

Fishery Management Report No. 13-39

Pasagshak River Weir Report, 2013

by

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient (multiple)	R
milliliter	mL	west	W	correlation coefficient (simple)	r
millimeter	mm	copyright	©	covariance	cov
		corporate suffixes:		degree (angular)	°
Weights and measures (English)		Company	Co.	degrees of freedom	df
cubic feet per second	ft ³ /s	Corporation	Corp.	expected value	E
foot	ft	Incorporated	Inc.	greater than	>
gallon	gal	Limited	Ltd.	greater than or equal to	≥
inch	in	District of Columbia	D.C.	harvest per unit effort	HPUE
mile	mi	et alii (and others)	et al.	less than	<
nautical mile	nmi	et cetera (and so forth)	etc.	less than or equal to	≤
ounce	oz	exempli gratia	e.g.	logarithm (natural)	ln
pound	lb	(for example)		logarithm (base 10)	log
quart	qt	Federal Information Code	FIC	logarithm (specify base)	log ₂ , etc.
yard	yd	id est (that is)	i.e.	minute (angular)	'
		latitude or longitude	lat. or long.	not significant	NS
Time and temperature		monetary symbols (U.S.)	\$, ¢	null hypothesis	H_0
day	d	months (tables and figures): first three letters	Jan, ..., Dec	percent	%
degrees Celsius	°C	registered trademark	®	probability	P
degrees Fahrenheit	°F	trademark	™	probability of a type I error (rejection of the null hypothesis when true)	α
degrees kelvin	K	United States (adjective)	U.S.	probability of a type II error (acceptance of the null hypothesis when false)	β
hour	h	United States of America (noun)	USA	second (angular)	"
minute	min	U.S.C.	United States Code	standard deviation	SD
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard error	SE
				variance	
Physics and chemistry				population sample	Var var
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				

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By

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ABSTRACT

A fish counting weir was installed in the Pasagshak River during 2013 by the Alaska Department of Fish and Game to enumerate sockeye salmon *Oncorhynchus nerka* escapement into Lake Rose Teed. Escapement was enumerated through a conventional wood tripod and aluminum panel weir daily from June 13 through August 6. Torrential rains during August 5 and 6 caused the river to crest on August 6, submerging and bypassing the weir and resulted in erosion under the weir. The total number of sockeye salmon counted through the weir was 11,021 and the estimate of fish passage after the weir was out was 400 fish. The total estimated sockeye salmon escapement was 11,421 fish with peak passage occurring on several individual dates during late June through mid July. Additionally, 106 pink salmon *O. gorbuscha*, and 65 chum salmon *O. keta* were counted through the weir. Sockeye salmon were sampled for age, sex, and length from a trap built onto the weir and from the subsistence gillnet harvest in Pasagshak Bay. The average length (mid eye to tail fork) of Pasagshak River sockeye salmon escapement was 556 mm and the dominant age class was age-0.3, 73.0 percent of the run. The Pasagshak River sockeye salmon escapement consisted of approximately 37.5% females and 62.5% males.

Key words: sockeye salmon; age, sex, and length (ASL); subsistence; Pasagshak River; Lake Rose Teed

INTRODUCTION

Pasagshak River, located on the Kodiak road system (Figures 1 and 2), has recently supported one of the largest sockeye salmon *Oncorhynchus nerka* subsistence fisheries for Kodiak Island residents (Figures 3 and 4; Alaska Department of Fish and Game [ADF&G], Division of Commercial Fisheries, unpublished data). During the past two decades, subsistence harvest of Pasagshak River sockeye salmon has increased disproportionately to escapement (Figure 3). Previous escapement enumeration methodology provided only postseason estimates via aerial and foot surveys of the spawning grounds, making inseason subsistence and sport fisheries management impossible and refinement of an escapement goal for this stock problematic. A conventional wood tripod and aluminum panel weir was constructed near the outlet of the lake by the Alaska Department of Fish and Game (ADF&G) during 2011 through 2013 to provide timely and accurate escapement information to help maintain the sustainability of this important subsistence and recreational use salmon run.

The Pasagshak River is located on the northeast side of Kodiak Island and is accessible by car from the city of Kodiak (Figure 1). Lake Rose Teed (formerly “Rose Tead”), which drains into the Pasagshak River, is a small, shallow lake (0.94 km²; 2.1 m average depth). Prior to the 1964 earthquake and subsequent tsunami, Lake Rose Teed had little salmon rearing habitat; however, the earthquake lowered the elevation of the lake, allowing nutrient rich marine water to enter the lake during high tide cycles, dramatically increasing the salmon rearing potential (Murray 1986). Pasagshak River State Recreational Site is the only designated park land outside of the immediate city area but still within the road system (Figure 2). The mouth of the Pasagshak River is also a prehistoric native settlement site (P. Saltonstall, Alutiiq Museum, Kodiak, personal communication).

Since 1968, Pasagshak River salmon escapement had been estimated post season using both aerial and foot surveys of the spawning grounds. Although annual survey estimates have been highly variable, sockeye salmon production has generally increased since that time (Figure 3). The current escapement goal for Pasagshak River sockeye salmon is a lower-bound sustainable escapement goal of 3,000 fish (Nemeth et al. 2010). Because surveys took place on the spawning grounds, estimates of the escapement were not made until well after the fish escaped the subsistence, sport, and commercial fisheries. Since escapement was not estimated in season, no

management action to regulate harvests was possible and overharvest could have occurred but not have been detected until any action was too late.

Subsistence harvest of this salmon stock has been increasing since subsistence records were initiated in 1986. During 2008 and 2009 the Pasagshak River was the largest subsistence salmon fishery in the Kodiak Management Area (Figure 4; ADF&G, Division of Commercial Fisheries, unpublished data). During 2010 through 2012, the Settler's Cove put and take subsistence fishery near the City of Port Lions received unexpectedly large runs and Pasagshak fell to the second largest subsistence fishery in the Kodiak Management Area. During recent years prior to 2010, two other significant sockeye salmon runs near the City of Kodiak, Afognak and Buskin lakes, experienced significant reductions in run size, restricted fishing opportunities, and total subsistence fishing closures in some years (Baer et al. 2009; Dinnocenzo et al. 2009; Jackson et al. 2010). Such restrictions on stocks can displace users to other systems (Magdanz et al. 2003), leading to concern that without a weir in place, Pasagshak River sockeye salmon will incur increased harvest pressure while ADF&G is unable to monitor escapement in season.

Timely inseason estimates of Pasagshak River sockeye salmon escapement were made during 2011 through 2013 through operation of a weir near the outlet of Lake Rose Teed. Age, sex, and length (ASL) data was also collected with a trap attached to the upstream portion of the weir.

In addition to the installation and annual operation of the escapement monitoring weir, important information on subsistence effort at the Pasagshak River was obtained through harvester interviews conducted by ADF&G technicians. ASL data obtained from subsistence harvests augment ASL data obtained from the weir trap and provide valuable information on the harvest composition, size selectivity, and magnitude relative to escapement.

METHODS

The Pasagshak River weir was installed and fish tight on June 13, 2013 (Figure 5), approximately 1 km downstream of the outlet of Lake Rose Teed, and escapement was enumerated through August 6. Operation of the weir was conducted in accordance with the Pasagshak River salmon weir operational plan (Witteveen 2013). The gate to allow fish passage was opened daily, approximately every two to three hours between 7:00 AM and midnight. All species including sockeye, pink *O. gorbuscha*, chum salmon *O. keta*, and Dolly Varden *Salvelinus malma* were enumerated.

During the high tidal cycles (with higher high tides of about 9.3 ft), a strong upstream current took place at the weir location. With the knowledge gained from the 2011 season that weir panels had to be secured to the tripods with Telespar® and lagbolts, the weir was able to withstand those currents during 2012 and 2013.

ASL sampling from sockeye salmon caught in the fish trap was conducted with a weekly goal of 240 fish. Ideally 80 fish were sampled on Wednesday, Friday, and Monday of each statistical week. All scales, when possible, were collected from the preferred area of each fish following procedures outlined by the International North Pacific Fisheries Commission (INPFC 1963). The "preferred scale" (located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin) was removed with forceps and mounted on a scale "gum" card. The sex and length of the fish (fish length in millimeters from mid eye to tail fork) was recorded to rugged digital assistants and the data was downloaded to laptop computers daily.

All scales collected were mounted on scale cards and impressions were made on cellulose diacetate (Clutter and Whitesel 1956). Fish ages were assigned by examining scale impressions for annual growth increments using a microfiche reader fitted with a 48X lens following designation criteria established by Mosher (1968). Ages were entered directly into the salmon database using European notation (Koo 1962) where a decimal separates the number of winters spent in fresh water (after emergence) from the number of winters spent in salt water.

Peak subsistence effort (number of boats) was estimated daily. Subsistence fishermen were interviewed approximately three times per week and ASL samples of their catch were taken. ADF&G technicians opportunistically contacted sockeye salmon subsistence fishermen on the fishing grounds in front of the Pasagshak River or at Pasagshak State Recreation Area boat landing. Following a set of brief introductory remarks by the technician, all subsistence users who agreed to be interviewed were asked a short series of questions to determine their level of effort at Pasagshak River (Appendix A). An effort was made to conduct interviews in a weekly quantity proportional to subsistence effort.

2012 HARVEST RATE

With reliable escapement estimates provided by the weir along with reliable harvest estimates, a harvest rate for Pasagshak River sockeye salmon can be calculated. Sport and subsistence sockeye salmon harvest data are not available from 2013 yet; however, data from 2012 has been compiled. Sport harvest of Pasagshak fish from 2012 totaled 2,080 sockeye salmon and subsistence harvest was estimated at 4,981 sockeye salmon (ADF&G, Division of Commercial Fisheries, unpublished data). There was no commercial salmon fishing effort in Pasagshak Bay or in the statistical area of the Outer Ugak Bay Section adjacent to Pasagshak in 2012. The stock composition of other adjacent fishing areas is unknown and therefore, the run size and associated harvest rate is considered a minimum. The total estimated harvest was 7,061 sockeye salmon. Summing the harvest with 2012 escapement of 4,585 sockeye salmon results in a total run estimate of 11,646 fish. The harvest rate is calculated as:

$$HR=h/r, \tag{1}$$

where

h = harvest

r = run.

RESULTS

The total sockeye salmon escapement through the Pasagshak River weir in 2013 was 11,421 fish including 158 jacks (Table 1). In addition 106 pink salmon and 65 chum salmon (Table 1) passed through the weir. The daily sockeye salmon escapement peaked during late June through mid July, but a large proportion of the total escapement was limited to four or five single day peaks of escapement (Figures 6 and 7). Large pulses of daily passage did not correlate as well with increasing tidal cycles (Figures 6 and 7) as observed in 2011; however, there appears to be some relationship between the two. Sockeye salmon were often observed holding in various portions of the river for several days before they approached and passed through the weir, so salmon entry in to the river may be related to tidal cycles, but passage through the weir may be delayed, masking the relationship.

During August 5 and 6, torrential rains and high water conditions doubled the width of the river at the weir site and river depth rose over half of the weir panels. The excessive plant debris from the lake caused erosion under the weir panels and the weir was not fish tight when the water receded. Due to the relatively low counts prior to the weir washing out and the short amount of time until the targeted weir pull out date of August 15, the weir was not reinstalled when the water receded. Based on the counts during the week prior to the washout and observations by the weir crew, a post weir escapement of 400 fish was estimated.

Trapping fish at the weir for ASL samples continued to be difficult in 2013. Since fish were observed entering the trap and then going back down river despite a small trap opening, a cod trigger, typically used on a commercial cod pot was fitted to the trap entrance. This required the fish to push through plastic “fingers” to enter the trap, but then made it more difficult to escape the trap. This improved trap retention and the number of fish available to sample. A total of 328 fish were sampled during 2013 (Table 2). Early season fish were especially difficult to get into the trap, but samples were more available from the subsistence fishery early in the season (Table 3), so the total run was well represented.

The dominant age of Pasagshak River sockeye salmon escapement collected at the weir trap was age-0.3 fish which composed about 73.0 percent of the escapement (Table 2). Temporally, age-0.3 fish composition decreased slightly late in the run, but were always the dominant age class. Age-1.3 fish composed most of the remainder of the run with 20.6% and age-0.2, -1.2, and -2.2 fish contributed relatively small numbers. The 2013 age composition structure was different than in 2012 when age-1.3 fish were dominant (Witteveen 2012). The ages during 2013 were more similar to the 2011 season; however, during 2011, age-0.3 were dominant early in the season and diminished substantially throughout the season (Witteveen 2011).

The age of fish collected from the subsistence fishery was similar to the escapement ages with age-0.3 fish dominating the catch throughout the season averaging 64.3% of the catch (Table 3). Temporal trends seemed similar to the escapement (Table 2); however, a small number of age-2.3, and -2.4 fish were observed in the harvest and were not observed in the escapement.

Pasagshak River sockeye salmon were large compared to other Kodiak Management Area sockeye salmon (ADF&G, Division of Commercial Fisheries, unpublished data) with an average length of 555 mm mid eye to tail fork from the escapement samples and an average length of 562 mm mid eye to tail fork from the subsistence samples (Tables 4 and 5).

Subsistence effort increased markedly during late June and appeared to slowly taper off after mid July (Figure 8). The weir crew put a lot of extra effort into increasing the number of samples from the subsistence fishery this year. They were able to sample 905 fish, up significantly from only 199 fish in 2012.

2012 HARVEST RATE

The harvest rate on Pasagshak River sockeye salmon by sport and subsistence fisheries was estimated at 0.61.

DISCUSSION

Passage of sockeye salmon through the Pasagshak River occurred primarily during late June through July, later than most Kodiak area early sockeye salmon runs but earlier than most late sockeye salmon runs (Foster 2011). Daily escapement seemed to be less dependent on tidal cycle (Figure 6) than during 2011 season.

Age composition of Pasagshak River fish was primarily age-0.3 and -1.3 fish. The high proportion of age-0.3 fish less common in most Kodiak area sockeye salmon systems (Foster 2011). Locations that age-0 fish are typically found are similar to the Pasagshak system with a significant estuarine environment, areas with significant marine nutrient input, lack of deep water overwintering area, or protected marine rearing environments such as Cinder and Ilnik rivers and Upper Station (Foster 2011; Moore 2011).

Subsistence harvest effort appeared to peak in early July. The Pasagshak River weir crew made an increased effort to assess subsistence effort this season. While there is much more data available for 2013, the effort levels seem to follow a similar temporal distribution in 2011 and 2012 (Figure 8). Subsistence harvest records are not available until later in the year. The similarity in size and age between the weir ASL samples and the catch ASL samples suggest very little selectivity is occurring in the subsistence fishery and that the bulk of the subsistence harvest is bound for Pasagshak River.

Pasagshak River sockeye salmon are large compared with most Kodiak area fish (Foster 2011) and appear to be the largest from streams monitored in the Kodiak Management Area during 2013.

The 2012 harvest rate of 0.61 was much higher than the 0.35 harvest rate calculated in 2011 (Witteveen 2012). While the escapement was much higher in 2011 than in 2012 (13,402 fish versus 4,585 fish), the harvest was similar (7,088 fish in 2011 versus 7,061 fish in 2012). The number of permits fished in the Pasagshak Bay area was similar as well with 205 permits fishing in 2011 and 199 permits fishing in 2012.

ESCAPEMENT GOAL REVIEW

The department reviews escapement goals in every commercial fishing management area once every three years in conjunction with Board of Fisheries meetings for that area. While the Kodiak Management Area escapement goal review is in cycle for 2013, the time at which the escapement goal committee began the review was prior to the 2013 salmon season. As a result, there were only two seasons of Pasagshak River sockeye salmon escapement that were estimated with weir counts. The committee determined that there was not enough information to change the Pasagshak River lower-bound sustainable escapement goal of 3,000 fish (Sagalkin et al. *In Prep*).

With the 2013 salmon season complete, there are weir count estimates of escapement for Pasagshak River for three seasons. Escapement during 2011 through 2013 was 13,402, 4,585, and 11,421 fish respectively. These estimates were on the same order of estimates made by aerial survey during 1968 through 2010 (Figure 3) which averaged about 11,000 fish. During 2011 and 2013, aerial surveys were conducted on Lake Rose Teed after the weir was removed. In 2011, the aerial survey estimate was 8,100 sockeye salmon, or 60% of the weir count; however, the observer noted that there was a large ball of fish deep in the lake that he was unable to estimate.

In 2013, the aerial survey estimate was 10,150 fish, or 89% of the weir estimate. While aerial survey estimates cannot be made in a timely manner to have a bearing on management of the commercial, sport, or subsistence fishery, based on the two years they were conducted, they appear to be reasonable but conservative estimates compared to those made with weir counts. The 2011 through 2013 weir counts are on the same order as aerial surveys in the recent past. Since these are the same data on which the goal is based, there is no current compelling reason to modify the current escapement goal.

Age information from 2011 through 2013 indicates inconsistent age dominance and inconsistent temporal trends within seasons. Varying dominance of age 0 and age 1 fish in different years, indicates a fairly substantial life history change of Pasagshak River sockeye salmon between years. Pasagshak River sockeye salmon escapement also varied widely in the three years that the weir has been used to estimate escapement, with the largest year being almost three times larger than the smallest. If large variations in life history are occurring at Pasagshak, it will be interesting to compare future age compositions and escapement levels as those data become available.

If funding continues through the next escapement goal review cycle for the Kodiak Management Area, more data will be available to evaluate weir counts' comparability to aerial surveys. A more rigorous escapement goal review of Pasagshak River sockeye salmon will be possible and the goal will be modified if appropriate.

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TABLES AND FIGURES

Table 1.–Daily and cumulative counts of salmon passage through the Pasagshak River weir, 2013.

Date	Number of Salmon							
	Sockeye Adults	Sockeye Jacks	Daily Total	Sockeye Cumulative	Pink	Pink Cumulative	Chum	Chum Cumulative
13-Jun	28	0	28	28	0	0	0	0
14-Jun	12	0	12	40	0	0	0	0
15-Jun	38	0	38	78	0	0	0	0
16-Jun	82	0	82	160	0	0	0	0
17-Jun	241	0	241	401	0	0	0	0
18-Jun	49	0	49	450	0	0	0	0
19-Jun	17	0	17	467	0	0	0	0
20-Jun	0	0	0	467	0	0	0	0
21-Jun	18	0	18	485	0	0	0	0
22-Jun	0	0	0	485	0	0	0	0
23-Jun	542	15	557	1,042	0	0	0	0
24-Jun	777	10	787	1,829	0	0	0	0
25-Jun	649	7	656	2,485	0	0	0	0
26-Jun	513	9	522	3,007	0	0	0	0
27-Jun	369	2	371	3,378	0	0	0	0
28-Jun	2	0	2	3,380	0	0	0	0
29-Jun	597	12	609	3,989	0	0	0	0
30-Jun	156	4	160	4,149	0	0	0	0
1-Jul	64	1	65	4,214	0	0	0	0
2-Jul	22	0	22	4,236	0	0	0	0
3-Jul	9	0	9	4,245	0	0	0	0
4-Jul	42	1	43	4,288	0	0	0	0
5-Jul	5	0	5	4,293	0	0	0	0
6-Jul	5	1	6	4,299	0	0	0	0
7-Jul	3	1	4	4,303	3	3	0	0
8-Jul	664	4	668	4,971	0	3	0	0
9-Jul	158	0	158	5,129	3	6	0	0
10-Jul	38	3	41	5,170	0	6	0	0
11-Jul	191	3	194	5,364	5	11	1	1
12-Jul	37	2	39	5,403	6	17	0	1
13-Jul	82	2	84	5,487	7	24	0	1
14-Jul	32	0	32	5,519	0	24	1	2
15-Jul	1	0	1	5,520	0	24	0	2
16-Jul	804	26	830	6,350	48	72	30	32
17-Jul	369	2	371	6,721	0	72	7	39
18-Jul	343	5	348	7,069	3	75	4	43
19-Jul	108	2	110	7,179	1	76	0	43
20-Jul	128	1	129	7,308	0	76	0	43
21-Jul	475	9	484	7,792	6	82	11	54
22-Jul	219	3	222	8,014	0	82	0	54
23-Jul	126	0	126	8,140	2	84	3	57
24-Jul	941	12	953	9,093	5	89	5	62

-continued-

Table 1.–Page 2 of 2.

Date	Number of Salmon							
	Sockeye Adults	Sockeye Jacks	Daily Total	Sockeye Cumulative	Pink	Pink Cumulative	Chum	Chum Cumulative
25-Jul	272	2	274	9,367	2	91	1	63
26-Jul	405	6	411	9,778	0	91	2	65
27-Jul	118	3	121	9,899	2	93	0	65
28-Jul	101	2	103	10,002	1	94	0	65
29-Jul	136	0	136	10,138	3	97	0	65
30-Jul	140	2	142	10,280	0	97	0	65
31-Jul	3	0	3	10,283	0	97	0	65
1-Aug	37	0	37	10,320	0	97	0	65
2-Aug	4	0	4	10,324	0	97	0	65
3-Aug	446	6	452	10,776	9	106	0	65
4-Aug	137	0	137	10,913	0	106	0	65
5-Aug	8	0	8	10,921	0	106	0	65
6-Aug	100	0	100	11,021	0	106	0	65
Post weir	400	0	400	11,421	0	106	0	65
Total	11,263	158	11,421		106		65	

Table 2.—Estimated age composition of Pasagshak River sockeye salmon escapement, 2013 (interpolated between sampling events).

Stat Week	Sample Fish		Ages					Total Fish
			0.2	0.3	1.2	1.3	2.2	
24 (June 7 - June 13)	0	Percent	0.0	71.4	0.0	28.6	0.0	100.0
		Numbers	0	20	0	8	0	28
25 (Jun 14 - Jun 20)	7	Percent	0.0	72.1	0.0	27.9	0.0	100.0
		Numbers	0	314	0	125	0	439
26 (Jun 21 - Jun 27)	27	Percent	0.0	80.3	0.0	19.7	0.0	100.0
		Numbers	0	2,367	0	544	0	2,911
27 (Jun 28 - Jul 04)	28	Percent	0.0	87.4	0.0	12.2	0.4	100.0
		Numbers	0	793	0	116	1	910
28 (Jul 05 - Jul 11)	27	Percent	0.0	82.6	0.1	14.5	2.8	100.0
		Numbers	0	880	1	160	34	1,076
29 (Jul 12 - Jul 18)	42	Percent	0.1	76.3	2.4	20.2	1.0	100.0
		Numbers	3	1,279	52	363	9	1,705
30 (Jul 19 - Jul 25)	138	Percent	1.1	64.5	8.3	22.7	3.5	100.0
		Numbers	25	1,457	200	526	90	2,298
31 (Jul 26 - Aug 01)	59	Percent	0.2	59.8	8.6	25.1	6.4	100.0
		Numbers	3	574	83	236	57	953
32 (Aug 02 - Aug 08)	0	Percent	0.0	59.3	8.5	25.4	6.8	100.0
		Numbers	0	653	93	280	75	1,101
Totals	328	Percent	0.3	73.0	3.8	20.6	2.3	100.0
		Numbers	31	8,337	429	2,358	266	11,421

Table 3.—Age composition of Pasagshak Bay subsistence sockeye salmon catch samples, 2013.

Stat Week		Ages							Total
		0.2	0.3	1.2	1.3	2.2	2.3	2.4	
25 (Jun 14 - Jun 20)	Number	0	40	0	16	1	0	0	57
	Percent	0.0	70.2	0.0	28.1	1.8	0.0	0.0	
26 (Jun 21 - Jun 27)	Number	1	60	2	14	0	0	0	77
	Percent	1.3	77.9	2.6	18.2	0.0	0.0	0.0	
27 (Jun 28 - Jul 04)	Number	0	113	2	48	2	0	0	165
	Percent	0.0	68.5	1.2	29.1	1.2	0.0	0.0	
28 (Jul 05 - Jul 11)	Number	0	180	19	85	10	4	0	298
	Percent	0.0	60.4	6.4	28.5	3.4	1.3	0.0	
29 (Jul 12 - Jul 18)	Number	0	34	6	16	3	1	1	61
	Percent	0.0	55.7	9.8	26.2	4.9	1.6	1.6	
30 (Jul 19 - Jul 25)	Number	1	114	27	28	5	5	0	180
	Percent	0.6	63.3	15.0	15.6	2.8	2.8	0.0	
31 (Jul 26 - Aug 01)	Number	0	42	9	17	0	0	0	68
	Percent	0.0	61.8	13.2	25.0	0.0	0.0	0.0	
Total:	Number	2	583	65	224	21	10	1	906
	Percent	0.2	64.3	7.2	24.7	2.3	1.1	0.1	

Table 4.–Length composition of Pasagshak River sockeye salmon escapement samples by age and sex, 2013.

	Ages					Total
	0.2	0.3	1.2	1.3	2.2	
Mean Length Females	579	539	505	537	502	534
Standard Error Females	0.0	2.3	10.1	4.1	10.5	2.2
Range Females	579-579	490-586	455-543	507-580	464-539	455-586
Sample Size Females	1	82	9	23	6	121
Mean Length Males	551	569	556	573	552	569
Standard Error Males	0.0	2.1	6.8	3.2	7.5	1.7
Range Males	551-551	438-615	528-579	522-610	539-573	438-615
Sample Size Males	1	143	8	45	4	201
Mean Length	565	558	529	561	522	556
Standard Error	14.0	1.8	8.7	3.3	10.5	1.6
Range	551-579	438-615	455-579	507-610	464-573	438-615
Sample Size	2	225	17	68	10	322

Table 5.—Length composition of Pasagshak Bay sockeye salmon subsistence catch samples by age and sex, 2013.

	Ages							Total
	0.2	0.3	1.2	1.3	2.2	2.3	2.4	
Mean Length Females	0	554	520	555	534	543	571	552
Standard Error Females	0.0	1.2	3.7	2.4	10.5	9.4	0.0	1.4
Range Females		493-606	496-557	498-610	498-556	507-567	571-571	493-610
Sample Size Females	0	269	19	94	5	6	1	394
Mean Length Males	565	574	535	577	541	593	0	570
Standard Error Males	0.5	1.4	3.5	1.9	5.6	10.4	0.0	1.2
Range Males	564-565	498-634	484-573	518-623	515-597	567-610		484-634
Sample Size Males	2	313	46	130	16	4	0	511
Mean Length	565	565	531	568	540	563	571	562
Standard Error	0.5	1.0	2.8	1.7	4.9	10.5	0.0	0.9
Range	564-565	493-634	484-573	498-623	498-597	507-610	571-571	484-634
Sample Size	2	582	65	224	21	10	1	905

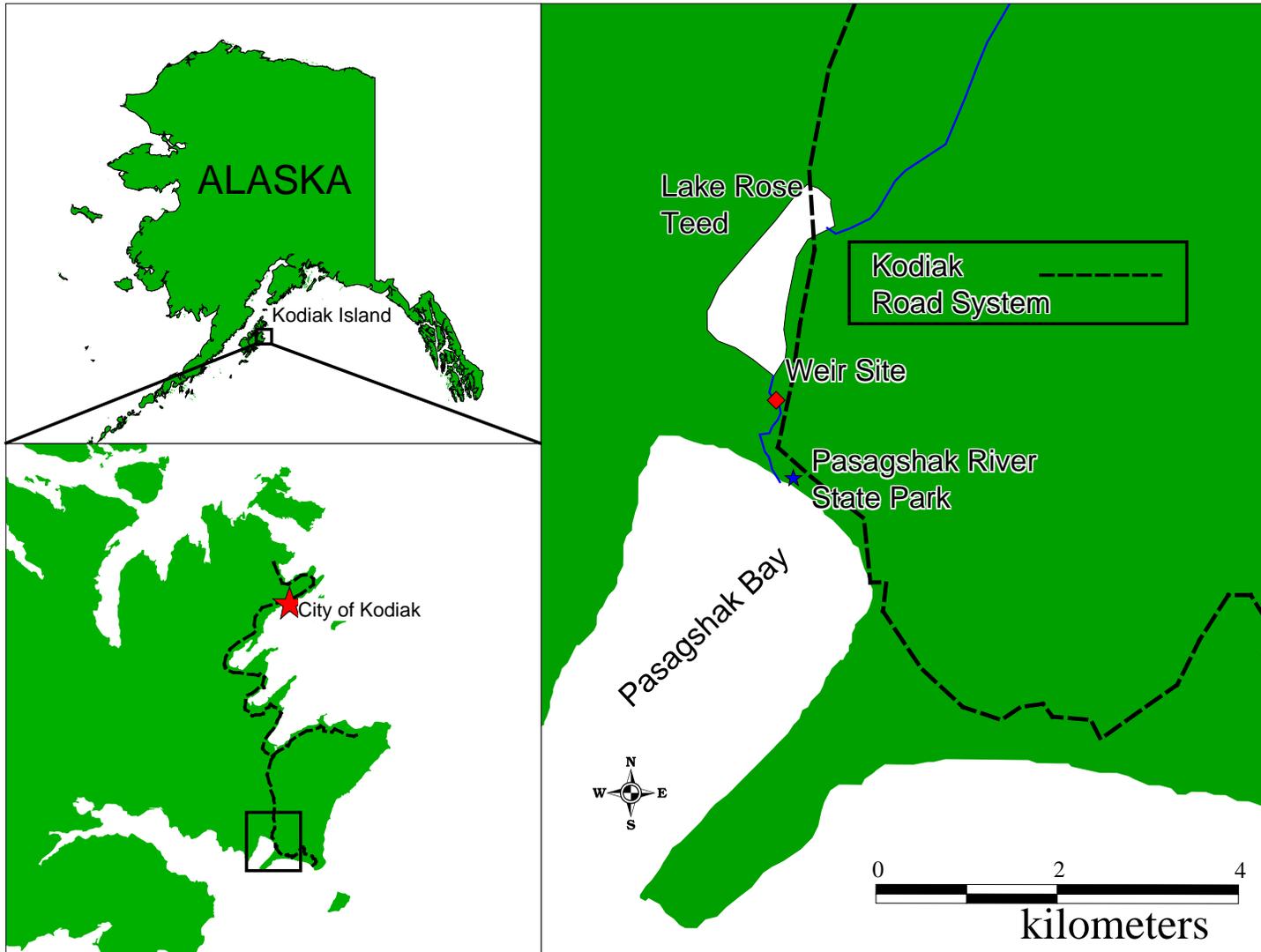


Figure 1.—Map depicting Pasagshak Bay and Lake Rose Teed area on the Kodiak road system.



Figure 2.—Aerial view of Pasagshak River State Recreation Area.

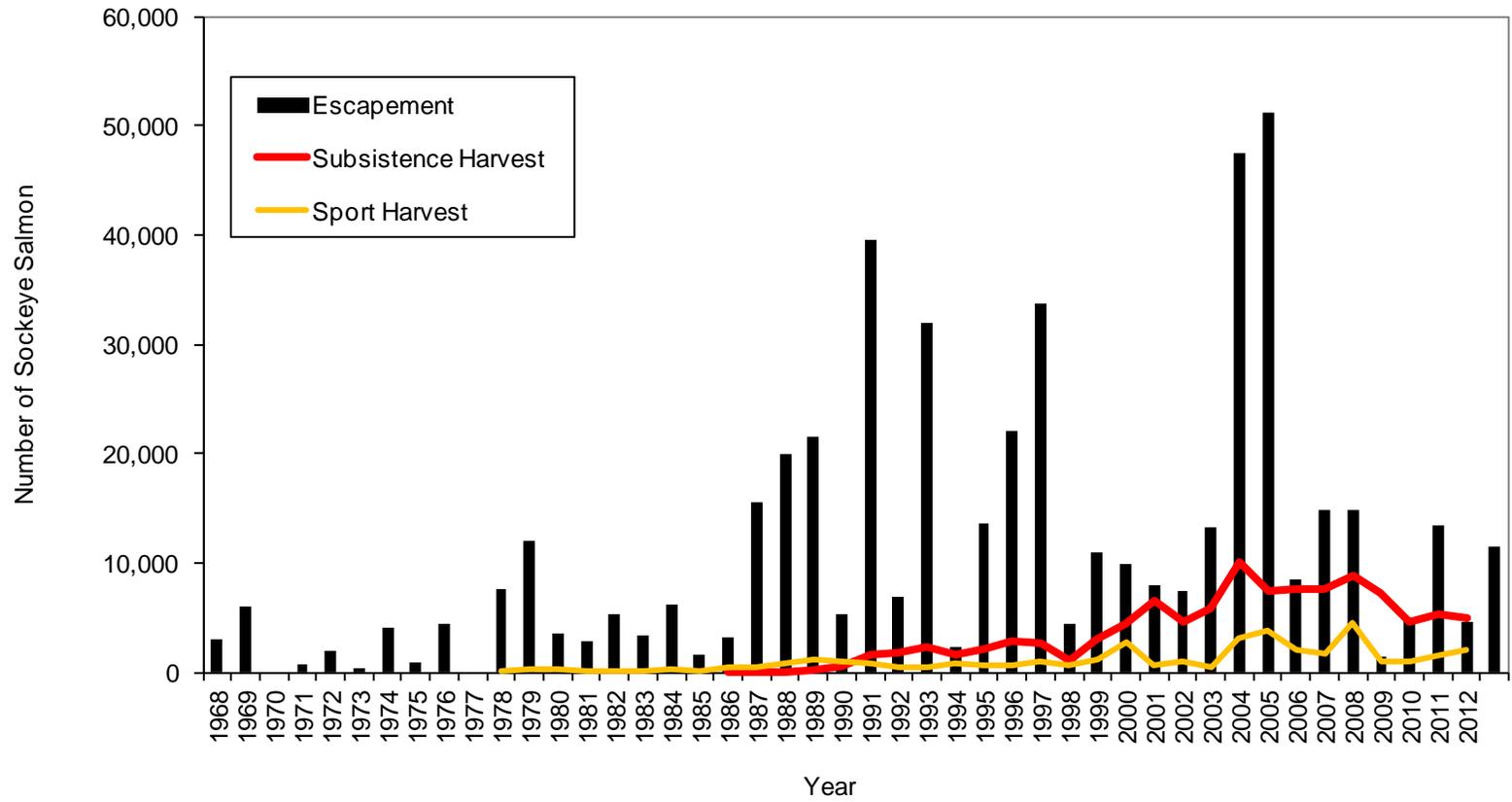


Figure 3.—Historical estimated sockeye salmon escapement and sport and subsistence harvest at Pasagshak River.

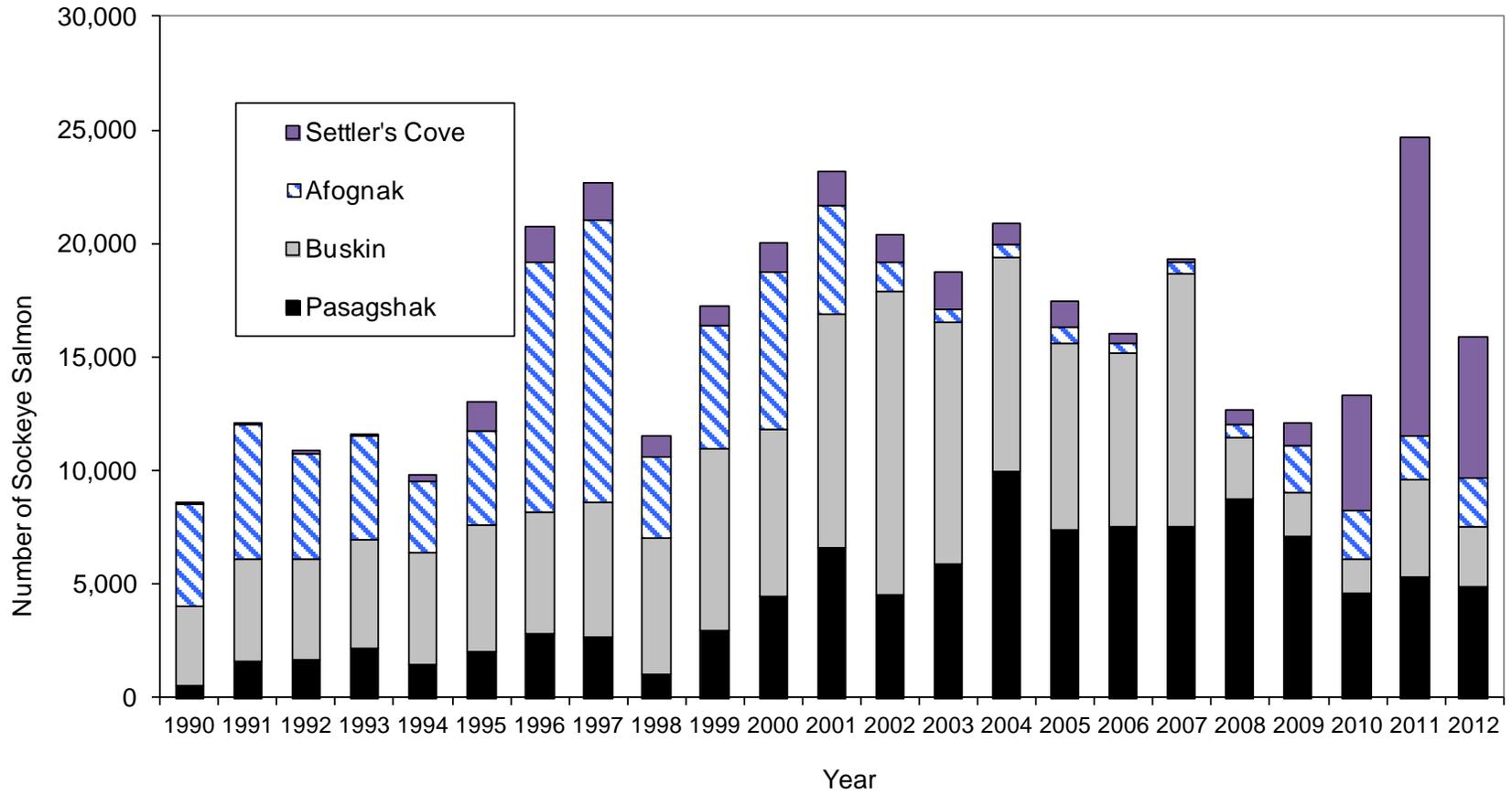


Figure 4.—Historical sockeye salmon subsistence harvest estimates for four important subsistence systems near the City of Kodiak.



Figure 5.—Pasagshak Weir fish tight on June 13, 2013.

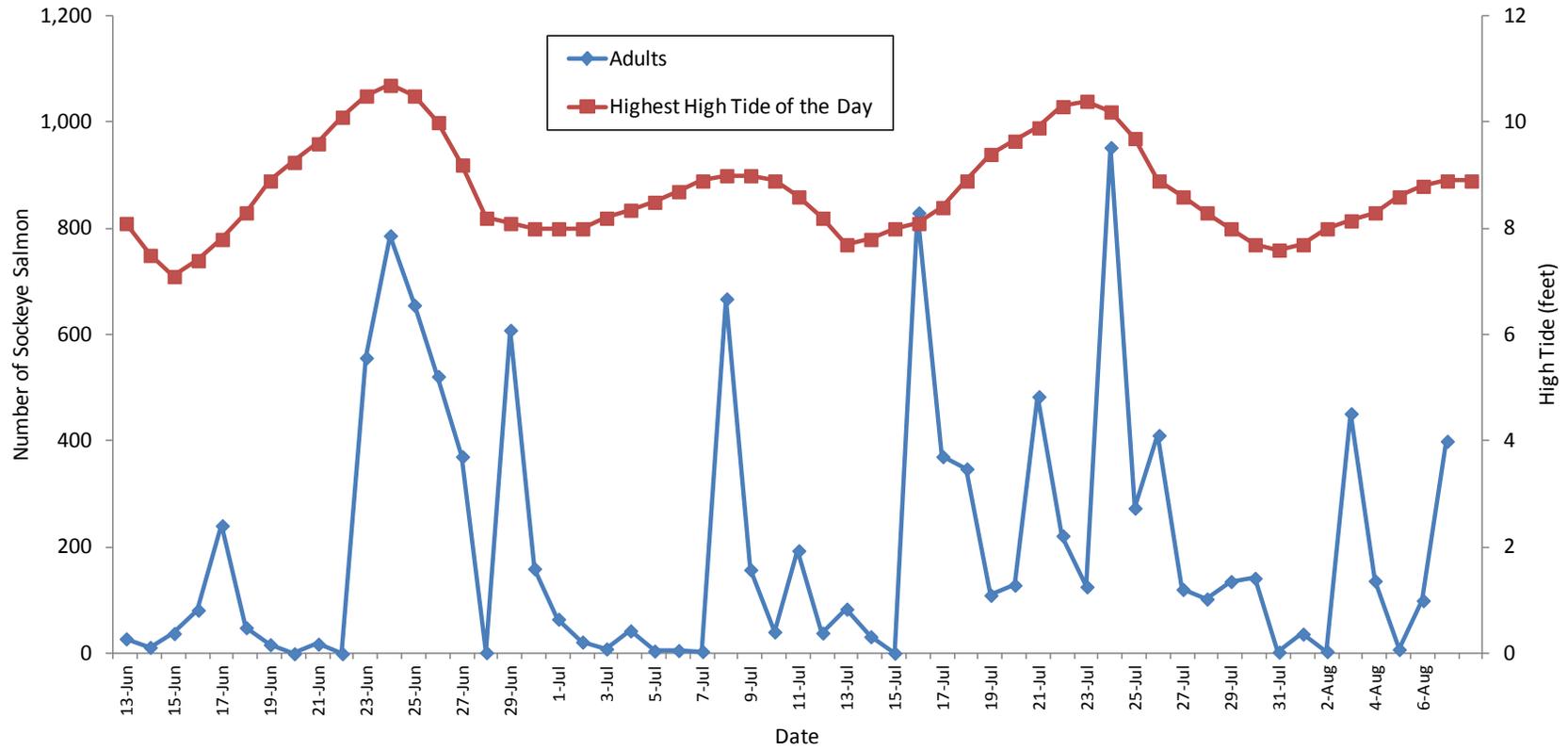


Figure 6.—Daily sockeye salmon passage through the Pasagshak River weir and the corresponding highest high tide of the day, 2013.

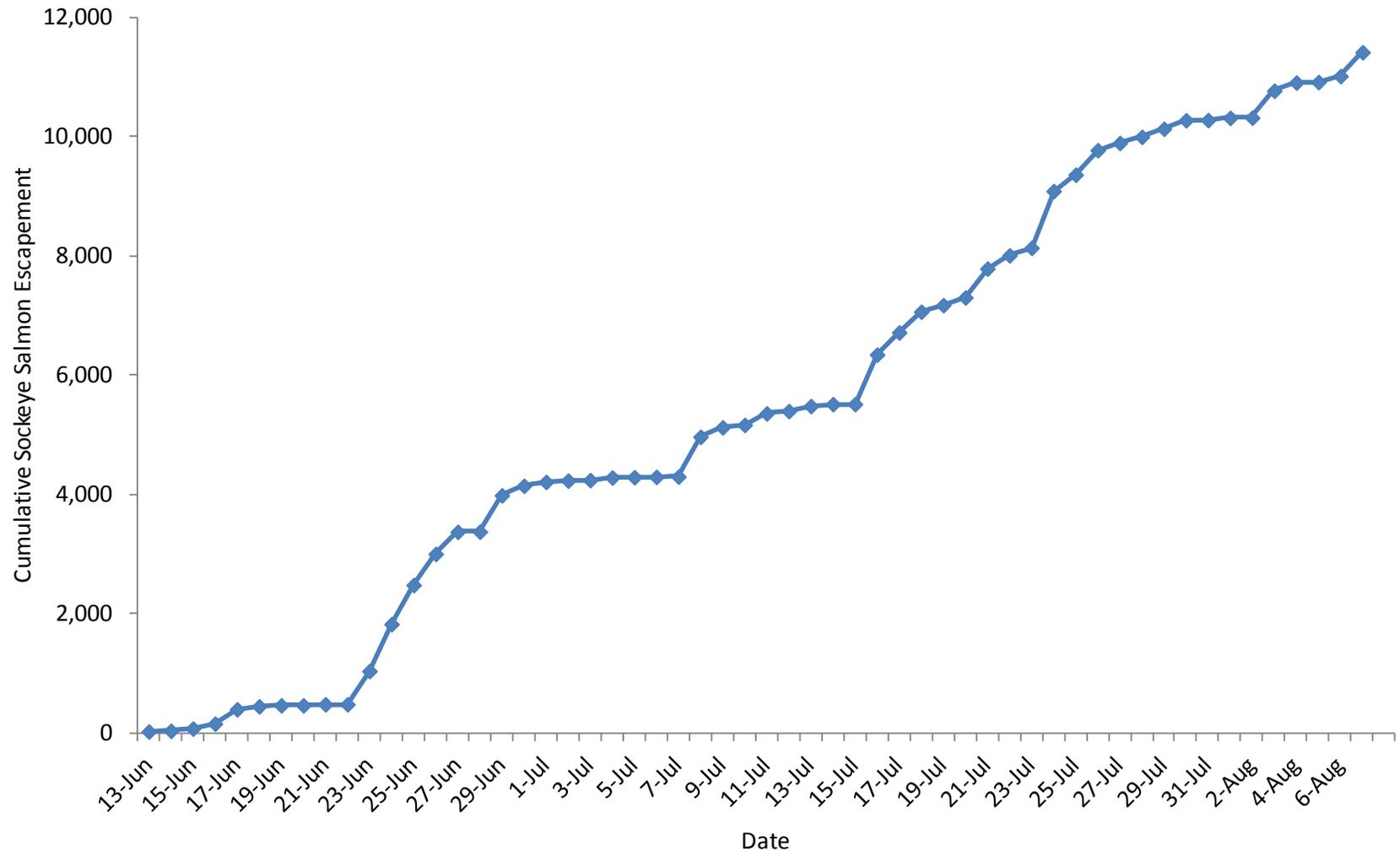


Figure 7.—Pasagshak River sockeye salmon cumulative escapement by day, 2013.

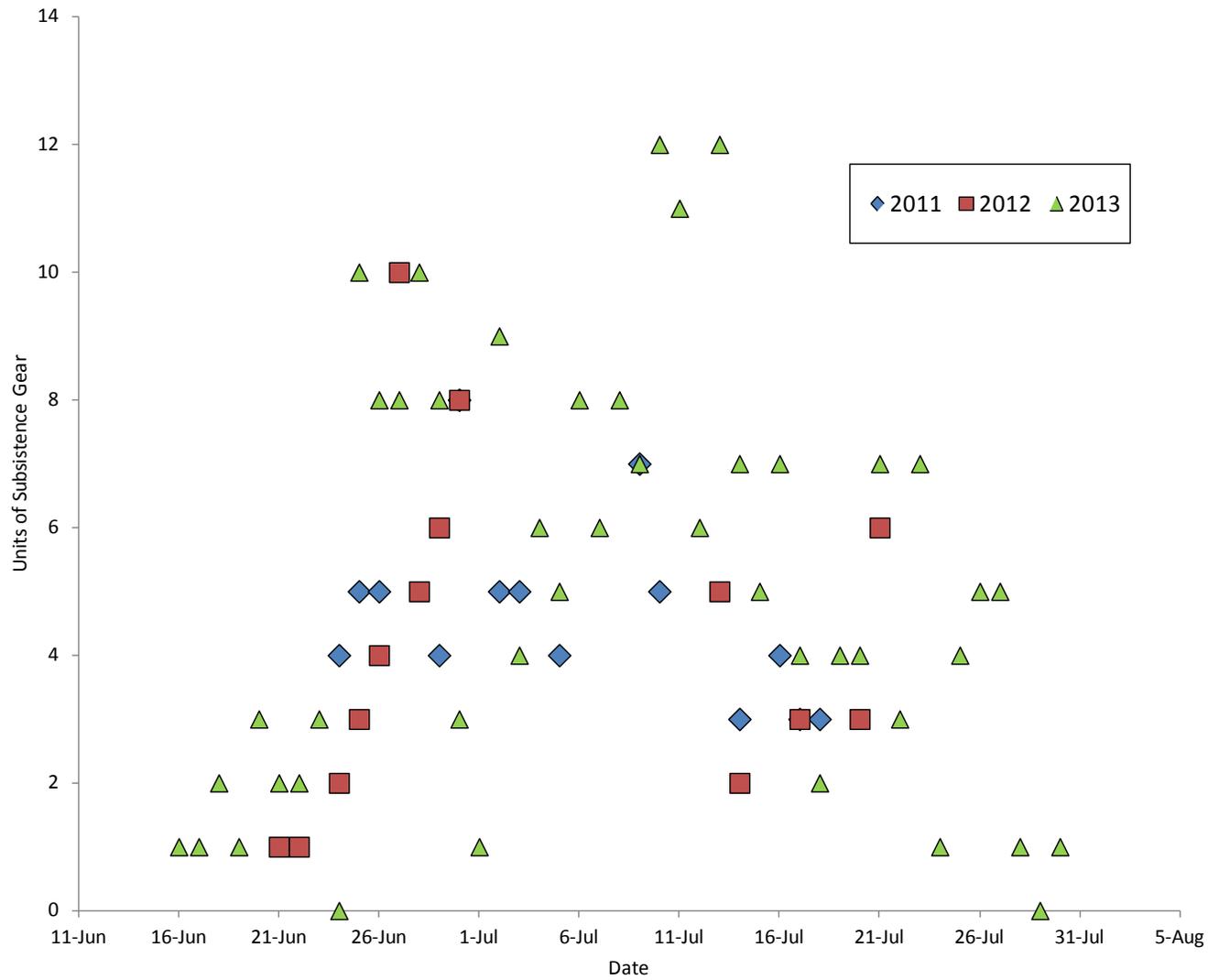


Figure 8.—Estimated daily subsistence fishing effort, measured by number of nets fishing, in Pasagshak Bay, 2011 through 2013.

APPENDIX A. SUBSISTENCE FISHERY INTERVIEW FORM

Appendix A1.–Subsistence fishery interview form.

Daily Pasagshak Subsistence Fishery Data Sheet

Date: _____ Personnel: _____

Wx: _____

Peak Estimate of Effort
(Units of gear/boats)

Fishermen Interviews

Fisherman Name (Optional)	Number of Nets	Mesh Size	Hours Fished	Number of Sockeye Salmon Caught	# Collected For ASL	Card #	Fish #
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>