

**State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME**

**ANNUAL REPORT
SHASTA AND SCOTT RIVER
JUVENILE SALMONID OUTMIGRANT STUDY, 2001-2002
PROJECT 2a1**

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Abstract

This report summarizes the third consecutive year of rotary trapping for juvenile steelhead, (*Oncorhynchus mykiss irideus*), coho, (*Oncorhynchus kisutch*) and Chinook salmon (*Oncorhynchus tshawytscha*) on the Shasta and Scott rivers in Siskiyou County California. Data collected included weekly sums of catch, life stage, forklength, volume of water sampled, stream temperature and weekly trap efficiency for steelhead and Chinook salmon.

Shasta River

The Shasta River rotary trap began sampling six days per week on 2/25/02. Trapping ended on 7/6/02 due to low flows. The trap was fished for a total of 1,450.6 hours and sampled 126,650,999 cubic feet of water. Including all life stages, a total of 8,294 steelhead, 747 coho and 526,256 Chinook were trapped. The largest weekly total of steelhead smolts and silvery parr (120) were trapped during julian week 16 (week ending 4/22/02). The largest weekly total of parr (2,078) were trapped during week 23 (week ending 6/10/02). When the number of recaptures was sufficient, we produced weekly estimates of the number of steelhead smolts and Chinook salmon outmigrants (Carlson 1998). Estimates of steelhead smolt outmigrants for 7 weeks totaled 6,657. Estimates of the number of Chinook outmigrants for 14 weeks totaled 3,135,902.

Although the Shasta River has well sustained summer flows, diversions greatly reduce instream flows and rearing habitat for salmonids. As a result, a substantial percentage of the steelhead and coho recruitment for 2002 left the Shasta River as age 0 fry and parr in search of rearing habitat in the Klamath River or other tributaries.

Scott River

The Klamath National Forest, Scott River Ranger District and the California Department of Fish & Game, Steelhead Research and Monitoring Program cooperatively operated the Scott River rotary trap in 2002. We sampled the Scott River with a five-foot rotary trap from Julian week 9 (2/26/02) through 28 (7/13/02). The trap was fished for a total of 2,605 hours and sampled 374,889,243 cubic feet of water. Including all life stages, a total of 11,918 steelhead, 1,939 coho and 11,793 Chinook were trapped. The largest weekly total of steelhead smolts and silvery parr (180) were trapped during julian week 14, (week ending 4/08/02). The largest weekly total of parr (3,307) was trapped during week 26 (week ending 7/01/02). . When the number of recaptures was sufficient, we produced weekly estimates of the number of steelhead smolts and Chinook salmon outmigrants. (Carlson 1998). Estimates of steelhead smolt outmigrants for five weeks totaled 5,088. Estimates of the number of Chinook outmigrants for eight weeks totaled, 319,286.

Background

2002 was the third consecutive year of rotary trapping on the Shasta and Scott Rivers. The objectives of the trapping in 2002 were to:

- Determine emigration abundance and timing for juvenile salmonids.
- Estimate rotary trap efficiencies for Chinook and steelhead and produce production estimates if possible.
- Measure fork lengths and determine life stage from a sub-sample of the salmonids collected.
- Collect scale samples from a sub-sample of the trapped steelhead for age analysis.
- Collect tissue for genetic analysis.
- Investigate the relationships between environmental conditions and emigration pattern of salmonids

Shasta River Rotary Screw Trap Summary

Methods

We sampled the Shasta River with a five-foot rotary screw trap manufactured by EG Solutions, Corvallis, Oregon. The trap was operated in the same location and manner as it was in 2000 and 2001 (Chesney, 2000). We fished six days per week, Sunday PM through Saturday AM just downstream of the Shasta River Fish Counting Facility. The initial operation of the trap was the same as in 2000 and 2001. The trap catch was processed two times a day, at approximately 2200 and 0700 hours. It was necessary to check the trap at 1600 hours daily to remove algae and debris between trap processings. Due to a statewide hiring freeze in 2002, we were shorthanded throughout the field season. We were able to employ CDFG Klamath River Project staff members until early April. On 4/8/02 due to a lack of staff, we eliminated the 1000 to 2200 set. We continued the overnight set (2200 to 0800) as previously scheduled. We released the marked fish after the trap was set at 2200.

Flow into the trap was measured at the beginning and end of each set using a General Oceanics digital flow meter, model 2030R. This enabled us to calculate the total volume of water fished during the set. Hourly water temperatures were recorded with an Onset Optic StowAway temp logger attached to the downstream end of the trap. All vertebrates collected in the trap were identified and counted. In order to reduce the handling stress and processing time for the large numbers of Chinook fry, we determined the number of fish per gram and then weighed the total catch of Chinook fry to obtain an estimate of the number trapped. Scales were collected from a sub-sample of the steelhead trapped. Salmonids collected in the trap were classified by life stage: sac fry, fry, parr, silvery parr, smolt and adult.

Trap Efficiency Determinations

Weekly estimates of the trap catch efficiency were calculated for Chinook, steelhead smolts and silvery parr and parr. A known number of Chinook and steelhead were taken from the trap, marked and released upstream during julian weeks 9 through 25. Chinook were marked in a solution of Bismarck brown dye. 0.6 grams of Bismarck brown were mixed into 5 gallons of water. The steelhead smolts and silvery parr were marked with a unique fin margin clip each week. The fish were marked during the morning processing and held in live cars until approximately one hour before sunset. During the peak of the

steelhead parr emigration in weeks 23 and 24, we marked a known number of steelhead parr with Bismarck brown.

By recording the number of marked fish that we recaptured, we were able produce a Petersen estimate of the total number of steelhead and Chinook outmigrants moving downstream during the week.

Results

The Shasta River rotary trap began sampling six days per week on 2/25/02. Trapping ended on 7/6/02 due to low flows. The trap was fished for a total of 1,450.6 hours and sampled 126,650,999 cubic feet of water. Including all life stages, a total of 8,294 steelhead, 747 coho and 526,256 Chinook were trapped. Table 1 shows the total catch for all species.

Table 1.

Sum of Fish Species Trapped, Shasta River

Species	Count
Steelhead <i>Onchorhynchus mykiss irideus</i>	8,294
Chinook Salmon <i>Onchorhynchus tshawytscha</i>	526,256
Coho Salmon <i>Onchorhynchus kisutch</i>	747
Pacific Lamprey <i>Lampetra tridentata</i>	14,452
Sculpin <i>Cottus spp.</i>	83
Speckled Dace <i>Rhinichthys osculus</i>	721
Klamath Smallscale Sucker <i>Catostomus rimiculus</i>	190
Brown Bullhead <i>Ictalurus nebulosus</i>	146
Green Sunfish <i>Lepomis cyanellua</i>	23
Japanese Pond Smelt <i>Hypomesus transpacificus</i>	15
Largemouth Bass <i>Micropterus salmoides</i>	1

Steelhead

The largest weekly total of steelhead smolts and silvery parr (120) were trapped during julian week 16 (week ending 4/22/02, Chart 1). The largest weekly total of parr (2,078) were trapped during week 23 (week ending 6/10/02, Chart 2).

The fork lengths of steelhead fry, parr, silvery parr and smolts were measured. The fork length frequency for the trap catch is shown by month in Charts 3a-e. The largest mean size for the steelhead catch was observed during weeks 14-17 at 198.85 mm (Chart 3b). Age 0+ steelhead fry and parr first appeared in the catch during week 14. 207 scale samples were collected from a sub-sample of the measured fish. They will be read during the winter of 2003 in order to determine the age/length relationship of the steelhead that were trapped.

Chart 1

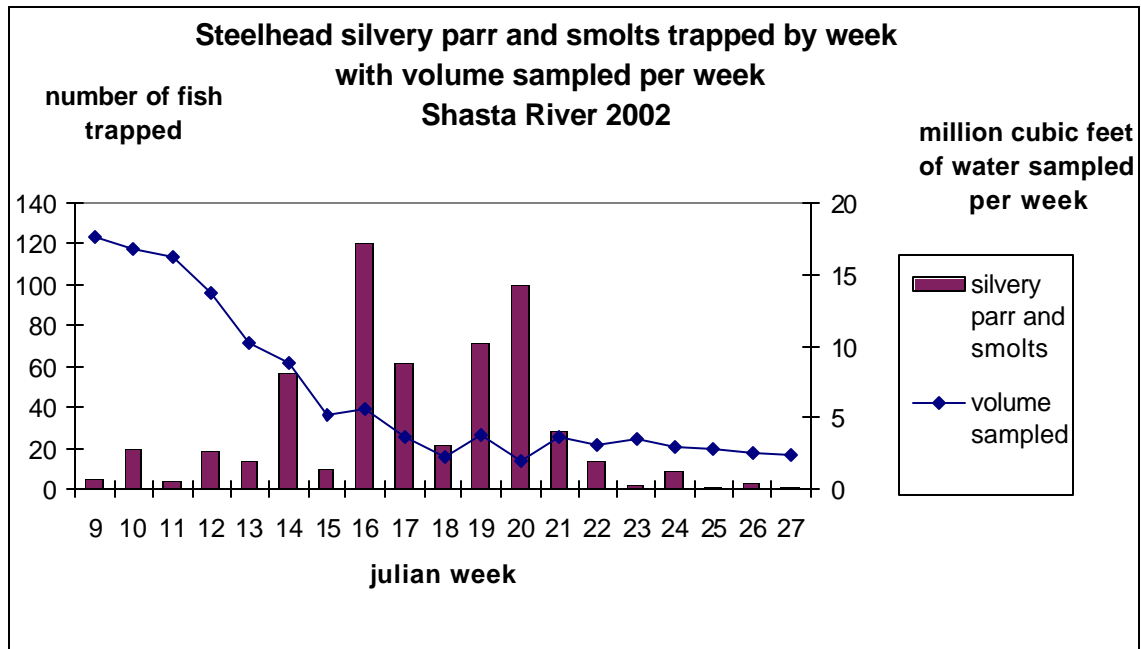


Chart 2

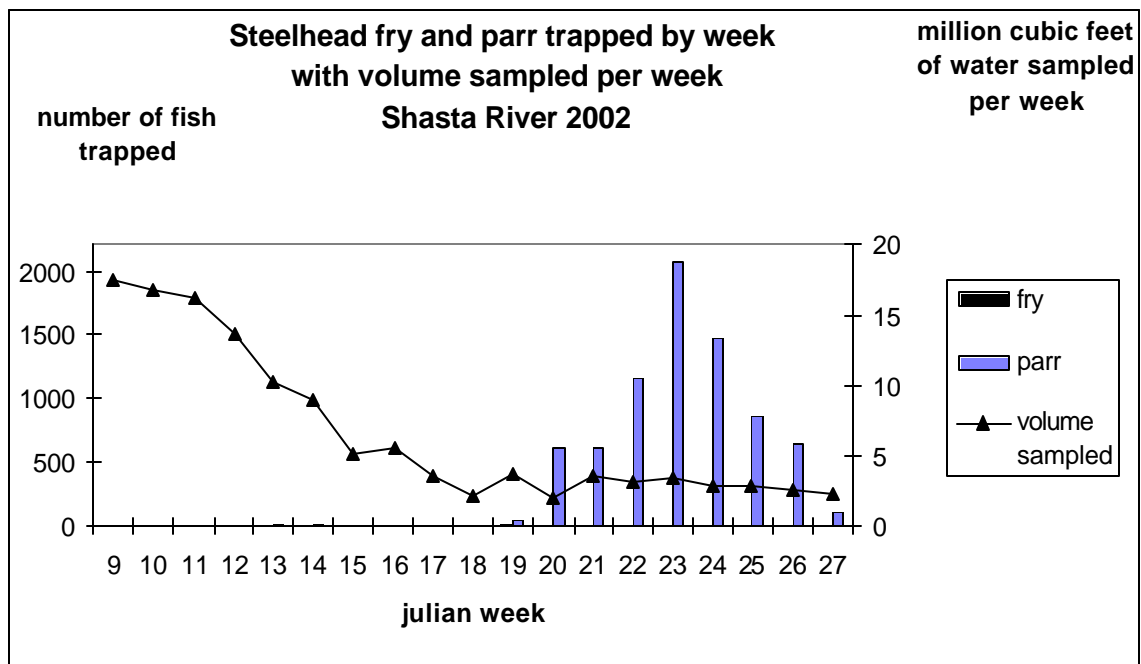
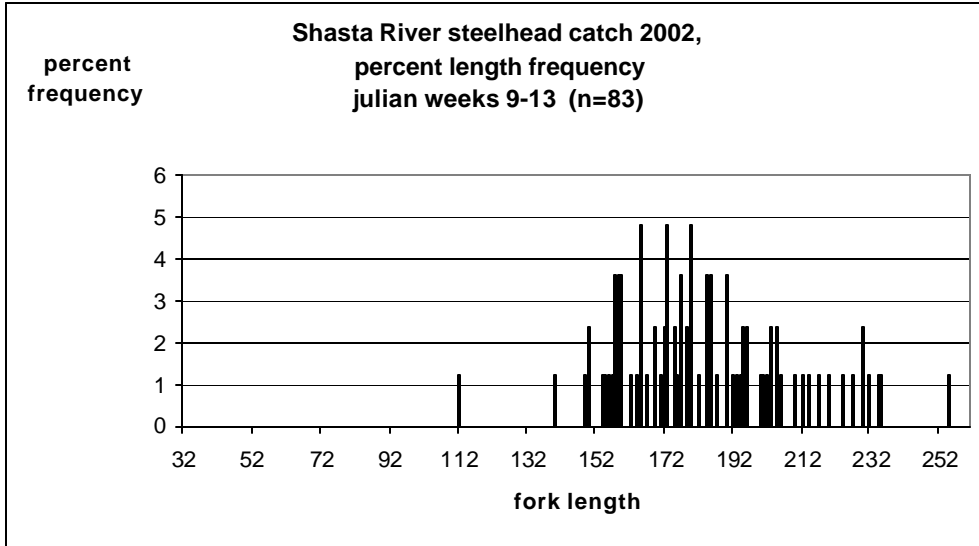


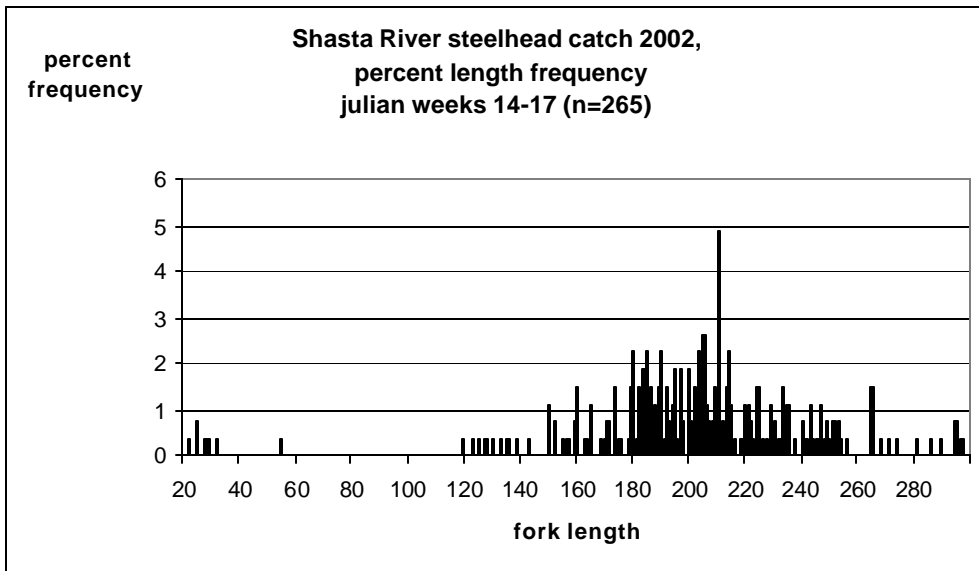
Chart 3a-d; Shasta River steelhead fork length by month

Chart 3a



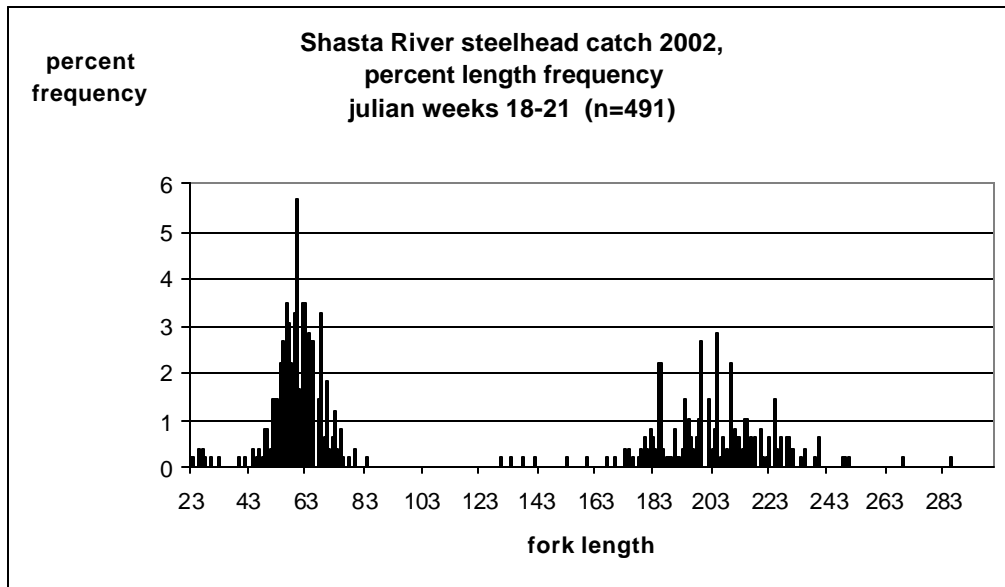
mean length = 182.07 mm, std. dev.= 29.95

Chart 3b



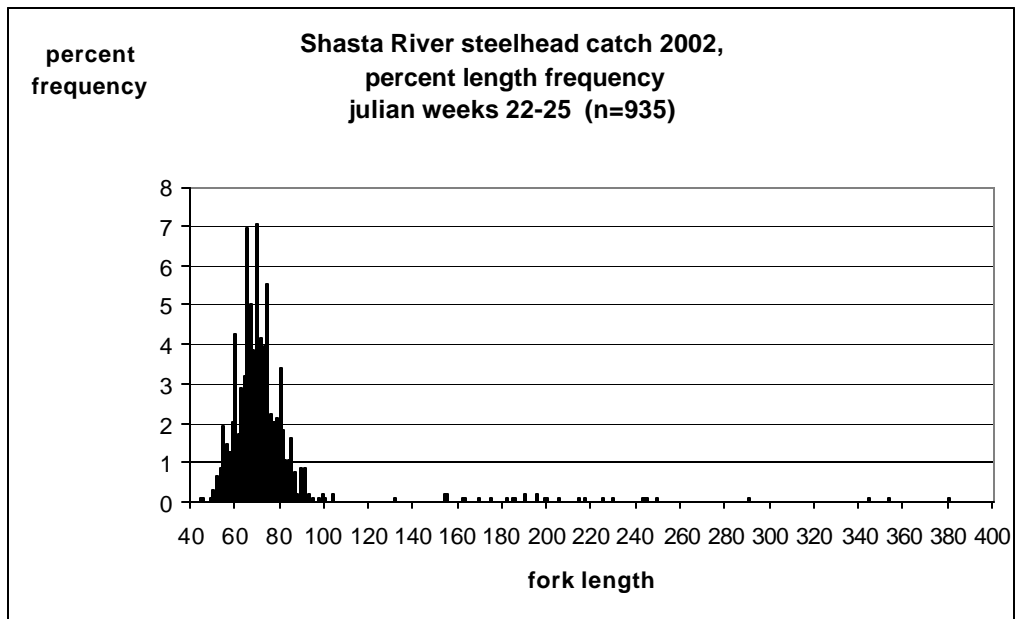
mean length = 198.85 mm, std. dev.= 44.42

Chart 3c



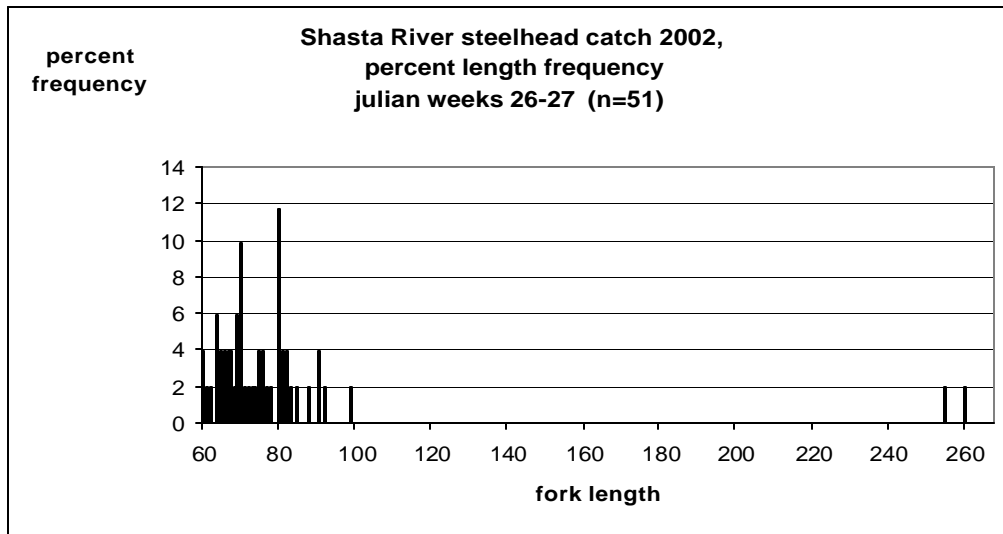
mean length = 118.3, std.dev. = 71.8.

Chart 3d



mean length = 74.65 mm, std.dev. = 28.8

Chart 3e



mean fork length = 81.39 mm, std. dev. = 37.01

Trap Efficiency for Steelhead

A total of 322 steelhead smolts and silvery parr were marked with fin margin clips. Of these marked fish, 15 (4.65%) were recaptured. The highest trap efficiency for steelhead smolts as determined by Carlson mark and recapture estimates occurred during week 12, 11.1% (Chart 4). The greatest density of smolts trapped per unit volume fished occurred during week 20, with 50.2 smolts trapped per million cubic feet of water sampled (Chart 5). The estimates for the number of steelhead smolts emigrating for weeks 12 through 21 are listed in Table 2.

Shasta River trap efficiencies for steelhead smolts
Table 2.

Julian week	Number of smolts trapped	Estimated total of smolts emigrating for the week	Estimated trap efficiency	95% Confidence Interval	
				upper	lower
12	18	90	11.1%	0	186
13	14	zero recaptures no estimate			
14	56	1372	2.0%	0	2919
15	10	Trap vandalized no estimate			
16	116	1833	5.1%	383	3,282
17	61	1218	2.4%	0	2,719
18	22	High flows no estimate			
19	68	731	7.1%	103	1,359
20	96	1382	5.6%	281	2,407
21	18	31	5.6%	0	364

Chart 4

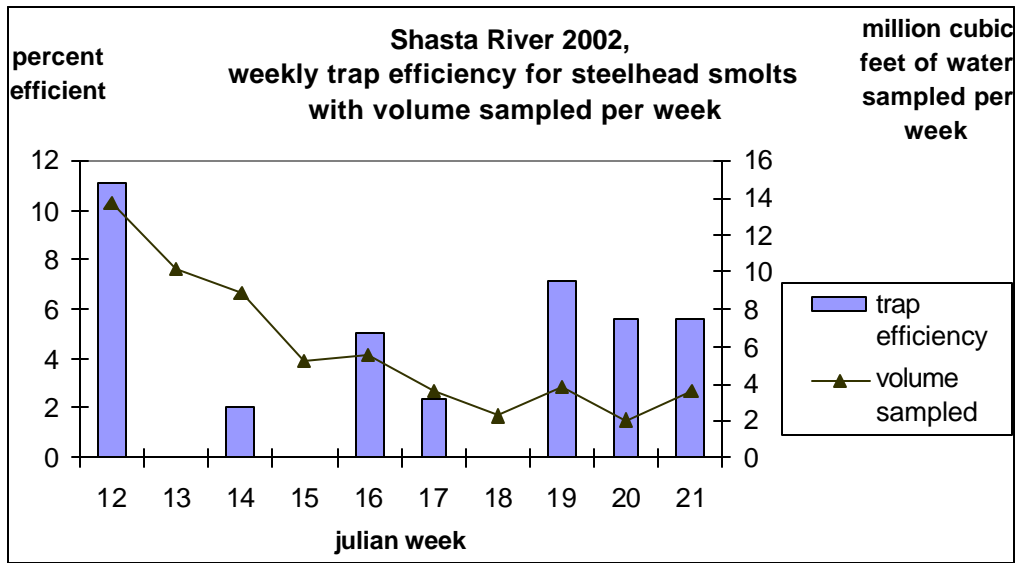
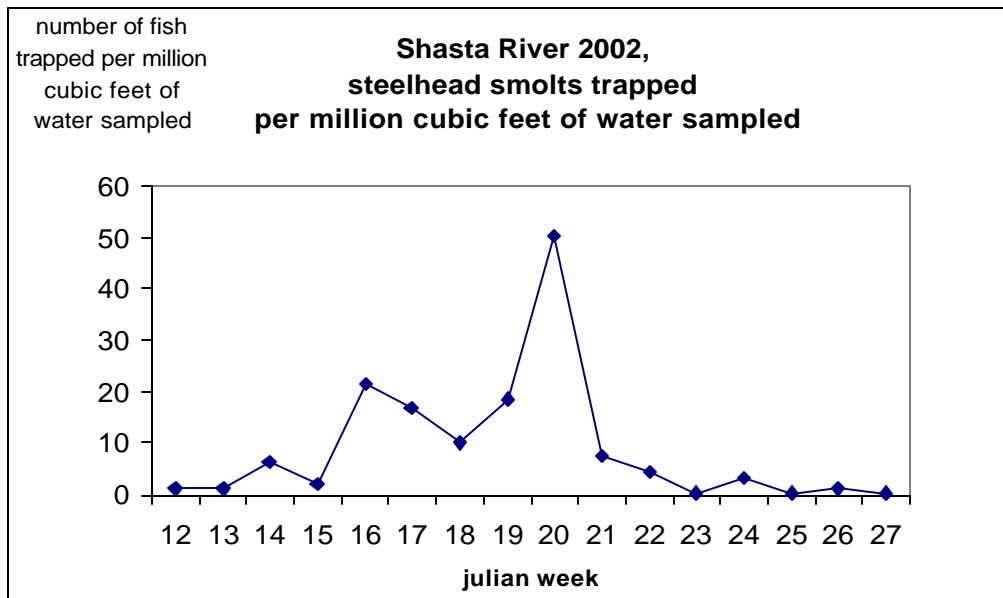


Chart 5



Coho

The largest weekly total of coho smolts and silvery parr were trapped during Julian week 17 (week ending 4/29/02, Chart 6). The largest weekly total of parr were trapped during Julian week 20 (week ending 5/20/02, Chart 7). The largest weekly total of fry were trapped during Julian week 14 (week ending 4/08/02, Chart 7). The fork lengths of a total of 582 coho fry, parr and smolts were measured. The fork length frequencies for the coho trapped are shown by month in Charts 8a-d.

Chart 6

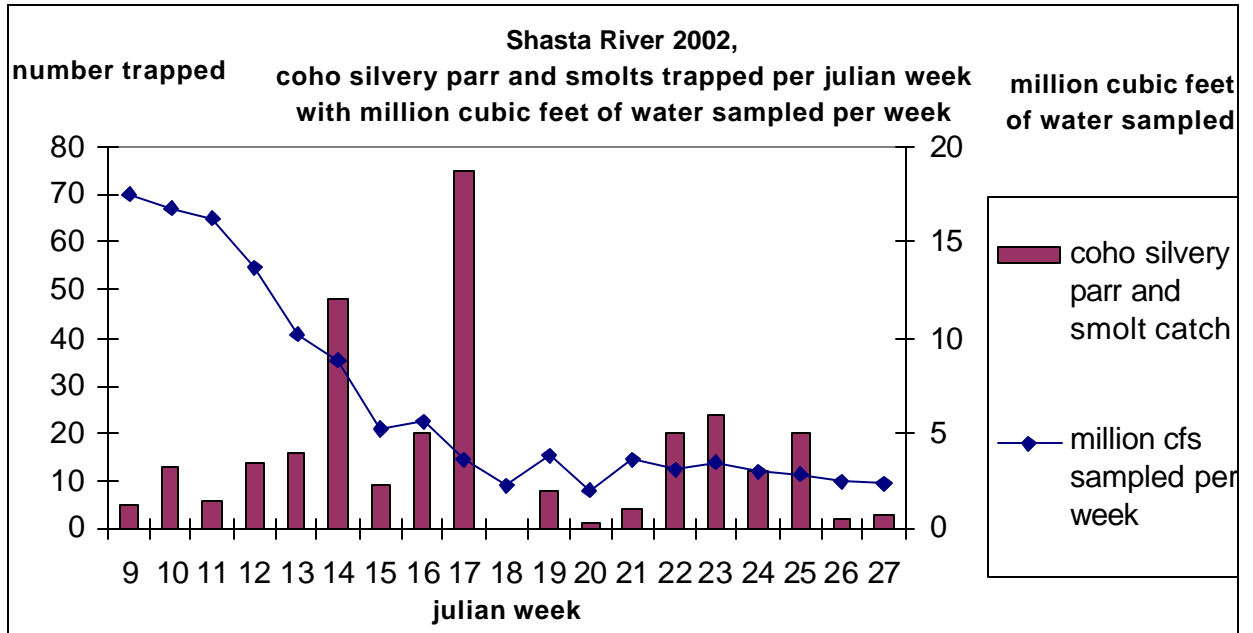


Chart7

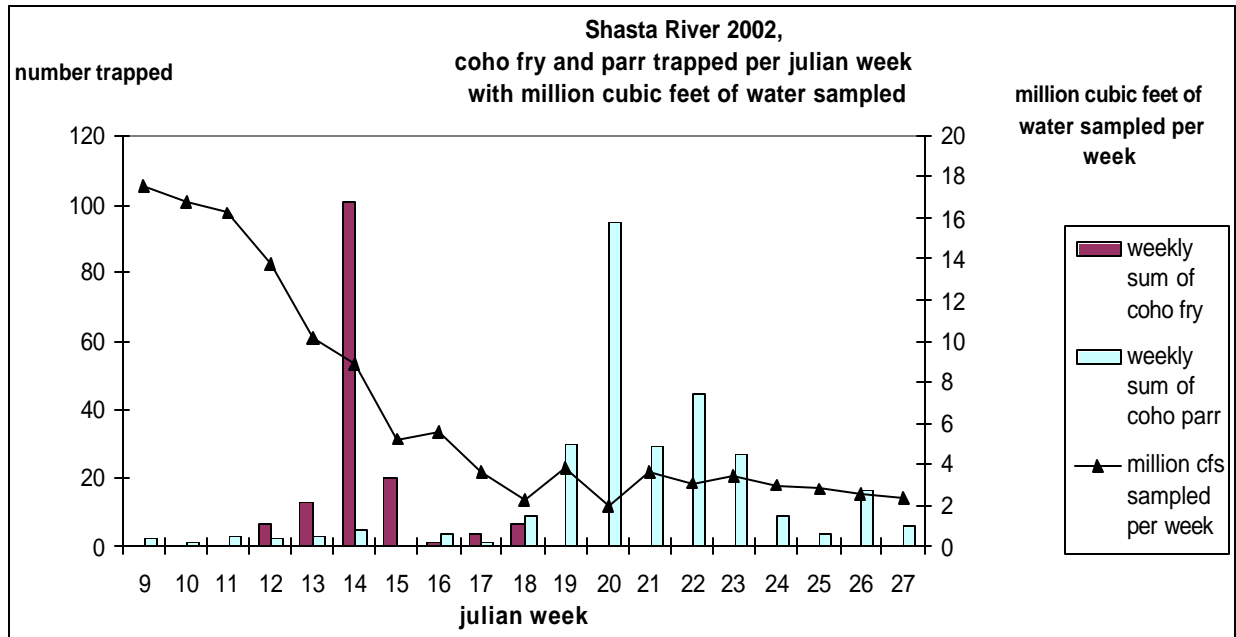
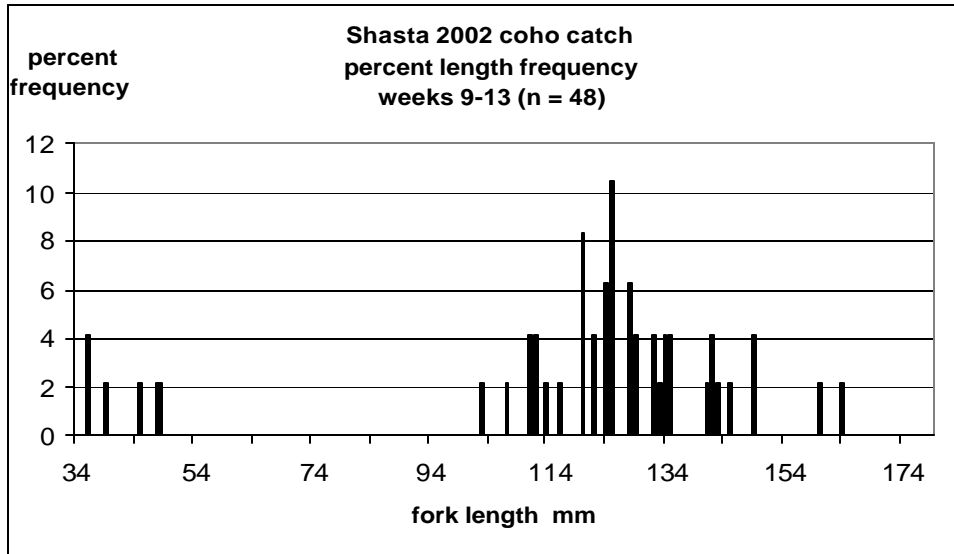


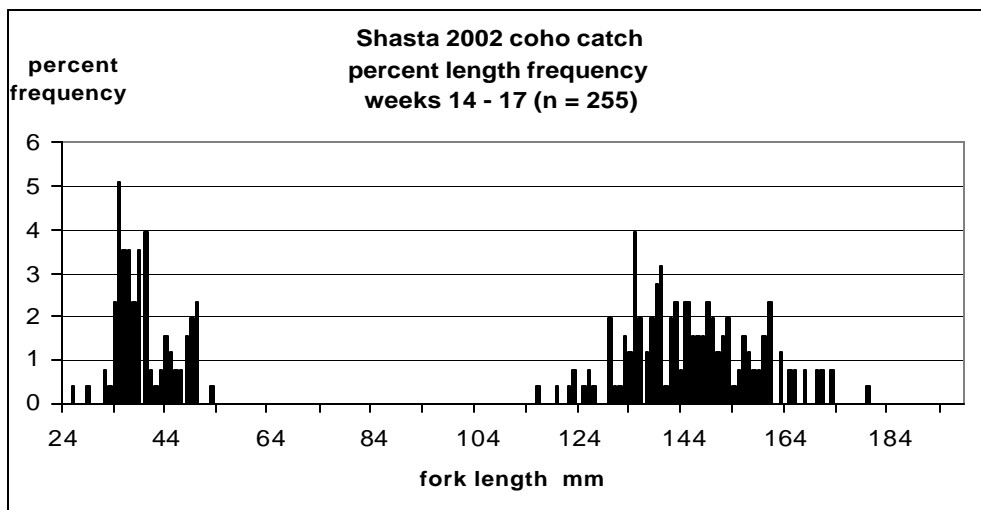
Chart 8a-d; Shasta River Coho length frequency by month

8a



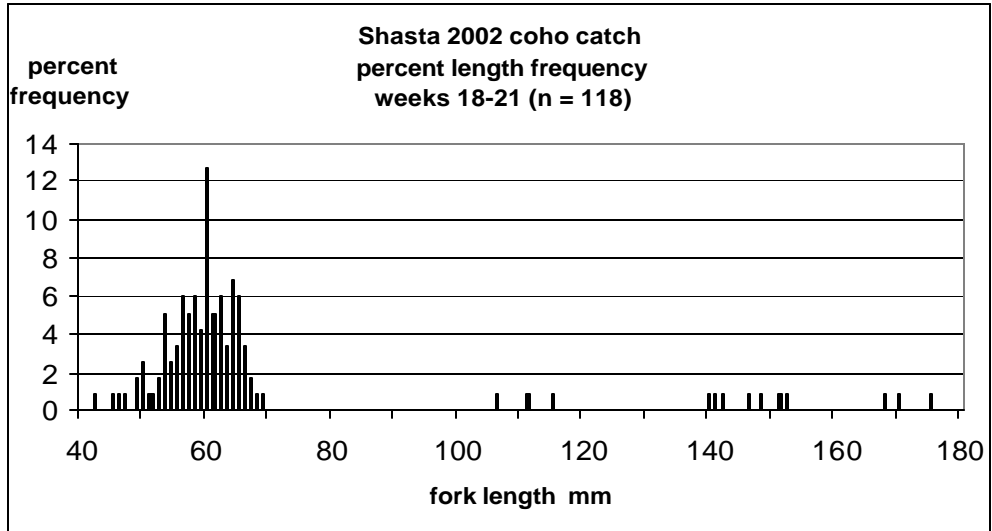
mean length = 119.23mm, std dev = 29.85

8b



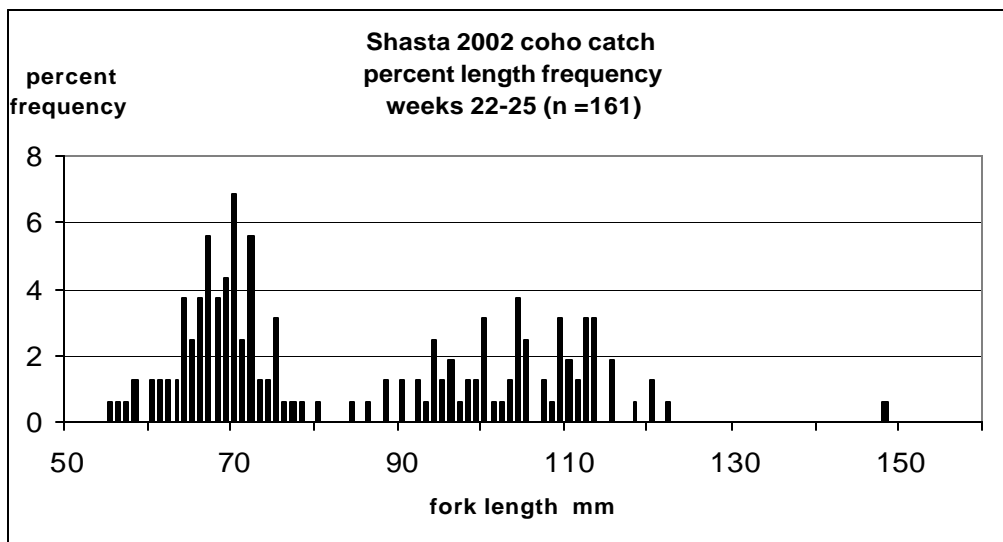
mean length = 104.78, std. dev. = 52.83

8c



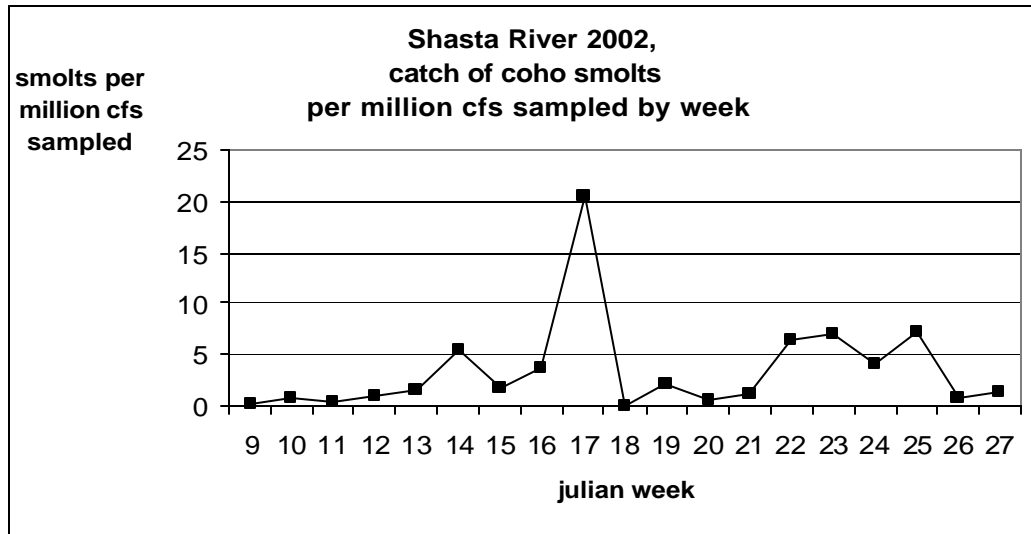
mean length = 68.11 mm, std. dev. = 27.99

8d



mean length = 84.53 mm, std. dev.= 19.7

Chart 9



Chinook

The largest weekly total of Chinook were trapped during julian week 10 (week ending 3/11/02). A total of 84,164 fry were trapped during six days of trapping at a density of 5012 Chinook per million cubic feet of water sampled (Chart 12). The fork lengths of a total of 4,132 Chinook fry, parr and smolts were measured. The fork length frequencies for the measured sub-sample are shown by month in Charts 12 a-d. The mean length for the samples and the standard deviations are shown.

A total of 8,565 Chinook were marked with bismark brown dye and released upstream of the trap. Of the marked fish, 1,518 (17.7%) were recaptured. The highest trap efficiency for Chinook occurred during week 21, at 37.4% (Chart 12). Table 3 shows the estimated number of Chinook emigrating from the Shasta River during weeks 10- 24.

Chart 10

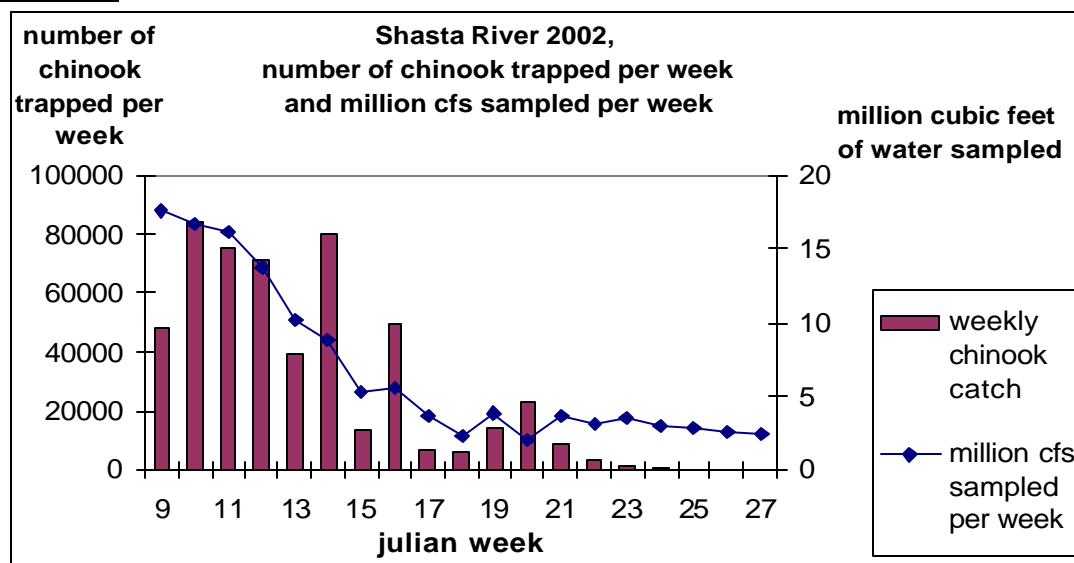


Chart 11

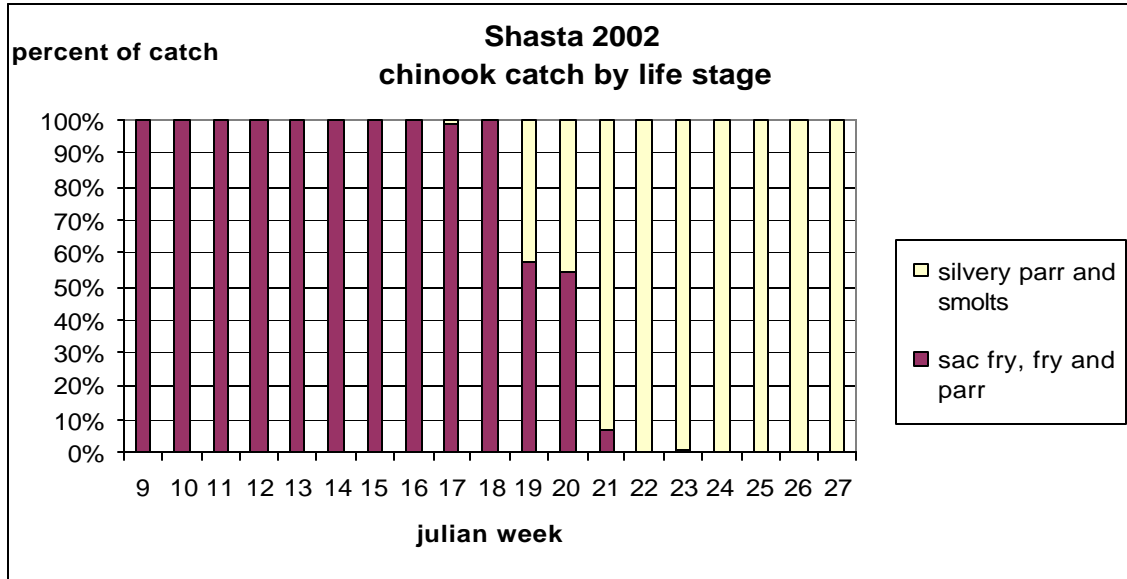
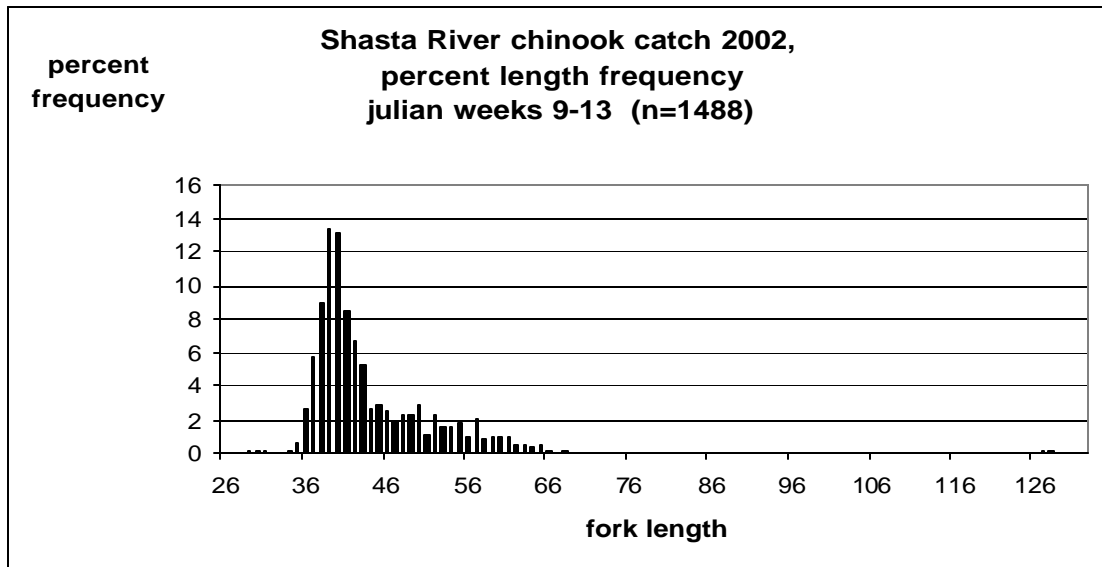


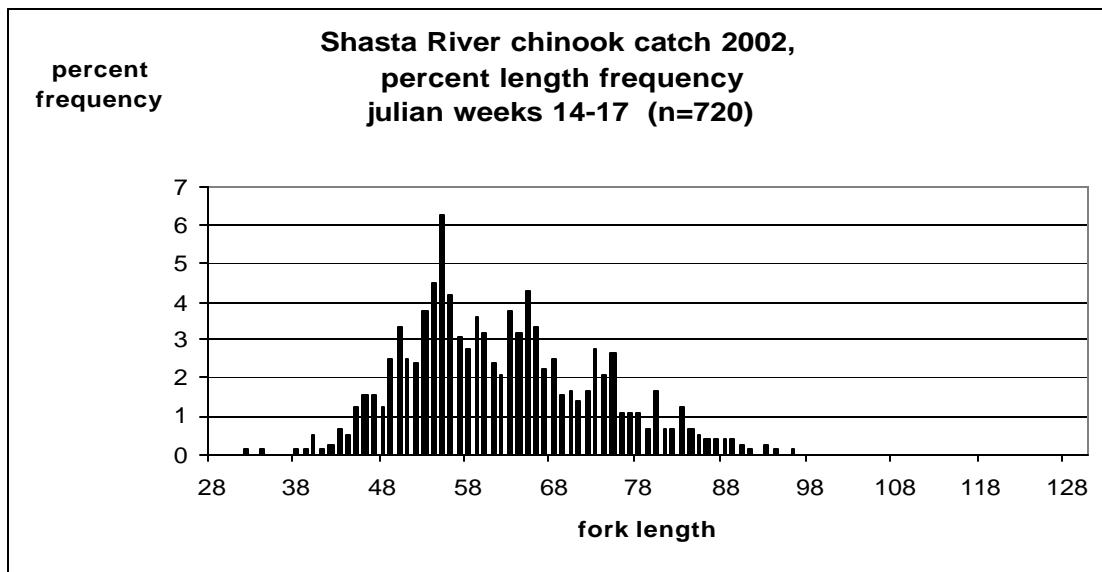
Chart 12 a-d; Chinook length frequency by month

Chart 12a



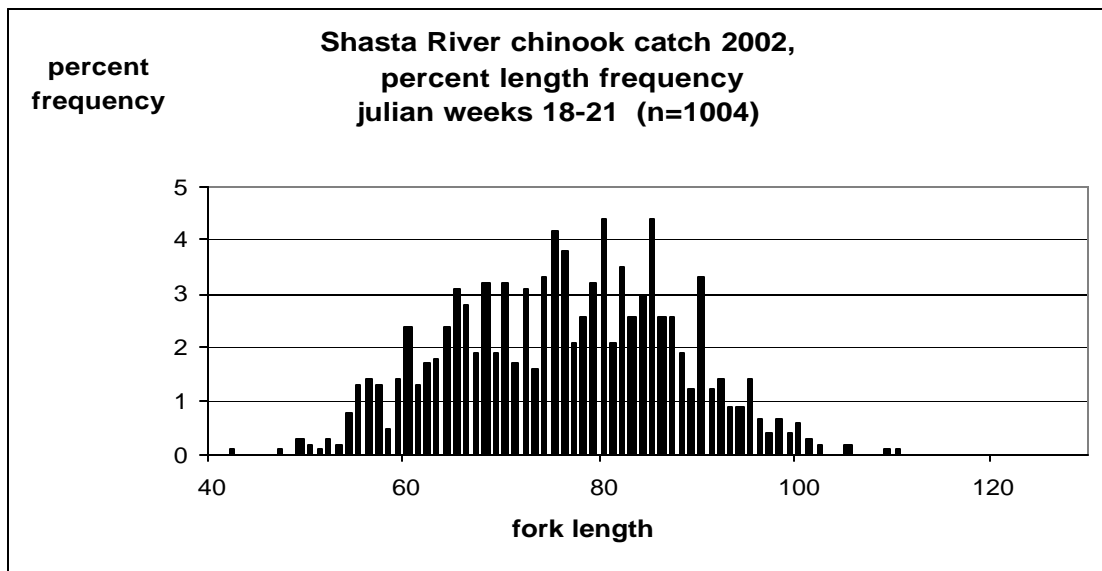
mean length = 43.85mm, std. dev.= 7.45

Chart 12b



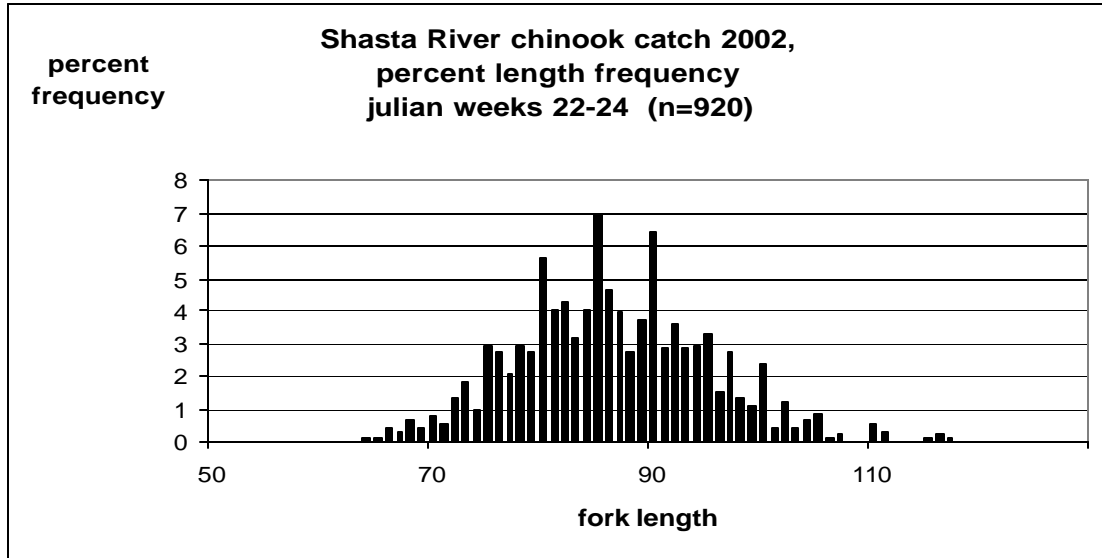
mean length = 61.99mm, std. dev. 11.07

Chart 12c



mean length = 76.00mm, std. dev. = 11.43

Chart 12d



mean length = 86.36mm, std. dev. 8.75

Chart 13

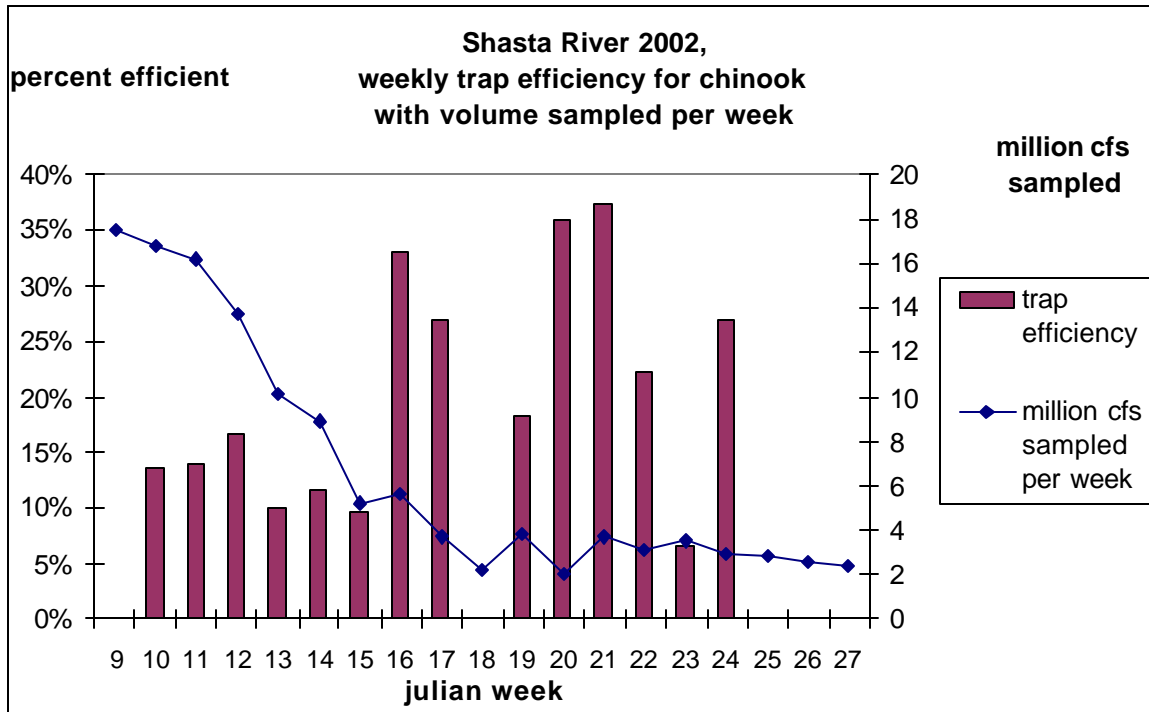


Chart 14

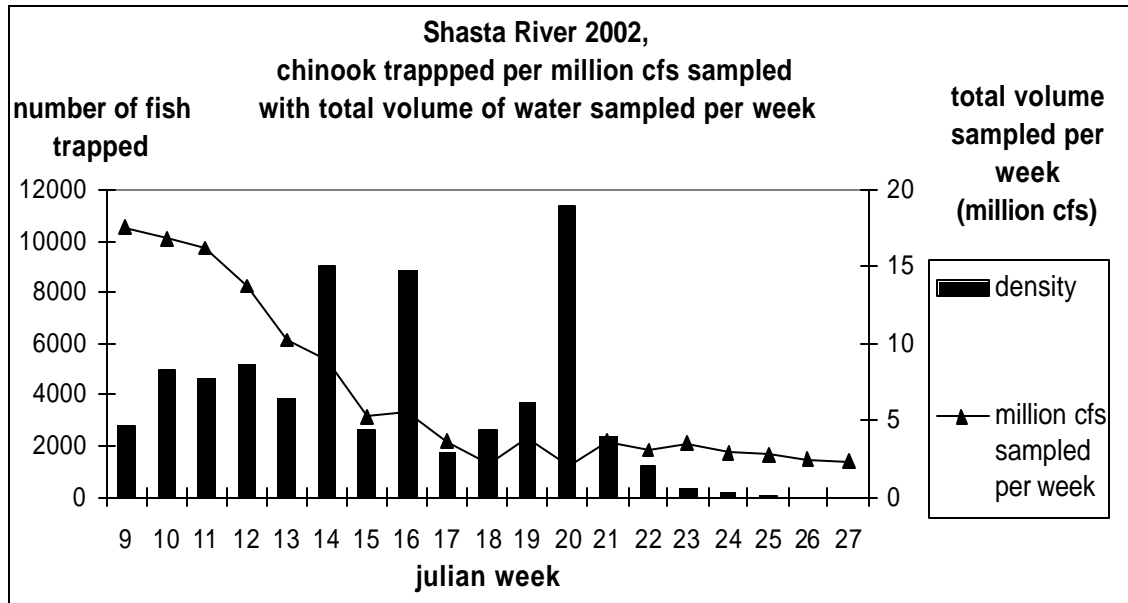


Table 3.

Shasta River 2002: estimated emigration of Chinook, weeks 9-24. Estimates are only for the six days per week that the trap was operated.

Julian week	Number of Chinook trapped	Estimated total of Chinook emigrating for the week	95% Confidence Interval		Estimated trap efficiency
			lower	upper	
9	48,580	No estimate			
10	84,096	610,610	477,726	743,494	13.6%
11	74,952	528,635	450,701	606,569	19.0%
12	70,529	420,783	364,314	477,252	16.6%
13	39,219	388,228	315,990	460,467	10.0%
14	80,067	683,041	544,064	822,017	13.1%
15	13,802	137,468	87,304	187,631	9.1%
16	49,192	148,769	130,222	167,315	32.9%
17	6,160	22,665	19,331	25,999	27.0%
18	5,748	No estimate			
19	14,062	76,491	62,325	90,658	18.5%
20	22,542	62,211	54,925	69,497	36.1%
21	8,396	22,300	19,787	24,873	37.4%
22	3,728	16,610	13,872	19,347	22.3%
23	1,175	16,597	8,940	24,254	6.7%
24	417	1,494	983	2,006	21.5.0%
25	440	No estimate			
26	32	No estimate			
27	4	No estimate			

Discussion

Trap Operation

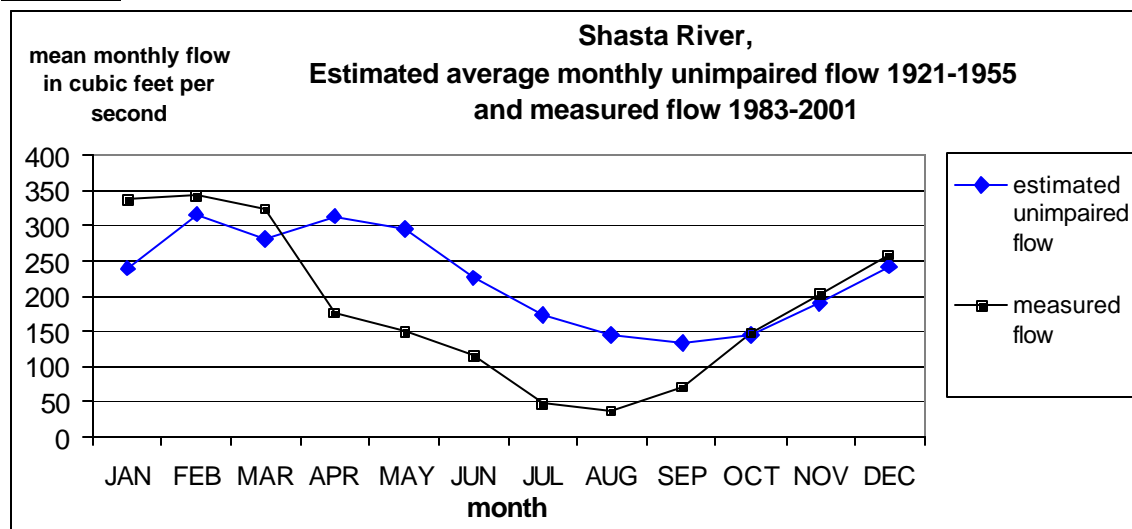
The Shasta River rotary trap is located directly downstream from the Shasta River Fish Counting Facility. In the early 1960s, I-beams and removable dam boards were installed, making it possible to create a pool below the weir. During periods of low flow in 2002, we utilized dam boards to control the quantity and velocity of the water passing through the rotary trap. We also placed sandbags downstream of the trap to increase the depth of water below the cone. These changes improved the trap's catch efficiency and extended the period that we were able to operate the trap.

Shasta River summer flow characteristics

DWR Bulletin 87 describes the Shasta River as having “well sustained summer flows...due to the predominance of the volcanic structures of the basin which rapidly absorbs and stores precipitation and yields the stored water at a comparatively even rate. Water sources include water melted from five perennial glaciers located on the north and east slopes of Mt Shasta above an elevation of 10,000 feet”. Within the Klamath basin, the Shasta River is unique for these flow characteristics. Estimates of the natural runoff for a period of 35 years, 1920 through 1955 are included in Bulletin 87. Natural runoff or unimpaired flow is defined as “the flow of a stream as it would be if unaltered by upstream diversion, storage, import, or export”.

The well-sustained summer flows are apparent in Chart 15 which shows the mean estimated natural flow in cubic feet per second for water years 1921-1955

Chart 15



Estimates of unimpaired flow after 1955 are not available at this time.

Chart 15 also shows the average measured monthly flows for 1983-2001 in cubic feet per second (cfs). These flows are monthly averages; actual flows can be higher and lower.

Chart 16 compares the measured flow that was available to salmonids for emigration and rearing habitat in 2002, to the estimated unimpaired flow. Chart 17 shows the measured flow in 2002 as a percentage of the estimated unimpaired flow.

Chart 16

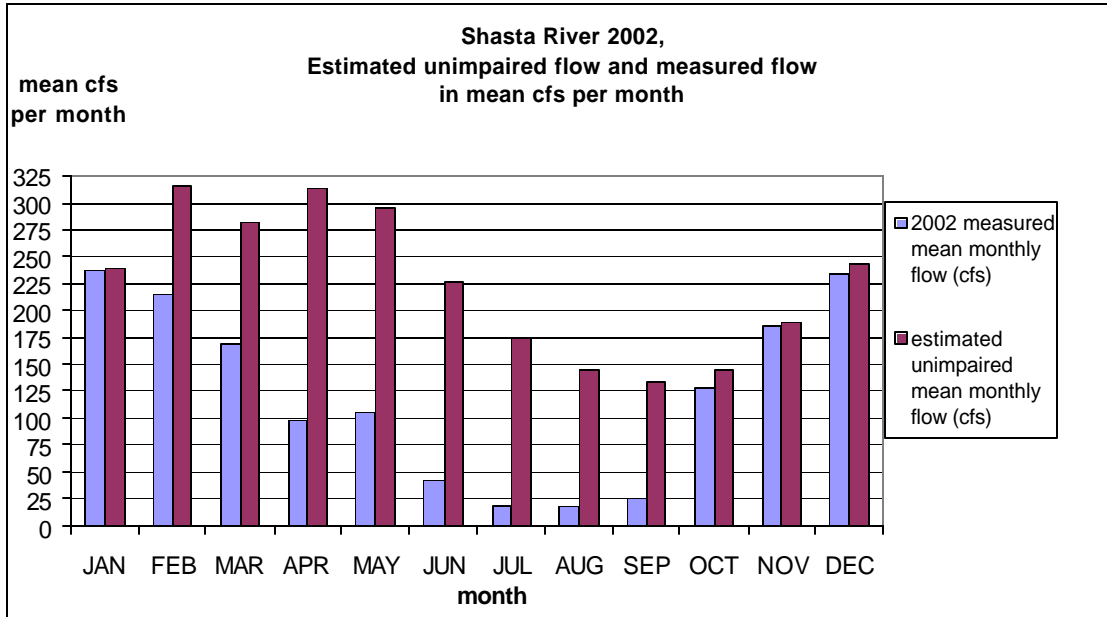
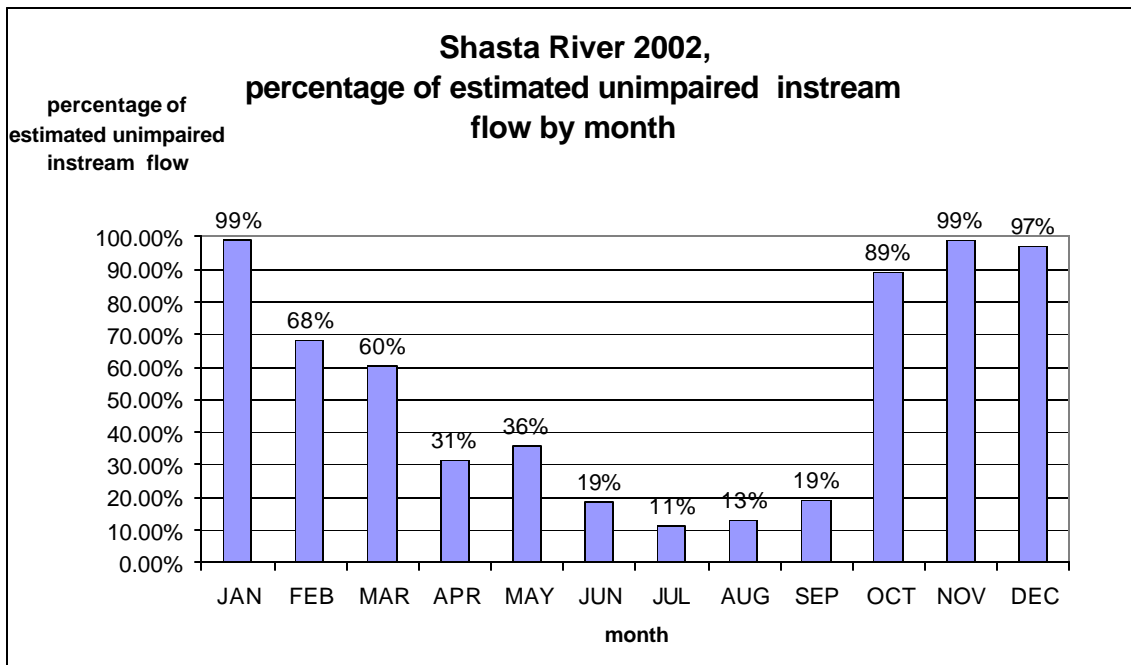


Chart 17



Age 0 steelhead emigration

It is well documented that age 0 steelhead emigrate from small tributaries as flows decrease to summer base levels (Everst 1973, Faudskar 1980).

This is thought to occur in response to changes in habitat as the water warms and rearing area diminishes. In 2002, a total of 528, age 1+ (6.46%) and 7,641 (93.56%) young of the year or age 0 steelhead were trapped as they emigrated from the Shasta River. The age 0 steelhead emigration began as the smolt migration ended in julian week 20 (week ending 5/20) when water temperatures increased and flows and habitat decreased (Chart 1 and 2).

Age 0 Coho emigration

Of the 744 coho trapped, 300 (40.4%) were smolts or silvery parr. 444 (59.6%) were age 0. Of these fish, 231 (52%) left after week 19 as available habitat decreased.

Although the Shasta River has well sustained summer flows, diversions greatly reduce instream flows and rearing habitat for salmonids. As a result, a substantial percentage of the steelhead and coho recruitment for 2002 left the Shasta River as age 0 fry and parr in search of rearing habitat in the Klamath River or other tributaries.

Both steelhead and coho have life histories requiring one and two years of rearing in fresh water, respectively. Adequate rearing areas during the summer are essential to maintaining and increasing their population size.

Recommendations

- Schedule and conduct annual surveys to determine where juvenile salmonid rearing occurs in the Shasta River during the summer.
- Identify the location and estimate the quantity of spring inflow within the Shasta River.
- Begin trapping in week 6 if possible to improve estimate of Chinook production

Chart 18

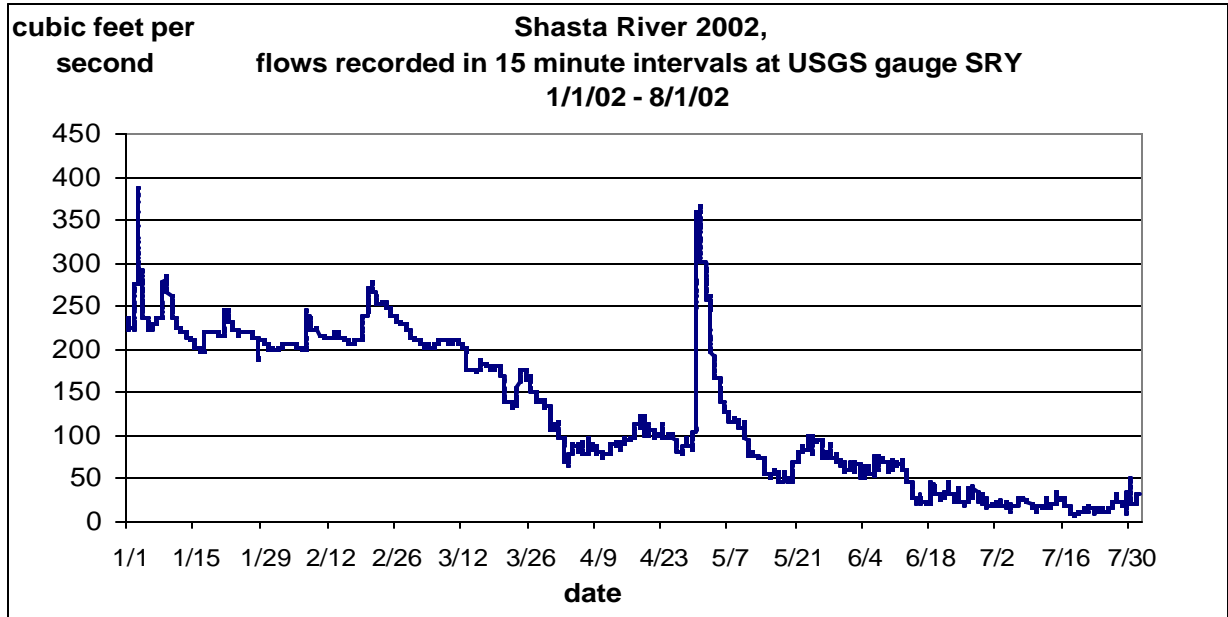
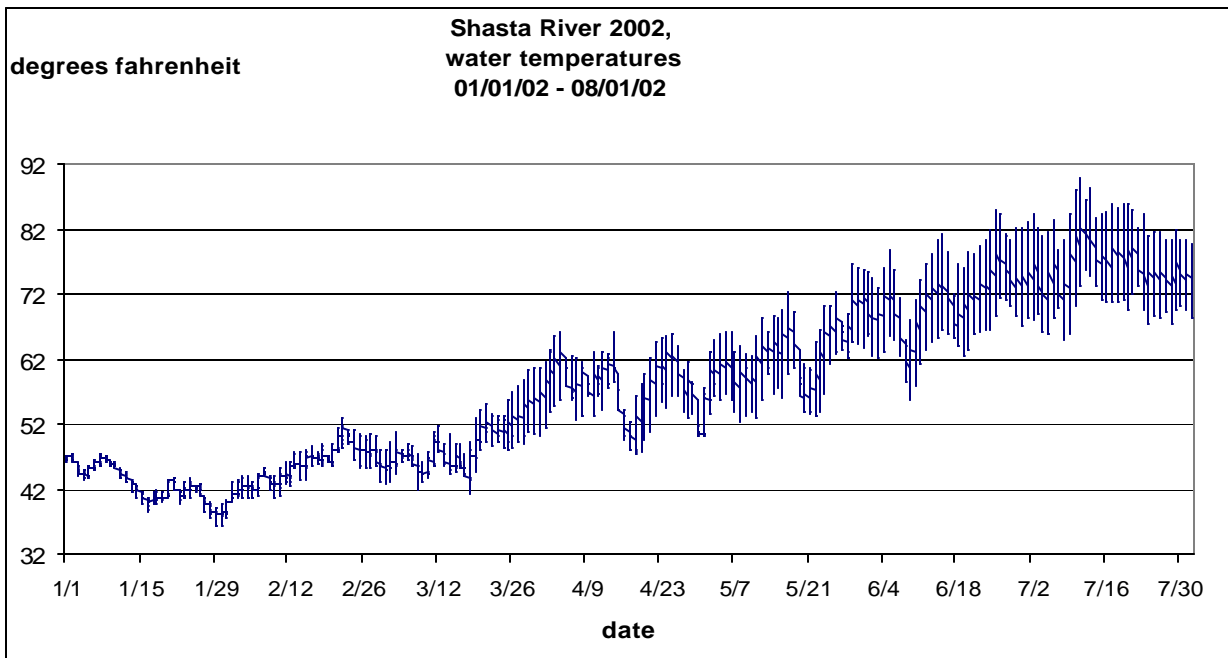


Chart 19



Scott River Rotary Screw Trap Summary

As in 2000 and 2001, The Klamath National Forest, Scott River Ranger District and the California Department of Fish & Game, Steelhead Research and Monitoring Program cooperatively operated the Scott River rotary trap in 2002.

Methods

We sampled the Scott River with a five-foot rotary trap from Julian week 9 (2/26/02) through 28 (7/13/02). As in 2001, we operated the trap at the Cabin Hole located 4.75 miles upstream of the mouth of the Scott River. The trap was fished from Sunday PM through Saturday AM throughout the season. The catch was processed at approximately 0800 and at 1600 hours daily. Hourly water temperatures were recorded at the site with an Onset Optic StowAway temperature logger. If sufficient numbers were present in the catch, a random sample of twenty-five fish of every salmonid species was measured and classified by life stage. All vertebrates collected in the trap were identified and counted. Trap efficiency determinations were conducted as described for the Shasta River rotary trap beginning in week 13.

Results

The trap was fished for a total of 2,605 hours and sampled 374,889,243 cubic feet of water. Table 4 shows the total unexpanded catch for all species trapped.

Table 4.
Sum of Fish Species Trapped, Scott River 2002

Species	Count
Steelhead Trout <i>Onchorhynchus mykiss irideus</i>	11,918
Coho Salmon <i>Onchorhynchus kisutch</i>	1,939
Chinook Salmon <i>Onchorhynchus tshawytscha</i>	11,793
Pacific Lamprey <i>Lampera tridentata</i>	7,827
Klamath Small-scaled Sucker <i>Catosomus rimiculus</i>	3,452
Sculpin spp. <i>Cottus spp.</i>	3
Speckled Dace <i>Rhinichthys osculus</i>	3,073
Three Spine Stickleback <i>Gasterosteus aculeatus</i>	70

Steelhead

The largest weekly total of steelhead smolts and silvery parr, 180, were trapped during week 14 (Chart 20, Table 5). The fork lengths of 4,284 steelhead were measured. The fork length frequency of the measured sub-sample is shown by month in Charts 24 a-e. Age 0+ steelhead fry and parr first appeared in the catch during week 16 (4/20/02). 641 scale samples were collected from a sub-sample of the measured fish.

Trap efficiency for Steelhead

The highest trap efficiency for steelhead smolts and silvery parr as determined by Carlson mark-recapture estimates occurred during week 18, 10% (Chart 25). The greatest number of steelhead trapped per unit volume sampled occurred during week 25, with 9.82 fish trapped per million cubic feet sampled (Chart 22). The estimates for the total number of smolts and silvery parr steelhead moving past the trap between weeks 14-25 are shown in Table 5. The largest weekly estimate occurred during week 14 with 2,150 steelhead estimated for the week.

Chart 20

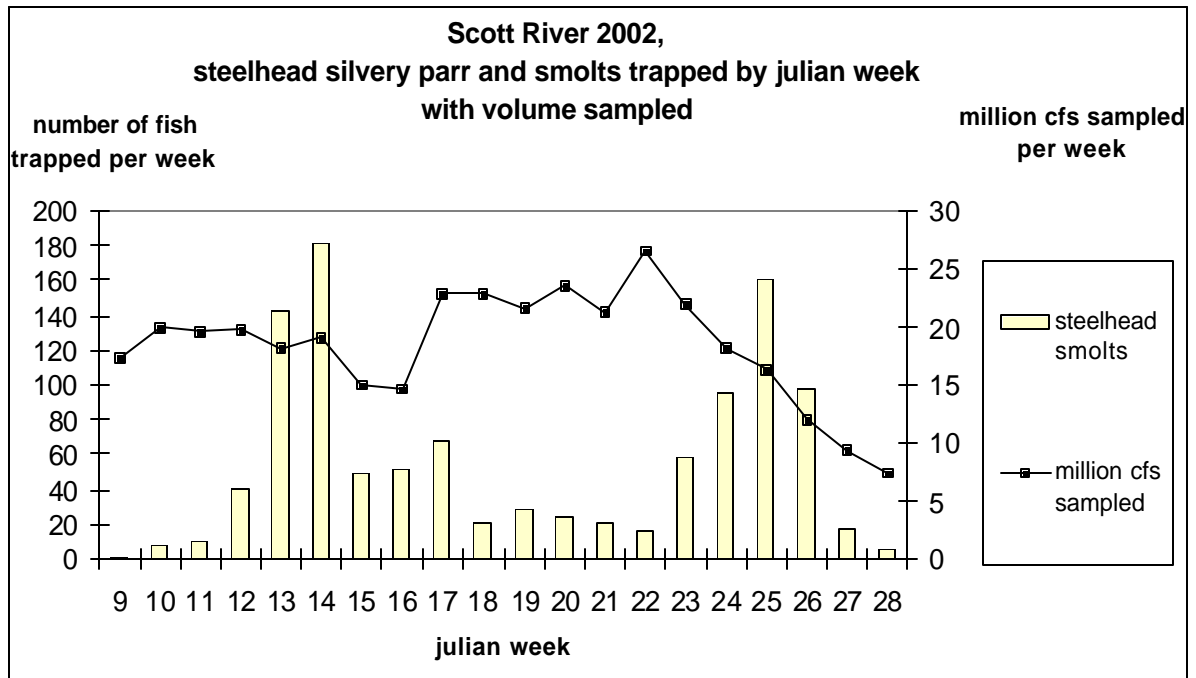


Chart 21

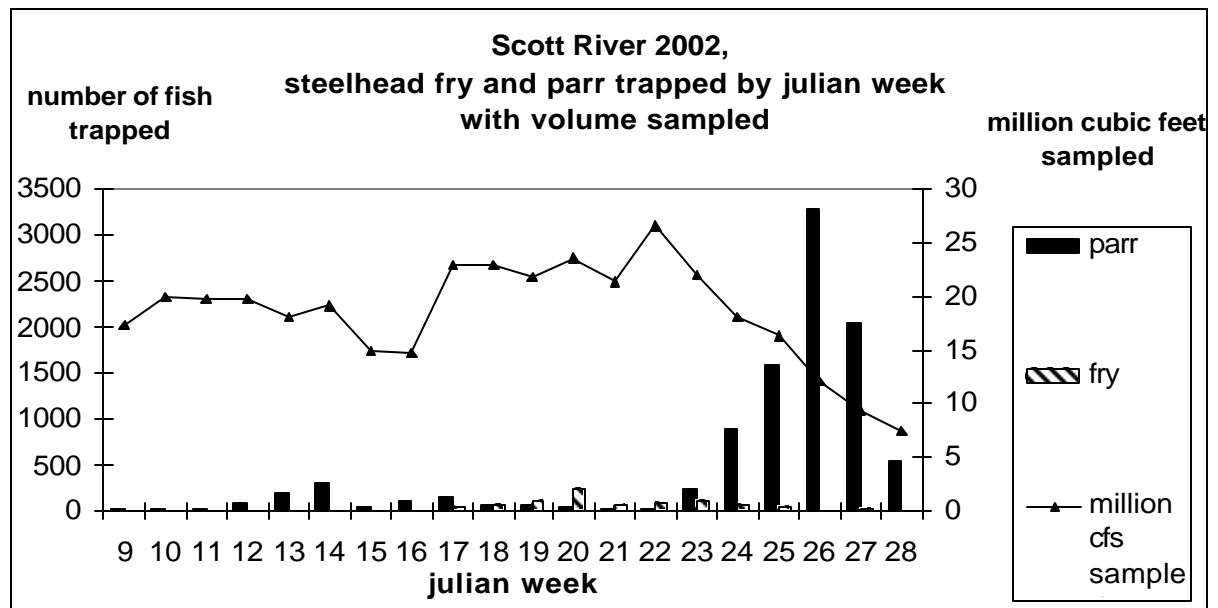


Chart 22

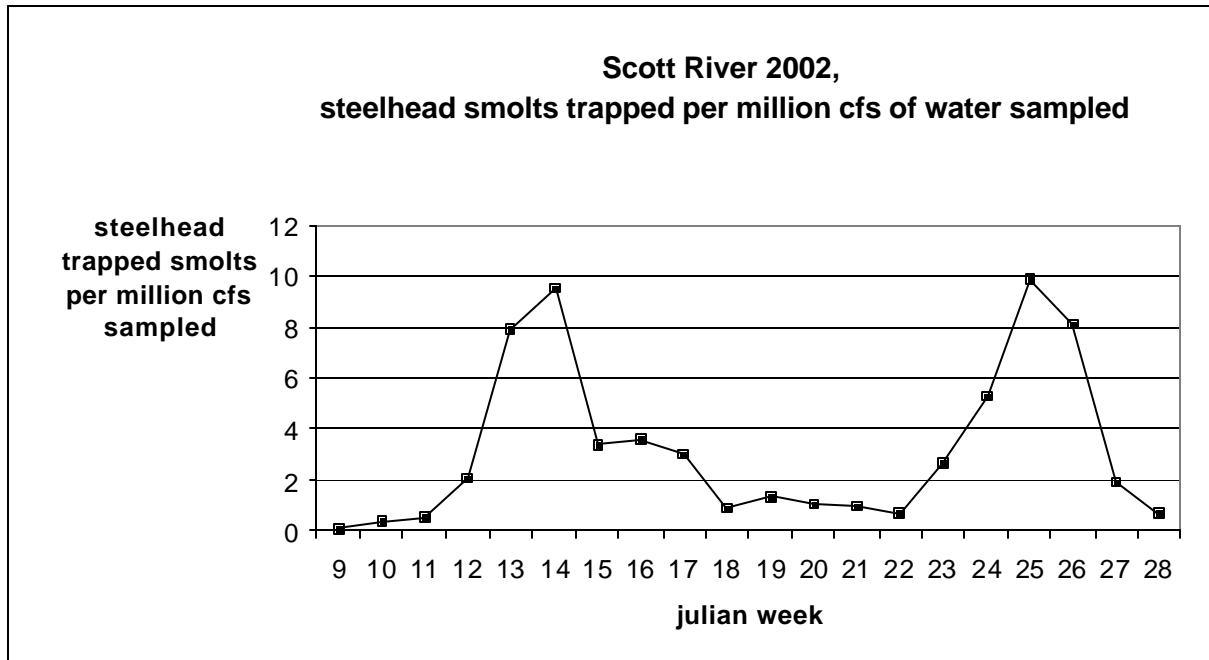


Chart 23

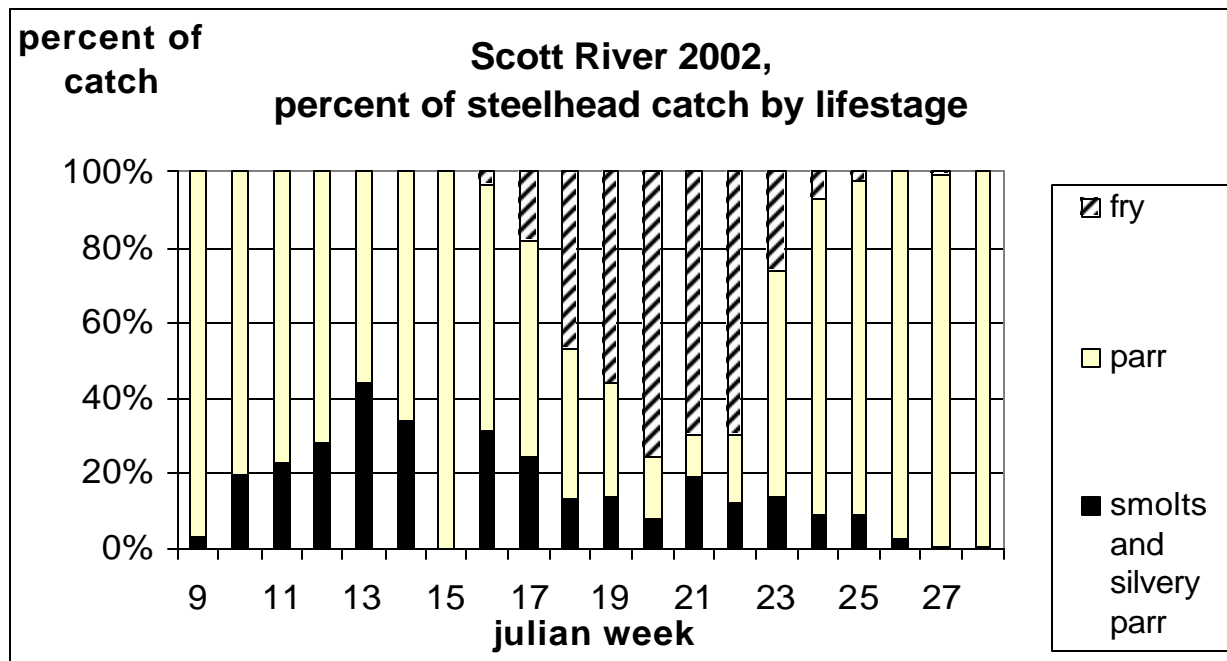
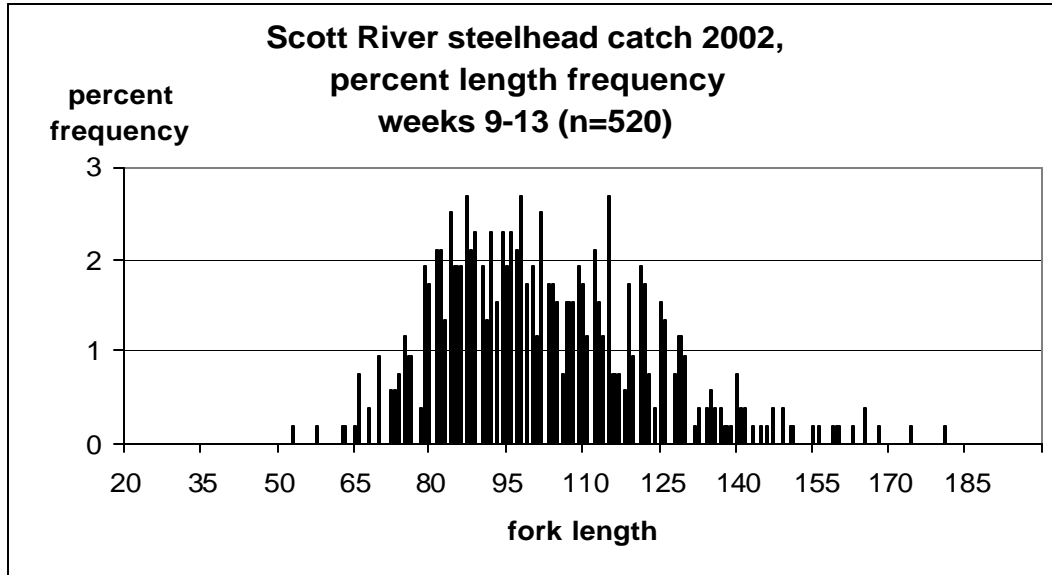


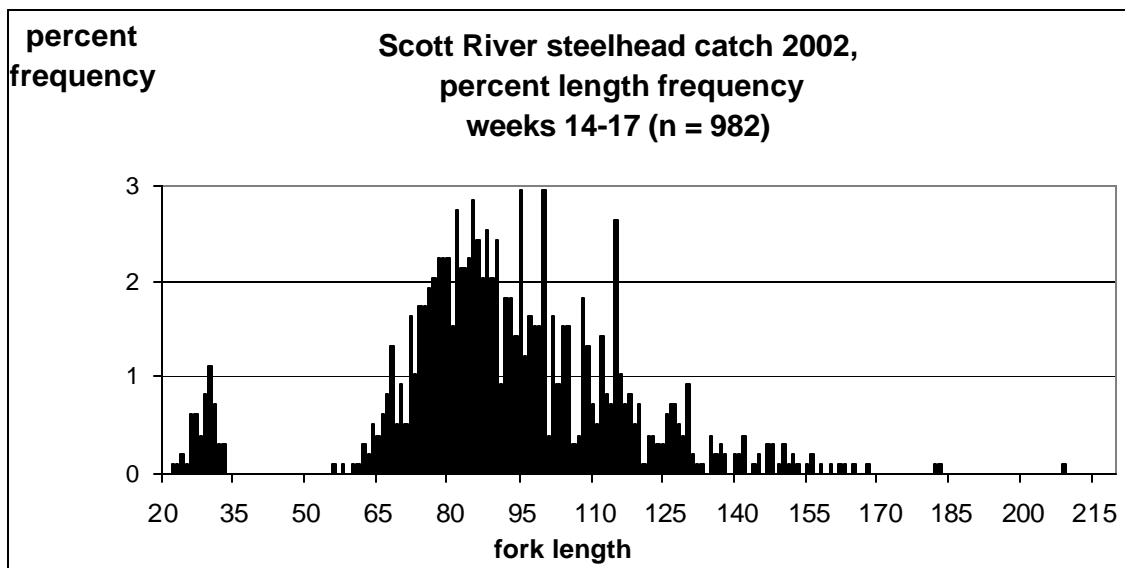
Chart 24 a-d Scott River steelhead length frequency by month

Chart 24a



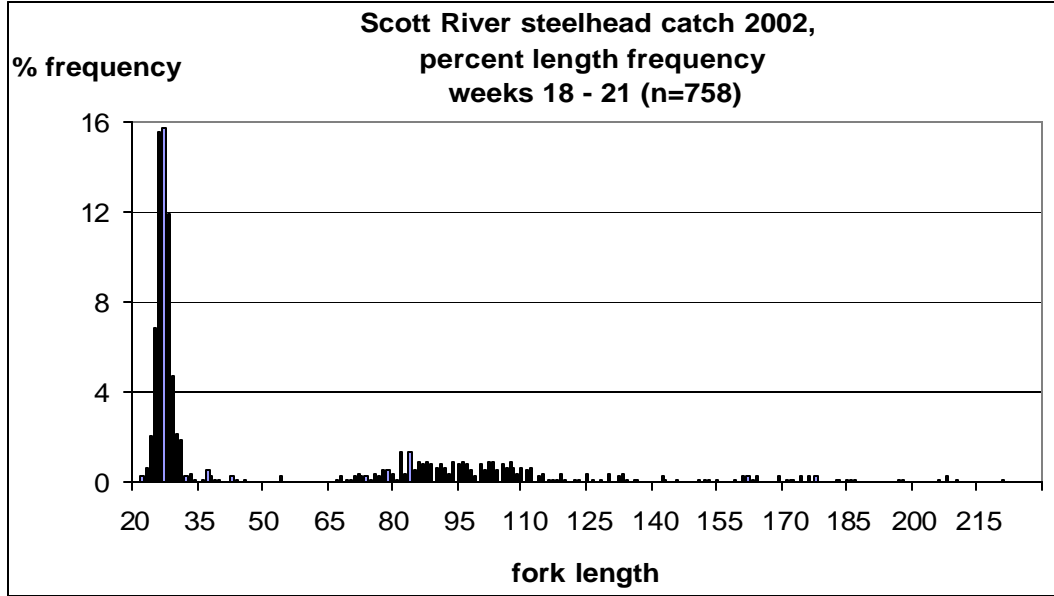
mean = 102.33 mm, std. dev. = 20.07

Chart 24b



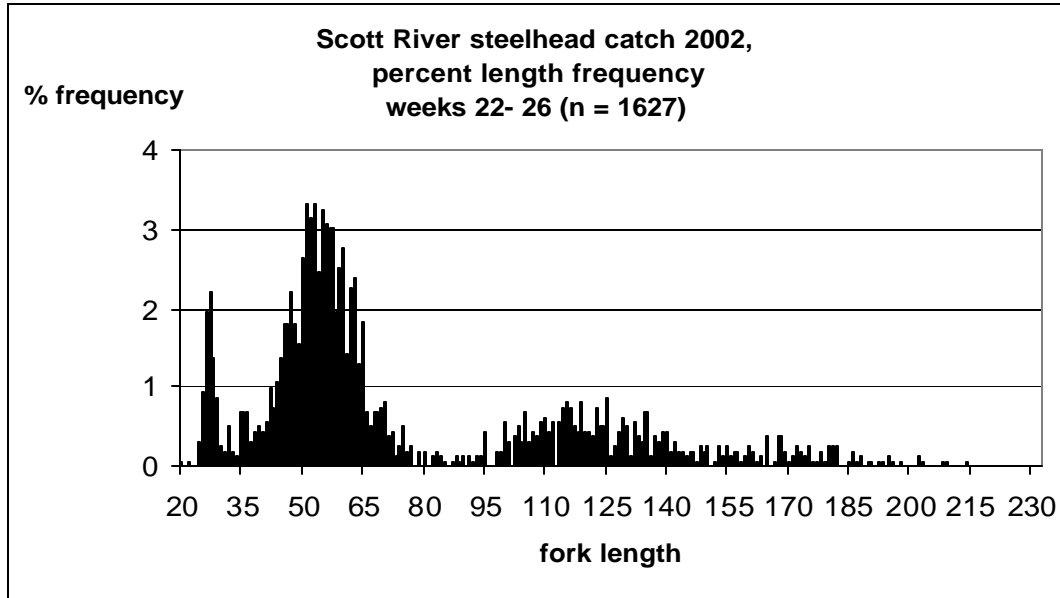
mean length = 91.85mm, std. dev. = 24.97

Chart 24c



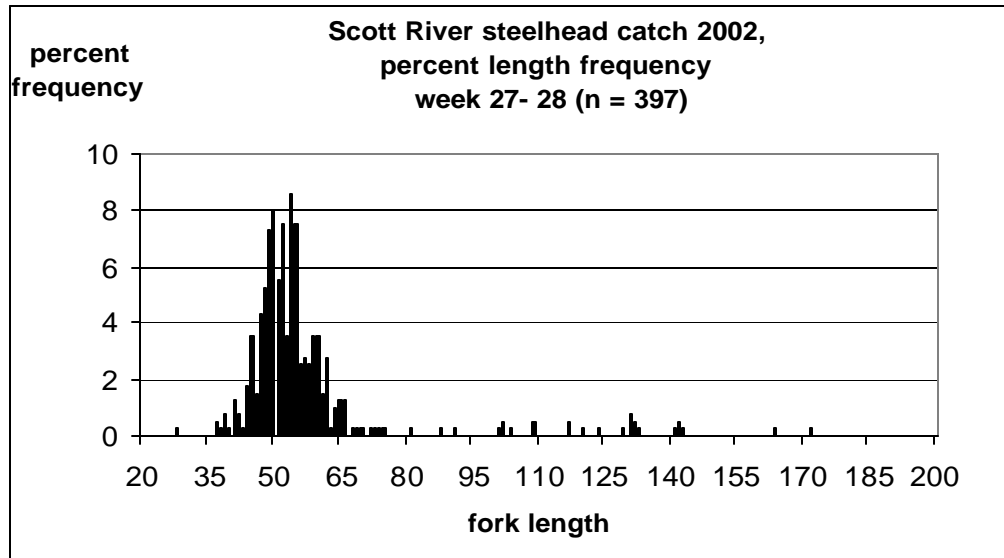
mean length = 55.5., std. dev. 42.43

Chart 24d



mean length = 74.62 mm, std. dev.= 39.99

Chart 24e



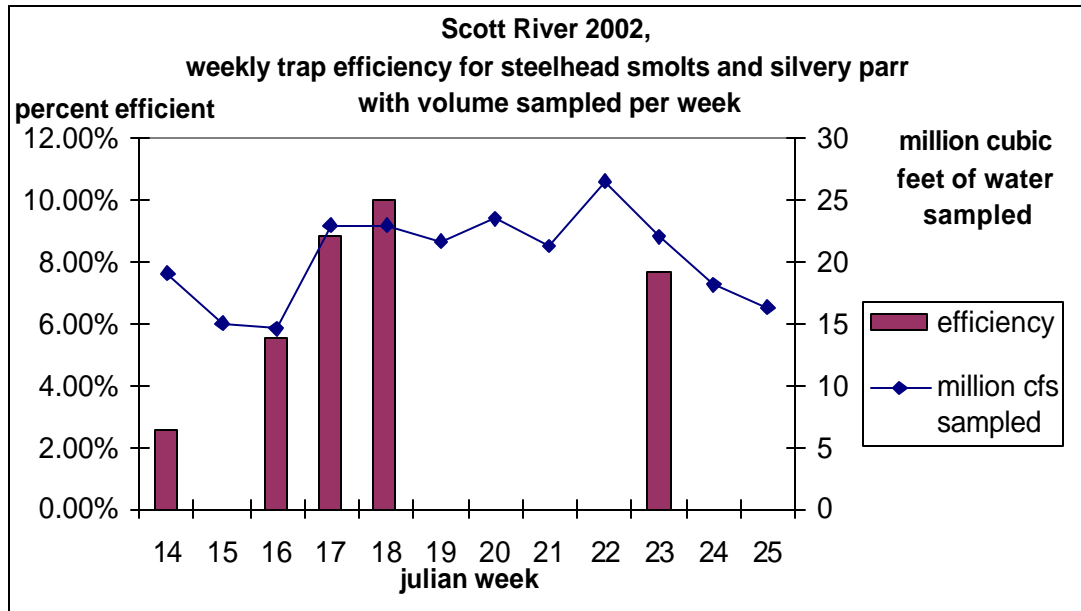
mean length =57.35mm, std. dev.19.17

Table 5.

Scott River 2002: trap efficiency and estimated number of juvenile steelhead emigrating by julian week

Julian week	Number of steelhead smolts and silvery parr trapped	Estimated number of smolts and silvery parr emigrating for the week	Estimated trap efficiency	95 % confidence interval	
				Upper	Lower
14	180	2150	2.56%	5124	0
15	50	zero recaptures no estimate			
16	51	569	5.56%	1052	85
17	65	110	8.82%	228	0
18	20	435	10.00%	1027	0
19	29	zero recaptures no estimate			
20	24	zero recaptures no estimate			
21	21	zero recaptures no estimate			
22	17	zero recaptures no estimate			
23	56	1824	7.69%	4297	56
24	96	zero recaptures no estimate			
25	160	zero recaptures no estimate			

Chart 25



Coho

A total of 1,939 juvenile coho were collected in the trap. Catch by life stage and week is shown in Charts 26, 27 and 28. The fork lengths of 773 of these fish were measured and their length frequencies by month are shown in Charts 29 a-e. To minimize handling stress, we did not collect scale samples from coho.

Chart 26

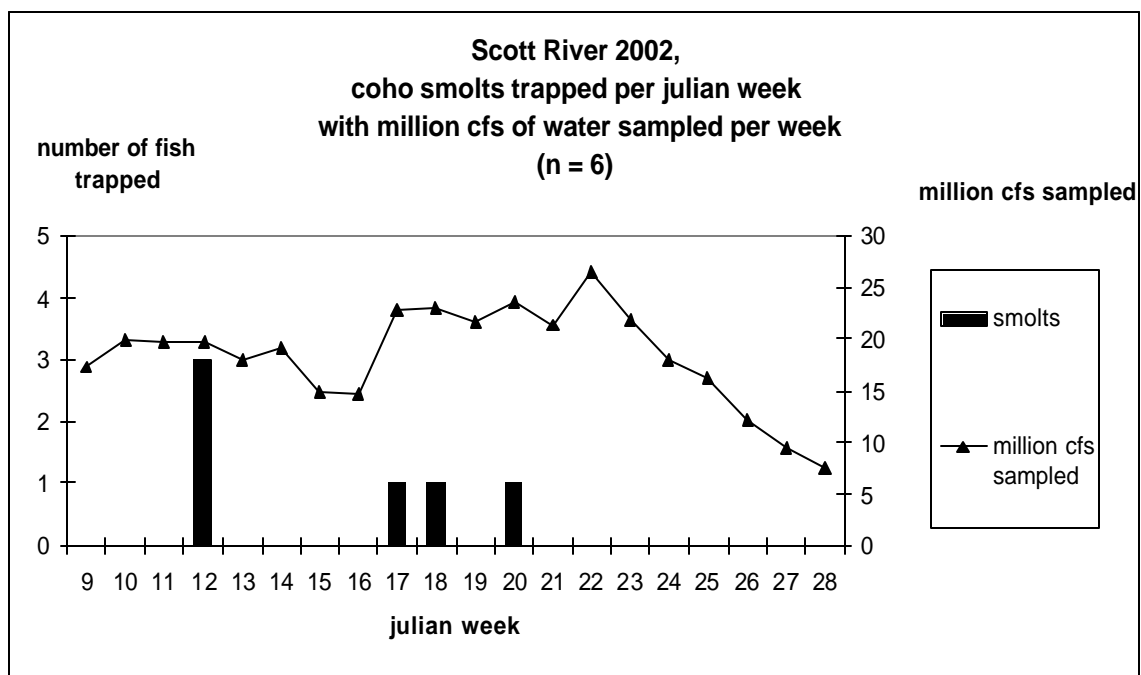


Chart 27

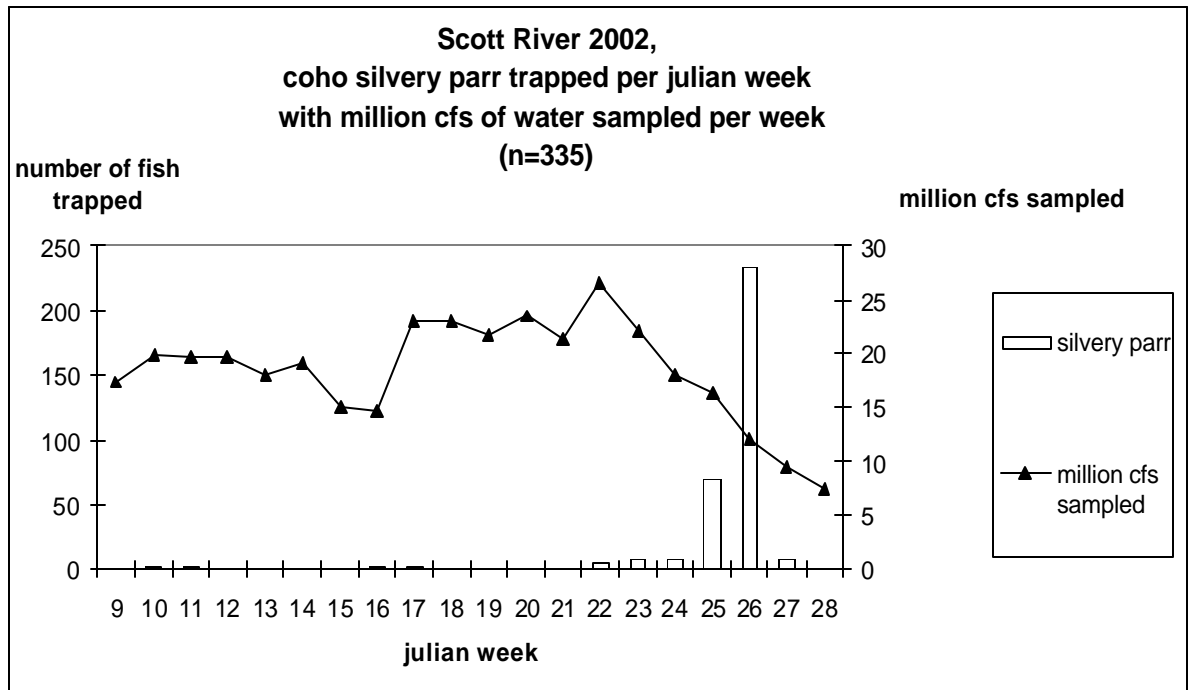


Chart 28

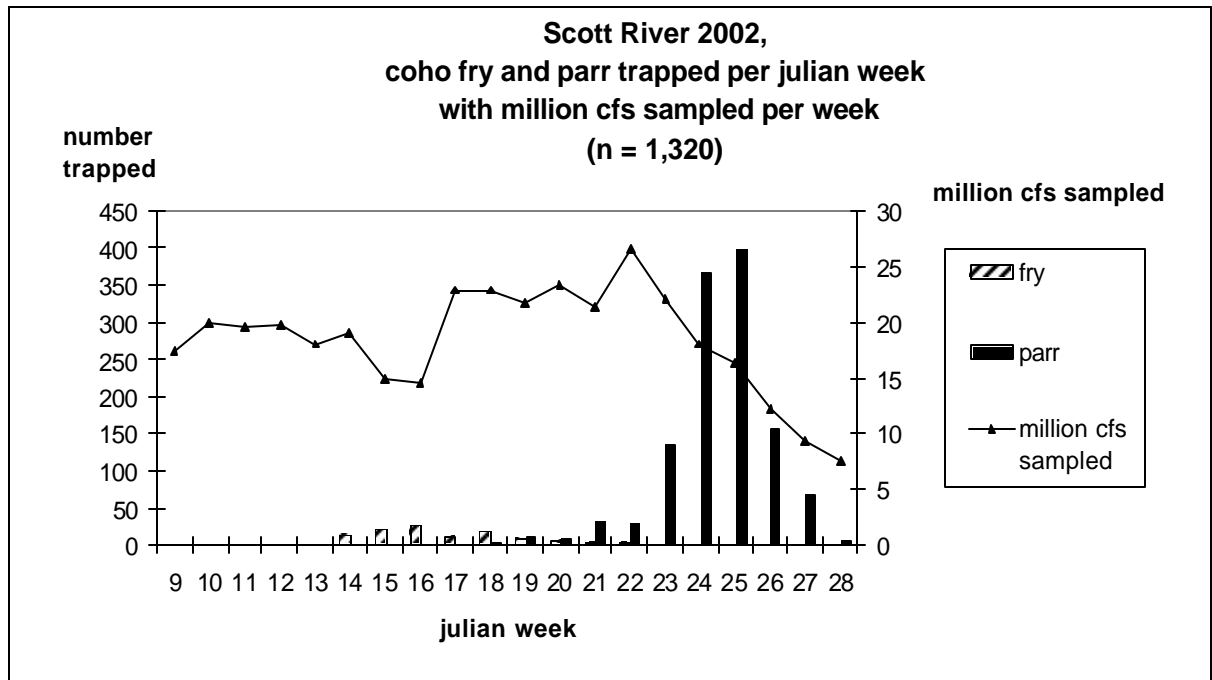
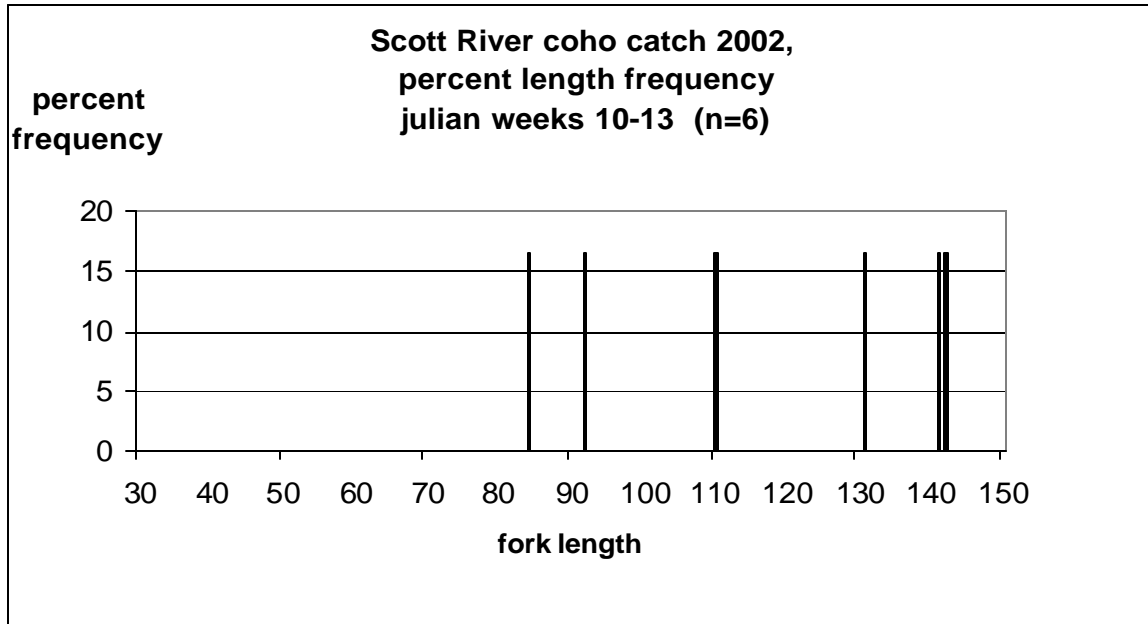


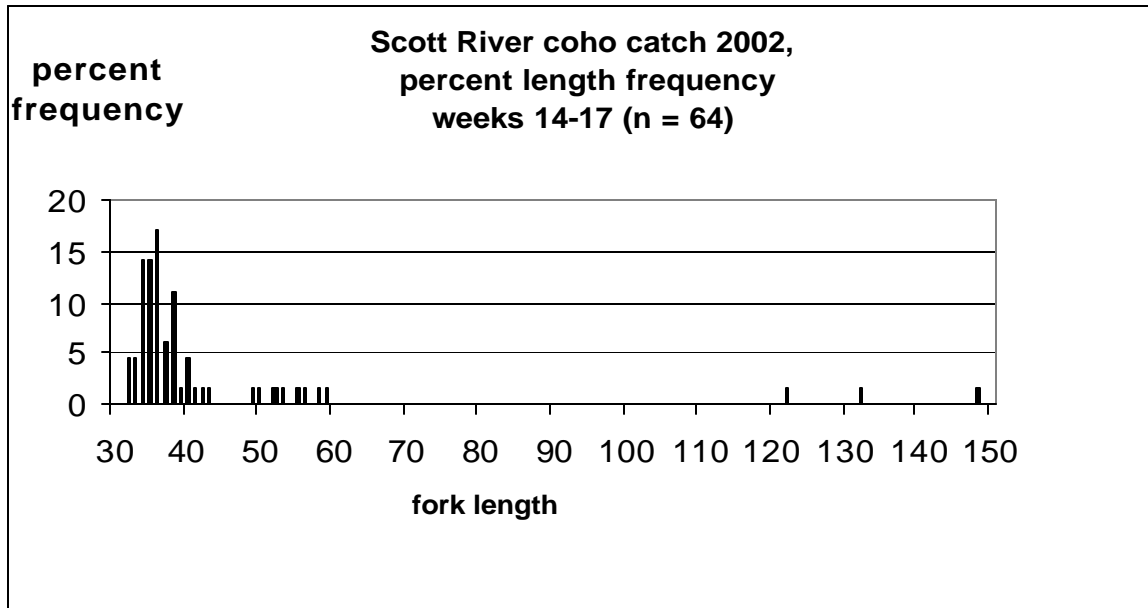
Chart 29 a-e Scott River Coho length frequency by month

Chart 29a



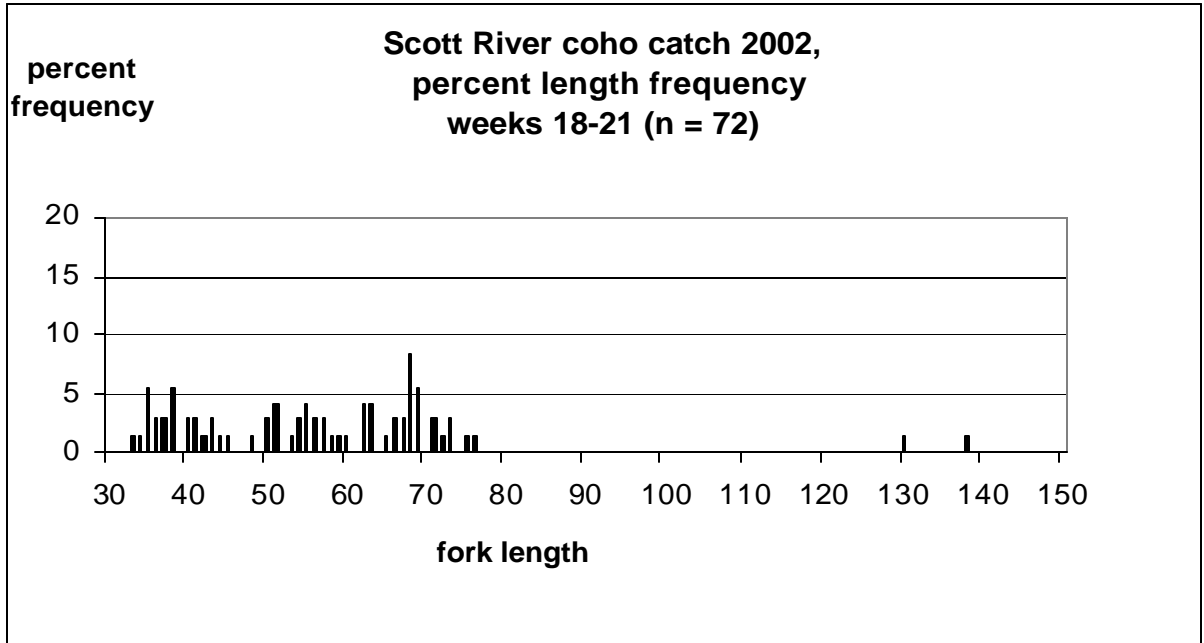
mean length = 118.67 mm, std. dev. = 25.14

Chart 29b



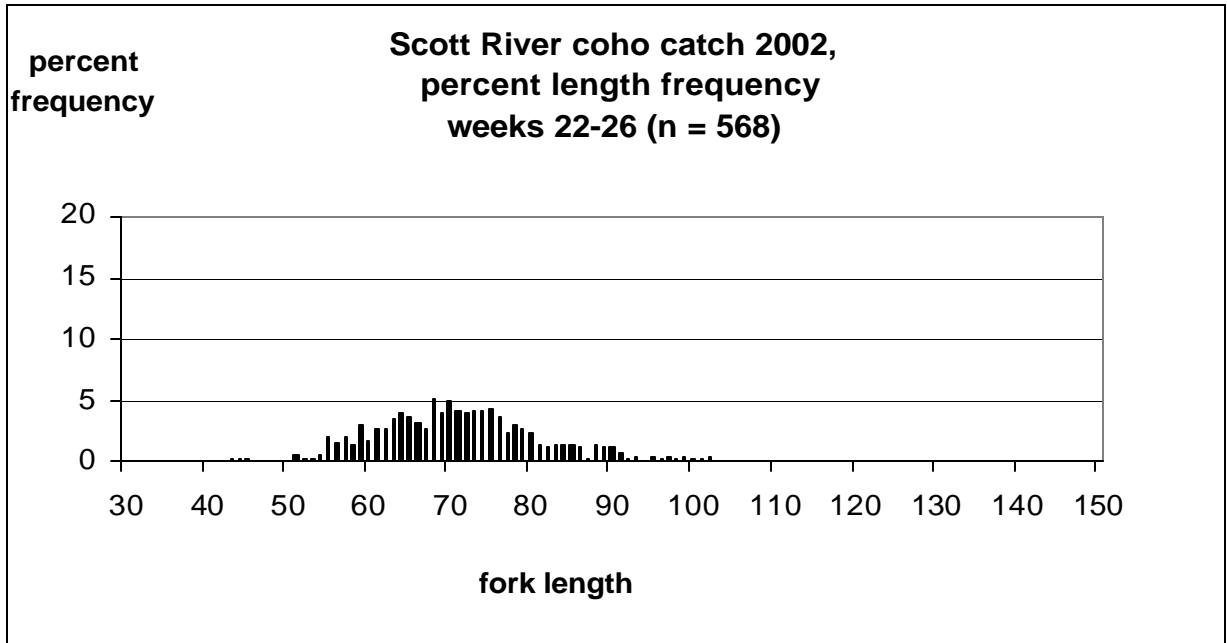
mean length = 42.89 mm, std. dev. 21.50

Chart 29c



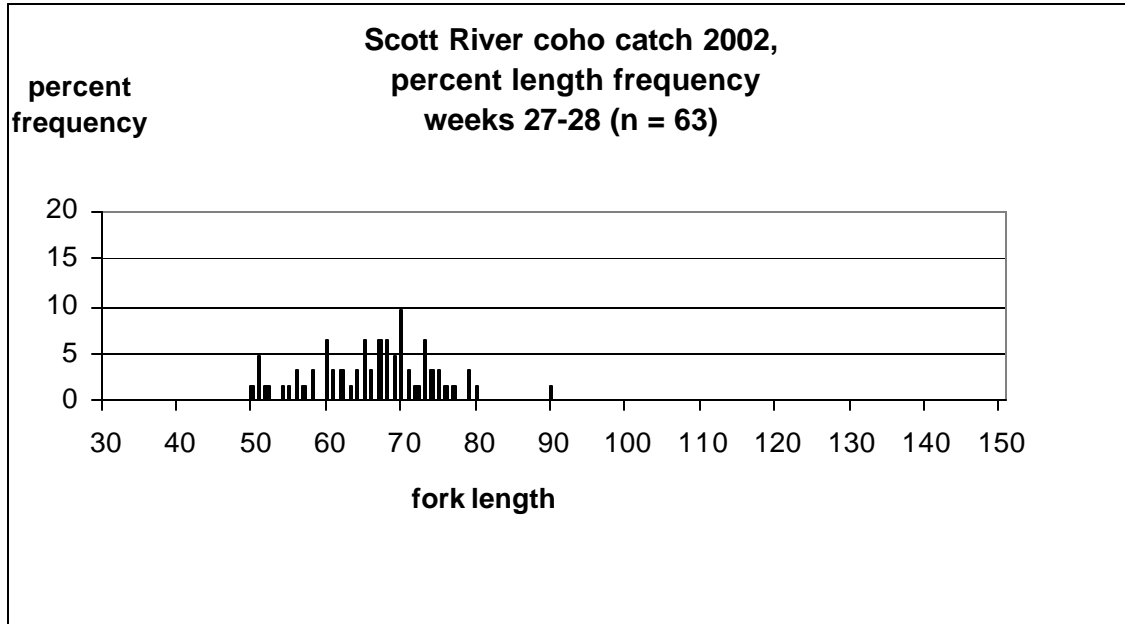
mean length = 56.71 mm, std. dev. 18.44

Chart 29d



mean length = 71.01 mm, std. dev. 9.86

Chart 29e

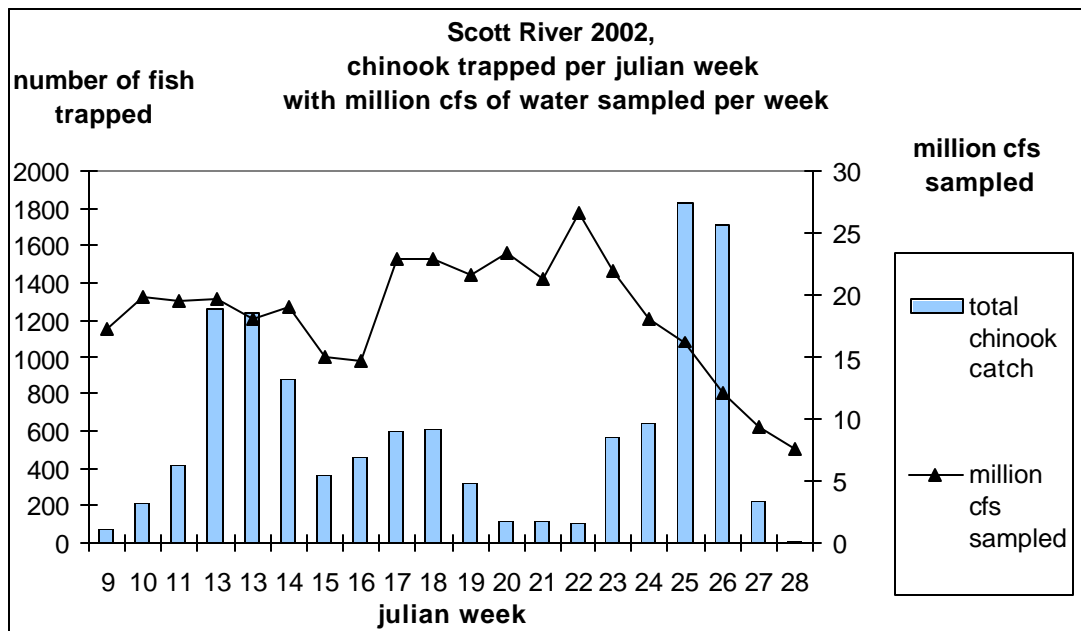


mean length = 66.19 mm, std. dev.8.12

Chinook

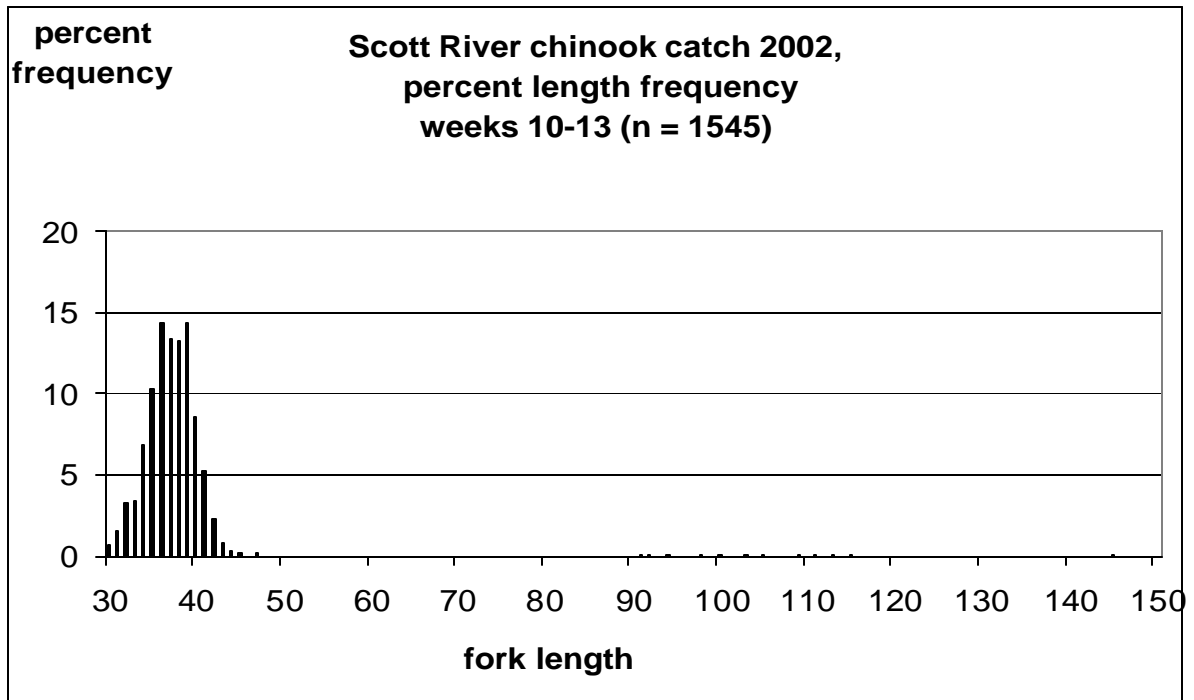
A total of 11,793 Chinook were collected in the trap. The catch per week is shown in Chart 28. The largest weekly catch of Chinook occurred during week 21 (1,823) the greatest catch density occurred during week 26 with 141.3 Chinook trapped per million cubic feet of water sampled (Chart 33). The fork lengths of 4,119 Chinook were measured. The fork length frequencies of the measured sub-sample are shown by month in Charts 30 a-d. The highest trap efficiency for Chinook occurred during week 20 at 4.34% (Chart 31). Table 6 shows the estimated number of Chinook moving downstream of the trap during the period when efficiency estimates were made.

Chart 30



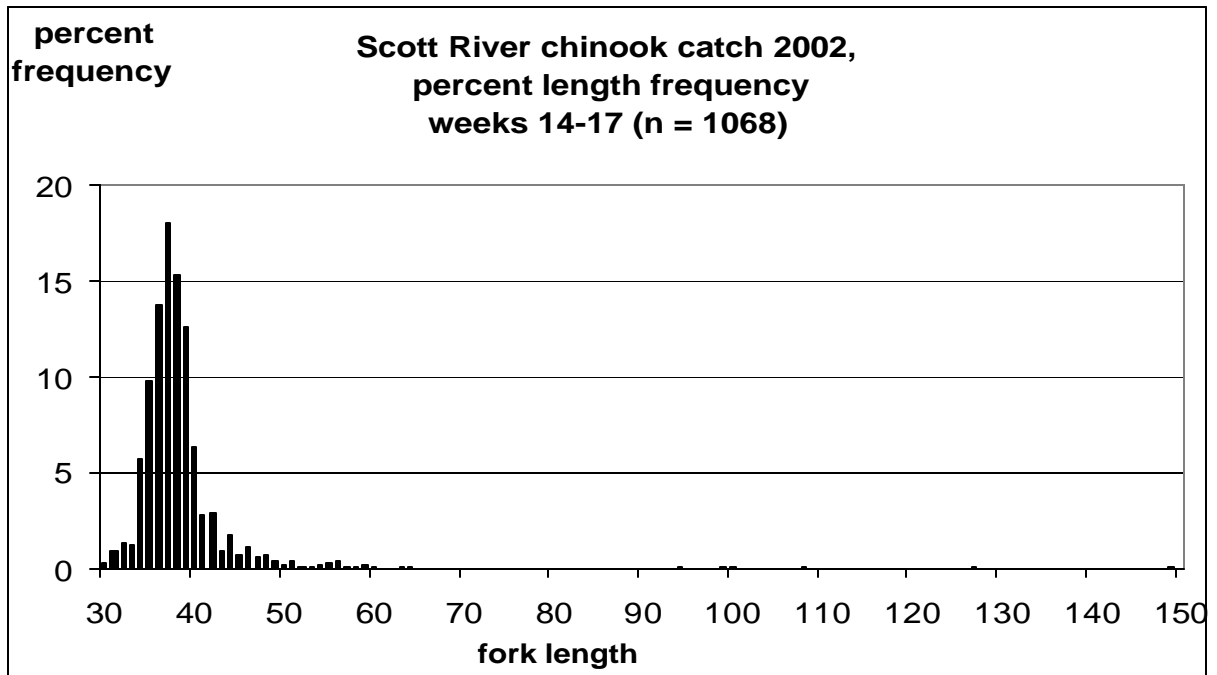
Charts 31 a-d Chinook length frequency by month

Chart 31a



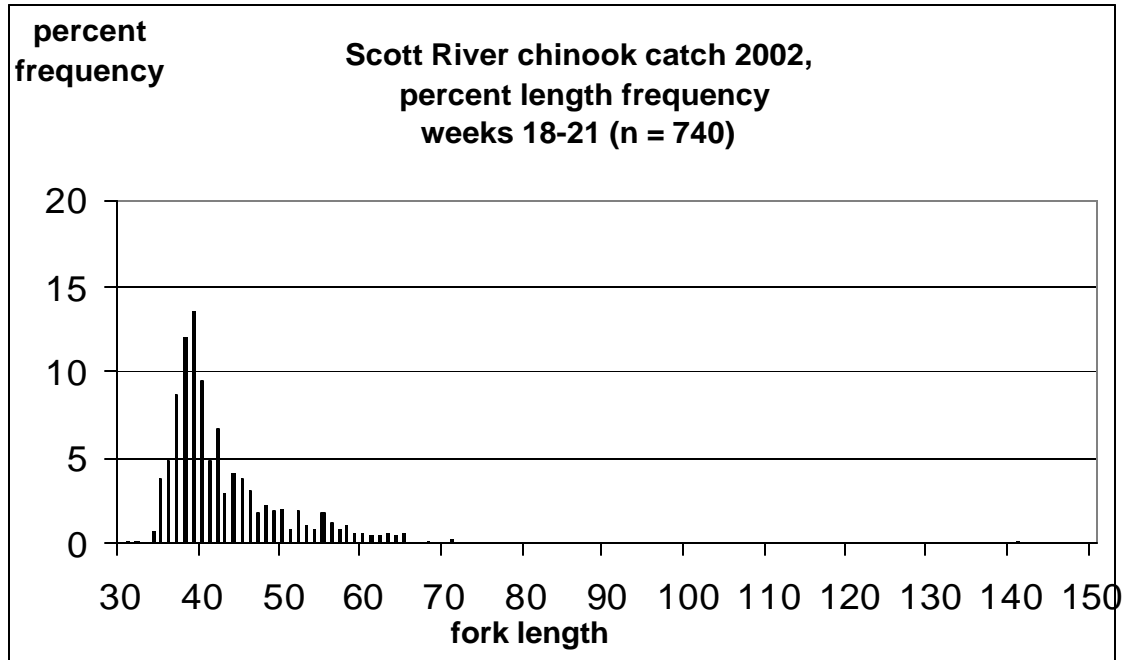
mean length = 37.65 mm, std dev 7.03

Chart 31b



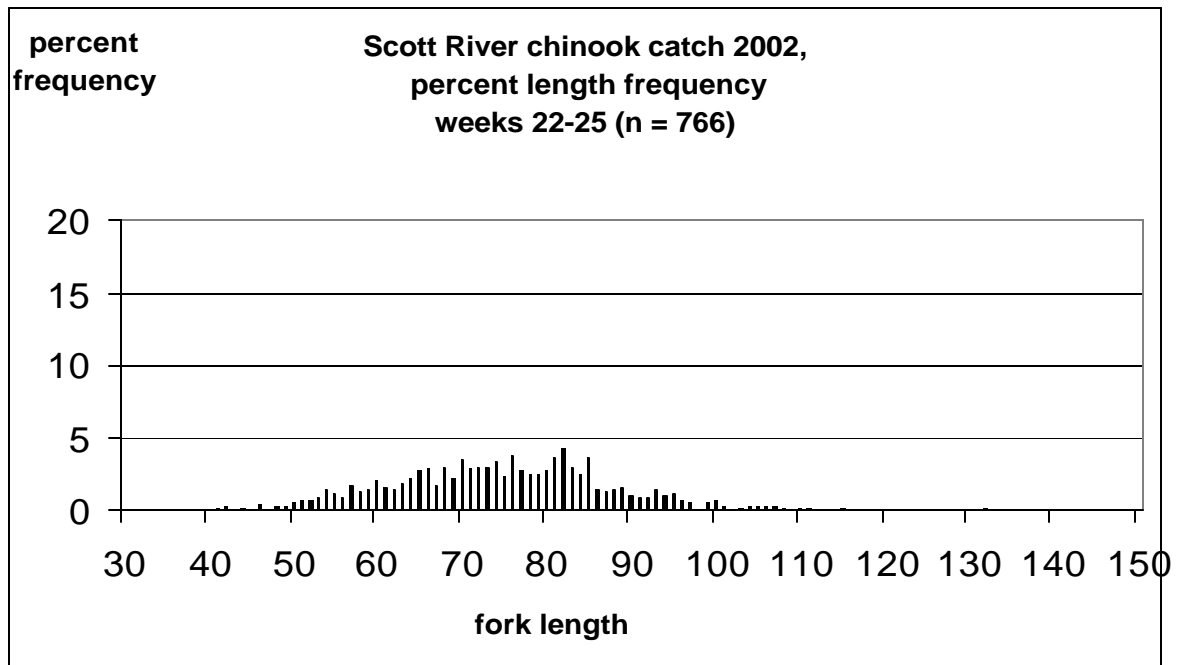
mean length = 38.47mm, std. dev.= 7.00

Chart 31c



mean length = 42.66 mm, std. dev. 7.73

Chart 31d



mean length = 74.65 mm, std. dev. 12.59

Chart 32

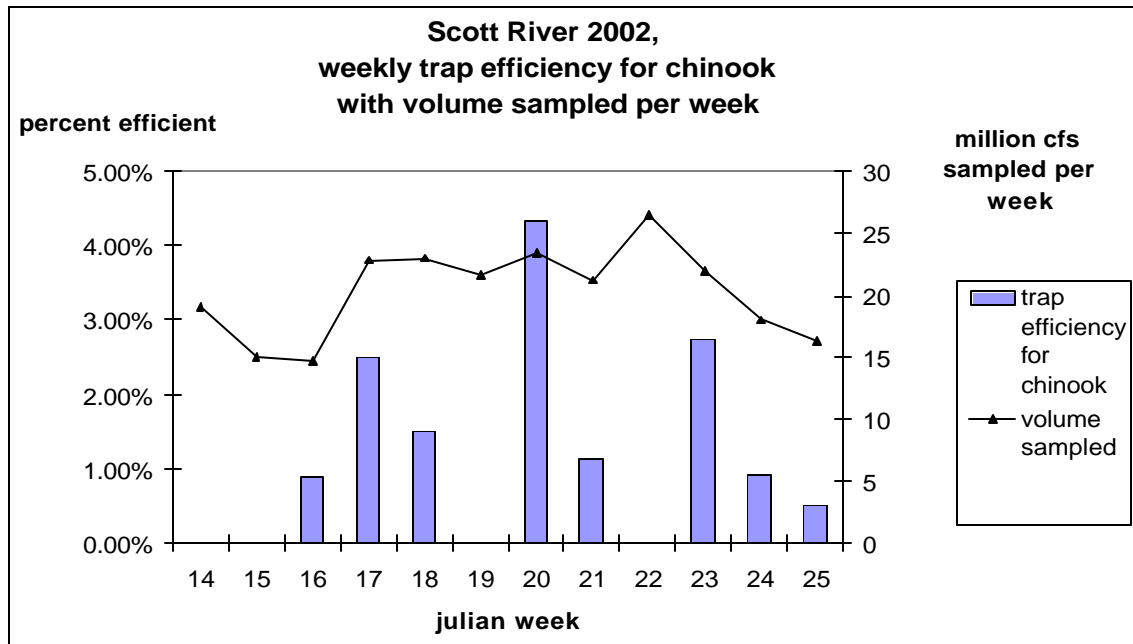


Chart 33

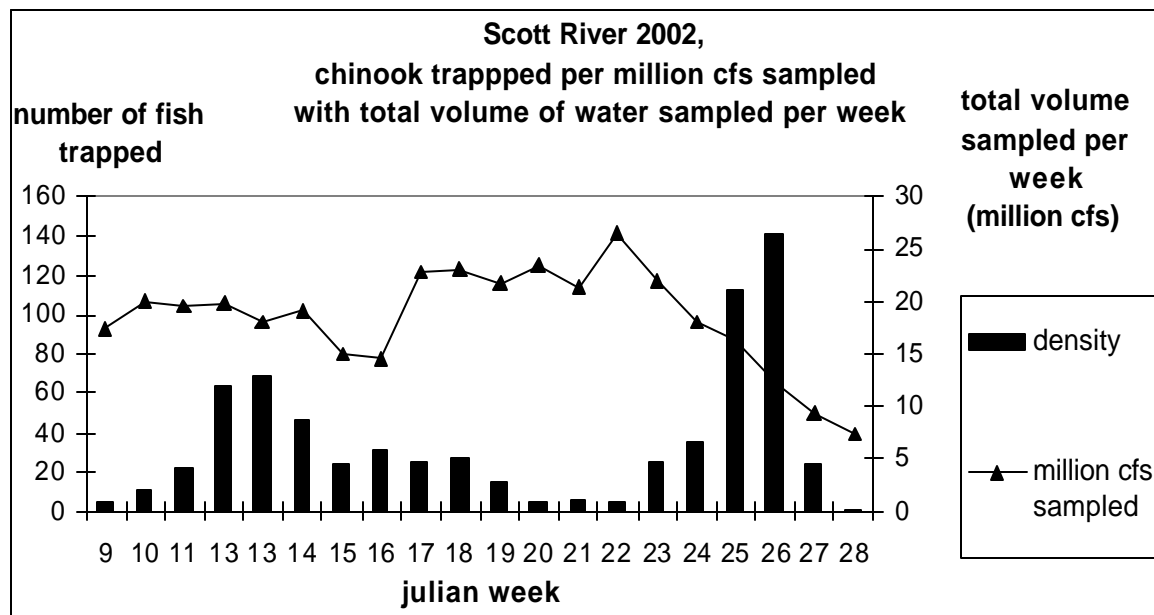


Table 6.

Julian week	Number of Chinook trapped	Estimated total of Chinook emigrating for the week	95% Confidence Interval		Estimated trap efficiency
			lower	upper	
14	882	No recaptures			
15	362	No recaptures			
16	457	25,592	0	54,355	0.90%
17	596	21,009	7,389	34,629	2.49%
18	611	32,505	6,636	58,374	1.50%
19	319	No recaptures			
20	113	1,356	0	2,838	4.34%
21	118	5,192	0	11,049	1.14%
22	110	No recaptures	0	8,343	
23	569	16,615	3,493	29,737	2.75%
24	637	34,717	0	73,701	0.92%

Chart 34

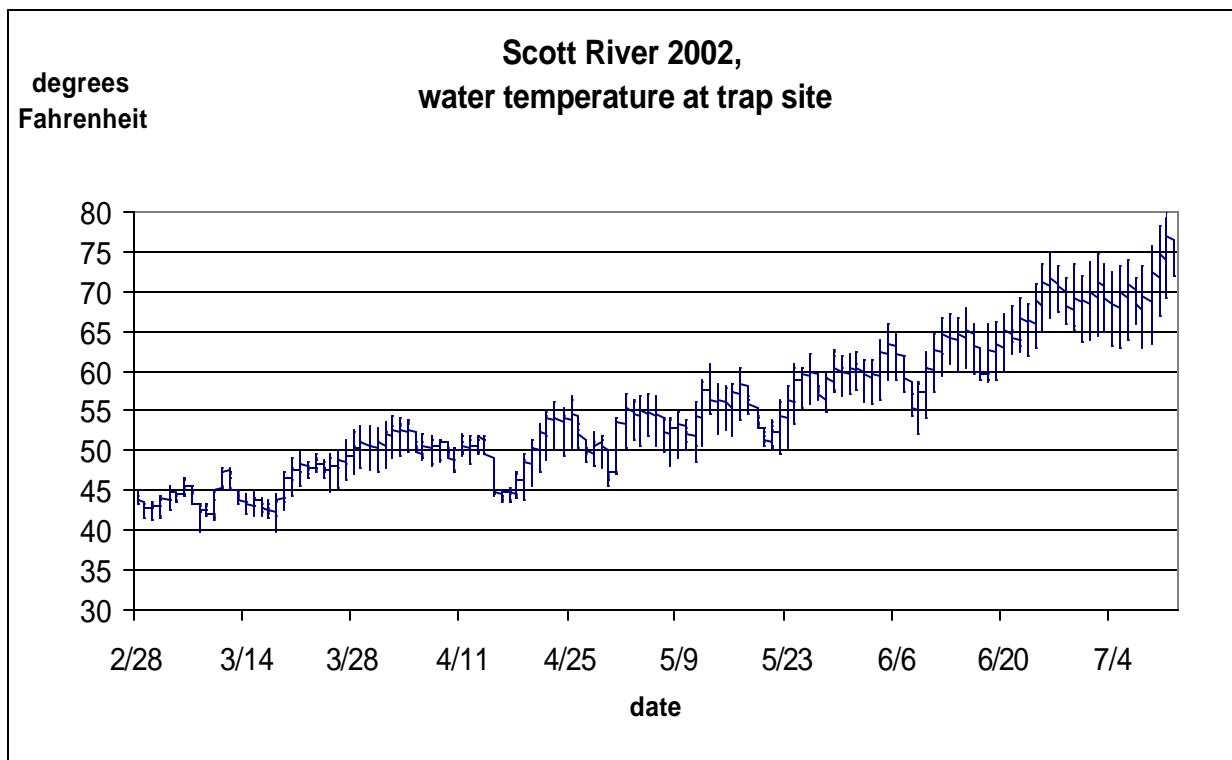
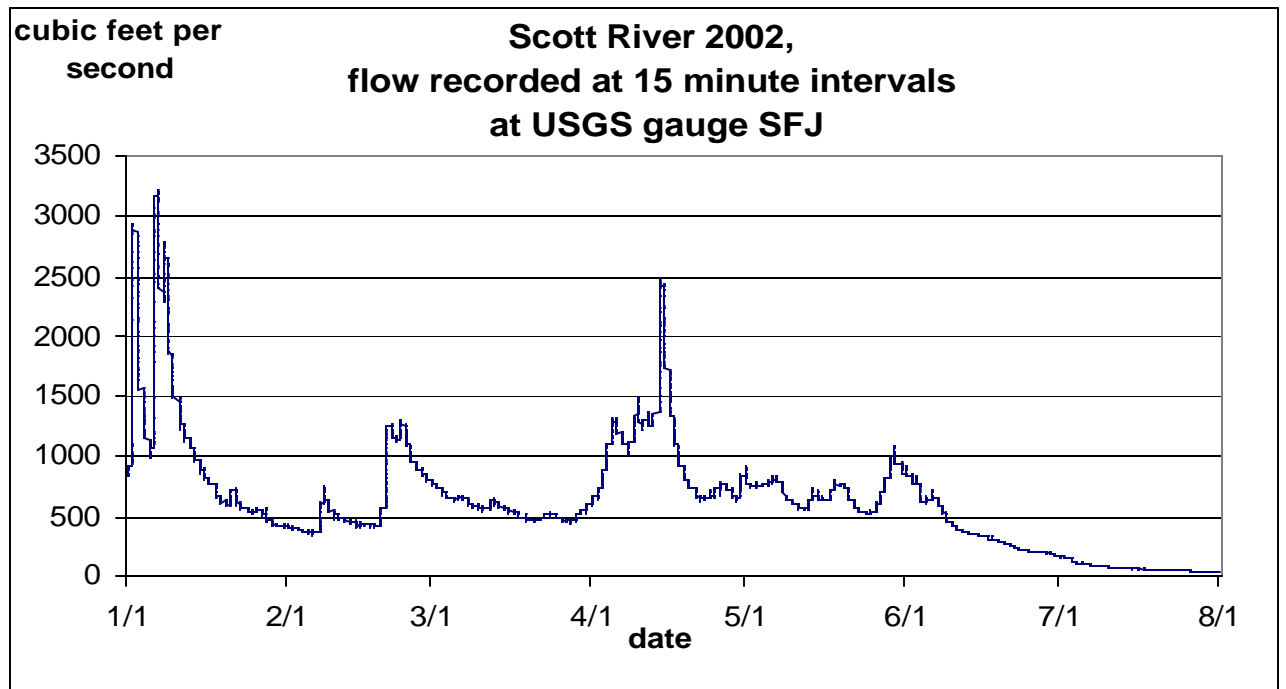


Chart 35



Preliminary flow data, subject to revision

Discussion

Fish stranding and rescue

From 5/17/02 to 7/17/02, Julian weeks 20-28, the Yreka Screen Shop staff rescued 29,653 age 0 coho and 130,837 steelhead parr from stranding near water diversion sites on the Scott River and its tributaries (Yreka Screen Shop files). These fish were collected from Moffett Creek, Shackelford Creek, French Creek, McAdams and the Scott River main stem below Farmers ditch. The majority of the fish were released one half mile downstream of the Meamber Bridge at River mile 25 and into Canyon Creek (RM 15.6). A total of 15,168 steelhead parr and 8,427 coho were transported upstream and released into Grouse Creek, a tributary to the East Fork of the Scott River.

During weeks 20 – 28, there was a sharp increase in the rotary trap catch of steelhead and coho parr (Charts 21 and 27). It is unknown how many of the rescued and relocated parr were included in this catch.

Fall Chinook spawning distribution

Low flows in the fall of 2001 made it difficult for adult Chinook to get upstream of the trap site. The majority of spawning was observed downstream of Little Ferry Creek (RM 6.9) (California Department of Fish & Game, Klamath River Project, 2001). It is likely that this distribution of spawning is responsible in part for the drop in the rotary trap catch of Chinook from 33,000 in 2001 to 11,000 in 2002.

Observed summer rearing of salmonids

A two-day snorkel survey of approximately 8 miles of the Scott River canyon (Jones Beach to Gold Flat) took place on August 29th and 30th, 2002 to “gather information on water temperature, location and fish usage of cool water areas thought to be providing summer time thermal refugia for salmonids in the lower Scott River” (Pisano, 2002). Age 0 Chinook and juvenile steelhead were observed throughout the surveyed area. Age 0 coho were observed in two of the four reaches. Numerous sites of cool water inflow were observed resulting from tributary inflow; hill slope groundwater inflow and mainstem inter-gravel flow. This rearing was observed well upstream of the rotary trap site and confirmed the presence of salmonids in the mainstem Scott River after rotary trapping ceased on 7/13/02.

Recommendations

- In 2003, consider operating a funnel net trap equipped with multiple fyke boxes near the bank to increase catch efficiency and sample the stream margin with slower water velocities.

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Chesney, W.R. 2000. Annual Report, Study 3a1, Shasta and Scott River juvenile steelhead trapping, 2000. California Dept. of Fish and Game, Steelhead Research and Monitoring Program, Yreka, CA. 36p

Dambacher, J. 1991, Distribution, abundance and emigration of juvenile steelhead, Steamboat Creek, Oregon. M.S. thesis, Oregon State University, Corvallis, Oregon.

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Pisano, M. 2002, Juvenile salmonid use of thermal refugia in the lower Scott River, 2002; A cursory investigation.

Appendix A. List of julian weeks and calendar equivalents

<u>Julian Week #</u>	<u>Inclusive Dates</u>
<u>1</u>	<u>1/1 - 1/7</u>
<u>2</u>	<u>1/8 - 1/14</u>
<u>3</u>	<u>1/15 - 1/21</u>
<u>4</u>	<u>1/22 - 1/28</u>
<u>5</u>	<u>1/29 - 2/4</u>
<u>6</u>	<u>2/5 - 2/11</u>
<u>7</u>	<u>2/12 - 2/18</u>
<u>8</u>	<u>2/19 - 2/25</u>
<u>9</u>	<u>2/26 - 3/4*</u>
<u>10</u>	<u>3/5 - 3/11</u>
<u>11</u>	<u>3/12 - 3/18</u>
<u>12</u>	<u>3/19 - 3/25</u>
<u>13</u>	<u>3/26 - 4/1</u>
<u>14</u>	<u>4/2 - 4/8</u>
<u>15</u>	<u>4/9 - 4/15</u>
<u>16</u>	<u>4/16 - 4/22</u>
<u>17</u>	<u>4/23 - 4/29</u>
<u>18</u>	<u>4/30 - 5/6</u>
<u>19</u>	<u>5/7 - 5/13</u>
<u>20</u>	<u>5/14 - 5/20</u>
<u>21</u>	<u>5/21 - 5/27</u>
<u>22</u>	<u>5/28 - 6/3</u>
<u>23</u>	<u>6/4 - 6/10</u>
<u>24</u>	<u>6/11 - 6/17</u>
<u>25</u>	<u>6/18 - 6/24</u>
<u>26</u>	<u>6/25 - 7/1</u>

<u>Julian Week #</u>	<u>Inclusive Dates</u>
<u>27</u>	<u>7/2 - 7/8</u>
<u>28</u>	<u>7/9 - 7/15</u>
<u>29</u>	<u>7/16 - 7/22</u>
<u>30</u>	<u>7/23 - 7/29</u>
<u>31</u>	<u>7/30 - 8/5</u>
<u>32</u>	<u>8/6 - 8/12</u>
<u>33</u>	<u>8/13 - 8/19</u>
<u>34</u>	<u>8/20 - 8/26</u>
<u>35</u>	<u>8/27 - 9/2</u>
<u>36</u>	<u>9/3 - 9/9</u>
<u>37</u>	<u>9/10 - 9/16</u>
<u>38</u>	<u>9/17 - 9/23</u>
<u>39</u>	<u>9/24 - 9/30</u>
<u>40</u>	<u>10/1 - 10/7</u>
<u>41</u>	<u>10/8 - 10/14</u>
<u>42</u>	<u>10/15 - 10/21</u>
<u>43</u>	<u>10/22 - 10/28</u>
<u>44</u>	<u>10/29 - 11/4</u>
<u>45</u>	<u>11/5 - 11/11</u>
<u>46</u>	<u>11/12 - 11/18</u>
<u>47</u>	<u>11/19 - 11/25</u>
<u>48</u>	<u>11/26 - 12/02</u>
<u>49</u>	<u>12/03 - 12/09</u>
<u>50</u>	<u>12/10 - 12/16</u>
<u>51</u>	<u>12/17 - 12/23</u>
<u>52</u>	<u>12/24 - 12/31**</u>

* = eight days only during leap years

** = eight day julian week

Appendix B. Trapping Mortalities

Scott River 2002

	Number Trapped	Mortalities	% Mortality
Steelhead	11,918	201	1.68%
Coho	1,939	17	0.87%
Chinook	11,793	811	6.8%

Shasta River 2002

	Number Trapped	Mortalities	% Mortality
Steelhead	8,294	82	0.98%
Coho	748	9	1.20%
Chinook	526,256	9,304	1.76%