

Fishery Data Series No. 92-31

Sitkoh Creek Steelhead Study, 1991

by

Artwin E. Schmidt

September 1992

Alaska Department of Fish and Game

Division of Sport Fish



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ABSTRACT

A creel survey was conducted to sample angler catch, harvest, and effort on lower Sitkoh Creek from April 22 to May 19, 1991. The survey estimated that 866 total angler hours (SE = 195) were expended to catch 316 (SE = 96) steelhead *Oncorhynchus mykiss*. The harvest of steelhead was estimated at 19 (SE = 5) fish, for an overall release rate of 94%. An estimated 75 cutthroat trout *Oncorhynchus clarki* were also caught (SE = 19); of that total, 8 (SE = 11) were kept. Two Dolly Varden *Salvelinus malma* were caught and kept (SE = 1), and another 49 were caught and released for a total Dolly Varden catch of 51 (SE = 21). An estimated 39 rainbow trout were caught (SE = 11) and 35 were released (SE = 10).

KEY WORDS: Steelhead, *Oncorhynchus mykiss*, escapement, cutthroat trout, *Oncorhynchus clarki*, Dolly Varden, *Salvelinus malma*, creel survey, Sitkoh Creek, Southeast Alaska, Chichagof Island, harvest.

INTRODUCTION

Sitkoh Creek, located on Chichagof Island (Figure 1), supports one of the largest steelhead *Oncorhynchus mykiss* stocks and most popular sport fisheries in northern Southeast Alaska. Sitkoh Creek attracts steelhead anglers from all urban centers of the region, with the majority coming from Sitka (Jones 1983).

Escapement index surveys or weir counts of Sitkoh Creek have been conducted annually (1976-1990, except 1977) to estimate the number of adult steelhead in the system (Table 1). The average number of adult steelhead observed from 1983 through 1987 was 103 fish, while the numbers observed in 1988 and 1989 were 17 and 20 fish, respectively. The severity and abruptness of the reduction in the index prompted installation of a weir and operation of a creel survey in 1990.

A total of 661 steelhead was counted through the weir in 1990 (Jones et al. 1991). On three other occasions (1936, 1937, and 1982), a weir was used to count the number of steelhead entering Sitkoh Creek during the spring. The resultant counts were 760, 1108, and 770 steelhead, respectively (Table 1). Thus, escapement in 1990 was about 25% (roughly 1 standard deviation) below the average of previous weir counts. Due to continuing concern for the Sitkoh Creek steelhead, a creel survey was conducted again in 1991 to monitor harvests.

Most of the fishery in Sitkoh Creek occurs in the lower sections of the creek, but some effort occurs at Sitkoh Lake, where a U.S. Forest Service (USFS) recreational cabin is located. Informal creel surveys at Sitkoh Creek were conducted in 1976, 1978, and 1982 (Table 2).

The creel survey in 1976 was a partial census which did not begin until May 8 but was then operated continuously until the end of May (Wiley, *unpublished*). The creel sampling conducted in 1978 was limited to weekends from April 15 through May 28, so expansion of the data is approximate at best. The creel census done in 1982 was a total census conducted in conjunction with a weir project (Jones 1983). The steelhead size limit was restricted to fish 33 inches or longer during the period 1978 through 1982, so census data from this period are not directly comparable with information from earlier or later censuses. Harvest of steelhead during this period targeted the large individuals, and the Sitkoh Creek steelhead fishery became known as a trophy fishery.

Schmidt (*unpublished*) estimated that 807 angler hours were spent to catch 216 and harvest 53 steelhead in 1987. Jones et al. (1991) estimated that 1,205 angler-hours of effort were used to catch 278 and harvest 35 steelhead in the Sitkoh (Creek and Lake) system in 1990; an estimated catch of 51 and harvest of 1 steelhead occurred in Sitkoh Lake.

This study was designed to accumulate more quantitative information on angler effort, catch and harvest of steelhead in Sitkoh Creek and Lake to aid future management actions, if necessary to sustain the health of this important population.

The research objective in 1991 was to estimate the recreational angling effort, catch, and harvest of steelhead in lower Sitkoh Creek between April 22 and May 19, 1991. In addition, we hoped to estimate the recreational angling effort, catch, and harvest of steelhead taken at the USFS cabin at Sitkoh Lake between April 22 and May 19, 1991.

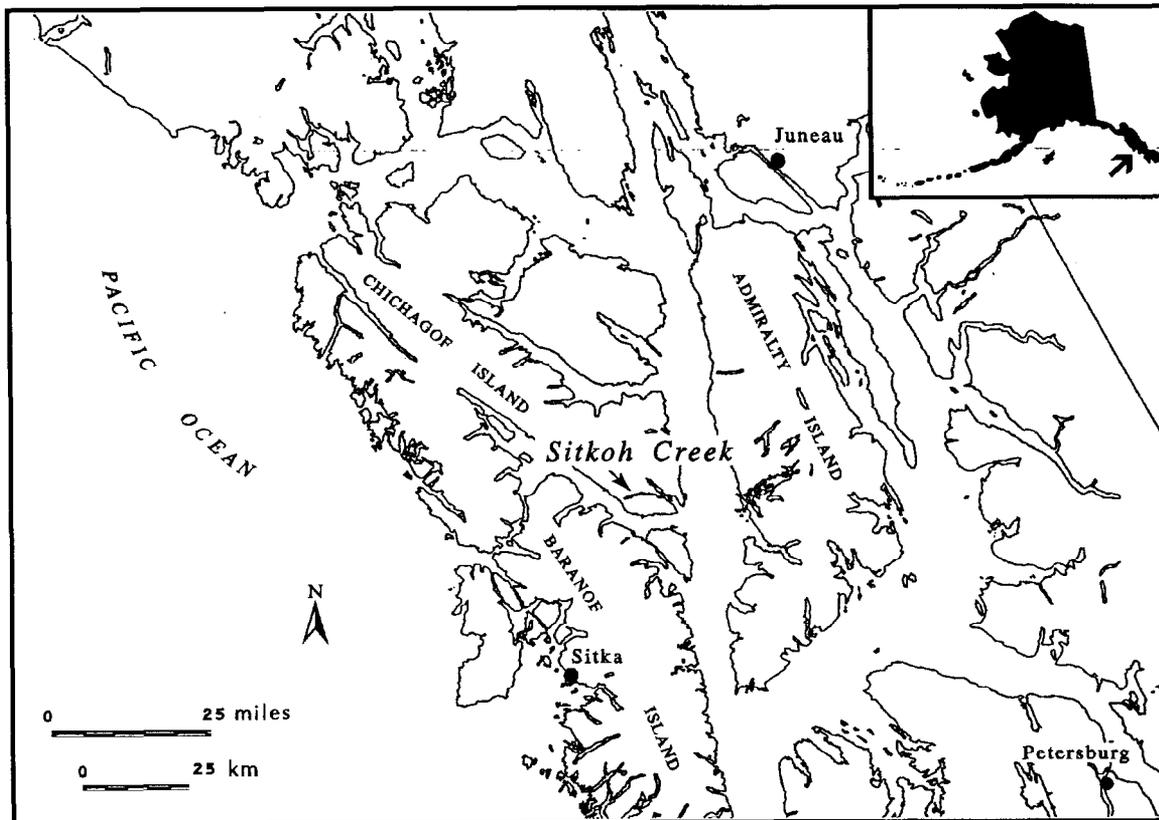


Figure 1. Sitkoh Creek on Chichagof Island, northern Southeast Alaska.

Table 1. Summary of weir and foot surveys for steelhead in Sitkoh Creek.

Year	Weir count	Foot survey			Expanded estimate ^a
		Count	Date	Conditions	
1936	760				
1937	1,108				
1973		6	April 27	too early	
1976		33	May 17-18	good	386
1978		18	May 16		210
1979		17			199
1980		42			491
1981		42			491
1982	770	-- ^b			
1983		143	May 17	good	1,672
1984		92	May 11	good	1,076
1985		115	May 21	good	1,345
1986		58	May 21	late count	678
1987		107	May 20	good	1,251
1988		17	May 24	high water	200
1989		20	May 18	good	210
1990	661				
1991		40	May 14	good	468
mean	824				

^a Calculated from expansion factor determined during 1982 weir operation: foot counts were made during periods of known escapement. Foot counts averaged 8.55% of known escapement.

^b Stream count of 45 on May 18 when weir count was 520, and stream count of 58 on May 30 when weir count was 685.

Table 2. Summary of Sitkoh Creek creel survey information.

Year	No. of anglers	Angler hours	Total catch	No. of fish kept	Catch per hour	Percent released
1976 ^a	111	2,107	98	49	0.05	50.0%
1978 ^b	150	763	70	32	0.09	54.3%
1982 ^c	116	-- ^d	348	45	-- ^c	87.1%
1987 ^e	123	807	216	53	0.27	75.5%
1990 ^f	134	1,205	278	35	0.23	87.4%
1991	164	848	316	19	0.36	94.0%

^a Wiley (*unpublished*).

^b Marriott et al. (1979); 33-inch size limit in effect.

^c Jones (1983); 33-inch size limit in effect.

^d Data not comparable; 238 angler-days reported.

^e Schmidt (*unpublished*).

^f Jones et al. (1991).

METHODS

A "direct expansion" type creel survey based on randomized sampling of anglers completing their trips in lower Sitkoh Creek was used to estimate angler effort and harvest of steelhead between April 22 and May 19, 1991. The fishery was stratified into two biweekly periods (seasonal strata): April 22-May 5, and May 6-19. The surveys had days as primary units and anglers within days as secondary units. When a day was selected for sampling, the entire day was sampled. The sampling day began 30 minutes after the time of average sunrise and ended the time of average sunset plus 30 minutes. Sampling days were between 15.4 and 16.4 hours in length during the two strata. Seven days in each biweekly period were randomly selected for sampling.

Data collected from each sampling period included the number of anglers completing their fishing trips during the period and the number of anglers interviewed. Each angler completing a trip during the period was interviewed, if possible. Data collected from each interview included the number of hours fished by each angler, the number of fish kept by species, and the number of fish released by species.

The estimation of angler harvest C in stratum h was accomplished with the following formula. Estimation of catch H (or effort E) used the following formula with H or E substituted for C :

$$\hat{C}_h = D_h \bar{C}_h \quad (1)$$

$$\bar{C}_h = \frac{\sum_{i=1}^{d_h} \hat{C}_{hi}}{d_h} \quad (2)$$

$$\hat{C}_{hi} = M_{hi} \bar{C}_{hi} \quad (3)$$

$$\bar{C}_{hi} = \frac{\sum_{j=1}^{m_{hi}} C_{hij}}{m_{hi}} \quad (4)$$

where C_{hij} is the harvest by angler j in sampling day i stratum h , m_{hi} is the number of anglers interviewed in day i , M_{hi} is the number of anglers completing trips in day i , d_h is the number of days sampled in stratum h , and D_h is the number of days in stratum h . The variance of the harvest by stratum is estimated:

$$\begin{aligned}
V[\hat{C}_h] = & (1 - f_{1h}) D_h^2 \frac{\sum_{i=1}^{d_h} (\hat{C}_{hi} - \bar{C}_h)^2}{d_h (d_h - 1)} \\
& + D_h \sum_{i=1}^{d_h} M_{hi}^2 (1 - f_{2hi}) \frac{\sum_{j=1}^{m_{hi}} (C_{hij} - \bar{C}_{hi})^2}{d_h m_{hi} (m_{hi} - 1)}
\end{aligned}
\tag{5}$$

where f_{1h} = the sampling fraction for days, f_{2hi} = sampling fraction for anglers.

Harvest and effort for the season (and their variances) are the sums across strata $\sum C_h$ and $\sum V[C_h]$, and $\sum E_h$ and $\sum V[E_h]$.

Some angling for steelhead also occurs in upper Sitkoh Creek, primarily by parties who stay in the USFS cabin at Sitkoh Lake. We left self-addressed and stamped forms in the Sitkoh Lake cabin for voluntary use by anglers who fished from the cabin. The information requested was the same as that collected in our interviews at the stream mouth. After the fishing season, we contacted the Forest Service and obtained a list of all cabin reservations to determine the total number of anglers who used the cabin. We contacted all registered cabin users by mail if they did not fill out the voluntary form at the cabin.

RESULTS

The survey was conducted as planned, except that sampling which was to be done on May 10 was delayed until May 16 because of weather. All anglers exiting Sitkoh Creek on sampling days were interviewed. Angler effort was greatest during the first two weeks of the survey (April 22-May 5) when we observed 307 hours of effort (Table 3). Observed effort and catch decreased after the first biweek of the survey.

Anglers at lower Sitkoh Creek fished an estimated 848 hours (SE = 195) from April 22 through May 19 (Table 4) and caught an estimated 310 (SE = 96) steelhead. The total number of steelhead kept was 16 (SE = 5), for an overall release rate in 1991 of 95%. Anglers also caught an estimated 70 cutthroat trout *Oncorhynchus clarki* (SE = 19), 46 Dolly Varden *Salvelinus malma* (SE = 21), and 38 rainbow trout (SE = 11).

According to USFS records, only one party stayed at the cabin during the census period. A questionnaire was returned by this party after the first mailout. This party of nonresidents included four people who fished a total of 18 hours over 5 days of fishing. They caught 6 steelhead (3 were kept), 5 cutthroat (none were kept), 5 Dolly Varden (none were kept), and one rainbow trout (none were kept). Since all parties with reservations at the cabin responded to our questionnaire, the variances of these estimates are zero.

DISCUSSION

The creel census period this year was two weeks shorter than in 1990, but included the period when 91% of the 1990 effort and 94.6% of the catch occurred (Jones et al. 1991). Peak catches of steelhead in 1991 occurred during the first week of May immediately following a series of extreme tides.

Table 3. Observed angler effort, number of interviews, number of periods sampled, number of possible sampling periods, and observed harvest and catch by species from sampling at lower Sitkoh Creek during 1991.

Strata	Angler effort (hrs)	Anglers ^a interviewed	Periods sampled	Samples possible	Steelhead		Cutthroat		Dolly Varden		Rainbow	
					Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught
4/22-5/5	307	56	7	14	6	147	2	15	1	21	1	6
5/6-5/19	117	26	7	14	2	8	2	20	0	2	1	13
Totals	424	82	14	28	8	155	4	35	1	23	2	19

^a Number of anglers interviewed = number of anglers in both strata.

Table 4. Estimated total angler effort, harvest, and catch by sampling period from census sampling at lower Sitkoh Creek and from questionnaires left at the Sitkoh Lake USFS cabin, 1991.

	Lower Sitkoh Creek			Upper River/ Lake	Total
	Apr 22 May 5	May 6 May 19	Total		
Angler hours					
Estimate	614	234	848	18	866
Variance	34,943	2,959	37,902	0	37,902
SE	187	54	195		195
Relative precision ^a	0.60	0.45	0.45		0.44
Steelhead kept					
Estimate	12	4	16	3	19
Variance	21	3	24	0	24
SE	5	2	5		5
Relative precision	0.82	0.98	0.61		0.50
Steelhead catch					
Estimate	294	16	310	6	316
Variance	9,203	25	9,228	0	9,228
SE	96	5	96		96
Relative precision	0.64	0.61	0.61		0.60
Cutthroat kept					
Estimate	4	4	8	0	8
Variance	3	8	11		11
SE	2	3	3		3
Relative precision	0.98	1.47	0.74		0.74
Cutthroat catch					
Estimate	30	40	70	5	75
Variance	156	217	373	0	373
SE	12	15	19		19
Relative precision	0.78	0.74	0.53		0.50
Dolly Varden kept					
Estimate	2	0	2	0	2
Variance	2	0	2		2
SE	1	0	1		1
Relative precision	0.98		0.98		0.98
Dolly Varden catch					
Estimate	42	4	46	5	51
Variance	425	3	428	0	428
SE	21	2	21		21
Relative precision	0.98	0.98	0.89		0.80
Rainbow kept					
Estimate	2	2	4	0	4
Variance	2	2	4		4
SE	1	1	2		2
Relative precision	0.98	0.98	0.98		0.98
Rainbow catch					
Estimate	12	26	38	1	39
Variance	30	95	125	0	125
SE	5	10	11		11
Relative precision	0.82	0.75	0.57		0.56

^a Relative precision = 1.96 SE/estimate.

Similar patterns of fishing have been observed by the author in previous years. The census, therefore, included the vast majority (probably over 90%) of the catch and effort which occurred during the spring fishery at Sitkoh Creek.

The entire length of Sitkoh Creek was walked on May 14 to count steelhead. The escapement was estimated on the basis of a correction factor for counting efficiency (8.55%) developed by dividing the survey count in 1982 by the known escapement in 1982 (Table 1). The escapement estimate for 1991 is thus about 468 steelhead. Many of the traditional steelhead holding holes where we expect to see 12 to 15 fish on a good escapement year had only 2 to 4 fish present during the 1991 survey. This lack of fish abundance is sometimes limited to the upper section of the river, but in 1991 was common throughout the river. Although the estimate of escapement is not as defensible as a weir count, the escapement in 1991 appears reduced from the 661 steelhead counted by weir in 1990 (Jones et al. 1991) but above the counts made in 1988 and 1989.

The total (lower river plus upper river/lake) estimated catch of steelhead in our creel survey (316) represents 68% of the estimated escapement. The release rate of steelhead this year was 94%, compared to the previous high of 87% in 1990. Many of the anglers we contacted during the survey fish Sitkoh Creek every year and are very concerned about its steelhead stocks. Because of this concern, most anglers at Sitkoh Creek do not keep any steelhead, and the release rate has increased from the 50% rate first documented in 1976. The harvest in 1991 was about 4% of the total escapement.

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