ANNUAL REPORT

KLAMATH RIVER FISHERIES ASSESSMENT PROGRAM

JUVENILE SALMONID MONITORING ON THE MAINSTEM KLAMATH RIVER AT BIG BAR AND MAINSTEM TRINITY RIVER AT WILLOW CREEK 1992-1995

U.S. Fish and Wildlife Service
Coastal California Fish and Wildlife Office
Arcata, California

John S. Lang
Ann E. Gray
Christine L. Jackson
Roderick F. Mcleod
Ginger G. Phalen

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There are no significant differences between the draft and the final report.

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ABSTRACT

Klamath River chinook (*Oncorhynchus tshawytscha*) yearlings at Big Bar occurred in small numbers through May of each year (1992-1995) during the spring monitoring period (February -August). Chinook young-of-year (YOY) emigration generally peaked in June, with peak natural emigration occurring approximately one week prior to the arrival of chinook fingerling releases from Iron Gate Hatchery (IGH). The chinook YOY abundance index total for spring 1994, was larger than for any other spring monitoring period since 1989, and is thought to have resulted from good adult escapement in 1993, followed by mild winter rearing conditions. IGH fingerings represented 24, 50, 19, and 62% of spring YOY abundance index totals for 1992-1995, respectively. Monitoring in the fall (October-December) was conducted in 1992 and 1994 at Big Bar, with abundance index totals much lower than for the spring monitoring periods. For the Trinity River at Willow Creek, peak emigration of natural YOY chinook occurred during May and June for all years. YOY chinook abundance index totals were largest during the spring of 1992 and 1994. Chinook fingerling releases from Trinity River Hatchery (TRH) represented 11, 17, 13, and 42% of spring YOY abundance index totals for 1992-1995, respectively. Fall monitoring (September-December) abundance index totals were much less than for spring monitoring, with TRH "yearling" releases comprising 73 to 80% percent of index totals for 1992-1994 respectively.

Klamath River steelhead (*O. mykiss*) fry were first captured in late May, with parr and smolts present throughout both monitoring periods. The highest combined (fry, parr and smolt) steelhead abundance index total occurred in 1992, coinciding with a large release of steelhead from IGH. On the Trinity River, steelhead catches were the highest during April and May, although steelhead were present in trap catches throughout both monitoring periods. The abundance index total for natural steelhead was largest for the 1992 and 1994. TRH steelhead releases represented 51, 24, 15, and 76% for 1992-1995 respectively.

Small numbers of yearling coho (*O. kisutch*) smolts were captured each year at Big Bar. The highest coho abundance index total occurred in 1993, and coincided with a large coho release from IGH. The IGH coho contribution in 1992 was 26 percent. IGH contributions were not determined for 1993-1995. Trinity River coho smolts were captured during the months of April, May, and June, with peak emigration occurring in May. TRH coho releases where captured only during the spring monitoring period and represented 26, 60, 26, and 93 percent of the coho abundance index for 1992-1995, respectively. The majority of natural coho YOY were captured in mid-February through August, however, small numbers of coho YOY were also captured during the fall monitoring period.

Non-salmonid species data are presented for Pacific lamprey (*Entosphenus tridentata*), sturgeon (*Acipenser* sp.), Klamath smallscale suckers (*Catostomus rimiculus*), speckled dace (*Rhinichthys osculus*), American shad (*Alosa sapidissima*), prickly sculpin (*Cottus asper*) and threespine stickleback (*Gasterosteus aculeatus*) for 1994 and 1995. As was the case with salmonids, emigration timing and magnitude was seemed to be affected by water year type. In relative terms, 1992 and 1994 were low water years, and 1993 and 1995 high water years for both the Klamath and Trinity rivers.

INTRODUCTION

The Klamath River system is the second largest river system in California, draining an area of approximately 26,000 square kilometers (km^2) in California, and 14,400 km^2 in Oregon. The Trinity River is the largest tributary to the Klamath River, draining approximately 7,690 km^2 in California. Two dams, Iron Gate Dam on the Klamath River and Lewiston Dam on the Trinity River, are the upper limits of anadromous fish migration in the Basin. Two fish hatcheries, Iron Gate Hatchery (IGH) on the Klamath River and Trinity River Hatchery (TRH), were constructed to mitigate for losses of anadromous fish habitat upstream of Iron Gate and Lewiston dams.

The Klamath and Trinity rivers once supported large runs of chinook salmon (Oncorhynchus tshawytscha), coho salmon (O. kisutch) and steelhead trout (O. mykiss) which supported tribal, ocean troll and recreational fisheries. Declines in the Klamath Basin anadromous fish populations due to floods, water and land management and fish harvest management (Klamath River Basin TF, 1991), led Congress to enact the Trinity River Basin Fish and Wildlife Restoration Act (PL 98-541) in 1984 and the Klamath River Basin Conservation Area Fishery Restoration Program (PL 99-552) in 1986. Both of these Acts directed the Secretary of the Interior to take actions necessary to restore the fishery resource of the Klamath Basin, primarily by addressing restoration of the freshwater habitat.

Fishery investigations in the Basin have been focused primarily on adult returns, due to harvest allocation and escapement concerns. The monitoring of emigrating juvenile salmonid populations focuses more on the effects of habitat availability and suitability on production success, and may over time permit for the evaluation of restoration efforts.

Intermittent juvenile salmonid investigations have been conducted in the Klamath River Basin by Coastal California Fish and Wildlife Office (CCFWO) since 1981 (USFWS 1982, 1983). In 1988, a substantial monitoring effort was undertaken in both the mainstem Klamath and Trinity rivers utilizing frame nets, and in 1989, the utilization of rotary screw traps. The purpose of this project was to monitor the abundance, timing, hatchery contribution, and biological parameters of emigrating anadromous salmonids in the mainstem Klamath and Trinity rivers. It is intended that this information will provide basic biological information that can be used by freshwater habitat managers and possibly, fishery harvest managers.

METHODS

In 1989, CCFWO initiated juvenile salmonid emigration monitoring utilizing rotary screw traps on the Klamath River (16 rkms downstream of Orleans CA) and the Trinity River (6 rkms downstream of the town of Willow Creek). The Klamath River trap site was located approximately 1 rkm downstream from the U.S. Forest Service Big Bar river access area (rkm 80) which has been the trap site since the initiation of juvenile monitoring (Figure 1). The Trinity River trap site was changed from rkm 37 to rkm 34 in 1991 to allow better access to the trap.

For both rivers, an effort was made to begin trapping prior to the onset of natural fall chinook emigration, however, river conditions ultimately dictated when trapping was able to begin. Rotary screw traps utilized 2.44 m diameter cones (Figure 2). Traps were anchored with 0.64 cm diameter aircraft cable to large trees or a series of steel fence stakes upstream. A 0.1 x 0.15 x 6.0 m (4"x6"x10') beam was used to move the trap in or out from the streambank to compensate for changes in river stage. In general, traps were operated within a range of 5 to 11 cone revolutions per minute. At less than five cone revolutions, fish may have been able to escape by swimming back through the cone, and excessive ware occurred when cone exceeded 11 revolutions per minute. Traps were fished on the edge of the thalweg during high river discharge and subsequently moved back into the thalweg as river discharge decreased.

A sampling day was defined as time elapsed between the setting of the trap and removal of any captured fish the following day. This period encompassed all night hours, when the majority of juvenile salmonids emigrate. In 1992, the sample week began on Monday and ended on Friday, but was extended to include weekends when outmigration of juveniles was anticipated to change dramatically (hatchery releases). Starting in 1993, a seven day trapping schedule was initiated regardless of hatchery releases.

Water Flow and Temperature Measurements

Normal cone operating depth was 1.07 m. Daily velocity measurements were taken for sixty seconds in front of cone at three stations (right, center, left). A General Oceanics digital flowmeter (Model 2030) was placed at 0.2 and 0.8 of cone operating depth at each of the three stations, dividing the submerged portion of the cone into six cells. Each cell area (m^2) was calculated, then multiplied by its corresponding water velocity (m/s). The values for each cell were summed, yielding an estimate of volume of river discharge sampled (Q_s)

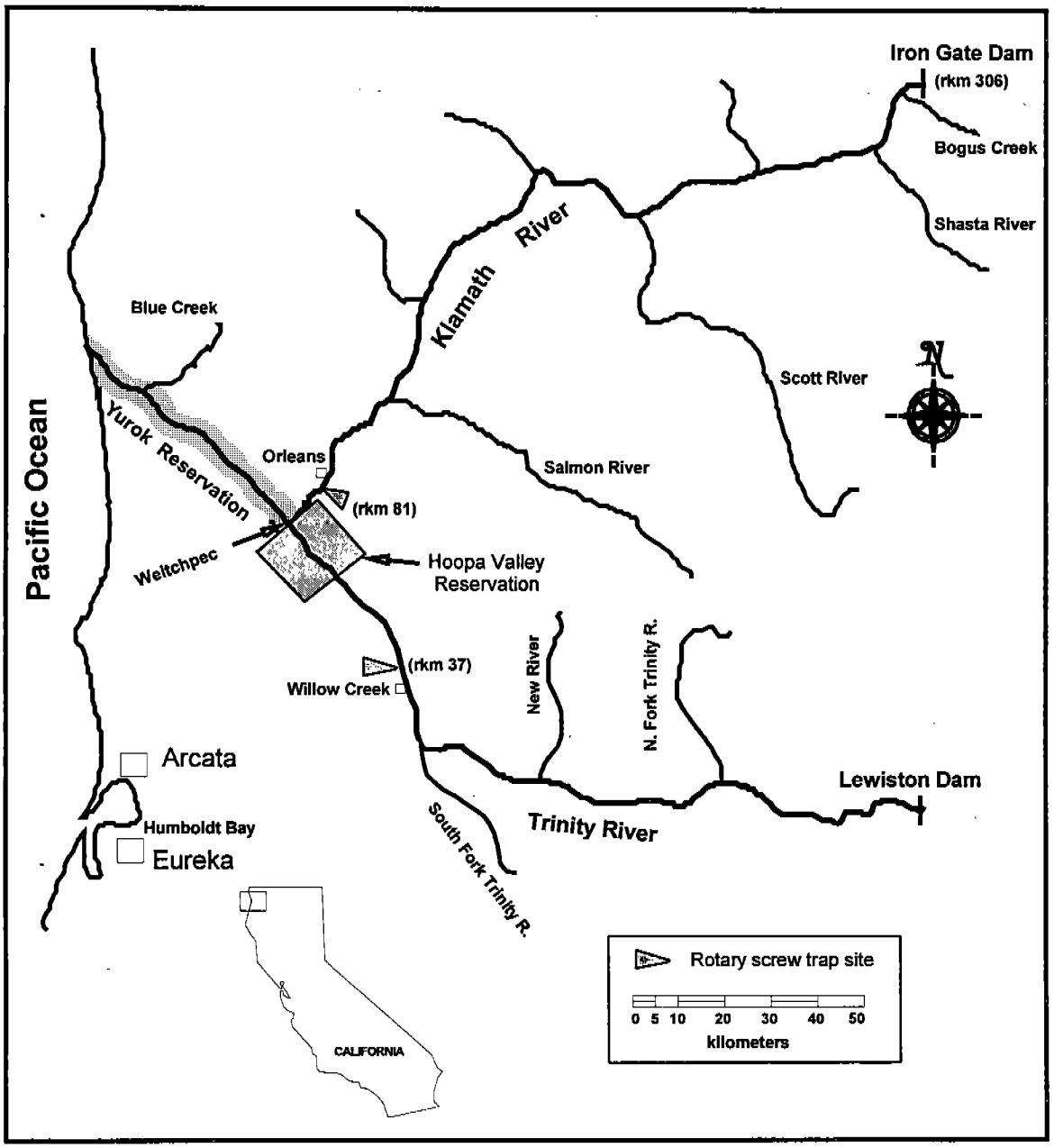

Figure 1. Klamath River basin showing locations of the two CCFWO rotary screw traps.

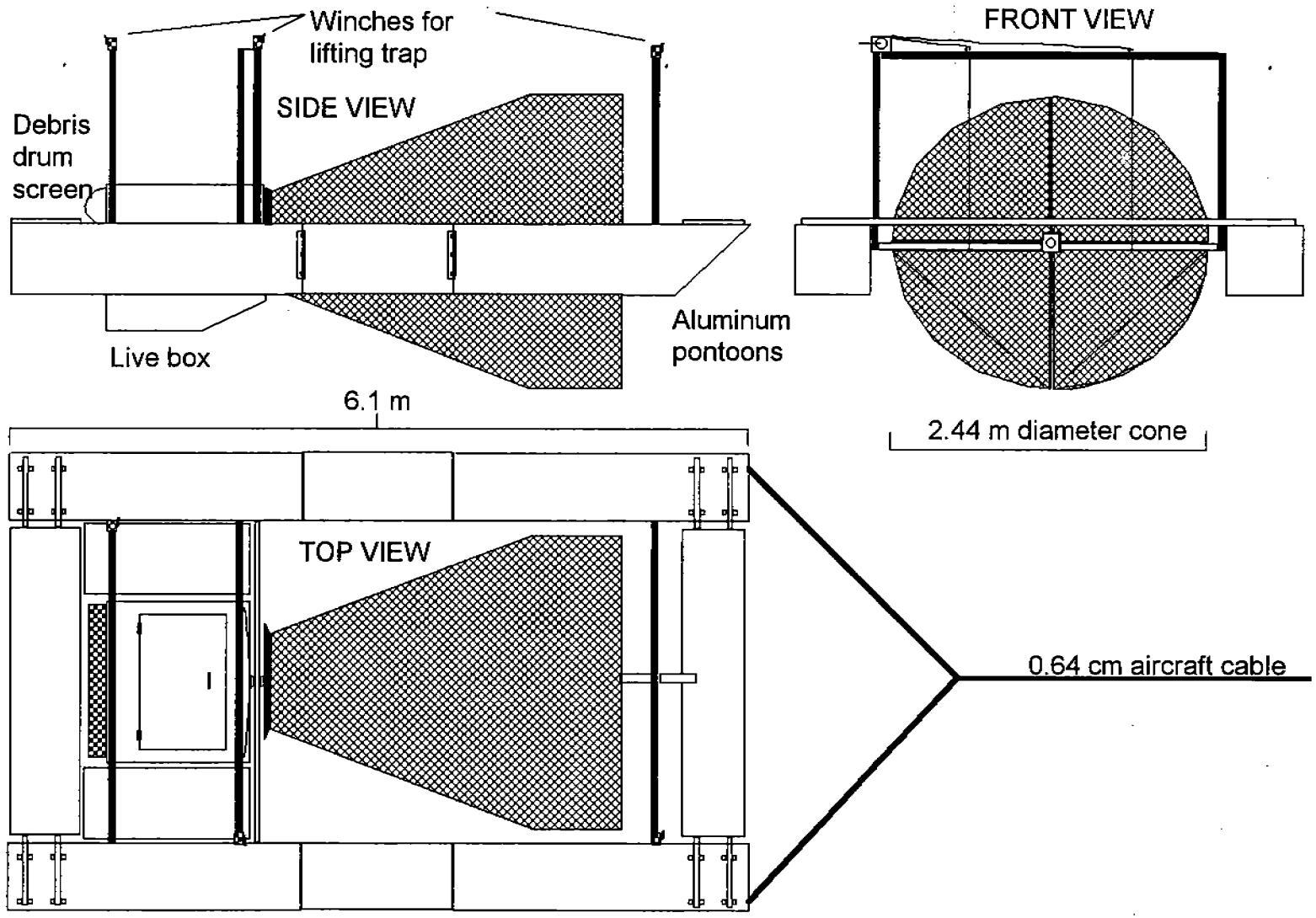

Figure 2. Rotary screw trap design depicting key components and dimensions.

in cubic meters per second (m^3/s). U.S. Geological Survey Water Resource gauge stations at Orleans, #11-52300 (rkm 95.2) on the Klamath River, and #11-530000 at Hoopa (rkm 19.9) on the Trinity River were used as a surrogate measure of daily river discharge (Q) at the traps. It was assumed that there was no significant difference between river discharge at these gauging stations and the respective trap locations.

Water temperature data was collected using a Ryan TempMentor attached to the outside of each live box. Temperature was recorded every two hours for the entire sampling season. Temperature data were averaged between 01:00 and 24:00 hours to produce daily mean, maximum and minimum temperatures.

Biological Sampling Procedures

A subsample of each species and developmental stage was anesthetized with tricaine methanesulfonate (MS-222) and sampled at least three times a week (1992) and typically seven times a week for 1993-1995. Measurements of fork length in mm and volumetric displacement in ml (substituted for weight; Anderson and Gutreuter, 1983) were taken. Fish developmental stage (fry, parr, smolt), fin clips, physical irregularities were recorded and scales were also collected. Data were recorded for up to 30 fish per species for chinook and coho. Steelhead were further categorized into two subgroups. Steelhead fry and parr were sampled as one subgroup; steelhead smolts, half-pounders, and adults were sampled as a second subgroup. Any juveniles captured in excess of 30 were anesthetized, examined for fin clips and tallied. All anesthetized fish not retained were allowed to resuscitate in buckets of ambient river water before released downstream. Steelhead half-pounders and adults were not anesthetized, their fork lengths were approximated while still in the live box, then netted and released. Any salmonid mortalities in the live box were checked for fin clips and included in the sample, but measured for fork length only. If a salmonid escaped during netting or handling before it could be checked for a fin clip, it was counted in the sample tally of its species as a "unknown". Based on the probability of occurrence, unknown fish were redistributed daily into the marked or unmarked tallies.

A missing adipose fin (AD-clip) was the external marker depicting fish with a coded wire tag (CWT) embedded in the snout. AD-clipped fish were sacrificed for subsequent CWT retrieval. If the AD-clip component of a daily catch was large, and the possibility of multiple CWT codes high, a subsample of up to 50 AD-clipped fish was collected. Otherwise a subsample consisted of up to 30 AD-clipped fish. If the

AD clipped component within a sample was small, and the probability of multiple CWT codes low, subsamples of up to 10 AD-clipped fish were collected every other day.

Juvenile chinook and coho that were silvery in appearance and lacked distinct parr marks were classified as smolts regardless of size. Delineating between smolting young-of-year (YOY) and yearlings was subjective and largely based on fork length, time of year, and age interpretation based on scale samples taken.

Captured salmonids were categorized as being either of hatchery or natural origin, when possible. Natural fish were defined as the progeny of river or tributary spawning adults which had reared as juveniles in these environments regardless of parental genetics (Bjornn, 1977). Hatchery release strategies for chinook consisted of a fingerling release in the spring, and yearling release in the fall. These two releases prompted the dividing of the trapping season into two distinct spring and fall monitoring periods.

Hatchery and Natural Stocks Estimate

Chinook and Coho Salmon

All AD-clipped fish collected were passed through a magnetic field detector manufactured by Northwest Marine Technology to determine the presence or absence of a CWT. The snout of each fish registering positive for a tag was dissected until the CWT was recovered. Each fish registering negative for a tag had its head dissolved in a solution of potassium hydroxide. A magnet was then stirred through the resultant slurry to recover the tag. If a tag was not recovered, the fish was considered an AD-clipped fish which had shed its tag (No-Tag). Recovered CWTs were decoded using a dissection microscope. The number of CWT fish represented per code was estimated by multiplying the number of CWTs recovered by an expansion factor (E), which accounted for subsampling of AD-clipped fish, CWTs that were lost during dissection, and unreadable tags. The expansion factor (E) was calculated using the formula:

$$E=\left(\frac{C}{MS}\right)\left(\frac{AD}{H}\right)\left(\frac{T}{TR}\right)$$

Where,
- C = Total # of chinook or coho captured,
- MS= Number of fish examined for AD-clips,
- AD= Number of AD-clipped fish observed,
- H = Number of AD-clipped fish collected,
- T = Number of collected AD-clipped fish containing a CWT,
- TR= After processing; total number of CWTs recovered and decoded.

To account for unmarked hatchery fish over a sample week, the expanded estimates for each CWT code were multiplied by a production multiplier (PM) specific to each CWT code. Each PM was calculated using hatchery release data (Pacific Salmonid Coded Wire Tag Releases 1985-1994) using the following formula:

$$PM = \frac{\#\ \text{Tagged} + \#\ \text{Poor Tagged} + \#\ \text{Unmarked}}{\#\ \text{Tagged}}$$

Where:

Tagged = The actual number of AD-clipped fish released with a CWT,

Poor Tagged = The number of AD-clipped fish that were tagged and shed the tag (No-Tags),

Unmarked = The number of unmarked fish in a release group.

The estimated contribution of hatchery fish attributable to a specific CWT $code_i$ for a given sample week, was calculated by the following formula:

$$\#\ \text{Hatchery}_{\text{code I}} = (\#\ \text{recovered}_{\text{code I}}) * (E_{\text{code I}}) * (PM_{\text{code I}})$$

The total weekly estimated hatchery contribution to the catch was the sum of all estimated hatchery fish attributable to CWT codes.
The weekly contribution of naturally produced chinook or coho to the catch was estimated by subtracting the estimated hatchery contribution from the total catch. Specific to the Trinity River, the California Department of Fish and Game (CDFG) tagged and AD-clipped natural chinook upstream as part of a natural stocks assessment program. Due to the tagging of natural fish, all lost tags and unreadable codes were determined but excluded from hatchery/natural calculations due to the inability to decipher whether these tags were of hatchery or natural origin.

Due to relatively few fish passing by the trap towards the end of each emigration period, it was possible to have continued capturing juveniles of hatchery origin that were not represented by a AD-clipped fish. In the absence of AD-clipped fish a hatchery contribution cannot be calculated and subsequently all chinook are considered of natural origin, although this may not always be the case. The hatchery and natural stock estimates assume no differential mortality between tagged and untagged fish of the same release group, an equal vulnerability to capture, and accurate estimates of the numbers of marked, unmarked, and poor tagged fish released from the hatchery.

Steelhead

Because basin hatcheries release steelhead production as age 1+ smolts or older, all steelhead fry and parr were considered of natural origin. When hatchery production was unmarked, fin condition, absence of fins, body size and scale loss were parameters considered in categorizing smolts as natural or hatchery. IGH steelhead were rarely marked with fin clips, so irregularities (bent or crooked) of dorsal fin rays, roundness at tips of caudal fin rays, scale loss, or any combination of these, were used in classifying a IGH steelhead. All TRH steelhead were fin clipped. The hatchery and natural estimate assumes equal capture vulnerability regardless of origin. Analysis of scale samples taken over the sampling season provided fork length to age relationships.

Abundance Index

Catch effort data were collected and evaluated for each sample day. Trends in emigration were analyzed on a weekly basis (7 days) using daily abundance indexes and daily abundance index estimates for days not sampled. Daily abundance indexes ($Index_d$) for each species and development stage were calculated for each species by the following equation:

$$Index_d = Catch_d / (Q_s/Q).$$

Where: $Catch_d$ = daily catch of a species
Q_s = volume of water sampled (cfs)
Q = mean daily river discharge (cfs)

For a day not sampled and/or a fouled set (cone rotation ceased due to woody debris, or an accumulation of aquatic vegetation) an abundance index estimate was calculated by averaging abundance index values for the day preceding and the day proceeding. Estimated abundance indexes for when two or more consecutive days were not sampled were calculated by averaging the abundance index values of the two preceding and two proceeding sample days. Weekly abundance indexes were calculated by summing daily abundance index estimates for Sunday through Saturday. This index was used to describe relative abundance between weeks during the trapping season and was not intended to represent population estimates. During the trapping season, the traps were moved to adjust for changing flow conditions. These movements were necessary to maintain the traps in an optimal fishing location and were on the order of a few meters closer to or farther from the bank. Assuming similar trapping effort and efficiency, the abundance index also allows for comparison of relative salmonid abundance between years.

Migration Rate

Initial migration rates for hatchery chinook, coho, and steelhead were estimated by dividing the distance (rkm) traveled by the number of days elapsed between release and initial capture for specific CWT codes or marked fish. When possible, mean migration rates were calculated for each CWT group throughout the emigration period. If fish containing a specific CWT code were released over an extended time period, a mean migration rate calculation was not attempted. Because of the relatively small percentage of the river that a screw trap samples, and the possibility that released fish could have moved pasted the trapping area before any were caught, daily migration rates were weighted by the proportion of river sampled to reflect the magnitude of the fish passing through the sampling area. The expansion (R) was used to address the ratio of river discharge to river discharge sampled for each sample day. A mean migration rate per CWT code or marked fish was calculated by the following formula with the first and last 10% of each group excluded.

$$Rate_{mean} = \frac{\Sigma \left(\# * \frac{rkm}{d} * \frac{Q}{Q_s}\right)}{\Sigma \left(\# * \frac{Q}{Q_s}\right)}$$

where # = Daily expanded CWT_i code or fin clip counts,

rkm/d = distance traveled divided by number of days taken to reach trap after initial release.

The 10 through 90 percent capture dates were used to illustrate when the majority of the specific CWT or mark groups migrated (Fish Passage Center, 1985). However, when less than ten tags of any specific release group were recovered, all tags were used. Released AD-clipped chinook were included in migration rate calculations using tag allocation procedures previously described in the hatchery and natural stocks estimation section of this report.

Trap Efficiency

Only chinook salmon were used to determine trap efficiencies using mark-recapture methodologies and therefore estimates were specific to this species. Efficiency tests were conducted only on the Trinity River. The Klamath River trap never captured sufficient numbers of fish for marking. Fish were marked using the biological stain Bismarck Brown Y. Fish were placed in large aerated plastic barrels

containing a concentration of 0.018 g Bismark brown Y per liter of water for a period of 15 to 30 minutes. Aeration was controlled by a regulator attached to a canister of compressed air and airstone bubblers to help defuse oxygen into the water. Fish were marked during the cool part of the morning, transported upstream by boat, placed into a inriver holding pen, held until evening and released between 2030 and 2200 hours. Marked fish were released in a pool approximately 500m upstream from the trap. Two random groups of 25 unmarked and 25 marked (controls) fish were held instream in a 0.4 x 1.0 x 0.75 m net pen to determine any differential mortality. These groups were kept for up to 3 days. All chinook captured in the trap on subsequent sampling days were examined for dye marks. Generally, after 3 days the Bismarck Brown Y dye faded beyond visual detection and hence, recaptures could no longer be determined beyond three days. Trap efficiency was determined by dividing the number of marked fish recaptured by the number of marked fish released (corrected for marking induced mortality). The potential marking mortality within the release group was determined by multiplying any differential mortality observed in the control groups (percent mortality of marked fish minus percent mortality of unmarked fish) by the actual number of marked fish released. If mortality was greater in the unmarked control group, differential mortality was assumed to be zero.

RESULTS AND DISCUSSION

Chinook Monitoring on the Mainstem Klamath River at Big Bar:

Year to year variation in Klamath River flow made deploy of a rotary trap at the same time of year difficult. In general, trapping began in April before any significant natural chinook YOY emigration occurred. The discrepancy in the number of days trapped (Table 1) resulted from; 1) a four day trap week in 1992, to a seven day trap week beginning in 1993, 2) different start and stop dates due to flow or high water temperatures, and 3) events that disabled a trap for short periods of time. River temperatures reached "stressful" levels (>20.0°C, Bell 1973) from late July through early August (Figure 3), at which time spring trapping ceased at the Big Bar trap (BBT).

Table 1. Period and duration of spring trapping at the BBT, 1992-1995.

Year	Spring Monitoring	# of days trapped
1992	April 02 to July 28	68
1993	April 27 to August 11	95
1994	February 21 to July 13	135
1995	April 05 to July 31	111

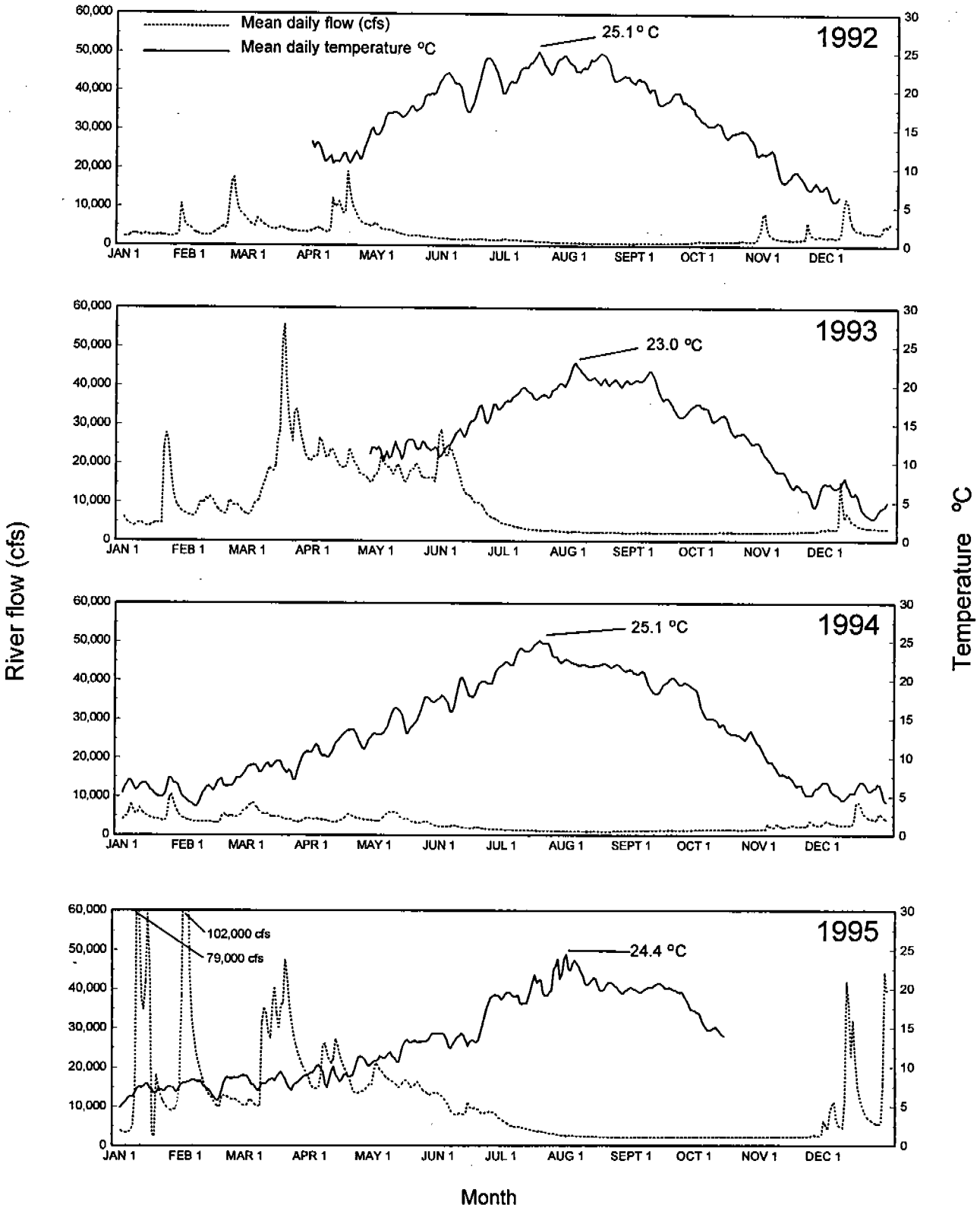

Figure 3. Mean daily Klamath River flow (cfs) at Orleans and mean daily river temperature (° C) at the BBT, 1992-1995.

IGH released between 3.3 to 5.0 million fingerling chinook (Table 2) in early to mid-June of each year. Yearling releases occurred in October and November from IGH and small tributary hatcheries. Approximately 1.0 million yearlings were released into the Klamath River above the BBT each fall with approximately 5% released from tributary facilities on Red Cap Creek (rkm 85), Camp Creek (rkm 92) and Indian Creek (rkm 172).

Table 2. Iron Gate Hatchery and tributary rearing facility releases.

Release Year	Fingerling Fall chinook	Yearling Fall chinook
1992	3,579,732	976,678
1993	3,315,579	974,838
1994	5,006,272	1,006,136
1995	4,913,457	N/A

Spring Monitoring Catch Totals:

For spring monitoring 1992 through 1995, the number of YOY chinook captured ranged from 5,301 to 56,169 fish. Catches were predominately YOY with relatively few yearlings caught (Table 3). AD-clipped yearlings released in the fall of the previous year contributed to catches in the spring after overwintering in the upper Klamath River. Yearlings released in the fall and captured the following spring also occurred in past monitoring (USFWS 1991, 1992a, 1992b, 1994).

Table 3. Chinook catches at the BBT, spring monitoring 1992-1995.

Spring period	Yearlings		YOY Natural	YOY Hatchery		Total Chinook
	AD-clipped	Non-AD		AD-clipped	Non-AD	
1992	8	189	3,760	65	1,279	5,301
1993	0	6	3,852	314	4,852	9,024
1994	9	208	44,784	424	10,744	56,169
1995	0	41	4,800	345	8,109	13,295
Totals	17	444	57,196	1,148	24,984	83,789

Fall Monitoring Catch Totals:

Fall monitoring efforts captured comparatively few fish, which has been the case in all previous fall monitoring at the BBT (USFWS 1991, 1992a, 1992b, 1994). A combined total of 534 chinook were captured during two fall monitoring seasons in 1992 and 1994, which included 101 AD-clipped fish (Table 4). Fall monitoring was not conducted in 1993 or 1995.

Table 4. Period and duration of trapping and corresponding chinook catches at the BBT, fall monitoring 1992 and 1994.

Fall period	Dates	Trap days	Natural chinook	Hatchery Chinook		Total chinook
				AD	Non-AD	
1992	October 26 to December 8	24	103	23	17	143
1994	September 13 to December 1	68	128	78	185	391
Totals			231	101	202	534

Abundance Index and Hatchery Contributions by Year:

Spring-1992:

Monitoring started in late March and initial catches consisted largely of yearling chinook (62) of which two were AD-clipped. During the following six weeks, an additional 135 yearling chinook, including six AD-clipped fish, were captured. Seven CWTs recovered represented IGH chinook, brood year 1990, released November 15, 1991. Based on CWT expansion, IGH yearlings represented 43% of the total yearling abundance index, with yearlings representing 9% of the combined (YOY and yearling) abundance index.

Small contributions were made by natural chinook YOY for the first seven weeks of trapping (late March through mid-May), representing 11% of the total natural YOY abundance index. Natural YOY chinook emigration increased during the last two weeks of May. Fifty percent of the natural YOY abundance index occurred by the end of May, and 95% by the first week in June (Appendix 1).

Natural chinook YOY represented 76% of the total YOY abundance index, with 53% emigrating past the BBT prior to the arrival of IGH chinook fingerling releases. IGH fingerling releases occurred from June 3-14, in six different sized lots. The largest IGH fish (56/lb) were released during the first three days followed by releases of successively smaller sized fish (Table 5). IGH AD-clips were released on June 7, which meant that for four consecutive days, unmarked IGH fish were released without an AD-clipped representative.

Table 5. Iron Gate Hatchery fingerling releases, spring 1992. (AD/CWT= adipose clipped and coded wire tag)

Date	Number released	Size	Estimated mean fork length (mm)	Tagged (AD/CWT)	Percentage of total
June 3	50,000	56/lb	91	NO	
June 4	119,500	56/lb	91	NO	
June 5	119,500	56/lb	91	NO	17%
June 6	304,650	73/lb	83.4	NO	
June 7	304,650	73/lb	83.4	NO	8.6%
	191,242	80/lb	81	YES	5.4%
June 8	229,625	91/lb	77.5	NO	
June 9	229,625	91/lb	77.5	NO	
June 10	230,310	93/lb	77	NO	69%
June 11	230,310	93/lb	77	NO	
June 13	780,300	95/lb	76.4	NO	
June 14	780,300	95/lb	76.4	NO	
Total =	3,570,012		Ave= 79.2		100%

The four initial release groups represented 17% of the total 1992 IGH release. Nine percent of unmarked fish were released concurrently with the AD-clipped group and the remaining number of unmarked fish (69%) were released after the release of the AD-clipped group (Table 5).

The first AD-clipped chinook captured at the BBT occurred on June 12, and thus it is unlikely that all unmarked chinook captured during the week of June 7 were of natural origin. Because of this, AD-clipped chinook and the resultant hatchery percentage during June 12-15, was ascribed to the week beginning June 7. Succeeding weekly hatchery contributions were 76%, 36%, 81% and 35% for the weeks June 14 through July 5, respectively. The YOY abundance index total for the spring monitoring period was 222,677, of which 24% was attributed to IGH releases.

Fall-1992:

Monitoring in the fall began October 26, one day prior to the yearling release from the Indian Creek rearing facility. The trap was damaged the night of October 30, when an increase in river stage dislodged large quantities of filamentous algae, some of which was captured in the cone. Repairs were made and trapping resumed on November 4. The first Indian Creek AD-clip was captured on November 5. During the down time, it is not known how many Indian Creek yearlings may have

moved past the BBT. On November 17, IGH released 1.1 million yearlings. For the fall period, 17 AD-clipped chinook were collected, 15 from Indian Creek and 2 from IGH. The chinook abundance index for fall 1992, totaled 8,253, with hatchery fish (Indian Creek and IGH) representing 40%, of this total.

Spring-1993:

The start of trapping in 1993, was delayed until late-April due to high flows throughout early spring. Natural chinook yearlings were captured until mid-May, and accounted for less than 1% of the total spring abundance index.

Fifty percent of the natural YOY abundance index occurred by mid-June, and 95% by mid-July. IGH released 3.3 million fingerling chinook on June 15, with the first AD-clipped fish captured on June 28 (Appendix 2). IGH fish moved past Big Bar within four weeks post release. The YOY (natural and hatchery) abundance index totaled 438,330, of which 50% was attributable to IGH releases.

Spring-1994:

Low flow conditions during the early spring allowed trap deployment in late February of 1994. Yearlings were present in small numbers throughout March, April and May, with peak emigration occurring between late-April and early-May. CWT data from nine AD-clipped yearlings collected indicated that these fish were of IGH and Camp Creek origin (released in the fall of 1993). Based on CWT expansions, hatchery yearlings accounted for 47% of the total yearling abundance index. However, yearlings as a whole represented less than 1% of the total spring abundance index.

Natural chinook YOY were present from the start of trapping through the end of the spring monitoring period (July 13). Fifty percent of the natural YOY abundance index occurred by mid-June, and 95% by late June. IGH inadvertently released AD-clipped fingerlings prior to the scheduled June 15 release date. One of these fish was captured at the BBT on May 28, representing less than 1% of abundance index for the week of May 22 (Appendix 3). The scheduled IGH release of more 4.9 million fingerling occurred from June 14-16, with approximately 1/3 released each of the three days. AD-clipped fingerlings were release on June 15 only. In addition, an inadvertent release of over 31,000 IGH chinook (initially slated to over-summer at IGH and to be released in the fall as yearlings) also occurred June 15. IGH fingerlings moved down through the upper mainstem relatively quick, with 70% of the hatchery abundance index accounted for within one week post release, and 95% by the end of the second week. The combined

(hatchery and natural) YOY chinook abundance index totaled 1,366,815, with IGH fingerling contributions representing 19%.

The Bureau of Reclamation (BOR) in an effort to determine whether pulse flow releases benefit chinook emigration, conducted four pulse flow releases from Iron Gate Dam. The effect of the first pulse flow (May 9-10) on catch numbers at the BBT was confounded by a period of heavy rains which increased flow prior to the initiation of the pulse flow release date. The second (May 23-24) and third (June 6-7) pulse flow releases were followed by increased catch, however, an increase in chinook catches also occurred on June 2, when the flow had been steadily decreasing. The fourth pulse was followed by peak chinook catch numbers. This increase however, could be attributed to the concurrent release of IGH fingerlings. In addition, the affect of large numbers of hatchery chinook moving downstream may have also moved natural chinook downstream (Figure 4). And thus deciphering a direct benefit to the chinook emigration from the pulse flows is ambiguous.

Fall-1994:

Fall monitoring started in mid-September and all chinook captured through mid-October were considered of natural origin due to the absence of a AD-clipped hatchery representative. Yearlings released from Red Cap Creek, Camp Creek, and IGH occurred in late October (Appendix 35). The first AD-clipped yearling, captured November 1, was from the Red Cap Creek facility. Of the 40 AD-clipped chinook collected during fall monitoring, 23 (58%) had shed their CWT and a hatchery contribution percentage could not be determined. The chinook abundance index for fall trapping 1994 totaled 6,985.

Spring-1995:

High flows in February and March delayed the start of trapping until early April. Chinook yearlings were present through mid-June, with 50% of the yearling abundance index occurring by mid-May. All yearlings captured were considered natural, as no AD-clips were captured. Yearlings accounted for less than 1% of the total spring abundance index. Fifty percent of natural YOY abundance index occurred by late June and 95% by mid-July. The spring YOY abundance index totaled 804,309, with IGH fingerling contributions representing 62%.

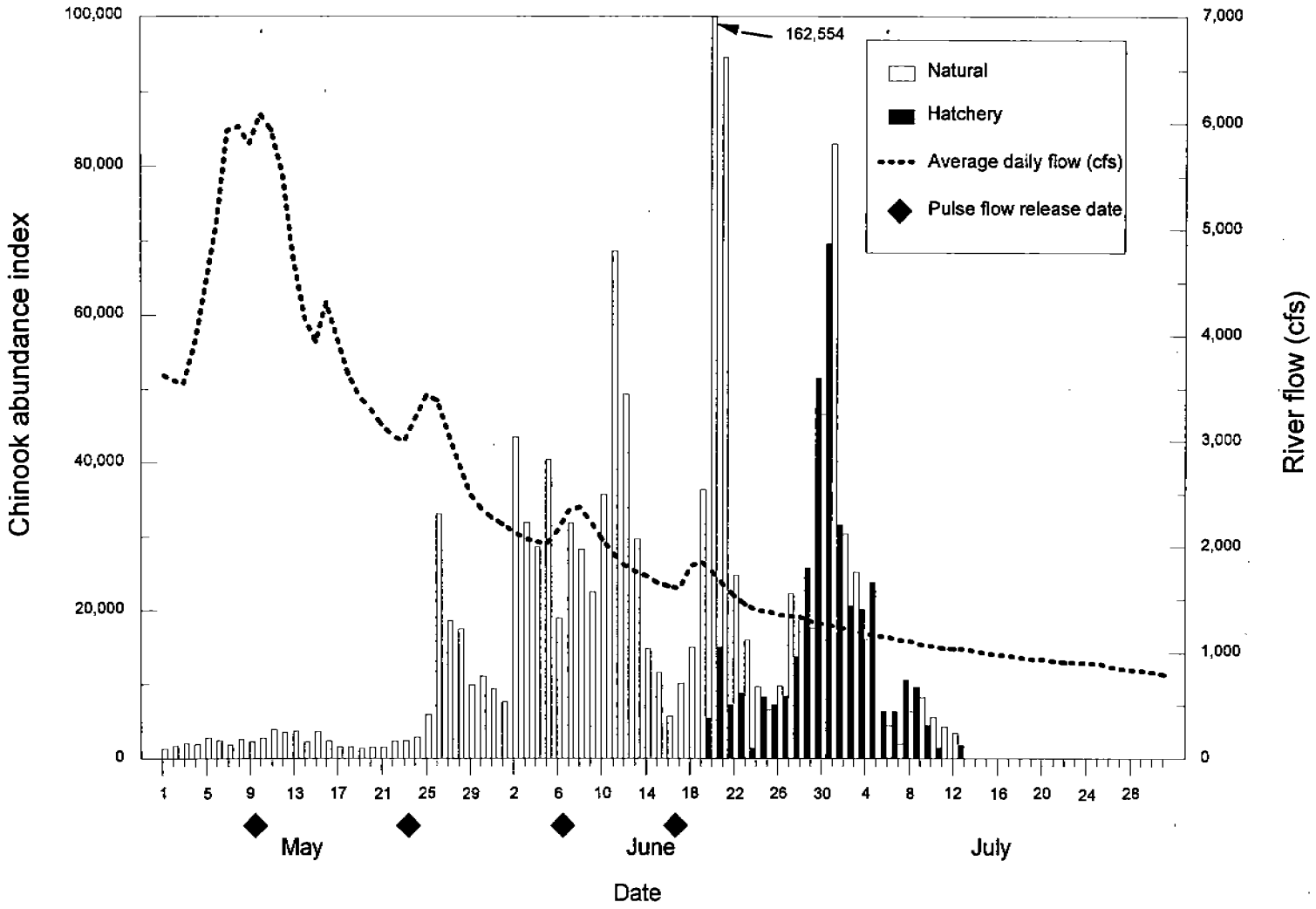

Figure 4. Daily juvenile chinook abundance index totals and mean daily Klamath River flow (cfs) at Orleans during periods of pulse flow releases from Iron Gate Dam , May through July, 1994.

Fish Length and Emigration Timing:

Spring and fall, 1992:

Fork lengths from 972 chinook (18% of the total catch) were measured during spring monitoring. Initial chinook catches in early April were YOY, mean fork length 46mm (standard deviation (sd)=15.7, number (n)=9) and yearlings, mean fork length 183mm (sd=11.4, n=60)(Appendix 25). Monthly length frequency histograms depict a bimodal distribution in April and May, reflecting the emigration of YOY and yearlings. Mean fork length for natural YOY juveniles increased from 50mm (sd=10.2, n=70) in April to 85mm (sd=17.0, n=271) in May (Figure 5). There was no appreciable change in the size of chinook YOY upon the arrival of IGH fish in early June. Mean fork length for chinook YOY was 89mm (sd=9.1, n=90) and 90mm (sd=9.3, n=89) respectively, for the first two weeks in which IGH fingerling releases occurred in trap catches. The fork length of natural YOY chinook was in the upper 80mm range during the two weeks prior to the arrival of IGH fingerling releases. Mean weekly fork lengths decreased slightly through July, possibly reflecting the contribution of smaller sized fish of the later IGH release groups (Table 5).

Two size classes of chinook were present during fall monitoring 1992. The smaller fish (85 to 112mm), either remained in tributary streams longer or sought cooler water near tributary mouths in order to endure lethal temperatures typical of the mainstem Klamath River during July and August. The mean fork length for all chinook captured during fall monitoring was 154mm (sd=30.9, n=124), which includes yearlings reared at IGH and tributary facilities. Indian Creek yearlings were released on October 27, almost a month before IGH yearling releases (November 17) (Appendix 33), and which may account for a decrease in the mean fork length for November (Figure 5).

Spring-1993:

Fork lengths from 1,018 chinook (19% of the catch) were measured during spring monitoring. During the first week of trapping, the mean fork length for YOY chinook was 44mm (sd=0.71, n=2)(Appendix 26). Yearlings were captured only during a two week period in mid-May, with a mean fork length of 140mm (sd=11.0, n=6)(Figure 6). Mean fork lengths of YOY chinook increased through May and peaked at 104mm (sd=19.6, n=39), which was slightly larger than the mean fork length for YOY chinook after the arrival of IGH fingerling releases. Chinook fork lengths were slightly larger before the arrival of IGH fish. When IGH releases were present in trap catches, mean fork lengths ranged between 96-98mm, and remained so for six of the remaining seven weeks prior to pulling the trap. Mean fork length was 100mm (sd=7.3, n=10) during the last week of trapping.

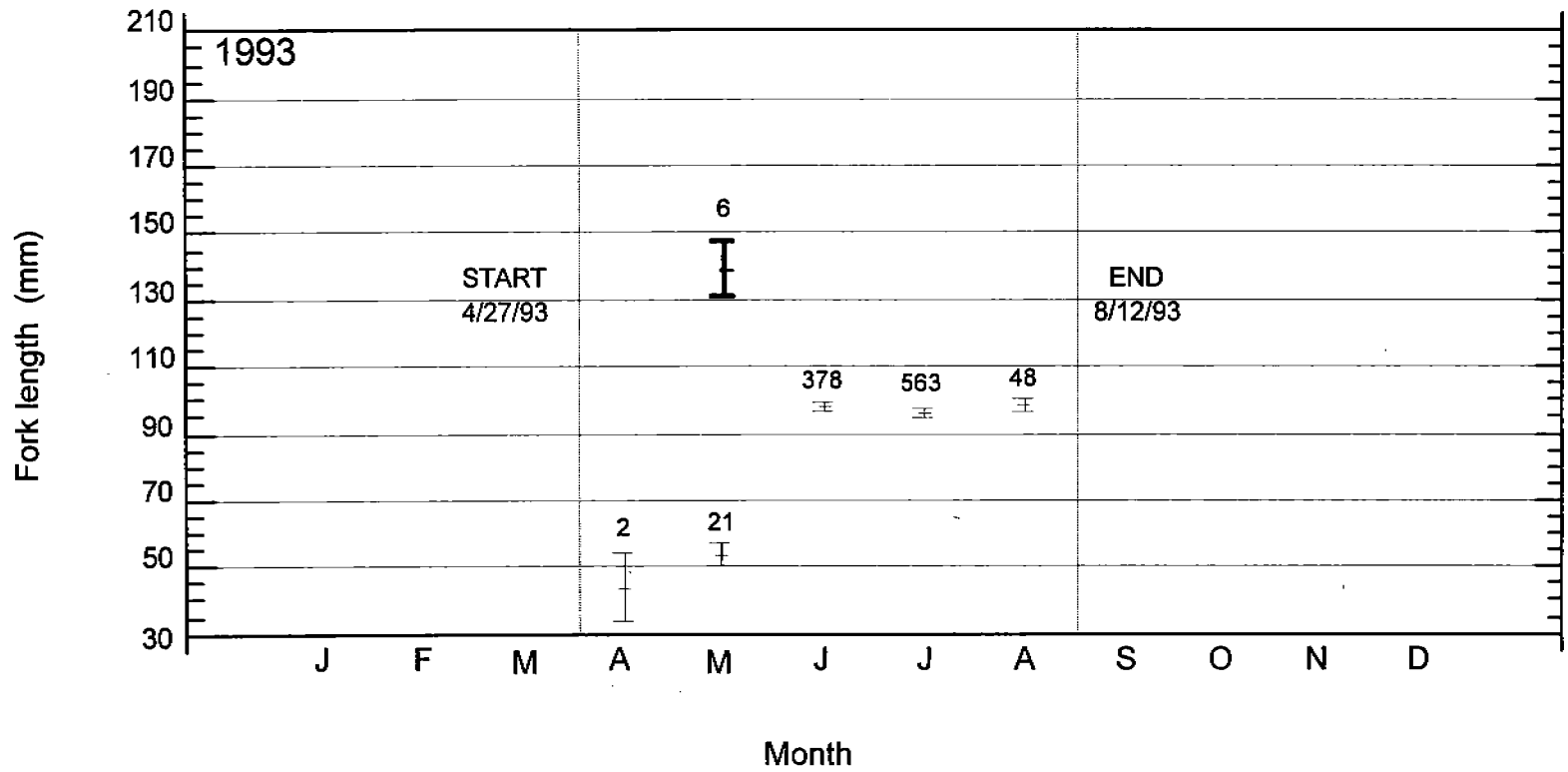

Figure 6. BBT chinook YOY (⊥) and yearling (⊥) mean fork length (mm) by month, spring monitoring, 1993. (+/- 1 standard error, sample size)

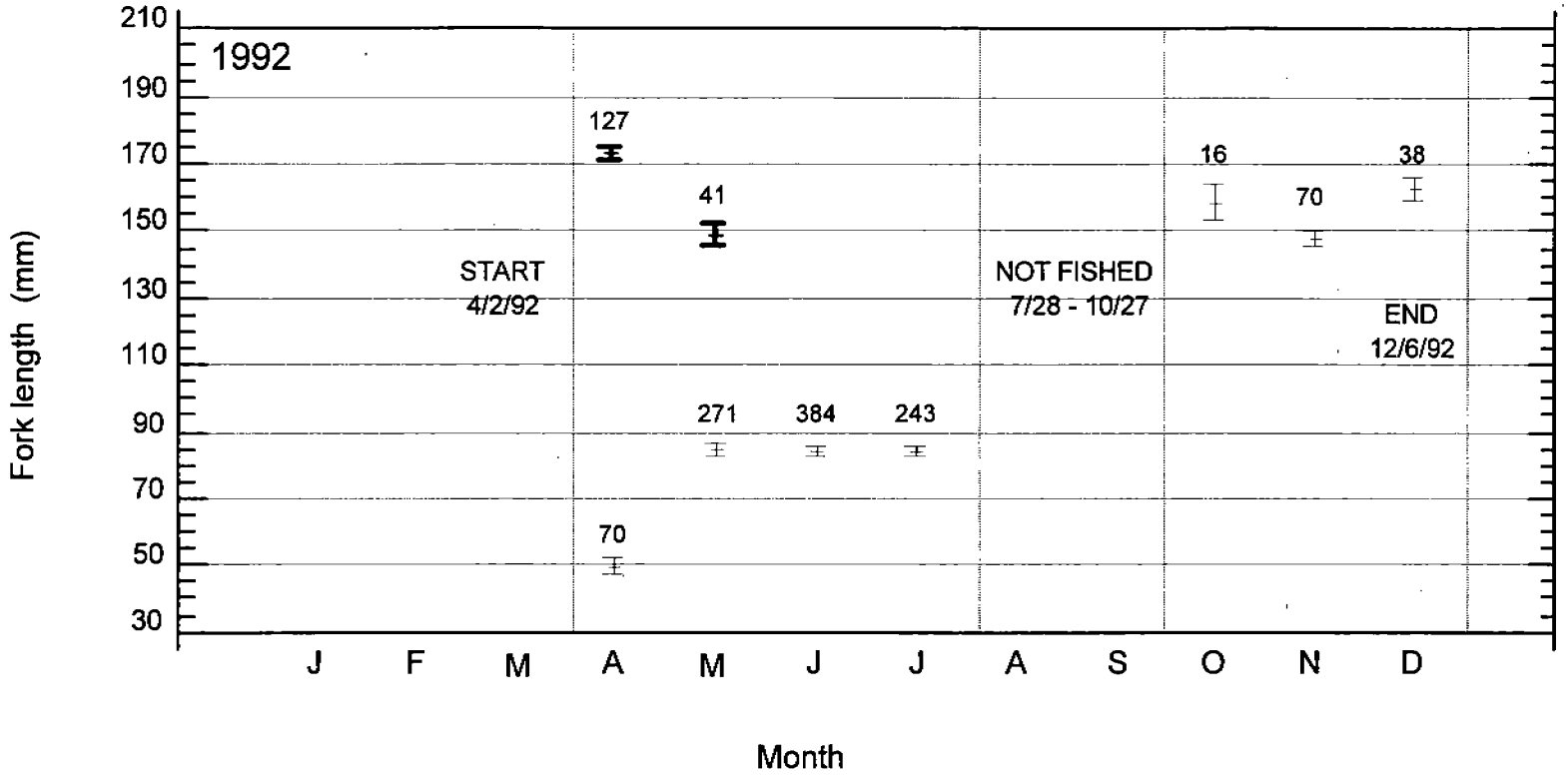

Figure 5. BBT chinook YOY (±) and yearling (±) mean fork length (mm) by month, spring and fall monitoring, 1992. (+/- 1 standard error, sample size)

Spring and fall, 1994:

Fork lengths from 2,651 chinook (5% of catch) were measured during spring trapping. During the first week (February 28-March 6) catches consisted entirely of yearlings, with a mean fork length of 132mm (sd=28.9, n=2)(Appendix 27). A few yearlings, including AD-clipped fish, were captured each week through mid-April. The size of these fish ranged from 92 to 205mm (n=12). Fifty-one yearlings ($\bar{x}$=169mm, sd=16.9), including five AD-clips, were captured during the first week of May. Yearling catches decreased throughout May (Figure 7).

YOY chinook were captured in small numbers through March and had fork lengths ranging from 31-60mm, ($\bar{x}$=40mm, sd=45.9, n=73). Mean fork lengths increased to 53mm for April, and 69mm for May, before peaking at 84mm in June (Figure 7). The largest size differential for chinook YOY occurred in May, where fork lengths ranged from a minimum of 41mm to a maximum 120mm (Appendix 27). The mean size of chinook YOY increased through mid-June, with the largest mean weekly fork length of 88mm occurring one week before the arrival of IGH fingerlings. The mean fork length of YOY chinook decreased to the 76-81mm range with the arrival of IGH the fingerlings.

Spring-1995:

Initial chinook catches in early April consisted of yearlings. A total of 41 yearlings ($\bar{x}$=122mm, sd=10.8) were captured from early April to early June. Mean fork lengths for yearlings increased from 110mm (sd=12.5, n=7) in April to 136mm (sd=6.9, n=6) in June (Figure 8).

Three chinook YOY were first captured at the end of April, having a mean fork length of 55mm (sd=3.5). Catch numbers as well as fish lengths changed little in May ($\bar{x}$=60mm, sd=15.5, n=12). However, both catch numbers and associated mean fork length increased significantly in June ($\bar{x}$=97mm, sd=12.9, n=444). With the arrival of IGH fingerlings in late June, mean fork lengths decreased slightly ($\bar{x}$=92mm, sd=7.4, n=867) (Figure 8).

Big Bar Trap, A Comparison Between Years:

Variation in the magnitude of spring emigration is in part, a function of natural spawning escapement, spawning success and egg-to-fry survival through winter. The natural chinook spawner escapement to the Klamath River for 1991 through 1994, was 6,232, 6,503, 14,653, and 24,498, respectively (CDFG 1995). Emigration timing of YOY chinook

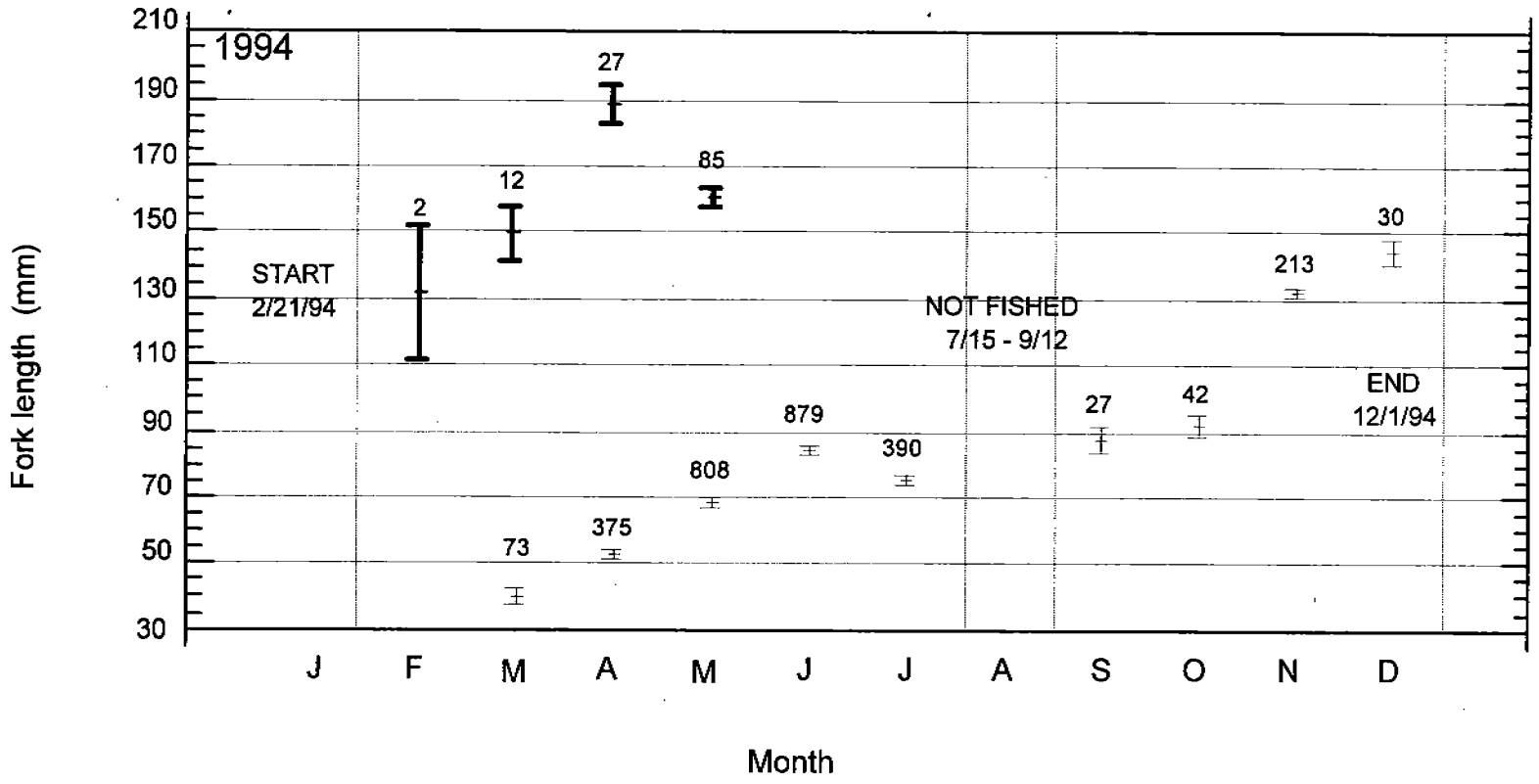

Figure 7. BBT chinook YOY (±) and yearling (±) mean fork length (mm) by month, spring and fall monitoring, 1994. (+/- 1 standard error, sample size)

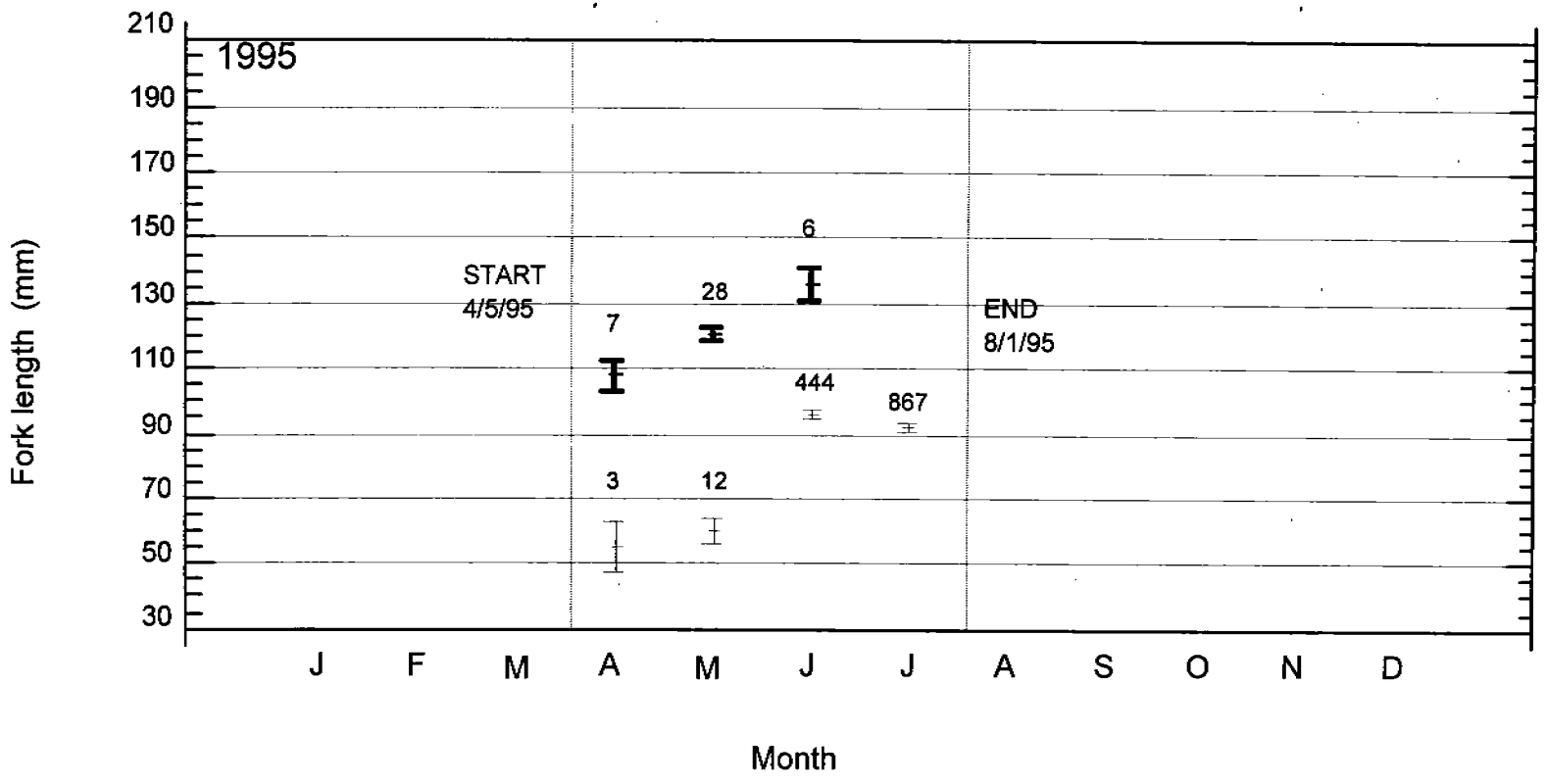

Figure 8. BBT chinook YOY (±) and yearling (±) mean fork length (mm) by month, spring monitoring, 1995. (+/- 1 standard error, sample size)

was likely related to the magnitude of flow during winter/spring months and subsequent stream temperatures. Water temperature during rearing can influence growth rate, population density, swimming ability, and the ability to capture food (Reiser and Bjornn, 1979).

By using the percentage of natural emigration at the BBT before and after the arrival of IGH fingerlings as a benchmark, a larger percentage of the total natural YOY abundance index occurred before the arrival of IGH fish during the low water years (1992 and 1994) and latter during higher (1993 and 1995)(Table 6). In 1992 and 1994, the lower winter/spring flows likely promoted egg-to-fry survival and the warmer water temperatures were more conducive to increased growth rates and thus an earlier emigration.

Table 6. Spring abundance index totals for natural chinook YOY at the BBT before and after IGH releases, 1992-1995.

	pre-hatchery release		post-hatchery release		
Trapping Period	index total	% season total	index total	% season total	Spring total
Spring 92	111,762	67%	53,465	32%	165,227
Spring 93	75,673	34%	144,766	66%	220,439
Spring 94	593,444	54%	509,333	46%	1,102,777
Spring 95	54,446	18%	248,135	82%	302,581

Abundance index comparisons for 1992 through 1995, show the largest emigration of juvenile chinook occurred during the spring of 1994 (1,102,777) (Table 6). The relatively high natural spawner escapement in 1993 combined with low steady flows throughout the winter of 1993/1994, resulted in the large natural chinook YOY abundance index for the spring 1994. The 1994 natural YOY abundance index was almost eight times greater than that of spring 1992, and may reflect the larger adult escapement in 1993. Despite almost twice the number of natural spawners returning in 1994, the resulting 1995 spring abundance index was 3.6 times smaller than that of 1994. Winter flows may have had a great impact on brood year (BY) 1994 egg-fry survival contributing to this disappointing total. Flows were high and sporadic from December through mid-June, 1995 (Figure 9). These winter/spring flows may have scoured out redds resulting in high mortality and/or significantly delayed YOY emigration into the fall months. Fall monitoring was not conducted in 1993 or 1995 and thus there is no means of confirming that emigration was significantly delayed. In 1995 however, crews from the USFWS and CDFG, which were

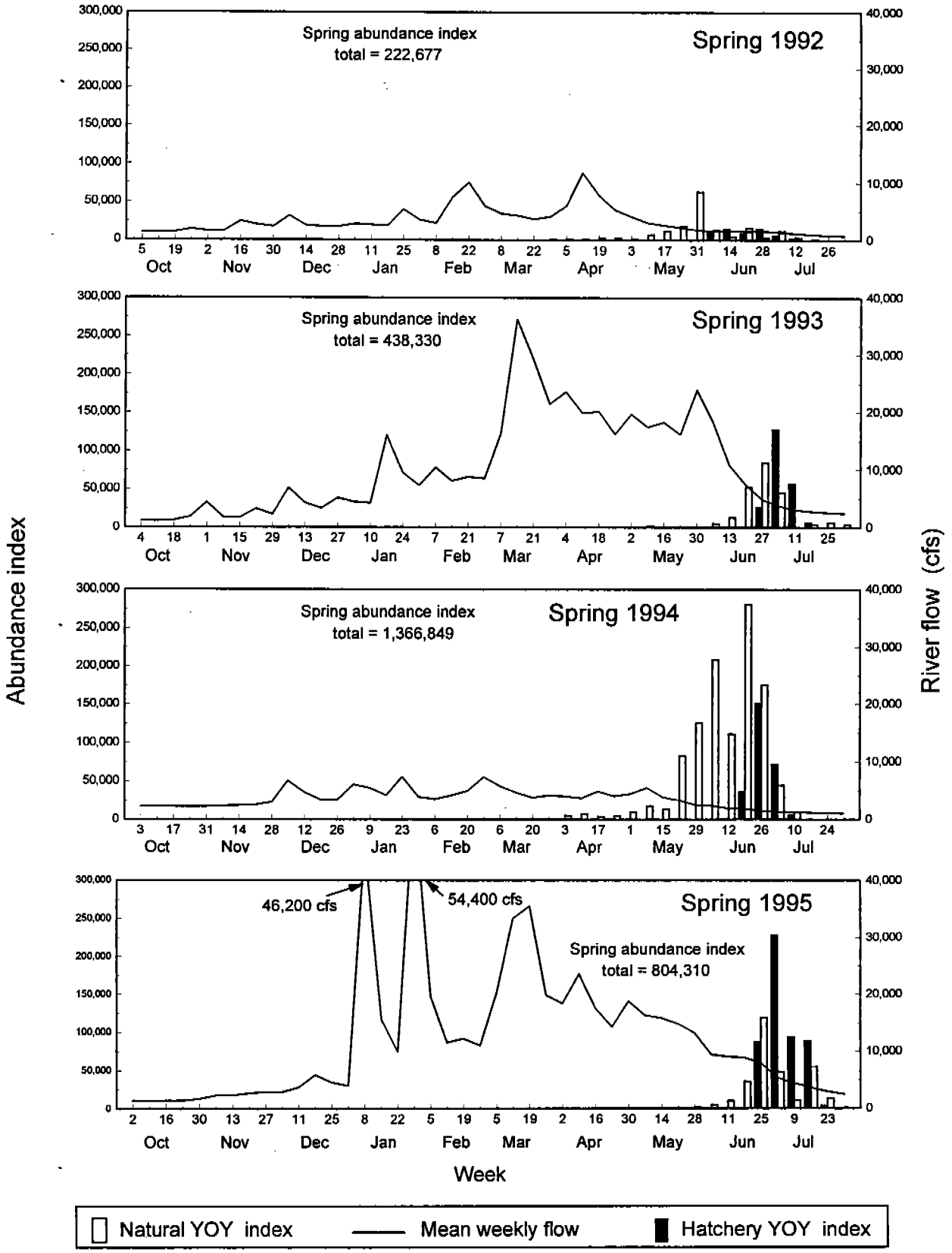

Figure 9. Mean weekly Klamath River flow (cfs), fall through mid-summer at Orleans, and natural and hatchery chinook YOY emigration timing and abundance index totals at the BBT, spring monitoring, 1992-1995.

conducting fisheries work in the lower mainstem Klamath River, did note large numbers of juvenile chinook through the lower river in August and September (Craig and Wallace, pers. comm. 1995).

Abundance indexes for fall monitoring were much lower than those of the spring monitoring periods, and the hatchery component larger due to yearling releases and the relatively low numbers of over-summering natural chinook. Flows were also relatively low throughout the fall-early winter months (Figure 10). Abundance index totals for fall monitoring was 8,253 and 6,985 for 1992 and 1994, respectively.

Migration Rates:

Rates at which IGH fingerlings and yearlings emigrate through the upper mainstem have been calculated since 1989. The timing of fingerling and yearling releases from IGH is intended to mimic the emigration timing of natural chinook which increases the potential for intra-specific competition. To help limit this potential impact, IGH has delayed the fingerling release time until a size of 90/lb is reached. This strategy was implemented with the 1992 fingerling release. Prior to 1992, the release size of fingerlings ranged from 269/lb to 122/lb (Table 7).

With the exception of the yearling release in the fall, there was a general relationship between migration rate and fish size at release, with smaller fish migrating at slower rates (Figure 11). From 1989 through 1995, migration rates during the spring monitoring period ranged from 4 km/d to 19.1 km/d (Table 7).

Migration rates of yearlings released from IGH and tributary rearing facilities had the slowest migration rates, ranging from 5 km/d to 9.8 km/d. Due to the fact that fall monitoring was either not conducted or ceased by mid-December and that some yearlings over-winter upriver, the migration information regarding the yearling release strategy has limited application.

Size (fork length) of chinook, along with other variables such as photoperiod, stream flows, water temperatures, and density-dependent factors, influence the migratory behavior. A unique opportunity arose in 1994 to empirically test migration rate as a function of size. IGH marked a portion of each distinct size lot utilizing five different CWT codes (Table 7). All marked fish in 1994 were released on June 15 and therefore subject to the same flow regime during emigration. As expected, the larger chinook migrated at faster rates than smaller chinook. As a group, the 1994 IGH CWT release was larger in size at the time of release than most other hatchery releases since 1989. The

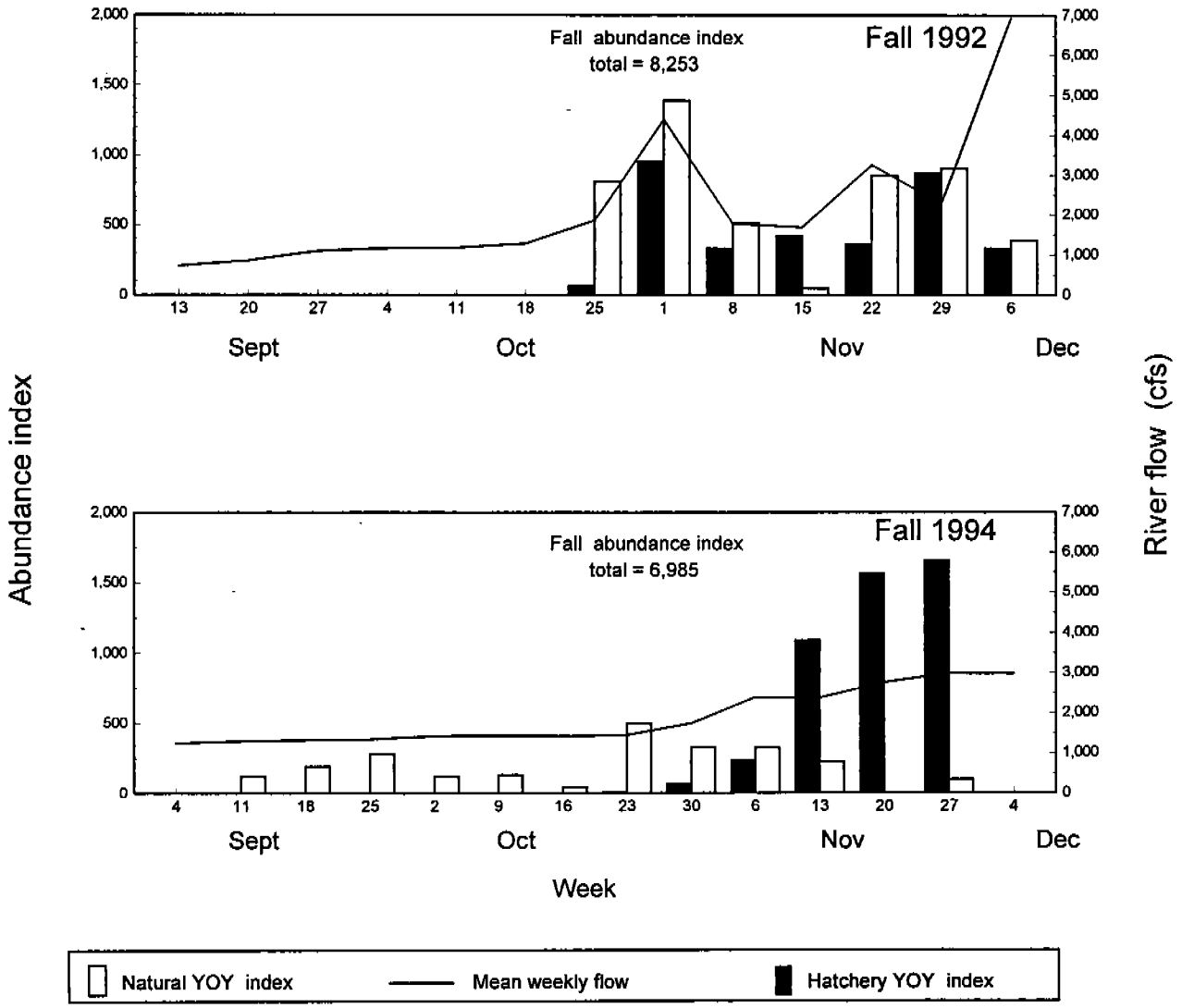

Figure 10. Mean weekly Klamath River flow (cfs), late summer through late fall at Orleans, and natural and hatchery chinook YOY emigration timing and abundance index totals at the BBT, fall monitoring, 1992-1995.

Table 7. Migration rates for CWT chinook captured at the BBT site, 1989-1995.

Release Date	Origin	Code	Race	Release Type	Size #/lb	Size (grams)	Chinook captured	Rate km/day
4/24/89	IGH	B-series	fall	f		1.7		4
6/02/89	IGH	6-1-2-1-1	fall	f				
6/02/89	IGH	6-1-2-1-2	fall	f	122	3.7	34	10.7
5/21/90	IGH	6-1-2-1-4	fall	f	233	1.9	5	5.5
5/28/91	IGH	6-1-2-1-5	fall	f	150	3.0	43	6
5/28/91	IGH	6-1-2-1-6	fall	f	150	3.0	33	6.6
10/21/91	Ind Cr.	6-63-24	fall	y	7	64.8	29	2.8
10/21/91	Elk Cr.	6-63-27	fall	y	7	64.8	73	2.7
11/15/91	IGH	6-57-03	fall	y	8	56.8	63	9.8
6/07/92	IGH	6-1-2-1-3	fall	f	90	5.0	35	13.6
6/07/92	IGH	6-1-2-1-7	fall	f	90	5.0	28	10.2
10/27/92	Ind Cr.	6-63-34	fall	y	10	45.4	15	5.0
6/15/93	IGH	6-1-2-1-8	fall	f	81	5.6	15	9.3
6/15/93	IGH	6-1-2-1-9	fall	f	81	5.6	15	9.3
6/15/94	IGH	6-1-2-1-10	fall	f	84	5.4	216	19.1
6/15/94	IGH	6-1-11-3-7	fall	f	109	4.2	104	15.1
6/15/94	IGH	6-1-11-3-8	fall	f	107	4.2	93	13.4
6/15/94	IGH	6-1-11-3-9	fall	f	122	3.7	59	12.5
6/15/94	IGH	6-1-11-3-10	fall	f	136	3.3	13	11.3
6/15/95	IGH	All chinook	fall	f	81	5.6	335	12.8

Release Type: f= fingerling, y= yearling, IGH= Iron Gate Hatchery Ind Cr. = Indian Creek

Duration: number of days the code was recovered, excluding the first and last 10% of the tags.

Data source: USFWS 1991, 1992a, 1992b, 1994.

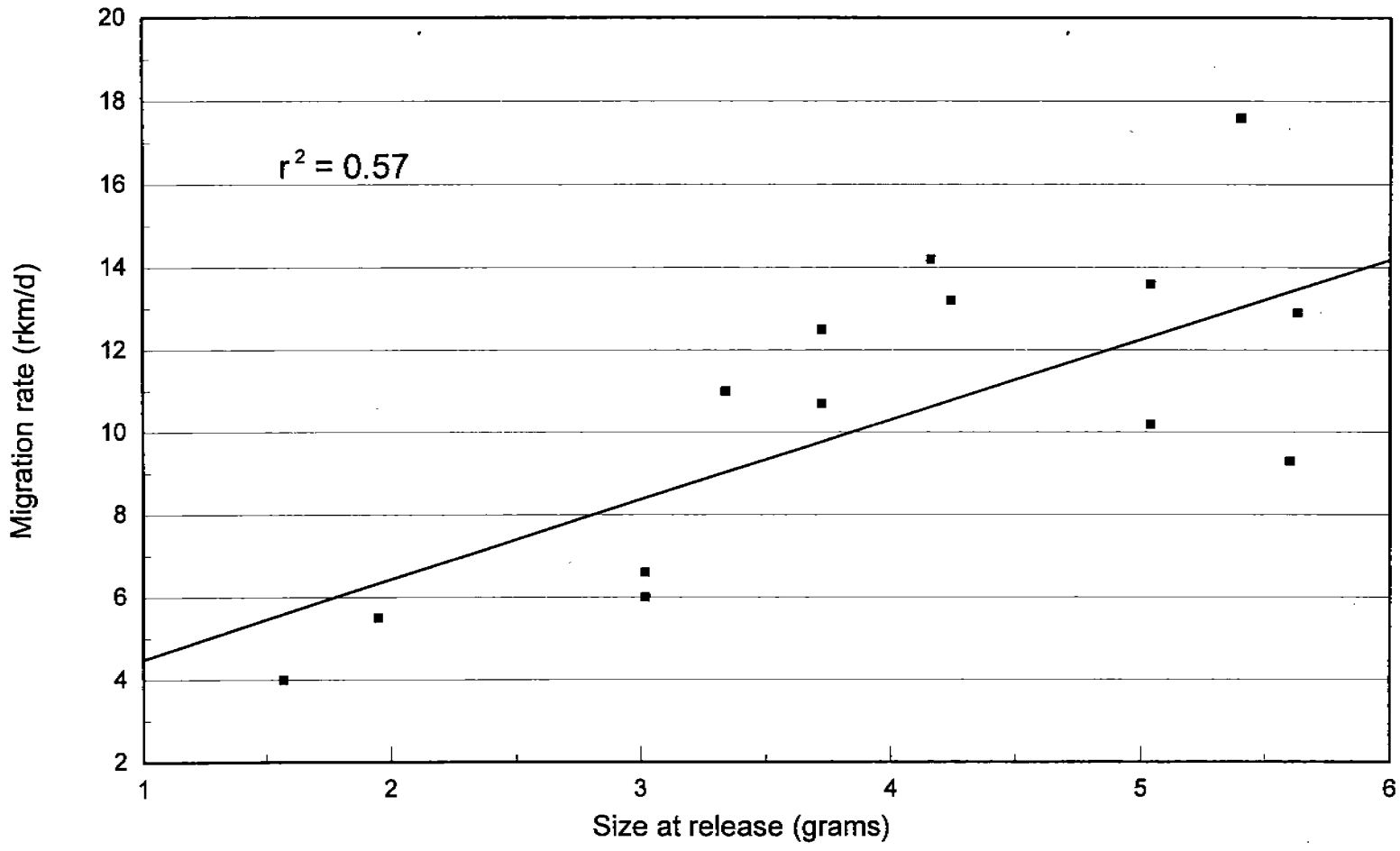

Figure 11. The relationship between fish size (grams) and migration rate (river kilometer per day) based on AD-clipped IGH chinook captured at the BBT from 1989-1994.

mean rate of migration for the 1994 AD-clipped release group was greater than in any previous year of this monitoring project. The utilization of pulse flows to help increase the rate at which hatchery fish move through the upper Klamath River mainstem may be warranted in the future. It should be noted though that until fish reach appropriate physiological development or "readiness" to migrate, increased or pulsed flow events may do little than displace fish downstream.

From 1992 through 1995, catch numbers started to increase when fork lengths approached the 60 to 70 mm range, which for these years could indicate a size range at which physiological development reached the point that fish were ready for emigration. Chinook fork length may be a significant and easily obtained indicator of such readiness and may serve to provide water managers and biologists a gauge of how best to time pulse flows to assist emigration.

CHINOOK MONITORING ON THE MAINSTEM TRINITY RIVER AT WILLOW CREEK:

Spring Monitoring:

As with the Klamath River, year to year variation in Trinity River discharge (Figure 12) made it difficult to deploy the trap at the same time each year (Table 8). Spring monitoring typically began in late February and ended by late September. Exceptions to this occurred in 1993 and 1995.

Table 8. Period and duration of spring trapping at the WCT, 1992-1995.

Year	Spring Monitoring	# of days trapped
1992	February 28 to September 26	120
1993	March 30 to September 25	161
1994	February 21 to October 01	216
1995	February 29 to July 31	124

TRH released both spring and fall-run chinook fingerlings in early June of each year. Beginning in 1994, however, releases from TRH became volitional, i.e. chinook were able to leave the Hatchery raceways and enter the Trinity River voluntarily for a period of up to two weeks (Table 9), after which all remaining chinook were manually moved into the river.

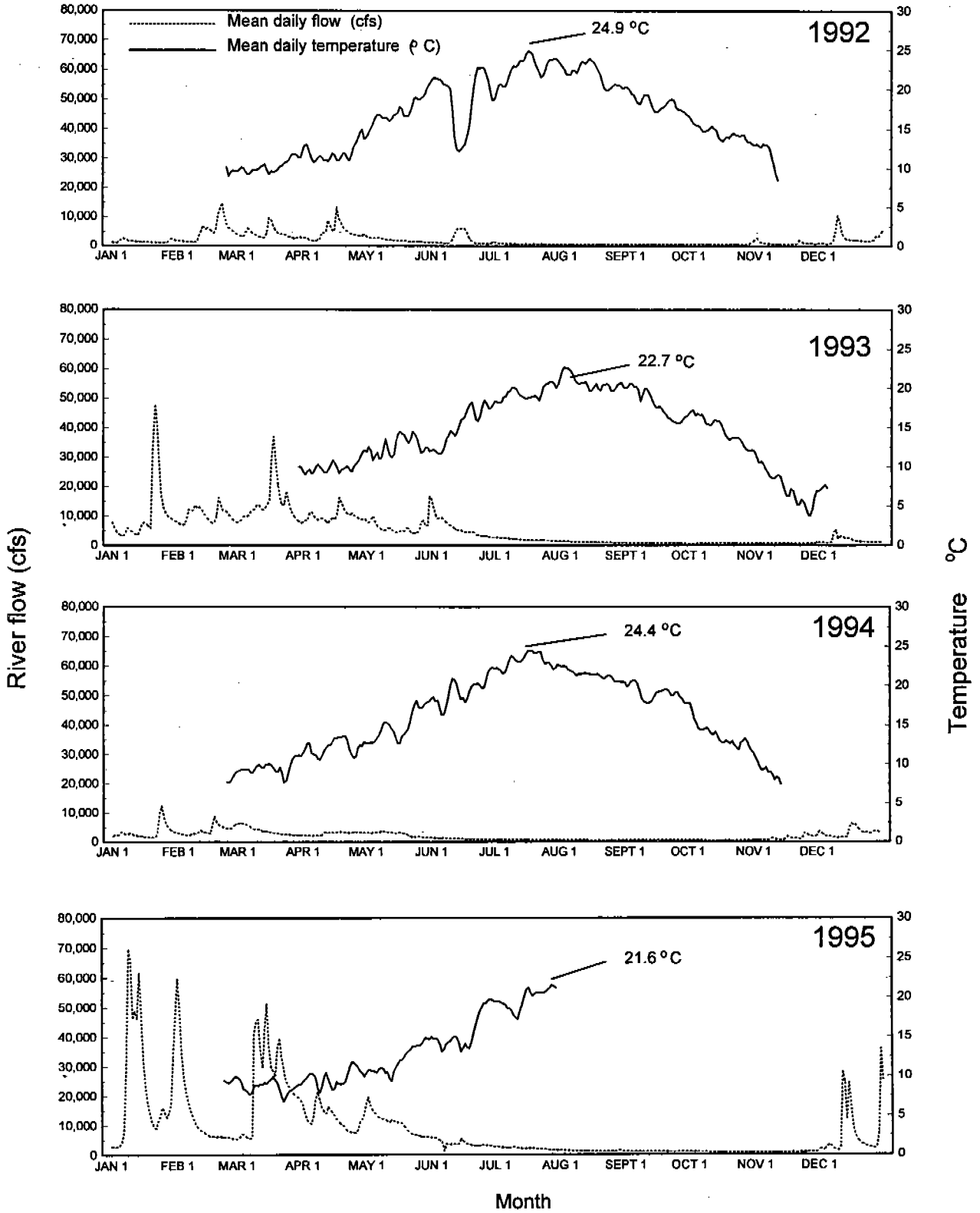

Figure 12. Mean daily Trinity River flow (cfs) at Hoopa, and mean daily river water temperature (°C) at the WCT, 1992-1995.

Table 9. Trinity River Hatchery fingerling releases, 1992-1995.

Release Year	Spring chinook release date/s	Spring chinook release totals	Fall chinook release date/s	Fall chinook release totals	Totals
1992	06/05/92	210,188	06/22/92	586,432	796,620
1993	06/15/93	488,219	06/16/93	2,342,037	2,830,256
1994	06/01 - 06/10/94	1,500,622	06/10 - 06/15/94	202,275	1,702,897
1995	06/06/95	1,458,916	06/01 - 06/09/95	2,153,982	3,612,898

Spring Monitoring Catch Totals:

Just under 125,000 chinook were captured in the Willow Creek trap (WCT) during the four spring monitoring periods, with over half (54%) captured in 1994 (Table 10). For all years, chinook catches were predominately YOY, with 16 to 64% of the YOY chinook attributable to TRH fingerling releases. Chinook captured in 1992, 1993 and 1994, included tagged (AD-clipped\CWT) natural chinook YOY (Appendix 33-36), which were part of CDFG's natural stocks project. Tagging of natural stocks was not conducted by CDFG in 1995 (Zuspan, pers. comm. 1995). All yearlings captured during the spring monitoring period were considered of natural origin due to a lack of a marked hatchery representative.

Table.10. Chinook catches at the WCT, spring monitoring 1992-1995.

Spring monitoring	Yearlings		Natural YOY		TRH fingerlings		Catch totals
	AD	Non-AD	AD[1]	Non-AD	AD	Non-AD	
1992	0	13	731	37,706	3,440	4,107	45,996
1993	0	0	83	7,626	191	1,480	9,380
1994	0	0	366	55,690	2,852	8,255	67,163
1995	0	90		1,223	96	1,037	2,446
Total	0	103	1,180	102,245	6,579	14,879	124,985

[1] Fish Tagged By CDFG natural stocks project.

Fall Monitoring Catch Totals:

Fall monitoring began each year from late September to early October (Table 11) just prior to the TRH yearling release. Fall trapping generally ceased by mid-December due to low catch numbers and the beginning of winter storms.

Table 11. Period and duration of fall monitoring for the WCT, 1992-1994.

Year	~~Spring~~ Monitoring	# of days trapped
1992	September 02 to December 09	45
1993	October 27 to December 05	70
1994	October 21 to December 14	67

TRH yearling releases were also volitional, and occurred by mid-October. Between 1.0 to 1.4 million fish were released annually from TRH and consisted of both spring and fall-run chinook (Table 12). For fall monitoring in 1992, 1993 and 1994, TRH chinook yearling releases represented between 72 and 81% of all chinook captured (Table 13). Trapping in the fall of 1995 was not conducted.

Table.12. Trinity River Hatchery yearling releases, 1992-1994.

Spring chinook release dates	Spring chinook yearling releases	Fall chinook release dates	Fall chinook yearling releases	Totals
10/02 - 10/15/92	375,301	10/02 - 10/15/92	934,141	1,309,442
10/01 - 10/07/93	485,260	10/01 - 10/07/93	971,588	1,456,848
10/03 - 10/14/94	213,053	10/03 - 10/14/94	800,205	1,013,258

Table 13. Chinook catches at the WCT, fall monitoring, 1992-1994.

Fall period	Natural YOY		TRH yearlings		Total Chinook	Percent TRH yearlings
	AD	Non-AD	AD	Non-AD		
1992	0	2,565	6,583	1,294	10,442	75%
1993	6	1,753	3,862	647	6,268	72%
1994	0	2,031	1,901	6,757	10,689	81%
Total	**7**	**6,349**	**12,346**	**8,698**	**27,399**	**77%**

Abundance Index and Hatchery Contributions by Year:

Spring-1992:

Yearlings and YOY of natural origin comprised chinook catches in late February 1992. Based on cumulative weekly totals, 50% of the yearling chinook abundance index occurred at the WCT by late February-early March, and 95% by mid-April (Appendix 5). Overall, chinook yearling contributions in spring 1992 were very small, and accounted for less than 1% of the total (yearling and YOY) abundance index for 1992.

The abundance index for natural YOY chinook through the first eleven weeks (late February, through the end of April), represented 11% of the total natural YOY chinook abundance index for spring monitoring 1992 (Appendix 5). Natural YOY chinook contributions increased through May, with 50% of the spring abundance index total occurring at the WCT by the end of May, and 95% by early July.

Over 210,000 spring-run fingerling chinook were released from TRH on June 5, 1992. Significant contributions in the trap catches resulting from this release did not occur until the week of June 21. Capture totals of natural YOY chinook had been increasing since mid-May, but decreased dramatically during the week beginning June 14. This decrease was likely in response a scheduled flow increase from Lewiston Dam as part of a ten year flow study (Zedonis, pers. comm. 1992), as well as a concurrent storm event. Lewiston releases were increased from approximately 1,300 cfs to 6,000 cfs over a seven day period starting June 10. Peak Trinity River flow as recorded at the USGS gauge station in Hoopa, CA. occurred June 12-18. The flow increase caused a dramatic decrease in the mean daily river temperature as well as the daily chinook abundance index values (Figure 13). In addition, due to bed load movement the channel depth at the WCT site decreased over a three day period (June 21 to 23), resulting in the inability to operate the trap at cone depth greater than 0.76 m. However, as flow receded and sand and gravel deposits scoured, the channel had resumed its pre-release depth profile by June 24.

On June 22, TRH released over 578,000 fall-run chinook fingerlings. AD-clipped fish from this release were captured on June 23 at the WCT. For the weeks beginning June 14 and June 21, TRH chinook abundance index contributions increased from 9 to 38%. Although TRH chinook were present in trap catches through the end of spring monitoring (late September), 90% of the TRH chinook spring abundance index total had occurred by mid-July. TRH fingerlings accounted for 11% of the combined (hatchery and natural) YOY chinook abundance index (Appendix 5).

Fall-1992:

Fall monitoring in 1992 began prior to the TRH yearling release. Like the IGH yearling releases, these chinook are actually still YOY and of the same brood as the spring fingerling release. The yearling release was volitional and occurred from October 2-15. Both spring and fall-

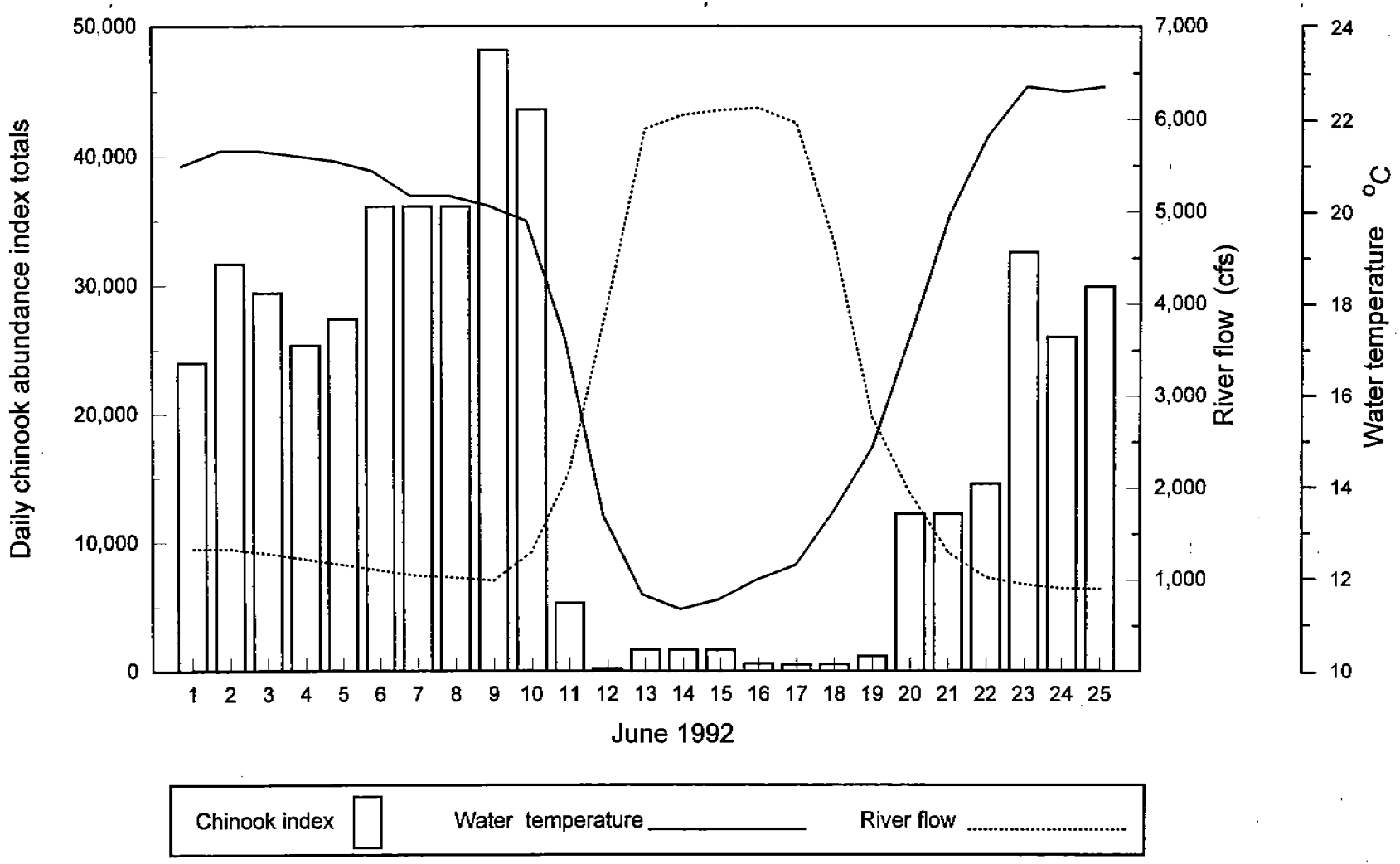

Figure 13. Daily chinook abundance index totals, Trinity River flow (cfs), and water temperature (°C) in June 1992, before and after a 6,000 cfs release from Lewiston Dam.

run chinook were released and the first AD-clipped were captured on October 5. For the week beginning October 4, TRH yearlings represented 66% of this weeks abundance index total. Although in the minority for the week, 75% of all chinook attributed to natural stocks for the fall monitoring period were captured during the week of October 4. This may indicate that the large numbers of TRH yearlings moving through the mainstem Trinity River affected a downstream displacement of mainstem rearing chinook. Seventy-nine percent of the total fall abundance index occurred within four weeks of the initial TRH yearling release date, which may indicate that the majority of the TRH release move downstream rather quickly.

Spring-1993:

Trap deployment occurred in late March 1993, due to high flows earlier in the month (Appendix 6). Yearling chinook were not captured at all throughout the spring of 1993, and chinook YOY catches were sparse through the month of May. A storm event in late May-early June, caused significant damage to the trap resulting in only one day of trapping for the week beginning May 30. Trapping resumed for five days during the week of June 6. The natural chinook YOY abundance index reached 50% by mid-June, which coincided with the influx of TRH chinook released June 15-16. The natural YOY abundance index reached 95% by mid-September. Fifty percent of the hatchery abundance index occurred by the end of June, and 95% by the first week in September. The combined (hatchery and natural) YOY chinook abundance index totaled 345,838, of which 17% was attributed to TRH fingerling releases.

Fall-1993:

TRH conducted a volitional release of spring and fall-run yearlings from October 1-8, 1993. These fish moved downstream relatively quick, with 50% and 74% of the fall hatchery abundance index occurring within the first two weeks of the initial release date (Appendix 6). Fifty percent of the natural chinook abundance index occurred during the first week of fall monitoring, and this may have been in response to the TRH yearlings displacing downstream chinook which had been over-summering in the mainstem Trinity River. By late October, 95% of the hatchery abundance index had occurred at the WCT. Ninety-five percent of the natural chinook abundance index occurred by the first week of November. The combined (hatchery and natural) fall abundance index totaled 85,107, of which 73% was attributed to TRH yearling releases.

Spring-1994:

Flows during the winter/spring of 1993/94 were very mild and trapping was able to begin in late February. Chinook yearlings were not captured during the entire spring monitoring period, however catches of YOY chinook were the highest since inception of spring monitoring in 1989. Chinook YOY catches increased steadily through March and April, with significant catch increases beginning the first week in June (Appendix 7). By mid-June, the natural YOY chinook abundance index had reached 50% at the WCT, and 95% was reached by early August. TRH chinook fingerling releases occurred from June 1-15, with spring-run chinook released during the first ten days and fall-run chinook the last five days. Fifty percent of the hatchery abundance index (spring and fall-run chinook) was reached by mid-June, and 95% by late August. The combined (hatchery and natural) YOY chinook abundance index totaled 882,417, of which 13% was attributed to TRH fingerling releases.

Fall-1994:

Fall monitoring started with significant increases in trap catches resulting from the TRH yearling release which occurred October 3-14. Both fall and spring-run chinook were released concurrently. The first AD-clipped yearling was captured on October 6, with 50% of the hatchery abundance index occurring at the WCT during the first week of fall monitoring (October 3-9). As in past years, the largest portion of the natural chinook abundance index occurred following the release of TRH yearlings. Eighty-seven percent of the natural abundance index occurred during the first week of fall monitoring, and 95% by mid-November. TRH yearlings represented 80% of the total fall abundance index.

Spring-1995:

First deployed in mid-February, the trap operated for only eight days through late March due to high flows. During this time eleven chinook were captured: five yearlings and six YOY (Appendix 8). Consistent trapping began the first week of April, however, chinook YOY catches were sparse through most of the month of June. Chinook yearlings which were all of natural origin, were captured through late May, with 50% of the yearling abundance index captured by late April, and 95% by mid-May. Fifty percent of the natural chinook YOY abundance index occurred by late June, and 95% by mid-July. TRH fingerling releases occurred June 1-9, and 50% of the hatchery abundance index occurred at the WCT by the end of June, and 95% by late July. The trap was pulled

on July 31, which marked the earliest termination of any spring monitoring period to date. The combined (hatchery and natural) spring abundance index was 111,853, of which 42% were attributed to TRH fingerling releases.

Fish Length and Emigration Timing:

Spring and fall, 1992:

Eleven of thirteen yearling chinook captured in 1992 were measured, with fork lengths ranging from 112 to 132mm (Figure 14). A total of 2,115 (5.6% of YOY catch) YOY chinook were measured. Fork lengths generally increased throughout the spring trapping period, and ranged from 32 to 140mm (Figure 14). No noticeable difference in mean fork length was observed upon the arrival of TRH fingerling releases. In the fall, mean fork length gradually increased from 111mm (sd=10.0, n=252) in October to 153mm (sd=22.4, n=420) by November. The large increase in the mean fork length observed through October is due to the preponderance of larger TRH yearling releases in catches. Mean fork length remained virtually the same for November and December at 155mm (sd=27.1, n=334) and (sd=15.9, n=25) respectively, reflecting the continuance of hatchery yearlings in catches. Smaller sized chinook were also captured during fall monitoring and ranged from 73 to 112mm. These fish may represent later emigrating fish of natural origin, or those which opted to over-summer in the mainstem Trinity River.

Spring and fall, 1993:

Two yearling chinook were captured in April 1993, and had a mean fork length of 128mm (Figure 15). A total of 3,247 (4.4% of YOY catch) YOY chinook were measured during spring monitoring 1993. The smallest YOY chinook (34mm) were captured in mid-April. Mean fork length for YOY chinook for the month of April was 43mm (sd=7.6, n=98). Noticeable difference did not occur in monthly mean fork length upon the arrival of TRH fingerling releases. Monthly mean fork length increased through the spring monitoring period with a mean of 107mm (sd=7.6, n=749) by September. Mean fork length increased in October to 132mm (sd=16.9, n=741) as TRH yearlings contributed to catches. Mean fork length decreased in November ($\bar{x}$=126mm, sd=16.7, n=423) and December ($\bar{x}$=125mm, sd=28.9, n=11) respectively. Non-hatchery yearling sized fish were also present during fall monitoring, with the smallest fish ranging from 50 to 79mm.

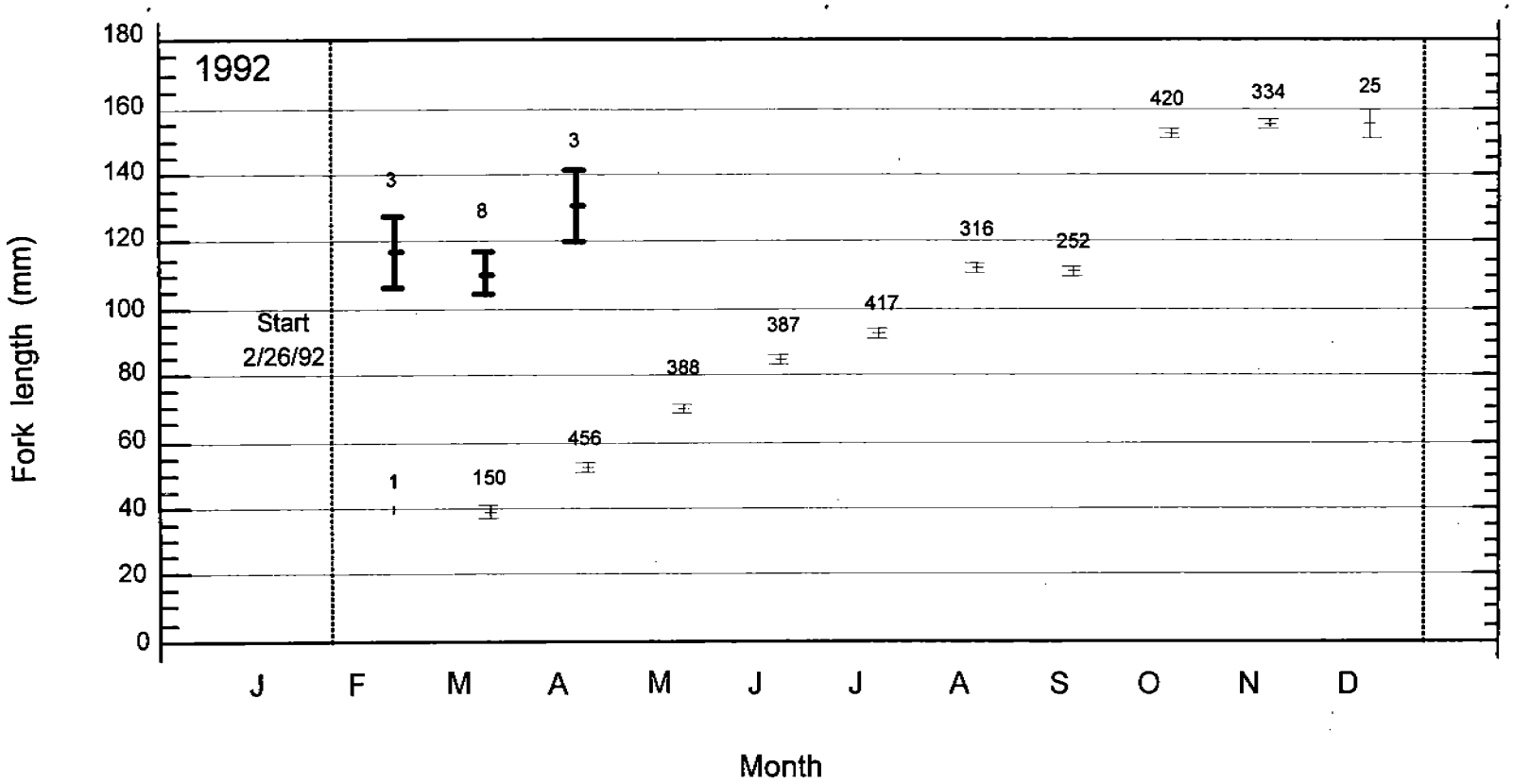

Figure 14. WCT chinook YOY (±) and yearling (±) mean fork length (mm), spring and fall monitoring, 1992. (+/- 1 standard error, sample size)

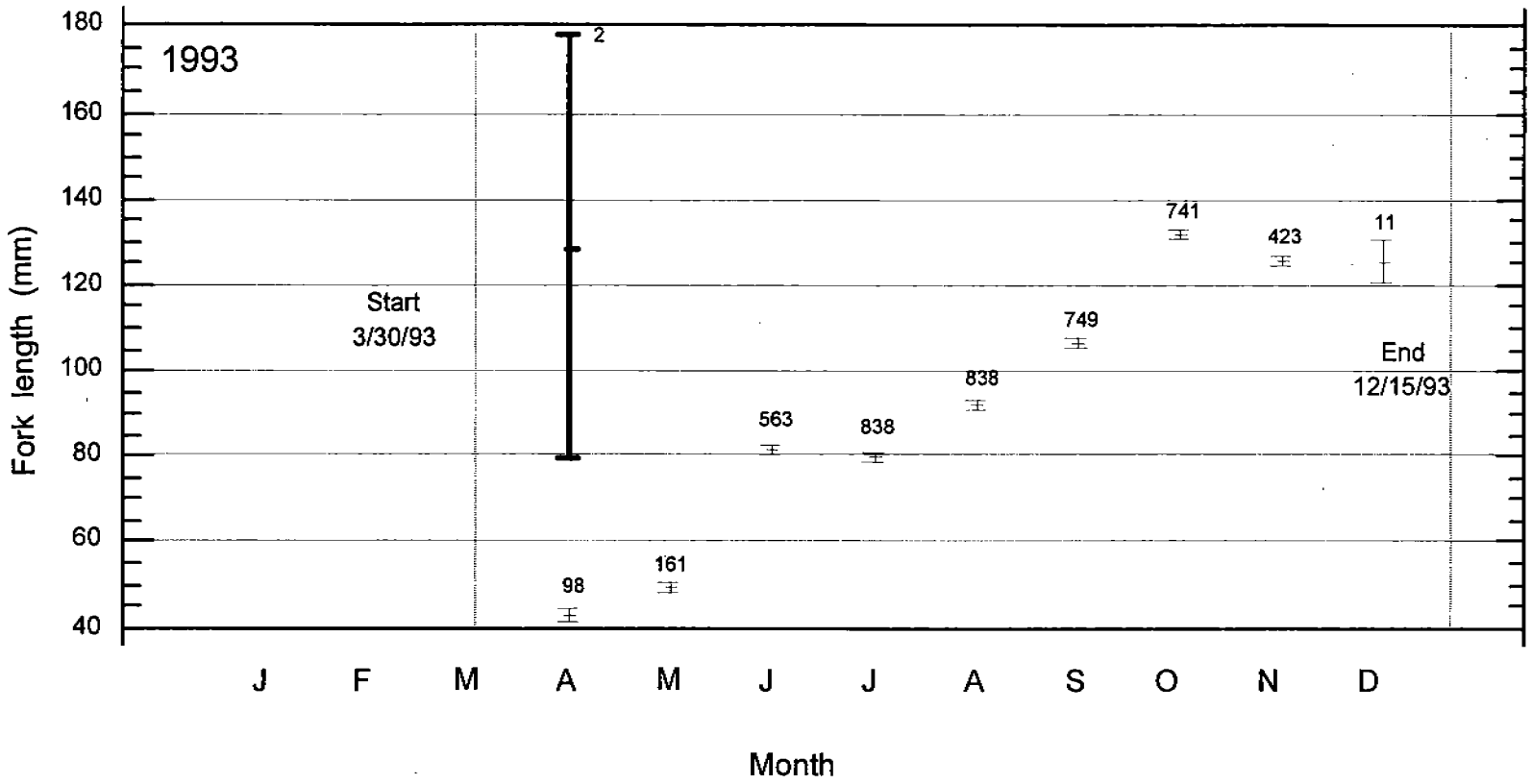

Figure 15. WCT chinook YOY (±) and yearling (±) mean fork length (mm), spring and fall monitoring, 1993. (+/- 1 standard error, sample size)

Spring and fall, 1994:

Yearling chinook were captured in March, April and May, with mean fork lengths of 116mm (sd=19.9, n=16), 122mm (sd=14.6, n=3) and 125mm (n=1); respectively (Figure 16). A total of 5,249 (7.8% of YOY catch) YOY chinook were measured during spring monitoring 1994. The few YOY chinook captured in late February had a mean fork length of 32mm (sd=4.0, n=5). As fish numbers increased through March, the range of fork lengths increased (25 to 75mm) with the smallest fish being recently emergent sac-fry. The mean fork length of YOY chinook for the month of March increased slightly to 34mm (sd=9.4, n=93). An increase in catch and mean fork length ($\bar{x}$=50mm, sd=11.1, n=737) occurred during April. Noticeable difference in mean fork length were not apparent when TRH fingerling releases contributed to trap catches. Mean fork length increased through the spring and summer months, with a mean fork length of 95mm (sd=8.6, n=900) in September. Mean fork length increased in October to 129mm (sd=24.7, n=921), as TRH yearling releases began to be captured, however, chinook as small as 52mm were also captured in October. Mean fork length decreased in November ($\bar{x}$=113mm, sd=28.8, n=254) and December ($\bar{x}$=89mm, sd=28.7, n=254). Based on the relatively small size of fish captured in December, it seems the larger chinook from the TRH yearling release had likely moved past the trap site by December.

Spring-1995:

A greater number of natural yearling chinook were captured during spring efforts in 1995 then the previous three years. Since inconsistent trapping effort occurred throughout the early part of spring due to high flows, fork length data collected before April is limited. However, based on the trend observed in number and distribution, yearlings occurred in greater numbers later into the spring. Mean monthly fork length for yearlings ranged between 90 and 112mm for the months February through June (Figure 17). Mean fork length for YOY ranged from 35 to 49mm through the month of May. Catch numbers increased significantly beginning in June with the capture of TRH fingerlings. The mean fork length increased to 91mm (sd=11.7, n=278) in June and 89mm (sd=8.4, n=867) in July. The WCT was pulled at the end of July and was not redeployed for fall monitoring.

Willow Creek Trap, A Comparison Between Years:

Although there is variability from year to year, the peak of YOY chinook emigration through the mainstem Trinity River typically occurred during May and June, with the largest catches generally

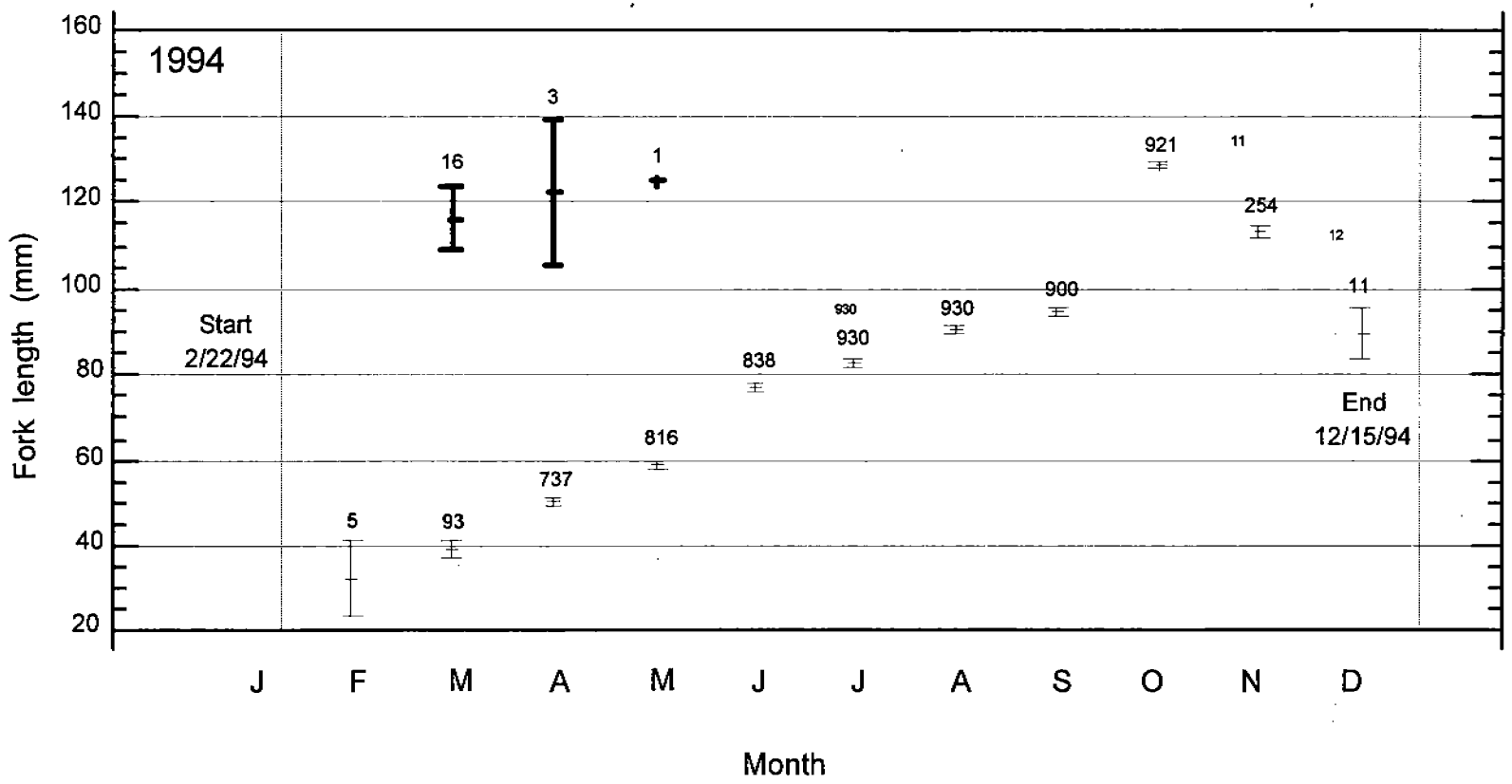

Figure 16. WCT chinook YOY (±) and yearling (±) mean fork length (mm), spring and fall monitoring, 1994. (+/- 1 standard error, sample size)

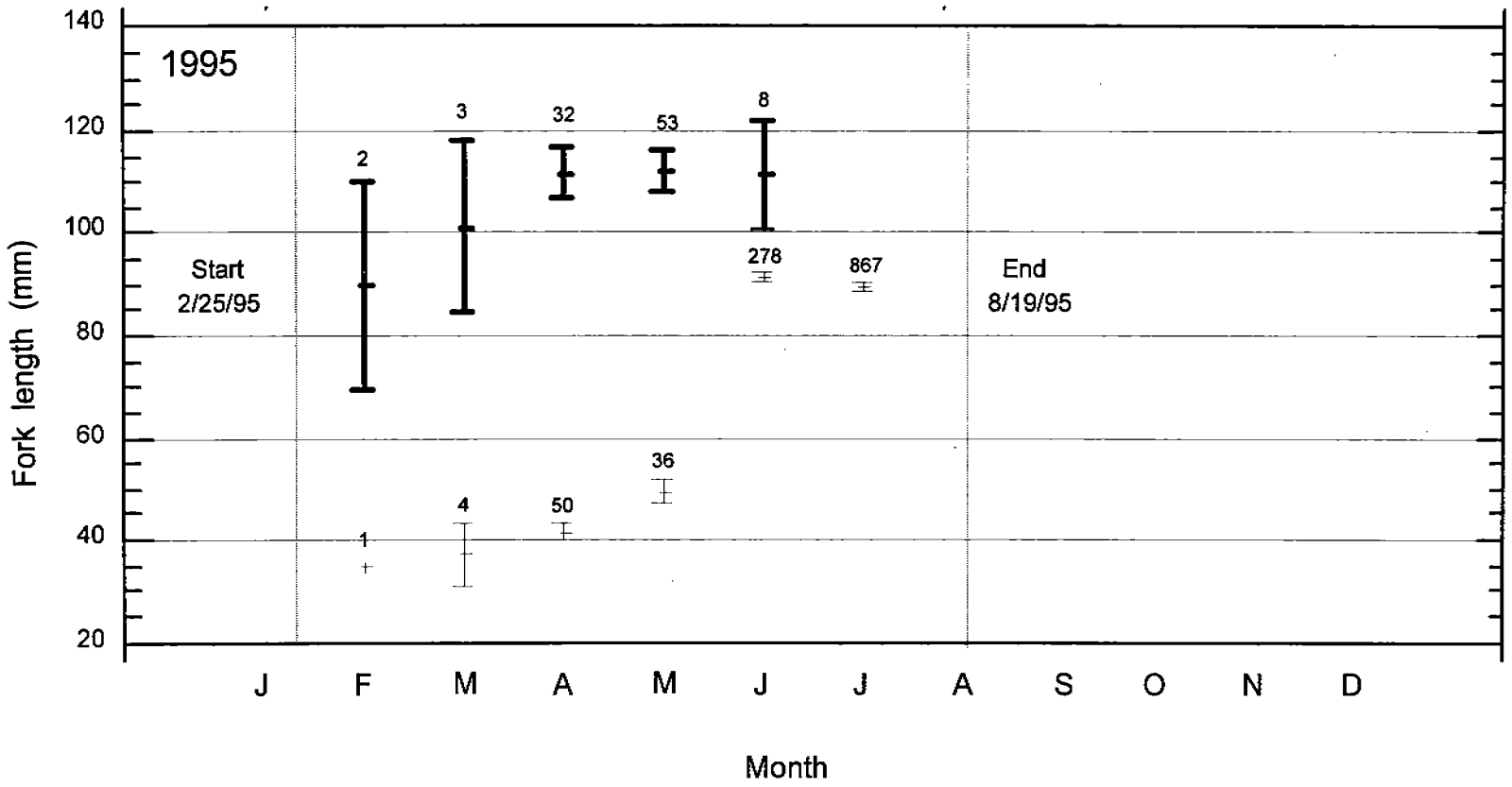

Figure 17. WCT chinook YOY (±) and yearling (±) mean fork length (mm), spring monitoring, 1995 (+/- 1 standard error, sample size)

following the TRH fingerling releases. The combined abundance index total of both hatchery and natural YOY chinook were largest during the spring of 1992 (1,115,035) and 1994 (882,417), respectively. The smallest combined (hatchery and natural) abundance index totals occurred during the two high water years, 1993 (345,838) and 1995 (98,311), respectively. TRH fingerling releases represented 11%, 17%, 13% and 42%, respectively, for the spring 1992-1995 YOY abundance index totals.

Periods of peak emigration for natural chinook YOY occurred earlier following mild winter/spring flow conditions (1992 and 1994) and the average fork length in May for these years was larger than chinook captured in May 1993 and 1995 (higher water years)(Figure 18). The relatively small natural YOY abundance index in 1995 occurred despite having the largest (naturally spawning) fall chinook escapement in 1994 (n= 13,411). The natural fall chinook escapement in 1991, 1992, and 1993 was 5,249, 9,702, and 8,370, respectively (CDFG 1995). In general, chinook YOY were larger in size earlier and emigration occurred sooner in 1992 and 1994 (low water years). It was unfortunate spring monitoring in 1995 ceased at the end of July. Despite the very low abundance index totals through July, USFWS and CDFG personnel observed large numbers of juvenile chinook in the mainstem Trinity River during August and September of 1995. This may have indicated a extended emigration into the fall months that had not occurred in prior years.

Abundance index totals for fall monitoring 1992-1994, were 130,867, 85,107, 77,703, respectively (Figure 19). TRH yearlings composed the large majority of the fall abundance index totals, representing 75%, 73% and 80% of the fall totals, respectively.

Migration Rates:

Average migration rate and duration were determined for CWT groups which were released over a time period not in excess of three days. Initial migration rates were calculated for all CWT releases. Unfortunate for calculating migration rates, most of TRH release groups after 1992 were volitional, having extended release periods of up to fourteen days (Appendix 33-36). The majority of CWT releases of natural chinook stocks, tagged by CDFG, Trinity Fisheries Investigations Project (TFIP), were also released over a prolonged time period (Appendix 33-36).

Migration rates for spring-run and fall-run chinook fingerlings released from TRH (1992-1994) ranged from 19.7 km/d to 7.4 km/d (Appendix 33-36). These rates are comparable to previous fingerling

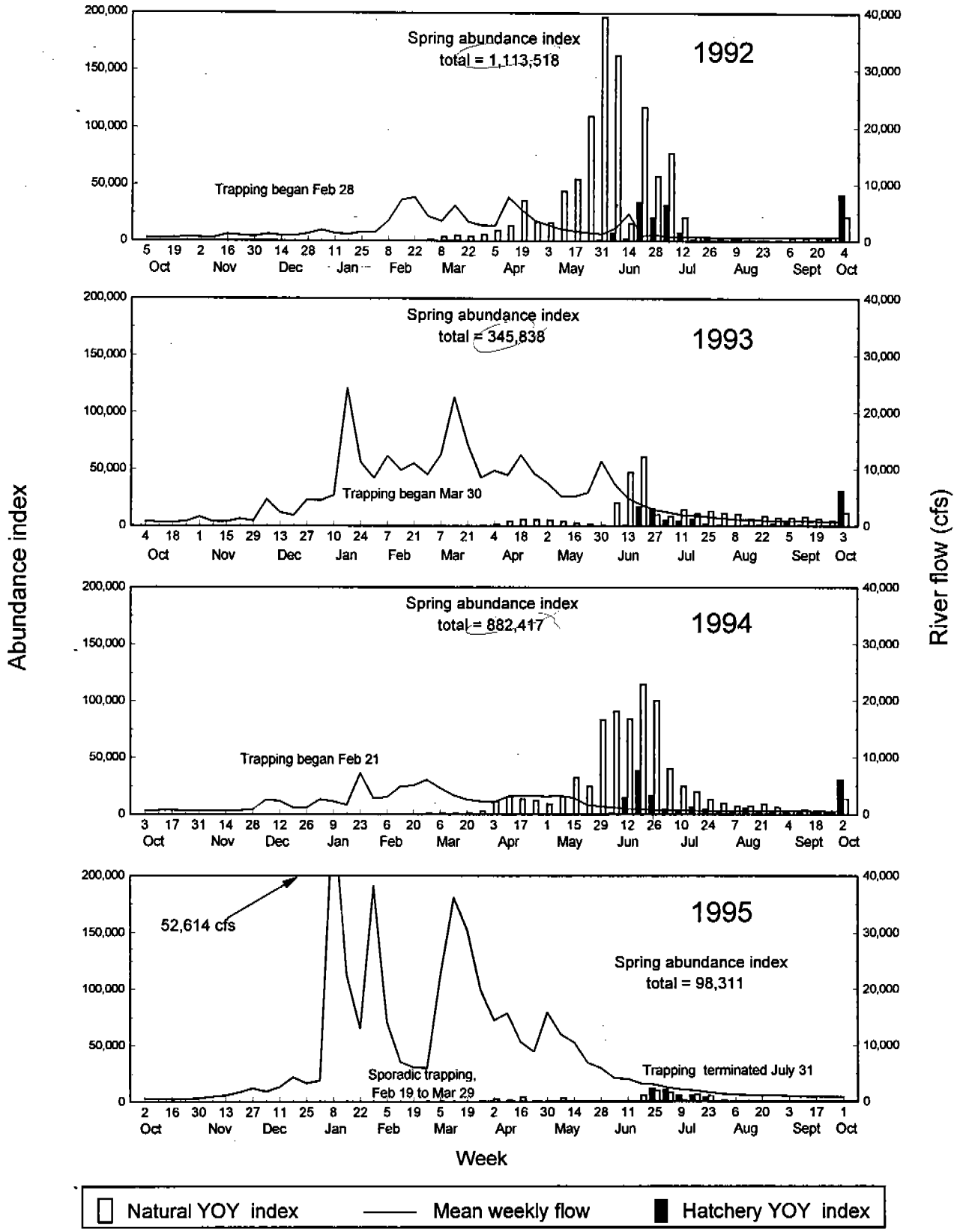

Figure 18. Mean weekly Trinity River flow (cfs), fall through mid-summer at Hoopa, and natural and hatchery chinook YOY emigration timing and abundance index totals at the WCT, spring monitoring, 1992-1995.

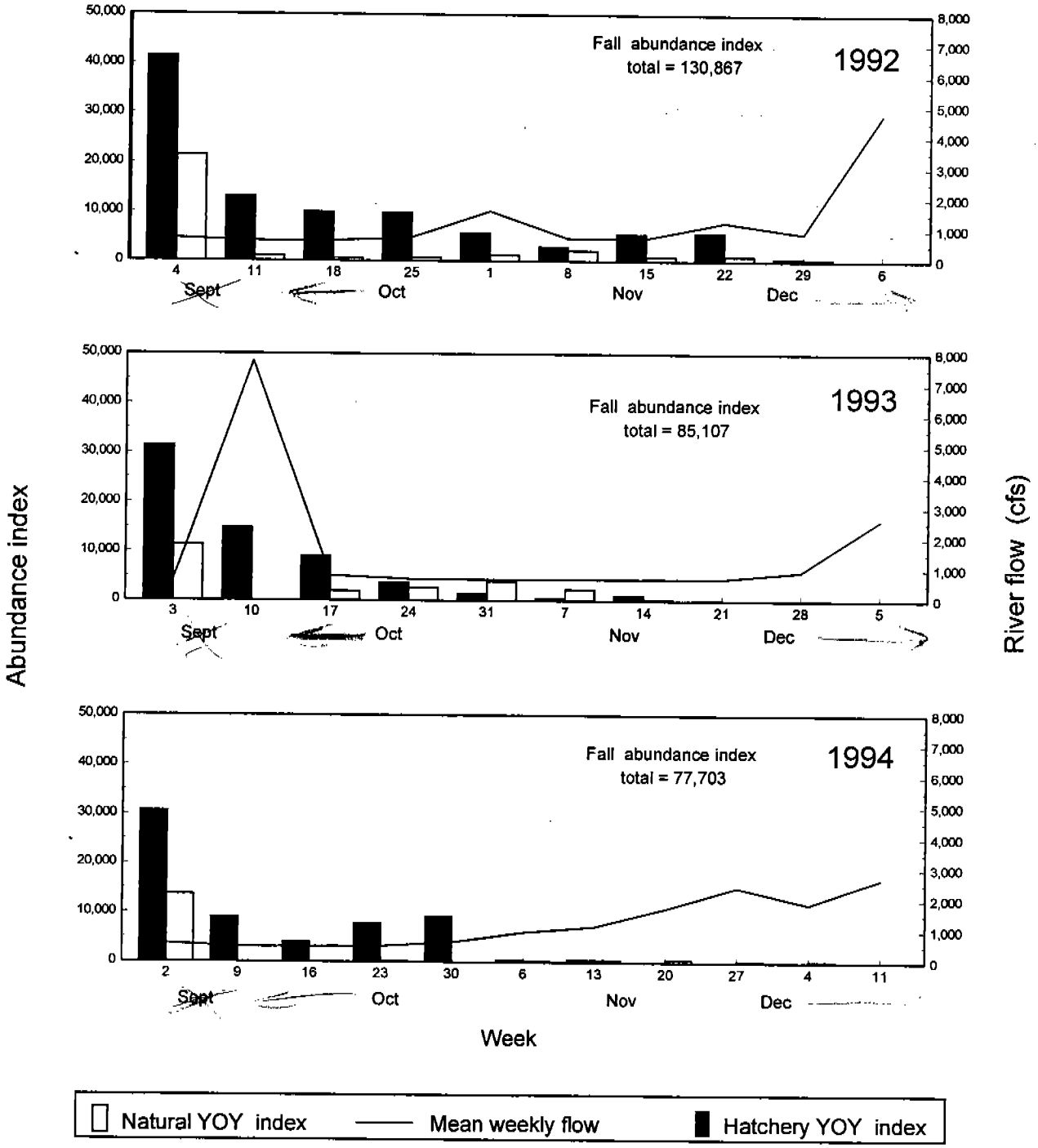

Figure 19. Mean weekly Trinity River flow (cfs), late summer through late fall at Hoopa, and natural and hatchery YOY chinook emigration timing and abundance index totals at the WCT, fall monitoring, 1992 and 1994.

migration rates, 1989 through 1991, which ranged from 16.3 km/d to 5.8 km/d (USFWS 1991, 1992a, 1992b, 1994). All yearling releases after 1992 were also volitional. Spring-run and fall-run yearling releases in 1992 averaged 17.3 km/d, which is comparable to the slowest migration rate (16.9 km/d) for a yearling release, which occurred in 1990 (USFWS, 1992a).

The relationship between migration rates and size (fork length) of fish were analyzed (Figure 20). Larger fish were found to emigrate at a faster rate then smaller sized fish. Natural stock chinook tagged early in the spring took longer to reach the trap than those tagged later in the spring, which on average were larger fish. Natural stocks had the slowest migration and longest duration of migration periods (Appendix 33-36). Natural stocks tagged in 1993 exhibited the longest duration period.

Trap Efficiency:

Mark-recapture efficiency tests were conducted on seven different occasions in 1992. On only one occasion in 1993 were enough chinook (261 fish) captured to conduct an efficiency test. Flows during 1993 were the highest in which efficiency tests were conducted. In 1994, one efficiency test was conducted before river temperatures became too high to attempt any further testing. Efficiency tests were not conducted in 1995.

Efficiency rates varied from 0% to 17.65% (Table 14). Efficiency tests yielded consistent results between tests #1 and #2 (1.9% & 2.9%), and tests #5 and #6 (9.9% and 9.1%)(Table 14). However, test #4 (0.9% efficiency) was much lower then preceding and proceeding weeks and coincided with increased flows associated with the 6,000 cfs release during June 10-17, 1992. During test #3, the percentage of marked mortality was very high (60%) and on two occasions (tests #7 and #9) mortality was moderately high (>10% mortality) (Table 14). Reasons for the high mortality for these tests were likely stress related factors (i.e. warm water temperatures, increased handling, and high fish density).

Trap efficiency and the proportion of flow sampled data were transformed using the logit and the natural logarithm transformations respectively. The logit transformation is appropriate for data where the dependent variable (trap efficiency (E)) asymptotically approaches zero or one as the independent variable (proportion of flow sampled (Q_s))increases or decreases, respectively (Ashton 1972). Correlation analysis revealed that a significant

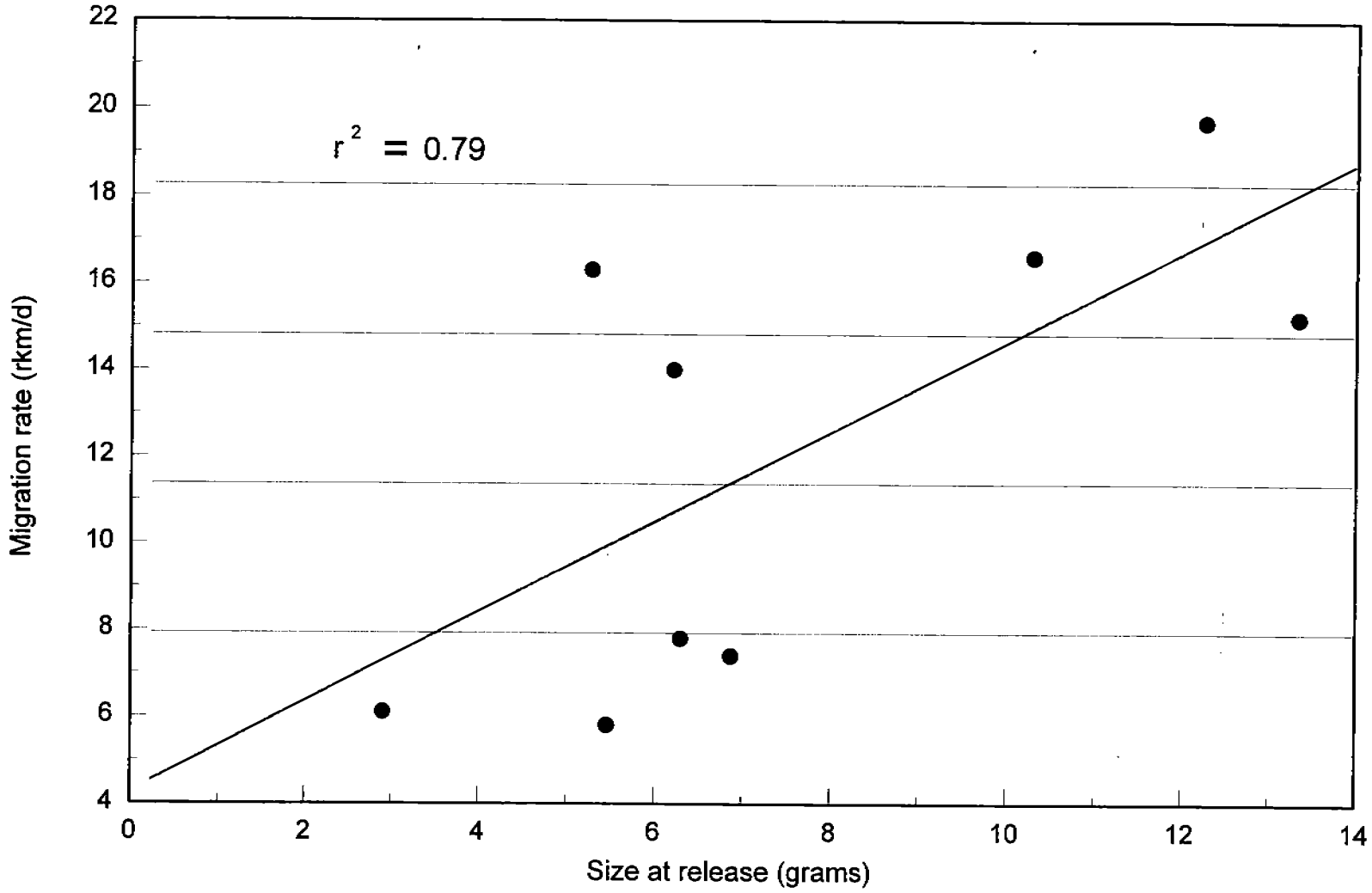

Figure 20. The relationship between fish size (grams) and migration rate (river kilometer per day) based on AD-clipped TRH chinook captured at the WCT from 1989-1994.

Table 14. WCT efficiency test summary for 1992 through 1994.

Test #	Release date	Time of day	Chinook marked & released	Adjusted Release (after mark mortality)	Number recovered	% Marked mortality	% Efficiency	River flow
1	05/20/92	2300	449	413	8	8.0	1.9	1,756
2	05/27/92	2100	801	801	23	0.0	2.9	1,483
3	06/02/92	2100	1,297	519	41	60.0	7.9	1,260
4	06/10/92	2100	813	812	7	0.15	0.9	2,351
5	06/24/92	2130	814	804	80	1.2	9.9	987
6	06/30/92	2130	807	767	76	5.0	9.1	1,116
7	07/08/92	2130	588	516	91	12.3	17.6	824
8	06/28/93	2130	261	256	0	2.0	0.0	2,877
9	06/30/94	1830	893	797	20	10.7	2.1	825

relationship exists between trap efficiency and the proportion of flow sampled ® = 0.92, P<.001)(Figure 21). Thus, using the simple linear regression equation Y = a + bX, or Logit (E) = 5.045 + 2.8009(LN(Q_s)), efficiency on any given day could be estimated from Q_s. Then, by dividing the known number of fish that were released (corrected for mortality) by the product of Logit(E) and the number of recaptures, a constant could be calculated which would convert daily catch into an estimate of the total number of fish that passed the trap during that day. However, trap efficiency typically decreases as fish size increases, and thus efficiency curves should be developed for various size classes (ie. fry, parr, smolt). With the present number of efficiency tests conducted, the strong correlation between E and Q_s suggests that derivation of an abundance index by dividing daily catch totals by Q_s is valid and comparable between years.

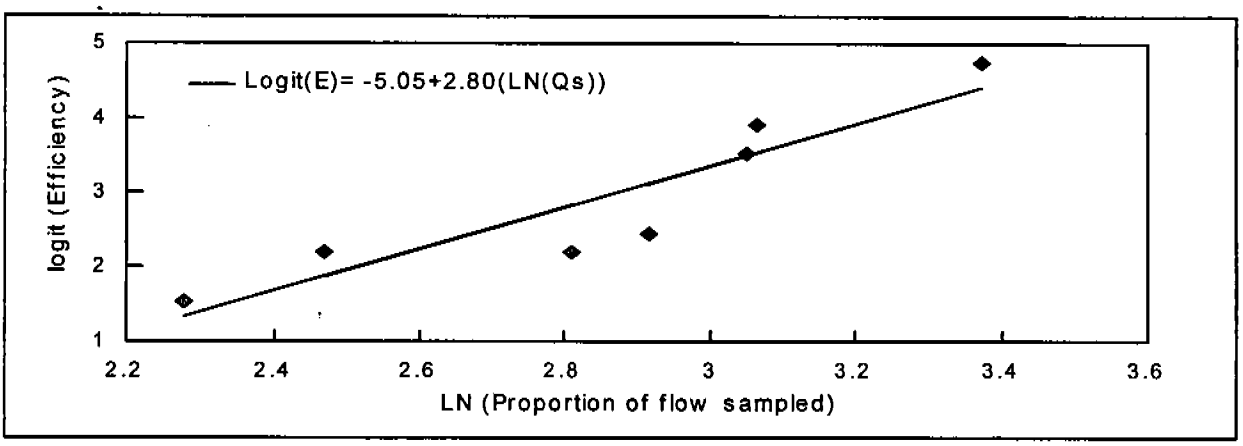

Figure 21. Relationship between trap efficiency and proportion of flow sampled at the WCT.

Numbers of chinook to pass by the trap during a given week were estimated based on the mark-recapture efficiency test results conducted during that week (Table 15). Efficiency tests as conducted by CCFWO in 1992, 1993, and 1994 yielded inconsistent relationships with abundance index values, and therefore, no attempt was made to estimate the population size of a given emigrating brood year. The inability to estimate population size led to the use of the abundance index as a means for yearly comparison of emigration magnitude.

Table 15. WCT efficiency test results and corresponding weekly abundance index totals and average flow, 1992 and 1994.

Week	Efficiency test results	Chinook abundance index	Average river flow (cfs)
05/17 - 05/23/92	91,841	54,667	1,756
05/24 - 05/30/92	104,827	110,174	1,483
05/31 - 06/06/92	82,825	198,107	1,260
06/10 - 06/13/92	270,860	171,316	2,351
06/21 - 06/27/92	96,571	153,715	987
06/28 - 07/04/92	32,910	78,316	1,116
07/05 - 07/11/92	51,149	110,855	824
06/30 - 07/03/94	163,685	35,554	825

Cross Channel Fish Distribution:

A dive survey was conducted on the night of July 10, 1993 to determine the cross channel distribution of emigrating juveniles. The survey was conducted along the cross sectional area in the channel where the trap was located. Five divers, spaced equidistant along a rope strung across the channel, held a dive light to illuminate the area directly in front of them. For thirty minutes, each diver counted the number of juvenile salmonids to swim past them. Two separate counts were conducted and the results are presented in Table 16. No calibrations were performed to gauge each crew member's scope of vision and it is not known if the lighting attracted or repelled fish to or from the illuminated areas.

Table 16. WCT cross channel fish distribution count in 1992.

	Left stream bank					Right stream bank
Stations	1	2	3	4		5
Count 1	13	10	0	3	Trap	23
Count 2	0	50	26	45	Site	33
Total	13	60	26	48		56

A description of the cross sectional area of the trap location is as follows for 1992-1994. Looking downstream, the cross section sloped from a shallow sandy left bank to a deeper cobble bottomed right bank. The trap was positioned closest to the right stream bank during monitoring in 1992 through 1994. The channel did not change noticeably from spring 1992, through the end of trapping in December of 1994, and thus cross channel profile measurements taken during low flows in August 1993 (Figure 22), are a good representation of what the channel looked like during this time period. High flows during the winter/spring of 1995 did noticeably change the channel, and a second cross channel profile was measured during low flows in September of 1995 (Figure 22). The effect of the high flows during the winter/spring of 1995 resulted in a thalweg shift to the left as flows decreased throughout the summer. The most notable effect on trap performance was a decrease in cone revolutions in July 1995.

INTRA-BASIN COMPARISON

Flows, Water Temperature, Chinook Abundance and Size:

A comparison of yearly trapping results for the Klamath and Trinity rivers during the period of largest chinook YOY emigration (May, June, July), shows that the relative magnitude of emigration can differ appreciably between years. However, despite large differences in river discharge between the Klamath and Trinity rivers, mean daily water temperatures varied little (Figure 23). With one exception (1992), natural chinook abundance index totals were higher at the BBT than at the WCT (Figure 24). The number of naturally spawning fall chinook adults returning to the Trinity River was estimated to be less than for the Klamath River in three of four years, and this corresponds with to general emigration trends observed at the traps. An exception to this occurred in 1992, where the magnitude of emigration for natural chinook YOY at the WCT was much greater than for the BBT despite an estimated 1,000 more adults returning to spawn in the Klamath River (CDFG 1997). There were little differences in chinook YOY emigration timing between the two rivers, and mean monthly fork lengths of chinook at the BBT were larger in April and May for all years, however, this trend was not true for the months of June and July (Figure 25).

Salmonid Health Assessment:

The USFWS California-Nevada Fish Health Center (CA-NFHC), in cooperation with the CCFWO, has conducted fish health assessments at various locations along the Klamath and Trinity rivers since 1991. Organosomatic assays were used to examine general fish health in terms of hematological parameters, gross morphology and size. Microbial assays measured levels of viral, bacterial and parasitic infections.

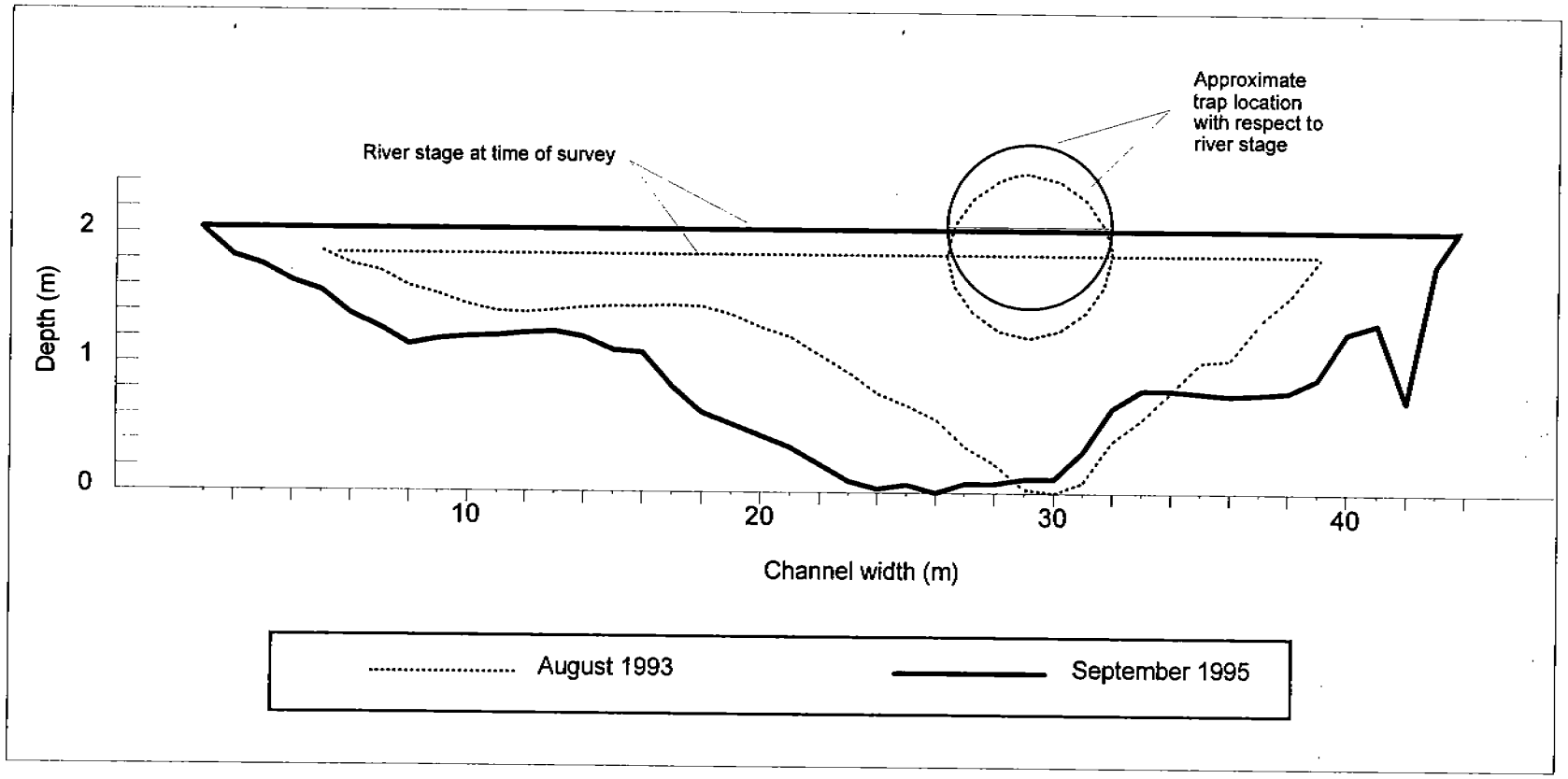

Figure 22. Cross sectional profile (depth in meters) of the Trinity River at the WCT site during low summer flows of August 1993, and September 1995, respectively.

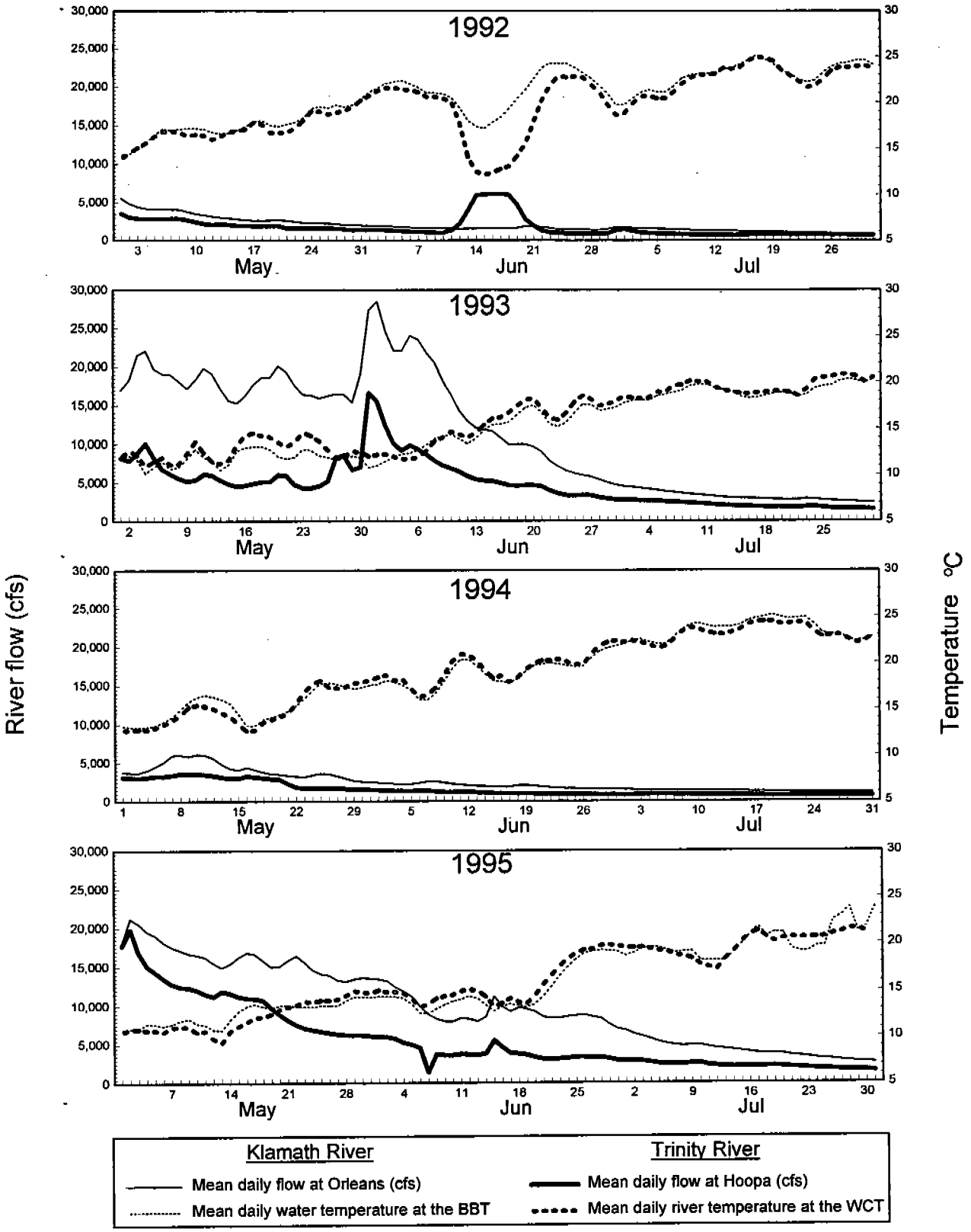

Figure 23. Mean daily Klamath and Trinity river flow (cfs) and water temperatures (°C) at the Big Bar and Willow Creek trap sites during the period of peak chinook YOY emigration (May through July), 1992-1995.

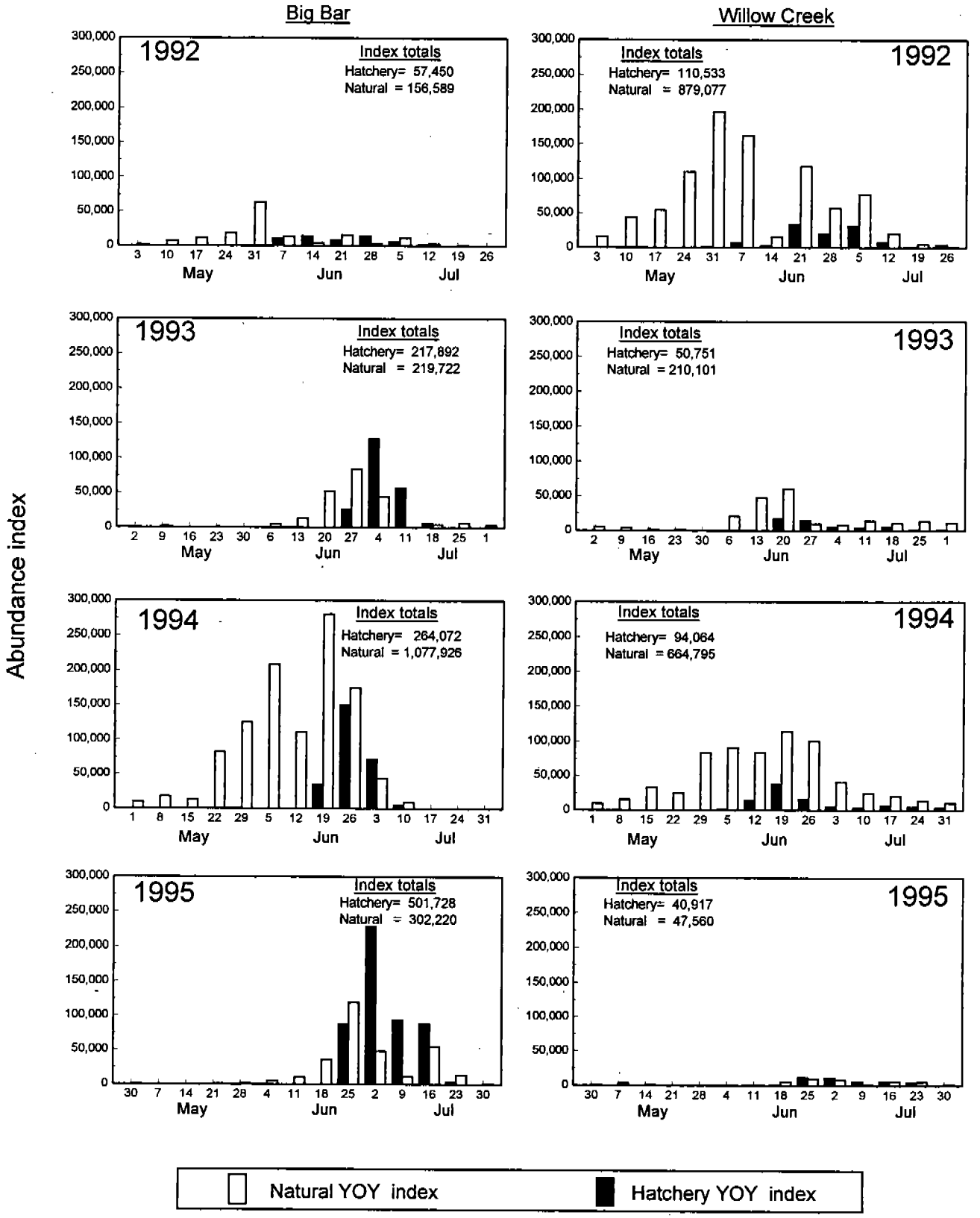

Figure 24. Weekly chinook YOY abundance index totals, May through July, at the Big Bar and Willow Creek trap sites, 1992-1995.

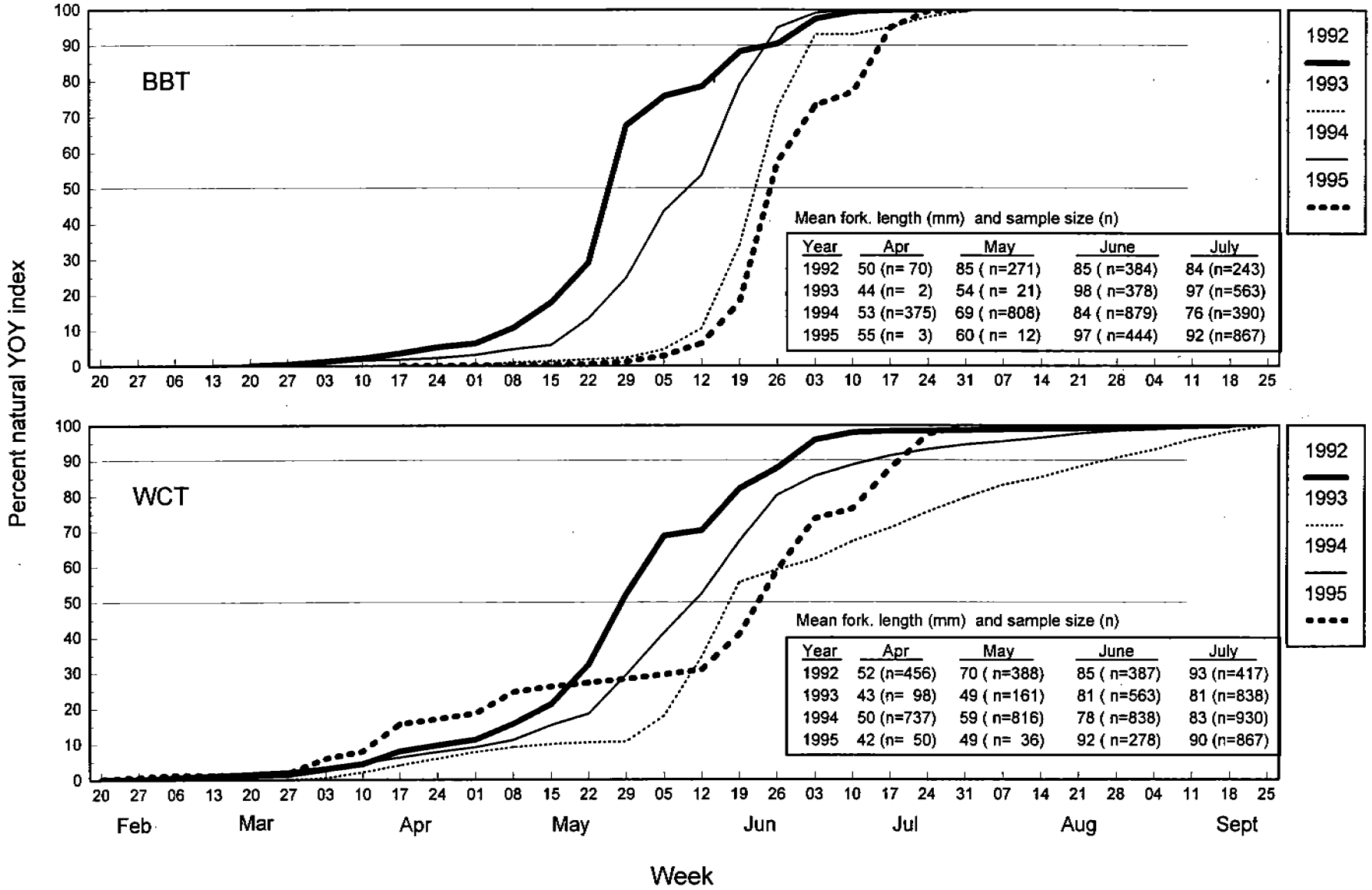

Figure 25. Chinook emigration timing for the BBT and WCT expressed as a percentage of the total spring abundance index, 1992-1995. Also, a comparison of chinook mean monthly fork length (mm) (April through July), 1992-1995.

The presence and severity of infection with the bacterium responsible for Bacterial Kidney Disease (BKD), *Renibacterium salmoninarum,* was determined by an Enzyme-Linked Immuno Sorbant Assay (ELISA) test. In this assay, labeled antibody binds to soluble *R. salmoninarum* antigens in kidney tissue to produce a color reaction. The optical density (O.D.)of the run-adjusted sample is proportional to the quantity of antigen(s) and is assigned to three semi-quantitative categories: 1) BNC = sample O.D. Below the Negative kidney Control (BNC) value, 2) Suspect (low level)= sample O.D. above BNC and less than 0.2, and 3) Positive (moderate to high)= sample O.D. > 0.2. The 0.2 O.D. level was chosen to represent a value which there is a likelihood of confirmation infection by another method (Direct Fluorescent Antibody Technique (DFAT)). Fish with active infections of BKD typically have O.D. values above 0.2. In 1993 saltwater challenge tests and gill ATPase assays were implemented to examine physiological parameters associated with smolting activity (Foott et al., 1991-1993; 1994 (draft), 1995 (draft)) and/or personal communication with Dr. Foott of the CA-NFHC.

1992

Between March and October of 1992, 20-fish samples of chinook, coho and steelhead were collected at the BBT, and 20-fish samples of chinook and steelhead were collected at the WCT. Fish collected prior to the hatchery release were deemed "natural". After the hatchery releases, both marked hatchery fish and unmarked were captured at the traps. Most of these groups must be considered as both natural or hatchery "mixed". Hatchery fish were sampled at IGH and TRH prior to their release.

The most significant pathogens detected in 1992 were the bacterium *Renibacterium salmoninarum* (the agent of Bacterial Kidney Disease, BKD) and the trematode parasite *Nanophyetus salmincola*. Hatchery and natural chinook smolts in the Klamath and Trinity rivers had similar *R. salmoninarum* infection profiles. Active *R. salmoninarum* infection (ELISA positive rating) was present in 7% of the IGH coho prior to release, 30% of IGH coho collected at the BBT, and 2% of the pre-release IGH steelhead. IGH steelhead were not sampled at the BBT. Infected chinook were also detected in samples from the upper (25%) and lower (6%) estuary. Active *R. salmoninarum* infection averaged 17% for the pre-release TRH chinook, 11% for TRH chinook captured at Willow Creek, 0% for the pre-release TRH steelhead, 6% for TRH steelhead captured at the WCT, and 53% for natural steelhead.

In 1992 only Trinity River fish were examined for the presence of *N. salmincola*, and no attempt was made to measure intensity of infection.

Nanophyetus salmincola was not detected in fish at TRH, however, *N. salmincola* metacercaria were found in 65% of TRH chinook and 91% of natural chinook captured at the WCT. No morbidity was associated with *N. salmincola* infection. Other findings in 1992 included an unidentified myxosporean parasite in the kidney tubules of chinook and coho, and a low incidence of *Ceratomyxa shasta* infection in chinook collected from the estuary.

Organosomatic assays were performed on the above fish groups and most had relatively low abnormality values (AS) which indicates relatively good health.

1993

Between March and October of 1993, tissue samples from natural and hatchery chinook were collected at IGH, TRH, BBT, WCT and the Klamath River estuary. Low level (suspect) infections of *R. salmoninarum* and *N. salmincola* were quite prevalent in natural and hatchery chinook in both rivers. Active (high ELISA OD) *R. salmoninarum* infection averaged 22% for pre-released IGH chinook, 22% for IGH chinook collected at BBT, and 8% for natural chinook captured at the BBT. Infected chinook were also detected in samples from the upper (26%) and lower (59%) Klamath River estuary. Active (high ELISA OD) *R. salmoninarum* infection averaged 8% for pre-release TRH chinook, 4% for TRH chinook captured at the WCT, and 6% for natural chinook captured at the WCT.

N. salmincola was not detected in fish at either IGH or TRH. *N. salmincola* metacercaria were found in 53% of IGH chinook and 46% of natural chinook captured at the BBT, and 53% of TRH chinook and 80% of natural chinook captured at WCT. *N. salmincola* was also found in 37% of lower and 72% of upper Klamath River estuary chinook sampled. Intensity of *N. salmincola* infection was much greater in Trinity River chinook as opposed to Klamath River chinook. In fact, Dr. Foott suggested the possibility of using the incidence of *N. salmincola* infection as a biological marker for Trinity River fish in 1994.

Organosomatic assays performed in 1993, again resulted in relatively low abnormality AS values for fish from both rivers. Starting in 1993, a variety of physiological measurements were taken, including gill ATPase activity, plasma triglyceride concentration, blood glucose concentration, liver glycogen concentration, leukocrit (white blood cell quantity), and the albumin to globulin ratio. Smolts from both rivers were also subjected to a 24 hour "saltwater challenge", after which plasma sodium concentration was measured. In short, physiological measurements indicated that during outmigration,

Table 21. WCT steelhead catches by development stage, spring monitoring 1992-1995.

Spring monitoring	Hatchery smolt	Natural steelhead fry	parr	smolt	Total steelhead
1992	1,564	297	486	693	3,039
1993	75	44	135	170	424
1994	276	82	430	595	1,382
1995	547	36	49	155	787
Totals	2,462	459	1,100	1,613	5,632

Significantly fewer steelhead were captured during fall monitoring. A total of 341 steelhead were captured in three fall monitoring periods, of which parr represented 70%, natural smolts 24%, and fry 6%.

Abundance Index and Hatchery Contributions:

The largest abundance index totals for a spring monitoring period occurred in 1992 (140,989) and 1995 (105,616) (Figure 31), which also coincided with the larger steelhead releases from TRH. TRH steelhead represented 52% and 76% of the total spring abundance index in 1992 and 1995, respectively. Comparatively lower abundance index totals occurred in 1993 (32,005) and 1994 (39,930) with TRH steelhead releases composing 25% and 16%, respectively.

Abundance index totals as a percentage of life history stage that showed smolts generally composed the largest abundance index component and fry the smallest (Table 22). The percentages of fry and parr were the lowest in 1995, which again had the highest winter/spring flows. The hatchery smolt percentage was largest in 1995 (76%), however this was over a shorter time period. If trapping could have continued through September, 1995, this hatchery percentage is likely to have been lower. The highest component of the fall abundance index were steelhead parr for all years that fall trapping occurred. Steelhead fry were captured during the fall monitoring period only in 1994.

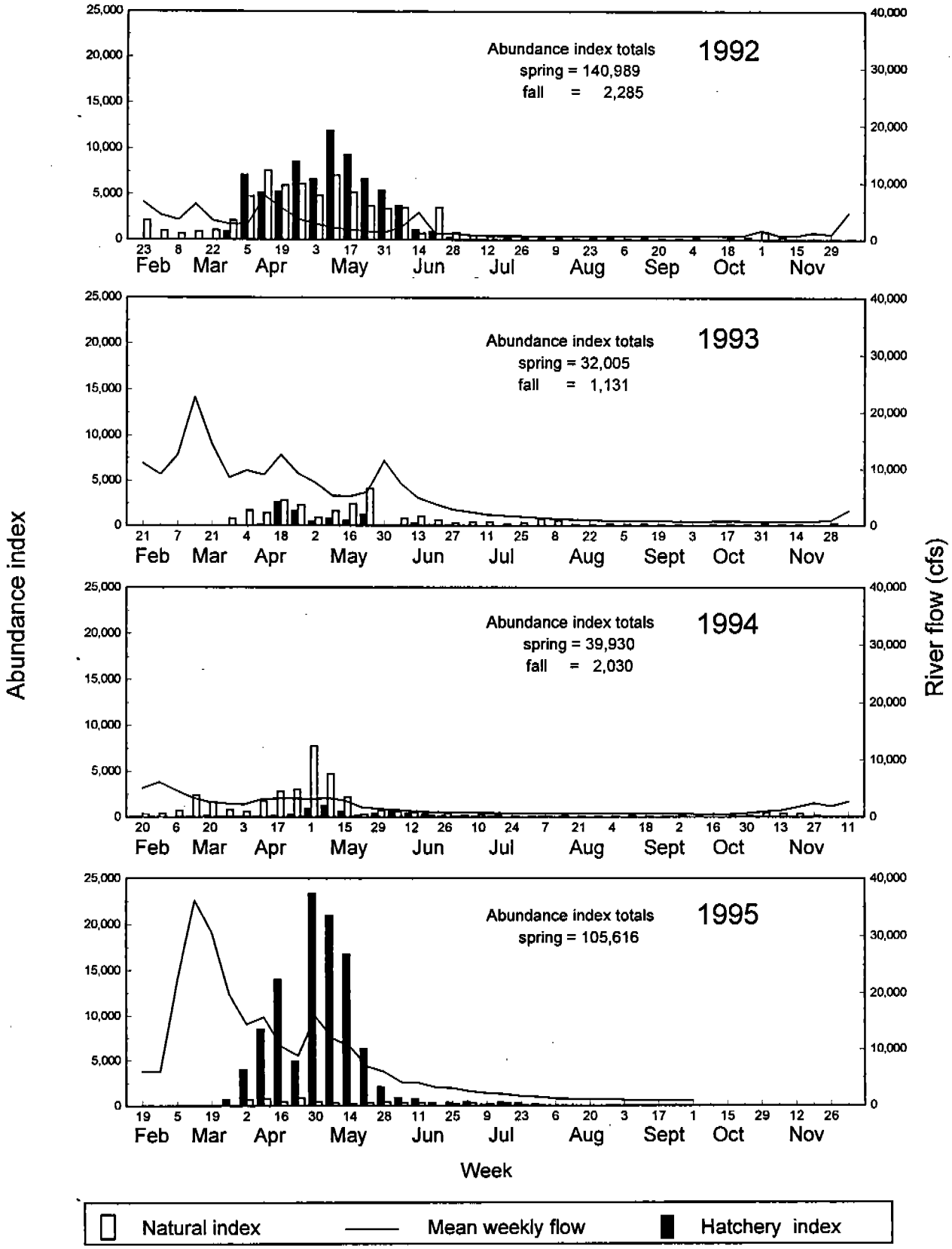

Figure 31. Mean weekly Trinity River flow (cfs) at Hoopa and the combined weekly steelhead abundance index total for fry, parr, and smolt at the WCT, spring and fall monitoring, 1992-1995.

Table 22. WCT steelhead abundance index percentage by development stage, spring and fall monitoring, 1992-1995.

	Spring monitoring					Fall monitoring		
Year	Fry	Parr	Natural Smolts	Hatchery Smolts		Fry	Parr	Smolt
1992	5%	13%	29%	53%			75%	25%
1993	6%	19%	50%	25%			67%	33%
1994	2%	30%	52%	16%		27%	62%	11%
1995	1%	4%	19%	76%				

Fish Length and Emigration Timing:

Natural Steelhead:

Natural steelhead were present throughout the spring in all four years. Based on smolt emigration trends from spring monitoring 1992-1995, timing varied little, typically, 50% of the natural smolt abundance index occurring by late April to early May, and 95% by late May to early June (Appendix 13-16). Mean fork lengths in April and May in 1992 were 198mm (sd=9.0, n=90) and 176mm (sd=9.5, n=122), respectively (Figure 32). Little variation in fork length for April and May occurred during the other three years (Figures 33-35). The greatest variability in fork length between years occurred in March, however the sample sizes were small, between 2 and 14 fish.

Steelhead parr were present throughout both the spring and fall monitoring periods. Based on spring monitoring 1992-1995, 50% of the parr abundance index occurred by early April to late May, and 95% between late June early September (Appendix 13-16). Analysis of scales collected February through April 1992, and again during the same time period in 1994, suggest that 80% of steelhead captured February through April were age 1+ parr, and the remaining 20%, age 2+ smolts. Confirmation of a similar trend could not be made in 1993 due to the low numbers of scales collected. In 1995, high flows prevented trapping throughout most of February and March, however for April, scale analysis indicated 21% age 1+ parr, 19% age 1+ smolt and 60% age 2+ smolt. The difference in 1992/1994 with 1995 may in part result from age 1+ parr having been missed during February and March due to high flows.

Fork lengths of steelhead parr ranged from 50mm to 205mm for monitoring conducted in 1992-1995. Typically, larger numbers of parr were measured in April and May, with little variation in mean fork length between years for these months. Mean fork lengths during April and May ranged from 95mm to 122mm (n=283) (Figures 32-35).

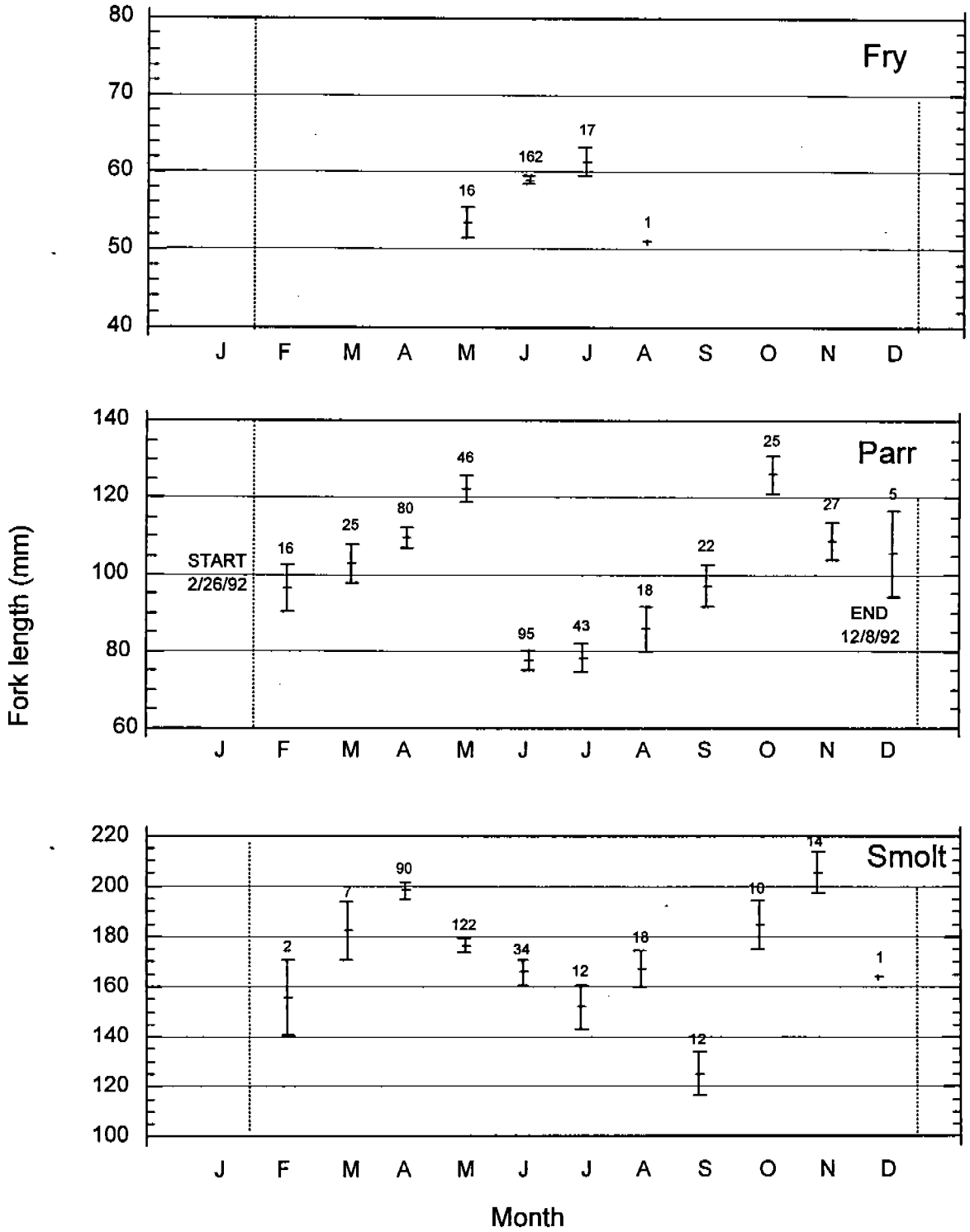

Figure 32. WCT natural steelhead (fry, parr, smolt) mean fork length (mm) by month, spring and fall monitoring, 1992. (+/- 1 standard error, sample size)

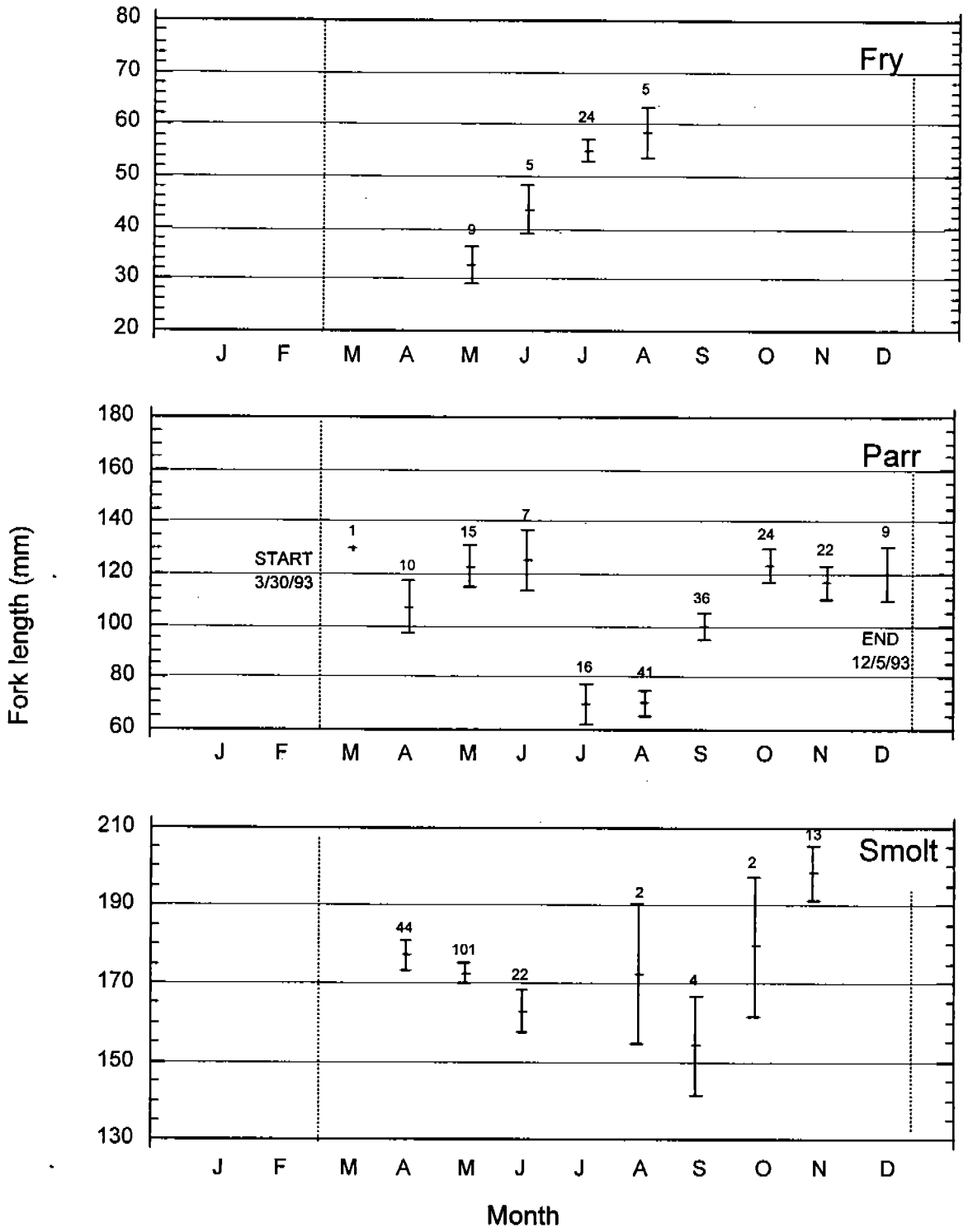

Figure 33. WCT natural steelhead (fry, parr, smolt) mean fork length (mm) by month, spring and fall monitoring, 1993. (+/- 1 standard error, sample size)

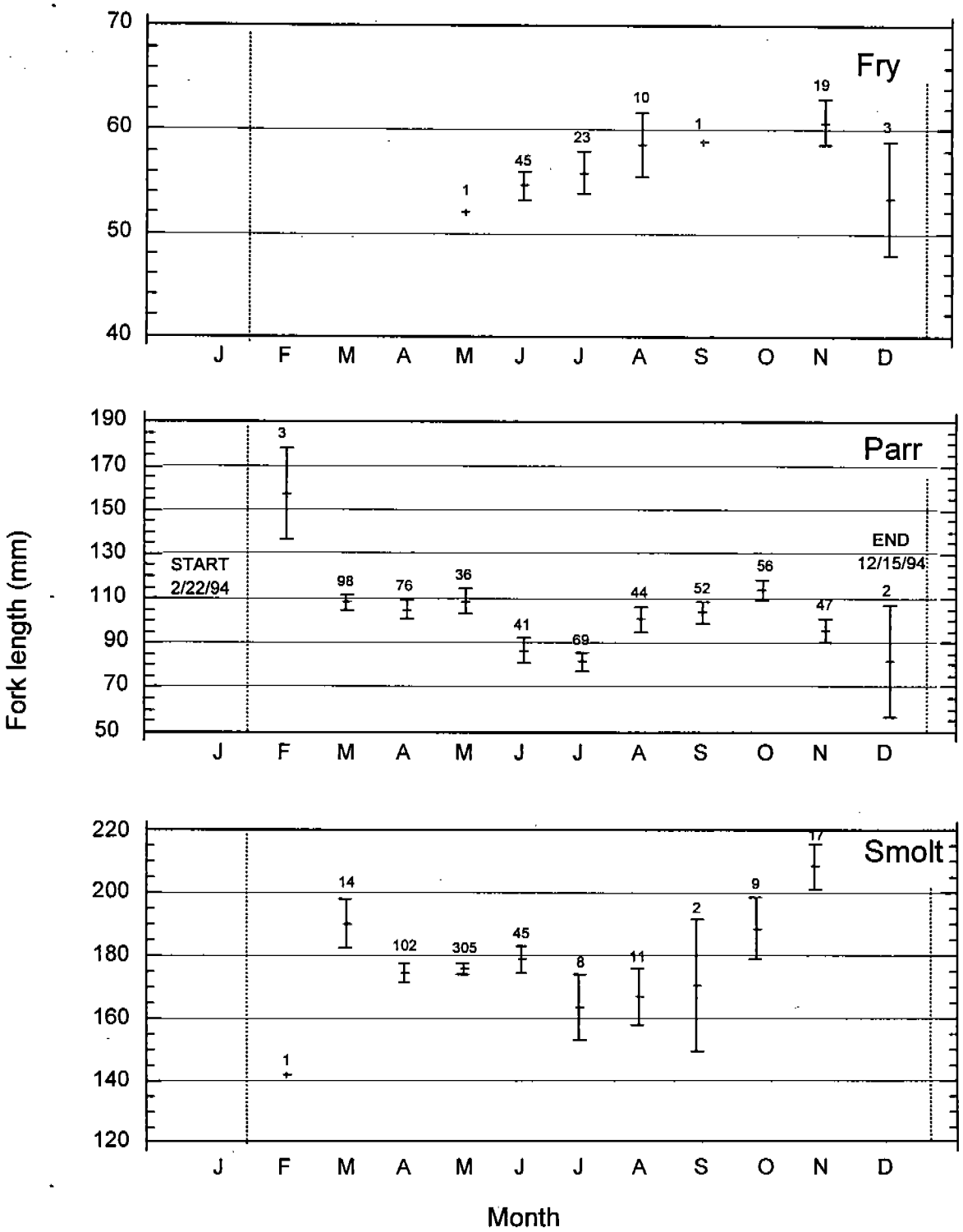

Figure 34. WCT natural steelhead (fry, parr, smolt) mean fork length (mm) by month, spring and fall monitoring, 1994. (+/- 1 standard error, sample size)

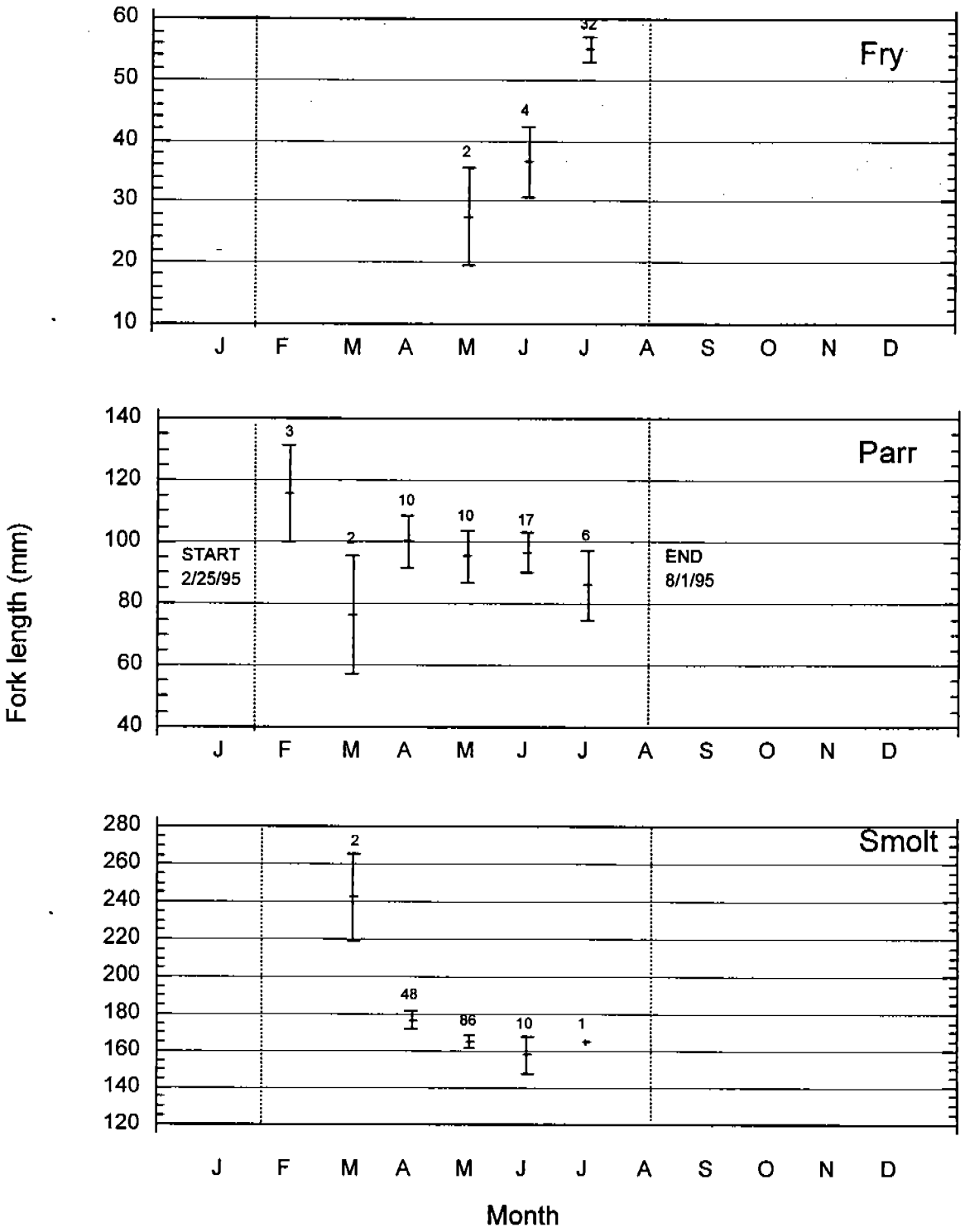

Figure 35. WCT natural steelhead (fry, parr, smolt) mean fork length (mm) by month, spring monitoring, 1995. (+/- 1 standard error, sample size)

Initial captures of steelhead fry generally occurred late April to mid-May. Based on abundance index data from spring monitoring 1992-1995, 50% of the fry abundance index occurred early June to early July, with 95% of the fry abundance index having occurred by late June to the end of July (Appendix 13-16). Fork lengths of steelhead fry ranged from 26mm to 81mm, with mean fork lengths in June and July ranging from 37mm to 61mm (Figures 32-35).

Hatchery Steelhead:

Very few 2+ hatchery steelhead were captured in the rotary trap in 1992 and 1993, indicating that they avoided capture or residualized upstream. Initial TRH steelhead catches typically occurred in late March to mid-April, and this was dictated by the timing of the 1+ releases. Based on the abundance index data from 1992-1995, 50% of the hatchery abundance index occurred by late April to early May, and 95% of the abundance index occurred by late May to late July. There was no trend in the size of fish and emigration timing for hatchery steelhead and this was consistent throughout the four spring monitoring periods.

Initial migration rates for TRH steelhead were 7.6 km/d, 48 km/d, and 20.5 km/d for 1992, 1993, and 1994, respectively. Mean migration rate for steelhead in 1993 was 7 km/d. All other TRH releases were volitional and mean migration rates could not be calculated. High flows precluded trapping during the 1995 steelhead release and emigration rates were not calculated.

KLAMATH RIVER COHO:

Typically, coho smolts (age 1+) were captured in early May to mid-June, and coho YOY from late February to early July. Each spring, IGH released 1+ coho smolts in mid-March, however, only in 1992 were IGH coho represented by marked (AD-clipped) fish (Table 23).

Table 23. Iron Gate Hatchery coho releases, 1992-1995.

Brood year	Date of release	Coho		Total release
		AD-clipped	not tagged	
1990	3/26/92	50,163	37,143	87,306
1991	3/17/93	0	144,998	144,998
1992	3/16/94	0	76,999	76,999
1993	3/16/95	0	79,506	79,506

Catches, Abundance Index and Hatchery Percentages:

A total of 271 coho were captured at the BBT during spring monitoring 1992-1995 (Table 24)(Appendix 33-36). Smolts ranged from 37% to 70% of spring catch totals. The remainder were composed of YOY (fry and parr).

Table 24. BBT coho catches, spring monitoring 1992-1995.

Spring monitoring	YOY	Smolts No-clip	Smolts AD-clipped	Total coho
1992	63	23	14	100
1993	19	44		63
1994	42	36		78
1995	17	13		30
Totals	141	116	14	271

Peak emigration occurred each May following IGH coho releases. IGH coho contributions were 26% of the total coho abundance index in spring 1992. This percentage was derived from the capture of 14 AD-clipped 1+ coho smolts (Table 24). IGH contributions could not be determined for spring 1993-1995, due to unmarked releases. Abundance index totals during the spring monitoring periods from high to low, were 9,797, 6,064, 3,662 and 3,345, for 1993, 1992, 1994 and 1995, respectively (Figure 36). The coho smolt abundance index totals corresponded to the relative number of 1+ coho released from IGH. A total of twenty-one coho were captured in two fall (1992 and 1994) monitoring periods. Two coho YOY were captured in 1992 and nineteen coho YOY were captured in 1994.

Fork Length and Emigration Timing:

Based on combined (1992-1995) fork length measurements, coho smolts ranged from 93 to 188mm (Appendix 25-28), with mean fork length in May ranging from 133 to 170mm (Figure 37). Coho YOY ranged from 28 to 91mm, with the larger fish captured in March and April.

Coho YOY captured in fall 1992 ranged from 92 to 102mm ($\bar{x}$=92mm, sd=14.8, n=2). In 1994, the nineteen measured YOY ranged from 67 to 87mm ($\bar{x}$=80mm, sd=6.33, n=19) (Appendix 25 and 27).

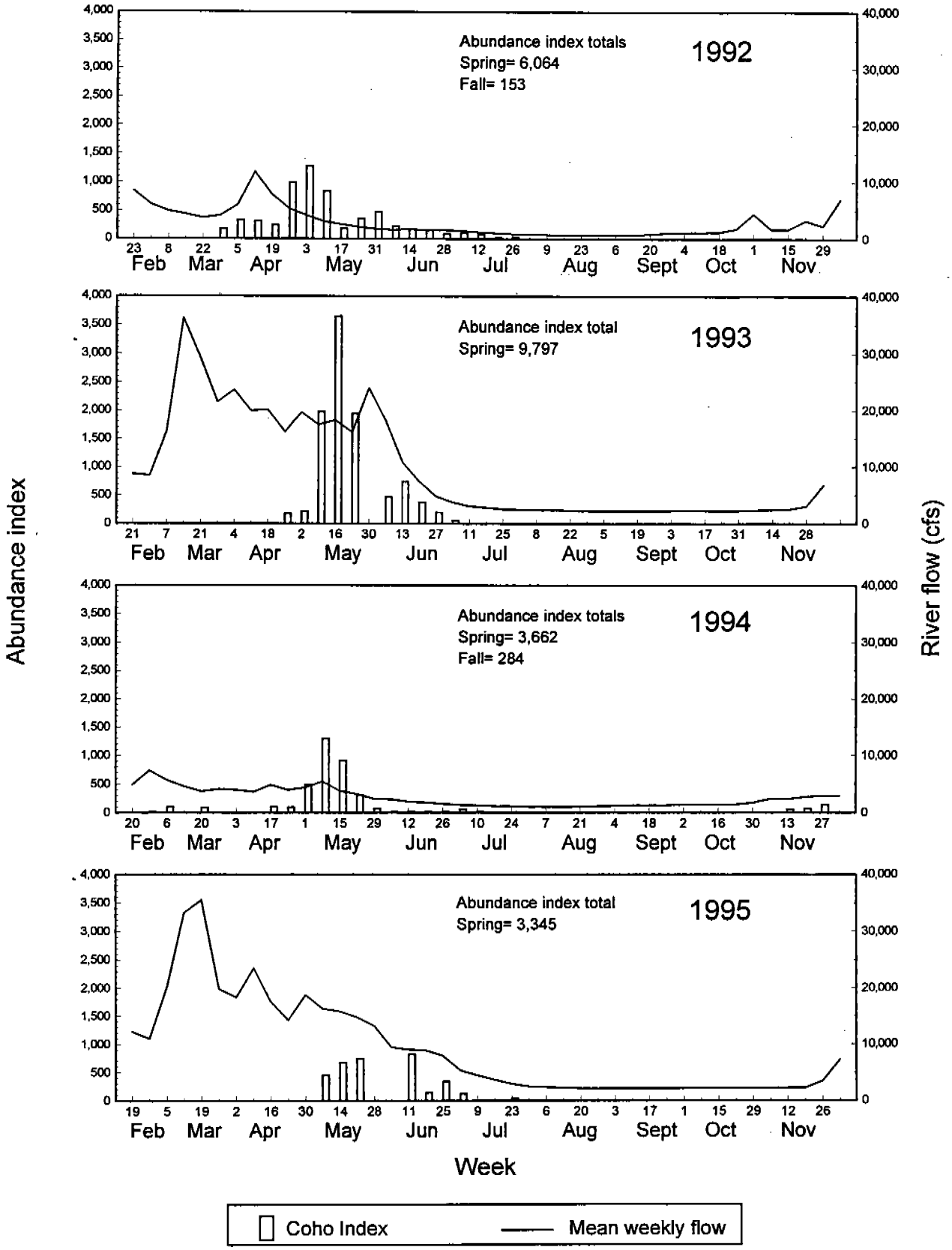

Figure 36. Mean weekly Klamath River flow (cfs) at Orleans, and the combined weekly abundance index total for YOY and yearling (hatchery and natural) coho at the BBT, spring and fall monitoring, 1992-1995.

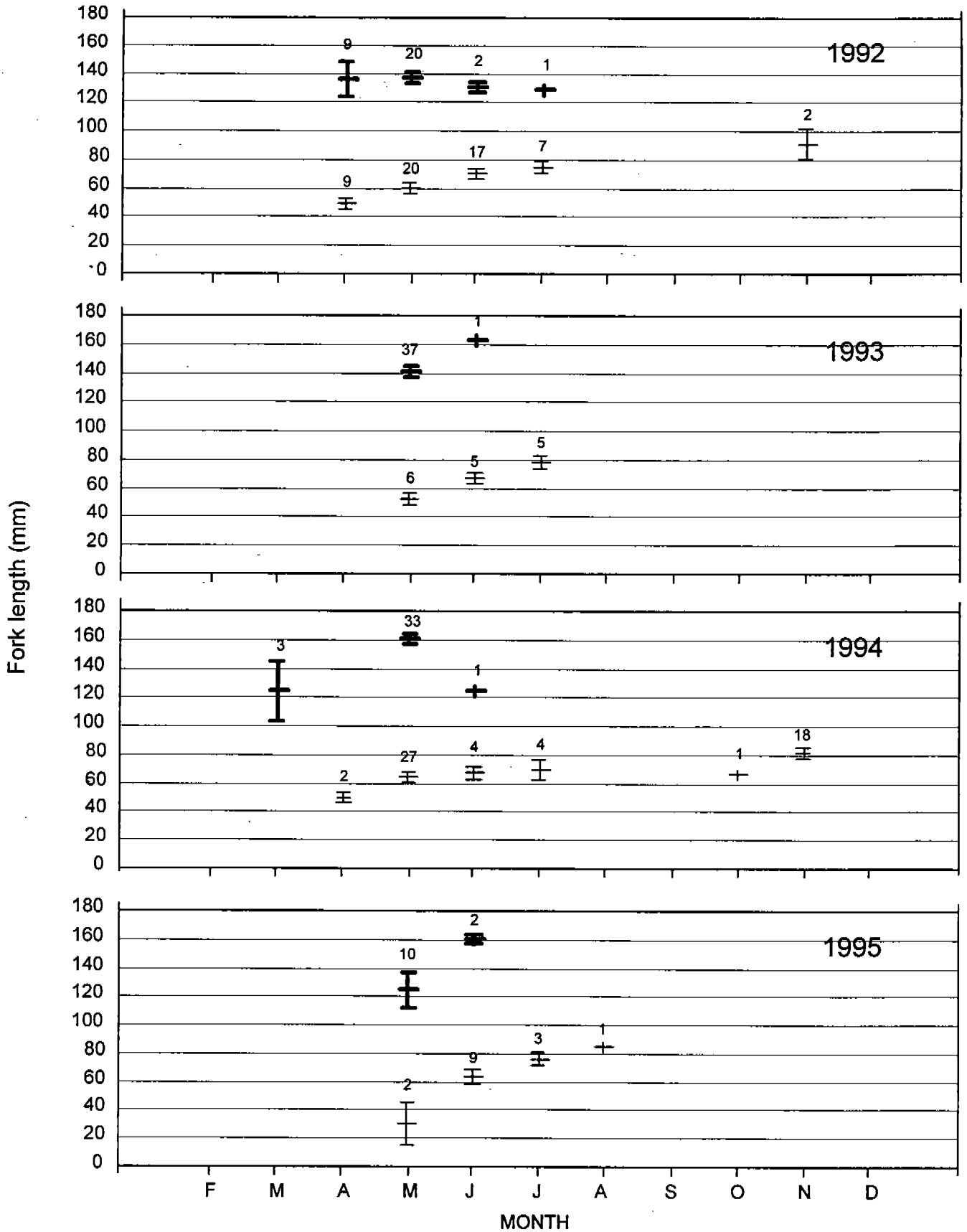

Figure 37. BBT YOY (⊥) and yearling (⊥), hatchery and natural) coho mean fork length by month, 1992 -1995. (+/- 1 standard error, sample size)

TRINITY RIVER COHO:

Coho Catches:

TRH released between 385,000 and 550,000 1+ coho smolts each spring, generally from mid-March to early April (Appendix 33-35). A total of 2,557 coho were captured during the four spring monitoring periods (Table 25). Coho smolt ranged between 20% and 99% of a total spring catch for 1992 through 1995.

Eighty-eight coho were captured in three fall monitoring periods, 1992 through 1994, eighty-five of which were captured in 1994. All coho caught during the fall monitoring period were YOY.

Table 25. WCT coho catches, spring monitoring 1992-1995.

Spring monitoring	YOY	Smolts No-clip	Smolts AD-clipped	Total coho
1992	375	245	20	636
1993	77	172	23	272
1994	837	203		1,040
1995	2	59	548	609
Totals	1,291	679	591	2,557

Abundance Index and Hatchery Percentages:

Percentages of TRH coho for spring 1992-1994, were based on expansions of recovered CWT's from AD-clipped smolts. A representative marking did not occur for the 1995 release and the hatchery percentage was based primarily on scale pattern reading and secondarily on length frequency distributions.

Combined abundance index totals for spring monitoring 1992-1995, ranged from 23,791 to 75,330 (Figure 38). TRH contributions accounted for 26%, 60%, 26% and 93%, respectively for 1992 through 1995. For both natural and hatchery smolts during spring monitoring 1992-1995, abundance index totals reached 50% by early May, and 95% had occurred by late May to mid-June (Appendix 21-24).

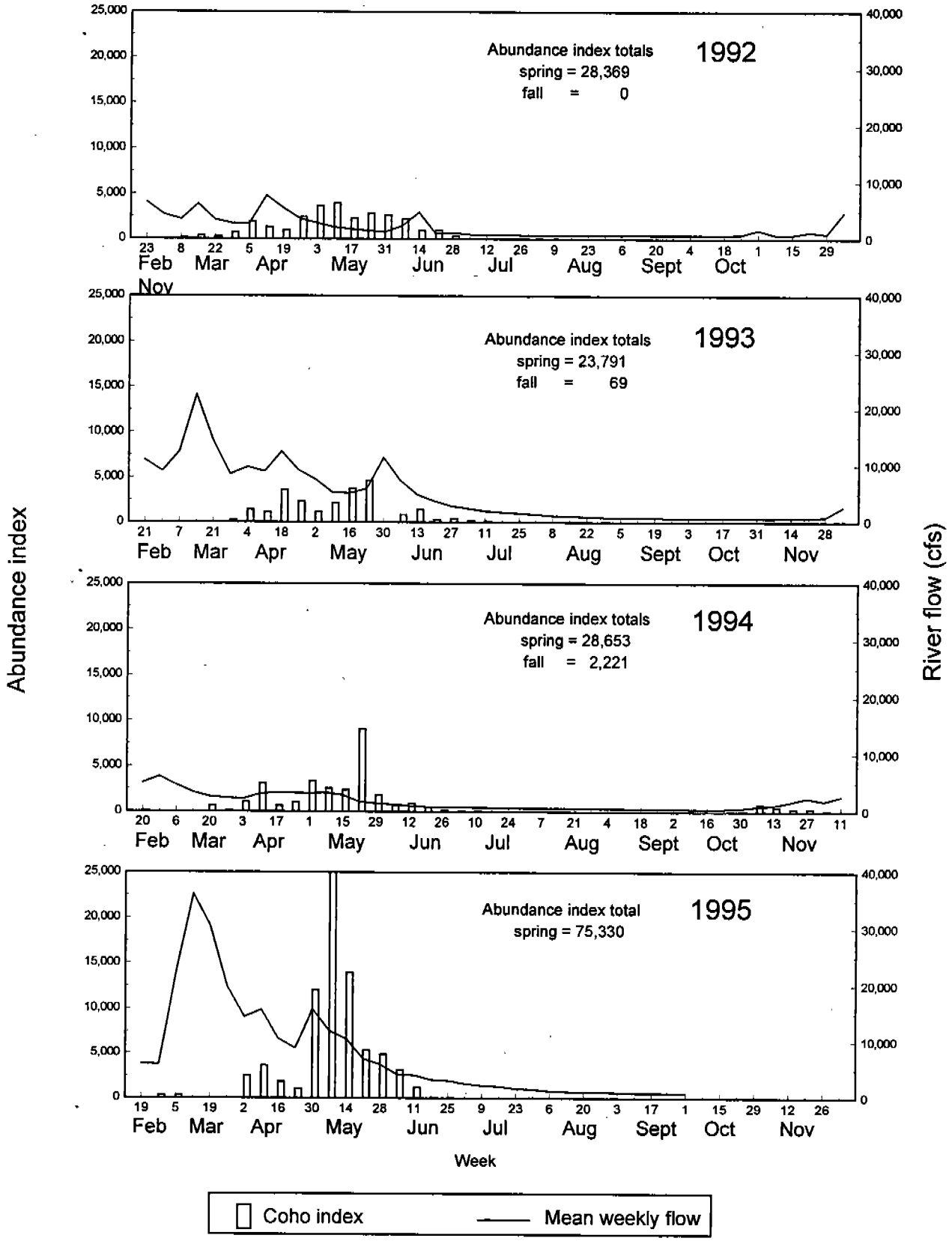

Figure 38. Mean weekly Trinity River flow (cfs) at Hoopa, and the combined abundance index total for YOY and yearling (hatchery and natural) coho at the WCT, spring and fall monitoring, 1992-1995.

Fork Length and Emigration Timing:

Fork lengths for coho smolts ranged from 110 to 270mm. Mean fork length during peak coho smolt emigration in April and May ranged from 154 to 170mm (n=826) (Figure 39). Very few natural smolts were captured. This is based on past observations in that natural coho are significantly smaller than TRH coho releases. Relatively few smolts less than 150mm were captured. There were three coho smolts aged as 2 year olds; two were caught in early April ($\bar{x}$=207mm sd=19.80) and one in early May (200mm).

Coho YOY were captured as early as February, however 50% of abundance index totals occurred from mid-May to mid-June, and 95% by late June to mid-July (Appendix 21-24). Mean fork lengths in June and July varied little and ranged from 63 to 82mm (n=152). Catches of YOY during the fall monitoring period occurred primarily in November 1994, and had a mean fork length of 75mm (sd=7.37, n=82) (Appendix 29-32).

Chum Salmon:

A total of thirty-eight juvenile chum salmon (*O. keta*) were captured during the three years of monitoring from 1992-1994. Chum were captured from April to October. The greatest frequency of capture (45%) occurred August through September. Three chum were captured in 1992, fifteen in 1993, and twenty-one in 1994. Fork length measurements of two chum captured in April 1994 averaged 27mm, this was the only year in which chum were captured this early. The mean fork length measurement of chum captured in August and September was 57mm (n=23). No chum were captured in 1995 during the period the trap was operated.

Captures of Non-Salmonid Fish Species:

Non-salmonid fish species captured in the Big Bar and Willow Creek rotary traps (Table 26) were enumerated and measured during both spring and fall trapping in 1994. However, in 1995 lengths were recorded for only a few individuals. The total catch for individual species varied greatly between the two years (Table 26), and much of this variation is likely attributable to trapping duration and discharge. The 1994 trapping season was considerably longer than in 1995, particularly at the WCT. Discharge for both rivers was considerably less in 1994 than in 1995. Therefore, in 1994 a greater proportion of the discharge was sampled, and for a longer period of time. Thus, other factors being equal, one would expect catches to be greater in 1994 than 1995. This appears to be the case for the WCT;

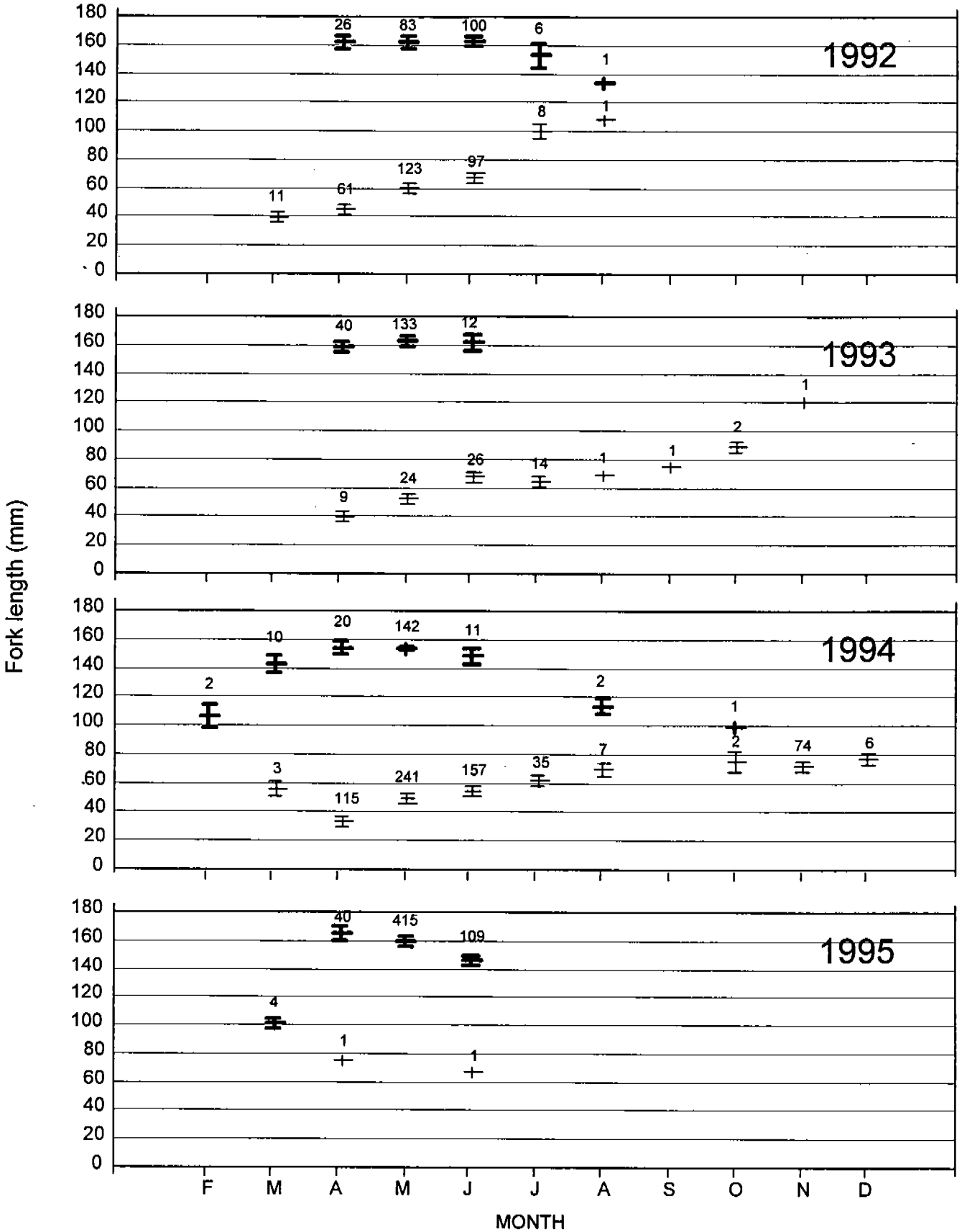

Figure 39. WCT YOY (⊥) and yearling (⊥), hatchery and natural) coho mean fork length (mm) by month, 1992-1995. (+/- 1 standard error, sample size)

captures of all non-salmonid species, except Pacific lamprey, were more frequent in 1994 (Table 26). In the BBT, however, captures of most species were more frequent in 1995 (Table 26). One other factor that may have affected catch rates was the variation in trap placement.

Table 26. Non-salmonid fish species captured in the BBT and WCT in 1994 and 1995. Listed in order of capture frequency.

		Total number captured				
		Klamath		Trinity		
Common Name	Species	1994	1995	1994	1995	Total
Pacific lamprey	Entosphenus tridentatus	2,099	4,592	5,606	2,100	14,397
Sucker	Catostomus sp.	808	417	12,652	361	14,238
Threespine stickleback	Gasterosteus aculeatus	61	20	3,333	14	3,428
Speckled dace	Rhinichthys osculus	258	550	2,302	108	3,218
American shad	Alosa sapidissima	705	0*	776	0*	1,481
Sculpin	Cottus sp.	37	38	122	12	209
Brown Bullhead	Ictalurus sp.	119	27	0	0	146
Green Sturgeon	Acipenser medirostris	6	42	0	1	49
Golden shiner	Notemigonus crysoleucas	8	23	0	0	31
Minnow sp.	Cyprinidae	4	15	0	0	19
Crappie	Pomoxis sp.	2	7	0	0	9
Sunfish sp.	Lepomis sp.	1	5	0	0	6
Brown trout	Salmo trutta	0	0	0	4	4
Largemouth bass	Micropterus salmoides	0	1	2	0	3
Yellow perch	Perca flavescens	0	2	0	0	2
Bluegill	Lepomis macrochirus	1	0	0	0	1
Green sunfish	Lepomis cyanellus	0	0	1	0	1

* Trapping ceased prior to the onset of juvenile emigration

To account for variation in weekly trapping effort and discharge, abundance indices were calculated for the more abundant non-salmonid species in the same manner as was done for the salmonids (due to their low numbers brown trout were grouped with the non-salmonids). As with the salmonids, validity of this abundance index is contingent upon the assumption that catch rates are directly proportional to the percentage of river flow sampled. For fish migrating downstream, such as the salmonid smolts, this assumption seems reasonable. However, this may not be the case for other species that are not actively migrating.

Weekly abundance indices were higher in the early part of the trapping season for many species. Because flows are higher during this period (sometimes several orders of magnitude), the higher indices may simply represent higher rates of "passive" fish displacement rather than "active" emigration. This may explain the greater 1995 early season catches for sculpin and dace in the BBT, and for stickleback and

lamprey ammocetes in both rivers (Figures 40-41). However, early season catches of sculpin, dace and sucker in the WCT were higher in 1994, a lower flow year, than 1995. Thus, other basin specific factors seem to have affected a species catchability.

A brief discussion on each of the more abundant non-salmonid species captured in the Big Bar and Willow Creek rotary traps follows. Potentially up to four species of sculpin could have been collected, with prickly sculpin *Cottus asper,* the most likely sculpin to be caught in both rivers. The coastrange sculpin *C. aleuticus* is probably also present in both rivers, but it is seldom as abundant as the prickly sculpin when they occur together (Moyle 1976). Marbled sculpin *C. klamathensis* are reportedly widely distributed in the Klamath River, and the reticulate sculpin *C. perplexus* may occasionally be found in the lower Klamath (Moyle 1976).

Sculpin captures were highest in the early part of the trapping season on both rivers and during both years (Figures 40 and 41). In general, prickly and coastrange sculpin typically migrate downstream to breeding areas between January and March and may spawn between February and June (Moyle 1976). Thus, the high abundance index values early in the season likely reflect breeding related activity.

Speckled dace capture trends were different between 1994 and 1995. For the BBT in 1994, indices were considerably lower than for 1995, and show no distinct seasonal pattern during either year. For the WCT in 1994, captures of dace show a distinct peak in early July, and gradually tapering through October. This rise in captures may be attributed to breeding activity, as many individuals captured during this peak period exhibited breeding colors. WCT dace captures were much lower in 1995 and showed no distinct pattern (Figure 41).

Four species of sucker are found in the Klamath drainage, Klamath smallscale sucker *Catostomus rimiculus*, Klamath largescale sucker *C. snyderi,* Lost River sucker *C. luxatus*, and shortnose sucker *Chasmistes brevirostris* (Moyle 1976). The Klamath smallscale sucker is the only sucker found in the Trinity River, and it is rare to find any other sucker species in the Klamath River below Klamath Falls (Moyle 1976). As such, all suckers captured were assumed to be of *C. rimiculus* species. Klamath largescale suckers are a relatively uncommon species found almost exclusively above Klamath Falls, though there are a few records for the lower Klamath River (Moyle 1976). Shortnose and Lost River suckers are confined to lakes and their tributaries in the upper Klamath drainage (Moyle 1976).

Klamath smallscale suckers, almost all of which were juveniles, were the most frequently captured non-salmonid species. Two distinct catch

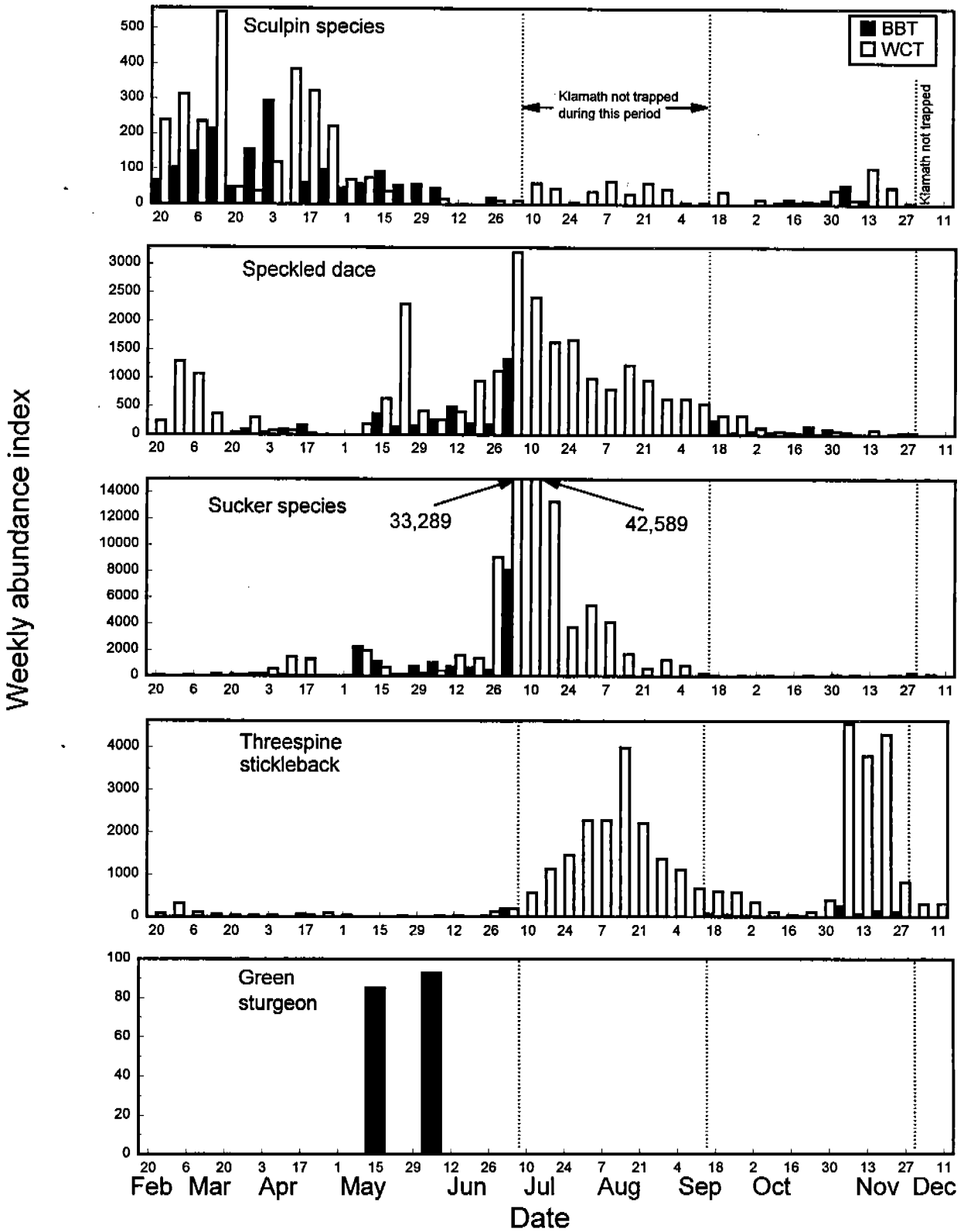

Figure 40. Weekly index totals for sculpin species, speckled dace, sucker species, threespine stickleback, and juvenile green sturgeon captured in the BBT and WCT in 1994.

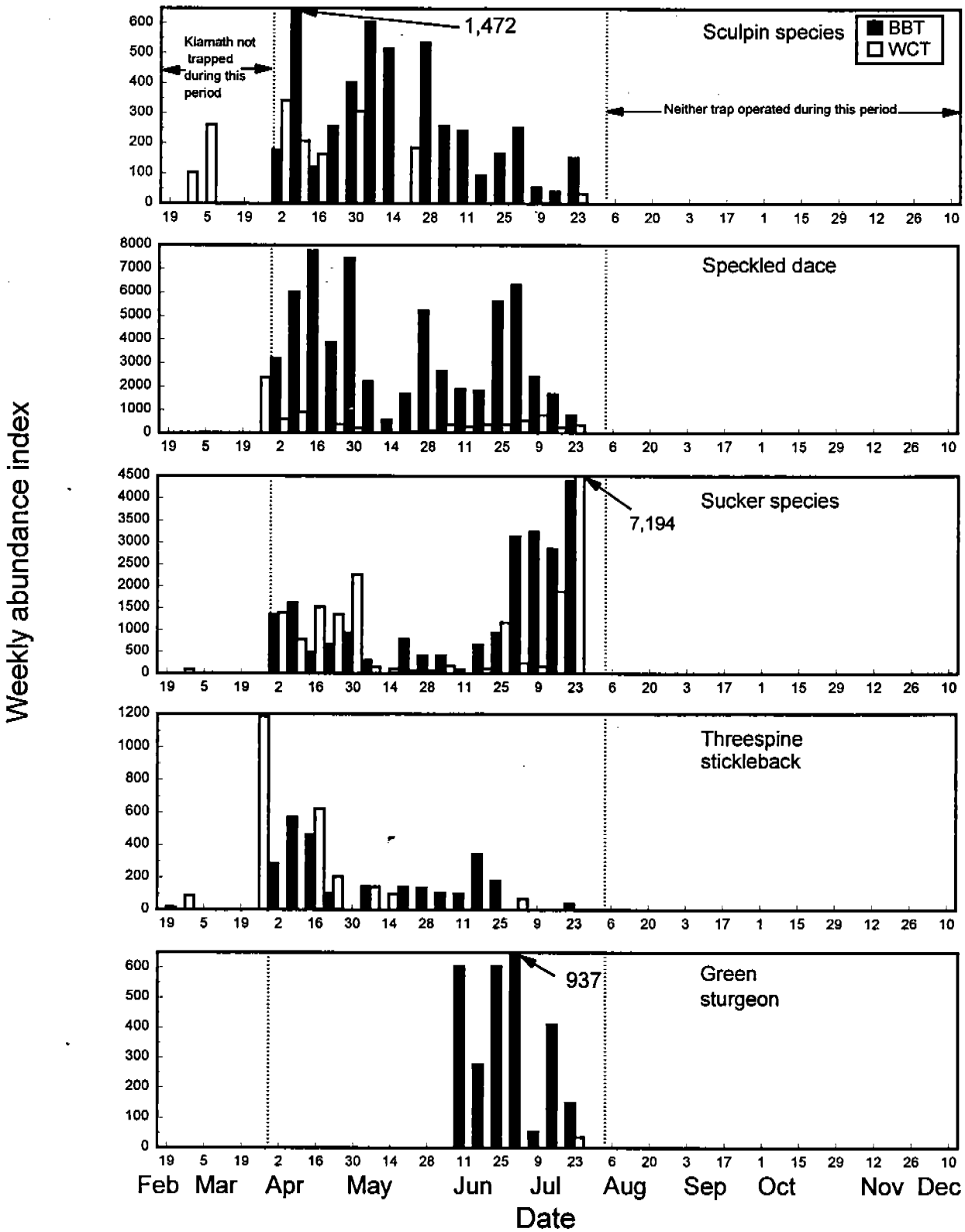

Figure 41. Weekly index totals for sculpin species, speckled dace, sucker species, threespine stickleback, and juvenile green sturgeon captured in the BBT and WCT in 1995.

periods were apparent. The smaller of the two consisted of adult sized fish in April and May when adults migrate upstream to spawn, followed by a much larger catch in June and July, consisting of sucker fry (Figures 40-41).

Threespine stickleback capture rates on both rivers were very different in 1994 and 1995. On the Klamath, few stickleback were captured during either year. In 1994 only a few individuals were captured before September. In 1995, most individuals were captured between April and June (Figures 40-41). On the Trinity, stickleback captures were sporadic until July of both 1994 and 1995. In July 1994 stickleback captures began to dramatically increase, peaking in August. Catches then steadily declined until mid-October. Captures again increased for a few weeks in November, then sharply dropped for the remainder of the trapping season (Figure 40). The peak in August probably represents adult spawning activity, while the peak in November probably represents YOY dispersal. No such trends were evident in 1995, likely due to the differences in trapping periods (Figure 41).

Three different life history stages Pacific lamprey were captured: ammocetes, eyed juveniles, and adults. Pacific lamprey ammocetes are a non-parasitic larval stage which were categorized by the lack of developed eyes. Most ammocetes were captured between April and July (Figures 42-43). In 1994 a significant number of ammocetes were captured at the WCT between late October and early December. Ammocete larvae captured in the traps were either YOY, or juveniles several years old and recently emerged from the substrate and undergoing metamorphosis. Ammocete YOY often move downstream with the current to areas of greater organic bottom debris where they take up a filter feeding existence in the substrate. They remained buried throughout their five to seven years of larval stage (McGinnis 1984). Metamorphosis to a macrophthalmia stage (obvious morphological change; [i.e. eyes and lateral tooth plates]) marks the onset of parasitic feeding (Hardisty and Potter 1971, *in* Beamish 1980). Eyed juveniles were captured at both traps during their downstream migration throughout the 1994 trapping season, peaking in late May and early June (Figure 42). Interestingly, no eyed juveniles were captured on either river during 1995. Adult lamprey were captured during or following their spawning migration, primarily between April and July, and looked to be in post-spawning condition. No adult lamprey were caught at the BBT in 1995, prior to the pulling of the trap in late July (Figure 43).

American shad, a non-native anadromous species, spawn in the Trinity and Klamath Rivers annually. Live adults are rarely captured in the rotary traps but are commonly observed by crews in the late spring/early summer. Emigrating YOY were captured in 1994, primarily between August and October on the Trinity, and from the start of

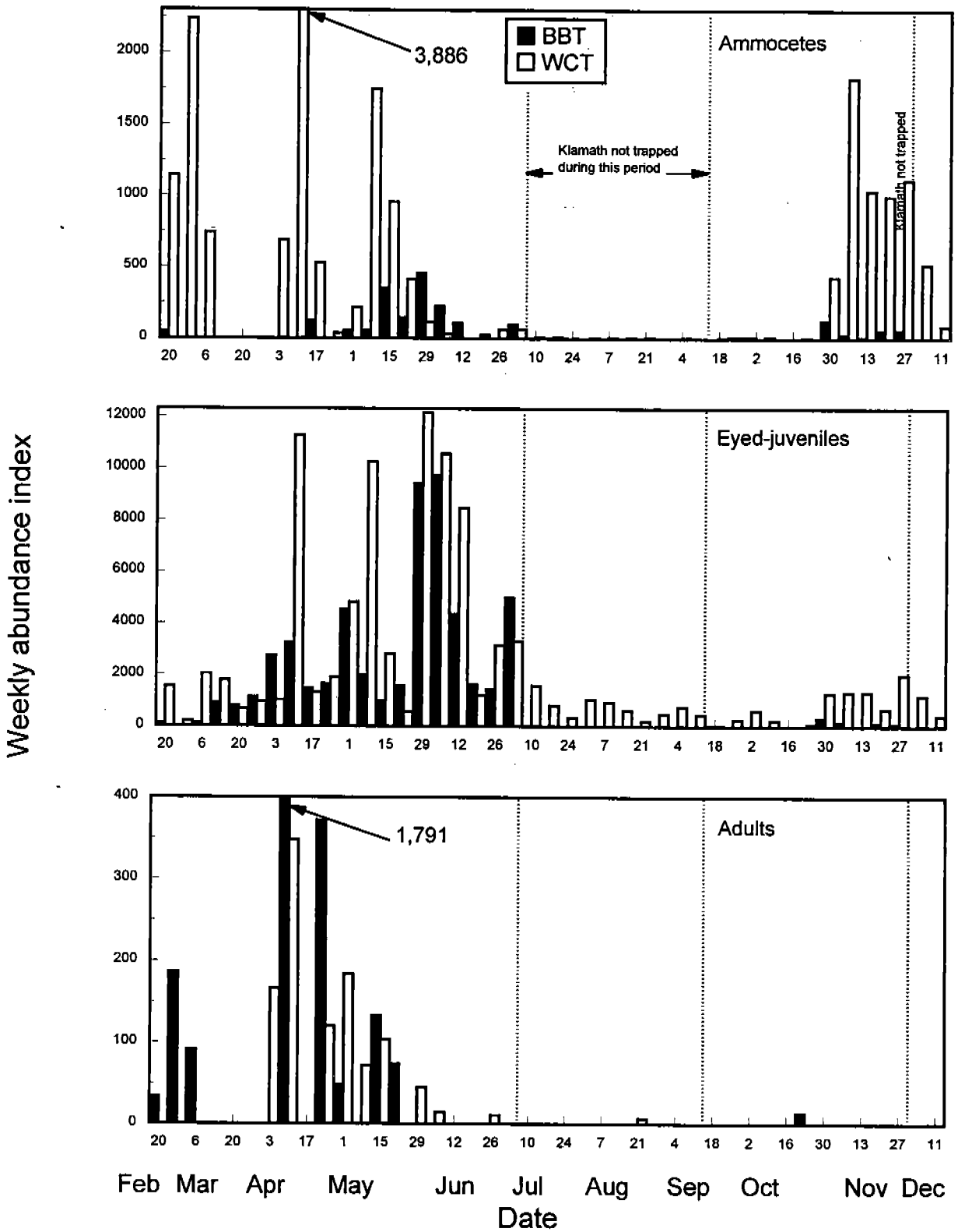

Figure 42. Weekly index totals for lamprey ammocetes, eyed-juveniles, and adults captured in the BBT and WCT, 1994.

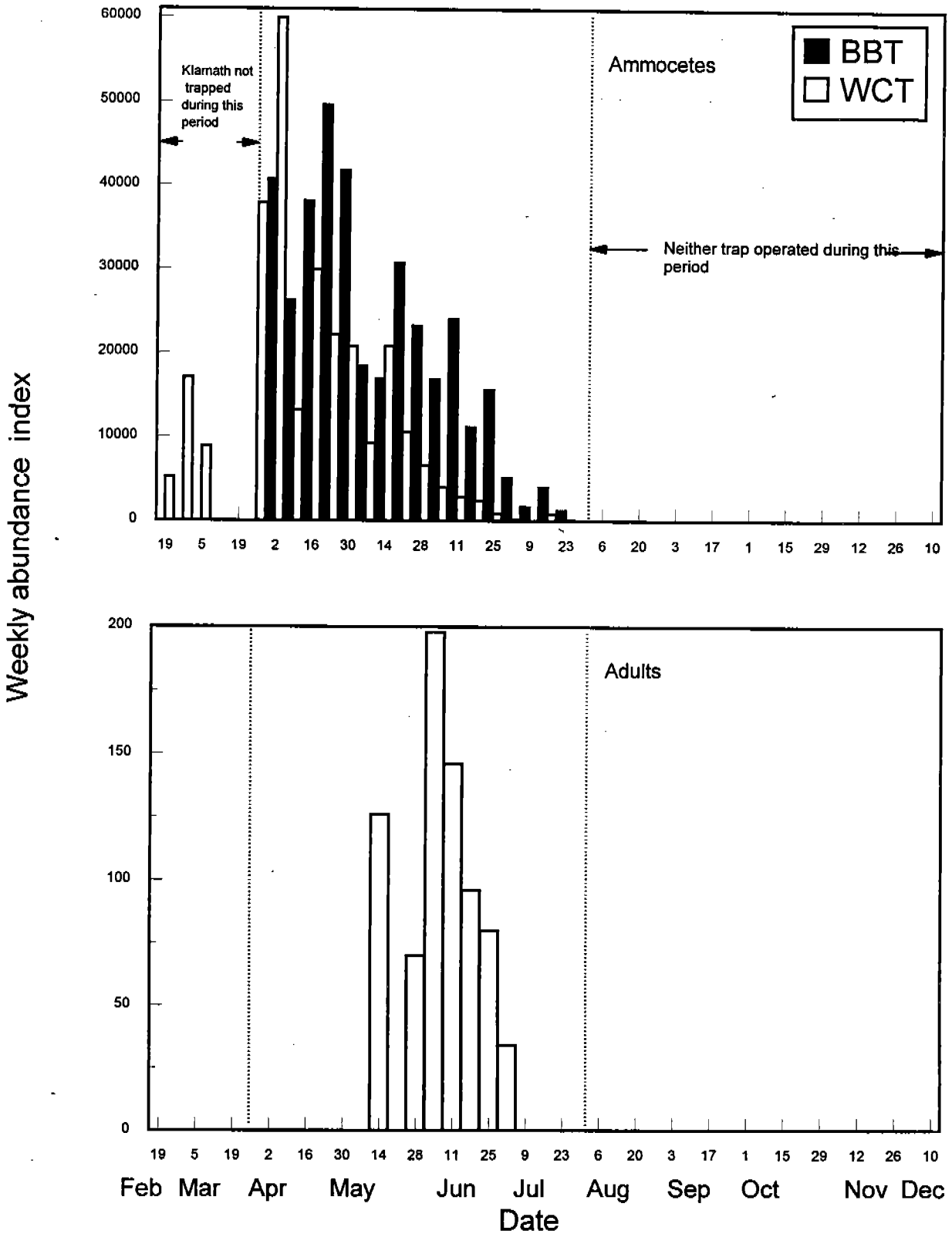

Figure 43. Weekly index totals for lamprey ammocetes and adults captured in the BBT and WCT in 1995.

trapping in mid-September through early November on the Klamath. There was no fall trapping in 1995, and no shad were captured to document the presence of juvenile shad.

Juvenile sturgeon were captured in all four spring monitoring periods at the BBT. Twenty-five juveniles were captured in 1992, forty-two in 1993, four in 1994 and forty-two in 1995. Initial captures occurred in mid May to mid June and as late into mid-August (1993). Total lengths ranged from 26 to 185mm.

At the WCT sturgeon were also captured all four years. Initial captures occurred mid-June in the years when many juveniles were captured. Forty-three juvenile sturgeon were captured in 1992, 4 in 1993, 10 in 1994, and 1 during the 1995 monitoring season. Total lengths ranged from 29 to 203mm. Juvenile sturgeon were present in trap catches as late as September.

RECOMMENDATIONS

The utilization of rotary screw traps in fisheries work has greatly increased the last few years. Traps currently utilized by CCFWO have been continually modified in an attempt to allow greater trapping consistency. The rotary screw trap has proven to be an advantageous method of field sampling through periods of high flow and the typically concurrent high debris load.

CCFWO recommends the continuation of annual rotary trapping programs to collect data to assess: hatchery and natural contributions, abundance indexes, size and emigration rate relationships and emigration duration. The traps also provide fish for health and disease evaluation. Furthermore, although much is known about the life history of salmonids, there are still unanswered questions regarding the abundance of spring chinook, lamprey, green sturgeon, chum salmon, as well as other species referred to within the context of this report, as "non-target" species. Many of these incidental catches could prove significant indicators as to the overall health of the Klamath River basin.

The continuance of juvenile salmon monitoring may enable fisheries biologist a means of relating natural juvenile abundance indices and adult escapement estimates. Monitoring allows us to better understand the effect on juvenile salmonid emigration by water resource management policies during low water "drought" years, which is a contentious issue within the basin. Any relationships may provide a foundation from which fishery resource managers and water resource management can best meet the water needs of their respective interests.

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Appendix 9. Klamath River at Big Bar weekly steelhead catches, abundance index totals and hatchery contributions, 1992.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD CATCH TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Catch Total	STEELHEAD INDEX TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Index Total	Cumulative Index (%) Nat Fry	Nat Parr	Nat Smolt	Hat Smolt	(%) Hatchery
02/23	8,489	0															
03/01	6,096	0															
03/08	4,917	0															
03/15	4,367	0															
03/22	3,704	0															
03/29	4,084	3		22	1	0	23		1,237	70	0	1,307		0.0%	0.0%		
04/05	5,976	4		14	1	0	15		1,386	131	0	1,517		12.6%	0.5%		0%
04/12	11,787	4		10	1	0	11		2,389	283	0	2,672		26.7%	1.4%		0%
04/19	7,841	4		13	7	0	20		2,007	747	0	2,754		51.0%	3.3%		0%
04/26	5,299	4		5	17	0	22		637	1,953	47	2,637		71.4%	8.5%	0.0%	0%
05/03	4,116	5		1	54	12	67		101	3,449	658	4,207		77.9%	22.0%	0.8%	2% [1]
05/10	3,060	6		2	27	7	36		76	1,192	296	1,564	0.0%	78.9%	45.9%	11.3%	16% [1]
05/17	2,567	4		0	36	5	41	18	9	1,843	335	2,205	0.3%	79.7%	54.1%	16.0%	19% [1]
05/24	2,143	3	3	2	14	15	34	222	106	1,548	1,223	3,099	3.3%	79.7%	66.8%	21.3%	15% [1]
05/31	1,807	4	16	0	50	60	126	613	18	2,040	2,408	5,078	11.9%	80.8%	77.5%	40.9%	39% [1]
06/07	1,576	4	14	0	14	23	51	597	0	725	1,037	2,360	20.2%	81.0%	91.7%	79.3%	47% [1]
06/14	1,694	4	10	0	6	5	21	551	61	203	235	1,055	27.8%	81.0%	96.7%	95.9%	44% [1]
06/21	1,506	4	45	26	2	0	74	1,640	803	128	22	2,593	50.6%	81.6%	98.1%	99.8%	22% [1]
06/28	1,594	4	51	11	1	0	63	1,948	550	33	0	2,531	77.7%	89.8%	99.0%	100.0%	1% [1]
07/05	1,427	4	22	4	2	0	28	791	121	69	0	981	88.7%	95.4%	99.2%		0%
07/12	1,213	4	10	5	1	0	16	407	182	38	0	628	94.3%	96.6%	99.7%		0%
07/19	1,024	2	3	1	0	0	4	245	103	11	0	359	97.7%	98.5%	99.9%		0%
07/26	863	1	3	1	0	0	4	164	48	0	0	212	100.0%	99.5%	100.0%		0%
08/02	771	0											100.0%	100.0%			0%
08/09	732	0															
08/16	687	0															
08/23	672	0															
08/30	691	0															
09/06	723	0															
09/13	723	0															
09/20	857	0															
09/27	1,095	0															
10/04	1,161	0															
10/11	1,176	0															
10/18	1,276	0												0.0%	0.0%		
10/25	1,866	3	0	3	1	0	4	0	396	64	0	459		6.4%	18.1%		0%
11/01	4,400	2	0	36	1	0	37	0	2,737	76	0	2,813		50.5%	39.7%		0%
11/08	1,777	3	0	20	1	0	21	0	1,613	38	0	1,650		76.5%	50.4%		0%
11/15	1,691	4	0	4	0	0	4	0	722	22	0	744		88.1%	56.7%		0%
11/22	3,264	5	0	10	2	0	12	0	555	90	0	645		97.1%	82.2%		0%
11/29	2,289	6	0	2	2	0	4	0	97	63	0	160	0.0%	98.6%	100.0%		0%
12/06	6,939	1	1	1	0	0	2	85	85	0	0	170	100.0%	100.0%			0%
Spring Subtotal		68	177	117	234	127	656	7,196	9,834	14,463	6,261	37,759					17%
Fall Subtotal		24	1	76	7	0	84	85	6,205	353	0	6,641					0%
Total		92	178	193	241	127	740	7,281	16,039	14,816	6,261	44,400					14%

[1] Hatchery contribution for age 2+ steelhead based on expansions from 1992 IGH release information.
Hatchery contribution for age 1+ steelhead based on field observations of individual fish.

Appendix 10. Klamath River at Big Bar weekly steelhead catches, abundance index and hatchery contributions, 1993.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD WEEKLY CATCH NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Catch Totals	STEELHEAD INDEX TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Index Totals	Cumulative Index (%) Nat Fry	Nat Parr	Nat Smolt	Hat Smolt	Hatchery Steelhead Contribution
02/21	8,821	0															
02/28	8,511	0															
03/07	16,371	0															
03/14	36,229	0															
03/21	29,257	0															
03/28	21,500	0															
04/04	23,628	0															
04/11	19,957	0															
04/18	20,142	0															
04/25	16,243	5	0	8	0	0	8	0	1,371	0	0	1,371		42%		0%	0%
05/02	19,671	6	0	3	0	0	3	0	693	0	0	693		64%		0%	0%
05/09	17,500	7	0	2	0	0	2	0	376	0	0	376		75%	0%	0%	0%
05/16	18,300	7	0	1	6	1	8	0	202	1,212	142	1,556		81%	35%	43%	9% [1]
05/23	16,157	7	0	0	3	1	4	0	0	516	190	706		81%	50%	100%	27% [1]
05/30	23,957	3	0	0	1	0	1	0	0	760	0	760		81%	71%		0%
06/06	18,243	7	0	1	2	0	3	0	313	469	0	782		91%	85%		0%
06/13	10,891	7	0	0	1	0	1	0	0	106	0	106	0%	91%	88%		0%
06/20	7,456	7	1	2	4	0	7	80	177	364	0	622	60%	96%	98%		0%
06/27	4,856	7	0	0	1	0	1	0	0	56	0	56	60%	96%	100%		0%
07/04	3,744	5	1	1	0	0	2	53	53	0	0	107	100%	98%			0%
07/11	3,069	7	0	0	0	0	0	0	0	0	0	0		98%			0%
07/18	2,821	7	0	0	0	0	0	0	0	0	0	0		98%			0%
07/25	2,579	5	0	0	0	0	0	0	0	0	0	0		98%			0%
08/01	2,463	4	0	0	0	0	0	0	0	0	0	0		98%			0%
08/08	2,387	4	0	2	0	0	2	0	65	0	0	65		100%			0%
08/15	2,420	0															
08/22	2,291	0															
08/29	2,236	0															
09/05	2,266	0															
09/12	2,243	0															
09/19	2,256	0															
09/26	2,247	0															
10/03	2,273	0															
10/10	2,363	0															
10/17	2,330	0															
10/24	2,290	0															
10/31	2,325	0															
11/07	2,377	0															
11/14	2,474	0															
11/21	2,577	0															
11/28	3,079	0															
12/05	6,791	0															
Spring Subtotal		95	2	20	18	2	42	133	3,249	3,483	332	7,197					5%
Fall Subtotal		0															
Total		95	2	20	18	2	42	133	3,249	3,483	332	7,197					5%

[1] Hatchery contribution based on field observations of individual fish.

Appendix 11. Klamath River at Big Bar weekly steelhead catches, abundance index totals and hatchery contributions, 1994.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD WEEKLY CATCH: Natural Stocks Fry	Parr	Smolts	Catch Totals	STEELHEAD INDEX TOTALS: Natural Stocks Fry	Parr	Smolts	Index Total	Cumulative Index (%) Fry	Parr	Smolt
02/20	4,964	5	0	4	1	5	0	218	51	269		4%	1%
02/27	7,419	4	0	3	0	3	0	333	0	333		10%	1%
03/06	5,803	5	0	2	0	2	0	288	0	288		16%	1%
03/13	4,660	7	0	11	1	12	0	595	52	647		27%	2%
03/20	3,781	7	0	10	0	10	0	455	0	455		35%	2%
03/27	4,179	7	0	9	0	9	0	475	0	475		44%	2%
04/03	4,000	7	0	30	4	34	0	1,423	192	1,615		71%	6%
04/10	3,686	7	0	11	3	14	0	501	130	632		80%	9%
04/17	4,900	7	0	5	2	7	0	278	115	393		86%	11%
04/24	4,037	7	0	0	1	1	0	0	49	49		86%	12%
05/01	4,430	7	0	5	5	10	0	228	227	455		90%	17%
05/08	5,533	7	0	1	6	7	0	49	335	384		91%	24%
05/15	3,837	7	0	1	8	9	0	50	363	413		92%	31%
05/22	3,317	7	0	2	4	6	0	73	161	233		93%	35%
05/29	2,456	6	0	0	37	37	0	0	915	915		93%	54%
06/05	2,389	7	0	3	85	88	0	69	1,934	2,004		94%	94%
06/12	1,966	7	0	1	7	8	0	20	148	169		95%	97%
06/19	1,830	7	0	0	4	4	0	0	85	85		95%	99%
06/26	1,564	6	4	8	2	14	124	239	41	404	25%	99%	100%
07/03	1,413	7	14	1	1	16	277	20	20	317	80%	100%	
07/10	1,300	4	5	1	0	6	99	20	0	119	100%		
07/17	1,214	0											
07/24	1,139	0											
07/31	1,067	0											
08/07	1,047	0											
08/14	1,039	0											
08/21	1,069	0											
08/28	1,217	0											
09/04	1,257	0											
09/11	1,304	5	0	0	0	0	0	0	0	0		0%	
09/18	1,334	7	0	1	0	1	0	21	0	21		3%	
09/25	1,349	7	0	1	0	1	0	17	0	17		5%	
10/02	1,429	7	0	4	0	4	0	61	0	61		13%	0%
10/09	1,449	7	0	1	1	2	0	15	15	29		15%	11%
10/16	1,430	7	0	1	1	2	0	15	14	29		17%	21%
10/23	1,454	6	0	2	0	2	0	54	0	54		25%	21%
10/30	1,737	5	0	2	0	2	0	46	0	46		31%	21%
11/06	2,396	3	0	3	1	4	0	81	20	101		42%	36%
11/13	2,376	5	0	7	0	7	0	133	2	135		59%	37%
11/20	2,760	5	0	5	2	7	0	120	52	171		76%	75%
11/27	2,981	4	0	14	2	16	0	182	34	216		100%	100%
12/04	2,986												
Spring Subtotal		135	23	108	171	302	500	5,334	4,818	10,654			
Fall Subtotal		68	0	41	7	48	0	745	137	880			
Total		203	23	149	178	350	500	6,079	4,955	11,534			

Appendix 12. Klamath River at Big Bar weekly steelhead catches, abundance index totals and hatchery contributions, 1995.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD WEEKLY CATCH Natural Stocks Fry	Parr	Smolts [1]	Catch Totals	STEELHEAD INDEX TOTALS Natural Stocks Fry	Parr	Smolts [1]	Index Totals	Cumulative Index (%) Fry	Parr	Smolt
02/19	12,243	0											
02/26	11,029	0											
03/05	20,286	0											
03/12	33,329	0											
03/19	35,543	0											
03/26	19,886	0											
04/02	18,443	3	0	4	0	4	0	644	0	644	0%	19%	0%
04/09	23,586	5	0	2	1	3	0	380	396	776	0%	30%	21%
04/16	17,557	7	0	2	1	3	0	292	122	415	0%	39%	28%
04/23	14,314	7	0	7	0	7	0	831	0	831	0%	63%	28%
04/30	18,814	7	1	2	0	3	176	316	0	492	21%	72%	28%
05/07	16,343	7	1	1	0	2	139	147	0	285	38%	77%	28%
05/14	15,843	7	0	0	2	2	0	0	252	252	38%	77%	41%
05/21	14,814	7	0	2	0	2	0	303	0	303	38%	86%	41%
05/28	13,229	7	0	1	2	3	0	134	271	405	38%	90%	55%
06/04	9,451	7	0	1	3	4	0	77	270	346	38%	92%	70%
06/11	9,073	4	0	0	2	2	0	0	330	330	38%	92%	87%
06/18	8,903	6	0	0	0	0	0	0	0	0	38%	92%	87%
06/25	7,946	7	0	0	2	2	0	0	172	172	38%	92%	96%
07/02	5,403	7	1	2	1	4	73	134	70	277	46%	96%	100%
07/09	4,483	7	2	2	0	4	100	106	0	205	58%	99%	100%
07/16	3,693	7	5	1	0	6	203	40	0	243	82%	100%	100%
07/23	3,000	7	3	0	0	3	111	0	0	111	96%	100%	100%
07/30	2,537	2	1	0	0	1	36	0	0	36	100%	100%	100%
08/06	2,403												
08/13	2,289												
08/20	2,179												
08/27	2,126												
09/03	2,186												
09/10	2,146												
09/17	2,119												
09/24	2,129												
10/01	2,154												
10/08	2,184												
10/15	2,177												
10/22	2,160												
10/29	2,160												
11/05	2,203												
11/12	2,246												
11/19	2,276												
11/26	3,476												
12/03	7,270												
Spring Subtotal		111	14	27	14	55	838	3,404	1,883	6,123			
Fall Subtotal		0	0	0	0	0	0	0	0	0			
Total		111	14	27	14	55	838	3,404	1,883	6,123			

[1] May contain both hatchery and wild smolts. 73,999 age 1+ steelhead released from IGH on May 15, 1995.

Appendix 13. Trinity River, Willow Creek weekly steelhead catches, abundance index and hatchery contributions, 1992.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD CATCH TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Catch Total	STEELHEAD INDEX TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Index Total	Cumulative Index (%) Nat Fry	Nat Parr	Nat Smolt	Hat Smolt	(%) Hatchery
02/23	6,610	3	0	16	4	0	20	0	1,712	438	0	2,150		9.0%	1.1%		
03/01	4,370	3	0	3	1	0	4	0	753	206	0	959		13.0%	1.6%		
03/08	3,536	3	0	3	2	0	5	0	356	299	0	655		14.9%	2.3%		
03/15	6,299	4	0	3	3	0	6	0	379	539	0	918		16.9%	3.6%		
03/22	3,439	4	0	13	2	0	15	0	893	155	0	1,048		21.6%	4.0%	0.0%	
03/29	2,771	4	0	16	16	0	32	0	1,065	1,067	918	3,050		27.2%	6.5%	1.3%	30%
04/05	2,749	4	0	33	73	192	298	0	1,595	3,194	7,090	11,879		35.6%	14.3%	11.0%	60%
04/12	7,741	4	0	3	35	24	62	0	574	7,016	5,203	12,793		38.6%	31.2%	18.1%	41%
04/19	5,556	4	0	22	21	42	85	0	1,596	4,372	5,309	11,277		47.0%	41.8%	25.3%	47%
04/26	3,614	4	0	15	68	118	201	10	1,295	4,852	8,565	14,722	0.1%	53.8%	53.5%	37.1%	58%
05/03	2,804	4	1	2	59	82	144	82	401	4,373	6,631	11,467	1.0%	55.9%	64.1%	46.1%	58%
05/10	2,083	4	0	21	138	282	441	6	835	6,213	11,939	18,993	1.0%	60.3%	79.1%	62.5%	63%
05/17	1,756	5	9	37	108	287	441	212	1,174	3,833	9,309	14,528	3.8%	66.5%	88.3%	75.2%	64%
05/24	1,483	4	18	7	67	180	272	728	438	2,537	6,691	10,394	13.5%	68.8%	94.5%	84.4%	64%
05/31	1,260	4	74	8	28	170	280	2,035	434	965	5,417	8,851	40.4%	71.1%	96.8%	91.8%	61%
06/07	2,351	4	61	57	8	117	243	1,860	1,349	297	3,758	7,264	65.0%	78.2%	97.5%	96.9%	52%
06/14	4,803	4	0	1	0	10	11	334	325	37	1,097	1,793	69.4%	79.9%	97.6%	98.4%	61%
06/21	987	5	88	113	17	50	267	1,458	1,842	245	877	4,422	88.7%	89.7%	98.2%	99.6%	20%
06/28	1,116	5	23	9	2	9	43	498	271	56	220	1,045	95.3%	91.1%	98.3%	99.9%	21%
07/05	824	5	13	16	4	0	33	189	226	63	22	500	97.8%	92.3%	98.5%	100.0%	4%
07/12	729	6	5	23	6	0	34	61	221	60	0	342	98.6%	93.4%	98.6%		0%
07/19	759	4	2	6	3	0	11	52	111	50	0	213	99.3%	94.0%	98.7%		0%
07/26	699	3	2	7	2	0	11	40	146	48	0	234	99.8%	94.8%	98.9%		0%
08/02	641	4	1	10	6	0	17	14	138	83	0	235	100.0%	96.5%	99.1%		0%
08/09	643	4	0	7	4	0	11	0	102	65	0	167		96.1%	99.2%		0%
08/16	674	4	0	4	4	1	9	0	70	70	13	153		96.4%	99.4%		8%
08/23	672	3	0	4	8	0	12	0	95	130	4	229		96.9%	99.7%		2%
08/30	689	3	0	6	1	0	7	0	120	61	0	181		97.6%	99.8%		
09/06	705	2	0	6	0	0	6	0	174	4	0	178		98.5%	99.9%		
09/13	696	3	0	13	1	0	14	0	220	20	0	240		99.6%	99.9%		
09/20	695	3	0	2	2	0	4	0	70	39	0	109		100.0%	100.0%		
09/27	731	3	0	3	1	0	4	0	74	43	0	117		4.3%	7.6%		
10/04	752	6	0	11	6	0	17	0	135	72	0	207		12.2%	20.2%		
10/11	652	7	0	7	1	0	8	0	59	8	0	67		15.6%	21.7%		
10/18	661	4	0	9	5	0	14	0	131	66	0	197		23.2%	33.3%		
10/25	778	5	0	9	4	0	13	0	178	56	0	234		33.6%	43.1%		
11/01	1,630	4	0	28	1	0	29	0	788	40	0	828		79.5%	50.2%		
11/08	741	3	0	4	7	0	11	0	156	124	0	280		88.6%	72.0%		
11/15	753	4	0	2	4	0	6	0	37	77	0	114		90.7%	85.6%		
11/22	1,272	3	0	1	2	0	3	0	41	59	0	100		93.1%	96.0%		
11/29	901	4	0	4	1	0	5	0	71	23	0	94		97.3%	100.0%		
12/06	4,738	2	0	1	0	0	1	0	47	0	0	47		100.0%			
Spring Subtotal		120	297	486	693	1,564	3,039	7,559	18,980	41,387	73,063	140,989					52%
Fall Subtotal		45	0	79	32	0	111	0	1,717	568	0	2,285					0%
Total		165	297	565	725	1,564	3,150	7,559	20,697	41,955	73,063	143,274					51%

Appendix 14. Trinity River, Willow Creek weekly steelhead catches, abundance index and hatchery contributions, 1993.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD CATCH TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Catch Total	STEELHEAD INDEX TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Index Total	Cumulative Index (%) Nat Fry	Nat Parr	Nat Smolt	Hat Smolt	(%) Hatchery
02/21	11,077	0															
02/28	9,121	0															
03/07	12,586	0															
03/14	22,700	0	HIGH FLOWS , TRAP NOT OPERATED					HIGH FLOWS, TRAP NOT OPERATED									
03/21	14,400	0												0.0%	0.0%		
03/28	8,546	5	0	1	4	0	5	0	135	666	0	801		2.2%	4.2%		
04/04	9,821	4	0	2	7	0	9	0	368	1,313	0	1,681		8.2%	12.4%	0.0%	
04/11	9,024	5	0	5	4	1	10	0	726	661	114	1,501		20.0%	16.6%	1.4%	8%
04/18	12,543	5	0	2	12	15	29	0	543	2,236	2,568	5,347		28.8%	30.6%	34.0%	48%
04/25	9,294	7	0	2	16	13	31	0	252	2,025	1,670	3,947		32.9%	43.3%	55.1%	42%
05/02	7,639	7	0	1	6	3	10	0	80	792	466	1,338	0.0%	34.2%	48.2%	61.0%	35%
05/09	5,307	7	1	4	17	11	33	78	264	1,266	785	2,393	3.9%	38.6%	56.2%	70.9%	33%
05/16	5,187	7	1	3	31	8	43	86	191	2,153	548	2,978	8.2%	41.6%	69.7%	77.9%	18%
05/23	5,950	7	5	5	45	15	70	480	493	3,082	1,267	5,322	32.1%	49.6%	89.0%	93.9%	24%
05/30	11,504	1	2	0	0	2	4	TRAP DAMAGED; LIMITED OPERATION					32.1%	49.6%	89.0%	93.9%	
06/06	7,426	5	1	1	7	1	10	77	77	604	85	843	35.9%	50.9%	92.8%	95.0%	10%
06/13	4,941	7	1	3	11	4	19	79	218	741	282	1,320	39.8%	54.4%	97.4%	98.6%	21%
06/20	3,786	7	1	5	6	2	14	47	264	318	113	742	42.2%	58.7%	99.4%	100.0%	15%
06/27	2,877	7	4	2	0	0	6	198	96	0	0	294	52.0%	60.3%	99.4%		
07/04	2,451	7	9	1	0	0	10	367	44	0	0	411	70.3%	61.0%	99.4%		
07/11	1,986	7	7	5	0	0	12	252	162	0	0	414	82.9%	63.6%	99.4%		
07/18	1,790	7	3	2	0	0	5	92	63	0	0	155	87.5%	64.6%	99.4%		
07/25	1,591	7	4	7	0	0	11	118	198	0	0	316	93.3%	67.8%	99.4%		
08/01	1,377	7	4	23	1	0	28	97	585	25	0	707	98.2%	77.4%	99.6%		
08/08	1,199	5	0	10	0	0	10	13	536	13	0	562	98.8%	86.1%	99.7%		
08/15	1,119	7	1	4	1	0	6	24	95	24	0	143	100.0%	87.6%	99.8%		
08/22	991	7	0	3	0	0	3	0	56	0	0	56		88.5%	99.8%		
08/29	890	7	0	13	0	0	13	0	196	0	0	196		91.7%	99.8%		
09/05	835	5	0	5	0	0	5	0	154	0	0	154		94.2%	99.8%		
09/12	838	7	0	10	1	0	11	0	141	14	0	155		96.5%	99.9%		
09/19	835	7	0	9	1	0	10	0	130	14	0	144		98.6%	100.0%		
09/26	699	7	0	7	0	0	7	0	85	0	0	85		100.0%			
10/03	692	7	0	3	0	0	3	0	38	0	0	38		5.2%	0.0%		
10/10	770	7	0	3	1	0	4	0	50	22	0	72		12.0%	5.5%		
10/17	803	6	0	8	1	0	9	0	131	28	0	159		29.9%	12.5%		
10/24	703	7	0	9	1	0	10	0	123	14	0	137		46.7%	16.0%		
10/31	687	7	0	12	4	0	16	0	159	53	0	212		68.4%	29.3%		
11/07	694	7	0	3	8	0	11	0	41	107	0	148		74.0%	56.1%		
11/14	706	7	0	4	3	0	7	0	55	41	0	96		81.6%	66.4%		
11/21	717	7	0	1	0	0	1	0	13	0	0	13		83.3%	66.4%		
11/28	940	7	0	6	6	0	12	0	122	134	0	256		100.0%	100.0%		
12/05	2,612	1															
Spring Subtotal		168	44	135	170	75	424	2,008	6,152	15,947	7,898	32,005					25%
Fall Subtotal		63	0	49	24	0	73	0	732	399	0	1,131					0%
Total		231	44	184	194	75	497	2,008	6,884	16,346	7,898	33,136					24%

Appendix 15. Trinity River, Willow Creek weekly steelhead catches, abundance index and hatchery contributions, 1994.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD CATCH TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Catch Total	STEELHEAD INDEX TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Index Total	Cumulative Index (%) Nat Fry	Nat Parr	Nat Smolt	Hat Smolt	(%) Hatchery
02/20	5,076	5	0	3	1	0	4	0	248	70	0	318		2.0%	0.3%		
02/27	6,169	4	0	3	0	0	3	0	395	0	0	395		5.3%	0.3%		
03/06	4,677	5	0	11	0	0	11	0	718	0	0	718		11.2%	0.3%		
03/13	3,410	7	0	40	7	0	47	0	2,041	338	0	2,378		28.1%	2.0%	0.0%	
03/20	2,651	7	0	30	6	4	39	0	1,430	258	161	1,850		39.9%	3.2%	2.6%	9%
03/27	2,359	7	0	14	5	1	20	0	577	209	44	831		44.7%	4.2%	3.3%	5%
04/03	2,216	7	0	10	6	3	19	0	393	237	120	750		47.9%	5.4%	5.2%	16%
04/10	3,070	7	0	20	21	3	44	0	856	891	132	1,878		55.0%	9.7%	7.4%	7%
04/17	3,314	7	0	25	45	4	74	0	992	1,786	155	2,934		63.2%	18.4%	9.9%	5%
04/24	3,294	6	0	25	39	5	69	0	1,100	1,915	276	3,291		72.3%	27.7%	14.3%	8%
05/01	3,174	7	0	22	192	26	240	0	787	6,948	925	8,660		76.8%	61.3%	29.3%	11%
05/08	3,366	7	0	10	117	33	160	0	374	4,366	1,229	5,969		81.9%	82.5%	49.1%	21%
05/15	2,936	7	0	3	56	16	75	0	112	2,061	590	2,763	0.0%	82.8%	92.5%	58.6%	21%
05/22	1,726	7	1	6	7	9	23	24	151	165	218	560	2.4%	84.0%	93.3%	62.2%	39%
05/29	1,449	7	1	5	30	19	55	21	93	608	375	1,097	4.5%	84.8%	96.3%	68.2%	34%
06/05	1,267	7	13	7	19	45	84	210	107	301	727	1,345	25.4%	85.7%	97.7%	80.0%	54%
06/12	1,076	7	19	9	10	32	70	272	125	152	445	995	52.5%	86.7%	98.5%	87.1%	45%
06/19	931	7	4	10	4	29	47	48	121	50	357	576	57.3%	87.7%	98.7%	92.9%	62%
06/26	825	7	12	17	7	14	50	128	183	74	149	534	70.0%	89.2%	99.1%	95.3%	28%
07/03	854	7	12	7	3	8	30	132	76	33	89	329	83.2%	89.8%	99.2%	96.8%	27%
07/10	777	7	6	21	2	4	33	61	209	19	40	329	89.2%	91.6%	99.3%	97.4%	12%
07/17	710	7	3	20	2	7	32	26	163	15	57	261	91.8%	92.9%	99.4%	98.3%	22%
07/24	689	7	1	17	1	2	21	7	130	7	15	159	92.5%	94.0%	99.4%	98.6%	9%
07/31	667	7	2	8	0	3	13	15	60	0	22	97	94.0%	94.5%	99.4%	98.9%	23%
08/07	659	7	5	9	5	5	24	38	68	38	37	180	97.8%	95.1%	99.6%	99.5%	21%
08/14	638	7	3	16	4	0	23	22	120	30	0	172	100.0%	96.0%	99.7%	99.5%	0%
08/21	634	7	0	5	4	1	10	0	37	30	8	75		96.3%	99.9%	99.6%	11%
08/28	593	7	0	11	2	1	14	0	82	15	8	105		97.0%	100.0%	99.8%	8%
09/04	594	7	0	11	0	1	12	0	78	0	7	85		97.7%		99.9%	8%
09/11	605	7	0	25	0	1	26	0	180	0	7	187		99.2%		100.0%	4%
09/18	588	7	0	10	0	0	10	0	73	0	0	73		99.8%			
09/25	585	7	0	4	1	0	5	0	29	7	0	36		100.0%			
10/02	599	7	0	33	1	0	34	0	234	7	0	241		16.5%	3.3%		
10/09	487	7	0	6	3	0	9	0	42	21	0	63		21.8%	13.0%		
10/16	492	7	0	3	0	0	3	0	20	0	0	20		23.4%	13.0%		
10/23	513	7	0	13	4	0	17	0	90	27	0	117		30.5%	25.6%		
10/30	648	7	0	4	15	0	19	0	38	116	0	154	0.0%	33.5%	79.5%		
11/06	965	6	9	18	3	0	30	176	233	30	0	439	32.1%	51.9%	93.5%		
11/13	1,152	7	4	14	1	0	19	100	280	14	0	394	50.4%	74.0%	100.0%		
11/20	1,736	5	4	11	0	0	15	103	229	0	0	332	69.2%	92.0%			
11/27	2,424	4	2	1	0	0	3	101	62	0	0	163	87.6%	96.9%			
12/04	1,870	6	1	0	0	0	1	39	10	0	0	49	94.7%	97.7%			
12/11	2,677	4	1	1	0	0	2	29	29	0	0	58	100.0%	100.0%			
Spring Subtotal		216	82	430	595	276	1,382	1,004	12,108	20,623	6,193	39,930					16%
Fall Subtotal		67	21	103	27	0	152	548	1,267	215	0	2,030					0%
Total		283	102	533	622	276	1,532	1,552	13,375	20,838	6,193	41,959					15%

Appendix 16. Trinity River, Willow Creek weekly steelhead catches, abundance index and hatchery contributions, 1995.

Week of	Mean River Flow (cfs)	Trap Days	STEELHEAD CATCH TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Catch Total	STEELHEAD INDEX TOTALS NATURAL Fry	Parr	Smolt	HATCHERY Smolt	Index Total	Cumulative Index (%) Nat Fry	Nat Parr	Nat Smolt	Hat Smolt	(%) Hatchery
02/19	6,116	1	0	3	0	0	3	0	213	0	0	213		5.4%			
02/26	6,007	3	0	2	0	0	2	0	139	0	0	139		8.9%			
03/05	22,404	2	0	0	0	0	0	0	0	0	0	0		8.9%			
03/12	36,200	0	Trap not operated due to high flows.											8.9%			
03/19	30,571	0												8.9%	0.0%	0.0%	
03/26	19,886	2	0	0	2	1	3	0	0	476	238	714		8.9%	2.3%	0.3%	33%
04/02	14,514	6	0	0	9	12	21	0	0	1,684	2,284	3,968		8.9%	10.6%	3.2%	58%
04/09	15,757	4	0	1	3	38	42	0	244	662	7,619	8,525		15.0%	13.8%	12.7%	89%
04/16	10,661	7	0	3	20	78	101	0	365	2,715	10,930	14,010		24.2%	27.1%	26.4%	78%
04/23	8,903	7	0	6	15	16	37	0	683	1,841	2,412	4,936		41.4%	36.1%	29.4%	49%
04/30	15,914	6	0	3	15	79	97	0	720	3,500	19,168	23,388		59.6%	53.3%	53.4%	82%
05/07	12,014	7	0	0	22	128	150	0	0	3,058	17,912	20,970	0.0%	59.6%	68.2%	75.9%	85%
05/14	10,569	7	1	0	33	101	135	111	0	4,056	12,553	16,720	8.0%	59.6%	88.1%	91.6%	75%
05/21	6,973	7	0	5	16	59	80	0	390	1,238	4,745	6,373	8.0%	69.4%	94.2%	97.5%	74%
05/28	6,000	7	1	2	9	18	30	70	139	618	1,233	2,060	13.1%	72.9%	97.2%	99.1%	60%
06/04	4,213	7	1	6	4	5	16	65	310	224	267	866	17.7%	80.7%	98.3%	99.4%	31%
06/11	4,070	7	0	6	4	4	14	0	308	202	203	713	17.7%	88.5%	99.3%	99.7%	28%
06/18	3,264	7	1	4	1	1	7	49	173	36	47	305	21.3%	92.9%	99.5%	99.7%	15%
06/25	3,113	7	2	2	1	4	9	76	80	41	159	356	26.8%	94.9%	99.7%	99.9%	45%
07/02	2,549	7	10	0	0	2	12	340	0	0	72	412	51.3%	94.9%	99.7%	100.0%	17%
07/09	2,226	7	3	0	1	0	4	96	0	36	0	132	58.2%	94.9%	99.8%		0%
07/16	2,049	7	8	3	0	0	11	265	98	0	0	363	77.3%	97.4%	99.8%		0%
07/23	1,700	7	6	2	1	0	9	200	65	33	0	298	91.7%	99.0%	100.0%		0%
07/30	1,535	2	3	1	0	0	4	115	40	0	0	155	100.0%	100.0%			0%
08/06						Trap pulled 7/31/95.											
Spring total		124	36	49	155	547	787	1,387	3,967	20,420	79,842	105,616					76%

Appendix 17. Klamath River at Big Bar weekly coho catches, abundance index and hatchery contribution , 1992.

			COHO CATCH TOTALS				COHO INDEX TOTALS						
Week of	Mean River Flow (cfs)	Trap Days	YOY	Smolts NC	Smolts AD	Catch Total	YOY	Smolts	Index Total	Cumulative Index (%) YOY	Cumulative Index (%) Smolts	(%) Hatchery Smolts	(%) Hatchery Total
02/23	8,489	0											
03/01	6,096	0											
03/08	4,917	0											
03/15	4,367	0											
03/22	3,704	0											
03/29	4,084	3	1	1	1	3	74	101	176	2.2%	3.9%		
04/05	5,976	4	3	1	0	4	235	93	327	9.0%	7.4%		
04/12	11,787	4	2	0	0	2	263	51	314	16.6%	9.3%		
04/19	7,841	4	0	1	0	1	59	183	243	18.3%	16.4%		
04/26	5,299	4	5	2	3	10	431	563	994	30.8%	37.8%		
05/03	4,116	5	3	12	4	19	175	1,100	1,275	35.9%	79.9%		
05/10	3,060	6	14	2	5	21	554	285	839	51.9%	90.8%		
05/17	2,567	4	2	0	0	2	147	33	180	56.2%	92.0%		
05/24	2,143	3	5	0	0	5	341	18	359	66.1%	92.7%		
05/31	1,807	4	8	4	0	12	341	140	481	76.0%	98.1%		
06/07	1,576	4	5	0	0	5	210	12	222	82.1%	98.5%		
06/14	1,694	4	4	0	0	4	177	0	177	87.3%	98.5%		
06/21	1,506	4	4	0	0	4	151	0	151	91.6%	98.5%		
06/28	1,594	4	3	0	0	3	88	0	88	94.2%	98.5%		
07/05	1,427	4	2	0	0	2	99	5	104	97.1%	98.7%		
07/12	1,213	4	1	0	1	2	46	33	78	98.4%	100.0%		
07/19	1,024	2	0	0	0	0	21	0	21	99.0%			
07/26	863	1	1	0	0	1	35	0	35	100.0%			
08/02	771	0											
08/09	732	0											
08/16	687	0											
08/23	672	0											
08/30	691	0											
09/06	723	0											
09/13	723	0											
09/20	857	0											
09/27	1,095	0											
10/04	1,161	0											
10/11	1,176	0											
10/18	1,276	0											
10/25	1,866	3	0	0	0	0	0	0	0				
11/01	4,400	2	0	0	0	0	0	0	0				
11/08	1,777	3	0	0	0	0	0	0	0	0.0%			
11/15	1,691	4	0	0	0	0	22	0	22	14.3%			
11/22	3,264	5	2	0	0	2	131	0	131	100.0%			
11/29	2,289	6	0	0	0	0	0	0	0				
12/06	6,939	1	0	0	0	0	0	0	0				
Spring Subtotal		68	63	23	14	100	3,447	2,617	6,064			61%	26%
Fall Subtotal		24	2	0	0	2	153	0	153			0%	0%
Total		92	65	23	14	102	3,600	2,617	6,218				

Appendix 18. Klamath River at Big Bar weekly coho catches, abundance index and hatchery contributions, 1993.

Week of	Mean River Flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts [1]	Catch Total	COHO INDEX TOTALS YOY	Smolts [1]	Index Total	Cumulative Index (%) YOY	Smolts
02/28	8,511	0								
03/07	16,371	0								
03/14	36,229	0								
03/21	29,257	0								
03/28	21,500	0								
04/04	23,628	0								
04/11	19,957	0								
04/18	20,142	0								
04/25	16,243	5	0	1	1	0	177	177	0.0%	2.4%
05/02	19,671	6	1	0	1	220	0	220	8.8%	2.4%
05/09	17,500	7	1	11	12	128	1,846	1,974	14.0%	27.7%
05/16	18,300	7	0	20	20	0	3,651	3,651	14.0%	77.6%
05/23	16,157	7	4	8	12	766	1,177	1,943	44.9%	93.7%
05/30	23,957	3	0	0	0	0	0	0	44.9%	93.7%
06/06	18,243	7	1	1	2	157	313	469	51.2%	97.9%
06/13	10,891	7	6	0	6	737	0	737	80.9%	97.9%
06/20	7,456	7	4	0	4	374	0	374	95.9%	97.9%
06/27	4,856	7	1	3	4	48	151	198	97.8%	100.0%
07/04	3,744	5	1	0	1	53	0	53	100.0%	
07/11	3,069	7	0	0	0	0	0	0		
07/18	2,821	7	0	0	0	0	0	0		
07/25	2,579	5	0	0	0	0	0	0		
08/01	2,463	4	0	0	0	0	0	0		
08/08	2,387	4	0	0	0	0	0	0		
08/15	2,420	0								
08/22	2,291	0								
08/29	2,236	0								
09/05	2,266	0								
09/12	2,243	0								
09/19	2,256	0								
09/26	2,247	0								
10/03	2,273	0								
10/10	2,363	0								
10/17	2,330	0								
10/24	2,290	0								
10/31	2,325	0								
11/07	2,377	0				No Fall trapping conducted in 1993				
11/14	2,474	0								
11/21	2,577	0								
11/28	3,079	0								
12/05	6,791	0								
Spring Subtotal		95	19	44	63	2,483	7,315	9,797		
Fall Subtotal		0	0	0	0	0	0	0		
Total		95	19	44	63	2,483	7,315	9,797		

[1] May contain both hatchery and natural smolts. IGH released 144,998 unmarked yearlings on March 17, 1993

Appendix 19. Klamath River at Big Bar weekly coho catches, abundance index totals and hatchery contributions, 1994.

Week of	Mean River Flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts [1]	Catch Total	COHO INDEX TOTALS YOY	Smolts [1]	Index Total	Cumulative Index (%) YOY	Smolt
02/20	4,964	5	0	0	0	0	0	0	0.0%	
02/27	7,419	4	0	0	0	17	0	17	0.9%	
03/06	5,803	5	1	0	1	102	0	102	6.5%	
03/13	4,660	7	0	0	0	0	0	0	6.5%	0.0%
03/20	3,781	7	1	1	2	50	43	93	9.3%	2.3%
03/27	4,179	7	0	0	0	0	0	0	9.3%	2.3%
04/03	4,000	7	0	0	0	0	0	0	9.3%	2.3%
04/10	3,686	7	0	0	0	0	0	0	9.3%	2.3%
04/17	4,900	7	2	0	2	107	0	107	15.1%	2.3%
04/24	4,037	7	2	0	2	98	0	98	20.5%	2.3%
05/01	4,430	7	4	6	10	199	293	492	31.4%	18.3%
05/08	5,533	7	1	22	23	49	1246	1295	34.0%	86.2%
05/15	3,837	7	19	1	20	870	49	919	81.7%	88.8%
05/22	3,317	7	3	4	7	145	162	307	89.6%	97.7%
05/29	2,456	6	2	1	3	44	23	67	92.0%	98.9%
06/05	2,389	7	1	0	1	22	0	22	93.2%	98.9%
06/12	1,966	7	1	0	1	22	0	22	94.4%	98.9%
06/19	1,830	7	1	0	1	21	0	21	95.6%	98.9%
06/26	1,564	6	1	0	1	20	0	20	96.7%	98.9%
07/03	1,413	7	2	1	3	41	20	60	98.9%	100.0%
07/10	1,300	4	1	0	1	20	0	20	100.0%	
07/17	1,214	0								
07/24	1,139	0								
07/31	1,067	0								
08/07	1,047	0								
08/14	1,039	0								
08/21	1,069	0								
08/28	1,217	0								
09/04	1,257	0								
09/11	1,304	5	0	0	0	0	0	0		
09/18	1,334	7	0	0	0	0	0	0		
09/25	1,349	7	0	0	0	0	0	0	0.0%	
10/02	1,429	7	1	0	1	16	0	16	5.6%	
10/09	1,449	7	0	0	0	0	0	0	5.6%	
10/16	1,430	7	0	0	0	0	0	0	5.6%	
10/23	1,454	6	0	0	0	0	0	0	5.6%	
10/30	1,737	5	0	0	0	0	0	0	5.6%	
11/06	2,396	3	0	0	0	0	0	0	5.6%	
11/13	2,376	5	4	0	4	57	0	57	25.7%	
11/20	2,760	5	3	0	3	70	0	70	50.4%	
11/27	2,981	4	11	0	11	141	0	141	100.0%	
12/04	2,986	0	0	0	0	0	0	0		
Spring Subtotal		135	42	36	78	1827	1,836	3,662		
Fall Subtotal		68	19	0	19	284	0	284		
Total		203	61	36	97	2111	1,836	3,946		

[1] May contain both hatchery and wild smolts. 76,999 unmarked yearlings released from IGH on March 16, 1994.

Appendix 20. Klamath River at Big Bar weekly coho catches, abundance index totals and hatchery contributions, 1995.

Week of	Mean River Flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts [1]	Catch Total	COHO INDEX TOTALS YOY	Smolts [1]	Index Total	Cumulative Index (%) YOY	Smolt
02/19	12,243	0								
02/26	11,029	0								
03/05	20,286	0								
03/12	33,329	0								
03/19	35,543	0								
03/26	19,886	0								
04/02	18,443	3	0	0	0	0	0	0		
04/09	23,586	5	0	0	0	0	0	0		
04/16	17,557	7	0	0	0	0	0	0		
04/23	14,314	7	0	0	0	0	0	0		
04/30	18,814	7	0	0	0	0	0	0		0.0%
05/07	16,343	7	0	3	3	0	451	451	0.0%	24.8%
05/14	15,843	7	1	4	5	141	541	682	9.2%	54.6%
05/21	14,814	7	0	5	5	0	749	749	9.2%	95.9%
05/28	13,229	7	0	0	0	0	0	0	9.2%	95.9%
06/04	9,451	7	0	0	0	0	0	0	9.2%	95.9%
06/11	9,073	4	8	0	8	824	0	824	63.2%	95.9%
06/18	8,903	6	2	0	2	139	0	139	72.3%	95.9%
06/25	7,946	7	3	1	4	264	75	340	89.5%	100.0%
07/02	5,403	7	2	0	2	123	0	123	97.6%	
07/09	4,483	7	0	0	0	0	0	0	97.6%	
07/16	3,693	7	0	0	0	0	0	0	97.6%	
07/23	3,000	7	1	0	1	37	0	37	100.0%	
07/30	2,537	2	0	0	0	0	0	0		
08/06	2,403	0								
08/13	2,289	0								
08/20	2,179	0								
08/27	2,126	0								
09/03	2,186	0								
09/10	2,146									
09/17	2,119									
09/24	2,129									
10/01	2,154									
10/08	2,184									
10/15	2,177									
10/22	2,160									
10/29	2,160									
11/05	2,203									
11/12	2,246									
11/19	2,276									
11/26	3,476									
12/03	7,270									
Spring Subtotal		111	17	13	30	1,528	1,816	3,345		
Fall Subtotal		0								
Total		111	17	13	30	1,528	1,816	3,345		

[1] May contain both hatchery and wild smolts. 79,506 unmarked yearlings released from IGH on March 16, 1995.

Appendix 21. Trinity River, Wilow Creek coho catches, abundance index and hatchery contributions, 1992.

Week of	Mean river flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts NC	Smolts AD	Catch Total	COHO INDEX TOTALS YOY	Smolts	Index Total	Cumulative Index (%) YOY	Cumulative Index (%) Smolts	(%) Hatchery Smolt	(%) Hatchery Total
02/23	6,610	3	0	0	0	0	0	0	0	0.0%			
03/01	4,370	3	0	0	0	0	24	0	24	0.1%			
03/08	3,536	3	1	0	0	1	176	0	176	1.2%			
03/15	6,299	4	2	0	0	2	334	0	334	3.1%			
03/22	3,439	4	4	0	0	4	266	0	266	4.7%	0.0%		
03/29	2,771	4	11	0	0	11	688	13	702	8.8%	0.1%		
04/05	2,749	4	34	3	0	37	1,821	131	1,953	19.5%	1.3%		
04/12	7,741	4	7	1	0	8	1,243	103	1,345	26.8%	2.2%		
04/19	5,556	4	9	0	0	9	777	155	932	31.4%	3.5%		
04/26	3,614	4	6	26	3	35	521	1,930	2,451	34.4%	20.5%		
05/03	2,804	4	23	31	2	56	1,447	2,263	3,710	43.0%	40.4%		
05/10	2,083	4	55	24	4	83	2,503	1,523	4,026	57.7%	53.8%		
05/17	1,756	5	52	14	3	69	1,744	553	2,296	68.0%	58.6%		
05/24	1,483	4	52	23	0	75	1,961	869	2,830	79.5%	66.2%		
05/31	1,260	4	58	27	1	86	1,704	941	2,645	89.5%	74.5%		
06/07	2,351	4	28	35	5	68	1,003	1,192	2,195	95.4%	85.0%		
06/14	4,803	4	1	6	0	7	169	770	939	96.4%	91.7%		
06/21	987	5	20	39	1	58	349	646	996	98.5%	97.4%		
06/28	1,116	5	8	7	0	15	169	155	323	99.5%	98.8%		
07/05	824	5	1	1	1	3	45	27	72	99.8%	99.0%		
07/12	729	6	3	4	0	5	33	44	77	99.9%	99.4%		
07/19	759	4	0	1	0	1	9	26	35	100.0%	99.6%		
07/26	699	3	0	1	0	1	0	14	14		99.8%		
08/02	641	4	0	0	0	0	0	2	2		99.8%		
08/09	643	4	0	1	0	1	0	15	15		99.9%		
08/16	674	4	0	1	0	1	0	11	11		100.0%		
08/23	672	3	0	0	0	0	0	0	0				
08/30	689	3	0	0	0	0	0	0	0				
09/06	705	2	0	0	0	0	0	0	0				
09/13	696	3	0	0	0	0	0	0	0				
09/20	695	3	0	0	0	0	0	0	0				
09/27	731	3	0	0	0	0	0	0	0				
10/04	752	6	0	0	0	0	0	0	0				
10/11	652	7	0	0	0	0	0	0	0				
10/18	661	4	0	0	0	0	0	0	0				
10/25	778	5	0	0	0	0	0	0	0				
11/01	1,630	4	0	0	0	0	0	0	0				
11/08	741	3	0	0	0	0	0	0	0				
11/15	753	4	0	0	0	0	0	0	0				
11/22	1,272	3	0	0	0	0	0	0	0				
11/29	901	4	0	0	0	0	0	0	0				
12/06	4,738	2	0	0	0	0	0	0	0				
Spring Subtotal		120	375	245	20	636	16,986	11,383	28,369			65%	26%
Fall Subtotal		45	0	0	0	0	0	0	0			0%	0%
Total		165	375	245	20	636	16,986	11,383	28,369				

Appendx 22. Trinity River, Wilow Creek rotary trap coho catches, abundance index , hatchery contributions, 1993.

Week of	Mean river flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts NC	Smolts AD	Catch Total	COHO INDEX TOTALS YOY	Smolts	Index Total	Cumulative Index (%) YOY	Cumulative Index (%) Smolts	(%) Hatchery Smolt	(%) Hatchery Total
02/21	11,077	0	0	0	0	0	0	0	0				
02/28	9,121	0	0	0	0	0	0	0	0				
03/07	12,586	0	0	0	0	0	0	0	0				
03/14	22,700	0	0	0	0	0	0	0	0				
03/21	14,400	0	0	0	0	0	0	0	0		0.0%		
03/28	8,546	5	0	1	0	1	0	273	273	0.0%	1.5%		
04/04	9,821	4	1	5	2	8	154	1,224	1,378	2.6%	8.4%		
04/11	9,024	5	2	5	0	7	335	778	1,113	8.2%	12.7%		
04/18	12,543	5	2	16	1	19	433	3,163	3,596	15.6%	30.4%		
04/25	9,294	7	6	12	0	18	753	1,532	2,286	28.3%	39.0%		
05/02	7,639	7	6	4	1	11	546	583	1,129	37.5%	42.3%		
05/09	5,307	7	7	24	0	31	484	1,679	2,164	45.7%	51.7%		
05/16	5,187	7	5	43	8	56	322	3,393	3,714	51.1%	70.7%		
05/23	5,950	7	5	49	9	63	422	4,255	4,677	58.2%	94.5%		
05/30	11,504	1	0	0	0	0	0	0	0	58.2%	94.5%		
06/06	7,426	5	6	3	0	9	549	293	842	67.5%	96.1%		
06/13	4,941	7	13	6	1	20	921	486	1,407	83.0%	98.8%		
06/20	3,786	7	4	1	1	6	206	97	303	86.5%	99.4%		
06/27	2,877	7	7	1	0	8	339	44	382	92.2%	99.6%		
07/04	2,451	7	5	1	0	6	214	38	252	95.8%	99.8%		
07/11	1,986	7	4	0	0	4	143	0	143	98.3%	99.8%		
07/18	1,790	7	1	0	0	1	32	0	32	98.8%	99.8%		
07/25	1,591	7	1	1	0	2	28	28	56	99.3%	100.0%		
08/01	1,377	7	1	0	0	1	27	0	27	99.7%			
08/08	1,199	5	0	0	0	0	0	0	0	99.7%			
08/15	1,119	7	0	0	0	0	0	0	0	99.7%			
08/22	991	7	0	0	0	0	0	0	0	99.7%			
08/29	890	7	1	0	0	1	15	0	15	100.0%			
09/05	835	5	0	0	0	0	0	0	0				
09/12	838	7	0	0	0	0	0	0	0				
09/19	835	7	0	0	0	0	0	0	0				
09/26	699	7	0	0	0	0	0	0	0				
10/03	692	7	0	0	0	0	0	0	0	0.0%			
10/10	770	7	1	0	0	1	15	0	15	21.7%			
10/17	803	6	0	0	0	0	0	0	0	21.7%			
10/24	703	7	1	0	0	1	14	0	14	42.6%			
10/31	687	7	2	0	0	2	27	0	27	81.3%			
11/07	694	7	0	0	0	0	0	0	0	81.3%			
11/14	706	7	0	0	0	0	0	0	0	81.3%			
11/21	717	7	1	0	0	1	13	0	13	100.0%			
11/28	940	7	0	0	0	0	0	0	0				
12/05	2,612	1	0	0	0	0	0	0	0				
Spring Subtotal		168	77	172	23	272	5,924	17,867	23,791			80%	60%
Fall Subtotal		63	5	0	0	5	69	0	69			0%	0%
Total		231	82	172	23	277	5,994	17,867	23,861				

Appendix 23. Trinity River, Willow Creek weekly coho catches, abundance index totals and hatchery contributions, 1994.

Week of	Mean River Flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts NC	Smolts AD	Catch Total	COHO INDEX TOTALS YOY	Smolts	Index Total	Cumulative Index (%) YOY	Cumulative Index (%) Smolts	(%) Hatchery
02/20	5,076	5	1	1		2	61	70	131	0.3%	0.9%	
02/27	6,169	4	0	0		0	0	0	0	0.3%	0.9%	
03/06	4,677	5	0	0		0	0	0	0	0.3%	0.9%	
03/13	3,410	7	0	0		0	0	0	0	0.3%	0.9%	
03/20	2,651	7	8	5		13	390	238	628	2.1%	4.2%	
03/27	2,359	7	3	0		3	123	0	123	2.7%	4.2%	
04/03	2,216	7	27	0		27	1,071	0	1,071	7.7%	4.2%	
04/10	3,070	7	73	1		74	3,064	41	3,105	22.1%	4.7%	
04/17	3,314	7	11	5		16	445	193	638	24.2%	7.4%	
04/24	3,294	6	7	15		22	279	761	1,040	25.5%	17.7%	
05/01	3,174	7	10	83		93	365	2,997	3,362	27.2%	58.4%	
05/08	3,366	7	18	40		58	698	1,854	2,552	30.5%	83.6%	
05/15	2,936	7	48	20		68	1,673	725	2,398	38.4%	93.4%	
05/22	1,726	7	365	3		368	9,012	74	9,085	80.7%	94.4%	
05/29	1,449	7	86	3		89	1,771	61	1,832	89.0%	95.2%	
06/05	1,267	7	39	5		44	618	80	698	91.9%	96.3%	
06/12	1,076	7	57	9		66	819	130	949	95.8%	98.1%	
06/19	931	7	29	7		36	360	85	445	97.5%	99.3%	
06/26	825	7	21	0		21	223	0	223	98.5%	99.3%	
07/03	854	7	12	0		12	135	0	135	99.1%	99.3%	
07/10	777	7	7	3		10	66	32	98	99.5%	99.7%	
07/17	710	7	6	0		6	49	0	49	99.7%	99.7%	
07/24	689	7	1	0		1	8	0	8	99.7%	99.7%	
07/31	667	7	2	1		3	15	8	23	99.8%	99.8%	
08/07	659	7	3	0		3	22	0	22	99.9%	99.8%	
08/14	638	7	1	0		1	7	0	7	99.9%	99.8%	
08/21	634	7	2	1		3	16	8	23	100.0%	99.9%	
08/28	593	7	0	1		1	0	7	7		100.0%	
09/04	594	7	0	0		0	0	0	0			
09/11	605	7	0	0		0	0	0	0			
09/18	588	7	0	0		0	0	0	0			
09/25	585	7	0	0		0	0	0	0			
10/02	599	7	0	0		0	0	0	0	0.0%		
10/09	487	7	2	0		2	14	0	14	0.6%		
10/16	492	7	0	0		0	0	0	0	0.6%		
10/23	513	7	0	0		0	0	0	0	0.6%		
10/30	648	7	3	0		3	34	0	34	2.2%		
11/06	965	6	38	0		38	848	0	848	40.9%		
11/13	1,152	7	18	0		18	504	0	504	63.9%		
11/20	1,736	5	12	0		12	334	0	334	79.2%		
11/27	2,424	4	5	0		5	304	0	304	93.0%	0.0%	
12/04	1,870	6	2	1		3	96	30	126	97.4%	100.0%	
12/11	2,677	4	2	0		2	57	0	57	100.0%		
Spring Subtotal		216	837	203		1,040	21,290	7,363	28,653			26%
Fall Subtotal		67	82	1		83	2,191	30	2,221			0%
Total		283	919	204		1,123	23,481	7,393	30,874			

Appendix 24. Trinity River, Willow Creek weekly coho catches, abundance Index totals and hatchery contributions, 1995.

Week of	Mean River Flow (cfs)	Trap Days	COHO CATCH TOTALS YOY	Smolts Nat	Smolts Hat	Catch Total	COHO INDEX TOTALS YOY	Smolts Nat	Smolts Hat	Index Total	Cumulative Index (%) YOY	Nat Smolts	Hat Smolts	(%) Hatchery Total
02/19	6,116	1	0	0	0	0	0	0	0	0		0.0%		
02/26	6,007	3	0	2	0	2	0	278	0	278		5.1%		
03/05	22,404	2	0	2	0	2	0	278	0	278		10.2%		
03/12	36,200	0										10.2%		
03/19	30,571	0										10.2%		
03/26	19,886	2	0	0	0	0	0	0	0	0		10.2%	0.0%	
04/02	14,514	6	0	1	9	10	0	209	2,323	2,532		14.0%	3.3%	
04/09	15,757	4	0	0	10	10	0	0	3,615	3,615		14.0%	8.5%	
04/16	10,661	7	0	0	13	13	0	0	1,810	1,810	0.0%	14.0%	11.1%	
04/23	8,903	7	1	1	5	7	100	171	777	1,048	66.7%	17.2%	12.2%	
04/30	15,914	6	0	1	53	54	0	206	11,820	12,026	66.7%	21.0%	29.2%	
05/07	12,014	7	0	8	172	180	0	1,098	24,015	25,113	66.7%	41.1%	63.6%	
05/14	10,569	7	0	5	109	114	0	652	13,284	13,937	66.7%	53.1%	82.7%	
05/21	6,973	7	0	12	56	68	0	939	4,386	5,325	66.7%	70.4%	89.0%	
05/28	6,000	7	0	8	63	71	0	553	4,337	4,890	66.7%	80.5%	95.2%	
06/04	4,213	7	1	11	44	56	50	584	2,518	3,152	100.0%	91.2%	98.8%	
06/11	4,070	7	0	7	12	19	0	440	738	1,178		99.3%	99.8%	
06/18	3,264	7	0	0	2	2	0	0	111	111		99.3%	100.0%	
06/25	3,113	7	0	1	0	1	0	38	0	38		100.0%		
07/02	2,549	7	0	0	0	0	0	0	0	0				
07/09	2,226	7	0	0	0	0	0	0	0	0				
07/16	2,049	7	0	0	0	0	0	0	0	0				
07/23	1,700	7	0	0	0	0	0	0	0	0				
07/30	1,535	2	0	0	0	0	0	0	0	0				
08/06				Trap pulled 7/31/95										
Spring total		124	2	59	548	609	150	5,445	69,736	75,330				93%

Appendix 25. Klamath River at Big Bar weekly fork length data for chinook, steelhead and coho, 1992.

Week	CHINOOK YOY Fork Length					CHINOOK Yearlings Fork Length					STEELHEAD Fry Fork Length					STEELHEAD Parr Fork Length					STEELHEAD Smolt Fork Length					COHO YOY Fork Length					COHO Smolt (1+) Fork Length				
	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d
02/23 - 02/29/92																																			
03/01 - 03/07/92																																			
03/08 - 03/14/92																																			
03/15 - 03/21/92																HIGH FLOWS :TRAP NOT OPERATED																			
03/22 - 03/28/92																																			
03/29 - 04/04/92	9	46	39	88	15.69	60	183	162	225	11.45						22	106	84	175	22.50	1	241	241	241							3	125	93	172	41.58
04/05 - 04/11/92	15	47	38	68	8.51	43	173	144	195	10.97						13	97	79	122	13.68	1	230	230	230		3	48	47	50	1.53	1	105	105	105	
04/12 - 04/18/92	6	41	36	49	4.29	2	146	122	170	33.94						10	113	94	141	16.26	1	160	160	160		2	49	45	52	4.95					
04/19 - 04/25/92	18	52	40	64	7.86	5	170	134	192	21.80						13	122	90	201	34.34	7	223	190	268	24.74						1	98	98	98	
04/26 - 05/02/92	28	53	39	74	9.34	19	161	111	182	18.34						5	101	80	121	16.92	17	201	167	228	17.36	5	52	39	57	7.29	5	156	127	185	25.04
05/03 - 05/09/92	15	62	41	92	12.01	36	152	121	185	14.69						1	95	95	95		47	215	161	328	34.31	1	67	67	67		14	140	116	169	12.40
05/10 - 05/16/92	100	85	47	109	17.63	3	114	111	118	3.51						2	119	118	119	0.71	32	201	163	270	26.45	13	60	48	74	7.97	5	134	105	146	16.54
05/17 - 05/23/92	90	89	48	110	15.63																25	194	152	268	34.13	1	59	59	59						
05/24 - 05/30/92	60	88	58	104	10.18						2	54	51	57	4.24	2	124	120	127	4.95	22	193	149	250	29.56	4	63	59	65	2.51					
05/31 - 06/06/92	90	83	57	98	8.58						13	54	46	68	7.01						75	197	153	252	23.75	7	73	60	97	15.14	2	130	126	134	5.65
06/07 - 06/13/92	90	89	63	111	9.14						13	54	45	63	5.08						25	201	153	242	25.54	3	72	61	80	10.01					
06/14 - 06/20/92	89	90	58	104	9.26						10	59	53	66	4.74						11	187	132	226	31.77	4	70	65	74	4.24					
06/21 - 06/27/92	89	79	59	109	11.07						36	56	44	65	4.57	20	70	59	133	15.64	2	105	78	132	38.18	2	61	57	65	5.65					
06/28 - 07/04/92	86	83	62	102	8.61						42	56	44	65	4.74	11	70	65	77	3.79	1	172	172	172		4	68	64	74	4.89					
07/05 - 07/11/92	90	83	63	100	6.42						19	59	46	67	5.99	2	74	70	78	5.66	1	163	163	163		2	79	75	82	4.98					
07/12 - 07/18/92	81	86	70	109	8.52						9	58	53	65	3.71	2	73	71	75	2.83	1	154	154	154		1	84	84	84		1	128	128	128	
07/19 - 07/25/92	9	81	69	94	7.34						3	59	57	60	1.53	1	70	70	70																
07/26 - 08/01/92	3	75	73	78	2.52						3	61	58	64	3.00	1	66	66	66							1	83	83	83						
08/02 - 08/08/92																																			
08/09 - 08/15/92																HIGH WATER TEMPERATURES :TRAP NOT OPERATED																			
08/16 - 08/22/92																																			
08/23 - 08/29/92																																			
08/30 - 09/05/92																																			
09/06 - 09/12/92																																			
09/13 - 09/19/92																																			
09/20 - 09/26/92																																			
09/27 - 10/03/92																																			
10/04 - 10/10/92																																			
10/11 - 10/17/92																																			
10/18 - 10/24/92																																			
10/25 - 10/31/92	16	159	127	171	11.7											2	91	70	112	29.7	1	197	197	197											
11/01 - 11/07/92	11	126	85	169	37.3											18	94	73	125	12.2	1	85	85	85											
11/08 - 11/14/92	8	106	70	171	37.24											20	102	78	135	16.98	1	146	146	146											
11/15 - 11/21/92	7	159	112	176	22.24											4	98	80	138	26.76															
11/22 - 11/28/92	24	160	90	197	27.69											10	96	72	180	31.62	2	166	161	170	6.36	2	92	81	102	14.85					
11/29 - 12/05/92	52	161	85	195	28.02											2	98	85	111	18.38	2	215	208	221	9.19										
12/06 - 12/12/92	6	164	155	184	11.51						1	66	66	66		1	107	107	107																
Spring Subtotal	968	82	36	111		168	169	111	225		150	57	44	68		105	95	59	201		268	200	78	328		53	64	39	97	11.76	32	137	93	185	21.36
Fall Subtotal	124	154	70	197							1	66	66	66		57	98	70	180		7	170	85	221		2	92	81	102	14.85					
Total	1092	90	36	197		168	169	111	225		151	57	44	68		162	96	59	201		275	200	78	328		55	64	39	102	12.32	32	137	93	185	21.36

Appendix 26. Klamath River at Big Bar weekly fork length data for chinook, steelhead and coho, 1993.

Week	CHINOOK YOY Fork Length					CHINOOK Yearlings Fork Length					STEELHEAD Fry Fork Length					STEELHEAD Parr Fork Length					STEELHEAD Smolt Fork Length					COHO YOY Fork Length					COHO Smolt (1+) Fork Length				
	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d
02/21 - 02/27/93																																				
02/28 - 03/06/93																																				
03/07 - 03/13/93																																				
03/14 - 03/20/93																																				
03/21 - 03/27/93																																				
03/28 - 04/03/93																																				
04/04 - 04/10/93																																				
04/11 - 04/17/93																																				
04/18 - 04/24/93																																				
04/25 - 05/01/93	2	44	43	44	0.71											8	92	73	105	12.89															
05/02 - 05/08/93																3	129	104	146	22.11						1	39	39	39						
05/09 - 05/15/93	11	50	38	67	10.00	4	137	120	148	12.69						2	142	139	144	3.54						1	57	57	57		11	143	119	170	15.12
05/16 - 05/22/93	4	67	45	92	19.26	2	147	146	147	0.71						1	120	120	120		7	167	154	185	11.31						18	140	119	162	13.81
05/23 - 05/29/93	6	52	40	72	11.06																4	166	160	174	6.13	4	56	48	61	5.56	8	137	116	148	11.71
05/30 - 06/05/93	1	116	116	116																	1	137	137	137												
06/06 - 06/12/93	38	100	56	126	22.38											1	122	122	122		2	172	141	203	43.84	1	72	72	72		1	162	162	162	
06/13 - 06/19/93	39	104	52	128	19.60																					4	67	61	74	7.22					
06/20 - 06/26/93	180	99	54	125	12.88						1	57	57	57		2	144	137	151	9.90	2	186	180	192	8.49										
06/27 - 07/03/93	210	96	60	122	7.84																1	210	210	210		4	81	67	91	10.10					
07/04 - 07/10/93	120	96	74	116	6.49						1	59	59	59		1	62	62	62							1	68	68	68						
07/11 - 07/17/93	135	96	78	111	6.30																															
07/18 - 07/24/93	111	98	48	114	9.22																															
07/25 - 07/31/93	107	98	80	116	7.76																															
08/01 - 08/07/93	38	98	75	112	9.54																															
08/08 - 08/14/93	10	100	88	108	7.30											2	117	75	158	58.69																
08/15 - 08/21/93																																				
08/22 - 08/28/93																																				
08/29 - 09/04/93																																				
09/05 - 09/11/93																																				
09/12 - 09/18/93																																				
09/19 - 09/25/93																																				
09/26 - 10/02/93																																				
10/03 - 10/09/93																No Fall trapping conducted in 1993.																			
10/10 - 10/16/93																																				
10/17 - 10/23/93																																				
10/24 - 10/30/93																																				
10/31 - 11/06/93																																				
11/07 - 11/13/93																																				
11/14 - 11/20/93																																				
11/21 - 11/27/93																																				
11/28 - 12/04/93																																				
12/05 - 12/11/93																																				
Spring Subtotal	1012	97	38	128	12.52	6	140	120	148	10.08	2	58	57	59	1.00	20	111	62	158	28.61	17	170	137	210	19.11	16	66	39	91	13.54	38	141	116	170	13.91
Fall Subtotal																																				
Total	1012	97	38	128	12.52	6	140	120	148	10.08	2	58	57	59	1.00	20	111	62	158	28.61	17	170	137	210	19.11										

Appendix 27. Klamath River at Big Bar weekly fork length data for chinook, steelhead and coho, 1994.

Week	CHINOOK YOY Fork Length					CHINOOK Yearlings Fork Length					STEELHEAD Fry Fork Length					STEELHEAD Parr Fork Length					STEELHEAD Smolt Fork Length					COHO YOY Fork Length					COHO Smolt (1+) Fork Length				
	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d
02/20 - 02/26/94						2	132	111	152	28.99						4	82	77	86	3.92	1	215	215	215											
02/27 - 03/05/94	7	34	31	37	1.99	1	174	174	174	0.00						2	80	78	81	2.12															
03/06 - 03/12/94	12	37	34	42	2.19	4	134	92	184	47.64						2	115	84	145	43.10															
03/13 - 03/19/94	18	36	33	40	1.92	4	151	113	183	28.97						11	95	77	125	13.30	1	151	151	151											
03/20 - 03/26/94	25	42	31	56	6.76	3	162	144	180	18.01						9	89	80	101	6.98											2	136	104	167	44.55
03/27 - 04/02/94	19	46	33	60	6.93											9	98	80	127	18.50											1	105	105	105	
04/03 - 04/09/94	91	45	30	62	7.34	1	161	161	161	0.00						30	96	75	144	14.60	4	145	105	178	35.18										
04/10 - 04/16/94	137	53	35	67	8.98	2	205	192	218	18.38						11	96	76	126	13.90	3	150	136	170	17.95										
04/17 - 04/23/94	60	54	36	71	7.22	10	205	185	230	14.59						5	95	81	102	8.08	2	204	182	226	31.11	2	51	50	52	1.41					
04/24 - 04/30/94	78	60	42	82	10.43	15	178	165	203	9.64																									
05/01 - 05/07/94	157	58	43	85	9.29	51	169	124	199	16.85						5	103	90	126	14.80	5	238	214	270	28.73	4	52	44	57	5.56	6	170	156	182	10.33
05/08 - 05/14/94	187	62	41	106	11.82	24	156	121	185	16.10						1	118	118	118		6	210	172	252	25.61	1	52	52	52		22	163	122	188	14.54
05/15 - 05/21/94	195	67	46	120	16.79	9	132	115	148	10.07						1	117	117	117		8	210	181	235	19.67	19	66	49	77	7.73	1	162	162	162	
05/22 - 05/28/94	209	82	46	137	17.27	1	141	141	141	0.00						2	159	157	161	2.83	3	205	185	215	17.04	3	76	61	87	13.32	4	144	119	182	27.16
05/29 - 06/04/94	179	87	48	115	13.15																36	200	172	245	15.79	2	71	63	78	10.61	1	125	125	125	
06/05 - 06/11/94	210	88	54	116	11.62											3	147	134	164	15.40	84	198	172	292	17.38	1	56	56	56						
06/12 - 06/18/94	210	85	54	112	9.19																5	199	167	216	19.58	1	72	72	72						
06/19 - 06/25/94	210	81	58	99	7.49																2	157	114	220	74.95										
06/26 - 07/02/94	190	77	57	95	5.88						4	55	52	57	2.22						2	178	139	217	55.15										
07/03 - 07/09/94	210	76	60	100	5.54						14	56	47	62	4.10	1	160	160	160		1	203	203	203		3	65	51	76	12.76					
07/10 - 07/16/94	120	76	50	100	8.10						5	58	56	61	2.39											1	83	83	83						
07/17 - 07/23/94																																			
07/24 - 07/30/94																																			
07/31 - 08/06/94																																			
08/07 - 08/13/94																																			
08/14 - 08/20/94																																			
08/21 - 08/27/94																																			
08/28 - 09/03/94																																			
09/04 - 09/10/94																																			
09/11 - 09/17/94	6	86	68	105	15.83																														
09/18 - 09/24/94	9	88	70	102	10.23											1	88	88	88																
09/25 - 10/01/94	16	86	67	114	13.88											1	83	83	83							1	67	67	67						
10/02 - 10/08/94	10	92	75	111	10.7											1	93	93	93																
10/09 - 10/15/94	9	88	68	115	15.5											1	85	85	85		1	270	270	270											
10/16 - 10/22/94	3	102	86	120	17.09											2	132	77	187	77.80															
10/23 - 10/29/94	18	97	67	124	15.50											2	90	82	98	11.30															
10/30 - 11/05/94	18	125	86	172	27.92											1	98	98	98																
11/06 - 11/12/94	15	109	79	187	32.07											3	82	79	87	4.36	1	193	193	193		4	82	75	87	5.92					
11/13 - 11/19/94	49	134	75	166	22.48											7	78	70	87	5.58						2	85	83	87	2.83					
11/20 - 11/26/94	62	134	82	193	27.25											5	148	80	202	60.20	2	201	190	212	15.56	12	81	68	87	5.89					
11/27 - 12/03/94	102	140	70	182	30.11											14	79	68	98	9.84	2	193	163	223	42.43										
12/04 - 12/10/94																																			
12/11 - 12/17/94																																			
Spring Subtotal	2524	78	30	120	17.29	127	165	92	230	25.48	23	56	47	62	3.48	96	99	75	164	20.16	163	198	105	292	23.93	37	65	44	87	10.68	37	158	104	188	21.16
Fall Subtotal	317	125	66	193	31.76						0					38	93	68	202	34.43	6	208	163	270	33.31	19	80	67	87	6.33					
Total	2841	82	30	193	25.40	127	165	92	230	25.48	23	56	47	62	3.48	134	97	68	202	25.22	169	198	105	292	24.41	56	70	44	87	12.09	37	158	104	188	21.16

Appendix 28. Klamath River at Big Bar weekly fork length data for chinook, steelhead and coho, 1995.

Week	CHINOOK YOY Fork Length					CHINOOK Yearlings Fork Length					STEELHEAD Fry Fork Length					STEELHEAD Parr Fork Length					STEELHEAD Smolt Fork Length					COHO YOY Fork Length					COHO Smolt (1+) Fork Length				
	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d
02/19 - 02/25/95																																				
02/26 - 03/04/95																																				
03/05 - 03/11/95																																				
03/12 - 03/18/95																																				
03/19 - 03/25/95																Trap not operated due to high river flows.																				
03/26 - 04/01/95																																				
04/02 - 04/08/95						3	110	93	128	17.50						4	96	72	141	30.94																
04/09 - 04/15/95						2	113	103	123	14.14						2	81	67	94	19.09	1	171	171	171												
04/16 - 04/22/95						2	106	100	111	7.78						2	73	71	75	2.83	1	190	190	190												
04/23 - 04/29/95	3	55	51	57	3.46											6	80	71	91	8.14																
04/30 - 05/06/95						2	119	118	120	1.41	1	26	26	26		3	91	61	140	43.02																
05/07 - 05/13/95	1	56	56	56	56.00	6	118	111	128	5.71	1	39	39	39		1	82	82	82												2	133	120	145	17.68
05/14 - 05/20/95	2	59	50	68	12.73	8	122	111	133	8.00											2	209	189	228	27.58	1	45	45	45		4	145	127	164	18.46
05/21 - 05/27/95	6	63	43	94	18.96	6	124	113	132	6.57											2	120	98	141	30.41						5	142	127	153	11.35
05/28 - 06/03/95	12	79	49	116	26.08	8	128	115	144	9.29						1	113	113	113		2	150	148	151	2.12										
06/04 - 06/10/95	54	98	46	124	17.71	4	135	125	143	7.62						1	116	116	116		3	173	153	194	20.55										
06/11 - 06/17/95	55	100	56	125	15.15																2	179	165	192	19.09	6	66	57	71	5.00					
06/18 - 06/24/95	146	100	60	130	12.23																					1	28	28	28						
06/25 - 07/01/95	210	92	72	120	7.93																2	147	144	150	4.24	4	79	72	85	5.71					
07/02 - 07/08/95	180	89	68	105	6.34						1	54	54	54		1	139	139	139		1	159	159	159		1	79	79	79						
07/09 - 07/15/95	210	92	73	114	7.16						1	56	56	56		3	101	60	123	35.54																
07/16 - 07/22/95	210	94	76	114	7.57						1	60	60	60		5	55	32	69	13.85																
07/23 - 07/29/95	210	94	76	116	6.98						2	58	55	60	3.54	1	58	58	58							1	67	67	67						
07/30 - 08/05/95	27	95	70	118	9.29						1	56	56	56		Trapping terminated on July 31.																				
08/06 - 08/12/95																																				
08/13 - 08/19/95																																				
08/20 - 08/26/95																																				
08/27 - 09/02/95																																				
09/03 - 09/09/95																																				
09/10 - 09/16/95																																				
09/17 - 09/23/95																																				
09/24 - 09/30/95																																				
10/01 - 10/07/95																																				
10/08 - 10/14/95																																				
10/15 - 10/21/95																																				
10/22 - 10/28/95																																				
10/29 - 11/04/95																																				
11/05 - 11/11/95																																				
11/12 - 11/18/95																																				
11/19 - 11/25/95																																				
11/26 - 12/02/95																																				
12/03 - 12/09/95																																				
Spring Subtotal	1326	93	43	130	10.54	41	122	93	144	10.79	8	51	26	60	11.21	30	84	32	141	27.22	16	165	98	228	28.73	14	67	28	85	15.06	11	142	120	164	14.39
Fall Subtotal																																				
Total	1326	93	43	130	10.54	41	122	93	144	10.79	8	51	26	60	11.21	30	84	32	141	27.22	16	165	98	228	28.73	14	67	28	85	15.06	11	142	120	164	14.39

Appendix 29. Trinity River, Willow Creek weekly fork length data for chinook, steelhead and coho, 1992.

Week	CHINOOK Fork Length n	mean	min	max	s.d	STEELHEAD Fry Fork Length n	mean	min	max	s.d	STEELHEAD Parr Fork Length n	mean	min	max	s.d	STEELHEAD Smolt Fork Length n	mean	min	max	s.d	HATCHERY STEELHEAD Fork Length n	mean	min	max	s.d	COHO YOY Fork Length n	mean	min	max	s.d	COHO Smolt (1+) Fork Length n	mean	min	max	s.d
02/23 - 02/29/92	4	99	40	125	39.66						16	96	76	140	17.74	4	156	120	180	25.93																
03/01 - 03/07/92	19	61	32	140	37.59						3	90	85	95	5.00	1	130	130	130																	
03/08 - 03/14/92	32	41	34	110	12.70						3	115	82	170	47.72	2	185	171	198	19.09						1	37	37	37						
03/15 - 03/21/92	36	38	33	43	2.32						3	94	88	103	7.94	3	184	168	199	21.92						2	45	39	50	7.78					
03/22 - 03/28/92	55	41	34	108	9.89						13	104	87	139	16.35	2	205	188	221	23.33						4	42	36	47	4.50					
03/29 - 04/04/92	92	41	36	67	4.52						16	110	84	128	13.88	16	216	176	295	31.59	1	202	202	202		11	44	37	55	5.06					
04/05 - 04/11/92	113	56	38	125	12.99						33	109	87	156	18.17	73	202	144	245	25.31	191	208	170	237	14.75	34	49	41	62	5.20	3	139	125	152	13.53
04/12 - 04/18/92	70	47	37	140	13.59						3	95	71	113	21.63	35	179	170	196	14.73	24	211	210	212	1.41	7	44	36	52	5.59	1	110	110	110	
04/19 - 04/25/92	120	56	39	85	10.49						22	114	76	150	18.11	21	193	155	250	20.88	42	197	112	239	20.88	9	48	38	56	6.16					
04/26 - 05/02/92	110	59	44	132	10.72						15	118	94	163	21.16	68	187	156	236	16.92	118	208	168	297	19.84	6	53	47	56	3.39	29	169	131	198	19.15
05/03 - 05/09/92	68	60	46	87	8.50	1	42	42	42		2	95	92	98	4.24	59	177	121	220	18.04	82	208	163	245	16.12	9	58	65	64	4.27	27	168	150	201	12.17
05/10 - 05/16/92	90	70	47	109	13.78						21	130	98	158	17.96	138	179	152	216	15.37	282	202	175	232	14.91	42	61	51	79	5.93	25	163	145	183	9.97
05/17 - 05/23/92	90	76	51	109	15.37	9	49	43	54	7.78	37	116	101	150	10.70	108	171	149	192	11.56	287	202	168	245	17.47	26	63	55	73	4.90	6	168	150	188	14.43
05/24 - 05/30/92	90	78	49	107	12.23	18	55	45	66	6.31	7	121	116	129	5.56	67	172	127	206	16.17	180	203	112	246	22.69	44	64	54	76	6.71	18	161	149	185	9.06
05/31 - 06/06/92	90	76	51	101	10.46	74	58	44	72	6.77	8	103	71	123	23.11	28	167	113	200	24.68	170	204	129	248	18.14	50	67	57	96	7.33	21	161	135	198	12.80
06/07 - 06/13/92	90	80	49	105	9.37	81	59	47	66	4.99	57	74	63	150	17.84	8	161	138	182	19.46	117	210	165	250	17.46	26	69	58	115	10.53	36	163	133	188	9.64
06/14 - 06/20/92	27	102	77	132	14.56						1	-	-	-							10	212	171	237	20.61						6	173	157	181	8.75
06/21 - 06/27/92	120	89	71	122	10.42	86	59	47	66	4.63	113	78	64	115	13.49	17	165	127	235	29.70	50	206	168	258	19.52	18	76	63	103	8.70	33	169	120	199	16.34
06/28 - 07/04/92	120	90	70	116	9.59	23	59	42	65	5.81	9	77	66	125	19.93	2	163	140	185	31.82	8	205	182	234	18.63	5	78	57	108	18.83	5	155	133	180	19.46
07/05 - 07/11/92	87	92	71	122	11.52	13	65	65	66	0.58	18	86	68	137	20.14	4	162	125	199	37.00	1	264	264	264		1	109	109	109		1	153	153	153	
07/12 - 07/18/92	120	86	71	118	7.79	5	62	55	66	4.56	23	75	57	89	7.99	6	157	133	182	20.14						5	105	91	115	9.35					
07/19 - 07/25/92	90	94	75	124	12.27	2	64	64	64	0	6	75	68	86	6.62	3	144	135	152	12.02											2	176	168	183	10.61
07/26 - 08/01/92	60	106	68	130	12.83	2	-	-	-	-	7	72	68	79	4.79	2	143	132	154	15.56											1	131	131	131	
08/02 - 08/08/92	90	112	88	135	10.51	1	51	51	51	0	10	83	70	98	9.04	6	162	138	184	19.89															
08/09 - 08/15/92	90	112	81	133	10.74						7	93	67	135	30.38	4	155	151	158	3.79						1	110	110	110						
08/16 - 08/22/92	90	114	97	133	8.56						4	88	80	94	7.09	4	179	144	255	38.92	1	225	225	225							1	137	137	137	
08/23 - 08/29/92	46	108	85	128	10.71						4	83	82	85	1.53	6	164	146	183	16.33															
08/30 - 09/05/92	48	109	95	140	8.24						6	90	75	106	12.05	1	143	143	143																
09/06 - 09/12/92	60	111	89	135	9.30						6	90	83	99	5.79																				
09/13 - 09/19/92	60	111	91	124	7.07						13	102	81	132	15.22	1	110	90	124	11.2															
09/20 - 09/26/92	54	113	70	135	12.93						2	133	133	133	0.00	2	162	158	166	5.66															
09/27 - 10/03/92	60	113	68	140	13.4						3	116	94	130	19.5	1	155	155	155																
10/04 - 10/10/92	120	148	96	189	21.6						11	125	87	163	23.6	6	178	152	204	22.8															
10/11 - 10/17/92	90	161	105	193	17.42						7	118	94	162	27.60	1	190	190	190																
10/18 - 10/24/92	90	161	114	196	17.24						9	133	91	155	21.51	5	195	187	206	9.71															
10/25 - 10/31/92	90	157	104	192	19.52						9	150	150	150	0.00	4	182	182	182	0															
11/01 - 11/07/92	68	156	76	207	31.37						28	107	65	154	23.51	1	224	224	224																
11/08 - 11/14/92	90	133	73	200	29.04						4	118	99	135	14.83	7	205	175	235	18.54															
11/15 - 11/21/92	88	166	98	196	15.54						2	119	116	122	4.24	4	206	192	230	18.19															
11/22 - 11/28/92	88	168	96	193	13.50						1	81	81	81		2	196	189	202	9.19															
11/29 - 12/05/92	25	155	112	183	15.94						4	101	67	163	42.74	1	164	164	164																
12/06 - 12/12/92											1	125	125	125																					
Spring Subtotal	2351	81	32	140	26.09	297	59	42	72	5.90	486	96	57	170	23.40	693	178	90	295	27.66	1564	205	112	297	18.69	301	62	36	115	13.20	216	165	110	201	14.71
Fall Subtotal	809	153	68	207	25.28	0					79	116	65	163	24.98	32	194	152	235	21.15	0														
Total	3160	99	32	207	40.62	297	59	42	72	5.90	565	98	57	170	24.69	725	179	90	295	27.54	1564	205	112	297	18.69	301	62	36	115	13.20	216	165	110	201	14.71

Appendix 30. Trinity River, Willow Creek weekly fork length data for chinook, steelhead and coho, 1993.

Week	CHINOOK Fork Length n	mean	min	max	s.d	STEELHEAD Fry Fork Length n	mean	min	max	s.d	STEELHEAD Parr Fork Length n	mean	min	max	s.d	STEELHEAD Smolt Fork Length n	mean	min	max	s.d	HATCHERY STEELHEAD Fork Length n	mean	min	max	s.d	COHO YOY Fork Length n	mean	min	max	s.d	COHO Smolt (1+) Fork Length n	mean	min	max	s.d
02/21 - 02/27/93																																				
02/28 - 03/06/93																																				
03/07 - 03/13/93																																				
03/14 - 03/20/93											HIGH FLOWS :TRAP NOT OPERATED																									
03/21 - 03/27/93																																				
03/28 - 04/03/93	2	38	37	38	0.71	0					2	115	100	130	21.21	4	164	150	172	11.93	0										1	175	175	175	
04/04 - 04/10/93	6	40	37	43	2.16	0					2	104	103	104	0.71	7	167	119	194	30.59	0					1	36	36	36		7	157	122	190	23.95
04/11 - 04/17/93	27	44	38	69	8.68	0					5	106	99	112	5.18	4	183	153	211	23.73	1	213	213	213	0.00	2	37	35	38	2.12	4	149	128	161	14.91
04/18 - 04/24/93	31	50	34	134	23.13	0					2	114	113	114	0.71	12	182	160	216	19.98	15	223	191	256	18.98	2	49	38	59	14.85	17	167	130	194	17.21
04/25 - 05/01/93	41	41	36	48	2.25	0					2	100	97	102	3.54	16	179	153	251	23.66	13	202	184	232	18.86	6	42	35	52	5.71	12	150	117	178	20.41
05/02 - 05/08/93	45	44	38	83	8.31	0					1	96	96	96		6	178	149	200	18.01	3	239	235	242	4.95	5	50	45	55	3.64	6	164	119	188	32.48
05/09 - 05/15/93	52	50	32	86	10.95	1	28	28	28		4	105	89	119	12.50	17	173	144	197	15.16	11	212	190	238	18.86	7	50	46	67	7.21	24	168	135	219	15.04
05/16 - 05/22/93	28	50	36	81	10.90	1	-	-	-		3	139	102	162	32.15	31	171	151	186	9.74	8	204	182	236	22.04	5	52	44	61	6.07	45	160	120	191	15.40
05/23 - 05/29/93	24	58	39	96	13.83	6	31	29	34	2.07	5	143	106	158	21.18	45	171	143	207	13.67	15	208	170	252	25.08	5	57	48	65	6.43	57	163	132	185	11.07
05/30 - 06/05/93	5	64	53	84	13.37	2	41	41	41		0					3	182	175	188	9.19	0														
06/06 - 06/12/93	83	78	46	114	18.08	1	32	32	32		1	148	148	148		7	158	144	175	11.91	1	210	210	210	0.00	5	65	53	79	9.65	3	157	152	160	4.16
06/13 - 06/19/93	210	83	47	120	13.17	1	29	29	29		3	130	115	139	13.08	11	161	128	178	16.59	4	235	233	237	2.83	12	66	56	79	7.44	7	163	112	191	25.65
06/20 - 06/26/93	150	80	49	109	13.26	1	-	-	-		5	118	113	122	6.36	6	169	167	170	21.69	2	181	156	206	xxx	3	70	68	73	2.64	2	164	161	166	3.54
06/27 - 07/03/93	208	83	53	118	11.74	4	53	33	67	14.38	2	78	54	102	33.94	0					0					8	72	58	88	12.37					
07/04 - 07/10/93	180	80	46	110	10.43	9	58	49	69	7.48	1	145	145	145		0					0					5	58	53	66	5.54					
07/11 - 07/17/93	210	80	58	104	7.71	7	52	49	58	2.67	5	57	54	65	4.60	0					0					4	62	60	73	5.69					
07/18 - 07/24/93	150	80	57	104	8.06	3	50	48	55	4.04	2	69	65	73	5.66	0					0					1	73	73	73						
07/25 - 07/31/93	210	82	58	105	7.30	4	56	52	62	4.35	7	70	60	97	13.03	0					0					2	67	60	73	9.19					
08/01 - 08/07/93	210	86	67	117	7.59	4	59	52	62	3.97	23	68	52	86	8.22	1	171	171	171		0					1	69	69	69						
08/08 - 08/14/93	150	89	70	112	6.44	0					10	75	66	91	6.89	0					0														
08/15 - 08/21/93	208	94	80	164	8.42	1	53	53	53		4	70	60	78	8.43	1	174	174	174		0														
08/22 - 08/28/93	180	96	79	115	5.98	0					3	65	65	65		0					0														
08/29 - 09/04/93	209	102	87	131	7.39	0					13	90	65	146	22.78	0					0					1	75	75	75						
09/05 - 09/11/93	150	106	90	136	8.29	0					5	79	61	93	12.60	0					0														
09/12 - 09/18/93	180	106	87	133	6.95	0					10	108	75	177	38.77	1	164	164	164		0														
09/19 - 09/25/93	180	108	84	129	6.85	0					9	111	84	153	25.64	1	167	167	167		0														
09/26 - 10/02/93	180	110	85	127	6.76	0					5	103	77	119	17.3	1	172	172	172		0														
10/03 - 10/09/93	179	129	90	168	16.3	0					2	136	107	165	41	0					0					1	90	90	90						
10/10 - 10/16/93	150	136	95	172	13.21	0					2	152	112	165	56.57	1	192	192	192		0														
10/17 - 10/23/93	180	138	50	172	15.47	0					8	131	108	177	22.70	1	213	213	213		0					1	88	88	88						
10/24 - 10/30/93	150	133	94	165	16.38	0					9	114	101	135	11.61	1	146	146	146		0					1	120	120	120						
10/31 - 11/06/93	172	122	92	173	15.10	0					12	115	99	133	9.48	4	175	164	183	9.13	0														
11/07 - 11/13/93	150	130	84	183	18.35	0					3	132	89	165	38.97	5	218	197	244	16.70	0														
11/14 - 11/20/93	105	127	80	171	15.62	0					4	130	76	180	44.15	3	190	171	212	20.66	0														
11/21 - 11/27/93	16	129	77	167	20.57	0					1	97	97	97		0					0														
11/28 - 12/04/93	6	108	79	136	28.30	0					12	115	65	147	27.51	0					0														
12/05 - 12/11/93	7	142	128	158	11.48	0					0					0					0														
Spring Subtotal	3129	86	32	164	18.10	44	49	29	69	11.79	129	91	52	177	29.26	173	172	119	251	17.28	73	212	170	256	21.45	75	59	35	88	12.22	185	162	112	219	16.43
Fall Subtotal	1295	128	50	183	17.41	0					58	119	65	192	25.21	16	194	114	244	31.36	0					3	99	88	120						
Total	4424	98	32	183	26.08	44	49	29	69	11.79	187	100	52	192	30.99	189	174	114	251	19.62	73	212	170	256	21.45										

Appendix 31. Trinity River, Willow Creek weekly fork length data for chinook, steelhead and coho, 1994.

Week	CHINOOK Fork Length n	mean	min	max	s.d	STEELHEAD Fry Fork Length n	mean	min	max	s.d	STEELHEAD Parr Fork Length n	mean	min	max	s.d	STEELHEAD Smolt Fork Length n	mean	min	max	s.d	HATCHERY STEELHEAD Fork Length n	mean	min	max	s.d	COHO YOY Fork Length n	mean	min	max	s.d	COHO Smolt (1+) Fork Length n	mean	min	max	s.d
02/20 - 02/26/94	5	32	28	39	4.04	0					3	158	131	205	41.10	1	142	142	142	0.00	0										2	109	101	117	11.31
02/27 - 03/05/94	9	31	25	35	3.84	0					3	128	118	144	14.00	0					0														
03/06 - 03/12/94	13	39	32	97	17.36	0					11	107	81	147	23.13	0					0														
03/13 - 03/19/94	14	70	30	154	42.79	0					40	103	71	158	19.51	7	170	115	216	36.55	0														
03/20 - 03/26/94	33	57	30	153	33.86	0					30	114	79	184	28.22	6	200	186	217	12.13	4	220	207	240	14.54	3	59	49	65	8.70	9	147	116	178	19.34
03/27 - 04/02/94	62	41	29	75	9.32	0					14	107	75	149	20.96	5	212	180	243	23.30	1	216	216	216	0.00	2	46	36	56	14.14	1	130	130	130	
04/03 - 04/09/94	170	50	33	75	11.61	0					10	108	84	149	18.35	6	189	150	214	23.46	3	236	233	238	2.52	27	35	32	37	1.34					
04/10 - 04/16/94	190	48	31	75	11.18	0					20	104	75	139	15.51	21	180	138	224	22.25	3	228	226	230	2.00	73	36	33	52	3.22	1	106	106	106	0.00
04/17 - 04/23/94	208	48	31	76	10.01	0					25	105	79	166	19.56	45	169	120	218	24.37	4	231	215	251	15.01	11	37	34	48	3.93	5	165	161	168	2.65
04/24 - 04/30/94	148	61	38	138	13.77	0					25	103	88	130	10.61	39	173	118	223	21.58	5	213	204	228	9.09	2	35	33	36	2.12	14	158	120	187	19.57
05/01 - 05/07/94	192	58	34	94	9.90	0					22	107	77	135	14.22	192	175	125	257	22.00	26	212	180	253	20.46	10	46	43	49	2.27	81	158	122	178	11.29
05/08 - 05/14/94	176	56	36	125	10.06	0					10	112	98	130	13.64	117	176	136	230	18.54	33	212	190	240	12.32	18	54	41	80	8.84	39	158	139	205	11.17
05/15 - 05/21/94	202	58	37	96	10.36	0					3	111	102	119	8.54	56	179	141	241	18.51	16	208	186	241	15.77	47	53	41	60	4.77	19	152	126	174	15.19
05/22 - 05/28/94	180	61	40	98	12.56	1	52	52	52	0.00	6	110	101	132	11.75	7	184	165	200	11.33	9	206	189	234	16.76	145	53	42	65	3.69	1	140	140	140	
05/29 - 06/04/94	186	67	42	100	13.87	2	60	55	65	5.00	5	114	103	120	9.29	30	174	145	194	15.54	19	216	198	241	14.73	52	55	45	62	3.80	3	152	140	175	19.92
06/05 - 06/11/94	179	76	48	99	11.37	13	53	49	60	4.50	7	148	122	162	14.74	19	190	163	234	19.92	45	198	163	225	14.75	28	56	47	65	4.76	4	152	135	163	11.67
06/12 - 06/18/94	210	80	46	112	11.47	19	52	39	66	7.02	9	83	52	128	34.01	10	176	115	220	26.98	32	202	176	259	18.64	56	58	43	67	4.96	5	163	155	172	6.98
06/19 - 06/25/94	180	82	51	104	10.71	4	56	49	63	5.72	10	68	57	78	7.47	4	156	130	193	32.91	29	198	164	235	17.52	26	60	53	67	3.91	1	107	107	107	
06/26 - 07/02/94	210	81	57	108	9.92	12	57	48	67	6.95	17	68	55	113	12.97	7	183	161	198	15.68	14	199	178	233	15.97	22	63	57	76	4.62					
07/03 - 07/09/94	210	80	61	115	9.38	12	60	44	81	9.71	7	78	57	150	32.45	3	168	168	168	0.00	8	203	182	215	11.26	12	65	57	78	5.91					
07/10 - 07/16/94	210	81	57	112	8.70	6	53	48	58	3.99	21	77	53	149	29.67	2	167	167	167	0.00	4	191	183	204	11.59	10	64	56	75	6.49					
07/17 - 07/23/94	210	83	55	108	8.37	3	53	50	55	2.52	20	78	54	155	26.82	2	144	143	145	1.41	7	183	149	209	21.11	6	67	62	70	2.93					
07/24 - 07/30/94	210	87	63	109	7.90	1	58	58	58		17	95	50	165	36.27	1	150	150	150	0.00	2	183	165	200	24.75	1	62	62	62						
07/31 - 08/06/94	210	88	70	115	7.67	2	64	59	68	6.36	8	105	63	167	40.67	0					3	192	173	210	18.50	2	60	54	65	7.78	1	111	111	111	
08/07 - 08/13/94	210	90	56	118	6.96	5	58	48	69	7.70	9	105	70	160	31.03	5	172	149	197	18.11	5	187	162	217	24.02	3	74	65	79	7.61					
08/14 - 08/20/94	210	93	68	111	6.37	3	57	54	60	3.00	16	97	61	134	23.73	4	163	146	178	13.15	0					1	82	82	82						
08/21 - 08/27/94	210	90	71	109	6.31	0					5	82	70	98	12.11	4	161	138	183	31.82	1	185	185	185	0.00	1	83	83	83						
08/28 - 09/03/94	210	92	60	111	6.61	0					11	115	63	172	41.46	2	171	151	190	27.58	1	163	163	163	0.00						1	122	122	122	
09/04 - 09/10/94	210	93	72	116	7.66	0					11	100	63	190	37.67	0					1	182	182	182	0.00										
09/11 - 09/17/94	210	94	65	115	8.38	2	58	57	59	0.00	25	104	57	152	25.84	0					1	200	200	200	0.00										
09/18 - 09/24/94	210	98	67	125	8.69	0					10	99	84	117	12.32	0					0														
09/25 - 10/01/94	210	97	71	117	9.53	0					4	118	81	168	31.66	1	168	168	168	0	0														
10/02 - 10/08/94	209	116	67	164	24.8	0					33	110	76	163	20.2	1	144	144	144	0	0					2	78	71	85	9.90					
10/09 - 10/15/94	210	137	72	175	20.7	0					6	112	80	158	30	3	190	180	196	8.96	0														
10/16 - 10/22/94	207	130	52	166	24.72	0					3	115	99	127	14.57	0					0														
10/23 - 10/29/94	205	135	66	170	20.48	0					13	120	59	168	30.80	4	192	188	200	5.32	0					2	79	74	84	7.07	1	102	102	102	
10/30 - 11/05/94	188	125	58	171	28.10	0					4	112	101	123	9.04	15	205	179	238	16.85	0					38	74	61	96	7.12					
11/06 - 11/12/94	44	112	62	168	33.39	9	61	52	67	5.43	18	99	60	172	35.84	3	217	212	221	6.36	0					18	75	60	92	7.40					
11/13 - 11/19/94	54	111	65	174	28.75	4	60	54	68	5.77	14	91	52	122	24.66	1	245	245	245	0.00	0					12	75	65	87	7.45					
11/20 - 11/26/94	24	100	70	162	21.74	4	64	58	67	4.03	11	90	68	132	22.92	0					0					5	80	72	90	7.77					
11/27 - 12/03/94	5	87	76	97	9.68	2	60	55	65	7.07	1	90	90	90	0.00	0					0					3	79	70	95	13.65					
12/04 - 12/10/94	7	88	80	94	5.53	1	50	50	50	0.00	0					0					0					2	75	75	75						
12/11 - 12/17/94	3	93	73	103	17.32	1	45	45	45	0.00	1	74	74	74	0.00	0					0														
Spring Subtotal	5297	77	25	154	19.46	85	55	39	81	7.00	434	100	50	205	28.03	596	176	115	257	21.59	276	204	149	259	18.71	558	52	33	83	10.05	187	155	101	205	15.40
Fall Subtotal	1156	126	52	175	26.36	20	60	45	68	6.22	104	104	52	172	27.09	27	202	144	245	20.43	0					82	75	60	96	7.37	1	102	102	102	
Total	6453	86	25	175	28.16	105	56	39	81	7.06	538	101	50	205	27.89	623	177	144	257	22.27	276	204	149	259	18.71	640	55	32	96	12.51	188	155	101	205	15.84

Appendix 32. Trinity River, Willow Creek weekly fork length data for chinook, steelhead and coho, 1995.

Week	CHINOOK Fork Length					STEELHEAD Fry Fork Length					STEELHEAD Parr Fork Length					STEELHEAD Smolt Fork Length					HATCHERY STEELHEAD Fork Length					COHO YOY Fork Length					COHO Smolt (1+) Fork Length					COHO Smolt (2+) Fork Length				
	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d	n	mean	min	max	s.d
02/19 - 02/25/95	2	62	35	89	38.18	0					3	116	71	139	38.70	0					0																			
02/26 - 03/04/95	4	85	35	109	34.02	0					2	77	76	77	0.71	0					0										2	105	100	110	7.07					
03/05 - 03/11/95	4	51	37	90	26.01	0					0					0					0										2	104	98	109	7.78					
03/12 - 03/18/95	0					0					0					0					0																			
03/19 - 03/25/95	0					0					0					0					0																			
03/26 - 04/01/95	1	38	38	38	0.00	2	243	195	290	67.18	0					2	243	195	290	67.18	1	245	245	245	0.00															
04/02 - 04/08/95	18	69	34	120	36.96	9	197	155	260	35.02	0					9	197	155	260	35.02	12	225	207	270	16.76						8	153	122	195	21.17	2	207	193	221	19.80
04/09 - 04/15/95	9	102	38	216	58.46	3	169	136	206	35.12	1	92	92	92	0.00	3	169	136	206	35.12	36	221	196	249	15.74						9	192	152	266	42.21					
04/16 - 04/22/95	41	59	36	114	28.81	19	180	146	250	26.31	3	98	86	118	17.67	19	180	146	250	26.31	78	214	90	275	28.92						12	161	138	173	9.42					
04/23 - 04/29/95	13	80	37	120	31.68	16	164	104	222	28.16	5	94	83	105	8.76	16	164	104	222	28.16	16	211	185	240	14.16	1	78	78	78		6	174	128	210	29.04					
04/30 - 05/06/95	13	87	38	130	32.07	14	164	137	200	16.42	4	106	90	148	28.04	14	164	137	200	16.42	75	214	178	265	16.75						55	181	117	247	28.55					
05/07 - 05/13/95	30	83	32	177	44.89	17	167	143	212	21.14	0					17	167	143	212	21.14	98	212	182	251	15.04						145	165	92	270	21.82	1	200	200	200	
05/14 - 05/20/95	21	89	42	127	30.33	33	167	133	215	19.51	0					33	167	133	215	19.51	101	209	152	274	18.87						113	162	122	255	18.64					
05/21 - 05/27/95	23	90	47	146	28.00	16	163	138	217	16.74	5	94	83	112	12.66	16	163	138	217	16.74	58	205	167	251	18.09						68	153	105	192	17.09					
05/28 - 06/03/95	9	90	45	115	26.04	8	163	154	181	10.03	2	102	95	109	9.90	8	163	154	181	10.03	18	199	164	227	18.61						71	155	103	197	12.92					
06/04 - 06/10/95	12	73	45	159	33.12	3	156	151	163	6.11	6	105	94	125	11.08	3	156	151	163	6.11	6	198	171	212	14.55	1	70	70	70		55	148	98	192	16.83					
06/11 - 06/17/95	26	86	50	102	14.57	4	153	147	163	7.04	6	89	80	105	9.50	4	153	147	163	7.04	4	208	204	212	3.30						19	142	110	166	16.37					
06/18 - 06/24/95	91	96	75	155	9.25	1	164	164	164	0.00	3	84	74	89	8.39	1	164	164	164	0.00	1	213	213	213	0.00						2	151	150	152	1.41					
06/25 - 07/01/95	180	93	73	111	7.15	1	177	177	177	0.00	2	114	103	124	14.85	1	177	177	177	0.00	4	203	178	216	16.94						1	175	175	175	0.00					
07/02 - 07/08/95	210	92	65	115	8.52	0					0					0					2	199	196	202	4.95															
07/09 - 07/15/95	169	88	69	112	8.09	0					0					0					0																			
07/16 - 07/22/95	200	90	69	121	9.39	0					3	79	66	100	18.36	0					0																			
07/23 - 07/29/95	207	89	74	109	7.34	1	165	165	165	0.00	2	104	67	141	52.33	1	165	165	165	0.00	0																			
07/30 - 08/05/95	51	87	71	115	8.25	0					1	71	71	71	0.00	0					0																			
08/06 - 08/12/95																																								
08/13 - 08/19/95											Trapping terminated 7/31/95.																													
08/20 - 08/26/95																																								
08/27 - 09/02/95																																								
09/03 - 09/09/95																																								
09/10 - 09/16/95																																								
09/17 - 09/23/95																																								
09/24 - 09/30/95																																								
10/01 - 10/07/95																																								
10/08 - 10/14/95																																								
10/15 - 10/21/95											Fall trapping not funded.																													
10/22 - 10/28/95																																								
10/29 - 11/04/95																																								
11/05 - 11/11/95																																								
11/12 - 11/18/95																																								
11/19 - 11/25/95																																								
11/26 - 12/02/95																																								
12/03 - 12/09/95																																								
12/10 - 12/16/95																																								
Spring Subtotal	1334	89	32	216	16.80	147	52	25	65	11.16	48	96	66	148	19.24	147	169	104	290	25.10	510	211	90	275	19.80	2	74	70	78	5.66	568	161	92	270	22.92	3	204	193	221	14.57
Fall Subtotal	N/A	N/A				N/A					N/A					N/A					N/A																			
Total	1334	89	32	216	16.80	147	52	25	65	11.16	48	96	66	148	19.24	147	169	104	290	25.10	510	211	90	275	19.80	2	74	70	78	5.66	568	161	92	270	22.92	3	204	193	221	14.57

Appendix 33.

1992 Klamath River Basin CWT realease groups.

Trinity River releases groups								Tagging rates				CWT recoveries at trap site			Migration rates	
Tag code	Race	Brood year	Release Type	Size @ release #/lb	Size @ release mm	Release site (rkm)	Release date/s	# Correctly Tagged	shed tags	# not tagged	Production Multiplier	Date of first capture	Days after Initial release	# Captured	Initial Rate (rkm/day)	10-90% Mean Rate km/d
CDFG Natural Stocks Codes																
[1] 6-1-8-3-1	chinook	91'	f	436	46	172.5	03/13-03/30/92	8,069	188	N/A	N/A	05/21/92	70	15	1.9-2.6	2/
[1] 6-1-8-3-3	chinook	91'	f	198	60	147.7	04/09-04/24/92	9,058	331	N/A	N/A	05/21/92	43	40	2.6-4.1	2/
[1] 6-1-8-3-4	chinook	91'	f	205	60	135.0	04/10-04/30/92	9,408	143	N/A	N/A	05/20/92	41	56	2.5-4.8	2/
[1] 6-1-8-3-6	chinook	91'	f	189	62	147.7	04/28-04/29/92	9,642	64	N/A	N/A	05/23/92	26	47	4.4-4.5	2.5
[1] 6-1-8-3-7	chinook	91'	f	167	64	147.7	04/29-05/05/92	10,235	95	N/A	N/A	05/12/92	14	65	8.1-14.2	2/
[1] 6-1-8-3-8	chinook	91'	f	160	64	147.7	05/05-05/07/92	4,260	10	N/A	N/A	05/27/92	23	36	4.9-5.4	2.6
[1] 6-1-8-3-9	chinook	91'	f	159	64	135.0	05/11-05/18/92	3,076	28	N/A	N/A	05/15/92	5	24	20.2	2/
[1] 6-1-8-3-10	chinook	91'	f	159	64	135.0	05/11-05/18/92	2,861	32	N/A	N/A	06/02/92	23	20	4.4-6.3	2/
Trinity River hatchery releases																
6-1-4-1-5	spr chin	91'	f	34	104	TRH	06/05/92	198,277	11,911	0	1.1	06/09/92	5	319	28.8	15.2
6-1-4-1-4	fall chin	91'	f	37	105	TRH	06/22/92	207,467	3,842	375,123	2.8	06/23/92	1	460	144	19.7
06-56-58	spr chin	91'	y	8	159	TRH	10/02-10/15/92	110,797	1,070	263,434	3.4	10/05/92	3	190	48	2/
06-57-31	fall chin	91'	y	10	146	TRH	10/02-10/15/92	58,580	145			10/05/92	3	152	48	2/
06-57-32	fall chin	91'	y	10	146	TRH	10/02-10/15/92	56,720	200	818,496	8.1	10/05/92	3	176	48	2/
06-56-57	coho	90'	y	7	180	TRH	04/03/92	52,233	552	386,738	8.4	04/29/92	27	20	5.3	3.4
Iron Gate hatchery and off-site releases																
06-57-03	fall chin	90'	y	8	-	IGH	11/15/91	95,880	3,620	894,120	10.4	11/21/91	6	-	37.7	-
6-1-2-1-3	fall chin	91'	f	90	-	IGH	06/07/92	105,146	5,347			06/12/92	6	35	37.7	13.6
6-1-2-1-7	fall chin	91'	f	90	-	IGH	06/07/92	86,054	4,385	3,378,800	18.7	06/16/92	10	28	22.6	10.24
06-63-37	fall chin	91'	y	8	-	IGH	11/17/92	45,861	3,164			12/01/92	15	2	15.1	2/
06-57-02	fall chin	91'	y	8	-	IGH	11/17/92	43,115	2,902	832,356	10.4			0	2/	2/
06-63-34	fall chin	91'	y	10	145	Indian Cr	10/27/92	23,164	1,479	24,637	2.1	11/05	10	15	10.6	5
06-63-25	coho	90'	y	14	-	IGH	03/26/92	47,856	2,307	37,143	1.8	04/01/92	7	14	32.3	5.4

f = fingerling release; y = yearling release

[1] *Naturally produced chinook captured and released with Ad/CWT by the Trinity Fisheries Investigations Project conducted by the California Department of Fish and Game.*

2 *Information was not available due to extended release periods.*

Appendix 34.

1993 Klamath River Basin CWT release groups.

Trinity River releases groups								Tagging rates				CWT recoveries at trap site			Migration rates	
Tag code	Race	Brood year	Release Type	Size @ release #/lb	Size @ release mm	Release site (rkm)	Release date/s	# Correctly Tagged	shed tags	# not tagged	Production Multiplier	Date of first capture	Days after Initial release	# Captured	Initial Rate (rkm/day)	10-90% Mean Rate km/d
CDFG Natural Stocks Codes																
[1] 6-1-8-4-2	chinook	92'	f	378	48	148.1	03/26-04/09/93	9,816	132	N/A	N/A	06/14/93	80	11	1.4-1.2	2/
[1] 6-1-8-4-3	chinook	92'	f	252	54	133.7	05/11-05/14/93	7,780	303	N/A	N/A	06/12/93	32	11	3.1-2.9	2.2
[1] 6-1-8-4-4	chinook	92'	f	216	57	133.7	05/14-05/16/93	7,494	302	N/A	N/A	06/15/93	32	15	3.1-2.9	1.9
[1] 6-1-8-4-5	chinook	92'	f	216	57	133.7	05/16-05/18/93	6,568	205	N/A	N/A	06/15/93	30	16	3.3-3.1	2.3
[1] 6-1-8-4-6	chinook	92'	f	206	58	133.7	05/18-05/26/93	4,914	100	N/A	N/A	05/25/93	7	23	14.2-6.7	2/
[1] 6-1-8-4-7	chinook	92'	f	197	62	133.7	05/18-05/26/93	7,993	219	N/A	N/A	06/15/93	28	13	14.2-6.7	2/
Trinity River hatchery releases																
6-1-4-1-6	spr chin	92'	f	45	94	TRH	06/15/93	215,038	11,556	261,625	**2.3**	06/19/93	4	90	36	16.6
6-57-33	fall chin	92'	f	66	77	TRH	06/16/93	192,032	22,051	2,127,954	**12.2**	06/21/93	5	102	28.8	7.4
06-57-34	spr chin	92'	y	11	153	TRH	10/01-10/07/93	53,675	852	0		10/04/93	3	102		
06-57-35	spr chin	92'	y	11	150	TRH	10/01-10/07/93	56,281	765	373,687	**4.4**	10/04/93	3	132	48-16	2/
06-57-48	fall chin	92'	y	15	133	TRH	10/01-10/07/93	54,586	116	0		10/04/93	3	225		
06-57-49	fall chin	92'	y	15	132	TRH	10/01-10/07/93	54,308	710	861,868	**8.9**	10/04/93	3	186	48-16	2/
06-56-62	coho	91'	y	8	165	TRH	03/29/93	53,058	1,133	330,364	**7.2**	04/02/93	4	169	36	3.3
Iron Gate hatchery and off-site releases																
6-1-2-1-9	fall chin	92'	f	81	-	IGH	06/15/93	95,109	5,005	0		06/28/93	13			
6-1-2-1-8	fall chin	92'	f	81	-	IGH	06/15/93	90,355	10,262	3,114,848	**17.9**	06/28/93	13	15	17.4	9.3
06-59-02	fall chin	92'	y	8	-	IGH	11/02-11/03/93	74,024	3,326	873,000	**12.8**	No fall monitoring conducted in 1993				
05-33-41	fall chin	92'	y	8	-	Camp Cr.	10/25-10/31/93	23,925	563	0	**1.0**					

f = fingerling release; y = yearling release

[1] *Naturally produced chinook captured and released with Ad/CWT by the Trinity Fisheries Investigations Project conducted by the California Department of Fish and Game.*

2 *Information was not available due to extended release periods.*

Appendix 35

1994 Klamath River Basin CWT release groups.

Trinity River releases groups								Tagging rates				CWT recoveries at trap site			Migration rates	
Tag code	Race	Brood year	Release Type	Size @ release #/lb	Size @ release mm	Release site (rkm)	Release date/s	# Correctly Tagged	shed tags	# not tagged	Production Multiplier	Date of first capture	Days after Initial release	# Captured	Initial Rate (rkm/day)	10-90% Mean Rate km/d
CDFG Natural Stocks Codes																
[1] 6-1-8-2-12	chinook	93'	f	1008	37.1	131.0	02/11-03/08/94	9,177	348	N/A	N/A	05/01/94	79	16	1.3-0.96	2/
[1] 6-1-8-2-13	chinook	93'	f	782	40.1	131.0	03/10-03/15/94	8,648	706	N/A	N/A	06/02/94	84	29	1.2-1.12	2/
[1] 6-1-8-2-14	chinook	93'	f	667	41.6	131.0	03/11-03/16/94	7,125	105	N/A	N/A	05/31/94	81	26	1.23-1.16	2/
[1] 6-1-8-2-15	chinook	93'	f	381	46.1	131.0	03/22-04/02/94	9,999	138	N/A	N/A	05/31/94	70	19	1.42-1.23	2/
[1] 6-1-8-3-11	chinook	93'	f	354	47.6	131.0	04/02-04/06/94	11,443	186	N/A	N/A	04/09/94	7	53	14.2-9.0	2/
[1] 6-1-8-3-12	chinook	93'	f	278	53.9	131.0	04/06-04/07/94	10,856	165	N/A	N/A	04/10/94	4	50	24.9-19.9	1.5
[1] 6-1-8-3-13	chinook	93'	f	278	53.9	131.0	04/08-04/09/94	11,699	11	N/A	N/A	04/13/94	5	41	19.9-16.2	1.8
[1] 6-1-8-5-2	chinook	93'	f	278	53.9	131.0	04/09-04/12/94	11,838	246	N/A	N/A	05/28/94	49	67	2.0-1.9	2
[1] 6-1-8-5-3	chinook	93'	f	278	53.9	131.0	04/09-04/12/94	10,113	209	N/A	N/A	05/27/94	48	37	2.1-1.95	1.6
[1] 6-1-8-5-4	chinook	93'	f	268	51.6	131.0	05/27-05/27/94	1,588	0	N/A	N/A	06/01/94	5	29	19.9	2.9
Trinity River hatchery releases																
6-1-4-1-7	spr chin	93'	f	53	84.4	TRH	06/01-06/10/94	222,056	2,607	1,275,959	**6.8**	06/10/94	9	1385	16-8.4	2/
6-57-4	fall chin	93'	f	87	72.8	TRH	06/10-06/15/94	201,032	1,243	0	**1.0**	06/24/94	14	1666	21.9-17.7	2/
6-57-5	fall chin	93'	y		139	TRH	10/03-10/14/94	55,039	11	50,357		10/06/94	3	386	48.0-13.1	2/
6-57-6	fall chin	93'	y		132	TRH	10/03-10/14/94	55,349	1,657	50,640		10/06/94	3	477	48.0-13.1	2/
6-57-8	spr chin	93'	y		147	TRH	10/03-10/14/94	53,738	510	331,535		10/06/94	3	385	48.0-13.1	2/
6-57-9	spr chin	93'	y		148	TRH	10/03-10/14/94	57,787	112	356,523		10/06/94	3	492	48.0-13.1	2/
All TRH grouped								221,913	2,290	789,055	**4.6**					2/
6-57-60	coho	92'	y	10	151	TRH	03/15-03/28/94	54,723	166	426,067	**8.8**	04/19/94	35	59	4.1	2/
Iron Gate hatchery and off-site releases																
6-1-2-1-10	fall chin	93'	f	84		IGH	06/15/94	103,275	7,032	2,614,646		6/20/94	5	216	50	17.6
6-1-11-3-7	fall chin	93'	f	109		IGH	06/15/94	24,023	1,635	608,167		06/21/94	6	104	49.9	14.2
6-1-11-3-8	fall chin	93'	f	107		IGH	06/15/94	24,011	1,635	607,884		06/23/94	8	93	30	13.2
6-1-11-3-9	fall chin	93'	f	122		IGH	06/15/94	30,736	2,092	778,109		06/29/94	14	59	16.7	12.5
6-1-11-3-10	fall chin	93'	f	136		IGH	06/15/94	6,517	443	164,976		06/29/94	14	13	19	11
All IGH grouped								188,562	12,837	4,773,782	**26.4**			485		14.5
6-59-2	fall chin	92'	y	8		IGH	11/02-11/03/93	74,024	3,326	873,000	**12.8**	3/	-	-	-	-
5-33-41	fall chin	92'	y	8		Camp Cr.	10/25-10/31/93	23,925	563	0	**1.0**	3/	-	-	-	-
5-36-9	fall chin	93'	y	6		Red cap	10/24-10/31/94	6,279	194	0	**1.0**	11/01/94	8	7	28.2-15.1	-
5-36-10	fall chin	93'	y	8		Camp Cr.	11/08-11/15/94	24,204	621	0	**1.0**	11/16/94	8	51	28.2-15.1	-
6-63-19	fall chin	93'	f	12.2		IGH	06/01-11/17/94	16,399	824	177,787						
6-63-33	fall chin	93'	f	12.2		IGH	06/01-11/17/94	27,335	1,374	296,353						
6-63-36	fall chin	93'	f	12.2		IGH	06/01-11/17/94	23,274	1,170	252,350		11/22/94	5	21	45.2	-
All IGH grouped								67,008	3,368	726,490	**11.9** [4]					

f = fingerling release; y = yearling release

[1] *naturally produced chinook captured and released with Ad/CWT by the Trinity Fisheries Investigations Project conducted by the California Department of Fish and Game.*

[2] *Information was not available due to extended release periods.*

[3] *Yearling releases conducted in the fall of 1993, no monitoring was conducted during that fall period thus valid migration computations were not possible.*

[4] *31,091 fingerlings inadvertently released in the spring not included in the production multiplier. Migration results are for those fish captured in the Fall monitoring period after 11/17/94.*

Appendix 36.

1995 Klamath River Basin CWT realease groups.

Tag code	Race	Brood year	Release Type	Size @ release #/lb	Size @ release mm	Release site (rkm)	Release date/s	Tagging Rates: # Correctly Tagged	Tagging Rates: shed tags	Tagging Rates: # not tagged	Tagging Rates: Production Multiplier	CWT recoveries at trap site: Date of first capture	CWT recoveries at trap site: Days after initial release	CWT recoveries at trap site: # Captured	Migration rates: Initial Rate (rkm/day)	Migration rates: 10-90% Mean Rate km/d
Trinity River Hatchery releases																
6-1-4-1-8	fall chin	94'	f	160	67.4	TRH	06/01-06/09/95	107,935	2,315	1,001,553	**10.3**			10		
6-50-21	fall chin	94'	f	123	71.4	TRH	06/01-06/09/95	54,625	109	466,356	**9.5**			8		
6-50-22	fall chin	94'	f	123	71.9	TRH	06/01-06/09/95	53,516	432	467,141	**9.7**			6		
ALL fall chin								216,076	2,856	1,935,050	**10.0**	07/02/95	31-39	70	4.6-3.6	/2
6-52-20	spr chin	94'	f	63	-	TRH	06/06-06/09/95	113,236	455	1,345,225	**12.9**	06/17/95	3-5	94	48-28.9	/2
Coho (not tagged)		93'	Y	10.3		TRH	03/15-03/29/95			493,968	**N/A**					
Coho (not tagged)		93'	Y	3.4		TRH	03/15-03/29/95			56,015	**N/A**					
Iron Gate hatchery releases																
6-1-2-1-13	fall chin	94'	f	80.6	-	IGH	06/14-06/16/95									
6-1-2-1-14	fall chin	94'	f	80.6	-	IGH	06/14-06/16/95									
6-1-2-1-15	fall chin	94'	f	80.6	-	IGH	06/14-06/16/95									
6-1-2-2-1	fall chin	94'	f	80.6	-	IGH	06/14-06/16/95									
All chinook								194,644		4,718,813	**25.2**	06/26/95	13	335	24	12.8

f = fingerling release

1 *Preliminary information from California Department of Fish and Game.*

2 *Trapping did not extend past July, its possible fingerlings remained upstream past July and thus mean migration rates and duration calculations not possible.*