shaktoolik and Unalakleet Subdistricts, which share a common boundary, consistently attract commercial markets due to larger volumes of fish and better transportation services.

Management actions typically encompass both subdistricts because salmon tend to intermingle, and harvest in 1 subdistrict affects the movement of fish in the adjacent subdistrict. Results from ADF&G's test net in Unalakleet River (Kent 2010), North River tower counts, and interviews with subsistence fishery participants in Unalakleet had been used to set early fishing periods in both subdistricts. However, the test net project was discontinued in 2013. Commercial fishing is typically allowed after Chinook salmon have been observed in increasing numbers in subsistence fishing nets and ADF&G is confident the midpoint of the Chinook salmon escapement goal range of 1,200–2,600 fish will be reached at the North River counting tower; otherwise, no commercial gillnet fishing periods are allowed for any species until after June 30. Radiotelemetry projects in the Unalakleet River drainage have shown that a larger percentage of the Chinook salmon run spawns in the North River compared to the chum and coho salmon run (Estensen et al. 2005; Estensen and Hamazaki 2007; Joy et al. 2005; Joy and Reed 2006, 2007; Wuttig 1998 and 1999). Aerial surveys are only useful for late-season escapement assessment because of the long travel time between the fishing and spawning grounds.

SUBSISTENCE FISHERY OVERVIEW

Norton Sound District subsistence salmon harvest surveys have been conducted sporadically since statehood. From 1994 through 2003, ADF&G conducted an annual subsistence postseason salmon harvest assessment effort in northwest Alaska to provide more extensive, complete, and reliable salmon harvest estimates than had previously existed. These household subsistence harvest surveys were primarily funded by ADF&G Division of Commercial Fisheries and were conducted by the Division of Subsistence during the fall in 8 villages (Brevig Mission, Teller, Golovin, White Mountain, Elim, Koyuk, Shaktoolik, and Unalakleet). In 2004, surveys were replaced by permits in northern Norton Sound. Over the last 10 years in Norton Sound Subdistricts 1–6 (2008–2017), the average subsistence harvest was over 64,000 salmon, and the majority was pink salmon (Appendix A14).

Two goals of the postseason household subsistence survey are to collect harvest data to estimate subsistence salmon catch by species and community, and to compile information on gear types, participation rates, sharing, use of salmon for dog food, and household size. A copy of the Norton Sound subsistence salmon harvest survey form is shown by village in Appendices G4–G6.

In 2004, ADF&G's subsistence salmon harvest assessment program changed substantially when household surveys were discontinued in most communities because the household subsistence permit system was expanded from Nome Subdistrict to include Port Clarence District (affecting the communities of Teller and Brevig Mission) and Norton Sound Subdistricts 2 and 3 (affecting the communities of Council, White Mountain, Golovin, and Elim). Thereafter, subsistence salmon harvest for those communities are reported totals from subsistence permits, and household surveys have not been necessary. Permits issued at the Nome office, and by ADF&G personnel in the field, identify gear restrictions, bag limits, subsistence zones (for Subdistrict 1, Salmon Lake and Pilgrim River only), location and access descriptions, and subsistence regulations for each location or body of water. In addition, the permit contains a catch calendar for household members to record gear type used, area fished, and catch in numbers by species for each day fished. If subsistence fishery participants reach their harvest limit in 1 river, they can fish in other rivers until they reach the limit in those rivers. Subsistence permits are important to management because they identify users, fishing effort, harvests, and catch limits.

Subdistrict 1 (Nome), due to low salmon stock levels combined with a large concentration of users, has required subsistence fishing permits since 1975. By regulation, permits with catch calendars are issued to each requesting household listing all Nome Subdistrict fishing locations, catch limits, and gear restrictions. After the fishing season, households are required to return the completed permit to ADF&G whether they fished or not. Due to the subsistence permit program, all subsistence salmon catches from Norton Sound Subdistrict 1 have been determined from returned permits since 1975. However, not all fishery participants obtained or returned permits from 1975 to 2003, and the data were not expanded for unreturned permits because the assumption was that those permit holders did not fish. Beginning in 2004, stricter enforcement of regulations including fines for failure to return a permit resulted in at least 98% of all permits issued being returned, and for the last 7 years nearly all subsistence salmon permits issued have been returned or households have reported catches in person, by telephone, or by email.

Norton Bay, Shaktoolik, and Unalakleet Subdistricts have continued to be surveyed postseason by household interviews. Additionally, daily surveys of Unalakleet River and ocean subsistence fishery participants were conducted annually from 1985 to 2012 after fishing periods during the Chinook salmon run. Although total subsistence harvests were not documented inseason, effort and catch information were used to judge timing and magnitude of the Chinook salmon run. These surveys were discontinued in 2012 because major reductions in subsistence fishing time and gear restrictions limited the utility of the data inseason. The directed Chinook salmon commercial fishery has not occurred since 2005 and can only be opened once it becomes apparent subsistence needs will be met and escapement goals will be achieved as indexed by North River counting tower and Unalakleet River mainstem weir counts.

Beginning in 2007, regulations allowed for cash sales of up to $200 worth of subsistence-taken finfish per household, per year, in the Norton Sound–Port Clarence Area, and starting in 2013 the amount allowed was raised to $500. From 2007 to 2012, 5 or fewer customary trade finfish permits were issued per year, but more recently (2013–2017), due to ADF&G's increased efforts to remind residents about the permit requirement when selling subsistence-caught finfish, an average of 17 customary trade permits were issued per year in Norton Sound District. Total annual sales have never exceeded $2,300 (Appendix A34).

HISTORICAL REGULATORY AND MANAGEMENT ACTIONS

Nome Subdistrict (Subdistrict 1) has been the focus of most regulatory actions within the Norton Sound District since the 1970s. Although pink salmon are usually the most abundant species of salmon in Nome Subdistrict streams, the commercial fishery primarily targeted chum salmon during the 1970s. Relatively large chum salmon catches in this subdistrict in conjunction with weak local abundance implied that the fishery may have harvested nonlocal stocks. A 1978–1979 Norton Sound stock separation study (Gaudet and Schaefer 1982) showed that some salmon tagged near Nome were recaptured in fisheries from Golovin (Subdistrict 2) to Kotzebue. To provide for spawning requirements and for an important subsistence fishery that targets local stocks, a commercial harvest guideline of 5,000–15,000 chum salmon was adopted as a regulation.

The Alaska Board of Fisheries (BOF), in response to an advisory committee petition, directed ADF&G to manage the Nome Subdistrict commercial fishery for optimal chum salmon escapement after poor chum salmon escapements during the 1982 and 1983 seasons. During 1984 fall BOF meetings, directives in practice that season became regulation. In response to

public and advisory committee proposals, the following commercial fishery restrictions were adopted as regulations:

(1) Salmon may be taken commercially only from July 1 through August 31.
(2) Fishing periods were restricted to two 24-hour periods per week.
(3) Waters west of Cape Nome were closed to commercial salmon fishing to allow for rebuilding of river stocks that supported the historical subsistence effort.

ADF&G was directed to allow a harvest at the lower end of the guideline harvest range of 5,000–15,000 chum salmon, as stipulated in regulation 5 AAC 04.360. In addition to these restrictions, a proposal to restrict sport fishing in the Nome and Snake Rivers was adopted in 1984 that allowed "a bag and possession limit of 15 salmon, other than Chinook salmon, of which only 5 could be chum and coho salmon, in combination."

Subsistence permit limits in Nome and Snake Rivers were restricted to 20 chum and 20 coho salmon. The remainder of the permit limit could be filled with salmon other than chum or coho salmon.

Even with these restrictive regulations in place, chum salmon escapement goals were difficult to attain. The 1987 fishing season experienced poor returns of both chum and pink salmon to Nome Subdistrict streams. Numerous management actions were made to curtail commercial fishing activities; and later, sport, personal use, and subsistence fishing were restricted. Despite these drastic fishery restrictions, escapement goals for chum salmon were not attained during 1987 in the Nome, Eldorado, Flambeau, Bonanza, Snake, and Solomon Rivers. In response to this continuing trend of decreasing chum and pink salmon returns to Nome Subdistrict, several new regulations were adopted by the BOF in 1987 restricting gillnet length and mesh size in the subsistence fishery. Beach seine use in specific waters in the subsistence fishery was also eliminated.

Beginning in 1991, no subsistence chum salmon harvests were allowed until escapement goals were likely to be met or conservative management actions were judged to be no longer effective. Regulation changes in 1992 affected the use of beach seines for subsistence fishing in Nome Subdistrict. Managers were given authority to allow subsistence harvest of chum or pink salmon by beach seine if escapement needs were likely to be met. In the past, beach seines were viewed as an overly effective means to harvest fish. However, since 1999, beach seines were used to harvest abundant species and allow live release of other species experiencing depressed runs.

In 1999, the BOF concluded that the previous management plan did not provide adequate opportunity for all subsistence salmon users to meet their annual needs for chum salmon. Therefore, Nome Subdistrict was designated a Tier II subsistence chum salmon permit fishery during a special BOF meeting held in Nome, March 1999. Under Tier II, permits are dispensed to individuals prioritized by fishing history and dependence and were based on projected harvestable surplus. As a result, ADF&G allowed 20 individuals who scored highest on the Tier II application process in 1999 to subsistence fish. The intent was to allow Tier II permit holders priority over other subsistence users if only a small harvestable surplus of chum salmon returned. If the run was assessed to be strong, then the subsistence fishery would open to all Alaska residents who obtained a Tier I permit, and individual harvests would be restricted to prescribed bag limits. In addition, to protect chum salmon on the spawning grounds the BOF established *closed waters* areas where no subsistence salmon fishing would be allowed at any time and placed existing chum salmon aerial survey escapement goals for 6 Nome Subdistrict streams into

regulation. In 1999, due to poor chum salmon returns, ADF&G closed the Tier II fishery, and in 2000, only 10 Tier II permits were issued.

During a BOF work session in September 2000, several Norton Sound District chum salmon stocks were determined to be *stocks of concern* based on the *Policy for the Management of Sustainable Salmon Fisheries*. Chum salmon in Nome Subdistrict were determined to be a stock of *management concern*, and chum salmon in Golovin and Elim Subdistricts were determined to be a stock of *yield concern*.

Based upon the stock of concern determinations, the BOF made several changes to regulations for management of Norton Sound salmon. In January 2001, the BOF repealed the existing biological escapement goals (BEG) in regulation and adopted optimal escapement goals (OEG) for chum salmon for 5 Norton Sound rivers. In the past, escapement goals were expressed as aerial survey counts of salmon. Aerial surveys do not count all salmon present but serve as an index to compare current and previous surveys. The new OEGs were in actual number of fish and based on allocative factors considered by the BOF and ADF&G escapement goal analyses (Clark 2001). Except for Kwiniuk and Tubutulik Rivers, which factor in additional chum salmon needed to provide for inriver subsistence use, the OEGs were the same as ADF&G-established sustainable escapement goals (SEG) at that time. The BOF-established OEGs, by subdistrict, were as follows:

Nome Subdistrict (Subdistrict 1)

Snake River: 1,600–2,500 chum salmon
Nome River: 2,900–4,300 chum salmon
Eldorado River: 6,000–9,200 chum salmon

Elim Subdistrict (Subdistrict 3)

Kwiniuk River: 11,500–23,000 chum salmon
Tubutulik River: 9,200–18,400 chum salmon

A chum salmon management plan for Nome Subdistrict (Subdistrict 1) and a salmon management plan for Golovin and Elim Subdistricts (Subdistricts 2 and 3) were adopted by the BOF. Commercial chum salmon fishing in Nome Subdistrict was closed and the fishery was not to be reopened again until the abundance of chum salmon reached a harvestable surplus large enough to meet subsistence needs for 4 consecutive years. Consequently, commercial chum salmon fishing remained closed until 2013.

ADF&G was given authority to establish subsistence gillnet mesh size restriction of 4.5 inch or less by emergency order when necessary to conserve chum salmon in Subdistricts 1, 2, and 3. Also, the Cripple and Penny Rivers were closed to subsistence fishing for chum salmon.

In addition, the BOF expanded legal gear for the subsistence fishery to include a line attached to a rod or pole, from Cape Espenburg on the northern Seward Peninsula along the coast to Bald Head (between Elim and Koyuk). Bald Head is the boundary between Subdistricts 3 and 4. Therefore, west of Cape Espenburg in the Kotzebue District, in Port Clarence District, and in Norton Sound District from Cape Douglas to Bald Head, hook and line became legal subsistence gear. Although hook and line can be used for subsistence fishing, sport fishing methods and means requirements still apply to harvesting fish (for example, no snagging fish is allowed). Sport fish bag and possession limits, by species, as specified in regulation 5 AAC 70.022 also apply, except when fishing through ice or in the Nome Subdistrict subsistence areas designated for

each river. However, sport fish bag and possession limits cannot be combined with subsistence harvest permit limits.

In 2001, chum salmon runs began to improve in Nome Subdistrict and additional permits were issued in the Tier II chum salmon fishery. Beginning in 2004, the BOF expanded the salmon subsistence permit requirement for the Norton Sound area to include all marine waters and fresh waters flowing into marine waters from Cape Prince of Wales to Bald Head. This regulation required salmon permits to be issued for waters by Brevig Mission, Teller, White Mountain, Golovin, and Elim in addition to Nome.

Improving chum salmon runs in Nome Subdistrict resulted in Tier II chum salmon fishery restrictions being suspended beginning in 2006. A permit is still required for subsistence salmon fishing, but there is no longer a Tier II fishery that restricts participation in subsistence fishing. In 2007, the BOF upgraded Nome Subdistrict stock from a management concern to a yield concern. The yield concern status was reaffirmed for Golovin and Elim Subdistricts, and all 3 subdistricts continued to be stocks of yield concern by BOF designation at the 2010 and 2013 BOF regulatory meetings. However, beginning in 2013, the BOF allowed commercial chum salmon fishing in Nome Subdistrict and liberalized subsistence fishing restrictions during chum salmon season. Specifically, this included expanding subsistence fishing time in the marine waters east of Cape Nome to 7 days a week and allowing the use of beach seines during the scheduled freshwater gillnet periods throughout the Nome Subdistrict from June 15 through August 15. Starting in 2016, the BOF dropped yield concern status for Nome Subdistrict chum salmon stocks and further increased subsistence fishing time in fresh waters from 4 days to 5 days a week and in marine waters west of Cape Nome from 3 days to 5 days a week. Golovin and Elim Subdistricts retained yield concern status for chum salmon.

In January 2019, the BOF dropped yield concern status for Golovin and Elim Subdistricts chum salmon stocks and repealed the existing OEGs in regulation since 2001 and adopted new OEGs based on SEGs that ADF&G had updated from Subdistricts 1 and 3. The new OEGs in regulation now are as follows:

Nome Subdistrict (Subdistrict 1)

Snake River: 1,600–5,300 chum salmon
Nome River: 2,000–4,200 chum salmon
Eldorado River: 4,400–14,200 chum salmon

Elim Subdistrict (Subdistrict 3)

Kwiniuk River: 9,100–32,600 chum salmon
Tubutulik River: 3,100–9,900 chum salmon

Regulatory actions were also undertaken in other subdistricts. Subdistricts 5 and 6 Chinook salmon were designated a stock of yield concern in 2004, and the BOF continued this designation in 2007, 2010, 2013, and 2016. To increase Chinook salmon escapements, the BOF also adopted a more conservative *Subdistricts 5 and 6 King Salmon Management Plan* (5 AAC 04.395) that was first implemented during the 2007 season. Under the new plan, commercial fishing directed at Chinook salmon can only occur if the midpoint of the North River tower SEG range is projected to be reached. Additionally, the plan directs ADF&G to provide escapement windows by restricting subsistence gillnet fishing for salmon from mid-June to mid-July to two 48-hour fishing periods a week in marine waters, and two 36-hour fishing periods a week in Unalakleet River. Subsistence fishing time can only be liberalized if ADF&G projects that the

lower end of the SEG range for North River Chinook salmon passage will be achieved; otherwise, ADF&G is directed to close the Chinook salmon fishery.

In 2013, Chinook salmon escapements from the Unalakleet River mainstem and its major tributary North River were the lowest ever recorded at less than 700 fish each (Appendices A30 and A31). Subsistence Chinook salmon harvests in Subdistricts 5 and 6 were also the lowest recorded—less than 500 fish each—since survey methods were standardized in 1994 (Appendices A10 and A11). The following 2 years, the subsistence fishing seasons began with unprecedented closures to subsistence salmon fishing with the intended result: Chinook salmon escapements dramatically improved and reached the North River counting tower escapement goal range of 1,200–2,600 Chinook salmon. However, in 2016 and 2017, even with similarly strict subsistence restrictions in place, the Chinook salmon runs were again very weak. In 2018, the Chinook salmon run met the escapement goal for the first time since 2015, and in 2019 the run was one of the best in the recent decade with record counts at both Unalakleet River weir and North River tower where the escapement goal range was exceeded.

PORT CLARENCE SALMON OVERVIEW

DISTRICT BOUNDARIES

Port Clarence District encompasses all waters from Cape Douglas north to Cape Prince of Wales including Salmon Lake and Pilgrim River drainages (Figure 4). Salmon, saffron cod *Eleginus gracilis*, whitefish, and herring *Clupea pallasii* are the major subsistence species.

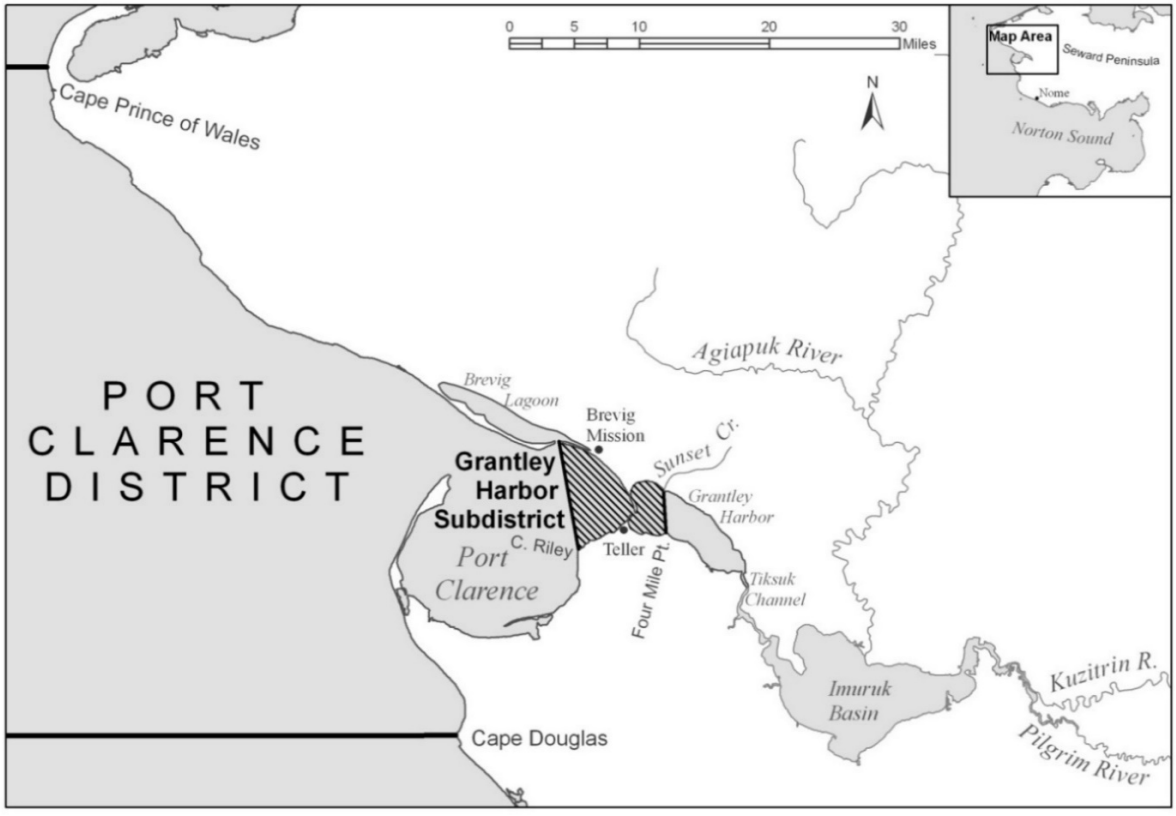

Figure 4.–Port Clarence District.

Note: Cross-hatched area on map shows location where commercial salmon fishing may be opened.

COMMERCIAL FISHERY OVERVIEW

In contrast to Norton Sound District, commercial fishing has been limited in Port Clarence District. In 1966, a commercial salmon fishery was established in the Grantley Harbor/Tuksuk Channel area of the Port Clarence District, but the fishery that year yielded fewer than 2,300 combined chum, pink, and sockeye salmon (ADF&G 1967). It was closed later that same season, due to small salmon runs and concerns from residents about impacts to area subsistence salmon fisheries, and remained closed until relatively recently. In the mid-2000s, there were large increases in sockeye salmon runs as well as positive results from an ADF&G test fishery in 2006. Consequently, in 2007, the BOF reestablished by regulation a Port Clarence District commercial salmon fishery. The BOF also established an inriver run goal of at least 30,000 sockeye salmon as a trigger point to allow a commercial fishery. The 2007 fishery harvest was 1,152 sockeye and 3,183 chum salmon, whereas the 2008 fishery harvest was 89 sockeye, 256 chum, and 910 pink salmon (Menard et al. 2010). The 2008 commercial fishery was closed when the inriver goal of 30,000 sockeye salmon for Pilgrim River was projected to fall short. The commercial fishery has remained closed since 2009 because the inriver run goal of 30,000 sockeye salmon had not been achieved through 2014. In 2015, a surge of sockeye during the second half of July resulted in an escapement of just over 36,000 fish past the Pilgrim River weir and the possibility of a commercial fishery, but there was no buyer interest. Although a commercial fishery was possible the last 3 years, there was still no buyer interest.

SUBSISTENCE FISHERY OVERVIEW

Salmon Lake, which empties into the Pilgrim River in the Port Clarence District, along with Glacial Lake in the northwestern portion of the Nome Subdistrict, supports the northernmost sockeye salmon populations of significant size in North America. Subsistence harvests of sockeye salmon in the Sinuk River, which drains Glacial Lake, have historically been low due to difficulties navigating this shallow, boulder-laden river. In contrast, sockeye salmon harvests in the Pilgrim River are much higher because it is more easily traveled and several beach seining and set gillnet fishing locations are accessible via the Kougarok Road (Nome–Taylor Highway) out of Nome. A traditional subsistence salmon fishery has probably occurred within this district for centuries; however, subsistence fishing has only been reported at Salmon Lake since the 1930s and monitored at the upper Pilgrim River since 1962. Data collected by ADF&G personnel showed most of the Brevig Mission subsistence fishery occurs in the northern and northeastern sections of Port Clarence District, and the Teller subsistence fishery occurs in Grantley Harbor and Tuksuk Channel. Interviews with residents indicated substantial fishing effort within Agiapuk River.

Beginning in 2007, regulations allowed cash sales of up to $200 worth of subsistence-taken finfish per household, per year, in the Norton Sound–Port Clarence Area, and starting in 2013 the amount allowed was raised to $500. From 2007 to 2012, at most, 1 customary trade finfish permit was issued in Port Clarence District, but more recently, due to ADF&G's increased efforts to remind residents about the permit requirement when selling subsistence-caught finfish, an average of 8 customary trade permits were issued. Total annual sales have never exceeded $2,300 (Appendix A34).

Village subsistence surveys were conducted annually by the Division of Commercial Fisheries until 1983 (Menard et al. 2013). The Division of Subsistence conducted a partial survey of Brevig Mission in 1989 and conducted full-scale household surveys of both Brevig Mission and

Teller from 1994 to 2003. Since expansion of the subsistence salmon permit program in 2004, subsistence salmon harvests for residents of both villages have been determined from reported totals on permits. Salmon Lake and Pilgrim River stocks have been fished by residents of Nome, Brevig Mission, and Teller for quite some time. To conserve declining sockeye salmon stocks, the BOF adopted a regulation in 1972 to close Salmon Lake and its tributaries to subsistence salmon fishing from July 15 through August 31. However, due to increasing fishing restrictions in Nome Subdistrict that started the 1990s, and because Pilgrim River is accessible from the road system (Figure 5), fishing effort from Nome area residents increased—and continued to increase into the mid-2000s when there were record runs of sockeye salmon to Salmon Lake.

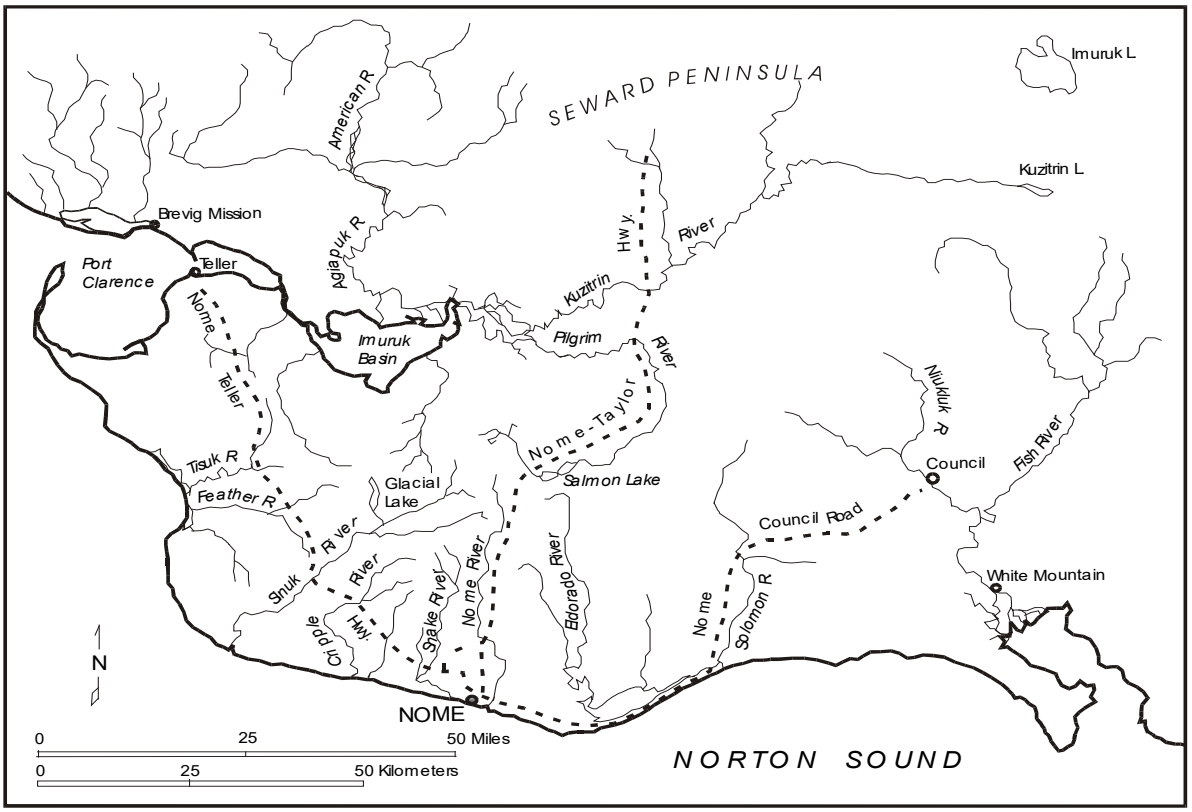

Figure 5.–Seward Peninsula with road-accessible waters.

In 2003, the first year of the recent good salmon runs 100 permits were issued. Over the next 5 years, the average number of permits issued was 217 (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). For comparison, in 2002 only 25 permits were issued, and a counting tower in operation that year at the same location as the present-day weir estimated fewer than 4,000 sockeye salmon passing (Appendix B2). The number of permits issued dropped from 255 in 2008 to 133 in 2011, probably due to subsistence fishing closures on Pilgrim River, but since then, even though numerous fishing restrictions have been eliminated in Nome Subdistrict, there continues to be increasingly heavy fishing effort at Pilgrim River. The average number of permits issued from 2012 to 2015 was 273, compared to the record number of 506 issued in 2016 (Menard et al. 2017), followed by 489 in 2017, 498 in 2018, and 476 in 2019. A major contributing factor was that, due to indications of a good run, fishing limits for Pilgrim River has been waived early in the season for the last 5 years, including 2019.

From 1997 to 2001, ADF&G conducted a fertilization program at Salmon Lake, partially funded by NSEDC and the Bureau of Land Management to restore sockeye salmon to historical levels by applying liquid fertilizer. However, ADF&G could not determine whether the method was effective and suspended fertilization in 2001. After impressive 2003 sockeye salmon returns, the project was reevaluated, and fertilizer was applied at a reduced rate in 2004, stopped again in 2005 and 2006, restarted in 2007 by NSEDC, and has continued in subsequent years at a reduced amount from the earlier years (Appendix B4).

KOTZEBUE SALMON OVERVIEW

DISTRICT BOUNDARIES

Kotzebue District encompasses all waters from Point Hope to Cape Prince of Wales, including those waters draining into the Chukchi Sea (Figure 6). Salmon, saffron cod, whitefish, and herring are major subsistence species.

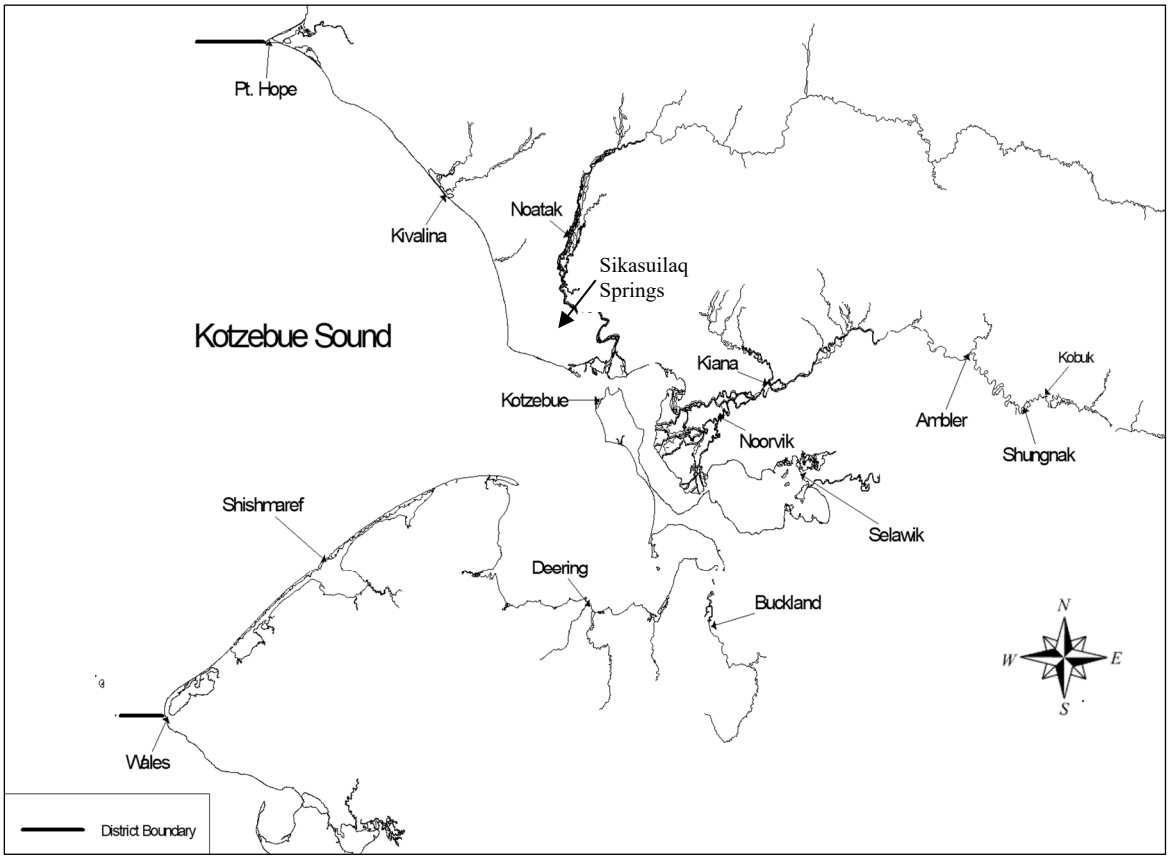

Figure 6.–Kotzebue District, villages and subsistence fishing area.

COMMERCIAL FISHERY OVERVIEW

Kotzebue District supports the northernmost commercial salmon fishery in Alaska. The district is divided into 3 subdistricts. Subdistrict 1 has 6 statistical areas where commercial salmon fishing may occur (Figure 7).

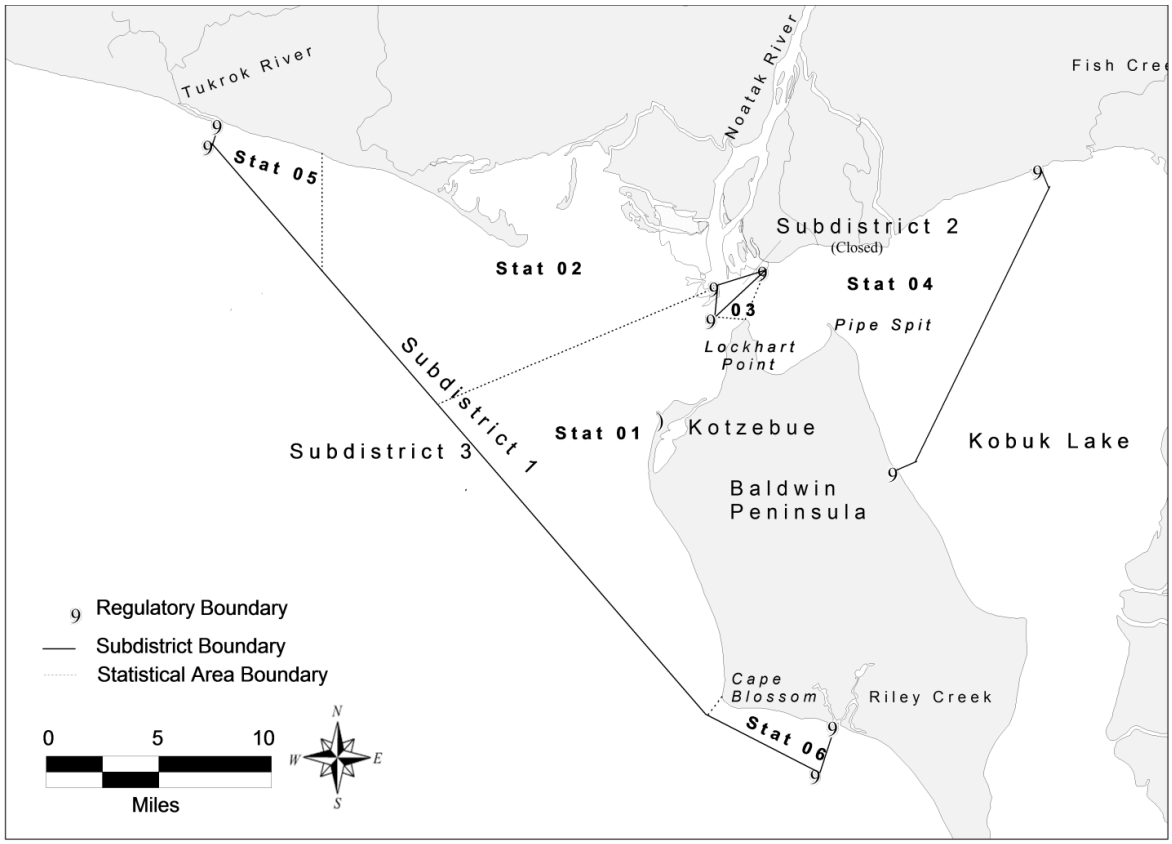

Figure 7.–Kotzebue Sound commercial salmon fishing subdistricts and statistical areas.

The commercial fishery under state management opened in 1962. Salmon harvests consist primarily of chum salmon, although limited amounts of Dolly Varden, sheefish, whitefish, and Chinook, sockeye, pink, and coho salmon are harvested during the fishery.

In the Kotzebue fishery, gear is limited to setnets with an aggregate of no more than 150 fathoms per permit holder. Setnetters generally operate with an end on or near shore and with all 3 shackles connected but may also set in deeper channels in the mudflats farther out from shore. Most gear used in the district is 5.875-inch or 6.0-inch stretch mesh gillnet.

The earliest documented sales of salmon in Kotzebue District were in 1909 when Lockhart's store purchased 21,906 pounds of salmon from residents and resold it at $0.05 per pound. Of those sales, 21,366 pounds were sold to gold miners on the Kobuk River drainage and 540 pounds were sold to a company in Seattle. A commercial fishery occurred from 1914 to 1918. Salmon were canned, and the bulk of the harvest is assumed to have been sold to miners who worked in the upper Kobuk River drainage. The next organized commercial fishery began under state management in 1962 and continues to the present. The current fishery became fully developed in the mid-1970s. In 1987, the fisheries managers' new program emphasized attaining escapement goals. Before 1987, harvests were proportional to total return. Since 1995, poor market conditions and limited buyer capacity have caused harvests to fall short of their potential. The fishery bottomed out in 2002 and 2003 when no major buyer came to Kotzebue but began to slowly rebound in 2004 when 1 major buyer returned and slowly increased their capacity over a decade. This buyer remained the only major buyer for 10 years, but in 2014, 2 additional major buyers purchased fish (Menard et al. 2015). Only 1 major buyer, Copper River Seafoods,

returned in 2015 and 2016, but there were again 3 buyers in 2017, 2018, and 2019 (Appendix G3), although 1 buyer only bought limited quantities the last few weeks of the season.

In 1981, a chum salmon hatchery was established at Sikasuilaq Springs, a tributary of Noatak River. The hatchery was closed in 1995 due to lack of funding support. At peak production in 1992, the hatchery incubated 11,100,000 eggs. An estimated peak adult hatchery return of 90,000 chum salmon occurred in 1997. The estimated contribution to the commercial fishery was unknown.

SUBSISTENCE FISHERY OVERVIEW

Subsistence salmon fishing in Kotzebue Sound District continues to be important, but fish abundance and fishing activities vary from community to community. Along the Noatak and Kobuk Rivers where chum salmon runs are strong, household subsistence activities in middle and late summer revolve around catching, drying, and storing salmon. In southern Kotzebue Sound, fewer salmon are taken for subsistence because of low availability. Some subsistence users base their fishing effort out of their village, and others move seasonally to fish camps where they stay for several days to several weeks. The predominant species in the district is chum salmon, although small numbers of other salmon species are present.

Historical subsistence surveys for the Kotzebue area have been less complete than for Norton Sound and Port Clarence Districts. However, expanded documented surveys from 1995 to 2001 estimated the total annual subsistence salmon harvest for the Kotzebue Sound area to be 74,000 fish (Appendix C4). During these years, ADF&G Division of Subsistence conducted annual household subsistence salmon surveys in select Kotzebue Sound District communities, including surveying the town of Kotzebue using mail-in postcards. Due to budget constraints, these surveys were discontinued in 2005 but were restarted from 2012 to 2014, when comprehensive subsistence fish harvest data were again collected from 6 to 9 Kotzebue area villages by the Division of Subsistence. From 2012 to 2014, total subsistence chum salmon reported caught ranged from 27,000 to 42,000 fish, more than in 2003 and 2004, the last 2 years that the same 6 villages were surveyed (Appendices C4 and C5). Subsistence chum salmon harvest per household averaged 66 to 85 salmon for Kobuk River villages during the years 2012–2014 (Appendix C6). The town of Kotzebue, which had not been surveyed since 2001, was last surveyed from June 2014 to May 2015. No subsistence surveys have been conducted in the district since then.

ARCTIC SALMON OVERVIEW

DISTRICT BOUNDARIES

The Arctic District includes all waters of Alaska north of the latitude of the westernmost tip of Point Hope and west of 141 degrees W longitude, including those waters draining into the Chukchi Sea, Beaufort Sea, and Arctic Ocean (Figure 8).

SUBSISTENCE FISHERY OVERVIEW

There are no commercial salmon fisheries in the Arctic District. Small numbers of chum, pink, and Chinook salmon have been reported by subsistence users along the Arctic coast; pink salmon are the most numerous followed by chum salmon. Salmon are caught in gillnets as an incidental species when other nonsalmon finfish are targeted. In October 2012, 2 sockeye salmon were caught in Ikroavik Lake, approximately 5 miles south of Barrow, by subsistence gillnetters

fishing under the ice for least cisco *Coregonus sardinella*. There are no reliable reports of coho salmon being caught.

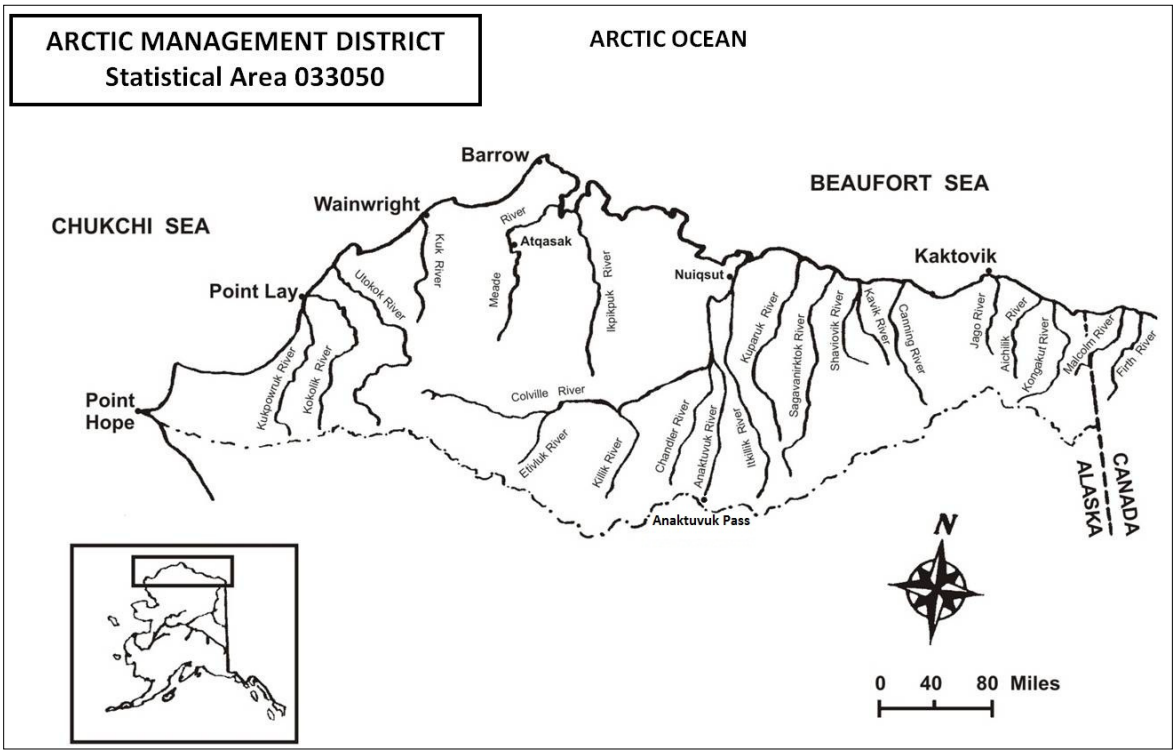

Figure 8.–Arctic management district.

AREAWIDE PACIFIC HERRING OVERVIEW

DISTRICT BOUNDARIES

Pacific herring *Clupea pallasii* are present in Norton Sound, Port Clarence, Kotzebue Sound, and Arctic Districts. Norton Sound Herring District consists of all state waters between the latitude of the westernmost tip of Cape Douglas and the latitude of Point Romanof (Figure 9). Port Clarence Herring District consists of all Alaska waters between the latitude of Cape Douglas and the latitude of Cape Prince of Wales. Kotzebue Sound Herring District consists of all Alaska waters between the latitude of Cape Prince of Wales and the latitude of Point Hope. The Arctic District does not have herring district boundaries in regulation.

SPAWNING AREAS AND TIMING

Arrival of herring on the spawning grounds is greatly influenced by climate and oceanic conditions, particularly the extent of the Bering Sea ice pack. Most herring spawning populations appear near the eastern Bering Sea coast immediately after ice breakup between mid-May and mid-June. Spawning progresses in a northerly direction and may continue into July or August along portions of the Seward Peninsula or within the Chukchi Sea.

The largest abundance of herring in the AYK Region is in Norton Sound District. Primary spawning areas are from Stuart Island to Tolstoi Point. When sea ice has remained into June, spawning has been more extensive along Cape Denbigh and locations along the northern shore of Norton Sound between Bald Head and Bluff. Additional northerly spawning areas have been

more difficult to identify because of small herring stock sizes and limited investigations. Likely spawning areas include Imuruk Basin in Port Clarence District, and Shishmaref Inlet, Deering–Kiwalik coast, and Hotham Inlet in Kotzebue District. Although subsistence herring catches have been reported in the Arctic District near Utqiagvik, there is no information available on spawning areas.

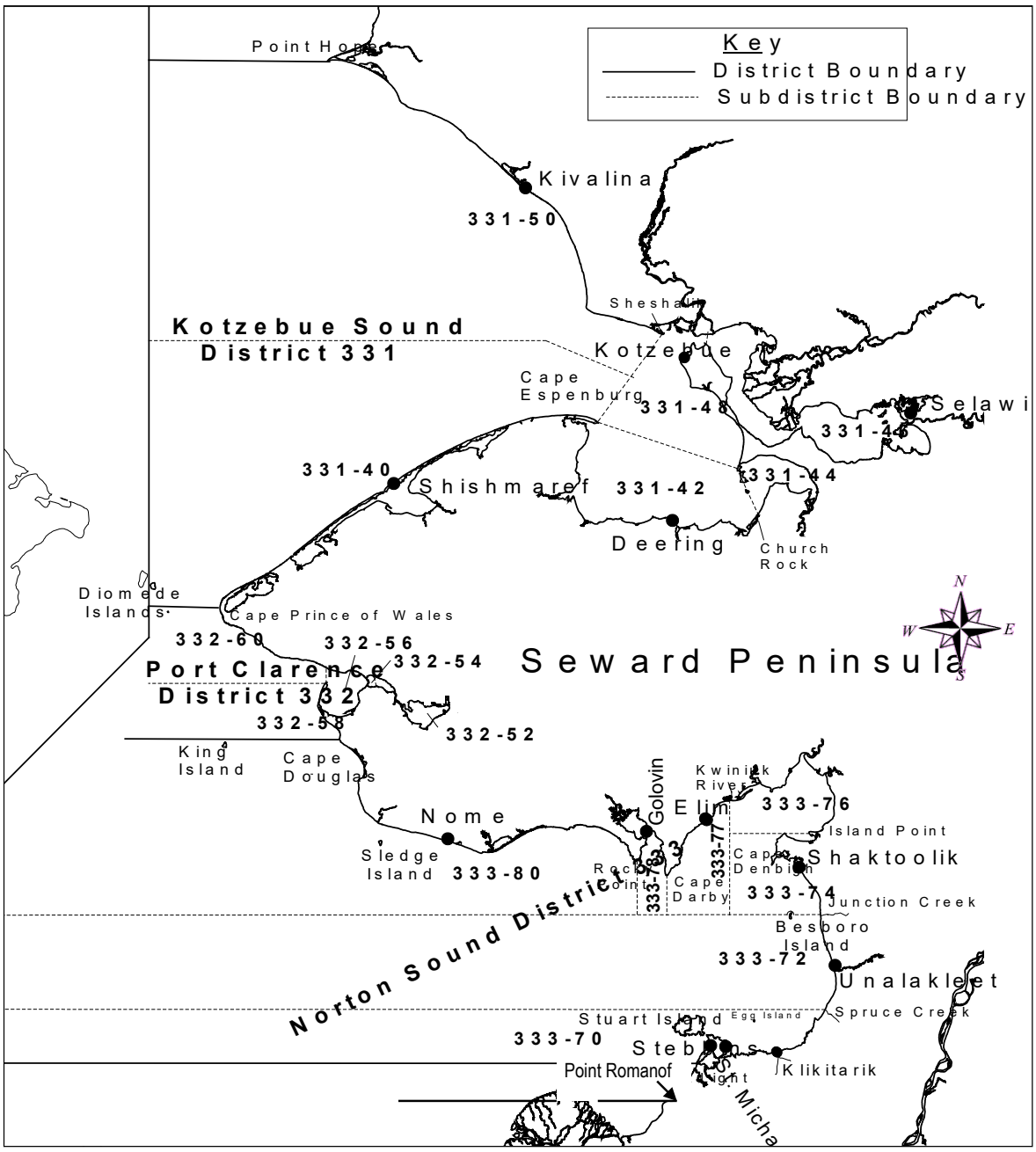

Figure 9.–Commercial herring districts and statistical areas of Norton Sound, Port Clarence, and Kotzebue Sound.

NORTON SOUND PACIFIC HERRING OVERVIEW

COMMERCIAL FISHERY OVERVIEW

Sac Roe Fishery

The earliest American commercial effort on Bering Sea herring apparently took place in the early part of the 1900s near Golovin in Norton Sound (Menard et al. 2013). Domestic commercial fishing resumed for "spring herring" in Norton Sound in 1964 near Unalakleet and continued sporadically until 1979. Between 1964 and 1978, the fishery averaged about 10 short tons[1] of herring annually for sac roe extraction. In 1979, a domestic herring fishery for sac roe began on a larger scale in Norton Sound when approximately 1,292 short tons of herring were taken by 63 commercial fishery participants (13 purse seiners, 50 gillnetters). Purse seiners took 70% of the total catch.

After the 1979 season, the BOF adopted a public proposal that made gillnets and beach seines the only legal commercial herring fishing gear within Norton Sound. A purse seine fishery could only be opened if the gillnet fleet could not take the allowable harvest. The regulation attempted to encourage local commercial fishery operators to participate in this developing fishery.

During the 1980 season, 294 gillnetters harvested 2,452 short tons of herring (Menard et al. 2013). Because gillnetters demonstrated they can take the available harvest, a regulation was passed in 1981 to prohibit any purse seine gear within Norton Sound District.

Before the 1984 season, harvest by beach seiners was negligible, but in 1984, 10 beach seiners harvested 327 short tons. In 1984, the BOF set a beach seine gear limit of 100 fathoms and limited harvest to "not exceed 10% of the total herring sac roe harvest projections as published by the ADF&G." During the fall 1987 BOF meetings, beach seine gear was further restricted to a limit of 75 fathoms. Beach seine harvests from 1985 to 2000 were only about 8% of total reported harvest; and since 1998, little market interest has existed for herring caught with beach seines because of the smaller average size of herring captured.

As with most developing fisheries, fishing effort and harvest increased with each season. In 1984, Norton Sound became a superexclusive herring fishing district to slow growth and bolster local involvement, but it had limited success. The 1987 herring sac roe gillnet harvest was 3,759 short tons and had the highest level of fishing effort on record (Menard et al. 2013). This effort was more than twice the average from 1980 through 1986, yet Norton Sound area residents accounted for only about a third of both the effort and total harvest. Then, in 1987 after a public proposal adopted at the fall BOF meeting, the Commercial Fisheries Entry Commission changed the Norton Sound Herring District to Limited Entry status with a maximum number of 301 gillnet and 4 beach seine permits. Beginning in 1988, a moratorium was placed on Norton Sound and no new entrants were allowed into the sac roe herring fishery.

No harvest occurred in 1992 due to very late ice breakup, but both gillnet and beach seine fisheries continued, and more than 200 gillnetters and beach seiners participated until 1998. The 1995 gillnet harvest of 6,033 short tons was the largest on record, and the 1993 beach seine harvest of 742 short tons was the largest harvest on record by this gear type. Combined dollar

[1] The Alaska Board of Fisheries requires that inseason catch and aerial survey biomass estimates be calculated and reported in short tons. The English short ton = 2,000 lb or 907.2 kg. The metric tonne (1,000 kg or 2,205 lb) = tons/1.1023.

value for both the beach seine and gillnet fisheries peaked in 1996 at $4.5 million (Appendix D2).

Since 1997, poor market conditions have been the primary influence on the level of commercial harvest. There has been no harvest by beach seine since 2000. The number of participants has decreased from 122 in 1999 to an average of 13 for the last 5 years. From 1999 to present, the number of buyers has steadily declined (from 4 to 1) and no sac roe buyers were present in 2004, 2007–2009, 2012, and after 2013. Even when there was a buyer, sometimes only bait was purchased, as happened in every one of the last 6 years. In 2012 and since 2013, there has been no sac roe fishery either due to ocean ice blocking tenders or preventing deliveries, or lack of market interest. One bright spot was the high recovery of over 13% roe in 2010, 2011, and 2013, but the last year that a sac roe fishery occurred, in 2013, fewer than 500 short tons of sac roe herring was harvested (Appendix D1).

Spawn-on-Kelp Fishery

A small-scale spawn-on-kelp *Fucus* sp. fishery existed in Norton Sound from 1977 to 1984. Harvests during the 1977–1984 periods ranged from less than 1 ton (1977) to approximately 47 tons (1981). During the 1984 season, 1 ton of *Macrocystis* kelp imported into Norton Sound resulted in a harvest of approximately 3 tons of product (Menard et al. 2013). In response to a public proposal, the BOF closed all spawn-on-kelp fisheries in Norton Sound before the start of the 1985 season.

The 1998 herring market was known to be poor before the southernmost fisheries opened. An experimental herring spawn-on-*Macrocystis*-kelp fishery was approved by the BOF to operate in Norton Sound during the 1998 season. The commissioner approved emergency regulations to allow a herring spawn-on-wild-*Fucus*-kelp fishery shortly before the normal start of the sac roe fishery. The intent of these decisions was to allow as much opportunity as possible to sac roe permit holders, because only a small minority would have an opportunity to participate in the sac roe fishery.

At the January 1999 meeting, the BOF instituted a *Macrocystis* kelp open pound fishery and allowed for a wild *Fucus* spawn-on-kelp fishery for sac roe permit holders who had not sold sac roe product. Wild *Fucus* harvest is limited to an area west of Wood Point to Canal Point, including Stuart Island, and the guideline harvest level (GHL) may not exceed 30 metric tons. The herring pound spawn-on-kelp GHL may not be more than 90 tons, to include combined weight of herring eggs and kelp.

After 2001, little (less than 1 ton) or no harvest has occurred from either the *Macrocystis* kelp or wild *Fucus* spawn-on-kelp fisheries (Appendix D2).

Food and Bait Fishery

Early records indicate about 3,200 short tons of “fall herring” were processed in Norton Sound from 1916 to 1941 (Menard et al. 2013). This fishery, dependent on salt curing, declined because foreign competition produced poor marketing conditions. Japan began gillnetting in Norton Sound during 1968 with 3 vessels. Effort was concentrated about 12 miles offshore between St. Michael and Golovin. Approximately 40 Japanese vessels reported harvesting a record 1,400 short tons of herring during 1969 (Menard et al. 2013). An average annual harvest of approximately 450 short tons was reported in Norton Sound by the Japanese during 1968–1974. All foreign fleets were prohibited in 1977 from gillnet fishing in the area.

Since 1977, there has not been a consistent domestic commercial food and bait herring fishery in Norton Sound. Most reported food and bait herring harvest estimates were initially harvested as sac roe but bought and processed as food and bait; therefore, they were considered food and bait for the purposes of this report. The largest Norton Sound herring harvest in the last 50 years occurred in 1995 when an estimated 6,763 short tons of sac roe herring were delivered, of which only 116 short tons were purchased as food and bait. Since 1997, no more than 91 short tons of herring were sold annually as food and bait (Appendix D1).

COMMERCIAL FISHERY MANAGEMENT

The overall statewide management strategy is based upon the *Bering Sea Herring Fishery Management Plan* (5 AAC 27.060) to annually harvest 0–20% of the herring biomass. The upper end of the exploitation range is applied to stocks in good condition. The lower end of the exploitation range is applied to stocks exhibiting a trend of decreasing abundance and poor recruitment. If a minimum biomass threshold level of 7,000 short tons for Norton Sound is not achieved, no commercial fishery will be allowed.

Typically, herring are long-lived fish and will usually remain harvestable for at least 5 years after recruiting into the fishery. Harvesting only a percentage of the biomass ensures fish will remain for the following years. This type of strategy helps mitigate population fluctuations caused by successive years of poor recruitment, a common occurrence in marine-spawning fish. Before 1983, harvests in Norton Sound were regulated by subdistrict so harvests would be dispersed over the entire fishing grounds (Menard et al. 2013). This strategy prevented harvest efforts from concentrating in 1 area, on what was then thought to be a distinct stock of fish.

Methods to reliably forecast herring returns are still being developed and estimates of recruitment are not available; therefore, inseason assessments of biomass supersede projected biomass for management of Norton Sound herring. The herring fishery is managed for a 20% exploitation rate at biomass levels twice minimum threshold or greater. If the run does not materialize as projected, the harvest exploitation rate may be reduced to a lower level. Starting in 2016, due to budget limitations, ADF&G no longer plans to fly aerial surveys to estimate biomass or conduct ASL sampling. Because of the decline in market demand, there is no expectation that commercial harvest will exceed 20% of actual biomass.

Generally, fisheries management staff has tried to set commercial openings to allow gillnetters to fish flood tides as they crest. Figured heavily in this strategy is the belief that ripe females approach the beach at that time to spawn. Because the Norton Sound fishery covers a large area with varying tides, opening at the optimal time throughout the district is not always possible. The fishing fleet must be flexible to maximize catches and roe quality. However, since 1997 there have been limited markets for herring and the catch has been well below the GHL. Since 2002, to maximize efficiency for gillnetters and buyers, ADF&G has opened the fishery continuously once buyers are ready and then buyers direct the fleet when to set and pull nets.

In the past, duration of beach seine openings was dependent on herring abundance near the beach and favorable weather conditions for spotters and fishing. Beach seiners preferred to work flood tides similar to gillnetters; however, fisheries managers frequently provided fewer optimal fishing times. Beach seiners can harvest their allotment of 10% of the preseason harvest goal in a single 3-hour opening under ideal conditions. By nature of the gear, beach seiners have the potential to wrap up large numbers of fish that could potentially exceed their allocation. In the past, management staff often reduced beach seine efficiency by allowing a gillnet opening to

occur before a beach seine opening. This opening breaks up school size and reduces likelihood of excessive harvests. Occasionally, the beach seine fleet has been used to test roe quality of herring newly arrived in nearshore waters before a gillnet opening. The potential for waste would have been great had the entire gillnet fleet fished on poor quality herring.

In the 2000s, the market desired a higher roe percent and larger size fish. These criteria have been difficult to achieve with beach seine gear and therefore no buyer interest has existed for herring harvested from beach seines.

SUBSISTENCE FISHERY OVERVIEW

Pacific herring were used for subsistence purposes by coastal residents well before the mid-1800s when their use was first documented by early explorers. Subsistence harvest of herring and herring roe-on-kelp is not documented but is believed to be relatively small. It is also known that St. Michael and Stebbins residents harvest herring spawn-on-kelp for subsistence use.

PORT CLARENCE AND KOTZEBUE PACIFIC HERRING OVERVIEW

COMMERCIAL FISHERY OVERVIEW

Port Clarence and Kotzebue commercial herring fisheries have been in regulation since 1982. In Port Clarence and Kotzebue Districts, regulations state that herring may be taken from April 15 through November 15, except that herring may not be taken during the open commercial salmon fishing season. The 1983 and 1984 regulations set a guideline harvest of 150 metric tons (165 tons) for each subdistrict, which is still in effect. Purse seines, beach seines, and gillnets are legal commercial gear within these districts.

Before 1987, no spring sac roe commercial fisheries had ever occurred within these districts. In 1987 and 1988, a spring sac roe herring fishery was attempted in the Port Clarence District. In 1994 and 1995, a fish buyer located in Nome provided a ready crab bait market and transportation for fish, which facilitated a spring harvest. However, no one has fished for bait since 1996 (Appendix D4).

Regulations allow spawn-on-kelp fisheries in Port Clarence and Kotzebue Districts. Attempts at open pound *Macrocystis* harvest in Port Clarence District in 1991 and 1992 were unsuccessful.

HISTORICAL RESOURCE INVESTIGATIONS

Resource investigations of Port Clarence and Kotzebue Sound area herring stocks were conducted by ADF&G from March 1976 to September 1978 (Barton 1978). These studies indicated herring populations from Golovnin Bay (Norton Sound) northward differed significantly in size and behavioral characteristics from herring populations occurring in the southern Bering Sea. Differences between populations were summarized as follows (Barton 1978).

Seward Peninsula populations	Southern Norton Sound to Southern Bering Sea pelagic populations
Smaller herring at age with lower vertebral counts.	Larger herring with probable higher vertebral counts.
Lower abundance.	Higher abundance.
Subtidal spawning (3 m) in shallow bays, inlets, and lagoons.	Intertidal and shallow subtidal spawning along exposed rocky headlands.
Zosteria sp. primary spawning substrate.	*Fucus* sp. primary spawning substrate.
More euryhaline.	Less euryhaline.
Overwinter in shallow bays; water is warmed by river discharge under ice cover.	Over winter in deep ocean layers near the Pribilof Islands.
Fall (nonspawning) runs documented.	No fall runs documented.
Larval development in brackish water.	Larval development probable in more saline water.

Data collected from herring populations along the Seward Peninsula strongly indicated that a separate stock of herring occurs in Port Clarence and Kotzebue Sound Districts. These data do not preclude the possibility of more southern stocks utilizing this region, such as stocks that winter near the Pribilof Islands and migrate to the western Alaska coast to spawn. Migration to the central Bering Sea for wintering herring stocks along the western Seward Peninsula is unlikely; instead, they might remain in coastal lagoons, bays, or inlets that are warmed by river discharge under the ice (Barton 1978). Size difference may be explained by warmer water temperatures from river discharge. Water temperatures and feeding conditions in deep ocean waters are probably more favorable for herring growth than winter habitats along the Seward Peninsula, where the herring have apparently become adapted to Arctic conditions (Barton 1978).

Aerial surveys are difficult in Port Clarence District because of organic coloring in the waters of Imuruk Basin, Tuksuk Channel, Grantley Harbor, and, to a lesser extent, Port Clarence. Presence of other species of fish caught in test commercial gear sets indicate the need for verifying species composition of any biomass sighted. Spring ice conditions present a further complicating factor within Port Clarence. Port Clarence is a sheltered body of water that becomes highly stained over winter and takes time to clear once ice melts. Typically, outside waters are significantly warmer than inside waters, which are covered by ice longer, thereby slowing solar gain and water mixing. Soon after ice begins to shift, herring move into the warm shallow lagoons to spawn. Herring are invisible to aerial observation once they enter stained water. The best aerial survey conditions exist just outside the entrance to Port Clarence, where herring mass just before the ice moves. Herring have been observed in Imuruk Basin in the fall, and seals have also been observed by aerial observation when returning through the area from salmon surveys.

NORTON SOUND KING CRAB OVERVIEW

DISTRICT BOUNDARIES

Norton Sound Section (Q3) consists of all waters in Registration Area Q north of the latitude of Cape Romanzof (lat 61˚49′N), east of the International Dateline, and south of lat 66˚N (Figure 10).

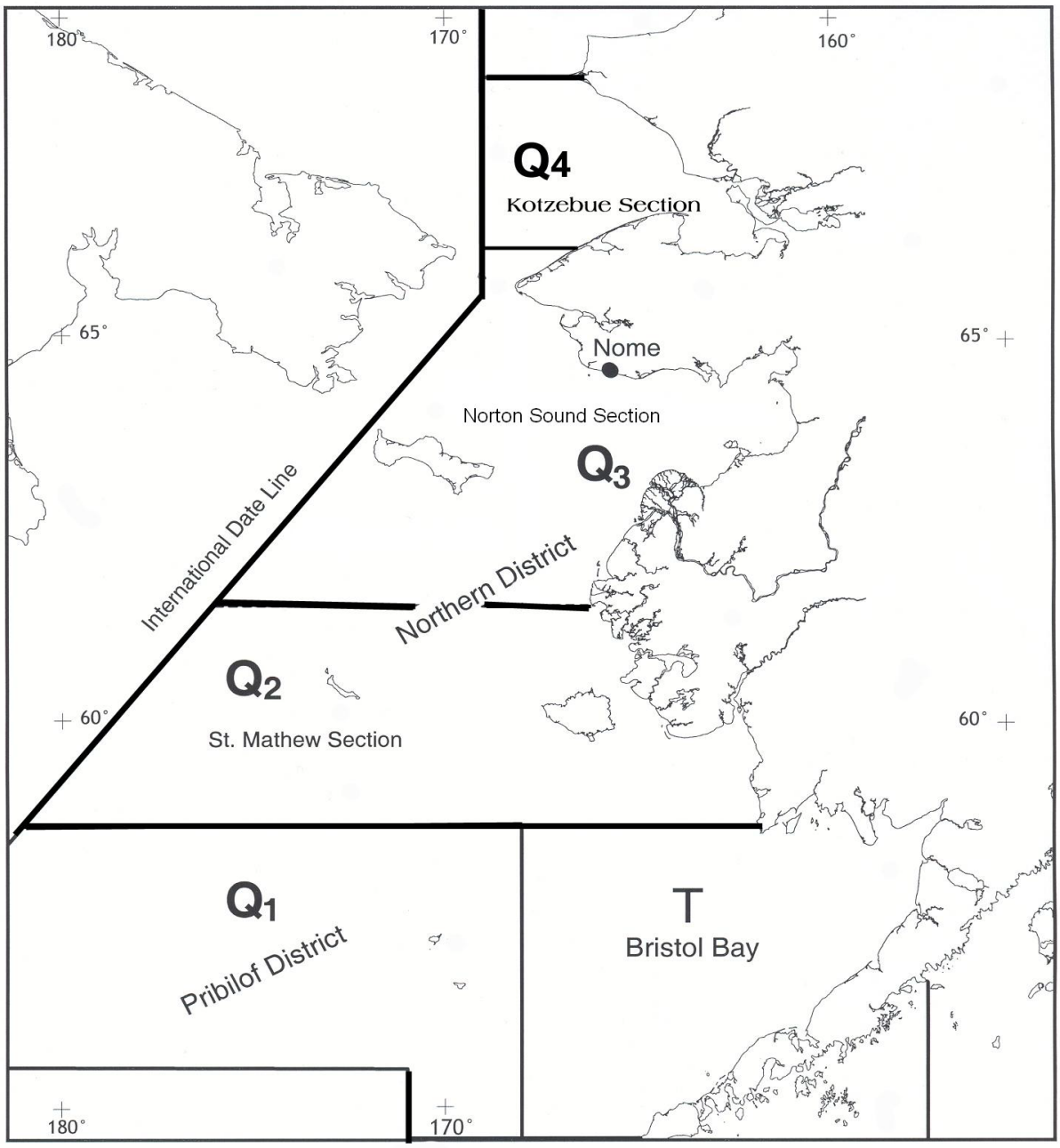

Figure 10.–King crab fishing districts and sections of Statistical Area Q.

ABUNDANCE

From 1976 to the late 1990s, abundance of legal (over 4.75-inch carapace width) red king crab *Paralithodes camtschaticus* biomass in Norton Sound was estimated based on standardized results from triennial trawl surveys and sporadic summer pot surveys, which indicated periods of weak and strong recruitment (Menard et al. 2013; Appendix E9).

Since 1998, a length-based population model has been used to predict biomass for the red king crab population in Norton Sound (Zheng et al. 1998). Incorporating data from trawl surveys (Appendices E9 and E24–E26), historical winter and summer pot studies, and winter and summer fisheries (Appendices E16–E23), the model is used to project abundance estimates of legal male crab even in years when no trawl survey occurs, allowing abundance-based management of the summer commercial crab fishery. Every time new data is incorporated into the population model, it estimates current abundance and revises prior years' abundances. Trawl survey estimates prior to 1996 were revised and standardized in 2013 (NPFMC 2013). Starting in 2018, the triennial trawl surveys were replaced by annual trawl surveys, which will greatly help abundance estimation.

Preliminary results from the latest trawl survey, which occurred in 2019, indicated that legal male red king crab increased by a third, but it was still the second-lowest abundance in the history of the survey. Prerecruit-1 abundance decreased to become the lowest prerecruit-1 abundance in the history of the survey (Appendix E9). In contrast, the estimated prerecruit-2 abundance was almost 6-fold the abundance seen in the 2018 survey and was the second highest in the history of the trawl survey. Similarly, the number of female red king crab captured in 2019 was the second-highest number of females captured during the trawl survey, behind only 2018 (Bell and Hamazaki *In prep*).

The following estimates (covering the last 5 years) are based on the model's results from spring 2019, which included data from the 2018 trawl survey, the 2018 summer fishery, and the 2011–2012 winter study. In 2014, legal biomass estimate for the summer crab fishery was 3.49 million pounds, close to 2013. The legal population estimate then increased the following 2 years, by 22% to 4.26 million pounds in 2015, and by 3% to 4.37 million pounds in 2016. From 2016 to 2019, the estimate decreased annually, to 3.83 million pounds in 2017, 3.03 million pounds in 2018, and 2.51 million pounds in 2019 (NPFMC 2019).

No winter study has taken place after the 2011–2012 season because ADF&G did an expanded spring and summer tagging study from 2012 to 2015. Results from this tagging project will be compared with previous winter tagging projects for possible future incorporation into model estimates.

COMMERCIAL FISHERY OVERVIEW: SUMMER

The last year that a large-vessel summer commercial crab fishery existed in Norton Sound Section was in 1990. No summer commercial fishery occurred in 1991 because of ADF&G staff constraints. In 1992, the summer commercial fishery resumed. Appendix E13 shows historical summer commercial harvest by year and statistical area for Norton Sound crab fishery since 1990. Historical information before 1990 can be found in *2012 Annual management report Norton Sound-Port Clarence Area, and Arctic-Kotzebue Area* (Menard et al. 2013). Regulation changes adopted during the March 1993 BOF meeting changed participation in the fishery to small boats. A superexclusive designation went into effect for the Norton Sound commercial crab fishery on June 27, 1994. This designation stated a vessel registered for the Norton Sound

crab fishery may not be used to take king crab in any other registration area during that registration year. Later, a vessel moratorium put into place before the 1996 season was intended to precede a license limitation program. Community Development Quota (CDQ) groups were allocated a portion of the summer harvest beginning in 1998, but no CDQ harvest occurred until the 2000 season. The North Pacific License Limitation Program went into effect for the Norton Sound crab fishery January 1, 2000. The program states that a vessel exceeding 32 feet in length overall must hold a valid crab license issued under the License Limitation Program by National Marine Fisheries Service. Regulation changes and location of buyers resulted in harvest distribution moving eastward in Norton Sound in the mid-1990s (Appendix E14).

During the March 1999 BOF meeting, a new management strategy was enacted for the Norton Sound summer red king crab fishery. A threshold level of abundance of legal male red king crab biomass was set at 1.5 million pounds. A summer commercial season may only open if the legal crab biomass is estimated to be at least 1.5 million pounds, and if the legal biomass falls in the range of 1.5 to 2.5 million pounds the harvest rate will be no more than 5% so that the stock may rebuild. If legal biomass is 2.5 million pounds or more, the harvest rate will be no more than 10%. In March of 2012, this regulation was modified by the BOF so that the new threshold level of abundance of legal male red king crab biomass was set at 1.25 million pounds. If the estimated legal crab biomass falls within the range of 1.25 to 2.0 million pounds, the harvest rate will be no more than 7% of legal male abundance. From 2.0 to 3.0 million pounds, the harvest rate will be no more than 13%. If the estimated legal biomass is more than 3.0 million pounds, the harvest rate will be no more than 15%. Improved abundance estimates, and the current management strategy will greatly reduce the risks of overfishing the stock.

Since 1981, to protect crab utilized by the inshore subsistence fishery from commercial harvest, an area delineated by a line approximately 10 to 15 miles off the shores of southern Seward Peninsula from Port Clarence to St. Michael has been closed to the summer commercial fishery. This closure line has been adjusted over the years to its current position adopted by the BOF in 2002 (Appendix E12).

To reduce handling mortality of sublegal and smaller female crab, the BOF at its March 2008 meeting put a new regulation into effect: a minimum of 4 escapement rings are required per pot with each ring having a minimum inside diameter of 4.5 inches located within 1 mesh size from the bottom of the pot, or at least one-half of the vertical surface of a square pot or sloping side-wall surface of a conical or pyramid pot must be composed of no less than 6.5-inch stretched mesh. Also, starting with the 2008 season, despite the minimum legal size of red king crab (4.75-inch carapace width), the local seafood plant did not always buy crab less than 5.0-inch carapace width. The Anchorage buyer, however, has continued to buy crab if they are of legal size.

In 2010, due to concern over lack of stock status information, the North Pacific Fishery Management Council closed the Bering Strait area above Cape Prince of Wales to crabbing. Only state waters (within 3 miles of shore) were open to crabbing north of the latitude of Cape Prince of Wales (Appendix E12).

Community Development Quota Fishery

NSEDC and Yukon Delta Fisheries Development Association divide the CDQ allocation. Only commercial fishery participants designated by these 2 CDQ groups are eligible for this portion of the king crab fishery, and they are required to have a CDQ fishing permit from the Commercial Fisheries Entry Commission and register their vessel with ADF&G before making their first

delivery. Fishery participants operate under authority of the CDQ group and each CDQ group decides how their crab quota is harvested.

During the March 2002 BOF meeting, new regulations were adopted that affected the CDQ crab fishery and relaxed closed-water boundaries in eastern Norton Sound and waters west of Sledge Island. Closed-water boundaries are illustrated in Appendix E12. The Norton Sound CDQ fishery may begin at 12:00 noon, June 15, or no less than 72 hours after commercial gillnet or beach seine herring fishing is closed, whichever is later, through 12:00 noon, June 28. After July 1, the commissioner may, by emergency order, open a CDQ fishery for any remaining allocation after closure of the open-access fishery. At the March 2008 BOF meeting, the regulation requiring the herring fishery to be closed was repealed, and the CDQ fishery can occur by emergency order before, during, or after the open-access fishery. Previously, the open-access fishery started on July 1, but the BOF passed a regulation allowing ADF&G to open the fishery by emergency order anytime beginning on or after June 15.

From 2016 to 2018, NSEDC chose to harvest their CDQ allocation during the winter fishing season, but in 2019, they chose to harvest it during the summer season.

Commercial Catch Sampling

The Norton Sound red king crab summer commercial fishery had the benefit of an onboard observer during the 2000 and 2001 seasons because there was a floating processor on the fishing grounds in those years. In years with no onboard observer, a smaller percentage of crab from the commercial harvest is sampled because crabbers sometimes delivered at night. The seafood processing plant, Norton Sound Seafood Products (NSSP), began operating in Nome in summer 2002, greatly improving the ability of Nome ADF&G staff to sample crab brought to the Nome dock. Crab were either sampled at NSSP or at the small boat harbor where nonresident crabbers or catcher–processors not selling to NSSP offload their catch for delivery to Anchorage. An average of 3,800 crab were sampled from 2010 to 2019 (Appendices E20–E23).

From 2016 to 2018, up to 500 crab were also sampled during the winter commercial fishery out of live holding tanks, but no winter sampling occurred in 2019 due to poor harvests. Since 2015, all crabs have been sampled at NSSP during both the summer and winter fisheries. ADF&G will continue to make a concerted effort to coordinate catch sampling with crabbers and buyers to ensure optimal commercial harvest data collection.

COMMERCIAL FISHERY OVERVIEW: WINTER

A winter commercial through-the-ice fishery has existed in Norton Sound since 1978. Until 2010, all harvest occurred within 15 miles of Nome, with an area closed to commercial fishing that is roughly 2 miles west to 3 miles east of town and extending to the ice edge (Appendix E15). The harvest is generally divided among residents who buy crab directly from the crabbers, the seafood plant (NSSP) in Nome, and other nonlocal markets such as Anchorage and South Korea.

By regulation, season dates were initially from January 1 to April 30, but in its March 1985 meeting, the BOF set the new season dates from November 15 to May 15 (Appendix E4).

In March of 2015, a proposal adopted by the BOF set new season dates with the start date to be established by emergency order on or after January 15 and the regulatory closure to occur on April 30, unless extended by emergency order. This action was initiated to reduce pot loss and

potential ghost fishing by lost pots because the shorefast ice is relatively more stable and solid from mid-January to April.

In the past, the winter commercial fishery did not have a quota, but beginning in 2016, harvest allocation for the winter commercial fishery is 8% of the total open-access GHL.

Also adopted at the March 2015 meeting and implemented starting with the 2017 season was a regulation limiting commercial permit holders to 20 pots, with the requirement that each pot have a current-year pot tag attached.

All 3 proposals were adopted by the BOF in response to the dramatic increases in winter fishing effort that have occurred since 2012 due to much higher exvessel prices. During the years 1978–2011, an average of 9 permit holders fished commercially in winter. From 2012 to 2015, winter fishery participation more than tripled, to an average of 32 permit holders. From 1978 to 2011, the average harvest was roughly 7,000 pounds, but from 2012 to 2015, the average harvest increased almost 8-fold, to almost 55,000 pounds. Average exvessel price for winter red king crab from 2012 to 2015 was $6.68/lb, more than twice the average price of $3.25/lb during the previous 5-year period (Appendix E4). Part of the reason for the price increase was the expansion of live king crab markets overseas, particularly in South Korea; from 2013 to 2016, crab were sold live to South Korea by 1 or 2 catcher–processors based in Nome.

Prior to 2010, all the crabbers were based out of Nome. Starting with the 2009–2010 winter season, crabbers in other Norton Sound villages started participating in the winter commercial crab fishery. In 2012, both Shaktoolik and Unalakleet crabbers sold roughly a third each of the total harvest, whereas Nome crabbers only accounted for one-fourth of the harvest sold. Since then, ice conditions in eastern and southern Norton Sound have not been conducive to winter crab fishing; consequently, Nome crabbers have harvested 90% or more of the total commercial winter harvest since 2012. All crab harvested by crabbers based outside of Nome are shipped live and sold to NSSP in Nome. In 2014 and 2015, some crab were shipped live from Nome and sold to Aquatech in Anchorage by a Nome crabber.

SUBSISTENCE FISHERY OVERVIEW

Norton Sound residents utilize red king crab for subsistence, mainly during winter. Fishing occurs with hand lines and pots through cracks or holes cut in the ice. To document trends in subsistence harvest, the BOF enacted a regulation in 1977 requiring subsistence fishery participants in Norton Sound to obtain a permit before fishing, and to record their daily effort and catch on these permits.

Catch information for king crab before 1990 can be found in *2012 Annual management report Norton Sound-Port Clarence Area, and Arctic-Kotzebue Area* (Menard et al. 2013). Since 1990, the winter subsistence crab fishery harvest has ranged from a high of 12,152 crab during the 1989–1990 season to a low of 256 crab during the 2000–2001 season (Appendix E7). Lack of success in the winter crab fishery during some years has been attributed to a declining crab population caused by removal of crab in the summer commercial fishery—along with low recruitment, low effort caused by poor ice conditions, and changes in nearshore winter distribution of crab. All these factors, to varying degrees, affect the success of the winter fishery, along with increased use of more efficient gear (pots instead of hand lines). Unstable ice conditions and record snowfalls adversely affected 1992–1993, 1996–1997, 2000–2001, 2003–2004, 2005–2006, and 2018–2019 catches. During years of stable ice conditions, approximately

85 crabbers averaged 75 crab each. For the last 10 years (2010–2019), winter subsistence harvest averaged 5,700 crab annually.

ST. LAWRENCE ISLAND AND KOTZEBUE KING CRAB OVERVIEW

DISTRICT BOUNDARIES

Formerly, the St. Lawrence Island Section was located immediately west and north of the Norton Sound Section, but in May of 2006, the BOF expanded the Norton Sound Section to include the St. Lawrence Island Section south of lat 66˚N and west of long 168˚W (Figure 10). The former St. Lawrence Island Section north of lat 66˚N is now the Kotzebue Section.

ABUNDANCE

Unlike Norton Sound, the area of the Bering Strait that includes St. Lawrence Island has never been surveyed consistently by ADF&G. Even though commercial and subsistence harvests are allowed by regulation, ADF&G does not have abundance estimates for this area. In the summer of 2005, an exploratory pot survey was conducted by NSEDC in cooperation with ADF&G to assess the number and distribution of male blue king crab near King Island, Wales, and Port Clarence. The survey was only partially successful due to strong currents that made pot retrieval difficult when set deeper than 10 fathoms. Shallow pot placement resulted in a catch primarily of egg-bearing female blue king crab and indicated that using standard Norton Sound crab gear would only access a nursery site for gravid female blue king crab. When more suitable gear becomes available, further surveys will be necessary to determine the feasibility of a summer fishery. At the March 2008 BOF meeting, the legal size requirement for blue king crab was reduced from 5.5 inches to 5.0 inches. Preliminary data indicate that blue king crab size at maturity is very similar to Norton Sound red king crab.

In the summers of 2006, 2008, and 2011, trawl surveys in the northern Bering Sea were conducted by NSEDC in cooperation with ADF&G to assess crab resources in the St Lawrence Island and Bering Strait areas of Norton Sound District. The primary focus was to collect information on blue king crab size, distribution, and abundance. The area surveyed lies west and northwest of the standard ADF&G triennial Norton Sound red king crab trawl survey locations. In 2006, trawl surveys were conducted from near the southwest corner of St. Lawrence Island to the Bering Strait area southwest of Cape Prince of Wales. Size information and general distribution of blue king crab was collected. In 2008 prior to the trawl survey, a camera sled was towed a few meters above the seabed to observe crab and other species in the St. Lawrence Island area that had been surveyed in 2006. The 2008 and 2011 surveys focused on looking at the distribution of blue and red king crab in the area between Port Clarence and King Island. More survey work is necessary to generate an abundance estimate and to better understand the distribution of blue king crab. The 2006, 2008, and 2011 survey data should only be considered a starting point to understanding the Bering Strait and St. Lawrence Island blue king crab stock. No surveys have been conducted by NSEDC in this area since 2011.

COMMERCIAL FISHERY OVERVIEW

In 1984, a regulation was adopted to close waters within 10 miles of all inhabited islands within the St. Lawrence Island Section (St. Lawrence Island, Little Diomede, and King Island). This regulation attempted to protect stocks targeted by the local commercial crab fishery and reduce

impacts on marine mammal subsistence harvests. Since 1990, commercial catches in the former St. Lawrence Island Section have only been reported for 4 years. In 1992, 53 pounds of blue king crab were landed. In 1995, 7,913 pounds of blue king crab were delivered from 3 landings (Bue et al. 1997). In 2005, 316 pounds of red king crab were harvested in the Kotzebue area, and in 2006, 340 pounds were harvested.[2]

Commercial crab fishery participants from Little Diomede and St. Lawrence Island have bartered with and sold winter-caught blue king crab to residents of Nome and other villages for years. ADF&G does not have an accurate estimate of the magnitude of this trade. Remoteness of the villages contributes to lack of catch records. Current regulations allow a commercial harvest and sale of king crab caught near shore during winter. However, residents have decided not to export any of their winter catch for commercial sale.

MISCELLANEOUS FISHERIES OVERVIEW

Several species other than salmon, crab, and herring are utilized for commercial and subsistence purposes in Norton Sound, Port Clarence, Kotzebue, and Arctic Districts (Appendix G1). Primary species include inconnu or "sheefish" *Stenodus leucichthys*, Dolly Varden *Salvelinus malma*, whitefish (*Coregonus laurettae*, *C. pidschian*, *C. sardinella*, *C. nasus*, and *Prosopium cylindraceum*), *Coregonus* sp., *Prosopium* sp., and saffron cod *Eleginus gracilis*.

These fish are taken by set gillnets, beach seines, "jigging" through the ice, and rod and reel. Subsistence catches taken during summer months are normally air dried, and winter catches are stored frozen. Fish are utilized for human consumption and for dog food. Fish taken for commercial purposes are mainly sold locally, although some are shipped out of the area.

Subsistence harvest of most species is not limited by regulation. Commercial harvest may be prohibited in some freshwater areas, but limited commercial endeavors are allowed in many areas under terms of a permit.

INCONNU (SHEEFISH)

Spawning Areas and Timing

Sheefish are distributed throughout nearshore estuarine areas of Kotzebue Sound, with the largest spawning stocks and harvests in the Kobuk–Selawik River drainages and Hotham Inlet. However, there is a small population in the Sheshalik and Krusenstern areas of northern Kotzebue Sound and in the Koyuk River of Norton Bay in Norton Sound (Figure 11).

Spawning and overwintering migration behavior of sheefish makes them available for harvest by various fisheries throughout their life cycle but also increases their vulnerability to overharvest. Although sheefish are capable of consecutive spawning, most spawn every 2–3 years, and slow maturation rates of 5–7 years for males and 7–11 for females increase the time required to restore depleted populations. Sheefish have high fecundity, and large females can carry over 400,000 eggs. Such populations may be subject to episodic recruitment events depending on environmental conditions. If spawner abundance is maintained above a threshold level, intermittent years of good recruitment can carry the population through years of less favorable ice conditions.

[2] Statewide electronic fish ticket database [Internet]. 1985-present. Juneau, AK: Alaska Department of Fish and Game, Division of Commercial Fisheries. [URL not available because some information is confidential]. Hereafter referenced as *fish tickets*.

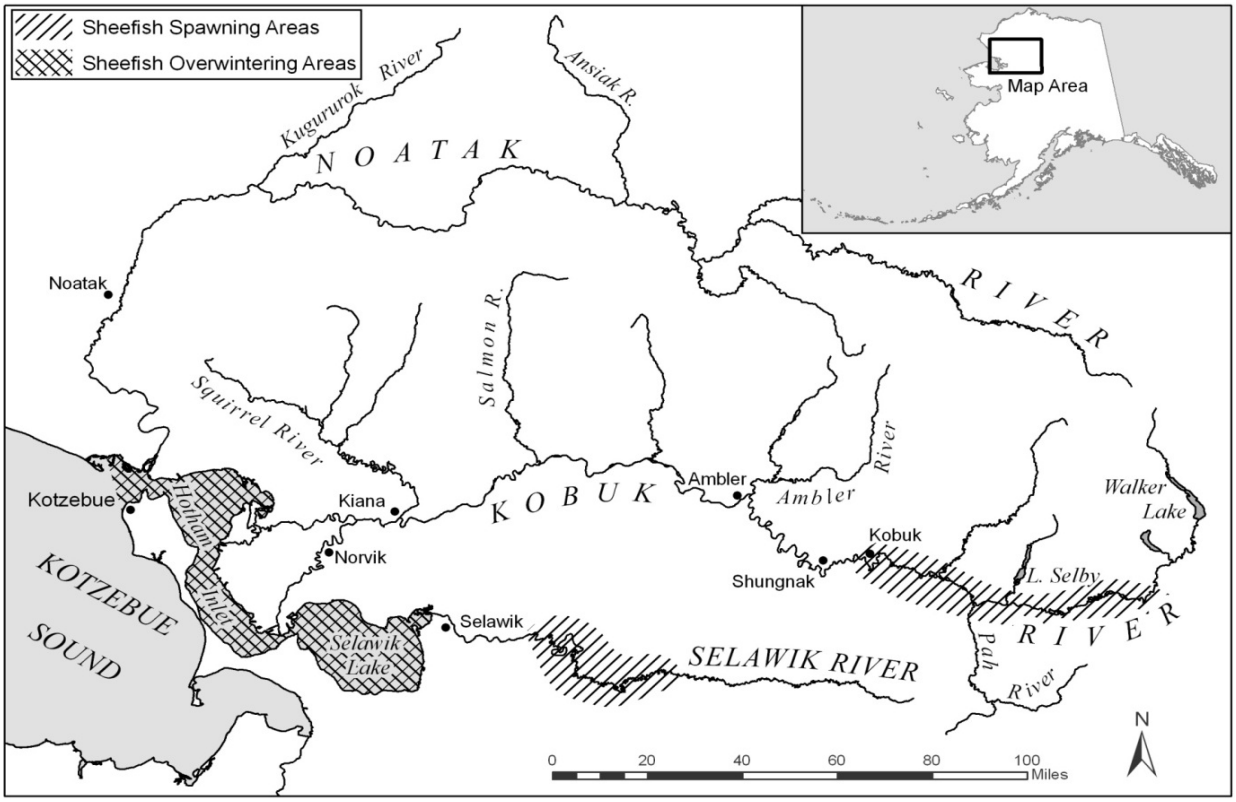

Figure 11.–Kotzebue and Kobuk River Valley villages and their spatial relationship with sheefish spawning and overwintering areas.

After ice breakup in Kotzebue Sound area, adult sheefish migrate upriver to spawning areas on the Kobuk and Selawik Rivers. On the Kobuk River, spawning occurs upstream from the village of Kobuk, and the greatest concentration is observed between the Mauneluk and Beaver Rivers. Then, when spawning is complete in late September and early October, sheefish disperse downstream to overwintering areas within Hotham Inlet/Selawik Lake.

Historical Fishery Use

During the 1960s, ASL data indicated sheefish stocks were overharvested by commercial and subsistence fisheries in Kotzebue District. Consequently, an annual area commercial harvest quota of 25,000 pounds was instituted, but the subsistence fishery is given priority and has remained unrestricted.

Subsistence Fishery Overview

Sheefish have long been utilized for subsistence purposes throughout Kotzebue basin, especially in Kotzebue, Selawik, and the villages along the Kobuk River. These harvests may include winter, summer, and fall catches. Because of budget constraints, the Division of Subsistence did not survey the villages in Kotzebue District for subsistence sheefish harvests from 2005 to 2011. Due to limited survey effort during many years, total catch and effort should be regarded as minimum numbers and are not comparable year to year. Subsistence sheefish harvest information was not always collected for the town of Kotzebue, where a sizable ice fishery occurs for sheefish in late winter and spring. From 2012 to 2014, a comprehensive subsistence

survey for fish and wildlife harvests was collected from 6–9 Kotzebue area villages. For these years, the last years that information is available, the estimated annual combined harvest of sheefish from these villages is well over 10,000 fish (Appendix F2).

Summer and fall subsistence fishing for sheefish occurs along Kobuk and Selawik Rivers from June through October with gillnets, beach seines, and rod and reel. In spring, residents of Kotzebue, Noorvik, and Selawik harvest sheefish with hand jigs through the ice of Hotham Inlet and Selawik Lake. In early winter, Kotzebue, Noorvik, and Selawik fishery participants use gillnets set under the ice in Hotham Inlet and Selawik Lake. No requirement exists for harvest reporting; catch information is gathered with the use of subsistence household surveys, if conducted.

In 1987, the BOF adopted a regulation limiting size of gillnets used to take sheefish for subsistence to be not more than 50 fathoms in aggregate length or 12 meshes in depth, nor have a mesh size larger than 7.0 inches (5 AAC 01.120). This regulation was intended to conserve the larger, breeding portion of the stock. Except for this gear restriction, ADF&G does not restrict timing, area, or quantity of subsistence sheefish harvest.

Commercial Fishery Overview

Most commercial fishing effort occurs through the ice in Hotham Inlet, near Kotzebue, using gillnets with 5.5–7.0 inch stretched mesh. Recorded commercial catches are relatively small, but undocumented catches may be significant. Therefore, harvest totals should be considered minimum estimates. Lack of markets outside northwestern Alaska greatly limits commercial activity; however, most individuals participating in the winter commercial fishery also fish for subsistence purposes. Sheefish incidentally caught in the commercial salmon fisheries are sold in years when there is a market, but only in small amounts. Reported harvest and effort in the commercial fishery have declined in the last 15 years. Since 1998, harvest has not exceeded 1,250 pounds, compared to the highest harvest of 8,224 pounds in 1991 (Appendix F1). Since 2005, there have been no reported commercial sheefish catches except in 2011 and 2015–2018. In all those seasons, there were fewer than 3 permit holders fishing, making catch information confidential.

Sport Fishery Overview

Kotzebue District sheefish are considered by many to be among the pinnacle of Alaska freshwater sport fishing due to their large size. Despite this, the level of sport fishing effort is still quite low.

Residents of Kobuk River villages have expressed concern over sport fish practices near spawning grounds on the upper Kobuk River. Catch-and-release fishing is considered by some residents to be disrespectful and damaging to sheefish. Also, the practice of discarding filleted carcasses in the water is thought to drive other sheefish away from the area. In 1986, the Division of Subsistence investigated these concerns and found the concerns could be addressed if sport anglers were more aware of local customs and culture. An educational brochure is now available to anglers on upper Kobuk River in the hope that proper handling during catch-and-release can minimize impacts on spawning populations. Although overall harvests are substantial, populations appear to be healthy and sport harvests are relatively low (Scanlon 2017). Sheefish sport harvests in the last 10 years have averaged under 500 annually (Appendix F3).

Historical Escapement

Historically, aerial surveys were conducted on key sheefish spawning areas incidental to effort of enumerating salmon. These surveys were primarily conducted along upper Kobuk River in September. Survey conditions historically result in either very few or no sheefish being observed. During these surveys, species identification has been a problem. Surveys were not conducted from 1984 through 1990 because of high and/or turbid water, poor weather conditions, or lack of personnel. Through the early 1990s, incomplete escapement and catch data provided little basis for assessing current population status of sheefish in Kotzebue District, but some residents were concerned that the sheefish stocks were declining.

Because of these concerns, a cooperative tagging project on sheefish in Kotzebue District occurred from 1994 to 1997. This study was conducted by the Division of Sport Fish, the U.S. Fish and Wildlife Service, and the National Park Service. Spawning sheefish were tagged in Upper Kobuk and Selawik Rivers. The Selawik River project ended in 1996, and it ended a year later in Upper Kobuk River. Spawning population estimates of sheefish in Upper Kobuk River were 32,300 in 1995, 43,000 in 1996, and 26,800 in 1997. Sheefish spawn upstream of the village of Kobuk; the greatest observed concentrations were between Maneluk and Beaver Rivers. After spawning is complete in late September, fish disperse to downstream overwintering areas. In Selawik River, the spawning population estimate was 5,200 in 1995 and 5,300 in 1996. Tag recoveries showed that these stocks mixed in Hotham Inlet winter habitats but maintained fidelity to their spawning areas (DeCicco 2001).

From 2008 to 2014, the Division of Sport Fish conducted additional studies on sheefish in the Kobuk River, using radiotelemetry to document their spawning locations, describe the timing of upstream and downstream spawning migrations, and estimate their spawning frequency. The mean date of upstream passage ranged from late August to early September, and the mean date of downstream passage ranged from late September to early October. Sheefish were shown to exhibit several spawning strategies, but roughly a third each of males and females spawned at least every other year (Savereide and Huang 2016).

DOLLY VARDEN

Dolly Varden are distributed throughout Norton Sound, Port Clarence, Kotzebue, and Arctic Districts. Although taxonomists have disagreed on distinguishing Dolly Varden characteristics and distribution of Arctic char and Dolly Varden, most now agree char in this area are the northern form of Dolly Varden. To eliminate confusion, in this report these fish are referred to as Dolly Varden, the common name for this species complex; however, locally they are called trout.

Spawning Areas and Timing

Dolly Varden in northwest Alaska are primarily nonconsecutive spawners. They spawn throughout late summer and fall in almost all Norton Sound drainages, some northern Seward Peninsula rivers, and the major Kotzebue Sound and Chukchi Sea drainages. Fry emerge in spring and migrate to the ocean during early summer after spending from 1 to 6 (generally 2–5) years in freshwater. Movements of Norton Sound Dolly Varden coincide with salmon. In spring, following a large pink salmon run, Dolly Varden probably remain longer in streams to feed on abundant outmigrating fry. Also, they are sometimes present in streams during summer to feed on salmon eggs, especially during years of high pink salmon abundance.

Because Dolly Varden are a late-maturing fish (generally age 6–7), they are susceptible to overfishing by commercial, subsistence, and/or sport fisheries. Consequently, commercial fisheries have been maintained at low levels or prohibited to both reduce potential overharvest and provide for reproductive needs and subsistence uses.

Subsistence Fishery Overview

Dolly Varden is an important component in the diet of subsistence users in Norton Sound–Kotzebue Sound and Arctic areas. In some communities, they outrank salmon and whitefish in importance to subsistence; however, most of the Dolly Varden harvest in Norton Sound District is reported as incidental catch in subsistence salmon nets. Dolly Varden are harvested with seines in fall, hook and line through ice in winter, and gillnets in spring. The fall seine fishery contributes the greatest number of fish to annual subsistence Dolly Varden harvest.

In Kotzebue District, fall seine fishing is a group effort with several households making up a fishing group. Catch is stored and allowed to freeze in willow cribs located near the seining site. These fish are used throughout the winter by the fishing group. Most Dolly Varden harvests take place before or just after freeze-up. Fishery participants from Noatak usually fish before freeze-up, but residents of Kobuk River villages of Shungnak and Noorvik fish for Dolly Varden throughout the winter. Since 1991, subsistence catch of Dolly Varden in Noatak has ranged from almost 3,000 to over 11,000 fish (Appendix F5). However, these harvests should be considered minimal figures because of survey timing. Except for 2007, no Kivalina Dolly Varden harvest surveys have been conducted during the last 25 years. From 2012 to 2014, a comprehensive subsistence survey for fish and wildlife harvests was collected from 6–9 Kotzebue area villages by the Division of Subsistence, but not since then.

In the Arctic District, fishery harvest studies by ADF&G's Division of Subsistence noted that annual community catches of Dolly Varden in Kaktovik (Pedersen and Linn 2005) and Anaktuvuk Pass (Pedersen and Hugo 2005) produced annual catches of "char" (a mix of Arctic char and Dolly Varden).

Commercial Fishery Overview

Dolly Varden generally appear in commercial catches beginning the last 3 weeks of August and are taken as a nontarget species in the Kotzebue Sound commercial chum salmon fishery. In 1976, regulations closed the commercial chum salmon fishery on August 31 and thus reduced harvest of Dolly Varden. Spawning and overwintering Dolly Varden usually pass through the area during September but typically begin migration along the northern shore of Kotzebue Sound during the third week of August. Reported Dolly Varden sales are dependent upon available markets. The typical season catch, when buyers are purchasing Dolly Varden throughout August, is approximately 1,000 to 3,000 fish. However, limited markets in the 2000s have resulted in fewer than 200 Dolly Varden reported sold each year in Kotzebue Sound, and none sold since 2005 because the buyer no longer purchases Dolly Varden (Appendix F4). Regardless of sales, Dolly Varden catches are still required to be reported on fish tickets. According to these fish tickets, during the 2011–2012 season, 3 commercial fishery participants caught and sold 903 pounds of Dolly Varden to the fish plant in Nome as bait. The following year, 4 commercial fishery participants sold 2,256 pounds for bait. These were the only recorded sales of Dolly Varden in Norton Sound in the last 10 years except for 2016, but only 1 fishery participant made any deliveries and therefore catch information is confidential.

Sport Fishery Overview

The drainages of Kotzebue Sound and the Chukchi Sea are known for the large size of anadromous Dolly Varden, but Kotzebue area residents and nonlocals boating on Kobuk and Noatak Rivers are the primary participants in this area's Dolly Varden sport fishery. Both Noatak and Kobuk Rivers are National Wild and Scenic Rivers with headwaters included in Gates of the Arctic National Park. However, the Wulik River is probably the most important Dolly Varden stream in northwestern Alaska. The 90-mile Wulik River is known for the largest and most abundant Dolly Varden populations. Located approximately 90 miles north of Kotzebue, Wulik River flows into the Chukchi Sea through Kivalina Lagoon near the village of Kivalina and is estimated to have over 100,000 overwintering Dolly Varden annually.

Sport fishing effort has been consistently low, which is probably due to the remote location and difficult access of fishing sites (Scanlon 2017). Dolly Varden sport fish harvests in the last 10 years in Norton Sound averaged 1,500 fish annually but was less than half that number in the Kotzebue/Chukchi Sea areas (Appendix F3).

Historical Escapement

Since 1990, aerial survey counts of overwintering Dolly Varden on the Wulik River have ranged from over 144,000 fish in 1993 to 1,500 fish in 2003 (Appendix F7). Weather and water conditions have precluded flying aerial surveys during many years. Weather permitting, the Division of Sport Fish conducts aerial surveys of Noatak River spawning grounds in summer, and Kivalina and Wulik Rivers overwintering areas in fall. Since 2000, however, only Wulik River has been surveyed.

WHITEFISH

Although sheefish belong to the whitefish family, this section deals with several smaller species of genera *Coregonus* and *Prosopium*. Genus *Coregonus* contains "broad" *C. nasus* and "humpback" *C. pidschian* whitefish. In addition, 3 whitefish species known as "ciscoes" belong to these genera: least cisco *C. sardinella*, Arctic cisco *C. autumnalis*, and Bering cisco *C. laurettae*. "Round" whitefish *Prosopium cylindraceus* are the sole representatives of genus Prosopium in this area.

Spawning Areas and Timing

Whitefish occur throughout most bodies of fresh water in the Norton Sound, Port Clarence, Kotzebue, and Arctic Districts and can also be found at various times of year in inshore marine waters. Several whitefish species spawn in freshwater from late August to October when lakes and streams are close to freezing.

Subsistence Fishery Overview

Whitefish are important for subsistence use and taken mainly by beach seine or set gillnets. Catches are usually dried and used for human consumption or dog food. In some areas, fish are "gutted" and dried early in summer, but later in summer, fish are filleted and dried with eggs and viscera intact.

Subsistence catch enumeration is difficult because fish are not counted individually but by "tubs," "bags," "strings," or other estimators of gross abundance. Additionally, many fish are dried and consumed or stored in caches before the survey period. Reported subsistence harvests

were generally the result of a limited and sporadic survey effort and should be regarded as minimum values and not comparable from year to year. In 1997, subsistence harvests of whitefish were included for the first time in Division of Subsistence household salmon harvest surveys in Kotzebue Sound villages (Appendix F8).

The relative importance of whitefish is higher in Kotzebue District than in many areas of Alaska (Georgette and Shiedt 2005). Average subsistence harvests of whitefish estimated for the village of Noatak and the 5 Kobuk River villages combined from 2012–2014, the last 3 years for which information is available, was 74,000 fish (Appendix F8). Harvest numbers are considered minimal and are not comparable year to year.

Commercial Fishery Overview

Limited commercial whitefish harvests have been allowed since statehood, normally under auspices of a permit that delineates harvest levels, open areas, legal gear, etc. Commercial whitefish fisheries were generally limited to large open-water areas (e.g., Grantley Harbor in Port Clarence District) or ocean waters. Beach seines were stipulated as legal gear in some instances to reduce the number of incidental species taken. Little comparative commercial catch and effort data were recorded, but harvest levels were historically low. Most commercial catches were made in Golovnin Bay in Norton Sound District, in Kuzitrin River in Port Clarence District, and in Hotham Inlet and Selawik River in Kotzebue District. Fish were sold to local markets for human consumption, dog food, or, more recently, crab bait. During the 2006–2007 season 1 local Nome fishery participant, who waived confidentiality, sold just over 3,700 pounds of whitefish. No further whitefish harvests occurred until the 2010–2011 season, and since then just over 4,700 pounds of whitefish have been commercially harvested in 1 season (Appendix F9). No reported harvest has occurred since the 2016–2017 season.

In the Arctic District, a commercial fishery for freshwater finfish has existed in the Colville River delta (located approximately 60 miles west of Prudhoe Bay) since 1964 (Menard et al. 2013). Historically, commercial fishing generally took place during late June and July for broad and humpback whitefish and from October through early December for Arctic and least cisco. However, since 1990, commercial fishing effort has predominantly occurred in October and November for Arctic and least cisco. Set gillnets are used as capture gear, and fishing during fall months occurs under the ice. All fish were harvested with the intent to sell commercially and are reported daily on a catch form. However, not all fish reported on permits for this area were sold. Those fish not commercially sold were retained and used for subsistence purposes. No commercial harvest has been reported since 2007 from the Coville River (Appendix H1).

Sport Fishery Overview

No harvest data are collected in Norton Sound, Port Clarence, or Kotzebue Districts for whitefish.

Historical Escapement

Whitefish escapements have not been monitored in the past, but limited ADF&G observations and interviews with fishery participants do not indicate declining populations.

SAFFRON COD

Saffron cod, or tomcod as they are called locally, are extensively utilized as a subsistence resource in Norton Sound–Port Clarence and Arctic–Kotzebue areas. Tomcod are taken through the ice by jigging, and with gillnets in open water and under the ice.

No extensive commercial fishery on tomcod in Norton Sound–Port Clarence and Arctic–Kotzebue areas has ever occurred, but during the 1980s, a limited commercial fishery occurred in Norton Sound (Menard et al. 2013). According to local commercial fishery participants, these fish were used for dog food, crab bait, and human consumption. In the mid-1990s, NSEDC established markets for several fish species not commercially utilized in the past. The need for crab bait was the primary factor in initiating the saffron cod fishery near Unalakleet. A total of 1,402 pounds of saffron cod were sold during the 1993–1994 season. The NSEDC market was not available the following winter and was probably a factor in the reduced harvest of 52 pounds (Appendix F10). No commercial harvest was reported again until the fall of 2009. Since then, total annual tomcod harvest has ranged from 1,700 pounds to almost 34,000 pounds, all sold to NSSP in Nome for use as crab bait. NSSP would only buy tomcod that were caught through the ice by jigging gear. No reported harvest has occurred since the 2016–2017 season.

Sport Fishery Overview

Sport fisheries for Arctic grayling exist in Norton Sound–Port Clarence and Arctic–Kotzebue areas, but they are relatively small. Average annual sport fish harvests for Arctic grayling in the last 5 years were roughly 400 fish in both Norton Sound and Kotzebue Districts. In Norton Sound, average Arctic grayling sport fish harvests for the last 10 years are roughly a third of that of Dolly Varden, but in Kotzebue District, average Arctic grayling sport fish harvests for the last 10 years is almost two-thirds that of Dolly Varden (Appendix F3).

CAPELIN

Commercial Fishery Overview

No reported commercial fishery has occurred for capelin *Mallotus villosus*, although there are substantial stocks in northern Norton Sound (Pahlke 1985).

Subsistence Fishery Overview

Because no subsistence permit for capelin is required, accurate harvests of capelin are not reported or documented. Capelin spawning events occurring on Nome beaches are incidentally reported to ADF&G by Nome residents or observed by ADF&G employees. Tracking these reported sightings did not start until 2013. Starting that year, capelin have been sighted nearshore of Nome or spawning on beaches of Nome as early as early June and as late as July 19 (Appendix F11). Many residents harvest capelin with various gear types, such as nets, buckets, plastic bags, and shovels.

OTHER FINFISH SPECIES

Other finfish species taken for subsistence in Norton Sound, Port Clarence, Kotzebue, and Arctic areas include capelin, rainbow smelt (boreal smelt), northern pike, starry flounder, yellow fin sole, Arctic flounder, Alaska plaice, Arctic grayling, burbot, blackfish, and halibut (Appendix G1).

Subsistence Fishery Overview

Subsistence utilization of these species has been documented, although effort and catch vary widely in scale and importance with locality. Some species are important to the subsistence community in certain localities during specific seasons of the year. In Nome Subdistrict, both Nome and Solomon Rivers were closed to subsistence fishing for Arctic grayling in 2001 when abundance was determined to be low.

Commercial Fishery Overview

Burbot, or freshwater cod, have been commercially sold sporadically in the past in Kotzebue, Port Clarence, and Norton Sound Districts under commercial permits.

SECTION 2: SALMON FISHERIES

2019 NORTON SOUND SALMON FISHERY

COMMERCIAL FISHERY SEASON SUMMARY

Well above average runs of chum, pink, sockeye, and coho salmon highlighted the 2019 fishery. The coho salmon commercial harvest was the fourth highest in history and was a Top 5 harvest for the third year in a row, and the chum salmon commercial harvest was the third highest in the last 35 years (Appendix A14; Menard et al. 2013). The sockeye salmon commercial harvest, although a small portion of the overall harvest, was a record with over 7,200 fish caught. The pink salmon run was one of the greatest runs for an odd-numbered year, and pink salmon escapements were records at several salmon counting projects. However, there was minimal interest from the only buyer in purchasing pink salmon. No commercial fishing targeting Chinook salmon was allowed, but the run was much better than expected and the harvest of nearly 1,400 fish was the highest in 20 years.

The commercial fishery season started on June 17 in Subdistricts 1–4 (Nome, Golovin, Elim, and Koyuk), with a 24-hour fishing period, and on July 1 in Subdistricts 5 and 6 (Shaktoolik and Unalakleet), with a 48-hour fishing period, all targeting chum salmon. Above-average catches of chum salmon occurred in all subdistricts except in Subdistrict 4. High water delayed escapement counting projects throughout Norton Sound so ADF&G used harvest-based management by comparing catches with previous years to determine additional openings. In July, most projects became operational to provide escapement data. In the first week of August, coho salmon catches and escapements indicated a well-above-average run except for Subdistrict 4, which continued to have poor catches and then little interest in further fishing by permit holders.

Total Norton Sound commercial salmon harvest was 1,390 Chinook, 76,408 pink, 157,938 chum, 139,837 coho, and 7,013 sockeye salmon (Table 1), and did not include 167 Chinook, 608 pink, 536 chum, 77 coho, and 190 sockeye salmon kept for personal use. The combined commercial (including personal use) harvest of all salmon species (384,164 fish) ranked third highest since 1998 in Norton Sound. The number of commercial permits fished in 2019 (145) was 4 fewer than last year and was the second highest since 1993 (Appendix A2). The 2019 fishery value to the permit holders of $2,078,034 was the third year in a row that the value exceeded $2 million and the ninth year in 10 years that the value exceeded $1 million (Appendix A3). Before 2010 the only time the fishery value exceeded $1 million was in 1982 (Menard et al. 2013).

The coho salmon catch of over 139,800 fish, although the fourth highest on record, was a little more than half of last year's record catch of just over 260,500 fish (Appendix A1; Menard et al. 2013). The chum salmon catch of over 157,900 fish also was down from last year's second-highest catch in history of over 237,800 fish but was still the third highest in the last 35 years.

Average dock prices per pound in 2019 were $3.00 for Chinook, $0.13 for pink, $0.50 for chum, $1.39 for sockeye, and $1.57 for coho salmon (Appendix A4). Pink salmon prices were down $0.12 and chum prices were down $0.30 from their average per pound prices last year. Average commercial weights by species were 10.8 pounds for Chinook, 3.4 pounds for pink, 6.7 pounds for chum, 6.0 pounds for sockeye, and 6.4 pounds for coho salmon (Appendix A5).

Only 1 salmon buyer operated in Norton Sound during the 2019 season. The Unalakleet fish plant operated by NSSP was the base of commercial fisheries operations. Salmon were both delivered to the Unalakleet dock and tendered from Subdistricts 2–5. Subdistrict 1 catch was delivered to the Nome plant by the permit holders, and some catches from Subdistricts 2 and 3 were also processed in Nome. The floating processor *Pavlof* was also anchored offshore of Elim, processing and freezing salmon delivered by tenders.

SUBSISTENCE FISHERY SEASON SUMMARY

Subsistence salmon fishery participants in Port Clarence District and Subdistricts 1–3 (Nome, Golovin, and Elim) were required to possess a subsistence permit for each household that fished in these locations. Like the last several years, the return rate in 2019 was close to 100% (Table 2). Subsistence catches in 2019 in northern Norton Sound were below recent 5-year averages, but those averages were taken from catches that were some of the highest in over 10 years (Appendices A6–A8). The Port Clarence District total subsistence catch was similar to recent years (Appendix B3).

In southern Norton Sound, in 2019, postseason household surveys were conducted in Koyuk, Shaktoolik, and Unalakleet, and attempts were made to contact 100% of the households. For Koyuk, the total amount of subsistence harvest was above the recent 5-year average, but for Shaktoolik, it was slightly below, and for Unalakleet, it was almost 25% below the recent 5-year average (Appendices A9–A11).

In Norton Sound District, only certain rivers in Subdistrict 1 (Nome) have subsistence salmon harvest limits, in place since 1985. In 2019, an above-average chum salmon run was forecasted for Subdistrict 1, and it was not closed to salmon fishing in mid-June for the 14th year in a row.

Regulations allow for cash sales of up to $500 worth of subsistence-taken finfish per household. In 2019, there was a total of 9 customary trade permits issued in Norton Sound and Port Clarence Districts. Cash sales of $1,390 were recorded in 2019 for both Norton Sound and Port Clarence Districts combined (Appendix A34).

SEASON SUMMARY BY SUBDISTRICT

Nome–Norton Sound Subdistrict 1

In Subdistrict 1, 2019 chum salmon run abundance was projected to achieve escapement goal ranges and the amounts necessary for subsistence range of 3,430–5,716 fish. As such, a Tier II fishery was not implemented in 2019. There has not been a Tier II fishery or Tier II subsistence fishing restrictions implemented since 2005.

The chum salmon escapement goal range for the Eldorado River, which is east of Cape Nome, is double the combined escapement goal range of the Nome and Snake Rivers, both of which are west of Cape Nome, highlighting the disparity in river productivity within the subdistrict. In the last 10 years, the Eldorado River has exceeded the chum salmon escapement goal range every year, and the Nome and Snake Rivers have exceeded their escapement goal ranges every year in 8 of the last 10 years (Table 3; Appendices A21, A22, and A26). (Note that, in 2019, the high end of the escapement goal ranges increased from 9,200 to 14,200 for Eldorado River; from 4,300 to 5,300 for Nome River; and from 2,500 to 4,200 for Snake River.) Although chum salmon runs are greater east of Cape Nome (Appendix A32), for pink salmon the run strength is much greater west of Cape Nome (Appendix A33). Both the Nome and Sinuk Rivers have much

larger runs of pink salmon, particularly in even-numbered years, compared to rivers east of Cape Nome. Nome River has the only pink salmon escapement goal (3,200 in an odd-numbered year) in Subdistrict 1, and in 2019 had the greatest pink salmon escapement of any river in the subdistrict with over 656,000 fish counted through the Nome River weir, and probably would have exceeded the previous odd-year record of nearly 718,000 fish counted in 2017 if the weir had been operational during most of August (Appendix A26). No coho salmon escapement goals have been established in Subdistrict 1. Recent years' escapements in the Nome and Snake Rivers were comparable to the 2000s—reliable escapement estimates with no large-scale flooding events—but in 2019 flooding prevented accurate coho salmon escapement counts.

Since the mid-1990s, 2019 was the seventh consecutive season that commercial fishing was allowed in Nome Subdistrict. There were 7 permit holders that fished this year, tied with the previous year for the most since fishing resumed in 2013, but the effort was less than any other district (Appendix A2). Permit holders fished during 16 of the 18 fishing periods, foregoing fishing during period 13 and the last fishing period of the year (Table 4). Total commercial harvest including personal use was 42 Chinook, 816 sockeye, 7,832 coho, 4,941 pink, and 15,274 chum salmon (Appendix A6). The sockeye salmon harvest was a record, and the coho salmon harvest was the second highest on record, only trailing last year's harvest of 9,080 fish (Appendix A6). The chum salmon harvest was the third highest in history (Menard et al. 2013).

In recent years, subsistence fishing time was liberalized in Nome Subdistrict by increasing marine gillnet fishing time from 3 days to 5 days a week west of Cape Nome and 7 days a week east of Cape Nome. Also, freshwater gillnet fishing time was increased from 4 days to 5 days a week. In 2019, the chum salmon run to Nome Subdistrict was again a strong run allowing for commercial fishing from June through July. However, the chum salmon subsistence catch was one of the lowest, except during years of subsistence closures, catch limits, or Tier II fishing restrictions. Weather was not an issue for preventing fishing. Possible explanations for the low chum salmon catch include subsistence permit holders harvesting another large run of sockeye salmon from Pilgrim River, or another big Nome Subdistrict odd-year pink salmon run resulting in less gillnet fishing for chum salmon because nets were being plugged with pink salmon. Although the coho salmon run to Nome Subdistrict occurs 1 month later and is much smaller than the chum salmon run, the subsistence harvest of coho salmon was the third highest since 2008 and was over 5 times the chum salmon subsistence harvest. Like 2018, the pink salmon subsistence harvest was over 8 times the chum salmon harvest (Appendix A6).

For over 40 years subsistence salmon permits have been required for the Nome Subdistrict, and during the 2019 season 560 permits were issued. Of the 560 permits issued, 559 were returned (Table 2). Reported subsistence harvest was 14 Chinook, 629 chum, 5,351 pink, 3,389 coho, and 366 sockeye salmon (Appendix A6).

Golovin–Norton Sound Subdistrict 2

The Subdistrict 2 regulatory salmon management plan limits commercial harvest to a maximum of 15,000 chum salmon before mid-July to protect chum salmon stocks and allow for some harvest while flesh quality is at its best. By mid-July, the chum salmon run can be assessed and fishing time adjusted accordingly. The counting tower project on the Niukluk River was used to evaluate escapement in the Golovin Subdistrict from 1995 to 2012, but the project was discontinued in 2013. The Niukluk River is a tributary of Fish River, a major salmon-producing

river in the Golovin Subdistrict. Telemetry studies in the early 2000s showed an average of 33% of the chum salmon in the Fish River drainage pass the Niukluk River tower (Todd et al. 2005).

There was no commercial chum salmon fishing in Golovin Subdistrict in the mid-2000s, largely because escapements, in most of those years, had fallen short of the lower-bound SEG of greater than 30,000 fish for the Niukluk River (Appendix A24). Consequently, ADF&G has implemented a conservative approach to determine when commercial fishing may occur. In 2014, a new counting tower project was initiated by NSEDC on the Fish River, and in 2019, operation of this tower did not begin until July 20 due to high water, and counting only lasted 7 days. The daily pink salmon passage on July 24 (257,184 fish) and July 25 (209,676 fish) were the highest days in project history, and the cumulative count of coho salmon (3,150 fish) through July 25 was the highest on record. The aerial survey escapement goal range for Niukluk River and Ophir Creek is 750–1,600 coho salmon, but the aerial survey was not completed in 2019 because of high water.

The commercial fishing season began with two 24-hour fishing periods starting June 17 followed by 48-hour fishing periods throughout the season (Table 5). Four 48-hour fishing periods were extended to allow for additional fishing time because of weather. The last 2 fishing periods of the season were 96-hour openings in September, but due to lack of tender service at that time no effort occurred. Total commercial catch including personal use was 33 Chinook, 122 sockeye, 2,426 coho, 7,412 pink, and 25,598 chum salmon caught by 18 permit holders (Table 5; Appendix A7). The chum salmon commercial harvest was the highest harvest since the mid-1980s (Menard et al. 2013), and coho salmon commercial harvest was above the 5-year average and was the eighth highest since 1994.

This was the 16th year that subsistence salmon permits were required in Golovin Subdistrict and all 202 permits issued were returned (Table 2). Subsistence fishing was allowed 7 days a week with no catch limits throughout the season. Reported harvest was 39 Chinook, 9 sockeye, 1,277 coho, 5,174 pink, and 375 chum salmon (Appendix A7). The total number of salmon reported harvested (6,874) was below both the 5- and 10-year averages and was the fourth lowest in 20 years. Even though chum salmon had a good run, the reported subsistence harvest was less than a third of the 5-year average, and harvest of sockeye salmon was less than one-sixth of the 5-year average.

Elim–Norton Sound Subdistrict 3

The Subdistrict 3 management plan directs ADF&G to project that chum salmon escapement goals will be reached and ensure that harvestable surpluses will be in excess of subsistence needs before directed chum or pink salmon commercial fishing is allowed. Further, in times of low chum salmon abundance, directed pink salmon commercial fishing may not occur before July 7. By this date, historical data indicate that the bulk of the chum salmon run is in river, and commercial pink salmon fishing would be expected to have little impact on chum salmon escapement or subsistence needs.

In 2019, escapement past the Kwiniuk tower was 122 Chinook, 15 sockeye, 21,363 chum, 808,156 pink, and 5,649 coho salmon. Chinook salmon passage was below the escapement goal of 250 fish for the fourth year in a row, but the chum salmon passage was within the escapement goal range of 11,500–23,000 fish. Pink salmon escapement was highest in the last 20 years for an odd year, but coho salmon escapement was only a third of 2018 (Appendix A23). Counting at the Kwiniuk River tower has only extended into coho salmon season starting in 2001.

The Elim Subdistrict commercial fishing schedule was the same as the Golovin Subdistrict, with less additional fishing time in the final month of the season due to higher participation in the Elim Subdistrict than in the Golovin Subdistrict. Total commercial catch including personal use was 121 Chinook, 724 sockeye, 11,450 coho, 14,911 pink, and 13,803 chum salmon caught by 27 permit holders (Table 6; Appendix A8). The pink salmon run was well above average but there were no directed pink salmon fishing periods. The chum salmon run was well above average, and the commercial harvest was the sixth highest in the last 30 years (Menard et al. 2013). The coho salmon run was a good run again and the commercial harvest was the sixth highest on record but below the recent 5-year average when there were record harvests.

There were 51 subsistence salmon permits issued for Elim Subdistrict in 2019 and 50 were returned. The number of salmon reported harvested (4,613) was less than two-thirds the 5-year average. Estimated subsistence harvests by species were 105 Chinook, 20 sockeye, 853 coho, 3,065 pink, and 570 chum salmon (Appendix A8). Reported subsistence harvests were well below average for all species.

Norton Bay–Norton Sound Subdistrict 4

Until recently, due to a lack of ground-based escapement projects, Norton Bay Subdistrict has typically been managed based on Shaktoolik and Unalakleet Subdistricts' salmon run assessments. However, in 2011, an enumeration tower project was initiated by NSEDC on the Inglutalik River to provide an index of salmon escapement to Norton Bay. In most years high water prevents operating the tower project during coho salmon season; this was the case for the 2019 season as high water made the tower inoperable after August 2. The project started operations on June 19 in 2019, the third earliest date for the tower to be operational (Appendix A29). Escapements counts, which should be considered minimal, were 172 Chinook, 24,624 chum, 209,025 pink, 48 sockeye, and 918 coho salmon. All counts, except for pink salmon, were below average in 2019 based on its operation since 2011. Currently, the Inglutalik River escapement counts are considered ancillary to comparative catch statistics for inseason management until a longer time series of escapement data becomes established.

In 2008, a small-scale commercial salmon fishery occurred in Norton Bay Subdistrict for the first time since 1997, and until 2011, 4–7 permit holders participated each season. Participation was limited due to a combination of reasons, particularly in 2010: inadequate tendering capacity, mechanical breakdowns on tender vessels, and reduced fishery effort probably due to concurrent fisheries prosecuted in the Elim and Shaktoolik Subdistricts. However, in 2011, effort increased to 12 permit holders and since then, there have been up to 20 permit holders fishing in Norton Bay Subdistrict each year (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome).

In 2019, the Norton Bay Subdistrict commercial fishing schedule was the same as the Elim Subdistrict, but fishing effort was sporadic throughout the season. Total commercial catch by species for Norton Bay Subdistrict including personal use was 8 Chinook, 106 sockeye, 199 coho, 1,320 pink, and 1,982 chum salmon caught by 9 permit holders (Table 7; Appendix A9). All harvests were well below average, with the total harvest a fifth of 2018. Both the chum and coho salmon commercial harvests were the lowest in the last 10 years. There was extreme flooding in Subdistrict 4 rivers in July and August of 2014 as well as flooding in the summer of 2015, which may have been contributing factors to the poor returns from that parent year.

To protect Chinook salmon, ADF&G restricted subsistence fishing in Norton Bay Subdistrict to two 36-hour fishing periods a week during the month of June. The first fishing period each week had a restriction of 6.0 inches or smaller mesh size and the second period had no mesh size restrictions.

This was the 11th consecutive year that household subsistence salmon surveys were conducted in the village of Koyuk. In 2019, 41 households were successfully contacted out of a possible 86. Results from these households were expanded to estimate harvests by species, gear type, and location (e.g., Inglutalik River, Ungalik River, Koyuk River, Mukluktulik River, and marine waters) for those households not surveyed. An estimated 16 Chinook, 135 sockeye, 1,544 coho, 4,466 pink, and 2,306 chum salmon were reported as subsistence harvest in Norton Bay Subdistrict in 2019, with the total amount above both the 5- and 10-year averages (Appendix A9).

Shaktoolik and Unalakleet–Norton Sound Subdistricts 5 and 6

In Shaktoolik and Unalakleet Subdistricts, where management actions are usually the same for both subdistricts, commercial fishing is typically only allowed after Chinook salmon have been observed in increasing numbers in subsistence fishing nets and ADF&G is confident the midpoint of the Chinook salmon escapement goal range of 1,200–2,600 fish will be reached at the North River counting tower; otherwise, no commercial gillnet fishing periods are allowed for any species until after June 30.

Observations during the season indicated that the Unalakleet River was once again the river that had the most fishing effort out of Subdistricts 5 and 6, the Unalakleet and Shaktoolik Subdistricts. The Unalakleet River weir had its highest Chinook salmon escapement count on record, almost double the previous record set in 2018, but most salmon counting projects within Subdistricts 5 and 6 had below-average chum salmon escapement counts (Appendices A30 and A31). North River had a near-record pink salmon escapement count, but coho salmon escapement counts were difficult to assess because flooding events prevented counting.

Directed commercial Chinook salmon fishing has occurred in only 2 of the previous 18 years in these 2 subdistricts, and none since 2005. Restrictive action was also taken in the subsistence and sport fisheries from 2003 to 2004 and since 2006. Because the 2019 forecast was for a below-average run of Chinook salmon, commercial fishing targeting chum salmon did not begin until July 1 with a 48-hour fishing period, and all fishing periods throughout the season occurred concurrently in both subdistricts. Chum salmon escapement counts, commercial harvest statistics, and robust Chinook escapement counts at the Unalakleet River weir, North River counting tower, and Shaktoolik River counting tower allowed ADF&G to be more liberal in scheduling fishing time. Therefore, two 48-hour fishing periods were scheduled per week in July, with 2 periods extended to 72 hours and 120 hours. Record coho salmon escapement and commercial harvest allowed for 48-hour fishing periods in August. Because there were no buyer staff or capacity concerns in August, 2 fishing periods were extended to 72 hours. Continued above-average coho salmon escapement counts allowed for two 96-hour fishing periods in September (Tables 8 and 9).

Commercial catch for chum salmon for both the Shaktoolik and Unalakleet Subdistricts was third highest on record with 42,827 fish caught in Shaktoolik Subdistrict and 58,990 fish caught in Unalakleet Subdistrict (Appendices A10 and A11; Menard et al. 2013). Coho salmon commercial harvest was half compared to 2018 for both subdistricts but well within the 5- and 10-year averages. Although an incidental catch, the sockeye salmon harvest was the highest on record in

both subdistricts, with 1,995 fish caught in Shaktoolik and 3,440 fish caught in Unalakleet. The number of permit holders in 2019 was 36 for Shaktoolik Subdistrict (Table 8) and 77 for Unalakleet Subdistrict (Table 9).

Due to the below-average run of Chinook salmon forecast for 2019, there were initial restrictions on subsistence fishing. However, a more improved Chinook salmon run than forecasted allowed the regular subsistence fishing schedules to occur starting July 1. In previous years subsistence fishing restrictions had remained until mid-July.

Both the Shaktoolik and Unalakleet Subdistricts' subsistence Chinook salmon catch was double, or nearly double, that of 2018, and both catches were well above the 5- and 10-year averages for their respective subdistricts (Appendices A10 and A11).

ESCAPEMENT

Table 3 summarizes escapement assessments for the major index river systems of Norton Sound and Port Clarence Districts in 2019. Appendices A21–A31 present passage numbers for Chinook, chum, coho, pink, and sockeye salmon at various enumeration projects in Norton Sound. Aerial survey assessments are indices and relative to historical escapement sizes.

Escapement projects in Norton Sound include counting towers on North, Inglutalik, Fish, and Kwiniuk Rivers; a sonar/tower on Shaktoolik River; and weirs on Unalakleet, Snake, Nome, Solomon, Eldorado, Bonanza, and Pilgrim Rivers.

Escapement project operations were a result of multiple collaborators, including ADF&G, NSEDC, and the Native Village of Unalakleet. All projects supplied important daily information to ADF&G that was very useful for management of local salmon resources and will become more important the longer they operate. Funding sources for projects come from U.S. Fish and Wildlife Service Office of Subsistence Management, NSEDC, and ADF&G.

High water created delays of several weeks at most projects and knocked out projects for most of August, so only partial escapement counts were obtained in 2019. High water also prevented most aerial surveys in 2019. As usual, the Nome Subdistrict streams received the most intensive assessment efforts because salmon stocks local to the Nome area are easily accessed by the road system and are exposed to intensive subsistence and sport fishing pressure.

Chinook Salmon

The 2019 Chinook salmon run was much better than forecasted. Subsistence fishing restrictions were in effect in June in southern Norton Sound, limiting fishing time and restricting gear to 6 inches or smaller mesh size. Restrictions were lifted in July when escapement counts were much better than expected.

The North River count of 3,315 Chinook salmon was a record (Appendix A30) in the 25-year project history, and the Unalakleet River count (6,641 fish) was also a record in the 10-year project history (Appendix A31).

The escapement goal of 250 Chinook salmon at Kwiniuk River counting tower was not reached for the fourth year in a row; only 122 fish were counted (Appendix 23).

Chum Salmon

Chum salmon escapement goal ranges were reached or exceeded in all rivers where escapement could be enumerated. Because of a lack of aircraft during certain times in 2019, not all rivers were surveyed, but based on commercial and subsistence catches and reports of chum salmon in the rivers from residents, there were no concerns with chum salmon escapement.

Subdistrict 1 chum salmon escapement was again reached at the 3 rivers with escapement goal ranges. The Eldorado River escapement of 28,427 chum salmon was well above the escapement goal range of 4,400 to 14,200 fish (Table 3). Despite limited counting the Nome River was above its escapement goal range, and Snake River was within its goal range.

Escapement at Kwiniuk River tower was 21,363 chum salmon (Appendix A23), which was within the escapement goal range of 9,100–32,600 fish despite a 2-week delay before counting began because of high water at the start of the season.

In southern Norton Sound the Inglutalik River had the lowest cumulative count of chum salmon (24,624 fish) in the 9-year project history (Appendix A29), and the North River tower count of 11,223 chum salmon was less than half of the 2018 count (Appendix A30). The Inglutalik River's low count of chum salmon may have been the result of poor survival because of the catastrophic flooding that occurred in 2014 and less extreme flooding in 2015.

Coho Salmon

Coho salmon are found in nearly all the chum salmon-producing streams throughout Norton Sound, with the primary commercial contributors being the Unalakleet and Shaktoolik Rivers. Because inclement weather is normally experienced in this area during August and September, escapement data can be somewhat incomplete. Streams in the northern subdistricts of Norton Sound are typically surveyed.

The 2019 coho salmon run continued the streak of well-above-average runs in recent years. Catches were above average but flooding in August and September made it impossible to get accurate escapement counts at many projects.

There are 3 aerial survey goals in Norton Sound. Niukluk River and Ophir Creek have an aerial survey escapement goal range of 750–1,600 coho salmon. Kwiniuk River has an aerial survey escapement goal range of 650–1,300 coho salmon, and North River has an aerial survey goal range of 550–1,100 coho salmon (Table 3). No aerial surveys were flown in 2019, but escapement goals were believed to have been reached based on tower counts. The Fish River tower downstream of Niukluk River was operational for only 7 days because of high water, but when the project was terminated after July 26, the 3,366 coho salmon counted by July 26 was the highest cumulative count for that date in the 6-year project history (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). The Kwiniuk River counting tower had a count of 5,649 coho salmon but counting was limited by flooding in early August and the project was pulled in early September because of high water (Appendix A23). The North River counting tower also had limited counting operations because of high water. The last day of counting was on August 1, with a cumulative count of 1,533 coho salmon, which was above average for that date (Appendix A30).

Pink Salmon

For over 30 years pink salmon returns to Norton Sound have followed an odd- and even-year cycle with the even-numbered year returns typically much higher in number than the odd-numbered years. There are 3 pink salmon escapement goals in Norton Sound and those goals, at Kwiniuk (8,400), Nome (3,200), and North (25,000) Rivers, were all easily exceeded in 2019 (Table 3), and there were also record escapements for an odd-numbered year for several rivers. The Snake River pink salmon count of 101,151 was nearly 5 times the previous record count set in 2017 even though counting started 2 weeks later than normal because of high water (Appendix A22). The Nome River pink salmon count of 656,033 fish was second to the 717,770 pink salmon counted in 2017 and would probably have been a record for an odd-numbered year if the project had been able to count during the month of August (Appendix A26). The Kwiniuk River pink salmon count of 808,156 was a record (Appendix A23) for an odd-numbered year since counting began in 1965 (Menard et al. 2013). The North River pink salmon count of 2,070,267 fish was a record and, if counting had not been suspended in early August because of high water, would have probably exceeded the record even-numbered year count of 2,169,890 fish in 2006 (Appendix A30).

Sockeye Salmon

Sockeye salmon are typically found in small numbers throughout the Norton Sound District with the largest spawning stock at Glacial Lake, where 1,000 to 2,000 sockeye salmon usually return to spawn each year. However, large runs from 5,000 to over 10,000 sockeye salmon have occurred in the mid-2000s and in 2015 through Glacial Lake weir (Appendix A28), which was operated from 2000 to 2015. In 2019, the aerial survey escapement goal range of 800–1,600 at Glacial Lake was easily exceeded with a count of 5,175 sockeye salmon (Table 3).

ENFORCEMENT

Fishing regulations are primarily enforced by the Department of Public Safety, Alaska Wildlife Troopers (AWT). One AWT officer provided enforcement for the Norton Sound–Port Clarence Area in 2019. In addition, Nome ADF&G Division of Commercial Fisheries has 5 deputized staff with the ability to issue citations.

2020 NORTON SOUND SALMON OUTLOOK

Salmon outlooks and harvest projections for the 2020 salmon season are based on qualitative assessments of parent-year escapements, sibling relationships, subjective determinations of freshwater overwintering and ocean survival, and, in the case of the commercial fishery, the projections of local market conditions. Continuing the trends seen over the past 3 years, there were high coho and chum salmon harvests; the 2019 commercial coho salmon harvest was the fourth highest on record, and the chum salmon harvest was the third highest harvest since 1983 (Appendix A14; Menard et al. 2013). ADF&G expects better coho and chum salmon runs in 2020 and an improved Chinook salmon run. The regular subsistence fishing schedule is expected to be in effect for Chinook salmon with no additional subsistence restrictions. No commercial fishing for Chinook salmon is expected, but incidentally caught Chinook salmon in commercial fisheries will be allowed to be sold. Chum salmon runs are expected to be well above average and the harvest is expected to be 180,000 to 230,000 fish. ADF&G expects the pink salmon run to be well above average for an even-numbered year, but harvest will depend on buyer interest and could range from 25,000 to 75,000 fish. No pink salmon-directed fishing periods are

expected because of buyer interest in more valuable salmon species, so the pink salmon harvest would probably be an incidental harvest only. However, ADF&G does have the authority to increase fishing net aggregate length from 100 fathoms to 200 fathoms if there were a pink salmon-directed fishery. The coho salmon run is expected to be well above average based on ocean survival conditions in recent years, and the commercial harvest is expected to be 200,000 to 250,000 fish. In the Port Clarence District, ADF&G expects the commercial fishery to remain closed because of a lack of buyer interest even though the inriver goal of 30,000 sockeye salmon at Pilgrim River is expected to be reached. Subsistence fishing closures in the Pilgrim River are not expected, but ADF&G will limit sockeye salmon subsistence harvest to 25 fish initially and will increase or waive the limit if the run is similar to the last several years.

2019 PORT CLARENCE SALMON FISHERY

COMMERCIAL FISHERY SEASON SUMMARY

Port Clarence is the salmon district immediately to the northwest of Norton Sound, with a larger run of sockeye salmon than Norton Sound. In 2019, the run at Pilgrim River was probably larger than in 2018 but counting at the floating weir was delayed because of high water. Even with the late project start when nearly one-fourth of the sockeye run had probably passed, the escapement count in 2019 was the fourth largest since the record runs of the mid-2000s (Appendix B2). However, because there was no buyer interest, no commercial sockeye salmon fishing occurred in Port Clarence even though end of season subsistence catch reports combined with the Pilgrim River weir count showed that the run well exceeded the 30,000 inriver sockeye salmon threshold for a commercial fishery.

SUBSISTENCE FISHERY SEASON SUMMARY

Salmon Lake, located in Port Clarence District, is drained by Pilgrim River, which is easily accessed by road from Nome. Subsistence fishing permits have been required for Pilgrim River since 1964, and beginning in 2003, the number of permits issued has greatly increased with the record sockeye salmon runs in the mid-2000s. A total of 474 Pilgrim River subsistence permits were issued in 2019, fourth only to 2016 (506), 2018 (500), and 2017 (486; data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). Pilgrim River estimated subsistence harvests by species were 2 Chinook salmon, 72 coho salmon, 65 chum salmon, 8,598 sockeye salmon, and 593 pink salmon (Table 2). The sockeye salmon harvest was 71% of the record harvest of 12,148 sockeye salmon harvested in 2017. For comparison, prior to 2015, the record was 5,556 sockeye salmon harvested in 2006. Most of the Pilgrim River harvest is by seines.

Port Clarence District also has large summer and fall chum salmon runs that are harvested by residents of Teller and Brevig Mission using gillnets in marine waters.

Although permits have been required in the Pilgrim River drainage for over 50 years, 2019 was the 16th year that permits were required throughout Port Clarence District. The number of subsistence salmon permits issued for all waters of Port Clarence District, excluding Pilgrim River and Salmon Lake, was 197 permits (Table 2).

In 2019, there were 5 customary trade permits issued in Port Clarence District. Cash sales of $1,390 were recorded in 2019 for both Norton Sound and Port Clarence Districts combined (Appendix A34).

ESCAPEMENT

In 2019, escapement of chum salmon to the Pilgrim River was the lowest on the last 10 years, probably due to missed counts at the beginning of the run because the weir was installed 2 weeks later than usual (Appendix B2). Escapement of pink salmon to the Pilgrim River was nearly 400,000 fish, which was a record. For sockeye salmon, Salmon Lake spawning populations seldom exceeded 10,000 fish in years prior to 2003, but like Glacial Lake in Norton Sound, record-breaking runs were counted through the Pilgrim River weir in the mid-2000s. In 2019, ADF&G waived subsistence catch limits early in the season, as they had the previous 4 years.

Aerial surveys are not typically flown in Port Clarence District (except for Salmon Lake) because higher priority is assigned to the Nome Subdistrict and surrounding areas where commercial fishing occurs. Since 2010, aerial surveys have shown sockeye salmon returns to Salmon Lake are increasing (Appendix B1). The combined escapement goal range of Salmon Lake and Grand Central River is 4,000–8,000 sockeye salmon by aerial survey, and this year's total count of 35,635 fish exceeded the upper end of the range by over 345% (Table 3; Appendix B1). The combined Salmon Lake and Grand Central River aerial survey escapement goal for sockeye salmon has been reached the last 9 years, but in 3 of those years, subsistence closures were required in Pilgrim River.

ENFORCEMENT

In 2019, 1 AWT officer patrolled Pilgrim River in Port Clarence District.

2020 PORT CLARENCE SALMON OUTLOOK

The guideline harvest range set by the BOF for the Port Clarence commercial sockeye salmon fishery allows for a harvest of up to 10,000 fish. In the Port Clarence District, ADF&G expects the commercial fishery to remain closed due to a lack of buyer interest even though the inriver goal of 30,000 sockeye salmon at Pilgrim River is expected to be reached. Subsistence fishing closures in the Pilgrim River are not expected, but ADF&G will limit sockeye salmon subsistence harvest to 25 fish initially and will increase or waive the limit if the run is like the last several years.

2019 KOTZEBUE SOUND SALMON FISHERY

COMMERCIAL FISHERY SEASON SUMMARY

In 2019, the Kotzebue Sound District commercial salmon fishery had 3 buyers: Copper River Seafoods, Maniilaq Services dba Arctic Circle Wild Salmon, and Pacific Star. Copper River Seafoods and Pacific Star were the major buyers. Maniilaq bought salmon from July 22 until August 9.

The commercial salmon season opened on July 10 and closed by regulation after August 31. Commercial fishing was allowed 6 days a week with no fishing on Saturday. From July 10 through July 12, fishing was open for 10 hours daily; from July 15 through August 2 and from August 16 through August 30, fishing was open for 12 hours daily; from August 4 through August 14, fishing was open for 14 hours daily. During the season, the earliest that fishing opened was at 8:00 AM and the latest that fishing closed was at 10:00 PM. Commercial fishing

periods increased to 14 hours once a floating processor vessel arrived, and restricted fishing time (based on limited airplane cargo capacity to move the fish out of Kotzebue) was eliminated.

In the commercial salmon fishery, gear is limited to setnets with an aggregate of no more than 150 fathoms per permit holder. Setnetters generally operate with 1 end on or near shore, or they may also set in deeper channels from the mud flats farther out from shore. Most gear used in the district is 5.75-inch to 6.0-inch stretch mesh gillnet.

The commercial harvest of 494,593 chum salmon (Appendix C1) was the seventh-highest harvest on record (Menard et al. 2013). Also, 16 Chinook salmon and 29 sockeye salmon were sold. Fish reported in the catch and kept for personal use include 29 chum, 141 Chinook, 447 sockeye, 2,743 pink, and 118 coho salmon; 927 Dolly Varden; 196 sheefish; 10 whitefish; and 1 pike (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). There were probably additional fish kept for personal use that were not reported on fish tickets.

For the fourth straight year, the 2019 harvest exceeded 400,000 chum salmon (Appendix C1). There were 92 permit holders that sold fish in 2019, which was fewer than last year when 95 permit holders sold fish, and was the fifth highest permit holder participation in 25 years. The highest daily fishing effort occurred on July 29 when 57 permit holders fished.

A total of 4,017,629 pounds of chum salmon (average weight 8.1 lb) was sold at an average of $0.39 per pound, slightly less than last year's price of $0.40 per pound (Appendix C2). The total exvessel value was $1,559,260 and was down nearly one-third from last year but was only the fifth time since 1988 that the value was over $1 million (Appendix C3; Menard et al. 2013).

ASL composition was taken from commercial catch samples but was not used to manage the fishery. Most of the chum salmon each year are usually 4- and 5-year-old fish. In 2019, commercial catch samples were 1% age-0.2 fish, 55% age-0.3 fish, 43% age-0.4 fish and 1% age-0.5 fish. There were 28% fewer age-0.3 fish and twice as many age-0.4 fish compared to 2018 (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome).

SUBSISTENCE FISHERY SEASON SUMMARY

Since May of 2015, no subsistence salmon surveys have been conducted in Kotzebue Sound District. In 2019, subsistence harvesters reported high water was affecting their ability to harvest fish in both the Kobuk River and Noatak River.

ESCAPEMENT

Primary fishery management objectives are to provide adequate chum salmon escapement throughout the duration of the commercial fishery to ensure sustainability of the fishery and to provide for subsistence priority. A test fishery conducted on the Kobuk River provides the only inseason escapement index of the Kotzebue Sound District.

This year's test fishery chum salmon CPUE daily cumulative index at the ADF&G test fishery project on Kobuk River near Kiana was 1,509, the third lowest in the last 10 years (Appendix C8), but was the eleventh highest in the 27-year project history (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome).

Kobuk River test fishery catch samples in 2019 were 3% age-0.2 fish, 64% age-0.3 fish, and 33% age-0.4 fish. The percentage of age-0.4 fish was over 4 times that of 2018.

No aerial surveys were conducted in 2019.

ENFORCEMENT

One AWT officer patrolled the Kotzebue Sound District 2019 commercial salmon fishery.

2020 KOTZEBUE SALMON OUTLOOK

The outlook for the 2020 season is based on the parent-year returns and returning age classes observed in the commercial catch samples and in test fishery catch samples from the Kobuk River in 2019. During the 2020 season, the 4-year-old component of the run is expected to be above average based on the 3-year-old return. The 5-year-old component of the run is expected to be above average based on the 4-year-old return last season. The 3-year-old and 6-year-old age classes are much smaller components of the run and are expected to be average (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). The commercial harvest is expected to fall within the range of 450,000 to 650,000 chum salmon.

SECTION 3: PACIFIC HERRING FISHERIES

2019 NORTON SOUND PACIFIC HERRING FISHERY

COMMERCIAL FISHERY SEASON SUMMARY

Sac Roe Fishery

A commercial fishery directed on sac roe did not occur in 2019. Like prior seasons, the absence of a sac roe fishery in 2019 was due to a lack of market interest.

Historical information for the Norton Sound commercial sac roe fishery can be found in Appendix D2 and Menard et al. (2013). Current and other historical information (1990–2019) about this fishery is presented in Appendices D1 and D3.

Spawn-on-Kelp Fishery

There was no market interest expressed in the commercial spawn-on-wild-kelp (*Fucus* sp.) or *Macrocystis* spawn-on-kelp fisheries.

Bait Fishery

A small, directed herring bait fishery occurred in 2019. The Norton Sound commercial bait herring fishery was opened by emergency order on May 9 and NSSP purchased 42 short tons of herring from May 10 to May 12 with 7 permit holders making deliveries (Appendix D2).

COMMERCIAL FISHERY MANAGEMENT

In 2019, due to budget limitations, ADF&G did not fly aerial surveys to estimate biomass or conduct ASL sampling. With the decline in market demand, there was no expectation that commercial harvest would exceed 20% of actual biomass.

Budget reductions have resulted in no ADF&G field crew deployed to Cape Denbigh during the 2019 season and no test fishery operations being conducted from Unalakleet. No commercial samples were taken.

ENFORCEMENT

No AWT officers were on Norton Sound herring grounds during the 2019 fishery because there was no sac roe fishery.

BIOMASS DETERMINATION

There were no Norton Sound herring aerial surveys conducted this season by NSEDC or ADF&G biologists. Due to budget restrictions, ADF&G will no longer conduct aerial surveys or ASL sampling in future.

SECTION 4: KING CRAB FISHERIES

NORTON SOUND CRAB FISHERY

ABUNDANCE

The ADF&G length-based population model estimated harvestable legal (over 4.75-inch carapace width) male crab biomass for the 2019 commercial crab fishery at 2.51 million pounds, based on the model's results from spring of 2019 that included data from the 2018 summer fishery and the 2018 trawl survey (Appendix E9). By regulation, a harvest rate of up to 13% is allowed when the legal male biomass is 2.0–3.0 million pounds. Additionally, the North Pacific Fishery Management Council had set an allowable biological catch of 190,000 pounds for 2019 that includes the winter and summer commercial harvests, estimated winter and summer subsistence harvests, and estimated incidental mortality of nontarget crab discards. Starting in 2016, under the new king crab management plan, both winter and summer commercial fisheries are now combined under 1 red king crab harvest strategy. To not exceed the recommended allowable biological catch, ADF&G applied a harvest rate of 6.0% to the legal male biomass, yielding a total GHL of 150,600 pounds for the commercial red king crab fisheries. By regulation, 8% of the GHL is allocated to the winter commercial fishery resulting in a 12,048-pound allocation. The Community Development Quota (CDQ) fishery is allocated 7.5% by regulation resulting in a 11,295-pound allocation. Any commercial harvest allocation not taken during the winter commercial fishery will be added to the summer commercial fishery allocation.

COMMERCIAL FISHERY SEASON SUMMARY

The 2019 total GHL of 150,600 pounds and the total commercial harvest of 78,318 pounds were both the lowest since 1999 (Appendix E8). The winter commercial harvest was the poorest in over 10 years (Appendices E4 and E5) and only one-eighth of the 2018 winter harvest due to low participation and ice and weather conditions. The summer commercial harvest, which included the CDQ, was the poorest in almost 20 years (Appendices E1 and E3) and only one-fourth of the 2018 summer harvest due to weak catch rates and reduced participation. Fishing during both the winter and summer seasons halted ahead of the regulatory closure dates: for the winter, it was due to the ice going out for good, and for the summer, it was due to lack of a buyer.

Open Access Commercial Fishery: Winter

The 2019 winter open-access fishery opened at 12:00 noon, February 25, a week earlier than in 2018 to allow for more fishing opportunity. In addition to NSSP registering to buy crab, 3 crabbers applied for a catcher–seller permit to sell crab dockside (2 made sales). Of the 18 crabbers that registered in winter, 9 set pots but only 6 delivered crab, with 21 total landings, compared to 322 landings in 2018 (Appendix E4). In addition to heavy snowfall like that in 2018, frequent storms and unstable ice hampered harvest in 2019. Most of the pot loss that occurred (32 out of 96 reported fishing; Appendix E11) happened on March 10, when the ice around Nome went out. Additionally, poor ice all winter in eastern and southern Norton Sound resulted in no effort in those areas. Consequently, all harvests were made by Nome crabbers, who reported fishing from

5 miles west to 50 miles east of Nome, excluding the area closed to commercial fishing, with 30% of harvest occurring in March and 70% in April. The fishery closed April 30 by regulation, but crabbers pulled (or lost) their pots by mid-April when the nearshore ice went out for good. Based on fish tickets, 3,295 pounds (1,050 crabs; just over one-fourth of the winter open-access quota) was harvested, with an overall CPUE of 5 crab/pot and average weight of 3.1 lb/crab (Table 12). Even though the average price of crab ($6.97/lb) was the second-highest paid in the Norton Sound winter king crab fishery, the total exvessel value was $20,700, less than 4% of the peak value of $617,400 in 2015 (Appendix E4).

Open Access Commercial Fishery: Summer

The 2019 summer open-access commercial king crab fishery was opened by emergency order at 12:00 noon, June 25 in the Norton Sound Section, with a GHL of 136,000 pounds, including the unharvested portion of the winter open-access quota. NSSP, which operated a seafood processing plant in Nome, along with 3 crab tenders in eastern Norton Sound in 2019, were registered to buy crab, and 1 crabber registered to sell crab dockside as catcher–seller. This year, as in past years, the season start was based on when the sole crab processor was ready to purchase crab, and once the season was underway, NSSP bought crab continuously until August 25, when they ceased buying due to low catch rates and soft-shelled crab.

Between the first delivery (June 26) and final delivery (August 25), 24 vessels and 26 permit holders made 146 landings totaling 73,784 pounds (24,504 crab; Table 13), just over half of the combined summer quota. Of this total, 807 pounds were reported as deadloss and 620 pounds were reported as retained and not sold. Season length was 71 days, more than twice the length of 2018, and average weight was 3.0 lb/crab, like 2016 and 2017 (Appendix E1). Including CDQ, number of pots registered was 1,096, and there were 5,436 pot pulls.

In 2019, even though average daily CPUE was as high as 14 crab/pot in July, for most of the season the CPUE was 9 crab/pot or fewer—and went as low as 1 crab/pot—for a season average of 5 crab/pot (Table 13), well below the average of 14 crab/pot for the previous 5 seasons (Appendix E1). Due to poor catch rates, many crabbers opted for longer soaks and by mid-July began leaving the fishery. As the season progressed, several of the remaining crabbers began fishing halibut or salmon concurrently with crab. (Prior to this year, NSSP did not buy halibut from Norton Sound crabbers—only from St Lawrence Island crabbers, until the crab fishery closed.) By early August, 13 vessels were still fishing crab; however, by late August, when NSSP stopped buying crab, only half a dozen vessels were still fishing crab. As a result of the poor catch rate and low effort, the summer harvest rate in 2019 was the slowest out of the last 20 years (Appendix E3 includes other slow years for comparison). Although the average price paid ($6.98/lb) was the highest amount ever paid for the summer fishery, the total exvessel value, including CDQ, was $514,000, less than one-third of 2018 (Appendix E1). NSSP stopped buying crab August 25; however, the fishery was not closed until September 3 (by regulation) to allow the lone catcher–seller to make sales, but no landings occurred after August 25.

COMMUNITY DEVELOPMENT QUOTA FISHERY

From 2016 to 2018, the CDQ fishery was prosecuted during the winter season, but in 2019, NSSP reverted to purchasing CDQ crab only in the summer season. Like the previous 12 years, Yukon Delta Fisheries Development Association transferred their quota to NSEDC. Unlike 2014–2018, when NSEDC crabbers harvested all—or nearly all—of the entire allocation, in 2019 slightly over 10% of the CDQ allocation was harvested, for a total harvest of 1,239 pounds

(409 crab). Even though the CDQ fishery was opened concurrently with the open-access fishery (June 25), the first landing was not made until mid-July, and the final landing was made on August 20 (Table 13). Compared to 27 crabbers that fished CDQ in the winter of 2018, only 2 crabbers fished CDQ in the summer of 2019, for an exvessel value that totaled under $8,600 (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). Of the CDQ harvest, 13 pounds were reported as deadloss. This was the 19th year a CDQ harvest occurred since the CDQ fishery was implemented in 1998 and was the smallest CDQ harvest to date (Appendix E1).

HARVEST AREAS AND COMMERCIAL CATCH SAMPLING

There were 14 statistical areas fished during the summer season (Table 14). Like 2017 and 2018, the top harvest (54%) and effort (43%) came from statistical area 636401 located southwest of Golovnin Bay in eastern Norton Sound. The next-highest harvests came from statistical area 626401 (22%), southeast of Golovnin Bay, and statistical area 646401 (13%), southeast of Nome. These 3 statistical areas are directly south of the closed waters boundary line (Appendix E12) and, like 2017 and 2018, effort was concentrated in this main area. The remaining 11 statistical areas had less than 5% of the total harvest (Appendix E13). The catch from statistical areas east of long 164°W made up 77% of the harvest, the highest in the last 11 years (Appendix E14).

Carapace length (CL) measurements and shell ages were collected from 1,160 commercially caught crab during the summer season (Appendix E23). Since the summer of 2002, NSEDC has operated a seafood processing plant in Nome. In 2019, 100% of sampling data was collected from this plant, either as crabbers offloaded their catch or from holding tanks. Carapace age was classified as new (2–12 months) or old (over 13 months). Male new-shell crab made up 72% of the total legal crab sampled. Recruit crab are new-shell legal crab less than 116 mm CL. Postrecruit crab are legal new-shell male crab greater than or equal to 116 mm CL and all legal old-shell males. Recruit crab made up 38% of the legal crab sampled, more than twice that of 2018, and postrecruit crab made up 62% (Appendix E2). Overall mean CL of legal male crab was 119 mm, similar to 2016 and 2017. For comparison of historical length composition of Norton Sound red king crab summer commercial harvests from 1990–2019, see Appendices E16–E23.

ENFORCEMENT

No AWT trooper made dockside checks during the 2019 summer crab fishery; however, an ADF&G staff member who worked the king crab fishery was deputized to cite violations if necessary. No violations were cited in 2019.

SUBSISTENCE FISHERY

Both a summer and a winter subsistence red king crab fishery occur in Norton Sound, although most of the effort and harvest is from the winter fishery (Appendices E6 and E7). For the 2018–2019 winter crab season, all 101 issued permits were returned, and the 60 permit holders that fished reported retaining 1,545 crab. The number caught, including crab thrown back to the ocean, was 2,080 crab, less than one-fourth of the average catch from the previous 10 years (Appendix E7). Residents of Elim, Savoonga, and Stebbins signed up to fish but caught no crab; however, residents of Unalakleet (98%) and White Mountain (2%) had a combined harvest of almost 500 crab, a third of the total harvest. Unalakleet crabbers caught all their crab in April or May using boats instead of snowmachines because ice was so poor in eastern and southern

Norton Sound all winter. All permittees fished with pots (no handlines), and out of at least 132 pots reported fishing, 59 (45%) were reportedly lost during the season due to moving ice. Percentages of subsistence crab harvested each month are as follows: January 7%, February 33%, March 12%, April 7%, and May 41% (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome).

During the 2019 Norton Sound summer subsistence crab season, all 38 permits issued were returned. The 15 crabbers who fished reported harvesting a total of 315 crab, which averaged out to 21 crab each (Appendix E6). Total pounds harvested was less than half of the 2018 harvest and less than one-fifth of the recent 5-year average. Of the total harvest, 61% came from the Nome area, 27% from the Unalakleet area, and 12% from the White Mountain area, with 10 pots total (24%) reported lost (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). Residents of Brevig Mission and Golovin signed up for subsistence permits but did not report any harvest.

SPORT FISHERY

Sport fishery anglers can fish for crab, and a harvest log issued by the Nome office similar to a subsistence permit is required. Sport fishery anglers are only allowed to keep 6 male crab daily, and they must be of legal size (4.75-inch or greater CL). The only recent harvest was in 2005. That year, 9 harvest logs were issued and 8 were returned, showing that 6 nonresident anglers caught 918 crab and kept 106, for an average harvest of 18 crab each (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome). In 2019, no harvest logs were issued.

FUTURE RESOURCE INVESTIGATIONS

Red king crab biomass estimates from Norton Sound trawl surveys are an integral part of the data used in the length-based population model to project the summer king crab legal biomass and appropriate GHL for the summer commercial king crab fishery. Starting in 2018, the trawl surveys are scheduled to take place annually. Prior to 2018, they took place every 3 years.

An observer program has been in effect during the summer crab commercial fishery since 2012 and a winter observer program was started during the 2016 winter crab commercial fishery. Observers are collecting information about the handling of nontarget (e.g., sublegal and female) red king crab and, additionally, up to 500 commercially caught crab each winter are being sampled (CL measurements and shell age information collected) to monitor the fast-growing winter commercial fishery. No winter observing took place in 2019 due to poor ice and consequent low harvest but will proceed in future if harvest and ice and weather conditions allow.

ST. LAWRENCE ISLAND CRAB FISHERY

COMMERCIAL FISHERY OVERVIEW

In 2006, the BOF split the St. Lawrence Island section between north and south of lat 66°N. In the northern section, now known as the Kotzebue section, the commercial season was from noon on June 15 through August 1. The southern section was merged with the Norton Sound section. This change was initiated by Norton Sound area crabbers to expand fishing opportunity to an area with little commercial utilization since 1995. No harvest was reported from this new area in 2019. No permit holders fished in the Kotzebue section in 2019.

SECTION 5: MISCELLANEOUS SPECIES FISHERIES

INCONNU (SHEEFISH)

Commercial Fishery Season Summary

In Kotzebue Sound District, for the winter of 2018–2019, no commercial fishery participants reported selling inconnu, commonly known as sheefish (Appendix F1). Sheefish are not commonly found in either Norton Sound or Port Clarence Districts.

Subsistence and Sport Fishery Season Summary

From 2012 to 2014, there were comprehensive subsistence surveys for fish and wildlife harvests of 6–9 Kotzebue area villages conducted by the Division of Subsistence. In 2013, surveyed households in 5 Kobuk River villages and Buckland, Noatak, and Selawik reported harvesting over 22,000 sheefish, more than any other year since 1990 (Appendix F2). In 2014, the last year that surveys were conducted, sheefish harvest totaled almost 32,000 fish but included harvest by the residents of Kotzebue. Because survey effort was limited during many years, harvest numbers should be considered minimal and are not comparable year to year.

Sport fish harvest reports for Kotzebue Sound District in 2018 indicate a harvest of 298 sheefish, over 6-fold compared to 2017 (Appendix F3). Sheefish sport harvests in the last 10 years have averaged fewer than 500 fish annually. Information for 2019 is not yet available.

Escapement

No aerial surveys are flown to determine sheefish escapement. An ADF&G test fishery project on the Kobuk River helps to give an index of abundance, but the test fishery is operated to determine the index of chum salmon abundance and begins operation well after sheefish have begun to pass the site. In 2019, Kobuk River test fishery resulted in 174 sheefish caught in 172 drifts, for a cumulative CPUE of 177, the fourth-lowest CPUE in this decade (data on file with Arctic Management Group, ADF&G, Division of Commercial Fisheries, Nome).

DOLLY VARDEN

Commercial Fishery Season Summary

Dolly Varden *Salvelinus malma* are occasionally incidentally caught in commercial salmon fisheries in Norton Sound and Kotzebue Districts. During the 2019 commercial salmon fishery, Kotzebue District reported 927 Dolly Varden caught but not sold (Appendix F4) and Norton Sound reported none caught.

Subsistence and Sport Fishery Season Summary

Subsistence harvest data for Dolly Varden were not recorded for Norton Sound or Port Clarence, and household surveys for Dolly Varden subsistence catches were not conducted in Arctic communities. A comprehensive survey of fish and wildlife harvests was done in 6–9 Kotzebue area villages by the Division of Subsistence from 2012 to 2014. During those years, surveyed

Noatak households reported harvesting from 6,200 to 9,300 fish annually (Appendix F5). No surveys have been conducted since 2014.

Sport fish harvest was 420 Dolly Varden in Norton Sound and 629 Dolly Varden in Kotzebue/Chukchi Sea areas in 2018 (Appendix F3). Information is not yet available for 2019. Overall, Dolly Varden sport fish harvests in the last 10 years in Norton Sound averaged 1,500 fish annually, with most fish usually harvested out of the Unalakleet River, which was what happened in 2019 (Appendix F6).

Escapement

Dolly Varden escapement is determined from aerial surveys conducted by ADF&G Division of Sport Fish in the Kotzebue area and weir or tower counts in Norton Sound. In 2019, a survey on the Wulik River counted a total of 17,308 Dolly Varden (Appendix F7).

WHITEFISH

Commercial Fishery Season Summary

No whitefish were harvested during the 2018–2019 season in Norton Sound District. One commercial fishery participant registered but reported no sales (Appendix F9).

Subsistence Fishery Season Summary

Subsistence harvest data for whitefish were not recorded for the Norton Sound, Port Clarence, or Arctic Districts, but a comprehensive survey of fish and wildlife subsistence harvests by the Division of Subsistence was conducted in 6–9 Kotzebue area villages from 2012 to 2014. During those 3 years, survey data showed that an average of 74,000 whitefish were harvested annually for 8 villages in Kotzebue District (Appendix F8). Due to varying survey effort, harvest numbers are considered minimal and are not comparable year to year. No surveys have been conducted since 2014.

SAFFRON COD

Commercial Fishery Season Summary

During the 2018–2019 season, no saffron cod *Eleginus gracilis*, commonly known as tomcod, was harvested in Norton Sound. There was 1 registered participant but no sales were made (Appendix F10). However, average harvest for the last 5 years (for which harvest was reported) was almost 16,000 pounds by 18 permit holders.

Subsistence Fishery Season Summary

In Norton Sound areas tomcod are primarily fished by jigging through the ice. Because no subsistence permit is required, and a sport fish license is not needed for Alaska residents in northern Norton Sound from Cape Prince of Wales to Bald Head, harvests of tomcod are not reported or documented. In 2019, Norton Sound household subsistence surveys were conducted; however, subsistence harvest information of tomcod was not collected.

CAPELIN

Subsistence Fishery Season Summary

In 2018, sightings of spawning capelin were actively solicited by a graduate student studying capelin in the Nome area. In 2019, there were related follow-ups in solicitations for sightings; therefore, there were more sightings reported in 2018 and 2019 than in other years (Appendix F11). No other information on capelin harvest is available.

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TABLES

Table 1.–Norton Sound commercial salmon harvest summary by subdistrict, 2019.

		Subdistricts						
		1	2	3	4	5	6	Total
Number of fishery participants[a]		7	18	27	9	36	77	145
Chinook	Number	20	33	106	7	318	906	1,390
	Weight (lb)	222	354	1,019	106	3,185	10,131	15,017
Sockeye	Number	768	122	711	106	1,995	3,311	7,013
	Weight (lb)	4,559	850	4,013	642	12,155	19,937	42,156
Coho	Number	7,805	2,424	11,446	199	35,381	82,582	139,837
	Weight (lb)	49,231	15,619	73,583	1,368	226,282	533,596	899,679
Pink	Number	4,798	7,412	14,911	1,320	19,015	28,952	76,408
	Weight (lb)	16,748	26,554	44,497	4,512	67,156	103,110	262,577
Chum	Number	14,934	25,594	13,788	1,982	42,827	58,813	157,938
	Weight (lb)	98,289	181,309	91,190	13,387	282,324	397,506	1,064,005
Total	Number	28,325	35,585	40,962	3,614	99,536	174,564	382,586
	Weight (lb)	169,049	224,686	214,302	20,015	591,102	1,064,280	2,283,434

Note: The above harvests do not include personal use. Average commercial weights by species were 10.8 lb for Chinook salmon, 6.0 lb for sockeye salmon, 6.4 lb for coho salmon, 3.4 lb for pink salmon, and 6.7 lb for chum salmon.

[a] Number of fishery participants is a unique number of permit holders that fished in each subdistrict. Some permit holders fished in more than 1 subdistrict.

Table 2.–Subsistence salmon harvest for northern Norton Sound, 2019.

	Permits fished[a]	Number of salmon harvested					
		Chinook	Sockeye	Coho	Pink	Chum	Total
Marine Waters	23	0	83	566	476	274	1,399
Bonanza River – above weir	1	0	0	12	0	0	12
Bonanza River –below weir	10	0	0	61	320	9	390
Eldorado River – below weir	11	0	5	236	227	84	552
Flambeau River	0	–	–	–	–	–	–
Safety Sound	1	0	3	27	5	10	45
Nome River – above weir	12	0	4	81	37	3	125
Nome River – below weir	215	8	99	907	3,464	209	4,687
Cripple Creek	20	0	15	184	16	10	225
Penny River	36	2	0	424	69	0	495
Sinuk River	25	0	143	56	44	3	246
Snake River – above weir	10	0	0	76	85	1	162
Snake River – below weir	100	4	11	696	552	22	1,285
Solomon River – above weir	6	0	0	22	0	0	22
Solomon River – below weir	7	0	3	41	56	4	104
Nome Subdistrict total[b]	368	14	366	3,389	5,351	629	9,749
Cape Woolley[c]	4	0	0	12	17	0	29
Marine Waters	9	25	1	8	1,044	202	1,280
Kachavik River	11	6	0	81	1,400	66	1,553
McKinley River	6	0	0	125	5	0	130
Chinik Creek	14	0	0	285	686	0	971
Fish River – above tower	12	1	5	106	1,410	38	1,560
Fish River – below tower	18	6	3	441	376	59	885
Niukluk River	19	1	0	196	253	10	460
Other rivers and creeks	2	0	0	35	0	0	35
Golovin Subdistrict total[d]	84	39	9	1,277	5,174	375	6,874
Marine Waters	5	7	0	10	59	5	81
Kwiniuk River – above tower	2	0	0	14	694	61	769
Kwiniuk River – below tower	23	21	10	310	967	312	1,620
Next Creek	3	0	0	15	0	0	15
Tubutulik River	12	72	1	37	389	123	622
Iron Creek	16	5	9	467	956	69	1,506
Elim Subdistrict total[e]	41	105	20	853	3,065	570	4,613
Port Clarence – marine waters	61	58	3,097	636	4,602	2,737	11,130
Tuksuk Channel	19	0	552	17	426	95	1,090
Imuruk Basin	1	0	54	0	27	0	81
Kuzitrin River	1	0	8	8	6	9	31
Pilgrim River – above weir	92	1	3,209	10	263	29	3,512
Pilgrim River – below weir	150	1	5,389	62	330	36	5,818
Salmon Lake[f]	0	–	–	–	–	–	–
Port Clarence District total[g]	306	60	12,309	733	5,654	2,906	21,662
Total		218	12,704	6,264	19,261	4,480	42,927

-continued-

Table 2.–Page 2 of 2.

Note: Subsistence permits were issued in 2019 in 6 locations for northern Norton Sound: (1) Nome Subdistrict; (2) Cape Woolley; (3) Golovin Subdistrict; (4) Elim Subdistrict; (5) Pilgrim River; and (6) Port Clarence District. Dashes indicate no data.

[a] Except for Pilgrim River and Salmon Lake, each permit is valid for both marine and fresh waters. Permits fished include those permit holders who fished but reported no harvest.

[b] Of 560 Nome Subdistrict permits issued, 559 were returned.

[c] All 29 Cape Woolley permits issued were returned.

[d] All 202 Golovin Subdistrict permits issued were returned.

[e] Of 51 Elim Subdistrict permits issued, 50 were returned.

[f] No Salmon Lake permits were issued.

[g] Of 474 Pilgrim River permits issued, 473 were returned. All 197 Port Clarence District permits issued were returned.

Table 3.–Salmon counts of rivers and associated salmon escapement goal ranges (SEG, BEG or OEG), Norton Sound and Port Clarence, 2019.

	Chinook salmon			Chum salmon				
Stream	Weir/ tower count	Escapement goal range	Aerial survey count[a]	Weir/ tower count	Escapement goal range	Aerial survey count[a]	Aerial survey expansion	Escapement goal range
Salmon Lake								
Grand Central River								
Pilgrim River	180			22,118				
Glacial Lake								
Sinuk River							12,999	
Cripple River								
Penny River								
Anvil Creek								
Snake River	7			2,375	2,000–4,200[b]			
Nome River	6			3,167	1,600–5,300[b]			
Flambeau River						5,057	13,054	
Eldorado River	15			28,427	4,400–14,200[b]			
Bonanza River	8			8,824				
Solomon River	0			764				
Fish River[c]	0			4,230				
Boston Creek								
Niukluk River								
Ophir Creek								
Kwiniuk River	111	250		17,790	9,100–32,600[d]			
Tubutulik River					3,100–9,900[e]			
Ungalik River								
Inglutalik R	171			24,727				
Shaktoolik River	2,585			28,914				
Unalakleet River	6,641			65,018				
Old Woman River								
North River	3,312	1,200–2,600		10,773				

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Table 3.–Page 2 of 3.

Stream	Coho salmon			Sockeye salmon			Pink salmon		
	Weir/ tower count	Escapement goal range	Aerial survey count[a]	Weir/ tower count	Escapement goal range	Aerial survey count[a]	Weir/ tower count	Escapement goal range	Aerial survey count[a]
Salmon Lake					Combined	26,935			
Grand Central River					4,000–8,000		8,700		
Pilgrim River	307			29,309			399,356		
Glacial Lake					800–1,600	5,175			900[f]
Sinuk River									420,000
Cripple River									208,080
Penny River									315,000
Anvil Creek									
Snake River	3,408			251			101,151		
Nome River	1,905			36			54,882	3,200	
Flambeau River									210
Eldorado River[b]	4			3			197,119		
Bonanza River	159			9			167,516		45,425
Solomon River	45			27			40,440		136,300
Fish River [c]	3,144			0			786,443		
Boston Creek									
Niukluk River		Combined							
Ophir Creek		750–1,600							
Kwiniuk River	5,630	650–1,300		15			669,815	8,400	
Tubutulik River									
Ungalik River									
Inglutalik R	909			24			208,956		
Shaktoolik River	5,106			172			4,177,632		
Unalakleet River[g]	10,749			1,088			[g]		
Old Woman River									
North River	1,533	550–1,100		30			2,049,504	25,000	

-continued-

Note: Data not available for all streams (blank). Sustainable escapement goal (SEG), biological escapement goal (BEG), and optimal escapement goal (OEG) are listed.

[a] All aerial surveys are rated fair to good, unless otherwise noted.

[b] The Alaska Board of Fisheries (BOF) also established an OEG with the same range as the BEG. Prior to 2019, the ranges were 1,600–2,500 fish for Snake River, 2,900–4,300 fish for Nome River, and 6,000–9,200 fish for Eldorado River.

[c] The BOF-established OEG is the same range as the BEG and is based on a combination of weir counts and expanded aerial survey counts. The OEG and BEG do not include Cripple and Penny Rivers.

[d] This represents the OEG in regulation. The BEG is 10,000–20,000 for the Kwiniuk River and 8,000–16,000 for the Tubutulik River.

[e] The goal listed is actual fish and not aerial counts. However, currently there is no counting project on the river.

[f] The pink salmon were located in the creek flowing into Glacial Lake.

[g] Starting in 2018, the weir picket spacing was increased to allow pink salmon to pass through; therefore, pink salmon are no longer enumerated.

Table 4.–Commercial salmon set gillnet catches from Nome, Subdistrict 1, Norton Sound, 2019.

Period	Target species	Dates fished	Length (hours)	Permits fished	Chinook harvest	Chum harvest	Pink harvest	Sockeye harvest	Coho harvest
1	chum	6/17–6/18	24	3	0	67	1	13	0
2	chum	6/21–6/22	24	4	5	412	3	20	0
3	chum	6/27–6/28	24	2	[a]	[a]	[a]	[a]	[a]
4	chum	7/04–7/07	72	4	4	1,955	1,571	28	0
5	chum	7/09–7/14	120	5	1	3,844	719	121	1
6	chum	7/16–7/21	120	5	2	3,259	1,265	93	37
7	chum	7/22–7/24	48	3	1	480	544	25	20
8	chum	7/26–7/28	48	5	1	2,082	499	56	214
9	coho	7/30–8/01	48	1	[a]	[a]	[a]	[a]	[a]
10	coho	8/02–8/05	72	1	[a]	[a]	[a]	[a]	[a]
11	coho	8/06–8/08	48	5	0	1,202	34	44	570
12	coho	8/09–8/11	48	5	1	619	0	91	2,189
13	coho	8/13–8/15	48	0	–	–	–	–	–
14	coho	8/16–8/19	72	6	3	314	0	146	2,106
15	coho	8/20–8/25	120	6	0	0	0	68	2,035
16	coho	8/27–9/01	120	4	0	0	0	26	509
17	coho	9/03–9/07	96	1	[a]	[a]	[a]	[a]	[a]
18	coho	9/09–9/13	96	0	–	–	–	–	–
Totals			1,248	7	20	14,934	4,798	768	7,805

Note: An additional 22 Chinook, 340 chum, 143 pink, 48 sockeye, and 27 coho salmon were retained for personal use in 2019. Dashes mean no data.

[a] Information is confidential because fewer than 3 permit holders fished.

Table 5.–Commercial salmon set gillnet catches from Golovin, Subdistrict 2, Norton Sound, 2019.

Period	Target species	Dates fished	Length (hours)	Permits fished	Chinook harvest	Chum harvest	Pink harvest	Sockeye harvest	Coho harvest
1	chum	6/17–6/18	24	5	5	276	1	3	0
2	chum	6/21–6/22	24	8	4	1,061	11	0	0
3	chum	6/24–6/26	48	10	10	3,298	32	24	0
4	chum	6/28–6/29	24	12	3	3,263	343	14	0
5	chum	7/01–7/03	48	10	1	1,448	1,229	4	0
6	chum	7/04–7/06	48	9	4	4,119	1,987	25	0
7	chum	7/09–7/11	48	7	1	2,299	1,571	17	0
8	chum	7/12–7/15	72	8	1	3,205	814	13	0
9	chum	7/16–7/18	48	5	0	1,230	210	1	5
10	chum	7/19–7/24	120	7	3	3,511	1,214	18	95
11	chum	7/26–7/28	48	3	0	369	0	2	28
12	coho	7/30–8/01	48	3	1	265	0	0	82
13	coho	8/02–8/05	72	1	[a]	[a]	[a]	[a]	[a]
14	coho	8/06–8/08	48	7	0	791	0	1	820
15	coho	8/09–8/11	48	2	[a]	[a]	[a]	[a]	[a]
16	coho	8/13–8/15	48	4	0	23	0	0	122
17	coho	8/16–8/19	72	2	[a]	[a]	[a]	[a]	[a]
18	coho	8/20–8/22	48	2	[a]	[a]	[a]	[a]	[a]
19	coho	8/23–8/25	48	1	[a]	[a]	[a]	[a]	[a]
20	coho	8/27–8/29	48	1	[a]	[a]	[a]	[a]	[a]
21	coho	8/30–9/01	48	2	[a]	[a]	[a]	[a]	[a]
22	coho	9/03–9/07	96	0	–	–	–	–	–
23	coho	9/09–9/13	96	0	–	–	–	–	–
Totals			1,080	18	33	25,594	7,412	122	2,424

Note: An additional 2 coho and 4 chum salmon were retained for personal use in 2019. Dashes mean no data.

[a] Information is confidential because fewer than 3 permit holders fished.

Table 6.–Commercial salmon set gillnet catches from Elim, Subdistrict 3, Norton Sound, 2019.

Period	Target species	Dates fished	Length (hours)	Permits fished	Chinook harvest	Chum harvest	Pink harvest	Sockeye harvest	Coho harvest
1	chum	6/17–6/18	24	6	7	51	0	1	0
2	chum	6/21–6/22	24	7	17	206	0	3	0
3	chum	6/27–6/28	24	14	40	571	78	11	0
4	chum	7/04–7/06	48	12	11	2,944	0	37	0
5	chum	7/09–7/11	48	10	7	1,056	3,158	37	0
6	chum	7/12–7/15	72	16	5	1,684	941	82	2
7	chum	7/16–7/18	48	10	2	1,466	4,107	26	22
8	chum	7/19–7/24	120	14	3	3,418	1,451	117	246
9	chum	7/26–7/28	48	14	3	1,195	2,888	110	277
10	chum	7/30–8/01	48	4	1	381	1,640	44	223
11	coho	8/02–8/05	72	7	0	113	315	24	295
12	coho	8/06–8/08	48	11	6	243	275	22	1,088
13	coho	8/09–8/11	48	17	0	117	54	29	1,445
14	coho	8/13–8/15	48	10	1	100	4	26	1,540
15	coho	8/16–8/19	72	19	3	243	0	57	2,998
16	coho	8/20–8/22	48	16	0	0	0	35	1,168
17	coho	8/23–8/25	48	7	0	0	0	16	953
18	coho	8/27–8/29	48	10	0	0	0	16	561
19	coho	8/30–9/01	48	8	0	0	0	14	364
20	coho	9/03–9/07	96	4	0	0	0	0	144
21	coho	9/09–9/13	96	4	0	0	0	4	120
Totals			1,176	27	106	13,788	14,911	711	11,446

Note: An additional 15 Chinook, 15 chum, 13 sockeye, and 4 coho salmon were retained for personal use in 2019.

Table 7.–Commercial salmon set gillnet catches from Norton Bay, Subdistrict 4, Norton Sound, 2019.

Period	Target species	Dates fished	Length (hours)	Permits fished	Chinook harvest	Chum harvest	Pink harvest	Sockeye harvest	Coho harvest
1	chum	6/17–6/18	24	0	–	–	–	–	–
2	chum	6/21–6/22	24	2	[a]	[a]	[a]	[a]	[a]
3	chum	6/27–6/28	24	7	2	364	30	6	20
4	chum	7/04–7/06	48	6	0	364	780	30	0
5	chum	7/09–7/11	48	1	[a]	[a]	[a]	[a]	[a]
6	chum	7/12–7/15	72	3	2	424	315	19	0
7	chum	7/16–7/18	48	0	–	–	–	–	–
8	chum	7/19–7/24	120	2	[a]	[a]	[a]	[a]	[a]
9	chum	7/26–7/28	48	4	0	207	0	26	66
10	chum	7/30–8/01	48	2	[a]	[a]	[a]	[a]	[a]
11	chum	8/02–8/05	72	0	–	–	–	–	–
12	chum	8/06–8/08	48	0	–	–	–	–	–
13	coho	8/09–8/11	48	1	[a]	[a]	[a]	[a]	[a]
14	coho	8/13–8/15	48	0	–	–	–	–	–
15	coho	8/16–8/19	72	1	[a]	[a]	[a]	[a]	[a]
16	coho	8/20–8/22	48	0	–	–	–	–	–
17	coho	8/23–8/25	48	0	–	–	–	–	–
18	coho	8/27–8/29	48	0	–	–	–	–	–
19	coho	8/30–9/01	48	0	–	–	–	–	–
20	coho	9/03–9/07	96	0	–	–	–	–	–
21	coho	9/09–9/13	96	0	–	–	–	–	–
Totals			984	9	7	1,982	1,320	106	199

Note: An additional 1 Chinook salmon were retained for personal use in 2019. Dashes mean no data.

[a] Information is confidential because fewer than 3 permit holders fished.

Table 8.–Commercial salmon set gillnet catches from Shaktoolik, Subdistrict 5, Norton Sound, 2019.

Period	Target species	Dates fished	Length (hours)	Permits fished	Chinook harvest	Chum harvest	Pink harvest	Sockeye harvest	Coho harvest
1	chum	7/01–7/03	48	14	12	1,974	2,328	54	0
2	chum	7/04–7/06	48	18	125	7,471	15,398	275	0
3	chum	7/09–7/11	48	18	34	5,937	844	403	4
4	chum	7/12–7/15	72	20	62	9,347	211	513	44
5	chum	7/16–7/18	48	9	11	3,223	0	102	34
6	chum	7/19–7/24	120	24	26	7,165	229	254	1,783
7	chum	7/26–7/28	48	26	7	2,070	5	96	2,046
8	coho	7/30–8/01	48	21	5	1,431	0	54	2,415
9	coho	8/02–8/05	72	21	5	1,421	0	44	1,152
10	coho	8/06–8/08	48	28	14	1,523	0	58	3,060
11	coho	8/09–8/11	48	31	6	699	0	48	3,131
12	coho	8/13–8/15	48	8	0	70	0	4	698
13	coho	8/16–8/19	72	30	11	496	0	34	9,622
14	coho	8/20–8/22	48	27	0	0	0	27	6,069
15	coho	8/23–8/25	48	23	0	0	0	24	1,618
16	coho	8/27–8/29	48	21	0	0	0	4	1,631
17	coho	8/30–9/01	48	20	0	0	0	1	1,145
18	coho	9/02–9/06	96	4	0	0	0	0	496
19	coho	9/09–9/13	96	9	0	0	0	0	433
Totals				36	318	42,827	19,015	1,995	35,381

Note: No salmon were reported as retained for personal use in 2019.

Table 9.–Commercial salmon set gillnet catches from Unalakleet, Subdistrict 6, Norton Sound, 2019.

Period	Target species	Dates fished	Length (hours)	Permits fished	Chinook harvest	Chum harvest	Pink harvest	Sockeye harvest	Coho harvest
1	chum	7/01–7/03	48	34	328	7,808	8,422	250	0
2	chum	7/04–7/06	48	33	213	6,185	17,607	432	0
3	chum	7/09–7/11	48	29	82	3,820	603	253	0
4	chum	7/12–7/15	72	38	108	8,535	2,267	650	18
5	chum	7/16–7/18	48	33	22	4,060	24	222	66
6	chum	7/19–7/24	120	47	50	13,053	29	499	2,083
7	chum	7/26–7/28	48	51	22	5,557	0	184	2,588
8	coho	7/30–8/01	48	43	24	3,271	0	139	5,831
9	coho	8/02–8/05	72	51	14	2,118	0	84	3,090
10	coho	8/06–8/08	48	58	19	2,198	0	133	7,099
11	coho	8/09–8/11	48	61	11	935	0	113	13,396
12	coho	8/13–8/15	48	48	9	664	0	70	9,378
13	coho	8/16–8/19	72	62	4	609	0	131	11,662
14	coho	8/20–8/22	48	63	0	0	0	66	9,189
15	coho	8/23–8/25	48	50	0	0	0	41	6,415
16	coho	8/27–8/29	48	44	0	0	0	24	5,645
17	coho	8/30–9/01	48	23	0	0	0	14	1,656
18	coho	9/02–9/06	96	20	0	0	0	4	3,988
19	coho	9/09–9/13	96	8	0	0	0	2	478
Totals				77	906	58,813	28,952	3,311	82,582

Note: An additional 129 Chinook, 177 chum, 465 pink, 129 sockeye, and 44 coho salmon were retained for personal use in 2019.

Table 10.–Kotzebue District commercial chum salmon catch and average weight by date, 2019.

Date	Permits fished	Catch	Pounds	Average weight
7/10	23	1,592	12,664	7.95
7/11	27	2,529	20,708	8.19
7/12	21	2,543	21,050	8.28
7/13	26	6,218	51,425	8.27
7/15	33	5,732	47,196	8.23
7/16	45	6,813	56,262	8.26
7/17	31	3,712	30,436	8.20
7/18	39	6,843	58,408	8.54
7/19	40	6,058	51,077	8.43
7/20	29	5,553	45,955	8.28
7/22	44	4,451	37,633	8.45
7/23	51	7,030	60,093	8.55
7/24	53	9,882	83,882	8.49
7/25	22	3,047	25,083	8.23
7/26	39	4,720	38,830	8.23
7/27	50	23,267	200,858	8.63
7/29	57	13,356	113,429	8.49
7/30	44	8,913	75,352	8.45
7/31	23	6,736	55,941	8.30
8/01	20	4,569	37,816	8.28
8/02	10	1,136	9,197	8.10
8/03	40	7,876	65,363	8.30
8/05	44	10,309	81,846	7.94
8/06	55	19,349	154,218	7.97
8/07	54	14,167	113,197	7.99
8/08	47	13,700	111,827	8.16
8/09	53	19,411	154,220	7.94
8/10	49	28,981	231,978	8.00
8/12	38	17,198	138,200	8.04
8/13	19	9,585	76,626	7.99
8/14	40	13,069	104,598	8.00
8/15	49	15,513	125,106	8.06
8/16	36	17,037	138,893	8.15
8/17	47	14,756	117,014	7.93
8/19	46	18,329	143,354	7.82
8/20	45	17,078	135,487	7.93
8/21	49	22,056	179,190	8.12
8/22	41	21,448	171,573	8.00
8/23	35	16,745	130,451	7.79
8/24	40	13,866	112,039	8.08
8/26	40	12,087	97,840	8.09
8/27	40	14,365	117,556	8.18
8/28	45	8,721	69,826	8.01
8/29	33	5,886	47,613	8.09
8/30	31	8,361	66,319	7.93
Totals	92	494,593	4,017,629	8.12

Notes: A total of 16 Chinook salmon with an average weight of 12.3 lb and 29 sockeye salmon with an average weight of 4.9 lb were harvested and sold during the 2019 commercial fishery. Also harvested during the 2019 commercial fishery and kept for personal use were 141 Chinook, 447 sockeye, 29 chum, 2,743 pink, and 118 coho salmon; 10 whitefish; 927 Dolly Varden; and 196 sheefish.

Table 11.–Historical chum salmon catch for Kobuk River drift test fishery, 1993–2019.

Year	Dates of operation	Number of drifts	Cumulative CPUE[a]	Midpoint date
1993	7/12–8/12	164	494	8/03
1994	7/13–8/30	248	1,207	8/04
1995	7/12–8/16	196	1,188	8/02
1996	7/09–8/14	208	2,581	7/31
1997	7/09–8/14	202	797	8/03
1998	7/10–8/15	182	538	7/29
1999	7/11–8/13	176	1,357	8/02
2000	7/07–8/14	228	1,481	8/01
2001	7/05–8/13	232	1,575	7/26
2002	7/05–8/12	218	875	7/23
2003	7/09–8/13	214	749	8/02
2004	7/02–8/12	242	855	8/05
2005	7/07–8/15	207	1,207	8/06
2006	7/07–8/19	217	743	8/16
2007	7/11–8/20	207	1,342	8/09
2008	7/09–8/14	200	2,269	7/30
2009	7/10–8/20	242	971	8/06
2010	7/15–8/24	234	1,401	8/05
2011	7/13–8/21	220	2,499	8/10
2012	7/17–8/16	151	2,398	8/08
2013	7/17–8/25	208	2,698	8/06
2014	7/17–8/13	152	4,150	8/02
2015	7/17–8/25	204	2,535	8/05
2016	7/20–8/24	189	1,484	8/06
2017	7/20–8/26	202	2,097	8/09
2018	7/20–8/27	204	2,529	8/08
2019	7/17–8/28	194	1,509	8/14

[a] Cumulative CPUE is calculated as the sum of daily CPUE during the period of data collection, and daily CPUE *(I)* is calculated as the number of fish that would have been caught if 100 fathoms of gillnet had been fished for 60 minutes. $I = (6{,}000 \times C)/(L \times T)$, where C = no. of chum salmon caught, L = length of gillnet in fathoms, and T = mean fishing time in minutes.

Table 12.–Daily catch for the winter open-access commercial king crab harvest, Norton Sound Section, Eastern Bering Sea, February 25–April 30, 2019.

Date[a]	Landings	Number of crab	Crab harvested (lb)	Cumulative total (lb)	Number of pots pulled	Average weight (lb)	CPUE
02/26	1	1	3	3	6	3.0	0
02/28	1	1	4	7	7	4.0	0
03/01	1	14	45	52	7	3.2	2
03/02	1	11	35	87	7	3.2	2
03/03	1	19	63	150	11	3.3	2
03/05	1	5	20	170	10	4.0	1
03/06	2	51	163	333	14	3.2	4
03/08	1	9	32	365	11	3.6	1
03/10	1	3	13	378	3	4.3	1
03/22	1	19	62	440	6	3.3	3
03/26	1	53	172	612	12	3.2	4
03/31	2	135	430	1,042	16	3.2	8
04/06	2	201	604	1,646	19	3.0	11
04/08	1	113	339	1,985	13	3.0	9
04/10	1	22	70	2,055	1	3.2	22
04/11	2	254	797	2,852	34	3.1	7
04/13	1	139	443	3,295	18	3.2	8
Totals	21	1,050	3,295		195	3.1	5

Source: Fish ticket data.

[a] The open-access fishery closed by regulation on April 30, but the last delivery was made on April 13.

Table 13.–Daily catch for the summer commercial open-access and CDQ king crab harvest, Norton Sound Section, Eastern Bering Sea, June 25–September 3, 2019.

Date[a]	Landings	Number of crab	Pounds of crab	Number of pots pulled	Average weight (lb)	CPUE
06/26	2	137	451	40	3.3	3
06/27	1	[b]	[b]	[b]	[b]	[b]
06/28	14	2,574	7,615	511	3.0	5
06/29	2	517	1,603	75	3.1	7
07/01	1	[b]	[b]	[b]	[b]	[b]
07/02	2	646	1,896	76	2.9	9
07/03	1	[b]	[b]	[b]	[b]	[b]
07/04	15	2,413	7,358	511	3.0	5
07/05	5	1,770	5,242	195	3.0	9
07/06	8	1,845	5,514	264	3.0	7
07/07	8	929	2,794	270	3.0	3
07/08	1	[b]	[b]	[b]	[b]	[b]
07/09	1	[b]	[b]	[b]	[b]	[b]
07/10	10	1,969	5,765	342	2.9	6
07/11	5	500	1,509	229	3.0	2
07/12	4	801	2,357	119	2.9	7
07/13	1	[b]	[b]	[b]	[b]	[b]
07/14	14	2,305	6,916	481	3.0	5
07/15[a]	4	229	704	116	3.1	2
07/16	2	482	1,439	80	3.0	6
07/19[a]	8	1,175	3,503	277	3.0	4
07/22	2	269	855	60	3.2	4
07/23	4	677	2,103	154	3.1	4
07/24	3	307	958	117	3.1	3
07/27	8	1,634	5,117	113	3.1	14
07/28[a]	4	397	1,200	40	3.0	10
07/29	1	[b]	[b]	[b]	[b]	[b]
08/01	3	209	678	101	3.2	2
08/02[a]	4	360	1,117	100	3.1	4
08/05[a]	3	143	461	119	3.2	1
08/07	1	[b]	[b]	[b]	[b]	[b]
08/08[a]	2	59	189	80	3.2	1
08/11	1	[b]	[b]	[b]	[b]	[b]
08/18	1	[b]	[b]	[b]	[b]	[b]
08/19	1	[b]	[b]	[b]	[b]	[b]
08/20[a]	1	[b]	[b]	[b]	[b]	[b]
08/21	3	518	1,636	86	3.2	6
08/22	1	[b]	[b]	[b]	[b]	[b]
08/25	1	[b]	[b]	[b]	[b]	[b]
Totals	153[c]	24,913[c]	75,023[c]	5,027	3.0	5

Source: Fish ticket data.

Note: Both fisheries closed by regulation on September 3, but the last open-access delivery was made on August 25 and the last CDQ delivery was made on August 20.

[a] Information includes CDQ data.

[b] Information is confidential because fewer than 3 permit holders fished.

[c] Totals include 7 CDQ landings and 1,239 pounds (409 crab).

Table 14.–Summer commercial open-access and CDQ harvest of red king crab from Norton Sound Section by statistical area, Norton Sound District, 2019.

Statistical area	Number of crab	Pounds of crab	Number of pots pulled	CPUE	Average weight (lb)
616331	180	570	79	2	3.2
626401	5,366	16,300	856	6	3.0
636330	154	479	39	4	3.1
636401	13,606	40,576	2,339	6	3.0
646330	191	592	40	5	3.1
646401	3,169	9,565	940	3	3.0
656401	586	1,869	294	2	3.2
666330	1,055	3,247	276	4	3.1
666401	102	341	118	1	3.3
666402	478	1,422	375	1	3.0
666431	19	49	40	0	2.6
676501	2	5	10	0	2.5
686431	2	5	20	0	2.6
686500	3	5	10	0	1.7
Totals	24,913	75,023	5,436	5	3.0

APPENDIX A: NORTON SOUND FISHERIES

Appendix A1.–Commercial salmon catch by species, Norton Sound District, 1990–2019.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	8,895	434	56,712	0	65,123	131,164
1991	6,068	203	63,647	0	86,871	156,789
1992	4,541	296	105,453	6,284	83,394	199,968
1993	8,972	284	43,291	163,176	54,448	270,171
1994	5,285	80	102,152	982,389	18,290	1,108,196
1995	8,860	128	47,862	81,644	42,898	181,392
1996	4,999	1	70,458	487,441	10,833	573,732
1997	12,573	161	32,284	20	34,103	79,141
1998	7,429	7	29,623	588,013	16,324	641,396
1999	2,508	0	12,662	0	7,881	23,051
2000	752	14	42,701	166,548	6,120	216,135
2001	213	44	19,492	0	11,100	30,849
2002	5	1	1,759	0	600	2,365
2003	12	16	17,058	0	3,560	20,646
2004[a]	0	40	42,016	0	6,296	48,352
2005	151	8	85,517	0	3,983	89,659
2006	20	3	130,808	0	9,995	140,826
2007	17	2	126,122	3,769	22,408	152,318
2008	66	46	120,293	75,792	25,124	221,321
2009[a]	0	84	86,998	17,306	34,121	138,509
2010	118	96	62,068	31,539	117,803	211,624
2011	145	347	58,884	7,120	110,552	177,048
2012[a]	0	100	36,963	205,403	62,765	305,231
2013[a]	0	193	53,864	8,227	119,056	181,340
2014	84	319	112,568	181,633	107,674	402,278
2015	780	3,653	153,844	62,167	147,350	367,794
2016	183	2,635	102,722	208,739	51,167	365,446
2017	230	2,806	191,197	18,954	163,422	376,609
2018	270	3,311	260,505	39,123	237,823	541,032
2019	1,390	7,013	139,837	76,408	157,938	382,586
Avg 2014–2018	309	2,545	164,167	102,123	141,487	410,632
Avg 2009–2018	181	1,354	111,961	78,021	115,173	306,691

Note: Some harvest numbers may differ from numbers in previous reports (e.g., Menard et al. 2013) because all personal use harvest has been removed from this table, starting in 2016.

[a] No Chinook salmon sales were allowed by ADF&G or the buyer would not purchase Chinook salmon.

Appendix A2.–Number of commercial salmon permits fished, Norton Sound, 1990–2019.

Year	Subdistrict 1	2	3	4	5	6	District total[a]
1990	0	15	23	0	28	73	128
1991	0	16	24	0	25	75	126
1992	2	1	21	9	25	71	110
1993	1	8	26	15	37	66	153
1994	1	5	21	0	39	71	119
1995	2	7	12	0	26	58	105
1996	1	4	12	0	20	54	86
1997	0	11	21	9	19	57	102
1998	0	16	23	0	28	52	82
1999	0	0	0	0	15	45	60
2000	0	12	13	0	26	49	79
2001	0	5	5	0	13	29	51
2002	0	0	0	0	7	5	12
2003	0	0	0	0	10	20	30
2004	0	0	0	0	11	25	36
2005	0	0	0	0	12	28	40
2006	0	0	0	0	22	40	61
2007	0	0	11	0	15	47	71
2008	0	4	12	4	23	58	91
2009	0	5	17	7	21	49	88
2010	0	10	19	5	35	59	115
2011	0	13	32	12	30	65	123
2012	0	14	24	18	21	55	123
2013	1	14	21	18	24	57	124
2014	3	18	29	20	24	63	128
2015	4	12	26	16	23	56	128
2016	5	10	25	18	28	68	141
2017	6	10	26	18	31	69	139
2018	7	18	34	12	36	80	149
2019	7	18	27	9	36	77	145
Avg 2014–2018	5	14	28	17	28	67	137
Avg 2009–2018	3	12	25	14	27	62	126

[a] District total is the number of commercial fishery participants that actually fished in Norton Sound; some may have fished more than 1 subdistrict.

Appendix A3.–Round weight and value of commercially caught salmon by species, Norton Sound District, 1990–2019.

Year	Pounds caught (round wt. in lb)					Salmon roe (lb)	Value of catch ($)
	Chinook	Sockeye	Coho	Pink	Chum		
1990	168,745	[a]	426,902	[a]	482,060	75	474,064
1991	107,541	[a]	469,495	[a]	597,272	221	413,479
1992	57,571	[a]	820,406	18,230	595,345	2,641	448,395
1993	151,504	[a]	287,702	406,820	347,072	2,608	368,723
1994	98,492	[a]	766,050	2,185,066	122,540	0	863,060
1995	174,771	[a]	356,190	198,121	290,445	0	356,164
1996	95,794	[a]	573,372	1,196,115	84,349	0	340,347
1997	225,136	1,095	235,517	50	253,006	880	363,908
1998	127,831	43	232,705	1,330,624	106,687	0	358,982
1999	48,421	0	88,037	0	57,656	0	76,860
2000	11,240	118	307,565	369,800	40,298	0	149,907
2001	3,803	353	152,293	0	79,558	0	56,921
2002	50	11	12,972	0	4,555	0	2,941
2003	136	121	139,775	0	23,687	0	64,473
2004	0	254	302,379	0	42,385	0	122,506
2005	2,511	2,069	659,278	0	28,071	0	296,154
2006	167	23	869,427	0	68,500	0	389,707
2007	206	16	1,002,078	10,537	151,386	0	572,195
2008	970	262	855,980	187,979	171,151	0	759,451
2009	0	583	679,416	46,698	240,502	0	722,167
2010	1,697	726	472,939	87,954	799,550	0	1,220,487
2011	1,659	2,396	438,481	19,768	774,906	0	1,269,730
2012	0	691	245,078	492,372	425,233	0	758,908
2013	0	1,416	410,791	24,201	823,453	0	1,183,236
2014	1,079	2,154	815,394	565,346	747,466	0	1,915,749
2015	10,704	25,642	1,226,475	215,552	1,018,487	0	1,940,408
2016	2,123	16,057	701,598	747,683	345,197	0	1,237,229
2017	2,321	16,748	1,308,875	72,839	1,163,445	0	2,788,316
2018	2,779	18,978	1,844,718	116,193	1,695,614	0	4,001,929
2019	15,017	42,156	899,679	262,577	1,064,005	0	2,073,586

[a] Information not available.

Appendix A4.–Estimated mean prices paid to commercial salmon fishery participants in dollars, Norton Sound District, 1990–2019.

Year	Chinook	Sockeye	Coho	Pink	Chum
1990	1.01	[a]	0.50	(0.75 for roe)	0.23
1991	0.87	[a]	0.36 (3.00 for roe)	[a]	0.27 (3.00 for roe)
1992	0.66	[a]	0.33 (1.50 for roe)	0.16	0.22
1993	0.72	0.40	0.22 (1.76 for roe)	0.15	0.24
1994	1.02	[a]	0.52	0.15	0.29
1995	0.66	[a]	0.43	0.18	0.18
1996	0.54	[a]	0.28	0.10	0.08
1997	1.00	[a]	0.47	0.06	0.11
1998	0.74	[a]	0.29	0.14	0.09
1999	0.82	[a]	0.35	[a]	0.11
2000	1.30	[a]	0.30	0.10	0.15
2001	1.00	0.37	0.25	[a]	0.19
2002	0.39	[a]	0.20	[a]	0.07
2003	0.64	0.45	0.44	[a]	0.14
2004	[a]	[a]	0.39	[a]	0.14
2005	1.22	0.45	0.44	[a]	0.15
2006	1.49	[a]	0.44	[a]	0.14
2007	0.55	0.55	0.53	0.14	0.24
2008	0.73	0.56	0.77	0.23	0.34
2009	[a]	0.34	0.93	0.18	0.33
2010	2.25	0.63	1.47	0.32	0.62
2011	3.01	1.04	1.70	0.25	0.68
2012	[a]	1.45	1.47	0.36	0.52
2013	[a]	1.49	1.77	0.22	0.55
2014	2.00	0.63	1.60	0.29	0.60
2015	2.25	0.60	1.10	0.14	0.50
2016	2.45	0.90	1.39	0.10	0.48
2017	3.00	1.40	1.40	0.03	0.79
2018	2.99	1.40	1.40	0.25	0.80
2019	3.00	1.39	1.57	0.13	0.50
Avg 2014–2018	2.62	0.99	1.38	0.16	0.63

[a] None sold.

Appendix A5.–Mean commercial salmon harvest weights, Norton Sound District, 1990–2019.

	Mean round weight in pounds[a]				
Year	Chinook	Sockeye	Coho	Pink	Chum
1990	19.0	7.4	7.5	[c]	7.4
1991	17.7	7.2	7.4	[c]	6.9
1992[b]	12.7	7.6	7.8	2.9	7.1
1993	16.9	7.4	6.7	2.6	6.5
1994	18.6	6.6	7.6	2.2	6.7
1995	19.7	7.2	7.4	2.4	6.8
1996	19.2	8.0	8.4	2.5	7.9
1997	17.9	6.8	7.3	2.5	7.4
1998	17.2	6.1	7.9	2.3	6.5
1999	19.3	[c]	7.0	[c]	7.3
2000	15.0	8.4	6.9	2.2	6.5
2001	17.9	8.0	7.8	[c]	7.2
2002[b]	10.0	11.0	7.4	[c]	7.6
2003[b]	11.3	7.6	8.2	[c]	6.7
2004	[c]	6.4	7.2	[c]	6.7
2005	16.6	6.3	7.7	[c]	7.1
2006[b]	14.5	7.7	6.7	[c]	6.9
2007[b]	12.0	8.0	8.0	2.8	6.8
2008[b]	14.7	5.7	7.1	2.5	6.8
2009	[c]	6.9	7.8	2.7	7.0
2010[b]	14.4	7.6	7.6	2.8	6.8
2011[b]	11.4	6.9	7.3	2.8	7.0
2012	[c]	6.9	6.6	2.4	6.8
2013	[c]	7.3	7.6	2.9	6.9
2014[b]	12.9	6.8	7.2	3.1	6.9
2015[b]	13.7	7.0	8.0	3.5	6.9
2016[b]	11.6	6.1	6.8	3.6	6.8
2017[b]	10.1	6.0	6.8	3.8	7.1
2018[b]	10.3	5.7	7.1	3.0	7.1
2019[b]	10.8	6.0	6.4	3.4	6.7

[a] Based on age-weight-length samples or fish tickets.

[b] Low Chinook salmon weight due to utilization of restricted mesh size.

[c] None sold.

Appendix A6.–Commercial and subsistence salmon catch by species, by year in Nome Subdistrict, Norton Sound District, 1990–2019.

	Nome (Subdistrict 1)																	
	Commercial						Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	0	0	0	0	0	0	58	234	510	2,233	4,246	7,281	58	234	510	2,233	4,246	7,281
1991	0	0	0	0	0	0	83	166	1,279	194	3,715	5,437	83	166	1,279	194	3,715	5,437
1992	1	2	693	185	881	1,762	152	163	1,481	7,351	1,684	10,831	153	165	2,174	7,536	2,565	12,593
1993	0	2	611	0	132	745	52	80	2,070	873	1,766	4,841	52	82	2,681	873	1,898	5,586
1994	0	1	287	0	66	354	23	69	983	6,556	1,673	9,304	23	70	1,270	6,556	1,739	9,658
1995	0	1	369	0	122	492	26	148	1,365	336	3,794	5,669	26	149	1,734	336	3,916	6,161
1996	0	0	9	13	3	25	9	185	828	3,510	2,287	6,819	9	185	837	3,523	2,290	6,844
1997	0	0	0	0	0	0	10	50	325	175	2,696	3,256	10	50	325	175	2,696	3,256
1998	0	0	0	0	0	0	15	14	1,057	4,797	964	6,847	15	14	1,057	4,797	964	6,847
1999[a]	0	0	0	0	0	0	11	85	161	58	337	652	11	85	161	58	337	652
2000	0	0	0	0	0	0	7	26	747	2,657	535	3,972	7	26	747	2,657	535	3,972
2001	0	0	0	0	0	0	2	92	425	113	858	1,490	2	92	425	113	858	1,490
2002	0	0	0	0	0	0	4	79	666	3,161	1,114	5,024	4	79	666	3,161	1,114	5,024
2003	0	0	0	0	0	0	63	76	351	507	565	1,562	63	76	351	507	565	1,562
2004	0	0	0	0	0	0	100	106	1,574	15,047	685	17,512	100	106	1,574	15,047	685	17,512
2005	0	0	0	0	0	0	62	177	1,287	5,075	803	7,404	62	177	1,287	5,075	803	7,404
2006[b]	0	0	0	0	0	0	24	159	3,865	9,329	890	14,267	24	159	3,865	9,329	890	14,267
2007	0	0	0	0	0	0	18	297	1,103	850	2,938	5,206	18	297	1,103	850	2,938	5,206
2008	0	0	0	0	0	0	39	127	3,423	12,592	739	16,920	39	127	3,423	12,592	739	16,920
2009	0	0	0	0	0	0	32	64	1,132	487	387	2,102	32	64	1,132	487	387	2,102
2010	0	0	0	0	0	0	39	77	1,983	6,281	3,124	11,504	39	77	1,983	6,281	3,124	11,504
2011	0	0	0	0	0	0	19	47	1,229	1,389	1,428	4,112	19	47	1,229	1,389	1,428	4,112
2012	0	0	0	0	0	0	11	171	1,150	8,376	2,521	12,229	11	171	1,150	8,376	2,521	12,229
2013[c]	[c]	[c]	[c]	[c]	[c]	[c]	48	211	1,804	845	3,065	5,973	48	211	1,804	845	3,065	5,973
2014	3	7	39	1,169	1,456	2,674	31	405	3,042	6,648	3,844	13,970	34	412	3,081	7,817	5,300	16,644
2015	4	244	13	509	4,861	5,631	21	1,081	1,790	3,180	3,967	10,039	25	1,325	1,803	3,689	8,828	15,670
2016	0	10	118	1,456	662	2,246	26	601	2,274	10,069	3,260	16,230	26	611	2,392	11,525	3,922	18,476
2017	43	522	5,973	1,605	6,788	14,931	8	605	3,943	5,211	1,326	11,093	51	1,127	9,916	6,816	8,114	26,024
2018	18	426	9,080	3,930	10,205	23,659	11	336	4,940	10,786	1,196	17,269	29	762	14,020	14,716	11,401	40,928
2019	42	816	7,832	4,941	15,274	28,905	14	366	3.389	5,351	629	9,749	56	1,182	11,221	10,292	15,903	38,654
5-yr avg[d,e]	14	242	3,045	1,734	4,794	9,828	19	606	3,198	7,179	2,719	13,720	33	847	6,242	8,913	7,513	23,548
10-yr avg[e,f]	8	134	1,691	963	2,664	5,460	22	376	2,387	5,825	2,339	10,950	30	511	4,078	6,788	5,003	16,410

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Note: Commercial harvest numbers may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Beginning in 1999, Tier II chum salmon fishing restrictions limited the number of permit holders that could fish for chum salmon.

[b] Beginning in 2006, Tier II chum salmon fishing restrictions were suspended.

[c] Less than 3 permit holders fished; therefore, information is confidential.

[d] 2014–2018.

[e] Confidential information is excluded from averages.

[f] 2009–2018.

Appendix A7.–Commercial and subsistence salmon catch by species, by year in Golovin Subdistrict, Norton Sound District, 1990–2019.

	Golovin (Subdistrict 2)																	
	Commercial						Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	52	21	9	9	15,993	16,066	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1991	49	1	0	0	14,839	14,889	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1992	6	9	2,085	0	1,002	3,102	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1993	1	4	2	8,480	2,803	11,290	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1994[b]	0	0	3,424	0	111	3,535	253	168	733	8,410	1,337	10,901	253	168	4,157	8,410	1,448	14,436
1995[b]	0	0	1,616	4,296	1,987	7,899	165	34	1,649	7,818	10,373	20,039	165	34	3,265	12,114	12,360	27,938
1996[b]	0	0	638	0	0	638	86	134	3,014	17,399	2,867	23,500	86	134	3,652	17,399	2,867	24,138
1997[b]	19	2	102	20	8,003	8,146	138	427	555	4,570	4,891	10,581	157	429	657	4,590	12,894	18,727
1998[b]	1	0	3	106,761	723	107,488	184	37	1,292	13,340	1,893	16,746	185	37	1,295	120,101	2,616	124,234
1999[b]	0	0	0	0	0	0	60	48	1,234	469	3,656	5,467	60	48	1,234	469	3,656	5,467
2000[b]	0	0	1,645	17,408	164	19,217	169	18	2,335	10,906	1,155	14,583	169	18	3,980	28,314	1,319	33,800
2001[b]	0	43	30	0	7,094	7,167	89	72	880	1,665	3,291	5,997	89	115	910	1,665	10,385	13,164
2002[b]	0	0	0	0	0	0	69	66	1,640	14,430	1,882	18,087	69	66	1,640	14,430	1,882	18,087
2003[b]	0	0	0	0	0	0	166	28	309	5,012	1,477	6,992	166	28	309	5,012	1,477	6,992
2004[c]	0	0	0	0	0	0	164	6	654	19,936	880	21,640	164	6	654	19,936	880	21,640
2005[c]	0	0	0	0	0	0	96	15	686	11,467	1,852	14,116	96	15	686	11,467	1,852	14,116
2006[c]	0	0	0	0	0	0	136	38	1,760	14,670	722	17,326	136	38	1,760	14,670	722	17,326
2007[c]	0	0	0	0	0	0	188	321	1,179	3,980	4,217	9,885	188	321	1,179	3,980	4,217	9,885
2008[c]	0	0	256	2,699	623	3,578	146	95	2,337	10,155	350	13,083	146	95	2,593	12,854	973	16,661
2009[c]	0	0	2,452	0	87	2,539	237	33	1,377	3,787	1,694	7,128	237	33	3,829	3,787	1,781	9,667
2010[c]	3	2	5,586	2,039	17,212	24,842	59	32	2,020	9,620	1,133	12,864	62	34	7,606	11,659	18,345	37,706
2011[c]	7	0	859	3	20,075	20,944	99	74	1,345	5,652	2,122	9,292	106	74	2,204	5,655	22,197	30,236
2012[c]	2	14	573	31,055	3,791	35,435	57	52	1,143	7,635	1,056	9,943	59	66	1,716	38,690	4,847	45,378
2013[c]	0	0	5,362	1,180	3,113	9,655	47	15	964	3,655	3,256	7,937	47	15	6,326	4,835	6,369	17,592
2014[c]	28	47	4,156	7,888	13,560	25,679	36	91	1,720	7,363	1,719	10,929	64	138	5,876	15,251	15,279	36,608
2015[c]	73	1,214	2,996	1,596	20,525	26,404	147	71	1,091	4,443	2,250	8,002	220	1,285	4,087	6,039	22,775	34,406
2016[c]	17	157	880	15,346	5,331	21,731	35	29	844	6,747	1,006	8,661	52	186	1,724	22,093	6,337	30,392
2017[c]	4	83	710	331	7,173	8,301	25	12	1,631	3,756	1,037	6,461	29	95	2,341	4,087	8,210	14,762
2018[c]	31	75	2,995	4,171	25,070	32,342	50	83	1,369	6,944	773	9,219	81	158	4,364	11,115	25,843	41,561
2019[c]	33	122	2,424	7,412	25,598	35,591	39	9	1,277	5,174	375	6,874	72	131	3,703	12,586	25,973	42,465
5-yr avg[d]	31	315	2,347	5,866	14,332	22,891	59	57	1,331	5,851	1,357	8,654	89	372	3,678	11,717	15,689	31,546
10-yr avg[e]	17	159	2,657	6,361	11,594	20,787	79	49	1,350	5,960	1,605	9,044	102	202	3,830	12,495	10,711	27,341

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Note: Commercial harvest numbers may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Norton Sound District subsistence salmon harvest surveys have been conducted sporadically since statehood, but no information is available.

[b] Subsistence harvests were estimated from Division of Subsistence household surveys.

[c] Beginning in 2004 a permit was required for the subdistrict, replacing household surveys. The permit system helped to record harvest by residents living outside the subdistrict.

[d] 2014–2018.

[e] 2009–2018.

Appendix A8.–Commercial and subsistence salmon catch by species, by year in Elim Subdistrict, Norton Sound District, 1990–2019.

	Elim (Subdistrict 3)																	
	Commercial						Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	202	0	0	501	3,723	4,426	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1991[b]	161	0	0	0	804	965	312	0	2,153	3,555	2,660	8,680	473	0	2,153	3,555	3,464	9,645
1992[b]	0	0	3,531	0	6	3,537	100	0	1,281	6,152	1,260	8,793	100	0	4,812	6,152	1,266	12,330
1993[b]	3	0	4,065	0	167	4,235	368	0	1,217	1,726	1,635	4,946	371	0	5,282	1,726	1,802	9,181
1994[b]	0	0	5,345	0	414	5,759	322	104	1,180	9,345	3,476	14,427	322	104	6,525	9,345	3,890	20,186
1995[b]	4	44	3,742	2,962	1,171	7,923	284	17	1,353	2,046	3,774	7,474	288	61	5,095	5,008	4,945	15,397
1996[b]	0	0	1,915	68,609	0	70,524	417	52	1,720	9,442	2,319	13,950	417	52	3,635	78,051	2,319	84,474
1997[b]	844	0	1,409	0	2,683	4,936	619	50	1,213	1,314	2,064	5,260	1,463	50	2,622	1,314	4,747	10,196
1998[b]	105	0	1,462	145,669	2,311	149,547	414	49	1,831	6,891	1,376	10,561	519	49	3,293	152,560	3,687	160,108
1999[b]	0	0	0	0	0	0	424	13	975	1,564	744	3,720	424	13	975	1,564	744	3,720
2000[b]	10	0	5,182	46,369	535	52,096	248	46	1,429	5,983	1,173	8,879	258	46	6,611	52,352	1,708	60,975
2001[b]	7	0	1,696	0	681	2,384	427	70	1,352	1,390	898	4,137	434	70	3,048	1,390	1,579	6,521
2002[b]	0	0	0	0	0	0	565	14	1,801	8,345	1,451	12,176	565	14	1,801	8,345	1,451	12,176
2003[b]	0	0	0	0	0	0	660	39	1,143	2,524	1,687	6,053	660	39	1,143	2,524	1,687	6,053
2004[c]	0	0	0	0	0	0	412	0	704	7,858	683	9,657	412	0	704	7,858	683	9,657
2005[c]	0	0	0	0	0	0	225	9	1,011	3,721	598	5,564	225	9	1,011	3,721	598	5,564
2006[c]	0	0	0	0	0	0	179	13	1,769	5,216	1,267	8,444	179	13	1,769	5,216	1,267	8,444
2007[c]	1	0	5,908	1,648	4,567	12,124	260	0	2,295	1,742	2,334	6,631	261	0	8,203	3,390	6,901	18,755
2008[c]	5	0	4,602	14,536	304	19,447	269	0	1,804	7,655	1,284	11,012	274	0	6,406	22,191	1,588	30,459
2009[c]	0	1	9,582	35	597	10,215	545	13	2,434	1,522	600	5,114	545	14	12,016	1,557	1,197	15,329
2010[c]	9	5	10,180	11,658	23,453	45,305	97	7	1,679	7,830	3,925	13,538	106	12	11,859	19,488	27,378	58,843
2011[c]	4	12	8,336	165	23,531	32,048	160	3	1,688	704	3,671	6,226	164	15	10,024	869	27,202	38,274
2012[c]	3	1	2,003	52,775	2,262	57,044	42	0	1,302	10,848	1,494	13,686	45	1	3,305	63,623	3,756	70,730
2013[c]	6	27	6,675	601	1,434	8,743	39	15	1,515	1,134	1,218	3,921	45	42	8,190	1,735	2,652	12,664
2014[c]	101	164	15,938	28,507	17,525	62,235	276	38	1,808	4,595	2,081	8,798	377	202	17,746	33,102	19,606	71,033
2015[c]	533	1,535	14,155	2,787	30,116	49,126	198	154	1,158	1,828	1,573	4,911	731	1,689	15,313	4,615	31,689	54,037
2016[c]	69	728	14,197	39,028	6,736	60,758	163	60	1,164	6,717	830	8,934	232	788	15,361	45,745	7,566	69,692
2017[c]	51	538	19,410	2,877	11,779	36,655	51	35	2,362	3,664	1,109	7,221	102	573	21,772	6,541	12,888	41,876
2018[c]	138	482	20,002	9,474	38,419	68,515	59	35	1,657	4,360	588	6,699	197	517	21,659	13,834	39,007	75,214
2019[c]	121	724	11,450	14,911	13,803	41,009	105	20	853	3,065	570	4,613	226	744	12,303	17,976	14,373	45,622
5-yr avg[d]	178	689	16,7405	16,535	20,9158	55,058	149	64	1,6300	4,233	1,236	7,313	328	754	18,3706	20,767	22,1510	62,370
10-yr avg[e]	91	349	12,048	14,791	15,585	42,864	163	36	1,677	4,320	1,709	7,905	254	385	13,725	19,111	17,294	50,769

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Note: Commercial harvest numbers may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Norton Sound District subsistence salmon harvest surveys have been conducted sporadically since statehood, but no information is available.

[b] Subsistence harvests were estimated from Division of Subsistence household surveys.

[c] Beginning in 2004, a permit was required for the subdistrict, replacing household surveys. The permit system helped to record harvest by residents living outside the subdistrict.

[d] 2014–2018.

[e] 2009–2018.

Appendix A9.–Commercial and subsistence salmon catch by species, by year in Norton Bay Subdistrict, Norton Sound District, 1990–2019.

	Norton Bay (Subdistrict 4)																	
	Commercial						Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1900	0	0	0	0	0	0	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1991	0	0	0	0	0	0	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1992	27	0	0	0	1,787	1,814	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1993	267	0	0	290	1,378	1,935	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1994[b]	0	0	0	0	0	0	308	1	370	6,049	4,581	11,309	308	1	370	6,049	4,581	11,309
1995[b]	0	0	0	0	0	0	475	46	985	3,514	5,828	10,848	475	46	985	3,514	5,828	10,848
1996[b]	0	0	0	0	0	0	295	3	676	3,929	4,161	9,064	295	3	676	3,929	4,161	9,064
1997[b]	194	0	0	0	531	725	656	54	322	1,795	4,040	6,867	850	54	322	1,795	4,571	7,592
1998[b]	0	0	0	0	0	0	684	0	388	2,009	6,192	9,273	684	0	388	2,009	6,192	9,273
1999[b]	0	0	0	0	0	0	327	0	167	1,943	4,153	6,590	327	0	167	1,943	4,153	6,590
2000[b]	0	0	0	0	0	0	397	2	267	2,255	4,714	7,635	397	2	267	2,255	4,714	7,635
2001[b]	0	0	0	0	0	0	460	14	276	5,203	4,445	10,398	460	14	276	5,203	4,445	10,398
2002[b]	0	0	0	0	0	0	557	0	509	6,049	3,971	11,086	557	0	509	6,049	3,971	11,086
2003[b]	0	0	0	0	0	0	373	46	510	4,184	3,397	8,510	373	46	510	4,184	3,397	8,510
2004	0	0	0	0	0	0	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2005	0	0	0	0	0	0	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2006	0	0	0	0	0	0	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2007	0	0	0	0	0	0	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2008	7	0	600	1,232	507	2,346	187	2	1,084	4,489	3,330	9,092	194	2	1,684	5,721	3,837	11,438
2009	0	0	1,714	558	1,850	4,122	259	2	891	2,508	3,183	6,843	259	2	2,605	3,066	5,033	10,965
2010	0	7	1,606	2,597	6,007	10,217	341	21	461	3,115	3,180	7,118	341	28	2,067	5,712	9,187	17,335
2011	5	9	4,836	652	7,558	13,060	239	1	549	1,132	3,529	5,450	6	558	5,968	4,181	13,008	13,066
2012	10	16	4,378	49,970	8,417	62,791	103	0	310	2,623	2,721	5,757	113	16	4,688	52,593	11,138	68,548
2013	8	4	5,485	487	36,021	42,005	123	2	826	1,341	3,853	6,145	131	6	6,311	1,828	39,874	48,150
2014	71	22	9,562	28,393	13,436	51,484	163	1	1,219	2,321	4,431	8,135	234	23	10,781	30,714	17,867	59,619
2015	245	335	9,468	8,297	23,568	41,913	269	56	1,005	1,692	3,646	6,668	514	391	10,473	9,989	27,214	48,581
2016	111	174	6,656	38,357	14,069	59,367	297	289	1,142	2,432	3,349	7,509	408	463	7,798	40,789	17,418	66,876
2017	61	265	2,990	3,666	31,653	38,635	318	229	1,487	2,845	6,553	11,432	379	494	4,477	6,511	38,206	50,067
2018[c]	52	158	1,513	1,007	14,548	17,278	69	100	596	1,367	1,469	3,601	121	258	2,109	2,374	16,017	20,879
2019	8	106	199	1,320	1,982	3,615	16	135	1,544	4,466	2,306	8,467	24	241	1,743	5,786	4,288	12,082
5-yr avg[d]	108	191	6,038	15,944	19,455	41,735	223	135	1,090	2,131	3,890	7,469	331	326	7,128	18,075	23,344	49,204
10-yr avg[e]	56	99	4,821	13,398	15,713	34,087	218	70	849	2,138	3,591	6,866	251	224	5,728	15,776	19,496	40,409

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Note: Commercial harvest numbers may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Norton Sound District subsistence salmon harvest surveys have been conducted sporadically since statehood, but no information is available.

[b] Subsistence harvests were estimated from Division of Subsistence household surveys.

[c] A limited survey took place.

[d] 2014–2018.

[e] 2009–2018.

Appendix A10.–Commercial and subsistence salmon catch by species, by year in Shaktoolik Subdistrict, Norton Sound District, 1990–2019.

	Shaktoolik (Subdistrict 5)																	
	Commercial						Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	2,644	49	4,695	0	21,748	29,136	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1991	1,324	55	11,614	0	31,619	44,612	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1992	1,098	56	14,660	0	27,867	43,681	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1993	2,756	20	11,130	106,743	20,864	141,513	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1994[b]	885	8	22,065	502,231	5,411	530,600	1,175	1	2,777	9,133	1,221	14,307	2,060	9	24,842	511,364	6,632	544,907
1995[b]	1,239	5	10,856	37,377	14,775	64,252	1,303	72	2,682	7,176	2,534	15,885	2,542	77	13,538	44,553	17,309	80,137
1996[b]	1,340	1	13,444	304,982	3,237	323,004	1,114	31	3,615	8,370	4,425	17,555	2,454	32	17,059	313,352	7,662	340,559
1997[b]	2,449	0	4,694	0	5,747	12,890	1,146	62	2,761	5,779	1,612	11,360	3,595	62	7,455	5,779	7,359	24,250
1998[b]	910	0	3,624	236,171	7,080	247,785	982	92	1,872	6,270	1,034	10,250	1,892	92	5,496	242,441	8,114	258,035
1999[b]	581	0	2,398	0	2,181	5,160	818	183	1,556	5,092	467	8,116	1,399	183	3,954	5,092	2,648	13,276
2000[b]	160	3	7,779	85,493	2,751	96,186	440	20	2,799	5,432	2,412	11,103	600	23	10,578	90,925	5,163	107,289
2001[b]	90	0	2,664	0	1,813	4,567	936	143	2,090	10,172	1,553	14,894	1,026	143	4,754	10,172	3,366	19,461
2002[b]	1	0	680	0	261	942	1,230	4	2,169	8,769	800	12,972	1,231	4	2,849	8,769	1,061	13,914
2003[b]	2	0	4,031	0	485	4,518	881	50	2,941	12,332	587	16,791	883	50	6,972	12,332	1,072	21,309
2004	0	0	12,734	0	1,372	14,106	943	12	1,994	7,291	139	10,379	943	12	14,728	7,291	1,511	24,485
2005	50	0	21,818	0	791	22,659	807	0	1,913	12,075	202	14,997	857	0	23,731	12,075	993	37,656
2006	8	0	32,472	0	3,321	35,801	382	36	1,968	4,817	351	7,554	390	36	34,440	4,817	3,672	43,355
2007	5	0	31,810	0	6,076	37,891	515	28	1,443	2,708	465	5,159	520	28	33,253	2,708	6,541	43,050
2008	6	24	37,624	8,219	6,042	51,915	422	2	1,504	4,920	201	7,049	428	26	39,128	13,139	6,243	58,964
2009	4	36	13,063	5,146	10,941	29,190	417	57	2,141	6,101	374	9,090	421	93	15,204	11,247	11,315	38,280
2010	4	18	11,868	4,622	40,483	56,995	327	115	1,940	6,406	1,680	10,468	331	133	13,808	11,028	42,163	67,463
2011	45	69	15,368	29	25,388	40,899	235	100	1,241	2,681	490	4,747	280	169	16,609	2,710	25,878	45,646
2012	25	29	7,828	19,253	20,141	47,276	214	9	1,110	4,609	634	6,576	239	38	8,938	23,862	20,775	53,852
2013	6	45	6,890	14	23,268	30,223	136	108	2,146	3,346	983	6,719	142	153	9,036	3,360	24,251	36,942
2014	16	47	19,753	33,137	29,455	82,408	158	82	1,159	3,961	682	6,042	174	129	20,912	37,098	30,137	88,450
2015	49	53	25,637	15,156	27,503	68,398	178	223	2,201	5,263	510	8,375	227	276	27,838	20,419	28,013	76,773
2016	23	510	25,866	28,308	12,149	66,856	290	128	2,142	4,082	645	7,287	313	638	28,008	32,390	12,794	74,143
2017	52	470	50,299	1,470	41,664	93,955	177	169	2,979	5,427	576	9,328	229	639	53,278	6,897	42,240	103,283
2018	19	516	71,468	2,489	41,482	115,974	162	56	2,107	1,121	319	3,765	181	572	73,575	3,610	41,801	119,739
2019	318	1,995	35,381	19,015	42,827	99,536	317	129	2,167	3,295	605	6,513	635	2,124	37,548	22,310	43,432	106,049
5-yr avg[c]	32	319	38,605	16,112	30,451	85,518	193	132	2,118	3,971	546	6,959	225	451	40,722	20,083	30,997	92,478
10-yr avg[d]	24	179	24,804	10,962	27,247	63,217	229	105	1,917	4,300	689	7,240	254	284	26,721	15,262	27,937	70,457

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Note: Commercial harvest numbers may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Norton Sound District subsistence salmon harvest surveys have been conducted sporadically since statehood, but no information is available.

[b] Subsistence harvests were estimated from Division of Subsistence household surveys.

[c] 2014–2018.

[d] 2009–2018.

Appendix A11.–Commercial and subsistence salmon catch by species, by year in Unalakleet Subdistrict, Norton Sound District, 1990–2019.

	Unalakleet (Subdistrict 6)																	
	Commercial						Subsistence						Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	5,998	358	52,015	0	23,659	82,030	2,476	[a]	[a]	[a]	[a]	[a]	8,474	[a]	[a]	[a]	[a]	[a]
1991	4,534	147	52,033	0	39,609	96,323	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1992	3,409	229	84,449	6,284	52,547	146,918	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1993	5,944	251	26,290	42,061	28,156	102,702	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1994[b]	4,400	71	71,019	480,158	12,288	567,936	3,035	404	11,386	27,163	3,325	45,313	7,435	475	82,405	507,321	15,613	613,249
1995[b]	7,617	78	31,280	37,009	24,843	100,827	3,114	591	9,833	16,625	5,458	35,621	10,731	669	41,113	53,634	30,301	136,448
1996[b]	3,644	0	52,200	113,837	7,369	177,050	3,023	181	11,187	18,026	4,227	36,644	6,667	181	63,387	131,863	11,596	213,694
1997[b]	9,067	159	26,079	0	17,139	52,444	4,191	196	6,746	10,600	1,603	23,336	13,258	355	32,825	10,600	18,742	75,780
1998[b]	6,413	7	24,534	99,412	6,210	136,576	4,066	201	7,489	13,654	3,038	28,448	10,479	208	32,023	113,066	9,248	165,024
1999[b]	1,927	0	10,264	0	5,700	17,891	2,691	537	8,140	10,060	3,692	25,120	4,618	537	18,404	10,060	9,392	43,011
2000[b]	582	11	29,803	17,278	2,700	50,374	2,429	212	5,878	10,540	3,000	22,059	3,011	223	35,681	27,818	5,700	72,433
2001[b]	116	1	15,102	0	1,512	16,731	2,810	359	6,270	11,269	2,918	23,626	2,926	360	21,372	11,269	4,430	40,357
2002[b]	4	1	1,079	0	339	1,423	2,367	280	4,988	15,915	3,877	27,427	2,371	281	6,067	15,915	4,216	28,850
2003[b]	10	21	13,029	0	3,075	16,135	2,585	297	6,192	21,779	1,785	32,638	2,595	318	19,221	21,779	4,860	48,773
2004	22	47	29,282	0	4,924	34,275	2,829	417	6,653	22,755	2,154	34,808	2,851	464	35,935	22,755	7,078	69,083
2005	101	12	63,705	0	3,192	67,010	2,193	656	7,886	25,447	2,660	38,842	2,294	668	71,591	25,447	5,852	105,852
2006	12	3	98,336	0	6,721	105,072	2,537	326	9,905	22,547	2,712	38,027	2,549	329	108,241	22,547	9,433	143,099
2007	13	2	88,418	2,121	11,788	102,342	1,666	292	5,859	11,674	2,057	21,547	1,678	294	94,277	13,795	13,845	123,889
2008	65	36	77,227	48,839	17,648	143,815	1,402	137	7,452	15,116	2,805	26,912	1,467	173	84,679	63,955	20,453	170,727
2009	80	89	60,230	11,625	20,647	92,671	1,892	200	6,923	11,707	2,708	23,430	1,972	289	67,153	23,332	23,355	116,101
2010	124	71	32,839	10,641	30,588	74,263	1,257	297	3,780	9,002	3,159	17,495	1,381	368	36,619	19,643	33,747	91,758
2011	124	279	29,518	6,292	34,003	70,216	607	189	2,486	5,608	3,316	12,206	731	468	32,004	11,900	37,319	82,422
2012	157	74	22,274	52,445	28,161	103,111	808	192	4,558	9,460	3,973	18,991	965	266	26,832	61,905	32,134	122,102
2013	131	171	29,390	6,056	54,873	90,621	468	221	6,117	7,724	3,129	17,659	599	392	35,507	13,780	58,002	108,280
2014	70	232	63,308	83,312	32,313	179,235	442	146	7,232	12,707	3,476	24,003	512	378	70,540	96,019	35,789	203,238
2015	384	738	101,659	34,543	40,924	178,248	1,139	294	6,723	8,940	2,821	19,917	1,523	1,032	108,382	43,483	43,745	198,165
2016	101	1,309	55,173	86,466	12,229	155,278	837	429	8,074	13,145	3,728	26,213	938	1,738	63,247	99,611	15,957	181,491
2017	327	1,097	111,872	10,372	64,416	188,084	496	304	8,680	11,069	3,625	24,174	823	1,401	120,552	21,441	68,041	212,258
2018	648	1,966	155,649	19,378	108,305	285,946	810	235	5,204	5,017	2,227	13,493	1,458	2,201	160,853	24,395	110,532	299,439
2019	1,035	3,440	82,626	29,417	58,990	175,508	1,459	571	5,584	8,055	1,795	17,464	2,494	4,011	88,210	37,472	60,785	192,972
5-yr avg[c]	306	1,068	97,532	46,814	51,637	197,358	745	282	7,183	10,176	3,175	21,560	1,051	1,350	104,715	56,990	54,813	218,918
10-yr avg[d]	215	603	66,191	32,113	42,646	141,767	876	251	5,978	9,438	3,216	19,758	1,090	853	72,169	41,551	45,862	161,525

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Note: Commercial harvest numbers may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Norton Sound District subsistence salmon harvest surveys have been conducted sporadically since statehood, but no information is available.

[b] Subsistence harvests were estimated from Division of Subsistence household surveys.

[c] 2014–2018.

[d] 2009–2018.

Appendix A12.–Subsistence salmon catch by species and year for St. Michael in Norton Sound District, 1994–2019.

Year	Chinook	Chum	Pink	Sockeye	Coho	Total
1994	769	4,309	2,673	127	1,022	8,900
1995	1,267	5,778	391	45	2,235	9,716
1996	1,400	6,352	1,503	3	1,641	10,899
1997	970	2,816	84	41	547	4,458
1998	542	1,502	961	143	1,406	4,554
1999	1,053	3,036	365	111	798	5,363
2000	160	1,381	80	16	1,180	2,817
2001	282	2,246	229	17	490	3,264
2002	227	1,136	583	20	989	2,955
2003	295	1,994	577	89	1,438	4,393
2004	Subsistence surveys were not conducted.					
2005	998	3,614	1,742	61	1,497	7,912
2006	271	2,628	480	347	1,256	4,982
2007	452	2,119	265	9	622	3,467
2008	Subsistence surveys were not conducted.					
2009	825	921	169	24	1,088	3,027
2010	Subsistence surveys were not conducted.					
2011	Subsistence surveys were not conducted.					
2012	80	2,172	457	20	911	3,640
2013	Subsistence surveys were not conducted.					
2014	323	2,202	683	0	460	3,668
2015	475	4,634	237	33	762	6,141
2016	667	3,591	373	0	1,098	5,729
2017	Subsistence surveys were not conducted.					
2018	Subsistence surveys were not conducted.					
2019	Subsistence surveys were not conducted.					

Note: Harvest numbers shown have been expanded to include households not contacted.

Appendix A13.–Subsistence salmon catch by species and year for Stebbins in Norton Sound District, 1994–2019.

Year	Chinook	Chum	Pink	Sockeye	Coho	Total
1994	1,525	5,989	5,552	288	3,948	17,302
1995	1,211	5,042	758	207	2,570	9,788
1996	1,030	7,401	2,375	424	3,746	14,976
1997	1,164	3,230	243	116	1,826	6,579
1998	1,410	3,909	3,125	295	3,116	11,855
1999	760	3,312	459	200	1,312	6,043
2000	298	2,913	364	341	2,429	6,345
2001	570	3,999	202	0	2,759	7,530
2002	450	3,586	7,459	300	2,324	14,119
2003	265	2,399	2,685	171	1,215	6,735
2004	Subsistence surveys were not conducted.					
2005	485	5,164	4,353	59	2,702	12,763
2006	355	4,236	4,321	140	4,856	13,908
2007	763	4,980	1,881	0	2,006	9,630
2008	Subsistence surveys were not conducted.					
2009	713	1,461	328	0	1,114	3,616
2010	Subsistence surveys were not conducted.					
2011	Subsistence surveys were not conducted.					
2012	109	3,456	3,659	0	1,256	8,480
2013	Subsistence surveys were not conducted.					
2014	209	5,104	1,124	0	1,492	7,929
2015	299	2,798	359	4	2,122	5,582
2016	778	4,383	2,245	38	2,268	9,712
2017	Subsistence surveys were not conducted.					
2018	Subsistence surveys were not conducted.					
2019	Subsistence surveys were not conducted.					

Note: Harvest numbers shown have been expanded to include households not contacted.

Appendix A14.–Commercial, subsistence, and sport salmon catch by species, by year for Subdistricts 1–6 in Norton Sound District, 1990–2019.

	Subdistricts 1–6																	
	Commercial						Subsistence						Sport fish					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
1990[a]	8,895	434	56,712	501	65,123	131,665	2,534	234	510	2,233	4,246	7,281	364	198	3,305	7,647	925	12,439
1991[a]	6,068	203	63,647	0	86,871	156,789	395	166	3,432	3,749	6,375	14,117	404	237	5,800	1,738	1,415	9,594
1992[a]	4,541	296	105,418	6,284	83,394	199,933	252	163	2,762	13,503	2,944	19,624	204	131	4,671	6,403	523	11,932
1993[a]	8,972	279	43,283	157,574	53,562	263,670	420	80	3,287	2,599	3,401	9,787	595	10	3,783	2,250	691	7,329
1994	5,285	80	102,140	982,389	18,290	1,108,184	5,116	747	17,429	66,656	15,613	105,561	600	18	5,547	7,051	536	13,752
1995	8,860	128	47,863	81,644	42,898	181,393	5,367	908	17,867	37,515	31,761	95,536	438	104	3,705	928	394	5,569
1996	4,984	1	68,206	487,441	10,609	571,241	4,944	586	21,040	60,676	20,286	107,532	662	100	7,289	5,972	662	14,685
1997	12,573	161	32,284	20	34,103	79,141	6,760	839	11,922	24,233	16,906	60,660	1,106	30	4,393	1,458	278	7,265
1998	7,429	7	29,623	588,013	16,324	641,396	6,345	393	13,929	46,961	14,497	82,125	590	16	4,441	6,939	682	12,668
1999	2,508	0	12,662	0	7,881	23,051	4,331	866	12,233	19,186	13,049	49,665	630	0	5,582	3,039	211	9,462
2000	752	14	44,409	166,548	6,150	217,873	3,690	324	13,455	37,773	12,989	68,231	889	45	7,441	2,886	1,097	12,358
2001	213	44	19,492	0	11,100	30,849	4,724	750	11,293	29,812	13,963	60,542	271	39	4,802	360	1,709	7,181
2002	5	1	1,759	0	600	2,365	4,792	443	11,773	56,669	13,095	86,772	802	0	4,211	4,303	818	10,134
2003	12	21	17,060	0	3,560	20,653	4,728	536	11,446	46,338	9,498	72,546	239	572	3,039	2,222	292	6,364
2004[a]	22	47	42,016	0	6,296	48,381	4,448	541	11,579	72,887	4,541	93,996	535	404	5,806	8,309	498	15,552
2005[a]	151	12	85,523	0	3,983	89,669	3,383	857	12,783	57,785	6,115	80,923	216	0	3,959	473	36	4,684
2006[a]	20	3	130,808	0	10,042	140,873	3,258	572	19,267	56,579	5,942	85,618	427	22	11,427	5,317	344	17,537
2007[a]	19	2	126,136	3,769	22,431	152,357	2,647	938	11,879	20,954	12,011	48,428	147	15	6,179	1,331	96	7,768
2008	83	60	120,309	75,525	25,124	221,101	2,465	363	17,604	54,927	8,709	84,068	580	63	10,756	6,855	341	18,595
2009	84	126	87,041	17,364	34,122	138,737	3,382	369	14,898	26,112	8,946	53,707	277	0	6,664	1,321	417	8,679
2010	140	103	62,079	31,557	117,743	211,622	2,120	549	11,863	42,254	16,201	72,987	61	0	5,876	2,717	118	8,772
2011	185	369	58,917	7,141	110,555	177,167	1,359	414	8,538	17,166	14,556	42,033	61	58	3,582	566	139	4,406
2012	197	134	37,056	205,498	62,772	305,657	1,235	424	9,573	43,551	12,399	67,182	0	28	5,099	3,220	209	8,556
2013	151	247	53,802	8,338	118,709	181,247	861	572	13,372	18,045	15,504	48,354	0	23	7,567	1,806	2,267	11,663
2014	289	519	112,756	182,406	107,745	403,715	1,106	763	16,180	37,595	16,233	71,877	0	0	3,358	4,603	511	8,472
2015	1,288	4,119	153,929	62,935	147,497	369,768	1,952	1,879	13,968	25,346	14,767	57,912	0	271	3,720	1,381	331	5,703
2016	321	2,888	102,890	208,961	51,176	366,236	1,648	1,536	15,640	43,192	12,818	74,834	78	83	5,554	8,368	486	14,569
2017	538	2,975	191,254	20,321	163,473	378,561	1,075	1,354	21,082	31,972	14,226	69,709	13	171	5,944	962	488	7,578
2018	906	3,623	260,707	40,449	238,029	543,714	1,161	845	15,873	29,595	6,572	54,046	0	19	6,251	1,649	218	8,137
2019	1,557	7,203	139,914	77,016	158,474	384,164	1,950	1,230	14,814	29,406	6,280	53,680	[b]	[b]	[b]	[b]	[b]	[b]
5-yr avg[c]	668	2,825	164,307	103,005	141,584	412,389	1,388	1,275	16,549	33,540	12,923	65,676	18	111	4,965	3,393	404	8,891
10-yr avg[d]	410	1,510	112,043	78,492	115,182	307,638	1,590	871	14,099	31,483	13,222	61,264	49	67	5,362	2,659	517	8,653

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Note: Commercial harvest may include some salmon reported on fish tickets that were retained for personal use and not commercially sold.

[a] Not all subdistricts were surveyed.

[b] Information is not yet available.

[c] 2014–2018.

[d] 2009–2018.

Appendix A15.–Sport salmon harvest by species, by year, for the Unalakleet River, 1990–2019.

Year	Chinook	Coho	Chum	Pink	Total
1990	276	1,826	298	1,180	3,580
1991	296	2,180	497	437	3,410
1992	117	1,555	379	779	2,830
1993	382	643	116	89	1,230
1994	379	2,425	220	402	3,426
1995	259	2,033	207	222	2,721
1996	384	3,411	463	59	4,317
1997	842	2,784	228	1,055	4,909
1998	513	2,742	447	434	4,136
1999	415	2,691	211	2,946	6,263
2000	345	4,150	403	961	5,859
2001	250	2,766	714	188	3,918
2002	544	2,937	607	1,378	5,466
2003	97	1,604	191	29	1,921
2004	356	3,524	47	2,003	5,930
2005	216	3,959	36	473	4,684
2006	394	4,985	224	891	6,494
2007	147	4,117	85	618	4,967
2008	580	6,029	175	2,077	8,861
2009	236	5,095	260	586	6,177
2010	61	3,006	59	535	3,661
2011	54	2,493	77	391	3,015
2012	0	3,283	118	20	3,421
2013	0	4,068	354	886	5,308
2014	0	1,432	377	352	2,161
2015	0	2,602	78	222	2,902
2016	78	3,748	28	974	4,828
2017	13	4,446	254	37	4,750
2018	0	5,333	30	49	5,412
2019	Information is not yet available.				
Avg 2014–2018	18	3,512	153	327	4,011
Avg 2009–2018	44	3,551	164	405	4,164

Appendix A16.–Sport salmon harvest by species, by year, for the Fish and Niukluk Rivers, 1990–2019.

Year	Chinook	Coho	Chum	Pink	Total
1990	0	267	216	638	1,121
1991	14	977	272	356	1,619
1992	0	753	15	357	1,125
1993	9	1,185	514	278	1,986
1994	10	1,122	119	231	1,482
1995	18	818	27	136	999
1996	11	1,652	166	404	2,233
1997	71	462	0	58	591
1998	0	316	0	0	316
1999	44	1,365	0	80	1,489
2000	174	1,165	0	51	1,390
2001	0	969	439	161	1,569
2002	75	298	45	254	672
2003	39	216	101	196	552
2004	22	291	435	353	1,101
2005	37	400	0	58	495
2006	0	948	0	134	1,082
2007	0	786	11	30	827
2008	0	1,986	166	969	3,121
2009	30	939	72	25	1,066
2010	0	1,069	0	99	1,168
2011	0	700	29	10	739
2012	0	1,163	74	636	1,873
2013	0	1,227	0	0	1,227
2014	0	883	71	25	979
2015	0	302	0	39	341
2016	0	740	17	177	934
2017	0	82	12	12	106
2018	0	400	30	82	512
2019	Information is not yet available.				
Avg 2014–2018	0	481	26	67	574
Avg 2009–2018	3	751	31	111	895

Appendix A17.–Sport salmon harvest by species, by year for the Nome River, 1990–2019.

Year	Chinook	Coho	Chum	Pink	Total
1990	39	407	122	2,651	3,219
1991	22	417	241	356	1,036
1992	16	713	0	4,397	5,126
1993	93	602	0	723	1,418
1994	0	326	0	4,103	4,429
1995	0	143	0	230	373
1996	0	598	0	3,280	3,878
1997	10	295	0	83	388
1998	0	189	0	1,985	2,174
1999	0	219	0	0	219
2000	0	342	0	578	920
2001	0	297	0	0	297
2002	0	217	0	312	529
2003	0	68	0	12	80
2004	0	270	0	3,369	3,639
2005	0	1,001	0	1,193	2,194
2006	0	2,768	0	2,422	5,190
2007	0	797	0	402	1,199
2008	0	1,793	0	2,954	4,747
2009	0	229	0	178	407
2010	13	602	0	1,716	2,331
2011	0	68	0	85	153
2012	0	259	0	1,264	1,523
2013	0	279	139	302	720
2014	0	458	52	2,162	2,672
2015	0	243	39	474	756
2016	0	747	208	2,737	3,692
2017	0	973	120	832	1,925
2018	0	914	188	1,600	2,702
2019	Information is not yet available.				
Avg 2014–2018	0	667	121	1,561	2,349
Avg 2009–2018	1	477	75	1,135	1,688

Appendix A18.–Total Norton Sound escapement index for chum, pink, coho, and Chinook salmon from weir and tower projects at Kwiniuk, Niukluk, Nome, and Snake Rivers (starting 1995), North River (starting 1996), and Eldorado River (starting 1997) to 2019.

Year	Chum[a]	Pink	Coho[b]	Chinook[a]
1995	137,264	49,411	7,334	626
1996[c]	124,571	2,535,593	16,076	2,027
1997	107,952	163,728	11,434	4,305
1998	95,051	3,070,848	4,496	2,414
1999	53,315	73,077	10,069	1,229
2000	64,490	1,883,867	19,637	1,323
2001	70,013	79,706	30,645	1,276
2002	94,504	2,239,565	21,625	2,925
2003	50,075	392,827	13,761	2,240
2004	40,705	6,432,486	28,399	1,998
2005	68,498	2,594,334	44,351	1,530
2006	126,221	5,763,830	56,484	1,256
2007	124,175	708,669	37,112	2,324
2008	41,710	3,932,219	49,738	1,256
2009	42,300	275,834	39,262	3,052
2010	191,900	1,484,231	31,182	1,447
2011	102,203	207,017	13,003	933
2012[d]	52,724	1,013,293	6,015	1,065
2013[e]	51,624	73,928	16,686	621
2014[e]	90,893	732,115	23,693	2,691
2015[e]	96,846	626,383	19,741	2,316
2016[e]	59,917	4,378,422	14,956	697
2017[e]	145,976	2,789,554	23,925	1,143
2018[e]	119,120	6,189,114	53,622	2,769
2019[e]	69,483	3,690,489	12,499	3,465

Note: Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018.

[a] Bayesian analysis was done for years prior to 2019 for Chinook and chum salmon for all rivers here except Niukluk and Eldorado, so some numbers might have changed compared to 2018 FMR.

[b] Most projects did not operate during the coho salmon season until 2001.

[c] In 1996 the majority of pink salmon for Nome River escaped through the pickets and were not counted.

[d] Most projects were only operational for a short duration during coho salmon season because of high water.

[e] Starting in 2013, there was no longer a counting tower at Niukluk.

Appendix A19.–Total escapement (4–6 rivers) and catch (commercial, subsistence, and sport fishing) for chum, pink, coho, and Chinook salmon for Norton Sound District, 1995–2019.

Year[a,b]	Chum[c]	Pink	Coho	Chinook[c]
1995	212,317	169,498	76,769	15,291
1996[d]	156,128	3,089,682	112,611	12,617
1997[e]	159,239	189,439	60,033	24,744
1998[e]	126,554	3,712,761	52,489	16,778
1999	74,456	95,302	40,546	8,698
2000	84,726	2,091,074	84,942	6,654
2001	96,785	109,878	66,232	6,484
2002	109,017	2,300,537	39,368	8,524
2003	63,425	441,387	45,306	7,219
2004	52,040	6,513,682	87,800	7,003
2005	78,632	2,652,592	146,616	5,280
2006	142,549	5,825,726	217,986	4,961
2007	158,713	734,723	181,306	5,137
2008	75,884	4,069,526	198,407	4,384
2009	85,785	320,631	147,865	6,795
2010	325,962	1,560,759	111,000	3,768
2011	227,453	231,890	84,040	2,538
2012	128,104	1,265,562	57,743	2,497
2013	188,104	102,117	91,427	1,633
2014	215,382	956,719	155,987	4,086
2015	259,441	715,998	191,357	5,556
2016	124,397	4,638,943	139,040	2,744
2017	324,148	2,842,809	242,205	2,769
2018	363,939	6,260,807	336,453	4,836
2019[f]	234,237	3,796,911	167,227	6,972

Note: Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018.

[a] Kwiniuk, Niukluk, Nome, and Snake Rivers (starting 1995), North River (starting 1996), and Eldorado River (starting 1997). Does not include Niukluk River after 2012.

[b] Not all subdistricts from 2004 to 2007 were surveyed for subsistence use.

[c] Hierarchical Bayesian analysis was done for years prior to 2019 for Chinook and chum salmon for all rivers here except Niukluk and Eldorado, so some numbers might have changed compared to the previous year's annual management report.

[d] In 1996, the majority of pink salmon for Nome River escaped through the pickets and were not counted.

[e] Subsistence totals for 1997 and 1998 include data from Savoonga and Gambell.

[f] Information for 2019 does not include sport fish catch.

Appendix A20.–Nome Subdistrict chum salmon estimated escapement, 1999–2019.

Year	Rivers	Aerial survey counts	Estimated escapement[a]
1999	Nome	–	1,048
	Snake[b]	–	484
	Eldorado[b]	–	4,218
	Flambeau	51	637
	Solomon	51	637
	Sinuk	1,697	6,370
	Bonanza	361	2,304
			15,698
2000	Nome	658	4,056
	Snake[b]	–	1,394
	Eldorado[b]	3,383	11,617
	Flambeau	819	3,947
	Solomon	150	1,294
	Sinuk[c]	–	7,198
	Bonanza	1,130	4,876
			34,899
2001	Nome	946	3,166
	Snake[b]	752	1,945
	Eldorado[b]	4,450	11,635
	Flambeau	3,612	10,465
	Solomon	280	1,949
	Sinuk	3,746	10,718
	Bonanza	1,084	4,745
			44,553
2002	Nome	–	1,720
	Snake[b]	402	2,776
	Eldorado[b]	–	10,215
	Flambeau	1,876	6,804
	Solomon	325	2,150
	Sinuk	1,682	6,333
	Bonanza	595	3,199
			33,197
2003	Nome	888	1,958
	Snake	440	2,201
	Eldorado	1,257	3,591
	Flambeau	647	3,380
	Solomon	73	806
	Sinuk	677	3,482
	Bonanza	220	1,664
			17,081
2004	Nome	–	4,095
	Snake	–	2,165
	Eldorado	–	3,277
	Flambeau	2,250	7,667
	Solomon[c]	–	1,436
	Sinuk[c]	–	3,198
	Bonanza[c]	–	2,167
			23,792
2005	Nome	2,082	5,584
	Snake	1,842	2,967
	Eldorado	5,445	10,369
	Flambeau	2,261	7,692
	Solomon	775	3,806
	Sinuk	1,072	4,710
	Bonanza	1,370	5,534
			40,662
2006	Nome	394	5,204
	Snake	840	4,160
	Eldorado	2,355	42,105
	Flambeau	16,000	27,828
	Solomon	305	2,062
	Sinuk	1,115	4,834
	Bonanza	60	708
			87,374
2007	Nome	1,449	7,034
	Snake	1,702	8,147
	Eldorado	6,315	21,312
	Flambeau	4,452	12,006
	Solomon	673	3,469
	Sinuk	7,210	16,481
	Bonanza	2,628	8,491
			76,940
2008	Nome	106	2,607
	Snake	–	1,294
	Eldorado	–	6,746
	Flambeau	4,235	11,618
	Solomon[c]	–	959
	Sinuk[c]	–	5,367
	Bonanza[c]	–	3,636
			32,177
2009	Nome	–	1,565
	Snake	–	891
	Eldorado	1,069	4,943
	Flambeau	860	4,075
	Solomon	89	918
	Sinuk	344	2,232
	Bonanza	1,851	6,744
			21,368
2010	Nome	2,998	5,906
	Snake	2,625	6,974
	Eldorado[d]	30,600	42,612
	Flambeau	13,600	25,009
	Solomon	454	2,678
	Sinuk	3,955	11,107
	Bonanza	686	3,513
			97,769

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Year	Rivers	Aerial survey counts	Estimated escapement[a]
2011	Nome	–	3,578
	Snake	–	4,352
	Eldorado	–	16,273
	Flambeau	6,283	15,056
	Solomon	1,010	4,529
	Sinuk	6,265	15,028
	Bonanza	2,113	7,357
			66,173
2012	Nome	–	2,028
	Snake	–	978
	Eldorado	–	13,348
	Flambeau	7,911	17,517
	Solomon	165	1,377
	Sinuk	3,650	10,537
	Bonanza	1,550	6,002
			51,787
2013	Nome	–	4,846
	Snake	–	2,995
	Eldorado	–	26,131
	Flambeau	16,088	27,928
	Solomon[e]	–	1,377
	Sinuk	19,500	31,691
	Bonanza	5,284	13,437
			108,130
2014	Nome	–	5,789
	Snake	–	3,983
	Eldorado	–	27,054
	Flambeau	10,776	21,462
	Solomon[e]	–	1,504
	Sinuk	9,050	19,136
	Bonanza	8,602	18,508
			97,234
2015	Nome	–	6,166
	Snake	–	4,442
	Eldorado	–	25,560
	Flambeau	–	12,011
	Solomon[e]	–	1,128
	Sinuk	–	29,643
	Bonanza	–	13,212
			91,925
2016	Nome	–	7,093
	Snake	–	3,677
	Eldorado	–	18,938
	Flambeau	–	13,254
	Solomon[e]	–	2,016
	Sinuk	–	9,408
	Bonanza	–	6,374
			60,749
2017	Nome	–	8,340
	Snake	–	5,165
	Eldorado	–	73,882
	Flambeau	–	17,738
	Solomon[e]	–	3,931
	Sinuk	–	7,284
	Bonanza	–	7,734
			123,794
2018	Nome	–	5,240
	Snake	–	3,133
	Eldorado	–	42,361
	Flambeau	–	12,823
	Solomon[e]	–	2,917
	Sinuk	–	11,061
	Bonanza[f]	–	7,903
			85,333
2019[g]	Nome	–	6,014
	Snake	–	2,456
	Eldorado	–	28,427
	Flambeau	–	13,054
	Solomon[e]	–	1,226
	Sinuk	–	12,999
	Bonanza[f]	–	8,824
			73,000

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Notes: Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018. Also, hierarchical Bayesian analysis was done for years prior to 2019 for chum salmon for Nome, Snake, and Solomon Rivers, so some numbers might have changed compared to the previous year's annual management report. Dashes mean no data.

[a] Escapement is estimated by adding Nome, Snake, and Eldorado weir counts and the aerial survey expansion estimates of the other 4 rivers. Aerial survey expansion is calculated as aerial survey count to 0.657142 power multiplied by 48.059 (Clark 2001), unless otherwise footnoted.

[b] Escapement was estimated by counting tower.

[c] Because of the lack of aerial survey estimates, method used (Clark 2001) was Solomon (0.368) multiplied by Nome escapement, Sinuk (1.476) multiplied by Bonanza escapement, and Bonanza (0.198) multiplied by Eldorado and Flambeau escapements combined.

[d] Weir was breached, and aerial survey expansion count was used.

[e] Solomon escapement was a weir count beginning in 2013.

[f] Bonanza escapement was a weir count beginning in 2018.

[g] High water resulted in a late start and early pulling of counting projects. Except for Flambeau and Sinuk Rivers, all counts should be considered minimal.

Appendix A21.–Historical escapement of salmon and Dolly Varden at Eldorado River counting tower, 1997–2002, and weir, 2003–2019.

Year	Operating period	Chinook	Chum	Pink	Coho	Sockeye	Dolly Varden
1997	June 29–Aug 19	98	14,302	1,022	194	ND	ND
1998	June 29–Aug 12	8	13,808	137,283	21	ND	ND
1999	July 10–Sept 01	28	4,218	977	510	ND	ND
2000	June 29–Aug 25	33	11,617	55,992	192	ND	ND
2001	July 08–Sept 13	50	11,635	488	1,509	ND	ND
2002	June 24–Sept 10	26	10,215	119,098	540	10	377
2003	June 21–Sept 08	29	3,591	173	115	0	60
2004	June 22–Sept 09	25	3,277	60,866	1,151	39	0
2005	June 23–Sept 02	32	10,369	12,356	689	10	23
2006	June 26–Aug 03	41	42,105	222,348	55	1	65
2007	June 26–Aug 06	14	21,312	833	2	22	60
2008	June 27–July 31	36	6,746	244,641	38	3	14
2009	July 02–Aug 03	31	4,943	1,119	2	0	72
2010[a]	June 30–July 24	23	42,612	48,136	2	8	72
2011	June 30–Aug 03	3	16,273	507	1	0	2
2012	July 04–Aug 15	0	13,348	59,318	1	0	30
2013	July 01–Aug 06	9	26,131	1,029	15	0	2
2014	June 23–July 27	18	27,054	46,746	0	0	4
2015	June 23–July 30	25	25,560	1,483	1	0	37
2016	June 26–Aug 02	0	18,938	42,699	41	16	57
2017	June 22–July 31	6	73,882	12,357	29	12	425
2018	June 28–July 31	31	42,361	197,119	47	3	98
2019[b]	July 11–July 29	15	28,427	54,882	4	36	8

Notes: ND is no data. Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018.

[a] Numerous breaches in weir during the season resulted in minimal counts, except for chum salmon count that was determined by aerial survey expansion from the aerial survey count.

[b] Project started late because water was too high to install weir and count fish.

Appendix A22.–Historical escapement of salmon and Dolly Varden at Snake River counting tower 1995–2002 and weir 2003–2019.

Year	Operating period	Chinook	Chum	Pink	Coho	Sockeye	Dolly Varden
1995	July 01–Aug 18	0	3,498	919	857	0	ND
1996	July 03–Aug 22	5	2,772	44,558	1,638	0	ND
1997	July 07–Aug 18	12	4,811	6,742	1,157	0	ND
1998	July 01–Aug 11	0	7,952	219,679	178	0	ND
1999	July 01–Aug 14	20	484	116	90	0	ND
2000	June 29–Aug 25	28	1,394	4,723	406	0	ND
2001	July 08–Sept 05	33	1,945	1,295	1,335	0	ND
2002[a]	June 28–Sept 16	9	2,776	4,103	851	8	149
2003	June 26–Sept 11	50	2,201	2,856	489	84	111
2004	June 23–Sept 03	17	2,165	126,917	474	22	290
2005	June 27–Sept 11	31	2,967	13,813	2,948	275	28
2006	July 01–Sept 11	32	4,160	74,028	4,776	302	614
2007	July 01–Sept 14	61	8,147	4,634	1,781	1,354	121
2008	July 06–Sept 06	13	1,294	145,761	5,206	143	452
2009[b]	July 08–Aug 30	6	891	769	50	2	14
2010	July 03–Sept 11	43	6,974	51,099	2,243	124	198
2011	July 08–Sept 11	1	4,352	7,090	343	14	5
2012	July 06–Aug 15	1	978	8,601	22	3	3
2013	July 19–Sept 10	8	2,995	1,333	1,203	163	1
2014	July 05–Sept 10	11	3,983	20,067	1,424	86	62
2015	July 04–Sept 14	6	4,442	16,321	1,638	56	67
2016	July 01–Sept 20	15	3,677	204,641	1,115	120	277
2017	July 01–Sept 11	8	5,165	22,252	2,974	269	116
2018	July 07–Sept 13	12	3,133	463,742	7,491	455	215
2019[c]	July 14–Sept 05	7	2,456	101,151	3,408	251	43

Notes: ND is no data. Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods were standardized in 2015 and 2018. Also, hierarchical Bayesian analysis was done for years prior to 2019 for chum salmon, so some numbers might have changed compared to the previous year's annual management report.

[a] Includes 442 coho salmon estimated by aerial survey to be holding below the weir site after the weir was removed.

[b] Weir was not fish tight last week of August and hundreds of coho salmon passed through the weir without being counted.

[c] Counts should be considered minimal because project started late, the weir was inoperable August 1–20, and project was pulled early, all because of high water.

Appendix A23.–Historical salmon escapement at Kwiniuk River counting tower, 1990–2019.

Year	Operating period	Chum	Pink	Chinook	Coho
1990	June 21–July 25	13,957	416,512	900	6
1991	June 18–July 27	19,801	53,499	708	2
1992	June 27–July 28	12,077	1,464,716	479	202
1993	June 27–July 27	15,824	43,063	600	0
1994	June 23–Aug 09	33,012	2,303,114	625	3,004
1995	June 21–July 26	42,500	17,511	498	114
1996	June 20–July 25	28,493	907,893	577	362
1997	June 18–July 27	20,119	9,535	974	0
1998	June 18–July 27	24,247	655,934	303	0
1999	June 25–July 28	8,763	607	116	0
2000	June 22–July 27	12,879	750,173	144	2
2001	June 27–Sept 15	16,999	8,423	261	9,532
2002	June 17–Sept 11	37,995	1,114,410	778	6,459
2003	June 15–Sept 15	12,125	22,329	747	5,490
2004	June 16–Sept 14	10,362	3,054,684	639	11,240
2005	June 17–Sept 13	12,102	341,048	342	12,950
2006	June 22–Sept 12	39,519	1,347,090	195	22,341
2007	June 21–Sept 10	27,756	54,255	258	9,429
2008	June 23–Sept 07	9,483	1,444,231	237	10,462
2009	June 24–Sept 13	8,739	42,963	444	8,705
2010	June 25–Sept 07	71,409	634,169	138	8,058
2011	June 20–Sept 11	32,263	30,913	57	3,290
2012	June 23–Aug 16	5,765	393,030	60	781
2013	June 24–Sept 11	5,631	13,212	15	3,729
2014	June 15–Sept 08	40,195	322,830	429	14,637
2015	June 15–Sept 03	37,812	67,295	312	6,252
2016	June 17–Sept 16	8,528	1,909,949	135	9,210
2017	June 15–Sept 12	32,564	506,593	63	13,593
2018	July 04–Sept 16	41,658	1,804,752	87	17,172
2019[a]	July 02–Sept 06	21,363	808,156	122	5,649

Notes: Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018. Also, hierarchical Bayesian analysis was done for 2001–2019 for Chinook and chum salmon, so some numbers might have changed compared to the previous year's annual management report.

[a] Project started late and was pulled early because of high water.

Appendix A24.–Historical salmon escapement at Niukluk River counting tower, 1995–2012.

Year	Operating period	Chum	Pink	Chinook	Coho
1995	June 29–Sept 12	86,332	17,088	123	4,713
1996	June 23–Sept 12	80,178	1,154,922	243	12,781
1997	June 28–Sept 09	57,305	10,468	259	3,994
1998	July 04–Aug 13	45,588	1,624,438	260	840
1999	July 04–Sept 04	35,239	20,351	40	4,260
2000	July 04–Aug 27	29,573	961,603	48	11,382
2001	July 10–Sept 08	30,662	41,625	30	3,468
2002	June 25–Sept 10	35,307	645,141	621	7,391
2003	June 25–Sept 10	20,018	75,855	179	1,282
2004	June 25–Sept 08	10,770	975,895	141	2,064
2005	June 28–Sept 09	25,598	270,424	41	2,727
2006	June 26–Sept 08	29,199	1,371,919	39	11,169
2007	July 01–Sept 04	50,994	43,617	30	3,498
2008	July 01–Sept 06	12,078	669,234	33	13,779
2009	July 03–Sept 02	15,879	24,204	204	6,861
2010	July 01–Sept 01	48,561	434,205	15	9,042
2011	June 28–Sept 06	23,607	15,425	18	2,405
2012	July 04–Aug 17	19,576	249,212	21	1,729

Notes: The Niukluk River counting tower project was discontinued after 2012. Starting with 2008, some numbers might have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015.

Appendix A25.–Salmon escapement at Bonanza River weir, 2018–2019.

Year	Operating period	Chum	Pink	Chinook	Coho	Sockeye
2018	July 08–Aug 19	7,903	885,735	11	1,030	189
2019[a]	July 09–July 30	8,824	167,516	8	159	9

Note: The Bonanza River weir was initiated in 2018.

[a] Project was pulled early because of high water.

Appendix A26.–Historical salmon escapement at Nome River counting tower, 1993–1995, and weir, 1996–2019.

Year	Operating period	Chum	Pink	Chinook	Coho	Sockeye
1993	July 25–Aug 28	1,859	13,036	63	4,349	ND
1994	June 24–Aug 15	2,984	142,604	55	726	ND
1995	June 22–Sept 06	4,934	13,893	5	1,650	ND
1996	June 26–July 23	3,339	95,681[a]	5	66	ND
1997	June 27–Aug 27	5,664	8,035	22	321	ND
1998	July 01–Aug 11	1,930	359,469	70	96	ND
1999	July 02–Aug 25	1,048	2,033	3	417	6
2000	June 29–Aug 25	4,056	41,673	24	696	19
2001	July 08–Sept 11	3,166	3,138	7	2,418	55
2002	June 29–Sept 11	1,720	35,057	7	3,418	29
2003	July 05–Sept 10	1,958	11,402	12	548	47
2004	June 25–Sept 12	4,095	1,051,146	51	2,283	114
2005	June 27–Sept 11	5,584	285,759	69	5,848	381
2006	July 02–Sept 07	5,204	578,555	43	8,308	188
2007	July 03–Sept 16	7,034	24,395	13	2,437	534
2008	July 02–Sept 17	2,607	1,186,554	28	4,605	90
2009	July 01–Sept 20	1,565	16,490	10	1,370	103
2010	June 30–Sept 16	5,906	165,934	9	4,114	43
2011	July 01–Sept 12	3,578	14,384	12	1,831	22
2012	July 04–Aug 15	2,028	151,791	6	237	48
2013	July 05–Sept 16	4,846	10,257	9	2,624	38
2014	July 05–Sept 11	5,789	96,397	8	2,637	34
2015	July 01–Sept 20	6,166	75,603	23	2,418	96
2016	July 01–Sept 20	7,093	1,175,723	25	2,331	254
2017	June 28–Sept 25	8,340	717,770	21	4,983	429
2018	July 06–Sept 25	5,240	3,246,072	56	8,902	245
2019[b]	July 10–Sept 02	6,014	656,033	6	1,905	20

Notes: ND is no data. Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015. Also, hierarchical Bayesian analysis was done for years prior to 2019 for chum salmon, so some numbers might have changed compared to the previous year's annual management report.

[a] The majority of pink salmon escaped through the pickets and was not counted.

[b] Project started late and was pulled early because of high water.

Appendix A27.–Salmon escapement at Solomon River weir, 2013–2019.

Year	Operating period	Chum	Pink	Chinook	Coho	Sockeye
2013	July 05–Aug 26	1,377	2,733	0	178	3
2014	July 02–Aug 20	1,504	20,691	0	79	0
2015	June 26–Aug 24	1,128	18,764	5	46	3
2016	June 30–Aug 18	2,016	128,046	6	215	11
2017	June 26–Aug 11	3,931	63,988	9	190	5
2018	July 08–Aug 09	2,917	456,035	11	161	18
2019[a]	July 14–Aug 01	1,226	40,440	0	45	27

Note: The Solomon River weir was initiated in 2013. Hierarchical Bayesian analysis was done for years prior to 2019 for chum salmon, so some numbers might have changed compared to 2018 FMR.

[a] Project started late and was pulled early because of high water.

Appendix A28.–Historical sockeye salmon escapement at Glacial Lake weir, 2000–2015.

Year	Operating period	Chum[a]	Pink[b]	Sockeye
2000	July 11–July 30	ND	ND	884
2001	July 02–July 28	1	ND	2,487
2002	June 25–July 26	ND	ND	1,047
2003	June 24–July 28	ND	ND	2,004
2004	June 18–July 25	1	ND	8,115
2005	June 20–July 25	ND	ND	11,135
2006	July 04–July 18	ND	ND	6,849
2007	July 05–July 20	ND	ND	4,533
2008	June 27–July 28	10	614	1,794
2009	June 20–July 27	0	0	826
2010	June 26–July 28	0	0	1,047
2011	June 28–July 26	4	0	1,697
2012[c]	July 01–Aug 09	25	165	1,636
2013[d]	June 20–Aug 12	35	2	2,544
2014[e]	June 30–Aug 07	0	0	4,211
2015[e]	June 24–July 12	0	0	9,257

Note: The Glacial Lake weir was discontinued after 2015.

[a] Chum salmon will pass upstream through the Glacial Lake weir and often exit the lake back downstream through the weir.

[b] Pink salmon have been observed often in even-numbered years, but 2008 was the first year the crew was instructed to enumerate pink salmon passage.

[c] A video project was tested during 2012 and was in operation for 11 days (July 31 to August 9) after human occupation of the weir site. Included in totals are 34 sockeye, 12 pink, and 10 chum salmon that were counted by camera during that time.

[d] A video project was in operation from July 14 to August 12. Included in totals are 657 sockeye, 2 pink, and 33 chum salmon that were counted by camera during that time.

[e] A video project was in operation for the entire duration.

Appendix A29.–Historical salmon escapement at Inglutalik River counting tower, 2011–2019.

Year	Operating period	Chum	Pink	Chinook[a]	Coho
2011[b]	June 24–Aug 14	65,010	547,453	1,469	1,400
2012[b]	June 23–Aug 23	33,123	90,831	1,159	1,431
2013[c]	June 21–Aug 11	51,099	201,438	3,411	4,488
2014[b]	June 20–July12	62,153	61,752	1,676	978
2015[b]	June 23–Aug 21	82,156	1,041,693	1,543	8,247
2016[b]	June 16–July 17	43,694	78,916	3,300	693
2017[b,d]	June 12–July 31	93,273	1,625,743	2,256	2,424
2018[b]	June 21–Aug 22	28,736	20,231	207	2,367
2019[e]	June 19–Aug 02	24,624	209,025	172	918

Notes: The Inglutalik River tower was initiated in 2013. Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018.

[a] ADF&G considers the Chinook salmon count prior to 2018 to be suspect based on reported Chinook salmon catches in the same-year commercial and subsistence fisheries.

[b] Counts were interpolated because high water prevented counts for a few to many days during the season.

[c] Due to speciation problems, the Chinook and coho salmon counts are probably inaccurate.

[d] Three aerial surveys were flown with a highest count of only 206 for Chinook salmon.

[e] Counts should be considered minimal because tower was inoperable July 25–30 and project was pulled early.

Appendix A30.–Historical salmon escapement at North River counting tower, 1996–2019.

Year	Operating period	Chum	Pink	Chinook	Coho
1996	June 16–July 25	9,789	332,539	1,197	1,229
1997	June 16–Aug 21	5,751	127,926	2,940	5,768
1998	June 15–Aug 12	1,526	74,045	1,773	3,361
1999	June 30–Aug 31	3,563	48,993	1,022	4,792
2000	June 17–Aug 12	4,971	69,703	1,046	6,959
2001	July 05–Sept 15	5,606	24,737	895	12,383
2002	June 19–Aug 29	6,491	321,756	1,484	2,966
2003	June 15–Sept 13	10,182	280,212	1,223	5,837
2004	June 15–Sept 14	10,036	1,162,978	1,125	11,187
2005	June 15–Sept 15	11,878	1,670,934	1,015	19,189
2006	June 18–Sept 11	6,034	2,169,890	906	9,835
2007	June 16–Sept 05	8,932	580,935	1,948	19,965
2008	June 19–Sept 13	9,502	241,798	909	15,648
2009	June 19–Sept 11	10,283	190,289	2,357	22,274
2010	June 19–Sept 07	16,438	150,688	1,219	7,723
2011	June 17–Sept 08	20,705	138,542	841	4,975
2012	June 21–Aug 19	9,860	137,012	975	3,258
2013	July 01–Aug 05	12,021	48,097	580	9,115
2014	June 14–Sept 01	13,872	246,075	2,225	4,995
2015	June 14–Aug 25	22,866	465,681	1,950	9,432
2016	June 13–Sept 07	21,681	1,045,410	522	2,259
2017	June 14–Sept 12	26,025	1,530,582	1,045	2,346
2018	June 26–Aug 26	26,728	477,429	2,583	20,010
2019[a]	June 15–Aug 01	11,223	2,070,267	3,315	1,533

Notes: Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018. Also, hierarchical Bayesian analysis was done for years prior to 2019 for Chinook and chum salmon, so some numbers might have changed compared to the previous year's annual management report.

[a] Project was pulled early because of high water.

Appendix A31.–Historical salmon escapement at Unalakleet River weir, 2010–2019.

Year	Operating period	Chum	Pink	Chinook	Coho	Sockeye
2010	June 22–July 31	70,811	832,904	1,021	5,382	130
2011	June 17–Aug 07	104,050	354,361	1,030	10,231	181
2012	June 24–Aug 15	70,859	674,250	823	17,548	237
2013	June 20–Aug 22	106,715	143,250	680	25,550	217
2014	June 28–Aug 27	55,341	1,194,708	1,132	44,524	206
2015	June 18–Aug 15	97,885	1,616,042	2,789	40,964	996
2016	June 11–July 20	31,756	4,752,639	505	132	580
2017	June 09–Aug 10	146,449	6,094,350	2,947	21,453	1,199
2018	July 02–Aug 08	128,253	[a]	3,650	58,755	630
2019	June 21–Aug 02	65,023	[a]	6,641	10,746	1,093

Notes: The Unalakleet River weir was initiated in 2010. Some numbers might have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015. Also, hierarchical Bayesian analysis was done for years prior to 2019 for Chinook salmon, so some numbers might have changed compared to the previous year's annual management report.

[a] Starting in 2018, the weir picket spacing was increased to allow pink salmon to pass through; therefore, pink salmon are no longer enumerated.

Appendix A32.–Chum salmon escapement by river, Nome Subdistrict, 1993–2019.

	Rivers west of Cape Nome			Rivers east of Cape Nome				
Year	Sinuk[a]	Snake[b]	Nome[c]	Flambeau[a]	Eldorado[d]	Bonanza[a]	Solomon[a]	Total[e]
1993	6,052	2,115	5,925	6,103	9,048	3,007	2,525	34,775
1994	4,905	3,519	2,984	12,889	13,202	5,178	1,066	43,743
1995	9,464	3,498	4,934	16,474	18,955	11,182	2,106	66,613
1996	6,658	2,772	3,339	13,613	32,970	7,049	2,141	68,542
1997	9,212	4,811	5,664	9,455	14,302	4,140	2,111	49,695
1998	6,720	7,952	1,930	9,129	13,808	4,552	925	45,016
1999	6,370	484	1,048	637	4,218	2,304	637	15,698
2000	7,198	1,394	4,056	3,947	11,617	4,876	1,294	34,382
2001	10,718	1,945	3,166	10,465	11,635	4,745	1,949	44,623
2002	6,333	2,776	1,720	6,804	10,215	3,199	2,150	33,197
2003	3,482	2,201	1,958	3,380	3,591	1,664	806	17,082
2004	3,198	2,165	4,095	7,667	3,277	2,167	1,507	24,076
2005	4,710	2,967	5,584	7,692	10,369	5,534	3,806	40,662
2006	4,834	4,160	5,204	27,828	42,105	708	2,062	86,901
2007	16,481	8,147	7,034	12,006	21,312	8,491	3,469	76,940
2008	5,367	1,294	2,607	11,618	6,746	3,636	959	32,227
2009	2,232	891	1,565	4,075	4,943	6,744	918	21,368
2010	11,107	6,974	5,906	25,009	42,612	3,513	2,678	97,799
2011	15,028	4,352	3,578	15,056	16,273	7,357	4,529	66,173
2012	10,537	978	2,028	17,517	13,348	6,002	1,377	51,787
2013	31,691	2,995	4,846	27,928	26,131	13,437	1,377	108,405
2014	19,136	3,983	5,789	21,462	27,054	18,508	1,504	97,436
2015	29,643	4,442	6,166	12,011	25,560	13,212	1,128	92,162
2016	9,408	3,677	7,093	13,254	18,938	6,374	2,016	60,760
2017	7,284	5,165	8,340	17,738	73,882	7,734	3,931	124,074
2018	11,061	3,133	5,240	12,823	42,361	7,903	2,917	85,438
2019	12,999	2,456	6,014	13,054	28,427	8,824	1,226	73,000
Totals	271,828	91,246	117,813	339,634	546,899	172,040	53,114	1,592,574

Notes: Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018. Also, hierarchical Bayesian analysis was done for chum salmon for Nome, Snake, and Solomon Rivers in 2019, so some numbers might have changed compared to the previous year's annual management report.

[a] Sinuk, Flambeau, Bonanza, and Solomon Rivers' escapements are estimated by aerial survey, but beginning in 2013, Solomon River escapement was a weir count, and beginning in 2018, Bonanza River escapement was also a weir count.

[b] Snake River escapements are estimated by aerial survey (1993–1994), tower counts (1995–2002), and weir counts (2003–2018). Escapement goal range is 1,600–2,500 chum salmon.

[c] Nome River escapements are estimated by aerial survey expansion (1993), tower counts (1994–1995), and weir counts (1996–2018). Escapement goal range is 2,900–4,300 chum salmon.

[d] Eldorado River escapements are estimated by aerial survey (1993–1996), tower counts (1997–2002), and weir counts (2003–2018). Escapement goal range is 6,000–9,200 chum salmon.

[e] Subdistrict 1 BEG is 23,000–35,000 chum salmon.

Appendix A33.–Pink salmon escapement by year and river, Nome Subdistrict, 1993–2019.

	Rivers west of Cape Nome			Rivers east of Cape Nome				
Year	Sinuk[a]	Snake[b]	Nome[c]	Flambeau[a]	Eldorado[d]	Bonanza[a]	Solomon[a]	Total
1993	5,120	ND	13,036	5,584	120	ND	ND	23,860
1994	492,100	63,860	142,604	19,202	53,890	20	ND	771,676
1995	1,250	919	13,893	8,086	4,243	619	350	29,360
1996	74,400	44,558	95,681	17,182	46,100	40,510	15,230	333,661
1997	1,200	6,742	8,035	2,117	1,022	ND	80	19,196
1998	342,100	219,679	359,469	8,720	137,283	167,130	45,175	1,279,556
1999	180	116	2,033	1,251	977	245	90	4,892
2000	12,175	4,723	41,673	2,159	55,992	12,410	2,899	132,031
2001	115	1,295	3,138	924	488	221	ND	6,181
2002	28,487	4,103	35,057	2,233	119,098	17,095	9,170	215,243
2003	9,907	2,856	11,402	194	173	1,540	157	26,229
2004	1,267,100	126,917	1,051,146	7,351	60,866	185,000	109,000	2,807,380
2005	211,285	13,813	285,759	873	12,356	55,000	11,100	590,186
2006	515,000	74,028	578,555	6,556	222,348	268,500	165,215	1,830,202
2007	6,810	4,634	24,395	336	833	1,360	2,400	40,768
2008	1,496,000	145,761	1,186,554	3,510	244,641	212,000	81,000	3,369,466
2009	6,740	769	16,490	175	1,119	3,276	1,565	30,134
2010	168,600	51,099	165,934	4,797	48,136	106,000	21,804	566,370
2011	21,100	7,090	14,384	58	507	11,050	5,580	59,769
2012	506,500	8,601	151,791	2,657	59,318	54,700	15,000	798,567
2013	143,921	1,333	10,257	ND	1,029	800	2,733	160,073
2014	115,000	20,067	96,397	25,000	46,746	71,000	20,691	394,901
2015	57,050	16,321	75,603	400	1,483	10,500	18,764	180,121
2016	405,200	204,641	1,175,723	1,450	42,699	139,200	128,046	2,096,959
2017	150,200	22,252	717,770	1,320	12,357	19,490	63,988	987,377
2018	1,068,000	463,742	3,246,072	1,320	197,119	885,735	456,035	6,318,023
2019	420,000	101,151	656,033	210	54,882	167,516	40,440	1,440,232
Totals	7,525,540	1,611,070	10,178,884	123,665	1,425,825	2,430,917	1,216,512	24,512,413

Notes: ND is no data. Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015 and 2018.

[a] Sinuk, Flambeau, Bonanza, and Solomon Rivers' escapements are estimated by aerial survey, but beginning in 2013, Solomon River escapement was a weir count, and beginning in 2018, Bonanza River escapement was also a weir count.

[b] Snake River escapements are estimated by aerial survey (1993–1994), tower counts (1995–2002), and weir counts (2003–2019).

[c] Nome River escapements are estimated by tower counts (1993–1995) and weir counts (1996–2019). Escapement goal range is 13,000 pink salmon in even-numbered years and 3,200 pink salmon in odd-numbered years.

[d] Eldorado River escapements are estimated by aerial survey (1993–1996), tower counts (1997–2002), and weir counts (2003–2019).

Appendix A34.–Number of customary trade permits issued, Norton Sound District and Port Clarence District, 2007–2019.

	Norton Sound District									Port Clarence District			Total	
Year	Nome	White Mountain	Golovin	Elim	Koyuk	Shaktoolik	Unalakleet	St. Michael	Stebbins	Teller	Brevig Mission	Wales	(both districts)	Value
2007	3	0	0	2	0	0	0	0	0	0	0	0	5	$200.00
2008	3	0	0	0	0	0	0	0	0	1	0	0	4	$0.00
2009	1	0	0	0	0	0	1	0	0	1	0	0	3	$100.00
2010	1	0	0	0	0	0	0	0	0	0	0	0	1	Confidential
2011	0	0	0	0	0	0	0	1	0	0	0	0	1	Confidential
2012	2	0	0	0	0	0	0	0	0	0	0	0	2	Confidential
2013	4	0	4	1	0	0	0	0	0	3	6	0	18	$1,790.00
2014	6	1	1	0	0	0	1	0	0	0	11	0	20	$1,885.00
2015	4	1	1	0	0	0	0	0	0	0	8	0	14	$1,255.00
2016	4	0	1	0	0	0	1	0	0	1	5	0	12	$575.00
2017	11	1	0	0	0	0	0	0	0	0	8	0	20	$2,245.00
2018	4	1	0	0	0	0	0	0	0	0	7	0	12	$1,375.00
2019	4	0	0	0	0	0	0	0	0	0	5	0	9	$1,390.00

APPENDIX B: PORT CLARENCE FISHERIES

Appendix B1.–Comparative sockeye salmon aerial survey indices, Port Clarence District, 1990–2019.

Year	Salmon Lake	Grand Central River	Total
1990	2,834	926	3,760
1991	3,790	1,570	5,360
1992	1,500	[a]	1,500
1993	2,885	216	3,092
1994	3,740	1,230	4,970
1995	5,433	628[b]	6,061
1996	6,610	770	7,380
1997	8,760	1,520	10,280
1998	5,210	1,977	7,187
1999	31,720	1,780	33,500
2000	12,772	[a]	12,772
2001	9,400	155	9,555
2002	3,520	71	3,591
2003	19,275	1,015	20,290
2004	23,005	2,855	25,860
2005	41,500	740	42,240
2006	39,400	2,380	41,780
2007	14,920	5,692	20,612
2008	9,420	2,252	11,672
2009	136	50	186
2010	73	711	784
2011	4,604	540	5,144
2012	4,730	1,100	5,830
2013	5,820	1,151	6,971
2014	4,535	768	5,303
2015	3,030	7,500	10,530
2016	6,155	2,403	8,558
2017	25,004	15,300	40,304
2018	20,627	5,900	26,527
2019	26,935	8,700	35,635

[a] No survey occurred.

[b] Early count.

Appendix B2.–Historical escapement of salmon and Dolly Varden at Pilgrim River counting tower (1997–2002) and weir (2003–2019).

Year	Operating period	Chinook	Chum	Pink	Coho	Sockeye	Dolly Varden
1997	July 12–Aug 21	356	15,652[a]	5,557	452	15,652[a]	–
1998	Did not operate	–	–	–	–	–	–
1999	July 13–Aug 06	6	2,617	35,577	104	4,650	–
2000	July 05–Aug 18	72	861	374	21	12,141	–
2001	Did not operate	–	–	–	–	–	–
2002	July 04–Aug 04	150	5,590	3,882	246	3,888	–
2003	June 21–Sept 14	1,016	15,200	14,100	677	42,729	550
2004	June 21–Sept 14	925	10,239	50,760	1,573[b]	85,417	264
2005	June 24–Sept 05	216	9,685	13,218	304	55,951	112
2006	June 30–Sept 09	275	45,361	17,701	973	52,323	505
2007	June 29–Sept 10	501	35,334	3,616	605	43,432	339
2008[c]	June 25–Sept 01	133	25,008	92,641	260	20,452	409
2009	June 26–Aug 31	52	5,427	483	18	953	130
2010	June 24–Sept 01	44	25,379	29,239	272	1,654	285
2011	June 28–Sept 01	44	41,740	3,364	269	8,449	229
2012[d]	June 26–Aug 18	65	25,733	46,201	95	7,090	65
2013[c]	June 27–Sept 08	37	47,557	1,060	890	12,428	27
2014[c]	June 25–Aug 27	48	25,634	4,197	425	9,719	66
2015[c]	July 02–Aug 25	99	41,121	2,807	296	36,052	76
2016[c]	June 23–Aug 25	34	21,379	2,986	554	15,066	135
2017	June 21–Aug 22	101	50,189	80,124	665	55,764	450
2018	July 04–Aug 16	88	33,135	46,490	239	33,802	294
2019	July 11–Aug 18	164	18,480	387,799	240	30,472	206

Note: Dashes mean no data.

[a] Chum and sockeye salmon escapements were combined due to species identification problems during 1997.

[b] Coho salmon were misidentified. Nearly 30% of scale samples in 2004 were actually sockeye salmon.

[c] Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because of postseason updating.

[d] Some numbers have changed compared to previous reports (e.g., Menard et al. 2013) because interpolation methods in calculating escapement counts were standardized in 2015.

Appendix B3.–Estimated number of subsistence fishing families and harvest in Port Clarence District, 1994–2019.

Year	No. of fishing families interviewed	Chinook	Sockeye	Coho	Pink	Chum	Total
1994[a]	127	203	2,220	1,892	4,309	2,294	10,918
1995[a]	122	76	4,481	1,739	3,293	6,011	15,600
1996[a]	117	194	2,634	1,258	2,236	4,707	11,029
1997[a]	126	158	3,177	829	755	2,099	7,018
1998[a]	138	289	1,696	1,759	7,815	2,621	14,180
1999[a]	155	89	2,392	1,030	786	1,936	6,233
2000[a]	134	72	2,851	935	1,387	1,275	6,520
2001[a]	160	84	3,692	1,299	1,183	1,910	8,168
2002[a]	159	133	3,732	2,194	3,394	2,699	12,152
2003[a,b]	204	177	4,495	1,434	4,113	2,430	12,649
2004[c]	376[d]	278	8,688	1,131	5,918	2,505	18,520
2005[c]	335[d]	152	8,492	726	6,615	2,479	18,464
2006[c]	345[d]	102	9,940	1,061	4,939	4,353	20,395
2007[c]	363[d]	85	9,484	705	1,468	4,454	16,196
2008[c]	408[d]	125	5,069	512	7,527	2,449	15,682
2009[c]	326[d]	40	1,643	804	1,882	3,060	7,429
2010[c]	290[d]	63	824	596	5,202	5,232	11,917
2011[c]	270[d]	57	1,611	393	2,610	4,338	9,008
2012[c]	335[d]	44	1,422	703	5,200	7,802	15,171
2013[c]	431[d]	38	5,243	651	1,788	6,588	14,308
2014[c]	430[d]	21	3,969	564	5,040	5,085	14,679
2015[c]	549[d]	64	13,872	550	2,982	4,231	21,699
2016[c]	664[d]	40	12,140	627	4,322	4,303	21,432
2017[c]	665[d]	39	15,424	697	5,365	6,886	28,411
2018[c]	689[d]	55	12,381	764	4,556	5,625	23,381
2019[c]	575[d]	60	12,309	733	5,654	2,906	21,662
5-yr avg.	599	44	11,557	640	4,453	5,226	21,920
10-yr avg.	465	46	6,853	635	3,895	5,315	16,744

[a] Harvest estimate from ADF&G Division of Subsistence survey.

[b] Includes harvest reported from 59 Pilgrim River permits. In total, 101 permits were issued and 79 were returned.

[c] Beginning in 2004 a permit was required for Port Clarence District (including Pilgrim River and Salmon Lake) that replaced household surveys.

[d] The number is all permits issued for the Port Clarence District (including Pilgrim River and Salmon Lake permits).

Appendix B4.–Application of 20-05-00 liquid blend of phosphorous and nitrogen fertilizer to Salmon Lake, 1997–2019.

Year	Fertilizer (tons)	Organization
1997	40	NSEDC/ADF&G/BLM
1998	40	NSEDC/ADF&G/BLM
1999	40	NSEDC/ADF&G/BLM
2000	40	NSEDC/ADF&G/BLM
2001	40	NSEDC/ADF&G/BLM
2002	0	–
2003	0	–
2004	27	NSEDC/ADF&G
2005	0	–
2006	0	–
2007	16	NSEDC
2008	8	NSEDC
2009	28	NSEDC
2010	19	NSEDC
2011	11	NSEDC
2012	10	NSEDC
2013	11	NSEDC
2014	20	NSEDC
2015	21	NSEDC
2016	30	NSEDC
2017	35.5	NSEDC
2018	35	NSEDC
2019	35	NSEDC

Note: Dashes mean not applicable. NSEDC = Norton Sound Economic Development Corporation; ADF&G = Alaska Department of Fish and Game; BLM = Bureau of Land Management.

APPENDIX C: KOTZEBUE FISHERIES

Appendix C1.–Kotzebue District chum salmon catch statistics, 1990–2019.

Year	Chum salmon		Other[a]	Number of participants	Season catch per participant
	Number of fish	Pounds			
1990	163,263	1,453,040	538	153	1,067
1991	239,923	1,951,041	714	142	1,690
1992	289,184	2,397,302	2,714	149	1,941
1993[b]	73,071	613,968	1,507	114	641
1994[c]	153,452	1,166,494	73	109	1,408
1995	290,730	2,329,898	93	92	3,160
1996[d]	82,110	657,224	1,204	55	1,493
1997	142,720	1,141,741	649	68	2,099
1998	55,907	447,256	2,971	45	1,242
1999	138,605	1,108,898	87	60	2,310
2000	159,802	1,370,637	106	64	2,497
2001	211,672	1,847,361	64	66	3,207
2002	8,390	74,341	0	3	2,797
2003	25,423	218,091	0	4	6,356
2004	51,038	419,059	1,450	43	1,187
2005	75,971	621,573	1,258	41	1,853
2006	137,961	1,040,023	0	42	3,285
2007	147,087	1,209,842	0	46	3,198
2008	190,550	1,541,922	0	48	3,970
2009	187,562	1,505,734	0	62	3,025
2010	270,343	2,160,264	0	67	4,035
2011	264,225	2,158,365	0	89	2,969
2012	227,965	1,751,473	0	83	2,747
2013	319,062	2,555,304	0	66	4,834
2014	636,187	5,330,144	0	94	6,768
2015	305,383	2,626,607	0	105	2,908
2016	400,417	3,284,097	0	86	4,656
2017	463,749	3,832,578	0	100	4,637
2018	695,153	5,642,859	28	95	7,317
2019	494,593	4,017,629	45	92	5,376
Avg 2009–2018	377,005	3,084,743	3	85	4,390

[a] Can include Chinook, sockeye, and pink salmon, and Dolly Varden.

[b] Includes 11,160 pounds from the Sikusuilaq Springs Hatchery terminal fishery.

[c] Includes 31,500 pounds commercially caught but not reported on fish tickets.

[d] Includes 17,600 pounds commercially caught but not sold on fish tickets.

Appendix C2.–Kotzebue District mean prices paid per pound in dollars to salmon fishery participants by species, 1990–2019.

	Chum salmon				
Year	Average weight	Average price	Chinook salmon	Inconnu	Dolly Varden
1990	8.9	0.31	2.00	[a]	0.25
1991	8.1	0.22	1.64	0.50	0.18
1992	8.3	0.22	1.89	0.58	0.10
1993	8.5	0.38	2.37	0.50	0.10
1994	7.8	0.20	1.14	[a]	0.17
1995	8.0	0.13	1.00	0.50	0.20
1996	8.0	0.09	1.00	0.44	0.25
1997	8.0	0.16	1.02	[a]	0.20
1998[b]	8.0	0.15	1.00	[a]	0.20
1999[b]	8.0	0.16	1.00	[a]	0.20
2000	8.6	0.18	1.00	[a]	0.20
2001	8.7	0.17	1.00	[a]	[a]
2002	8.9	0.10	[a]	[a]	[a]
2003	8.6	0.12	[a]	[a]	0.50
2004	8.2	0.15	0.72	[a]	0.26
2005	8.2	0.20	0.50	[a]	0.30
2006	7.5	0.22	[a]	[a]	[a]
2007	8.2	0.20	[a]	[a]	[a]
2008	8.1	0.25	[a]	[a]	[a]
2009	8.0	0.25	[a]	[a]	[a]
2010	8.0	0.40	[a]	[a]	[a]
2011	8.2	0.40	[a]	[a]	[a]
2012	7.7	0.32	[a]	[a]	[a]
2013	8.0	0.27	[a]	[a]	[a]
2014	8.4	0.54	[a]	[a]	[a]
2015	8.6	0.33	[a]	[a]	[a]
2016	8.4	0.33	[a]	[a]	[a]
2017	8.3	0.48	[a]	[a]	[a]
2018	8.1	0.40	[c]	[a]	[a]
2019	8.1	0.39	2.00	[a]	[a]

[a] Did not purchase.

[b] Each chum salmon was assumed to weigh 8 pounds, but no fish were weighed individually.

[c] Information was not available.

Appendix C3.–Kotzebue District commercial fishery dollar value estimates, 1990–2019.

Year	Gross value of catch to fishery participants[a]	Number of fishery participants	Average value per participant
1990	$438,044	153	$2,863
1991	$437,948	142	$3,084
1992	$533,731	149	$3,582
1993[b]	$235,061	114	$2,062
1994	$233,512	109	$2,142
1995	$316,031	92	$3,435
1996	$56,310	55	$1,024
1997	$187,978	68	$2,764
1998	$70,587	45	$1,569
1999	$179,781	60	$2,996
2000	$246,786	64	$3,856
2001	$322,650	66	$4,889
2002	$7,572	3	$2,524
2003	$26,377	4	$6,594
2004	$64,420	43	$1,498
2005	$124,820	41	$3,044
2006	$229,086	42	$5,454
2007	$243,149	46	$5,286
2008	$385,270	48	$8,026
2009	$376,554	62	$6,073
2010	$860,125	67	$12,838
2011	$867,085	89	$9,743
2012	$567,664	83	$6,839
2013	$689,163	66	$10,442
2014	$2,879,016	94	$30,628
2015	$867,583	105	$8,263
2016	$1,123,248	86	$13,061
2017	$1,839,637	98	$18,772
2018	$2,279,477	95	$23,994
2019	$1,559,260	92	$16,948
Avg 2009–2018	$1,234,955	85	$14,324

[a] Values represent chum salmon value and incidental species such as char, whitefish, and other salmon.

[b] Includes $3,648 from Sikusuilaq Springs Hatchery terminal fishery.

Appendix C4.–Kotzebue District commercial and subsistence salmon catches, 1990–2019.

	Commercial catch			Subsistence catch[a]			
Year	Chum[b]	Other[c]	Total	Chum	No. of participants interviewed	Average catch per participant	Total documented catch
1990	163,263	32	163,295	8,268	[d]	[d]	171,563
1991	239,923	44	239,967	14,740	[d]	[d]	254,707
1992	289,184	204	289,388	14,303	[d]	[d]	303,691
1993	73,07[e]	131	73,202	15,430	[d]	[d]	88,632
1994	153,452[f]	3	153,455	36,226	375	97	189,681
1995	290,730	5	290,735	102,881[g]	593	173	393,616
1996	82,110[h]	3	82,113	99,740[g]	596	167	181,853
1997	142,720	45	142,765	57,906[g]	530	109	200,671
1998	55,907	210	56,117	48,980[g]	592	83	105,097
1999	139,120	5	139,125	94,342[g]	353	267	233,467
2000	159,802	10	159,812	65,975[g]	422	156	225,787
2001	211,672	6	211,678	49,232[g]	408	121	260,910
2002	8,390	0	8,390	16,880[i]	191	88	25,270
2003	25,423	0	25,423	19,201	446	43	44,624
2004	51,038	116	51,154	24,637	440	56	75,791
2005	75,971	7	75,978	Subsistence surveys were not conducted.			
2006	137,961	17	137,978	Subsistence surveys were not conducted.			
2007	147,087	20	147,107	Subsistence surveys were not conducted.			
2008	190,550	742	191,292	Subsistence surveys were not conducted.			
2009	187,562	106	187,668	Subsistence surveys were not conducted.			
2010	270,343	583	270,926	Subsistence surveys were not conducted.			
2011	264,321	166	264,487	Subsistence surveys were not conducted.			
2012	227,965	476	228,441	26,693	360	74	255,134
2013	319,062	114	319,176	42,216	386	109	361,392
2014	636,187	475	636,662	37,217	401	93	673,879
2015	305,391	30	305,421	Subsistence surveys were not conducted.			
2016	400,435	1,548	401,983	Subsistence surveys were not conducted.			
2017	463,749	1,319	465,068	Subsistence surveys were not conducted.			
2018	695,153	1,480	696,633	Subsistence surveys were not conducted.			
2019	494,593	3,523	498,116	Subsistence surveys were not conducted.			
Avg 2009–2018	377,017	630	377,647	Avg 1998–2014	42,537	400	109	226,135

-continued-

[a] Villages surveyed are Ambler, Kiana, Kobuk, Noatak, Noorvik, and Shungnak.
[b] May include chum salmon reported on fish tickets that were retained for personal use and not commercially sold.
[c] Includes Chinook, coho, pink, and sockeye salmon that were not sold but retained for personal use.
[d] Information not available.
[e] Includes 2,000 chum salmon from the Sikusuilaq Springs Hatchery terminal fishery.
[f] Includes 4,000 chum salmon commercially harvested on August 5 but not sold.
[g] Includes the town of Kotzebue.
[h] Includes 2,200 chum salmon commercially harvested on July 29 but not sold.
[i] Only 2 of 6 villages surveyed.

Appendix C5.–Kotzebue District subsistence chum salmon catches by village, 1990–2014.

Year	Village					Kobuk R. villages	Noatak village	Village					District total
	Noorvik	Kiana	Ambler	Shungnak	Kobuk			Kotzebue	Deering	Kivalina	Buckland	Shishmaref	
1990	4,353	[a]	[a]	[a]	[a]	4,353	3,915	[a]	[a]	[a]	[a]	[a]	8,268
1991	6,855	[a]	[a]	4,248	[a]	11,103	3,637	[a]	[a]	[a]	[a]	[a]	14,740
1992	8,370	[a]	[a]	3,890	[a]	12,260	2,043	[a]	[a]	[a]	[a]	[a]	14,303
1993	8,430	[a]	[a]	3,730	[a]	12,160	3,270	[a]	[a]	[a]	[a]	[a]	15,430
1994	8,157	1,891	2,860	7,982	5,722	26,612	6,126	[a]	3,488	[a]	[a]	[a]	36,226
1995	15,485	5,985	8,558	5,880	2,959	38,867	6,359	50,708	[a]	[a]	[a]	6,947	102,881
1996	13,611	5,935	9,062	8,649	1,819	39,076	10,091	50,573	[a]	[a]	[a]	[a]	99,740
1997	14,323	3,064	2,713	5,513	629	26,242	5,309	26,355	[a]	[a]	[a]	[a]	57,906
1998	9,845	3,414	2,432	4,676	1,031	21,398	2,614	24,968	[a]	[a]	[a]	[a]	48,980
1999	17,843	3,788	590	3,868	1,869	27,958	1,616	64,768	[a]	[a]	[a]	[a]	94,342
2000	10,391	2,876	5,009	2,944	318	21,538	7,293	37,144	[a]	[a]	[a]	[a]	65,975
2001	16,540	5,500	[a]	4,310	2,843	29,193	2,326	17,713	[a]	[a]	[a]	[a]	49,232
2002	13,943	[b]	[b]	[b]	[b]	[b]	2,937	[b]	[a]	[a]	[a]	[a]	16,880
2003	7,982	3,010	1,719	2,860	1,453	17,024	2,177	[a]	[a]	[a]	[a]	[a]	19,201
2004	6,025	3,896	3,446	4,186	3,087	20,640	3,997	[a]	[a]	[a]	[a]	[a]	24,637
2012	9,584	2,442	1,621	2,595	2,637	18,879	7,814	[a]	[a]	[a]	[a]	[a]	26,693
2013	19,972	2,969	4,320	7,257	2,076	36,594	5,655	[a]	[a]	[a]	3,104	[a]	45,353
2014	16,668	2,849	4,182	5,101	1,840	30,640	6,577	21,144	[a]	[a]	4,188	[a]	62,549

Note: No subsistence surveys were conducted 2005–2011 and after 2014.

[a] Not surveyed.

[b] The Kotzebue Sound communities of Ambler, Kiana, Kobuk, Kotzebue, and Shungnak, although normally included, were not surveyed in 2002 (Georgette et al. 2003).

Appendix C6.–Kotzebue District average subsistence chum salmon harvest per household by village, 1990–2014.

Year	Kotzebue	Noatak	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Deering
1990	[a]	135	198	[a]	[a]	[a]	[a]	[a]
1991	[a]	145	311	[a]	[a]	283	[a]	[a]
1992	[a]	89	310	[a]	[a]	243	[a]	[a]
1993	[a]	136	312	[a]	[a]	196	[a]	[a]
1994	[a]	90	133	32	99	154	260	92
1995	71	69	123	59	110	111	110	[a]
1996	73	115	117	58	111	154	76	[a]
1997	41	71	125	35	39	117	28	[a]
1998	35	27	79	34	30	84	41	[a]
1999	78	18	151	42	8	76	81	[a]
2000	48	72	93	33	72	64	11	[a]
2001	23	24	152	62	[a]	94	109	[a]
2002	[a]	29	121	[a]	[a]	[a]	[a]	[a]
2003	[a]	21	58	32	26	57	43	[a]
2004	[a]	50	56	46	56	75	111	[a]
2012	[a]	94	115	38	31	56	88	[a]
2013	[a]	45	151	32	63	112	67	[a]
2014	26	53	134	29	57	82	56	[a]

Note: No subsistence surveys were conducted 2005–2011 and after 2014.

[a] Not surveyed.

Appendix C7.–Kotzebue District chum salmon aerial survey counts, 1990–2014.

Stream[a]	1990[b]	1991[b]	1992[b]	1993	1994[c]	1995	1996	1997	1998	1999
Noatak Drainage										
Noatak River below Kelly River	23,345[b]	82,750	34,335	25,415	ND	147,260	306,900[c]	[c]	[b]	ND
Eli River	3,000	2,940	701	4,795	ND	7,860	30,040[c]	[c]	[b]	ND
Kelly River and Lake	325[d]	654	726	9	ND	8,384	1,427	2,792	2,631	ND
Noatak River system total	26,670	86,344	35,762	30,219	ND	163,504	338,367	ND	[b]	84,085
Kobuk Drainage										
Kobuk to Pah River	4,610	9,840	1,030	3,896	ND	12,190	20,700	2,248[b]	[b]	ND
Pah River to just below Selby River	305	2,780	3,820	1,535	ND	4,537	4,600	404[b]	[b]	ND
Selby River mouth and slough	420	1,040	1,500	1,800	ND	1,250	4,100	662[b]	[b]	ND
Selby River	7,505	1,460	868	824	ND	3,364	14,950	853[b]	730	ND
Selby River mouth to Beaver Creek	ND	5,250	3,845	929	ND	10,898	15,480	2,582[b]	[b]	ND
Beaver Creek mouth	2,515	ND	ND	ND	ND	ND	ND	914[b]	[b]	ND
Above Beaver Creek	ND	4,155	740	3,174	ND	3,486	14,940	850[b]	[b]	ND
Upper Kobuk River total	15,355	24,525	11,803	12,158	ND	35,725	74,770	8,513[b]	ND	27,340
Squirrel River	5,500	4,606	2,765	4,463	ND	10,605	10,740	4,779[b]	[b]	13,513
Salmon River	6,335	5,845	1,345	13,880	ND	13,988	23,790	1,181[b]	[b]	4,989
Tutuksuk River	2,275	744	1,162	1,196	ND	3,901	21,805	163[b]	[b]	2,906
Kobuk River system total	29,465	35,720	17,075	31,697	ND	64,219	131,105	14,636	[b]	48,748

-continued-

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Stream[a]	2001	2002	2003	2004	2006	2008	2009	2014	Goals[e]
Noatak Drainage									
Noatak River below Kelly River	ND	700	34,575	49,541	36,125[b]	257,695	67,265	414,235	ND
Eli River	ND	ND	ND	2,917	1,285[b]	13,052	2,607	32,174	ND
Kelly River and Lake	ND	1,116	1,566	2,987	2,375[b]	1,865	3,986	37,530	ND
Noatak River system total	ND	ND	36,141	55,445	39,785[b]	272,612	73,858	483,939	42,000–91,000
Kobuk Drainage									
Kobuk to Pah River	2,790	ND	5,501	7,493	8,525[b]	19,421	7,468	ND	ND
Pah River to just below Selby River	1,380	857	828	1,885	ND	5,795	10,852	ND	ND
Selby River mouth and slough	1,780	2,100	1,110	3,846	ND	ND	ND	2,113	ND
Selby River	ND	ND	427	3,760	500[b]	1,750	208	ND	ND
Selby River mouth to Beaver Creek	7,470	ND	1,274	6,215	ND	13,201	26,627	ND	ND
Beaver Creek mouth	ND	ND	ND	ND	ND	ND	ND	ND	ND
Above Beaver Creek	ND	490	2,462	ND	ND	3,180	ND	ND	ND
					39,725[f]			63,540[f]	
Upper Kobuk River total	13,420	3,447	11,602	23,199	48,750[b]	43,347	45,155	65,653	9,700–21,000
Squirrel River	ND	ND	[b]	ND	ND	ND	ND	ND	4,900–10,500
Salmon River	ND	ND	[b]	ND	ND	ND	ND	ND	3,300–7,200
Tutuksuk River	ND	ND	[b]	ND	ND	ND	ND	ND	1,400–3,000
Kobuk River system total	13,420	3,447	11,602	23,199	48,750[b]	43,347	45,155	65,653	19,600–39,200

Note: No surveys were flown in 2000, 2005, 2007, 2010–2013, and after 2014.

[a] Three aerial surveys may be attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indices listed in this table are the largest survey observed for each tributary during the given year.

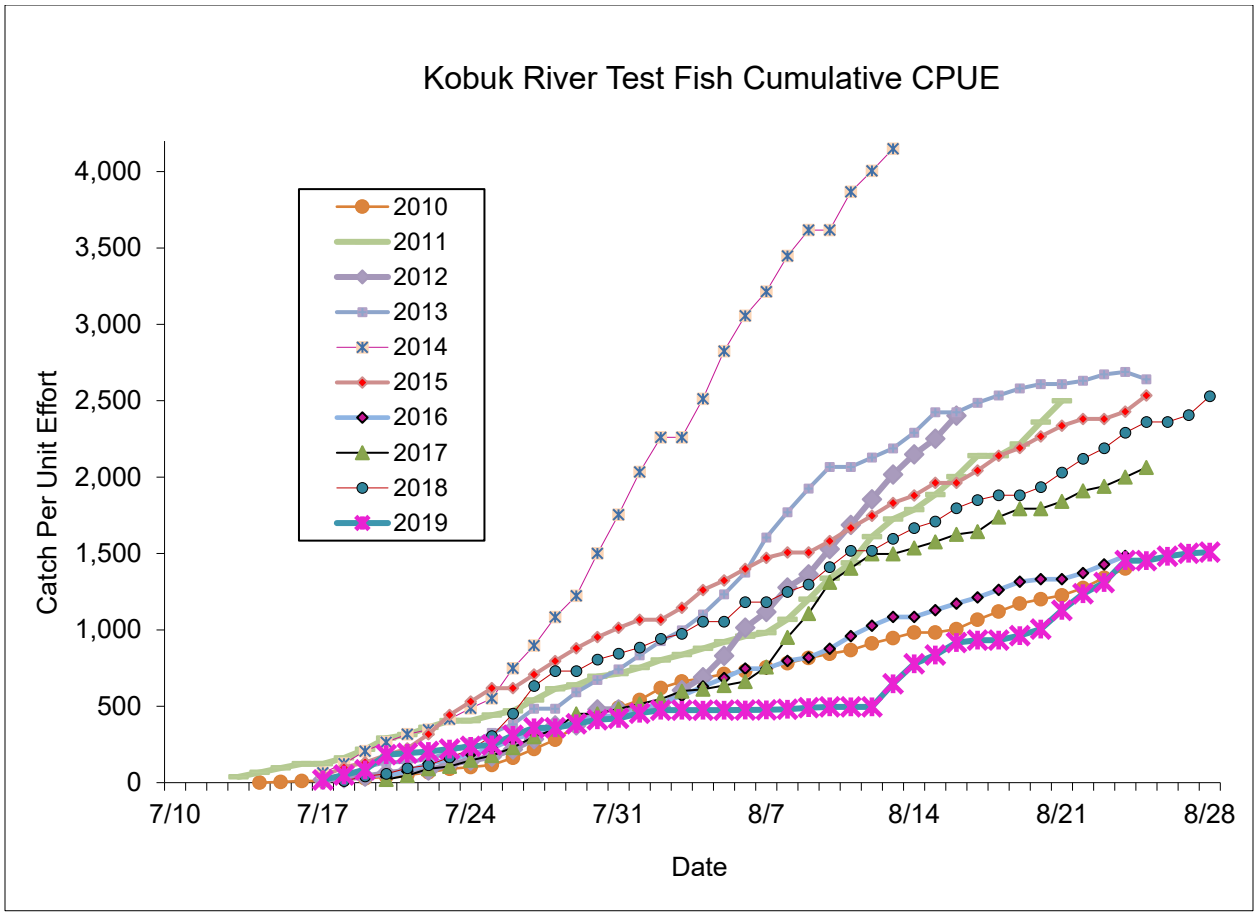
[b] Poor survey conditions or incomplete, early, or late survey.

[c] Unacceptable survey conditions.

[d] Surveyed well before peak of migration.

[e] Aerial survey goals were revised in 2007.

[f] Unclear where these fish were observed.



Appendix C8.–Kobuk River chum salmon drift test fishery cumulative catch per unit effort (CPUE), 2010–2019.

APPENDIX D: HERRING FISHERIES

Appendix D1.–Norton Sound herring and spawn-on-kelp harvests (in short tons) by U.S. commercial fishery participants, 1990–2019.

Year[a]	Sac roe herring	Food or bait herring	Total herring	Spawn on kelp
1990	5,253	1,026	6,279	0
1991	5,465	207	5,672	0
1992[b]	0	0	0	0
1993	4,713	321	5,034	0
1994	958	2	960	0
1995	6,647	116	6,763	0
1996[c]	6,061	109	6,220	0
1997[d]	3,709	262	3,976	0
1998	2,623	8	2,631	9.04[e]
1999	2,693[f]	53	2,751	3.74
2000	4,487[g]	0	4,487	2.25
2001	2,245	0	2,245	2.20
2002	1,059	64	1,123	0
2003	1,587	21	1,608	0.88
2004[b]	0	11	11	0
2005	1,951	0	1,951	0
2006	646	25	671	0.57
2007[b]	0	33	33	0.14
2008[b]	0	91	91	0.18
2009[b]	0	28	28	0
2010	623	65	688	0
2011	739	67	806	0
2012[b]	0	7	7	0
2013	490	2	492	0
2014[b]	0	1	1	0
2015[b]	0	73	73	0
2016[b]	0	14	14	0
2017[b]	0	55	55	0
2018[b]	0	81	81	0
2019[b]	0	42	42	0

[a] From 1990 to present, the fishery has occurred in southeastern Norton Sound.

[b] No commercial fishery took place in 1992, and no sac roe fishery took place in 2004, 2007–2009, 2012, and after 2013.

[c] Total includes an estimated 50 short tons (st) of wastage.

[d] Total includes an estimated 5 st of wastage and approximately 1,000 lb taken as bait.

[e] Includes 2,100 lb of wild kelp and 16,083 lb of *Macrocystis* kelp.

[f] Includes an estimated 5 st of wastage.

[g] Includes an estimated 15 st of wastage.

Appendix D2.–Commercial herring fishery summary information, Norton Sound District, 1990–2019.

Year	Estimated biomass (tons)	Catch gillnet (tons)	Beach seine (tons)	Wild kelp (tons)	*Macrocystis* kelp (lb)	Number of fishery participants	Dollar value (millions)	Number of buyers	Average roe %	Peak catch day	Fishery duration
1990	39,384	6,032	347	0	0	365	3.60	8	8.8	5/29	5/28–05/30
1991	42,854	5,150	522	0	0	279	2.40	8	9.3	5/25	5/23–05/25
1992	57,974	0[a]	0[a]	0	0	[a]	0.00	[a]	[a]	6/20[b]	[a]
1993	46,549	4,291	742	0	0	264	1.50	5	9.9	5/25	5/24–06/05
1994	31,088	921	40	0	0	215	0.30	6	10.3	6/8	6/05–06/09
1995	37,779	6,033	614	0	0	215	4.20	6	10.4	5/24	5/23–05/30
1996	26,596	5,581	589	0	0	287	4.50	10	10.6	5/25	5/24–05/25
1997	47,748	3,459	513	0	0	220	0.61	9	9.9	5/22	5/20–05/24
1998	52,033	2,632	0	1.00	16,083	47	0.20	2	9.2	5/25	5/22–06/09
1999	34,314	2,755	0	0	7,482	122	0.61	4	10.5	6/17	6/13–06/22
2000	32,680	4,390	81	0	4,500	97	0.89	4	9.5	6/11	6/07–06/15
2001	26,305	2,245	0	0	4,400	76	0.35	3	12.3	6/12	6/12–06/16
2002	27,068	1,123	0	0	0	46	0.16	2	10.6	5/24	5/22–06/03
2003	32,918	1,608	0	0	1,750	32	0.22	2	10.5	5/18	5/16–05/25
2004[a]	34,180	11[c]	0	0	0	4	0.00	0	[a]	5/24[b]	[c]
2005	43,013	1,951	0	0	0	56	0.32	1	11.4	6/04	6/03–06/10
2006	38,833[d]	671[e]	0	0.57	0	41	0.14	1	10.2	6/09	6/08–06/11
2007[a]	38,415[d]	33	0	0.14	0	7	0.02	1	[a]	6/09	6/09–06/15
2008[a]	37,401[d]	91	0	0	0	14	0.18	1	[a]	6/11	6/10–06/24
2009[a]	36,917[d]	28	0	0	0	6	0.02	1	[a]	6/12	6/12–06/15
2010	42,889[d]	688	0	0	0	30	0.19	1	13.5	6/17	6/11–06/19
2011	53,786	807	0	0	0	35	0.27	1	14.8	6/04	6/01–06/10
2012[a]	52,949[d]	7	0	0	0	8	0.01	1	[a]	6/25	6/16–06/25
2013	58,594[d]	492	0	0	0	40	0.15	1	13.2	6/15	6/14–06/20
2014[a]	52,138	1	0	0	0	1	confidential	1	[a]	6/04	6/04–06/07
2015[a]	51,582	73	0	0	0	11	0.04	1	[a]	5/25	5/23–05/26
2016[a]	35,355[f]	14	0	0	0	6	0.01	1	[a]	5/16	5/16–05/22
2017[a]	33,924[f]	55	0	0	0	6	0.03	1	[a]	5/18	5/17–05/30
2018[a]	33,924[f]	81	0	0	0	6	0.05	1	[a]	5/16	5/15–05/19
2019[a]	34,180[f]	42	0	0	0	7	0.03	1	[a]	5/11	5/10–05/12

-continued-

[a] No or very limited fishery due to late sea ice breakup in 1992, 2012, and 2014, and no sac roe fishery in 2004, 2007–2009, and after 2013 due to lack of a buyer.

[b] Date of peak aerial survey biomass estimate, typically 1 or 2 days prior to peak catch. The 2004 catch was by king crab permit holders for bait.

[c] All fish caught were kept as bait; none were sold.

[d] Conditions did not allow for a peak survey; therefore, biomass was estimated by extrapolation.

[e] Out of total sac roe herring catch, 25 tons was sold off as bait to NSEDC.

[f] Estimated biomass is an average of the long-term biomass estimates from 1981 to 2014, including only years when the aerial surveys were rated 3 or higher.

Appendix D3.–Norton Sound commercial herring harvest (tons) by subdistrict, by year, 1990–2019.

Year[a]	Subdistricts 1	2	3	4	5	6	7	Totals
1990	4,498	950	931	0	0	0	0	6,379[b]
1991	0	880	4,792	0	0	0	0	5,672[c]
1992[d]	0	0	0	0	0	0	0	0
1993	2,288	587	1,881	0	278	0	0	5,034[e]
1994	250	36	634	0	40	0	0	960
1995	2,359	604	1,524	0	2,108	167	0	6,762
1996	3,074	111	2,831	0	153	0	0	6,170[f]
1997	2,046	62	1,864	0	0	0	1[g]	3,976[h]
1998	1,543	0	1,081	0	0	0	0	2,624
1999	285	323	2,050	0	0	0	8	2,746[i]
2000[j]	2,623	81	1,767	0	0	0	0	4,471
2001[j]	898	0	1,347	0	0	0	0	2,245
2002[j]	373	0	750	0	0	0	0	1,123
2003[j]	283	0	1,325	0	0	0	0	1,608
2004	0	0	0	0	0	0	11	11
2005[j]	783	9	1,149	0	10	0	0	1,951
2006	191	0	480	0	0	0	0	671
2007	0	33	0	0	0	0	0	33
2008	0	91	0	0	0	0	0	91
2009	0	28	0	0	0	0	0	28
2010	314	300	74	0	0	0	0	688
2011	600	84	123	0	0	0	0	807
2012	6	0	0	0	0	0	1	7
2013	107	84	302	0	0	0	0	492
2014	0	1	0	0	0	0	0	1
2015	0	73	0	0	0	0	0	73
2016	0	14	0	0	0	0	0	14
2017	0	55	0	0	0	0	0	55
2018	0	81	0	0	0	0	0	81
2019	0	42	0	0	0	0	0	42

[a] Includes herring taken for sac roe and bait.

[b] Does not include an estimated wastage of 60 short tons (st) in abandoned gillnets.

[c] Does not include an estimated wastage of 125 st in abandoned gillnets.

[d] No commercial fishery in 1992.

[e] Does not include an estimated wastage of 45 st in abandoned beach seine sets.

[f] Does not include an estimated 50 st of wastage.

[g] Approximately 1,000 lb of herring bait was taken under 5 AAC 27.971 in June (not during sac roe fishery).

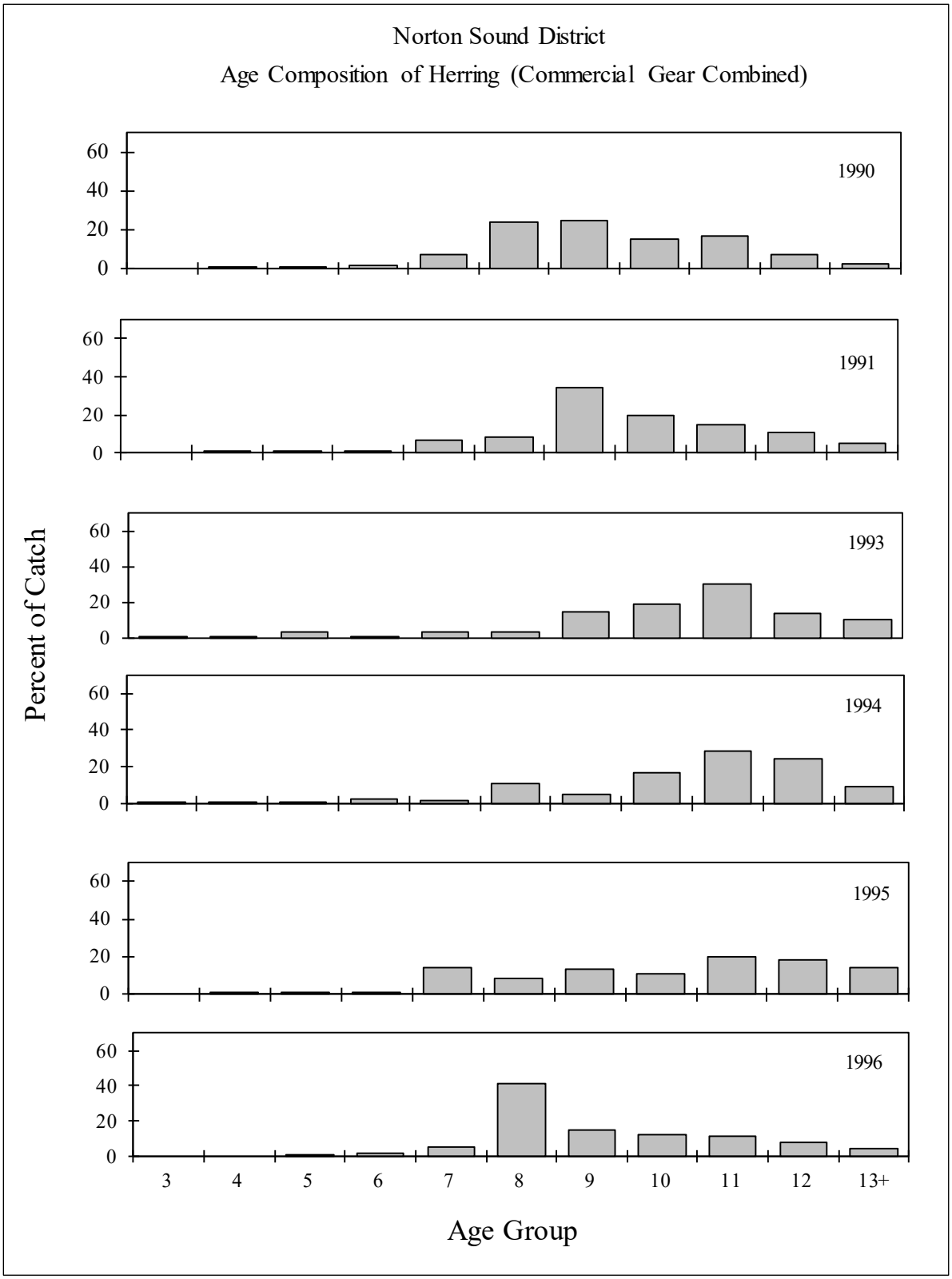
[h] Does not include an estimated 5 st of wastage.

[i] There were 75.8 tons added to the sac roe total due to dewatering by buyers. Three tons were added to the bait total due to dewatering by the buyer. Does not include an estimated 5 st of wastage.

[j] There was 10% added to sac roe total due to dewatering by buyers.

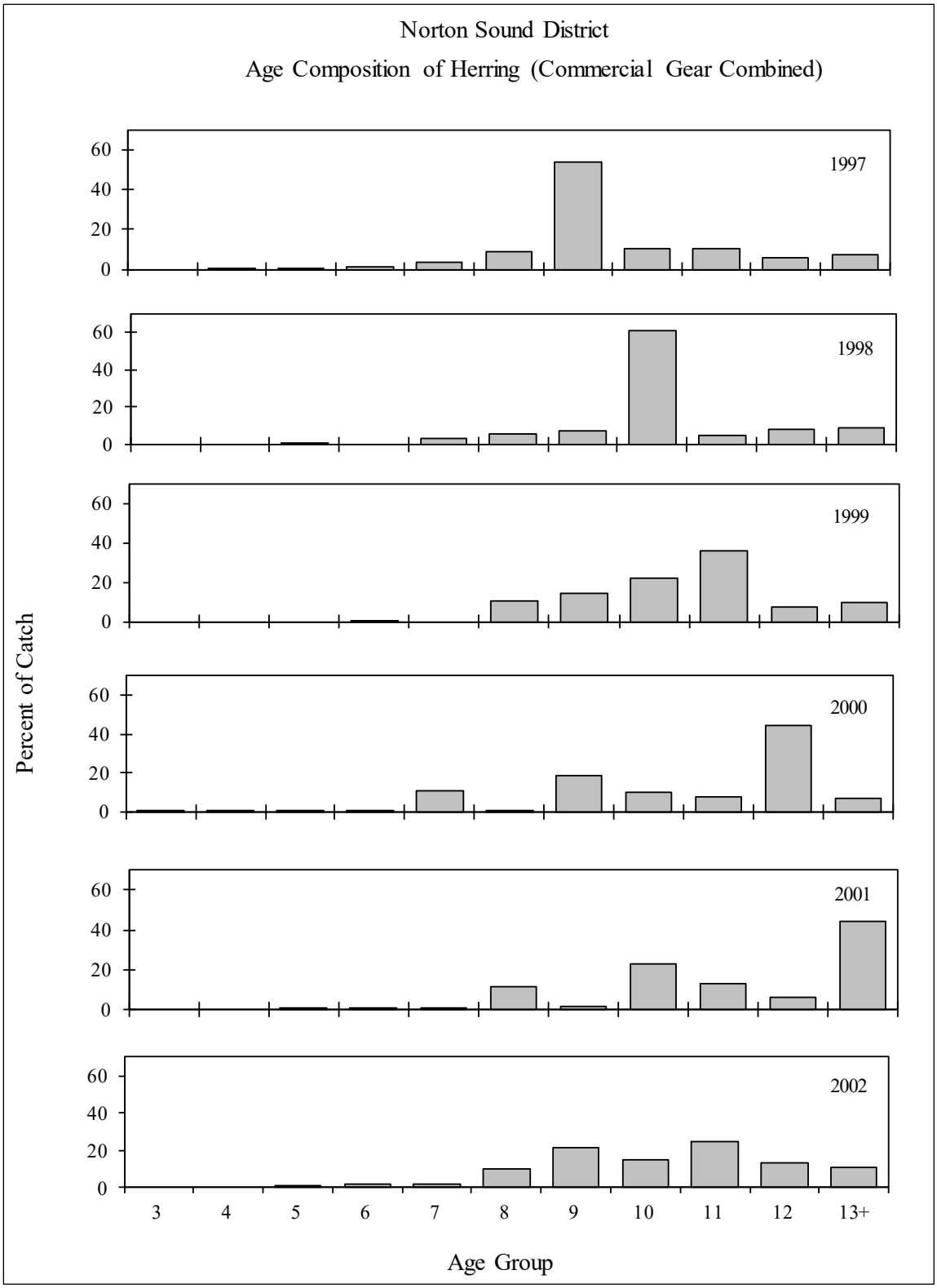
Appendix D4.–Port Clarence District commercial herring fishery, 1986–1996.

Year	Fishery	Gillnet permits	Purse seine permits	Harvest (pounds)
1986	Fall bait	1	0	130
1987	Sac roe	3	3	291,000
1987	Fall bait	Unknown	0	1,100
1988	Sac roe	3	3	160,000
1994	Fall bait	4	0	8,706
1995	Spring bait	8	0	19,193
1995	Fall bait	2	0	9,119
1996	Spring bait	4	0	5,546



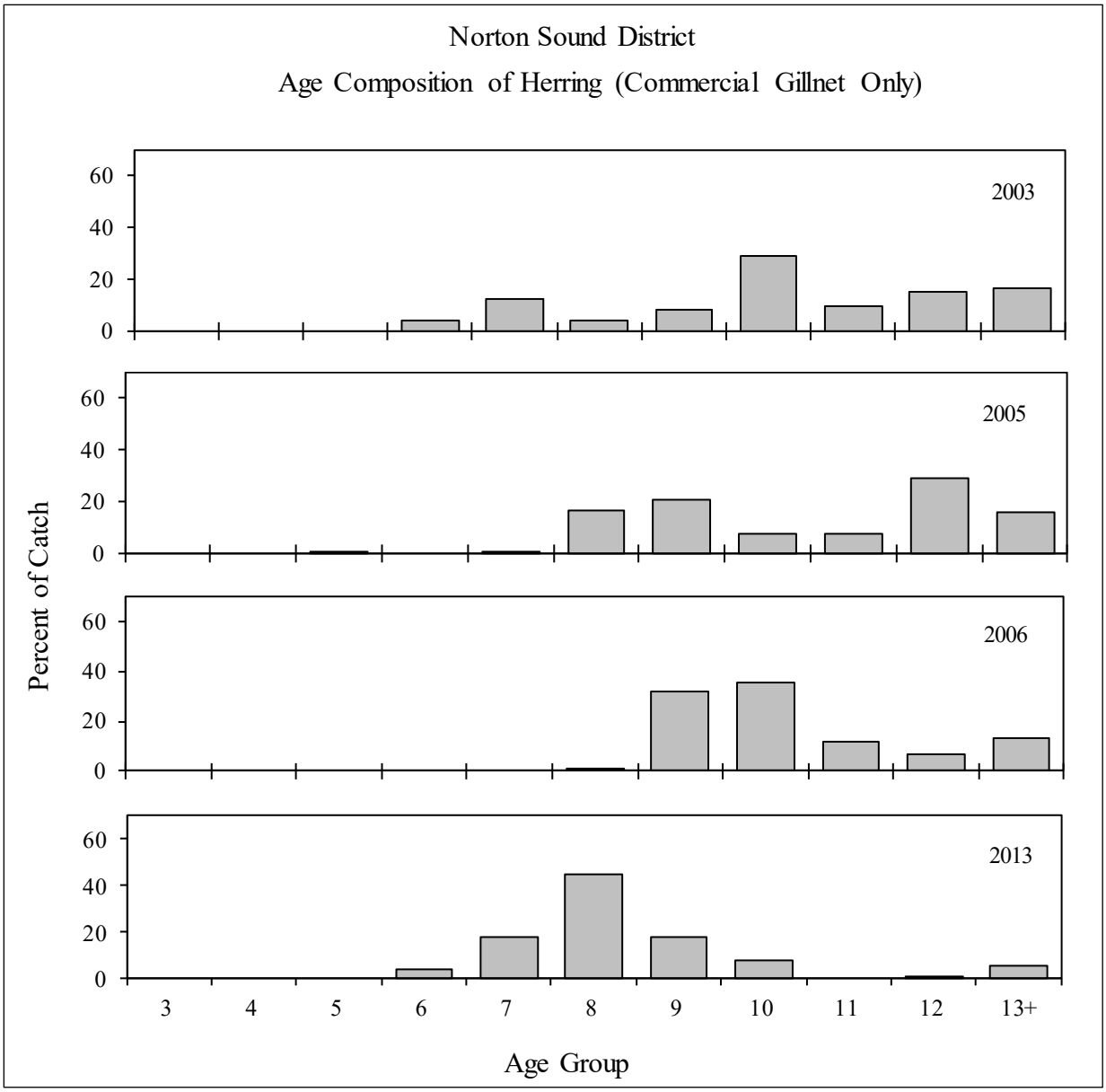
Appendix D5.–Norton Sound herring age class composition by percentage of commercial catch, commercial gear combined (beach seine and gillnet), 1990–1996.

Note: No commercial fishing occurred in 1992.



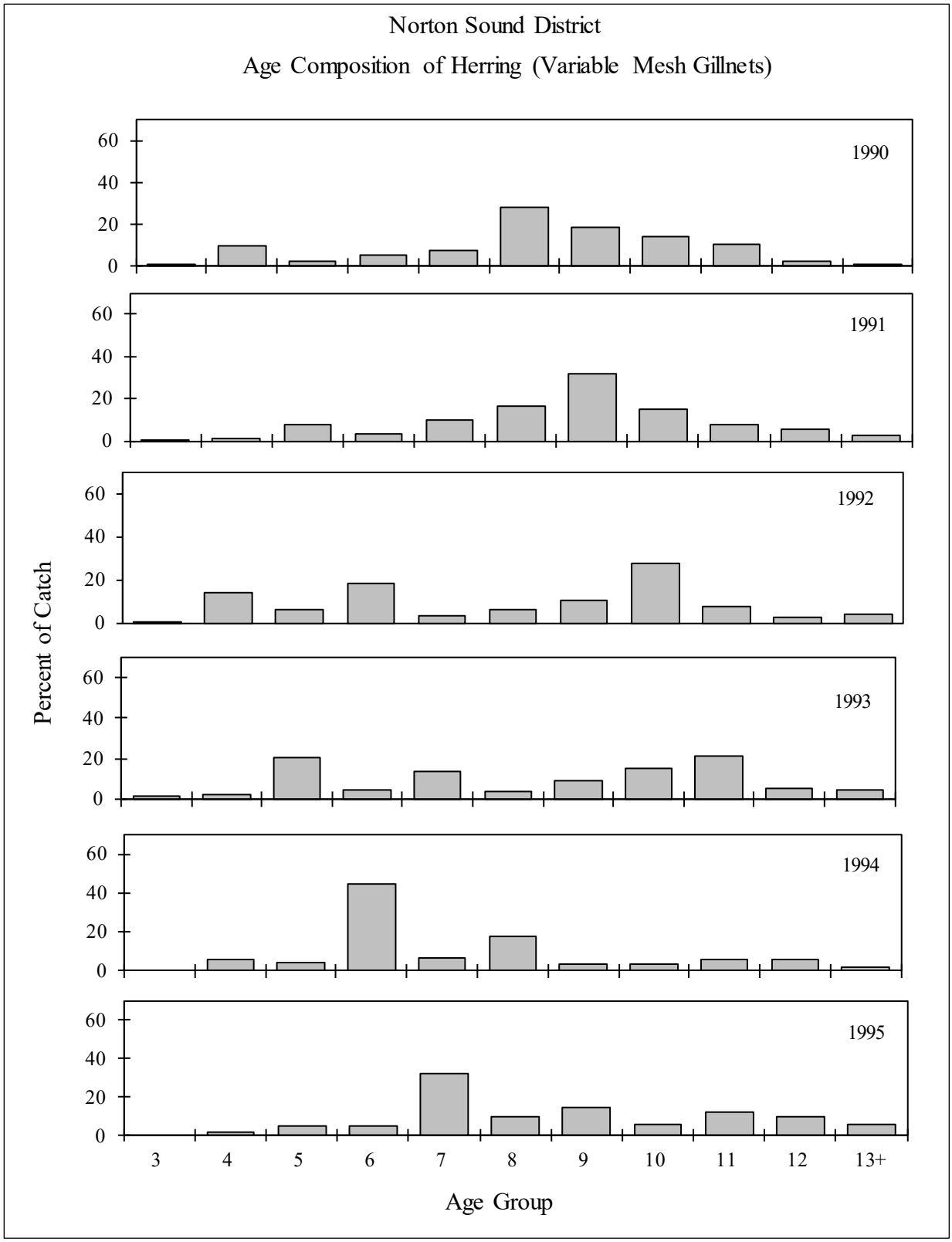
Appendix D6.–Norton Sound herring age class composition by percentage of commercial catch, commercial gear combined (beach seine and gillnet), 1997–2002.

Note: No commercial catch from beach seine gear in 1998 and 1999, and since 2000.

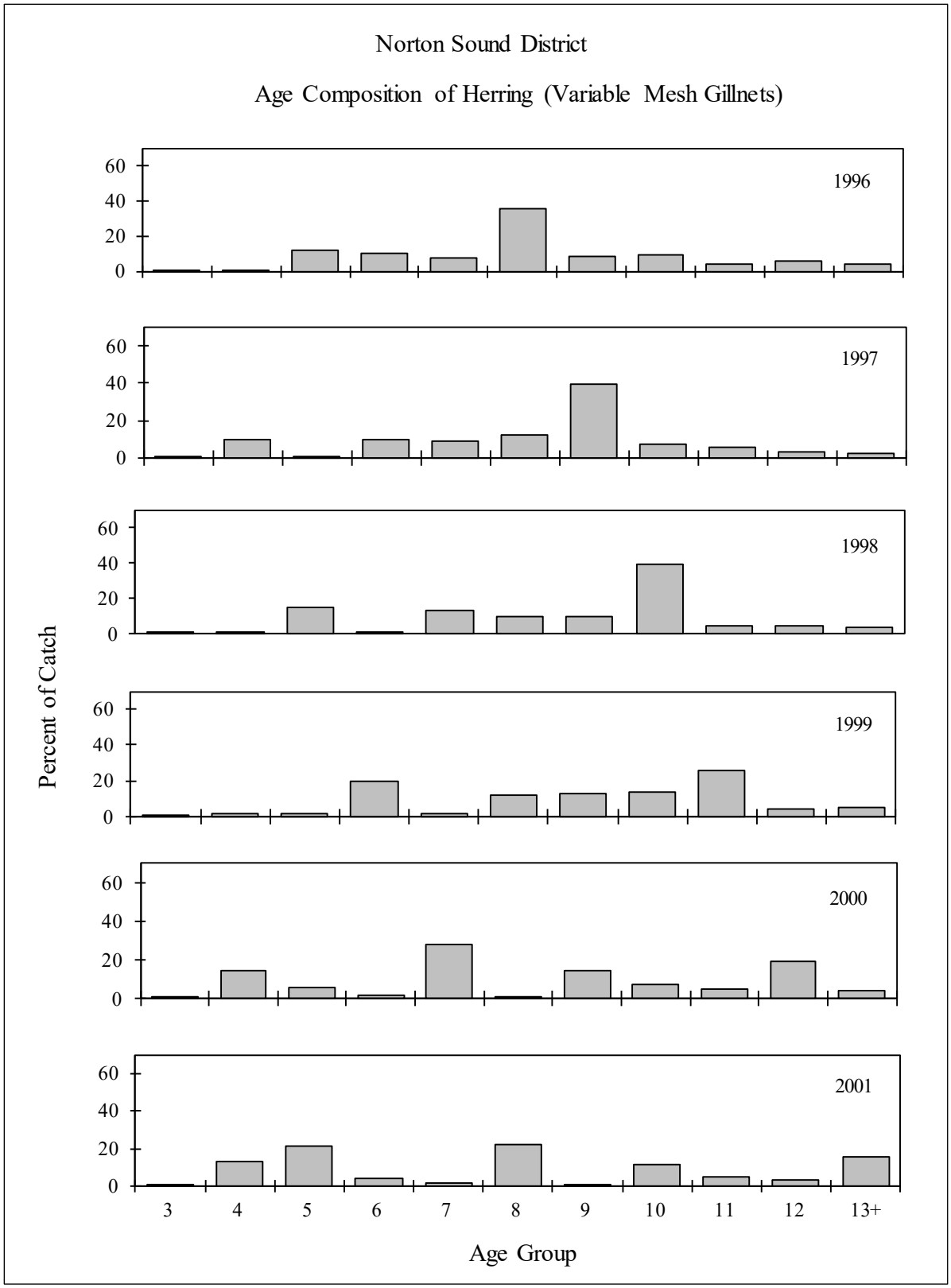


Appendix D7.–Norton Sound herring age class composition by percentage of commercial catch, gillnet only, 2003–2013.

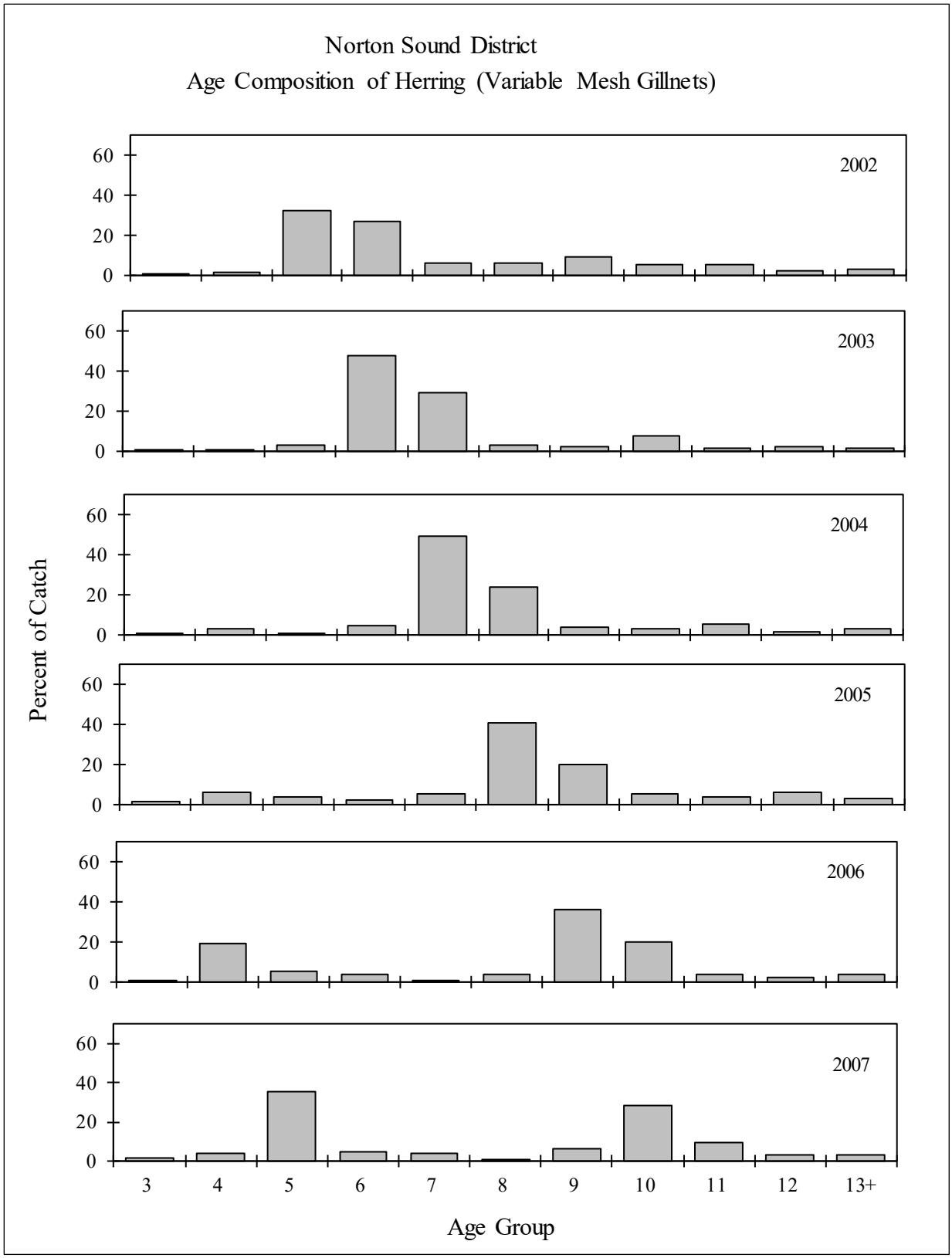
Note: No fishery in 2004. No commercial samples were available 2007–2012 and after 2013.



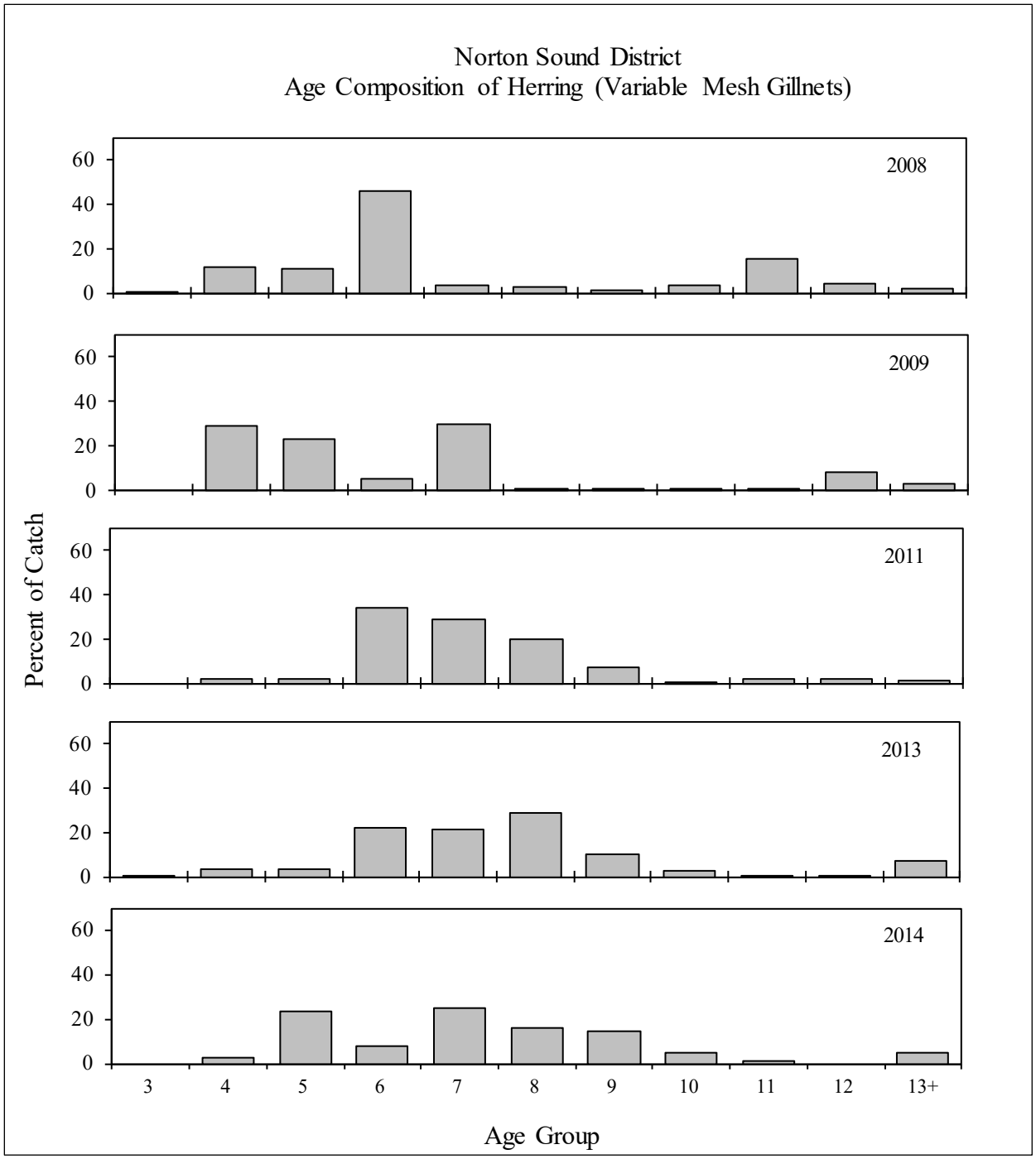
Appendix D8.–Norton Sound herring age class composition by percentage of total catch, variable mesh gillnets, 1990–1995.



Appendix D9.–Norton Sound herring age class composition by percentage of total catch, variable mesh gillnets, 1996–2001.



Appendix D10.–Norton Sound herring age class composition by percentage of total catch, variable mesh gillnets, 2002–2007.



Appendix D11.–Norton Sound herring age class composition by percentage of total catch, variable mesh gillnets, 2008–2014.

Note: Herring age class composition by percentage of total catch for 2010, 2012, and after 2014 are not available.

APPENDIX E: KING CRAB FISHERIES

Appendix E1.–Historical summer commercial red king crab fishery catch statistics and economic performance, Norton Sound Section, Eastern Bering Sea, 1990–2019.

Year	GHL (lb)[b]	Commercial harvest (lb)[a,b]		Number of			Number of pots		CPUE	Avg weight (lb)	Exvessel price/lb	Fishery value (millions $)	Season length		
		Open access	CDQ	Vessels	Permits	Landings	Registered	Pulls					Days	dates: Open access	dates: CDQ
1990	0.20	0.19	[d]	4	4	[c]	1,388	3,172	19	3.1	[c]	[c]	4	8/01–8/05	[d]
1991	0.34								No fishery						
1992	0.34	0.07	[d]	27	27	[c]	2,635	5,746	4	3.0	1.75	0.130	2	8/01–8/03	[d]
1993	0.34	0.33	[d]	14	20	208	560	7,063	16	2.9	1.28	0.430	52	7/01–8/28[e]	[d]
1994	0.34	0.32	[d]	34	52	407	1,360	11,729	9	3.0	2.02	0.646	31	7/01–7/31	[d]
1995	0.34	0.32	[d]	48	81	665	1,900	18,782	6	3.0	2.87	0.926	67	7/01–9/05	[d]
1996	0.34	0.22	[d]	41	50	264	1,640	10,453	7	3.0	2.29	0.519	57	7/01–9/03[f]	[d]
1997	0.08	0.09	[d]	13	15	100	520	2,982	11	2.8	1.98	0.184	44	7/01–8/13[g]	[d]
1998	0.08	0.03	[d]	8	11	50	360	1,639	7	2.8	1.47	0.041	65	7/01–9/03[h]	[d]
1999	0.08	0.02	[d]	10	9	53	360	1,630	5	2.7	3.08	0.073	66	7/01–9/04[i]	[d]
2000	0.33	0.29	0.01	15	22	201	560	6,345	18	2.7	2.32	0.715	91	7/01–8/29	9/01–9/29
2001	0.30	0.28	0.00	30	37	319	1,200	11,918	8	2.9	2.34	0.674	97	7/01–9/01	9/01–9/09
2002	0.24	0.24	0.01	32	49	201	1,120	6,491	14	3.0	2.81	0.729	77	7/01–8/06	6/15–28; 8/9–9/3
2003	0.25	0.25	0.01	25	43	236	960	8,494	11	2.8	3.09	0.823	68	7/01–8/13	6/15–28; 8/15–24
2004	0.35	0.31	0.03	26	39	227	1,120	8,066	15	2.8	3.12	1.063	51	7/01–8/08	6/15–6/28
2005	0.37	0.37	0.03	31	42	255	1,320	8,867	16	2.9	3.14	1.264	73	7/01–8/15	6/15–28; 8/17–27
2006	0.45	0.42	0.03	28	40	249	1,120	8,867	17	3.0	2.26	1.021	68	7/01–8/22	6/15–6/28
2007	0.32	0.29	0.02	38	30	251	1,200	9,118	12	2.8	2.49	0.750	52	7/01–8/17	6/15–6/28
2008	0.41	0.36	0.03	23	30	248	920	8,721	16	2.8	3.20	1.231	73	6/23–8/18	8/17–9/03
2009	0.38	0.37	0.03	22	27	359	920	11,934	12	2.8	3.17	1.225	98	6/15–9/20[j]	6/15–7/28[j]
2010	0.40	0.39	0.03	23	32	286	1,040	9,698	15	2.8	3.73	1.528	58	7/01–8/24	6/28–7/16
2011	0.36	0.37	0.03	24	25	173	1,040	6,808	21	2.8	5.23	2.016	33	6/28–7/30	6/28–7/08
2012	0.47	0.44	0.03	40	29	312	1,200	10,041	16	2.9	5.41	2.556	72	6/29–8/11	6/29–9/08
2013	0.50	0.37	0.02	37	33	460	1,420	15,058	9	3.0	5.63	2.165	74	7/03–9/14	7/03–9/14[h]
2014	0.38	0.36	0.03	52	33	309	1,560	10,127	13	3.0	5.12	1.960	52	6/25–8/02	6/25–8/15
2015	0.39	0.37	0.03	42	36	251	1,480	8,356	17	2.8	5.40	2.130	26	6/29–7/24	6/29–7/24[k]
2016	0.52	0.46	0.04	36	38[l]	229[l]	1,520	8,009[l]	17	3.0	6.50	2.710	25	6/27–7/21	6/27–7/08
2017	0.50	0.45	0.04	36	36	270	1,640	9,440	14	3.0	6.25	2.560	30	6/26–7/25	winter only
2018	0.32	0.30	0.02	33	33	256	1,400	8,797	10	3.3	6.25	1.846	35	6/24–7/28	winter only
2019	0.15	0.08	0.00	24	28[m]	153[m]	1,096	5,436[m]	5	3.0	6.98	0.514	71	6/25–9/03[n]	6/25–9/03[n]

-continued-

Note: Starting in 2016, the guideline harvest level (GHL) and the harvests include the winter commercial fishery, but all other information is for the summer only. The CDQ fishery was implemented in 1998.

[a] Deadloss included in total.

[b] Millions of pounds.

[c] Information not available.

[d] No CDQ harvest was allocated until 1998, and no harvest occurred until 2000.

[e] Fishing began July 8.

[f] Fishing began July 9 due to fishery participants' strike.

[g] First delivery was made July 10.

[h] First delivery was made July 16.

[i] The season was extended 24 hours due to bad weather.

[j] NSSP stopped buying crab from June 29 to July 6 due to poor meatfill.

[k] Final delivery was made July 17.

[l] Includes 1 permit, 2 landings, and 52 pot pulls from the CDQ fishery.

[m] Includes 2 permit, 7 landings, and 280 pot pulls from the CDQ fishery.

[n] Season ended by regulation on September 3, but NSSP stopped buying crab on 8/25.

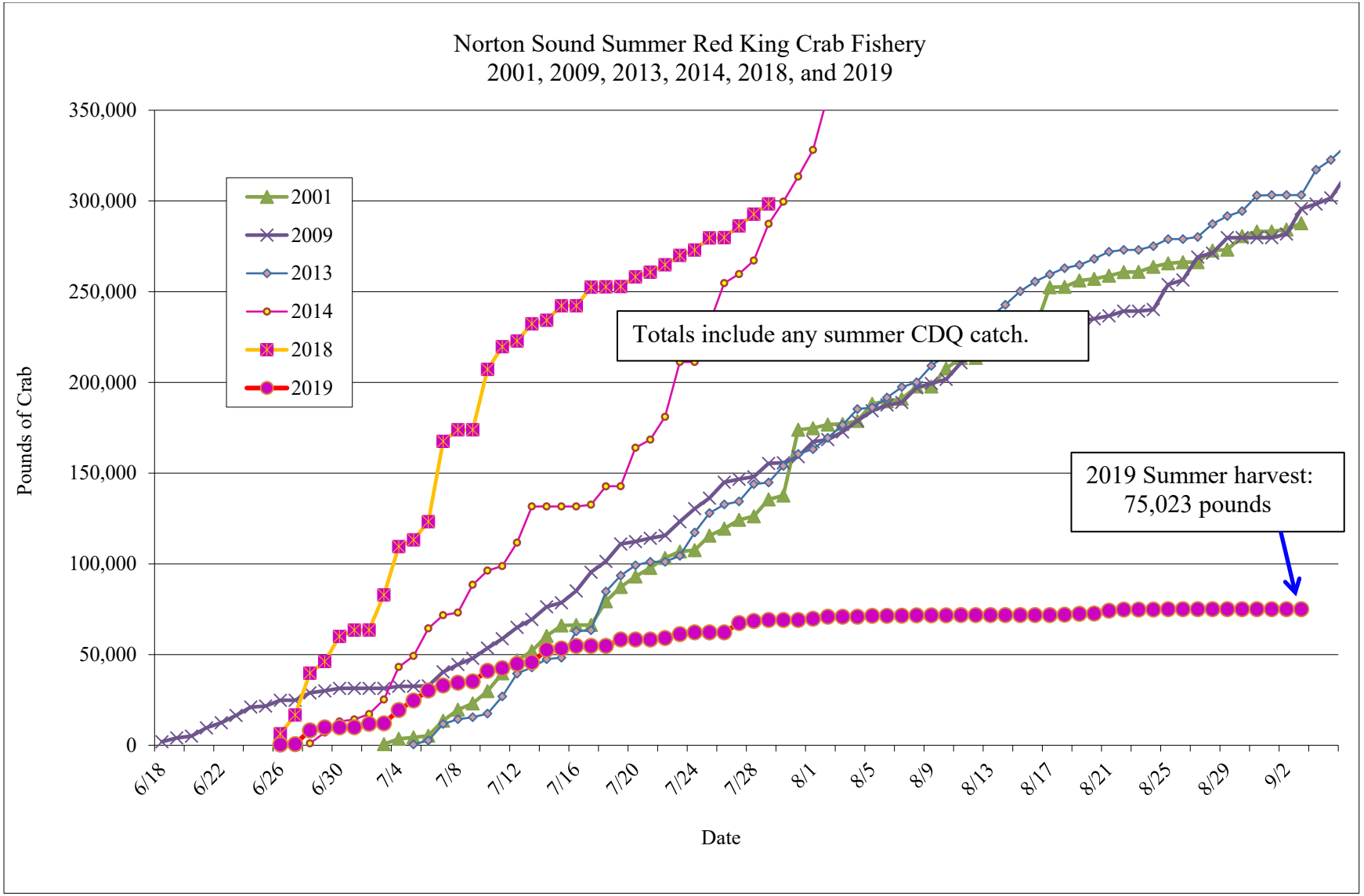
Appendix E2.–Average length and percentage of recruit and postrecruit male red king crab from summer commercial fishery catch samples in Norton Sound Section, Eastern Bering Sea, 1990–2019.

Year	Average length (mm)	Recruits (%)[a]	Postrecruits (%)[b]
1990	121	21	79
1991[c]	ND	ND	ND
1992	120	28	72
1993	119	31	69
1994	119	20	80
1995	118	36	64
1996	117	30	70
1997	116	49	51
1998	117	32	68
1999	118	42	58
2000	116	41	60
2001	119	33	67
2002	120	33	67
2003	117	48	52
2004	117	49	51
2005	118	36	64
2006	119	25	75
2007	117	45	55
2008	115	45	55
2009	116	43	57
2010	115	49	51
2011	116	43	57
2012	118	33	67
2013	120	32	68
2014	120	35	65
2015	115	58	42
2016	118	36	64
2017	120	25	75
2018	123	16	84
2019	119	38	62

[a] Recruits are all new-shell, legal size, male king crab of carapace length less than 116 mm.

[b] Postrecruits are all other male king crab of legal size.

[c] No summer commercial fishery.



Appendix E3.–Current and historical cumulative catch for the Norton Sound summer commercial crab fishery, 2001, 2009, 2013, 2014, 2018, and 2019.

Appendix E4.–Historical winter commercial red king crab fishery catch statistics and economic performance, Norton Sound Section, Eastern Bering Sea, 1990–2019.

Year	Commercial harvest (lb)[a]	Permits fished	Landings	Pot pulls	CPUE	Average weight (lb)	Exvessel price/lb	Fishery value ($)	Season dates[b]
1990	9,792	12	199	257	14	2.8	5.33[c]	19,327[c]	11/15–5/15
1991	10,064	11	187	609	6	2.7	5.00[c]	19,000[c]	11/15–5/15
1992	21,177	13	287	1,823	4	2.8	3.60	76,283	11/15–5/15
1993	4,926	8	66	[d]	[d]	2.8	2.84[c]	14,000[c]	11/15–5/15
1994	17,214	25	183	1,018	6	3.0	3.01	51,709	11/15–5/15
1995	21,813	42	345	3,302	2	2.9	3.09	66,190	11/15–5/15
1996	5,064	9	68	292	7	2.5	3.16	14,838	11/15–5/15
1997	[e]	2	[e]	[e]	[e]	[e]	2.81	[e]	11/15–5/15
1998	2,349	5	31	749	1	2.4	3.57	8,168	11/15–5/15
1999	7,041	5	61	425	6	2.6	3.69	24,777	11/15–5/15
2000	7,894	10	90	1,230	2	2.6	3.72	29,300	11/15–5/15
2001	2,943	3	21	534	2	2.7	3.60	10,582	11/15–5/15
2002	6,860	11	68	1,247	2	2.7	3.53	22,682	11/15–5/15
2003	16,827	13	128	1,960	3	2.5	3.52	57,577	11/15–5/15
2004[f]	1,293	2	16	397	1	2.5	3.95	5,110	11/15–5/15
2005	5,619	4	51	1,076	2	2.7	4.52	25,054	11/15–5/15
2006	[e]	1	[e]	[e]	[e]	[e]	3.98	[e]	11/15–5/15
2007	8,023	8	106	926	4	2.4	3.06	24,464	11/15–5/15
2008	14,676	9	129	1,008	6	2.5	3.03	43,664	11/15–5/15
2009	12,348	7	130	1,282	4	2.5	3.01	32,649	11/15–5/15
2010	12,028	10	184	1,848	3	2.5	3.54	41,265	11/15–5/15
2011	8,669	5	129	1,747	2	2.6	3.59	30,776	11/15–5/15
2012	24,142	35	319	1,668	5	2.6	6.47	150,569	11/15–5/15
2013	62,179	26	495	6,093	4	2.8	6.73	402,256	11/15–5/15
2014	34,587	21	323	4,037	4	2.3	6.94	234,291	11/15–5/15
2015	98,750	44	664	7,314	6	2.4	6.57	617,434	11/15–4/30
2016[g]	79,986	48	471	5,459	5	2.7	7.22	559,803	2/15–4/21
2017[g]	77,843	88	435	3,225	8	3.0	6.73	483,797	2/07–3/22
2018[g]	29,118	43	322	2,566	4	3.2	6.95	186,044	3/03–4/30
2019	3,295	6	21	195	5	3.1	6.97	20,699	2/25–4/30
Avg 2014–2018	64,057	49	443	4,520	5	2.7	6.88	416,274	
Avg 2009–2018	43,965	33	347	3,524	5	2.7	5.78	273,888	

[a] Deadloss included in total.

[b] Prior to 2015, season dates were from November 15 of the previous year to May 15 of the current year. In 2015, season dates were from November 15, 2014, to April 30, 2015.

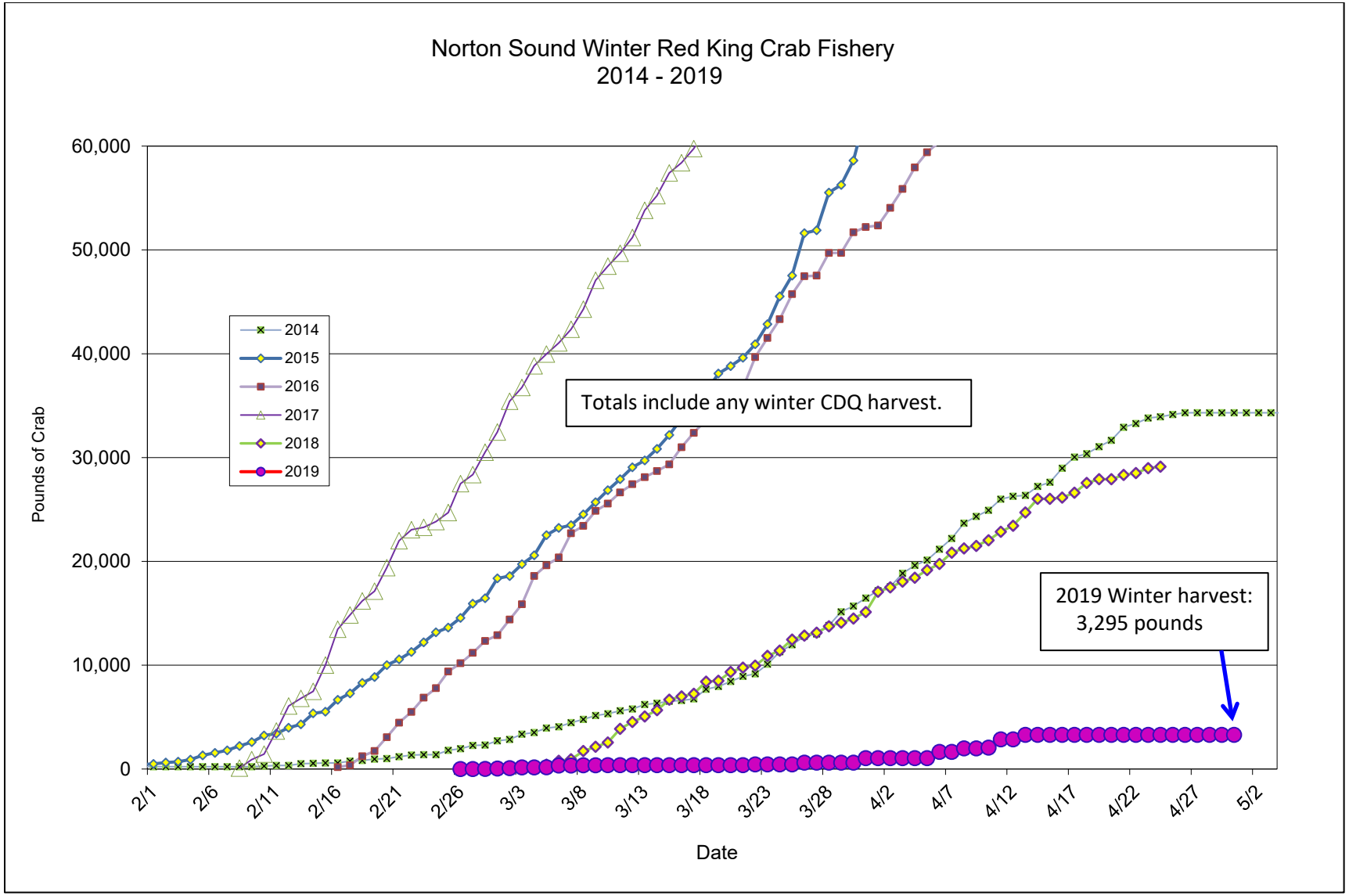
[c] Exvessel value is price per crab. Fishery value was derived by multiplying price per crab by number of crab harvested.

[d] Information is not available.

[e] Information is confidential because fewer than 3 permit holders delivered.

[f] Confidentiality was waived by participant.

[g] Information includes catch statistics and fishery values from the winter CDQ fishery.



Appendix E5.–Current and historical catch performance for the Norton Sound winter commercial crab fishery, 2014–2019.

Note: From 2016 to 2018, catch information includes data from the winter CDQ fishery.

Appendix E6.–Summer subsistence red king crab harvests, Norton Sound, Eastern Bering Sea, 2004–2019.

Year[a]	Permits issued	Permits returned	Permits fished	Crab caught[b]	Crab harvested[c]	Multiplier[d]	Pounds harvested[d]	Average number kept/ permits fished
2004	38	18	5	996	350	2.3	805	70
2005	14	12	4	753	304	2.4	727	76
2006	6	4	3	67	62	2.5	155	21
2007	19	19	5	1,425	1,008	2.3	2,318	202
2008	30	30	14	1,816	1,176	2.3	2,705	84
2009	20	20	13	1,874	653	2.3	1,502	50
2010	27	27	15	1,086	660	2.3	1,518	44
2011	43	42	27	4,026	2,658	2.3	6,193	98
2012	45	44	13	1,346	912	2.4	2,189	70
2013	47	46	26	3,102	1,865	2.5	4,663	72
2014	40	40	25	2,185	1,210	2.5	3,025	48
2015	31	30	14	5,812	2,862	2.3	6,525	204
2016	29	29	16	2,952	1,930	2.5	4,825	121
2017	39	39	17	2,164	1,777	2.5	4,443	105
2018	32	32	14	828	673	2.8	1,884	48
2019	38	38	15	461	315	2.5	788	21
Avg 2014–18	34	34	17	2,788	1,690	2.5	4,140	105
Avg 2009–18	35	35	18	2,538	1,520	2.4	3,677	86

Note: There were no recorded summer subsistence harvests prior to 2004.

[a] The summer subsistence fishery is open June through November.

[b] The number of crab actually caught; some may have been released.

[c] The number of crab harvested is the number of crab retained.

[d] Multiplier is the average weight of crab from the commercial fishery of the same year minus 0.5 pound. Pounds harvested are derived by multiplying the total number of harvested crab by the multiplier.

Appendix E7.–Winter subsistence red king crab harvest statistics, Norton Sound, Eastern Bering Sea, 1989–2019.

Winter[a]	Permits issued	Permits returned	Permits fished	Crab caught[b]	Crab harvested[c]	Multiplier[d]	Pounds harvested[d]	Average number kept/ permits fished
1989–90	136	118	107	16,635	12,152	2.3	27,464	114
1990–91	119	104	79	9,295	7,366	2.2	15,911	93
1991–92	158	105	105	15,051	11,736	2.3	27,345	112
1992–93	88	79	37	1,193	1,097	2.3	2,479	30
1993–94	118	95	71	4,894	4,113	2.5	10,241	58
1994–95	166	131	97	7,777	5,426	2.4	12,968	56
1995–96	84	44	35	2,936	1,679	2.0	3,408	48
1996–97	38	22	13	1,617	745	2.0	1,512	57
1997–98	94	73	64	20,327	8,622	1.9	16,296	135
1998–99	95	80	71	10,651	7,533	2.1	15,744	106
1999–00	98	64	52	9,816	5,723	2.1	11,961	110
2000–01	50	27	12	366	256	2.2	558	21
2001–02	114	101	67	8,805	3,669	2.2	7,888	55
2002–03	107	73	64	9,052	4,140	2.0	8,114	65
2003–04	96	77	41	1,775	1,181	2.0	2,338	29
2004–05[e]	170	102	60	6,496	3,973	2.2	8,542	66
2005–06	98	97	67	2,083	1,239	2.4	2,974	18
2006–07	129	127	116	21,444	10,690	1.9	20,525	92
2007–08	139	137	108	18,621	9,485	2.0	19,255	88
2008–09	105	105	70	6,971	4,752	2.0	9,456	68
2009–10	125	123	85	9,004	7,044	2.0	14,018	83
2010–11	148	148	95	9,183	6,640	2.1	13,811	70
2011–12	204	204	138	11,341	7,371	2.1	15,774	53
2012–13	149	148	104	21,752	7,662	2.3	17,240	74
2013–14	103	103	75	5,421	3,252	1.8	5,886	43
2014–15	155	154	108	9,849	7,660	1.9	14,631	72
2015–16	139	139	92	6,584	5,408	2.2	11,898	59
2016–17	163	163	109	7,185	6,039	2.5	15,098	55
2017–18	123	121	82	5,767	4,424	2.7	11,945	54
2018–19	101	101	60	2,080	1,545	2.6	4,017	26
Avg 2014–2018	137	136	93	6,961	5,357	2.2	11,891	57
Avg 2009–2018	141	141	96	9,306	6,025	2.2	12,976	63

[a] The winter subsistence fishery is open December through May.

[b] The number of crab actually caught: some may have been released.

[c] The number of crab harvested is the number of crab retained.

[d] Multiplier is the average weight of crab from the commercial fishery of the same year minus 0.5 pound. Pounds harvested are derived by multiplying the total number of harvested crab by the multiplier.

[e] Permits were only given out of the Nome ADF&G office, except during the 2004–2005 season, when permits were given out in Elim, Golovin, Shaktoolik, and White Mountain.

Appendix E8.–Summer and winter, commercial and subsistence red king crab harvests in pounds, Norton Sound, Eastern Bering Sea, 1990–2019.

	Commercial					Subsistence				Combined
Year	Summer harvest	Winter harvest	Winter/total harvest (%)	Total harvest	Guideline harvest level	Summer harvest[a]	Winter harvest[a]	Winter/total harvest (%)	Total harvest	total harvest[b]
1990	192,831	9,792	5	202,623	200,000	[c]	27,464	100	27,464	230,087
1991	[d]	10,064	100	10,064	[d]	[c]	15,911	100	15,911	25,975
1992	74,029	21,177	22	95,206	340,000	[c]	27,345	100	27,345	122,551
1993	335,790	4,926	1	340,716	340,000	[c]	2,479	100	2,479	343,195
1994	327,858	17,214	5	345,072	340,000	[c]	10,241	100	10,241	355,313
1995	322,676	21,813	6	344,489	340,000	[c]	12,968	100	12,968	357,457
1996	224,231	5,064	2	229,295	340,000	[c]	3,408	100	3,408	232,703
1997	92,988	[e]	[e]	92,988	80,000	[c]	1,512	100	1,512	94,500[f]
1998	29,684	2,349	7	32,033	80,000	[c]	16,296	100	16,296	48,329
1999	23,553	7,041	23	30,594	80,000	[c]	15,744	100	15,744	46,338
2000	312,524	7,894	2	320,418	336,000	[c]	11,961	100	11,961	332,379
2001	288,199	2,943	1	291,142	303,000	[c]	558	100	558	291,700
2002	259,601	6,860	3	266,461	248,000	[c]	7,888	100	7,888	274,349
2003	267,207	16,827	6	284,034	253,000	[c]	8,114	100	8,114	292,148
2004	340,746	1,293	0	342,039	326,500	805	2,338	74	3,143	345,182
2005	400,804	5,619	1	406,423	370,000	727	8,542	92	9,269	415,692
2006	451,748	[e]	[e]	451,748	454,000	155	2,974	95	3,129	454,877[f]
2007	312,875	8,023	3	320,898	315,000	2,318	20,525	90	22,843	343,741
2008	395,135	14,676	4	409,811	412,000	2,705	19,255	88	21,959	431,770
2009	397,587	12,348	3	409,935	375,000	1,502	9,456	86	10,958	420,893
2010	417,304	12,028	3	429,332	400,000	1,518	14,018	90	15,536	444,868
2011	400,840	8,669	2	409,509	358,000	6,193	13,811	69	20,004	429,513
2012	475,990	24,142	5	500,132	465,450	2,189	15,774	88	17,963	518,095
2013	391,863	62,179	14	454,042	495,600	4,663	17,240	79	21,902	475,944
2014	389,008	34,587	8	423,595	382,800	3,025	5,886	66	8,911	432,506
2015	401,115	98,750	20	499,865	394,600	6,583	14,613	69	21,196	514,478
2016	420,159	79,986	16	500,145	517,200	4,825	11,898	71	16,723	516,868
2017	411,739	77,843	16	489,582	496,800	4,443	15,098	77	19,541	509,123
2018	298,396	29,118	9	327,514	319,410	1,884	11,945	86	13,829	341,343
2019	75,023	3,295	4	78,318	150,600	788	4,017	84	4,805	83,123
Avg 2014–2018	384,083	64,057	14	448,140	422,162	4,152	11,888	74	16,040	462,864
Avg 2009–2018	400,400	43,965	10	444,365	420,486	3,682	12,974	78	16,656	460,363

-continued-

[a] Harvest in pounds is derived by multiplying number of crab by 0.5 pound less than the average weight from the respective commercial fishery.

[b] Combined total harvest is from summer and winter, commercial and subsistence red king crab harvests.

[c] There were no recorded summer subsistence harvests prior to 2004.

[d] There was no summer commercial fishery, therefore no GHL was set.

[e] Information is confidential.

[f] Does not contain winter commercial harvest because it is confidential information.

Appendix E9.–The results of the population assessment trawl surveys conducted for red king crab in Norton Sound since 1991.

Year	Date	Research agency	Population abundance estimates[a] (number of crab)			Legal male biomass (lb)[d]	Standard error (number of crab)		
			Pre-2 males[b]	Pre-1 males[b]	Legal males[c]		Pre-2 males[b]	Pre-1 males[b]	Legal males[c]
1991	8/22–08/30	NMFS	386,338	408,241	1,545,558	4,636,674	297,059	157,018	450,814
1996	9/07–09/18	ADF&G	395,888	277,595	528,431	1,585,293	243,594	78,712	157,909
1999	7/28–08/07	ADF&G	96,295	582,799	1,542,589	4,627,767	56,017	165,689	318,731
2002	7/27–08/06	ADF&G	393,689	482,815	740,450	2,221,350	85,797	81,271	81,271
2006	7/25–08/08	ADF&G	937,083	571,890	718,379	2,155,137	551,144	153,272	105,487
2008	7/24–08/11	ADF&G	795,777	689,843	811,727	2,435,181	187,516	120,153	152,145
2011	7/18–08/15	ADF&G	431,153	311,550	1,310,634	3,931,902	151,713	87,866	123,310
2014	7/18–07/30	ADF&G	1,547,538	2,110,274	1,747,720	5,243,160	643,563	1,474,574	912,399
2017	7/28–08/08	ADF&G	258,235	288,615	941,797	2,825,391	78,381	100,434	270,551
2018	7/22–08/09	ADF&G	212,664	151,903	303,806	911,418	58,798	61,909	93,597
2019	7/17–07/27	ADF&G	1,215,222	106,332	407,525	1,222,575	764,608	53,261	132,697

[a] Population estimates are valid for the date of the survey (i.e., either before or after the summer commercial fishery). All historical abundances were updated based on newly recovered data in 2015.

[b] Prerecruit-2 (pre-2) male crab were defined as 76–89 mm in carapace length (CL), and prerecruit-1 (pre-1) male crab were defined as sublegal crab greater than or equal to 90 mm in CL.

[c] Legal male red king crab were defined as greater than or equal to 121 mm (4.75 inch) in carapace width (CW) for all ADF&G trawl surveys (except for 1996, when legal male crab were defined as at least 105 mm CL), and greater than or equal to 104 mm CL for the NMFS trawl survey.

[d] Legal male biomass is estimated by multiplying the population abundance estimate of legal males by an average weight of 3.0 pounds.

Appendix E10.–Size composition by percent of red king crab from winter research pots near Nome, Norton Sound, Bering Sea, 1990–2012.

	Undersized[a]			Legal[a]		
Year	Prerecruit-2	Prerecruit-1	Total	Recruits	Postrecruits	Total
1990	16	33	49	25	26	51
1991	5	30	36	34	31	65
1992	[b]	[b]	[b]	[b]	[b]	[b]
1993	3	9	12	17	71	88
1994	[b]	[b]	[b]	[b]	[b]	[b]
1995	10	11	23[c]	32	45	77
1996	22	33	64[c]	10	26	36
1997	32	21	64[c]	14	22	36
1998	36	44	82[c]	9	9	18
1999	7	42	50[c]	39	11	50
2000	16	20	37[c]	39	25	64
2001	23	16	39[c]	14	48	61
2002	43	26	79[c]	9	12	21
2003	20	42	66[c]	20	14	34
2004	9	40	50[c]	37	13	50
2005	16	24	41[c]	25	34	59
2006	29	33	63[c]	16	22	38
2007	16	53	78[c]	11	11	22
2008	36	31	71[c]	18	12	30
2009	11	42	54[c]	24	22	46
2010	10	32	43[c]	30	27	57
2011	15	26	44[c]	23	33	56
2012	25	29	57[c]	14	29	43

Note: No winter study has occurred since 2012.

[a] Undersized crab are male crab less than 4.75-inch carapace width (CW). Legal crab are male king crab greater than or equal to 4.75 inch CW.

[b] No winter crab research study occurred in 1992 or 1994.

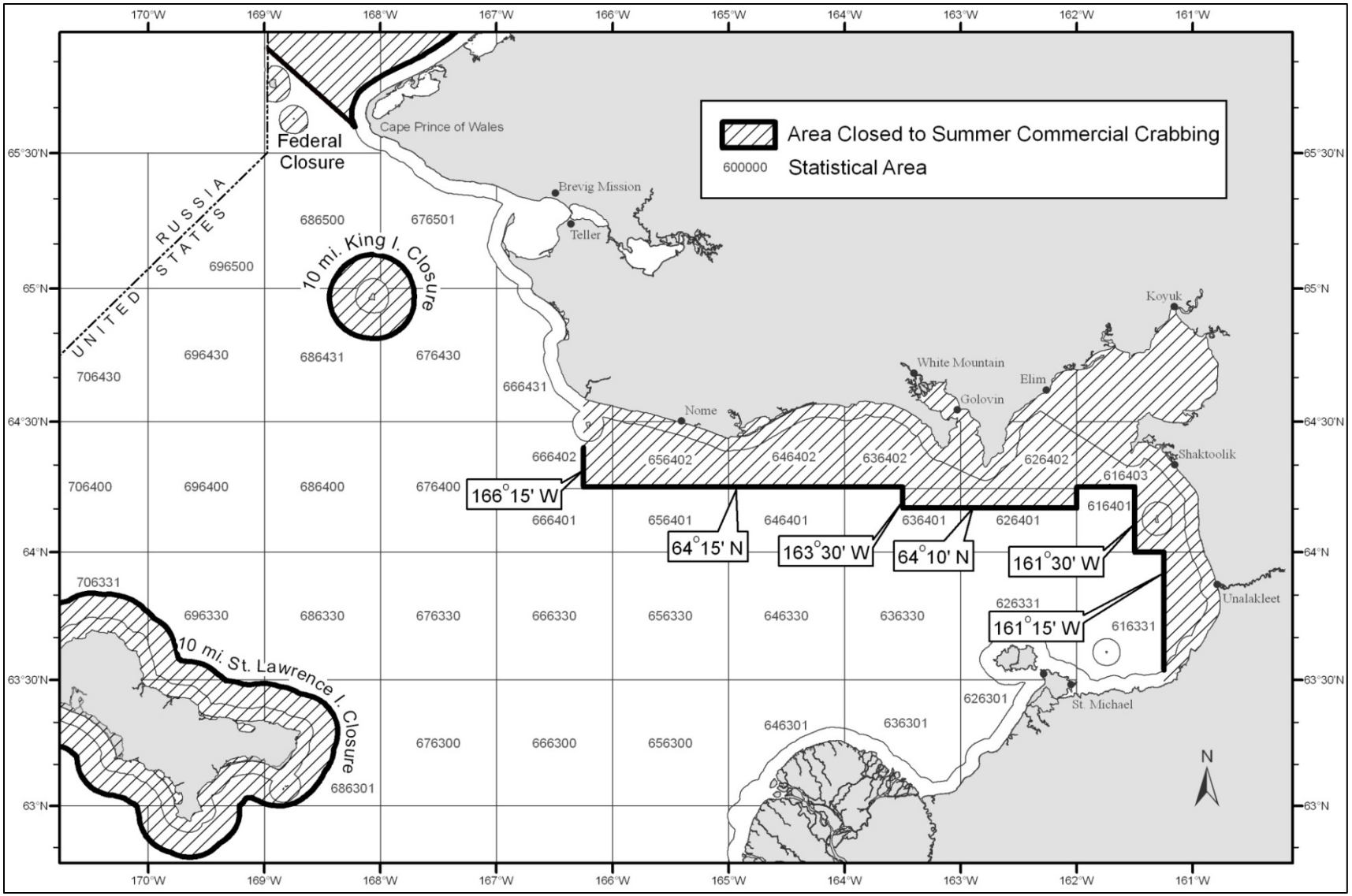
[c] Includes Prerecruit 3.

Appendix E11.–Reported number of crab pots lost during the commercial and subsistence winter crab fisheries, and ADF&G studies/surveys, 2005–2019.

Year	Commercial[a]	Subsistence	ADF&G winter study and spring/fall tagging studies[b]	Total
2005–06	ND	50	6	56
2006–07	ND	132	7	139
2007–08	ND	6	4	10
2008–09	ND	8	2	10
2009–10	30	23	2	55
2010–11	3	8	0	11
2011–12	64	19	4	87
2012–13	23	4	3	30
2013–14	105	16	1	122
2014–15	104	16	0	120
2015–16	38	20	No tagging studies done	58
2016–17	201	11	No tagging studies done	212
2017–18	179	33	No tagging studies done	212
2018–19	32	59	No tagging studies done	91

[a] Prior to the 2009–2010 season, lost pots were not tracked for the winter commercial fishery.

[b] The 2011–2012 winter season was the last time the winter study took place. The spring/fall tagging studies took place 2012–2015.



Appendix E12.–Closed waters area in effect for the Norton Sound summer commercial crab fishery.

Note: Line drawn around the coastline delineates the 3 mile state waters zone.

Appendix E13.–Historical commercial summer harvest of red king crab from Norton Sound Section, Eastern Bering Sea, by statistical areas, 1990–2019 (catch in pounds).

Statistical area	1990	1992	1993	1994	1995	1996[a]	1997	1998	1999
616331	0	0	0	48	0	0	0	0	633
616401	0	0	0	0	35	0	0	0	0
626331	0	0	0	0	0	61	0	0	0
626401	0	0	0	0	18,971	45,045	18,066	8,065	508
626402	0	0	0	0	0	0	0	0	0
636330	0	0	0	0	0	4,560	3,838	2,449	0
636401	0	1,159	1,373	3,340	24,329	70,677	59,206	10,771	14,201
636402	0	0	0	1,754	3,466	0	0	0	0
646301	0	0	0	0	4,628	13,888	0	0	0
646330	0	0	0	0	1,493	2,894	314	0	3,021
646401	0	0	1,963	37,510	105,045	22,834	1,052	3,194	221
646402	0	0	730	139,661	66,821	0	0	0	0
656300	0	0	0	0	0	0	0	0	0
656330	0	4,814	265	0	19,745	15,446	4,661	4,078	1,300
656401	171	53,119	105,341	34,686	32,289	9,985	4,035	1,127	2,739
656402	0	0	193,079	110,289	44,000	0	0	0	0
666230	0	0	0	0	0	0	0	0	0
666300	0	0	0	0	0	25,519	0	0	0
666330	27,185	4,305	31,758	0	730	0	0	0	0
666401	162,263	10,632	746	396	0	3,001	1,816	0	930
666402	0	0	535	1,221	0	0	0	0	0
666431	0	0	0	0	1,124	0	0	0	0
676300	0	0	0	0	0	546	0	0	0
676330	0	0	0	0	0	0	0	0	0
676400	3,212	0	0	0	0	9,775	0	0	0
676430	0	0	0	0	0	0	0	0	0
676501	0	0	0	0	0	0	0	0	0
686330	0	0	0	0	0	0	0	0	0
686431	0	0	0	0	0	0	0	0	0
686500	0	0	0	0	0	0	0	0	0
Total	192,831	74,029	335,790	328,905	322,676	224,231	92,988	29,684	23,553
(tons)	96	37	168	164	161	112	46	15	12

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Appendix E13.–Page 2 of 3.

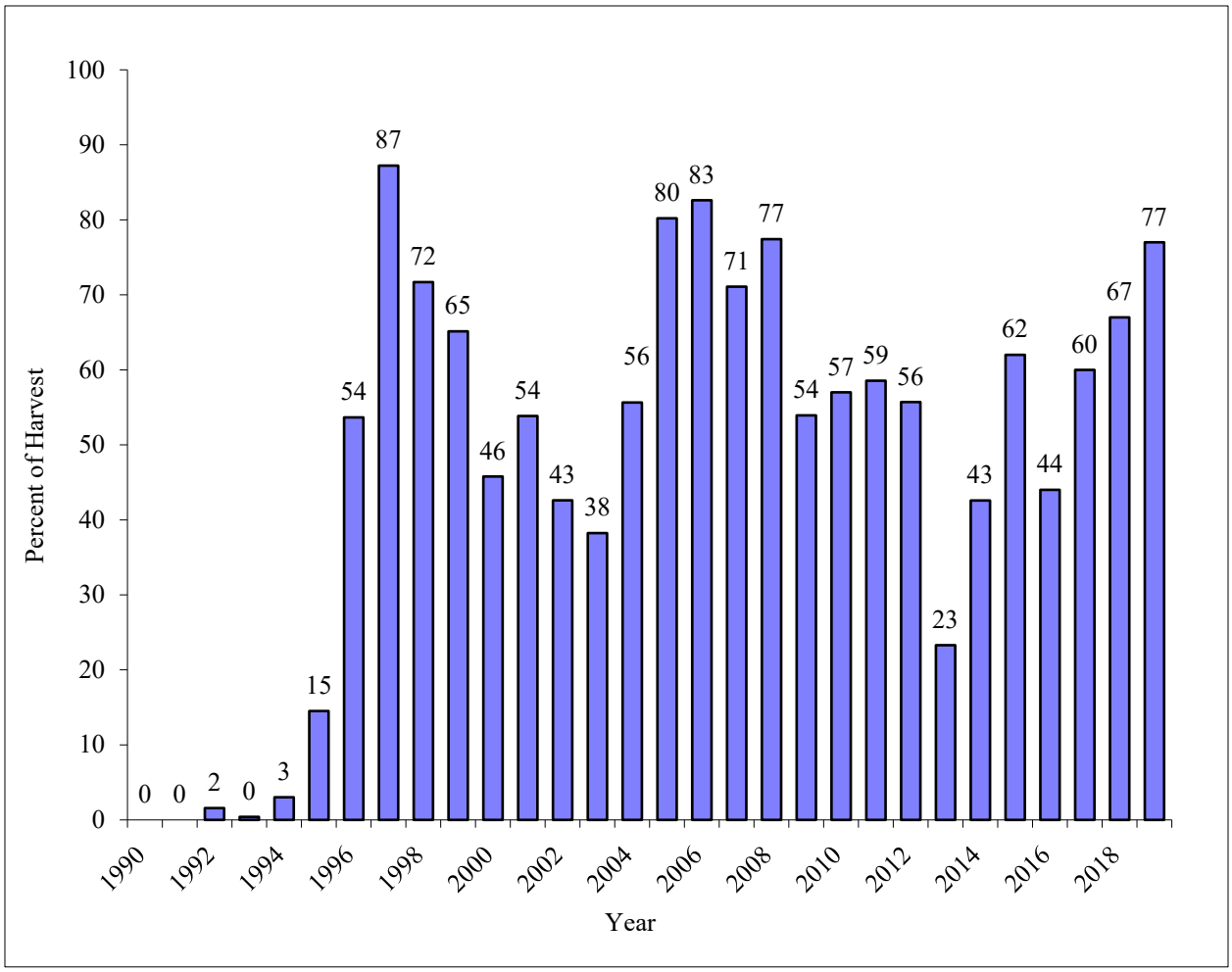
Statistical area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
616331	4,557	0	3,506	646	0	0	2,357	0	5,658	888
616401	0	0	0	0	0	0	0	231	416	6,170
626331	0	0	2,455	0	0	0	1,415	27,018	3,235	3,047
626401	4,689	61,620	53,722	15,899	23,113	94,130	118,202	61,704	96,327	103,043
626402	0	0	0	1,352	0	0	0	0	0	0
636330	0	2,253	0	0	0	126	26,680	10,253	2,350	5,026
636401	130,463	91,343	50,906	83,949	166,489	227,204	224,531	123,092	197,948	96,279
636402	0	0	0	0	0	0	0	0	0	0
646301	0	0	0	0	0	0	0	0	0	0
646330	0	1,868	1,955	0	2,226	4,097	2,629	5,290	1,505	933
646401	0	4,287	0	3,952	1,964	149	1,660	0	18,728	46,264
646402	0	0	0	0	0	0	0	0	0	0
656300	0	0	0	14	932	0	284	1,909	0	0
656330	1,990	20,869	12,374	21,176	46,288	47,411	17,752	4,911	0	10,617
656401	95,979	55,158	63,038	40,566	21,579	9,405	28,434	70,065	68,968	107,557
656402	0	0	0	1,441	0	380	807	2,254	0	0
666230	0	0	0	0	0	0	1,721	0	0	0
666300	0	0	0	0	0	0	18,245	0	0	0
666330	5,839	7,030	1,332	1,296	12,359	142	5,041	511	0	1,514
666401	69,007	43,771	35,970	83,998	42,452	727	600	2,498	0	10,021
666402	0	0	30,070	12,873	23,344	16,025	1,050	2,959	0	6,228
666431	0	0	4,274	45	0	0	0	0	0	0
676300	0	0	0	0	0	0	0	0	0	0
676330	0	0	0	0	0	0	0	0	0	0
676400	0	0	0	0	0	0	0	180	0	0
676430	0	0	0	0	0	0	0	0	0	0
676501	0	0	0	0	0	1,008	0	0	0	0
686330	0	0	0	0	0	0	0	0	0	0
686431	0	0	0	0	0	0	340	0	0	0
686500	0	0	0	0	0	0	0	0	0	0
Total	312,524	288,199	259,602	267,207	340,746	400,804	451,748	312,875	395,135	397,587
(tons)	156	144	130	134	170	200	226	156	198	199

-continued-

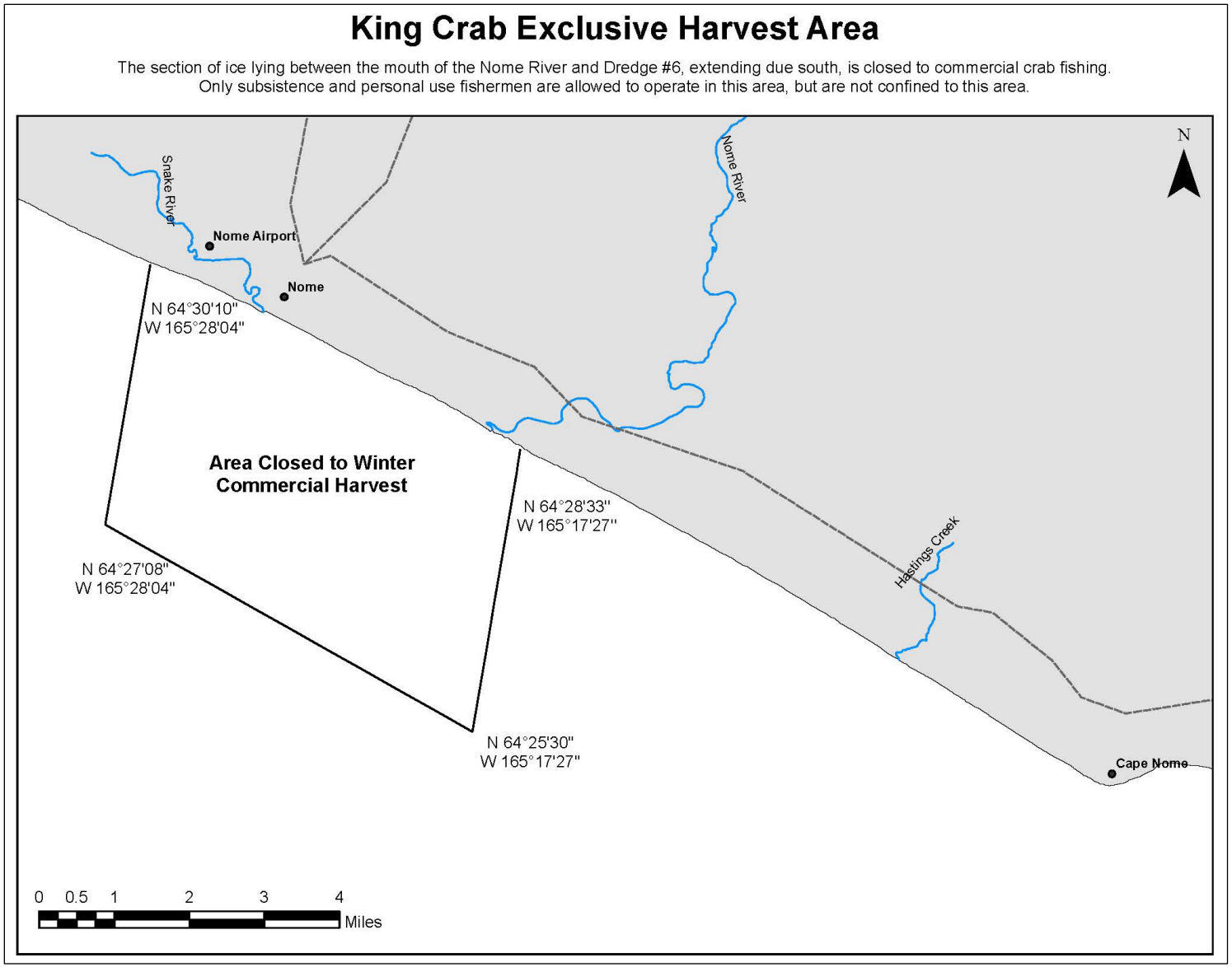
Statistical Area	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
616331	0	0	0	4,923	3,410	0	0	1,110	570	28,305
616401	0	0	7,729	4,692	1,929	0	2,368	ND	ND	23,570
626331	2,489	0	686	0	0	0	3,366	956	ND	44,728
626401	85,271	115,524	36,802	69,936	103,881	19,488	53,398	22,520	16,300	1,298,277
626402	0	0	0	0	0	0	0	ND	ND	1,352
636330	0	1,454	12,035	7,565	2,680	10,122	3,429	949	479	98,832
636401	146,973	148,183	34,027	78,572	137,285	154,502	185,444	174,811	40,576	2,859,673
636402	0	0	0	0	0	0	0	ND	ND	5,220
646301	0	0	0	0	0	0	0	ND	ND	18,516
646330	0	1,204	4,195	5,390	1,812	0	388	ND	592	43,010
646401	83,099	98,811	59,737	36,409	58,929	126,906	101,796	60,162	9,565	961,673
646402	0	0	5,271	0	0	0	0	ND	ND	212,483
656300	0	0	0	0	0	0	0	ND	ND	3,139
656330	1,546	8,168	8,515	0	4,828	307	2,317	ND	ND	277,037
656401	77,149	85,920	147,569	122,631	69,355	97,414	44,007	4,885	1,869	1,537,784
656402	0	0	37,743	0	0	0	0	ND	ND	389,993
666230	0	0	0	0	0	0	0	ND	ND	1,721
666300	0	0	0	0	0	0	0	ND	ND	43,764
666330	2,042	1,000	0	0	0	0	1,469	595	3,247	107,395
666401	0	15,726	33,469	38,099	9,308	6,030	12,412	9,963	341	594,176
666402	2,271	0	1,419	18,968	7,699	5,391	1,347	22,445	1,422	156,843
666431	0	0	2,669	1,825	0	0	0	ND	49	9,986
676300	0	0	0	0	0	0	0	ND	ND	546
676330	0	0	0	0	0	0	0	ND	ND	0
676400	0	0	0	0	0	0	0	ND	ND	13,167
676430	0	0	0	0	0	0	0	ND	ND	0
676501	0	0	0	0	0	0	0	ND	5	1,013
686330	0	0	0	0	0	0	0	ND	ND	0
686431	0	0	0	0	0	0	0	ND	5	345
686500	0	0	0	0	0	0	0	0	5	5
Total	400,840	475,990	391,863	389,008	401,115	420,160	411,739	298,396	75,023	8,732,552
(tons)	200	238	196	195	201	210	206	149	38	4,366

Note: No commercial fishery occurred in 1991.

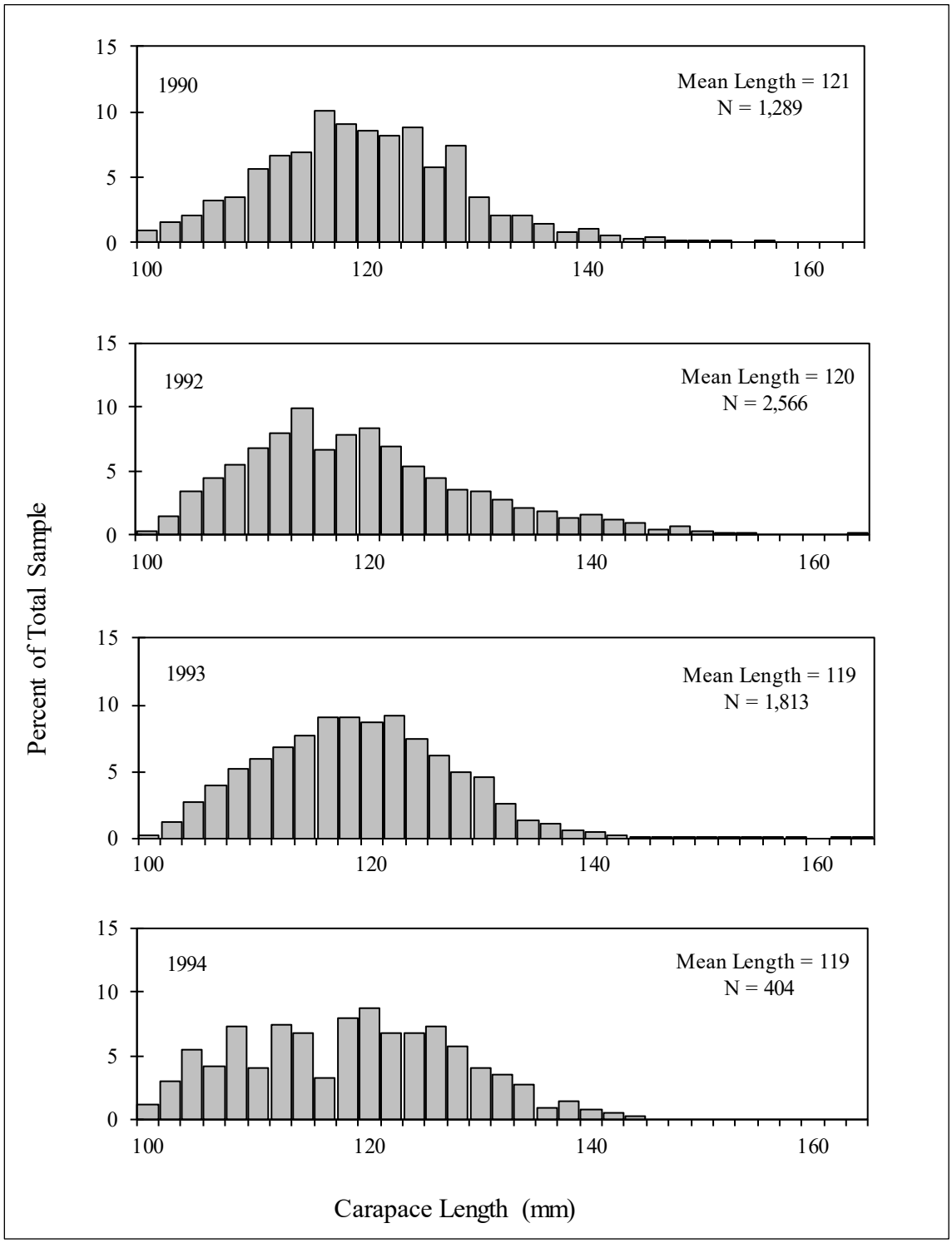
[a] Does not include approximately 2,490 lb not reported on fish tickets.



Appendix E14.–The percent of crab harvested during the Norton Sound summer commercial red king crab fishery east of long 164°W, 1990–2019.

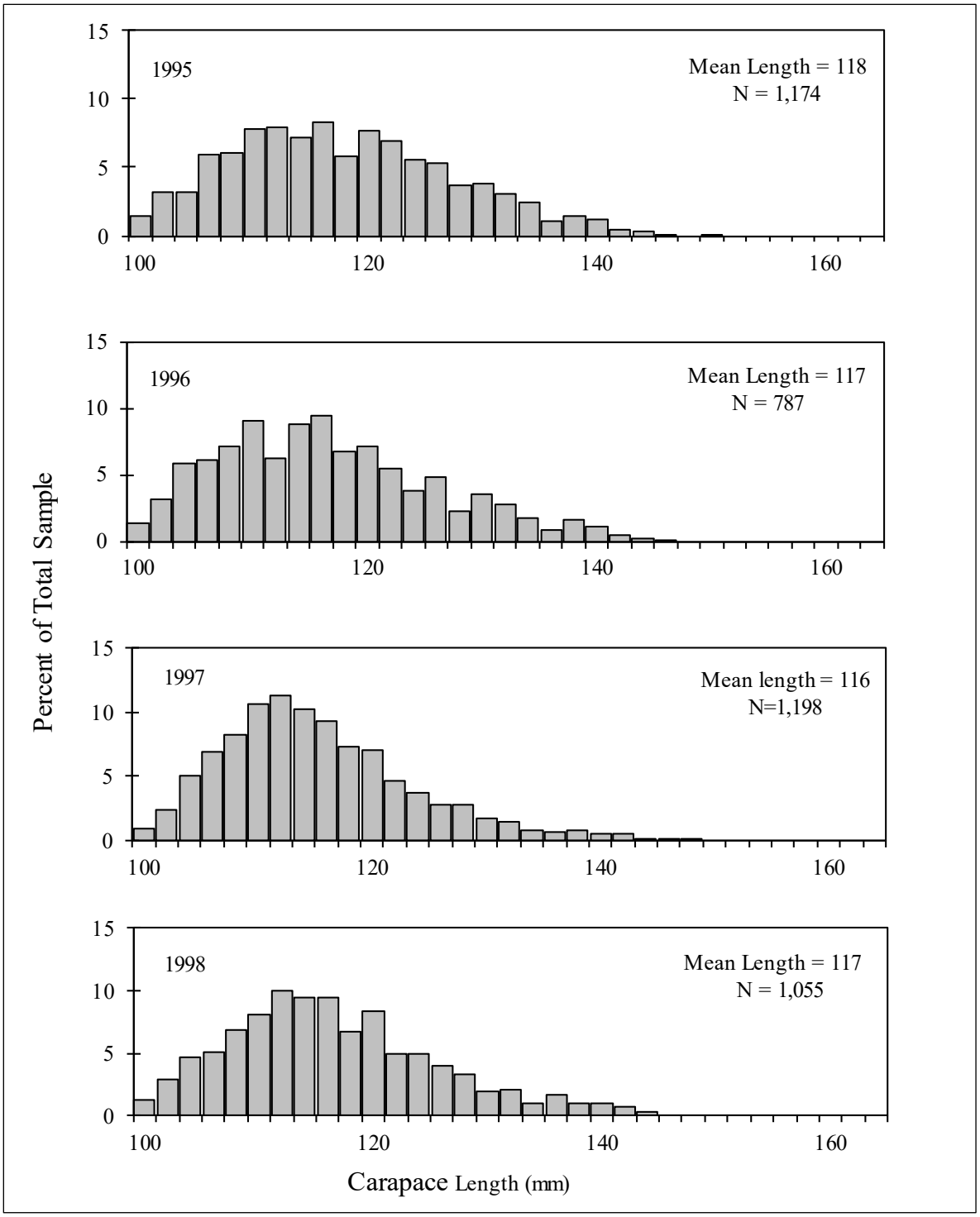


Appendix E15.–Closed waters area in effect for the Norton Sound winter commercial crab fishery.

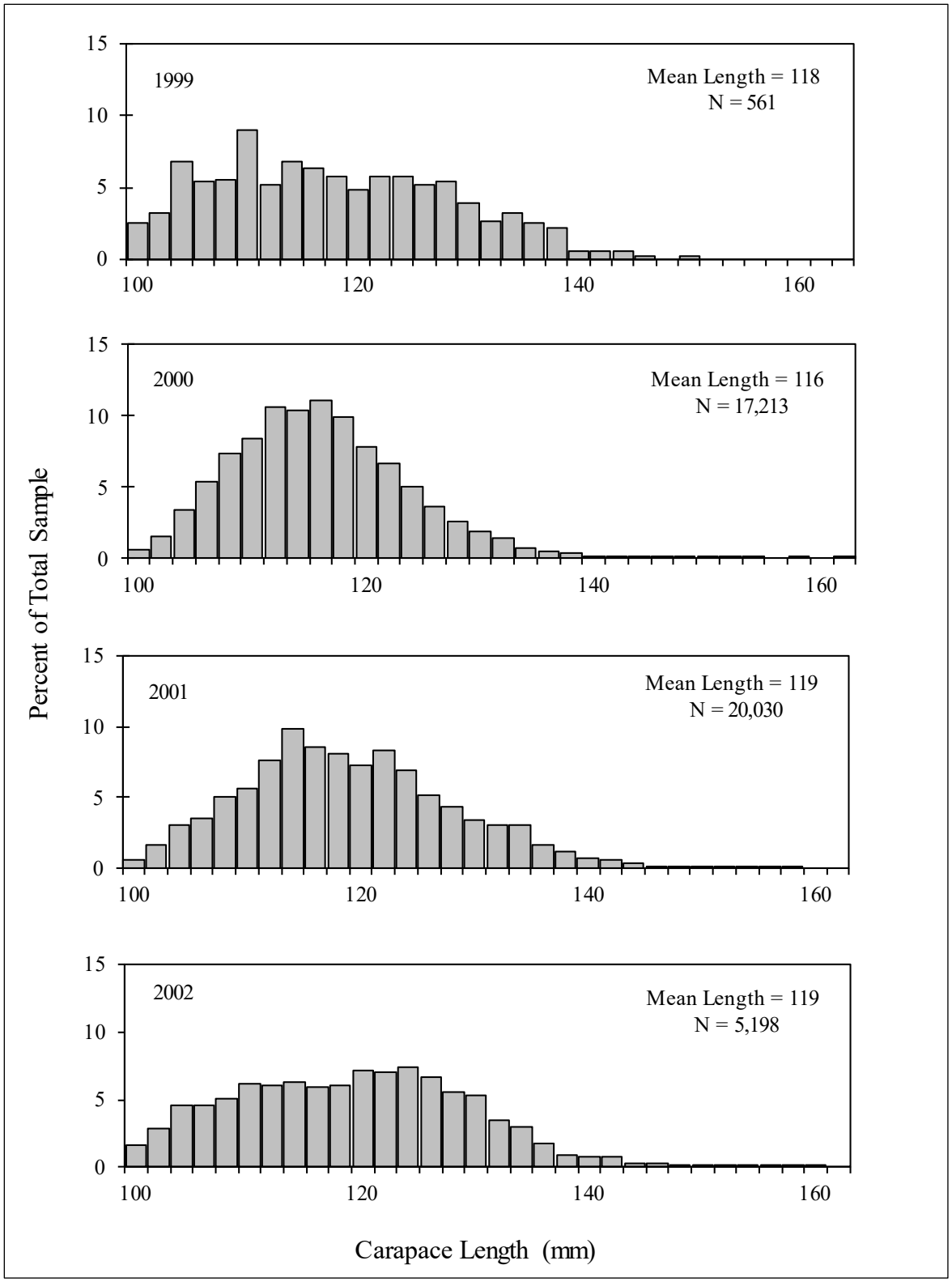


Appendix E16.–Length composition of Norton Sound red king crab summer commercial harvests, 1990–1994.

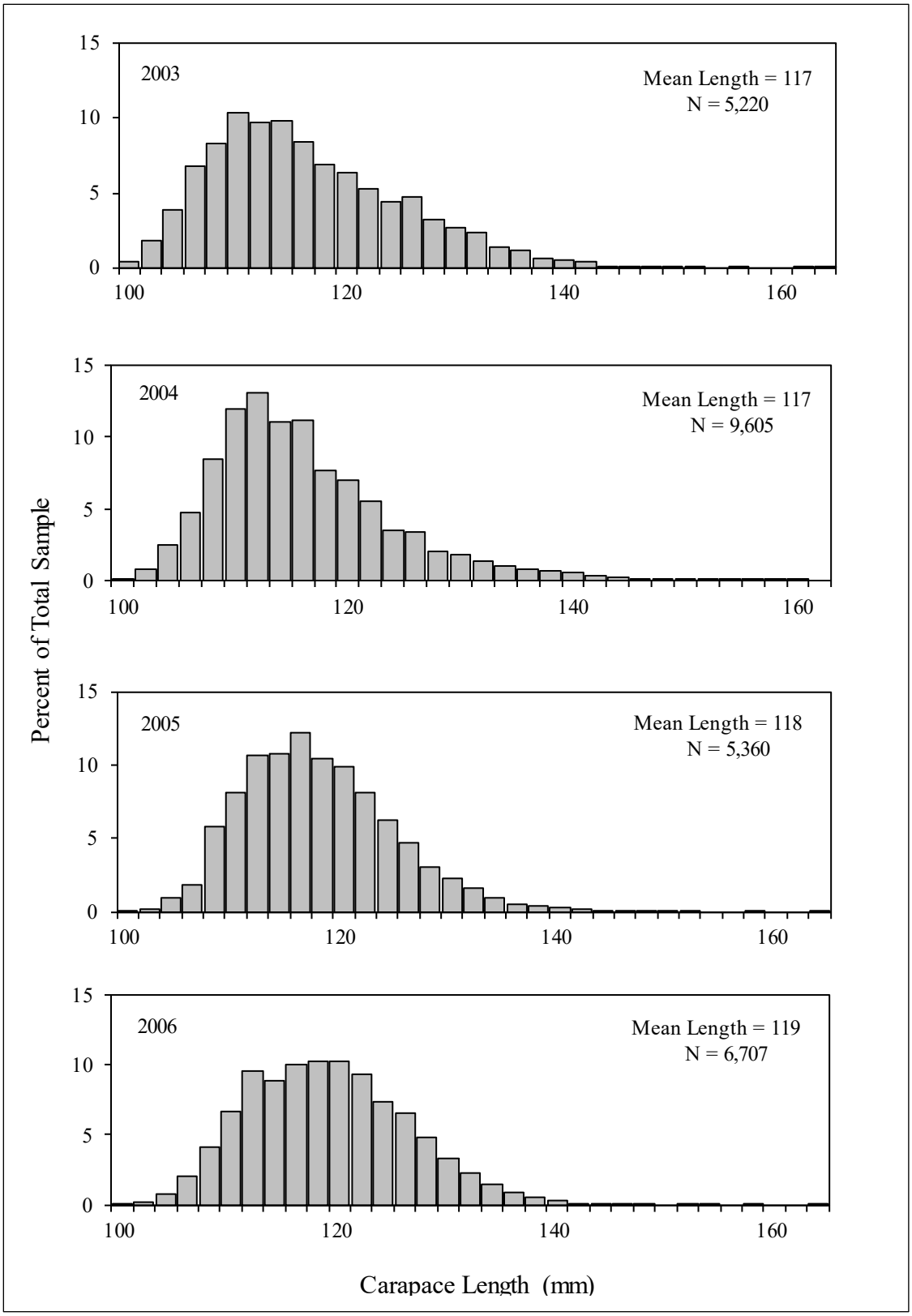
Note: No fishery in 1991.



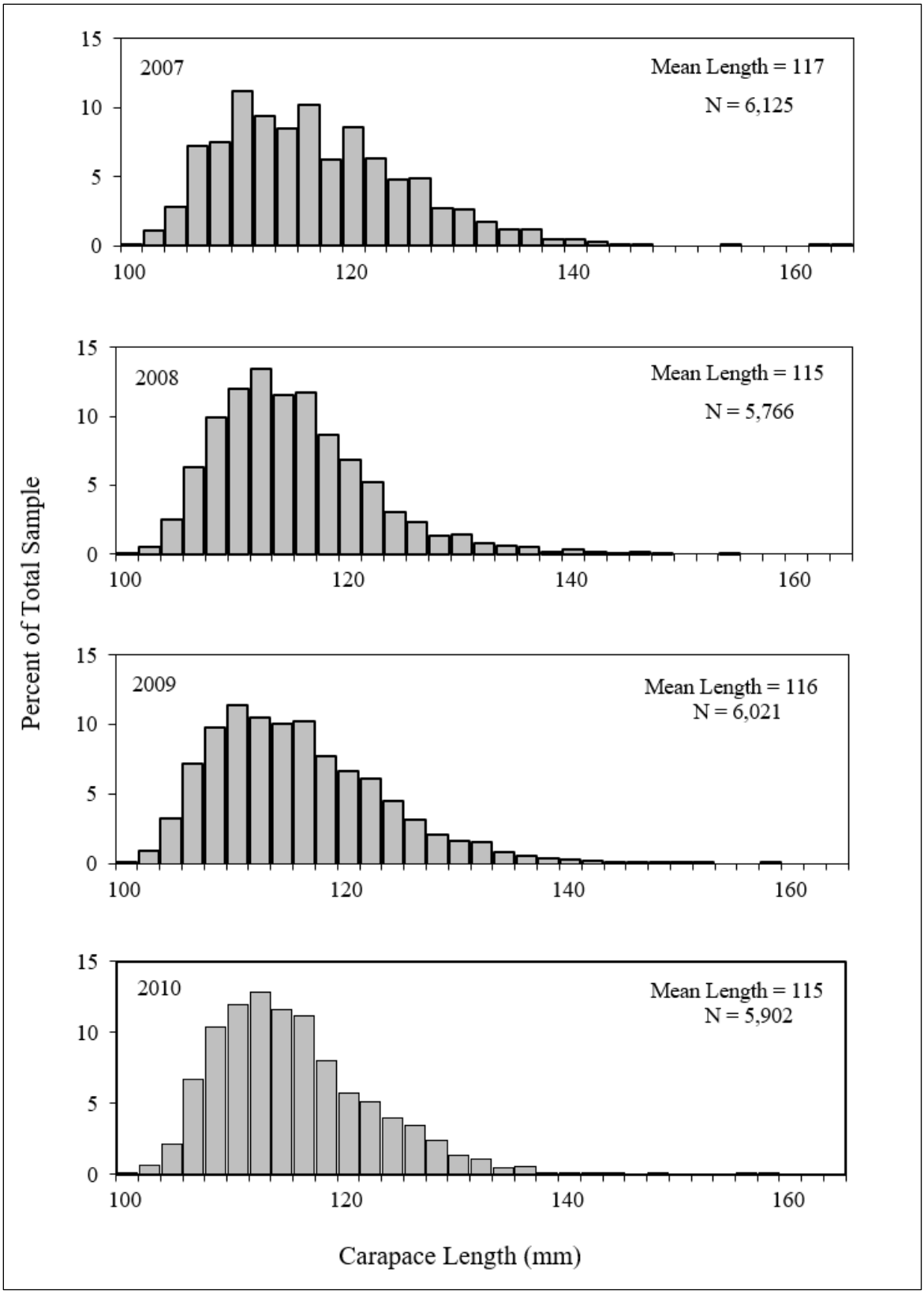
Appendix E17.–Length composition of Norton Sound red king crab summer commercial harvests, 1995–1998.



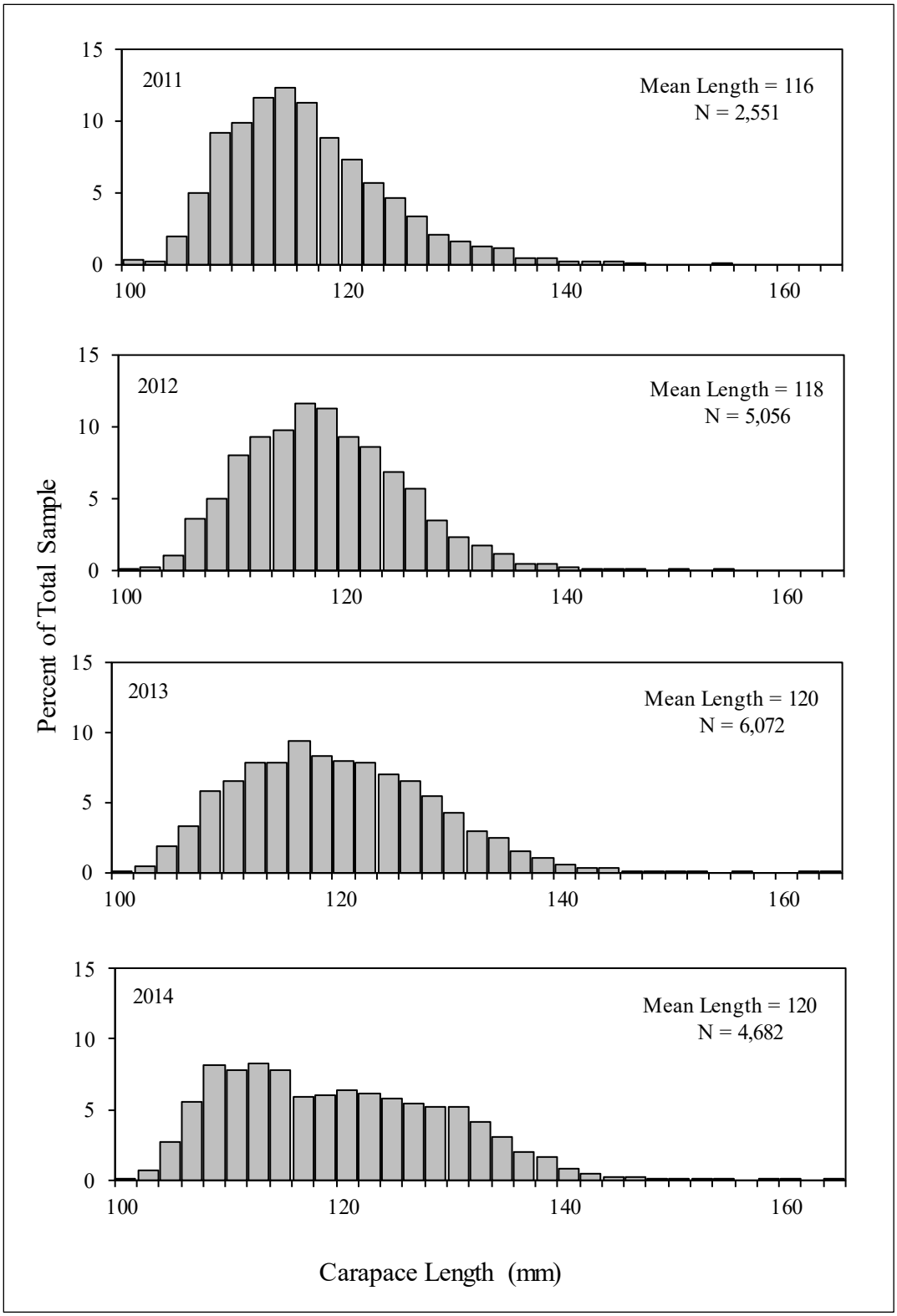
Appendix E18.–Length composition of Norton Sound red king crab summer commercial harvests, 1999–2002.



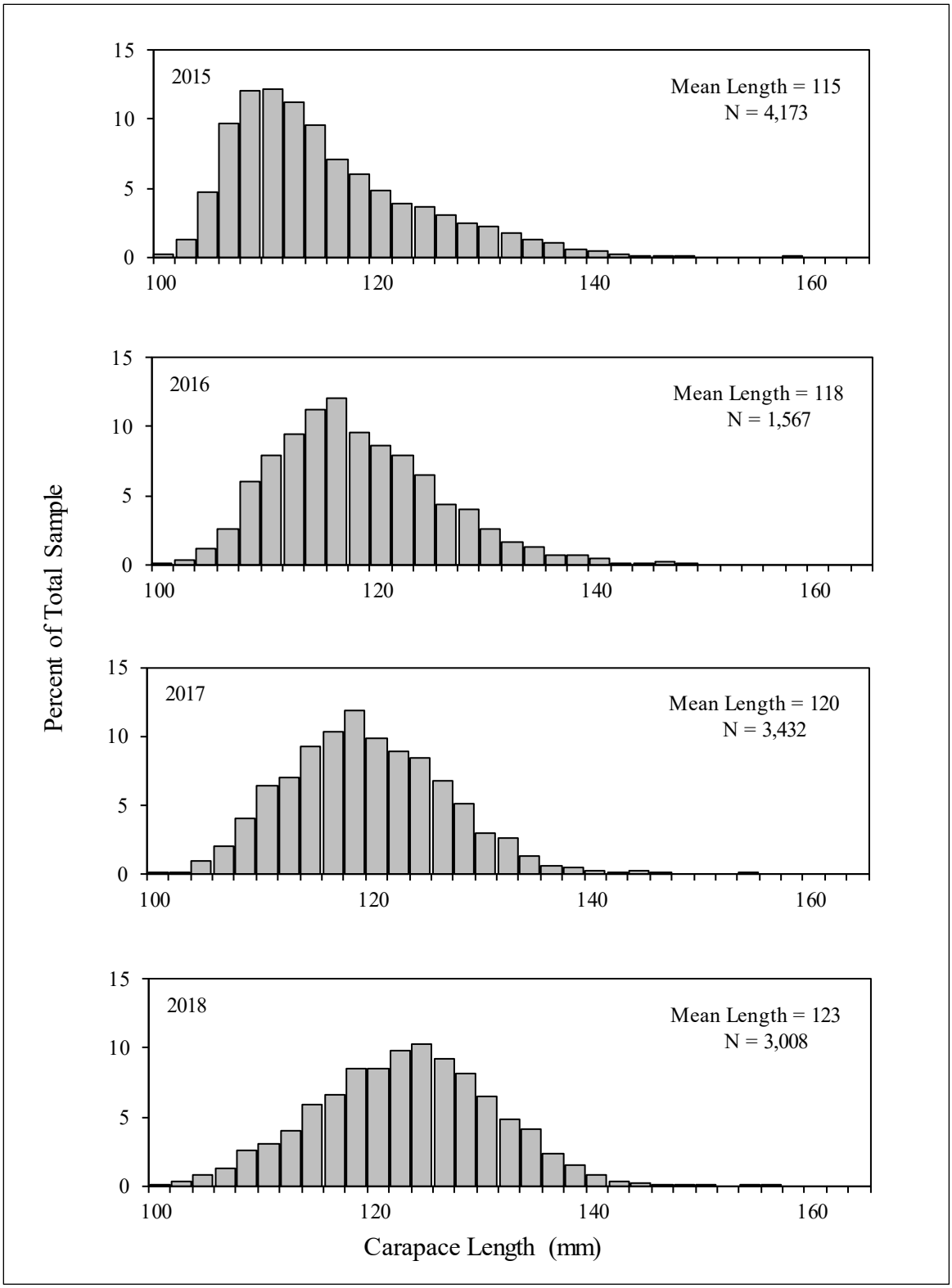
Appendix E19.–Length composition of Norton Sound red king crab summer commercial harvests, 2003–2006.



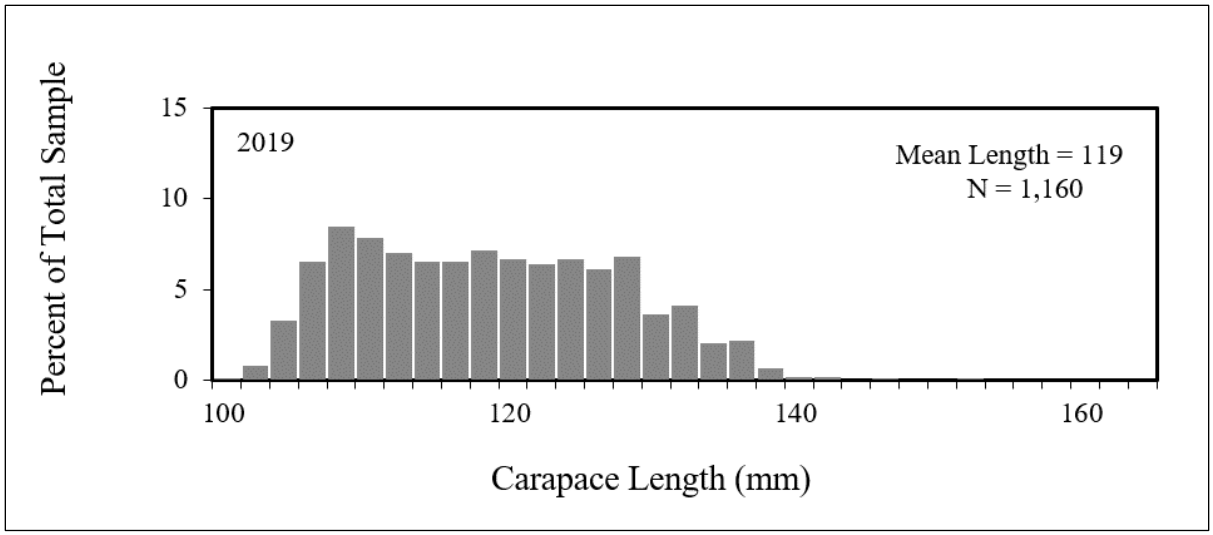
Appendix E20.–Length composition of Norton Sound red king crab summer commercial harvests, 2007–2010.



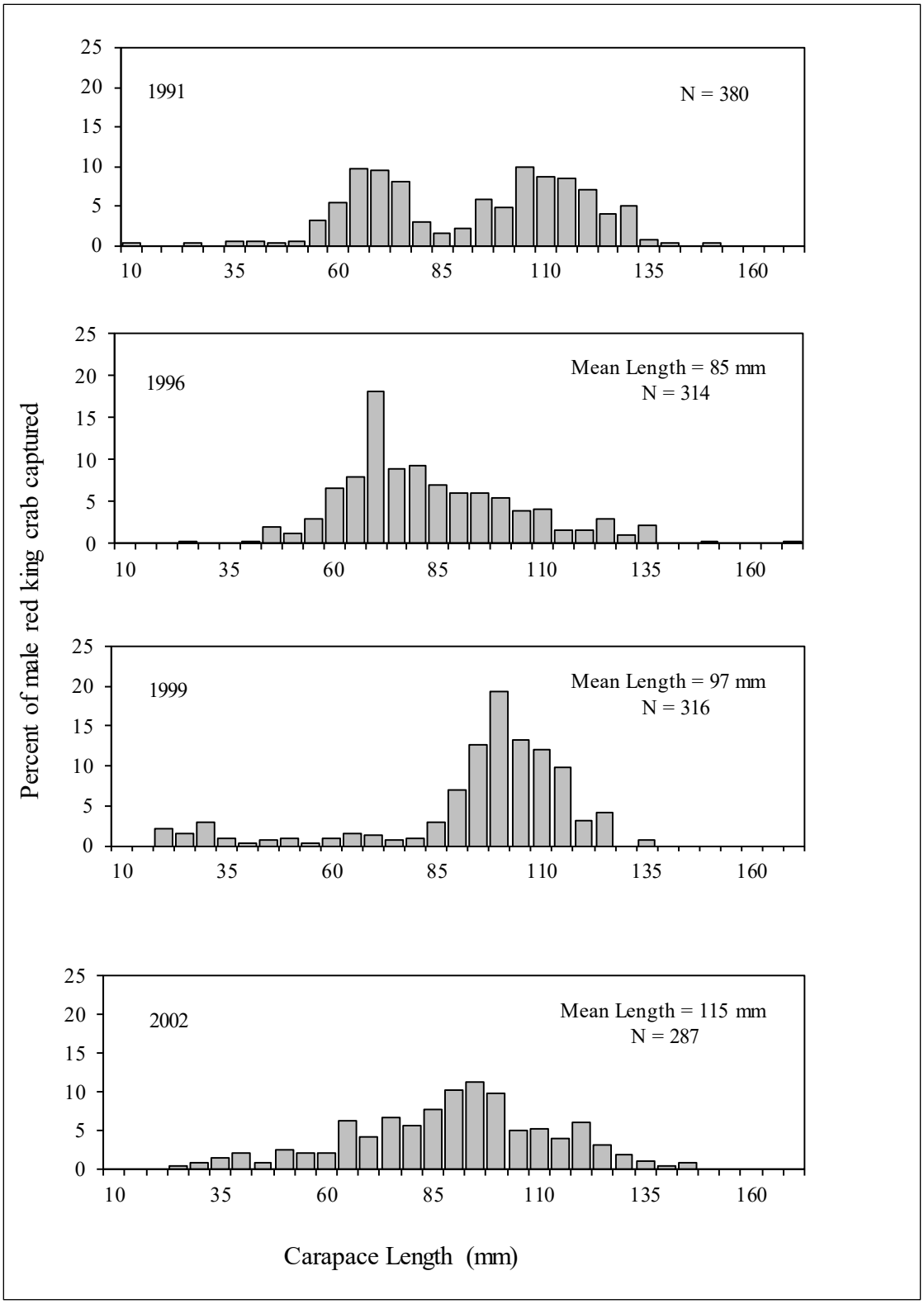
Appendix E21.–Length composition of Norton Sound red king crab summer commercial harvests, 2011–2014.



Appendix E22.–Length composition of Norton Sound red king crab summer commercial harvest, 2015–2018.

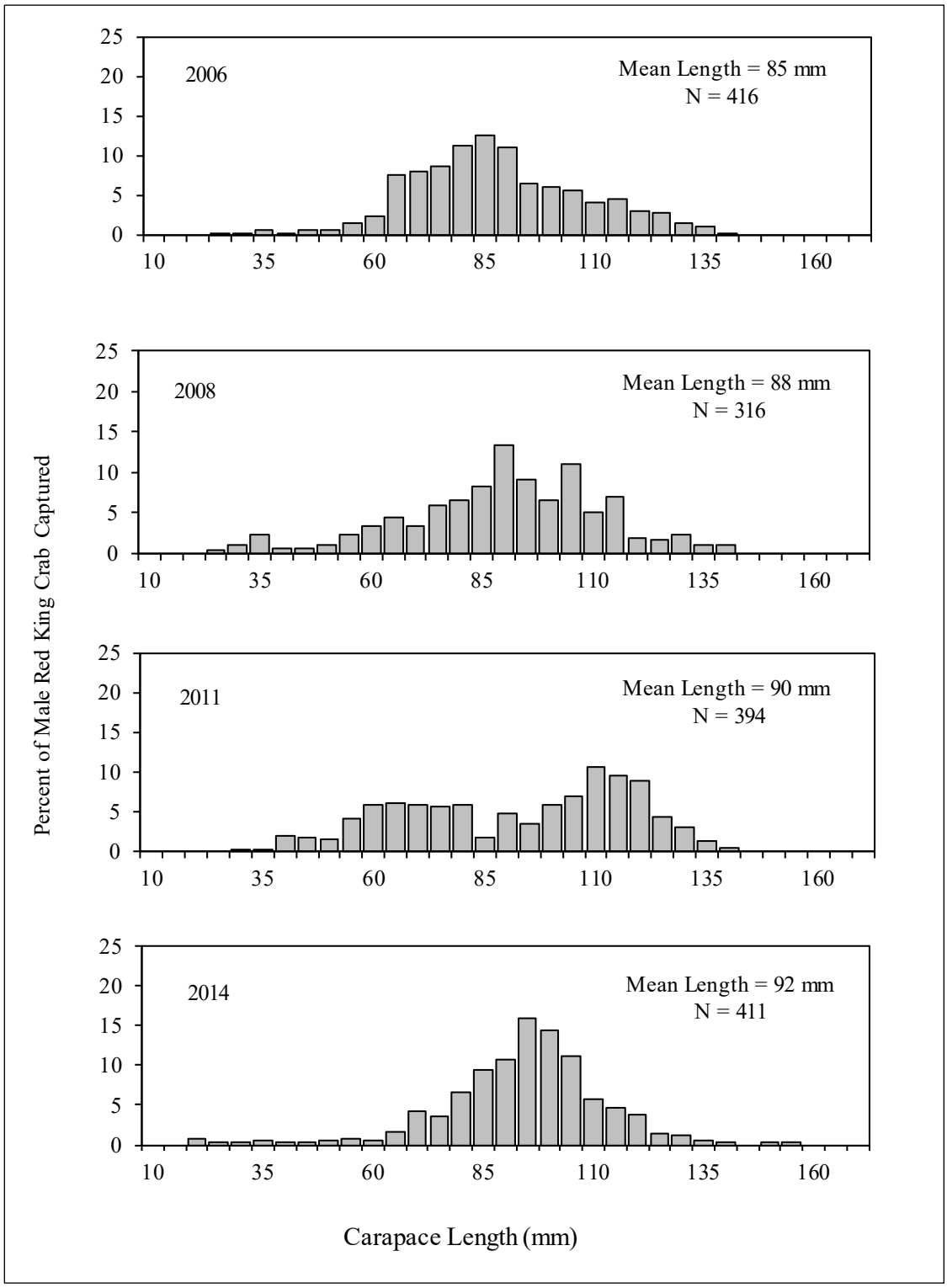


Appendix E23.–Length composition of Norton Sound red king crab summer commercial harvest, 2019.

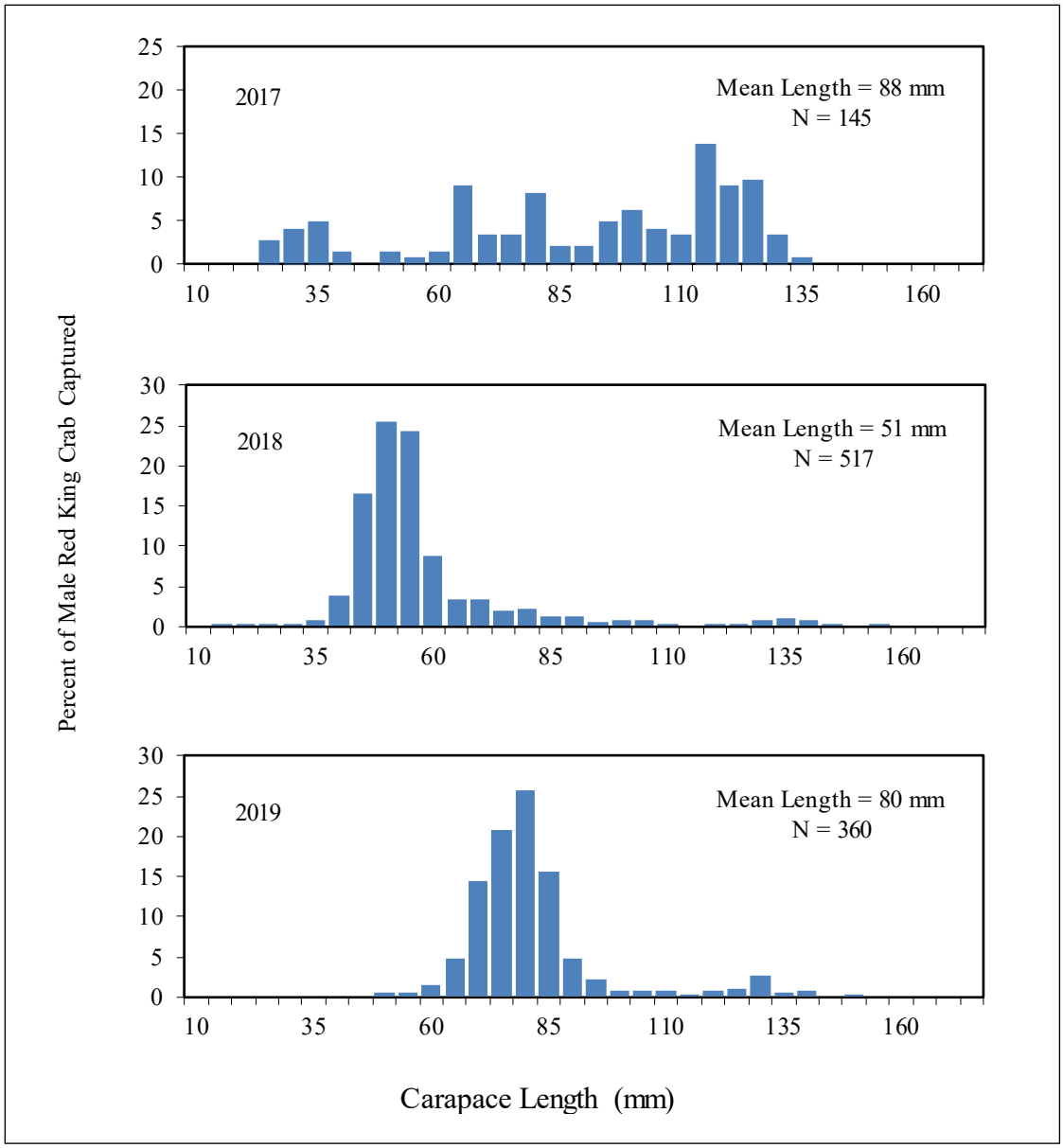


Appendix E24.–Norton Sound male red king crab size distribution from trawl assessment surveys conducted by the National Marine Fisheries Service in 1991, and by ADF&G in 1996, 1999, and 2002.

Note: Mean length information is not available for 1991.



Appendix E25.–Norton Sound male red king crab size distribution from trawl assessment surveys conducted by ADF&G in 2006, 2008, 2011, and 2014.



Appendix E26.–Norton Sound male red king crab size distribution from trawl assessment survey conducted by ADF&G in 2017, 2018, and 2019.

APPENDIX F: MISCELLANEOUS FISHERIES

Appendix F1.–Kotzebue District winter commercial sheefish harvest statistics, 1990–2019.

Year[b]	Number of fishery participants	Number of fish	Pounds[a]		Price per pound ($)	Estimated value ($)
			Total	Average		
1990	6	687	5,617	8.2	[c]	[c]
1991	5	852	8,224	9.7	0.50	4,112
1992	3	289	2,850	9.9	0.65	1,853
1993	1	210[d]	1,700	8.1	0.50	850
1994[e]	–	–	–	–	–	–
1995	1	226	2,240	9.9	0.50	1,120
1996	2	308	3,002	9.7	0.44	1,321
1997[e]	–	–	–	–	–	–
1998	1	254	2,400	9.4	0.43	1,032
1999–2000[e]	–	–	–	–	–	–
2001	1	19	200	10.5	1.00	200
2002	4	30	300	10.0	1.00	300
2003	1	122	1,250	10.2	0.56	700
2004	1	37	474	12.8	1.91	905
2005	3	242	3,744	15.5	1.20	4,493
2006–2010[e]	–	–	–	–	–	–
2011	1	Confidential Information			2.09	[f]
2012–2014[e]	–	–	–	–	–	–
2015	2	Confidential Information			1.02	[f]
2016	2	Confidential Information			1.25	[f]
2017	1	Confidential Information			1.00	[f]
2018	2	Confidential Information			0.94	[f]
2019[e]	–	–	–	–	–	–

[a] Data are not exact; in some instances, total catch poundage was determined from average weight and catch data. Similarly, various price-per-pound figures were determined from price-per-fish and average weight data.

[b] Season was from October 1 to September 30. Year indicated would be the year the commercial season ended. For example, the year 1980 would represent October 1, 1979, to September 30, 1980.

[c] Data unavailable or incomplete.

[d] Number of fish is not always reported. Estimates were based on average weight from reported sales that documented the number of fish.

[e] No reported commercial catches.

[f] Less than 3 participants; data confidential under Alaska Statute 16.05.815. Prior to 2005, confidentiality was waived by permit holders.

Appendix F2.–Kotzebue District reported subsistence harvests of sheefish, 1991–2014.

Year[a]	Number of households interviewed	Reported harvest	Average catch per household
1991	40	2,180	55
1992	43	2,821	66
1993	46	2,441	53
1994	171	3,181	19
1995[b]	314	9,465	30
1996[b]	389	6,953	18
1997[b]	338	9,805	29
1998[b]	435	5,350	12
1999[b]	191	8,256	43
2000[b]	237	7,446	31
2001[b]	363	3,838	11
2002	101	3,882	38
2003	488	7,823[c]	16
2004[d]	440	10,163	23
2012[d]	360	11,694	32
2013[d,e]	618	22,116	36
2014[f]	866	31,909	37

Note: Subsistence surveys were not conducted 2005–2011 and after 2014.

[a] Due to limited survey effort during many years, total catch and effort should be regarded as minimum numbers only and are not comparable year to year.

[b] Subsistence sheefish harvests are from villages on Kobuk River.

[c] Includes 10 fish reported from commercial salmon fishery and used for subsistence.

[d] Subsistence surveys were not conducted in the town of Kotzebue.

[e] Villages surveyed were Ambler, Buckland, Kiana, Kobuk, Noatak, Noorvik, Shungnak, and Selawik.

[f] Villages surveyed were Ambler, Buckland, Kiana, Kobuk, Noatak, Noorvik, Shishmaref, Shungnak, Selawik, and Kotzebue.

Appendix F3.–Nonsalmon sport fish harvests in Norton Sound and Kotzebue/Chukchi Sea, 1990–2019.

	Norton Sound		Kotzebue / Chukchi Sea		
Year	Dolly Varden	Arctic Grayling	Dolly Varden	Arctic Grayling	Inconnu/ sheefish
1990	3,765	1,378	806	622	151
1991	10,365	5,121	1,149	1,981	603
1992	2,382	492	582	968	1,904
1993	5,907	1,584	914	916	1,029
1994	3,071	1,331	2,365	814	564
1995	2,908	1,037	939	910	1,142
1996	4,285	1,485	913	2,136	485
1997	4,467	1,262	598	1,903	906
1998	2,240	298	440	1,788	414
1999	6,708	1,600	796	1,247	635
2000	7,952	1,203	1,599	1,233	1,201
2001	3,174	994	1,693	1,244	1,305
2002	2,252	1,565	1,884	1,994	500
2003	5,531	1,778	533	1,473	2,509
2004	4,318	824	1,285	1,983	1,634
2005	2,617	595	239	269	393
2006	3,180	419	2,328	760	810
2007	2,808	314	2,924	836	1,066
2008	3,319	965	852	293	61
2009	3,373	1,185	1,644	439	957
2010	1,835	232	493	366	595
2011	4,041	1,398	865	486	385
2012	252	520	781	626	104
2013	1,184	500	1,074	563	218
2014	154	0	216	237	244
2015	412	154	221	664	1,191
2016	2,016	1,215	1,081	496	667
2017	1,314	366	245	24	46
2018	420	143	629	731	298
2019	Information is not yet available.				
Avg 2014–2018	863	376	478	430	489
Avg 2009–2018	1,500	571	725	463	471

Appendix F4.–Kotzebue District incidentally caught and sold Dolly Varden during the commercial salmon fishery, 1990–2019.

Year	Number of fish sold	Estimated total catch[a]	Pounds sold	Average weight[b]	Average price
1990	604	[c]	4,219	7.0	0.25
1991	6,136	[c]	40,747	6.6	0.18
1992	1,977	[c]	11,951	6.0	0.10
1993	76	[c]	540	7.1	0.10
1994	149	[c]	767	5.1	0.17
1995	2,090	[c]	13,195	6.3	0.20
1996	188	[c]	1,153	6.1	0.25
1997	3,320	[c]	23,203	7.0	0.20
1998	349	[c]	2,640	7.6	0.20
1999	1,502	[c]	11,352	7.6	0.20
2000	7	[c]	44	6.3	0.20
2001	0	[c]	0	[d]	0.00
2002	0	30	0	[d]	0.00
2003	20	176	160	8.0	0.50
2004	124	[c]	846	6.8	0.26
2005	181	[c]	1,158	6.4	0.30
2006	0	278	0	[d]	0.00
2007	0	960	0	[d]	0.00
2008	0	1,629	0	[d]	0.00
2009	0	960	0	[d]	0.00
2010	0	1,323	0	[d]	0.00
2011	0	400	0	[d]	0.00
2012	0	300	0	[d]	0.00
2013	0	302	0	[d]	0.00
2014	0	620	0	[d]	0.00
2015	0	62	0	[d]	0.00
2016	0	710	0	[d]	0.00
2017	0	523	0	[d]	0.00
2018	0	688	0	[d]	1.00
2019	0	927	0	[d]	0.00

[a] Estimate includes fish caught but not sold based on commercial fishery participant interviews or fish tickets.

[b] Some data extrapolated from average reported weight.

[c] No estimates were made of Dolly Varden caught but not sold.

[d] Dolly Varden caught but not sold were not weighed.

Appendix F5.–Subsistence harvests of Dolly Varden from the villages of Kivalina and Noatak, 1991–2014.

	Kivalina		Noatak[b,c]
Year[a]	Number	Pounds	Number
1991	–	–	4,814
1992	–	–	4,395
1993	–	–	4,275
1995	–	–	5,762
1996	–	–	5,031
1997	–	–	4,763
1998	–	–	3,872
2000	–	–	3,315
2001	–	–	2,702
2002	–	–	3,242
2003	–	–	6,386
2004	–	–	11,697
2007	20,527	67,739	10,234
2012	–	–	6,437
2013	–	–	6,223
2014	–	–	9,289

Note: Dashes mean no data.

[a] Subsistence surveys were not conducted in 1994, 1999, 2005–2006, 2008–2011, and after 2014.

[b] No data are available on poundage.

[c] Based on ADF&G, Division of Subsistence, household surveys in Noatak.

Appendix F6.–Dolly Varden sport fish harvests in Norton Sound, by river, 1990–2019.

	Location									
Year	Marine water	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other streams	Total
1990	183	1,078	166	614	348	ND	ND	ND	1,227	3,616
1991	0	1,220	856	1,474	1,474	729	1,252	2,219	1,141	10,365
1992	204	557	131	746	270	139	115	131	89	2,382
1993	205	917	448	427	1,003	536	331	893	1,147	5,907
1994	90	431	63	410	699	305	117	197	759	3,071
1995	0	462	74	976	346	158	131	366	395	2,908
1996	12	873	388	1,506	402	485	97	49	473	4,285
1997	189	328	65	936	2,071	346	81	186	265	4,467
1998	0	302	14	588	160	311	0	383	482	2,240
1999	330	791	45	2,384	1,952	88	44	154	920	6,708
2000	1,069	340	0	4,462	1,687	59	199	0	136	7,952
2001	166	43	270	1,002	1,197	86	108	162	140	3,174
2002	67	511	72	789	259	47	18	18	471	2,252
2003	0	1,223	482	134	110	712	13	0	2,857	5,531
2004	72	226	0	3,593	120	42	0	53	212	4,318
2005	95	553	12	500	1,148	141	27	0	141	2,617
2006	0	959	0	1,307	0	531	51	153	179	3,180
2007	14	625	0	731	193	144	461	481	159	2,808
2008	0	46	0	1,062	1,061	107	46	0	997	3,319
2009	0	253	0	2,794	108	50	50	0	118	3,373
2010	0	165	0	1,411	12	117	0	24	106	1,835
2011	0	0	11	2,219	1,631	0	10	0	170	4,041
2012	0	111	0	88	0	9	33	0	11	252
2013	0	17	0	483	0	0	0	0	684	1,184
2014	0	0	0	40	0	20	0	15	79	154
2015	0	97	0	120	0	195	0	0	0	412
2016	0	24	0	1,611	197	45	24	0	115	2,016
2017	0	573	0	485	0	0	0	0	0	1,058
2018	32	72	0	264	0	16	0	0	36	420
2019	No data available.									
Avg 2014–2018	6	153	0	504	39	55	5	3	46	812
Avg 2009–2018	3	131	1	952	195	45	12	4	132	1,475

Note: Data are not available for all years.

Appendix F7.–Aerial survey counts of overwintering and spawning Dolly Varden in the Kotzebue District, 1990–2019.

Year[a]	Noatak River spawner surve[b]	Overwintering	
		Wulik River[c]	Kivalina River[c]
1990	7,261	[d]	[d]
1991	9,605	126,985	35,275
1992	[d]	135,135	[e]
1993	9,560	144,138	16,534
1994	[d]	66,752	[d]
1995	6,500	128,705	28,870
1996	12,184	61,005	[d]
1997	[d]	95,412	[d]
1998	[d]	104,043	[d]
1999	9,059[f]	70,704	[d]
2000	[d]	[d]	[d]
2001	[d]	92,614	[d]
2002	[d]	44,257	[d]
2003	[d]	1,500[g]	[d]
2004	[d]	101,806	[d]
2005	[d]	120,848	[d]
2006	[d]	108,352	[d]
2007	[d]	99,311	[d]
2008	[d]	71,493	[d]
2009	[d]	63,977	[d]
2010	[d]	36,866	[d]
2011	[d]	64,499	[d]
2012	[d]	21,084	[d]
2013	[d]	23,312[h]	[d]
2014	[d]	64,351	[d]
2015	[d]	72,895	[d]
2016	[d]	70,969	[d]
2017	[d]	62,557	[d]
2018	[d]	97,385	[d]
2019	[d]	17,308	[d]

[a] Counts are considered minimal because data listed include both poor and good surveys.

[b] Includes spawner counts on the Kelly, Kugurorok, and Nimiuktuk Rivers, and tributaries of the Noatak River.

[c] Surveys conducted by the Division of Sport Fish.

[d] Not surveyed.

[e] Poor weather hampered or prevented survey.

[f] Poor conditions on the Nimiuktuk did not allow a count.

[g] Spawning survey conducted very early (August 20, 2003).

[h] Counting conditions were poor due to presence of river ice.

Appendix F8.–Subsistence whitefish catch and effort in the Kotzebue District, 1991–2014.

Year[a]	Number of households interviewed	Number of whitefish harvested	Average catch per household
1991[b]	63	16,015	254
1992[b]	66	17,485	265
1993[b]	70	19,060	272
1997	413[c]	84,851	205
1998	435[c]	39,754	91
1999	191[c]	56,326	295
2000	237[c]	70,097	296
2001	363[c]	30,976	85
2002	101[d]	25,607	254
2003	446	73,242	164
2004	440[c]	50,501	115
2012	360[c]	38,113	106
2013	618[e]	100,948	163
2014	866[f]	82,903	96

Note: Subsistence surveys were not conducted 1994–1996, 2005–2011, and after 2014.

[a] Whitefish harvest information was collected during chum salmon subsistence surveys and is considered a fraction of the annual catch. Whitefish numbers include all species of whitefish, except sheefish.

[b] Subsistence interviews from Noatak, Noorvik, and Shungnak villages only.

[c] Subsistence harvest information is from Ambler, Kiana, Kobuk, Noatak, Noorvik, and Shungnak.

[d] Subsistence harvest information is from Noatak and Noorvik only.

[e] Subsistence harvest information is from Ambler, Buckland, Kiana, Kobuk, Noatak, Noorvik, Selawik, and Shungnak.

[f] Subsistence harvest information is from Ambler, Buckland, Kiana, Kobuk, Noatak, Noorvik, Selawik, Shishmaref, Shungnak, and Kotzebue.

Appendix F9.–Norton Sound District winter commercial whitefish harvest statistics, 2006–2019.

Year[a]	Number of fishery participants	Number of whitefish	Total pounds	Price per pound ($)	Estimated value ($)
2006–2007	1	3,209	3,723	0.44	2,635
2007–2008[b]	–	–	–	–	–
2008–2009[b]	–	–	–	–	–
2009–2010[b]	–	–	–	–	–
2010–2011	1	1,733	2,009	0.50	1,005
2011–2012	1	1,853	2,148	0.40	859
2012–2013	2	68	105	0.50	53
2013–2014[c]	1	3,947	4,726	0.50	2,288
2014–2015[b]	–	–	–	–	–
2015–2016	3	1,971	2,076	0.50	1,038
2016–2017	1	1,999	1,999	0.50	1,000
2017–2019[b]	–	–	–	–	–

Note: Confidentiality was waived by fishery participants. Dashes mean no data.

[a] Season was from September 15 to June 15.

[b] No reported sales.

[c] Total pounds include personal use.

Appendix F10.–Norton Sound District winter commercial saffron cod harvest statistics, 1993–2019.

Year[a]	Number of fishery participants	Total pounds	Price per pound ($)	Estimated value ($)
1993–1994	[b]	1,402	[b]	[b]
1994–1995	[b]	52	0.50	26
2009–2010[c]	1	1,748	0.30	524
2010–2011	5	8,031	0.50	4,016
2011–2012	9	3,780	0.47	1,772
2012–2013	25	33,939	0.50	16,970
2013–2014	27	19,050	0.50	9,525
2014–2015	16	12,973	0.50	6,487
2015–2016	6	3,921	0.50	1,961
2016–2017	16	9,792	0.50	4,896
2017–2019[d]	–	–	–	–
Average 2014–2018	16	11,434	0.50	5,717

Note: Information is not available for 1996–2008. Dashes mean no data.

[a] Season was from September 15 to June 15.

[b] Information is not available.

[c] Confidentiality was waived by the fishery participants.

[d] No reported sales.

Appendix F11.–Norton Sound District capelin sightings, 2013–2019.

Year	Dates
2013	7/19
2014	mid-June
2015	early and late June
2016	6/19
2017	7/2
2018	6/15-6/21
2019[a]	first 3 weeks of June, 7/4, and 7/10

Note: Capelin sightings were not tracked or recorded by ADF&G prior to 2013.

[a] The June sightings were along the coastline from a plane.

APPENDIX G: OVERVIEW OF 2019

Appendix G1.–List of common and scientific names of finfish species of the Norton Sound, Port Clarence, Kotzebue, and Arctic Districts.

Common name	Scientific name
Arctic lamprey	*Lampetra camtschatica*
Arctic char	*Salvelinus alpinus*
Arctic cod	*Boreogadus saida*
Arctic flounder	*Liopsetta glacialis*
Arctic grayling	*Thymallus arcticus*
Alaska plaice	*Pleuronectes quadrituberculatus*
Burbot	*Lota*
Bering cisco	*Coregonus laurettae*
Bering poacher	*Ocella dodecaedria*
Bering wolfish	*Anarjicas orientalis*
Blackfish	*Dallia pectoralis*
Boreal smelt (rainbow toothed)	*Osmerus mordax*
Broad whitefish	*Coregonus nasus*
Capelin	*Mallotus villosus*
Dolly Varden	*Salvinus malma*
Pond smelt	*Hypomesus olidus*
Humpback whitefish	*Coregonus pidschian*
Inconnu (sheefish)	*Stenodus leucichthys*
Lake trout	*Salvelinus namaycush*
Least cisco	*Coregonus sardinella*
Longhead dab	*Liranda probiscidea*
Ringtail snailfish	*Liparis rutteri*
Northern Pike	*Esox lucius*
Longnose sucker	*Casostomus catostomus*
Pricklebacks	*Stichaeidae*
Pacific herring	*Clupea harengus pallasii*
Rock flounder	*Lepidosetta bilineata*
Rock greenling (terpug)	*Hexagrammus lagocephalus*
Round whitefish	*Prosopium cylindraceum*
Sculpins	*Cottodae*
Pink salmon	*Oncorhynchus gorbuscha*
Chum salmon	*Oncorhynchus keta*
Coho salmon	*Oncorhynchus kisutch*
Sockeye salmon	*Oncorhynchus nerka*
Chinook salmon	*Oncorhynchus tshawytscha*
Saffron cod	*Eleginus gracilis*
Starry flounder	*Platichthys stellatus*
Sandlance	*Amrodytes hexapterus*
Sturgeon poacher	*Angonus acipenserinus*
Threespine stickleback	*Gasterocteus aculeatus*
Ninespine stickleback	*Pungitius*
Tubenose poacher	*Pallasina barbata aix*
Whitespotted greenling	*Hexagrammus stelleri*
Yellowfin sole	*Limanda aspera*

Appendix G2.–Alaska Department of Fish and Game and associated cooperative studies conducted within the Norton Sound, Port Clarence, Kotzebue, and Arctic Districts, 2019.

SALMON

Bonanza River Weir
- a) Location: Bonanza River, approximately 6 miles upstream from the Bonanza channel bridge, and just below Jackson Creek.
- b) Description: Determine daily and seasonal timing and magnitude of chum, pink, and coho salmon escapements. Collect age, sex, and length data from chum salmon from weir trap. Cooperative project operated by ADF&G with assistance from NSEDC.

Eldorado River Weir
- a) Location: Eldorado River, approximately 15 miles upstream from the Safety Sound highway bridge, and approximately 3 miles above the furthest upstream connecting channel to the Flambeau River.
- b) Description: Determine daily and seasonal timing and magnitude of chum and pink salmon escapements. Collect age, sex, and length data from chum salmon from weir trap. Cooperative project operated by NSEDC with assistance from ADF&G.

Fish River Tower
- a) Location: Fish River, approximately 9 miles upstream of White Mountain.
- b) Description: Determine daily and seasonal timing and magnitude of salmon escapement. NSEDC project with assistance from ADF&G.

Inglutalik River Tower
- a) Location: Inglutalik River, approximately 18 miles upstream from the mouth at Norton Bay.
- b) Description: Determine daily and seasonal timing and magnitude of Chinook, chum, pink, and coho salmon escapements. Collect age, sex, and length data from Chinook, chum, and coho salmon from beach seine. Cooperative project operated by NSEDC with assistance from ADF&G.

Kwiniuk River Tower
- a) Location: Kwiniuk River, approximately 5 miles upstream from mouth.
- b) Description: Determine daily and seasonal timing and magnitude of salmon escapements. Determine age, sex, and length of Chinook and chum salmon in the Kwiniuk River escapement from beach seining. ADF&G project with additional funding from NSEDC.

Nome River Weir
- a) Location: Nome River, approximately 1 mile upstream of the VOR site.
- b) Description: Determine daily and seasonal timing and magnitude of salmon escapement. Compare aerial survey totals with weir counts to improve survey accuracy. Collect age and sex data through escapement sampling of weir trap. ADF&G project with additional funding from NSEDC.

North River Tower
- a) Location: North River, approximately 2 miles below bridge.
- b) Description: Determine daily and seasonal timing and magnitude of salmon escapements. Cooperative project operated by NSEDC with assistance from ADF&G.

Pilgrim River Weir
- a) Location: Pilgrim River, approximately 6 miles downstream of Pilgrim River bridge at mile 65 of the Kougarok Road / Nome–Taylor Highway.
- b) Description: Determine daily and seasonal timing and magnitude of the salmon escapements. Collect age, sex, and length data from weir trap. Cooperative project operated by NSEDC with assistance from ADF&G.

Shaktoolik River Sonar/Tower
- a) Location: Shaktoolik River, approximately 2 miles upstream from the village of Shaktoolik.
- b) Description: Determine daily and seasonal timing and magnitude of salmon escapements. Cooperative project operated by NSEDC with assistance from ADF&G.

-continued-

SALMON (continued)

Snake River Weir

a) Location: Snake River, approximately 5 miles upstream of boat harbor, where river turns north.

b) Description: Determine daily and seasonal timing and magnitude of salmon escapements. Sample for age, sex, and length. Cooperative project operated by ADF&G and NSEDC.

Solomon River Weir

a) Location: Solomon River, at approximately mile 35.5 on the Nome–Council road.

b) Description: Determine daily and seasonal timing and magnitude of salmon escapements. ADF&G project.

Unalakleet River Weir

a) Location: Unalakleet River, approximately 15 miles upstream from village of Unalakleet.

b) Description: Determine daily and seasonal timing and magnitude of Chinook, chum, and pink escapements. Collect age, sex, and length data from Chinook and chum salmon from weir trap. Cooperative ADF&G, BLM, NSEDC, and Unalakleet IRA project.

Ungalik River Tower

a) Location: Ungalik River, approximately 2 miles upstream from the mouth (Norton Bay) and 30 miles southeast of Koyuk.

b) Description: Determine daily and seasonal timing and magnitude of salmon escapements. Cooperative project operated by NSEDC with assistance from ADF&G.

Kobuk River Test Fish

a) Location: Lower Kobuk River, approximately 2 miles downriver of Kiana.

b) Description: Evaluate chum salmon abundance migrating into the Kobuk River drainage using systematic drift gillnet catches. To qualitatively assess the impact of the Kotzebue District commercial salmon fishery on chum abundance into the Kobuk River drainage for fisheries management purposes. Describe migratory timing in the lower Kobuk River. Sample for age, sex, and length. ADF&G project.

Salmon Lake Limnology Project / Sockeye Salmon Restoration

a) Location: Salmon Lake, throughout; and smolt trap 2 miles downstream from lake, on Pilgrim River.

b) Description: Restore sockeye salmon population to higher historical levels. Biological (age, weight, and length) samples taken from emigrating smolt and enumerated by mark–recapture. Hydroacoustic-tow net studies conducted to estimate rearing fry population and gather growth data. Fertilization of Salmon Lake. Operated by NSEDC.

Subsistence Salmon Fishing Surveys

a) Location: Norton Sound District.

b) Description: Determine subsistence utilization of salmon for formulating management procedures and goals. Subsistence salmon permits were issued in northern Norton Sound and Port Clarence District by Commercial Fisheries Division. Koyuk, Shaktoolik, and Unalakleet were also surveyed by Commercial Fisheries Division. ADF&G project.

CRAB

Summer King Crab Observing Program

a) Location: Observers were placed on commercial fishing vessels during the summer commercial fishery in Norton Sound.

b) Description: Investigate size and sex composition and handling of red king crab in Norton Sound. Sample for sex, carapace length, and shell condition. Cooperative project between ADF&G and NSEDC.

Norton Sound Red King Crab Trawl Survey (Conducted in 2019)

a) Location: Ocean waters of Norton Sound, 10-mile grid.

b) Description: Annual trawl survey to establish abundance of red king crab. Biological (sex and size) samples and species presence-absence data taken. Cooperative ADF&G and NSEDC project.

Appendix G3.–Norton Sound and Kotzebue Sound processors, 2019.

Company	Address	Type of processing	District
Norton Sound Seafood Products	Nome, AK 99762, and Unalakleet, AK 99684	Frozen/fresh salmon Herring and miscellaneous finfish bait Frozen/fresh king crab	Norton Sound
Maniilaq Services, Inc. dba Arctic Circle Wild Salmon	1700 Seventh Avenue Suite 2100 Seattle, WA 98101	Buy and Fly Frozen/fresh salmon	Kotzebue Sound
Copper River Seafoods	1118 East Fifth Avenue Anchorage, AK 99501	Buy and Fly Frozen/fresh salmon	Kotzebue Sound
Pacific Star Seafoods	520 Bridge Access Rd. Kenai, AK 99611	Buy and Fly Floating processor Frozen/fresh salmon	Kotzebue Sound

Appendix G4.–Norton Bay Subdistrict subsistence salmon harvest survey form, 2019.

NORTON SOUND 2019 SUBSISTENCE SALMON HARVEST SURVEY **Community ID# 204**

Alaska Department of Fish and Game **Household ID#_____**

Community: KOYUK

Survey Date: **Household Size: _____**

Interviewer: **(If new household) PO Box: _____**

Household participation is voluntary. Individual household data will not be released without permission of household head.

1. Did your household fish for salmon for subsistence use this year? (Include fishing with a rod and reel) ☐ YES ☐ NO

2. Does your household usually subsistence fish for salmon? ☐ YES ☐ NO

FOR SALMON FISHING HOUSEHOLDS ONLY ("Yes" to #1)

3. Please estimate how many salmon your household caught for subsistence use this year, including with a rod and reel. It is important not to double count fish harvests. Report only your share of the catch if fishing with others. Include salmon you gave away, ate fresh, fed to dogs, lost to spoilage, or obtained from helping others process fish.

SPECIES	NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED (BY GEAR TYPE)		NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED (BY LOCATION)			
	SUBSISTENCE GILL NET or SEINE (Number of fish)	ROD & REEL (Number of fish)	MARINE WATERS	KOYUK RIVER	INGLUTALIK RIVER	UNGALIK RIVER
CHUM SALMON Dog						
CHINOOK SALMON King						
PINK SALMON Humpy						
SOCKEYE SALMON Red						
COHO SALMON Silver						

4. Comments or Suggestions?

Appendix G5.–Shaktoolik Subdistrict subsistence salmon harvest survey form, 2019.

NORTON SOUND 2019 SUBSISTENCE SALMON HARVEST SURVEY **Community ID# 307**

Alaska Department of Fish and Game **Household ID#_____**

Community: SHAKTOOLIK

Survey Date: _____ **Household Size:** _____

Interviewer: _____ **(If new household) PO Box:** _____

Household participation is voluntary. Individual household data will not be released without permission of household head.

1. Did your household fish for salmon for subsistence use this year? (Include fishing with a rod and reel) ☐ YES ☐ NO

2. Does your household usually subsistence fish for salmon? ☐ YES ☐ NO

FOR SALMON FISHING HOUSEHOLDS ONLY ("Yes" to #1)

3. Please estimate how many salmon your household caught for subsistence use this year, including with a rod and reel. It is important not to double count fish harvests. Report only your share of the catch if fishing with others. Include salmon you gave away, ate fresh, fed to dogs, lost to spoilage, or obtained from helping others process fish.

SPECIES	NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED (BY GEAR TYPE)		NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED (BY LOCATION)	
	SUBSISTENCE GILL NET or SEINE (Number of fish)	ROD & REEL (Number of fish)	MARINE WATERS	SHAKTOOLIK RIVER
CHUM SALMON Dog				
CHINOOK SALMON King				
PINK SALMON Humpy				
SOCKEYE SALMON Red				
COHO SALMON Silver				

4. Comments or Suggestions?

Appendix G6.–Unalakleet Subdistrict subsistence salmon harvest survey form, 2019.

NORTON SOUND 2019 SUBSISTENCE SALMON HARVEST SURVEY **Community ID# 357**

Alaska Department of Fish and Game **Household ID#_____**

Community: UNALAKLEET

Survey Date: _____ **Household Size:** _____

Interviewer: _____ **(If new household) PO Box:** _____

Household participation is voluntary. Individual household data will not be released without permission of household head.

1. Did your household fish for salmon for subsistence use this year? (Include fishing with a rod and reel) ☐ YES ☐ NO

2. Does your household usually subsistence fish for salmon? ☐ YES ☐ NO

FOR SALMON FISHING HOUSEHOLDS ONLY ("Yes" to #1)

3. Please estimate how many salmon your household caught for subsistence use this year, including with a rod and reel. It is important not to double count fish harvests. Report only your share of the catch if fishing with others. Include salmon you gave away, ate fresh, fed to dogs, lost to spoilage, or obtained from helping others process fish.

SPECIES	NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED (BY GEAR TYPE)		NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED (BY LOCATION)		
	SUBSISTENCE GILL NET or SEINE (Number of fish)	ROD & REEL (Number of fish)	MARINE WATERS	UNALAKLEET RIVER	NORTH RIVER
CHUM SALMON Dog					
CHINOOK SALMON King					
PINK SALMON Humpy					
SOCKEYE SALMON Red					
COHO SALMON Silver					

4. Comments or Suggestions?

RED KING CRAB

Emergency Order: 3-C-Z-01-19 Effective Date: February 7, 2019

EXPLANATION: This emergency order opens the Norton Sound winter through the ice open access and community development quota (CDQ) red king crab fisheries from 12:00 noon Monday, February 25 until 11:59 p.m. Monday, April 30, or when closed by subsequent emergency order when the guideline harvest level (GHL) is reached.

JUSTIFICATION: By regulation the open access winter red king crab fishery can open anytime on or after January 15 by emergency order. The GHL for the 2019 Norton Sound commercial red king crab fishery is 150,600 pounds with 8% reserved for the winter open access fishery and results in a potential harvest of 12,048 pounds. By regulation 7.5% of the 2019 GHL is reserved for the CDQ fishery, which can open anytime during the winter or summer fishery when the CDQ group is ready to harvest the crab. The CDQ crab can only be harvested by permit holders approved by Norton Sound Economic Development Corporation (NSEDC) and the quota is 11,295 pounds. The CDQ group has notified the department they are ready to harvest crab on February 25.

Emergency Order: 3-C-Z-02-19 Effective Date: June 25, 2019

This emergency order opens the summer commercial open access and CDQ crab fisheries in Norton Sound from 12:00 noon Tuesday, June 25 until 12:00 noon Tuesday, September 3, or when the open access and CDQ quotas are reached.

JUSTIFICATION: By regulation the summer open access king crab fishery can open anytime on or after June 15 by emergency order. The GHL for the 2019 Norton Sound summer open access fishery is the remainder of the total GHL after accounting for the winter open access harvest. The winter open access harvest was 3,295 pounds; therefore, 147,300 pounds remain for the summer commercial fishery, including 11,295 pounds for the CDQ fishery. The open access guideline harvest is 136,000 pounds. The major land-based processor-buyer has notified the department that they are ready to purchase crab.

HERRING

Emergency Order: 3-H-Z-01-19 Effective Date: May 9, 2019

EXPLANATION: This emergency order opens the Norton Sound District to commercial gillnet fishing for bait herring beginning 9:00 a.m. Thursday, May 9, 2019 until Monday, July 1, 2019, unless superseded by another emergency order.

JUSTIFICATION: The buyer, Norton Sound Seafood Products (NSSP), plans to buy up to 40 tons of herring for bait this season. Processing and buying operations will be limited to the NSSP processing plant in Unalakleet and possibly Nome. Herring catches have been reported for several days. The herring quota is over 6,000 tons, but there is only buyer interest in herring for bait and no interest in a sac roe fishery.

Leaving the fishery open continuously allows the buyer to direct the bulk of the fishing fleet to areas where harvest efficiency can be maximized. Any herring not purchased by the buyer must be retained for personal or subsistence uses.

KOTZEBUE SALMON

Emergency Order: 3-S-X-1S-19 Effective Date: July 1, 2019

EXPLANATION: This emergency order closes subsistence fishing in the ocean area adjacent to the end of the main runway nearest the ocean at the Kotzebue airport.

JUSTIFICATION: The main runway at the Kotzebue airport extends nearly to the ocean and concern has arisen over fishing effort creating a safety hazard by attracting birds that may be struck by airplanes while landing or taking off from Kotzebue airport. Consistent with **AS 16.05.060. Emergency orders**, when circumstances require, an area may be closed by emergency order because of safety concerns; therefore, it is warranted to close fishing in waters off the end of the runway as a public safety measure.

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Emergency Order: 3-S-X-02-19 Effective Date: July 10, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 10 hours daily from the hours of 10 a.m. until 8 p.m. Wednesday, July 10 through Friday, July 12.

JUSTIFICATION: Two buyers have registered to purchase Kotzebue chum salmon this season. Regulation allows the season to be open from July 10 through August 31. The buyers have notified the department that they would like to begin purchasing fish on Wednesday, July 10. Having daily 10-hour openings will serve as a test of early run strength and fishing effort.

Emergency Order: 3-S-X-03-19 Effective Date: July 14, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 12 hours daily from the hours of 8 a.m. until 8 p.m. Sunday, July 14 through Friday, July 19.

JUSTIFICATION: Three buyers have registered to purchase Kotzebue chum salmon this season. The first three fishing periods the catch was 6,664 chums which was average. If the catch is average or better the normal fishing schedule of six daily fishing periods will continue. Having daily 12-hour openings will serve as a test of early run strength and fishing effort.

Emergency Order: 3-S-X-04-19 Effective Date: July 21, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 12 hours daily from the hours of 10 a.m. until 10 p.m. Sunday, July 21 through Friday, July 26.

JUSTIFICATION: Through nine fishing periods the catch has been average with 42,000 chums harvested. If the catch is average or better the normal fishing schedule of six daily fishing periods will continue. Having daily 12-hour openings should not jeopardize subsistence opportunity or needed escapement. The Kobuk River test fish project has had average catches.

Emergency Order: 3-S-X-05-19 Effective Date: July 28, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 12 hours daily from the hours of 8 a.m. until 8 p.m. Sunday, July 28 through Friday, August 2.

JUSTIFICATION: Through 15 fishing periods the catch has been near average with 76,000 chums harvested. If the catch is average, or better, the normal fishing schedule of six daily fishing periods will continue. Having daily 12-hour openings should not jeopardize subsistence fishing efforts or needed escapement. The Kobuk River test fish project has had near average catches.

Emergency Order: 3-S-X-06-19 Effective Date: August 3, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 14 hours daily from the hours of 8 a.m. until 10 p.m. Sunday, August 4 through Friday, August 9.

JUSTIFICATION: Through 21 fishing periods the catch has been below average with 134,000 chums harvested; however, local weather has hampered fishing recently. The normal fishing schedule of six daily fishing periods will continue. Having daily 14-hour openings should not jeopardize subsistence opportunity or escapement needs. The Kobuk River test fish project is on track to meet or exceed catch objectives for the season.

Emergency Order: 3-S-X-07-19 Effective Date: August 11, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 14 hours daily from the hours of 8 a.m. until 10 p.m. Sunday, August 11 through Friday, August 16.

JUSTIFICATION: The catch has been average, with 220,000 chums harvested. If the catch is average or better the normal fishing schedule of six daily fishing periods will continue. Having daily 14-hour openings should not jeopardize subsistence fishing efforts or needed escapement. The Kobuk River test fish project has had average catches prior to this week but high water has hampered fishing both in the commercial fishery and test fishery.

-continued-

Emergency Order: 3-S-X-08-19 Effective Date: August 18, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 12 hours daily from the hours of 9 a.m. until 9 p.m. Sunday, August 18 through Friday, August 23.

JUSTIFICATION: The catch has been average, with 316,000 chums harvested. If the catch is average or better the normal fishing schedule of six fishing periods will continue. Having daily 12-hour openings should not jeopardize subsistence or escapement needs. The Kobuk River test fish project catches have improved this week and are now above department objectives.

Emergency Order: 3-S-X-09-19 Effective Date: August 25, 2019

EXPLANATION: This emergency order opens commercial salmon fishing in the Kotzebue District for 12 hours daily from the hours of 8 a.m. until 8 p.m. Sunday, August 25 through Friday, August 30.

JUSTIFICATION: The chum salmon catch this past week was the highest weekly catch of the season with 110,000 chums harvested. The Kobuk River test fish in Kiana had some of the best catches for this late in the season in the 27-year project history. Having daily 12-hour openings should not jeopardize subsistence or needs.

NORTON SOUND SALMON

Emergency Order: 3-S-Z-01S-19 Effective Date: June 11, 2019

EXPLANATION: This emergency order requires a subsistence salmon permit from Bald Head near Elim to Cape Prince of Wales and all waters between those locations flowing into the Bering Sea and the salmon catch limits as set in regulation.

JUSTIFICATION: The department forecast for 2019 is that the chum salmon run will exceed the ANS, and Tier II restrictions will not be required in Subdistrict 1. By regulation, catch limits are in effect for the various freshwater subsistence areas in Subdistrict 1 and Port Clarence District. All catch limits are listed on the permits. Department staff will be flying aerial surveys and boating some of the rivers to track the salmon escapement. The weirs on the Nome, Snake, Eldorado, Bonanza, Solomon and Pilgrim rivers will also count salmon escapements. If a river has adequate escapement, then catch limits will be relaxed in that location.

Emergency Order: 3-S-Z-02S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order closes all subsistence net fishing, except for dip nets and cast nets, from within 500 yards of the mouth of the Unalakleet River to confluence of the North River and includes the North River, and only subsistence gillnets with a mesh size less than 4 inches may be used in the Unalakleet River drainage or its tributaries upstream from the North River confluence and in the North River from June 15 through July 15, 2019. Any king salmon captured in dip nets or cast nets must be immediately returned to the water unharmed.

JUSTIFICATION: Small mesh size nets can ensnare king salmon and the department received reports 2 years ago of a fisherman using a trout net to capture king salmon just upstream of the Unalakleet River mouth. Salmon gillnet fishing had been closed to protect king salmon, but the department had allowed fishing with small mesh gillnets with a mesh size of 4 inches or less to target Dolly Varden and whitefish. To prevent fishermen using the small mesh exception during the salmon fishing closure to ensnare king salmon the department is restricting all subsistence fishing downstream of the North River. This closure will prevent any king salmon being harvested by small mesh gillnets. King salmon are a stock of concern and all salmon fishing has been greatly curtailed for several years to reach escapement goals.

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Emergency Order: 3-S-Z-03S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order closes subsistence salmon fishing in all fresh waters and marine waters of Norton Sound Subdistricts 5 and 6, the Shaktoolik and Unalakleet Subdistricts from June 15 until July 16, 2019.

JUSTIFICATION: Shaktoolik and Unalakleet Subdistrict king salmon runs have supported subsistence fisheries since well before statehood, and commercial fisheries since statehood. However, commercial fisheries directed at king salmon have been closed since 2005 and subsistence harvests have been at record low levels for a nearly a decade. Escapements of king salmon as indexed by the North River tower have been within the middle to upper end of the SEG range of 1,200–2,600 king salmon in 2014 and 2015. However, severe restrictions on subsistence fishing time and mesh size were necessary to achieve escapement goals. Nevertheless, king salmon run abundance had improved in 2014 and 2015 and met escapement but failed to do so in 2016 and 2017. Additional restrictions in 2018 allowed escapement to be met and provided some surplus for subsistence harvest opportunities directed on king salmon. This year restrictions have been delayed by one week to allow additional time for subsistence fishing. Ground-based escapement data and fishermen reports will be evaluated in season to determine if subsistence restrictions can be relaxed or rescinded earlier without jeopardizing king salmon escapement needs.

Emergency Order: 3-S-Z-04S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order closes subsistence salmon fishing from June 15 through July 1, 2019 in all marine waters from Point Dexter westward to the southern tip of Cape Denbigh, and all marine waters from Black Point south of Unalakleet to Wood Point, east of St. Michael.

JUSTIFICATION: Southern Norton Sound king salmon runs are expected to exhibit early run timing this season but are also expected to have well below average run strength. Restrictive measures, including area closures are needed to conserve king salmon bound for eastern Norton Sound drainages that will contribute towards spawning escapements and subsistence harvests in eastern Norton Sound fishing subdistricts. Closing the coastal areas from Point Dexter to Cape Denbigh and from Black Point to Wood Point to subsistence salmon fishing for the month of June is necessary to reduce subsistence harvests of king salmon to meet escapement needs.

Emergency Order: 3-S-Z-05S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order closes and immediately reopens all freshwaters of the Inglutalik and Ungalik River drainages and all marine waters of Norton Sound Subdistrict 4, the Norton Bay Subdistrict to subsistence salmon fishing with set gillnets to a schedule of two 36-hour periods per week from June 15 until July 1, 2019. Periods will be from 6:00 a.m. Mondays to 6:00 p.m. Tuesdays and from 6:00 a.m. Saturdays to 6:00 p.m. Sundays. For periods from Mondays to Tuesdays, subsistence salmon fishing is restricted to set gillnets with a stretched mesh size of 6 inches or less. For subsistence salmon fishing periods from Saturdays to Sundays, there are no mesh size restrictions. The Koyuk River remains open to subsistence salmon fishing and is not affected by this action.

JUSTIFICATION: Subdistrict 4 (Norton Bay Subdistrict) king salmon runs may constitute the northernmost coastal king salmon populations of significant size in Alaska supporting longstanding subsistence fisheries in Inglutalik River. Like other areas of western Alaska, an early but below average run of king salmon is expected for Norton Bay Subdistrict. However, a modest amount of harvestable surplus is expected. This subsistence fishing schedule combined with mesh size restrictions for half the periods should provide enough escapement opportunities for king salmon migrating to spawning areas. Inglutalik River tower counts, and aerial surveys will be flown to determine if additional subsistence fishing time can be provided without jeopardizing king salmon escapement needs. The Koyuk River is not affected by this action and will remain open 24 hours a day, 7 days a week.

Emergency Order: 3-S-Z-06S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order prohibits the retention of king salmon captured in dipnets or cast nets in all freshwaters of Norton Sound Subdistricts 4 (Norton Bay), 5 (Shaktoolik), and 6 (Unalakleet) from June 15 through July 31, 2019. This emergency order requires that any king salmon incidentally captured in dipnets and castnets to be returned immediately to the water alive and unharmed.

JUSTIFICATION: Subsistence effort using dipnets and cast nets in eastern Norton Sound is expected to be minimal. These gear types do provide an economic alternative to gillnets and beach seines that could be effective targeting pink and chum salmon. Additionally, dipnets and cast nets could be utilized during gillnet closures to target salmon other than king salmon. Below average runs of king salmon necessitate the requirement to have king salmon released alive and unharmed so that they may contribute to spawning escapements of eastern Norton Sound stocks.

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Emergency Order: 3-S-Z-07S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order prohibits the retention of king salmon captured in beach seines in freshwater areas of Norton Sound Subdistricts 4, 5 or 6. This emergency order requires that any king salmon incidentally captured in beach seines be returned immediately to the water alive and unharmed.

JUSTIFICATION: Beach seining is permitted 24 hours a day 7 days a week in the Norton Bay Subdistrict (Subdistrict 4). However, a below average run of king salmon underscores the need to conserve king salmon for escapement needs and beach seines can be an extremely effective gear type in areas where groups of king salmon are milling. Consequently, the department is requiring subsistence users in the Norton Bay Subdistrict to release any king salmon captured in beach seines alive and unharmed back into the water. Likewise, any openings in Subdistricts 5 and 6 allowing the use of beach seines will also require that king salmon captured must be released back unharmed to the water. This gear type does allow subsistence users to target more plentiful chum and pink salmon for subsistence harvest purposes even during gillnet closures without inflicting mortality on king salmon incidentally captured.

Emergency Order: 3-S-Z-08S-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order closes all subsistence net fishing, except for dip nets and cast nets from upstream of Boulder Creek on the Sinuk River including Glacial Lake.

JUSTIFICATION: Small mesh size nets can ensnare salmon and upstream of Boulder Creek; salmon hold in waters near and under the Sinuk River bridge. To prevent fishermen using the small mesh exception to ensnare salmon upriver of the subsistence salmon net fishing boundary, the department is closing subsistence net fishing except for dip nets and cast nets. Any salmon captured in a dip net or cast net must be immediately released unharmed in the water.

Emergency Order: 3-S-Z-01-19 Effective Date: June 17, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 1, 2, 3, and 4 to commercial fishing for 24 hours with nets restricted to 6 inches or less.

JUSTIFICATION: These openings will serve as index openings to test run strength. High water this year has delayed adult salmon escapement counting projects from being operational. The department has forecasted an above average chum salmon run and this opening will allow department staff to compare the catch per unit of effort (CPUE) with historical catches near the same date. If weak catches occur the department will wait for a longer duration before the next fishing period. This brief opening will allow some utilization of an expected harvest surplus while not jeopardizing escapement needs of chum salmon in Subdistrict 1, 2, 3, and 4 drainages.

Emergency Order: 3-S-Z-09S-19 Effective Date: June 19, 2019

EXPLANATION: T This emergency opens subsistence salmon fishing in the marine waters of Norton Sound Subdistricts 5 and 6, the Shaktoolik and Unalakleet Subdistricts from noon June 19 until midnight June 20, 2019.

JUSTIFICATION: Shaktoolik and Unalakleet Subdistrict king salmon runs have supported subsistence fisheries since well before statehood, and commercial fisheries since statehood. However, commercial fisheries directed at king salmon have been closed since 2005 and subsistence harvests have been at record low levels for nearly a decade. Escapements of king salmon as indexed by the North River tower have been within the middle to upper end of the SEG range of 1,200–2,600 king salmon in 2014 and 2015. However, severe restrictions on subsistence fishing time and mesh size were necessary to achieve escapement goals. Nevertheless, king salmon run abundance had improved in 2014 and 2015 and met escapement but failed to do so in 2016 and 2017. Last year escapement was reached with further restrictions and the department will have fishing periods once a week of 24 hours or 36 hours when weather is favorable to allow for subsistence fishing. This opening should provide for some subsistence harvest opportunity without jeopardizing king salmon escapement needs.

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Emergency Order: 3-S-Z-02-19 Effective Date: June 21, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 1, 2, 3, and 4 to commercial fishing for 24 hours with nets restricted to 6 inches or less.

JUSTIFICATION: These openings will serve as index openings to test run strength. The previous 24-hour opening starting Monday evening had weak catches of chum salmon. High water this year has delayed adult salmon escapement counting projects from being operational. The department has forecasted an above average chum salmon run and this opening will allow department staff to compare the catch per unit of effort (CPUE) with historical catches near the same date. This brief opening will allow some utilization of an expected harvest surplus while not jeopardizing escapement needs of chum salmon in Subdistrict 1, 2, 3, and 4 drainages.

Emergency Order: 3-S-Z-03-19 Effective Date: June 24, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistrict 2 to commercial fishing for 24 hours with nets restricted to 6 inches or less.

JUSTIFICATION: The most recent commercial opening had good chum salmon catches and CPUE. The department has forecast an above average chum salmon run. This opening will allow some utilization of an expected harvest surplus while not jeopardizing escapement needs of chum salmon in Subdistrict 2 drainages.

Emergency Order: 3-S-Z-10S-19 Effective Date: June 26, 2019

EXPLANATION: This emergency order opens subsistence salmon fishing in the marine waters of Norton Sound Subdistricts 5 and 6, the Shaktoolik and Unalakleet Subdistricts from noon June 26 until midnight June 27, 2019.

JUSTIFICATION: Shaktoolik and Unalakleet Subdistrict king salmon runs have supported subsistence fisheries since well before statehood, and commercial fisheries since statehood. However, commercial fisheries directed at king salmon have been closed since 2005 and subsistence harvests have been at record low levels for nearly a decade. Escapements of king salmon as indexed by the North River tower have been within the middle to upper end of the SEG range of 1,200–2,600 king salmon in 2014 and 2015. However, severe restrictions on subsistence fishing time and mesh size were necessary to achieve escapement goals. Nevertheless, king salmon run abundance had improved in 2014 and 2015 and met escapement but failed to do so in 2016 and 2017. Last year escapement was reached with further restrictions limited fishing periods to one 24-hour fishing period per week. This year there have been favorable king counts at Shaktoolik River tower and the Unalakleet River is now fish tight so subsistence fishing will be allowed for 36 hours. This opening should provide for some subsistence harvest opportunity without jeopardizing king salmon escapement needs.

Emergency Order: 3-S-Z-04-19 Effective Date: June 27, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 1, 3, and 4 to commercial fishing for 24 hours with nets restricted to 6 inches or less.

JUSTIFICATION: The last opening had below expected catches of chum salmon. Catches in the southern Norton Sound subsistence fishery have been well below average. Also, the Yukon River farther south has had one of the lower chum salmon runs on record. There has been no commercial fishing for 4 days and this opening will serve as index openings to test run strength. High water this year has delayed adult salmon escapement counting projects from being operational. The department has forecasted an above average chum salmon run and this opening will allow department staff to compare the catch per unit of effort (CPUE) with historical catches near the same date. If weak catches persist the department will again wait for a longer duration before the next fishing period. This brief opening will allow some utilization of an expected harvest surplus while not jeopardizing escapement needs of chum salmon in Subdistricts 1, 3, and 4 drainages.

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Emergency Order: 3-S-Z-05-19 Effective Date: June 28, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistrict 2 to commercial fishing for 24 hours with nets restricted to 6 inches or less.

JUSTIFICATION: The most recent commercial opening had average chum salmon catches and CPUE. The department has forecasted an above average chum salmon run. This opening will allow some utilization of an expected harvest surplus while not jeopardizing escapement needs of chum salmon in Subdistrict 2 drainages.

Emergency Order: 3-S-Z-11S-19 Effective Date: July 1, 2019

EXPLANATION: This emergency order opens beach seining in the Unalakleet River. The previous emergency order (3-S-Z-7S-19) requiring all king salmon to be returned to the water unharmed remains in effect.

JUSTIFICATION: Shaktoolik and Unalakleet Subdistrict king salmon runs have supported subsistence fisheries since well before statehood, and commercial fisheries since statehood. However, commercial fisheries directed at king salmon have been closed since 2005 and subsistence harvests have been at record low levels for nearly a decade. This year there have been favorable king counts at the Unalakleet River weir and opening beach seining while still not allowing king salmon to be harvested will allow for the harvest of other salmon while still protecting king salmon.

Emergency Order: 3-S-Z-12S-19 Effective Date: July 2, 2019

EXPLANATION: This emergency order opens subsistence salmon fishing in the marine waters of Norton Sound Subdistricts 5 and 6, the Shaktoolik and Unalakleet Subdistricts to a weekly schedule from noon Tuesday until midnight Wednesday and from noon Saturdays until midnight Sundays.

JUSTIFICATION: Shaktoolik and Unalakleet Subdistrict king salmon runs have supported subsistence fisheries since well before statehood, and commercial fisheries since statehood. However, commercial fisheries directed at king salmon have been closed since 2005 and subsistence harvests have been at record low levels for nearly a decade. Last year escapement was reached with restrictions limiting fishing periods to one 24-hour fishing period per week. This year there have been favorable king counts at Shaktoolik River tower and the Unalakleet River weir so subsistence fishing will be allowed for two 36-hour fishing periods a week. This opening should provide for some subsistence harvest opportunity without jeopardizing king salmon escapement needs.

Emergency Order: 3-S-Z-13S-19 Effective Date: July 1, 2019

EXPLANATION: This emergency order opens the fresh waters of Subdistrict 5 to subsistence fishing. The previous emergency order requiring all king salmon to be returned to the water unharmed from a beach seine, dip net and cast net remains in effect.

JUSTIFICATION: Shaktoolik and Unalakleet Subdistrict king salmon runs have supported subsistence fisheries since well before statehood, and commercial fisheries since statehood. However, commercial fisheries directed at king salmon have been closed since 2005 and subsistence harvests have been at record low levels for nearly a decade. This year there have been favorable king counts at Shaktoolik River tower and freshwater fishing while still not allowing king salmon to be harvested with beach seines will allow for salmon harvest while not jeopardizing escapement.

Emergency Order: 3-S-Z-14S-19 Effective Date: July 1, 2019

EXPLANATION: This emergency order eliminates previous restrictions on the retention of king salmon and allows the subsistence fishing schedule in regulation to proceed.

JUSTIFICATION: Salmon escapement at counting projects in both Shaktoolik and Unalakleet Subdistricts have seen a surge in king salmon passage. Therefore, all previous restrictions on subsistence fishing and the retention of king salmon are eliminated. The subsistence schedule in regulation is now in effect. Allowing the regular schedule will allow for salmon harvest while not jeopardizing escapement.

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Emergency Order: 3-S-Z-06-19 Effective Date: July 1, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2, 5 and 6 to commercial fishing for 48 hours with nets restricted to 6 inches or less.

JUSTIFICATION: This will be the fifth opening for Subdistrict 2 that had chum salmon catches above average last fishing period. This will be the first opening of the season for Subdistricts 5 and 6. Having the restriction on mesh size allows for a long fishing period because of the regulation limiting fishing time if targeting king salmon with larger mesh sizes. Having a commercial salmon fishing opening to target chum and pink salmon should not jeopardize escapement or subsistence fishing opportunity.

Emergency Order: 3-S-Z-07-19 Effective Date: July 4, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial fishing for 48 hours from 6 p.m. Thursday until 6 p.m. Saturday and Subdistrict 1 from 9 pm Thursday until 9 pm Sunday, with gillnets restricted to 6 inches or less.

JUSTIFICATION: Weather has delayed fishing time in the northern subdistricts. Subdistricts 5 and 6 had their first commercial opening starting July 1 to protect king salmon for escapement and subsistence uses. Having the restriction on mesh size allows for a longer fishing period and king salmon escapement is projected to exceed the midpoint of the escapement goal and having a commercial fishing opening to target chum and pink salmon should not jeopardize escapement or subsistence fishing opportunity. Now that the weather is forecasted to improve the department is allowing fishing again in the northern subdistricts also.

Emergency Order: 3-S-Z-08-19 Effective Date: July 9, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial fishing for 24 hours from 6 p.m. Tuesday until 6 p.m. Wednesday.

JUSTIFICATION: Water levels have been dropping and more escapement projects have begun counting. King, chum and pink escapements have been enough to allow additional fishing time. The buyer has requested a shorter duration fishing periods because of the high volume of pink catches.

Emergency Order: 3-S-Z-09-19 Effective Date: July 9, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistrict 1 to commercial fishing for 48 hours from 9 p.m. Tuesday until 9 p.m. Thursday.

JUSTIFICATION: Catch rates and expected low commercial effort indicate that a surplus of salmon, above escapement and subsistence needs, is available for commercial harvest.

Emergency Order: 3-S-Z-10-19 Effective Date: July 10, 2019

EXPLANATION: This emergency order extends the ongoing Norton Sound Subdistricts 2-6 commercial fishing period for an additional 24 hours from 6 p.m. Wednesday until 6 p.m. Thursday.

JUSTIFICATION: The buyer had originally requested a 24-hour fishing period to make sure they had enough capacity and would request an extension for another 24 hours to make it a normal 48-hour fishing period if there were no capacity concerns. King, chum and pink escapements have been enough to allow additional fishing time.

Emergency Order: 3-S-Z-11-19 Effective Date: July 11, 2019

EXPLANATION: This emergency order extends Norton Sound Subdistricts 1 to commercial fishing for 72 hours from 9 p.m. Thursday until 9 p.m. Sunday.

JUSTIFICATION: The department has begun to get Nome area weirs operational. Catch rates and the low commercial effort to date allow additional salmon to be harvested and subsistence needs and escapement are expected to be met.

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Emergency Order: 3-S-Z-12-19 Effective Date: July 12, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial fishing for 72 hours from 6 p.m. Friday until 6 p.m. Monday.

JUSTIFICATION: Escapement projects indicate that king, chum, and pink escapements are sufficient to meet escapement and subsistence needs; therefore, a 72-hour commercial fishery is warranted.

Emergency Order: 3-S-Z-15S-19 Effective Date: July 16, 2019

EXPLANATION: This emergency order waives the sockeye salmon subsistence catch limit at Pilgrim River.

JUSTIFICATION: The Pilgrim River weir count for sockeye salmon was over 1,300 fish on July 15 and the cumulative passage is 3,300 sockeyes. Historically the average midpoint of sockeye passage is July 19. Because of high water the Pilgrim River weir did not become operational until July 11, two weeks later than normal. The escapement goal range is 6,800 to 36,000 sockeye salmon passing through the weir. During an aerial survey yesterday afternoon at Salmon Lake nearly 5,000 sockeyes were observed. Because escapement is ensured waiving the catch limit will lessen the possibility of sockeye salmon exceeding the high end of the range.

Emergency Order: 3-S-Z-13-19 Effective Date: July 16, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial salmon fishing for two 48-hour fishing periods from 6 p.m. Tuesday until 6 p.m. Thursday and from 6 p.m. Friday until 6 p.m. Sunday and Subdistrict 1 from 9 p.m. Tuesday until 9 p.m. Thursday and from 9 p.m. Friday until 9 p.m. Sunday, with gillnets restricted to 6 inches or less.

JUSTIFICATION: The chum run overall has been average in Norton Sound with some subdistricts above average (1 and 2), some below average (3 and 4) and some average (5 and 6). Chum escapements are projected to be reached and fishing time should not jeopardize subsistence fishing or escapement.

Emergency Order: 3-S-Z-14-19 Effective Date: July 18, 2019

EXPLANATION: This emergency order extends the ongoing Norton Sound Subdistrict 1 commercial fishing period for an additional 24 hours from 9 p.m. Thursday until 9 p.m. Friday.

JUSTIFICATION: Rough seas may prevent fishermen from getting to their gillnets, so the department is extending the fishing period by 24 hours in the interest of safety. King, chum and pink escapements have been enough to allow additional fishing time.

Emergency Order: 3-S-Z-15-19 Effective Date: July 21, 2019

EXPLANATION: This emergency order extends fishing time in Norton Sound Subdistricts 2-6 for 48 hours from 6 p.m. Sunday until 6 p.m. Tuesday.

JUSTIFICATION: Chum salmon overall has been near average in Norton Sound. Chum salmon escapements and subsistence needs are projected to be met with a surplus available for commercial fishermen. The ongoing commercial fishery has been affected by weather; therefore a 48-hour extension is warranted.

Emergency Order: 3-S-Z-16-19 Effective Date: July 22, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistrict 1 to commercial fishing for 48 hours from 9:00 p.m. Monday until 9:00 p.m. Wednesday.

JUSTIFICATION: This emergency order extends fishing time in Norton Sound Subdistricts 2-6 for 48 hours from 6 p.m. Sunday until 6 p.m. Tuesday.

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Emergency Order: 3-S-Z-17-19 Effective Date: July 23, 2019

EXPLANATION: This emergency order extends fishing time in Norton Sound Subdistricts 2-6 for a 24-hour fishing period from 6 p.m. Tuesday until 6 p.m. Wednesday.

JUSTIFICATION: The chum salmon run in Norton Sound has been average, but recently catches have been above average for the second half of July. Chum salmon escapements and subsistence needs are projected to be met. High seas are forecast that would delay the start of the next commercial salmon fishing period and the department is extending fishing for 24 hours during more moderate weather.

Emergency Order: 3-S-Z-18-19 Effective Date: July 26, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial salmon fishing for 48-hours from 6 p.m. Friday until 6 p.m. Sunday and Subdistrict 1 from 9 p.m. Friday until 9 p.m. Sunday.

JUSTIFICATION: The chum run overall has been average in Norton Sound. Chum salmon is projected to have a harvestable surplus above escapement and subsistence needs and commercial fishing should not jeopardize subsistence fishing or escapement.

Emergency Order: 3-S-Z-19-19 Effective Date: July 30, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial salmon fishing for two 48-hour periods from 6 p.m. Tuesday, July 30, until 6 p.m. Thursday, August 1, and from 6 p.m. Friday, August 2, until 6 p.m. Sunday, August 4, and Subdistrict 1 from 9 p.m. Tuesday, July 30, until 9 p.m. Thursday, August 1, and from 9 p.m. Friday, August 2, until 9 p.m. Sunday, August 4.

JUSTIFICATION: The chum run overall has been average in Norton Sound. Chum salmon is projected to have a harvestable surplus above escapement and subsistence needs; therefor, commercial fishing opportunity is warranted.

Emergency Order: 3-S-Z-20-19 Effective Date: August 4, 2019

EXPLANATION: This emergency order extends fishing time in the Norton Sound Subdistricts 1-6 for 24-hours fishing from 6 p.m. Sunday until 6 p.m. Monday in Subdistricts 2-6 and from 9:00 p.m. Sunday to 9:00 p.m. Monday in Subdistrict 1.

JUSTIFICATION Chum salmon escapements and subsistence needs are projected to be met with a surplus available for commercial fishermen. The ongoing commercial fishery has been affected by weather; therefor, a 24-hour extension is warranted.

Emergency Order: 3-S-Z-21-19 Effective Date: August 6, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial salmon fishing for two 48-hour periods from 6 p.m. Tuesday, August 6, until 6 p.m. Thursday, August 8, and from 6 p.m. Friday, August 9, until 6 p.m. Sunday, August 11, and Subdistrict 1 from 9 p.m. Tuesday, August 6, until 9 p.m. Thursday, August 8, and from 9 p.m. Friday, August 9, until 9 p.m. Sunday, August 11.

JUSTIFICATION: The chum run overall has been average in Norton Sound. Chum salmon is projected to have a harvestable surplus above escapement and subsistence needs. Additionally, coho salmon are tracking to meet escapement and subsistence needs with a harvestable surplus for commercial fishing; therefor, commercial fishing opportunity is warranted.

Emergency Order: 3-S-Z-22-19 Effective Date: August 13, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial salmon fishing on a schedule of two 48-hour periods each week from 6:00 p.m. Tuesdays until 6:00 p.m. Thursdays and from 6:00 p.m. Fridays until 6:00 p.m. Sundays beginning 6:00 p.m. Tuesday, August 13, until 6:00 p.m. Sunday, September 1, and Subdistrict 1 from 9:00 p.m. Tuesdays until 9 p.m. Thursdays and from 9:00 p.m. Fridays until 9:00 p.m. Sundays beginning 9:00 p.m. Tuesday, August 13, until 6:00 p.m. Sunday, September 1.

JUSTIFICATION: Coho salmon have replaced chum salmon as the major contributor of the commercial harvest in Norton Sound. Early harvests of coho salmon were slightly above average and escapement projects were trending to above average escapements. Coho salmon are tracking to meet escapement subsistence needs with a harvestable surplus for commercial fishing; therefor, commercial fishing opportunity is warranted.

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Emergency Order: 3-S-Z-23-19 Effective Date: August 18, 2019

EXPLANATION: This emergency order extends fishing time in the Norton Sound Subdistricts 1-6 for 24-hours fishing from 6 p.m. Sunday until 6 p.m. Monday in Subdistricts 2-6 and from 9:00 p.m. Sunday to 9:00 p.m. Monday in Subdistrict 1.

JUSTIFICATION: The previous 48-hour fishing period was affected by weather greatly limiting fishing effort. Silver salmon catches this season indicate an above average run. The weather forecast is favorable, so the department is extending fishing by 24 hours during the ongoing fishing period.

Emergency Order: 3-S-Z-24-19 Effective Date: August 22, 2019

EXPLANATION: This emergency order extends fishing time in the Norton Sound Subdistrict 1 for 24-hours fishing from 9 p.m. Thursday until 9 p.m. Friday.

JUSTIFICATION: This extension can take advantage of good weather before the weather is forecast to deteriorate later this weekend. Silver salmon catches this season indicate an above average run. The weather forecast is favorable, so the department is extending fishing by 24 hours during the ongoing fishing period.

Emergency Order: 3-S-Z-25-19 Effective Date: August 29, 2019

EXPLANATION: This emergency order extends fishing time in the Norton Sound Subdistrict 1 for 24-hours fishing from 9 p.m. Thursday until 9 p.m. Friday.

JUSTIFICATION: This extension will allow fishermen to take advantage of good weather before the weather is expected to deteriorate later this weekend. Silver salmon catches this season indicate an above average run. Fishermen were delayed by one day being able to fish because of poor weather and the weather forecast is favorable for a short time so the department is extending fishing by 24 hours during the ongoing fishing period.

Emergency Order: 3-S-Z-26-19 Effective Date: September 3, 2019

EXPLANATION: This emergency order opens Norton Sound Subdistricts 2-6 to commercial salmon fishing for 96 hours from 6:00 p.m. Tuesday, September 3, until 6:00 p.m. Saturday, September 7, and Subdistrict 1 from 9:00 p.m. Tuesday, September 3, until 9 p.m. Saturday, September 7.

JUSTIFICATION: Coho salmon have replaced chum salmon as the major contributor of the commercial harvest in Norton Sound. Early harvests of coho salmon were slightly above average and escapement projects are trending from average to above average for escapement. Coho salmon are tracking to meet escapement and subsistence needs with a harvestable surplus for commercial fishing; therefor, commercial fishing opportunity is warranted.

Emergency Order: 3-S-Z-27-19 Effective Date: September 9, 2019

EXPLANATION: This emergency order extends the commercial fishing season in Norton Sound Subdistricts 2-6 to commercial salmon fishing for 96 hours from 6:00 p.m. Monday, September 9, until 6:00 p.m. Friday, September 13, and Subdistrict 1 from 9:00 p.m. Monday, September 9, until 9 p.m. Friday, September 13.

JUSTIFICATION: Inclement weather and low participation caused minimal effort in the previous commercial opening allowing for more escapement into local area streams. Coho salmon are tracking to meet escapement and subsistence needs with a harvestable surplus for commercial fishing; therefor, commercial fishing opportunity is warranted.

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NORTON SOUND SALMON – SPORT FISH

Emergency Order: 3-KS-W-02-19 Effective Date: June 15, 2019

EXPLANATION: This emergency order closes sport fishing for king salmon in all fresh waters from Bald Head to Point Romanof. This closure includes, but is not limited to, the Unalakleet, Shaktoolik, Koyuk, Ungalik, Inglutalik, and Golsovia river drainages. In addition, only one unbaited, single-hook, artificial lure may be used in these drainages.

All king salmon caught incidentally in the waters described above while fishing for other species may not be removed from the water and must be released immediately.

JUSTIFICATION: The 2019 preseason outlook for the Unalakleet River drainage king salmon run is expected to be insufficient to provide for a moderate harvestable surplus. According to the Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan, when the inriver subsistence fishery is closed to the retention of king salmon, sport fishing for king salmon will be closed. At this time, restrictions are planned to close the Unalakleet River subsistence fishery for king salmon effective June 16, 2019.

The department does not have reliable inseason stock assessment information for the Shaktoolik, Koyuk, Ungalik, Inglutalik, and Golsovia river drainages, but these king salmon runs generally trend with Unalakleet River stocks. The closure of sport fishing for king salmon in these rivers will provide protection for returning fish. The prohibition of bait while sport fishing should minimize catch-and-release mortality for king salmon incidentally caught while sport fishing for other species.

The department will continue to evaluate inseason run strength and take appropriate management actions to ensure that escapement requirements are met. If inseason stock assessment information indicates that the king salmon escapement goal in the Unalakleet River will be met, restrictions will be relaxed.

Emergency Order: 3-KS-W-04-19 Effective Date: July 3, 2019

EXPLANATION: This emergency order opens sport fishing for king salmon in all waters of the Unalakleet River drainage with a bag and possession limit of 2 fish, of which only 1 fish may be 20 inches or greater in length, and an annual bag limit of 2 fish greater than 20 inches. Bait is allowed in the Unalakleet River. All other fresh waters of southern Norton Sound including the Koyuk, Ungalik, Inglutalik, Shaktoolik, and Golsovia river drainages will remain closed to sport fishing for king salmon and the use of bait is prohibited in these waters.

JUSTIFICATION: Daily escapement counts of king salmon at the North River tower on the Unalakleet River have increased recently, and the midpoint of the Sustainable Escapement Goal (SEG) of 1,900 fish is projected to be exceeded. According to the Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan, when the subsistence fishery in the Unalakleet River drainage is opened to at least two 36-hour periods per week, and the subsistence fishery in the marine waters of Subdistricts 5 and 6 is opened to at least two 48-hour periods per week, the sport fishery may be open.

The department does not have reliable inseason stock assessment information for the Shaktoolik, Koyuk, Ungalik, Inglutalik, and Golsovia river drainages; therefore, the closure of sport fishing for king salmon in these rivers will remain in effect. The prohibition of bait while sport fishing should minimize catch-and-release mortality for king salmon incidentally caught while sport fishing for other species.

APPENDIX H: ARCTIC FISHERIES

Appendix H1.–Commercial freshwater finfish harvest and sales, Colville River, Arctic Area, 1990–2007.

Year	Number of fish harvested intended for commercial sale[a]					Estimated commercial sales based on fish tickets	
	Broad whitefish	Humpback whitefish	Least cisco (herring)	Arctic cisco ("kaktok")	Total harvest	Arctic cisco	Whitefish species[b]
1990	0	5,694	21,003	19,374	46,071	12,571[c]	14,249[c]
1991	0	1,240	5,697	13,805	20,742	1,970[d]	3,307[d]
1992	126	5,209	6,962	20,939	33,236	[e]	10,200[f]
1993	20	5,339	6,037	31,310	42,706	11,291[d]	6,170[d]
1994	ND	6,056[g]	10,176	8,958	25,190	7,434[d]	4,121[d]
1995	ND	33,794[h]	ND	ND	33,794	13,921	6,000
1996	ND	6,425[g]	7,796	21,817	36,038	9,076	4,127
1997	ND	1,721[g]	10,754	9,403	21,878	9,403	4,760
1998	ND	4,881[g]	9,936	7,019	21,836	5,648	7,105
1999	ND	6,875[g]	7,430	8,832	23,137	7,095	6,170
2000	ND	3,706[g]	5,758	2,619	12,083	2,809	6,569
2001	ND	6,078[g]	2,839	1,740	10,657	1,779	7,306
2002	ND	4,183[g]	5,503	3,935	13,621	899	4,093
2003	ND	6,463[g]	4,777	5,627	16,867	0	1,292
2004	ND	1,145[g]	3,061	3,061	7,267	2,412[f]	476
2005	ND	490[g]	2,870	9,343	12,703	2,975[f]	2,170
2006	ND	1,188[g]	4,995	3,293	9,476	1,482[f]	3,655
2007	ND	462[g]	2,265	390	3,117	[e]	[e]
Avg 2002–2006	ND	2,694	4,241	5,052	11,987	1,554	2,337

[a] Reported on daily catch form returned to ADF&G. Catch reports were returned to ADF&G following the fishing season. All fish reported on the catch report were harvested with the intent to sell.

[b] Whitefish species include mostly humpback whitefish and least cisco, with occasional broad whitefish.

[c] Commercial harvest estimate based on 1 fish ticket average weights of 0.89 lb (900 Arctic cisco at 800 lb) and 0.61 lb (1,400 whitefish species at 850 lb).

[d] Estimated commercial harvest sales based on 1995 to 2001 average weight of 0.92 lb for Arctic cisco and 0.89 lb for whitefish species (humpback and broad whitefish, and least cisco).

[e] No information is available from fish tickets indicating that harvested fish were sold commercially.

[f] Mixed commercial harvest of mostly Arctic cisco along with humpback whitefish, broad whitefish, and least cisco. Estimated commercial harvest sales based on 1995–2001 combined average of $1.07/lb for whitefish species and Arctic cisco.

[g] Humpback whitefish harvest includes undetermined amounts of broad whitefish.

[h] Humpback whitefish harvest includes undetermined amounts of broad whitefish, least cisco, and Arctic cisco.