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Estimation of Sockeye Salmon Escapement into McLees Lake, Unalaska Island, Alaska, 2008

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Estimation of Sockeye Salmon Escapement into McLees Lake, Unalaska Island, Alaska, 2008

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Abstract

The Anchorage Fish and Wildlife Field Office operated a fixed picket weir at the outlet of McLees Lake on Unalaska Island from 3 June to 20 July 2008. A total of 8,661 sockeye salmon *Oncorhynchus nerka* were counted through the weir. Peak daily passage occurred on 6 July when 888 sockeye salmon were counted through the weir. Seven hundred-two sockeye salmon were sampled for age, sex, and length analysis. Of this sample, 69 (9.8%) scales were unreadable and for 38 fish, gender could not be determined by external characteristics. Five age classes were identified from the 633 readable scales. Ages 1.2 (68%) and 1.3 (30%) accounted for 98% of the sample. Females comprised an estimated 54% of sockeye salmon sampled in 2008.

Introduction

Unalaska Village, on Unalaska Island, lies approximately 1,250 km southwest of Anchorage and is probably best known for its kinship to neighboring Dutch Harbor and the huge commercial fishery based there. While there is no commercial harvest of sockeye salmon in the region, this species is of great importance to local subsistence fishers. Unalaska Village is in close proximity to Unalaska Lake, and the residents of Unalaska have historically made use of the sockeye *Oncorhynchus nerka* stocks that return there each year to spawn. In 1997, the waters closest to the outlet of Unalaska Lake (approximately 100-m) were closed to subsistence fishing in an attempt to protect this stock and increase spawning escapements. In 2007, the Unalaska Lake area (this encompasses the entire watershed) subsistence salmon harvest was estimated to be 344 sockeye (14% of the total Unalaska District subsistence sockeye salmon harvest) and 10 coho *O. kisutch* (5% of the total Unalaska District subsistence coho salmon harvest) salmon (Tschersich and Russ 2008). While the 2007 coho salmon subsistence harvest from the Unalaska Lake area was the lowest on record, this species always comprises a much smaller proportion of the harvest than sockeye salmon.

With the decline of the sockeye salmon run to Unalaska Lake, Unalaska Village residents shifted their fishing efforts to the McLees Lake (also referred to as Wislow Island or Reese Bay) sockeye salmon run. This drainage is an important spawning and rearing habitat for sockeye salmon, and provides a relatively protected fishing area within Reese Bay, where the system empties into the Bering Sea. Subsistence harvests of sockeye salmon returning to McLees Lake have been monitored since 1985, and have ranged from 897 to 5,267 sockeye salmon (Tschersich and Russ 2008). In 2007, an estimated 1,605 sockeye salmon (67% of the Unalaska District subsistence sockeye salmon harvest) were harvested from the Reese Bay fishery.

Annual fluctuations in subsistence harvest have generally corresponded to the number of permits issued for the Unalaska District subsistence fishery. Since 1985, the number of subsistence permits issued for this fishery steadily increased, from 65 in 1985 to a peak of 231 in 2002 (Tschersich & Russ 2008). In 1992, the number of permits nearly doubled from that seen in the previous year, and though there has been a slow decline in permit applications since then, the

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number issued in 2008 was 207, well above the pre-1992 levels. These numbers reflect the increasing importance of sockeye salmon as a subsistence resource for the Unalaska community.

Prior to 2001, management of the fishery was based on aerial surveys, which had been conducted since 1974, and subsistence harvest data, which has been collected since 1985 (Palmer 2002). In 2001, the U. S. Fish and Wildlife Service (USFWS) installed a weir to assess the escapement, and aerial surveys were discontinued in 2003. Aerial surveys were generally limited to one survey each year, and counts ranged from 300 to 34,000 fish (A. R. Shaul, Alaska Department of Fish and Game (ADFG), personal communication). While aerial counts served as an index of abundance, they were greatly influenced by several factors including time of survey, poor weather, lack of suitable aircraft, and variation among observers.

Local residents and the ADFG were concerned that lack of reliable escapement estimates for sockeye salmon into McLees Lake could jeopardize the health of the run, as well as future opportunities for subsistence fishing. These concerns prompted the Kodiak/Aleutians Federal Subsistence Regional Advisory Council to identify an escapement monitoring project on McLees Lake as a high priority. To address these concerns, the USFWS and the Qawalangin Tribe of Unalaska entered into a partnership agreement to monitor the sockeye salmon return to McLees Lake from 2001 to 2003, and the USFWS Office of Subsistence Management provided funding to the Kenai Fish and Wildlife Field Office for the work through the Fisheries Resource Monitoring Program as project number FIS 01-059. Monitoring was continued by the King Salmon Fish and Wildlife Field Office from 2004 to 2006 as project FIS 04-404. In 2007, the King Salmon office became the Fisheries Branch of the Anchorage Fish and Wildlife Field Office (AFO) and continues the project to date. The McLees Lake sockeye salmon escapement project is currently funded through 2009 as project FIS 07-405.

Specific objectives of the project are to:

1. Enumerate the daily passage of sockeye salmon through the weir,
2. Describe the run-timing, or proportional daily passage, of sockeye salmon through the weir,
3. Estimate the sex and age composition of sockeye salmon such that simultaneous 90% confidence intervals have a maximum width of 0.20, and
4. Estimate the mean length of sockeye salmon by sex and age.

This report summarizes findings for the 2008 season, while Palmer (2002; 2003), Gates and Palmer (2004), Edwards (2005; 2006), Edwards and Hildreth (2005), and Anderson and Edwards (2008) have summarized project results for past years.

Study Area

McLees Lake empties into the Bering Sea at Reese Bay (lat. 54.0006°; long. –166.7280°) on the north side of Unalaska Island approximately 19 km northwest of the village of Unalaska (Figure 1). The McLees Lake watershed drains an area of approximately 41 km^2, and consists of a 3.98 km^2 lake with several small tributaries. The McLees Lake outlet stream is a fast moving high gradient stream that flows about 100 m before entering Reese Bay. Salmon often stage in Reese Bay and enter the McLees Lake system when migration conditions are optimal. The subsistence fishery targets salmon that are staging in Reese Bay.

The McLees Lake watershed supports spawning populations of sockeye salmon, coho salmon and Dolly Varden *Salvelinus malma*; chum *O. keta* and pink *O. gorbuscha* salmon are also present, but in limited numbers. Chinook salmon *O. tshawytscha* and steelhead *O. mykiss* have also been observed at the weir site.

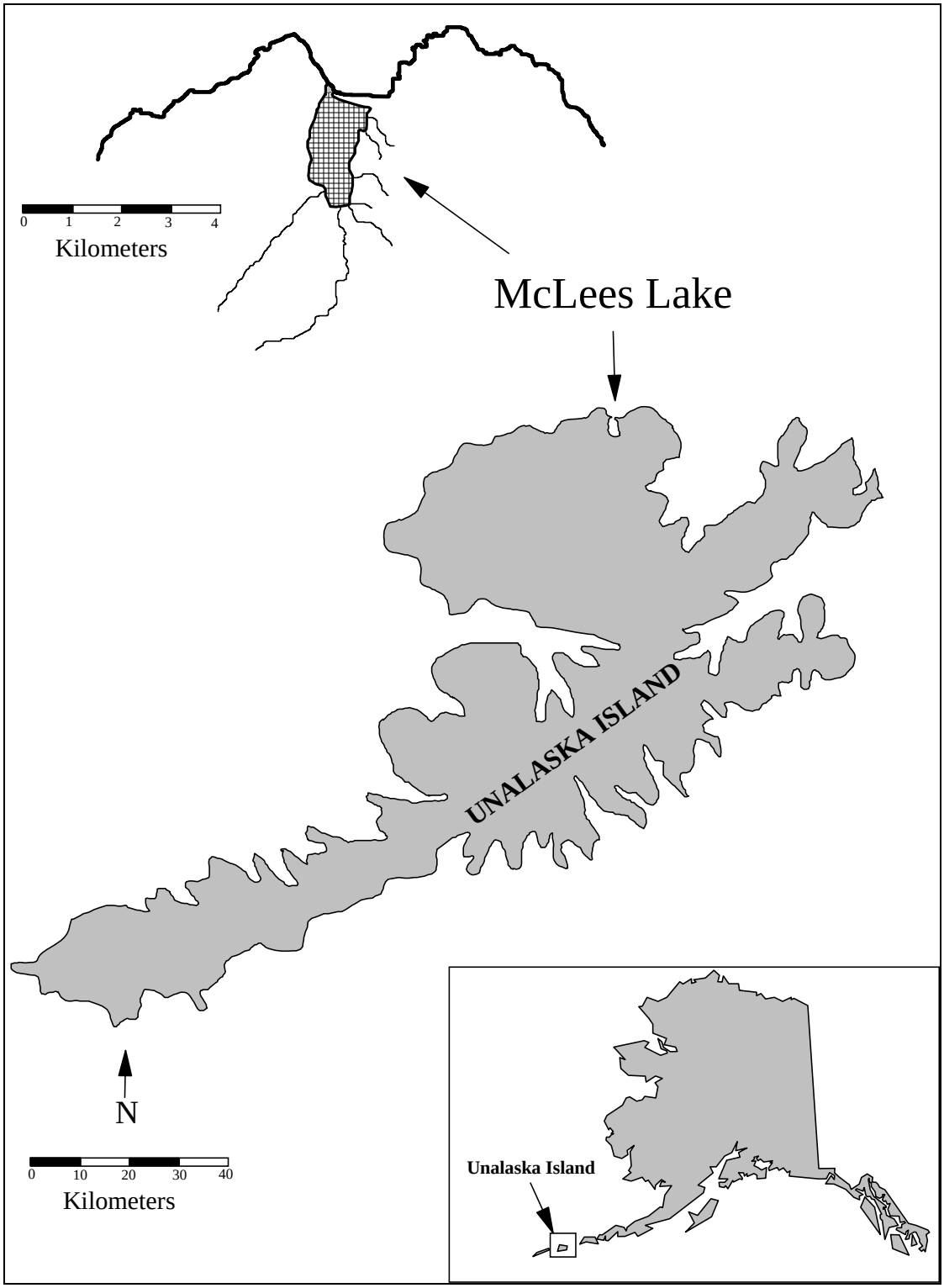

Figure 1. Map of Unalaska Island, southwest Alaska, showing location of McLees Lake study area.

Methods

Escapement Monitoring

A flexible picket weir spanning 21 m was installed at the outlet of McLees Lake and operated from 3 June to 20 July 2008. Weir pickets were composed of metal electrical conduit with a 1.3 cm inside diameter. Picket spacing ranged from 3.5 cm for panels in shallow water near each stream bank to 2.2 cm on panels near the middle of the outlet channel. All pickets were 1.5 m long and strung together with 3 mm diameter aircraft cable to make panels that spanned about 3 m. A spanning cable (6 mm diameter) was extended bank-to-bank and pulled tight about 0.3 m above the surface of the water. The weir panels were supported by the spanning cable, which was supported with two wooden tripods evenly spaced across the channel and fence posts spaced approximately every 3 m. To prevent fish from squeezing between the weir pickets, plastic snow fencing with 2.2 cm square mesh was attached to the downstream side on the bottom third of each weir panel. A live trap was constructed on the upstream side of the weir to facilitate the sampling of fish and passage of adult salmon through the weir. The weir and live trap were inspected daily and maintained as needed to ensure integrity. Stage height was measured in the morning and evening from a staff gauge located in the outlet channel.

Fish were passed and counted intermittently between 07:00 and 24:00 hours each day. The duration of each counting session varied depending on the number of fish arriving at the weir. Escapement counts were relayed to the AFO via satellite phone, and the AFO reported escapement information to ADFG managers (via e-mail) to support in-season management of the Reese Bay subsistence fishery.

Age, Sex, and Length Data

We collected sockeye salmon age, sex, and length (ASL) data using a temporally stratified sampling design (Cochran 1977) with statistical weeks defining strata. Samples were collected uniformly throughout the week. To avoid potential bias caused by the selection or capture of individual fish, all target species within the live trap were included in the sample even if the sample size goal for a species was exceeded. Although weir passage was stratified into statistical weeks *a priori*, strata for the analysis of sockeye salmon biological data at the McLees Lake weir were modified following the field season to represent actual weir passage (Table 1). For 2008, the first two weeks were combined into one stratum, as were the final two weeks, since weekly sample size goals could not be achieved.

Table 1. Strata (time periods) used for analysis of sockeye salmon biological data at McLees Lake, 2008.

Stratum	Dates
1	3 -16 June
2	17 - 23 June
3	24 - 30 June
4	1 - 7 July
5	8 - 20 July

Samples for ASL data were collected using a dip net to remove fish from the live trap in sufficient numbers to make the sample size adequate for statistical purposes. Adult salmon were

measured to the nearest mm (mid-eye to tail-fork) and their sex was determined from secondary characteristics. One scale from each sockeye salmon was removed from the preferred area on the left side of the fish (Jearld 1983), cleaned, and mounted on a gummed scale card. Sockeye salmon scales were pressed and aged after the field season by ADFG personnel. Salmon ages are reported according to the European method described by Jearld (1983) and Mosher (1968) where the number of winters the fish spent in fresh water and the number of winters spent in the ocean are separated by a decimal. Fish with scales that could not be aged were not included in age analyses. Non-target fish captured in the live trap were identified to species, enumerated, and released above the weir.

Maximum weekly sample size goals for sockeye salmon were established such that simultaneous 90% interval estimates of age composition for each week have maximum widths of 0.20 based on a multinomial sampling model (Bromaghin 1993). The weekly sample size determined from Bromaghin (1993) was n = 121 based on four age categories. This was increased to 135 to account for the expected number of unreadable scales (about 10% in past years).

Characteristics of sockeye salmon passing through the weir were estimated using standard stratified random sampling estimators (Cochran 1977). Within a given stratum m, the proportion of species i passing the weir that are of sex j and age k (p_{ijkm}) was estimated as

$$\hat{p}_{ijkm} = \frac{n_{ijkm}}{n_{i++m}},$$

where n_{ijkm} denotes the number of fish of species i, sex j, and age k sampled during stratum m and a subscript of "+" represents summation over all possible values of the corresponding variable, e.g., n_{i++m} denotes the total number of fish of species i sampled in stratum m. The variance of $\hat{p}_{ijkm}$ was estimated as

$$\hat{v}(\hat{p}_{ijkm}) = \left(1 - \frac{n_{i++m}}{N_{i++m}}\right)\frac{\hat{p}_{ijkm}\left(1 - \hat{p}_{ijkm}\right)}{n_{i++m} - 1},$$

where N_{i++m} denotes the total number of species i fish passing the weir in stratum m. The estimated number of fish of species i, sex j, age k passing the weir in stratum m ($\hat{N}_{ijkm}$) was

$$\hat{N}_{ijkm} = N_{i++m}\hat{p}_{ijkm},$$

with estimated variance

$$\hat{v}(\hat{N}_{ijkm}) = N_{i++m}^2\hat{v}(\hat{p}_{ijkm}).$$

Estimates of proportions for the entire period of weir operation were computed as weighted sums of the stratum estimates, i.e.,

$$\hat{p}_{ijk} = \sum_m \left(\frac{N_{i++m}}{N_{i+++}}\right)\hat{p}_{ijkm},$$

with estimated variance

$$\hat{v}\left(\hat{p}_{ijk}\right) = \sum_m \left(\frac{N_{i++m}}{N_{i+++}}\right)^2 \hat{v}\left(\hat{p}_{ijkm}\right).$$

The total number of fish in a species, sex, and age category passing the weir during the entire period of operation was estimated as

$$\hat{N}_{ijk} = \sum_m \hat{N}_{ijkm} ,$$

with estimated variance

$$\hat{v}\left(\hat{N}_{ijk}\right) = \sum_m \hat{v}\left(\hat{N}_{ijkm}\right).$$

If the length of fish of species *i*, sex *j*, and age *k* sampled in stratum *m* is denoted x_{ijkm}, the sample mean length of fish of species *i*, sex *j*, and age *k* within stratum *m* was calculated as

$$\bar{x}_{ijkm} = \frac{\sum x_{ijkm}}{n_{ijkm}} ,$$

with corresponding sample variance s^2_{ijkm} calculated as

$$s^2_{ijkm} = \left(1 - \frac{n_{ijkm}}{\hat{N}_{ijkm}}\right) \frac{\sum \left(x_{ijkm} - \bar{x}_{ijkm}\right)^2}{n_{ijkm} - 1} .$$

The mean length of all fish of species *i*, sex *j*, and age *k* ($\hat{\bar{x}}_{ijk}$) was estimated as a weighted sum of the stratum means, i.e.,

$$\hat{\bar{x}}_{ijk} = \sum_m \left(\frac{\hat{N}_{ijkm}}{\hat{N}_{ijk}}\right) \bar{x}_{ijkm} .$$

An approximate estimator of the variance of $\hat{\bar{x}}_{ijk}$ was obtained using the delta method (Seber 1982),

$$\hat{v}\left(\hat{\bar{x}}_{ijk}\right) = \sum_m \left\{ \hat{v}\left(\hat{N}_{ijkm}\right) \left[\frac{x_{ijkm}}{\sum_x \hat{N}_{ijkx}} - \sum_y \frac{\hat{N}_{ijky}}{\left(\sum_x \hat{N}_{ijkx}\right)^2} x_{ijky} \right]^2 + \left(\frac{\hat{N}_{ijkm}}{\sum_x \hat{N}_{ijkx}}\right)^2 s^2_{ijkm} \right\}.$$

Results

Escapement Monitoring

The McLees Lake weir was installed on 3 June, and fish were allowed passage every day until the removal of the weir on 20 July 2008. During this period, 8,661 sockeye salmon were counted through the weir (Figure 2; Appendix A). Peak daily passage occurred on 6 July when 888 sockeye salmon were counted through the weir. Four sockeye salmon mortalities were observed at the weir during this time period. These fish died after becoming trapped between pickets while attempting to jump through the weir just above the water surface.

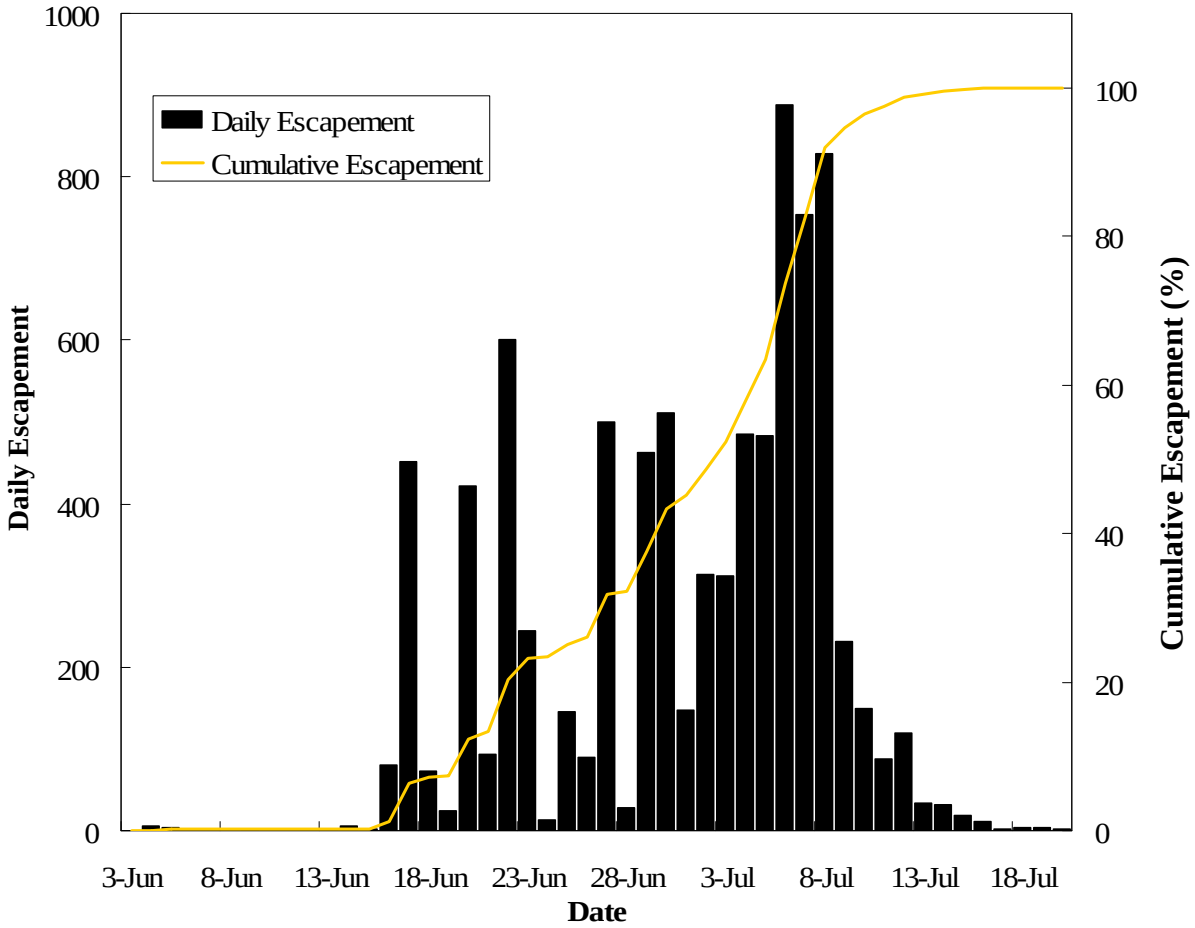

Figure 2. Daily and cumulative escapement of sockeye salmon at the McLees Lake weir, 2008.

Twenty-five pink, one coho, and eight Chinook salmon were also counted through the weir in 2008. Dolly Varden were observed passing through the weir and were captured in the live trap but were not counted.

The weir broke on two occasions due to corrosion of pickets. On 15 June, several of the pickets in the trap-box were discovered to be broken, leaving sufficient room for fish to escape from the trap undetected. The pickets were promptly replaced and because this was early in the run, it is unlikely that many fish passed the weir undetected. On 4 July, another breach in the trap-box was found. This occurred just prior to the seasonal peak of the run on 6 July when 888 sockeye salmon passed the weir. Although a critical period in the run, the opening was discovered in the

morning before the trap box was opened to collect sockeye salmon to sample. We are, therefore, confident that few fish would have been able to pass through the weir without being counted.

The 2008 sockeye salmon escapement into McLees Lake was the lowest recorded since the start of this weir project in 2001 (Table 6). The 2008 sockeye salmon entry pattern past the weir was also later than that recorded for any previous year (Figure 4; Figure 5). Since 2005, sockeye salmon escapements have been substantially lower than those recorded in previous years. This has generally resulted in much greater exploitation rates for these four years (2005 to 2008 mean = 13%) than the previous four years (2001 to 2004 mean = 6%), although the number of sockeye salmon harvested has greatly declined (2001 to 2004 mean = 4,060, 2005-2008 mean=1,887; Table 7).

Age, Sex, and Length Data

A total of 702 sockeye salmon were sampled during the season. Sex was determined for 664 of the sampled fish, and females comprised 54% of sockeye salmon sampled (Table 2; Table 3). Of the 702 sockeye salmon, 633 (90.2%) had readable scales. This allowed us to estimate the age composition of sockeye salmon in five time strata, such that simultaneous 90% confidence intervals had a maximum width of 0.20 (Appendix B). Six age classes were identified, and age-1.2 (68%) and -1.3 (30%) sockeye salmon accounted for 98 % of the sample (Table 4). Lengths of sockeye salmon sampled ranged from 440 to 620 mm for females and from 408 to 610 mm for males (Table 5; Figure 3).

Table 2. Estimated sex composition and escapement of sockeye salmon by stratum at the McLees Lake weir, 2008.

Stratum		*n*	Female (%)	Male (%)	SE (%)	Escapement
1	(3 - 16 June)	47	53	47	1.9	100
2	(17 - 23 June)	85	46	54	4.4	1,906
3	(24 - 30 June)	163	58	42	4.2	1,750
4	(1 - 7 July)	158	55	45	4.1	3,383
5	(8 - 20 July)	181	55	45	3.5	1,522
	Total	634	54	46	2.1	8,661

Table 3. Sockeye salmon sex and age composition at the McLees Lake weir, 2001 to 2008. Data are only presented for the two predominant age classes.

			Age (%)			
Year	Female (%)	SE	1.2	SE	1.3	SE
2001a	42	–	4	–	94	–
2002a	43	–	60	–	32	–
2003a	46	–	8	–	78	–
2004	43	2.2	54	2.2	32	2.0
2005	38	2.2	8	1.3	88	1.5
2006	45	2.1	38	2.0	58	2.1
2007	38	1.7	1	0.4	87	1.3
2008	54	2.1	67	2.1	32	1.6

a Standard errors (SE) for estimates not reported.

Table 4. Estimated age composition (%) of sockeye salmon by stratum at the McLees Lake weir, 2008.

	Age Class					
	0.3	1.2	1.3	1.4	2.2	2.3
			Stratum 1 (3 – 16 June)			
%	0	67	32	1	0	0
SE	0.0	2.3	2.3	0.5	0.0	0.0
n	0	54	26	1	0	0
			Stratum 2 (17 – 23 June)			
%	0	50	48	2	0	0
SE	0.0	4.2	4.2	1.3	0.0	0.0
n	0	66	63	3	0	0
			Stratum 3 (24 – 30 July)			
%	0	72	26	2	0	0
SE	0.0	3.8	3.7	1.3	0.0	0.0
n	0	92	33	3	0	0
			Stratum 4 (1 – 7 July)			
%	0	74	23	2	1	1
SE	0.0	3.8	3.6	1.1	0.8	0.8
n	0	95	29	2	1	1
			Stratum 5 (8 – 20 July)			
%	1	72	27	1	0	0
SE	0.6	3.3	3.3	0.6	0.0	0.0
n	1	118	44	1	0	0
			Total			
%	0	68	30	2	0	0
SE	0.1	2.0	1.9	0.6	0.3	0.3
n	1	425	195	10	1	1

Table 5. Sockeye salmon mean length (mm), standard error (SE), range, and sample size by sex and age, McLees Lake weir, 2008.

	Age Class					
Length	0.3	1.2	1.3	1.4	2.2	2.3
			Female			
Mean	–	493	548	518	–	–
SE	–	14.2	13.9	22.7	–	–
Min	–	440	458	471	–	–
Max	–	597	620	544	–	–
n	–	216	102	3	–	–
			Male			
Mean	579	510	555	573	541	576
SE	–	12.6	13.1	5.8	–	–
Min	579	408	473	532	541	576
Max	579	597	610	600	541	576
n	1	181	89	7	1	1
			All Fish			
Mean	579	499	550	552	541	576
SE	–	14.3	14.1	18.1	–	–
Min	579	408	458	471	541	576
Max	579	597	620	600	541	576
n	1	425	195	10	1	1

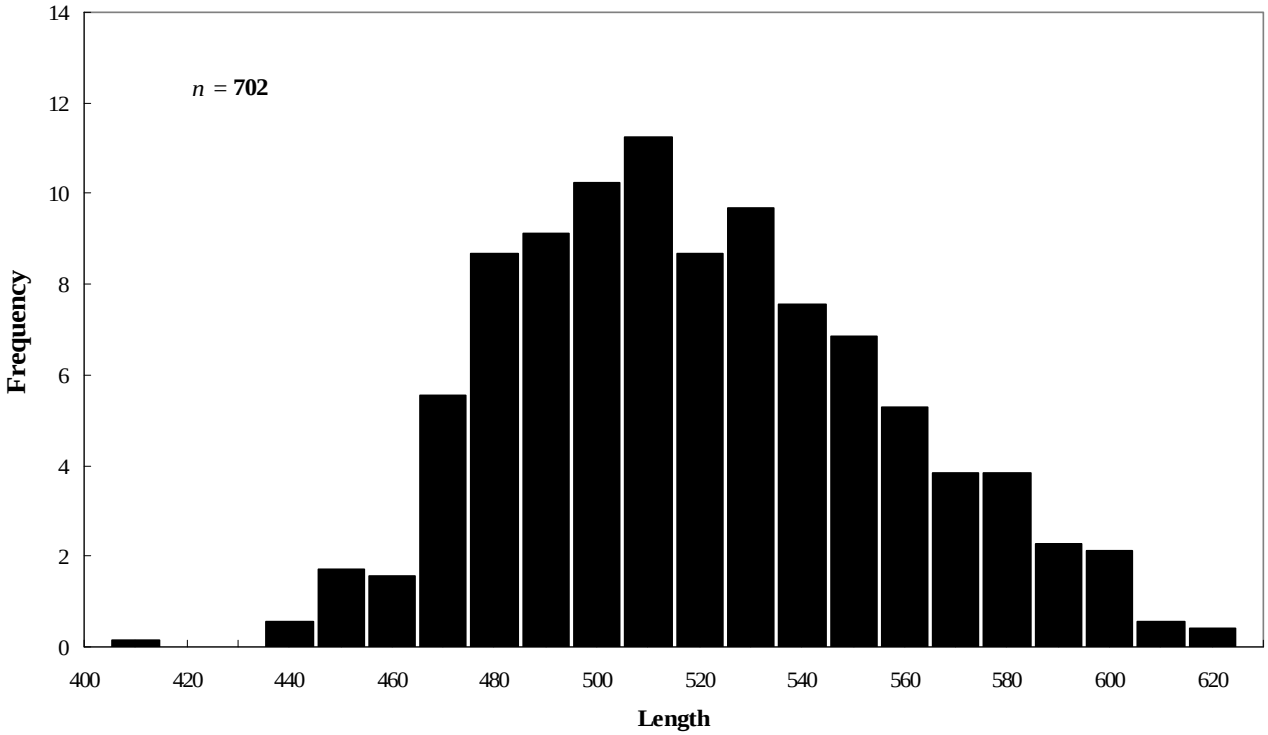

Figure 3. Length-frequency distribution of sockeye salmon sampled at the McLees Lake weir, 2008.

Discussion

There were large escapements in the McLees system in 2003 (over 100,000 sockeye salmon) and in 2002 (over 97,000 sockeye salmon). Consequently, we expected greater production of age-1.3 and -2.2 sockeye as a result of the 2003 escapement, and greater production of age -2.3 sockeye as a result of the 2002 escapement. Overall, we expected a larger return in 2008 than the 8,661 sockeye salmon that were counted past the weir, which was the lowest number since the start of the project in 2001 (Table 6). Run timing was later than average (Appendix A), and the proportion of females was the highest since the start of the project in 2001 (Table 3; Table 4). Dominant age classes were the same as in past years (age1.2 and 1.3; Table 2).

It is unlikely that many sockeye salmon entered McLees Lake prior to weir installation on 3 June or after weir removal on 20 July (Appendix A). The first sockeye salmon was not observed at the weir until 4 June, and while sockeye salmon were still migrating past the site when the weir was removed, daily passage rates had been less than 1% of the total escapement since 13 July. Although the weir was breached on two occasions in June, there were few fish present during the first breach and fish should not have been able to enter the trap-box during the second breach.

Table 6. Annual weir counts of Pacific salmon into McLees Lake, 2001 to 2008.

			Age (%)			
Year	Female (%)	SE	1.2	SE	1.3	SE
2001a	42	–	4	–	94	–
2002a	43	–	60	–	32	–
2003a	46	–	8	–	78	–
2004	43	2.2	54	2.2	32	2.0
2005	38	2.2	8	1.3	88	1.5
2006	45	2.1	38	2.0	58	2.1
2007	38	1.7	1	0.4	87	1.3
2008	54	2.1	67	2.1	32	1.6

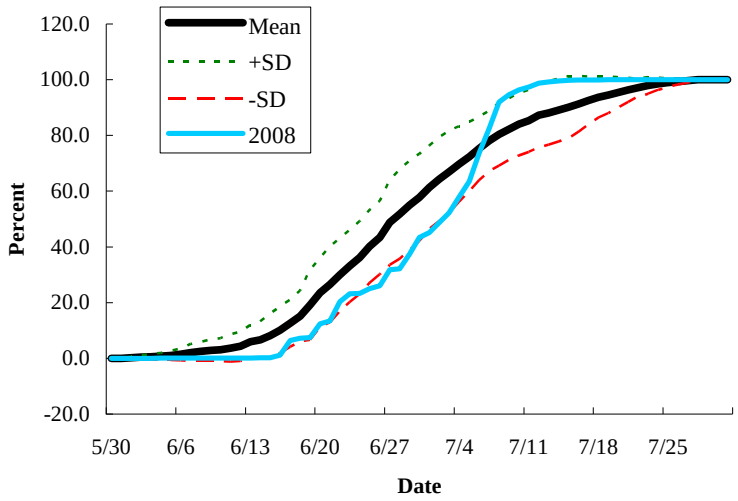

Figure 4. Cumulative proportion: average run-timing for McLees lake sockeye salmon, 2001 – 2008 (hashed red and green lines depict one standard deviation from the mean; blue solid line depicts 2008 run timing).

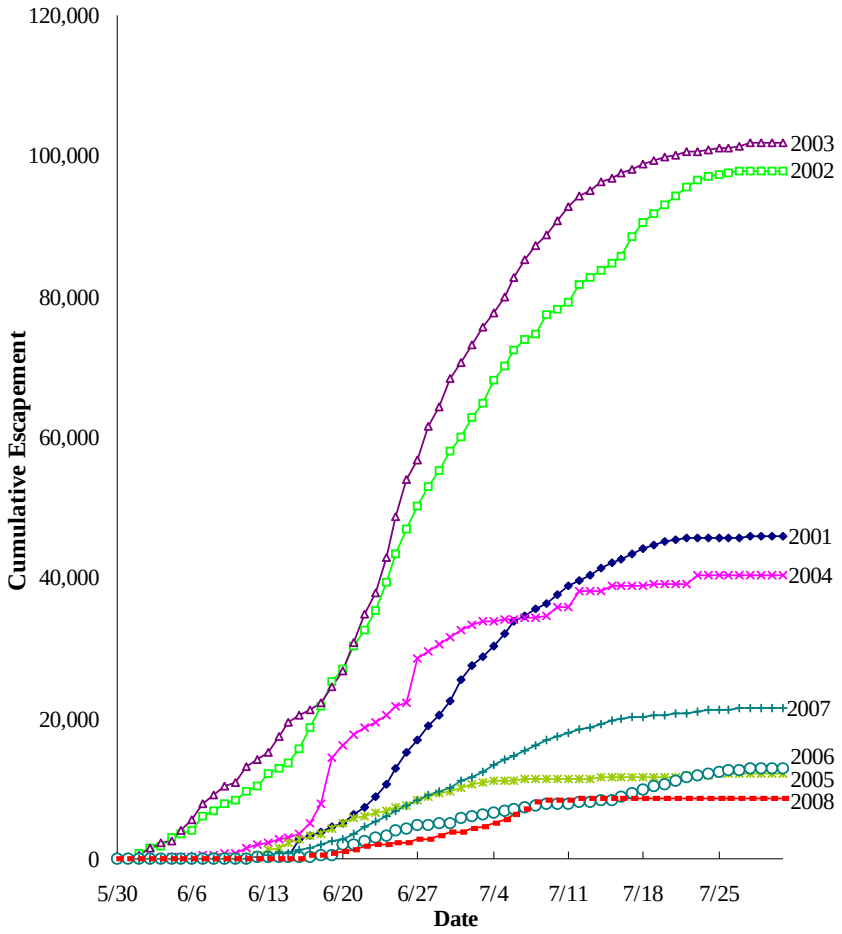

Figure 5. Cumulative escapement of sockeye salmon at the McLees Lake weir, 2001 to 2008.

Due to the decline in sockeye salmon abundance, Unalaska residents have been limited in their ability to harvest sockeye salmon at the outlet of Unalaska Lake, the location nearest the community, since that area was closed in 1997. This is why residents have traveled to Reese Bay to harvest sockeye salmon for subsistence uses over the past few years. However, based on discussions with local fishers and ADFG personnel, residents have been fishing longer, making multiple trips to Reese Bay, and catching fewer fish. This has also made it more expensive to catch sockeye salmon as well as more dangerous, since fishers need to traverse the open ocean to reach Reese Bay.

Between 1 July and 9 July, ADFG typically does not allow subsistence fishing in Reese Bay within an area extending 150 m on either side of the outlet to McLees Lake (Aaron Potter, ADFG, personal communication). However, the poor sockeye salmon escapement in 2008 led ADFG to maintain the 150 m closure for the entire season. This resulted in the lowest escapement as well as the lowest subsistence harvest recorded since the weir project began in 2001 (Table 7).

Table 7. McLees Lake weir escapement, subsistence harvest and exploitation rate of sockeye salmon in Reese Bay, Unalaska Island, 2001 to 2008. Subsistence harvest data are from Tschersich (2008).

			Age (%)			
Year	Female (%)	SE	1.2	SE	1.3	SE
2001a	42	–	4	–	94	–
2002a	43	–	60	–	32	–
2003a	46	–	8	–	78	–
2004	43	2.2	54	2.2	32	2.0
2005	38	2.2	8	1.3	88	1.5
2006	45	2.1	38	2.0	58	2.1
2007	38	1.7	1	0.4	87	1.3
2008	54	2.1	67	2.1	32	1.6

Recommendations

Escapement levels needed to sustain subsistence harvests and maintain healthy sockeye salmon runs to McLees Lake are not known. Escapements and subsistence harvest should continue to be monitored. Assessment of freshwater production may be necessary to better understand the large fluctuations in escapement. If escapements continue to decline, further restrictions of the subsistence fishery may be needed. If poor returns to McLees Lake persist, it is likely that Unalaska residents may shift their attention to other subsistence fishery resources, including coho stocks in Broad Bay, north of Unalaska Village (Forrest Bowers, ADFG, personal communication). Such a shift in subsistence resource use could result in the need to more closely monitor these coho stocks.

Acknowledgements

I would like to thank Benjamin Mann, A.J. Lestenkof, and Glenn Brandle for operating the McLees Lake weir in 2008. I also thank the Qawalangin Tribe for providing fisheries technicians for the project. I extend my sincere appreciation to Jeffery Anderson for his assistance in constructing the weir. Finally, I thank Forrest Bowers, Alaska Department of Fish and Game, and his staff for their assistance in transporting supplies and personnel from Dutch Harbor to the weir site, providing logistical support, and for providing bunkhouse space for the crew while in Dutch Harbor. The U. S. Fish and Wildlife Service Office of Subsistence Management provided funding for this work through Fisheries Resource Monitoring Program as project number FIS 07-405.

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Appendix A. Daily and cumulative escapement of sockeye salmon at McLees Lake weir, 2008.

Date	Daily Count	Cumulative Escapement
3-Jun	0	0
4-Jun	6	6
5-Jun	3	9
6-Jun	0	9
7-Jun	0	9
8-Jun	0	9
9-Jun	1	10
10-Jun	0	10
11-Jun	0	10
12-Jun	1	11
13-Jun	1	12
14-Jun	6	18
15-Jun	1	19
16-Jun	81	100
17-Jun	451	551
18-Jun	72	623
19-Jun	24	647
20-Jun	421	1,068
21-Jun	93	1,161
22-Jun	600	1,761
23-Jun	245	2,006
24-Jun	13	2,019
25-Jun	145	2,164
26-Jun	90	2,254
27-Jun	500	2,754
28-Jun	28	2,782
29-Jun	462	3,244
30-Jun	512	3,756
1-Jul	148	3,904
2-Jul	314	4,218
3-Jul	311	4,529
4-Jul	486	5,015
5-Jul	483	5,498
6-Jul	888	6,386
7-Jul	753	7,139
8-Jul	829	7,968
9-Jul	231	8,199
10-Jul	150	8,349
11-Jul	87	8,436
12-Jul	119	8,555
13-Jul	34	8,589
14-Jul	31	8,620
15-Jul	19	8,639
16-Jul	12	8,651
17-Jul	2	8,653
18-Jul	3	8,656
19-Jul	4	8,660
20-Jul	1	8,661
21-Jul	0	8,661

Appendix B. Standard Errors and Subsequent Derived Confidence Intervals (CI) for Age and Gender for Sockeye, McLees, 2008.

Age Class	1.2	1.3	1.4	Gender
SE	2.0	1.9	0.6	2.0
n	425	195	10	664
CI	0.03	0.03	0.01	0.04

0.3, 2.2 & 2.3 not reported because they were < 1% of the total.