Special Publication No. 12-18

Overview of the Bristol Bay Salmon Fishery 2010-2012, a Report to the Alaska Board of Fisheries

by

Tim Sands

November 2012

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

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by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

The Bristol Bay sockeye salmon (*Oncorhynchus nerka*) commercial fishery has produced two slightly below average and one above average harvest over the last three years. The exvessel value and sockeye salmon price per pound has been above the past 10- and 20-year averages for the same three year period. Escapement goals for all river systems were met or exceeded in all years for all rivers without exception. The Kvichak River continues to be a stock of concern, although it has achieved the minimum escapement goal the last three years.

Keywords: Naknek Kvichak, Ugashik, Egegik, Nushagak, Togiak, sockeye salmon, *Oncorhynchus nerka*, king salmon, *Oncorhynchus tshawytscha*, chum salmon, *Oncorhynchus keta*, pink salmon, *Oncorhynchus gorbuscha*, coho salmon, *Oncorhynchus kisutch*, stock of concern, commercial fishing, ADF&G, Bristol Bay, Alaska.

INTRODUCTION

The Bristol Bay Area includes all coastal waters and inland waters east of a line from Cape Newenham to Cape Menshikof (Figure 1) and is the largest sockeye salmon (*Oncorhynchus nerka*) producing region in the world. It also produces substantial returns of other salmon species as well as herring.

Bristol Bay is divided into five fishing districts: Togiak, Nushagak, Naknek-Kvichak, Egegik, and Ugashik. Associated with these districts are nine major rivers: Togiak, Igushik, Wood, Nushagak, Kvichak, Alagnak, Naknek, Egegik, and Ugashik. Several districts are divided into sections that provide more management flexibility in controlling exploitation of individual salmon stocks when more than one river system contributes to the district's salmon return. The districts and sections are confined to areas near the river mouths in order to minimize interceptions of salmon destined for other areas. In addition, there are special harvest areas in every district, with the exception of Togiak. Special harvest areas are designed to minimize the interception of salmon stocks bound for other systems or to provide additional opportunity to focus harvest on fish surplus to escapement needs. Commercial fishing is opened by emergency order in all districts, except the Togiak District, which has a regular weekly fishing schedule.

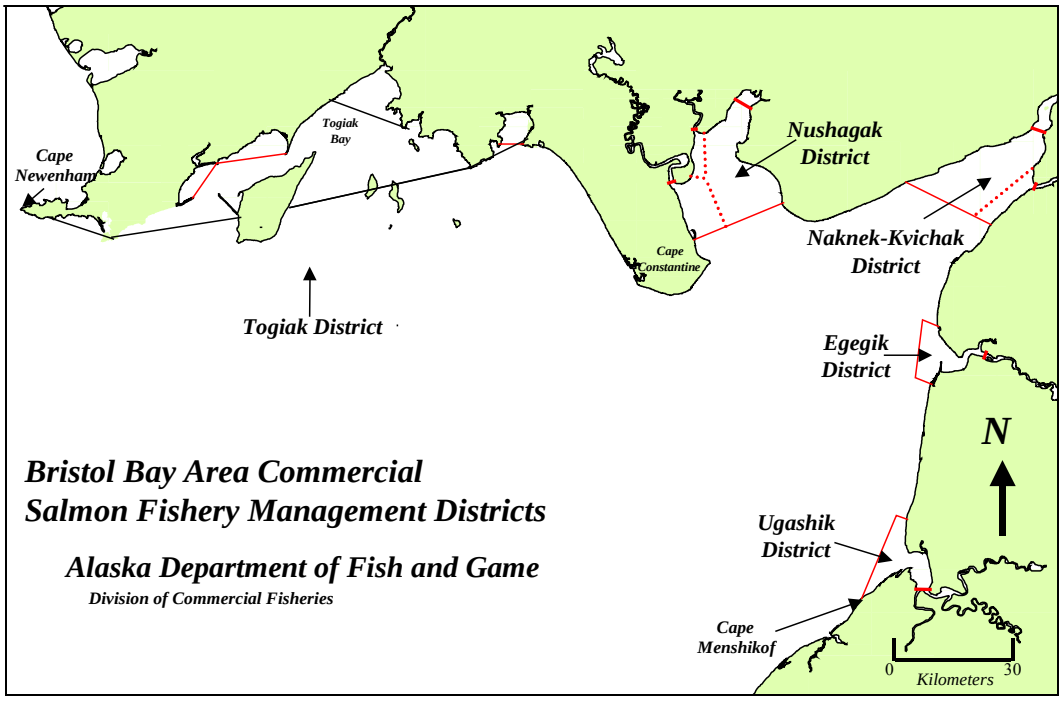

Figure 1.–Bristol Bay area commercial fisheries salmon management districts.

In the last 20 years (1992–2011), Bristol Bay commercial salmon harvests have averaged 25.3 million sockeye; 67,000 king (*O. tshawytscha*); 924,000 chum (*O. keta*); 253,000 pink (*O. gorbuscha*) (during even years); and 79,000 coho salmon (*O. kisutch*). The value of the Bristol Bay commercial salmon fishery has averaged $116.4 million over the last 20 years (Table 1) but, because of larger runs and higher prices, the recent five-year average is $137 million.

Subsistence salmon harvests for the past 20 years (1991–2010) have averaged approximately 138,000 salmon, of which 107,000 have been sockeye salmon. Sport fisheries primarily target king and coho salmon, but pink, chum, and sockeye salmon are also harvested.

The management objective for all districts in Bristol Bay is to achieve escapement goals for salmon species while providing opportunities to harvest fish surplus to escapement needs.

The Bristol Bay salmon fishery opens on June 1 by regulation. Prior to June 25, vessels wishing to fish in eastside districts (Naknek-Kvichak, Egegik, and Ugashik) are not required to register for a district before fishing. After June 25, fishermen must register prior to fishing in any district. In the Nushagak District, drift and set gillnet fishermen must register prior to fishing anytime between June 1 and July 17. Prior to 2009, if a permit holder wanted to fish in a different district, they needed to inform the department at the King Salmon or Dillingham ADF&G offices, in person or via an authorized agent, and had to serve a 48-hour waiting period. In 2009, a new program was introduced that allowed transfers to be made online by the permit holder or their authorized agent. Transfers were only allowed to be originated during office hours. This program has been subsequently modified to allow transfers at any time and for initial registration to be done online. After informing the department of intent to transfer, permit holders must still wait 48 hours before they become legal to fish in a different district. If an individual owns both a set and drift gillnet permit, they may not fish both permits at the same time, but must transfer and wait 24 hours before switching to the new gear. They may, however, fish the gear they were fishing during the waiting period.

In 2003, legislative action allowed drift and set gillnet fishermen to own two permits. In 2004, the Alaska Board of Fisheries (board) adopted regulation allowing two drift gillnet permit holders to combine as a dual operation and use 200 fathoms of drift gillnet. In 2009, the board adopted a regulation that allowed an individual to operate two set gillnet permits and use two full complements of gear. This regulation is scheduled to sunset in 2012 without further board action. Special harvest areas were exempted from allowing use of dual drift permits. In 2012, the department estimated that 326 dual permit partnerships were active for at least part of the season. By regulation, drift gillnet vessels in Bristol Bay are limited to an overall length of 32 feet or less.

2010-2012 COMMERCIAL SALMON FISHERY

Sockeye salmon catch, price per pound, value, and permit numbers for 2010–2012 are presented in Table 1. Sockeye salmon harvest for 2010–2012 has been below the 20-year average for two of the past three years. The base price per pound has increased since 2009 and the total exvessel value of Bristol Bay sockeye salmon has been above recent 10- and 20-year averages.

Table 1.–Bristol Bay commercial sockeye salmon fishery, 2010–2012, with 10- and 20-year averages.

Year	$/lb	Sockeye Catch	Value	Registered Drift Permits	Dual Permits
2010	1.07	29,052,737	$180,818,000	1,723	360
2011	1.17	21,879,088	$160,499,000	1,747	334
2012	1.00	20,556,967	$117,833,171	1,740	326
Avg.	1.08	23,829,827	$152,348,000	1,697	340
20-year Avg.	0.78	25,348,637	$115,528,000	1,691	[a]
10-year Avg.	0.73	24,091,211	$104,060,000	1,541	[a]

[a] Dual permit tracking did not begin until 2010.

NAKNEK-KVICHAK DISTRICT

The largest producer of sockeye salmon in Bristol Bay over the last three years has been the Naknek-Kvichak District. Kvichak River sockeye salmon have been listed as a stock of concern since 2000, but escapement goals have been achieved for the most recent three years (2010, 2011, and 2012). Generally, fishing with set gillnets has occurred on a fairly liberal basis in both the Naknek and Kvichak sections of the district. Drift gillnet fishing early in each season has been limited to the Naknek Section of the district to protect Kvichak sockeye salmon, although some harvest of Kvichak stocks occurs in the Naknek Section drift gillnet fishery. As each season progressed, drift gillnet fishing in the Kvichak Section was dictated by Kvichak River escapement. Kvichak sockeye stocks tend to arrive later than those of the Naknek and it is important to consider this run timing differential when making management decisions.

EGEGIK DISTRICT

Over the past three years, Egegik District harvests have varied between 4.6 and 5.1 million sockeye salmon. Although harvests of this size are below the 20-year average for Egegik, the escapement goal was achieved in all years. In 2009, the board modified the district registration regulation to allow fishermen to fish in eastside districts prior to June 25 without having to register for a district. The intent was to encourage fishermen to fish early and potentially spread more of the harvest out over the season. Since Egegik run timing tends to be the earliest in Bristol Bay, this district was expected to have a significant amount of early fishing effort. This was the case in 2010 and 2011, but because of lower than expected runs in those years, the department was more conservative in 2012. Based on escapement, there were no drift gillnet openings in Egegik between June 15 and 25 in 2012.

UGASHIK DISTRICT

The Ugashik District produced well over the past three year period. The 2010 harvest was 32% above the 20-year average. The 2011 and 2012 harvests in Ugashik were slightly below average, but the sockeye salmon escapement goal for the Ugashik River was achieved every year and there were significant amounts of fishing time in all years. In the past, there had been some difficulty with Ugashik fishermen finding a market for their fish, but this was not the case in 2010–2012.

NUSHAGAK DISTRICT

In 2010, the Nushagak District produced the second largest harvest (8.4 million) of sockeye salmon since records have been kept starting in 1884. The department was forced to implement the *Wood River Sockeye Salmon Special Harvest Area Management Plan* (WRSSSHAMP) to protect returning Nushagak River sockeye salmon. After five tides of fishing in the Wood River Special Harvest Area (WRSHA), Nushagak sockeye salmon escapement was back on track to meet the escapement goal. The board modified the WRSSSHAMP in 2009 and allowed for commercial fishing to occur in the WRSHA when escapement in the Wood River had exceeded 1.1 million and was projected to exceed 1.4 million sockeye salmon. This provision allowed for harvest of salmon surplus to Wood River escapement needs, but had already passed the commercial district. The strong Wood River sockeye salmon run of 2010 met the conditions of the regulation and the WRSHA was opened (periodically) for the remainder of the sockeye salmon season in 2010 to provide opportunity to harvest fish surplus to escapement needs.

Both the 2011 Nushagak District sockeye salmon run and harvest (4.9 million fish) was near the long-term average. Escapement goals were met or exceeded for all Nushagak District river systems. The 2012 harvest of 2.7 million sockeye salmon was the lowest since 1997 and the total run was the worst since 1988. A poor sockeye salmon run to the Nushagak River also necessitated use of the WRSHA for five tides in 2012. Ultimately, escapement goals for all river systems were met in 2012.

Nushagak District king salmon harvests have decreased over the last three years. A directed king salmon fishery occurred in 2010, but harvest was low (less than 1,500 fish) and escapement that started off well ended below the escapement goal range, which resulted in restrictions to sport and subsistence fisheries. The poor run was exacerbated by the combination of a large sockeye salmon run and a late king salmon run. Incidental harvest of king salmon in the directed sockeye salmon fishery is higher when there is an increased overlap between sockeye and king salmon run timing. Subsequent king salmon harvest, combined with a poor king salmon run to the Nushagak River, resulted in a king salmon escapement below the escapement goal range in 2010.

During the 2011 season, early Nushagak king salmon escapement lagged below the historical run curve and the department delayed opening the commercial sockeye salmon fishery for 2 days to allow for additional king salmon escapement. When the department opened the fishery on June 26, harvest exceeded 700,000 sockeye salmon and 15,000 king salmon. Ultimately, the king salmon escapement reached 60,000 fish, within the escapement goal range of 40,000–80,000 king salmon. By contrast, because the sockeye salmon run was poor in 2012, there was much less commercial fishing, contributing to king salmon escapement into the Nushagak River.

In addition, 2010 and 2012 received increased interest in harvesting pink salmon. There is a larger return of pink salmon to the Nushagak District in even years. Although there was a directed pink salmon fishery in the late 1970s and early 1980s, there hasn't been any market interest since 1984. Several processors participated in both 2010 and 2012. The harvest in 2010 was 1.3 million and in 2012 was 877,000 pink salmon.

TOGIAK DISTRICT

Togiak District harvests over the last three years were above the long-term average and sockeye salmon escapement goals were achieved. One processor operating in the Togiak District has provided a late-season market for fishermen. Escapement monitoring of king salmon is done

with postseason aerial surveys that indicate king salmon runs to the Togiak River have been below average.

CHUM AND COHO SALMON HARVEST

In Bristol Bay, the harvest of chum salmon is incidental to the directed sockeye fishery. There were 665,000 chum salmon harvested in 2012. The majority of the chum salmon harvest occurs in Nushagak and Togiak districts. Price has increased considerably over the last three years, from $0.17 per pound in 2009 to $0.35 per pound in 2012.

The coho salmon harvest was above the long-term average for two of the last three years. The Nushagak River is the largest coho salmon producer in Bristol Bay and coho run timing overlaps with pink salmon run timing. In 2010 and 2012, harvests were 104,000 and 110,000 coho salmon, respectively. The 2011 coho salmon harvest was 14,000. This reflects a lack of market interest because there was no pink salmon fishery.

SUMMARY

From 2010–2012, sockeye salmon escapement goals have been met for all systems. Commercial fishing proposals for this board cycle include Togiak herring, fishing gear specifications and operations, closed waters, permit stacking for both set and drift gillnet gear groups, allocation, 32-foot length limit for drift gillnet vessels, and management plans. Harvest and escapement information for the last three years for each district are presented in Appendices A1–A3.

APPENDIX A

Appendix A1.–Total inshore run of salmon, in numbers of fish, Bristol Bay, 2010.

District	Sockeye	King	Chum	Pink	Coho	TOTAL
Naknek-Kvichak Catch	10,858,355	946	337,888	7,957	1,003	11,206,149
Escapement – Kvichak Tower	4,207,410	[a]	[a]	[a]	[a]	4,207,410
Naknek Tower	1,463,928	[a]	[a]	[a]	[a]	1,463,928
Alagnak Tower	1,187,730	[a]	[a]	[a]	[a]	1,187,730
NK Subtotal	17,717,423	946	337,888	7,957	1,003	18,065,217
Egegik Catch	5,071,043	179	57,286	1,709	10,344	5,140,561
Escapement - Egegik Tower	926,904	[a]	[a]	[a]	[a]	926,904
other [b]	150	188	5,560	[a]	[a]	5,898
Egegik Subtotal	5,998,097	367	62,846	1,709	10,344	6,073,363
Ugashik Catch	4,031,832	428	62,987	0	407	4,095,654
Escapement - Ugashik Tower	805,686	[a]	[a]	[a]	[a]	805,686
other [c]	25,200	295	2,222	[a]	[a]	27,717
Ugashik Subtotal	4,862,718	723	65,209	0	407	4,929,057
Nushagak Catch	8,424,030	25,501	424,210	1,274,460	72,686	10,220,887
Escapement - Wood Tower	1,804,344	[a]	[a]	[a]	[a]	1,804,344
Igushik	518,040	[a]	[a]	[a]	[a]	518,040
Nushagak	468,696	36,625	273,914	[a]	[a]	779,235
Nushagak Subtotal	11,215,110	62,126	698,124	1,274,460	72,686	13,322,506
Togiak Catch	667,850	5,134	118,760	49,898	24,062	865,704
Escapement - Togiak Tower	188,298	[a]	[a]	[a]	[a]	188,298
Togiak R. and Trib.	[a]	[a]	[a]	[a]	[a]	0
Kulukak	[a]	[a]	[a]	[a]	[a]	0
Togiak Subtotal	856,148	5,134	118,760	49,898	24,062	1,054,002
Bristol Bay Catch	29,053,110	32,188	1,001,131	1,334,024	108,502	31,528,955
Bristol Bay Escapement	11,596,386	39,304	431,696	[a]	[a]	12,067,386
Bristol Bay Total Run	40,649,496	71,492	1,432,827	1,334,024	108,502	43,596,341

Note: Escapement data for coho salmon are incomplete (in most cases the data are escapement index counts). Total run data do not include sport or subsistence harvests.

[a] Information not collected.

[b] Includes aerial surveys of King Salmon River drainage and Shosky Creek.

[c] Includes aerial surveys of King and Dog Salmon Rivers.

Appendix A2.–Total inshore run of salmon, in numbers of fish, Bristol Bay, 2011.

District	Sockeye	King	Chum	Pink	Coho	TOTAL
Naknek-Kvichak Catch	9,016,320	1,701	218,698	13	900	9,237,632
Escapement – Kvichak Tower	2,264,352	[a]	[a]	[a]	[a]	2,264,352
Naknek Tower	1,177,074	[a]	[a]	[a]	[a]	1,177,074
Alagnak Tower	883,794	[a]	[a]	[a]	[a]	883,794
NK Subtotal	13,341,540	1,701	218,698	13	900	13,562,852
Egegik Catch	4,810,362	449	39,237	0	290	4,850,338
Escapement - Egegik Tower	961,200	[a]	[a]	[a]	[a]	961,200
other [b]	[a]	[a]	[a]	[a]	[a]	0
Egegik Subtotal	5,771,562	449	39,237	0	290	5,811,538
Ugashik Catch	2,643,495	333	34,286	6	84	2,678,204
Escapement - Ugashik Tower	1,003,753	[a]	[a]	[a]	[a]	1,003,753
other [c]	26,100	67	31	[a]	[a]	26,198
Ugashik Subtotal	3,673,348	400	34,317	6	84	3,708,155
Nushagak Catch	4,886,553	26,443	296,864	294	4,492	5,214,646
Escapement - Wood Tower	1,098,006	[a]	[a]	[a]	[a]	1,098,006
Igushik	421,380	[a]	[a]	[a]	[a]	421,380
Nushagak	428,191	59,728	248,278	[a]	[a]	736,197
Nushagak Subtotal	6,834,130	86,171	545,142	294	4,492	7,470,229
Togiak Catch	744,626	6,650	113,234	347	7,605	872,462
Escapement - Togiak Tower	190,970	[a]	[a]	[a]	[a]	190,970
Togiak R. and Trib.	[a]	[a]	[a]	[a]	[a]	0
Kulukak	[a]	[a]	[a]	[a]	[a]	0
Togiak Subtotal	935,596	6,650	113,234	347	7,605	1,063,432
Bristol Bay Catch	22,101,356	35,576	702,319	660	13,371	22,853,282
Bristol Bay Escapement	8,454,820	59,795	248,309	[a]	[a]	8,762,924
Bristol Bay Total Run	30,556,176	95,371	950,628	660	13,371	31,616,206

Note: Escapement data for coho salmon are incomplete (in most cases the data are escapement index counts). Total run data do not include sport or subsistence harvests.

[a] Information not collected.

[b] Includes aerial surveys of King Salmon River drainage and Shosky Creek.

[c] Includes aerial surveys of King and Dog Salmon Rivers.

Appendix A3.–Total inshore run of salmon, in numbers of fish, Bristol Bay, 2012.

District	Sockeye	Chinook	Chum	Pink	Coho	TOTAL
Naknek-Kvichak Catch	9,992,067	863	122,813	3,535	423	10,119,701
Escapement - Kvichak Tower	4,164,444	[a]	[a]	[a]	[a]	4,164,444
Naknek Tower	900,312	[a]	[a]	[a]	[a]	900,312
NK Subtotal	15,056,823	863	122,813	3,535	423	15,184,457
Egegik Catch	4,889,724	24	38,121	285	1,286	4,929,440
Escapement - Egegik Tower	1,233,900	[a]	[a]	[a]	[a]	1,233,900
other [b]	300	188	7,600	[a]	[a]	8,088
Egegik Subtotal	6,123,924	212	45,721	285	1,286	6,171,428
Ugashik Catch	2,347,055	90	30,108	0	0	2,377,253
Escapement - Ugashik Tower	670,578	[a]	[a]	[a]	[a]	670,578
other [c]	45,158	295	10,205	[a]	[a]	55,658
Ugashik Subtotal	3,062,791	385	40,313	0	0	3,103,489
Nushagak Catch	2,701,830	11,501	268,361	877,466	92,598	3,951,756
Escapement - Wood Tower	764,202	[a]	[a]	[a]	[a]	764,202
Igushik	193,770	[a]	[a]	[a]	[a]	193,770
Nushagak	432,438	107,786	395,162	1214960	329946	2,480,292
Nushagak Subtotal	4,092,240	119,287	663,523	2,092,426	422,544	7,390,020
Togiak Catch	626,291	4,613	206,531	29,089	16,012	882,536
Escapement - Togiak Tower	203,148	[a]	[a]	[a]	[a]	203,148
Togiak R. & Trib.	[a]	[a]	[a]	[a]	[a]	0
Kulukak	[a]	[a]	[a]	[a]	[a]	0
Togiak Subtotal	829,439	4,613	206,531	29,089	16,012	1,085,684
Bristol Bay Catch	20,556,967	17,091	665,934	910,375	110,319	22,260,686
Bristol Bay Escapement	8,608,250	110,465	562,967	[a]	329,946	9,611,628
Bristol Bay Total Run	29,165,217	127,556	1,228,901	910,375	110,319	31,542,368

Note: Data are preliminary. Escapement data for coho salmon are incomplete (in most cases the data are escapement index counts). Total run data do not include sport or subsistence harvests.

[a] Information not collected.

[b] Includes aerial surveys of King Salmon River drainage and Shosky Creek.

[c] Includes aerial surveys of King and Dog Salmon Rivers.